

1284Port

**IEEE 1284 Level II Parallel Port for the PC
Installation Manual
Release 2.1**



Federal Communications Commission
R.F. Interference Statement

Warning: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Notice to user: Use of a shielded cable is required for FCC compliance. Please contact Warp Nine Engineering if you experience any problems.

SOFTWARE LICENSE AGREEMENT

1284Port software (FASTLPT.SYS, LISTIO.EXE, XIR_EPP.COM, SETCNF.EXE and SETMODE.EXE) is owned by Warp Nine Engineering, which reserves all rights. The purchaser of 1284Port has been granted a single user license to use the 1284Port software in conjunction with the 1284Port PC card that it was originally sold, or with any subsequent authorized replacement card. No warranty, expressed or implied, pertaining to the software's fitness for any purpose is contained in this agreement.

WARRANTY INFORMATION

The 1284Port card is warranted by Warp Nine Engineering, to the original purchaser, to be free of defects in materials and workmanship for three (3) years from the date of original purchase. Warp Nine Engineering makes no other warranties, expressed or implied, including implied warranties of merchantability and fitness for purpose.

During the warranty period, if a component is proven to be defective, Warp Nine Engineering will repair or replace it, at our option, with no charge for parts or labor, when returned to Warp Nine Engineering with dated proof of purchase. This warranty does not apply to any component which has been misused, defaced, or modified, or which has been serviced or repaired by other than Warp Nine Engineering.

This warranty gives you specific legal rights. You may have other rights which vary from state to state.

Important: Terms of warranty require that the proof of purchase date be presented by the owner to obtain warranty service. Please retain your dated sales receipt.

1284Port

IEEE 1284 Parallel Port for the PC

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INTRODUCTION TO 1284PORT

Thank you for your purchase of the Warp Nine Engineering 1284Port I/O card. The 1284Port provides the user one high performance IEEE 1284 level II compliant parallel port and two enhanced 16550 UART compatible serial ports. The IEEE 1284 type C connector on this card is provides for simple attachment and removal of parallel port cables.

The use of this card requires an IEEE 1284 compliant cable assembly with a type C connector on one end. For use with older standard printers, the other end would be a type B connector. For use with the latest printers, such as the Hewlett-Packard Laserjet 5P/5MP™, the other end would be a type C connector.

You may order these cables assemblies from Warp Nine Engineering:

FP-CB-xx	Standard type C to type B (old printer connector)
FP-CC-xx	Type C to type C
where xx is	10 for 10 feet
	20 for 20 feet
	30 for 30 feet
	50 for 50 feet

Parallel Port Features:

- IEEE 1284 Level II electrical interface
 - Longer cable drive
 - Higher Performance
 - Easy to use
- 1284 Type C connector
- ECP - Extended Capabilities Port protocol
- EPP - Enhanced Parallel Port protocol
- DMA capable- Channel 1 or 3
- Fast Centronics autostrobe
- I/O base address- 278 or 378
- IRQ selection - 5, 7, 12, 15
- 1284 EPP BIOS for DOS included
- DOS LPT Driver included

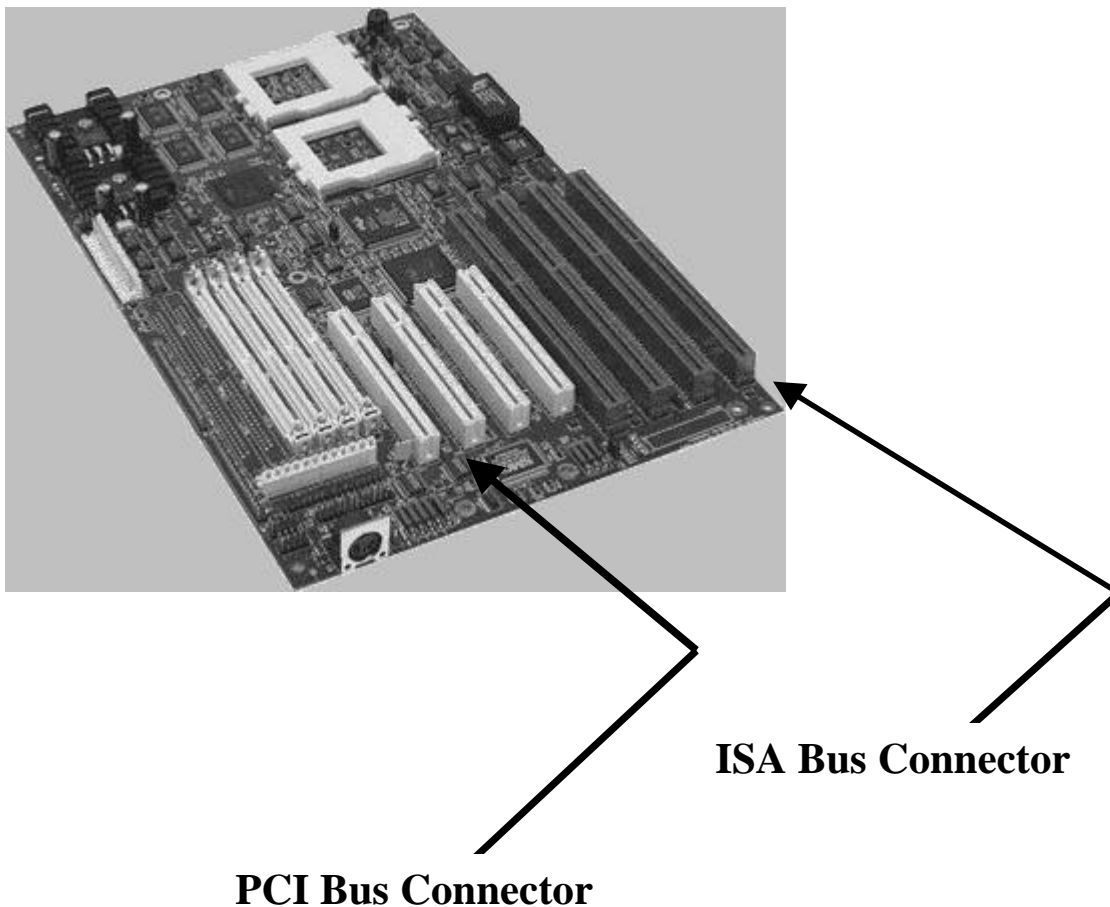
Serial Port Features:

- High Speed NS16C550 UART
- Programmable baud rate up to 115.2K baud
- MIDI capable
- 16 Byte FIFOs
- Configurable I/O address base for COM ports 1-4
- COM IRQs- 3, 4, 5, 9, 10, 11
- DB9 and a DB25 Connector

SYSTEM REQUIREMENTS

The 1284Port card will operate with any 286, 386, 486 or Pentium based personal computer with an ISA bus. The card will fit into any open ISA connector. The card will not fit into a PCI connector. See figure below.

Software is provided for enhanced operation under DOS, Win3.1 and Window for Workgroups 3.11. Operation under Win95 and Windows NT use the standard operating system drivers and require no additional software.



INSTALLATION

These instructions will guide you through the installation of the 1284Port I/O card. The steps include:

- Determining your system configuration
- Configuring the serial ports
- Configuring the parallel port
- Setting the Card Number
- Setting the DMA Channel
- Installing the 1284Port I/O card in the PC
- Configuring the software
- Installing the software

Determining Your System Configuration

In order to perform the setup and install of your 1284Port card, you will need to know what settings to use for the parallel port base address, IRQ, and serial port settings. This is easily done by running the LISTIO program from DOS or a DOS window running under Windows.

Use these steps to determine the current configuration of your system.

Run the LISTIO program. Insert the 1284Port diskette into your floppy drive (drive A for example) and type the following command:

```
A:LISTIO<return>
```

This will display the current settings of the installed COM and LPT ports, similar to the following:
I/O and LPT Ports are installed at addresses:

```
COM1 = 3f8h  
COM2 = 2f8h  
COM3 = 3e8h  
COM4 = 2e8h  
LPT1 = 3bch  
LPT2 = 378h  
LPT3 = 278h
```

The following table shows the system configuration for a PC with all the standard LPT and COM ports filled. Your PC should have some of these settings set to 000h. 000h indicates there is no board or port installed at that location. A LISTIO of a “typical” PC will look like the following:

I/O and LPT Ports are installed at addresses:

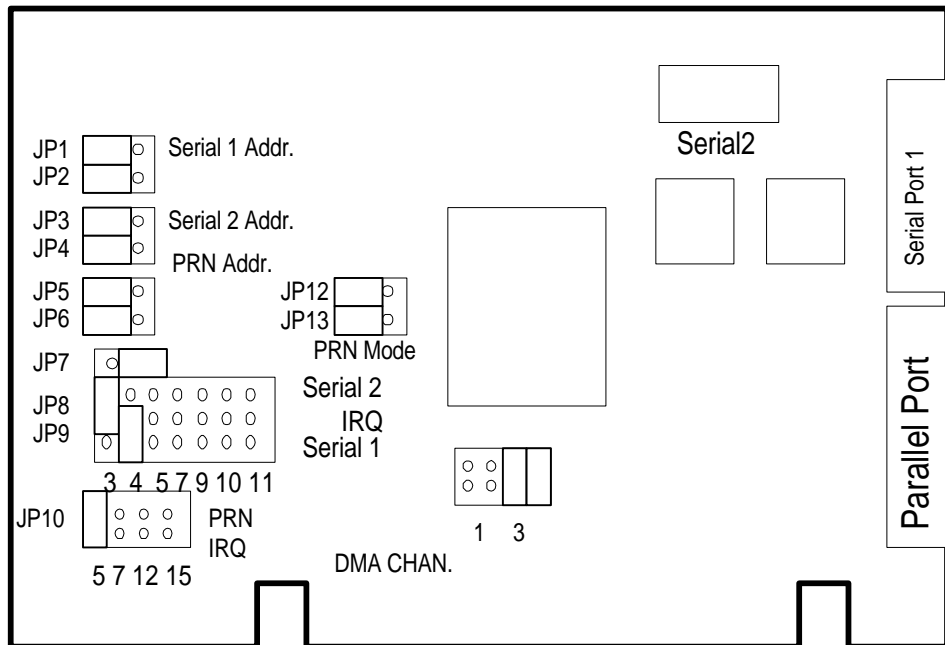
COM1 = 3f8h
COM2 = 2f8h
COM3 = 000h
COM4 = 000h
LPT1 = 3bch
LPT2 = 000h
LPT3 = 000h

This table shows that the PC has 2 COM ports installed, COM1 and COM2, at addresses 3f8h and 2f8h respectively. This means that up to two additional COM ports could be installed for COM3 and COM4. The table also shows that this PC has only one LPT (parallel port) installed (or configured) at address 3bch, and that up to two more LPT ports can be installed for LPT2 and LPT3.

Using this information, you will be able to set the jumpers on the 1284Port card so they do not conflict with the currently installed devices.

Hardware Configuration

The following diagram identifies the jumpers and connectors on the 1284Port card. The diagram also shows a typical Jumper configuration.



Configuring the Serial (COM) Ports

Refer to the table displayed by the LISTIO program to determine the I/O addresses used by the installed COM ports on your PC.

Locate the **Serial 1, 2 Addr.** Jumper Blocks; JP1-4 on the card. Using the following tables, identify an available I/O address and jumper setting for each of the serial ports.

An **L** in the jumper columns refers to placing the jumper on the left two pins. An **R** refers to placing the jumper on the right two pins.

JP1	JP2	Serial 1 Address
L	L	3F8 Default
L	R	2F8
R	L	3E8
R	R	Disabled

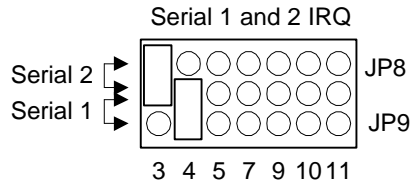
JP3	JP4	Serial 2 Address
L	L	2F8 Default
L	R	3F8
R	L	2E8
R	R	Disabled

Configuring the Serial (COM) Port IRQs

Locate the **Serial2, IRQ, Serial1** Interrupt Request Jumper Blocks; **JP8-9** on the card. Jumper Block **JP8** is used to set serial port 2, and **JP9** is used to set serial port 1.

Note that the COM ports on the PC may share the IRQ settings. COM 1 and 3 typically use IRQ 4 and COM 2 and 4 use IRQ 3. This may cause problems with some PC configurations. With the 1284Port card you may choose additional IRQ settings for these ports. If you do not use IRQ 3 and 4, you should make sure that your software will allow you to setup the IRQ to the number you have chosen. Please check your application software setup if you have any problems with your serial ports. If you are running Win95 you can change the COM port IRQ by using the Device Manager, found under the System setting in the Control Panel.

The available interrupts for the serial ports 1 and 2 are **3, 4, 5, 7, 9, 10, 11** as indicated in the following. These interrupts are set via **JP8** and **JP9**.



The Jumper at Pins 1 and 2 (from top row) are used to set the IRQ for serial port 2. The default is IRQ3. Pins 2 and 3 (bottom row) are used to set the IRQ for serial port 1. The default is IRQ4. If you are installing more than 2 COM ports in your PC, you may choose another IRQ for these ports. We do not suggest using IRQs 5 or 7 since these may interfere with your parallel port or network.

Again, check your application software setup if you have any problems with your serial ports.

Configuring the LPT (Parallel) Port

I/O Base Address

Refer again to the table displayed by the LISTIO program to determine the I/O addresses used for the installed LPT ports on your PC.

Locate the PRN ADDR. Jumper Blocks; JP5-6 on the card. An L in the jumper columns refers to placing the jumper on the left two pins. An R refers to placing the jumper on the right two pins. Use the following table to set the jumpers of the PRN ADDR. block to the desired (and unused) base address:

JP5	JP6	PRN ADDR.
L	L	278 (default)
L	R	378
R	L	Do Not Use
R	R	Disabled

I/O 378- PC default LPT2 address

I/O 278- PC default LPT3 address

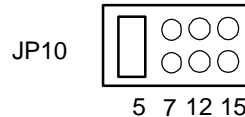
Do Not Use - This setting actually sets the LPT port to address 3BCh. This setting **CANNOT** be used if the LPT port is to be used for a device that operates in the EPP mode. An Iomega zip drive is an example of a device that should not be used at this address. This setting can be used if the port will be used for standard or ECP only. A Hewlett-Packard printer would be an example of a device that could use a LPT port at this setting.

NOTE: **BIOS** assigns the parallel port to LPT1, 2 or 3, dependent on the address. The highest address is assigned to LPT1 and then the next highest is assigned to LPT2, etc. The card must be installed as LPT1 or LPT2 in order to operate under Microsoft Windows 3.1 or 3.11.

Interrupt Request (IRQ)

Next, locate the **PRN IRQ** Jumper Block **JP10** on the card. Set the **PRN IRQ** jumper to the desired setting for the LPT port. The following identifies the general usage for IRQ settings:

IRQ	Description
5	Standard LPT2 setting (default)
7	Standard LPT1 setting
12	General purpose AT interrupt
15	General purpose AT interrupt

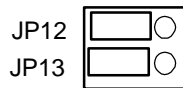


Setting the Card Number

This setting must be met. Locate the **CARD NUMBER** Jumper Block **JP7** on the card. Set the **CARD NUMBER** Jumper Block to **2**.

Setting the Printer Mode

This setting must be met.. Locate the **PRN Mode** Jumper Blocks **JP12,13** on the card. Set the **PRN Mode** Jumper Blocks as shown in the following.



DMA Channel Setup

Some software drivers may use Direct Memory Access (DMA) to transfer data to the 1284Port card. The card may be set to use DMA channel 1 or 3 by setting both **DMA CHAN. 1,3** jumpers to the appropriate setting. If you install two 1284Port cards, be sure they are configured to different DMA channels. Win95 operates best when a DMA channel is available for an ECP device on the parallel port. The FASTLPT driver and EPP mode drivers do not use DMA.

Connecting the Serial2 (COM) Port

If you are installing the second serial port, locate the **Serial2** COM port connector **J1** on the card. Locate pin No. 1 on the port connector (bottom row). Align this pin with the RED striped pin on the connector cable. Insert carefully, making sure no pins are bent and are fully seated. The other end of the cable is now ready for connection to a device.

Installing the 1284Port card in the PC

Now that the jumpers have been setup you may install the 1284Port card in to your PC. The card may be installed in either an 8 bit or 16 bit I/O ISA slot if you are using PRN IRQ 5 or 7 and COM Port IRQ 3 and 4 only. If you are using PRN IRQ 12 or 15, or COM IRQ 9, 10, or 11, then the card must be installed in a 16 bit I/O ISA slot.

SOFTWARE INITIALIZATION

The software installation is dependent upon the operating system being used. Refer to the section that describes the operating system you are using.

Win95

Unlike previous operating systems, Windows 95 (Win95) automatically recognizes the 1284Port card as "ECP Printer Port" and installs the correct driver to utilize the card features for printing. Depending upon the particular printer, Win95 will utilize either the ECP mode or the Fast Centronics mode for printing. These instructions will provide the information necessary to optimize these cards with Windows 95. Please note that the Win95 driver does not automatically load any EPP driver. This must still be provided by the EPP peripheral manufacturer

Installation:

1. Install the card into the PC according to the manual. Please make a note of the I/O Base Address (278 or 378), the DMA Channel (1 or 3) and the interrupt IRQ (5, 7, 12 or 15) setting that you previously selected with the appropriate jumper settings.
2. Power ON your PC and boot into Windows 95.
3. Double-click on "My Computer", then "Control Panel".
4. Double-click on "Add New Hardware". Proceed through the installation wizard and allow Win 95 to automatically identify new hardware. When this process is complete, the new parallel port should be recognized as an "ECP Printer Port". You can verify this by selecting "Settings", then "Control Panel", then "System", then "Device Manager".

When the Device Manager window is displayed, scroll down until you see "Ports (COM and LPT)". Double click this and you should see your new port displayed as "ECP Printer Port (LPTx)" where x is either 1, 2 or 3. At this point, your new card is installed and ready to use.

5. You may increase the capabilities of the card by enabling the IRQ and DMA features. This is done by the following process:
 - a. Return to the "Device Manager" until you see the ECP Printer Port you installed.
 - b. Double-click on the ECP Printer Port that you installed. This will bring up the Port Properties window.
 - c. Click on "Resources". This will bring up the port configuration.
 - d. Click on the box "Use automatic settings". This will clear the box.

- e. Click on the box "Setting based on:" and choose "basic configuration 2". This will display a new resource list that will include the following (for example):

Input/Output Range	0278-027A
Interrupt Request	03
Direct Memory Access	01

- f. If the values displayed next to each item do not match the choices you made when you installed the card then double-click on the resource and modify its setting to match the jumper settings of the installed card.
- g. When all of the resource settings match the installed card, select "OK". This will cause your PC to restart. At that time the card should be set and the port ready to use.

DOS and Win3.1

If you are installing this card for use under DOS or Win3.1, Win3.11, then you will need to install a driver to enable fast Centronics printing for these operating systems. This software does not provide an ECP driver for ECP printers. The card will support the ECP mode, but the driver must be provided by the peripheral manufacturer.

Use these steps to install the software and update your CONFIG.SYS file.

1. Insert the 1284Port diskette into drive A: or B:
2. Create a FPORTPLS directory on your C: drive by typing:
md fportpls
3. Copy the contents of the diskette to the FPORTPLS directory:
copy A: or B:*. * C:\FPORTPLS
4. Change directories to the FPORTPLS directory:
cd fportpls
5. Run the LISTIO program to determine the current I/O configuration of your PC. This will provide you with the I/O addresses of the serial and parallel ports currently installed. Using this information, set the jumpers on the 1284Port card so that they do not conflict with the currently installed devices.
6. Edit your CONFIG.SYS file and add the following line BEFORE any other parallel port device:

edit config.sys

```
DEVICE=C:\fportpls\FASTLPT.SYS -c{1, 2} -p{278, 378} -m{BIDI,  
EPP}
```

Where: c is the card number 1 or 2
 p is the port address 278 or 378
 m is the default mode for this port:
 BIDI Bidirectional Mode
 EPP EPP Mode

Example: DEVICE=C:\fportpls\FASTLPT.SYS -c2 -p278 -mEPP
This would set the card at address 278 to EPP on power-up.

Example: DEVICE=C:\fportpls\FASTLPT.SYS -c2 -p378 -mBIDI
This would set the card at address 378 to BIDI mode on
power-up.

**NOTE: REMEMBER TO INSTALL THIS COMMAND LINE BEFORE ANY
OTHER PARALLEL PORT DEVICE DRIVERS.**

Refer to the following sections for more information on these options.

7. Install the 1284Port card into the PC, turn on the power and happy printing!

DOS and WIN 3.1 PRINTING

The FASTLPT.SYS device driver provides a high speed Centronics mode for printing under DOS. The driver utilizes the fast Centronics FIFO mode available on the 1284Port I/O card. This mode is capable of delivering data to the printer at rates of up to 500KBytes per second in burst mode. It should be noted that the printer must be capable of accepting the data this fast. In any case, the 1284Port will deliver the data to the printer as fast as the printer can accept it.

EPP and ECP modes are not supported for printing.

The FASTLPT.SYS device driver is an LPTx DOS driver. This driver replaces the regular DOS LPT driver and implements a high speed Centronics style protocol for data transfer to the printer. To take advantage of the *fast* printing, use the following command to print files to your laser printer:

```
"COPY /b <filename> LPTx"
```

where x is either 1, 2 or 3 depending on how the card was configured. To use this card under Microsoft Windows, the card must be installed as LPT1 or LPT2. The /b option must be used to take advantage of the driver.

DOS Application Printing

In order for DOS applications to take advantage of the fast printing capability of the 1284Port, the application print driver must use DOS to print to the printer. First set the driver to print to the correct LPT port. If you do not see any noticeable gain in printing performance, then set the application to print to a file. The file name should be set to LPTx, where x is either 1, 2 or 3, depending on how the card was configured.

WINDOWS PRINTING

The 1284Port card will operate under Windows 3.1 or 3.11. To use the fast LPT driver, go to the "Control Panel", select "Printers" and then select the "Connect" option. Connect your printer to the LPT1.DOS or LPT2.DOS option. This will invoke the fast Centronics DOS driver for printing through Windows.

Printing performance will vary depending upon the application and printer being used.

This driver will only operate in fast Centronics (FIFO) mode.

PRINTER AND PERIPHERAL CABLING

A word of caution is required concerning the use of “standard” parallel port printer cables.

The 1284Port interface is compliant with the IEEE 1284 level II electrical interface specification. This means that performance is guaranteed at cable lengths up to 30' when connected to a 1284-compliant peripheral. The cable must be IEEE 1284-compliant in order to guarantee this performance.

IEEE 1284-compliant cables have, among others, the following features:

- 17 twisted pairs of conductors
- Full foil shield
- Wire braid
- Controlled impedance- 62 ohm
- Limited crosstalk

These features will guarantee that the cable will perform at the much higher bandwidth rates that the fast Centronics, EPP and ECP modes perform at.

“Standard” parallel port cables may have only 17 wires with a drain wire, unmatched, with uncontrolled impedance and lots of crosstalk. If you are using this kind of cable you may experience data errors! These may be reported by the printer as Paper Empty (when there is paper in the tray), unknown error, or data errors in the printed data. For example, on the Hewlett-Packard LaserJet 4 series of printers, this would appear as an "Error 22" error.

If you experience any of these symptoms please contact Warp Nine Engineering to purchase a 1284-compliant cable, they are readily available:

FP-CB-xx	1284Port to old printer connector
FP-AC-xx	1284Port to DB25
FP-CC-xx	1284Port to 1284 Level II peripheral (HP LJ5P, Tektronics Phasor, for example)

where xx is	10 for 10 feet
	20 for 20 feet
	30 for 30 feet
	50 for 50 feet

ADDITIONAL INFORMATION AND SOFTWARE UTILITIES

Iomega zip drive and Visioneer Strobe Scanner

Warp Nine's 1284Port is the easiest way to get the best I/O performance required by today's peripherals. Products such as the Iomega zip drive and the Visioneer Strobe color scanner are designed to take full advantage of this card. This is the card most recommended by peripheral manufactures as the premium parallel port to get the most out of your PC and your peripheral.

This section provides answers and solutions to common questions and problems. If this section does not provide the answer or solution you need, please contact Iomega Customer Support.

The following are the most common questions we get from customers and technical support types.

Q. How fast will the zip drive go using the 1284Port card?

- A. Actual performance is dependent upon the setup of the PC, it's memory, the applications that are running, and how the performance is being measured.

Some sources quote 20 to 30MBytes per minute with the zip drive. In reality, it is almost impossible to quote specific performance for a peripheral. These performance specs are given for a system running under DOS, with no other applications running.

Similar to the claims of color ink jet printer manufacturers. They may claim "4 pages per minute" on the box, but sometimes it's more like "4 minutes per page". You can get the former if you are printing blank pages, but that's not very useful.

What we guarantee is that with this card you will get the best performance possible with your particular system.

Q. My Hewlett-Packard or Canon printer won't work with the zip drive or scanner. What's wrong with the zip or scanner?

- A. Absolutely nothing! The problem is with the software that drives the printers. Many printers don't like to share the parallel port, so the software drivers refuse to give it up for another device to use.

In this case, the best solution is to add another parallel port to your system. Connect the printer to the old port, and use the new port for your zip drive, scanner and other sharable peripherals.

The zip drive and Strobe scanner are designed to work together and may be daisy chained without any problem. Just plug the scanner into the pass-through port of the zip drive and you're ready.

Q. I installed the 1284Port and attached my zip drive to it, but the system can't find the zip drive. What's wrong?

- A. If you have previously installed the zip drive to your old parallel port, let's say LPT1, and you then installed the 1284Port as LPT2. You must reinstall the zip_drive so that it will be set up properly.

After you get the 1284Port installed, uninstall or delete the Iomega zip drive from your system. Then connect the zip drive to the new parallel port and rerun the zip drive install program. The zip should then work fine.

Q. If I still have problems, is there an alternative method for installing the zip drive?

- A. There is a "brute force" method that should always work. This will work for Win95 only.

Try the following:

- a. Click on "Start"
- b. Go to "Settings"
- c. Click on "Control Panel"
- d. Click on "Add New Hardware"
- e. Click on Next
- f. Select 'No' to "Search for new hardware"
- g. Scroll down the components list and double click on "SCSI Controllers"
- h. Click on "Have Disk". Insert the Iomega install diskette in Drive "A:"
- i. Browse the A: drive and select "Iomega Parallel Port zip Interface"
- j. Select "Finish"
- k. Verify the zip drive is installed on the correct port and has power applied.
- l. Restart Windows 95

Q. How do I know I'm getting the very best performance possible with my new parallel port and zip drive?

- A. After you've installed the zip drive, run the Iomega utility program "Parallel Port Accelerator". This should set you up with the fastest transfer rate possible for your configuration. If you're still not satisfied, or you don't think it worked properly, do the following (againWin95 only):

- a. Go to "Control Panel"
- b. Double-click on "System"

- c. Click on "Device Manager"
- d. Scroll down the list until you see "SCSI controllers"
- e. Double-click on "SCSI controllers"
- f. Double-click on "Iomega Parallel Port zip Interface"
- g. Click on "Settings"
- h. If the settings box is empty ,then type the following into the box:
/mode:smcpepcp /port:278 /speed:6 (the /port:278 should be whatever you set
1284Port set to, 278 or 378.)
- i. Select "OK" and restart your computer.

This should get you the best performance with your machine.

Xircom Pocket Ethernet Adapter

DOS and Win3.1/3.11 ONLY

XIR_EPP.COM

This program is used to enable the Xircom Pocket Adapter in Enhanced Parallel Port mode. Run this program **in place of** the EPP.COM program distributed with the Xircom adapter. This will work for the PE3 adapter only. The PE2 and PEM will work with the 1284Port in EPP mode, but requires a software upgrade available from Xircom. Please contact Xircom Technical Support for more information on this. The 1284Port must be configured for EPP mode prior to loading the Xircom drivers. This may be done via the FASTLPT options in the CONFIG.SYS file or by using the SETMODE utility.

Usage: XIR_EPP -L{1, 2}
where -L1 is for LPT1 and -L2 is for LPT2

Example: XIR_EPP -L2 (instead of the EPP.COM provided by Xircom)
LSL These programs are provided by Xircom
PE2ODI
IPXODI
NETX

LISTIO.EXE

This program reads the BIOS table and displays the current COM and LPT port assignments.

SETMODE.EXE

This program is used to set the parallel port into bi-directional, EPP or ECP mode.

Usage: SETMODE <base_address> <mode>

Where:

base_address either 278h or 378h

mode either BIDI, EPP or ECP

Example: SETMODE 278 BIDI
 sets the parallel port at 278h to bi-directional mode.

SETCNF.EXE

This program is provided for developers. This routine enables you to read or write any of the 37C666 control registers. **CAUTION: There is no bounds checking for this program. Inappropriate use may cause erratic results.**

Usage: SETCNF <configuration_base> <r/w> <reg#> <data>

Where:

configuration_base the configuration base address of the controller,
 3F0h (card #1) or 370h (card #2).

r/w read or write option

reg# controller register number, 0-15

data byte data value if a write option

example: SETCNF 370 W 11 A5
 writes an 'A5' into register 11 of the controller which has the
 configuration register at 370.

example: SETCNF 3F0 R 2
 reads and displays the contents of register 2 of the controller which
 has the configuration register at 3F0.

Card Number	Configuration Address
1	3F0h
2	370h

TECHNICAL INFORMATION

Parallel Port Modes

This section is for individuals that are interested in more details about the various parallel port modes. The parallel port of the 1284Port directly supports four advanced modes of operation:

- Bi-directional Centronics
- Fast Centronics FIFO
- EPP - Enhanced Parallel Port
- ECP - Extended Capabilities Port

In addition to these modes, the 1284Port supports software drivers that operate in the following modes:

- Ordinary Unidirectional
- Nibble
- Byte

In the following descriptions, forward-channel or mode refers to the normal printing direction (ie: PC to printer), and reverse-channel refers to data transfer from the printer or peripheral to the PC (ie: scanning).

Bi-directional Mode

This mode operates as a regular IBM compatible parallel port for data transfer in the forward direction. This is the configuration of the standard parallel port and offers 100% compatibility with all parallel port devices.

This port can be set to an input port, read mode (reverse channel) by setting bit 5 of the parallel port control register (base + offset 2).

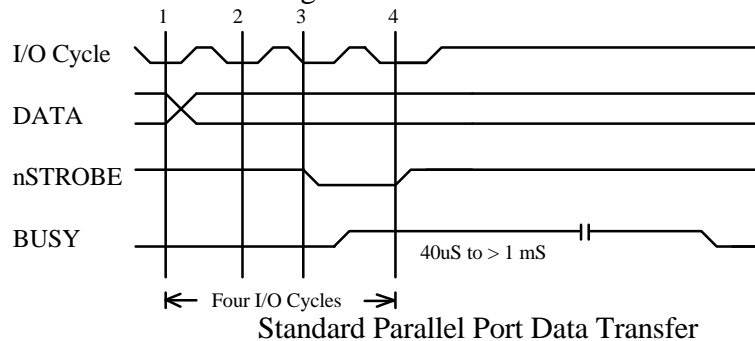
This mode is used by many peripheral devices such as portable tape backup systems such as the Colorado Memory Trakker 250, and the Mountain Network Solutions FileSafe SideCar.

Centronics Mode (or Compatibility Mode)

This usually refers to the 'basic, standard' way that data is transferred to printer. This is how all parallel port printers have operated, and is the default for almost all newer printers.

As an example of how the ordinary parallel port is used to transfer data, let's look at the sequence required to output a byte of data to a printer:

1. Write the data to the data register
2. Program reads the status register to check that the printer is not BUSY
3. If not BUSY, then Write to the Control Register to assert the STROBE line
- 4-Write to the Control register to de-assert the STROBE line



This diagram is used to show how data is transferred using the standard parallel port. As can be seen, it requires at least four I/O instructions to transfer one character of data. This is the primary limitation in the data transfer capabilities of the standard parallel port and limits its' performance to about 150Kbytes/sec.

Fast Centronics FIFO Mode

This is the mode used by the FASTLPT.SYS driver. In this mode, the printer interface is driven from a hardware state machine that transfers data from a FIFO on the 1284Port card to the printer. The state machine automatically generates the data STROBE and handshakes with the printers' BUSY status line.

The advantage of this mode is that the data is transferred to the 1284Port card with a single I/O instruction, and the 1284Port card then transfers the data to the printer.

This mode can transfer data up to 500KBytes per second and will work with any laser printer that supports the Centronics interface.

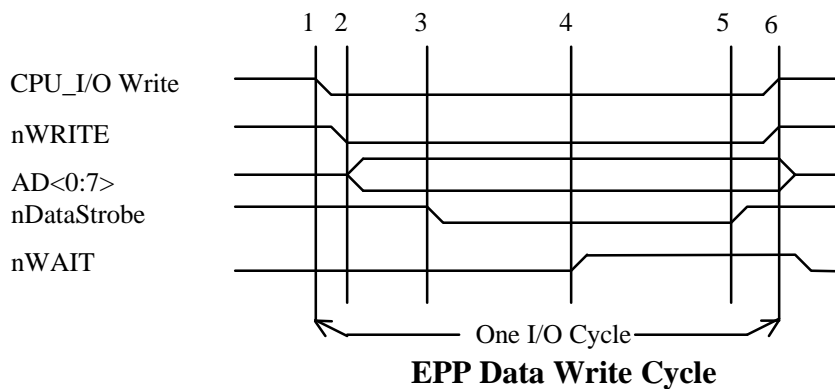
EPP- Enhanced Parallel Port Mode

The EPP mode is a new bi-directional parallel interface protocol defined by the IEEE 1284 standard. This mode provides for single instruction bi-directional data transfer between the host PC and the peripheral.

The interface hardware automatically generates the necessary strobes and interlocks with the peripheral to guarantee successful data transfer in the forward and reverse directions. This mode supports two types of data transfer: Address and Data cycles. EPP mode is used with peripherals that are "register oriented" in nature, ie: network adapters, disk drives, SCSI adapters, etc..

A Data_Write cycle example follows. The CPU signal nIOW is shown just to emphasize that the entire handshake sequence occurs within a single I/O cycle.

1. Program executes an I/O write cycle to port 4 (EPP Data Port)
2. The nWrite line is asserted and the data is output to the parallel port
3. The data strobe is asserted, strobing the data out.
4. The port waits for the acknowledge from the peripheral (nWAIT deasserted)
5. The data strobe is deasserted and the EPP cycle ends
6. The CPU I/O Write cycle ends



In order to enable this mode, both the PC interface adapter and the peripheral must support the EPP mode. When the 1284Port card is set to this mode, ordinary parallel port devices will operate but in standard parallel port mode. EPP mode is used by devices such as the Micro Solutions Backpack CD ROM drive, the Iomega zip drive and others.

ECP- Extended Capabilities Port Mode

The ECP mode is a new bi-directional parallel interface protocol also defined by the IEEE 1284 standard. This mode provides for FIFO buffers in both the forward and reverse channel directions in addition to the ability to have automatic RLE compression and decompression of the data streams.

The interface hardware automatically generates the necessary strobes and interlocks with the peripheral to guarantee successful data transfer in the forward and reverse directions between the FIFOs on the adapter card and the peripheral.

ECP mode is oriented at peripherals that are "block oriented" in nature, such as printers and scanners. **In order for this mode to work, both the PC interface adapter and the peripheral must support the ECP mode.** Printers such as the Hewlett-Packard Laserjet 5 series support the ECP protocol.

Nibble and Byte Modes

The Nibble and Byte modes of operation are also defined by the IEEE 1284 standard. These modes are for data transfer in the reverse direction only, ie: reading data from the printer or peripheral.

The Nibble mode of operation uses the printer status lines to transfer 4 bits of data at a time. The software driver must read two nibbles and then repack the data in to one byte. This mode should work with any IBM compatible printer adapter.

The Byte mode of operation uses the data lines to transfer one byte of data at a time. This mode requires that the parallel port support bi-directional control.

More Information on IEEE 1284

For more information on IEEE 1284, "*Standard Signaling Method for a Bi-directional Parallel Peripheral Interface for Personal Computers*" please contact the following sources of information:

- Warp Nine Engineering
- 1284 Information web site: <http://www.fapo.com/ieee1284.htm>

