

Ether•Write

2.0

User Manual

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Ether•Write User Manual, v. 2.0

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This product has been certified to comply with limits for a Class A computing device, pursuant to Subpart J of Part 15 of FCC Rules. It is designed to provide reasonable protection against radio or television communication interference in a commercial environment. Operation of this equipment in a residential area could cause interference with radio or television communication.

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About This Manual

This manual was designed to assist you in easily installing and configuring Ether•Write. The manual is divided into several sections that should provide you with all the information you will need to use Ether•Write in your particular network situation. If you have any difficulties during the installation or with the use of Ether•Write that are not answered by this guide, please call Compatible Systems Corporation or your Ether•Write dealer. Compatible Systems' phone number is listed on the front of this guide. We will be happy to help you.

What You Will Need

This part of the manual describes the contents of the Ether•Write package and emphasizes the preparation and equipment you will need to install Ether•Write.

AppleTalk Networking

This section will provide you with a quick overview of AppleTalk network systems in general and how Ether•Write will fit into your overall network. The information found here is introductory in content and may be skipped if you are already experienced with AppleTalk internets.

Hardware Installation

This part of the manual describes, step by step, how you physically connect Ether•Write to your network. This section also describes how to connect Ether•Write into a thick, thin, or twisted pair Ethernet cabling environment.

Ether•Write Manager Software

In most situations, once Ether•Write is physically connected to the network, it will configure itself automatically. This section will explain how to use the Ether•Write administration software to customize the configuration.

Appendices and Index

Additional information that might be of interest to you such as technical specifications and a quick reference to specific information can be found at the end of this guide.

About Ether•Write

Congratulations on your purchase of Ether•Write, a high speed dedicated LocalTalk to Ethernet converter which supports up to six LocalTalk printers, or other LocalTalk peripherals.

Once linked with Ether•Write, printers or other devices on LocalTalk can be transparently accessed by Macintoshes or other AppleTalk compatible devices on the Ethernet network. Ether•Write is fully compatible with bridges and routers from Compatible Systems and other vendors.

With Ether•Write you gain the flexibility of putting some of your LocalTalk devices directly on Ethernet, without the need for a full router.

Listed below are some of the basic features of Ether•Write:

- LocalTalk to Ethernet Converter
- Ethernet access to LaserWriters and other LocalTalk peripherals
- Advanced Flash ROM technology maintains network configuration
- Supports thick, thin and twisted-pair Ethernet
- Advanced Network Security Protocol (ANSP™)

A Few Notes

Please Read This Manual

The Ether•Write manual contains some very important information about Ether•Write and Ethernet networking in general. Please read the manual thoroughly; it's worth the few minutes it will take.

Also, please fill out the warranty registration card and return it to us today. This will help us keep you informed of updates to Ether•Write and future products available from Compatible Systems.

Warranty and Service

Ether•Write comes complete with a full one year warranty against manufacturing defects. Following this period, factory service is available.

If You Need Help With Ether•Write

If you have a question about Ether•Write and can't find the answer in this manual, please call us at Compatible Systems using the telephone number listed in the front of this guide. We will be glad to assist you with any questions or problems that might occur.

What You Will Need To Get Started

Before connecting Ether•Write please make sure that you have all the items supplied with the Ether•Write package and, also, any additional items that are necessary to connect Ether•Write to your network.

Supplied with Ether•Write

In addition to this manual you should have received the following items in the Ether•Write package:

- One (1) Ether•Write unit
- One (1) External power supply
- One (1) 3 1/2" diskette

Needed For Installation

Before connecting Ether•Write to your network, you need to make sure that you have the necessary equipment for connecting to the LocalTalk and Ethernet networks.

LocalTalk Connection Needs

Ether•Write allows for one LocalTalk network to be set up. The connector provided on the back of the Ether•Write box is the standard mini-DIN 8 pin connector found on all Macintosh models from the Macintosh Plus to the latest model. Since your LocalTalk network can be run over different media types (shielded twisted-pair, unshielded twisted-pair, fiber-optic) you will want to be sure that your network cabling has the proper connection box for attaching to the Ether•Write LocalTalk connector.

Cables and cable connectors are not supplied with the Ether•Write product. Please contact your local dealer or Compatible Systems representative for information on obtaining the correct cabling supplies.

Ethernet Connection Needs

Ether•Write 2.0 supports all three of the most popular types of Ethernet cabling (Thick, Thin, and 10BaseT Twisted Pair). Note that only one of these Ethernet connections will be active when Ether•Write is in operation.

Your Ether•Write box will automatically sense an Ethernet cable connected to one of its Ethernet ports, and internally configure itself to use that port.

To connect Ether•Write to a Standard (Thick) Ethernet cable you will need to have a transceiver cable connection at the correct location on your Ethernet cable. The transceiver cable will attach directly to the DB-15 pin connector on the Ether•Write box.

To connect Ether•Write to a Thin Ethernet cable you will need to have a T-connector at the correct location on your Ethernet cable.

You cannot attach the Ethernet cable directly into the BNC connector on Ether•Write without the use of a T-connector. Doing so will result in improper termination and a network that will not operate.

Ether•Write 2.0 must be connected to a properly terminated thin Ethernet cable before its auto-sensing circuitry will detect a thin Ethernet connection.

To connect to Twisted Pair Ethernet cabling you will need an unshielded twisted pair wire that is connected to a 10BaseT compatible twisted pair hub for your network.

Ether•Write 2.0 must be connected to an active 10BaseT hub before its auto-sensing circuitry will detect a 10BaseT connection.

Note The hardware installation instructions assume that the Ethernet cable network you are connecting Ether•Write to is already in place. Coaxial Ethernet network cables should be terminated at each end. A connector or transceiver must be available in the location where you will be installing Ether•Write. For twisted pair Ethernet you will need a 10BaseT compatible twisted pair hub for your network. (For more information on Ethernet see Appendix A in this manual entitled "Ethernet Primer.")

Ethernet Cabling Installation

If you are installing a complete Ethernet network or are unsure how to create a connector or transceiver location for Ether•Write, please refer to the documentation supplied with the manufacturers' equipment.

Cables and cable connectors are not supplied with the Ether•Write product. Please contact your local dealer or Compatible Systems representative for information on obtaining the correct cabling supplies.

Two national catalogs that carry cabling supplies are:
Inmac Catalog - (800) 526-9778 or,
Black Box Catalog - (412) 746-5530.

AppleTalk Networking

This section of the manual will serve as a brief introduction to AppleTalk networking and the function of Ether•Write in your internet. Its purpose is to familiarize you with some of the terminology that will be used in the upcoming sections. Before you install and use Ether•Write, it will help to be familiar with the terms and concepts of AppleTalk networking that are discussed in this section.

The AppleTalk Network System

A network is a group of computers and shared peripherals connected in a continuous cabling system. An internetwork or “internet” is a group of networks that have been interconnected using routers.

A network system is a communication environment in which network devices and software observe a common set of rules (protocols) for communicating. The AppleTalk network system uses a specific set of network protocols that describe exactly how network devices will communicate with each other.

AppleTalk protocols can be used with a wide variety of devices and transmission standards. Even though all AppleTalk networks use the AppleTalk protocols, they do not all use the same transmission standards or media. For the purpose of simplicity, this guide will only refer to two transmission standards, LocalTalk and Ethernet (referred to as EtherTalk within the AppleTalk network system). LocalTalk is the transmission standard that allows AppleTalk data to be transmitted at about 230 kilobits per second. LocalTalk is built into all Macintosh computers. EtherTalk is the transmission standard that transmits AppleTalk data at 10 megabits per second. EtherTalk is built into some newer Macintosh computers and can be added to others using Ethernet adapters from Compatible Systems and other vendors.

Both the LocalTalk and EtherTalk transmission standards can be utilized over different transmission media, such as twisted

pair, coaxial or fiber optic cabling. The transmission standards and media that your network site uses should be those that best suit your needs and budget. For more information on the different types of cabling used for Ethernet transmission, please refer to the Ethernet Primer that is included in Appendix A of this manual.

Network Numbers and Node Addresses

Regardless of the transmission standard and media that is installed, the AppleTalk network system transmits information in the same way. AppleTalk utilizes an addressing scheme that identifies the sender and destination of each transmission based on numbers which identify the specific cable and specific computer (or other networked device) that are communicating.

The address of an individual network on an AppleTalk internetwork is identified by a network number. To avoid conflicts, each network number in an internetwork must be unique. No two networks can share the same number.

Routers define the network numbers for the networks to which they are attached. (AppleTalk Phase 2 allows network ranges, a range of network numbers, to be defined for EtherTalk zones only. Like a network number, a network range must be unique within the internet such that no two network ranges overlap or have any network numbers in common.)

Every addressable device connected to an AppleTalk network is referred to as a node. Every node in a network, whether it is a computer, printer, a router or an Ether•Write, is identified by at least one unique node address. A node address is automatically assigned when a node is started up. Since the devices behind Ether•Write are on LocalTalk, Ether•Write does this for them on the Ethernet.

Zones

Each node in an AppleTalk internet belongs to a specific zone. Zones are used to group devices to make it easier to locate and access network services. Any user in the internet can communicate with devices in any zone, but it is more efficient to communicate with devices within one's own zone. Zones, which are designated by unique zone names, are defined by the network administrator through the use of a router(s). Zone assignments are usually based upon network traffic patterns, not the physical connections of the network. Nodes belonging to the same zone do not have to be in proximity to each other or even within the same network.

A Phase 1 EtherTalk zone has one network number which can contain 253 nodes. If you use EtherWrite to place six devices in a Phase 1 zone, then 7 node numbers (1 for EtherWrite, and 1 for each of the devices) will be used. This is important to keep in mind if you have a large network of Phase 1 devices, as the number of node addresses can get used up quickly.

Phase 2 helps avoid this problem. Instead of 1 network number, you may specify a range, where each number in the range is capable of supporting 253 nodes. Phase 2 also allows you to assign multiple zone names to this range. EtherWrite can take advantage of this and allows you to put it, and any device attached to it, into any of the defined Phase 2 zones.

Network services that are available within different zones on an AppleTalk internet can be viewed through the Macintosh Chooser desk accessory.

Suggestions For Setting Up Your Internet

Since most network installations are different, it's beyond the scope of this introductory section to describe exactly how your internet should be set up. However, we can offer a few helpful suggestions.

Every internet design, regardless of size, should be carefully planned out in order to maximize network performance. The drawing of a network map that designates where each device will reside on your internet should be your first step in designing your internet.

The network map will provide you with a quick visual reference to every network and device on your internet. You will be able to determine exactly where you will need to place routers to separate your networks and provide the most efficient communication routes.

Hardware Installation

This section of the manual will describe how to connect Ether•Write into your network environment. In summary, the steps for installation are:

1. Determine the Ethernet cable type of your network.
2. Connect Ether•Write to the Ethernet network.
3. Connect Ether•Write to the LocalTalk network.
4. Plug the power supply into Ether•Write, and then plug it into a wall outlet.

Determining Ethernet Cable Type

Ether•Write 2.0 will connect directly to Thick, Thin, or Twisted Pair Ethernet cabling.

Thick Ethernet cable, sometimes referred to as “Standard” Ethernet, consists of a large main cable that runs throughout the building with drop boxes that tap off of this large cable. These drop boxes, referred to as Medium Attachment Units (MAU’s) or transceivers, connect to the various workstations through 15-pin transceiver cables.

Thin Ethernet cable, sometimes referred to as “Cheapernet,” is usually a thin black coaxial cable similar (but not equivalent) to Cable TV cable. Each workstation has a BNC connector that attaches to the main cable at a T-connector.

Twisted Pair cable is unshielded twisted pair cabling (like phone wire) where each workstation is connected through its own length of wire back to a central “hub.” The accepted industry standard for Ethernet over twisted pair is referred to as 10BaseT. All Compatible Systems twisted pair products comply with the 10BaseT standard.

Before attempting to connect Ether•Write to the Ethernet network, you should have a T-connector, twisted pair port or transceiver cable available in the location where you will be installing it.

For twisted pair Ethernet you will need an unshielded twisted pair wire that is connected to your 10BaseT compatible twisted pair hub.

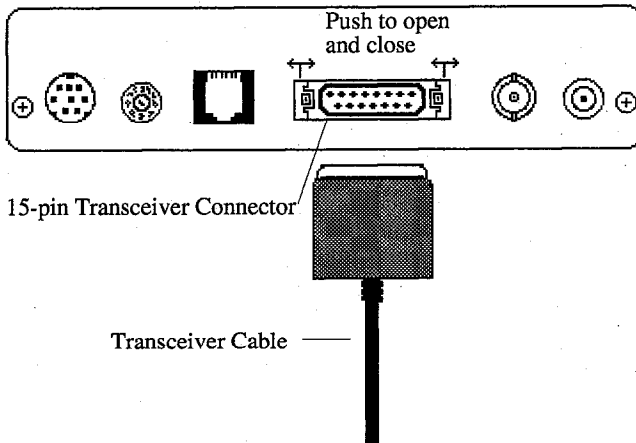
If you are installing a complete Ethernet network or are unsure how to create a connector or transceiver location for your Ether•Write, please contact your network administrator or refer to the documentation supplied with the networking equipment.

Connecting to Thick Ethernet

To connect Ether•Write to a Thick or standard Ethernet network simply plug one end of the transceiver cable into the transceiver connector located on the back panel of the Ether•Write box. Then, plug the other end of the transceiver cable into the transceiver that is connected to the Thick Ethernet network.

The detailed steps for installation are:

1. If Ether•Write is turned on, please power down the box by unplugging the Ether•Write power cable from the wall outlet.
2. Plug one end of the male 15-pin transceiver cable into the 15-pin transceiver connector on the back of the Ether•Write box. Secure the cable by sliding the locking guide on the sides of the connector. (See diagram on following page).
3. Plug the other end of the 15-pin transceiver cable into the transceiver on the Ethernet cable. The cable should connect to the transceiver in a similar manner to step 2, but please check the documentation supplied with the transceiver to verify the installation instructions.



This completes the installation for your Ether•Write onto a Thick Ethernet network. Please proceed to the “Connecting Ether•Write to the LocalTalk Cable” section to complete the hardware installation.

Connecting to Thin Ethernet

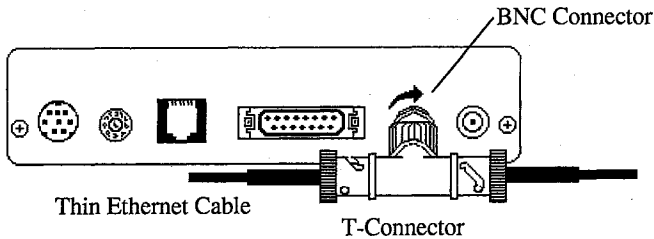
In order to connect Ether•Write to a Thin Ethernet cable, you will need to connect a T-connector onto the BNC connector located on the back of the Ether•Write box. (See diagram below)

Make sure that the T-connector is connected to the Thin Ethernet cable on both sides that extend out from the Ether•Write connection. If Ether•Write is to be the last device on the Ethernet network, then one end of the T-connector will be connected to the Thin Ethernet cable and the other end will have a network terminator installed. This should be done by your network administrator before connecting the T-connector to the Ether•Write port.

Step by step instructions for installation onto a Thin Ethernet network are:

1. If Ether•Write is turned on, please power down the box by unplugging the Ether•Write power cable from the wall outlet.

2. Install the T-connector onto the BNC connector on the back panel of the Ether•Write box. Twist the T-connector securing sleeve clockwise in order to lock the connector into place. (See diagram below).



This completes the installation of Ether•Write onto a Thin Ethernet network. Please proceed to the “Connecting Ether•Write to the LocalTalk Cable” section to complete the hardware installation.

Connecting to Twisted Pair Ethernet

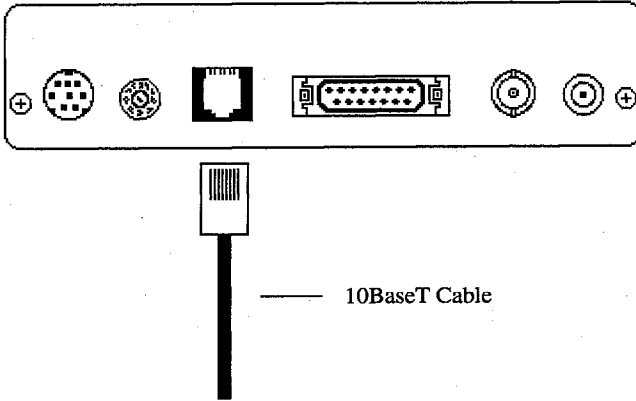
Before connecting Ether•Write to twisted pair cabling you will need an unshielded twisted pair cable that is connected to your 10BaseT compatible twisted pair hub. To connect the Ether•Write box to the twisted pair network simply plug in the twisted pair cable that is run from your twisted pair hub into the RJ-45 connection on the Ether•Write unit (See figure below.)

Please make sure that the twisted pair hub that you use to control your network is designed for the IEEE 10BaseT specifications. The documentation provided with the hub should provide this information along with other useful information on this type of network.

Step by step instructions for installation onto a 10BaseT Twisted Pair Ethernet network are:

1. If Ether•Write is turned on please power down the box by unplugging the Ether•Write power cable from the wall outlet.

2. Plug the 10BaseT cable's connector into the RJ-11 connector on the back panel of the Ether•Write box. Make sure you have inserted it firmly enough that it clicks and locks the connector into place. (See diagram below).



This completes the installation of Ether•Write onto a 10BaseT Ethernet network. Please proceed to the “Connecting Ether•Write to the LocalTalk Cable” section to complete the hardware installation.

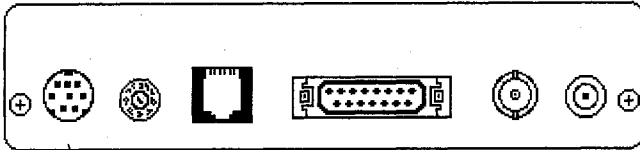
Connecting Ether•Write to the LocalTalk Cable

A LocalTalk network can run over different cable types such as shielded or unshielded twisted-pair. Each station on the network, of which Ether•Write will be one, requires a connection box to attach to the network cable.

The connection box for Ether•Write should be the same as the connection boxes for all shipping models of the Macintosh, which use the standard mini-DIN 8 pin connector.

Ether•Write comes with a mini-DIN 8 pin connector for one LocalTalk network. To connect Ether•Write to the LocalTalk network use the following procedure:

1. Connect a LocalTalk connection box to the mini-DIN 8 pin connector on the Ether•Write box (See diagram below).



LocalTalk Connector

Make sure that the mini-DIN 8 pin connector is situated correctly before pushing the connector into place. Do not force the connector or you may damage the mini-DIN or the Ether•Write box.

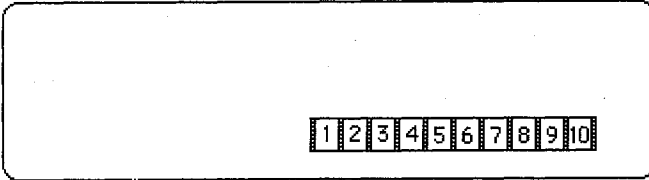
2. Connect the connection box to the existing LocalTalk network by plugging one end of the desired media cable into the connection box attached to Ether•Write. Then plug the other end of the cable into another connection box connected to a LaserWriter or some other network device.

Power Up Ether•Write

You may now plug the power supply in. Ether•Write will automatically configure itself for the type of Ethernet cabling you have connected it to. It will then take approximately 15 seconds to come up on the network. During this time it will automatically sense the presence of the LocalTalked devices (up to a limit of six) and register them as nodes on the Ethernet. Ether•Write's default EtherTalk configuration is autosense. For an explanation of the different types, see *Choosing an EtherTalk Type* in the *Configuring Your Ether•Write* chapter.

Ether•Write Display Lights

The Ether•Write box has ten display lights on the front. Once Ether•Write is connected to your network, the display lights will also indicate different levels of activity shown by different display patterns.



Ether•Write Display Lights

Lights 1 and 10 are used to indicate 10BaseT status on Ether•Write 2.0:

- Light 1 on continuously -- Incorrect wiring.
Indicates incorrect polarity on 10BaseT port. You must change the polarity of the receive pair at the wall plate or at the hub connection.
- Light 10 on continuously -- Good wiring.
Indicates good link on 10BaseT port.

Note: For thin & thick operation, both lights 1 and 10 will be off. For 10BaseT operation, light 1 should be off and light 10 should be on.

Below is a summary of the operational light patterns of Ether•Write:

- Lights 2 thru 9 come on in sequence.
Indicates the stages of initial startup. The next pattern after this startup sequence will be lights 4 & 5 blinking simultaneously.
- Lights 5 & 6 blinking simultaneously
Indicates Ether•Write is starting up. This will normally take about 15 seconds. If unit is set to auto-configure, it will stay in this state until Ethernet traffic is received.

- Light 2 on continuously
Indicates AppleTalk Phase 1 operation.
- Lights 6-9 indicate LocalTalk traffic
A flash pattern from 6 to 9 indicates send packets.
A flash pattern from 9 to 6 indicates receive packets.
- Lights 2-5 indicate Ethernet traffic
A flash pattern from 5 to 2 indicates send packets.
A flash pattern from 2 to 5 indicates receive packets.
- Lights 2,5 & 6,9 on continuously
Indicates a Flash Memory erase is taking place.
- Lights 2,3,4,5 flashing simultaneously
Flash has successfully been erased.
- Lights 2,3,4 & 7,8,9 on continuously
Indicates a Flash Memory write is taking place.
Ether•Write will restart after this procedure is complete.
- Lights 5 & 6 on continuously
Indicates Flash Memory CRC check failed and unit is running from ROM. Please refer to the manual section on downloading Flash ROM.
- Lights 2,4,6,8 are blinking simultaneously
Indicates a software “panic” condition has occurred.
Call Compatible Systems Corporation tech support.
- Lights 2,3 & 8,9 are blinking simultaneously
Indicates an “invalid” network condition. Usually means another Ether•Write or a router is connected to Ether•Write's LocalTalk network.

This completes the hardware installation section of the Ether•Write manual. Please proceed to the next section which describes how you may customize your network connection by using the Ether•Write Manager software to configure the Ether•Write unit.

Ether•Write Manager Software

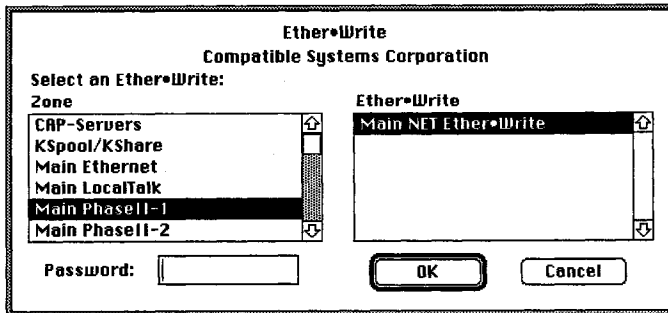
Ether•Write AppleTalk Auto Adapt

Ether•Write is designed not only to automatically configure itself to route AppleTalk data as soon as it is connected to a network, but also to adapt to most existing network environments.

Running Ether•Write Manager

The Ether•Write Manager program can be found on the Macintosh disk which was included with your Ether•Write. You can run the manager from any Macintosh on your AppleTalk internet. It allows you to administer and configure any Ether•Write which is on your AppleTalk internet, even across routers which support AppleTalk protocols.

To run the Ether•Write Manager simply insert the Ether•Write disk into any Macintosh on the network that includes an Ether•Write. Double-click on the Ether•Write Manager icon and the program will open to the first screen (see below).



Choosing an Ether•Write

This first screen of Ether•Write Manager allows you to select a Zone and an Ether•Write within that zone. When you launch the Ether•Write Manager, the zone where your Macintosh is located will be preselected in the "Zone" window and a list of all the Ether•Writes found in that zone will be listed in the "Ether•Write" window. If you have a simple network that contains no routers, you will not see any zones, just one or more Ether•Writes in the list on the right.

If you have multiple zones, it may be necessary to scroll through the zones in order to find the zone that contains the Ether•Write you wish to configure. Ether•Write's default AppleTalk Phase 2 configuration will put it in the default zone. If you do not know your default zone, check with your network administrator.

In order to access an Ether•Write for configuration or to display statistics information, you must enter the password. Ether•Write is shipped with the password: **letmein**

Note: As explained later, it is possible to enter a new password into your Ether•Write as part of a configuration. In case you lose your new password, Ether•Write is designed so that the **letmein** password is always valid for the first five minutes after a unit is powered up. Any password you have downloaded as part of a configuration will always be valid.

After typing the password, click the "OK" button or press return and the "Ether•Write Status" screen will be displayed.

Main Net Ether Write - Ether•Write Status		
Ether•Write Manager Compatible Systems Corporation	Software Version:	Ether•Write Flash V1.0.5
	Hardware:	128K Flash ROM, 128K RAM
	Configuration Status:	In Phase 2 Ethernet; HW Switch: 0
	Last Configuration Date:	none
	Ethernet Address:	0000A58A1E00
	Up Time:	0 days 2 hrs 36 mins 54 secs
Name/Type	Zone Name	(Net:Node)
LaserWriter II NT LaserWriter	Main PhaseII-2	10:240
LaserWriter IIg LaserWriter	Main PhaseII-1	10:241

Ether•Write Status Screen

Once you have accessed an Ether•Write and provided the correct password, Ether•Write Manager will bring up the "Ether•Write Status" screen and will enable a number of menu options. The status screen displays specific information about the selected Ether•Write and also shows information about the devices connected to it.

The name of the Ether•Write that you have selected and accessed is displayed in the title bar. A default name with the Ether•Write's Ethernet address will be displayed if no name has been configured. Below the name is a box which displays some important general information about the selected Ether•Write:

- The Ether•Write ROM or FLASH software version number.
- The hardware configuration of ROM and RAM.
- The Configuration Status.
- The date this Ether•Write was last configured.
- The Ethernet address for this Ether•Write device.
- The "UpTime." Amount of time since the last restart.

The remaining information on the screen shows the Name, Type, EtherTalk Zone Name, Network Number and Node Number of all devices on the LocalTalk.

The Menus

The following is an alphabetic list of the Manager menus with a brief description of the items under each.

Administer Menu

The Administer Menu provides options which allow you to control the Ether•Write and update the software contained in its Flash ROM. These options include:

- **Choose an Ether•Write**
This option allows you to bring up the original Ether•Write Manager screen, as described above, to select a different one.

- **Download Software**

In the future, it may be desirable to update the software in Flash ROM which the processor in your Ether•Write box is running. This menu selection allows new software to be loaded into the Flash ROM in an Ether•Write.

When you select this option, a file-dialog will allow you to locate the upgrade software file on one of your Macintosh storage devices. Once found and selected, a dialog box will give you the option to download the software or to cancel the download and maintain the Ether•Write software in its present state. When the new software is downloaded the old software is overwritten and will be lost.

Although the old software is overwritten, Ether•Write will maintain any configuration information (selected zones, Phase 1 or Phase 2, security passwords, etc.) you had previously loaded.

- **Restart Ether•Write**

At certain times you may wish to restart an Ether•Write. Selecting *Restart Ether•Write* will restart the Ether•Write you are accessing 2.5 seconds after you choose the option.

Configuration Menu

The Configuration Menu provides options which allow you to edit or create a configuration image at your Macintosh in memory, and then download the image to the Ether•Write you are accessing. These options include:

- **Edit Configuration**

This option brings up a dialog box which allows you to edit/enter device information into the configuration image located in the edit area.

- **Edit Name and Zone**

This option brings up a dialog box which allows you to edit/enter the Ether•Write name and the zone where the Ether•Write itself will show up, into the configuration

image located in the edit area. Note: Phase 2 must be selected under the Edit Configuration item in order to put Ether•Write itself into a zone.

If you don't configure individual LocalTalk printers/devices into different zones, they will be put in the zone entered here. If no zone is entered here, they will be put in the default zone for your network.

- **Edit Password**
This option brings up a dialog box which allows you to edit/enter a password, for accessing Ether•Write, into the configuration image located in the edit area.
- **Download Configuration**
Use this option after you have finished making changes to the configuration image. This option downloads the configuration image from the edit area to the Ether•Write you are accessing. A dialog will ask you to confirm that you want to do this and will tell you that if you do the Ether•Write will be restarted.

File Menu

File Menu functions are as follows:

- **Open Stats**
This option loads previously saved statistics from a storage device (such as a floppy or hard disk). Once you have loaded the statistics, all the statistic windows will be open and you can view them.

This option will only be active when there is no configuration in the edit area. Cancel the Choose an Ether•Write screen so that no windows are open.
- **Save Stats**
This option saves the present values of all statistics on a storage device (such as a floppy or hard disk). This file can later be retrieved and the statistics viewed using Open Stats. This menu option is only available when a statistics window is open.

- **Quit**

Quitting takes you back to the Macintosh Finder. If you have been editing a configuration image in the edit area and have not saved or downloaded it, you will be given an opportunity to change your mind.

Statistics Menu

The Statistics menu options allow you to display a variety of statistics windows containing information on packet types and errors from the Ether•Write you are accessing. The statistics are briefly described in Appendix C of this manual.

Window Menu

The Window menu is used to move between open windows during configuration. All windows, including the statistic windows will appear here if they are opened.

Configuring Your Ether•Write

This section explains in detail all the items under the Configuration Menu. It is with these items that you change the configuration information kept in the Ether•Write's Flash ROM. Changes downloaded to the Flash ROM will remain there even when the Ether•Write is powered off.

Since LocalTalk devices may get turned off occasionally (perhaps for maintenance or down time) the Ether•Write will check the network at from time to time and compare its Flash configuration with the actual devices on the network. Devices configured but not present will not be advertised to the EtherTalk network.

Editing Ether•Write's Name and Zone

This option will display a dialog box that will allow you to change the name in the edit area to any string of one to thirty-two characters. Embedded spaces in the name are allowed. Selecting a name that is easy to remember and is associated with the function of the Ether•Write (such as “Accounting” or “Engineering”) will help you identify it on your network.

This area also allows you to put Ether•Write (and by default all of its connected LocalTalk devices) into a specific zone on your network. You can use this feature to put Engineering's Ether•Write in the Engineering zone, etc. Once you have configured Ether•Write this way, it will show up in this zone when you look for it with the manager program. The configured zone must exist on the network where Ether•Write is connected, otherwise Ether•Write will put itself in the default zone.

Editing Ether•Write's Password

If you are concerned about security, you may change the password in the edit area by selecting this option. You should select a password that you can remember, and that no one else knows. The password can be any alpha-numeric combination of eight characters or less that you desire.

If you happen to forget the password that you set, Ether•Write has a built in safety feature. For five minutes after you cycle power on any Ether•Write box, the “letmein” default password will be active, along with any password you may have set with the Ether•Write Manager software.

Note that this means for absolute security the Ether•Write unit should be kept in a locked room or closet where unauthorized persons cannot cycle its power.

Configuring the Devices

Choose *Edit Configuration* and you will then be presented with the Ether•Write Configuration screen (see below). This window allows you to edit the Ethernet information for up to six devices connected to Ether•Write's LocalTalk port.

Name/Type	Zone Name	ENS Password
LaserWriter IIg LaserWriter	Main PhaseII-1	

The first column contains the Name and Type of each device. The Name is a unique string of up to 32 characters given to the device. The type corresponds to the service which that device provides and that is selectable in the Chooser. All AppleTalk devices are characterized by their type. Examples of types include LaserWriter for printers and AFPServer for AppleShare servers.

Choosing an EtherTalk Type

Ether•Write can be configured for EtherTalk Phase 1, Phase 2 or Autosensing. Choosing the type is done by selecting the desired method with the "Use EtherTalk:" popup.

Auto Sense is the factory setting, and means that Ether•Write will listen to the network when it first comes up and determine which EtherTalk type to use. If it hears a Phase 2 broadcast or a mixture of Phase 1 and Phase 2 broadcasts it will use Phase 2 and it will put itself in the default zone. If it hears only Phase 1 broadcasts it will use Phase 1.

When configured for Phase 1, Ether•Write will only listen for and reply to Phase 1 lookup requests. Since Phase 1 only supports one zone name, the edit boxes in the Zone Name column will be disabled. Note that light number 2 on the front panel will be lit during Phase 1 operation.

Phase 2, on the other hand, can have more than one zone name (seeded by a router). Then the edit boxes will be enabled and each device may be placed into a user-selected zone. If a device's zone box is not filled in, then the device will be put into whatever zone the Ether•Write itself is in.

The password field **does not** need to be filled in to put a device into a particular zone. It is used to password protect LocalTalk devices (see ANSP section below). Leave this field blank unless password protection is desired.

Back Panel Mode Switch

The mode switch puts Ether•Write into various modes:

Setting	Mode
0 (default)	Use configured EtherTalk setting
1	Force Phase 1 AppleTalk operation
2	Force Phase 2 AppleTalk operation
5	Erase code & configuration in Flash
9	Allow only one LocalTalk device
All Others	Reserved -- do not use.

Ether•Write is shipped with the Mode Switch set to 0.

ANSP

Advanced Network Security Protocol (ANSP) is a security protocol developed by Compatible Systems which allows Ether•Write to request a password from a Macintosh before granting access to a LocalTalk device (such as a specific LaserWriter). For each device that you want to protect, you need to enter a password.

Passwords should be assigned only to those devices that you want to protect. Although they don't all need to be different, variety protects your network from being completely compromised if one password becomes known.

Ether•Write Configuration		Use EtherTalk: <input type="text" value="Phase 2"/>
Name/Type	Zone Name	ENS Password
Essie 30 Macintosh SE/30	<input type="text" value="Main Phase2-1"/>	<input type="text"/>
LaserWriter II NT LaserWriter	<input type="text" value="Main Phase2-1"/>	<input type="text" value="2ntis4me"/>

For example, to protect the LaserWriter named LaserWriter II NT you would click in or tab to its ANSP Password edit box and enter a password.

Your ANSP entries will become effective when you download the configuration to the Ether•Write. Then, only Macintoshes with the ANSP init/cdev installed and with the correct password entries will be able to access the protected devices or services (See *How ANSP Works* later in this section). Macintoshes which do not need access to the protected devices do not need the init/cdev.

Devices which are protected by Ether•Write will simply not show up in the chooser of Macintoshes which either do not have the init/cdev, or do not have a password for the given protected device(s).

Sending the Configuration

Once you are satisfied with the configuration, select *Download Configuration* from the Configuration menu. A dialog box will appear that will ask you if you want to send the configuration information to Ether•Write. If you click on "OK" the information will be sent to the Ether•Write and the Ether•Write will be restarted. The Ether•Write will be ready and back on the network in 15 seconds. If you answer "Cancel" to the dialog box the program will cancel the download and return to the previous screen.

Remember, the changes that you make to any Ether•Write configuration will only be implemented if you send the information to an Ether•Write unit with the *Download Configuration* selection.

How ANSP Works

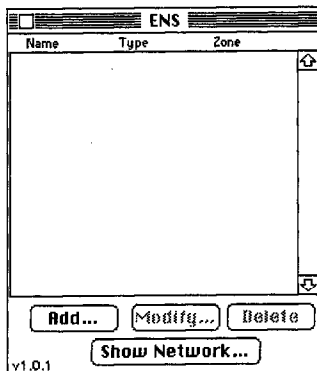
The AppleTalk Name Binding Protocol (NBP) is used to map logical services, for example printing or file services, to the physical network addresses of specific network nodes. The Chooser uses NBP to look up the physical addresses of network services in a particular AppleTalk zone. This look up process is a natural place in the AppleTalk protocols for providing network security. (For more information about NBP, see Chapter 7 of *Inside AppleTalk*.)

Ether•Write filters NBP Lookups intended for the devices on its LocalTalk. When a Macintosh user selects a service with the Chooser, these lookups may come to Ether•Write either directly or through a router. If an ANSP Password has been configured for the requested device, Ether•Write sends a password verification packet back to the requesting Macintosh. If the Macintosh responds correctly, the NBP Lookup is answered. This results in the device (or service) being displayed in the Chooser.

ANSP on the Macintosh

People who need access to devices protected by Ether•Write will need to install the ANSP init/cdev on their Macintosh. Installation of ANSP is done by dropping the ANSP init/cdev into the System Folder and creating a password access list.

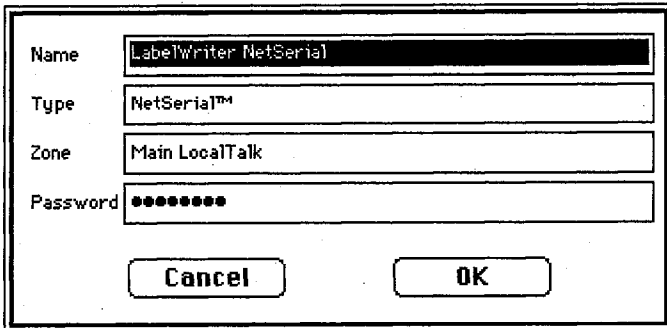
To create or change a Macintosh's ANSP list you must go to the Control Panel and select the ANSP cdev. The main ANSP screen looks like the following:



When ANSP entries are made an ANSPPasswords file is created. A password file created on one Macintosh will not be usable on another Macintosh.

To add an entry to the list, click on the Add button. A blank form will be displayed. Fill in the Name, Type, Zone and Password and click OK.

To modify an entry, select the item and click the Modify button. A form like the Add form will appear but with all enterable areas filled in. Note: The Password area will have eight (8) bullets, regardless of how many characters were actually typed.



The image shows a dialog box for adding or modifying an ANSP entry. It contains four text input fields and two buttons. The fields are labeled 'Name', 'Type', 'Zone', and 'Password'. The 'Name' field contains 'LabelWriter NetSerial', 'Type' contains 'NetSerial™', and 'Zone' contains 'Main LocalTalk'. The 'Password' field contains eight black dots. Below the fields are two buttons labeled 'Cancel' and 'OK'.

Name	LabelWriter NetSerial
Type	NetSerial™
Zone	Main LocalTalk
Password	••••••••

Cancel OK

To delete an entry which was previously added to the list, select the entry in the list and click on the delete button.

The Show Network button is provided as an assistance when creating the ANSP list. Entries can be selected by double-clicking on the desired items. Adding devices in this manner allows you to avoid misspellings of names and types. You can only use Show Network *prior* to protecting a device with Ether•Write, since once devices have been protected they will not show up in the list.

If you forget and configure the Ether•Write first, not all devices will appear. This can be overcome by adding an entry with the equal sign (=) in the Name and Type areas, an equal or approximately equal sign (≈) in the Zone area and the

Ether•Write password in the Password area. You need to then close the ANSP screen and restart your Macintosh to see all devices.

Users can add their own ANSP entries as long as they know all of the relevant information. This may require getting the information from the network administrator or the owner of the device that is hidden.

The password file is the key to access for users of ANSP. When the Macintosh is booted the init looks for the ANSPPasswords file and loads itself if it is present. If it is not present and the user creates one then the Macintosh will need to be restarted to load the init. Once the init is running, changes made to the ANSP entries will take effect when you close the cdev.

Note: In order to minimize network traffic generated by ANSP and improve performance, Ether•Write keeps a list of Ethernet nodes and the passwords they have used within a ten minute period. Successive NBP lookups from a node will not generate password validation traffic if the lookup is already in the list. As a side effect of this technique, nodes which have looked-up a protected device in the 10 minutes prior to a new password being downloaded for it will continue to have access until the 10 minute timeout has expired.

Appendix A - An Ethernet Primer

Ethernet is a communication method for linking computers together that was developed by Xerox Corporation.

In a computing environment, a communication method organizes the way that computers, or other devices like printers, interact on a network by determining when and how the machines should “talk.” In order to understand where Ethernet and Compatible Systems’ products fit into this networking scheme you need to look at the three main components of a network.

The three main components of any network are:

1. Network operating system software
2. Protocol software
3. Hardware and driver software

In the Apple Macintosh environment, the most commonly used protocol software, called AppleTalk (not to be confused with LocalTalk, the Mac’s built in network), is part of the Macintosh operating system software. The network operating system software is often AppleShare (one part of which is included with later versions of the Mac operating system, and is used with AppleShare and Novell servers), although it can also be TOPS or other software products from other vendors.

Our discussion of Ethernet will primarily be concerned with the hardware and driver software components of a network. If you are interested in a complete overview of all LAN (Local Area Network) components, there are many books available on the market that cover the complete subject. If you are planning to install your own Ethernet network, it will be helpful for you to read one of these books to better understand the subject.

In order to transmit and receive Ethernet communications, the devices on the network must all be attached physically through Ethernet adapters to a common Ethernet cabling system. These two components make up the hardware part of a network.

How are Macintoshes connected?

A number of companies, including Compatible Systems, manufacture Ethernet adapters for various Macintosh computers. The adapters provide an interface to the Ethernet cabling system.

There are many uses for an Ethernet connection to a Macintosh, from joining together with other Macintoshes in a standard network configuration to linking to a larger computer such as a VAX or a UNIX file server. The similarity between all the different Ethernet adapters for the Macintosh is that they all will require specific software, usually referred to as a "driver," to be loaded onto your Macintosh in order to make the connection work.

There are actually many kinds of drivers that handle different tasks and interact with your Macintosh at different levels. Drivers can fit into any of the three network components mentioned above. A hardware driver, as you might guess, is a program that is loaded onto your computer which allows it to "drive" a hardware device.

The software that is provided with Ethernet adapters can be classified as hardware drivers that tell your Macintosh how to send information through these hardware devices. The kind of information that is sent through the adapters, and how this information is communicated to other devices on the network, is handled by the protocol software and network operating system software that communicate with the hardware driver.

How do you connect your LocalTalked Macintoshes and LaserWriters?

In some cases, you may wish to link an entire LocalTalk network to an Ethernet network. This is particularly desirable when the devices on LocalTalk either cannot be linked directly to Ethernet, such as LaserWriters or other LocalTalk peripherals, or when the Macintoshes on a LocalTalk network do not need to have the enhanced speed which is provided by a direct connection to Ethernet through an adapter.

Ether•Route is Compatible Systems' hardware-based gateway/router which provides a connection between an Ethernet network and one or two LocalTalk networks. It handles both the hardware connection between the two types of networks and the software protocol translations necessary. A device which uses the AppleTalk software protocols on either Ethernet or LocalTalk will be able to seamlessly communicate with other devices using those same protocols, regardless of whether they are on Ethernet or LocalTalk.

Ether•Route/TCP extends the capabilities of the standard model Ether•Route to include support for communications using the TCP/IP software protocols.

If you only need to connect a limited number of LocalTalked devices, Ether•Write may be a more appropriate choice. Ether•Write can connect up to six LocalTalk devices to Ethernet, making them appear as Ethernet devices to the rest of the network. It also has the added flexibility to designate what zone(s) these devices appear in. Generally, it is used where an "all Ethernet" environment is desired.

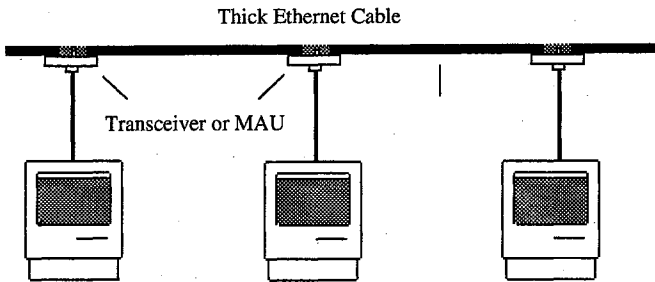
What about the Ethernet cables?

There are a number of different cabling systems used for Ethernet communications. The three most popular cabling systems include two different kinds of coaxial cable, and twisted-pair cable.

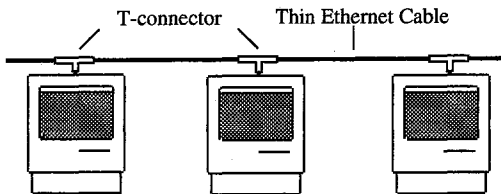
The two kinds of coaxial cable are referred to as "thick" or "Standard" Ethernet cable, and "thin" or "Cheapernet" cable. The "thick" or "thin" Ethernet refers to the actual size of the coaxial cabling. Almost all of the latest Ethernet sites, and in particular sites with a relatively small number of computers on the network, use thin or twisted-pair cabling because of cost advantages associated with this type of cable. Compatible Systems has various products which support all three kinds of cabling.

Devices are connected to both thick and thin Ethernet in what is called a “daisy-chain” configuration. In a thick cable installation there is simply one long cable with adapter connections made along it. In a thin cable installation a number of cable segments are joined with connectors (an adapter is typically attached at each connector) to create the electrical equivalent of one long cable.

In a thick cable installation, the Ethernet adapters are actually connected through short “drop cables” to a “transceiver” (sometimes also called an MAU or Medium Attachment Unit) which provides the physical attachment to the thick main cable that runs throughout the building. The drop cables are 15 wire cables that attach to a 15-pin connector located on the Ethernet adapter or router.



Thin Ethernet is usually a black coaxial cable, similar (but not equivalent) to the type of cable used for Cable TV. Only specific types of cable have the characteristics required for use with Ethernet. Devices are directly connected to the cable through the use of BNC connectors on the cable end and T-connectors on the Ethernet devices.



Both thin and thick Ethernet networks require that the cable be terminated at both ends of the network. Terminators are necessary to ensure that the network signal does not reflect back onto the network when it reaches the end devices. Terminators should only be used at the end points of a network so that the signal does not become distorted. All Ethernet terminators must have a value of 50 Ohms - other values will cause problems which are often very difficult to trace.

Twisted-pair Ethernet is based on a different cable configuration from coaxial Ethernet. With twisted-pair, each Ethernet adapter is connected through its own length of wire back to a central "hub." Thus, twisted-pair Ethernet installations are often referred to as "spoke and hub" or "star" configurations. Two twisted pairs (four wires total) are required for each connection, one for transmit and one for receive.

The popularity of twisted-pair Ethernet is due to the fact that twisted-pair cable is often already installed in offices as part of the telephone wiring system. Twisted-pair is considered easier to manage and less prone to problems which affect the entire network, since each adapter has its own link to a hub. However, there are length limitations and issues regarding the quality of existing wiring which should be carefully looked into when considering twisted-pair wiring.

An early proprietary type of twisted-pair Ethernet was called Lattisnet. Lattisnet is not recommended for new installations. For existing installations of Lattisnet, Synoptics provides converter modules which will connect to the 15-pin transceiver connector on Compatible Systems' products.

The industry standard for Ethernet over twisted-pair is 10BaseT. All new twisted-pair installations should use products which conform to this standard. All of Compatible Systems' products are available in versions which support 10BaseT.

General Recommendations

In general, except for very small networks or network segments (under 5 machines), twisted-pair Ethernet cabling is the least expensive to maintain and easiest to install cabling system.

Small networks of 5 or fewer machines can often be installed using thin coaxial cable by someone with some previous LocalTalk network installation experience, although you should expect it to take some homework and some trial and error.

Thick coaxial cable is generally not used for new installations, except for very large networks (i.e., greater than 200 machines), because of the cost of the cable itself, the cost of transceivers, and the difficulty of running the cable.

If you are installing a medium sized or larger network (over 5 to 10 machines), or are not particularly handy with cabling and electrical equipment, you will save yourself a great deal of time and aggravation by hiring a professional network installation company to run your cabling, test it, and help you set up your network. If you are planning to put new adapters on an existing network, always notify the person within your organization who is in charge of the network.

In general, larger cities will have a number of computer dealers who have personnel trained in network installation. There are also consultants and installers who specialize in local area network installations. Your local Yellow Pages will list Computer Dealers and Computer System Designers and Consultants. It is always a good idea to ask dealers and consultants for references specific to the work you want them to perform.

Installing a Small Thin Coaxial Ethernet Network

For a thin coaxial installation you will need the following:

1. Coaxial cable of type RG 58/U. This is the only kind of coaxial cable that can be used for thin Ethernet. Do not try to use other cable types. Always buy the cable cut to length with BNC male connectors already attached. Attaching connectors yourself is definitely not recommended. Buy your cables from a reputable supplier. Bad cables, or cables with connectors attached incorrectly, can be difficult to detect without expensive test equipment.
2. BNC T-connectors, one per adapter. The T-connector should have two female ends and one male end.
3. BNC 50 Ohm terminating plugs, two per network. One of these plugs must be attached at each end of the network. Make sure that they are 50 Ohms and not some other value, otherwise problems will result.

Installation Notes:

- The maximum length of a thin coaxial cable segment is 185m (607 ft.).
- The minimum distance between adapters is 0.5m (1.5 ft.).
- No more than 30 adapters are allowed per cable segment.
- Repeaters are available which can link up to 3 cable segments together.

There are several national mail-order suppliers which specialize in supplying data communications equipment and cabling supplies. These suppliers can provide thin coaxial cable with connectors already attached. Both suppliers listed on the following page have expert technical support people available to help you with cabling problems over the phone.

Inmac

2465 Augustine Drive
PO Box 58031
Santa Clara, CA 95052-8031

Technical Support 800-526-9778

Note: Inmac has regional sales offices, you can get the number of the one nearest you from the number above.

Black Box Corporation

PO Box 12800
Pittsburgh, PA 15241

Order Line: 412-746-5530
8:00 A.M. to 8:00 P.M. EST

Technical Support: 412-746-5151
8:00 A.M. to 8:00 P.M. EST

Appendix B - Hardware Specifications

Size:

Enclosure 5.5 x 1.2 x 7.5 inches. No fan.

Connections:

BNC for IEEE 802.3 10BASE2 (thin Ethernet)

DB-15 for IEEE 802.3 MAU interface (thick Ethernet)

RJ-45 for IEEE 802.3 10BASET (twisted-pair Ethernet)

Mini 8-pin din for LocalTalk

Power Supply:

UL listed Class 2 Transformer, Wall Mount (3 Prong)

12 VAC @ 1.67 AMPS = 20VA

Power Connector = Switch Craft S760 Plug

Main Components:

Ethernet controller	DP83902
LocalTalk	8530
Processor	80C188 @ 10MHz
RAM	128KB
Flash ROM	128KB
EPROM	64KB

Appendix C - Ether•Write Statistics

The following pages are provided as an aid to network managers for interpreting the Ether•Write Manager Statistics windows.

LocalTalk - Column 1

Packets In	Total LocalTalk packets received.
Packets Out	Total LocalTalk packets transmitted.
CRC Errors	LocalTalk CRC Errors.
RX Overruns	LocalTalk FIFO became too full on receive.
Parity Err	Bad parity detected on a received data byte.
Unkn Err	Unknown error from LocalTalk driver.
Send Posted	Packet posted to LocalTalk driver to be transmitted.
Pkt Busy	Transmit semaphore is false, but a packet still queued.
Pkt !Busy	Transmit complete, but no packet queued.
Chan Busy	Attempt to send, but transmit semaphore is set.
No Snd Post	Transmit complete, but transmit semaphore not set.
Send Error	Error posting transmit to LocalTalk driver.
Driver Busy	Driver indicated it was busy when posting a transmit.
Bad LAP	Bad AppleTalk LAP type on received packet.
Collisions	Too many collisions occurred during a LocalTalk send.
Defers	Too many back offs occurred due to traffic on LocalTalk.
Buff Null	LocalTalk was passed a null buffer from calling routine.
atgotrts	Not used.
atrstrcv	Reset the receive channel (may occur in normal operation).

LocalTalk - Column 2

attxok	Transmit occurred normally.
atgotack	Not used.
atbdcast	Sent a broadcast packet.
atenqok	Enquiry call to claim an address returned OK.
atsentcts	Not used.
atsentack	Sent an acknowledge in response to an address enquiry.
atctsrvd	Not used.
atackrvd	Received an acknowledge on an address enquiry.
atsentpkt	Sent a packet.
atsentlap	Sent a clear-to-send or acknowledge.
atunkint	Not used.
atspuriousint	Not used.
atsendattempt	A LocalTalk send was attempted.
atsndflgtrue	A send was attempted with send semaphore set.
atpostflgtrue	A send was attempted with the post semaphore set.
atsndnorbuff	A send was attempted without an active receive buffer.
atnolinkbuff	No buffers were available from buffer pool for LocalTalk.
atrcvinobuff	Not used.
atgotrts	Not used.

Ethernet

Packets In	Total Ethernet packets received.
Packets Out	Total Ethernet packets transmitted.
CRC Errors	Ethernet CRC errors.
Frame Errors	Ethernet received packet did not end on a byte boundary.
Miss Pkt Err	Ethernet packet intended for node missed because buffer full.
Overruns	Ethernet chip ring buffer overflow.
Pkt Too Large	Packet received too large for buffers, packet discarded.
Transmit Err	Ethernet chip transmit error.
Send Busy	Transmit semaphore set, cannot post packet to driver.
Post Send	Packet posted to LocalTalk driver to be transmitted.
Bad Len	Transmit packet is larger than transmit buffer.
rcv_int	Ethernet receive interrupt.
unexp_rst	Interrupt value unknown.
re_int	Ethernet receive error interrupt.
te_int	Ethernet transmit error interrupt.
cntovflw_int	Ethernet tally counter full.
dma_int	Remote DMA interrupt.

Buffer

Total	Total Buffers available.
Free	Total Buffers currently free.
Ethernet Chip	Buffers allocated for Ethernet chip ring buffer.
LT chip	Buffers allocated for LocalTalk channel.
Internal	Buffers allocated for internal router use.
NBP Queue	NBP replies awaiting password verification.
SndQ	Ethernet Buffers currently on Ethernet send queue.
LocalTalk	Buffers currently on LocalTalk send queue.
RcvQ	Ethernet Buffers currently on Ethernet receive queue.
LocalTalk	Buffers currently on LocalTalk receive queue.

Note: The column labeled Value in the table represents the value for the statistic and the column labeled High represents a “high water” mark or a maximum value that statistic has reached. The “High” value for the Total Buffers actually represents the lowest value that has been reached.

Appendix D - Terms and Conditions

Compatible Systems Corp. (Compatible Systems) offers to sell only on the condition that Customers's acceptance is expressly limited to Compatible Systems' terms and conditions of sale. Compatible Systems' acceptance of any order from Customer is expressly made conditional on assent to these terms and conditions of sale unless otherwise specifically agreed to in writing by Compatible Systems. In the absence of such agreement, commencement of performance or delivery shall be for Customer's convenience only and shall not be construed as an acceptance of Compatible Systems' terms and conditions. If a contract is not earlier formed by mutual agreement in writing, Customer's acceptance of any goods or services shall be deemed acceptance of the terms and conditions stated herein.

1. **Warranty.** Compatible Systems warrants to the Customer and to all persons who purchase Products from the Customer during the Warranty terms ("subsequent purchasers"), that, for a period of one(1) year from the date (the "shipping date") on which Compatible Systems ships the Products to the Customer: (a) the Product meets, in all material respects, all specifications published by Compatible Systems for such Products as of the shipping date; (b) the Products are free from all material defects in materials and workmanship under normal use and service; and (c) that as a result of the purchase of the Products from Compatible Systems, the Customer will have good title to the Products, free and clear of all liens and encumbrances.

Compatible Systems' obligations pursuant to this Warranty, and the sole remedies of the Customer and of any subsequent purchaser, shall be limited to the repair or replacement, in Compatible Systems' sole discretion, of any of the Products that do not conform to this Warranty.

This Warranty shall be invalidated if the Products (a) have not been installed, handled, or used in accordance with Compatible Systems recommended procedures; (b) have been damaged through the negligence or abuse of the Customer or of any subsequent purchasers; (c) are damaged by causes external to the Products, including (without limitation) shipping damage, power or air conditioning failure, or accident or catastrophe of any nature; and (d) have been subjected to repairs or attempted repairs by any person other than Compatible Systems (or an authorized Compatible Systems service technician).

To obtain service under this Warranty, the Customer (or subsequent purchaser, if applicable) must follow the procedures outlined below, under "Product Return Policy."

THE WARRANTIES SET FORTH IN THESE TERMS AND CONDITIONS ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. WITHOUT LIMITATION ON THE GENERALITY OF THE FOREGOING SENTENCE, COMPATIBLE SYSTEMS EXPRESSLY DISCLAIMS AND EXCLUDES ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND OF FITNESS (GENERALLY OR FOR A PARTICULAR PURPOSE).

2. **Shipments.** All delivery indications are estimated and are dependent in part upon prompt receipt of all necessary information to service an order. Compatible Systems shall not be liable for any premium transportation or other costs or losses incurred by Customer as a result of Compatible Systems inability to deliver Product in accordance with Customer's requested delivery dates. All shipments by Compatible Systems are made F.O.B. factory (Boulder, Colorado); risk of loss shall pass to Customer at point of shipment. Unless specified by the Customer, Compatible Systems will select the mode of transportation for each order. Compatible Systems reserves the right to make deliveries in installments. Partial shipments are subject to the terms of payment noted below. Compatible Systems reserves the right to allocate inventory and production if such allocation becomes necessary.

3. Payment Terms. Payment shall be made prior to shipment or upon delivery. Payment shall not constitute acceptance of the goods.

4. Force Majeure. All orders accepted by Compatible Systems are subject to postponement or cancellation for any cause beyond the reasonable control of Compatible Systems, including without limitation: inability to obtain necessary materials and components; strikes, labor disturbances, and other unavailability of workers; fire, flood, and other acts of God; war, riot, civil insurrection, and other disturbances; production or engineering difficulties; and governmental regulations, orders, directives, and restrictions.

5. Product Return Policy. Prior to shipping any Product to Compatible Systems, the Customer must contact Compatible Systems Marketing Administration (by letter or telephone) with the following information: (a) reason for return; (b) quantity, description, and model number, and (if applicable) serial number of each item being returned; (c) original Compatible Systems Sales Agreement number; and (d) any special instructions. Upon receipt of this information, Compatible Systems will issue an RMA ("Return Material Authorization") number and any required U.S. Customs identification to assure correct identification of the Customer and to insure prompt and accurate processing.

6. Limitation of Remedies. Compatible Systems' liability for all claims brought pursuant to or in connection with this agreement, including the purported breach hereof, shall be limited: (a) in the case of claims for breach of warranty, to compliance with the repair or replacement provisions of the warranty, and (b) in all other cases (including any claim that the warranty failed of its essential purpose), to actual damages of the Customer (or, if appropriate, of the subsequent purchaser).

IN NO EVENT SHALL COMPATIBLE SYSTEMS BE LIABLE FOR ANY SPECIAL, CONSEQUENTIAL, OR INCIDENTAL DAMAGES ARISING OUT OF THE SALE, USE, INSTALLATION OR OPERATION OF THE PRODUCTS, WHETHER A CLAIM IS BASED ON STRICT LIABILITY, BREACH OF WARRANTY, NEGLIGENCE, OR ANY OTHER CAUSE WHATSOEVER, WHETHER OR NOT SIMILAR.

This limitation on remedies shall apply even if Compatible Systems is advised of the possibility and nature of any special, consequential, or incidental damages.

7. Governing Law; Merger. This agreement and all Terms and Conditions hereof shall be governed by, and construed in accordance with the internal laws of the State of Colorado. Except as superseded by a separate written contract signed by both Compatible Systems and the Customer, superseding all prior negotiations or offers, written or oral, this agreement may be amended only in writing, signed by an authorized officer of Compatible Systems.

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