TANDY®

Technical Information Series

Education Laboratory

Reference Manual

01-0220 Computer Technical Services

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EDUCATION LABS

INSTALLATION AND SERVICING

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Revision 4/8/89 - RJB
Revision 8/1/9Ø - RJB

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CHAPTER 1

EDUCATION LABS

INTRODUCTION

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Introduction

An Educational lab is a local area network which is designed to allow students, logged into student stations, to learn lessons along with the experience and fun of interacting with a computer system. Education labs contain the same basic componets but vary with the type of network used, the type of server used and the vendor of the particular lab.

The purpose of this manual is two fold. First, it will familiarize you with the requirements for a complete lab installation from the pre-site visit to the final testing of the lab. Second, it will provide diagnostic procedures and helpfull information for you should you be faced with trouble during the installation of a lab or the repair of a downed lab.

The manual is divided into chapters for ease of use. When installing or repairing a lab, use the appropriate chapter for the vendor of the lab. If the lab vendor is Wasatch, then turn to the Wasatch Chapter for the information pertainig to that lab.

Some of the chapters are common to all labs. For example, if you have trouble with a lab during installation then turn to the Diagnostics Chapter for common information. **The main thing to remember is to look through the entire manual for the information you need. If you do not find it then call Computer Technical Services and ask for the Education Laboratory Support Group.**

Education labs are really not too difficult to install or understand if you have a basic idea of what composes a lab and how it is supposed to work. An education lab will consist of a server, student stations, a network and network software.

With this basic concept of a lab and your knowledge of how to use this manual, let's proceed forward.

CHAPTER 2

EDUCATION LABS OVERVIEW

Education Laboratories in General

The Server

The server is the main unit of the lab. The job of the server is to run the entire show. The server contains the software necessary to provide the students with the lessons they need. Student lessons may be stored on the server itself or on an additional storage device such as a hard drive or CDROM. Server software keeps track of what students are in what class, as well as what lessons have been completed and the lessons that are next in order for a particular student.

```
*********************************************
*                                           *
*        The server is the boss!            *
*                                           *
*********************************************
```

The server contains the software necessary to perform all the laboratory record keeping for the school. The lessons completed by students, student progress, student grades are all kept track of by the server software. Other maintenance tasks such as daily, weekly and monthly backup procedures, software upgrading and report generation are handled by the software found on the server. Needless to say that if the server is not working correctly, the lab becomes useless.

Another important function of the server is to control the network being used for communication between itself and the student stations. Several different network software packages are available and used with the various labs. This software can be very complicated to an unfamiliar user, however, later we will discuss how to use this software to test the lab upon installation.

The server may be a dedicated or non-dedicated server. What is the difference you ask? Well a dedicated server is just that. It is a server that when powered up may be placed in the server mode and not used in any other mode of operation. Of course the server may be booted and used as a regular MSDOS computer but once in the server mode it is a server and only a server.

The non-dedicated server on the other hand is an MSDOS computer that acts as a server in the background. With this mode of operation, you can actually use the server to log into the network as a workstation. It is much like logging into the Xenix console as a user. There are advantages and disadvantages to both modes of operation and the decision as to which type of server is used will be made by the vendor when selling the lab.

Already mentioned was the fact that the server will provide the printed reports required by the school. That means there will be some type of printer attached to the server. Be aware that the printer may or may not be manufactured by Tandy.

Some vendors will include a modem in the server. The modem may be used for software upgrading from a remote site, transfer of various reports to a central office or a limited degree of troubleshooting minor problems by the vendor.

Student Stations

The student stations in all cases will be Tandy computers. Each station is used by a student to communicate with the server to load a lesson and then to run that lesson as a stand alone computer. The student stations run under MSDOS and use the network software only to communicate with the server to receive lessons and return lesson results to the server. During a lesson or lesson result transfer, the network is actively in use and while the student is running the lesson the network is idle to that station.

```
*******************************************
*                                         *
*     The student station is the          *
*     main interface for the student.     *
*                                         *
*******************************************
```

As mentioned above, the student stations are Tandy computers. They will contain a minimum of 640K of RAM, at least one floppy drive and at least a network board for the network being used. There are a limited number of labs with student stations that contain a ROM board which takes the place of a disk drive. These student stations are self booting and need no diskettes.

In some cases the student stations will contain a special sound/speech board to provide audio to the student and a serial board to enable the use of a mouse. The exact configuration of the student station will depend on the vendor of the lab. In any case the student station will require booting with an MSDOS diskette (except diskless student stations) containing the proper network drivers. More will be discussed about the network drivers in each of the vendor sections.

The Network

Binding the server and student stations together and forming the communication protocol is the network itself. The network consists of two parts. The network interface boards in the server and each of the student stations along with the associated cabling comprise the hardware end of the network. To establish the communication within this hardware frame is the job of the network software.

```
*********************************************
*                                           *
*     The network consists of both          *
*     Hardware ++++++++++++ Software        *
*                                           *
*********************************************
```

The network software allows students to log in and transfer lessons to appropriate stations, transfer lesson results to the server and to exit when finished. This implies a close tie between the server software and the network software. In reality the two packages work closely together to perform the lab operation.

In the past the network software was associated with the vendor of the network board used in the lab. For example if the lab used the 3COM® Etherlink™ board then 3COM® software was used to network the lab together. With the advent of new network operating systems the trend has been to allow the network software to perform with a variety of network boards manufactured by various vendors. The current use of Novell® Netware™ with education labs provides for up to a total of four network interface boards to be installed in a single server and the boards need not be supplied by the same vendor.

The Lab

Education labs are all basically the same in the way they operate and the their end purpose. What will make your job a little more difficult is the number of different configurations for each vendor's lab. Therefore you need to be aware of the different condigurations for each of the vendors. As new products and software are released lab configurations will continue to change. Additionally, new vendors may be supported with their varied lab configurations. It is for these reasons that you must keep in touch with the Education Laboratory Support Group for the latest information on education labs.

```
*********************************************
*                                           *
*    Call Education Laboratory Support      *
*    for the latest information!            *
*                                           *
*********************************************
```

In most cases the sale of an Education Lab will follow a set procedure from beginning to end. For your part you may be involved in the complete installation of a lab or repair of a downed lab. Regardless of the type of call, there are large numbers of boards that are installed in both the server and the student stations.

Although the boards are configured and installed in the computers prior to shipment, you will need to be aware of the configurations and settings in order to service the system during installation. After the lab is installed you will need to be familiar with the configuration of the various boards in order to repair a downed lab. This manual provides this setup information as well as information on the diagnostics as an aid in support of this system.

Some labs will require a pre-site survey to be completed prior to commencement of the installation. If this is the case, you will be notified by Computer Technical Services or the Tandy Value Added Resale (VAR) department. When a pre-site survey is to be performed, make arrangements with the customer for an appointment to survey the site. At the appointed time, arrive on site and follow the checklist you have received in the mail.

When the pre-site inspection is complete, inform the customer as to whether the site passes or fails and if possible, leave a copy of the checklist with the customer. When returning to the shop, make a copy of the checklist for your records and mail the original checklist back to the ELS group.

Regardless of the pre-site requirement, all labs must have certain checks done prior to installation. Some of the items which must be checked for are:

1.) sufficient power at sufficient amperage to run the lab.
2.) proper voltage levels and grounding of the power circuits.
3.) AC noise between ground and neutral within specifications
4.) enough outlets/power strips for the computer load.
5.) enough tables for all the computers, students and students' books.
6.) any cables that need be run by a qualified person (wall and ceiling runs) must be run.

Power

IMPORTANT

Ensure that the lab classroom is the only classroom using the circuits connected to the computers to eliminate excessive power draw or noise from another source.

Concerning power, the size of the lab will determine the number of circuits required. A good rule of thumb is to allow 1 amp per student station and 5 amps for the server. **Ensure that the lab classroom is the only classroom using the circuits connected to the computers to eliminate excessive power draw or noise from another source.** Each student station will require an outlet for the computer and the monitor. Each server will require an outlet for the computer, monitor, printer and external storage device if attached.

Most labs will require two or more dedicated circuits depending on the size of the lab and the amperage capability of the circuits. Total power required can be estimated using our rule of thumb and adding an additional 5 amps to cover startup current and computers that draw more than 1 amp.

For example, let's assume a 22 station lab is to be installed. To estimate the power requirement we use the rule of thumb and the guidelines above.

```
 22       22 stations x 1 amp per station (rule of thumb)
+ 5       estimate for the server
 27 amps total
```

Adding the 5 amps for a safety margin we get:

```
 27       total estimate for lab
+ 5       safety margin
 32 amps total
```

Using the figure of 32 amps we will need three 15 amp circuits or two 2Ø amp circuits to supply power to the lab.

```
**********************************************
*                                            *
*      Power is extremely important!         *
*                                            *
*           CHECK EVERY OUTLET               *
*                                            *
**********************************************
```

Each individual outlet must be checked with a polarity tester (to insure correct wiring), a voltmeter (to test for floating grounds) and an oscilloscope (to measure noise between ground and neutral). This must be checked completely, as networks are highly sensitive to poor power conditions. Proper power cannot be overstressed. Bad grounding or improper power can and has resulted in burned monitors and exploding power supplies in printers. In one instance half of a 4Ø station lab was destroyed due to improper power. The other half of the lab was saved only because it was not energized. For complete information on locating power problems, refer to Technical Bulletin INFO:8.

Tips for the Installation

Tools/equipment

As well as the normal tools taken for any service call, be sure to take a sufficient number of wire ties and cable clips to allow you to do a neat and professional job. Discuss the cable and station layout with the customer prior to installation to determine any possible problems or cable/equipment shortages.

Most of the network cabling to connect the lab together will be premade and shipped with the lab. However, there will be circumstances that will require you to make up special lengths of cable. For this you will need a crimper and stripper tool for proper cable make up. Also, BNC connectors will be a must while on site. Besides being needed for any special cables you make up, you may also have to replace existing BNC connectors in the process of troubleshooting network problems with the lab. More about connectors and special tools will be covered in Chapter 6 of this manual.

Take a degaussing coil with you and degauss all of the monitor screens on site during the installation. Although this may not seem as important in a single computer system, it is of high importance in a large network where all of the screens should be the same color. Many different shades of a blue screen in a classroom environment can be very distracting to students.

```
*******************************************
*                                         *
*       Diagnostics must be run to        *
*       complete the installation         *
*       properly.                         *
*                                         *
*******************************************
```

Diagnostics are a part of any list of items to be taken on a service call. Besides the regular MSDOS computer diagnostics for the type of computers used in the lab, you should take along any special diagnostics available for the lab. For example, all Etherlink™ boards come with a diagnostic diskette that may be used to help track down problems with the network. If you are not sure what special diagnostics are available for the particular lab, call the **Education Laboratory Support Group.**

We all know that there is a certain amount of 'dead out of the box' casualties expected and to that end we should be as prepared as possible. Knowing the lab configuration can be a help. If possible you should take along a spare main logic board for a student station and spare network board as these items are usually found in large numbers in a lab and most likely to fail. In a new lab, the quick replacement of a failed network board with one you brought as a spare can save you a lot of time and possibly an additional trip to the site.

Prior to Leaving for the Site

The following is a checklist of things which should be checked to alleviate the possibility of potential problems even before the network is installed. This list is by no means a complete list (you should add your own personal favorites to the list) but should give you a head start towards a successful network installation.

PRE-INSTALLATION CHECKLIST

Before going on site to install the lab

_____ Is there sufficient power at the site?
_____ Are there sufficient number of outlets?
_____ Is there enough table space for the stations, students and their books?
_____ Has any cable which must be pulled through conduit and/or walls been pulled? Is it the correct cable?
_____ Has the equipment arrived on site?
_____ Do you have the proper tools; crimp and strip tools, extra cable; BNC connectors; wire ties; wire clips?
_____ Do you have the degaussing coil?
_____ Do you have the correct software (diagnostics and installation) and this manual?
_____ IS THE CUSTOMER EXPECTING ME?

On site for the installation

_____ Is all of the equipment here?
_____ Sufficient power, outlets?
_____ Power checkout? (INFO:8)
_____ Enough table space for the lab?
_____ Enough cable for the installation?

The questions listed under the 'Before going on site to install the lab' heading can usually be answered by a simple phone call to the customer. In some cases the customer will not be able to fully answer each question and you will have to defer the question until you arrive on site. For example, the customer may know how many outlets are in the classroom but not know the amperage rating of the circuit supplying the classroom.

Normal Procedures

Help During Installation

As mentioned earlier, these labs are important to the customer, Tandy and you. Because of this, there is a special group set up in Computer Technical Services to help you. If at any time prior to or during the installation of an Education Lab you have any questions, you are not sure of something, you are missing parts or equipment or need help in any way - **CALL THE EDUCATION LABORATORY SUPPORT GROUP (ELS)**. This group, a part of Computer Technical Services, and can be reached using the normal watts numbers. In addition to any problems or help you need you will be required to call Education Laboratory Support when completing a new lab installation or closing out a service call to an existing lab.

Installing the Lab

Let's take a few minutes and discuss the normal procedure for a new lab installation and/or the repair of an existing lab.

New Installation: Your shop will be contacted by either VAR or ELS informing you of the lab installation. You will be made aware of the site location, type of lab, vendor of the lab, any pre-site inspection requirement and the contact person. If a pre-site is necessary then you will need to reach the contact person and make the necessary arrangements. Otherwise give a courtesy call to the contact person to introduce yourself as the technician who will perform the lab installation.

For a pre-site inspection, arrive at the site on the appointed day and time and conduct the inspection. Use the standard form provided by the VAR department and be complete. If possible, leave a copy of the completed form indicating Pass or Fail results with the customer. When returning to the shop, make a copy of the completed pre-site form for shop records and mail the original form back to the VAR department at the address indicated on the form. If any additional inspections are necessary, you will be informed by VAR or ELS.

```
**********************************************
*                                            *
*      Being fully prepared can make         *
*      the installation simpler and          *
*      more enjoyable.                       *
*                                            *
**********************************************
```

When the service call is received for the installation, make the appointment with the customer and **KEEP IT!** If reasons beyond your control prevent you from keeping your appointment, call and explain the situation to the customer, the VAR department and ELS. Be sure to reschedule with the customer.

When arriving on site, be sure problems from the pre-site inspection have been corrected or if one was not conducted, check items from your generic pre-site checklist as a beginning to the installation.

Unpack and set up the equipment as required by the classroom arrangement. Verify proper power before connecting computers and equipment to the power source. Connect the power and network cabling as necessary. Test the lab with standard diagnostics and any special diagnostics available. Perform any other tests of the lab necessary to verify it is fully functional such as testing the printer or modem if installed.

When finished have the customer sign off on the installation. Make sure the customer has no complaints before leaving the site. If so correct them if possible or contact ELS. Once the installation is successfully completed, call ELS and inform them of the completion. This may be accomplished from the site or the shop but make sure it happens. In many cases the vendor is interested in the completion of the installation and will need to be informed by VAR or ELS groups.

Lab repair call: You will receive a service call to repair an existing education lab. As with any service call, contact the customer and make the appointment for the repair. Be sure to keep the appointment or take the appropriate steps outlined above. While talking to the customer, try to find out as much about the problem as possible. This will help give you an idea of what spare parts to take along. Don't forget spare cable and BNC connectors.

When dealing with an education lab, many times the problems can be caused by a single computer and will be a simple repair. However, some network problem may be very complex. For example, one student station may contain a faulty network board whose symptoms show up on a completely different student station. These types of problems will require all your special test equipment and diagnostics as well as a lot of time and patience.

```
**********************************************
*                                            *
*      Remember - you can always call        *
*      ELS for assistance                    *
*                                            *
**********************************************
```

When finished, inform the customer and complete the service call in the regular fashion. If for some reason the call cannot be completed in the same day, inform the customer and ELS. Remember, if the lab is down there are a number of students that cannot use it so it is imperative to get the lab up and running as soon as possible.

Types of Service

There are a number of different service policies provided for education labs depending on the vendor and the sales contract. Let me briefly mention some so you will be familiar with what to do with each.

Full On Site: This type of service will cover the entire lab. It is handled just like any other on site service contract.

On Site - Server only: This contract provides for regular on site service for the server and network interface only. This means that any problems with the server itself or the network interface will constitute an on site service call. The network interface consists of the network cabling and the network boards in the student stations. However, the network boards in the student stations are counted toward the on site service call for testing purposes only. If in testing the network, a problem is found in a particular network board in a student station, then the problem is determined to be in the student station and not the network.

Student stations on the other hand are covered by the carry in service contract. If a problem arises with a student station then the customer must bring the computer into the shop for contract service.

The tricky part of this type of service call is determining whether or not the problem warrants an on site or a carry in service call. Current policy is this: If it is not obvious that the problem warrants an on site or a carry in service call, then an on site call will be placed. If the problem is in the server or network interface (limited to the network cabling only) then the on site call will stand. If the problem is limited to only a student station then the on site call will be completed. A new carry in service call will be opened or the Mail-in option (described below) will be exercised for the downed student station, which ever applies to the lab. However, the shop will be reimbursed for the expense of the on site visit. Remember that the network boards are part of the on site service call for testing purposes only and are repaired under a carry in contract call.

```
**********************************************
*                                            *
*      If in doubt, call someone who         *
*      knows.  A good place to start         *
*      is ELS.                               *
*                                            *
**********************************************
```

Mail-in: This type of service contract is similar to the On Site Server only. The server and network interface is covered by an on site service contract as above. With this contract though, the student stations are covered by a Mail-in program where the customer can return a complete non-working student station to Tandy Systems Exchange (TSE) for immediate repair and return.

Generally, the customer will contact TSE directly and an overnight shipment will be arranged. When the the old unit arrives at TSE, it will receive top priority and be repaired immediately with parts from stock. All repairs will be completed within 24 hours of receipt. When completed, the unit will be returned to the customer via overnight shipment unless otherwise specified by the customer.

A Word About Service Contracts

We have discussed three types of service situations you may come across in servicing existing education labs. In addition, there may be a question as to who is responsible for placing and paying for service calls. Some older labs are covered by the Computer Centers that sold them, some by the lab vendor, some by the VAR department and still others by the owners of the equipment.

****
*****
*** It is extremely important to ***
*** remember that your job is service ***
*** and in this case to get the lab ***
*** up and running as soon as ***
*** possible. ***
*****
****

Because of this a great deal of confusion may result when it comes to placing and paying for service calls. It is extremely important to remember that your job is service and in this case to get the lab up and running as soon as possible. If for any reason you have a question or problem concerning a service call for an education lab, call ELS and get help! Do not simply do nothing thinking the problem will go away because it won't. It will come back to haunt you. So do it right the first time and get help if you need it.

A Time for Review

This chapter dealt with quite a bit of information concerning the make up and installation of education labs in general. Later chapters will deal with specifics of particular lab vendors, cabling and diagnostics. If you have paid close attention so far you should have all the basics necessary for a complete lab installation. Remember, help is always available.

CHAPTER 3

EDUCATION SYSTEMS LABS

Education Systems Corporation
Education Labs

An Education Systems Corporation (ESC) lab is just one of the types of education labs that Tandy supports. These labs are commonly referred to as ESC labs but it is important to remember that ESC represents the vendor of the lab and not a specific lab configuration.

ESC has several configurations of labs in the field at this time. As new computer products and network software appear on the market, lab configurations will continue to be upgraded and revised. For this reason you must keep in contact with personnel at Computer Technical Services for the latest information when servicing or installing labs.

The basic lab consists of the server, student stations, network and mass storage device. The actual equipment found in the lab will vary with the length of time it has been installed or if it is a new installation. Some of the equipment which may be found in an ESC lab is listed below. Remember, this list will change with time.

Server/Lab Manager

1 Tandy 3ØØØ family computer w/internal hard drive and 64ØK of RAM
1 Tandy RGB Color Monitor
1 Video Adapter
1 CDROM Mass Storage Reader w/ controller and cable
1 Etherlink™ Board
1 Hard drive/floppy controller board
1 Serial/parallel board

Note: A Tandy 1ØØØ family computer with an internal 2Ø Meg Hard Card may, in some situations be used as a server.

The CDROM may be manufactured by either Sony or Hitachi. If the Sony CDROM player is used it may be one of two types. The players operate the same in the lab and the only difference between the players are the associated drivers. The drivers necessary for the particular CDROM unit will already be on the software with your package so you need only verify you have the correct software package. The packages are listed below.

Student Stations

1 Tandy 1ØØØ family computer w/ 1 drive and at least 64ØK of RAM
1 Tandy Color Monitor
1 Mouse
1 Etherlink™ Board
1 Votrax® Speech Board
1 Fleetwood/ESC Headphone
1 RCA to RCA Audio cable
1 thin Ethernet™ cable w/ BNC Connectors

In some situations a station may be a driveless Tandy 1000SX with an Etherstart™ PROM installed to allow it to boot directly from the network. (This option will require different software.)

Depending on the mouse and computer combination there may be some type of serial board installed in the computer. Earlier labs using Tandy 1000SX computers will require a serial board to drive the mouse while the Tandy 1000TX, 1000TL and 1000SL computers have a built in serial port to drive the mouse.

Software

Software needed to setup and run this system with a Sony CDROM player is as follows:

	ESC Part Number
1 Tandy MSDOS 3.10.01 or greater	
1 Tandy/ESC Build Set Which Includes:	
CDROM Lessons V 2.20	(10051)
Tandy 3000; CDROM; 3COM® Build	(10102)
ESC Files (6 disk set)	(10090)
ETDATA	(10092)
ETDATA2	(10093)
Lesson Update (5 disk set)	(10127)
Student Station Boot Disk	(10103)
Student Station Update Disk	(10111)

NOTE: The drivers for the CDROM player are the same for both types of Sony CDROM units.

Software needed to setup and run this system with a Hitachi CDROM player is as follows:

	ESC Part Number
1 Tandy MSDOS 3.10.01 or greater	
1 Tandy/ESC Build Set Which Includes:	
CDROM Lessons V 2.4	(10215)
Tandy 3000; CDROM; 3COM® Build	(10249)
ESC Files (6 disk set)	(10090)
ETDATA	(10092)
ETDATA2	(10093)
Student Station Boot Disk	(10129)
Student Station Duplication Disk	(10212)

```
**********************************************
*                                            *
*        BACKUP - BACKUP  - BACKUP           *
*                                            *
*          Always make a backup              *
*                                            *
**********************************************
```

The software listed above will be sent to the installing shop prior to a new installation for the first lab only. The diskette package will become the property and responsibility of the shop and will be used on subsequent lab installations. You must make a backup copy of your master diskettes and use the backup copies on site.

Configuration of the Lab

Before starting the installation, verify that all of the equipment has arrived. Discuss the placement of the stations and the server with the customer. Discuss the routing of the network cable. See Chapter 6 for more information on cabling restrictions and specifics. For more information on 3Com® systems, you should also reference the 3Com® Network Guide.

When you are sure where each of the stations will be placed, proceed with setting up each of the stations. Although the stations should come pre-configured, information is given below on jumpering and installing each of the boards in the station. Remember to degauss each of the monitors as they are set up.

Student Station Configuration

Jumper/Switch settings for Boards installed in the Student Stations.

One of the following 2 boards will be installed in a Tandy 1ØØØSX:

The Plus RS232 Adapter

Switch 1: Position 1 and 3 OFF (COM2:, IRQ 3)
Installed closest to the power supply.

Dual Port Serial Board

Switch 1: Position 1, 2, and 3 ON
Jumper IRQ3 for port 2 (This port will be used for the mouse; COM2:)
Jumper IRQ4 for port 1
Install closest to the power supply

The following boards will be found in all stations.

Votrax® Speech Board

IRQ2-ON
24Ø-ON

These jumpers are not present on all Votrax® boards. If present, make sure they are jumpered. Disconnect the speaker on the main logic board and connect the RCA cable supplied between the audio out of the Tandy 1ØØØ and the audio in (RCA jack on rear of board) of the Votrax® Board. This Board is installed in the middle slot.

Etherlink™ Board

INT 5 jumped
DACK 1 jumped
DRQ 1 jumped
MEM ADDR 14,15,17,18,19 on top two pins (ECØØH)
12,13,16 on bottom two pins
MEM EN top two pins (disabled)
IO ADDR 8,9 on top two pins (sets to port Ø3ØØH)
4,5,6,7 on bottom two pins

NOTE: On some Etherlink™ boards the DACK jumper may be labeled ACK and the DRQ jumper may be labeled REQ. These are still the same signals.

1ØØØSX/TX Main Logic Board

SW1-1 on
SW1-2 off (this allows the Etherlink™ board to use interrupt 5)
SW1-3 on
SW1-4 on

Server Configuration

****
* *
* One of the most common problems *
* with an education lab is a bad *
* configuration. *
* *
****

Jumper/Switch settings for Boards installed in the server.

The Server will contain an internal hard drive, a video board, an Etherlink™ Board and a CDROM interface board. The jumpers are set as follows:

Sony CDROM CDU-2ØØB Interface Jumpers

Switch 1: Positions 1, 2, 4, 5, and 6 ON
Switch 2: Position 1 ON
Switch 3: Positions 3, and 6 ON

Note: When installing the interface cable into the CDROM unit, both of the connectors on the rear of the unit will work properly.

The switch on the rear of the CDROM unit must be set with positions Ø, 4, and 5 ON.

Sony CDROM CDU 61ØØ-Ø1 Interface Jumpers

Switch 1: Positions 1, 2, 4, 5, and 6 ON
Switch 2: Position 1 ON
Switch 3: Positions 3, and 6 ON

Note: When installing the interface cable into the CDROM unit, both of the connectors on the rear of the unit will work properly.

The switch on the rear of the CDROM unit must be set with positions Ø, 4, and 5 ON.

Hitachi CDROM Interface Jumpers

S7 is jumpered at the top row labeled P1.

Hitachi CDROM Player

The switch at the rear of the player should be set to position Ø. This switch is actually reset in the back panel and requires a medium straight blade screwdriver to rotate.

Etherlink™ Board Jumper Settings

INT	3 jumped	
DACK	1 jumped	
DRQ	1 jumped	
MEM ADDR	14,15,17,18,19 on top two pins	(ECØØH)
	12,13,16 on bottom two pins	
MEM EN	top two pins (disabled)	
IO ADDR	8,9 on top two pins (sets to port Ø3ØØH)	
	4,5,6,7 on bottom two pins	

NOTE: On some Etherlink™ boards the DACK jumper may be labeled ACK and the DRQ jumper may be labeled REQ. These are still the same signals.

The Tandy 3ØØØ server will contain a Color Graphics Adapter. You should insure that this board is set correctly and that the main board's monitor select jumper is set to the correct position for an 8Ø column color monitor. Use Notes and Jumpers for a reference.

The Tandy 3ØØØ server will contain a hard drive only controller or hard/floppy drive controller and serial/parallel board. Since the versions of these boards change, consult Notes and Jumpers for the proper jumper/switch settings for the boards installed in your server.

Tandy 1000 Server Configuration

If the server in this network is a Tandy 1000SX, the jumpers must be set a little differently than in a Tandy 3000. This is due in part to the different interrupt structure of the Tandy 1000 system. Jumpers are listed below.

CDROM CDU-200B Interface Jumpers

Switch 1: Positions 1, 2, 4, 5, and 6 ON
Switch 2: All positions off
Switch 3: All positions off

Note: When installing the interface cable into the CDROM unit, both of the connectors on the rear of the unit will work properly.

The switch on the rear of the CDROM unit must be set with positions 0, 4, and 5 ON.

Etherlink™ Board Jumper Settings

INT	3 jumped	
DACK	1 jumped	
DRQ	1 jumped	
MEM ADDR	14,15,17,18,19 on top two pins	(EC00H)
	12,13,16 on bottom two pins	
MEM EN	top two pins (disabled)	
IO ADDR	8,9 on top two pins (sets to port 0300H)	
	4,5,6,7 on bottom two pins	

NOTE: On some Etherlink™ boards the DACK jumper may be labeled ACK and the DRQ jumper may be labeled REQ. These are still the same signals.

20 Meg Hard Card Jumper Settings

There are several Hard Cards on the market today. Therefore, consult Notes and Jumpers for the correct jumper settings for the particular Hard Card installed in the Tandy 1000 family server.

Installation of the Lab

Under normal circumstances the ESC lab will be received by Tandy Systems Integration, completely assembled, configured and tested before being shipped to the site. Regardless of whether this has been accomplished or not your job remains the same. That is to **completely install and test the lab.**

```
*******************************************
*                                         *
*     A correct installation requires     *
*     you to COMPLETELY install and       *
*     test the lab.                       *
*                                         *
*******************************************
```

When you receive the service call to install the lab, contact the customer and make arrangements to perform the installation. At that time you may verify over the phone such things as adequate power available in the classroom; have any special electrical or network cable runs been completed; are the tables and desks assembled and in place; and anything else particular to the site.

Ensure that you have all the necessary tools and equipment as discussed in Chapter 2 and Chapter 6 of this manual. Be sure you have a copy of the current software in your possession prior to leaving the shop. If possible you should take along a spare Etherlink™ board, a spare student station main logic board, a set of terminators, bulk network cable and some BNC connectors. This will allow you to effect small repairs and possibly save you another trip to the site.

Once on the site, discuss with the lab attendant just where and how the lab is to be arranged. Make sure there are adequate power outlets available at each location for the arrangement. Test the outlets in accordance with Chapter 7 of this manual.

Unpack the server, monitor, storage device, printer and put them in place. Connect the printer to the computer with the supplied printer cable. Connect the storage device to the interface board installed in the computer. Connect the monitor to the video board in the computer. Connect the power cables to the printer, monitor, storage device and computer.

Unpack the student station computers from their boxes and set them in place on the tables. Connect the keyboards to the computers. Unpack and place a monitor on each of the student stations. Connect the monitor to the student station and connect power to the monitor and computer.

Using a bootable diagnostics diskette boot each of the student stations to ensure the computer boots and then start the Memory Diagnostic running. Using a bootable diagnostic diskette boot the server and ensure it boots properly. Pay attention for problems with the setup. Once booted, run the memory diagnostic.

To give adequate time for the computers to run memory diagnostics, a couple of things can be done. First, using the degaussing coil, degauss each of the color monitors in the lab. This should only take a few minutes per monitor. See the Video Monitors Workbook if you need help or instructions concerning degaussing of color monitors.

```
*********************************************
*                                           *
*                 CAUTION                   *
*                                           *
*    Be sure to remove the diagnostics      *
*    diskette from the disk drive prior     *
*    to using the degaussing coil.  The     *
*    degaussing coil is a magnetic          *
*    device and can damage floppy           *
*    diskettes.                             *
*                                           *
*********************************************
```

Second, layout the premade cables where required. Remove the 'T' connectors from the Etherlink™ boards on the student stations and connect the cables to the 'T' connectors. Cut and make up any special lengths of cables and install them to the appropriate 'T' connectors. Since you need to test the Etherlink™ boards with a loopback connector, you may leave the Ethernet™ cable disconnected at this time.

```
*********************************************
*                                           *
*      Completely testing the lab is        *
*      a very important part of the         *
*      installation.                        *
*                                           *
*********************************************
```

Reboot a student station under MSDOS. Using the two terminators that came with the lab, install them to a 'T' connector to form a loopback connector and attach this to the Etherlink™ board in the student station. Run the Etherlink™ diagnostics on the student station in the loopback mode. See Chapter 7 of this manual for more information. Run this test on each student station and then on the server.

If problems arise see Chapter 7 of this manual for more help. Otherwise connect the Etherlink™ cable to each of the student stations and the server via the 'T' connectors. Connect the terminators at the ends of the cables and run the Echo Server test on the network in accordance with Chapter 7 of this manual.

At this point you can dress the cables using the wire ties and clips to make a neat and professional looking installation. The next section will cover the software installation.

Software - Installation and Testing

While there are a number of diskettes that are to be used to build the Tandy server system, there is only one Tandy 1ØØØ student station boot diskette. Two MSDOS versions have been tested with this configuration, MSDOS 3.1Ø.Ø1 and 3.2Ø.Ø3. The particular version used is dependent on the one sold to the customer by the vendor and either version will work fine. On a new installation use which ever version was previously installed by TSI or the latest version if you are installing the system. In the case of an existing lab, use the same version currently on the hard disk.

The procedures are different depending on the DOS used, so follow the procedure for the type of DOS you are using. The first step is to format the server hard disk. When finished with the formatting procedure proceed to the "Setting Up the DOS Subdirectory" section of this manual.

Tandy 3ØØØ Hard Disk Format Procedure For MSDOS 3.1Ø.Ø1

First you must use HSECT on the Supplemental DOS Disk to do the low-level formatting. FDISK will then be used to partition the hard drive prior to system formatting. HFORMAT C:/S/B will be used last to do the final format, lock out bad tracks, and install the system files. The boot ROMS installed on the machine should be the latest supported version for the Tandy server being used.

```
*********************************************
*                                           *
*       Be sure to use your duplicate       *
*       copy of software diskettes          *
*       and not your masters!               *
*                                           *
*********************************************
```

Boot the computer with MSDOS 3.1Ø.Ø1 and insert the supplemental programs diskette. Type the command:

HSECT <ENTER>

Upon entering HSECT you will see the prompt:

Press any key to begin formatting drive C.

If the drive is blank, pressing any key will begin formatting drive C. If the drive is not blank you will see the message:

```
The disk has already been formatted
All data on disk will be DESTROYED!!

Press <ESC> or <CTRL><C> to cancel
any other key to continue formatting.
```

You should press **<ENTER>**.

HSECT should generate a message:

```
Formatting.....
      Format completed.
```

The second step is FDISK. Type the command:

FDISK <ENTER>

Upon entering FDISK you should see displayed on the screen:

```
1. Create DOS Partition
2. Change Active Partition
3. Delete DOS Partition
4. Display Partition Data
5. Select Next Hard Disk Drive
6. Select Previous Hard Disk
   Drive

Enter Selection -->

Press ESC to exit to MSDOS
```

Press '1' then **<ENTER>**. The next prompt should be:

```
Do you wish to use the entire
hard disk for DOS (Y/N) --> Y
```

You should press **<ENTER>** to default to the entire drive.

The partition will be created and you should see:

```
System needs to reboot
Insert system disk in Drive A
Press any key to reset the system
```

Press a key and let the system reboot.

The next step is HFORMAT. Type in the command:

HFORMAT C:/S/B <ENTER>

You should see the prompt:

```
Insert DOS disk in drive A and strike ENTER when ready.
Next head, track pair or press ENTER to quit.
```

For example for a defect at cylinder 257, head Ø, you would enter:

Ø,257<ENTER>

Continue entering defects in this manner until all are typed in, then press **<ENTER>** with no entries typed to end this step. You will see the message:

```
WARNING ALL DATA ON NON-REMOVABLE DISK
DRIVE C: WILL BE LOST!
Proceed with format (Y/N)?
```

Press "**Y <ENTER>**" at this point. The screen will fill with lines of dashes that turn into dots as each track is formatted. When finished the screen will show the size of the drive, how many bytes were used by the system, how many are in bad tracks, and how many are available for use. Press reset and reboot, then proceed to the "Setting up the DOS Subdirectory and AUTOEXEC.BAT File" section.

```
*******************************************
*                                         *
*       If you have made it this far,     *
*       you are on the road to a good     *
*       installation.                     *
*                                         *
*******************************************
```

Tandy 3ØØØ Hard Disk Format using MSDOS 3.2Ø.Ø3

After booting on MSDOS you must use HSECT on the Supplemental DOS Disk to do the low-level format. FDISK will then be used to partition the hard drive prior to system formatting. FORMAT C:/S will be used last to do the final format and install the system files. The boot ROMS installed on the machine should be the latest supported version for the Tandy server being used.

```
*********************************************
*                                           *
*       Be sure to use your duplicate       *
*       copy of software diskettes          *
*       and not your masters!               *
*                                           *
*********************************************
```

Boot the computer with MSDOS 3.2Ø.Ø3 and insert the supplemental programs diskette. Type the command:

HSECT <ENTER>

Upon entering HSECT you will see the prompt:

```
Which hard drive do you
want to format (C/D)
?
```

You should press 'C' then **<ENTER>**.

HSECT should generate a warning at this point:

```
All data on drive C will be
DESTROYED!!
Do you want to continue (Y/N)
?
```

You should press 'Y' then **<ENTER>**.

Now you should see the prompt:

```
Hard drive C is type x
Number of heads = x
Number of cylinders = x
Is this correct (Y/N)
?
```

The values displayed at x will depend on the SETUP of the machine you are formatting. If you have a 2Ø Meg Seagate drive, SETUP should show a Type "2". If you have a 4Ø Meg, then SETUP should show a Type "11". If they are wrong for the type of hard drive that you are going to format, then exit HSECT and run SETUP again.

After either answering 'Y **<ENTER>**' to the previous step, or upon entering the proper number of cylinders and heads you should now see:

```
Do you want to flag defective
tracks (Y/N)
?
```

If there are errors on the error media map attached to the hard drive bubble then press 'Y' then **<ENTER>** at this prompt. If there are no errors then press '**N <ENTER>**'and the low-level format will begin.

If you entered 'Y' at the previous prompt then you should see:

```
Enter next head, cylinder pair or
press <enter> to quit.
?
```

For example for a defect at cylinder 257, head Ø, you should enter:

Ø,257 <ENTER>

Continue entering all defects in this manner until all are typed in, then press **<ENTER>** with no entries typed in to end this step. The low-level format should then begin.

When you see the "Format Successful" message, type the command:

FDISK <ENTER>

Upon entering FDISK you should see displayed on the screen:

```
1. Create DOS Partition
2. Change Active Partition
3. Delete DOS Partition
4. Display Partition Data
5. Select Next Hard Disk Drive
6. Select Previous Hard Disk
   Drive

Enter Selection -->

Press ESC to exit to MSDOS
```

Press '1' then **<ENTER>**. The next prompt should be:

```
Do you wish to use the entire
hard disk for DOS (Y/N) --> Y
```

You should press **<ENTER>** to default to the entire drive.

The partition will be created and you should see:

```
System needs to reboot
Insert system disk in Drive A
Press any key to reset the system
```

Insert a DOS disk in drive A: and press any key.

Type in the command:

FORMAT C:/S <ENTER>

You should then see the prompt:

```
WARNING, ALL DATA ON NON-REMOVABLE DISK
DRIVE C: WILL BE LOST!
Proceed with format (Y/N)?
```

Before pressing 'Y' then **<ENTER>**, be sure that the boot disk is in Drive A.

The computer will display a cylinder count as it is formatting. When completed, you should be able to remove the system disk from Drive A and then reboot from the hard drive.

```
**********************************************
*                                            *
*       Be sure to use your duplicate        *
*       copy of software diskettes           *
*       and not your masters!                *
*                                            *
**********************************************
```

Setting Up the DOS Subdirectory and AUTOEXEC.BAT File

Once the hard drive has been properly initialized and you have successfully rebooted from it, you need to create a DOS subdirectory and copy all system files into the subdirectory. To do this type:

```
MKDIR DOS       <ENTER>
CD DOS          <ENTER>  (insert the boot disk in drive A)
COPY A:*.* C:   <ENTER>  (insert the supplemental disk in drive A)
<F3>            <ENTER>
```

This will create a subdirectory called DOS in the root directory. The only file that should be in the root directory is COMMAND.COM.

At this point you are ready to create the AUTOEXEC.BAT file in the root directory. Type in the lines:

```
CD \                    <ENTER>
COPY CON AUTOEXEC.BAT   <ENTER>
PATH=C:\DOS             <ENTER>
PROMPT $P$G             <ENTER>
<F6>                    <ENTER>
```

The "1 file(s) copied" message appears and the AUTOEXEC.BAT is written to the root directory.

Tandy Server BUILD Procedure

At the C> prompt, place the T3ØØØ build disk in drive A and type:

A:BUILD <ENTER>

The BUILD batch file will prompt you for the other disks as necessary. Once the Tandy 3ØØØ is built, the installation can be tested by rebooting. The drivers will be loaded and a directory of the CDROM will be displayed.

Then type in:

ESMASTER <ENTER>

A status screen will appear to indicate which student stations are on line. Student stations may be booted at this time. Depending on the version of ESC software, there may be a test lesson automatically loaded on bootup or there may appear a login screen at the student station. If the login screen appears, you may login as Visitor 1 and just press <ENTER> at the password prompt. This should load the test lesson.

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Tandy 1000SX Server Software Installation

In order to install the software on a Tandy 1000SX server, the 20 Meg Hard Card must first be formatted using the appropriate procedures for the Hard Card installed in the Tandy 1000SX. Be sure to use currently supported MSDOS version for the Tandy 1000SX. Use the command:

FORMAT C:/S

so that the system files will be transferred to the hard card. Now reboot from the hard card to ensure it boots properly. The next step is to create a DOS subdirectory and copy all of the MSDOS files into it.

Type:

MKDIR DOS <enter>

Insert the MSDOS boot diskette in to drive A: and type:

A: <enter>
COPY *.* C:\DOS

When the drive prompt reappears, remove the MSDOS diskette from drive A: and replace it with the Supplemental disk. Type:

F3 <enter>

The drive prompt should then reappear after all of the files have been copied. You may then proceed to the build procedure.

BUILD Procedure:

Place the Tandy 1000 Build disk into drive A: and type:

A:BUILD

The Build batch file will prompt you for the additional disks when necessary.

You may then start the server by rebooting, at the C:> prompt changing directories to C:\ESC and typing the command **'ESMASTER'**.

Tandy 1000 Boot Disk Procedures.

Each 1000 will need its own boot disk. Use DISKCOPY to duplicate the Master Boot Disk, then use ESMKBOOT to change the station number.

Run ESMKBOOT located on each boot disk to customize the AUTOEXEC.BAT file to match the station number. ESMKBOOT will clear the screen and display:

```
Place a Student Station Boot Disk in Drive A.
Enter Station Number: [  ] (99 to end)
```

Type in an appropriate number and press **<ENTER>**
This will rewrite the disk in drive A: and return you to the same prompt. Remove the disk from drive A: and label it with the appropriate station number.

NOTE

Ensure you mark the student station number on the diskette as you make it so it can be clearly identified as to which student station it goes with.

Type 99 and **<ENTER>** to quit.

At this point if the server is up, inserting a boot disk in a student station and pressing reset will send you the first lesson. If there are any problems check the jumper settings and cabling.

Final Checkout

If you've gotten this far and the network is still experiencing problems, chances are there is either one or more improperly setup or failed units in the system. You should verify that all of the boards have been jumpered correctly and were correctly installed. Cabling must also be checked.

Test the cable by using the TDR tester provided by Computer Technical Services. This test will show opens in the cable or an improperly terminated cable. Instructions for using the TDR are in its accompanying manual. Also use the ohm meter to completely test the cable. See Chapter 6 for more information on cable testing.

If this investigation doesn't turn up any bugs, a process of elimination type approach may be the next step. Try taking all but the two terminated end machines out of the network and testing their ability to communicate. If this presents no problems, add a machine at a time until problems start to occur. This will give you a suspect Etherlink™ board to put to the side while you continue testing the remaining student stations. When all student stations have been tested you may concentrate your efforts on the failed units.

Prior to leaving the site call the Education Laboratory Support group at Computer Technical Services and inform them that the lab is installed and running. It is very important to call so that the appropriate people involved in the lab installation are informed of its completion.

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CHAPTER 4

CONTROL DATA CORPORATION LABS

Control Data Corporation
Educational Laboratories

The Control Data Corporation (CDC) Educational Lab is another form of education laboratory supported by Tandy. The CDC lab follows the general format of other education labs found around the country.

The CDC lab consists of a server, student stations, network boards and cabling. One of the most notable aspects of this lab is the server. CDC provides a complete server which is not a Tandy machine but rather is built by Corvus®. In addition to the non-Tandy server, the network software is Novell® Netware™.

The student stations are Tandy 1ØØØ family computers with at least 64ØK of RAM and at least one disk drive. The student stations will also contain an EGA video card and an Etherlink™ network board.

The lab is tied together with 3COM® Etherlink™ boards using the thin Ethernet™ cable. This cable is designated RG58 C/U and is the only cable to be used on education labs. The lab operates in much the same manner as other labs and except for the slight hardware and software differences the installation procedures are the same.

Server/Lab Manager

The server is manufactured by Corvus® and will arrive at the installation site completely assembled. The 'box' consists of an 8Ø386 based mother board with 8 expansion slots. The network operating system and the educational software are stored internally on two hard disks. Drive C: is a Maxtor XT 219Ø drive with a storage capacity of 193 Meg. Drive D: is a CDC Wren II with a storage capacity of 86 Meg. Both hard drives are controlled by a Western Digital WD1ØØ3-WA2 controller board. This controller also drives the Teac floppy drive.

Other boards found in the server consist of an Archive Tape drive controller which controls a Wangtec tape drive, an Etherlink™ Plus network board and an AST® Rampage memory board stuffed to 2 Meg.

```
*********************************************
*                                           *
*        The key card is the 'key'          *
*        to the whole system!               *
*                                           *
*********************************************
```

Of particular interest is a Novell® key card which is a small board plugged into slot number J2. This key card contains a chip which serializes the network operating system to the card. The only version of Netware™ that may be run on the server is the one that matches the serial number in the key card.

If the key card were to fail, the software must be replaced along with the key card because of the serialization. The same holds true for the software. If the software must be replaced for any reason then the key card must be replaced with the one matched to the new software.

****
*
* **NOTE** *
*
* **Versions of Novell® Netware™** *
* **later than 2.ØA do not require** *
* **a Novell® Keycard.** *
*
****

Student Stations

A typical student station consists of the following:

1 Tandy 1ØØØ family computer w/ 1 floppy drive and at least 64ØK of RAM
1 Tandy Color Monitor
1 Etherlink™ board

Software

As mentioned earlier, the educational software is stored on the hard drives in the server. The network operating system will be a current version of NovellxT 2.xx Netware™.

Netware™ may be a little different than anything you have ever seen before. The operating system must be generated for the particular computer it is to be used on. This is a somewhat complicated procedure, however I will give a brief explanation of how it works.

****
*
* **This operating system must** *
* **be generated to the specific** *
* **hardware configuration.** *
*
****

The network operating system is linked to the resource set associated to it. The resource set consists of all the hard drives, printers, serial cards, network boards, floppy drives and any other devices in the system. The resource set must all be made known to the operating system prior to the install.

During the install procedure all of the appropriate drivers are loaded according to the resources that the user originally identified. When this procedure is complete, the operating system has been generated and installed on the hard drive along with the appropriate drivers and other files necessary to utilize the system.

Since the software is so closely tied to the hardware, if the hardware configuration changes, the software operating system must be regenerated. Also, if the key card fails, the software must be replaced meaning a complete new installation generation. Because this software is very complicated it will only be installed at TSI prior to shipment to the site or by the local CDC representative on site.

Configuration of the Lab

Before starting the installation, verify that all of the equipment has arrived. Discuss the placement of the stations and the server with the customer. Discuss the routing of the network cable. See the cabling section for more information on cabling restrictions and specifics. For more information on 3COM® systems, you should also reference the 3COM® Network Guide.

Student stations currently are configured with one of two types or network boards. One board found in a student station is the standard Etherlink™ I board. The other type of board used is a TiganNet™ board manufactured by Tigan®.

There are two versions of the TiganNet™ board. Both versions are the same for jumper and switch settings. The TiganNet™ TCL-32EN board supports BNC coaxial cable connection only. The TiganNet™ TCL-32DE supports both BNC coaxial cable connection and Thick Ethernet™ cable connection, however labs supported by Tandy currently only use the BNC connection. The proper jumper settings for each of these boards are listed below. The locations given for switches and jumpers are referenced to numbers labeled across the top of the board and letters labeled down the side of the board. Regardless of which board is installed in the student stations, the server will still contain an Etherlink™ Plus board.

When you are sure where each of the stations will be placed, proceed with setting up each of the stations. Although the stations should come pre-configured, information is given below on jumpering and installing each of the boards in the station. Remember to degauss each of the monitors as they are set up.

Student Station Configuration

Jumper/Switch settings for the boards installed in the student stations.

Etherlink™ Board

INT	3 jumped	
DACK	1 jumped	
DRQ	1 jumped	
MEM ADDR	14,15,17,18,19	on top pins
	12,13,16	on bottom pins
MEM EN	top pins	
IO ADDR	8,9	on top pins
	4,5,6,7	on bottom pins

NOTE: On some Etherlink™ boards the DACK jumper may be labeled ACK and the DRQ jumper may be labeled REQ. These are still the same signals.

NOTE: When installing the Etherlink™ board into a Tandy 1ØØØSL, set the DRQ (REQ) and DACK (ACK) jumpers to position 3 jumped.

TiganNet™ Board (both versions)

I/O Switch (located at position 5H on the board)

SW-1	OFF
SW-2	OFF
SW-3	ON
SW-4	ON
SW-5	OFF
SW-6	OFF

Ram Address Switch (located at position 5G on the board)

SW-1	OFF
SW-2	OFF
SW-3	ON
SW-4	OFF
SW-5	OFF
SW-6	ON

ROM Address Switch (located at position 8H on the board)

SW-1	OFF
SW-2	ON
SW-3	OFF
SW-4	ON
SW-5	ON
SW-6	ON

IRQ Jumper (located at position 6H on the board)

2 jumped

NOTE: These are the default settings of the board as it comes from the factory.

EGA Board

Because board versions change, see Notes and Jumpers for the jumper/switch settings of the current board installed and the particular monitor to be used with the student station.

1ØØØTX Main Logic Board

SW1-1 ON
SW1-2 ON
SW1-3 ON
SW1-4 ON

Server Configuration

Hard Drive Controller Board

E2 - E5
E3 - E6
E7 - E8

Tape Drive Controller Board

RR	jumped
Y	jumped
DRQ2	jumped
DACK2	jumped
IRQ6	jumped
A9	jumped
KK	jumped

Etherlink™ Plus Board

INT	3 jumped
ADDR	13 on left set of pins
	14 on right set of pins
	15 on right set of pins
	16 on left set of pins
	17 on left set of pins
MEM	18 on right set of pins
	19 on right set of pins
MEM EN	on right set of pins
DMA	two jumpers on pins #6
TEST	jumpered to OFF
CONFIG	1 on right set of pins
	2 on right set of pins
A15	jumpered to OFF
A16	jumpered to OFF
IO ADDR	4 on lift set of pins
	5 on lift set of pins
	6 on left set of pins
	7 on left set of pins
	8 on right set of pins
	9 on right set of pins

Rampage Memory Board

SW1-1	OFF	SW2-1	ON
SW1-2	OFF	SW2-2	ON
SW1-3	OFF	SW2-3	ON
SW1-4	OFF	SW2-4	ON
SW1-5	ON	SW2-5	OFF
SW1-6	ON	SW2-6	ON
SW1-7	ON	SW2-7	OFF
SW1-8	OFF	SW2-8	ON
SW1-9	ON		
SW1-1Ø	ON		

Main Logic Board

E2 to center pin
E4 to center pin

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Installation of the Lab

Under normal circumstances the Educational lab will be received by Tandy Systems Integration, completely assembled, configured and tested before being shipped to the site. Regardless of whether this has been accomplished or not, your job remains the same. That is to **completely install and test the lab.**

A CDC lab installation requires a little bit more coordination than other education labs you may encounter. Therefore, specific responsibilities have been assigned to certain groups involved in a lab installation. These responsibilities are outlined in the next few paragraphs.

Tandy Contract Marketing Department

Order Receipt and Control

All CDC educational lab sales will be processed and handled by the Tandy Contract Marketing Department (TCM). Equipment orders will be transmitted to the appropriate warehouses by TCM and equipment delivered to Tandy Systems Integration for hardware installation and component testing.

Upon receipt of the order, the TCM coordinator will contact ELS at Computer Technical Services. The ELS coordinator will maintain a status sheet on each lab and inform the local Business Products Service Center responsible for installation of the lab.

The TCM coordinator will be responsible for providing the names and telephone numbers of local CDC and customer contacts to ELS who in turn will provide the customer contacts to the service center technician.

Education Laboratory Support

Education Laboratory Support at Computer Technical Services will coordinate lab installation between TCM and the the local Business Products Service Centers. The TCM coordinator will be responsible for setting dates for the pre-site inspection and lab installation. TCM will inform ELS of these dates and ELS will inform the appropriate service center of these dates as far in advance as possible. **It is important to keep the scheduled dates with the customer.** If you fail to keep an appointment with the customer, call ELS immediately! Questions regarding laboratory installation and service procedures should be directed to this group.

Business Products Service Center

The local Business Products Service Center manager will be informed by the ELS coordinator that a CDC education lab order has been placed and his shop will be responsible for the installation. A brief discussion will be made as to the size of the lab, the contact persons and the dates for the pre-site and installation if known. Any tools/special software required to complete the installation will be ordered by the Service Center prior to the due date of the installation.

Pre-installation Inspection

Prior to the actual installation due date, the technician responsible for installing the lab shall be given an appointment for a pre-installation site inspection. (Actual dates and times will be established by CDC and the TCM department.) Using the *"Site Preparation Checklist"* prepared by TCM, the technician will verify that everything at the site is ready and prepared for the education laboratory. The checklist will be mailed directly to the service center by the TCM department.

The checklist covers important items to be provided by the customer such as adequate lighting and air conditioning, work tables and electrical outlets, and the layout of the training area. In addition to items directly involving the file server and work stations, the customer must make provision for a telephone to be installed near the file server for access to CDC's PLATO Hotline and Customer Service Department.

Upon completion of the pre-site inspection, the customer should be made aware of what items, if any, failed the inspection. The customer should arrange to correct all checklist failures (e.g. power outlets and lighting) prior to actual installation of the equipment. If possible leave a copy of the checklist for the customer. When back at the shop, make a copy of the checklist for shop records and return the original checklist to the TCM department in the envelope provided.

After the pre-site inspection is complete, confirm the installation date with the customer. If the customer feels that the originally scheduled installation date must be changed, the ELS coordinator must be informed. CDC and TCM will be notified of the proposed change in due date by ELS.

When you receive the service call to install the lab, contact the customer and make arrangements to complete the installation. If a pre-site survey had been completed, review the shop copy to see what problems there may have been. While on the phone with the customer, verify that all problems have been corrected. If any problems remain uncorrected, call and inform ELS. Again if the customer needs to change the installation date, call the ELS coordinator and inform him.

Ensure that you have all the necessary tools and equipment as outlined in Chapters 2 and 6 of this manual. There is no special software for this lab, however, do not forget diagnostics. If possible you should take along a spare Etherlink™ board, a spare student station main logic board, a set of terminators, bulk network cable and some BNC connectors. This will allow you to effect small repairs and possibly save you another trip to the site.

On Site

Once on the site, discuss with the lab attendant just where and how the lab is to be arranged. Make sure there are adequate power outlets available at each location for the arrangement. Test the outlets in accordance with Chapter 7 of this manual.

Unpack the server, monitor, storage device, printer and put them in place. Connect the printer to the computer with the supplied printer cable. Connect the storage device to the interface board installed in the computer. Connect the monitor to the video board in the computer then connect power to the printer, monitor, storage device and computer.

```
*******************************************
*                                         *
*     A correct installation requires     *
*     you to COMPLETELY install and       *
*     test the lab.                       *
*                                         *
*******************************************
```

Unpack the student station computers from their boxes and set them in place on the tables. Connect the keyboards to the computers. Unpack and place a monitor on each of the student stations. Connect the monitor to the student station and connect power to the monitor and computer.

Using a bootable diagnostics diskette boot each of the student stations to ensure the computer boots and then start the memory diagnostic running. Leave the memory diagnostics running until the student stations must be shut down.

A couple of things can be done with the lab at this point to give time to the computers to run the memory diagnostics. First, while all the color monitors are on you can degauss them. Degauss each color monitor in the lab one at a time. This should only take a few minutes per monitor. See the Video Workbook for more information on color monitor degaussing.

```
*********************************************
*                                           *
*                 CAUTION                   *
*                                           *
*    Be sure to remove the diagnostics      *
*    diskette from the disk drive prior     *
*    to using the degaussing coil.  The     *
*    degaussing coil is a magnetic          *
*    device and can damage floppy           *
*    diskettes.                             *
*                                           *
*********************************************
```

Second, layout all the premade cables for the student stations. Remove the 'T' connectors from the Etherlink™ boards on the student stations and connect the cables to the 'T' connectors. Cut and make up any special lengths of cables and install them to the appropriate 'T' connectors. Leave the 'T' connectors off the Etherlink™ boards at this time for easy access when testing the boards with the loopback connector.

When ready to start network testing, reboot each student station under MSDOS. Using the two terminators that came with the lab, attach them to a 'T' connector to form a loopback connector and attach this to the Etherlink™ board in the student station. For more information on the loopback connector, see Chapter 6 of this manual.

Run the Etherlink™ diagnostics on the student station in the loopback mode. See Chapter 7 of this manual for more information on diagnostics. Run this test on each student station one at a time and then on the server.

If problems arise see Chapter 7 of this manual for more help. Otherwise connect the Etherlink™ cable to each of the student stations and the server via the 'T' connectors. Connect the terminators at the ends of the cables and run the Echo Server test on the network in accordance with Chapter 7 of this manual.

```
*********************************************
*                                           *
*      Completely testing the lab is        *
*      a very important part of the         *
*      installation.                        *
*                                           *
*********************************************
```

At this point you can dress the cables using the wire ties and clips to make a neat and professional looking installation. Make sure all cables are tied together at the backs of the student stations leaving no stray cables to hang free. Ensure all cables are off the floor where they may be stepped on or tripped over. As much as possible, hide the cabling from normal view.

Software - Installation and Testing

Server Software

The server in this lab is a Corvus® built server with all the necessary software already installed. Therefore it is not necessary to install anything on the server itself. When booted, the server is in a dedicated mode and will show a blank screen with a colon (:) at the upper left hand corner for a prompt.

Tandy 1ØØØ Boot Disk Procedures

Each student station will need its own boot disk. Under normal circumstances boot diskettes will be provided with the lab. If not use DISKCOPY on an MSDOS diskette to duplicate the Master Boot Disk, then label each boot diskette for each station. There are no numbers associated with the student station and boot diskette. Any boot diskette can be used in any student station as the software assigns the student station a number on bootup.

Final Checkout

If you've gotten this far and the network is still experiencing problems, chances are there is either one or more improperly setup or failed units in the system. You should verify that all of the boards have been jumpered correctly and were correctly installed. Cabling must also be checked.

Test the cable by using the TDR tester provided by Computer Technical Services. This test will show opens in the cable or an improperly terminated cable. Instructions for using the TDR are in its accompanying manual. Also use the ohm meter to completely test the cable. See Chapter 6 for more information on cable testing.

If this investigation doesn't turn up any bugs, a process of elimination type approach may be the next step. Try taking all but the two terminated end machines out of the network and testing their ability to communicate. If this presents no problems, add a machine at a time until problems start to occur. This will give you a suspect Etherlink™ board to put to the side while you continue testing the remaining student stations. When all student stations have been tested you may concentrate your efforts on the failed units.

If you run into any problems during the installation with the hardware or the software as always call ELS for assistance. Additionally CDC has two telephone numbers you can call in the event you cannot reach ELS. The CDC Plato Hotline is (8ØØ) 869-22ØØ for lab assistance. The CDC technical support number is (612) 832-14Ø4. With either number, identify yourself as a Tandy service technician installing or repairing a CDC Plato education lab and inform them of the site location.

Prior to leaving the site call the Education Laboratory Support group at Computer Technical Services and inform them that the lab is installed and running. It is very important to call so that the appropriate people involved in the lab installation are informed of its completion.

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CHAPTER 5

WASATCH CORPORATION LABS

Wasatch Corporation
Educational Laboratories

The Wasatch Corporation Educational Lab is another form of education laboratory supported by Tandy. The Wasatch lab follows the general format of other education labs found around the country.

The Wasatch lab consists of a server, student stations, the network boards and cabling. The server is a Tandy computer of either 3000 or 4000 variety and the student stations consist of Tandy 1000 family computers. In addition to the standard Arcnet® network, the network software used is Novell® Netware™.

The lab is tied together with Tandy Arcnet® boards using the Arcnet® RG-69/62 cable Active and Passive Hubs. The lab operates in much the same manner as other labs and except for the slight hardware and software differences the installation procedures are the same.

Server/Lab Manager

The server is a Tandy 3000 or 4000 computer and will arrive at the installation site completely assembled. The computer is standard in configuration with two exceptions. First, there are two Tandy Arcnet® boards installed. One Arcnet® board is used to provide network communications to the student stations in the lab. The other Arcnet® board is for future expansion of the lab and can be ignored at this time.

The second difference is the absence of the reset button on the computer. Novell® Netware™ is similar to other network operating systems in that it needs to be shutdown in a controlled manner. To avoid accidently resetting the server the reset button has been removed.

The network operating system and the educational software are stored on hard drives. Early labs have two hard drives. Drive C: is an internally mounted Storage Dimensions LAN-64 drive with a storage capacity of 64 Meg. Drive D: is a Storage Dimensions LAN-2 drive with a storage capacity of 183 Meg and is mounted externally in its own case. In later labs the server contains one internal 344 Meg SCSI hard drive which contains all software for the system.

Other boards found in the server consist of a 2 Meg. RAM board, floppy drive controller (3000 only), two Tandy Arcnet® network boards, video board, serial/parallel board, Novell® Keycard and an internal modem board.

```
*********************************************
*                                           *
*        The key card is the 'key'          *
*        to the whole system!               *
*                                           *
*********************************************
```

Of particular interest is a Novell® key card which is a small board plugged into slot number J2. This key card contains a chip which serializes the network operating system to the card. The only version of Netware™ that may be run on the server is the one that matches the serial number in the key card.

If the key card were to fail, the software must be replaced along with the key card because of the serialization. The same hold true for the software. If the software must be replaced for any reason then the key card must be replaced with the one matched to the new software.

```
*******************************************
*                                         *
*                  NOTE                   *
*                                         *
*     Versions of Novell® Netware™        *
*     later than 2.ØA do not require      *
*     a Novell® Keycard.                  *
*                                         *
*******************************************
```

Later labs use a newer version of Novell® that does not require a KeyCard installed in the server. The serialization is provided by the installation diskettes.

Student Stations

A typical student station consists of the following:

1 Tandy 1ØØØ family computer w/ 1 drive and at least 64ØK of RAM
1 Tandy Color Monitor
1 Tandy Arcnet® board

An internal modem will be installed in one of the student stations which will allow a degree of system testing and maintenance over the phone. In another student station there will be installed a tape backup device for performance of system backups. Currently being used is the Tandy TCS-1ØØ tape backup system.

Software

As mentioned earlier, the educational software is stored on the hard drive(s) in the server. The network operating system will be a current version of Novell® 2.xx Netware™.

Netware™ may be a little different than anything you have ever seen before. The operating system must be generated for the particular computer it is to be used on. This is a somewhat complicated procedure, however I will give a brief explanation of how it works.

```
*******************************************
*                                         *
*       This operating system must        *
*       be generated to the specific      *
*       hardware configuration.           *
*                                         *
*******************************************
```

The network operating system is linked to the resource set associated to it. The resource set consists of all the hard drives, printers, serial cards, network boards, floppy drives and any other devices in the system. The resource set must all be made known to the operating system prior to the install. During the install procedure all of the appropriate drivers are loaded according to the resources that the user originally identified. When this procedure is complete, the operating system has been generated and installed on the hard drive along with the appropriate drivers and other files necessary to utilize the system.

Since the software is so closely tied to the hardware, if the hardware configuration changes, the software operating system must be regenerated. Also, if the key card fails, the software must be replaced meaning a complete new installation generation. Because this software is very complicated it will only be installed at TSI prior to shipment to the site or by the local Wasatch representative on site.

Configuration of the Lab

Before starting the installation, verify that all of the equipment has arrived. Discuss the placement of the stations and the server with the customer. Discuss the routing of the network cable. See the cabling section for more information on cabling restrictions and specifics.

When you are sure where each of the stations will be placed, proceed with setting up each of the stations. Although the stations should come pre-configured, information is given below on jumpering and installing each of the boards in the station. Remember to degauss each of the monitors as they are set up.

Student Station Configuration

Jumper/Switch settings for the boards installed in the student station.

Tandy Arcnet® Board

This board is set using two DIP switch banks and a set of jumpers.

Switch S1-1 thru S1-8 set the node address of the board. Each board in the lab must have a unique number different from any other board in the system. Also, Node Address Ø is not permitted for any board.

```
S2-1    ON   \
S2-2    OFF   -  I/O Base Address switches of 2EØH
S2-3    ON   /

S2-4    ON   \
S2-5    OFF   -  Memory Address switches of DØØØØH
S2-6    OFF  /

S2-7    ON   \ _ Ram Offset switches for first 2K block
S2-8    ON   /
```

A single jumper is placed across the labeled pins of JP1 for the desired Interrupt setting, in this case INT-3.

Internal Modem Board

Because the version of this board may change, see Notes and Jumpers for proper jumpering of the board installed. The modem board will be set for COM1.

Tape Cartridge Interface Board

ADDR SEL	B, D, E, G jumped
DRQ	1 jumped
DACK	1 jumped
IRQ	2 jumped

NOTE: The above settings are for a Tandy 1ØØØTX or Tandy 1ØØØTL. If the tape cartridge interface is installed in a Tandy 1ØØØSL then the DRQ and DACK settings must be changed to 3 jumped and the student station boot disk modified to reflect the changes.

1ØØØTX Main Logic Board

```
SW1-1  ON
SW1-2  ON
SW1-3  ON
SW1-4  ON
```

Server Configuration

Jumper/Switch settings for the boards installed in the server.

First Tandy Arcnet® Board with VGA Display Adaptor installed

This board is set using two DIP switch banks and a set of jumpers.

Switch S1-1 thru S1-8 set the node address of the board. Each board in the lab must have a unique number different from any other board in the system. Also, Node Address Ø is not permitted for any board.

```
S2-1    ON   \
S2-2    OFF   -  I/O Base Address switches of 2FØH
S2-3    OFF  /

S2-4    ON   \
S2-5    OFF   -  Memory Address switches of DØØØØH
S2-6    OFF  /

S2-7    ON   \ _ Ram Offset switches for first 2K block
S2-8    ON   /
```

A single jumper is placed across the labeled pins of JP1 for the desired Interrupt setting, in this case INT-3.

Second Tandy Arcnet® Board with VGA Display Adapter installed

This board is set using two DIP switch banks and a set of jumpers.

Switch S1-1 thru S1-8 set the node address of the board. Each board in the lab must have a unique number different from any other board in the system. Also, Node Address Ø is not permitted for any board.

```
S2-1    ON   \
S2-2    OFF   -  I/O Base Address switches of 2EØH
S2-3    ON   /

S2-4    ON   \
S2-5    ON    -  Memory Address switches of CØØØØH
S2-6    ON   /

S2-7    ON   \ _ Ram Offset switches for first 2K block
S2-8    ON   /
```

A single jumper is placed across the labeled pins of JP1 for the desired Interrupt setting, in this case INT-5.

First Tandy Arcnet® Board with other than VGA Display Adaptor installed

This board is set using two DIP switch banks and a set of jumpers.

Switch S1-1 thru S1-8 set the node address of the board. Each board in the lab must have a unique number different from any other board in the system. Also, Node Address Ø is not permitted for any board.

```
S2-1    ON   \
S2-2    OFF   -  I/O Base Address switches of 2EØH
S2-3    ON   /

S2-4    ON   \
S2-5    OFF   -  Memory Address switches of DØØØØH
S2-6    OFF  /

S2-7    ON   \ _ Ram Offset switches for first 2K block
S2-8    ON   /
```

A single jumper is placed across the labeled pins of JP1 for the desired Interrupt setting, in this case INT-2.

Second Tandy Arcnet® Board with other than VGA Display Adapter installed

This board is set using two DIP switch banks and a set of jumpers.

Switch S1-1 thru S1-8 set the node address of the board. Each board in the lab must have a unique number different from any other board in the system. Also, Node Address Ø is not permitted for any board.

```
S2-1    ON   \
S2-2    OFF   -  I/O Base Address switches of 2FØH
S2-3    OFF  /

S2-4    ON   \
S2-5    ON    -  Memory Address switches of CØØØØH
S2-6    ON   /

S2-7    ON   \ _ Ram Offset switches for first 2K block
S2-8    ON   /
```

A single jumper is placed across the labeled pins of JP1 for the desired Interrupt setting, in this case INT-3.

Storage Dimensions LAN-285 Controller

W1	Open
W2	Open
W3	Open
W4	Jumped
W5	Open

Floppy Only Board

Because the version of this board may change, see Notes and Jumpers for proper jumpering of the board installed.

Note: This board will only be found in the Tandy 3ØØØ server.

Serial/Parallel Board

Because the version of this board may change, see Notes and Jumpers for proper jumpering of the board installed.

EGA/CGA Board

Because the version of this board may change, see Notes and Jumpers for proper jumpering of the board installed.

VGA Board

Because the version of this board may change, see Notes and Jumpers for proper jumpering of the board installed.

SCSI Controller Board

Because the version of this board may change, see Notes and Jumpers for proper jumpering of the board installed.

344 Meg SCSI Drive

Because the version of this board may change, see Notes and Jumpers for proper jumpering of the board installed.

Installation of the Lab

Under normal circumstances the ESC lab will be received by Tandy Systems Integration, completely assembled, configured and tested before being shipped to the site. Regardless of whether this has been accomplished or not, your job remains the same. That is to **completely install and test the lab.**

When you receive the service call to install the lab, contact the customer and make arrangements to perform the installation. At that time you may verify over the phone such things as adequate power available in the classroom; have any special electrical or network cable runs been completed; are the tables and desks assembled and in place; and anything else particular to the site.

If a pre-site survey had been completed, review the shop copy to see what problems there may have been. Once on site, verify that all problems have been corrected. If any problems remain uncorrected, call and inform ELS.

Ensure that you have all the necessary tools and equipment as outlined in Chapters 2 and 6 of this manual. There is no special software for this lab, however do not forget diagnostics. If possible you should take along a spare Tandy Arcnet® board, a spare student station main logic board, a set of terminators, bulk network cable and some BNC connectors. This will allow you to effect small repairs and possibly save you another trip to the site.

Once on the site, discuss with the lab attendant just where and how the lab is to be arranged. Make sure there are adequate power outlets available at each location for the arrangement. Test the outlets in accordance with the Chapter 7 of this manual.

```
*********************************************
*                                           *
*     A correct installation requires       *
*     you to COMPLETELY install and         *
*     test the lab.                         *
*                                           *
*********************************************
```

Unpack the server, monitor, storage device, printer and put them in place. Make all the necessary connections to completely assemble the server. Attach one end of the Arcnet® cable to the server and the other end to a Passive or Active Hub as appropriate.

Unpack the student stations from their boxes and set them in place on the tables. Make all the necessary connections to the student stations. Using a bootable diagnostics diskette boot each of the student stations to ensure the computer boots and then start the Memory Diagnostic running. Using a bootable diagnostic diskette boot the server to ensure it boots properly then run the Memory Diagnostic.

A couple of things can be done with the lab at this point to give time to the computers to run the memory diagnostics. First, while all the color monitors are on you can degauss them. Degauss each color monitor in the lab one at a time. This should only take a few minutes per monitor. See the Video Workbook for more information on color monitor degaussing.

****
*
* **CAUTION** *
*
* **Be sure to remove the diagnostics** *
* **diskette from the disk drive prior** *
* **to using the degaussing coil. The** *
* **degaussing coil is a magnetic** *
* **device and can damage floppy** *
* **diskettes.** *
*
****

Second, layout the premade cables where required. Arrange the Passive Hubs and Active Hub to accommodate the wiring scheme of the room. Cut and make up any special lengths of cables necessary and connect them to the appropriate student stations.

For network testing, reboot the server from the internal hard drive. The server will boot and run Novell® Netware™ and terminate with a colon (:) prompt on the server monitor screen. Boot each student station with the provided boot diskette to the Wasatch Login screen. During bootup of the student stations, you should observe a message on the station screen indicating the station is attached to the file server. This attachment message is indication that the network is functioning properly.

****
*
* **Completely testing the lab is** *
* **a very important part of the** *
* **installation.** *
*
****

At this point you can dress the cables using the wire ties and clips to make a neat and professional looking installation. Make sure all cables are tied together at the backs of the student stations leaving no stray cables to hang free. Ensure all cables are off the floor where they may be stepped on or tripped over. As much as possible, hide the cabling from normal view.

Software - Installation and Testing

Server Software

For the most part the server in this lab is a standard Tandy 3000/4000 type computer which may have a Storage Dimensions hard drive installed. Because of the time required for installation and complexity of the software for this system all the necessary software for the server is already installed on delivery. Therefore there is no software installation procedure for this server.

If working correctly at boot up the server will have a blank screen with a colon (:) in the upper left hand corner. The server is dedicated and there is nothing you need to at the server.

Tandy 1000 Boot Disk Procedures

Each student station will need its own boot disk. Under normal circumstances, boot diskettes will be provided with the lab. If they are not, use DISKCOPY from a MSDOS diskette to duplicate the Master Boot Disk, then label each boot diskette for each station. There are no numbers associated with the student station and boot diskette. Any boot diskette can be used in any student station as the software assigns the student station a number on bootup.

Final Checkout

If you've gotten this far and the network is still experiencing problems, chances are there is either one or more improperly setup or failed units in the system. You should verify that all of the boards have been jumpered correctly and were correctly installed. Cabling must also be checked.

Test the cable by using the TDR tester provided by Technical Support. This test will show opens in the cable or an improperly terminated cable. Instructions for using the TDR are in its accompanying manual. Also use the ohm meter to completely test the cable. See Chapter 6 for more information on cable testing.

If this investigation doesn't turn up any bugs, a process of elimination type approach may be the next step. Try taking all but the two terminated end machines out of the network and testing their ability to communicate. If this presents no problems, add a machine at a time until problems start to occur. This will give you a suspect network board to put to the side while you continue testing the remaining student stations. When all student stations have been tested you may concentrate your efforts on the failed units.

Prior to leaving the site call the Education Laboratory Support group at Computer Technical Services and inform them that the lab is installed and running. It is very important to call so that the appropriate people involved in the lab installation are informed of its completion.

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CHAPTER 6

JOSTEN EDUCATION LABS

Josten Learning Corporation
Education Labs

A Jostens Learning Corporation Education lab is very similar to the ESC labs discussed in Chapter 3 of this manual. Education Systems Corporation has merged with Jostens Learning Corporation and continues in the education lab business. These labs may still be referred to as ESC labs but it is important to remember that the name of the lab represents the vendor of the lab and not a specific lab configuration.

Jostens has several configurations of labs in the field at this time. As new computer products and network software appear on the market, lab configurations will continue to be upgraded and revised. For this reason you must keep in contact with personnel at Computer Technical Services for the latest information when servicing or installing labs.

The basic lab consists of the server, student stations, network and mass storage device. The actual equipment found in the lab will vary with the length of time it has been installed or if it is a new installation. Some of the equipment which may be found in a Jostens lab is listed below. Remember, this list will change with time.

Server/Lab Manager

1 Tandy 4000 family computer w/ internal hard drive and 640K of RAM
1 Tandy VGA Color Monitor
1 Video Adapter
1 CDROM Mass Storage Reader w/ controller and cable
1 Tandy® Ethernet Board
1 Serial/parallel board

Student Stations

1 Tandy 1000 family computer w/ 1 drive and at least 640K of RAM
1 Tandy Color Monitor
1 Mouse
1 Tandy® Ethernet Board
1 thin Ethernet™ cable w/ BNC Connectors

In some situations a station may be a driveless Tandy 1000SX with an network boot PROM installed to allow it to boot directly from the network. (This option will require different software.)

Software

Software needed to setup and run this system with an Hitachi CDROM player is as follows:

1 Tandy MSDOS 3.3Ø.ØØ or greater
1 Novell Netware software set Version 2.1x or greater
1 Tandy Build Set Which Includes:

Diskette Label	ESC Part Number
CDROM Lessons V 2.2Ø	(1Ø22Ø)
ESC Files	(1Ø369)
Build/Convert/Upgrade	(1Ø387)
Root Files	(1Ø388)
EsMaster	(1Ø389)
Writing Processor Disk (WP)	(1Ø39Ø)
Potpourri	(1Ø391)
CDF/ESTUDENT	(1Ø392)
Dynamic ETDATA	(1Ø393)
Static ETDATA	(1Ø394)
Supplemental Software Update Diskette	(1Ø398)
Thesaurus	(1Ø441)
Tandy Novell File Server Boot Template	(1Ø488)
Additional Drivers	(1Ø486)
LAN_DRV_2ØØ	(1Ø487)
ESMAKBOOT Tandy SL/Novell	(1Ø489)
ESMAKBOOT Tandy TL/Novell	(1Ø49Ø)
Student Station Setup T1ØØØSL/Novell	(1Ø491)
ESMAKBOOT Tandy SL/Novell	(1Ø492)

The software listed above will be delivered to the site by Jostens. It is used by the Jostens representative for initial installation, system upgrade and reinstallation of an existing lab. The software remains in the possession of the Jostens representative and is not left at the school. This means that if service is required on the lab involving Jostens software, the Jostens Representative must be called to the site.

The Novell Netware operating system will be installed on the hard drive by TSI and need not be installed on site. The complete set of Novell Netware will be shipped along with the lab from TSI and will remain at the school as their property. This software is serialized to the hard drive and must remain with the server for the lab. If for some reason, work on the network operating system needs to be performed, the schools copy of the Netware will need to be used.

Configuration of the Lab

Before starting the installation, verify that all of the equipment has arrived. Discuss the placement of the stations and the server with the customer. Discuss the routing of the network cable. See Chapter 6 for more information on cabling restrictions and specifics.

When you are sure where each of the stations will be placed, proceed with setting up each of the stations. Although the stations should come pre-configured, information is given below on jumpering and installing each of the boards in the station. Remember to degauss each of the monitors as they are set up.

Student Station Configuration

Jumper/Switch settings for Boards installed in the Student Stations.

Tandy Etherlink Board

The jumpers found on the Tandy Etherlink Board are set at the factory and need not be changed. W1 will force the board to be recognized if another option board is installed in the computer with a default address of 24ØH. W3 selects between DIX and BNC connectors and is set for BNC. W9 jumpers are used to set the ROM size and have no effect when ROM's are not installed. This board requires software to change the settings for the various parameters on the board. The proper parameters are;

Parameter	Setting
Base I/O Address	Ø2EØh
Interrupt Line	Enable
IRQ Interrupt	3
Adapter RAM Used	8K
RAM Base Address	D4ØØØ
6MHz AT	No

Tandy 1ØØØSL/SL2 Main Logic Board

E2 - 3 on
E6 - 7 on
E2 - 3 on (Satellite Board)

Tandy 1ØØØTL/TL2 Main Logic Board

E2 - 3 on
E4 - 5 off
E6 - 7 on

Computer Setup

Besides the jumpers in the student stations, the Tandy 1000SL/SL2 and 1000TL/TL2 have a machine setup stored in CMOS RAM. This setup must be checked to ensure it matches the required setup for use as a student station on the network. The correct setup for the Tandy 1000SL/SL2 1000TL/TL2 is;

Video Display	Color
Automatic Prompt for Date and Time	No
Memory Diagnostics on Start Up	No
Primary Start-up Device	Disk
Initial Start-up Program	MSDOS
Computer Speed	Fast
Number of Disk Buffers	17
Maximum # of Open Files	20
Check for Config.sys on Drive	A:
Check for Autoexec.bat on Drive	A:
Diskette Drive A: Designation	Top

This setup can be checked and changed if necessary by running the setup program found on the MSDOS diskette that came with the computer. From the A:> prompt type

SETUP<ENTER>

This will bring up the setup display allowing you to verify and change the current setup. When finished, press the F1 Function key to save the settings and exit the program.

If the Tandy Etherlink board is not configured properly, you will need to reconfigure the board using the Superdisk provided with the board. Boot the computer with a normal MSDOS diskette to the A:> prompt. It is important to not load the drivers for the board or the Superdisk configure program will fail to initialize the Tandy Etherlink Board. Remove the MSDOS diskette from Drive A: and install the Superdisk. Type the following commands.

CD SETUP <ENTER>
SETUP <ENTER>
Main Menu will appear **<ENTER>**
Select board to configure **<ENTER>**
Select the 'Change basic configuration parameters' selection
<ENTER>

Server Configuration

A list of the options available and their settings will appear on the screen. Select any option that needs to be changed and select the correct setting. Follow the instructions on the screen. Repeat the procedure for all options that require changing. See the list of proper settings above. When completed type the following commands to conclude the operation.

<F1Ø> to save the new settings
Select 'Exit to operating system' <ENTER>
Select 'Yes' <ENTER>

The board is now set correct for lab operation.

```
*******************************************
*                                         *
*     One of the most common problems     *
*     with an education lab is a bad      *
*     configuration.                      *
*                                         *
*******************************************
```

Jumper/Switch settings for Boards installed in the server.

The Server will contain an internal hard drive, a video board, a Tandy Etherlink Board and a CDROM interface board. The jumpers are set as follows:

Hitachi CD-IFI4-A Interface Jumpers

There are no switches on this interface board and only one jumper block. Ensure the top most set of pins on the interface board are jumpered. The top set of pins are the pins along the top edge of the board as viewed when the board is installed in the computer.

Hitachi CD-15Ø3-S CDROM Player

There is a single rotary switch in the rear panel of the player. This switch does not have a knob but rather is recessed in the back panel and requires a small screwdriver to change it's positions. It should be set to the "Ø" position.

Tandy Etherlink Board Jumper Settings

The jumpers found on the Tandy Etherlink Board are set at the factory and need not be changed. W1 will force the board to be recognized if another option board is installed in the computer with a default address of 240H. W3 selects between DIX and BNC connectors and is set for BNC. W9 jumpers are used to set the ROM size and have no effect when ROM's are not installed. This board requires software to change the settings for the various parameters on the board. The proper parameters are;

Parameter	Setting
Base I/O Address	02E0h
Interrupt Line	Enable
IRQ Interrupt	3
Adapter RAM Used	8K
RAM Base Address	D4000
6MHz AT	No

See the procedure in Computer Setup above to change the settings of this board as necessary.

The Tandy 4000 will contain a Tandy VGA Adapter. This adapter has the dip switches set at the factory and need not be changed. Switches 1 thru 4 are off and Jumper W1 has pins 1-2 jumpered.

The Tandy 4000 will also contain a SCSI interface board, memory expansion board and serial/parallel board. There boards should have there jumpers set for standard configurations as per Notes and Jumpers.

Installation of the Lab

Under normal circumstances the Jostens lab will be received by Tandy Systems Integration, completely assembled, configured and tested before being shipped to the site. Regardless of whether this has been accomplished or not your job remains the same. That is to completely install and test the lab.

```
*********************************************
*                                           *
*     A correct installation requires       *
*     you to COMPLETELY install and         *
*     test the lab.                         *
*                                           *
*********************************************
```

When you receive the service call to install the lab, contact the customer and make arrangements to perform the installation. At that time you may verify over the phone such things as adequate power available in the classroom; have any special electrical or network cable runs been completed; are the tables and desks assembled and in place; and anything else particular to the site.

Ensure that you have all the necessary tools and equipment as discussed in Chapter 2 and Chapter 6 of this manual. Be sure you have a copy of any special diagnostics for the lab in your possession prior to leaving the shop. If possible you should take along a spare network board, a spare student station main logic board, a set of terminators, bulk network cable and some BNC connectors. This will allow you to effect small repairs and possibly save you another trip to the site.

Once on the site, discuss with the lab attendant just where and how the lab is to be arranged. Make sure there are adequate power outlets available at each location for the arrangement. Test the outlets in accordance with Chapter 7 of this manual.

Unpack the server, monitor, storage device, printer and put them in place. Connect the printer to the computer with the supplied printer cable. Connect the storage device to the interface board installed in the computer. Connect the monitor to the video board in the computer. Connect the power cables to the printer, monitor, storage device and computer.

Unpack the student station computers from their boxes and set them in place on the tables. Connect the keyboards to the computers. Unpack and place a monitor on each of the student stations. Connect the monitor to the student station and connect power to the monitor and computer.

Using a bootable diagnostics diskette boot each of the student stations to ensure the computer boots and then start the Memory Diagnostic running. Using a bootable diagnostic diskette boot the server and ensure it boots properly. Pay attention for problems with the setup. Once booted, run the memory diagnostic.

To give adequate time for the computers to run memory diagnostics, a couple of things can be done. First, using the degaussing coil, degauss each of the color monitors in the lab. This should only take a few minutes per monitor. See the Video Monitors Workbook if you need help or instructions concerning degaussing of color monitors.

****
*** ***
*** CAUTION ***
*** ***
*** Be sure to remove the diagnostics ***
*** diskette from the disk drive prior ***
*** to using the degaussing coil. The ***
*** degaussing coil is a magnetic ***
*** device and can damage floppy ***
*** diskettes. ***
*** ***
****

Second, layout the premade cables where required. Remove the 'T' connectors from the Tandy Etherlink boards on the student stations and connect the cables to the 'T' connectors. Cut and make up any special lengths of cables and install them to the appropriate 'T' connectors. Connect all the 'T' connectors to their respective computer network boards. Ensure all cable lengths are adequate for the run between each machine. Be sure to place a terminator at each end of the cable.

```
*******************************************
*                                         *
*      Completely testing the lab is      *
*      a very important part of the       *
*      installation.                      *
*                                         *
*******************************************
```

Reboot the server using an MSDOS to the A:> prompt. Remove the MSDOS diskette and insert the Tandy Etherlink Superdisk. Change directories from "Root" to the "Diagnose" sub-directory by typing the command

CD \DIAGNOSE <ENTER>

Next run the diagnostic program by typing

DIAGNOSE <ENTER>

A main screen will appear instructing you to press **<ENTER>** to continue. Next, you will be prompted to choose a board to test. One board selection should be available since there is only one board installed in the computer, so choose the available board. The next screen will be the main menu.

Ensure that the network cable is completely installed and attached to this network boards of all computers in the lab.

Select the Basic Adapter Test option from the main menu to test the board internally. If the board fails it must be replaced prior to continuing. When the board passes this test, select the Respond to Test Messages option from the main menu and leave the computer on.

Move to a student station and perform the same testing procedure as above to the point where the computer passes the Basic Adapter Test. At this point select Initiate Test Messages option from the main menu and communication should begin between the server and this student station. If no communication is established, check the cabling and termination for proper connection.

If communication is established, allow the test to complete before moving on. Leave the server running with the Respond to Test Messages option, turn off the first student station and move on to the next student station. Repeat this procedure until all student stations have been tested with the file server.

At this point you can dress the cables using the wire ties and clips to make a neat and professional looking installation. The next section will cover the software testing.

Software Testing

Once the lab is completely installed the next step is to boot the lab and test the software operation. Since all the necessary software is installed by TSI there is no need for you to perform any installation procedure other than making student station boot diskettes when not supplied as part of the lab. This will be outlined shortly.

Power up the server first. The Jostens server is setup as a non-dedicated server. This means that the computer must be booted from a floppy diskette before the network software on the hard drive can be recognized. The boot diskette will allow the server to boot MSDOS and then load the network operating system from the hard drive.

This boot diskette is a special boot diskette labeled '**File Server Boot Template Tandy/Novell**' that comes with the lab. It must be used to boot the server and load the Netware operating system. If this diskette is not with the lab, the file server can only be used as a normal dos computer. Contact ELS or the local Jostens representative if this diskette cannot be found with the lab.

As Novell Netware loads the server will initialize the printer port and the CDROM attached to the file server. It will internally initialize the network board installed. The boot diskette contains a batch file that will automatically place the server on the network and place you in the LOGIN directory of the file server. It will then display a prompt informing you to type **MASTER** in order to login as the Master User. Type

MASTER <ENTER>

The system will log you on as the Master User and then load the Jostens Lab Manager Software. The program is menu driven. The first menu selection to take is

1. ESC Master Program <ENTER>

This will bring up the Jostens Lab Manager software and ask you for a password. Type the password

ESC <ENTER>

The Labmaster program will continue to load and bring up a second menu. Chose the option

1. Lab Master <ENTER>

In a few seconds the screen will clear and a display box will appear showing the status of the student stations. A maximum of forty stations can be displayed.

Boot each of the student stations one at a time with the station's Josten boot diskette and ensure the station communicates with the server. The student station should complete the boot sequence with a test lesson or a login screen if no lesson has been assigned. The server screen should reflect the status of the student station as it boots.

Test each student station until the lab is completely up and running. If any student station fails to boot properly, check the cabling, "T" connector and station for problems. Correct problems encountered and reboot to test the station.

Making Student Station Boot Diskettes

Normally a student station boot diskette will come with the lab for each student station. In the event that these diskettes are not available when the lab is shipped or lost during shipping, then new boot diskettes will have to be make.

You will have to have a master student station boot diskette or a working copy of a student station boot diskette to make other copies. If you have no student station boot diskette at all, contact the ELS group or the local Jostens representative to obtain one.

If you have a master student station boot diskette, make a copy for each student station using the MSDOS DISKCOPY command. Once all the copies are made, use the master student station boot diskette and from the A:> prompt initiate the ESMAKEBOOT program by typing the command

ESMAKEBOOT <ENTER>

This program will prompt you to insert a student station boot diskette into Drive A: and type the number of the student station the diskette is for. Once the number has been entered, the program will prompt you for the next diskette or to type 99 to end the program. Remove the diskette and mark the number of the student station on the diskette. Repeat the procedure for each diskette until all student station boot diskettes have been made. Boot and test all student stations as above.

```
*********************************************
*                                           *
*      Ensure you mark the student          *
*      station number on the diskette       *
*      as you make is so it can be          *
*      clearly identified as to which       *
*      student station it goes with.        *
*                                           *
*********************************************
```

Final Checkout

If you have gotten this far and the network is still experiencing problems, chances are there is either one of more improperly setup or failed units in the system. You should verify that all of the boards have been jumpered correctly and were correctly installed. Cabling must also be checked.

Test the cable by using the TDR tester provided by Computer Technical Services. This test will show opens in the cable or an improperly terminated cable. Instructions for using the TDR are in its accompanying manual. Also use the ohm meter to completely test the cable. See Chapter 6 for more information on cable testing.

If the investigation doesn't turn up any bugs, a process of elimination type approach may be the next step. Try taking all but the two terminated end machines out of the network and testing their ability to communicate. If this presents no problems, add one machine at a time until problems start to occur. This will give you a suspect Tandy Etherlink board. Leave this station off line while you continue testing the remaining student stations. When all student stations have been tested you may concentrate your efforts on the failed units.

Prior to leaving the site call the Education Laboratory Support group at Computer Technical Services and inform them that the lab is installed and running. It is very important to call so that the appropriate people involved in the lab installation are informed of its completion.

CHAPTER 7

THE ROACH ORGANIZATION LABS

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The Roach Organization
Educational Laboratories

The Roach Organization (TRO) Educational Lab is another form of education laboratory supported by Tandy. The TRO lab follows the general format of other education labs found around the country.

TRO labs are very similar to the CDC labs as discussed in Chapter 4 of this manual. The Education branch of CDC was broken off and sold to The Roach Organization so all responsibility for the older CDC labs as well as the newer TRO labs rests with The Roach Organization. For specifics on CDC labs, refer to Chapter 4 of this manual. For TRO labs, this chapter will apply.

The TRO lab consists of a server, student stations, network boards and cabling. One of the most notable aspects of this lab is the server. TRO provides a complete server which is not a Tandy machine but rather is built by Zeos, a third party computer manufacturer. In addition to the non-Tandy server, there is an Administrative Workstation built by Zeos and the network software is Novell® Netware™.

The student stations are Tandy 1ØØØ family computers with at least 64ØK of RAM and at least one disk drive. The student stations will also contain an EGA or VGA video card and a Tandy Etherlink network board.

The lab is tied together with Tandy Etherlink boards using the thin Ethernet™ cable. This cable is designated RG58 C/U and is the only cable to be used on education labs. The lab operates in much the same manner as other labs and except for the slight hardware and software differences the installation procedures are the same.

Server/Lab Manager

The server is manufactured by Zeos and will arrive at the installation site completely assembled. The 'box' consists of an 8Ø386 based mother board with 8 expansion slots. The network operating system and the educational software are stored internally on one hard disk. Drive C: is an Imprimis Wren IV SCSI drive with a storage capacity of 344 Meg.

Other boards found in the server consist of an Eterinty Serial/Paralle Card, Parallel Port Card, Monochrome Graphics Adapter, Future Domain SCSI Host Adapter and Western Digital Etherlink Card.

Administrative Workstation

The Administrative Workstation is a station set aside for the teachers use to control the lab during operation and to perform maintenance tasks such as backup and courseware installation/maintenance. The station is an 8Ø286 based motherboard with 64ØK RAM, a floppy drive, tape backup drive, video board, SCSI Host Adapter and network board.

This workstation may be put together by Zeos on new labs or may be the earlier CDC Tower when an older lab is upgraded. More information on these workstations will be given later.

Student Stations

A typical student station consists of the following:

1 Tandy 1000 family computer w/ 1 floppy drive and at least 640K of RAM
1 Tandy Color Monitor
1 Tandy Etherlink™ board

Software

As mentioned earlier, the educational software is stored on the hard drive in the server. The network operating system will be a current version of NovellxT 2.xx Netware™.

Netware™ may be a little different than anything you have ever seen before. The operating system must be generated for the particular computer it is to be used on. This is a somewhat complicated procedure, however I will give a brief explanation of how it works.

```
*******************************************
*                                         *
*       This operating system must        *
*       be generated to the specific      *
*       hardware configuration.           *
*                                         *
*******************************************
```

The network operating system is linked to the resource set associated to it. The resource set consists of all the hard drives, printers, serial cards, network boards, floppy drives and any other devices in the system. The resource set must all be made known to the operating system prior to the install.

During the install procedure all of the appropriate drivers are loaded according to the resources that the user originally identified. When this procedure is complete, the operating system has been generated and installed on the hard drive along with the appropriate drivers and other files necessary to utilize the system.

Since the software is so closely tied to the hardware, if the hardware configuration changes, the software operating system must be regenerated. Also, if the key card fails, the software must be replaced meaning a complete new installation generation. Because this software is very complicated it will only be installed at TSI prior to shipment to the site or by the local CDC representative on site.

Configuration of the Lab

Before starting the installation, verify that all of the equipment has arrived. Discuss the placement of the stations and the server with the customer. Discuss the routing of the network cable. See the cabling section for more information on cabling restrictions and specifics.

When you are sure where each of the stations will be placed, proceed with setting up each of the stations. Although the stations should come pre-configured, information is given below on jumpering and installing each of the boards in the station. Remember to degauss each of the monitors as they are set up.

Student Station Configuration

Jumper/Switch settings for Boards installed in the Student Stations.

Tandy Etherlink Board

The jumpers found on the Tandy Etherlink Board are set at the factory and need not be changed. W1 will force the board to be recognized if another option board is installed in the computer with a default address of 24ØH. W3 selects between DIX and BNC connectors and is set for BNC. W9 jumpers are used to set the ROM size and have no effect when ROM's are not installed. This board requires software to change the settings for the various parameters on the board. The proper parameters are;

Parameter	Setting
Base I/O Address	28Øh
Interrupt Line	Enable
IRQ Interrupt	3
Adapter RAM Used	8K
RAM Base Address	DØØØØ
6MHz AT	No

Tandy 1ØØØSL/SL2 Main Logic Board

E2 - 3 on
E6 - 7 on
E2 - 3 on (Satellite Board)

Computer Setup

Besides the jumpers in the student stations, the Tandy 1000SL/SL2 computers have a machine setup stored in CMOS RAM. This setup must be checked to ensure it matches the required setup for use as a student station on the network. The correct setup for the Tandy 1000SL/SL2;

Video Display	Color/Monochrome *
Automatic Prompt for Date and Time	No
Memory Diagnostics on Start Up	No
Primary Start-up Device	ROM
Initial Start-up Program	MSDOS
Computer Speed	Fast
Number of Disk Buffers	17
Maximum # of Open Files	23
Check for Config.sys on Drive	A:
Check for Autoexec.bat on Drive	A:
Diskette Drive A: Designation	Top

* Note - the video selection is based on the type of monitor attached to the computer.

This setup can be checked and changed if necessary by running the setup program found on the MSDOS diskette that came with the computer. Simply type **SETUP** from the A:> prompt and press **<ENTER>**. This will bring up the setup display allowing you to verify and change the current setup. When finished, press the **F1** Function key to save the settings and exit the program.

If the Tandy Etherlink board is not configured properly, you will need to reconfigure the board using the Superdisk provided with the board. Boot the computer with a normal MSDOS diskette to the A:> prompt. It is important to not load the drivers for the board or the Superdisk configure program will fail to initialize the Tandy Etherlink Board. Remove the MSDOS diskette from Drive A: and install the Superdisk. Type the following commands.

CD SETUP <ENTER>
SETUP <ENTER>
Main Menu will appear **<ENTER>**
Select board to configure **<ENTER>**
Select the 'Change basic configuration parameters' selection
<ENTER>

A list of the options available and their settings will appear on the screen. Select any option that needs to be changed and select the correct setting. Follow the instructions on the screen. Repeat the procedure for all options that require changing. See the list of proper settings above. When completed type the following commands to conclude the operation.

<F1Ø> to save the new settings
Select 'Exit to operating system' **<ENTER>**
Select 'Yes' **<ENTER>**

The board is now set correctly for lab operation.

```
*******************************************
*                                         *
*     One of the most common problems     *
*     with an education lab is a bad      *
*     configuration.                      *
*                                         *
*******************************************
```

EGA Board

Because board versions change, see Notes and Jumpers for the jumper/switch settings of the current board installed and the particular monitor to be used with the student station.

Zeos Server Configuration

Future Domain SCSI Host Adapter Board

E3 - E4 Open
E6 - E7 Open
E7 - E8 Open

S1 - 1 On
S1 - 2 Off
S1 - 3 Off
S1 - 4 On
S1 - 5 On
S1 - 6 Off
S1 - 7 Off
S1 - 8 Off

Monochrome Graphics Adapter

No jumpers on this board.

Western Digital Etherlink™ Board

This board is configured in the same manner as for a workstation above. The same settings apply.

VIP Parallel Port Card

No jumpers on this board.

Eternity Serial/Parallel I/O Card

S1 - 1 Off
S1 - 2 Off
S1 - 3 On
S1 - 4 On

S2 - 1 Off
S2 - 2 On
S2 - 3 On
S2 - 4 Off

Zeos Administrative Workstation

Archive Viper 215ØS SCSI Tape Drive

There is a large jumper block consisting of three vertical sets of jumper pairs. The three rightmost and the three center sets of jumpers are jumpered only. This sets the SCSI ID to 7.

Eternity AR1ØØ Serial/Parallel I/O Card

S1 - 1 Off
S1 - 2 Off
S1 - 3 Off
S1 - 4 On

S2 - 1 Off
S2 - 2 On
S2 - 3 On
S2 - 4 Off

These settings will give the COM port COM1 an interrupt request of IRQ4 and the printer port LPT2 an interrupt request of IRQ7.

Tecmar VGA Graphics Adapter

JPR1 jumped 1 - 2

SW1 - 1 On
SW1 - 2 Off
SW1 - 3 On
SW1 - 4 On
SW1 - 5 On
SW1 - 6 On

These settings give a non-monochrome analog operation of the board.

Future Domain TMC-871 SCSI Host Adapter

E1 - E2 Open Diskette optional address disabled
E3 - E4 Open Sets BIOS address to CAØØ:ØØØØ
E5 - E6 Open Sets BIOS address to CAØØ:ØØØØ
E7 - E8 Open Zero wait state option disabled

SW1 - 1 On
SW1 - 2 Off
SW1 - 3 Off
SW1 - 4 On
SW1 - 5 On
SW1 - 6 On
SW1 - 7 On
SW1 - 8 On

SW1 settings set the floppy diskette option to 1.2 Meg floppy and hard disk option to not installed.

Western Digital 8ØØ3EB Ethernet Adapter

This card is set by software to IRQ3, port address 28ØH, Interrupt Line enabled, 8K RAM and RAM Address of DØØØ.

TRO 286 Tower Administrative Workstation

The 286 Tower Administrative Workstation will be found on older labs that have been upgraded to the new Zeos Server configuration. These admin workstations are the same as described Chapter 4 of this manual with the exception that some of the internal boards have been removed.

Archive Tape Drive Controller Board

RR	jumped
Y	jumped
DRQ2	jumped
DACK2	jumped
IRQ6	jumped
A9	jumped
KK	jumped

Etherlink™ Plus Board

INT	3 jumped
ADDR	13 on left set of pins
	14 on right set of pins
	15 on right set of pins
	16 on left set of pins
	17 on left set of pins
MEM	18 on right set of pins
	19 on right set of pins
MEM EN	on right set of pins
DMA	two jumpers on pins #6
TEST	jumpered to OFF
CONFIG	1 on right set of pins
	2 on right set of pins
A15	jumpered to OFF
A16	jumpered to OFF
IO ADDR	4 on lift set of pins
	5 on lift set of pins
	6 on left set of pins
	7 on left set of pins
	8 on right set of pins
	9 on right set of pins

Quadram Quadport AT Serial/Parallel I/O Card

JP1	1 - 2	Jumped
JP2	1 - 2	Jumped
JP3	2 - 3	Jumped
JP4	2 - 3	Jumped
JP5	1 - 2	Jumped
JP6	1 - 2	Jumped

These settings will give the COM port COM1 an interrupt request of IRQ4 and the printer port LPT2 an interrupt request of IRQ7.

Tandy EGA/CGA Graphics Adapter

See Notes and Jumpers for the proper setting.

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Main Logic Board

E2 to center pin
E4 to center pin

Installation of the Lab

Under normal circumstances the Educational lab will be received by Tandy Systems Integration, completely assembled, configured and tested before being shipped to the site. Regardless of whether this has been accomplished or not, your job remains the same. That is to completely install and test the lab.

A TRO lab installation requires a little bit more coordination than other education labs you may encounter. Therefore, specific responsibilities have been assigned to certain groups involved in a lab installation. These responsibilities are outlined in the next few paragraphs.

Tandy Contract Marketing Department

Order Receipt and Control

All TRO educational lab sales will be processed and handled by the Tandy Contract Marketing Department (TCM). Equipment orders will be transmitted to the appropriate warehouses by TCM and equipment delivered to Tandy Systems Integration for hardware installation and component testing.

Upon receipt of the order, the TCM coordinator will contact ELS at Computer Technical Services. The ELS coordinator will maintain a status sheet on each lab and inform the local Business Products Service Center responsible for installation of the lab.

The TCM coordinator will be responsible for providing the names and telephone numbers of local TRO and customer contacts to ELS who in turn will provide the customer contacts to the service center technician.

Education Laboratory Support

Education Laboratory Support at Computer Technical Services will coordinate lab installation between TCM and the the local Business Products Service Centers. The TCM coordinator will be responsible for setting dates for the pre-site inspection and lab installation. TCM will inform ELS of these dates and ELS will inform the appropriate service center of these dates as far in advance as possible. It is important to keep the scheduled dates with the customer. If you fail to keep an appointment with the customer, call ELS immediately! Questions regarding laboratory installation and service procedures should be directed to this group.

Business Products Service Center

The local Business Products Service Center manager will be informed by the ELS coordinator that a CDC education lab order has been placed and his shop will be responsible for the installation. A brief discussion will be made as to the size of the lab, the contact persons and the dates for the pre-site and installation if known. Any tools/special software required to complete the installation will be ordered by the Service Center prior to the due date of the installation.

Pre-installation Inspection

Prior to the actual installation due date, the technician responsible for installing the lab shall be given an appointment for a pre-installation site inspection. (Actual dates and times will be established by TRO and the TCM department.) Using the *"Site Preparation Checklist"* prepared by TRO, the technician will verify that everything at the site is ready and prepared for the education laboratory. The checklist will be mailed directly to the service center by the ELS Group.

The checklist covers important items to be provided by the customer such as adequate lighting and air conditioning, work tables and electrical outlets, and the layout of the training area. In addition to items directly involving the file server and work stations, the customer must make provision for a telephone to be installed near the file server for access to TRO's PLATO Hotline and Customer Service Department.

Upon completion of the pre-site inspection, the customer should be made aware of what items, if any, failed the inspection. The customer should arrange to correct all checklist failures (e.g. power outlets and lighting) prior to actual installation of the equipment. If possible leave a copy of the checklist for the customer. When back at the shop, make a copy of the checklist for shop records and return the original checklist to the ELS Group.

After the pre-site inspection is complete, confirm the installation date with the customer. If the customer feels that the originally scheduled installation date must be changed, the ELS coordinator must be informed. TRO and TCM will be notified of the proposed change in due date by ELS.

When you receive the service call to install the lab, contact the customer and make arrangements to complete the installation. If a pre-site survey had been completed, review the shop copy to see what problems there may have been. While on the phone with the customer, verify that all problems have been corrected. If any problems remain uncorrected, call and inform ELS. Again if the customer needs to change the installation date, call the ELS coordinator and inform him.

Ensure that you have all the necessary tools and equipment as outlined in Chapter 2 and 6 of this manual. There is no special installation software for this lab, however, do not forget diagnostics. If possible you should take along a spare Tandy Etherlink™ board, a spare student station main logic board, a set of terminators, bulk network cable and some BNC connectors. This will allow you to effect small repairs and possibly save you another trip to the site.

On Site

Once on the site, discuss with the lab attendant just where and how the lab is to be arranged. Make sure there are adequate power outlets available at each location for the arrangement. Test the outlets in accordance with Chapter 7 of this manual.

Unpack the server, monitor and printer and put them in place. Connect the printer to the computer with the supplied printer cable. Connect the monitor to the video board in the computer then connect power to the printer, monitor and computer.

```
*******************************************
*                                         *
*     A correct installation requires     *
*     you to COMPLETELY install and       *
*     test the lab.                       *
*                                         *
*******************************************
```

Unpack the Administrative Workstation and monitor. Place the unit on the appropriate table and connect the monitor to the video board and power to the station. Connect the network cable to the network board.

Unpack the student station computers from their boxes and set them in place on the tables. Connect the keyboards to the computers. Unpack and place a monitor on each of the student stations. Connect the monitor to the student station and connect power to the monitor and computer.

Using a bootable diagnostics diskette boot each of the student stations to ensure the computer boots and then start the memory diagnostic running. Leave the memory diagnostics running until the student stations must be shut down.

A couple of things can be done with the lab at this point to give time to the computers to run the memory diagnostics. First, while all the color monitors are on you can degauss them. Degauss each color monitor in the lab one at a time. This should only take a few minutes per monitor. See the Video Workbook for more information on color monitor degaussing.

```
*********************************************
*                                           *
*                 CAUTION                   *
*                                           *
*    Be sure to remove the diagnostics      *
*    diskette from the disk drive prior     *
*    to using the degaussing coil.  The     *
*    degaussing coil is a magnetic          *
*    device and can damage floppy           *
*    diskettes.                             *
*                                           *
*********************************************
```

Second, layout the premade cables where required. Remove the 'T' connectors from the Tandy Etherlink boards on the student stations and connect the cables to the 'T' connectors. Cut and make up any special lengths of cables and install them to the appropriate 'T' connectors. Connect all the 'T' connectors to their respective computer network boards. Ensure all cable lengths are adequate for the run between each machine. Be sure to place a terminator at each end of the cable.

```
*********************************************
*                                           *
*      Completely testing the lab is        *
*      a very important part of the         *
*      installation.                        *
*                                           *
*********************************************
```

Reboot the server using an MSDOS to the A:> prompt. Remove the MSDOS diskette and insert the Tandy Etherlink Superdisk. Change directories from "Root" to the "Diagnose" subdirectory by typing the command

CD \DIAGNOSE <ENTER>

Next run the diagnostic program by typing

DIAGNOSE <ENTER>

A main screen will appear instructing you to press **<ENTER>** to continue. Next, you will be prompted to choose a board to test. One board selection should be available since there is only one board installed in the computer, so choose the available board. The next screen will be the main menu.

Ensure that the network cable is completely installed and attached to this network boards of all computers in the lab.

Select the Basic Adapter Test option from the main menu to test the board internally. If the board fails it must be replaced prior to continuing. When the board passes this test, select the Respond to Test Messages option from the main menu and leave the computer on.

Move to a student station and perform the same testing procedure as above to the point where the computer passes the Basic Adapter Test. At this point select Initiate Test Messages option from the main menu and communication should begin between the server and this student station. If no communication is established, check the cabling and termination for proper connection.

If communication is established, allow the test to complete before moving on. Leave the server running with the Respond to Test Messages option, turn off the first student station and move on to the next student station. Repeat this procedure until all student stations have been tested with the file server.

At this point you can dress the cables using the wire ties and clips to make a neat and professional looking installation. The next section will cover the software testing.

```
*********************************************
*                                           *
*      Completely testing the lab is        *
*      a very important part of the         *
*      installation.                        *
*                                           *
*********************************************
```

At this point you can dress the cables using the wire ties and clips to make a neat and professional looking installation. Make sure all cables are tied together at the backs of the student stations leaving no stray cables to hang free. Ensure all cables are off the floor where they may be stepped on or tripped over. As much as possible, hide the cabling from normal view.

Software Testing

Server Software

The server in this lab is a Zeos built server with all the necessary software already installed. Therefore it is not necessary to install anything on the server itself. When booted, the server is in a dedicated mode and will show a blank screen with a colon (:) at the upper left hand corner for a prompt.

Tandy 1000 Boot Disk Procedures

Each student station will need its own boot disk. Under normal circumstances boot diskettes will be provided with the lab. If not use DISKCOPY on an MSDOS diskette to duplicate the Master Boot Disk, then label each boot diskette for each station. There are no numbers associated with the student station and boot diskette. Any boot diskette can be used in any student station as the software assigns the student station a number on bootup.

Using a Student Station Boot diskette, boot each student station and watch the monitor for indication that the student station has booted properly and "attached" successfully to the file server. This will be indicated by a message on the screen that the station is "Attached to server <servername>". At this point the student station is communicating with the file server. When all student stations have been tested and attached, the lab may be considered running properly.

Administrative Workstation Software

The Administrative Workstation has a boot diskette similar to the Student Station boot diskette. This will boot the workstation to the operational point on the network. There is no other software involved with this station.

Final Checkout

If you've gotten this far and the network is still experiencing problems, chances are there is either one or more improperly setup or failed units in the system. You should verify that all of the boards have been jumpered correctly and were correctly installed. Cabling must also be checked.

Test the cable by using the TDR tester provided by Computer Technical Services. This test will show opens in the cable or an improperly terminated cable. Instructions for using the TDR are in its accompanying manual. Also use the ohm meter to completely test the cable. See Chapter 6 for more information on cable testing.

If this investigation doesn't turn up any bugs, a process of elimination type approach may be the next step. Try taking all but the two terminated end machines out of the network and testing their ability to communicate. If this presents no problems, add a machine at a time until problems start to occur. This will give you a suspect Etherlink™ board to put to the side while you continue testing the remaining student stations. When all student stations have been tested you may concentrate your efforts on the failed units.

If you run into any problems during the installation with the hardware or the software as always call ELS for assistance. Additionally CDC has two telephone numbers you can call in the event you cannot reach ELS. The CDC PLATO Hotline is (8ØØ) 869-22ØØ lab assistance. The CDC technical support number is (612) 832-14Ø5. With either number, identify yourself as a Tandy service technician installing or repairing a CDC PLATO education lab and inform them of the site location.

Prior to leaving the site call the Education Laboratory Support group at Computer Technical Services and inform them that the lab is installed and running. It is very important to call so that the appropriate people involved in the lab installation are informed of its completion.

CHAPTER 8

EDUCATION LAB CABLING

CABLING

Currently Educational Labs use Ethernet™ standard transmission. This type of topology has a single cable that runs the length of the lab with student stations tapping off through 'T' connectors on the Etherlink™ board. The server taps into the cable through its 'T' connector in the same manner. It is important to remember that there is no specific location requirement for student stations or the server. The server may be at either end of the cable or somewhere in the middle.

****
*
* **RG58 C/U cable is the only**
* **cable to be used in a lab**
* **having Etherlink™ boards.**
*
****

The cable used with Etherlink™ boards is RG58 C/U coax. No other type of cable is acceptable. With this type of cable we may have a maximum network length of 1ØØØ feet. Each machine is required to have at least 3 feet of cable between it and the next machine.

The student stations are cabled in a serial fashion. That is the Ethernet™ cable coming from Student Station 1 attaches to one side of the 'T' connector of Student Station 2. The other side of the 'T' connector for Student Station 2 will be cabled to one side of the 'T' connector for Student Station 3 and so on down the line.

It is important to note that student station numbers are not relevant to the physical location of the student station on the network. For example Student Station 8 may be the first station after the server with Student Station 3 being next in line. Also, the server can occupy any position on the cable and does not need to be at one end or the other. For proper operation of the network, the end machines only are terminated whether student station or server.

Each Etherlink™ board comes with a 'T' type connector and a standard length of cable. Should this cable length be insufficient or should you need special cable lengths, additional bulk cable and BNC connectors are available.

Premade cable - 2Ø'	26-553Ø
Premade cable - 5Ø'	26-5531
Premade cable - 1ØØ'	26-5532
Bulk cable	26-5533
BNC connector	JE-ØØ12
BNC 'T' connector	JE-ØØ22

NOTE: The BNC connectors listed above are impedance matched for use with Etherlink™ boards. **No other BNC connectors are acceptable.**

Your service center should have the proper crimp and stripping tools (Stripper - AXX-9229, Crimp Tool - AXX-9167). Instructions for installing these BNC connectors is given in the next section. The 'T' connectors must be used to connect the Cable to the Etherlink™ board. This provides proper impedance matching as well as an easy way to disconnect a station without disturbing the rest of the network.

BNC Connector Installation

The BNC is made up of 4 pieces. The connector case, the center pin, the connector retainer, and the boot (see Figure 1). Become familiar with these terms as they are used throughout this procedure.

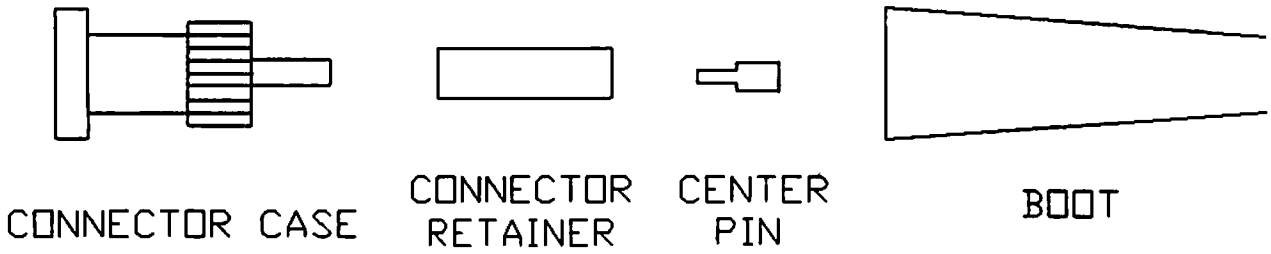

Figure 1

1. Cut the end of the cable cleanly at a point near the end. Do not remove the cable from the spool at this time.

2. First slide the rubber boot and then the metal connector retainer onto the cable. The wide end of the boot should face towards the end of the cable.

3. Using the cable stripping tool, prepare the end of the cable for the connector. After stripping the cable should have a small amount of the center lead followed by a small amount of the ground shield showing. If not, cut the cable and try again.

4. Fold the ground shielding back over the outer case of the cable.

5. Slide the inner cable into the hole in one end of the center conductor. Using the crimping tool, crimp the center pin with the inner cable in place. See Figure 2.

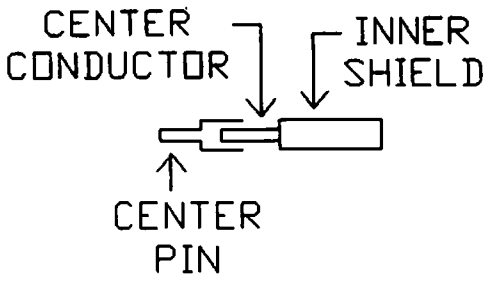

Figure 2

6. Slide the center pin and cable assembly into the connector case. Make sure that the center pin lines up in it's hole correctly. If it does not line up, the pin will not be centered in the connector opening. You may need to use a needle nose pliers to pull the center pin all the way in from the other side. DO NOT pull too hard, you will yank the center pin all the way through the connector or separate it from the cable. See Figure 3.

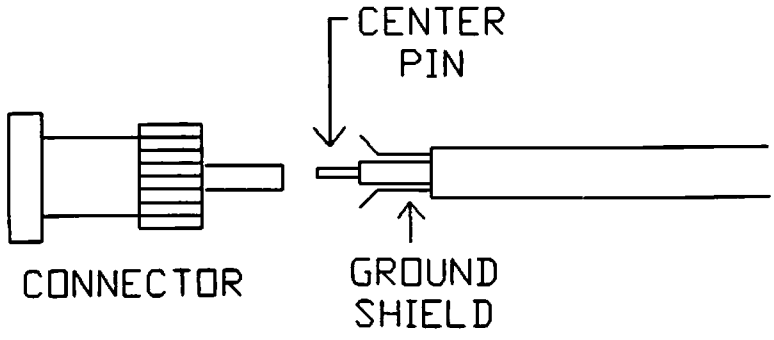

Figure 3

7. The cable's outer shield should now be up against the back end of the connector housing. Using your wire cutters, cut the any excess lengths of wire from the cable.

8. Slide the connector retainer up to the back of the connector case. This is best done by placing the face of the connector on a table top and then pushing the connector retainer down. Crimp the retainer where indicated in Figure 4.

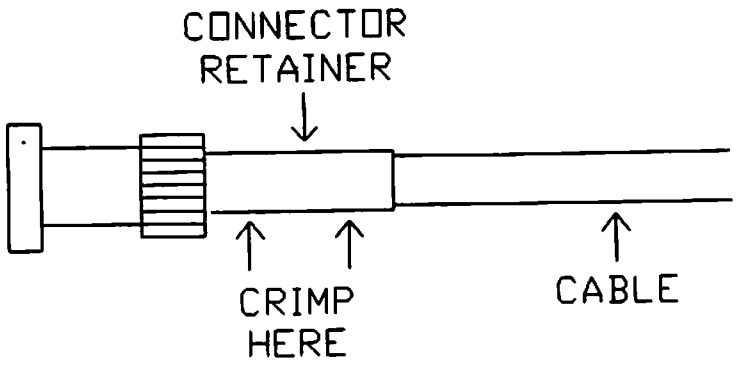

Figure 4

9. Slide the boot over the connector.

1Ø. Tug on the connector to insure that the mechanical connection is good.

After completing the wiring of the computers, both ends of the Ethernet™ cable will need to be terminated. A terminator is a BNC connector with a 52 ohm resistor between center conductor and shield. You should receive two of these with each system. One of the terminators has a piece of 22 gauge wire connected to the shield side. This must be connected to the ground connection on a wall outlet. Only one end terminator will be grounded.

WARNING:

The AC outlet contains high voltages which are dangerous. The screw on the outlet plate is often connected to ground and may be the best place to attach the terminator's ground. Referring to Technical Bulletin INFO:8, insure that the outlet is wired correctly. Then use a ohmmeter to determine if the outlet plate screw is connected to safety ground. Then, and only then, attach the ground wire to the outlet plate screw.

Cable Testing

The best test for a coax cable is a Time Domain Reflectometry (TDR) test. The TDR works by sending a signal over the network and then listening for any reflections or signals that come back. If the network is properly connected and terminated, no signals return and the test shows that it passed. If there is a break in the network or if it is improperly terminated, the signals are reflected back when they reach the break or bad termination.

The TDR is able to sense these conditions during the test and report the results. Use the TDR supplied to your shop by Computer Technical Services should any problems with network cabling occur. Instructions for using the TDR are in its accompanying manual. For more assistance, call ELS.

It is important to note that when the TDR reports a failure, it will give the approximate distance to the failure point in the network. Remember that this distance is only approximate and should only be used as a guide in troubleshooting a cabling problem in the network.

A test of cable integrity can be made using an ohm meter. Disconnect a 'T' connector from any Etherlink™ board and with the ohm meter measure between the center pin and outside case. The meter should show 24-27 ohms on a properly terminated network. This reading comes from the fact that the two terminators are connected in parallel and will yield a reading of half there resistance since they are the same value. Any additional resistance in the reading will result from the wire itself and will increase with the length of the cable.

Another quick test of the cable is to remove the terminators from each end and read the resistance between the center conductor and cable ground. It should read open. If not suspect a short to ground somewhere along the cable. If this is the case divide the cable in half by disconnecting the cable at a 'T' connector and checking each half. The bad half can then be divided again until the problem can be isolated.

Cable Dressing

There are three things that should be considered when dressing the cable. These are:

1. Take care to dress the cable so that it will not be tripped over, yanked on or cut. Where school children are concerned a good rule is 'out of site out of mind'.

2. Dress the cable so that it will not be susceptible to RFI. This means do not coil the cable in a loop so that it will act as an antenna or wrap it around the monitor base.

3. Make your installation look good. Don't leave wires hanging tangled together and in plain sight. Use plenty of wire ties and cable hangers to complete a professional installation.

4. When installing cable around corners, insure there is sufficient cable to make a smooth curve around the corner. Sharp bends in the cable can damage the inner conductor and/or outer shielding causing the cable to operate intermittently or fail completely.

CHAPTER 9

EDUCATION LAB DIAGNOSTICS

Education Lab Diagnostics

Standard Diagnostics

Whether doing an installation of a new Education Lab or troubleshooting of an existing lab the computers used for the student stations are Tandy computers. As such these computers can be tested with normal diagnostics provided by Computer Technical Services. When setting up a new lab the memory diagnostic should be run as a general test of the operation of a student station. If successful, the test will show a properly functional computer in the area of boot ROM, video, RAM and floppy drive.

```
*******************************************
*                                         *
*       The memory diagnostic test        *
*       is a quick way to show the        *
*       proper operation of the           *
*       computer.                         *
*                                         *
*******************************************
```

If the server is a Tandy computer then the same applies for it. Using the standard diagnostics from Computer Technical Services you can demonstrate a functional machine or uncover problems before the customer does. Many times, simple diagnostic tests can uncover minor problems that if left alone can result in a down lab, customer dissatisfaction and additional trips to the site at a cost to the service center. **Remember, just because the lab was assembled and tested by Tandy Systems Integration is no excuse for you not to completely test it yourself.** Also, not all labs pass through Systems Integration. Some are sold directly by stores or are existing networks that are upgraded into education labs.

As mentioned in the Cabling Section, the TDR can be a useful tool in diagnosing problems with cabling. This will require the use of an oscilloscope so be sure to take one with you to the site.

Special Diagnostics

EtherlinkxT and EtherlinkxT Plus Boards

Diagnostic disks come with each EtherlinkxT board sold. These disks are not bootable but the diagnostic programs may be copied to a MSDOS disk and run. The names used for the diagnostic programs are 3C5Ø1 for the EtherlinkxT Board, and 3C5Ø5 for the EtherlinkxT Plus.

The diagnostics must be run on each board individually before it is attached to the network. To run on each board individually, the loopback mode must be used and a loopback connector must be connected to the back of the network board. A loopback connector can be made by simply attaching a terminator to each end of a 'T' connector. A 'T' connector from any Etherlink™ can be used. This loopback connector can then be easily moved from board to board as each computer passes the diagnostics. See figure 5. The machine must be booted from MSDOS and **NO DRIVERS** loaded in order for the diagnostic to run properly.

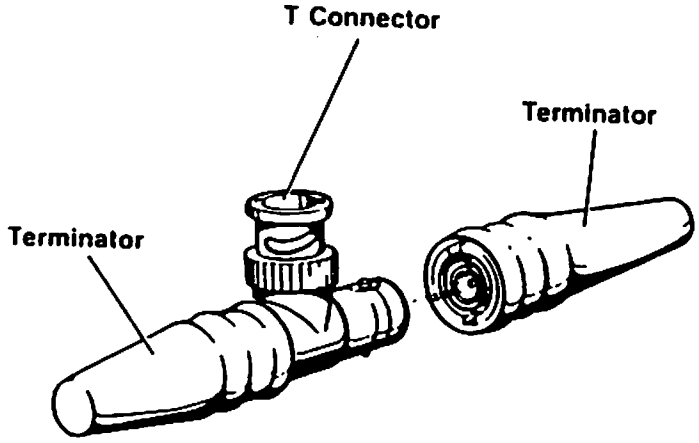

Figure 5

A description of the tests the diagnostic will run is given below. The first four tests should be run on each individual machine before it is connected to the network. The remaining tests are run between two or more machines (i.e. one machine set up as a server by running test option 7, the other set up as a slave with option 5).

1.Preliminary Test - Tests to see that the diagnostic and the machine in which the board is installed can communicate with the Ethernet controller chip on the Ethernet Board.

2.DMA/Interrupt Test - Sends packets to and receives packets from the board using the DMA channel. Also tests the chosen interrupt channel.

3.Packet Test - Packets of different sizes are transmitted from the board and received back through the loopback plug. **Do not run this test while the board is connected to an active network.**

4.Recognizer Test - This test verifies that the board will receive packets intended for it and reject packets which are not intended for it.

5.Message Exchange Test - Sends packets back and forth between the computer and the server designated with option 7 - Echo Server Test.

6.Passive Receive Test - Counts the number of packets being transmitted over the network. This may be run on a functioning network.

7.Echo Server Test - Turns the computer into a simulated network server for other computers to communicate with during testing.

Diagnostic Parameters

The command line for the diagnostic is as follows:

3C5Ø1(or 3C5Ø5) [#] [A] [E] [L] [-I] [-D] [Ix] [Dx] [Bxxx]

It doesn't matter what order you give these parameters in as long as they are separated by a space. If no parameters are given, the first five tests are run. If just an 'L' parameter is given, only the first four tests will be run. The brackets indicate that the parameter is optional.

PARAMETER:	MEANING:
#	Selects the test corresponding to the number given. Numbers are the same as the numbers listed in the test descriptions above.
A	Reports all non-fatal errors that occur during the testing.
E	Used only on Xerox 8ØØØ networks that have echo servers.

L	Loopback mode. Performs the first 4 tests with a loopback connector connected.
-I	Skips the Interrupt test. **NOTE: You must use this parameter when testing a 1000 family computer as the interrupt test will fail. This is because the method used for testing interrupt on these boards will not work properly in a Tandy 1000 family computer.**
-D	Skips the DMA test.
Ix	Sets the interrupt to the number (x) you specify. Use this parameter if you change the interrupt from the default setting of 3 (this will normally be done if there is something else in the machine which uses interrupt 3).
Dx	Sets the DMA channel to the number you choose. This will be used when you change the DMA channel jumpers on the board in order to eliminate a conflict with another option which is installed in the machine.
Bxxx	Use this if the Base address on the board has been changed to eliminate a conflict with another option.

Examples:

3C501 L -I

This is the command line you would use to run the loopback test on a Tandy 1000 family computer. As you can see interrupts are disabled.

3C505 L I10 D5 B310

This command line will test an EtherlinkxT Plus Board with the jumper settings changed to reflect a Interrupt of 10, DMA of 5, and a Base Address of 310.

3C501 L x x B310

This command line would be used to test an EtherlinkxT board which has had it's base address changed to 310. Note the place marker x's used for the interrupt and DMA. The default values will be used for these options.

Other Diagnostic Procedures

This chapter of the manual primarily talks about the software diagnostics available to you for testing of the lab during the installation. However, there are other options you can use to help isolate problems you may uncover. Already mentioned was power and how critical is is to the proper operation of a lab. A complete checkout of the power circuits is necessary before a lab can be expected to work properly all the time. Noise on the power lines is the greatest contributing factor in an intermittently operational lab. **Power must be thoroughly checked as part of a lab installation.**

The cabling of the lab is the next worst offender in a problem lab. Chapter 6 is dedicated to cabling and its testing. It is very easy to make a false assumption that the cabling is good because is came with the lab already pre-made. Cable sections just like anything else can fail out of the box or in transit. **Remember, if you haven't checked all the cable in the lab, you are asking for problems!**

Labs will range in size from a few stations to 3Ø or more stations. Because there are several student stations in any lab it gives you the opportunity to swap components from one station to another. This is a common troubleshooting practice and is very helpful in locating a bad component in a non-working student station. As your experience with lab installations increases, so will your knowledge of lab troubleshooting. As always, help is just a phone call away.

Close out

When you have completed the installation and testing of a new lab, prior to leaving the site be sure to call Computer Technical Services and let them know the job is finished. This also holds true for repair service calls on existing lab sites. It is very important to keep communications open between the shop, Tandy and any other vendors involved in these labs. Make certain to ask for the Education Laboratory Support group when calling to ensure the proper personnel are made aware of the status of the lab. If for some reason you cannot call from the site, call as soon as you return to the shop. As stated above it is important to call ELS and let them know the job is complete.

APPENDIX 1

NOVELL INSTALLATION

Novell Netware Installation for Education Labs

Novell is one of the early pioneers of network operating system software. When Tandy started in the Education Lab business, one of the major vendors of Education Labs began by using Novell Netware as their lab network operating system. A short time later other vendors of labs began using the same network operating system.

The first versions of Novell Netware required a Novell Keycard to be installed in the computer. This Keycard contains a chip which serializes the network operating system to the card. The only version of Netware™ that may be run on the server is the one that matches the serial number in the Keycard.

```
*********************************************
*                                           *
*        The Keycard is the 'key'           *
*        to the whole system!               *
*                                           *
*********************************************
```

If the key card were to fail, the software must be replaced along with the key card because of the serialization. The same holds true for the software. If the software must be replaced for any reason then the key card must be replaced with the one matched to the new software.

```
*********************************************
*                                           *
*                  NOTE                     *
*                                           *
*     Versions of Novell® Netware™          *
*     later than 2.ØA do not require        *
*     a Novell® Keycard.                    *
*                                           *
*********************************************
```

Later versions of Novell Netware™ will not require the Keycard to operate properly. However, the software is serialized when installed on the hard drive by the GENDATA diskette which mates the software to the hard drive. In this case a hard drive failure is not so significant. If the hard drive needs to be replaced then all that is required is to install the software on the new drive and continue to operate. Netware™ will serialize itself to the new hard drive.

Netware™ may be a little different than anything you have ever seen before. The operating system must be generated for the particular computer it is to be used on. This is a somewhat complicated procedure, however I will give a brief explanation of how it works.

```
*******************************************
*                                         *
*       This operating system must        *
*       be generated to the specific      *
*       hardware configuration.           *
*                                         *
*******************************************
```

The network operating system is linked to the resource set associated to it. The resource set consists of all the hard drives, printers, serial cards, network boards, floppy drives and any other devices in the system. The resource set must all be made known to the operating system prior to the install.

During the install procedure all of the appropriate drivers are loaded according to the resources that the user originally identified. When this procedure is complete, the operating system has been generated and installed on the hard drive along with the appropriate drivers and other files necessary to utilize the system.

Since the software is so closely tied to the hardware, if the hardware configuration changes, the software operating system must be regenerated. Also, if the key card fails, the software must be replaced meaning a complete new installation generation. Because this software is very complicated it will usually be installed at TSI prior to shipment to the site or by the local vendor representative on site. This appendix is provided to give you a little better understanding of Novell Netware™ and to provide basic instructions to complete a standard installation of Novell onto a hard drive.

Floppy Diskette NETGEN Procedure

The version of Novell will determine the number of diskettes in a complete Netware™ package. Regardless of the version, make a duplicate copy of all Novell Netware diskettes with the exception of the GENDATA diskette as well as any other Value Added Reseller (VAD) diskettes. VAD diskettes are usually diskettes that accompany installed hardware such as SCSI hard drives, network boards and tape drives.

Boot the computer with an MSDOS diskette to the A:> prompt. Run the setup program for this computer if one exists. Replace the diskette in Drive A: with the Novell NETGEN diskette. Type the command

NETGEN -NC <ENTER>

This will invoke the Netgen program telling the program this is a new (-N) installation and a custom (C) installation. The first menu screen will be the "Netgen Run Options" screen. Highlight the **Standard (Floppy)** option and press

<ENTER>

The "Netgen Run Options" menu will change to the "Network Generation Options" menu. Highlight the **Select Network Configuration** option and press

<ENTER>

You will be prompted for the AUXGEN, NETGEN, GENDATA and again the NETGEN diskettes. Insert the appropriate diskette when prompted and press the appropriate key as necessary.

NOTE: During the installation, you will be prompted several times to insert diskettes in a drive. Depending on the point you are at in the installation process you may have to press the **<ESC>** key and at other times you will be prompted to press the **<ENTER>** key to continue. The installation program will prompt you for the appropriate key so read the screen carefully. If you press the wrong key the program will not respond and you will not be permitted to continue until the correct key is pressed.

When this procedure is complete you will be placed in the "Available Options" menu. Highlight the **Select Operating System Options** option and press

<ENTER>

At the "Set Operating System Options" menu highlight **Advanced Netware 286/Dedicated** or **Advanced Netware 286/Non-Dedicated** and press

<ENTER>

You will be returned to the "Available Options" menu. Highlight **Select Resource Sets** option and press

<ENTER>

From the "Resource Set Options" menu, highlight the **Select Loaded Item** and press

<ENTER>

You will get a list of available options to choose from. Scroll thru the list until you find the **AT Compatible File Server** option. Highlight that selection and press

<ENTER>

then press

<ESC>

to return to the "Available Options" menu. Highlight the **Select LAN Drivers** option and press

<ENTER>

From the "LAN Driver Options" menu, highlight the **Select Loaded Item** and press

<ENTER>

You will get a list of LAN drivers options. Scroll thru the list until you find a LAN Driver that matches the LAN board installed in the server. Highlight that selection and press

<ENTER>

then press

<ESC>

to return to the "Available Options " menu. Highlight the **Select Disk Drivers** option and press

<ENTER>

From the "Disk Driver Options" menu, there are two options. **Select Loaded Item** allows you to select a standard disk driver which is defined within the standard Novell® Package. The **Load and Select Item** option allows you to first load a VAD disk driver and then select it as a normal option.

If the drive is pre-defined then follow the Pre-defined procedure. If the drive is non-standard then skip to the Non-standard procedure.

Pre-defined Drive Procedure

If the disk is standard then choose the **Select Loaded Item** option and press

<ENTER>

You will be prompted for a Disk Channel. Use Ø for the disk channel and press

<ENTER>

Next you will get an **Available Disk Drivers** list. Scroll thru the list until you find a Disk Driver that matches the Disk Drive installed in the server. Highlight that selection and press

<ENTER>

then press

<ESC>

to return to the "Available Options" menu.

Skip the next procedure to the **Installation Continued** section.

Non-standard Drive Procedure

If the disk is non-standard then choose the **Load and Select Item** option and press

<ENTER>

You will be prompted for a Disk Channel. Use Ø for the disk channel and press

<ENTER>

Next you will be instructed insert the Disk Driver diskette into a drive and press **<ESC>** to continue or **<F7>** to quit. Place the VAD diskette into a drive and press

<ESC>

After the driver is loaded you will be prompted to insert the NETGEN diskette into a drive and press

<ESC>

The list of **Available Disk Drivers** will be displayed. Scroll thru the list until you find a Disk Driver that matches the Disk Drive installed in the server. Highlight that selection and press

<ENTER>

then press

<ESC>

to return to the "Available Options" menu.

Installation Continued

Highlight the **Configure Drivers/Resources** option and press

<ENTER>

From the "Available Options" menu select **Configure Drivers/Resources** option and press

<ENTER>

From the "Configure Drivers/Resources" menu select **Choose LAN Configuration** and press

<ENTER>

Since there is only one board installed it is highlighted. Press

<ENTER>

and a list of available LAN board settings will appear. Select the one that matches the actual board settings and press

<ENTER>

You will be returned to the "Configure Drivers/Resources" menu. Highlight the **Choose Disk Driver Configuration** option and press

<ENTER>

Since only one disk interface board is installed, it will be highlighted. Select it by pressing

<ENTER>

A list of available disk interface board settings will appear. Select the one that matches the actual board settings and press

<ENTER>

You will be returned to the "Configure Drivers/Resources" menu. Highlight the **Enter Server Information** option and press

<ENTER>

You will be prompted for a network address. Use an address of "1" for the network. If you selected the **Advanced Netware 286/ Non-dedicated Server** option earlier you will also be prompted for a Non-dedicated Server DOS Process number. Use any number other than "1". The last prompt will be for the Communications Buffers. Use the number 14Ø. When completed press

<ESC>

to return you to the "Configure Drivers/Resources" menu. Press

<ESC>

one more time to return to the "Available Options" menu. Highlight the **Save Selections and Continue** choice and press

<ENTER>

You will be asked the question "Continue Network Generation Using Selected Configuration?". Highlight **YES** and press

<ENTER>

A "Network Generation Options" menu will appear. Highlight the **Link/Configure Netware Operating System** and press

<ENTER>

You will receive prompts directing you to insert various diskettes into a drive as the program works to link and configure the operating system. The diskettes you will need for this procedure are;

ANDOBJ	AUXGEN
DSK_DRV_ØØ1	GENDATA
LAN_DRV_ØØ1	LAN_DRV_ØØ2
OSEXE-1	NETGEN

Any special VAP diskettes may be called for here as well. Some diskettes will be used several times so just follow the prompts as required. When this procedure is completed, you will be returned to the "Network Generation Options" menu. Highlight the **Link/Configure File Server Utilities** and press

<ENTER>

Again you will be prompted to insert various diskettes into a drive. The list of diskettes you will need for this procedure are;

AUXGEN	DSK_DRV_ØØ1
NETGEN	UTILEXE
UTILOBJ	

This procedure requires many diskette changes and takes some time to complete. When completed you will be returned to the "Network Generation Options" menu. Highlight the **Analyze Disk Surface** option and press

<ENTER>

You will be prompted to ensure you want to continue to test the drive. Answer Yes to the prompt. You will then be instructed to insert the UTILEXE diskette into a drive. Insert the diskette into a drive and press

<ESC>

to continue. You will receive a warning message indicating that the testing will destroy all data on the drive. Since we are going to format the drive this is acceptable. Press

<ESC>

to continue. You may receive another warning message. If you do not have a printer connected and on line, a warning message will appear to indicate this fact. The drive analysis program has the capability to print the test results to the printer. We will not use this function so to continue press

<ESC>

Another prompt will appear asking for the drive to be tested. Select the highlighted drive and press

<ENTER>

A menu will appear with "Program Operation Parameters". The menu is empty and will list the options as you chose them. The first option will be to Format the Drive. Select Yes for this option and press

<ENTER>

The next option will be Interleave. Select a value of 2 for this choice then press

<ENTER>

A prompt will appear asking "Maintain the Current Media Defect List?" Select Yes and press

<ENTER>

The number of Sequential Passes option is next. Select Ø for this option and press

<ENTER>

The last option is Number of I/O's in Random Pass. There will be a default number in the choice. Use the **BACKSPACE** key to remove this number and insert a Ø in its place. Press

<ENTER>

Using Ø for both the Sequential Passes and Number of I/O's in Random Pass will allow the drive to be formatted with minimum testing. This makes for the quickest installation. If more through testing is required, use the default values for these options.

When all options have been completed you will be prompted to ensure all the parameters are correct. Answer Yes to the prompt. You will receive a warning message stating that the Number of I/O's in Random Pass value is below the recommended minimum value. To continue using the selected value press

<ESC>

When all the options have been completed, you will be prompted to ensure all the parameters are correct. Answer Yes to the prompt and press

<ENTER>

The drive will format followed by a test of cylinder Ø. When complete you will be prompted to display the Bad Block Table on the screen or to a printer. Press

<ESC>

to jump back to the main menu. Highlight Exit Compsurf and press

<ENTER>

The main menu will now offer an option to Install Netware. Highlight this option and press

<ENTER>

You will be prompted to insert the NETGEN diskette into any drive. Insert the diskette and press

<ESC>

to continue.

A prompt will appear asking to confirm the Drive Information. To continue, press

<ESC>

You will be prompted to confirm the attached drives. Highlight Drive List is Correct and press

<ENTER>

A menu of "Installation Options" will appear. Highlight **Select Default Installation Options** and press

<ENTER>

A series of prompts will follow. The first will ask to verify Drive/Volumes. Press

<ESC>

to continue. The second prompt will ask for a file server name. Type in the name of the file server and press

<ENTER>

Usually the file server is named the same as the school. The next prompt will be for System Configuration. There is nothing here that needs to be changed so press

<ESC>

to continue. You will be asked if COM1 is to be used for a network printer. Select **No** and press

<ENTER>

You will be asked if COM2 is to be used for a network printer. Select **NO** and press

<ENTER>

You will then be asked if LPT1 is to be user for a network printer. Select **Yes** for the answer and press

<ENTER>

The last prompt will be for Printer Status. There are no changes to be made here so to continue press

<ESC>

You will be returned to the "Installation Options" menu. Highlight **Select Custom Installation Options** and press

<ENTER>

Another menu entitled "Custom Installation" will appear. Highlight **Miscellaneous Maintenance** and press

<ENTER>

Highlight **Load Operating System** and press

<ENTER>

You will be prompted to **Set Flag for Operating System Load.** Select **Yes** and press

<ENTER>

The "Miscellaneous Maintenance" menu will return. Highlight **Load System and Public Files** and press

<ENTER>

You will be prompted to **Set Flag for System and Public Files Load.** Highlight **Yes** and press

<ENTER>

The "Miscellaneous Maintenance" menu will return. Next select the **Return to Previous Menu** option twice to return to the "Installation Options" menu. Once here, highlight the **Continue Installation** option selection and press

<ENTER>

You will be prompted with a question to "Install Networking Software on the File Server?". Select **Yes** and press

<ENTER>

You will be prompted to insert a series of diskettes in a drive during the installation procedure. The diskettes you will need are as follows;

BRUTILS	GENDATA
NETGEN	OSEXE-1
PROGRAMS-1	PUBLIC-1
PUBLIC-2	PUBLIC-3
PUBLIC-4	PUBLIC-5
SUPER-TUTOR	SYSTEM
USERTUTOR-1	

When the installation is complete you will be returned to the "Network Generation Options" menu. Highlight **Exit Netgen** and press

<ENTER>

Answer **Yes** to the prompt to "Exit Netgen?" and press

<ENTER>

You will finally be prompted to insert the diskette with COMMAND.COM on it into Drive A:. At this point Netware™ is installed on the hard drive of the file server and the boot process may be initiated.

If the file server has been set up as a Dedicated file server then resetting or powering up the server is all that is necessary to boot and run Netware™. If the file server has been installed as a Non-dedicated file server then a boot disk must be made for the server.

Format a blank diskettes using the "/S" option to make it bootable. Ensure you use the proper type of diskette for the A: drive in the file server. The only MSDOS files that need to be on the diskette are the two hidden system files and COMMAND.COM. Next, copy the appropriate NETx.COM file from the SHGEN-1 diskette in the Novell™ software package. The NETx.COM file is MSDOS version dependent. That is if you are running MSDOS 3.x version on the boot diskette then copy NET3.COM to the diskette. If MSDOS 4.x version is used on the boot diskette then copy NET4.COM to the diskette.

Next locate the OSEXE-1 diskette from the Novell™ software package and copy the NET$OS.EXE and NET$OS.EX1 files to the file server boot diskette. When this operation is complete use the COPY CON command and create an AUTOEXEC.BAT file like this;

```
A:> COPY CON AUTOEXEC.BAT <ENTER>

NET$OS
NET3
F:
```

End the file by typing CTRL Z or pressing the F6 key followed by <ENTER>. This batch file will allow the system to boot MSDOS, load and run Netware© and have the customer in the proper network drive to login to the system.

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APPENDIX 2

SHELL GENERATION PROCEDURES

Novell Shell Generation Procedures

In a Novell® Netware™ system, the file server is the heart of the system. On the file server resides the complete system of Netware™ and whether dedicated of non-dedicated, the server is complete in its software needs.

However, to we the users of Netware, it is a foreign operating system and one that we are generally unfamiliar with. We feel more confident with the MS™-DOS operating environment. In a Novell® system, there is no MS™-DOS operating system as part of Netware™.

Netware™ allows the installation of any version of MS™-DOS on to the file server so that users may access the MS™-DOS operating system. Netware™ if fact allows the installation of many versions of MS™-DOS on the file server. Thus each user can access the version of MS™-DOS required by any particular workstation attached to the network.

In order to use a workstation on the network the workstation must be first booted with the appropriate MS™-DOS for that computer. Once booted from a hard or floppy drive a software interface must be installed for network communications. This interface serves basically to determine if a software request is specifically for the workstation or for the network.

Software/hardware requests for the service of the workstation are examined by this interface and directed to the workstation. For example, the DOS command **DIR A:** is interpreted as a request for access to the workstation local floppy Drive A:. This request appears transparent to the network.

Software/hardware requests for the service of the network are examined by this interface and directed to the network interface board then to the file server. For example, the DOS command **DIR F:** is interpreted as a request for access to the file server's Drive F: thru the network. This request appears transparent to the workstation.

The shell generation operation accomplishes two things. First, a network communications protocol is generated that matches the installed network interface board with the network. This is used for internet communications. Second, the special network interface between MS™-DOS and the network is created. This software distinguishes between network and workstation requests.

All workstations must have these special files available for network communications. Each workstation must be booted in the normal fashion (from floppy or hard disk). Once at the regular DOS prompt the first file may be executed. IPX.COM is the special file that sets up the network communication protocol between the network and the workstation. It may be executed from the command line by typing IPX or from a batch file. Upon execution, a message will be displayed on the screen indicating the type of network board the IPX file is configured for and the board settings IPX is expecting.

When the DOS prompt returns, the next file to be executed is NETx.COM. This file is the software used to route workstation requests to the workstation or the network as appropriate. The x in NETx is matched to the MS™-DOS version being used on the workstation. For example, if DOS version 2.11 were being used at the workstation, then NET2.COM would be the file to use. In the same regard, if DOS version 3.3 were being used, NET3.COM would be the file necessary for the workstation. The file is executed at the command line by typing NETx or can be called by a batch file. Upon execution, a message will appear indicating the workstation is attached to a file server.

Shell Generation

There are several ways to generate a network shell with Novell® Netware™. A shell can be generated from floppy diskettes, from a hard drive or from a network drive. The last option is only available if you have an operational network to generate from. In the case of the hard drive or network drive options, the first time these options are exercised you are required to upload to the appropriate device the necessary files. This is part of the generation process and is menu driven.

In our discussion we will cover the floppy diskette generation option only. Also remember from Appendix 1 in some cases the procedure will ask you to press the **<ESC>** to continue and in other cases you will be asked to press any key to continue or the **<ENTER>** key to continue.

Boot a computer from floppy or hard drive as appropriate to the DOS prompt. Make Drive A: the active drive. Insert the **SHGEN** diskette into the drive. Begin the program by typing

SHGEN -NC <ENTER>

This will load and execute the shell generation program. The -N option tells the program to generate a new shell and to ignore the current shell on the diskette. The C option tells the program this is a custom installation as opposed to the default installation.

The first menu to appear is "Shgen Run Options". Highlight the **Standard (floppy disks)** option and press

<ENTER>

A "Shell Generation Options" menu will appear. Highlight the **Select Shell Configuration** option and press

<ENTER>

You will receive another menu entitled "Available Options". From this menu highlight **Select LAN Driver** and press

<ENTER>

The "LAN Driver Options" menu will be displayed. At this menu choose **Select Available Item** by highlighting the choice and pressing

<ENTER>

An "Available LAN Drivers" menu will appear along with a listing of available LAN drivers. Scroll thru the list until you find the driver for the LAN board installed in the workstation the shell is for.

NOTE: You may generate a workstation shell for any workstation configuration on any computer. You do not have to use the same computer the shell is for.

Highlight the correct selection and press

<ENTER>

followed by

<ESC>

to return to the "Available Options" menu. Once here select the **Configure Driver/Resources** option by highlighting it and press

<ENTER>

The "Configure Driver/Resources" menu will be displayed next. Highlight the **Choose LAN Configuration** option and press

<ENTER>

An 'Unconfigured Driver" menu will appear with the LAN driver chosen earlier highlighted. Press

<ENTER>

to select this driver to configure. An "Available LAN Driver Configurations" menu will appear with a list of available board settings. Choose the settings that match the board the shell is being generated for and press

<ENTER>

Press

<ESC>

once to return to the "Available Options" menu. From this menu highlight the **Save Selections and Continue** option and press

<ENTER>

You will be prompted to "Continue Shell Generation Using the Selected Configurations". Highlight "Yes" and press

<ENTER>

The "Shell Generation Options" menu will appear with the **Link Network Shell** option highlighted. Select this option by pressing

<ENTER>

You will be prompted to insert one or more diskettes into any drive. Insert these diskettes into Drive A: as required. The diskettes that may be required are LAN_DRV_001 and LAN_DRV_002 for a standard network board. Other boards will have a special diskette that accompanies the board for shell generation use. In this case you will be prompted to insert LAN_DRV_??? into any drive.

When the diskettes have been read by the system, you will be returned to the "Shell Generation Options" menu. Highlight the **Configure Network Shell** option and press

<ENTER>

After a brief time a message will appear indicating "A Valid Shell Exists on SHGEN-1". This is your indication that the shell generation process has completed correctly. The "Shell Generation Options" menu will now have the **Exit Shgen** option highlighted. To select it press

<ENTER>

You will then be prompted to "Exit Shgen". Highlight Yes and press

<ENTER>

When returned to the DOS prompt copy the IPX.COM and NETx.COM files from the SHGEN-1 diskette to the workstation boot diskette or hard drive.

Final Checkout

If the workstation uses a boot diskette, boot the computer using the diskette with the IPX and NETx files on it. Manually execute the IPX file followed by the NETx file from the DOS prompt. Ensure the network board is installed in the computer, the network cabling is connected and the file server is up and on the network. If all goes well you should receive the message that you are attached to a file server. You may now type F: to change to the network Drive F:.

If you do not meet with the expected results above troubleshoot as follows. These steps work on floppy and hard drive installations. Reboot the workstation to the DOS prompt. Type the command

IPX I <ENTER>

The I option tells IPX not to load into memory and to display the type of network board and the board settings it expects to see used. Verify you have the proper type of board and it is set to match IPX settings. If not you may change the board to match the IPX file settings or run the Shell Generation program again to select settings that match the board. In either case ensure the settings chosen do not conflict with other boards installed in the workstation. Once any problems here are corrected, try the system again.

If all is correct with the IPX file and you still cannot attach to the file server recopy the NETx.COM file from SHGEN-1 to your boot diskette or hard drive. Reboot the system and manually execute the IPX and NETx files. If attachment is still not achieved, more involved hardware troubleshooting techniques will be required.

Final Note

When generating network shells for workstations a short cut may be used. If two workstations have the same type of network board installed and use the same settings a network shell generated for either board will work on both boards. That is to say that an IPX.COM file generated for a specific board using specific settings will work on every other board in any workstation as long as the board is the same type and set the same way.

This means that if 15 workstations have the same board set the same way installed, you can generate a shell one time and then copy the IPX.COM file from SHGEN-1 to the boot diskettes/hard drives of all 15 workstations. This can really be a time saver in larger networks.