TeleVideo®
TS 802H Computer System
Installation and User's Guide

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1. INTRODUCTION

1.1 INTRODUCTION TO THIS MANUAL

TeleVideo's TS 802H is a compact tabletop microcomputer which can be used as a stand-alone computer, user station, or service processor terminal connected to a multiuser system (either a TeleVideo TS 806 or TS 816). Many peripheral devices (printers, teletypes, modems, etc.) can be used with the TS 802H, ensuring maximum flexibility.

When the TS 802H is a user station for a TS 806 or TS 816, it shares with other users the disk storage, printers, and other peripheral devices attached to the central system. Since user programs run in the TS 802H's internal processor, the performance of the central and local system is maximized.

This manual will show you how to successfully install and use your new TS 802H regardless of your past experience with computers.

If you are using your TS 802H as a user station with a TS 806 or TS 816, refer also to the TS 806 or TS 816 Computer System Installation and User's Guide.

Every attempt has been made to present all of the information you will need in a complete and easy-to-understand manual. Your comments about the manual are welcome. To facilitate this, we have provided a Reader Comment Card. Please take a moment to complete and return the card to us after you have finished installing your system.

1.2 LIMITED WARRANTY

The TS 802H is covered by a limited warranty. The terms and conditions of the complete limited warranty are provided in Appendix B.

1.3 HARDWARE CONFIGURATION
1.3.1 Hardware Overview

The TS 802H is a tabletop computer which contains the following components:

- One 5 1/4-inch Winchester hard disk drive
- One floppy disk drive
- A TS 800 logic board
- A "daughter" board containing floppy controller logic and a Winchester drive controller board
- A terminal with the capabilities of the Model 950
- A Z80A microprocessor
- 64K of RAM memory
- A 4K EPROM for diagnostics

The floppy disk drive uses 5 1/4-inch double-sided, double-density floppy diskettes (also called minidiskettes) with a capacity of 368 kilobytes disk storage. The Winchester disk drive has a capacity of 7.4 megabytes of disk storage. The total formatted capacity of the system (with the hard and the floppy disk drives) is 7.768 megabytes.

The microprocessor within the TS 802H will be referred to as the *internal processor*. All I/O ports operate through this internal processor, enabling you to use all standard CP/M function commands.

1. INTRODUCTION

The integral terminal has a nonglare screen and detached Selectric-style keyboard for the comfort of the user. Deluxe terminal features such as special graphics, visual attributes, and programmable function keys provide additional flexibility.

1.3.2 Disk Drives

The TS 802H has one hard disk drive and one floppy disk drive.

Much like a phonograph, each floppy drive has a head or arm which is lowered onto the disk or diskette whenever the drive door is closed, enabling the system to read or write information. The disk head can move back and forth ("seeking") as required to scan for information. The floppy drive is located behind the door on the upper lefthand side of the front of the case (Figure 1-1).

The head on the Winchester hard disk floats over the disk on a cushion of air whenever power is on. The hard disk drive is located immediately below the floppy disk drive.

1.3.3 Disk and Diskettes

Application programs, text, data, and the programs which operate the TS 802H are stored on the hard disk and floppy diskettes.

The drive heads automatically read both sides of the floppy diskettes (Figure 1-2). The TS 802H can use any floppy diskette which meets the specifications given in Appendix C. New diskettes must be formatted before data can be stored on them (as explained in 3.2.1 and Appendix M).
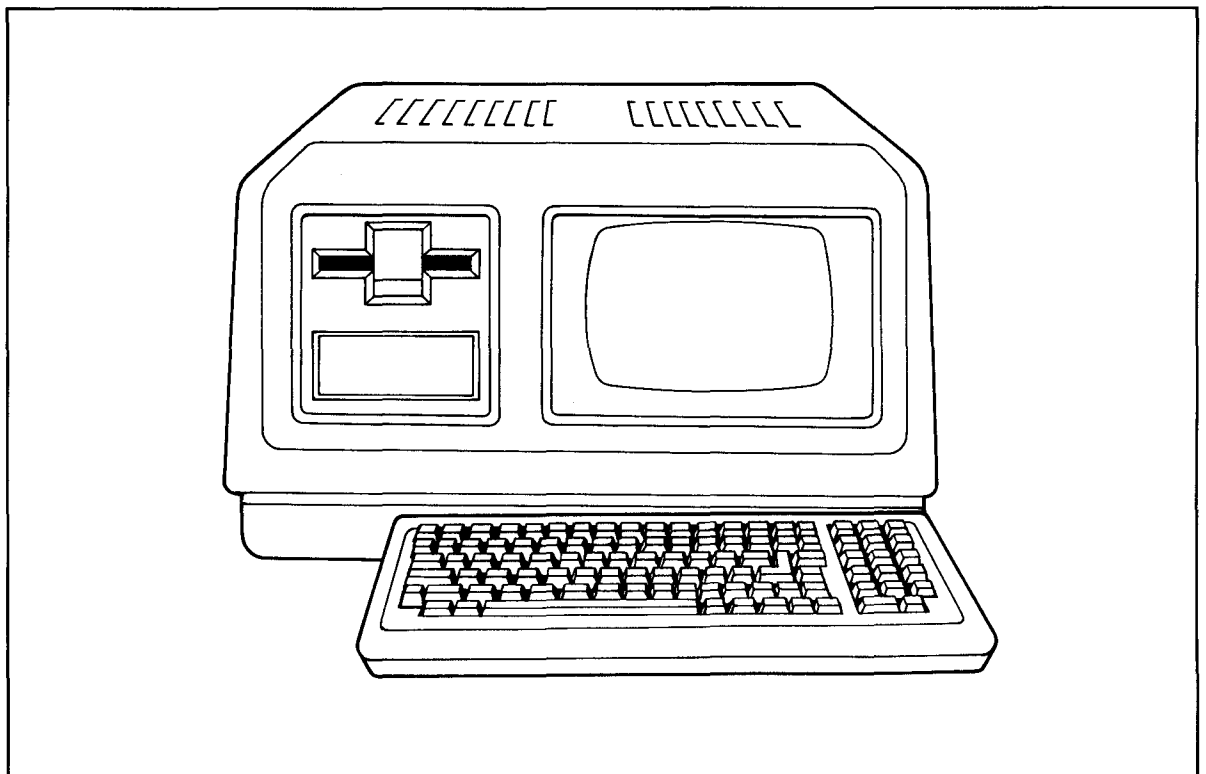
Figure 1-1   Floppy and Hard Disk Drives

1. INTRODUCTION
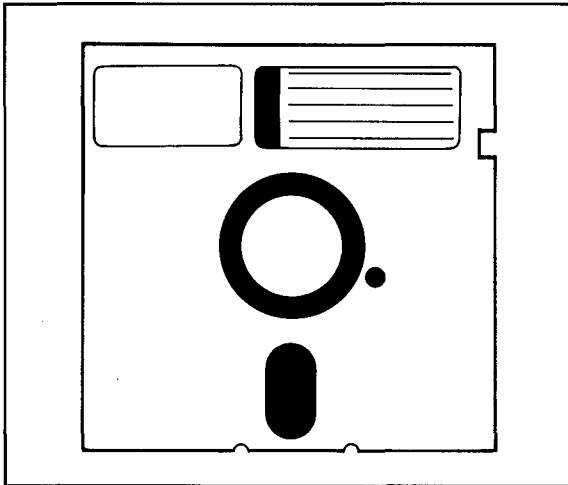
Figure 1-2   Floppy Diskette
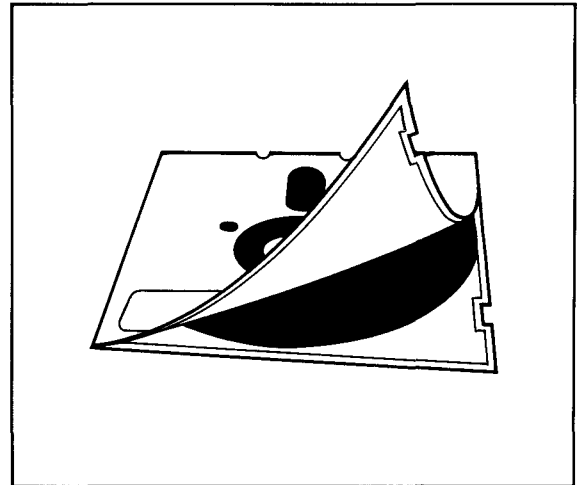
*Figure 1-3   Diskette Inside
Permanent Plastic Enclosure*

Each diskette has a magnetic coating on both sides. Lubricants inside this cover increase the life of the diskette. The actual diskette can be seen through some of the slots in the plastic cover. Figure 1-3 shows the actual floppy diskette and protective lining inside the plastic cover. When cared for as described in Chapter 4, diskettes can be reused many times.

When you insert the diskette in the drive and close the door, the drive spins the diskette (inside the cover). Data are stored on tracks in concentric rings on the diskette. The small opening in the diskette cover near the center hole is a reference point for the head while locating data. The oblong opening in the diskette cover allows the head to retrieve information in batches.

1.3.4   Peripheral Devices

Three ports on the rear of the TS 802H allow you to connect peripheral devices as described in Table 1-1.

Table 1-1   TS 802H Ports

Port	Description
P2 (left)	This RS232C port is for a user-supplied serial device such as a printer or a modem. This port is configured for a printer when shipped from the factory, but cutting traces and making jumper connections allows a modem to be connected to this port instead.
P1 (right)	This RS232C port may be configured in any of three ways: 1. When shipped, this port is configured for use with a modem. 2. Cutting traces and making jumper connections allows the TS 802H to be used with a serial printer. 3. Changing a dipswitch allows the TS 802H to be used as a service processor terminal with the TS 806/816 system console port.
RS422	This highspeed serial port connects the TS 802H to the TS 806 or TS 816 for use as a user station.

1. INTRODUCTION
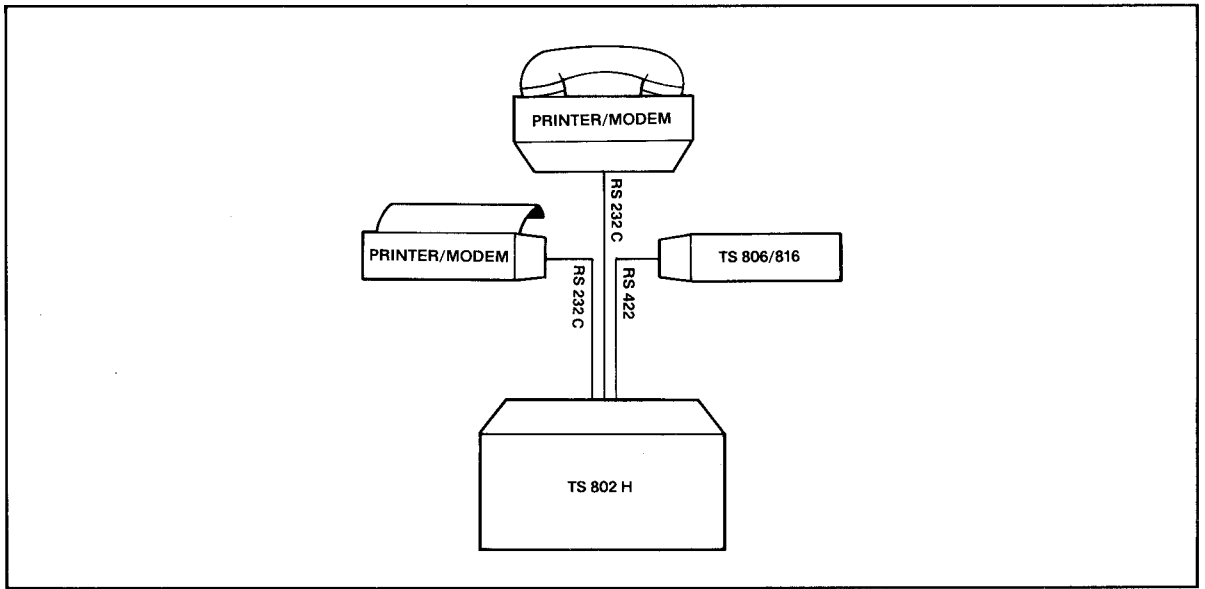
a. As a User Station
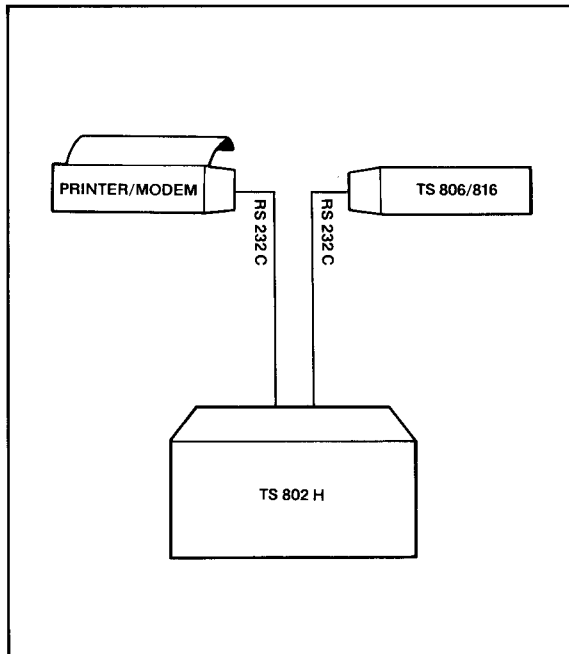
b. As a Service Processor Terminal
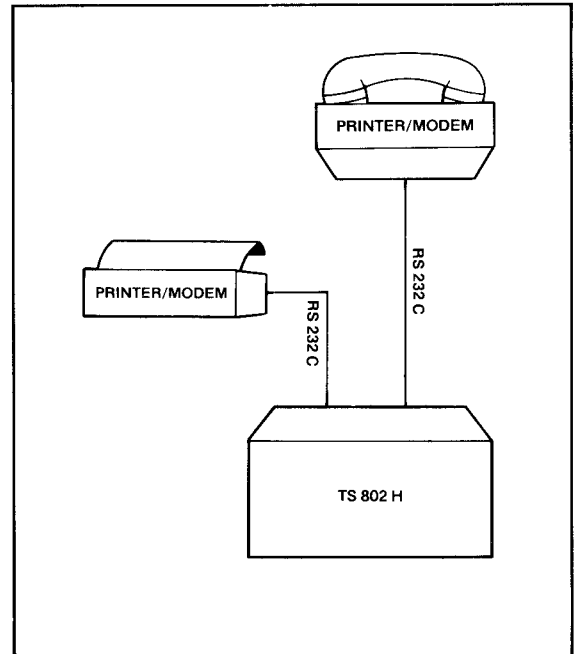
c. As a Stand-Alone

Figure 1-4   Possible TS 802H Configurations

1. INTRODUCTION

1.4 SOFTWARE OVERVIEW

1.4.1 Operating System

Every computer needs instructions in order to operate; these instructions are supplied by a group of programs collectively called the *operating system*.

Using dipswitches on the rear of the case, you can select one of three ways for the operating system to be loaded into the TS 802H, as described in Table 1-2. When the TS 802H is used as a stand-alone computer, its operating system can be loaded into memory from a floppy diskette or from the hard disk. When the TS 802H is a user station for a TS 806/816, the operating system is loaded from the TS 806/816. Table 1-2 shows the drive assignments for each configuration.

Table 1-2   Disk Drive Assignments

Source	Drive Assignments	Physical Device	Drive Capacity[1] (Kilobytes)	Maximum Directory Entries
Floppy	A	Floppy	342	64
	B	Hard[2]	342	64
	C	Hard	3488	512[3]
	D	Hard	3488	512[3]
Hard	A	Hard	3488	512[3]
	B	Hard	3488	512[3]
	C	Hard[2]	342	64
	D	Floppy	342	64
TS 806/816	M	Floppy	342	64
	N	Hard[2]	342	64
	O	Hard	3488	512[3]
	P	Hard	3488	512[3]

Notes
1. Excluding directory and operating system allocation
2. Simulated floppy drive
3. Expandable to 1024 using CBIOS

All TeleVideo computers use CP/M (Control Program for Microcomputers) Version X.X Operating System software, developed by Digital Research.

$$\triangle$$

If you are not already familiar with CP/M, TeleVideo highly recommends that you refer to the recommended reference books listed in Appendix D and become familiar with the basic operation of the CP/M system.

1.4.2 Programming Languages

The TS 802H can use any programming language which will run under CP/M. Among these are BASIC, ALGOL, APL, "C," CBASIC, COBOL, FORTH, FORTRAN, MBASIC, PL/I, AND RM/COBOL. When these languages are used with MmmOST, modifications which are described in the MmmOST Programmer's Manual allow them to take advantage of the features of MmmOST. In addition, TeleVideo COBOL allows application programs to be used with MmmOST with little or no modification.

1.4.3   Application Programs

Application programs are commercially available for a wide range of tasks from accounting to security. In addition, you may write your own application programs in one of the programming languages compatible with CP/M.

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Programs written specifically to take advantage of the features of terminals other than Tele-Video's Model 950 may need to be modified since the integral TS 802H terminal functions the same as a Model 950.

1.5   USING THE MANUAL
1.5.1   Organization

Chapter 2 will show you how to unpack and install the TS 802H. Chapter 3 will describe how to operate the system. Chapter 4 will suggest procedures for avoiding problems. Chapter 5 explains how to use the built-in terminal. Chapter 6 explains how to take advantage of the TS 802H's terminal features in your programs. Chapter 7 tells how to care for the TS 802H and what to do if you have a problem with it.

In the Appendices are the specifications, limited warranty, suggested references, and technical information. The inside back cover contains the Operator's Quick Reference Guide, a summary of all control and escape commands used by the TS 802H's internal terminal.

1.5.2   Special Information

Notes call your attention to information which is of special importance. Two categories of notes are used:

△   General note giving information to every operator.

🛑   Note giving information concerning the safety of the operator or possible loss of data. *When you see this, STOP and read the note before proceeding!*

Your responses to system prompts will be indicated by bold print.

1.5.3   Format of Control Commands

The key marked "CTRL" on the keyboard is the CONTROL key. To use it, press it and hold it down while you press another key (or keys). This combination is called a control command. In this manual, control commands will be shown as ∧ plus the control character (e.g., ∧C).

1.5.4   Carriage Returns

When you should press the RETURN key on the keyboard, the symbol <CR> for CARRIAGE RETURN will be used. (On TeleVideo terminals, you can press the ENTER key instead of the RETURN key.)

2. INSPECTION AND INSTALLATION

2.1 UNPACKING

2.1.1 How to Unpack

Before the TS 802H was shipped, it was placed in a large plastic bag, encased in foam, and double boxed (Figure 2-1). To unpack it, lift the corner foam pieces out of the shipping carton, turn the box over and slide out the inner box. After carefully opening the inner box, turn it over on its side and slide out the foam sides and the TS 802H. Remove the foam from the sides, and slide the TS 802H gently out of the plastic bag. The documentation is enclosed in an envelope.
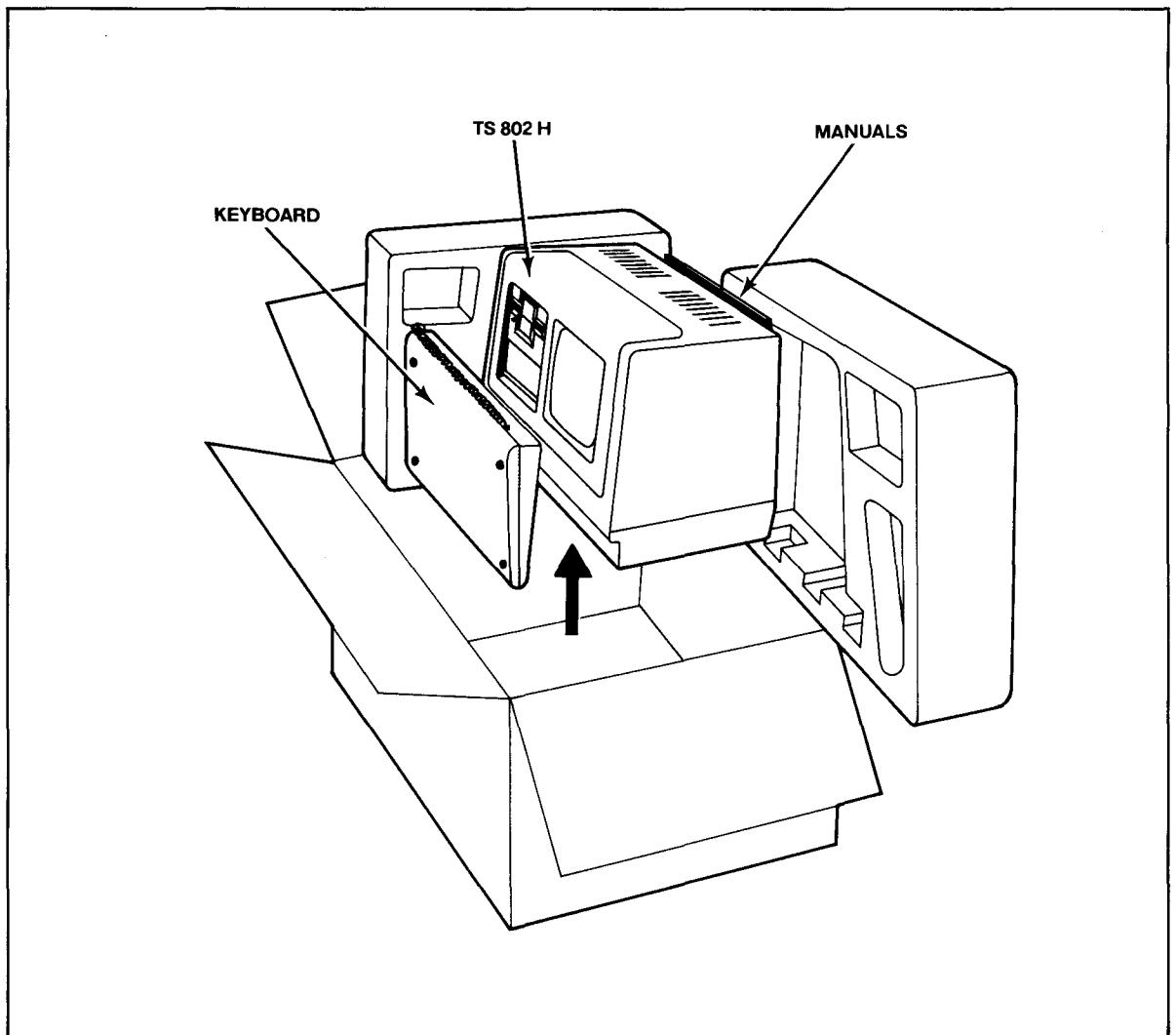
Figure 2-1   TS 802H as Packed in Container

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Save all packing materials and the carton in case you need to ship the TS 802H in the future.

2. INSPECTION AND INSTALLATION

2.1.2   Checklist of Components

As you unpack, check to make sure you received the following items:

1. TS 802H
2. Envelope containing the following items:
    a. Digital Research CP/M User Manual
    b. TS 802H Computer System Installation and User's Guide
    c. CP/M Licensing Agreement
    d. Two 5.25-inch floppy diskettes:
        CP/M (system diskette)
        CBIOS (source listing of system BIOS)

△

If any item is missing, contact your dealer before proceeding with the installation.

2.1.3   Shipping Damage

Check for shipping damage before proceeding with the installation. If the system case appears to be damaged, contact your freight carrier immediately. DO NOT PROCEED WITH THE IN-STALLATION IF YOU BELIEVE THERE WAS ANY SHIPPING DAMAGE. If in doubt, contact your dealer as well as the freight carrier.

2.2   SOFTWARE REGISTRATION

Inside the front cover of the CP/M Manual that accompanies the system is the CP/M Software License and License Agreement. Read the agreement and sign the card before opening the package containing the diskette. Signing the agreement and returning the card will:

1. Entitle you to use the CP/M operating system on your TS 802H and make back-up copies for your own use
2. Register you as a CP/M Owner, allowing you to receive:
    a. CP/M User's Newsletter
    b. Notices of updates and enhancements to Digital Research Software
    c. Digital Research Software bug reports and patches
    d. Discounts on updated versions of Digital Research software

2.3   SELECTING THE RIGHT LOCATION
2.3.1   Power Requirements

The TS 802H requires a steady supply of power:

115 VAC 60 Hertz (domestic) at 1.0 amp or 230 VAC 50 Hertz (international) at 0.5 amp

2. INSPECTION AND INSTALLATION

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Incorrect or fluctuating line voltages can cause disk errors or damage the system. If you have any doubt about the line voltages at your location, ask your dealer to check out your facility BEFORE PROCEEDING WITH THE INSTALLATION.

2.3.2 Physical Requirements

If the TS 802H is a user station connected to a TS 806/816, they should be within 300 feet of each other. If the TS 802H is being used as a service processor terminal (service console) attached to a TS 806/816, they should be within 50 feet of each other. The printer should be within 50 feet of the TS 802H.

Select a sturdy, level surface. The exterior dimensions of the TS 802H are:

    13.62 inches (34.6 cm) high
    22.47 inches (56.0 cm) wide
    14.37 inches (36.5 cm) deep

The TS 802H's keyboard is 7.48 inches deep.

Leave at least four inches of free space around the enclosure for proper air flow.
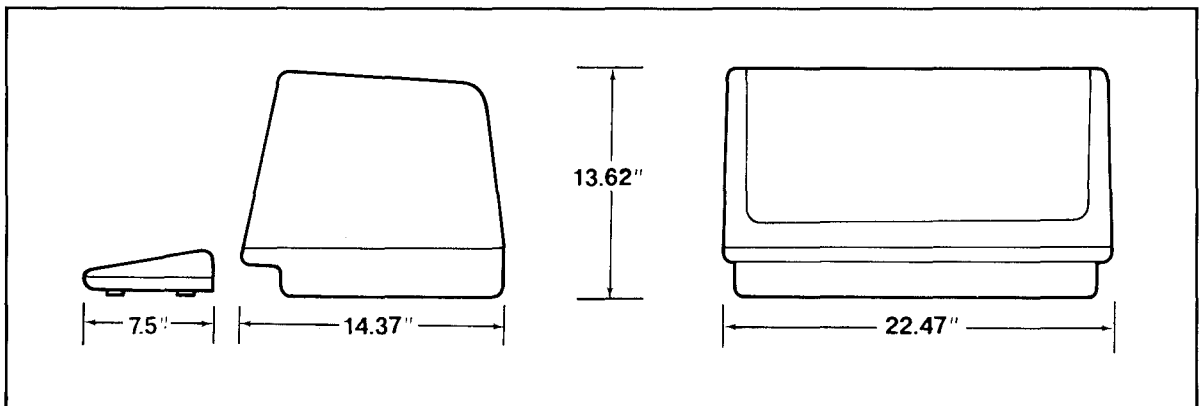
Figure 2-2   Outside Dimensions

2.3.3 General Environment

The TS 802H will operate best at temperatures and humidity levels in which you are also comfortable. Sudden and drastic temperature changes may adversely affect your stored data.

The system requires a clean environment—free of contaminants such as dust, carpet fuzz, and smoke. Excessive moisture or oil particles in the air will hinder the performance of the system. Keep the system away from the floor where dust or carpet fuzz would be more likely to get into the drives.

2.3.4 Magnetic Isolation

For optimum performance, locate the system at least five feet from other computing equipment, any electrical appliances, or equipment (such as elevators, radio transmitters, television sets) which generate magnetic fields.

2. INSPECTION AND INSTALLATION

2.4 INSTALLATION

General directions for all installation configurations are given in this section. The next four sub-sections give directions for installing a serial printer or modem (or other peripheral serial devices) and connecting the TS 802H (1) to a TS 806 or TS 816 as (a) a service processor terminal (service console) or (2) a user station.

2.4.1 Cables

To connect the TS 802H and a central computer, printer, and any other peripheral device (such as a modem), you will need cables. The number and types of cables needed are determined by the number of devices attached to the TS 802H. Your dealer can supply you with the appropriate cables. (The technical specifications for each type of cable are shown in Appendix E.)

Cable connectors commonly have D-shaped end connectors. These fit onto a D-shaped pin connector on the rear panel of the system. To install a cable, turn the connector end to fit the pin connector on the device, then gently but firmly push on the connector.
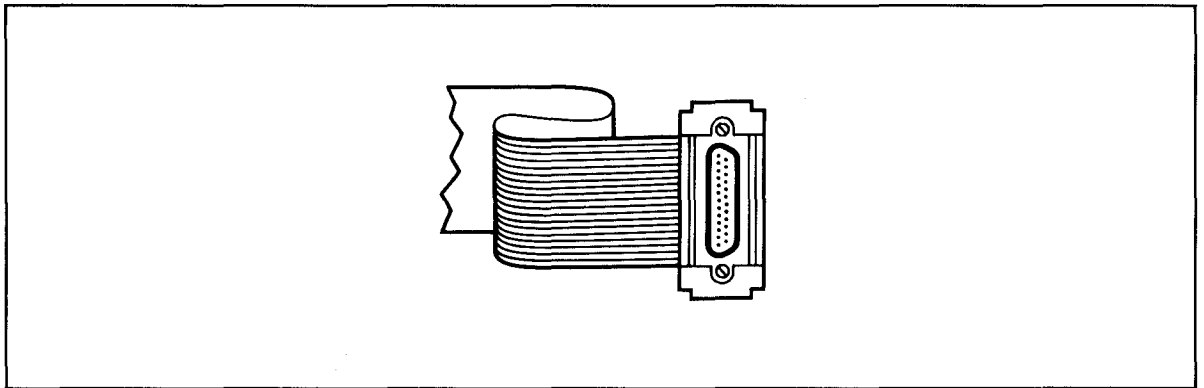
Figure 2-3   Cable Connector

As you connect the cables, leave some slack. If you have excess cable left, fold it loosely accordion-style (being careful not to crimp the cable) and secure it with a rubber band. Place the cable out of the way.
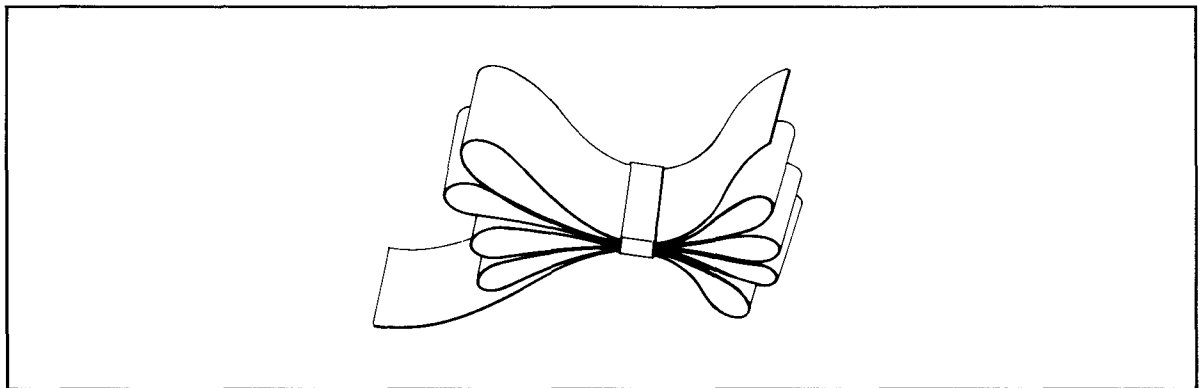
Figure 2-4   Correctly Folded Excess Cable

2.   INSPECTION AND INSTALLATION

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If you are using a ribbon cable, do not roll up excess cable. Rolled ribbon cable looks nice but it creates an inductor or choke which can adversely affect system performance.

Also plug the keyboard cable into the rear panel.

2.4.2   Power Configuration

The system will be configured for your power requirements at the factory (either 115 or 230 VAC). A three-prong plug is provided. If you use it with an adapter, ground it with a "pigtail." The power cord wires are color-coded as follows:

Green	Earth ground
Black	Primary power (hot)
White	Primary power return (neutral)

2.4.3   Using the TS 802H as a Stand-Alone

If you use the TS 802H as a stand-alone computer (i.e., not as a user station for a TS 806/816), no cable connections are necessary unless you wish to connect printers and/or modems to the TS 802H. Check settings for S2 dipswitches as described in Appendix G.

2.4.4   Connecting the TS 802H as a Service Processor Terminal

To attach the TS 802H as a service processor terminal to the TS 806/816, attach one end of an RS232C cable (Fig. E-1 in Appendix E) to the connector labeled "TERMINAL" on the rear of the TS 806/816 case. Attach the other end to the RS232C connector **P1** on the rear of the TS 802H. (The pin connector assignments for the terminal connector are furnished in Appendix F.)
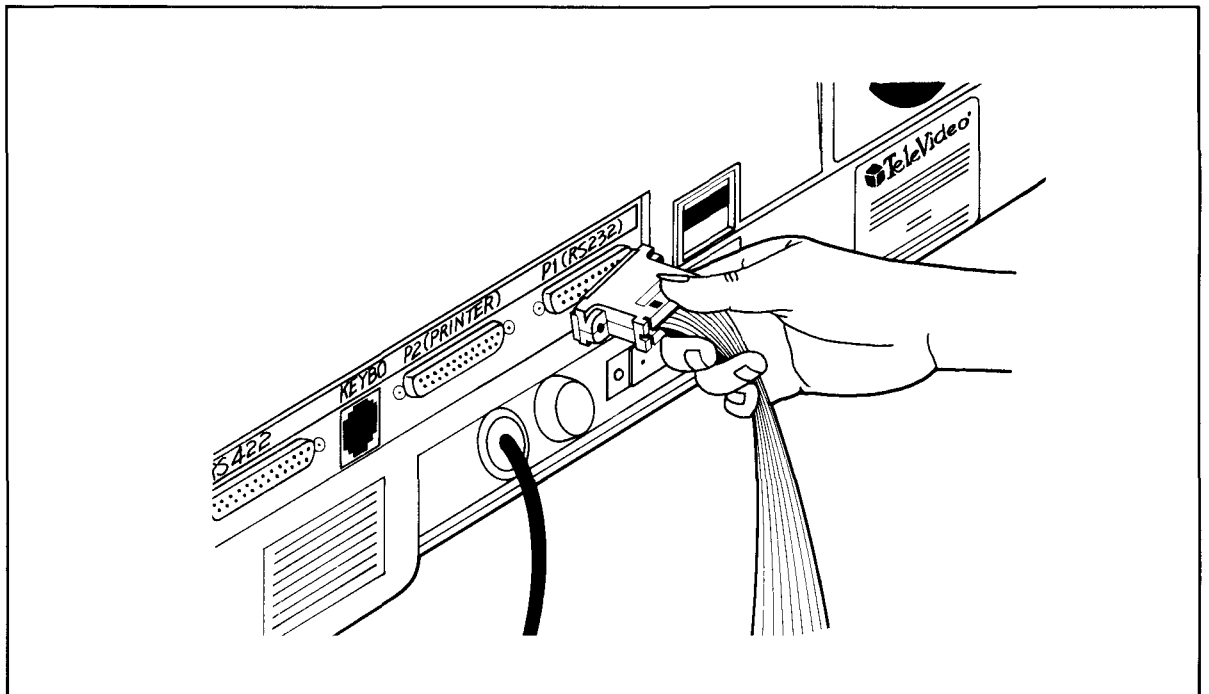
Figure 2-5   Attaching Terminal Connector

2. INSPECTION AND INSTALLATION

The system is shipped set for a terminal baud rate of 19.2K. Check the dipswitch settings on the rear of the TS 802H. The switch settings are described in Appendix G. Figure 2-6 shows the switch locations. Make sure dipswitches S2-5 and S2-7 are set according to Appendix G.
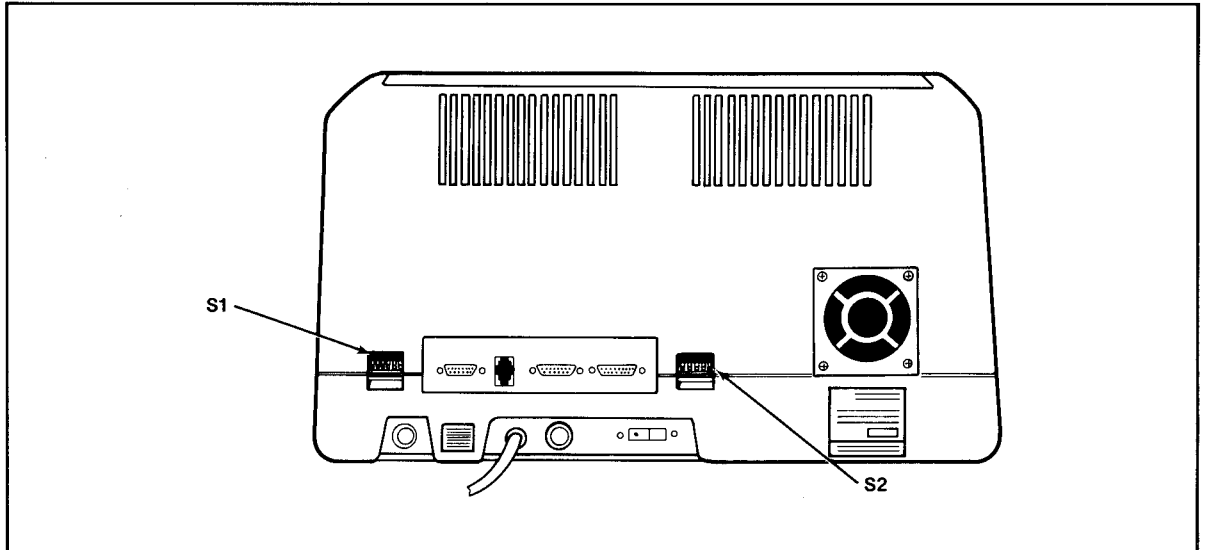
Figure 2-6 Location of Switches on Rear Panel

The TS 802H's internal terminal is set to operate at:

Full duplex
Eight bits
One stop bit
No parity

2.4.5   Installing the TS 802H as a User Station for a TS 806/816

To install the TS 802H as a user station, you will be using the RS422 port on the rear of the TS 802H.

Attach one end of an RS422 interface cable to the TS 802H (the connector is labeled *P4*) and the other end to one of the ports labeled "User ____" on the rear of the TS 806/816 (as shown in the TS806/816 installation guide).

Set dipswitches S2-5 and S2-7 for a user station configuration (Appendix G).

2.4.6   Connecting a Serial Printer

Your TS 802H can be connected to an auxiliary serial printer to make a permanent hard copy of data. The TS 802H's serial printer interface allows the TS 802H to be used with most RS232-compatible serial printers currently available on the market, including both character-by-character and buffered printers. You can use a dot matrix printer, a highspeed line printer, or a letter-quality printer. You may also connect a modem to transmit data to another location.

The RS232C serial port labeled *P2* is ready to use for a serial printer when the unit is shipped from the factory. If this port and the other RS232C port (labeled *P1*) are both used with printers, cut traces on the printed circuit board and install jumpers (as described in Appendix I) before attaching the RS232C interface cable.

Device assignments are given in Appendix L; addresses for RS232C ports are given in Appendix K.

The second diskette included with the TS 802H is labeled CBIOS. This diskette allows you to modify the default printer device from one serial type to another or establish different power-up default values. Instructions for modifying CBIOS are provided in Appendix O.

2.4.7   Connecting a Modem

You can connect one or two modems to the TS 802H. The RS232C port which is labeled *P1* is ready to interface to a modem.

This port is controlled by dipswitches which allow the TS 802H to be used with a modem or as a terminal for a TS 806/816. Appendix G lists the switch settings which control this switch.

To connect two modems to the TS 802H, cut traces on the printed circuit board and install jumpers in the pin connector of the port labeled *P2* (as described in Appendix I) before attaching the RS232C interface cables.

2.4.8   Plugging in the TS 802H

After you have connected the RS422 cable and all RS232C serial devices, plug the TS 802H into the wall outlet but *do not turn it on yet.*
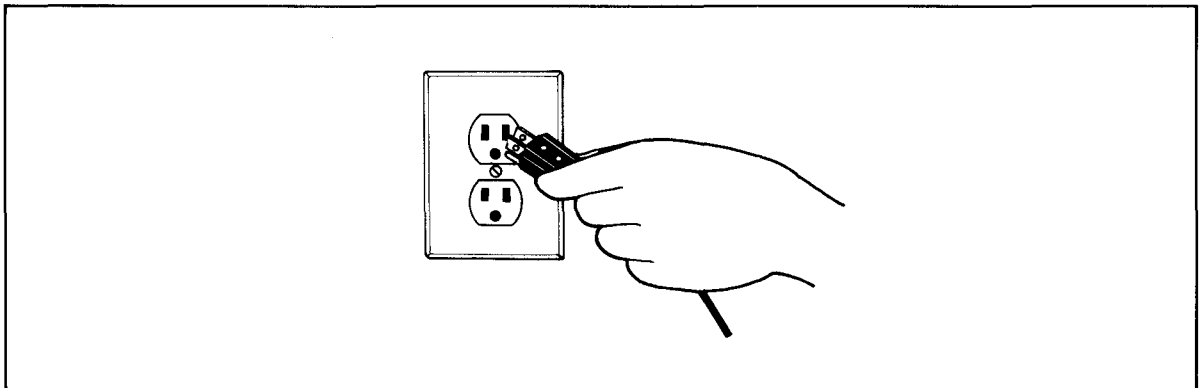
Figure 2-7   Plugging TS 802H into Wall Outlet

2.5   CHECKLIST OF INSTALLATION INSTRUCTIONS

1. Did you check TS 802H for possible shipping damage?
2. Is the location which you selected
   a. Magnetically isolated?
   b. Supplied with steady line voltage?
   c. Within comfortable temperature and humidity levels?

        d.   Clean?

        e.   Spacious enough for good ventilation around the case and on a sufficiently large table?

3.   Is the power plug correct for your wall outlet?

4.   If the TS 802H is connected to a serial printer and/or TS 806/816, are they connected and located within the distance limits specified?

5.   Did you set the switches for all peripheral devices? Did you make all necessary cuts and jumpers?

6.   Did you plug the TS 802H and peripherals into the wall outlet?

If the answer to all of these steps is YES, then you are ready to use the TS 802H.

3. OPERATION

3.1 START UP

3.1.1 Power On

Now that all peripheral devices are installed and the TS 802H is plugged in, make sure there is no diskette in the floppy drive. Turn on the TS 802H and adjust the CRT contrast if necessary (Figure 3-1).
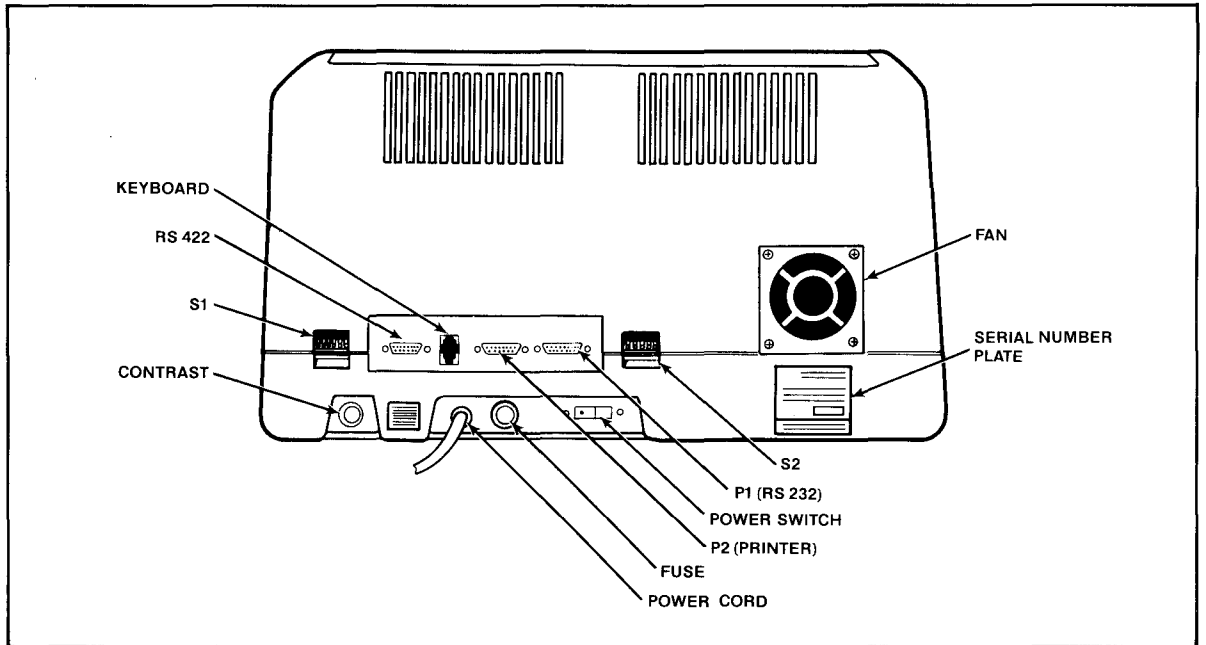
Figure 3-1   Rear Panel

3.1.2 Loading the Operating System Programs

3.1.2.1 **Booting Up**—The process of transferring the operating system programs to the system's memory is called **booting** or **booting the system** from the expression to "pull oneself up by one's bootstraps."

Booting the system the first time after you turn on the power is called a **cold boot, cold start**, or **reset**. A cold boot clears the system memory and loads the operating system program into the system again. This does not affect data already stored on the hard disk or floppy diskette but any data in memory will be lost. A cold boot is normally used if you have a problem with your program and wish to start over or if your system is not responding correctly.

To reset the TS 802H, press the BREAK key twice while holding down the SHIFT key.

A **warm boot** loads the operating system programs into the system again *yet does not affect user memory areas*. You can warm boot by entering ∧C (depress the CTRL and C keys simultaneously) when it is the first character entered in response to a system prompt and in application programs when allowed.

3. OPERATION

3.1.2.2 Loading from a Floppy Diskette

The diskette labeled "CP/M Version X.Y" contains the basic operating instructions for the system. From now on it will be referred to as the *system diskette.* You can load the operating programs from the system diskette.

To do this, you must change dipswitch S2-6 (on the rear of the TS 802H case) from open to closed. This causes the TS 802H to boot from the floppy disk drive rather than from the hard disk drive.

Next, insert the system diskette into the floppy drive. (Refer to 3.1.5 for instructions on inserting floppy diskettes.)

After you insert the system diskette, shut the drive door slowly. Reset the system by pressing the BREAK key twice while holding down the SHIFT key. You should hear a slight noise and see the following message on the CRT:

> System "boot" (X-Rev.X) from floppy disk in progress
> TELEVIDEO SYSTEMS TS-802H VX.X
> 64k CP/M vers X.Y
> Tandon TM-603s Winchester
>
> A>

(If no message appears, reset it again and/or refer to 7.2, Troubleshooting.)

3.1.2.3 Prompts

The last line of the initial system message is:

> A>

This is the *system prompt.* Prompts vary from one computer system to another but almost always indicate that the operating system is ready for your response. While you are using an application program you may see a different prompt symbol; this will be explained in the application program instructions.

The letter before the prompt itself (i.e., A>) tells you which of the drives is active.

△

The appropriate response to the prompt will be shown here in **bold letters.**

3.1.3 Installing the Operating System onto the Hard Disk

To install CP/M onto the TS 802H hard disk, follow this procedure.Once the installation is complete, you will be able to boot the TS 802H from the hard disk.

All user responses are shown in bold print.

USER:
1. Locate switch S2, dipswitch 6 (S2-6) on the rear of the TS 802H case. (See Figure 3-1.)

2. If S2-6 is open (up), change it to closed (down). If S2-6 is closed, do not change it.

3. Turn on the TS 802H.

SYSTEM:

4. Insert the system diskette (the floppy diskette that arrived with the TS 802H) into the floppy drive and slowly close the drive door.

5. Press the BREAK key twice while holding down SHIFT.

6. Displays

   System "boot" (X-Rev.X) from floppy disk
   in progress
   TELEVIDEO SYSTEM TS-802H VX.X
   64K CP/M vers X.X
   Tandon TM-603s Winchester

   A>

   △

   The drive that the cold boot originates from is accessed as drive A. For example, when the TS 802H is booted from the floppy drive:

   1. The floppy drive becomes logical drive A

   2. The hard disk becomes logical drives B,C, and D

   When the TS 802H is booted from the hard disk:

   1. The hard disk becomes logical drives A,B, and C

   2. The floppy drive becomes logical drive D

USER:

7. Enter

   DIR<CR>

SYSTEM:

8. Displays a directory which includes

   HFORMAT.COM
   FIXDISK.COM

   A>

USER:

9. Verify that the above files are listed on your screen. If they are not, contact your dealer or distributor.

10. Enter

    HFORMAT<CR>

SYSTEM:

11. Displays

    Hard Disk FORMAT
    TeleVideo Systems, Inc. Version x.y
    ***CAUTION:ALL DATA ON THE INTEGRAL HARD DISK WILL BE
    DESTROYED***
    TYPE RETURN when ready (ESC OR ∧C to abort.)

USER:

12. Press

    <CR>

3.   OPERATION

SYSTEM:	13.	Displays cylinder, head, sector, and count information.
	14.	Displays, in approximately fifteen minutes,
		HFORMAT Complete A>
	15.	If errors are found during formatting, specific error messages are displayed.
USER:	16.	Enter
		FIXDISK B:<CR>
SYSTEM:	17.	Displays
		FIX DISK PROGRAM VER. X.X CURRENT SCANNING BLOCK: #____
		(displays block numbers as they are scanned by the program)
		FIXDISK COMPLETED WITH XXXX DATA BLOCKS ERROR A>
USER:	18.	Enter
		FIXDISK C:<CR>
SYSTEM:	19.	Displays the messages in Step 17.
USER:	20.	Enter
		FIXDISK D:<CR>
SYSTEM:	21.	Displays the messages in Step 17.
USER:	22.	Enter
		PIP B:=A:*.*[vo]<CR>
		(The CP/M utility program PIP transfers all files on the system diskette to the hard disk logical drive B.)
SYSTEM:	23.	Displays
		A>
USER:	24.	Remove the system diskette from the floppy drive.
	25.	Insert the diskette labeled CBIOS into the floppy drive.
	26.	Enter
		DIR<CR>
SYSTEM:	27.	Displays a directory which includes

        802HBIOS.COM   (CBIOS module)
        802HBOOT.COM   (Bootstrap module)
        CPM59.COM   (BDOS AND CCP module)
        MAKESYS.COM   (Builds CP/M onto system track)

        A>

USER:	28.	Enter
		MAKESYS<CR>
SYSTEM:	29.	Displays
		MAKESYS Ver. X.Y Destination Drive?
USER:	30.	Enter
		B<CR>
SYSTEM:	31.	Displays
		Bootstrap Filename (Or RETURN to Skip)
USER:	32.	Enter
		802HBOOT<CR>
SYSTEM:	33.	Displays
		BDOS Filename (Or RETURN to Skip)
USER:	34.	Enter
		CPM59<CR>
SYSTEM:	35.	Displays
		BIOS Filename (Or RETURN to Skip)
USER:	36.	Enter
		802HBIOS<CR>
SYSTEM:	37.	Displays
		MAKESYS Completed
USER:	38.	Change S2-6 to the open position.
	39.	Reset the TS 802H (as described in Step 6) to boot from the hard disk.

3.1.4 Self-Tests During System Loading

During the loading process, the system performs some diagnostic self-tests of the hardware. Should the system fail any of these tests, you will see the following message instead of the initial system message:

Hardware Error (_____); Call Your Distributor

Within the parentheses will be an abbreviation designating the source of the hardware error, as listed in Table 3-1.

Table 3-1 Hardware Error Abbreviations

Abbreviation	Description
DMA	Direct memory access controller
CTC	Counter timer circuit
SIO #1	Serial I/O controller
SIO #2	Serial I/O controller
FDC	Floppy disk controller
WDC	Winchester disk controller

If you see this message, perform a reset to reload the system. If the message still appears, call your dealer. If you are unable to get either message (as shown) or you get obviously incorrect or garbled information, refer to Section 7.2, Troubleshooting.

3.1.5 Inserting a Floppy Diskette

To insert a floppy diskette in the floppy drive, put your finger under the doorhandle of the drive and open it gently.
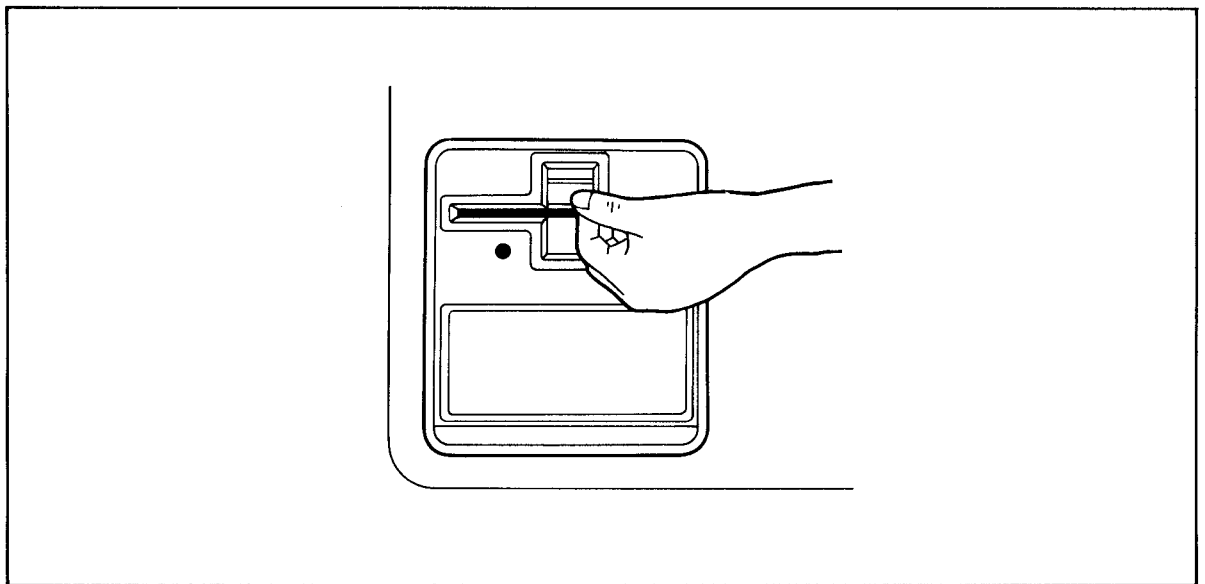
Figure 3-2 Opening Floppy Drive Door

△

BEFORE TURNING POWER ON OR OFF, ALWAYS MAKE SURE THE DRIVE DOOR IS OPEN. When power is turned on or off, the power may surge, damaging information stored on the diskette or the diskette itself. If the drive door is open, the disk head is away from the diskette surface.

Take the diskette out of its white paper jacket. Hold the diskette by the edge of the black plastic cover.
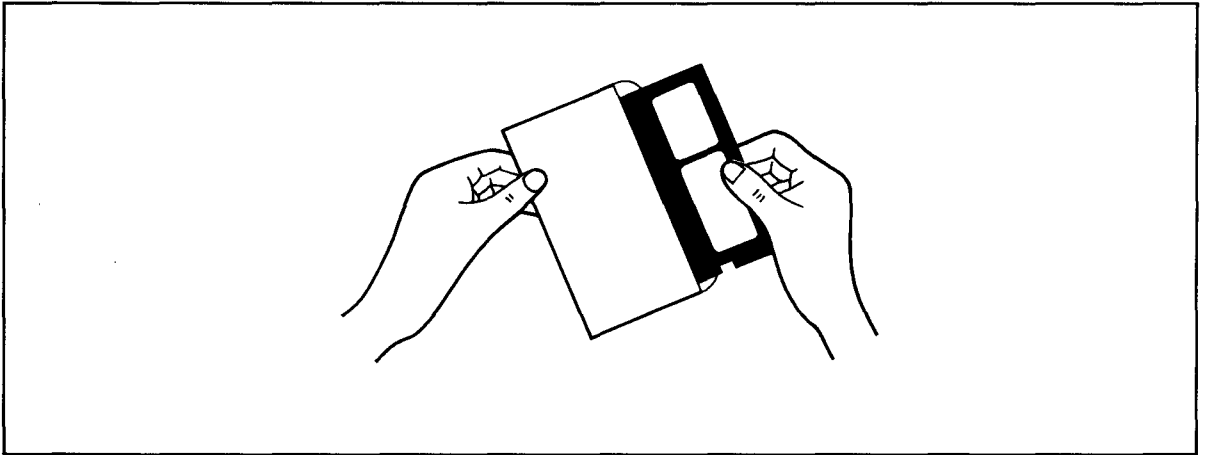
Figure 3-3   Removing Diskette from Jacket

△

Avoid touching the surface of the diskette (which shows through the openings on the cover) with your hands or the diskette may be damaged.

The small notch which is cut out of one side of the diskette near the label allows the disk head to write on the disk. (Refer to Section 4.3, where Write-Protection is discussed.)

When the notch is covered, the write mechanism cannot function and information on the diskette cannot be overwritten accidentally. Put a write-protect tab (furnished with each package of blank diskettes) over the notch on the system diskette.
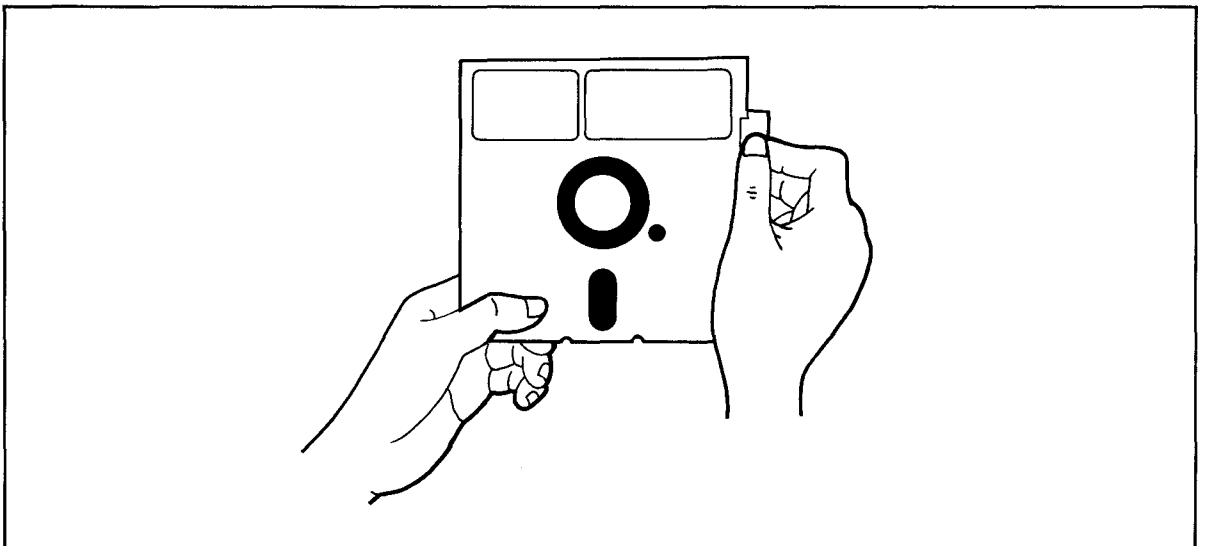
Figure 3-4   Write Protecting Diskette

Turn the diskette so the label is near you and facing up and the notch is on the left side.
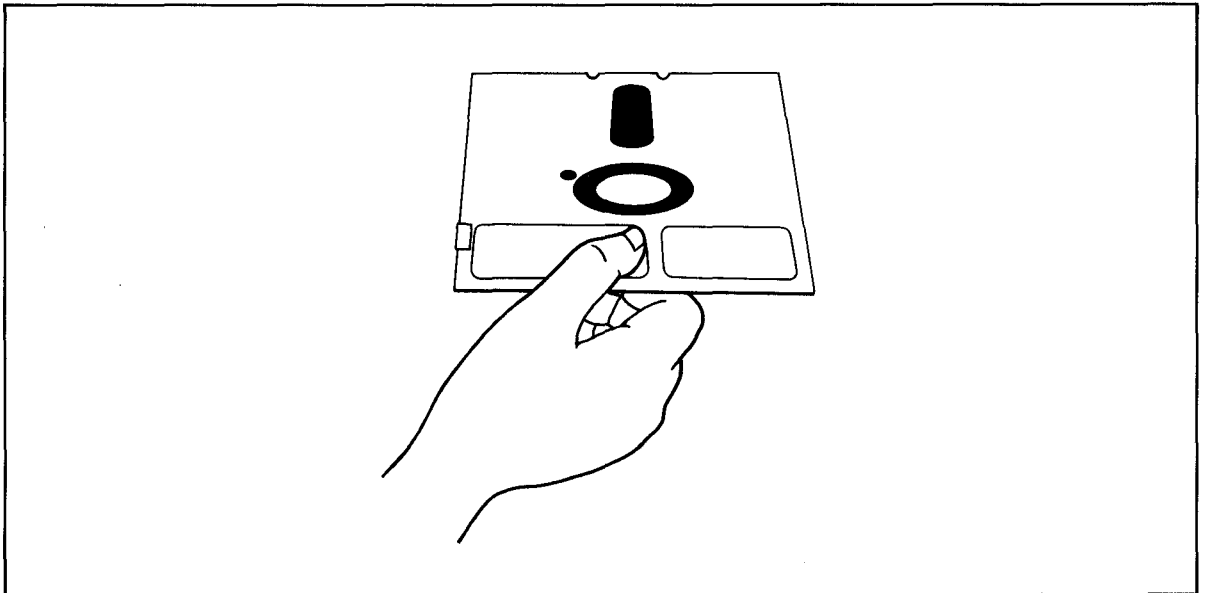
Figure 3-5   Holding Diskette Before Insertion

Insert it in the opening of the floppy drive. Using the tip of your finger, push it gently in the rest of the way.
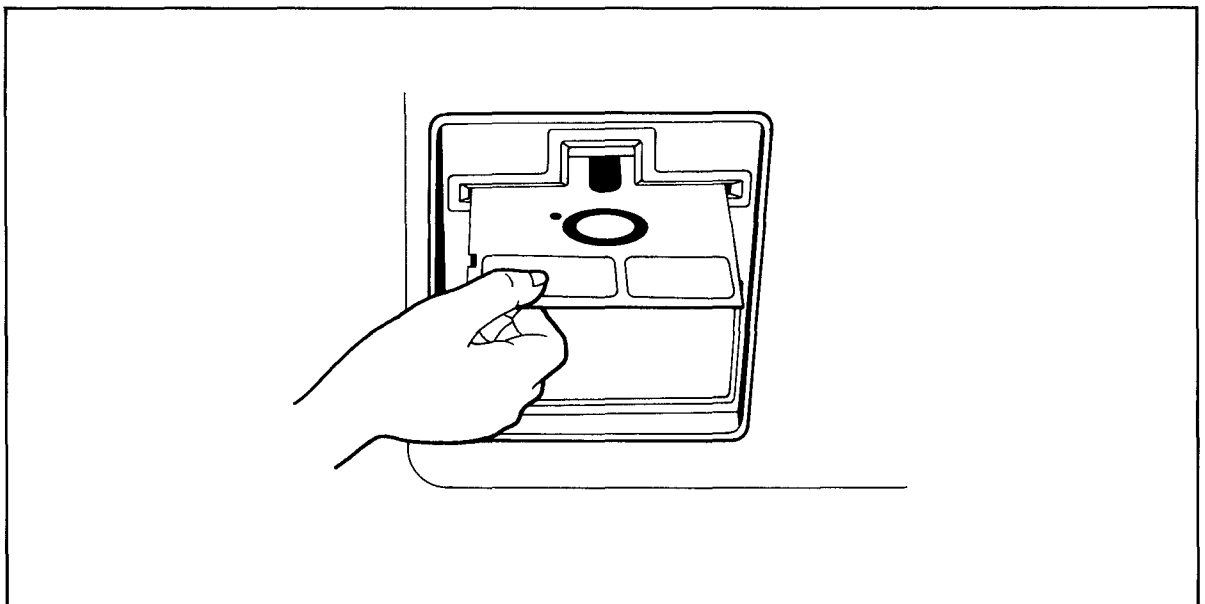
Figure 3-6   Inserting Diskette in Floppy Drive

3.   OPERATION

△

If the diskette seems to catch slightly, pull it out slightly and push it in gently again. DON'T FORCE IT IF IT RESISTS.

Close the drive door slowly.

3.1.6   Summary of Normal Start-Up Procedures

1.   Turn on the power.
2.   Wait for system boot message and prompt (A>) to appear on the CRT.

3.2   FORMATTING

Your hard disk and the system diskette contain a utility program called *DFORMAT*, described in Appendix M. This program superimposes messages on your blank diskette which serve as reference points for the system later. During formatting, any data already on the diskette is erased and the diskette is prepared for new data. The diskette is divided up into **tracks** (very much like grooves on a phonograph record) and then again into wedges called **sectors.**

Since each computer system has its own format requirements, blank diskettes are not formatted by diskette manufacturers. Before you can use a new diskette, you must first format it for your system. Diskettes formatted on a TeleVideo system can be used on any TeleVideo floppy-disk system.

Detailed instructions on using the utility program DFORMAT can be found in Appendix M.

3.3   WHEN YOU ARE FINISHED . . .

When you are finished using the TS 802H, follow these steps:

1.   Remove the floppy diskette.
2.   Turn off the power.

🛑

ALWAYS OPEN THE FLOPPY DRIVE DOOR BEFORE TURNING THE POWER ON OR OFF. OTHERWISE, RESULTING POWER SURGES MAY DESTROY THE STORED INFORMATION.

4.   OPERATIONAL GUIDELINES

This chapter will describe procedures which can prevent damage to your diskettes and possible loss of data.

4.1   WORKING NEAR THE SYSTEM

When working near the system, do not remove staples or leave paperclips, food, or beverages on or near the system. *Foreign objects (such as staples, paperclips, and liquids) which get inside the system are the most common causes of computer failure.*

$$\triangle$$

Contamination of the system by foreign objects will be considered neglect under the terms of the limited warranty.

4.2   CARING FOR DISKETTES

Although diskettes look sturdy, they can be easily damaged by scratches, fingerprints, magnetic fields, or liquids. If the diskette is damaged, the system can no longer "read" the diskette.

This section explains how to handle and store diskettes so their useful life is prolonged and the data stored on them protected.

4.2.1   Handling Diskettes

Each diskette arrives in a white paper jacket. *Do not discard this paper jacket, as it protects the diskette, prolongs its life, and ensures the accuracy of the information on the diskette.*

Although you can see parts of the diskette through openings in the black cover, NEVER touch the magnetic surface of the diskette itself. Objects touching the surface can cause scratches and oil from your skin can damage the surface. Whenever the diskette is not in the drive, keep it in the white paper jacket; otherwise the normal dust and chemicals in the air will shorten its life expectancy.

The diskette is encased in a black plastic cover. NEVER try to remove the black plastic jacket. This jacket contains cleaning agents and lubricants which prolong the life of the diskette.

Even with the black jacket around the diskette, the diskette can be damaged. *Anything which creases, mutilates, or distorts the surface of the diskette (e.g., paperclips, staples, and ballpoint pens) will keep it from operating correctly later.* You will prolong the life of your diskettes if you follow these rules:

*   NEVER attach anything to the diskette with paperclips or staples.
*   NEVER fold or mutilate the diskette.
*   Write on the diskette label only with a soft felt-tip pen. Press lightly. (Better yet, write on the label BEFORE putting it on the diskette.) NEVER write on the diskette label with a pencil or ballpoint pen or while the diskette is under your writing surface.

4. OPERATIONAL GUIDELINES
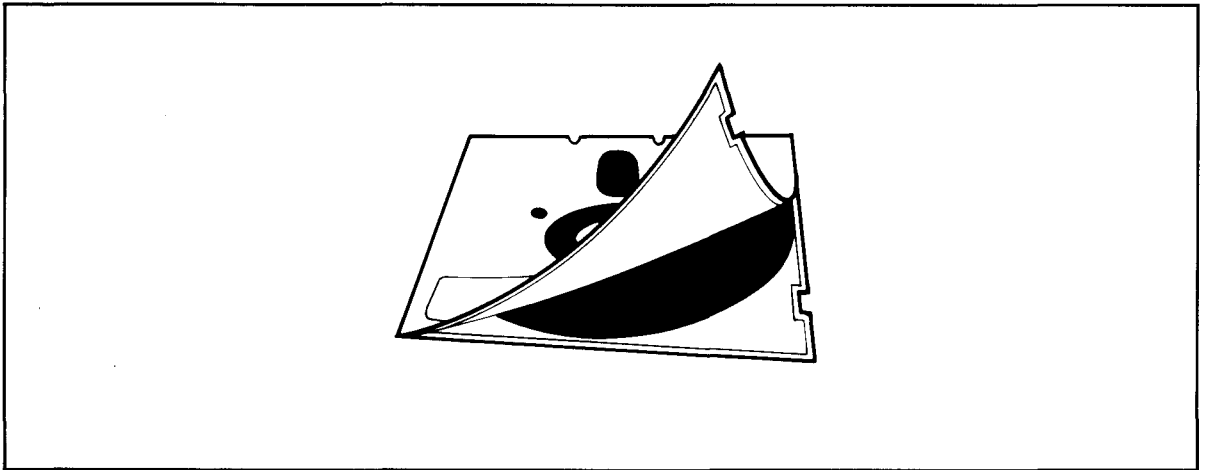
Figure 4-1   Diskette and Protective Lining Inside the Protective Plastic Enclosure

The diskette can also be damaged by careless handling. Hold the diskette GENTLY by the corners or on the edge. DO NOT BEND IT! (Think of the diskette as a photographic negative where you must hold it by the edges to avoid putting fingerprints on it.)

After the diskette is inserted in the drive, close the door slowly.

4.2.2   Storing Diskettes

Store diskettes in an UPRIGHT position in one of the excellent dustfree containers available on the market. Keep this container in a cool place. Diskettes left in direct sunlight or in a hot area (such as a hot car) even for a short time can warp. If this happens you may not be able to retrieve the data.

Diskettes are made of magnetically-treated mylar. Even temporary exposure to magnetic fields can erase the data. Magnetic fields are present around many items commonly present in an office environment, such as:

- Telephones
- Magnetic paperclip holders
- Typewriters
- Adding machines
- Television sets

Even the bell in a telephone can damage the disk if the telephone is resting on the diskette when the telephone rings.

As soon as you remove a diskette from the drive, put it back in the white jacket and in the storage container. If you need to ship diskettes, you can purchase special mailing protectors.

4.   OPERATIONAL GUIDELINES

4.3   WRITE-PROTECTING DISKETTES

When information is copied onto a diskette, it may erase or superimpose new data on the original information. If the information on a diskette is particularly important, you may want to protect it against accidental erasure by "write-protecting" the diskette.

To write-protect a diskette, place one of the silver self-adhesive tabs which are supplied with blank diskettes over the notch on the side of the diskette. Within the disk drive is a mechanism which "writes" on the diskette. When the tab is over the notch, the write mechanism cannot function. When you want to remove the protection, just remove the tab from the diskette.
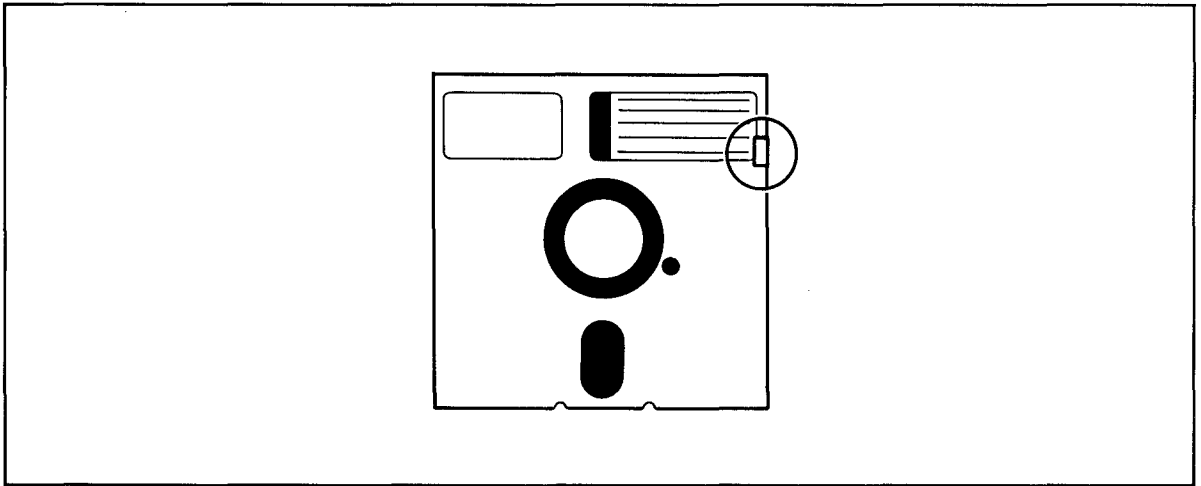
Figure 4-2   Write-Protected Diskette

4.4   BACKING UP THE HARD DISK

When diskettes work perfectly and you don't accidentally erase or change data, it is perhaps difficult to understand why back-up diskettes are so necessary. However, accidents do happen and diskettes do eventually wear out. To protect your investment of time and effort, learn to make a back-up copy of each file on a regular basis using the CP/M utility program PIP.

You will have to decide for yourself how often this should be done. If, for example, you are doing extensive text editing, you may want to make a back-up just before lunch and again before going home. Or perhaps only one back-up per day is sufficient.

Follow a regular system for backing up your files. One of the more common methods uses one or two back-up copies (on floppy diskettes) of files on the hard disk.

Of all the habits which you can develop as a computer user, probably the careful handling of diskettes and the faithful backing up of data are the most desirable.
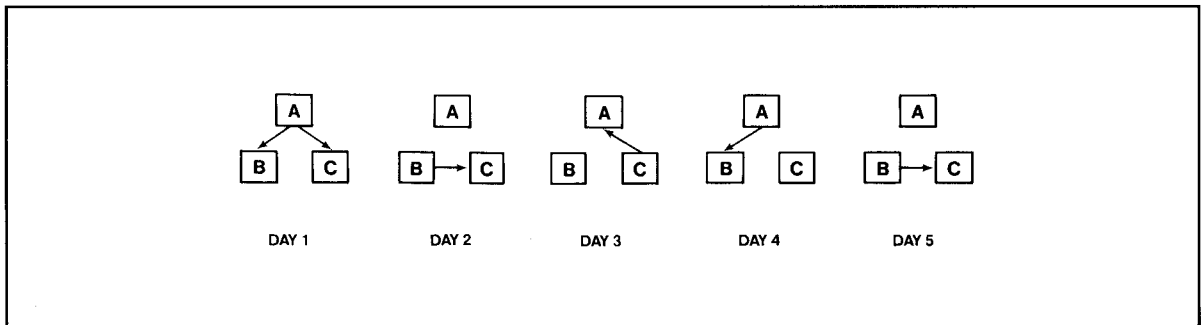
Figure 4-3   Typical Back-up System

4.5   COMMUNICATING WITH THE SYSTEM

4.5.1   Entering Commands

The computer system will recognize either upper or lower case letters but you should use blank spaces and punctuation carefully. If the system fails to respond to your command, doublecheck your command—it might simply be misspelled!

4.5.2   Input Line Editing

If you make an error while typing, simply press the BACKSPACE key and the cursor will move to the left. For every character position the cursor moves to the left, one character will be deleted. When you get to the error, just retype the information.

If you are editing previously-typed information and accidentally use the space bar instead of one of the cursor keys to advance the cursor, you will enter spaces where your information used to be. DO NOT USE THE SPACE BAR TO ADVANCE THE CURSOR UNLESS YOU WANT SPACES.

4.5.3   Additional Points

If your typing is of the hunt-and-peck variety, you may not normally pay attention to whether you hit the number "one" or a lowercase "L" when you mean "one." Although they look alike, they are not interchangeable.

Likewise, the number zero is not the same as the capital character "oh." The CRT will display a zero with a slash through it (although your printer may not make the difference obvious).

4.6   SUMMARY OF GOOD PRACTICES

1.   Handle diskettes gently and store them in a cool, protected environment. Always keep them in the paper jackets and in the storage container when not in use.

2.   Do NOT open the drive door while the system is executing a program unless the program or instructions tell you to do so.

3.   Open the drive door BEFORE turning the system off or on.

4.   Make a back-up copy of all updated files at least once a day (e.g., before you go to lunch or home).

5.   Do not eat, smoke, drink, or remove staples near the system!

6.   Use the original system disk only as a source for copies.

5. TERMINAL OPERATION

5.1 INTRODUCTION

This chapter provides step-by-step instructions for the operation of the terminal which is an integral part of the TS 802H. To program the integral terminal, refer to Chapter 6.

5.1.1 Terms

Terminal—In Chapters 5 and 6 of this manual, the term **terminal** will refer to the integral terminal.

Computer—Within this chapter and Chapter 6, the term **computer** can have two meanings: the TS 802H's internal processor and the central service proccessor (TS 806/816). Data goes to one or both of these, depending on how the TS 802H is being used. Table 5-1 desribes where data is sent.

Table 5-1   Data Destination

TS 802H Used As	Description
Stand-Alone	Codes and data sent from integral terminal *to* the TS 802H's internal processor
User Station	Codes and data sent from integral terminal *to* the TS 802H's internal processor
Service Processor Terminal	Codes and data sent from integral terminal *through* the TS 802H's internal processor to the central service processor (i.e., TS 806/816)

5.2 TURNING ON THE TERMINAL

1.   Make sure the AC power plug is plugged into a grounded outlet.
2.   Locate the ON/OFF rocker switch on the rear of the terminal (Figure 5-1). Push the end of the switch which is marked with a white dot.

KEYBOARD
RS422
S1
CONTRAST
FAN
SERIAL NUMBER PLATE
S2
P1 (RS232)
AC POWER SWITCH
P2 (PRINTER)
FUSE
AC POWER CORD
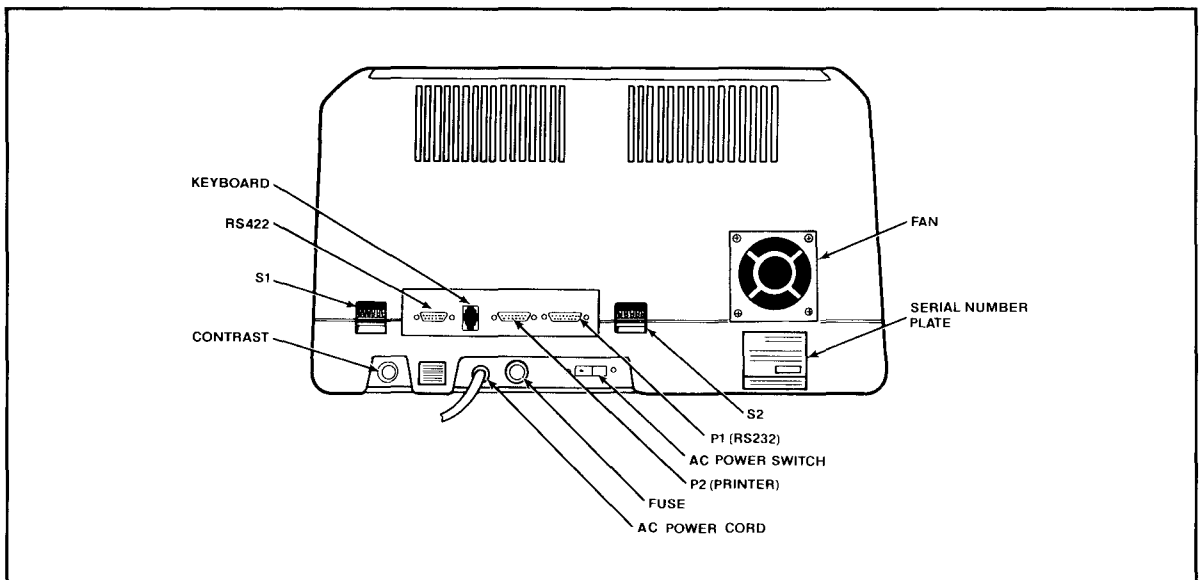
Figure 5-1   Rear Panel

3. Listen for a beep (indicating that power is on and the terminal has scanned the switch settings).

4. Watch for the cursor to appear in the upper lefthand corner of the screen within 10 to 15 seconds.

5. Adjust the contrast control on the rear panel for the desired screen intensity.

6. Refer to Chapter 7 if the installation does not proceed as indicated.

5.3 KEYBOARD CONTROLS

Figure 5-2 illustrates the keyboard layout. The character keys highlighted in Figure 5-2a include all alphabetic characters (a through z), numbers (0 through 9), punctuation marks, and mathematical symbols.

All alphanumeric keys repeat when pressed for more than one-half second.
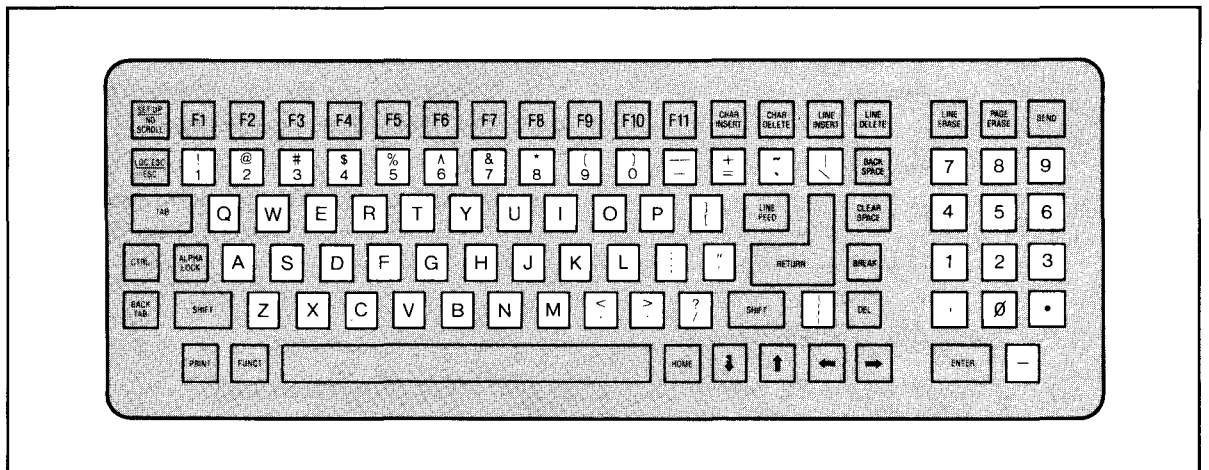
a.   Character Keys
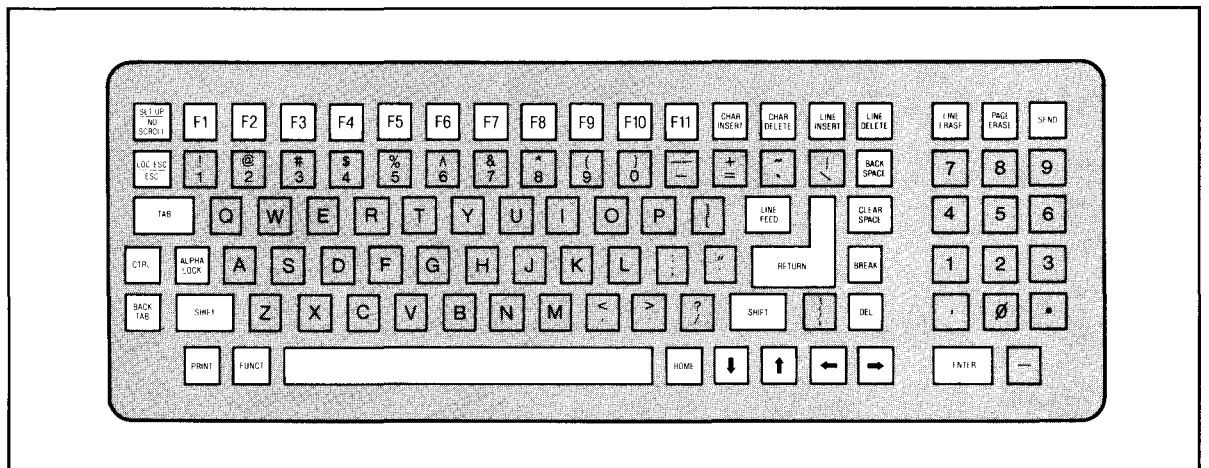
b.   Special Keys

Figure 5-2   Keyboard Layout

5. TERMINAL OPERATION

Table 5-2 summarizes the function of the special keys which are highlighted in Figure 5-2b. Many of these keys are also listed in the Operator's Quick Reference Guide on the inside back cover.

<div align="center">△</div>

Protect mode, frequently referred to in Table 5-2, is explained fully in 6.14.

<div align="center">

Table 5-2   Function of Keys

</div>

Key Name	Transmitted? (Y/N)*	Repeat Action? (Y/N)	Description
Space Bar	Y	Y	Causes a blank space to appear on the display and transmits an ASCII space code (20 Hex).
SHIFT	N	N	Selects upper character inscribed on a key, changes operation of most special keys, and capitalizes alpha characters.
ALPHA LOCK	N	N	Locks the SHIFT keys so that all alpha keys transmit codes for upper-case characters. The key is pressed to lock and pressed again to release.
TAB	Y	Y	Moves the cursor forward to typewriter tabs (protect mode off; see 6.14) or to the start of the next unprotected field (protect mode on). (Same as ∧ I.)
BACK TAB	Y	Y	Moves the cursor backward to typewriter tabs (protect mode off) or to the start of the previous unprotected field (protect mode on). (Same as ESC I.)
CTRL (Control)	N	N	Generates normally-nondisplayed ASCII control codes when used with another key. The control key combinations are used for special action by the terminal and/or the application program in the computer. The CTRL key is always used *simultaneously* with the other character in the command; i.e., the CTRL key is pressed first and held down while the other key is pressed. (It is similar in action to the SHIFT key.) Use of the control key is indicated by ∧.
HOME	Y*	N	Moves the cursor to the first unprotected character position on the page (usually column one of row one). (Same as ∧ ∧.)

Table 5-2   Continued

Key Name	Transmitted? (Y/N)*	Repeat Action? (Y/N)	Description
ESC (Escape)	Y	N	The ESC key sends an ASCII code for escape to the display processor. The key is generally used to momentarily leave (escape) an application program in order to use a special feature or function.
			Another function of the ESC key is to cause the next control character entered to be displayed on the screen. This facilitates putting control characters on the screen without going into monitor mode.
			The ESC key is used in conjunction with one alphanumeric character in the command sequence; i.e., the *ESC key is pressed and released before the second key is pressed.*
			If your computer does not echo back escape codes, the LOCAL ESC key allows you to use the terminal features without transmitting them to the computer.
RETURN/ENTER	Y*	N	The RETURN and ENTER keys can be used interchangeably. (Same as ∧ M.) They send the ASCII code for a carriage return (CR) to the terminal. Depending on the communication mode used, the code causes the terminal to transmit a CR to the computer and/or the cursor to be moved to the first unprotected position.
			If the entire current line is protected, the code moves the cursor to the next unprotected position on the page.
			The terminal's auto wraparound function eliminates the need to manually enter a CR and a LF at the end of each 80-character line.
DEL (Delete)	Y*	Y	The DEL key sends an ASCII DEL character to the computer. The computer echoes the code back to the terminal to be performed. This is usually interpreted by the computer as a character erase code.
CLEAR SPACE	Y*	Y	Replaces all unprotected characters on the page with spaces.
			Shifted CLEAR SPACE (same as ESC *) clears the entire page to nulls and turns off protect and half-intensity modes.
BREAK	Y*	N	Transmits a 250-millisecond break pulse to the computer.
			Pressing BREAK twice while holding down SHIFT resets (cold boots) the internal processor.

Table 5-2   Continued

Key Name	Transmitted? (Y/N)*	Repeat Action? (Y/N)	Description
LINEFEED	Y*	Y	Sends the ASCII code (OAH) for a linefeed (LF) to computer. The code causes the terminal to transmit an LF code to the computer and/or the cursor to be moved down one line on the screen in half duplex or to be echoed by the computer in full duplex. (Same as ∧ J.)
			See also 6.15 for descriptions of linefeed when protect mode is on.
BACKSPACE, ←	Y*	Y	Moves the cursor one character to the left. (Same as ∧ H.)
↑	Y*	Y	Moves the cursor up one line. (Same as ∧ K.)
↓	Y*	Y	Moves the cursor down one line. If the cursor is on the bottom line of the screen, the display will roll up one line. (Same as ∧ V.)
→	Y*	Y	Moves the cursor one character to the right. (Same as ∧ L.)
PRINT	N	N	The PRINT key does not function since printing is not controlled by the terminal, but by the computer.
FUNCT			The FUNCT key transmits a user-selected character bracketed by ∧ A (SOH) and a carriage return (CR) to the computer.
F1 through F11 (Function)	Y*	N	Transmit a three-code default or user-programmed sequence to the computer. When received, may initiate a special form or subroutine in the program that causes the terminal to display or perform a special function.
CHARACTER INSERT	Y*	Y	Enters the insert character (normally a space) at the cursor position, causing all succeeding characters to shift one position to the right. All characters shifted past the 80th character will be lost (unless page edit is on).
			Shifted CHAR INSERT changes edit mode from edit to insert. (Table 6-11.)
CHARACTER DELETE	Y*	Y	Deletes the character at the cursor position and causes all succeeding characters to shift one position to the left.
			Shifted CHAR DELETE changes edit mode from insert to edit.

Table 5-2 Continued

Key Name	Transmitted? (Y/N)*	Repeat Action? (Y/N)	Description
SET UP/ NO SCROLL	Y*	N	NO SCROLL stops screen updating during normal operation. Manually sets the operating characteristics of the terminal through the status line. During normal operation, the no scroll function is active. When NO SCROLL is pressed once, the terminal stops screen updating; when pressed again, screen updating resumes.
			If the receive buffer fills up while update is disabled, the terminal will send X-Off to the computer, causing it to stop sending data. When update is re-enabled, the buffer will empty, X-On will be sent, and data will be transmitted to the computer.
			Shifted SET-UP/NO SCROLL displays the terminal operating characteristics and permits these values to be manually changed on the status line.
LINE INSERT	Y*	Y	LINE INSERT creates an entire line of insert characters on the cursor line. The data on the cursor line and all following lines will shift down one line (the last line on the page will be lost).
			Shifted LINE INSERT changes the edit mode from line to page.
LINE DELETE	Y*	Y	LINE DELETE causes the entire line at the cursor position to be deleted. All following lines will shift up one line.
			Shifted LINE DELETE changes the edit mode from page to line.
LINE ERASE and PAGE ERASE	Y*	Y	LINE ERASE and PAGE ERASE replace the unprotected data (from the cursor to the end of the line or page) with a space of the proper intensity.
			Shifted LINE ERASE and shifted PAGE ERASE cause a line erase to null or a page erase to null.
SEND	Y*	N	Sends all unprotected data on the page from home through the cursor position to the computer.
			Shifted SEND sends all data from the first column through the cursor position.

Note
*Not transmitted in local edit mode.

5.   TERMINAL OPERATION

5.3.1   Cursor

The lighted rectangular block on the screen is the entry spot for the following character to be typed. It is called a **cursor**. As you reach the end of a line, the cursor automatically *wraps around* to the beginning of the next line; you do not need to enter a carriage return at the end of each line.

You can change the appearance of the cursor itself. To do this, either change the dipswitches on the rear (described in Table G-1) or follow the instructions in 6.6.

The cursor can be moved around the screen by pressing one of the cursor control keys (marked with an arrow) if you are in the local edit mode, by entering an escape sequence (described in Chapter 6), or pressing LINEFEED (to move it down one line). To return the cursor quickly to the top left position on the screen (referred to as **home**), press the HOME key.

Cursor movement is affected by the use of protect mode. Refer to 6.14.

5.4   SETTING UP THE TERMINAL

The bottom line on the screen is a status line which displays the following information:

> Currently-selected cursor position
> Edit mode
> Communication mode
> Terminal baud rate

Additional information such as error messages will automatically appear when appropriate. The terminal default values (those selected by switch settings) will be displayed until you change them using the procedure described here. You could also change some of these values either locally or from the computer using the escape and control sequences for each value.

The possible values for the status line are summarized in Figure 5-3 and described in greater detail in the following sections.

The left block on the status line displays the cursor position. This value automatically changes as the cursor is moved and cannot be changed by entering the status line.

To change the other values on the status line, follow these steps:

1.   Press SHIFT and SET-UP at the same time.
2.   Look for the cursor to appear in the block which displays either DUPE or LOCE.
3.   Press T to change the values of a block. Figure 5-3 lists the values which may appear in the status line blocks.
4.   Press → to move the cursor to the next status line block to be changed.
5.   Press T to select a new value.
6.   Press SHIFT and SET-UP at the same time to leave the status line and return to normal operation.

△

At the next power on, the status line will return to default values.
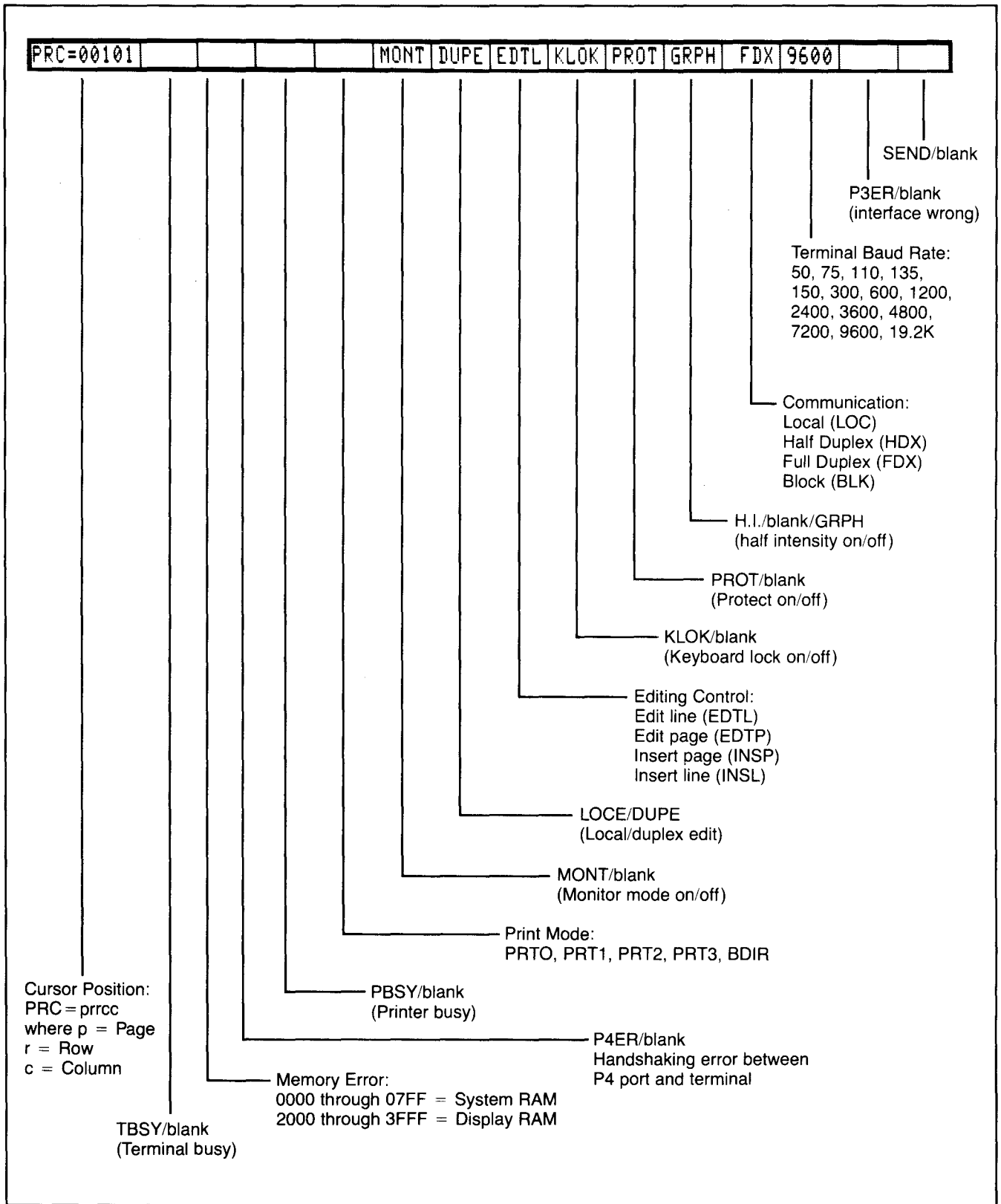
Figure 5-3   Status Line Fields

5. TERMINAL OPERATION

5.5 COMMUNICATING WITH THE COMPUTER

The terminal can communicate with the computer in any of four communication modes:

Local

Block

Half duplex (conversational)

Full duplex (conversational)

The selection can be made using one of three methods:

Changing switch settings

Changing the status line

Using escape sequences

The communications flow caused by these modes is illustrated in Figure 5-4.

5.5.1 Local Mode

In local mode, you can enter or change text and the results are sent only to the screen. The port leading to the computer is turned off.
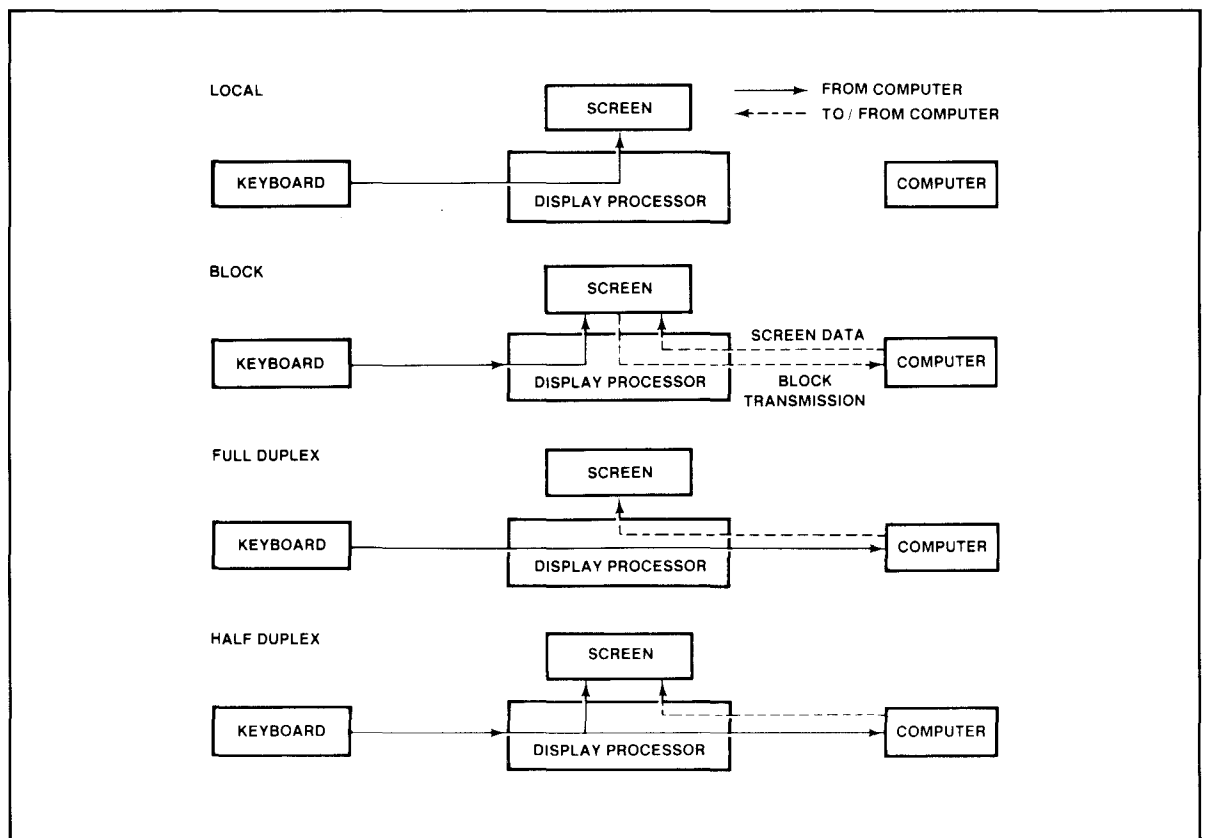
Figure 5-4   Communications Flow

5.5.2   Block Mode

In block mode, the terminal portion sends the results to the screen. When you are satisfied with the results of the data entry or changes made in the local mode, you can send the data to the computer in a block. Block mode allows you to make all corrections before transmission.

5.5.3   Half Duplex

The half duplex mode sends keyboard entries to the screen and to the computer at the same time. Half duplex will cause characters sent to the computer to be displayed twice unless the program controlling the computer is changed using CBIOS.

5.5.4   Full Duplex

The full duplex mode sends keyboard entries to the computer only. If the computer is programmed to act upon a code received from a keyboard entry, it may echo the result back to the terminal. (The time needed to echo back the information is so short it will seem to happen simultaneously.) For example, if **A** is pressed on the keyboard, the computer will probably send the **A** back to the screen.

5.5.5   Conversational Modes

In conversational modes, communication with the computer occurs continuously. The TS 802H is conversational in either half or full duplex modes.

5.6   EDITING

The editing keys allow you to edit text without using control or escape sequences. The keys available are:

    Character insert
    Character delete
    Line insert
    Line delete
    Line erase
    Page erase

These keys are described in detail in Table 5-2 and in 6.24.

5.7   PRINTING

To print, use the standard CP/M print commands. The PRINT key on the TS 802H is not used to send data to the printer.

6. PROGRAMMING

6.1 INTRODUCTION

Your computer programs can control the terminal within the TS 802H by transferring to it the appropriate ASCII codes. This chapter describes the features which can be utilized in your programs.

$$\triangle$$

Unless otherwise specified, all control code sequences are transmitted from the computer to the terminal to elicit the response associated with the code.

Programs written specifically to take advantage of the features of terminals other than Tele-Video's Model 950 may need to be modified.

6.2 MONITOR MODE

You can display control commands to make program debugging easier. This is called **monitor mode**; it can be used in local mode or through the computer.

To enable monitor mode via the computer, enter

> ESC U

To terminate the display of the control commands, enter either

> ESC u or ESC X

You can enter monitor mode while in local mode by entering

> SHIFT/ESC U

To terminate monitor mode while in local mode, enter either

> SHIFT/ESC X or SHIFT/ESC u

Table 6-1 lists the monitor mode control characters and Figure 6-1 shows the monitor mode control characters as they will appear.

6.3 USER AND STATUS LINES

You can replace the status line with a line programmed with up to 79 characters of data. This is called the **user line.**

$$\triangle$$

While the 25th line contains 80 characters, the first character position is used for the video attribute of the line and cannot be used for data.

Both the status and the user line can be sent to the computer.

6. PROGRAMMING

Table 6-1   Monitor Mode Control Characters

Code	ASCII	Hex	Character Displayed
∧ @	NULL	00	none
∧ A	SOH	01	S_H
∧ B	STX	02	S_X
∧ C	ETX	03	E_X
∧ D	EOT	04	E_T
∧ E	ENQ	05	E_Q
∧ F	ACK	06	A_K
∧ G	BEL	07	B_L
∧ H	BS	08	B_S
∧ I	HT	09	H_T
∧ J	LF	0A	L_F
∧ K	VT	0B	V_T
∧ L	FF	0C	F_F
∧ M	CR	0D	C_R
∧ N	SO	0E	S_0
∧ O	SI	0F	S_I
∧ P	DLE	10	D_L
∧ Q	DC1	11	D_1
∧ R	DC2	12	D_2
∧ S	DC3	13	D_3
∧ T	DC4	14	D_4
∧ U	NAK	15	N_K
∧ V	SYN	16	S_Y
∧ W	ETB	17	E_B
∧ X	CAN	18	C_N
∧ Y	EM	19	E_M
∧ Z	SUB	1A	S_B
∧ [	ESC	1B	E_C
∧ \	FS	1C	F_S
∧]	GS	1D	G_S
∧ ∧	RS	1E	R_S
∧ —	US	1F	U_S
DEL	DEL	7F	▨
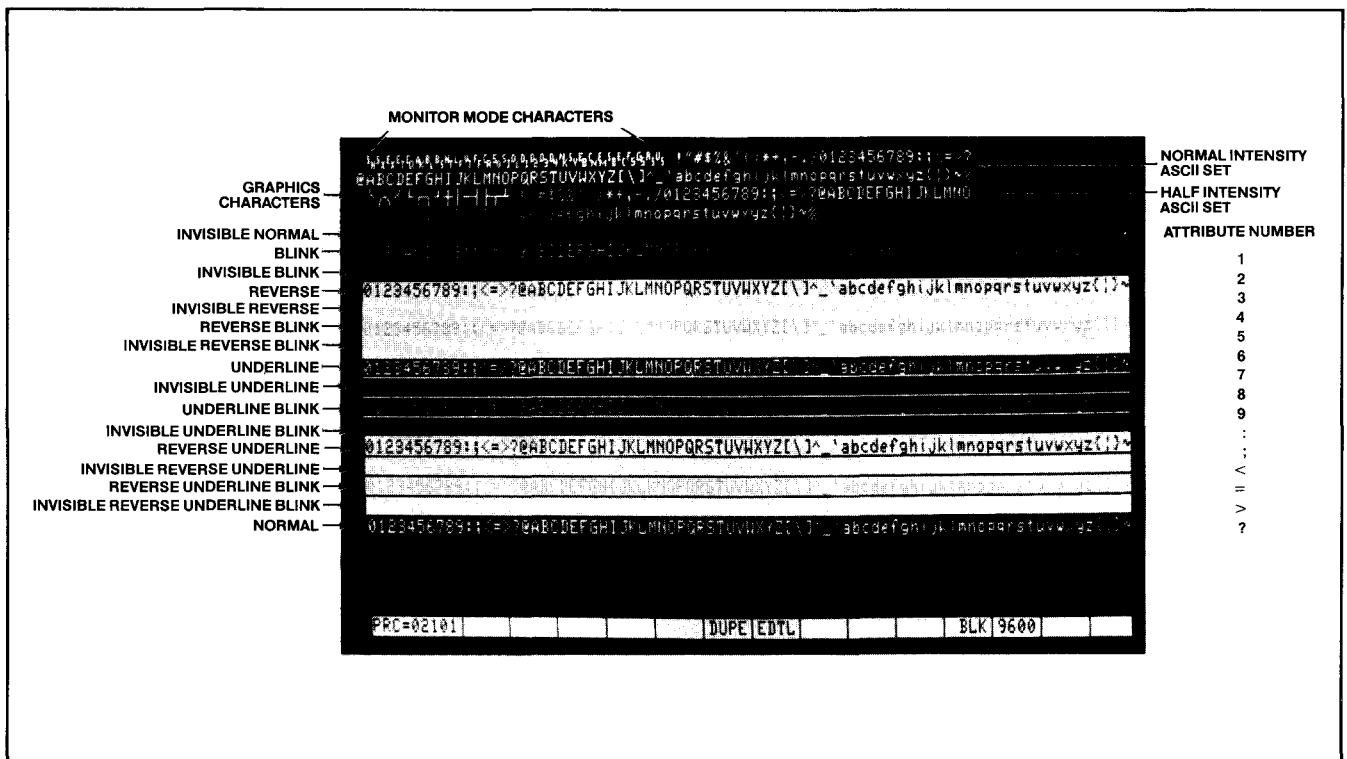
Figure 6-1 Video Attributes and Monitor Mode

6.3.1 User Line

To display the user line, press

ESC g

To load the user line with data:

1. Display the user line (if desired) by entering ESC g.
2. Press

   ESC f

3. The first character position is used for the video attribute for the user line. (Default is reverse video.) You can also add another attribute at any position in the line. To enter a video attribute for all or part of the user line, enter

   ESC G n

   where n is the position at which the attribute will begin and is a value from Table 6-2.

4. Enter up to 79 characters of text. (The message will appear on the user line as it is entered.)
5. You can move the cursor to any position by sending TAB plus the position (using a value from Table 6-2).
6. Press

   RETURN

   to end the programming mode.

6.   PROGRAMMING

To send the user line to the computer, press (in sequence)

    ESC Z 0

To redisplay the status line after displaying the user line, press

    ESC h

Table 6-2   Cursor Coordinates

Row/ Column	ASCII Code Transmitted	Row/ Column	ASCII Code Transmitted	Row/ Column	ASCII Code Transmitted
1	Space	33	@	65	'
2	!	34	A	66	a
3	"	35	B	67	b
4	#	36	C	68	c
5	$	37	D	69	d
6	%	38	E	70	e
7	&	39	F	71	f
8	'	40	G	72	g
9	(	41	H	73	h
10	)	42	I	74	i
11	*	43	J	75	j
12	+	44	K	76	k
13	,	45	L	77	l
14	-	46	M	78	m
15	.	47	N	79	n
16	/	48	O	80	o
17	0	49	P	81	p
18	1	50	Q	82	q
19	2	51	R	83	r
20	3	52	S	84	s
21	4	53	T	85	t
22	5	54	U	86	u
23	6	55	V	87	v
24	7	56	W	88	w
25	8	57	X	89	x
26	9	58	Y	90	y
27	:	59	Z	91	z
28	;	60	[	92	¦
29	<	61	\	93	¦
30	=	62	]	94	¦
31	>	63	∧	95	~
32	?	64	—	96	DEL/RUB

6.3.2   Status Line

To send the status line to the computer, press (in sequence)

    ESC Z 1

6. PROGRAMMING

6.4 LINE LOCK

The line lock feature allows you to lock the 80-character line on which the cursor is positioned into screen memory until the lock is released. The line will remain fixed in position on the screen regardless of the action of the remainder of the screen data (i.e., scrolling). The line lock function may be used to set up a stationary 80-character line or group of lines while other screen data scrolls past. Once line lock is cleared, all lines on the page can scroll normally.

You may lock multiple lines in any sequence; however, no more than 23 of the 24 lines on each page may be locked.

To enable line lock, enter

ESC ! 1

To disable line lock, enter

ESC ! 2

△

This command will unlock the entire screen.

6.5 DISABLING/ENABLING THE KEYBOARD

You can disable (lock) all keys except FUNCT, BREAK, SET-UP, NO SCROLL, and the function keys using a command sent from the computer.

Once the keyboard is disabled, it can only be enabled by another command.

△

If your applications program echoes all codes, the keyboard may be accidentally disabled.

To disable the keyboard, enter

ESC #

The keyboard will remain disabled until one of the following occurs:

The terminal receives an ESC " sequence

You press BREAK twice while holding down the SHIFT key

You change the status line

6.6 CURSOR DISPLAY

The cursor may appear in any of five ways. To change the cursor's appearance without changing the rear switch settings, enter one of the following escape sequences:

Appearance	Command
Cursor not displayed	ESC . 0
Blinking block cursor	ESC . 1
Steady block cursor	ESC . 2
Blinking underline cursor	ESC . 3
Steady underline cursor	ESC . 4

6.　　PROGRAMMING

6.7　　KEYCLICK AND BELL

You can control keyclick (the noise made as each key is activated) and sound the terminal's bell with the following code sequences:

Function	Command
Keyclick on	ESC >
Keyclick off	ESC <
Ring bell	∧ G

6.8　　SMOOTH SCROLL

The smooth scroll feature prevents display jitter as text lines scroll up or down. The slower rate of scrolling also allows you to more easily read the scrolling text.

When smooth scroll is on, the screen scrolls smoothly at a rate of six data lines per second. Without smooth scroll, screen data scrolls as fast as it is received.

To activate smooth scroll, enter

　　ESC 8

To turn off smooth scroll, enter

　　ESC 9

△

The computer must respond to X-On/X-Off commands or DTR control in order for this feature to work correctly.

6.9　　VIDEO DISPLAY

The video display feature turns the screen on (default) or off. You could use this to blank the screen while the computer is building a form or writing a long data list. The following commands control video display:

Screen Display	Command
On	ESC n
Off	ESC o

6.10　　VISUAL ATTRIBUTES

The visual attributes of each character as well as the spaces on the screen may be controlled to define the appearance of the screen (either wholly or partially).

Two methods may be used to set visual attributes. The method used determines whether the attribute will occupy a space and how much of the display will be affected. The two methods are summarized in Table 6-3.

Table 6-3 Visual Attributes

Method	Uses	Affects	Attribute Occupies Space?
1	Escape sequence	Partial/whole line/screen	Yes
2	Switch setting or escape sequence	Whole screen	No

The following attributes are available:

Normal Video   Restores the background of the screen to that selected by rear terminal switch settings.

Reverse Video   Changes the background of the screen to the reverse of that which appears at power on (default). If the screen is normally black with green characters, it will now be green with black characters. If method one is used, this attribute starts with the cursor position and continues until another attribute is encountered.

Half Intensity   Changes the intensity to half of normal on a character-by-character basis.

<div align="center">

△

</div>

Half intensity differs from other visual attributes in two ways:

1.   Once it is set, it affects all characters entered (regardless of cursor position) until it is turned off.

2.   This attribute character never occupies a character space.

Underline   Creates a solid line below all characters on the line (including the line created by the underscore key). This attribute starts with the cursor position and continues until another attribute is encountered. (Changed only by method one.)

Blink   Causes all characters to blink. This attribute starts with the cursor position and continues until another attribute is encountered. (Changed only by method one.)

Blank   Causes all data entered on the line to be invisible to you although the cursor will move and be transmitted to the computer. (A typical application might be payroll information.) This attribute starts with the cursor position and continues until another attribute is encountered. (Changed only by method one.)

Setting Visual Attributes
Method One

To set a visual attribute which can affect part or all of the screen, follow these steps:

1.   Place the cursor one position before you want the attribute to start.

6. PROGRAMMING

△

Remember that each attribute occupies a character position. If you type over the attribute, it will be lost unless you have protected it using protect mode.

2.   Enter the appropriate escape sequence as listed in Table 6-4.

Table 6-4   Escape Sequences for Visual Attributes

Attribute	Escape Sequence
Normal (default) video	ESC G 0
Invisible normal video	ESC G 1
Blink	ESC G 2
Invisible blink	ESC G 3
Reverse video (reverse of default)	ESC G 4
Invisible reverse	ESC G 5
Reverse and blink	ESC G 6
Invisible reverse and blink	ESC G 7
Underline	ESC G 8
Invisible underline	ESC G 9
Underline and blink	ESC G :
Invisible underline and blink	ESC G ;
Reverse and underline	ESC G <
Invisible reverse and underline	ESC G =
Reverse and underline and blink	ESC G >
Invisible reverse and underline and blink	ESC G ?

Method Two

This method changes the entire screen display using switches on the rear of the terminal or an escape sequence. Changing the display with those switches or with the escape sequence described in this section differs from the video attributes described above in two ways:

The attribute occupies no space on the screen

The entire screen is affected

Table 6-5 summarizes the effect of these escape sequences in combination with the rear switch settings.

6.11   SPECIAL GRAPHICS

The special graphics feature converts all alphanumeric characters received while this feature is active to one of 15 special graphic characters.

When this feature is being used, the SHIFT key has no effect and the status line displays GRPH. When special graphics is inactive, the status line displays either a space (or H.I. if half intensity was previously set).

Table 6-5   Screen Attributes

Rear Switch Setting	Escape Sequence	Function	Effect
Normal (green on black)	ESC b	Set reverse background	Changes screen to reverse video (black on green)
Reverse (black on green)	ESC b	Set reverse background	No effect since screen is already reversed with switch setting
Normal	ESC d	Set normal background	No effect since screen is already normal
Reverse	ESC d	Set normal background	Changes screen to normal video (green on black)

To control the special graphics mode, use the following commands:

Status	Code Sequence
Special graphics on	ESC $
Special graphics off	ESC %

The graphics characters which will be displayed are shown in Figure 6-2 with the corresponding alphanumeric characters.
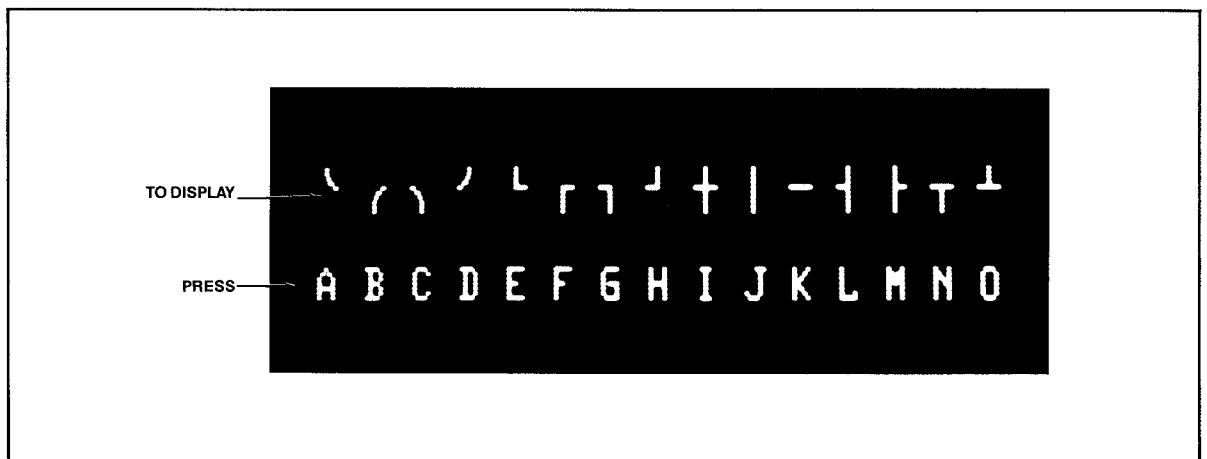
Figure 6-2   Special Graphics Characters

6.   PROGRAMMING

6.12   ADDITIONAL MEMORY

The TS 802H has a 48-line memory which can be divided into two 24-line pages or one 48-line page.

To set the number of lines per page, enter

ESC \ n

where n = 1 for 24 lines per page
2 for 48 lines per page

If you have selected two 24-line pages and wish to look at the next page of memory, enter

ESC K

To look at the previous page of memory, enter

ESC J

If you move forward (or backward) to the next page, the cursor will be located in the same position on the new page as it was on the previous page.

6.13   AUTO PAGE

The auto page feature causes the second page to flip into view when the cursor reaches the end of the screen. When auto page is not used, the screen scrolls over the total two pages, allowing you to view 24 lines at a time.

To turn on auto page, enter

ESC v

This new page will appear as a whole new page (i.e., the page will not scroll into view).

To turn auto page off, enter

ESC w

6.14   PROTECT MODE
6.14.1   Introduction

Using protect mode during the creation of a page allows you to:

Protect designated areas of the page from future change by the operator

Control transmission of those areas

Using protect mode involves two procedures:

Creating the areas to be protected using protected writing

Protecting all of those areas with protect mode

6.14.2   Application

A typical application would be the creation of a form, leaving blank spaces for later entry of variable information. Were the form headings not protected by protect mode, they would be vulnerable to change or accidental deletion as the form was being filled in.

6. PROGRAMMING

6.14.3 Effect

Fields input under protected writing appear on the screen at one-half the regular intensity. When protect mode is in effect, the cursor is not able to enter those fields, but will instead advance across those fields to the first unprotected field when you use → or ←. Linefeed, ↑, or ↓ will, however, move the cursor to the protected field. The screen does not scroll up in protect mode. If the whole screen is protected, the cursor will go to the home position and will not move. At no time, however, can any data be entered in the protected field.

6.14.4 Input

Individual areas (fields) which will be given blanket protection from later change are created using protected writing mode.

△

Information must be input using this procedure if it is to be protected later.

1. Position the cursor where the first protected character is to be located.
2. Enter

    ESC)

    This turns on protected writing mode. Until the mode is reset, each character entered will be displayed at half intensity. The status line will display H.I.
3. Enter the information to be protected in that area of the screen.
4. Proofread the entry and correct it if necessary.
5. Enter

    ESC (

    to end data entry in that area and turn off protected writing mode.
6. Move the cursor to the next area to be protected and repeat.

6.14.5 Protection

When all areas to be protected have been entered correctly, the *whole screen* is ready to be protected from change (protect mode on). Once this protection is given, the cursor will not be able to enter those areas unless the protection is removed.

1. To turn on protect mode, enter

    ESC &

△

The position of the cursor during this escape sequence is irrelevant.

2. Look for **PROT** on the status line, indicating that protect mode is on.

With protect mode on, all half-intensity, graphics, and attribute characters are protected from overwriting or erasure. All data and visual attributes within the protected areas are protected.

To disable protect mode (remove the protection), enter

    ESC '

The absence of PROT on the status line indicates that protect mode is off.

6. PROGRAMMING

6.15 NORMAL AND REVERSE LINEFEED

You can cause a normal linefeed with the sequence

∧ J

To move the cursor up one line (reverse linefeed), send

ESC j

Using auto page and/or protect mode can affect where the cursor will move when a linefeed and reverse linefeed are received. Tables 6-6 and 6-7 summarize the effect of auto page and protect mode when linefeed and reverse linefeed are used.

Linefeeds received by the terminal under certain conditions may result in the loss of data. Read the following control code explanations carefully.

Table 6-6   Effects of Auto Page/Protect Mode on Linefeed Actions

Auto Page	Protect Mode	Description
Off	Off	With auto page off and protect mode off, a linefeed advances the cursor to the next line on the page.
		If the cursor is at the bottom of the screen, linefeeds cause the display to roll up one line for each linefeed. If the cursor is also at the bottom of the page, a linefeed causes a new line of data to appear at the bottom of the screen and results in the loss of the top line of data on the page. The new line contains the insert character (6.20), which is normally spaces but may be programmed to be any other character.
Off	On	A linefeed causes the cursor to return to the top of the current page when it reaches the last line of the page.
On	Off or On	Linefeed advances the cursor to the next line on the page. When the cursor reaches the bottom of the page, it will advance to the first line of the next page. When it reaches the last line of the last page, it advances to the first line of the first page (page zero).

Table 6-7   Effects of Auto Page/Protect Mode on Reverse Linefeed Actions

Auto Page	Protect Mode	Description
On	Off or On	The cursor will move to the last line of the previous page when it reaches the first line of the current page. When the cursor reaches line one of page zero, it will not move further.
Off	On	The cursor does not move when on the first line.
Off	Off	The screen will scroll down one line when the cursor is on the first line and the last line of the page will be lost.

6.   PROGRAMMING

6.16   CURSOR CONTROL CODES

All cursor controls may be performed using escape and control sequences sent from the computer.

The cursor control codes are summarized in Table 6-8.

Table 6-8   Cursor Control Commands

Cursor Control	Control Code	Auto Page	Protect Mode	Effect
HOME	∧ ∧	Off/On	Off/On	Moves cursor to the first unprotected space on the screen. If the cursor is currently at the home position or the first unprotected position on the page, the code has no effect.
Carriage Return	∧ M	Off/On	Off	Moves the cursor left to column one of the current line.
		Off/On	On	Moves the cursor to the first unprotected position of the current cursor line.
Up	∧ K	Off/On	Off/On	Moves the cursor up one line until it encounters the top of the screen. If the cursor is not on the first line of the page, the display will roll down one line with each ∧ K until the cursor reaches the top of the page. Once it reaches the top of the page, receipt of further ∧ K codes has no effect.
Down	∧ V	Off/On	Off/On	Moves cursor down one line.
		Off	Off/On	If the cursor is on the bottom line of the page, the code has no effect.
Left	∧ H	Off	Off/On	Functions the same as BACKSPACE. Moves the cursor left to the next unprotected position on the page. If the cursor is currently in the first column of the line, it will move to the last column of the preceding line.
		On	Off/On	If the cursor is at the home position or the first unprotected position on the page, the cursor will move to the end of the preceding page or to the last position of the last unprotected field of the preceding page. If the current page is page zero, the code has no effect.

Table 6-8   Continued

Cursor Control	Control Code	Auto Page	Protect Mode	Effect
Right	∧ L	Off/On	Off/On	Moves the cursor right one column. If the cursor is at column 80, it moves the cursor to the first column of the next line.
		Off	Off	Causes the screen to scroll one line if the cursor is at column 80 of the last line.
		Off	On	If the cursor is at the last unprotected position on the page, the cursor will move to the first unprotected position of the current page.
		On	Off/On	If the cursor is at the last unprotected position on the page, the cursor will move to the first unprotected position of the next page. If that page is the last page, the cursor will advance to the first unprotected position of the first page.
New Line	∧ _	Off/On	Off/On	Causes the terminal to perform a LF and a CR.

6.17   THE FUNCTION KEYS

The function keys (F1 through F11) send a user-defined or default code to the screen, to the computer, or to both, depending on whether the keys are set up for local or duplex communication mode. (For example, the user-defined code may be a frequently-used escape or control code sequence in a text editing application.)

6.17.1   Description

There are eleven function keys; using them in combination with SHIFT allows up to 22 sets of codes to be transmitted.

6.17.2   Default Messages

When the terminal is first turned on, the function keys are already programmed with default messages set to full duplex mode. If you do not program the function keys, the default values shown in Table 6-9 will be transmitted by each function key.

6.   PROGRAMMING

Table 6-9   Default Function Key Values

Key	Unshifted Code	Shifted Code
F1	∧ A @ CR	∧ A " CR
F2	∧ A A CR	∧ A a CR
F3	∧ A B CR	∧ A b CR
F4	∧ A C CR	∧ A c CR
F5	∧ A D CR	∧ A d CR
F6	∧ A E CR	∧ A e CR
F7	∧ A F CR	∧ A f CR
F8	∧ A G CR	∧ A g CR
F9	∧ A H CR	∧ A h CR
F10	∧ A I CR	∧ A i CR
F11	∧ A J CR	∧ A j CR

6.17.3   Programming the Function Keys

You may program the function keys (i.e., not use the default values listed in Table 6-9) by following the procedure described here.

Enter the following code in the exact sequence shown:

ESC ¦ p1 p2 message ∧ Y

where

p1 is the number of the function key. The values of p1 are as follows:

Key	Unshifted	Shifted
F1	1	<
F2	2	=
F3	3	>
F4	4	?
F5	5	@
F6	6	A
F7	7	B
F8	8	C
F9	9	D
F10	:	E
F11	;	F

p2 is one of the following values:

1 = Send to the computer (full duplex)
2 = Send to screen (local)
3 = Send to computer and to screen (half duplex)

∧ Y is the termination character

The message can contain up to 63 bytes per key. (The total memory available for the function keys is 256 bytes total or 64 characters per key; however, one byte is added by the terminal processor for control purposes.)

Because control, escape, cursor position, and similar function keys are not normally stored, a ∧ P embedded in the text of the function key message may be used to store the next character entered.

For example, assume that the message desired for key F1 in local mode is:

TURN ON THE PRINTER

Precede this message with the following:

ESC ¦

The key number (1 for key F1)

The transmission mode (2 for local mode)

The entry will be:

ESC ¦ 1 2 TURN ON THE PRINTER CR ∧ Y

△

Program the computer's input/output string routine to catch the entire string and then process it (unless you are using an interrupt-driven computer, in which case you should not need to worry about data being lost).

6.17.4 Using Function Keys

To use one of the function keys in normal operation, press the function key for the first message, or press SHIFT and the key at the same time for the second message.

6.18 THE FUNCT KEY

Not to be confused with the function keys described in 6.17, the FUNCT key transmits a user-selected character (the ASCII code of the depressed key) bracketed by ∧ A (SOH) and a carriage return (CR). For example, if a ∧ A C CR sequence is required for a special operation in a text editing program, press FUNCT and C at the same time to transmit ∧ A C CR to the computer.

△

Program your computer's input/output string routine to catch the entire string and then process it (unless you are using an interrupt-driven computer, in which case you do not need to worry about data being lost).

6.19 ADDRESSING AND READING THE CURSOR POSITION

The computer can position the cursor (called addressing or loading the cursor) and determine the position of the cursor (reading the cursor).

To address the cursor, enter

ESC = r c

or

ESC - p r c

where

r is the desired row (line). Refer to Table 6-2 to find the ASCII code representing the desired row.

c is the desired column. Refer to Table 6-2 to find the ASCII code representing the desired column.

p is the page number. Possible values are:

0 for page one
1 for page two

△

If your applications program inserts nulls between characters, loading the cursor will not function as described. Instead, the cursor will go to an unpredictable position.

For example, if you want the cursor to go to Row 9 of Column 50, enter

ESC = (Q

To read the cursor's row and column position (listed in Table 6-2), enter

ESC ?

To read the cursor's current page, row, and column, enter

ESC /

The page value will be

0 for page one
1 for page two

The row and column values sent (specified in Table 6-2) are followed by a carriage return.

6.20 LOADING AN INSERT CHARACTER

Several editing, erase, and clear functions (in addition to scroll and reverse scroll) cause certain areas of the page to be replaced with a predefined character. When the terminal is turned on, this insert character is defined as a space (ASCII 20 HEX).

During normal operation, the insert character may be redefined to be any ASCII character (e.g., a null or an underline) with the following escape sequence:

ESC e n

where n is the insert character.

6. PROGRAMMING

6.21 TAB PROGRAMMING

Two types of tabs are available:

Typewriter-style tabs

Field tabs (used when protect mode is on)

Table 6-10 summarizes all tab controls.

Table 6-10   Tab Controls

Action	Control Code	Auto Page	Protect Mode	Effect
Set tab[1]	ESC 1	Off/On	Off	Sets a typewriter-style column tab.
		Off/On	On	Generates a vertical column of half-intensity spaces from the cursor position down to the first write-protected character of the column or to the end of the page, whichever is first.
Field Tab	ESC i	Off/On	Off	No effect.
		Off	On	If there are no following unprotected fields, the cursor moves to the first character of the first unprotected field at the top of the page. If there are no unprotected characters on the page, the cursor will move to the home position.
		On	On	If no unprotected field follows, the cursor will advance to the first unprotected character on the next page. If no unprotected field exists on the next page, the cursor moves to home position on that page.
Clear Typewriter Tab[2]	ESC 2	Off/On	Off	Clears the typewriter tab where the cursor is located when this code is entered.
		Off/On	On	No effect.
Clear All Tabs[3]	ESC 3	Off/On	Off/On	Clears all typewriter tabs regardless of the position of the cursor when the code is entered.

Notes
1. To set a tab, move the cursor to the column position where you want a tab. Be sure you enter a **numeral** one, not a lower case **L**.
2. Position the cursor at the tab to be cleared before entering the sequence.
3. The position of the cursor when this code is entered is not important.

Table 6-10   Continued

Action	Control Code	Auto Page	Protect Mode	Effect
Back Tab	ESC I	Off/On	Off	Causes the cursor to go back to the previous tab position set. If no tabs are set or if the cursor is on the first tab position on the page, this code moves the cursor to the first column on the line.
		Off	On	Moves the cursor back to the start of the first preceding unprotected field. If no preceding positions exist, the cursor will not move.
		On	On	If the cursor is at the first unprotected position on the page, it will move the cursor to the first unprotected character of the last unprotected field of the previous page. If no protected fields exist, home position is considered the start of an unprotected field. If the cursor is on the first unprotected position of the first page, this code has no effect.
Typewriter (Column) Tab	∧ I	Off/On	Off	Causes the cursor to advance to the next typewriter-style tab set. If no tabs are set, the code has no effect and the cursor will not move.
		Off	On	Moves the cursor to the first character of the next unprotected field. If there are no following unprotected fields, the cursor moves to the first character of the first unprotected field at the top of the page. If there are no unprotected characters on the page, the cursor will move to the home position.
		On	On	If no unprotected field follows, the cursor will advance to the first unprotected character on the next page. If no unprotected field exists on the next page, the cursor moves to home position on that page.

6. PROGRAMMING

6.22 COMMUNICATION MODES

Communication between the terminal and the computer can be controlled by escape sequences, switch settings, or the status line. Four modes are possible:

Local

Block

Half duplex (conversational)

Full duplex (conversational)

These are described in detail in 5.5.

6.22.1 Local

To operate in the local mode, enter

ESC c

6.22.2 Block

To operate in block mode, enter

ESC B

6.22.3 Half Duplex

To operate in half duplex mode, enter

ESC DH

6.22.4 Full Duplex

To operate in full duplex mode, enter

ESC DF

6.22.5 Conversation

Half duplex and full duplex are both conversational modes. You can return to the previous conversational mode by entering

ESC C

For example, you were using full duplex before you changed to local mode. Now you want to return to full duplex. You can do so by entering either ESC C (conversational) or the command for full duplex (ESC DF).

6.23 EDIT KEYS

The edit modes which are described in this section can be selected either with the switches on the rear of the terminal or with control codes.

Two communication editing modes are available: local edit and duplex edit.

6. PROGRAMMING

6.23.1 Local Edit

Using local edit enables you to change the text without transmitting the editing commands to the computer (i.e., all editing is in local mode).

In local edit mode, SEND, and the edit keys (CLEARSPACE, BACKSPACE, ↑, ↓, →, ←, TAB, HOME, BACK TAB, LINE INSERT, LINE DELETE, CHARACTER INSERT, CHARACTER DELETE, LINE ERASE, and PAGE ERASE) and the changes caused by these keys are not transmitted to the computer.

To enter local edit mode, either change the status line or enter

ESC k

While local edit is on, all other keys will operate normally.

6.23.2 Duplex Edit

When duplex edit is selected, all editing commands are transmitted to the computer. To make editing changes which will be sent to the computer in the same manner as the alphanumeric keys (i.e., either half or full duplex), either change the status line or enter

ESC l (lower case "L")

For example, if the terminal is set for half-duplex operation, both the alphanumeric and edit keys will operate in half duplex mode.

6.24 EDITING TEXT

Changing text can involve the following three actions:

Replacing (ie., typing over) existing text; referred to here as **editing**

Inserting new text which pushes existing text to the right from the cursor position

Deleting existing text (by either character, line, or page) by moving that text backward toward the cursor

Editing, inserting, and deleting can occur within either the line on which the cursor is positioned or within the entire page of memory. Text which reaches the beginning or the end of a line or the page by these actions will, if moved *further*, be lost (i.e., *fall off* that boundary—either line or page).

The four modes of operation available are:

Edit Page
Edit Line
Insert Page
Insert Line

These modes can be selected by any of the following methods:

Changing the status line (5.4)

Pressing some of the edit keys together with the SHIFT key (see Table 6-11)

Sending escape commands (see Table 6-11)

Table 6-11 summarizes the changes possible and the commands and keys which will cause those changes.

Table 6-11   Edit and Insert Modes

| Change | | | | Status Line |
From	To	Command	Press	Displays
Edit (replace)	Insert	ESC q	Shifted Char Insert	INS
Insert	Edit (replace)	ESC r	Shifted Char Delete	EDT
Line	Page	ESC N	Shifted Line Insert	P
Page	Line	ESC O	Shifted Line Delete	L

The following sections describe in detail the effect of these modes.

Page Edit—When page edit is selected and characters are inserted, the remaining text moves forward to the next line as necessary. The **page** length is determined by the number of lines of memory for that page. For example, if you have configured the memory to have one 48-line page, the text (of which you can see 24 lines at a time) would be able to flow forward within that 48-line area). When the end of the page is reached, however, text being pushed forward by the inserted text will be lost as it moves beyond column 80 of the last line of memory.

When characters are deleted while page edit is in effect, the character in column one of each line will move to column 80 of the previous line (i.e., backward wraparound).

Page edit will be indicated by the presence of **EDTP** on the status line.

Line Edit—This is the default mode (i.e., the mode in effect when the terminal is turned on). Line edit allows you to insert or delete text only on the line on which the cursor presently rests. Characters will move forward or backward until column one or column 80 is reached. Text can be lost (i.e., *fall off*) either end of the line being edited.

Line edit will be indicated by the abbreviation **EDTL** on the status line.

Insert Line—Insert Line allows you to insert or delete text only within the line on which the cursor presently rests.

Insert line will be indicated by the presence of **INSL** on the status line.

Insert Page—Insert Page allows you to insert or delete text in the page of memory on which the cursor is resting. Characters will move forward or backward until column one of page one or column 80 of the last line is reached. Text can be lost (i.e., *fall off*) either end of the page of memory being edited.

Insert page will be indicated by the presence of **INSP** on the status line.

Table 6-12 summarizes the effects of the available editing commands in conjunction with page edit, line edit, and protect mode.

Table 6-12   *Editing Commands*

Edit Command	Escape Sequence	Edit Mode	Protect On/Off	Effect
Character Insert	ESC Q	—	—	Causes character at the cursor to move right one column position and enters an insert character at the cursor position.
		EDTP	—	The character at column 80 wraps to column one of the next line.
		EDTP	On	This control will turn off Edit Page. A character insert will insert from the cursor position to the end of the line or to the first protected field.
		EDTL	—	As characters are inserted, characters reaching column 80 are lost.
		EDTL	Off	Causes the character at the cursor to move right one column and enters an insert character at the cursor position. The character at column 80 is lost.
			On	Inserts from the cursor position to the end of the line or to the first protected field.
Character Delete	ESC W	EDTL	Off	Deletes the character at the cursor position and moves all following characters left one position. At the end of the delete function, an insert character is written into the last position on the line.
		EDTP	Off	Deletes the character at the cursor position and moves all following characters left one position. At the end of the delete function, an insert character is written into the last position on the page.
		EDTL	On	Operates only from the cursor position to the end of the unprotected field or line.
Line Insert	ESC E	—	Off	Inserts a line consisting of insert characters at the cursor position. This causes the cursor to move to the start of the new line and all following lines to move down one line, resulting in the loss of the last line on the page.
		—	On	No effect.

Table 6-12   Continued

Edit Command	Escape Sequence	Edit Mode	Protect On/Off	Effect
Line Delete	ESC R	—	Off	Deletes the line at the cursor position and all following lines move up one line. The cursor will move to column one of the line and insert characters will be loaded into the last line of the page.
		—	On	No effect.
Erase to End of Line	ESC T	—	Off	Erases all characters from the cursor to the end of the line and replaces them with insert characters. If half intensity is on, half-intensity insert characters will replace the erased characters.
		—	On	Erases all unprotected characters from the cursor to the end of the field and replaces them with insert characters. If half intensity is on, half-intensity insert characters will replace the erased characters.
Erase to End of Line with Nulls	ESC t	—	Off	Erases all characters from the cursor position to the end of the line and replaces them with null characters.
		—	On	Erases all characters from the cursor position to the end of an unprotected field and replaces them with null characters.
Erase to End of Page	ESC Y	—	On	Replaces unprotected characters from the cursor position to the end of the screen with insert characters. If half intensity is on, erased characters will be replaced with half-intensity insert characters.
Erase to End of Page with Nulls	ESC y	—	On	Erases all unprotected characters from the cursor position to the end of the page and replaces them with null characters.

6. PROGRAMMING

6.25   CLEAR FUNCTION

The clear function is used in one of four ways to clear data from screen memory. Clear commands are summarized in Table 6-13.

Table 6-13   Clear Commands

Clear Command	Escape Sequence	Half Intensity	Protect	Effect
Clear Unprotected to Nulls	ESC :	Off/On	Off/On	Clears all unprotected data on the page to the null character or to the half-intensity character if half intensity is on.
Clear Unprotected to Insert Characters	ESC ; ESC + ∧ Z	Off/On	Off/On	Clears all unprotected data on the page to insert characters. The default insert character is a space, but may be programmed to be another character. If half intensity is on, the screen will be cleared to half-intensity insert characters.
		On	Off	Clears screen to half-intensity spaces.
Clear Page to Half-intensity Insert Characters	ESC ,	On	Off/On	Clears all unprotected data on the page to half-intensity insert characters.
Clear all Data to Nulls	ESC *	On/Off	On/Off	Clears all data on the page to nulls. Resets half intensity and protect modes.

6.26   X-ON/X-OFF CONTROL

When the terminal's receive buffer is almost full (less than 32 characters), the terminal automatically transmits X-Off to the computer, requesting it to stop sending data. When the data in the buffer has been sent to the screen or the printer's buffer, the terminal transmits X-On to the computer, indicating that the computer may resume sending data to the terminal.

This X-On/X-Off feature may be enabled or disabled with the following control sequences:

    Enable X-On/X-Off   ∧ O
    Disable X-On/X-Off   ∧ N

At power on, X-On/X-Off is enabled. If X-On/X-Off is disabled, DTR control (6.27) is enabled.

6.27   DATA TERMINAL READY CONTROL

If you have disabled the X-On/X-Off feature described above, the Data Terminal Ready feature is enabled (i.e., the DTR line is high). In that case, the DTR line will go low when the 256-byte receive buffer in the terminal has received 224 bytes from the computer—until the buffer is 20 percent empty again.

6. PROGRAMMING

6.28 SEND FUNCTION

Once you have entered and edited data or text, you can transmit it to the computer by one of two methods:

1. Press the preprogrammed SEND key to transmit line or page data.
2. Enter a control sequence to send specific data.

6.28.1 Programming the SEND Key

To program the SEND key, enter the following code:

    ESC 0 x y

where

    x is 1 to program the SEND key
       2 to program the shifted SEND key

    y is 4 to program ESC 4
       5 to program ESC 5
       6 to program ESC 6
       7 to program ESC 7
       S to program ESC S
       s to program ESC s

The SEND key operates both unshifted and shifted for transmittal of two-character escape sequences. Transmission of text by the SEND key may include embedded delimiters which define fields, end of line, and end of text.

6.28.2 Delimiter Programming

To set the send delimiters, enter the following code in the exact sequence shown below:

    ESC x n p1 p2

where

    n = 0 for delimit field code to p1 p2
       1 for delimit line code to p1 p2
       2 for delimit start protect field to p1 p2
       3 for delimit end protect field to p1 p2
       4 for delimit end of text to p1 p2

    p1 = A standard ASCII or control character

    p2 = A standard ASCII or control character

If no delimiter is desired, program p1 and p2 as nulls. For example, to eliminate the field delimiter during transmission, enter

    ESC x 0 null null

The default delimiter values are shown in Table 6-14.

Table 6-14   Default Delimiter Values

Delimiter	Values	
	p1	p2
Field	FS	null
Line	US	null
Start protected field	ESC	)
End protected field	ESC	(
End of text	Carriage return	null

To send specific data to the computer, use the commands shown in Table 6-15.

Table 6-15   Data Transmission Commands

Data Sent	Code	Effect
Unprotected line from start of line to cursor	ESC 4	Sends all unprotected data on the line from column one through the cursor position. Also sends an FS code (1C Hex) as field delimiters in place of each protected field and end-of-text characters at the end of the send transmission.
Unprotected page from home to cursor	ESC 5	Sends all unprotected data on the page from home through the cursor position. Sends an FS code (1C Hex) as field delimiters in place of each protected field. Sends line delimiters at the end of a line and an end-of-text at the end of the send transmission.
Whole line from start of line to cursor	ESC 6	Sends all data from the first column through the cursor position. Also sends ESC) at the beginning of each protected field and ESC (at the end of each protected field. If the character at the cursor position is protected, the terminal sends ESC ((end-protected field) to the computer. Sends the end-of-text characters at the end of the send transmission. If the data to be sent includes attribute characters, these will be sent also [the terminal will automatically include the suitable escape sequences (ESC Gn)].
Send whole message (STX to ETX)	ESC s	Same as ESC S above except protected fields delimited by start-protected field ESC (and end-protected field ESC) are also transmitted.

Table 6-15   Continued

Data Sent	Code	Effect
Send whole page	ESC 7	Sends all data on the page from home through the cursor position. It also sends ESC) at the start of each protected field and ESC (at the end of each protected field.
		If the character at the cursor position is protected, the terminal sends an ESC (to the computer. This code also sends line delimiters at the end of each line and the end-of-text characters at the end of the send transmission.
		If the data to be sent includes attribute characters, these will be sent also [the terminal will automatically include the suitable escape sequences (ESC Gn)].
Send unprotected message (STX to ETX)	ESC S	Sends all unprotected data bracketed by the start of text (STX) and end of text (ETX) codes displayed on a page. After the data is sent, the terminal positions the cursor at the ETX code. If the page contains no STX codes, transmission begins from the home position. If the page contains no ETX code, the terminal sends to the end of the page and positions the cursor at home after the data is sent. If the page contains neither an STX nor an ETX code, the entire page will be sent.
		The code sends an FS code (1C Hex) as field delimiters in place of protected fields. It also sends line delimiters at the end of each line and an end-of-text delimiter at the end of the send transmission.

Data other than text may also be sent to the computer using control sequences. Pressing SEND will not send that data. The commands to transmit other-than-text data are shown in Table 6-16.

Table 6-16   Transmit Commands

Data Transmitted	Code
Terminal identification[1]	ESC M
User line[2]	ESC Z 0
Status line[2]	ESC Z 1

Notes
1. The identification will include the software level and the number of lines in its memory, followed by a carriage return. The lines of memory will be indicated by the following values:

    1 for a 24-line memory
    2 for a 48-line memory

    For example, 1.0,2 CR would be sent for Level 1.0 firmware and 48 lines of memory.
2. Transmission is followed by a carriage return.

6.29   PRINT FUNCTION PROGRAMMING

The print functions which are normally available on a Model 950 terminal (such as ESC P, ESC L, ESC ", ESC a, ESC @, ESC A, ∧ R, and ∧ T) do not function on the TS 802H. All print functions on the TS 802H are controlled by the computer.

7. PREVENTIVE MAINTENANCE, TROUBLESHOOTING, AND SERVICE

7.1 CARE

Periodic preventive maintenance will prolong the useful life of your TS 802H.

7.1.1 Cleaning

Clean the TS 802H periodically (about every three months). To clean the case:

1. Vacuum the keyboard with a soft brush attachment (or use a small soft brush).
2. Clean the housing with a soft, lint-free cloth and a commercial detergent.

DO NOT use solvent-based or abrasive cleaners.

3. If you spill coffee or soft drinks on the keyboard, disassemble the keyboard and clean it with a soft cloth and water. Dry it thoroughly before reusing it.

7.1.2 Inspection

Check the cabinet and keyboard for damage or excessive wear periodically.

1. Inspect the cabinet for cracks or breaks. On customized units, check the bezel for paint damage (peeling, cracking, or severe scratches).
2. Check each key for free movement.
3. Inspect the cables and pin connectors twice a year for damage. Inspect the interface cable connectors for kinks or other signs of excessive stress (such as stretching).

Refer any damage to a qualified service technician.

7.2 TROUBLESHOOTING

The information provided in this section may enable you to resolve many operating problems without placing a service call. If your system does not work properly after you have followed the suggestions given here, call your dealer.

Your TS 802H is just one of several components in the entire computer system. A failure anywhere else in the system can cause the improper operation of the TS 802H. The service processor, memory systems, cables, and operational procedures should be checked if there has been a malfunction. Table 7-1 will be helpful in determining the cause of a problem. If this table does not help locate the cause of a problem, run the self test described in the next section or call your dealer for assistance.

Table 7-1   Troubleshooting Procedures

---

1. **IF TS 802H IS NOT ON AFTER POWER SWITCH IS TURNED ON AND**

   a. **TS 802H MAKES NO NOISE (FAN IS OFF)**

      Unplug power cord and plug it in again.

      Plug something else into the same wall outlet and test for power.

      Check the line fuse (as described in Section 7.3) and replace it if necessary.

   b. **FAN IS ON BUT SYSTEM PROMPT DOES NOT APPEAR ON CRT SCREEN**

      Push SHIFT/BREAK BREAK (to reset TS 802H).

Table 7-1   Troubleshooting Procedures (Continued)

c.   SCREEN DISPLAYS SYSTEM PROMPT BUT DOES NOT RESPOND TO OPERATOR COMMAND

Push SHIFT/BREAK BREAK (to reset TS 802H).

2.   TS 802H HAS BEEN OPERATING CORRECTLY; THEN THE FOLLOWING MESSAGE APPEARS: Hardware Error (FDC): Contact your distributor

Power has been off temporarily. Everything not on disk or diskette yet has probably been lost. Reload operating system.

3.   TS 802H DOES NOT RESPOND TO TS 806/816 WHEN USED AS USER STATION/TERMINAL

Reconnect all cables and check for cable damage.

Check central service processor port (P1) connector pins for damage.

Check dipswitch settings.

If printed circuit board was cut and jumpered, check jumper connections.

4.   TS 802H IS USED WITH MODEM AND DOES NOT RESPOND OR TRANSMIT TO CENTRAL SYSTEM PROCESSOR

Unplug and plug in modem; turn its power on and off, and reconnect modem to TS 802H P1 port.

5.   TS 802H APPEARS TO BE RUNNING BUT CURSOR DOES NOT APPEAR

Adjust display contrast settings on rear panel.

6.   TS 802H VIDEO DISPLAY ATTRIBUTES DO NOT CORRESPOND TO RECENTLY-CHANGED SWITCH SETTINGS

Turn TS 802H off and back on so software can scan new switch settings.

7.   TS 802H "LOCKED UP" (DOES NOT RESPOND TO KEYBOARD OR CENTRAL PROCESSOR)

Press SHIFT/BREAK BREAK (to reset system).

Run self test.

Enter ESC " to enable keyboard.

8.   PRINTER DOES NOT PRINT WHAT IS TYPED

Reconnect printer cable; make sure it is completely on pin connector.

Check printer cable configuration.

9.   ESCAPE AND CONTROL COMMANDS DO NOT FUNCTION AS ANTICIPATED

Re-enter commands, paying particular attention to whether upper or lower case characters are needed.

10.   COMMANDS ENTERED WHILE IN LOCAL MODE DO NOT FUNCTION AS ANTICIPATED

Application programs may limit the terminal functions otherwise available.

7.2.1 **Testing the TS 802H (Self Test)**

You can perform a self test to verify proper operation of the video attribute functions and the screen. The test will display all displayable characters (including the special graphics characters) and all 16 video attributes.

To start the self test, enter:

SHIFT/SET-UP/NO SCROLL

1

Twenty lines (containing all the characters and attributes of the TS 802H) will immediately appear on the screen (see Figure 7-1). This test checks character generation, the display RAM circuits (generally), the display processor, and the screen circuits. If any of the video attributes or display functions are inoperative, refer the problem to your dealer.
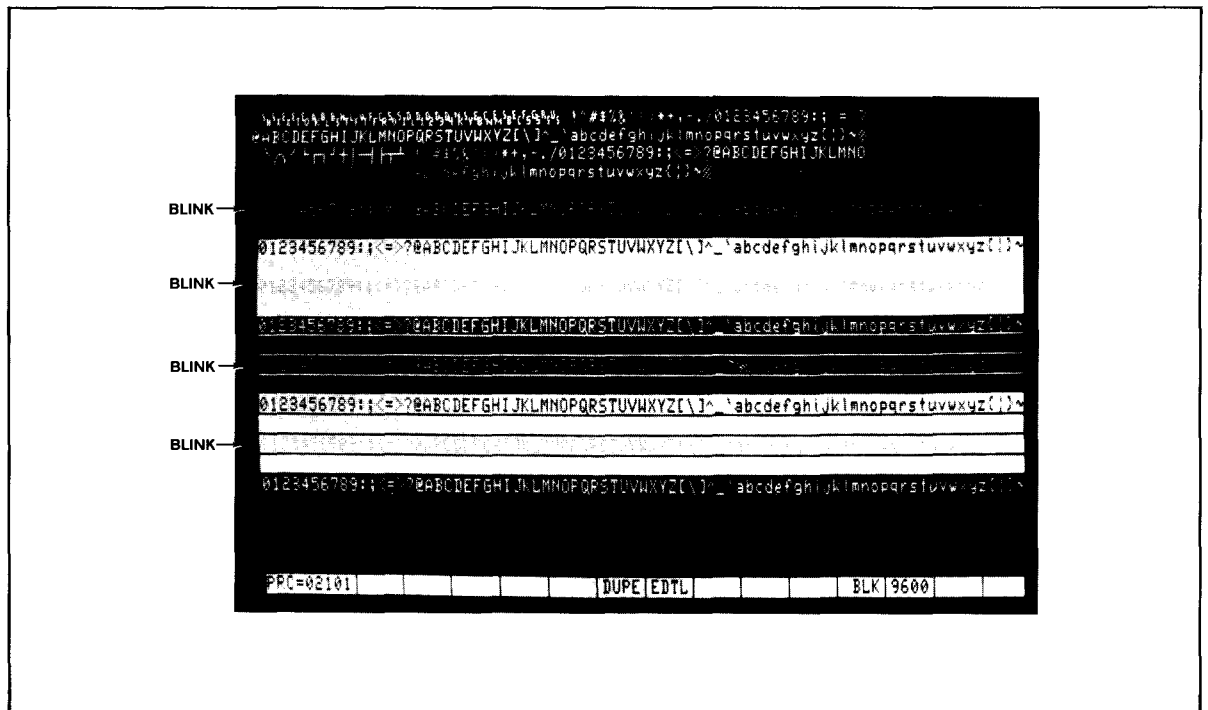
Figure 7-1   Display of Normal Self Test

△

*Should you accidently enter a numeral 2 (instead of a 1) to start the self-test, a test which **appears to fail** will appear. This test is not operative on the TS 802H and does not indicate any hardware failure.*

7. PREVENTIVE MAINTENANCE, TROUBLESHOOTING, AND SERVICE

7.3 CHANGING THE FUSE

The TS 802H has one exterior fuse.

To check and/or change this fuse, unscrew the fuse holder (see Figure 7-2). The fuse is a small glass cylinder. If the thin wire inside the fuse is still intact, the fuse should be functional. If the thin strip is broken and/or if the glass is black, the fuse is burned out and must be replaced.
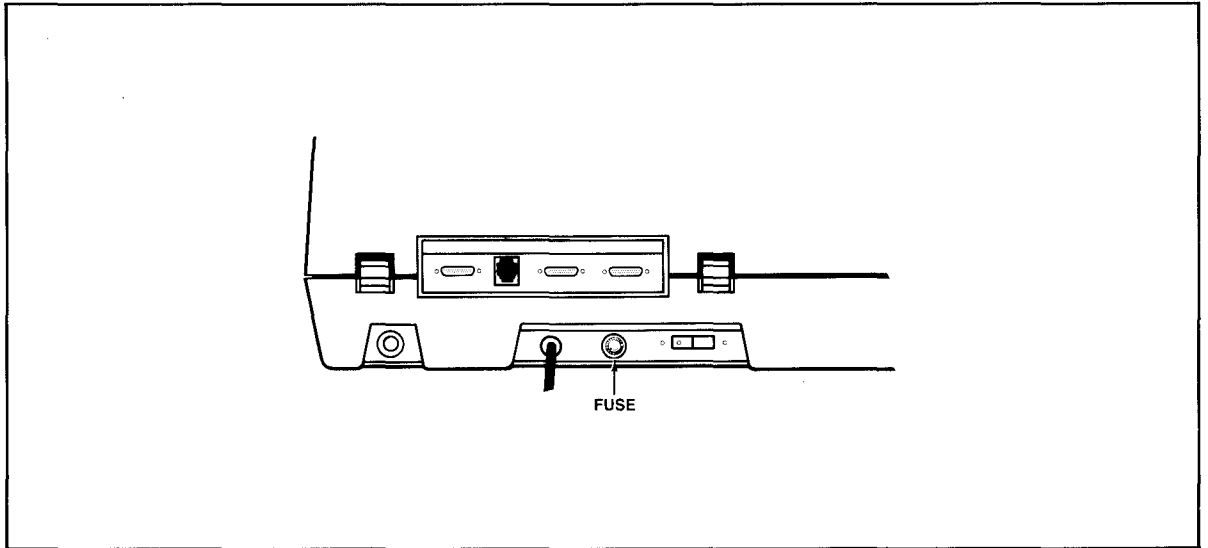
FUSE

Figure 7-2   Exterior Fuse Location
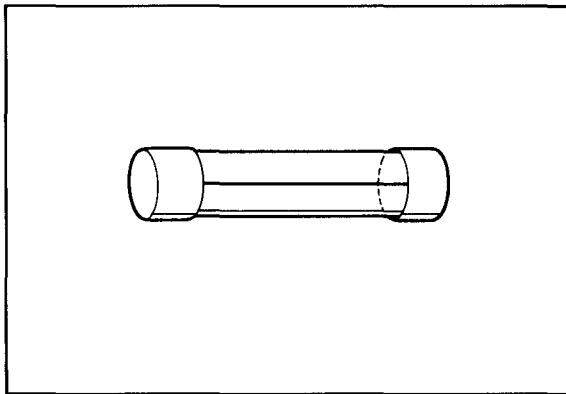
Figure 7-3   Good Fuse
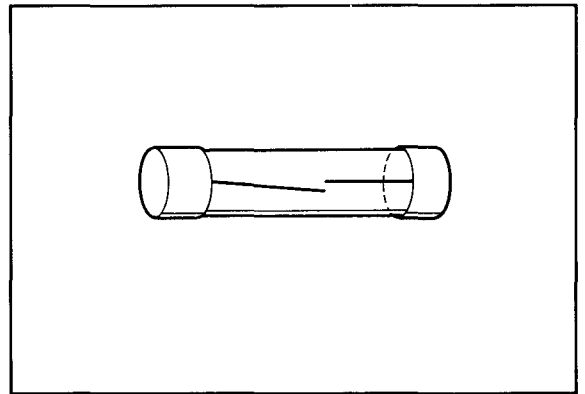
Figure 7-4   Burned Out Fuse

To replace the fuse, slip it out of the fuse holder and insert a new fuse. The fuse rating is shown on a label above the fuse holder. You can purchase new fuses from your dealer.

7. PREVENTIVE MAINTENANCE, TROUBLESHOOTING, AND SERVICE

7.4 HOW TO GET SERVICE

7.4.1 Service During Warranty

If you need service on your TS 802H while it is under TeleVideo's limited warranty, call your dealer and he will obtain a Return Material Authorization number for you. (Refer to the Limited Warranty in Appendix B for a detailed description of service provided under warranty.) In cases of extreme emergency, you might want to either pay for overnight delivery to and from TeleVideo's factory or have the unit serviced by one of the third-party service centers. If a third-party service center repairs it under warranty, you will be invoiced by them for labor charges. Your dealer can help you arrange for emergency warranty repair.

7.4.2 On-Site Service After Warranty

You can obtain on-site service after warranty from any of the third-party service centers. Call your dealer for the location of the nearest center.

7.4.3 Information Needed for Service

When you call for service, you will be asked for the serial number of your system. The serial number is located on a label at the top center of the rear panel (Figure 7-5). For future reference, note the serial number, the date you took delivery, and the name and phone number of your dealer and service center in the space below.

Model TS 802H Serial No. _____ Delivery Date _____

Dealer _____ Phone No. _____

Service Center _____ Phone No. _____
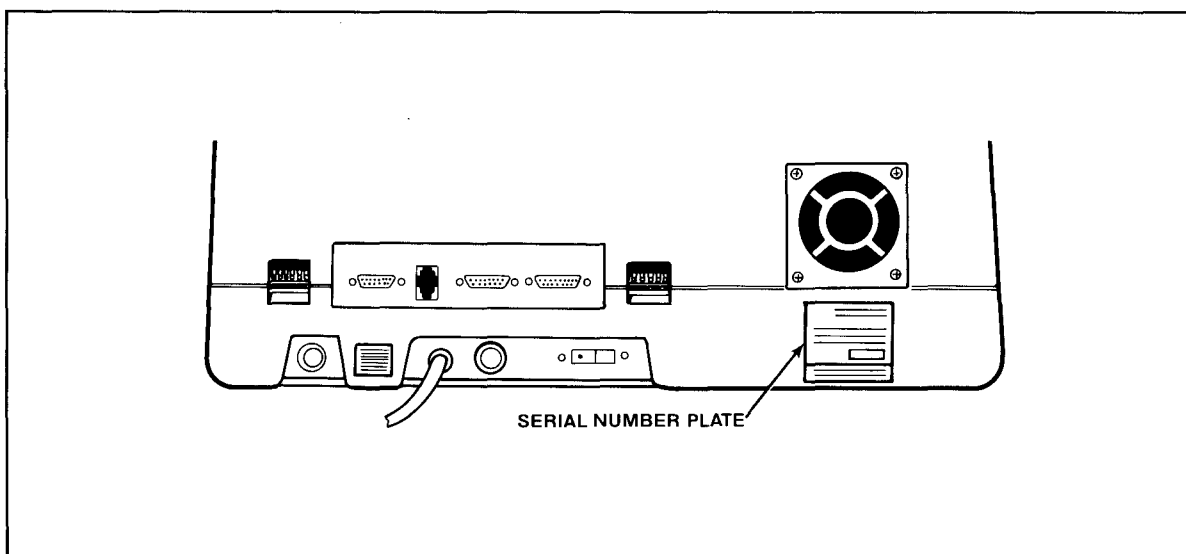
Figure 7-5   Location of Serial Number on Rear Panel

Should your company require a purchase order for out-of-warranty repairs, have the purchase order number ready when you call in. One purchase order may cover several repairs but we will give each unit its own individual RMA number. This allows us to return each item quickly and not hold up the entire purchase order because of one item.

7.5   Reshipping the TS 802H

Should you need to reship the TS 802H, follow these procedures:

1. Open the enclosure (see Appendix H).
2. Check the integrity of the internal cabling and security of internal mounting hardware.
3. Replace cover, being careful not to overtighten the screws.
4. Leave the drive door open.
5. Repack the unit in the original TeleVideo shipping container or other suitable materials.

7.6   Technical Assistance

Should you have any technical problems with your TS 802H, call your dealer.

APPENDICES

APPENDIX A   TS 802H SPECIFICATIONS

MICRPROCESSOR/MEMORY

CPU   Z80A microprocessor (processor speed 4 MHz)

Memory   64K bytes dynamic RAM
                                4K bytes EPROM

Operating System   CP/M

DISK DRIVES

Type   One Winchester (hard) disk drive; one floppy disk drive

Diskettes   Standard 5.25-inch floppy diskette
                                Soft sectored, 256 bytes/sector, 18 sectors/track, 40 tracks/side, 2 sides/
                                diskette, skew rate 4

Storage Capacity   Floppy: Double density, double sided
                                        368.6 kilobytes (formatted)
                                Hard: 7.47 megabytes (formatted)

Transfer Rate   Floppy: 250 kilobits/second
                                Hard: 5 megabits/second

Access Time   Floppy: 6 milliseconds (track to track)
                                Hard: 3 milliseconds (track to track)

INPUT/OUTPUT

Serial I/O   RS232C serial ports (two)
                                Asynchronous: 150 baud to 19.2 kilobaud
                                RS422 serial port 800 kilobits/second

POWER REQUIREMENTS

External
   Domestic   115 VAC (± 12 VAC) 50/60 Hertz
   International   115/230 VAC (± 12 VAC) 50-60 Hertz

Power Consumption   1.30 amps maximum at 115 VAC
                                0.65 amp maximum at 230 VAC

Power Cord   NEMA standard 5-15R, 3-prong receptacle (US only)

Start Current   1.3 amps at 115 VAC
                                0.65 amps at 230 VAC

ENCLOSURE

Dimensions   Height 7 1/4 inches (18.2 cm)
                                Width 17 1/2 inches (43.8 cm)
                                Depth 16 7/8 inches (42.0 cm)

Net Weight   44 pounds

Shipping Weight   54 pounds

Composition   Injection-molded plastic

ENVIRONMENT

Operating (with diskette)   50 to 85 degrees F
                                Maximum humidity 95% relative noncondensing
                                Maximum altitude 10,000 ft above sea level

Nonoperating (shipping)   32 to 120 degrees F (0 to 50 degrees C)

APPENDIX A   TS 802H SPECIFICATIONS

CRT SPECIFICATIONS

Size	12 inches measured diagonally Phosphor: P31 green, nonglare read-out

DISPLAYED CHARACTER SET	96-character ASCII upper and lower case alphabet
	24 lines
	   80 characters per line
	   1920 characters per screen
	   Video attributes:
	      Half intensity
	      Blinking fields
	      Security (blank) fields
	      Reverse video
	      Underlined fields

CHARACTER FONT	12 x 8 dot matrix with 10 x 14 cell
KEYBOARD FORMAT	Tab, Back tab
REPEAT	20 cps auto-repeat
EDITING FEATURES	Typeover Clear screen to space or null Character insert and character delete Line insert and line delete Absolute cursor addressing Erase to end of page Erase to end of line or field Line edit
CURSOR CONTROLS	→, ←, ↓, ↑, New Line, Home, Tab, Back Tab
TRANSMISSION	Conversation: Full or half duplex Block: Formatted information transmitted by line or page, protected and unprotected, or unprotected only Local
BAUD RATES	150, 300, 600, 1200, 2400, 4800, 9600, 19,200
INTERNAL SERIAL INTERFACES	CRT to computer

APPENDIX B   STATEMENT OF LIMITED WARRANTY

TeleVideo Systems, Inc. ("TeleVideo") warrants to Buyer that products, except software, manufactured by Tele-Video will be free from defects in material and workmanship. TeleVideo's obligations under this warranty will be limited to repairing or replacing, at TeleVideo's option, the part or parts of the products which prove defective in material or workmanship within 90 days after shipment by TeleVideo, provided that Buyer gives TeleVideo prompt notice of any defect and satisfactory proof thereof. Products may be returned by Buyer only after a Return Material Authorization number ("RMA") has been obtained from TeleVideo by telephone or in writing. Buyer will prepay all freight charges to return any products to the repair facility designated by TeleVideo and include the RMA number on the shipping container. TeleVideo will deliver replacements for defective products or parts on an exchange basis to Buyer, freight prepaid to the Buyer. Products returned to TeleVideo under this warranty will become the property of TeleVideo. With respect to any product or part thereof not manufactured by TeleVideo, only the warranty, if any, given by the manufacturer thereof, will apply.

EXCLUSIONS

This limited warranty does not cover losses or damage which occurs in shipment to or from Buyer, or is due to, (1) improper installation or maintenance, misuse, neglect or any cause other than ordinary commercial or industrial application, or (2) adjustment, repair or modifications by other than TeleVideo authorized personnel, or (3) improper environment, excessive or inadequate heating or air conditioning and electrical power failures, surges or other irregularities or (4) any statements made about TeleVideo's products by salesmen, dealers, distributors or agents, unless confirmed in writing by a TeleVideo officer.

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APPENDIX C   BUYING ADDITIONAL DISKETTES

SOURCES

Any TeleVideo Systems dealer or distributor

SPECIFICATIONS

Any new diskettes should meet these specifications to ensure data integrity:

Type	Floppy minidiskettes
Size	5.25-inch
Technology	Double density, double sided
Format	Soft sectored
	Guaranteed for 48 tpi drives
	40 tracks per side

RECOMMENDED BRAND(S)

Brand	Part No.	Manufacturer
Dysan Diskettes 104/2D	800272 (40 tracks)	Dysan Corporation
		Santa Clara, CA
		800/538-8150

QUALITY

You should purchase the best quality diskettes available to ensure data integrity.

LIFE EXPECTANCY

Depending on the care and amount of use given your diskettes, they may last from six months to two years. Many users automatically phase out diskettes periodically. Factors such as number of disk accesses, quality of diskette, environment, and care can significantly affect their life expectancy.

One of the first signs of diskette wear will be incorrect data. The care with which you handle and store diskettes is probably the most important single factor in life expectancy of diskettes.

APPENDIX D   SUGGESTED CP/M REFERENCES

The following books will be useful references:

1. Fernandez, Judi N. and Ruth Ashley, *Using CP/M: A Self Teaching Guide*, John Wiley and Sons, 605 Third Avenue, New York, New York, 1980, $8.95.

(This is an excellent self-teaching guide, highly recommended for the user unfamiliar with CP/M but perhaps familiar with computers. Assumes no prior knowledge about operating systems.)

2. Hogan, Thom, *Osborne CP/M User Guide*, Osborne/McGraw-Hill, 630 Bancroft Way, Dept. UB, Berkeley, CA 94710, $12.99.

(A complete book for the beginning computer operator. Covers all aspects of computer operation and CP/M use. Organization and presentation are outstanding.)

3. Zaks, Rodney, *The CP/M Handbook with MP/M*, SyBex, 2344 Sixth Street, Berkeley, CA 94710 (415/848-8233), 1980, $13.95.

(Giving very complete details of CP/M, this book gives more detail than many beginners will want.)

4. *CP/M Summary Guide for Versions 1.4 and 2.X*, edited by Bruce Brigham, The Rosetta Stone, Post Office Box 35, Glastonbury, CT, 06025, 203/633-8490, $6.95 plus $1.00 postage and handling.

5. Murtha, Stephen M. and Mitchell Waite, *CP/M Primer*, Howard W Sams & Co., Inc, 4300 West 62nd St., Indianapolis, Indiana 46268, $14.95.

(An excellent introduction to both CP/M and microcomputers.)

6. Townsend, Carl, *How to Get Started with CP/M*, dilithium Press, Post Office Box 606, Beaverton, Oregon 97075, $9.95

(A succinct discussion of CP/M. Also includes a listing of CP/M software suppliers.)

TeleVideo welcomes comments from you about these books as well as names of others which you find useful.

APPENDIX E   CABLE SPECIFICATIONS
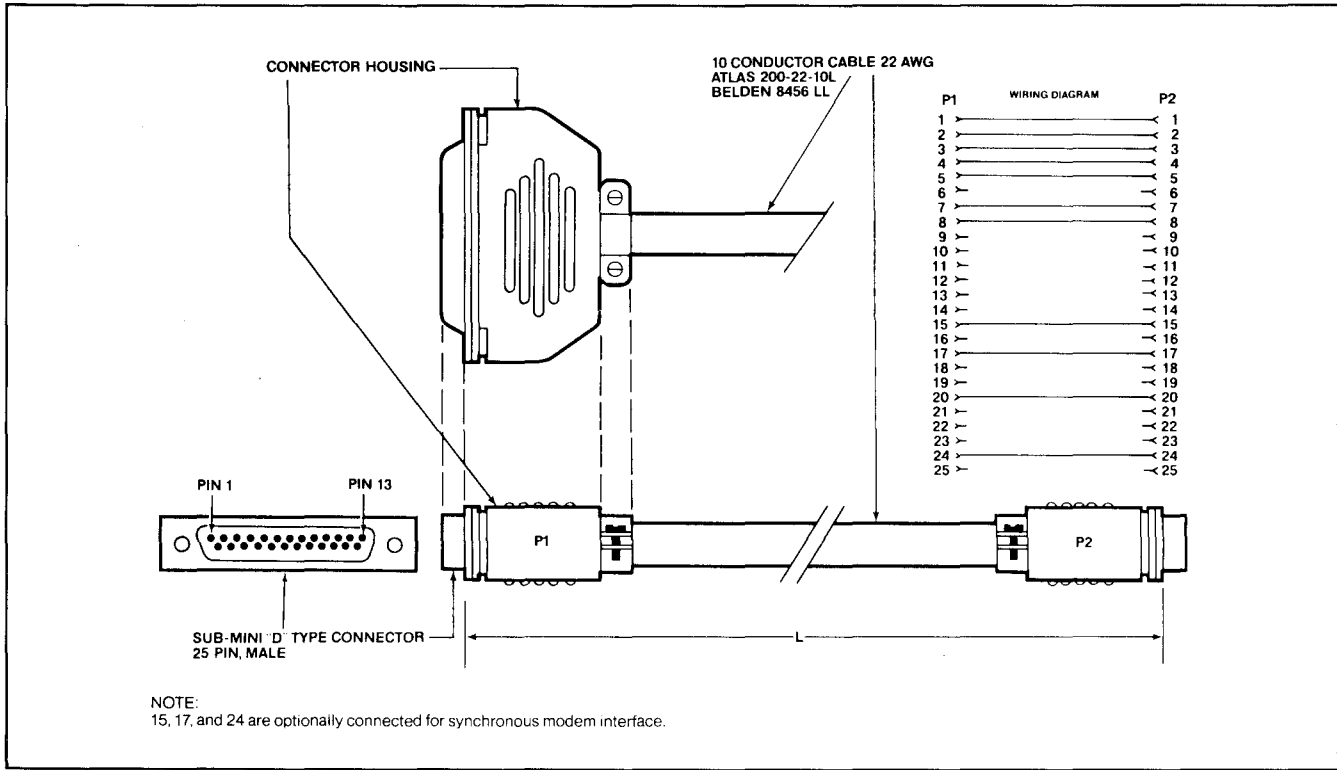
Figure E-1 RS232C
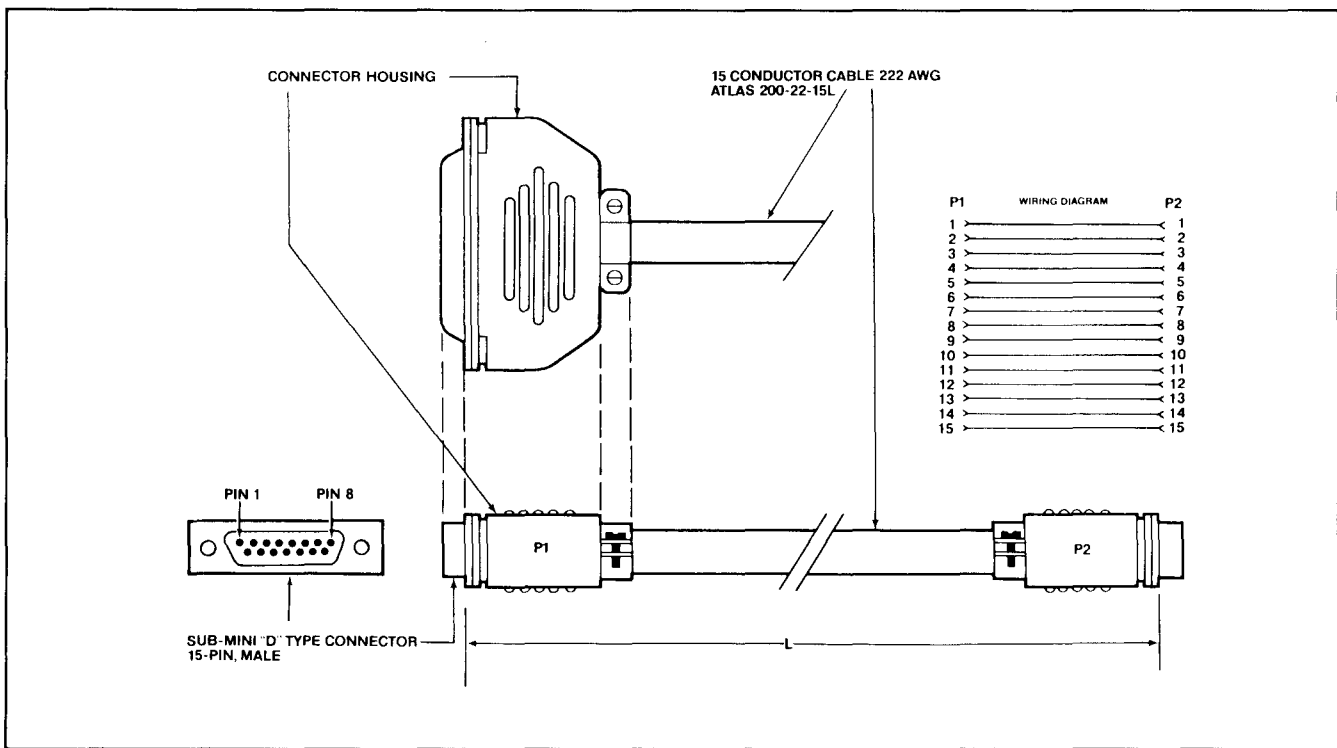
Figure E-2 RS422

APPENDIX F   PIN CONNECTOR ASSIGNMENTS

Table F-1   Connector Assignments for P1
(Configuration as Shipped is for Modem)

Pin No.	Signal Functional Name	(DCE)
1	Frame Ground	
2	Transmit Data	(receive)
3	Receive Data	(transmit)
4	Request to Send	
5	Clear to Send	
6	Data Set Ready	
7	Signal Ground	
8	Data Carrier Detect*	
15	Transmission Signal Element Timing	(source)
17	Receive Signal Element Timing	(source)
20	Data Terminal Ready	(printer busy)
24	Transmit Signal Element Timing	(source)

*Texas Instruments TI800 series printers require high signal on Pin 8.

Table F-2   Connector Assignments for P2 (DCE)
(Configuration as Shipped is for Printer)

Pin No.	Signal Functional Name	(DCE)
1	Frame Ground	
2	Transmit Data	(receive)
3	Receive Data	(transmit)
4	Request to Send	
5	Clear to Send	
6	Data Set Ready	
7	Signal Ground	
8	Data Carrier Detect*	
20	Data Terminal Ready	(printer busy)

*Texas Instruments TI800 series printers require high signal on Pin 8.

APPENDIX G   SWITCH SETTINGS

Table G-1   Switch Settings

Switch	Dipswitch		Open (Up)	Closed (Down)	Function
S1 (left)		1	x		Duplex
				x	Local
		2	x		Blinking cursor
				x	Steady cursor
		3		x	Always closed
		4		x	Always closed
		5		x	Always closed
		6	x		Green characters on black
				x	Black characters on green
		7			See Table G-2
		8			See Table G-2
		9	x		60 Hertz (115 VAC)
				x	50 Hertz (230 VAC)
		10	x		Keyclick off
				x	Keyclick on
S2 (right)	1	1			Printer/terminal baud rate*; see Table G-3
		2			Printer/terminal baud rate*; see Table G-3
		3			Printer/terminal baud rate*; see Table G-3
		4	20 MEG	10 MEG	~~Not used~~ HARD DISK SIZE 10/20 MEG
		5	x		User station
				x	Stand-alone computer
		6	x		TS 802H boots from hard disk
				x	TS 802H boots from floppy
		7	x		Service processor terminal
				x	User station or stand-alone computer
		8	either		Not used
		9	either		Not used
		10	either		Not used

*When TS 802H is a service processor terminal for TS 806/816

Table G-2   Communication Modes

Switch 2	Dipswitches 7	8	Function
	closed	closed	Half duplex
	closed	open	Full duplex
	open	closed	Block
	open	open	Local

Table G-3   Printer Baud Rate and Terminal* Baud Rate

Dipswitches 1 2 3	Baud Rate
0 0 0	19,200
1 0 0	9,600
0 1 0	4,800
1 1 0	2,400
0 0 1	1,200
1 0 1	600
0 1 1	300
1 1 1	150

0 = Switch closed (down)   1 = Switch open (up)
*When TS 802H is a terminal for TS 806/816
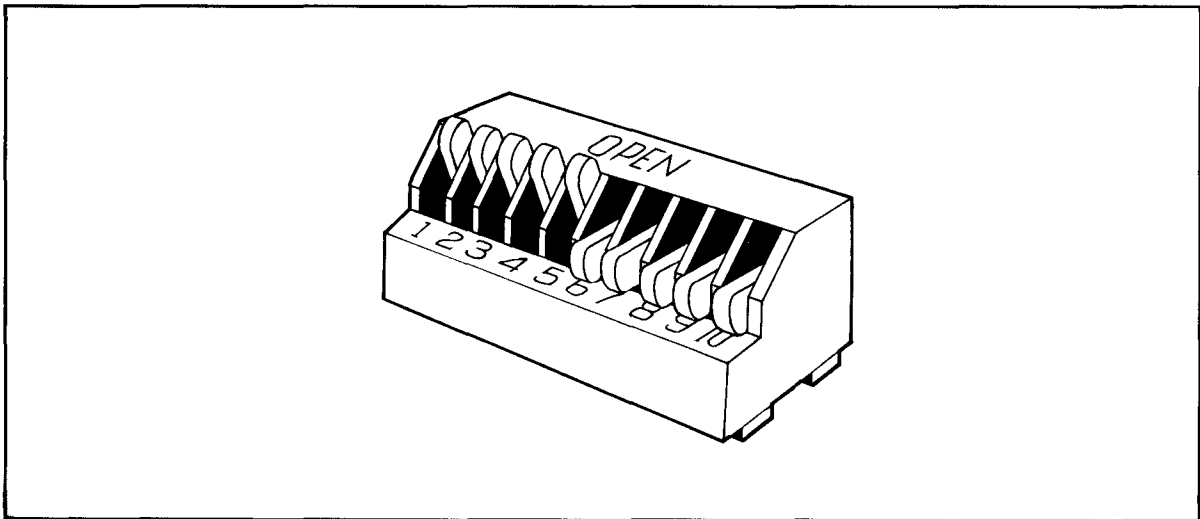
Figure G-1   Dipswitches 1 through 5 Open; 6 through 10 Closed

⬢ STOP

PROTECT YOURSELF!

Whenever you open the case, observe standard safety precautions (as you would with any electrical or electronic equipment). Since high voltages are retained by the CRT tube and capacitors even after power has been turned off, care should be taken whenever the case is open. Always discharge them to ground before touching them. Never reach into the TS 802H enclosure unless someone capable of giving first aid is present. Disconnect all power before performing any inspection or maintenance.

If the CRT tube breaks, always wear heavy rubber gloves or use tongs to pick up the broken CRT fragments since the coating on the inside of the tube is poisonous.

The top of the system case is secured to the base by four Phillips screws (Figure H-1).
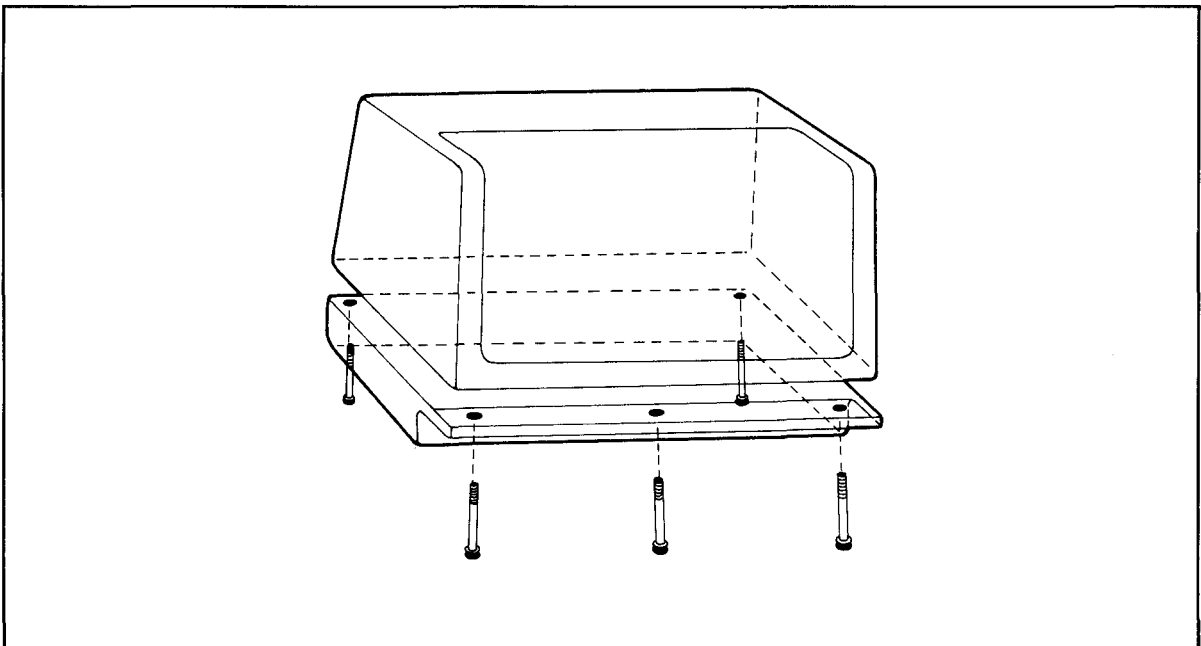
Figure H-1   Location of Screws in System Case

Keeping the unit upright, remove each screw and lift the top off.

To reassemble the case, position the top over the base and reinsert the four screws.

APPENDIX I   CHANGING THE PIN CONNECTOR ASSIGNMENTS

To change port P1 from DTE to DCE (i.e., to connect a printer instead of a modem to this port), make the cuts and jumpers described below:

Cut between both holes of the following traces:

    W18   W19   W20   W21   W22   W23   W24   W32   W33

Install jumpers between the following areas:

    W24 right and W23 left
    W20 top and W22 right
    W18 top and W19 bottom
    W18 bottom and W19 top
    W20 bottom and W23 right
    W24 left and W22 left

To change port P2 from DCE to DTE (i.e., to connect a modem instead of a printer to this port), make the cuts and jumpers described below:

Cut between both holes of the traces:

    W25   W26   W27   W28   W29   W35   W36

Install jumpers between the following holes:

    W25 right and W26 right
    W29 right and W27 left
    W36 top and W28 left
    W25 left and W26 left
    W36 bottom and W27 right
    W29 left and W28 right
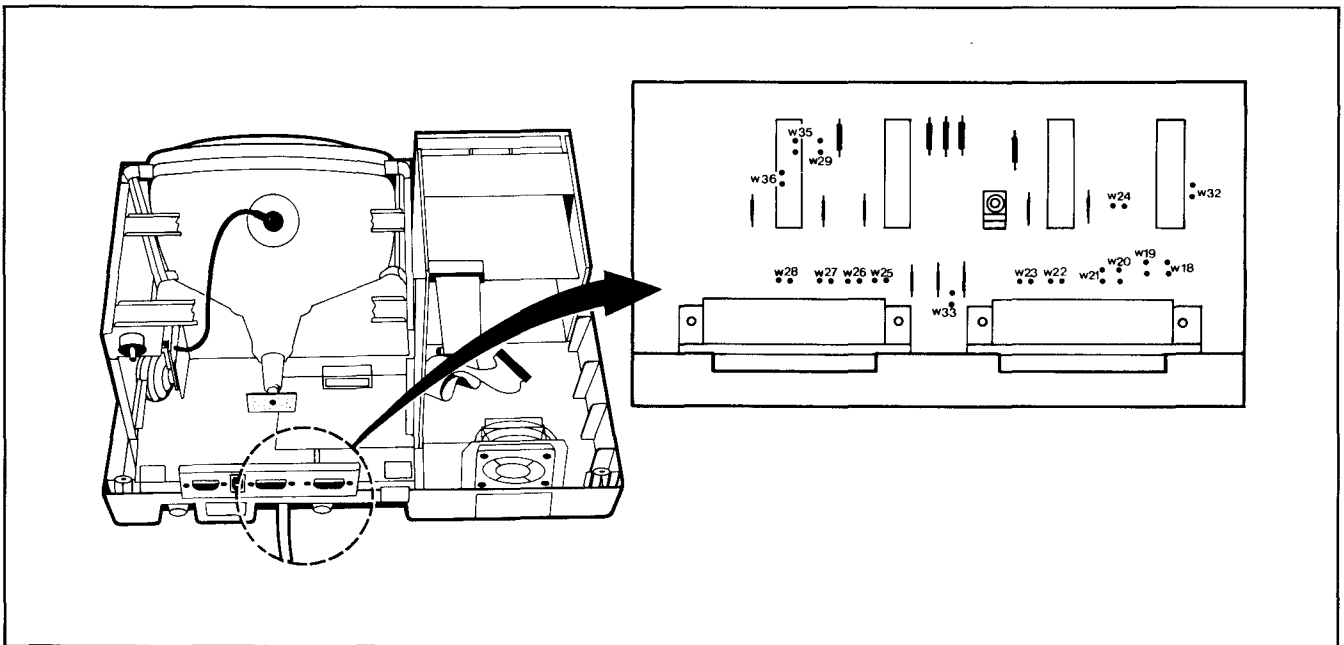
Figure I-1   Location of Traces on Printed Circuit Board

Your TS 802H arrives with the default LST: device set to TTY: (for devices Data Terminal Ready for the response to the printer busy status).[1] The procedure described here enables you to change the default LST: device to UL1: (for devices using using ETX/ACK protocol).[2]

Using the CP/M SYSGEN and DDT programs, you will change a byte in CP/M and save the modified CPM on the system area of a disk. Follow this procedure. User responses are shown in bold print.

USER:	1.	Boot the system from the hard disk.
	2.	Enter
		SYSGEN<CR>
SYSTEM:	3.	Displays
		TELEVIDEO SYSTEMS SYSGEN VX.Y SOURCE DRIVE NAME (OR RETURN TO SKIP)
USER:	4.	Enter
		A<CR>
SYSTEM:	5.	Displays
		SOURCE ON A, THEN TYPE RETURN
USER:	6.	Press
		<CR>
SYSTEM:	7.	Displays
		DESTINATION DRIVE NAME (OR RETURN TO REBOOT)
USER:	8.	Press
		<CR>
SYSTEM:	9.	Displays
		A>
USER:	10.	Enter
		SAVE60CPMXXXXX.COM<CR>
		(where CPMXXXXX.COM represents the file name of the modified CP/M)
SYSTEM:	11.	Displays
		A>
USER:	12.	Enter
		DDTCPMXXXXX.COM<CR>
SYSTEM:	13.	Displays
		DDT VERS X.Y NEXT PC 3E00 0100 —
USER:	14.	Enter
		S2043<CR>

1. Examples of printers using this protocol are Epson or Texas Instruments serial printer.
2. Examples of printers using this protocol are NEC Spinwriter and Diablo.

APPENDIX J   CHANGING THE DEFAULT LST: DEVICE

SYSTEM: 15.   Displays

2043 15

USER: 16.   Enter

D5<CR>

(where 15 is the code to enable the TTY device and D5 changes it to UL1. Table J-1 lists the available device codes)

Table J-1   Available Device Codes

Code	Device
15	TTY: Serial printer, pin 20 for DTR
55	CRT: Terminal
D5	UL1: Serial device using ETX/ACK protocol

△

In the above procedure, we have selected device UL1:.

SYSTEM: 17.   Displays

2044 32

(this is the next hexadecimal address)

USER: 18.   Enter

.<CR>

(BE SURE TO ENTER A PERIOD BEFORE <CR>. This is entered because you do not want to change this address.)

19.   Enter

∧**C**

SYSTEM: 20.   Displays

A>

USER: 21.   To regenerate the modified system, run SYSGEN again. Enter

SYSGEN<CR>

SYSTEM: 22.   Displays

TELEVIDEO SYSTEMS SYSGEN VX.Y
SOURCE DRIVE NAME (OR RETURN TO SKIP)

USER: 23.   Press

<CR>

SYSTEM: 24.   Displays

DESTINATION DRIVE NAME (OR RETURN TO REBOOT)

USER: 25.   Press

A<CR>

SYSTEM:	26.	Displays	
		DESTINATION ON A, THEN TYPE RETURN	
USER:	27.	Press	
		<**CR**>	
SYSTEM:	28.	Displays	
		FUNCTION COMPLETE	
		DESTINATION DRIVE NAME (OR RETURN TO REBOOT)	
USER:	29.	Press	
		<**CR**>	
SYSTEM:	30.	Displays	
		A>	

Now you can test your new system by booting the system from the drive containing the new version. The modifications will not take effect until the system is booted on the new customized CP/M.

APPENDIX K   PORT ASSIGNMENTS

Description	Hexadecimal Value
Dipswitch	00H
Memory latch	04H
CTC:	
Channel	
0 (RS232C optional port P1 baud rate)	08H
1 (RS232C port P2 baud rate)	09H
2 (not used for port)	0AH
3 (not used for port)	0BH
SIO No. 1	
Channel A (RS422 port P4)	
data	0CH
command/status	0EH
Channel B (internal processor/terminal interface)	
data	0DH
command/status	0FH
SIO No. 2:	
Channel A (RS232C modem port P1)	
data	20H
command/status	22H
Channel B (RS232C printer port P2)	
data	21H
command/status	23H
DMA	10H
FDD (floppy disk drive)	18H
FDC (floppy disk controller)	
status register	14H
track register	15H
sector register	16H
data register	17H
WDC (5.25-inch hard disk controller)	48H through 4FH

APPENDIX L   DEFAULT DEVICE ASSIGNMENT

CON: = CRT:
LST: = TTY:
RDR: = PTR: not implemented
PUN: = PTP: not implemented

Optional device assignment:

LST: = UL1:

UL1: device uses ETX/ACK protocol for a serial printer port. Types of printers supported are NEC Spinwriter and Diablo daisywheel.

TTY: device uses Data Terminal Ready (DTR) as the response to the printer busy status. Types of printers supported include Epson and Texas Instruments serial printers.

This appendix describes the utility programs contained on the TS 802H. The program descriptions are in alpha-betical order. READ ALL USER INSTRUCTIONS BEFORE ENTERING ANY COMMANDS. All user responses are shown in bold print.

UTILITY		**DFORMAT**
		For TS 802H
		Configuration: Stand-Alone/User Station*
		Version 2.0
		Release date: December 1981
		Copyright TeleVideo Systems, Inc. 1981
PURPOSE		DFORMAT formats floppy diskettes. Normally, this program is used only on new diskettes.
EXECUTION		
USER:	1.	Insert the diskette to be formatted into the floppy drive.
	2.	Enter
		[drive:]DFORMAT<CR>
		([drive:] is the drive DFORMAT is located on if not on the active drive)
SYSTEM:	3.	Displays
		TELEVIDEO SYSTEMS DFORMAT VX.Y
		Drive name? (ESC to abort.)
USER:	4.	Enter
		D
SYSTEM:	5.	Displays
		Press RETURN when ready (ESC to abort.)
USER:	6.	Press
		<CR>
SYSTEM:	7.	Displays
		formatting . . . .
		Formatting completed.
		Drive name? (ESC to abort.)
USER:	8.	Press
		ESC
		to end the program
		or
		insert another diskette into the floppy drive and enter
		D
		to rerun the program
SYSTEM:	9.	Displays (once ESC is entered)
		End of Execution
		[drive]>

*Drive designations in this program description are for stand-alone operation.

UTILITY		**FIXDISK** Version 1.0 TS 802H/802GH Configuration: Stand-Alone/User Station* Release date: 4 September 1981 Copyright TeleVideo Systems, Inc. 1981
PURPOSE		FIXDISK inspects the hard disk for defective data areas. It builds a file called FILE.BAD containing the pointers associated with the defective data blocks. This file has a CP/M user designation of User 15 and the attributes of Read Only and System (no directory listing).
		FIXDISK can be used on any CP/M-compatible disk drive. The program should be run immediately after formatting or whenever a disk is suspected of having defective areas. During the execution of the program, no data is destroyed. Directory areas are not scanned.
COMMENTS		While the program does not retrieve data which may already be on bad data blocks, it does prevent the system from using those areas for future data storage.
EXECUTION		
USER:	1.	Enter
		[drive]FIXDISK <drive name:> <CR>
		([drive] is the drive on which FIXDISK is located if other than the currently active drive)
		(<drive name:> is the specified disk drive to be checked. Use A: for drive A and B: for drive B, etc. If no drive is specified, FIXDISK will check the currently-selected disk drive.)
SYSTEM:	2.	Displays
		FIXDISK PROGRAM VER. X.Y CURRENT SCANNING BLOCK: #_____
	3.	Displays the block numbers as they are scanned by the program.
	4.	Displays
		FIXDISK COMPLETED WITH xxx DATA BLOCKS ERROR
USER:	5.	Press
		∧S∧C
		to abort the program any time during execution.

*Drive designations in this program description are for stand-alone operation.

UTILITY   HFORMAT Version 2.0
                         For: TS 802H
                         Configuration: Stand-Alone/User Station*
                         Release date: December 1981
                         Copyright TeleVideo Systems, Inc. 1981

PURPOSE   HFORMAT formats the hard disk. Use this program when installing CP/M onto the hard
                         disk or whenever you suspect the hard disk is malfunctioning.

EXECUTION

(STOP)

HFORMAT WILL OVERWRITE ALL DATA PRESENTLY ON THE HARD DISK. THUS ALL FILES, PROGRAMS, AND THE OPERATING SYSTEM PROGRAMS WILL BE ERASED.

USER: 1.   Enter

               [drive:]HFORMAT<CR>

               ([drive:] is the drive HFORMAT is located on if not on the currently active drive)

SYSTEM: 2.   Displays

               Hard Disk FORMAT
               TeleVideo Systems, Inc. Version x.y
               CAUTION: ALL DATA ON THE INTEGRAL HARD DISK WILL BE DESTROYED
               TYPE RETURN when ready (ESC OR ∧C to abort.)

USER: 3.   Press

               <CR>

               to proceed with the program

               or

               press

               ESC or ∧C

               to abort the program.

SYSTEM: 4.   Displays (in approximately fifteen minutes if <CR> was entered)

               HFORMAT Complete

               5.   If errors are found during formatting, specific error messages are displayed.

△

You may abort the program any time during the formatting process by entering ∧C. The system will display:

    Abort HFORMAT?(Y/N)

Enter Y if you wish to abort, or enter N if you do not. If you enter Y, realize that a portion of the disk will have been formatted while the rest remains unchanged.

APPENDIX N   ASCII CODE CHART

Bits 7	6	5			$0\,0\,0$	$0\,0\,1$	$0\,1\,0$	$0\,1\,1$	$1\,0\,0$	$1\,0\,1$	$1\,1\,0$	$1\,1\,1$
4	3	2	1	Column → ↓ Row	0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
0	0	1	0	2	STX	DC2	"	2	B	R	b	r
0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	6	ACK	SYN↓	&	6	F	V	f	v
0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
1	0	0	0	8	BS←	CAN	(	8	H	X	h	x
1	0	0	1	9	SKIP HT	EM	)	9	I	Y	i	y
1	0	1	0	10(a)	LF	SUB	★	:	J	Z	j	z
1	0	1	1	11(b)	VT↑	ESC	+	;	K	[	k	{
1	1	0	0	12(c)	FF→	FS	,	<	L	\	l		
1	1	0	1	13(d)	CR	GS	−	=	M	]	m	}
1	1	1	0	14(e)	SO	HOME RS	.	>	N	∧	n	~
1	1	1	1	15(f)	SI	NEW LINE US	/	?	O	—	o	DEL RUB

ASCII Code Table
Abbreviations For Control Characters

NUL	null	FF	form feed	CAN	cancel
SOH	start of heading	CR	carriage return	EM	end of medium
STX	start of text	SO	shift out	SUB	substitute
ETX	end of text	SI	shift in	ESC	escape
EOT	end of transmission	DLE	data link escape	FS	file separator
ENQ	enquiry	DC1	device control 1	GS	group separator
ACK	acknowledge	DC2	device control 2	RS	record separator
BEL	bell	DC3	device control 3	US	unit separator
BS	backspace	DC4	device control 4	SP	space
HT	horizontal tabulation	NAK	negative acknowledge	DEL	delete
LF	linefeed	SYN	synchronous idle		
VT	vertical tabulation	ETB	end of transmission block		

APPENDIX O   MODIFYING THE TS 802H CBIOS

Before modifying the CBIOS of the system, install CP/M onto the hard disk (described in 3.1.2.3). To generate a new operating system and to know when to make the appropriate modification in the source code, follow this procedure. All user responses are shown in bold print.

USER: 1.   Boot the system from the hard disk. Dipswitch S2-6, located on the rear of the TS 802H case, must be in the open (up) position.

SYSTEM: 2.   Displays

System "boot" (X-Rev.X) from hard disk in progress
TELEVIDEO SYSTEM TS-802H VX.X
64K CP/M X.X
Tandon TM-603s Winchester

A>

USER: 3.   Locate the floppy diskette labeled CBIOS that arrived with the TS 802H.

              4.   Insert the CBIOS diskette into the floppy drive.

              5.   Copy all files on this diskette to the hard disk. The files which are now on the hard disk are the ones that will be modified, not the files on the CBIOS floppy diskette.

              6.   Remove the CBIOS diskette from the floppy drive and store it in a safe place. *DO NOT MODIFY THE FILES ON THIS DISKETTE.IT IS YOUR ORIGINAL COPY.*

              7.   Enter

                    DIR<CR>

SYSTEM: 8.   Displays a directory which includes

802HBIOS.MAC	(Includes all MAC files except 802HBOOT.MAC)
802HBASE.MAC	(BIOS main routine)
802HCONS.MAC	(BIOS console and printer driver)
802HHARD.MAC	(BIOS hard disk driver)
802HFLOP.MAC	(BIOS floppy disk driver)
802HBOOT.MAC	(BIOS boot program)
CPM59.COM	(BDOS and CCP routine)
MAKESYS.COM	(Writes CP/M to the system track)
M80.COM	(Microsoft assembler)*
L80.COM	(Microsoft linking loader)*

A>

USER: 9.   Verify that the above files are listed on your screen. These files (except M80.COM and L80.COM) were copied from the CBIOS diskette. If they are not on the screen, contact your dealer or distributor.

              10.   Make the appropriate modifications to the source code.

              11.   Enter

                    M80 =802HBIOS.MAC<CR>

SYSTEM: 12.   Displays

No Fatal Error(s)
A>

*Contact your dealer or distributor for these programs.

USER: 13.   Enter

M80 =802HBOOT.MAC<CR>

SYSTEM: 14.   Displays

No Fatal Error(s)
A>

△

You can choose to modify only one of the above files. If you choose to only modify the 802HBIOS.MAC file, do not enter the command to assemble the 802HBOOT.MAC file (Step 13). Likewise, if you choose to only modify the 802HBOOT.MAC file, do not enter the command to assemble the 802HBIOS.MAC file (Step 11).

USER: 15.   Enter

L80 /P:100,802HBIOS/N,802HBIOS/E<CR>

SYSTEM: 16.   Displays

Data XXX YYY
[ZZZ VVV +]
A>

USER: 17.   Enter

L80 /P:100,802HBOOT/N,802HBOOT/E<CR>

SYSTEM: 18.   Displays

Data XXX YYY
[ZZZ VVV +]
A>

△

If you modified only one file, enter the one appropriate L80 command.

USER: 19.   Enter

DIR<CR>

20.   Check to see if the files you created through the programs M80 and L80, 802HBIOS-.COM and/or 802HBOOT.COM, are listed on your screen. (If they are not there, go back to Step11.)

21.   Insert a clean, formatted diskette into the floppy drive.

22.   Enter

MAKESYS<CR>

SYSTEM: 23.   Displays

MAKESYS Ver. X.Y
Destination Drive?

USER: 24.   Enter

D<CR>

SYSTEM:	25.	Displays
		Bootstrap Filename (Or RETURN To Skip)
USER:	26.	Enter
		802HBOOT<**CR**>
		(if you modified the boot file)
		or
		press
		<**CR**>
		(if you did not modify the boot file).
SYSTEM:	27.	Displays
		BDOS Filename (Or RETURN to Skip)
USER:	28.	Enter
		CPM59<**CR**>
SYSTEM:	29.	Displays
		BIOS Filename (Or RETURN to Skip)
USER:	30.	Enter
		802HBIOS<**CR**>
		(if you modified the BIOS file)
		or
		press
		<**CR**>
		(if you did not modify the BIOS file).
SYSTEM:	31.	Displays
		MAKESYS Completed
		A>
USER:	32.	The system modification is now complete and stored on the floppy diskette. To find out if your modification is successful, boot from the floppy that contains the modified operating system and experiment with it.

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OPERATOR'S QUICK REFERENCE GUIDE

Function	Command	Function	Command
MONITOR		**VISUAL ATTRIBUTES**	
Monitor mode on (transmitted)	ESC U	Normal video (green on black)	ESC G 0
Monitor mode off (transmitted)	ESC X	Invisible normal	ESC G 1
	ESC u	Blink	ESC G 2
		Invisible blink	ESC G 3
USER AND STATUS LINE		Reverse video (black on green)	ESC G 4
Display user line	ESC g	Invisible reverse	ESC G 5
Load user line	ESC f (text) CR	Reverse blink	ESC G 6
Display status line	ESC h	Invisible reverse blink	ESC G 7
LINE LOCK		Underline	ESC G 8
Enable linelock	ESC ! 1	Invisible underline	ESC G 9
Disable linelock	ESC ! 2	Underline blink	ESC G :
DISABLE/ENABLE KEYBOARD		Invisible underline blink	ESC G ;
Disable keyboard	ESC #	Reverse blink underline	ESC G <
Enable keyboard	ESC "	Invisible reverse underline	ESC G =
CURSOR		Reverse blink underline	ESC G >
Home	^^	Invisible reverse blink underline	ESC G ?
New line (LF and CR)	^_	Reverse screen background	ESC b
Carriage return	^M	Normal screen background	ESC d
Linefeed/cursor down	^J or ^V	**SPECIAL GRAPHICS**	
Cursor up	^K or ESC j	Special graphics on	ESC $
Backspace/cursor left	^H	Special graphics off	ESC %
Cursor right	^L	**SCREEN MEMORY**	
Cursor off	ESC . 0	Set lines per page	ESC \ n
Blinking block cursor	ESC . 1	Advance page of memory	ESC K
Steady block cursor	ESC . 2	View previous page	ESC J
Blinking underline	ESC . 3	**AUTO PAGE**	
Steady underline	ESC . 4	Auto page on	ESC v
KEYCLICK AND BELL		Auto page off	ESC w
Keyclick on	ESC >	**PROTECT MODE**	
Keyclick off	ESC <	Half intensity (protected writing) on	ESC)
Ring bell	^G	Half intensity (protected writing) off	ESC (
SMOOTH SCROLL		Protect on	ESC &
Enable smooth scroll	ESC 8	Protect off	ESC '
Disable smooth scroll	ESC 9	**FUNCTION KEYS**	
VIDEO DISPLAY		Program function key	ESC ¦ p1 p2
Screen display on	ESC n		(text) ^Y
Screen display off	ESC o		

OPERATOR'S QUICK REFERENCE GUIDE

Function	Command	Function	Command
ADDRESS/READ CURSOR		Erase screen to nulls	ESC y
Address cursor (row, column)	ESC = r c	Insert on	ESC q
Address cursor (page, row, column)	ESC − p r c	Edit on	ESC r
Read cursor (row, column)	ESC ?	Page on	ESC N
Read cursor (page, row, column)	ESC /	Line on	ESC O
INSERT CHARACTER		**CLEAR**	
Program insert character	ESC e n	Clear unprotected to insert characters	ESC +
TAB			^Z
Set typewriter (column) tab	ESC 1		ESC ;
Typewriter tab	^I	Clear all data to nulls	ESC *
Field tab	ESC i	Clear unprotected to nulls	ESC :
Back tab	ESC I	Clear page to half-intensity insert characters	ESC ,
Clear typewriter tab	ESC 2		
Clear all tabs	ESC 3	**X-ON/X-OFF**	
		Enable X-On/X-Off	^O
COMMUNICATION		Disable X-On/X-Off	^N
Local on	ESC c	**DATA TERMINAL READY**	
Block on	ESC B	Enable DTR	^N
Half duplex on	ESC D H	Disable DTR	^O
Full duplex on	ESC D F	**SEND KEY**	
Return to previous conversational mode	ESC C	Load SEND key	ESC 0 x y
EDIT KEYS		Set send delimiters	ESC x n p1 p2
Local edit keys	ESC k	Send unprotected line to cursor	ESC 4
Duplex edit keys	ESC l	Send unprotected page to cursor	ESC 5
EDITING TEXT		Send line to cursor	ESC 6
Character insert	ESC Q	Send page to cursor	ESC 7
Character delete	ESC W	Send unprotected message	ESC S
Line insert	ESC E	Send entire message	ESC s
Line delete	ESC R	Send terminal identification	ESC M
Erase line to spaces	ESC T	Send status line	ESC Z 1
Erase line to nulls	ESC t	Send user line	ESC Z 0
Erase screen to spaces	ESC Y		

Addendum For: TS 802H Installation and User's Guide
                         Revision B
                         Date Issued: March 10, 1982
                         Document No. B300015-001 (old)
                                       2003900 (new)

Addendum
Document Number: 2003902B

Date Issued: November 23, 1982

This document contains software enhancements for the TS 802H
computer system. The software installation procedure and
Appendices J, K, M, and O of the TS 802H manual have been revised
and included in this addendum. New information on various types
of error messages and using the modem port is also included.

3.1.3 Installing the Operating System onto the Hard Disk

To install CP/M onto the TS 802H hard disk, follow this procedure. Once the installation is complete, you will be able to boot the TS 802H from the hard disk.

All user responses are shown in bold print.

USER:

1. Locate switch S2, dipswitch 6 (S2-6) on the rear of the TS 802H case. (See Figure 3-1.)

2. If S2-6 is open (up), change it to closed (down). If S2-6 is closed, do not change it.

3. Turn on the TS 802H.

4. Insert the system diskette (the floppy diskette that arrived with the TS 802H) into the floppy drive and slowly close the drive door.

5. Press the BREAK key twice while holding down SHIFT.

SYSTEM:

6. Displays

   System "boot" (X-Rev.X) from floppy disk in progress
   TELEVIDEO SYSTEM TS-802H VX.X
   61K CP/M vers 2.2
   Tandon TM-603s Winchester

   A>

                          NOTE!

The drive that the cold boot originates from is accessed as drive A. For example, when the TS 802H is booted from the floppy drive:

1. The floppy drive becomes logical drive A
2. The hard disk becomes logical drives B, C, and D

When the TS 802H is booted from the hard disk:

1. The hard disk becomes logical drives A, B, and C
2. The floppy drive becomes logical drive D

USER:

7. Enter

   DIR<CR>

SYSTEM:	8.	Displays a directory which includes

HFORMAT.COM
FIXDISK.COM

A>

USER: 9. Verify that the above files are listed on your screen. If they are not, contact your dealer or distributor.

10. Enter

HFORMAT<CR>

SYSTEM: 11. Displays

TS-802H Hard Disk FORMAT
TeleVideo Systems, Inc. Version x.y
***CAUTION: ALL DATA ON THE INTEGRAL HARD DISK
WILL BE DESTROYED***
Type RETURN when ready (ESC or ^C to abort.)

USER: 12. Enter

<CR>

SYSTEM: 13. Displays cylinder, head, sector, and count information.

14. Displays, in approximately fifteen minutes,

HFORMAT Complete
A>

15. If errors are found during formatting, specific error messages are displayed.

USER: 16. Enter

FIXDISK B:<CR>

SYSTEM: 17. Displays

FIX DISK PROGRAM VER. X.X
CURRENT SCANNING BLOCK: #__

(displays block numbers as they are scanned by the program)

FIXDISK COMPLETED WITH XXXX DATA BLOCKS ERROR
A>

USER:	18.	Enter
		FIXDISK C:<CR>
SYSTEM:	19.	Displays the messages in Step 17.
USER:	20.	Enter
		FIXDISK D:<CR>
SYSTEM:	21.	Displays the messages in Step 17.
USER:	22.	Enter
		PIP D:=A:*.*[vo]<CR>
		(The CP/M utility program PIP transfers all files on the system diskette to the hard disk logical drive D.)
SYSTEM:	23.	Displays
		A>
USER:	24.	Remove the system diskette from the floppy drive.
	25.	Insert the diskette labeled CBIOS into the floppy drive.
	26.	Enter
		DIR<CR>
SYSTEM:	27.	Displays a directory which includes

```
802HBIOS.COM    (CBIOS module)
TSHBOOT.COM     (Bootstrap module)
CPM61.COM       (BDOS and CCP module)
MAKESYS.COM     (Builds CP/M onto system track)

A>
```

USER:	28.	Enter
		MAKESYS<CR>
SYSTEM:	29.	Displays
		MAKESYS Ver. X.Y Destination Drive?
USER:	30.	Enter
		D<CR>

SYSTEM:	31.	Displays
		Bootstrap Filename (Or RETURN to Skip)
USER:	32.	Enter
		TSHBOOT<CR>
SYSTEM:	33.	Displays
		BDOS Filename (Or RETURN to Skip)
USER:	34.	Enter
		CPM61<CR>
SYSTEM:	35.	Displays
		BIOS Filename (Or RETURN to Skip)
USER:	36.	Enter
		802BBIOS<CR>
SYSTEM:	37.	Displays
		MAKESYS Completed.
USER:	38.	Change S2-6 to the open position.
	39.	Reset the TS 802H (as described in Step 5) to boot from the hard disk.

CHANGING THE DEFAULT LST: DEVICE
USING THE SYSGEN AND DDT PROGRAMS

Your TS 802H arrives with the default LST: device set to TTY: (for devices using Data Terminal Ready for the response to the printer busy status).* The procedure described here enables you to change the default LST: device to UL1: (for devices using ETX/ACK protocol).**

Using the CP/M SYSGEN and DDT programs, you will change a byte in CP/M and save the modified CP/M on the system area of a disk. Follow this procedure. User responses are shown in bold print.

USER: 1. Insert the system diskette containing the
                        files DDT.COM and SYSGEN.COM in the floppy
                        drive.

                    2. Boot the system from the hard disk.

                    3. Enter

                        SYSGEN<CR>

SYSTEM: 4. Displays

                        TELEVIDEO SYSGEN VER x.y
                        SOURCE DRIVE NAME (OR RETURN TO SKIP)

USER: 5. Enter

                        A

SYSTEM: 6. Displays

                        SOURCE ON A:, THEN TYPE RETURN

*Examples of printers using this protocol are Epson or Texas
 Instruments serial printer.
**Examples of printers using this protocol are NEC Spinwriter and
 Diablo.

USER: 7. Enter

                   :

SYSTEM: 8. Displays

                   FUNCTION COMPLETE
                   DESTINATION DRIVE NAME (OR RETURN TO REBOOT)

USER: 9. Enter

                   <CR>

SYSTEM: 10. Displays

                   A>

USER: 11. Enter

                   SAVE 60 CPMXX.COM<CR>

                   (where CPMXX.COM represents the file name
                   of the modified CP/M)

SYSTEM: 12. Displays

                   A>

USER: 13. Enter

                   DDT CPMXX.COM<CR>

SYSTEM: 14. Displays

                   DDT VERS X.Y
                   NEXT PC
                   3D00 0100
                   —

USER: 15. Enter

                   S1FC2<CR>

SYSTEM: 16. Displays

                   1FC2 15

USER: 17. Enter

                        D5<CR>

                        where

                        15 in Step 16 is the code to enable the TTY device
                        D5 changes it to UL1

                        (Table J-1 lists the available device codes)

                             Table J-1

                        Available Device Codes

               Code   Device

               15   TTY: Serial printer, pin 20 for DTR

               55   CRT: Terminal

               D5   UL1: Serial device using ETX/ACK
                                 protocol

                             NOTE!

               In the above procedure, we have selected device
               UL1:.

SYSTEM: 18. Displays

                        1FC3 00

                        (this is the next hexadecimal address)

USER: 19.   Enter

                    .<CR>

                    (BE SURE TO ENTER A PERIOD BEFORE <CR>. This is
                    entered because you do not want to change this
                    address.)

              20.   Enter

                    ^C

SYSTEM: 21.   Displays

                    A>

USER: 22.   To regenerate the modified system, run SYSGEN
                    again.   Enter

                    SYSGEN<CR>

SYSTEM: 23.   Displays

                    TELEVIDEO SYSGEN VER x.y
                    SOURCE DRIVE NAME (OR RETURN TO SKIP)

USER: 24.   Enter

                    <CR>

SYSTEM: 25.   Displays

                    DESTINATION DRIVE NAME (OR RETURN TO REBOOT)

USER: 26.   Enter

                    A>

SYSTEM: 27.   Displays

                    DESTINATION ON A:, THEN TYPE RETURN

USER: 28.   Enter

                    <CR>

SYSTEM: 29. Displays

                 FUNCTION COMPLETE
                 DESTINATION DRIVE NAME (OR RETURN TO REBOOT)

USER: 30. Enter

                 <CR>

SYSTEM: 31. Displays

                 A>

Now you can test your new system by booting the system from the
drive containing the new version. The modifications will not
take effect until the system is booted on the new customized CP/M.

APPENDIX K

PORT ASSIGNMENTS

Description	Hexadecimal Value
Dip switch	00H
Memory latch	04H

CTC:

  Channel

0 (RS 232C optional port P1 baud rate)	08H
1 (RS 232C port P2 baud rate)	09H
2 (not used for port)	0AH
3 (time and date routine)	0BH

SIO No. 1:

  Channel A (RS 422 port P4)

data	0CH
command/status	0EH

  Channel B (internal processor/terminal
interface)

data	0DH
command/status	0FH

SIO No. 2:

  Channel A (RS 232C modem port P1)

data	20H
command/status	22H

  Channel B (RS 232C printer port P2)

data	21H
command/status	23H

DMA	10H
FDD (floppy disk drive)	18H

FDC (floppy disk controller)

      status register   14H
      track register   15H
      sector register   16H
      data register   17H

WDC (5.25-inch hard disk controller)   48H through 4FH

This appendix describes the utility programs for the TS 802H.
The program descriptions are in alphabetical order and contain
user entries and system prompts. READ ALL USER INSTRUCTIONS
BEFORE ENTERING ANY COMMANDS. All user entries are shown in
bold print.

UTILITY

COPYFILE
For: TS 802H, TS 806/20
Configuration Required: User Station/Service
Processor Terminal
Version 2.1
Release date: October 8, 1982
Copyright 1982 TeleVideo Systems, Inc.

PURPOSE

COPYFILE copies files from the hard disk to
floppy diskettes (file back-up) and copies files
from floppy diskettes to the hard disk (file
restore).

This utility allows you to back-up and restore
files that are larger than the capacity of a
single diskette. COPYFILE will divide the file
into as many diskettes as necessary to complete
the back-up operation. Likewise, COPYFILE will
restore a file to the hard disk from several
floppy diskettes.

During the back-up procedure, COPYFILE creates two
files on the floppy diskette(s). The first file
is called the destination file. It contains the
data that is being copied (backed-up) to the
floppy diskette. The second file is called the
status file. COPYFILE uses the status file during
the restoring process. The status file contains
the original (source) file size, information which
allows you to restore the data on several
diskettes in the right order, and the password
given to the file during the back-up procedure.
The password identifies diskettes and the file to
which they belong.

NOTE!

COPYFILE can be executed from user stations or from
a service processor terminal.

EXECUTION

USER:

1. Choose from two possible COPYFILE operations:

Function	Refer to
Back-Up Files (Hard Disk to Floppy Diskettes)	Step 2

Restore Files
(Floppy Diskettes to Hard Disk)   Step 14

2. To back-up a file, enter

    COPYFILE [source drive:filename] [destination
    drive:filename]<CR>

    where

    [source drive:filename] is a combination of
    the drive on which the file to be copied is
    presently located and the name of the file to
    be copied

    [destination drive:filename] is a combination
    of the drive to which the file will be copied
    and the name of the file to be copied

    For example:

    COPYFILE a:prnt.com c:prnt.com

    tells the system to copy the file prnt.com
    located on drive A (source drive or hard disk
    drive) to drive C (destination drive or
    floppy disk drive).

SYSTEM: 3. Displays

                    TELEVIDEO SYSTEMS, INC.
                    COPYFILE VX.X - YY/YY/YY

                    PRESS RETURN WHEN FLOPPY DISK IS READY.

USER: 4. Insert a floppy diskette into the floppy
                     drive.

                 5. Press

                     <CR>

SYSTEM: 6. Displays

                    PLEASE, ENTER PASSWORD: xxxxx

USER: 7. Create a password pertaining to the file being copied. The password can contain up to sixteen alphanumeric characters. Enter

password<CR>

SYSTEM: 8. Displays

BACK-UP PROCEDURE?   (yes or no)

USER: 9. Enter

YES<CR>

to start the file back-up program.

SYSTEM: 10. Displays

COPYING FILE TO FLOPPY DISK

If the file is not larger than the capacity of a single diskette, the system displays

COPY COMPLETED

followed by a system prompt. COPYFILE is now completed and your system is ready for your next command.

11. If the file is larger than the capacity of a single diskette, the system displays

FLOPPY DISK IS FULL, INSERT NEXT FLOPPY.

USER: 12. Insert the next floppy diskette and press

<CR>

to continue with the back-up program. Label each diskette by file name, password, and sequence (i.e. 1 of 3, 2 of 3, 3 of 3) for future use.

13. Watch for one of two messages: the message in Step 10 or the message in Step 11. Follow the designated procedures in either step.

STOP!

IF YOU RECEIVE AN ERROR MESSAGE, REFER TO TABLE
M-1.

USER: 14.   To restore a file from floppy diskettes to
                        the hard disk, enter

                        COPYFILE [source drive:filename] [destina-
                        tion drive:filename]<CR>

                        where

                        [source drive:filename] is a combination of
                        the drive on which the file to be copied is
                        presently located and the name of the file
                        to be copied

                        [destination drive:filename] is a combina-
                        tion of the drive to which the file will be
                        copied and the name of the file to be copied

                        For example,

                        COPYFILE c:prnt.com a:prnt.com<CR>

                        tells the system to copy file "prnt.com" from
                        drive C (origin drive or floppy drive) to
                        drive A (destination drive or hard disk drive).

SYSTEM: 15.   Displays

                        TELEVIDEO SYSTEMS, INC.
                        COPYFILE VX.X - YY/YY/YY

                        PRESS RETURN WHEN FLOPPY DISK IS READY

USER: 16.   Insert the floppy diskette containing the
                        file to be restored to the hard disk. If you
                        have several diskettes containing the file
                        (from the back-up process), insert the
                        diskette containing the beginning of the
                        file, press

                        <CR>

SYSTEM: 17. Displays

PLEASE, ENTER PASSWORD: xxxx

USER: 18. Enter

password<CR>

(given to the diskette during the back-up procedure)

SYSTEM: 19. Displays

BACK-UP PROCEDURE? (yes or no)

USER: 20. Enter

NO<CR>

to begin the restoring process.

SYSTEM: 21. Displays

COPYING FILE FROM FLOPPY DISK

22. If the file to be restored is contained on one floppy diskette, the system displays

COPY COMPLETED

followed by a system prompt. The system is now ready for the next command.

23. If the file to be restored is contained on several diskettes, the system displays

END OF FLOPPY DISK, INSERT NEXT FLOPPY

USER: 24. Insert the next diskette.

SYSTEM: 25. Displays either the message in Step 22 or the one in Step 23. Follow the designated procedures.

STOP!

IF YOU RECEIVE AN ERROR MESSAGE, REFER TO TABLE M-1.

See the CP/M Manual for more detailed information.

DESTINATION FILE WRITE ERROR -
(Return Code #)

The COPYFILE program was not able to write to the destination drive file because of the following possible reasons:

Return Code	Description
1	(Not possible on write)
2	Unsuccessful write operation due to a full disk
3	Cannot close current ext
4	Seek to unwritten extent
5	New extent cannot be cre due to directory overflo
6	Seek past physical end o disk

See the CP/M Manual for more detailed information.

DESTINATION FILE READ ERROR -
(Return Code #)

This message indicates that the destination file was unable to be read for verification due to program error. The return code value is the same as Source File Read Error.

CANNOT FIND NEXT FILE,
INSERT CORRECT FLOPPY

This message indicates that you inserted the wrong floppy diskette into the drive or the file has been deleted from the floppy. During a restore function, you may have inserted a diskette which was out of sequential order.

Table M-1 COPYFILE Error Messages

PASSWORD DOES NOT MATCH
SOURCE FILE PASSWORD IS "XXXX"
PLEASE, ENTER PASSWORD

This message may appear during the restore operation. It indicates that the password entered and the password in the status file are not the same. Check the inserted diskette and the password you entered; make sure they are correct. The correct password (the password the program was expecting) is listed in the string "XXXX."

FATAL VERIFY ERROR

This message indicates that COPYFILE detected a verify error during the restore operation. Probable cause of this error is a bad sector on the hard disk.

VERIFY ERROR
INSERT NEW FLOPPY DISK AND
PRESS RETURN TO CONTINUE

This message indicates COPYFILE detected a verify error during the back-up operation. Insert a new floppy diskette to continue the program.

SOURCE FILE READ ERROR -
(Return Code #)

The COPYFILE program was not able to read the source (origin) file because of the following possible reasons:

Return Code	Description
1	Reading unwritten data
2	(Not possible on read)
3	Cannot close current extent
4	Seek to unwritten extent
5	Not possible on read
6	Seek past physical end of disk

NO DIRECTORY SPACE

This message indicates that the COPYFILE program was not able to create a new file due to overflow in the directory space on the drive. If you are backing-up a file, insert a new diskette or erase old files on the one in the drive. If you are restoring a file, erase old files on the hard disk logical drive you are accessing or switch to the other logical drive.

CANNOT FIND PASSWORD FILE

This message indicates that you inserted the incorrect floppy diskette or that the status file is deleted from the floppy.

CANNOT WRITE FILE SIZE AND PASSWORD

This message indicates that the COPYFILE program was not able to write file size and password to the information file. The diskette may be full of information already.

CANNOT READ FILE SIZE AND PASSWORD

This message indicates that the COPYFILE program was not able to read the file size and password file.

CANNOT FIND SOURCE FILE

This message indicates that COPYFILE program was not able to find the original (source) file.

NO SOURCE FILE

When the command to run COPYFILE was given, no source parameter was given. Check your command and re-enter.

NO DESTINATION FILE

When the command to run
COPYFILE was given, no
destination parameter was
given. Check your command and
re-enter.

UTILITY   FORMAT
Version 3.0
Release date: August 1982
Copyright TeleVideo Systems, Inc. 1982

PURPOSE   FORMAT formats floppy diskettes. Normally, this
program is used only on new diskettes.

EXECUTION

USER: 1. Enter

        [drive:]FORMAT<CR>

        ([drive:] is the drive FORMAT is located on if
        not on the active drive)

SYSTEM: 2. Displays

        TELEVIDEO SYSTEM FLOPPY DISK FORMAT Vx.x

        1. TS-801/802 AS STAND ALONE
        2. TS-801/802 AS SATELLITE USERSTATION
        3. TS-802H AS STAND ALONE/SATELLITE USERSTATION
        4. TS-806
        5. EXIT

        Select system configuration option number

USER: 3. Enter

        3

SYSTEM: 4. Displays

        Insert a diskette into floppy disk drive.
        Press RETURN when ready. (ESC to abort.)

USER: 5. Press

        <CR>

SYSTEM: 6. Displays

formatting . . . .

Formatting Completed.

Insert a diskette into floppy disk drive
Press RETURN when ready. (ESC to abort.)

USER: 7. To format another diskette, remove the diskette in
the floppy drive, insert a new one, and press

<CR>

or

To end the program, press

ESC

SYSTEM: 8. Displays once ESC is pressed

End of Execution
A>

UTILITY	TOD
	For TS 802H
	Version 3.0
	Release Date: August 1982
	Copyright TeleVideo Systems, Inc. 1982

PURPOSE	The TOD utility program allows you to examine and set the correct time and date on your screen. When you power on or reset your system, the local time and date are reset to 0. Use TOD to change this initial value, at your option, to the current date and actual time.
	The date is represented as a month value in the range from 1 to 12, a day value in the range of 1 to 31, and a four-digit year value.
	Time is represented as a twenty-four hour clock, with the hour value from 00 to 11 for morning, and 12 to 23 for the afternoon.

COMMENTS

User must specify a four-digit value for the year (yy). If a two-digit value is entered, the program will assume that the specified year is to be relative to the year 1900.

EXECUTION

There are three ways to use this program:

1. To set the time and date

2. To display the time and date continuously

3. To call up the time and date

To set the time and date:

USER: 1.   Enter

TOD mm/dd/yy hh:mm:ss<CR>

where

mm/dd/yy = month/day/year

hh:mm:ss: = hour:minute:second

SYSTEM: 2.   Displays

                Press any key to set time and date

USER: 3.   When the "time" you specified in your command occurs, press any key. TOD begins timing at that instant.

After setting the time and date at power on/reset, you can display the time and date continuously by entering the following command:

USER: 1.   Enter

                TOD P<CR>

SYSTEM: 2.   Displays

                Current data and time is:

                mm/dd/yy/   hh:mm:ss

                (This message will remain on the screen until you press another key.)

After setting the time and date at power on/reset, you can call up the current date and time by entering the following command:

USER: 1.   Enter

                TOD<CR>

SYSTEM: 2.   Displays

                Current local date and time is: mm/dd/yy/   hh:mm:ss

APPENDIX O

MODIFYING THE TS 802H CBIOS

Before modifying the CBIOS of the system, install CP/M onto the hard disk (described in 3.1.2.3). To generate a new operating system and to know when to make the appropriate modification in the source code, follow this procedure. All user responses are shown in bold print.

USER: 1. Boot the system from the hard disk. Dip switch S2-6, located on the rear of the TS 802H case, must be in the open (up) position.

SYSTEM: 2. Displays

System "boot" (X-Rev.X) from hard disk in progress

TELEVIDEO SYSTEM TS-802H VX.X
61K CP/M vers 2.2
Tandon TM-603s Winchester.

A>

USER: 3. Locate the floppy diskette labeled CBIOS that arrived with the TS 802H.

4. Insert the CBIOS diskette into the floppy drive.

5. Copy all files on this diskette to the hard disk. The files which are now on the hard disk are the ones that will be modified, not the files on the CBIOS floppy diskette.

6. Remove the CBIOS diskette from the floppy drive and store it in a safe place. DO NOT MODIFY THE FILES ON THIS DISKETTE. IT IS YOUR ORIGINAL COPY.

7. Enter

DIR<CR>

SYSTEM: 8. Displays a directory which includes

802HBIOS.MAC	(Links all the modules of CBIOS and stores the addresses of CCP, BDOS, and BIOS entry points for the purpose of future MOVCPM generation)
802HCONS.MAC	(BIOS console and printer driver)
802HHARD.MAC	(Hard disk I/O routine module)
802HFLOP.MAC	(Floppy disk I/O routine module)
802HBOOT.MAC	(Cold/warm boot module)
802HEQU.MAC	(Equates to be used for all modules)
802HDATA.MAC	(Messages, storages, and tables) .
802HSUBS.MAC	(Subroutines)
TSHBOOT.MAC	(Source file for bootstrap loader)
TSHBOOT.COM	(Bootstrap loader)
CPM61.COM	(CP/M file name)
MAKESYS.COM	(Writes CP/M to the system tracks)
M80.COM	(Microsoft assembler)*
L80.COM	(Microsoft linking loader)*

A>

USER: 9. Verify that the above files are listed on your screen. These files (except M80.COM and L80.COM) were copied from the CBIOS diskette. If they are not on the screen, contact your dealer or distributor.

           10. Make the appropriate modifications to the source code.

           11. Enter

              M80 =802HBIOS<CR>

Note!

Be sure to enter a space after typing M80.

*Contact your dealer or distributor for these programs.

SYSTEM: 12. Displays

              No Fatal Error(s)
              A>

USER: 13. Enter M80 =TSHBOOT<CR>

SYSTEM: 14. Displays

              No Fatal Error(s)
              A>

                              Note!

              You can choose to modify only one of the above
              files. If you choose to only modify the
              802HBIOS.MAC file, do not enter the command to
              assemble the TSHBOOT.MAC file (Step 13). Like-
              wise, if you choose to only modify the
              TSHBOOT.MAC file, do not enter the command to
              assemble the 802HBIOS.MAC file (Step 11).

USER: 15. Enter

              L80 /P:100,802HBIOS/N,802HBIOS/E<CR>

                              Note!

              Be sure to enter a space after typing L80.

SYSTEM: 16. Displays

              Data XXXX YYYY
              [ZZZZ VVVV W]
              A>

USER: 17. Enter

              L80 /P:100,TSHBOOT/N,TSHBOOT/E<CR>

SYSTEM: 18. Displays

Data XXXX YYYY
[ZZZZ VVVV W]
A>

Note!

If you modified only one file, enter the one appropriate L80 command.

USER: 19. Enter

DIR<CR>

20. Check to see if the files you created through the programs M80 and L80, 802HBIOS.COM and/or TSHBOOT.COM, are listed on your screen. (If they are not there, go back to Step 10.)

21. Insert a clean, formatted diskette into the floppy drive.

22. Enter

MAKESYS<CR>

SYSTEM: 23. Displays

MAKESYS Ver. x.y
Destination Drive?

USER: 24. Enter

D<CR>

SYSTEM: 25. Displays

Bootstrap Filename (Or RETURN To Skip)

USER: 26. Enter

                    TSHBOOT<CR>

                    (if you modified the boot file)

                    or

                    enter

                    <CR>

                    (if you did not modify the boot file).

SYSTEM: 27. Displays

                    BDOS Filename (Or RETURN to Skip)

USER: 28. Enter

                    CPM61<CR>

SYSTEM: 29. Displays

                    BIOS Filename (Or RETURN to Skip)

USER: 30. Enter

                    802HBIOS<CR>

                    (if you modified the BIOS file)

                    or

                    enter

                    <CR>

                    (if you did not modify the BIOS file).

SYSTEM: 31.   Displays

                     MAKESYS Completed
                     A>

USER: 32.   The system modification is now complete and stored
                     on the floppy diskette. To find out if your
                     modification is successful, boot from the
                     floppy that contains the modified operating
                     system and experiment with it.

USING THE MODEM PORT

The IOBYTE has been upgraded to support the modem port for each logical device. The corresponding physical device assignments are:

```
                    logical        physical

                     CON:           UC1:
                     RDR:           UR1:
                     PUN:           UP1:
                     LST:           LPT:
```

To set the I/O byte for the various logical devices in order to use the modem port for use of a modem or a second printer:

1) For communication to a terminal through ports P1 and P2:

```
    +-------------------------(b)-------------------+
    |          +------------(a)---------------+     |
    |          |                              |     |
  +--+--+-----+--+--+                +------+---+-----+
  |  +--+     +--+  |                |      +---+     |
  |  P1       P2    |                |   RS 232 port  |
  |                 |                |                |
  +-----------------+                +----------------+
        TS 802H                            Terminal
```
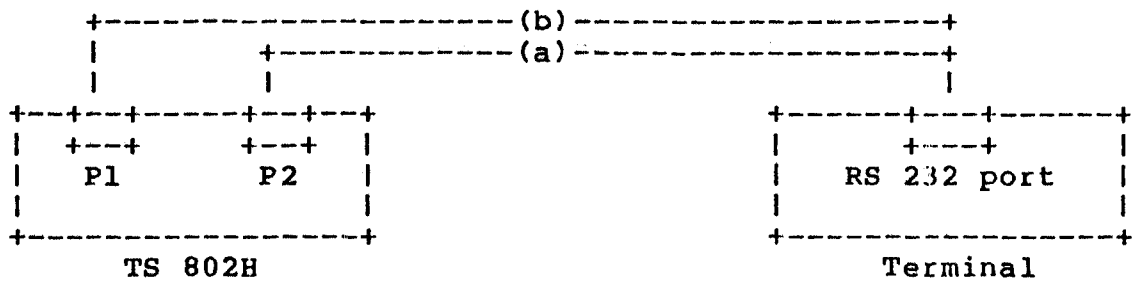
    (a) STAT CON:=TTY: (through P2: printer port)
         Cable needed: Straight

    (b) STAT CON:=UC1:   (through P1: RS 232 modem port)
         Cable needed: Crossover (refer to cable configuration)

2) For communication to a printer through ports P1 and P2:

```
    +----------------------(d)-----------------------+
    |          +--------(c)----------+               |
    |          |                     |               |
  +--+--+---+--+--+             +---+---+---+     +--+---+---+
  |  +--+   +--+  |             |   +---+   |     |  +---+   |
  |  P1     P2    |             |           |     |          |
  |              |              +-----------+     +----------+
  +--------------+                 printer           printer
      TS 802H
```
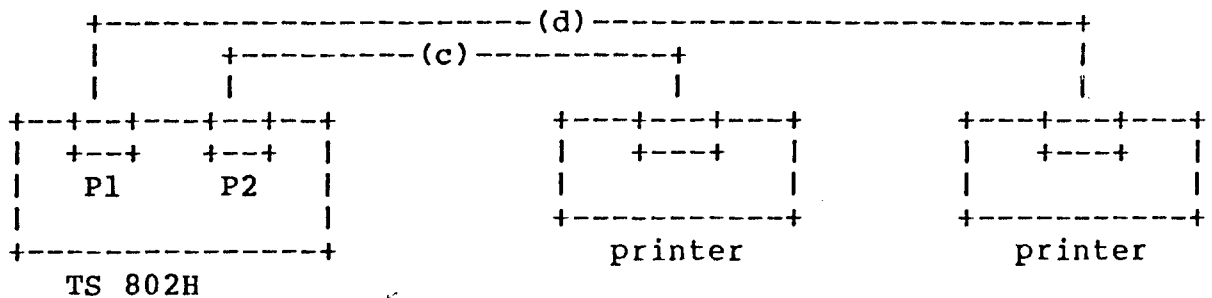
(c) To send a file from the printer port to a printer;
    if defalt is LST:=TTY:, then PIP LST:=file name
    otherwise, STAT LST:=TTY:
                PIP TTY:=file name

    Cable needed: Straight

(d) To send a file from the modem port to a printer;
    if default is LST:=LPT:, then PIP LST:=file name
    otherwise STAT LST:=LPT:
                PIP LPT:=file name

    Cable needed: Crossover

3) For communication to a terminal through a modem:

```
        +-(e)-----+
        |         |
+---+---+---+     |
|   +---+   |     |   +-------+         +-------+      +----------+
|  RS 232   |     +---+       |~~~~~~~~~|       |      |          |
|modem port |     |   |       |         |       |------|          |
+-----------+     +---+-------+         +-------+      +----------+
   TS 802H              modem             modem            DTE
```

(e) STAT CON:=UC1: (from modem port through modem to
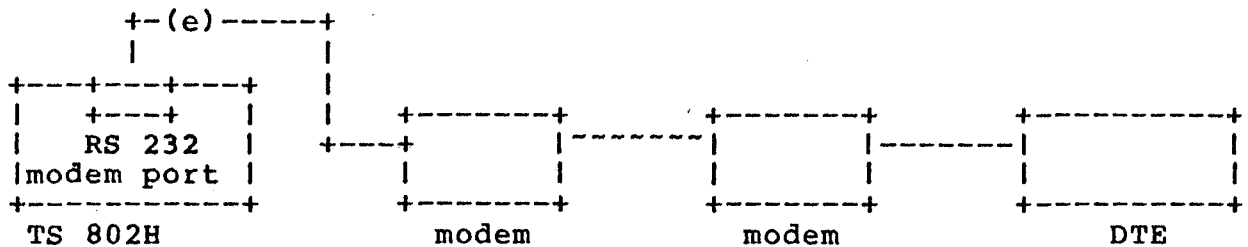   a terminal)

    Cable needed: Straight

    Note: P1 indicates RS 232 port
           P2 indicates printer port

CABLE CONFIGURATION:

(1) Straight - straight RS 232 cable

(2) Crossover -   modem port   printer/crt port
                       pin #   pin #

                         1   ~~~~~~~~~~~~~~~~   1
                         2   ~~~~~~~~~~~~~~~~   3
                         3   ~~~~~~~~~~~~~~~~   2
                         4   ~~~~~~~~~~~~~~~~   5
                         5   ~~~~~~~~~~~~~~~~   20
                         7   ~~~~~~~~~~~~~~~~   7
                         8   ~~~~~~~~~~~~~~~~   4
                        20   ~~~~~~~~~~~~~~~~   6 and 8

The logical devices as configured in the BIOS are the following:

Console (CON:)

TTY:	input/output from/to printer port
CRT:	input/output from/to CRT port
BAT:	current RDR device for input
	current LST device for output
UC1:	input/output from/to modem port

Reader   (RDR:)

TTY:	input from printer port
PTR:	input from CRT port
UR1:	input from modem port
UR2:	user-defined reader #2
	(not defined)

Punch   (PUN:)

TTY:	output to printer device
PTP:	output to CRT device
UP1:	output to modem port
UP2:	user-defined punch #2
	(not defined)

List   (LST:)

TTY:	output to printer device (standard)
CRT:	output to CRT device
LPT:	output to modem port
UL1:	output to ETX/ACK protocol

APPENDIX Q

ERROR MESSAGES

The format of the error message generated by BIOS is given below. The FDC status code for the floppy disk I/O activity and WDC status and error code for the hard disk I/O activity are also given by hexadecimal number.

1) Message format for floppy disk I/O error:

   "Bios (Read/Write) Error on (current drive name):"
   "Track = (xx), Sector = (xx)"
   "FDC status = (xx)H"

FDC Status Code Summary

For: High Order Byte

Hex	Bit	Read Sector	Write Sector
8	S7	NR	NR
4	S6	N/A	WP
2	S5	RT	WF
1	S4	RNF	RNF

For: Low Order Byte

8	S3	CRC	CRC
4	S2	LD	LD
2	S1	DRQ	DRQ
1	S0	BUSY	BUSY

Description of FDC Status Code

Bit	Code	Description
S7	NR	Drive is not ready.
S6	WP	Write protected.
S5	RT/WF	Error on a read record: RT Error on a write record: WF RT: record type from data field addr mark (1=deleted data mark, 0=data mark) WF: write fault
S4	RNF	Desired track, sector, or side was not found.
S3	CRC	CRC error: If S4 is set, error is in the ID fields. If S4 is not set, error is in the data field.
S2	LD	Lost Data The computer did not respond to DRQ in 1 byte time.
S1	DRQ	Data request: Data register is full on Read operation. Data register is empty on Write operation.
S0	BUSY	Command is under execution.

Example:

IF the FDC status = 10H, this indicates that record is not found.

2) The message format for hard disk I/O error is as follows:

"Bios (Read/Write/Restore/Unknown) Error on (current drive name):"
"Track = (xxx), Sector = (xx)"
"WDC status = (xx)H, WDC error = (xx)H"

WDC Condition Code and Description

For: High Order Byte

Hex	Bit	Status	Error
8	7	Busy	Bad block detected
4	6	Ready	CRC error – Data field
2	5	Write Fault	CRC error – ID field
1	4	Seek Complete	ID not found

For: Low Order Byte

Hex	Bit	Status	Error
8	3	Data Request	N/A
4	2	N/A	Aborted Command
2	1	N/A	Track000 Error
1	0	Error	Data address mark not fou

Examples:

If the WDC status = 01H, this indicates error(s) in the Error register.
If the WDC error = 40H, this indicates a CRC error in the data field.

APPENDIX R

USING THE TIME AND DATE CAPABILITY IN APPLICATIONS PROGRAMS

INTERFACING TO THE LOCAL TIME AND DATE

To access the local date and time, a user program must first read a two-byte address from location 001BH and 001CH (LSB,MSB). Next, add the offset 19 (13H) to it. The sum is the address of date and time function.

Call this address to GET/SET the current date and time.

```
    Entry ------->  +---------------------+  ------> Return
                    | local date and time |
    C = control     |       function      |  A = error flag
                    +---------------------+
    DE= buffer pointer                       DE= buffer pointer
```

TO GET THE CURRENT DATE AND TIME:

Upon entry, a user program sets C-reg = 0 and DE = address of the 22-byte, user-defined, date and time buffer.

Upon return, buffer will contain the current date and time (in ASCII format) as follows:

```
    buffer
    ----->  0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1

            M M x D D x Y Y Y Y x H H x M M x S S x N N
```

Note: The get date and time routine will not alter the characters in position "x" of read buffer; users can define their own field delimiter in position "x" of read buffer.

If error flag = 0 then date and time is initialized.
If error flag = 1 then date and time are not initialized.

TO SET THE CURRENT DATE AND TIME:

Upon entry, a user program sets C-reg = 1 and DE = address of
the 22-byte, user-defined, date and time buffer.

```
    buffer
    -----> 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1

           M M x D D x Y Y Y Y x H H x M M x S S x x x
```

Note: x = undefined
Upon return, the local date and time is set as specified in the
buffer, and 1/100 of second counter is reset to zero.