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

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1. INTRODUCTION

1.1 INTRODUCTION TO THIS MANUAL

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

When the TS 802 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 802'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 802 regardless of your past experience with computers.

If you are using your TS 802 as a user station and service processor terminal 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 802 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 802 is a tabletop computer which contains two floppy disk drives, a logic board, a terminal with the capabilities of TeleVideo's Model 950, a Z80A microprocessor, 64K of RAM memory, and a 4K EPROM for diagnostics. The disk drives use 5 1/4-inch double-sided, double-density floppy diskettes (also sometimes called *minidiskettes*) with a combined capacity of 1.0 Mbytes of unformatted disk storage.

The microprocessor within the TS 802 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.

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

1.3.2 Disk Drives

The TS 802 has two floppy disk drives (designated A and B when the TS 802 is used as a stand-alone computer). The drives are located behind the two doors on the front of the system (Figure 1-1). Much like a phonograph, the drive has a head or arm which is lowered onto the 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.

1. INTRODUCTION
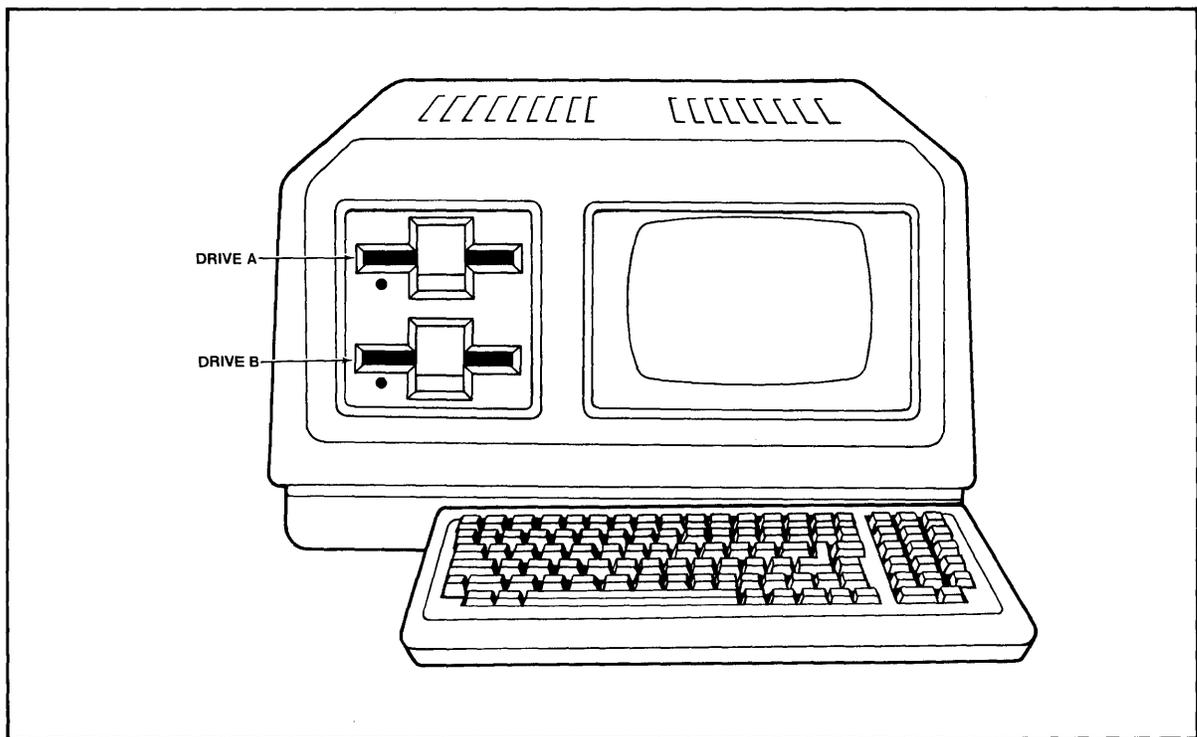
Figure 1-1   Drives A and B

1.3.3   Diskettes

Application programs, text, data, and the programs which operate the TS 802 are stored on the diskettes (Figure 1-2). The drive heads automatically read both sides of the diskettes. The total formatted capacity of the system (with two floppy disk drives) is 0.74 Mbytes. The TS 802 can use any diskette which meets the specifications given in Appendix C. New diskettes must be formatted before data can be stored on them (as explained in Section 3.2.1 and Appendix M).

Each diskette has a magnetic coating on both sides. It arrives in a protective black plastic cover which is NOT removable. 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 is 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 802 allow you to connect peripheral devices as described in Table 1-1.

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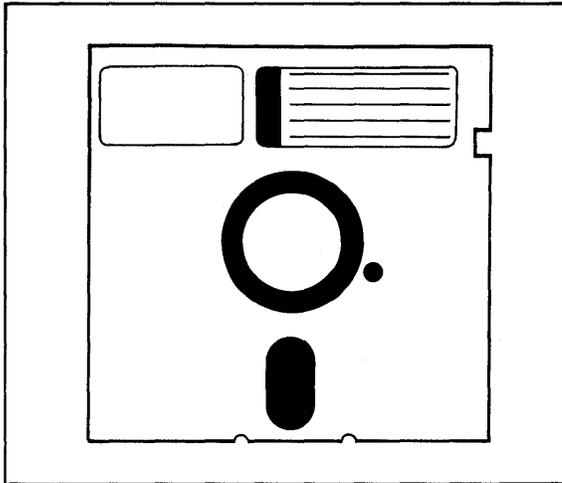
Figure 1-2   Floppy Diskette
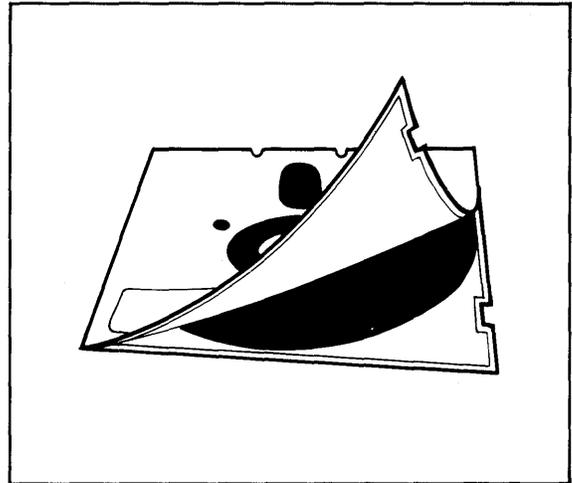
Figure 1-3   Diskette Inside Permanent Plastic Enclosure

Table 1-1   TS 802 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 802 to be used with a serial printer. 3. Changing a dipswitch allows the TS 802 to be used as a service processor terminal with the TS 806/816 system console port.
RS422	This highspeed serial port connects the TS 802 to the TS 806 or TS 816 for use as a user station.

1.4   SOFTWARE CONFIGURATION

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*.

When the TS 802 is used as a stand-alone computer, its operating system is loaded into memory from the system diskette whenever it is turned on. When the TS 802 is a user station, the operating system is loaded from the central processor (TS 806/816). All TeleVideo computers use CP/M (Control Program for Microcomputers) Operating System software, developed by Digital Research.
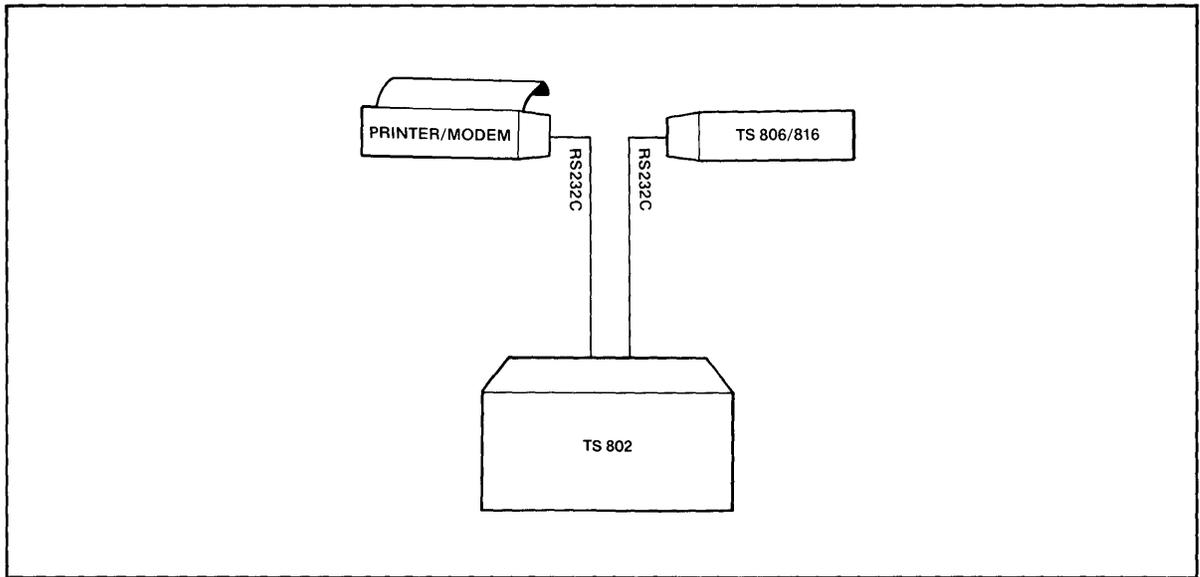
a. As a Terminal
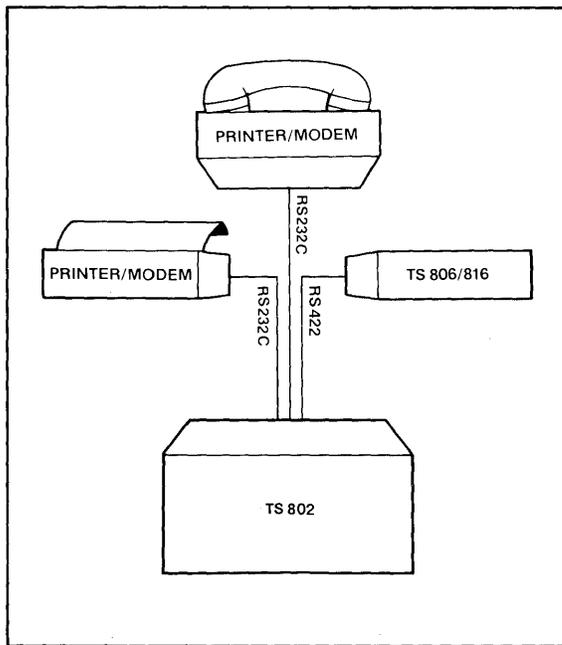
b. As a User Station
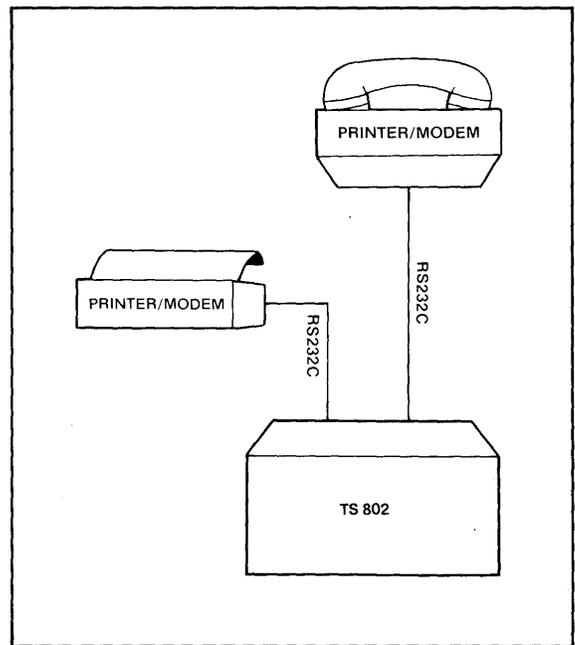
c. As a Stand-Alone

Figure 1-4   Possible TS 802 Configurations

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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 802 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 are used in a multiuser environment (TS 806/816) 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 TeleVideo's Model 950 may need to be modified since the integral TS 802 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 802. 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 terminal features in your programs. Chapter 7 tells how to care for the TS 802 and what to do if you have a problem with it.

In the Appendices are the specifications, limited warranty, suggested references, technical information on installation, utility program descriptions, and reference charts. The inside back cover contains the Operator's Quick Reference Guide, a summary of all control and escape commands used by the TS 802'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. INTRODUCTION

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 $\wedge$ plus the control character (e.g., $\wedge$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 802 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 opening the inner box carefully, turn it over on its side, and slide out the foam sides and the TS 802. Remove the foam from the sides, and slide the TS 802 gently out of the plastic bag. The documentation is enclosed in an envelope.
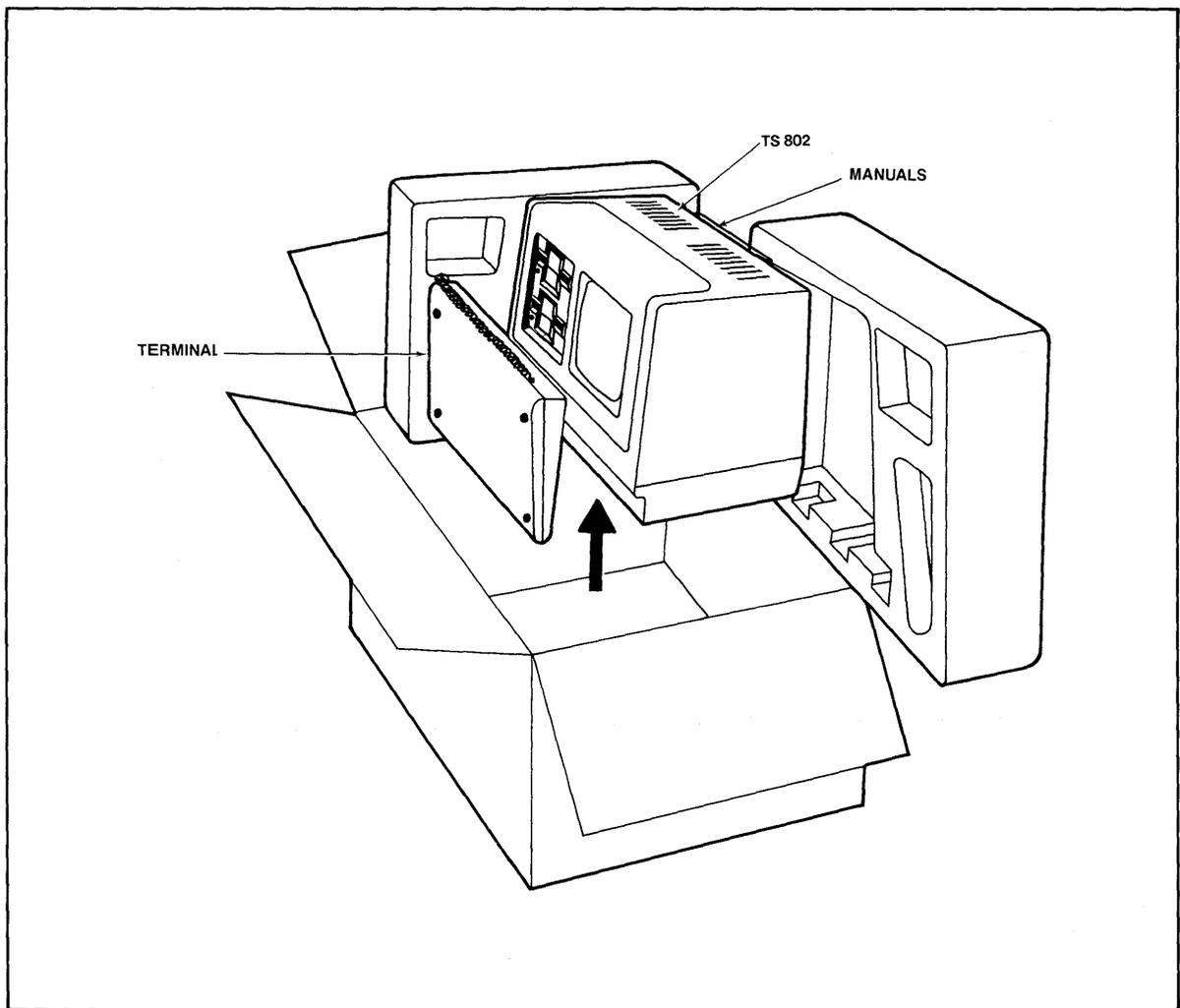
Figure 2-1   TS 802 as Packed in Container

△

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

2. Envelope containing the following items:

    a. Digital Research CP/M User Manual

    b. TS 802 Computer System Installation and User's Guide

    c. CP/M Licensing Agreement (inside CP/M manual)

    d. Two diskettes
       CP/M (system diskette)
       CBIOS (source listing of system BIOS)

$$\triangle$$

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 INSTALLATION 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 802 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 802 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

△

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 802 is a user station to a TS 806/816, they should be within 300 feet of each other. If the TS 802 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 serial printer should be within 50 feet of the TS 802.

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

13.62 inches (34.6 cm) high
22.47 inches (56.0 cm) wide
14.37 inches (36.5 cm) deep plus keyboard [7.5 inches (19.05 cm)]

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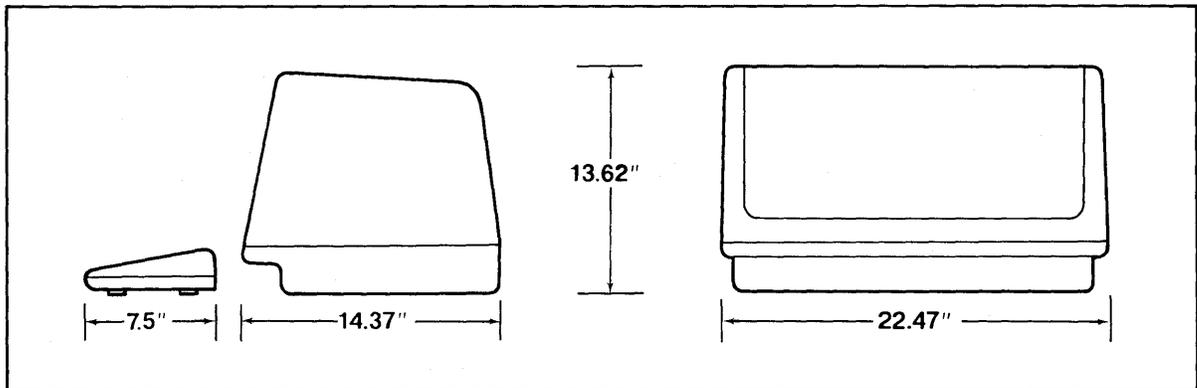
Figure 2-2   Outside Dimensions

2.3.3   General Environment

The TS 802 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, electrical appliances, or equipment (such as elevators, radio transmitters, television sets) which generates magnetic fields.

2.   INSPECTION AND INSTALLATION

2.4   INSTALLATION

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

2.4.1   Cables

To connect the TS 802 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 802. 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.
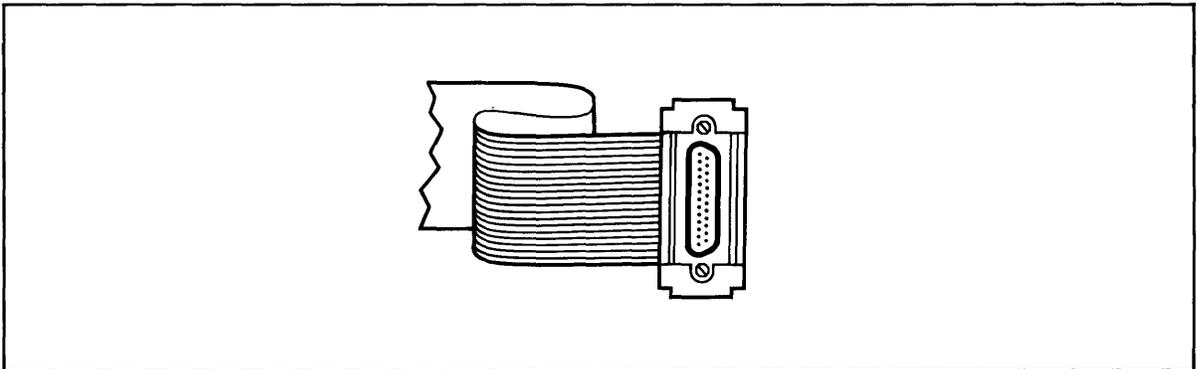
Figure 2-3   Cable Connector

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.
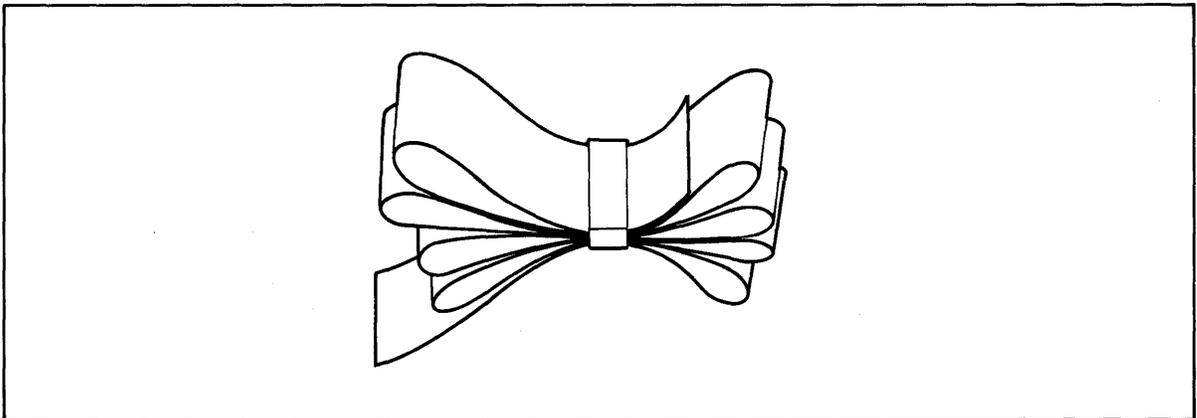
Figure 2-4   Correctly Folded Excess Cable

$\triangle$

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 (P6).

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 802 as a Stand-Alone

If you use the TS 802 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 802. Check settings for S2 dipswitches as described in Appendix G.

2.4.4 Connecting the TS 802 as a Terminal to a TS 806/816

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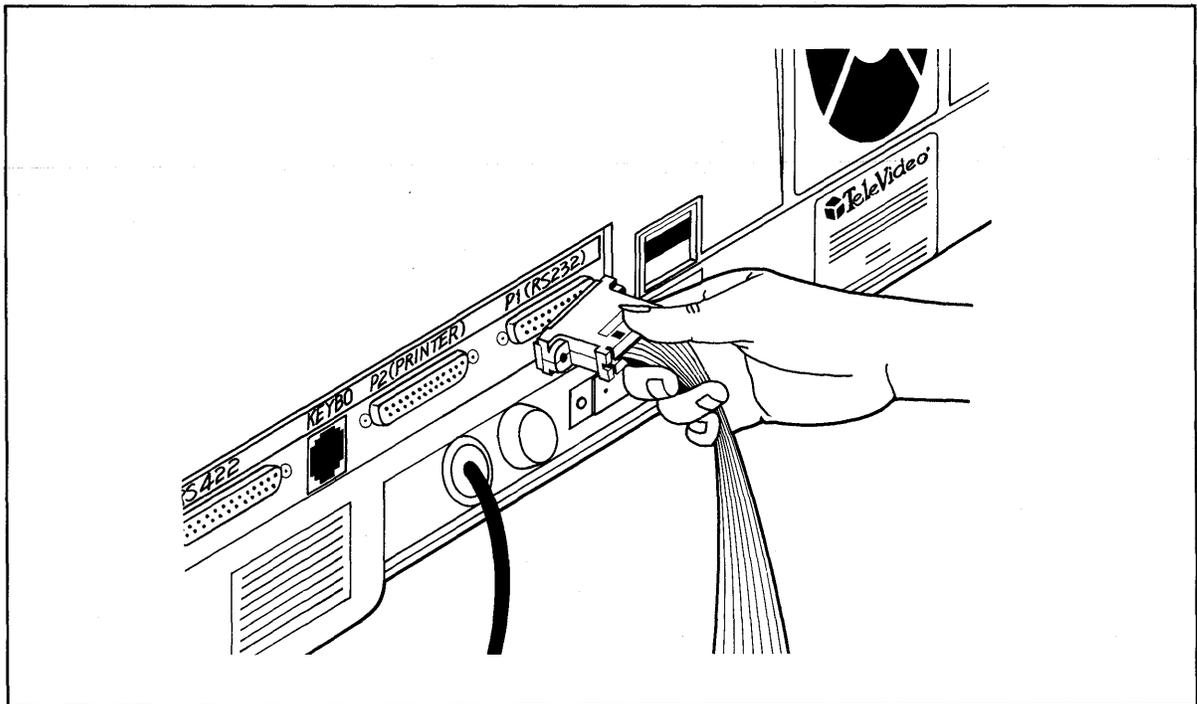
Figure 2-5   Attaching Terminal Connector

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 802. The switch settings are described in Appendix G. Figure 2-6 shows the switch locations. Set the dipswitches of S2 for a terminal (as described in Appendix G).

Figure 2-6   Location of Switches on Rear Panel

The terminal which is contained in the TS 802 is set to operate at:

- Full duplex
- Eight bits
- One stop bit
- No parity

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

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

Attach one end of an RS422 interface cable to the TS 802 (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 operator's manual).

Set the S2 dipswitches (Appendix G) for a user station configuration.

2.4.6   Connecting a Serial Printer

Your TS 802 can be connected to an auxiliary serial printer to make a permanent hard copy of data. The TS 802's serial printer interface allows the TS 802 to be used with most RS232-compatible serial printers currently available on the market. 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.

2. INSPECTION AND INSTALLATION

The RS232C serial port which is 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* to be connected to printers, cut traces and install jumpers on the printed circuit board (as described in Appendix I) before attaching the RS232C interface cable.

Addresses for RS232C ports are given in Appendix K.

The second diskette included with the TS 802 is labeled *CBIOS*. This diskette allows you to modify the default printer device from one serial type to another and 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 802. The RS232C port which is labeled *P1* is ready to interface to a modem.

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

To connect two modems to the TS 802, 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 802

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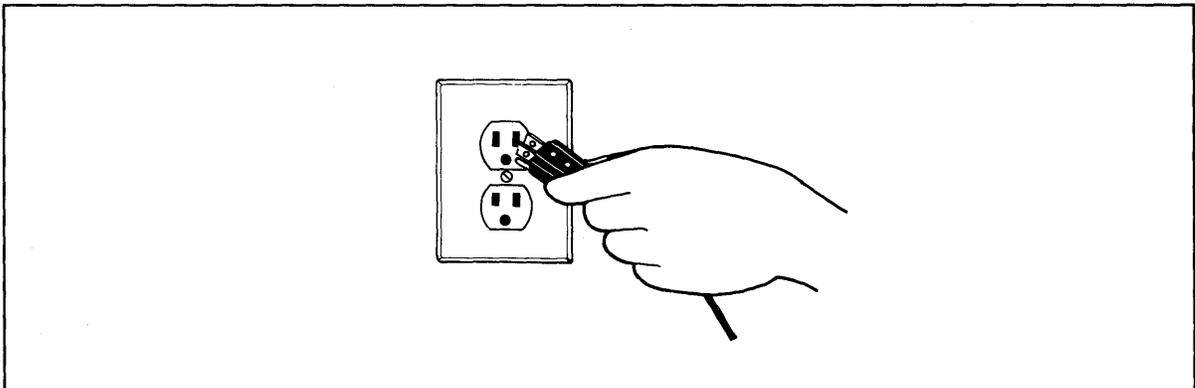
Figure 2-7   Plugging TS 802 into Wall Outlet

2.5 CHECKLIST OF INSTALLATION INSTRUCTIONS

1. Did you check the TS 802 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 802 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 802 and peripherals into the wall outlet?

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

3. OPERATION

3.1 START UP

3.1.1 Power On

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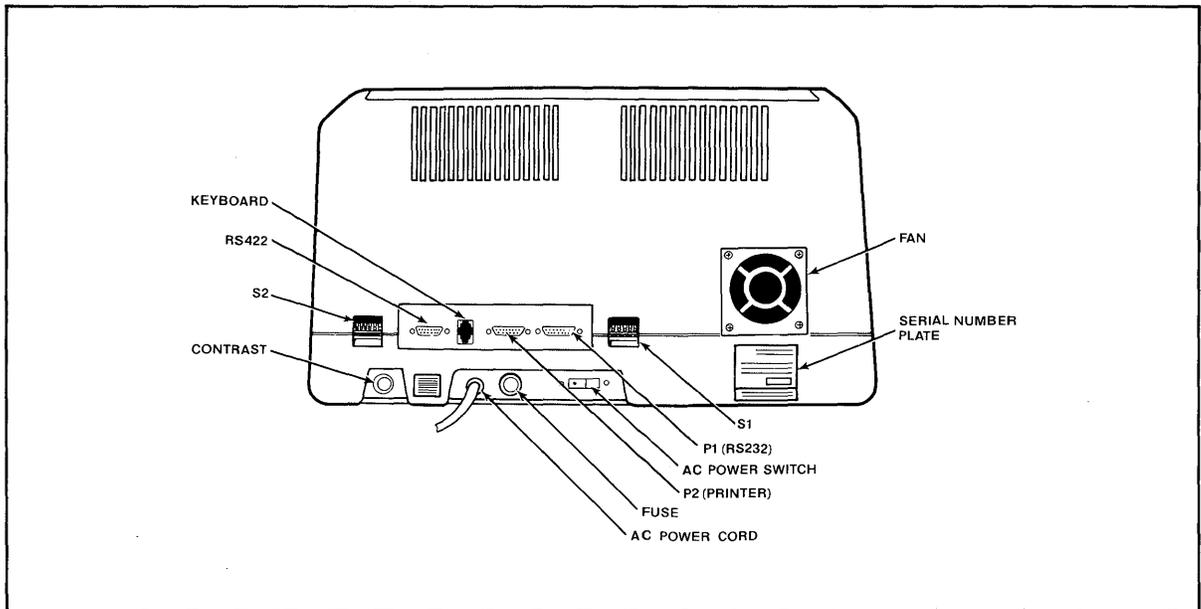
Figure 3-1   Rear Panel

3.1.2 Inserting the Diskette

One of the diskettes supplied with your TS 802 is labeled "CP/M Version X.X"; this contains your copy of the CP/M operating system programs.

Drive A is the top drive. This is where the diskette labeled "CP/M" will be used. This diskette contains the basic operating instructions for the system and will be referred to as the *system diskette*. The bottom drive is Drive B.

Put your finger under the doorhandle of Drive A and flip it open gently.

△

BEFORE TURNING POWER ON OR OFF, ALWAYS MAKE SURE THE DRIVE DOORS ARE 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 doors are open, the disk head is away from the diskette surface.

Take the system diskette out of its white paper jacket. Hold the diskette by the edge of the black plastic cover.

3. OPERATION
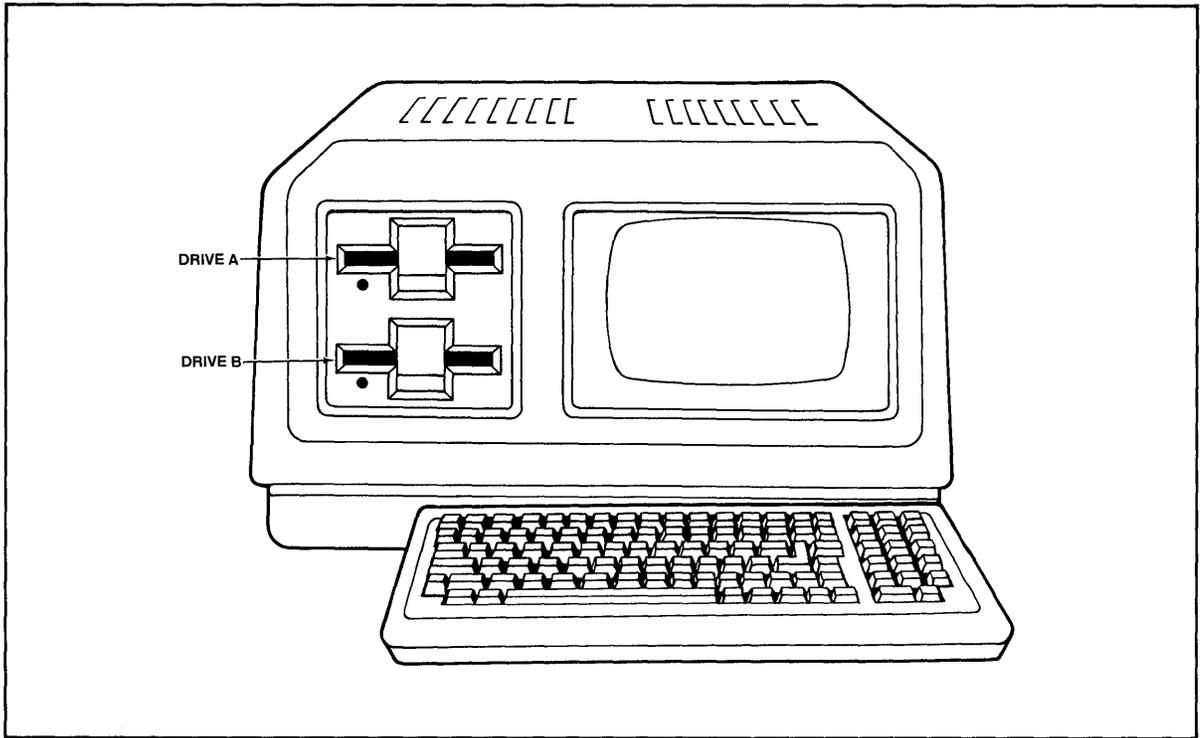
Figure 3-2   Location of Drives A and B
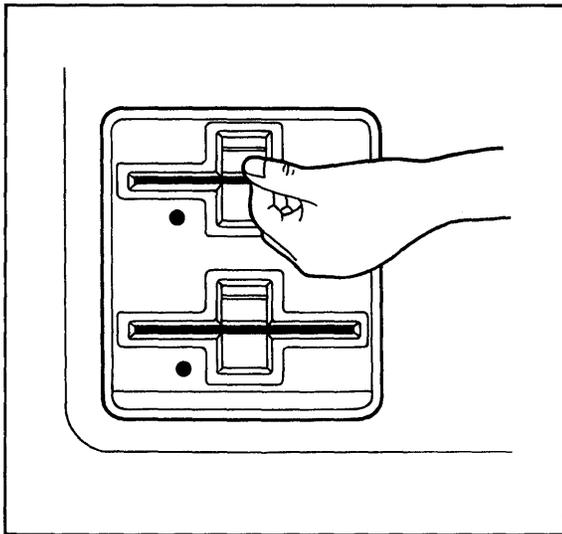
Figure 3-3   Opening Drive A Door
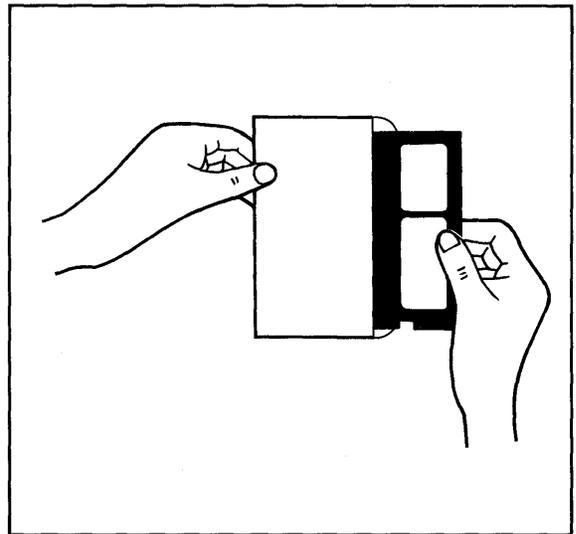
Figure 3-4   Removing Diskette
From Jacket

△

*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 diskette can not be overwritten accidentally. Put a Write-Protect tab (furnished with each package of blank diskettes) over the notch on the system diskette.
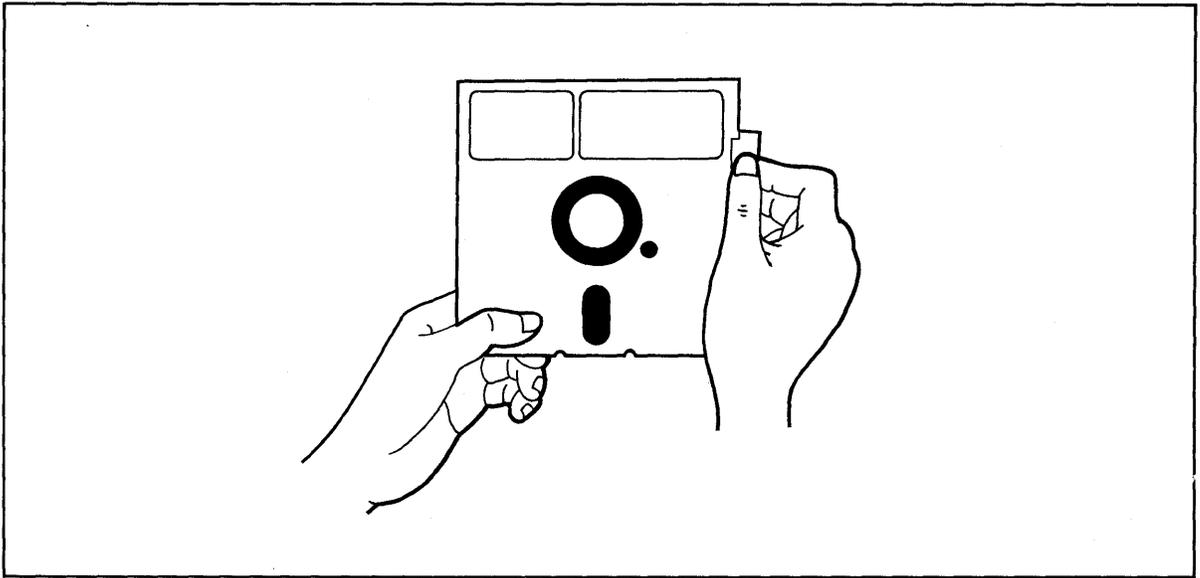
Figure 3-5   Write Protecting Diskette

Turn the diskette so the notch is on the left side.
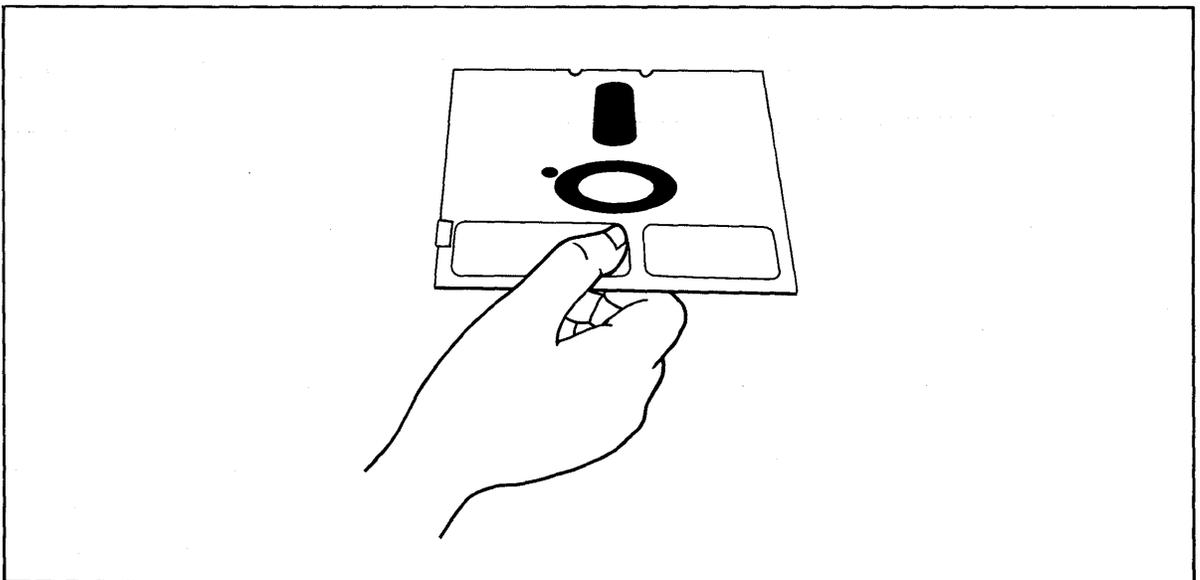
Figure 3-6   Holding Diskette Before Insertion

Hold the diskette level, with the notch on the left side and the oblong hole in the diskette cover towards the back of the diskette. Insert it in the opening of Drive A (the top drive). Using the tip of your finger, push it gently in the rest of the way.

Δ

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

Close the drive door slowly.
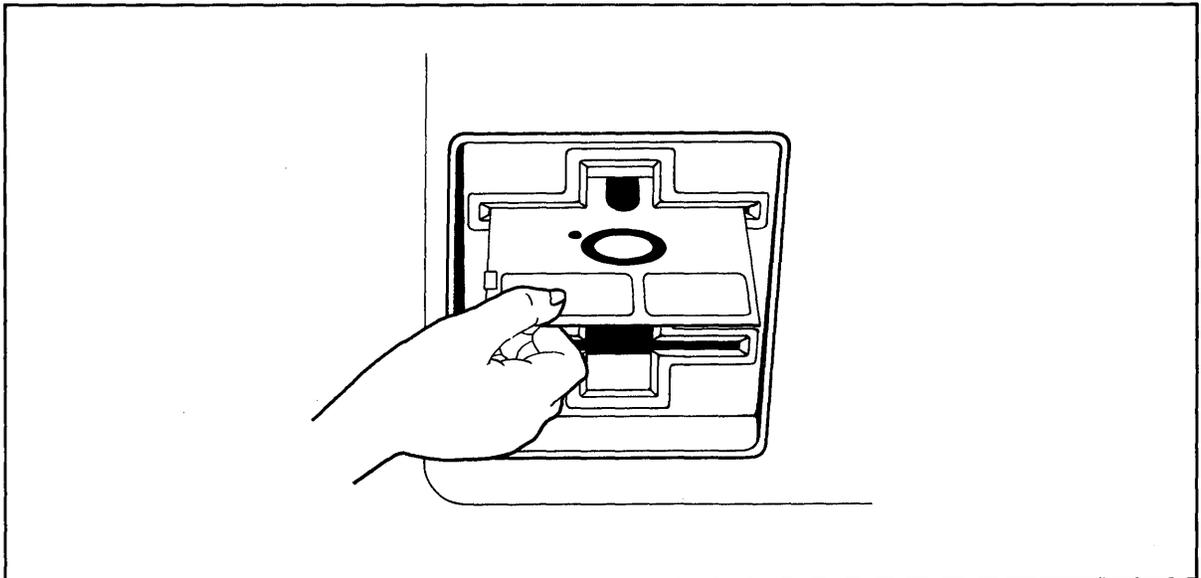
Figure 3-7   Inserting Diskette in Drive A

3.1.3   Loading the Operating System Programs

3.1.3.1   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 diskette but any data in memory (but not on diskette yet) 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 802, 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 would be the first character entered in response to a system prompt and in application programs when allowed.

3. OPERATION

When you first insert the system diskette and close the drive door, you will probably hear a whirring sound--this is normal. After the sound stops, you should see the following message on the terminal's display screen:

System "boot" (x-Rev. x) from floppy disk in progress
TELEVIDEO SYSTEM TS-802 Vx.x 62k
CP/M vers X.X

A>

If no message appears, press BREAK twice while holding down SHIFT. (If necessary, refer to Section 7.2, Troubleshooting.)

The line which shows *62k CP/M vers X.X* refers to the configuration of the CP/M operating system. The memory space which is available to you is determined by the configuration.

3.1.3.2   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 (A or B).

△

The appropriate response to the prompt will be shown here in BOLD LETTERS.

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 part of this test, you will see the following message instead of the initial system message:

Hardware Error (   ); Call Your Distributor

Within the parentheses will be a three-letter 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
CIC	Counter timer circuit
SIO #1	Serial I/O controller
SIO #2	Serial I/O controller
FDC	Floppy disk controller

If you see this message, perform a reset once or twice and 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   Summary of Normal Start Up Procedures

1. Turn on the power.

2. Insert the system diskette in Drive A and close the drive door.

3. Look for the system prompt (A>) on the CRT.

4. If the prompt does not appear, press BREAK twice while holding down the SHIFT key.

3.2   FORMATTING DISKETTES

Your system diskette contains a utility program called *FORMAT*. 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 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.

A blank diskette should be formatted now so you can make a back-up copy of the master system diskette.

$$\triangle$$

It is important for you to copy the system diskette before you start using the TS 802. Then you can use the copy for everyday use and keep the original system diskette as a back-up in case the working copy is damaged or wears out.

3.2.1   Using the FORMAT Program

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

3.3   COPYING THE SYSTEM DISKETTE

A utility program called *COPYDISK* allows you to copy a complete diskette quickly. Use COPYDISK, as described in Appendix M, to copy the master system diskette onto a blank diskette.

After you copy the master system diskette, remove it from Drive A and store it in a secure place. Move the copy of the system diskette from Drive B to Drive A and perform a reset.

3. OPERATION

3.4 WHEN YOU ARE FINISHED . . .

When you are finished using the system, follow these steps:

1. Remove diskettes from both drives.

2. Turn off the power.

🛑

ALWAYS OPEN BOTH DRIVE DOORS BEFORE TURNING THE POWER TO THE SYSTEM AND TERMINAL 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.*

$$\Delta$$

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.

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.)
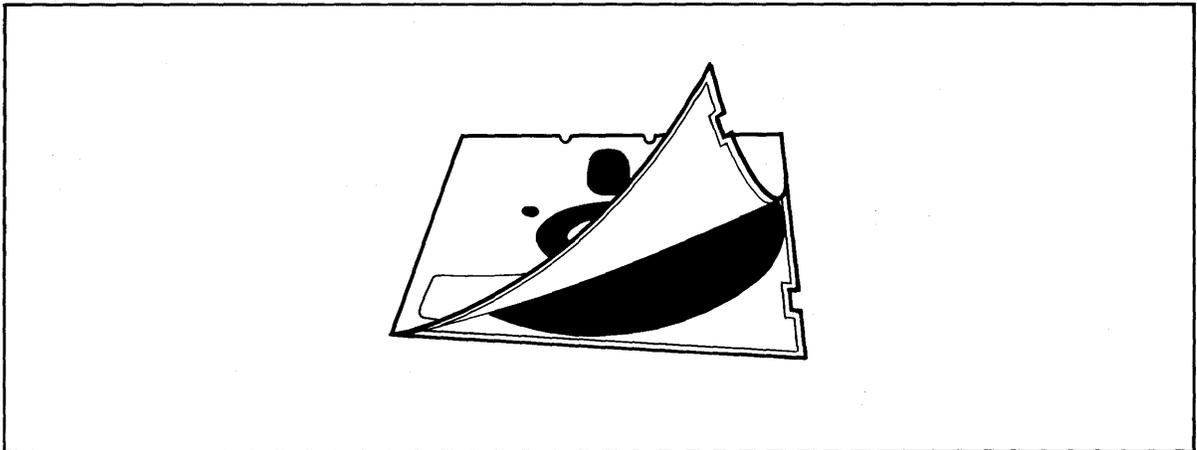
Figure 4-1 Diskette and Protective Lining
Inside the Protective Black Plastic Enclosure

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

4.2.2 Storing Diskettes

Store the 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.

4.3 WRITE-PROTECTING DISKETTES

When information from one diskette is copied onto another diskette, it may erase or superimpose new data on the information originally there. 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. When the tab is over the notch, the drive cannot write on the diskette. When you want to remove the protection, just remove the tab from the diskette.
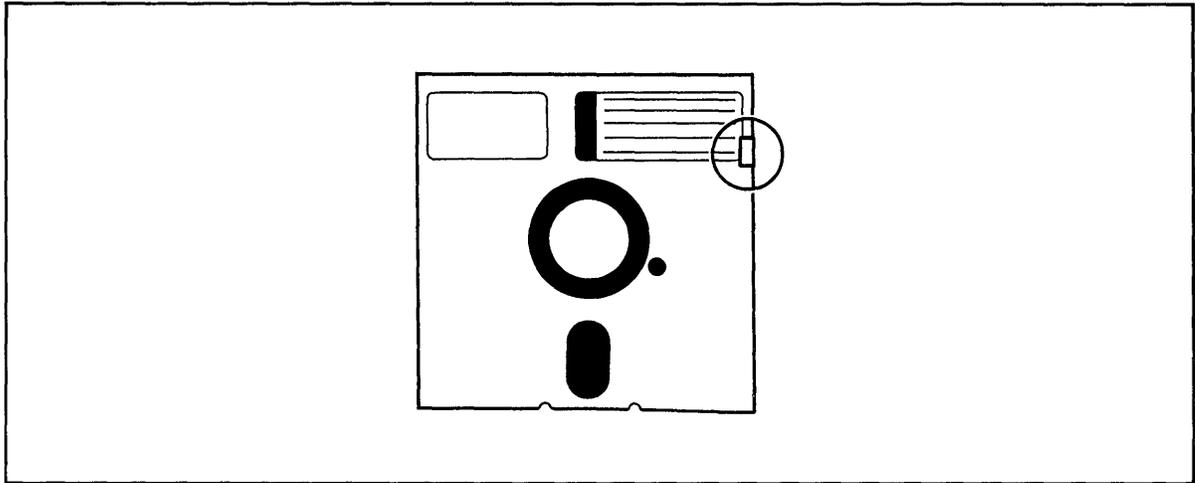
Figure 4-2   Write-Protected Diskette

4.4   BACKING UP DISKETTES

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 diskette on a regular basis using the utility program COPYDISK.

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 diskettes. One of the more common methods uses two back-up copies and one current diskette. You start by making back-up Copies B and C from Diskette A at the end of the first day. Next day use Copy B as the working copy. Copies A and C are back-ups. At the end of the second day, update Copy C from B, leaving Copy A as the more outdated back-up. The third day, use Copy C as the working copy and back it up on Copy A. You may want to date each version with a felt-tip pen, or simply mark them *A, B, C.*

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.

4. OPERATIONAL GUIDELINES
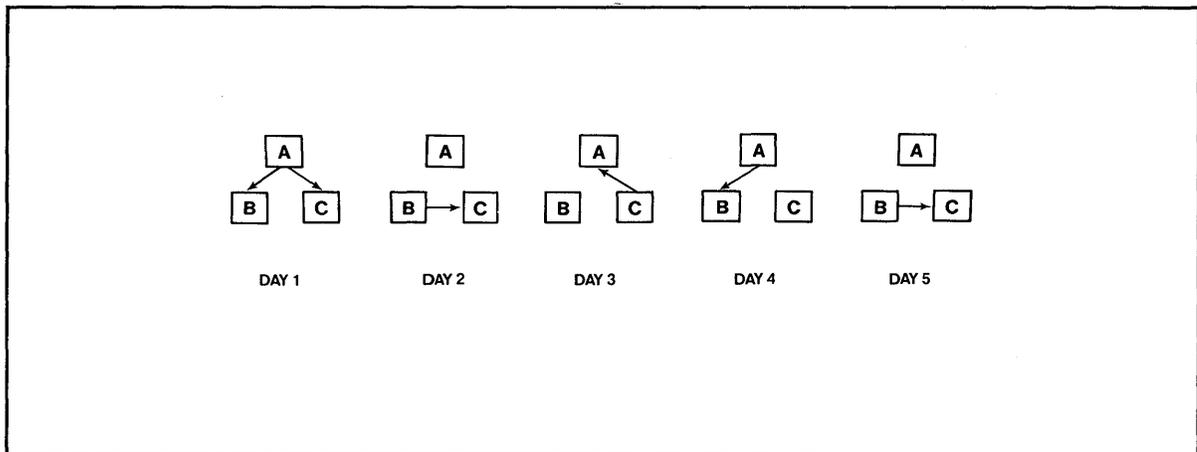
Figure 4-3   Typical Back-up System

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   PROTECT THE TS 802

Although the TS 802 is packaged in a durable housing, you can help protect it by using it on a secure surface.

4. OPERATIONAL GUIDELINES

4.7 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 doors while the system is executing a program unless the program or instructions tell you to do so.

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

4. Make a back-up copy of all updated disks 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 802. 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 802's internal processor and the central service processor (TS 806/816). Data goes to one or both of these, depending on how the TS 802 is being used. Table 5-1 describes where data is sent.

Table 5-1   Data Destination

TS 802 Used As	Description
Stand-Alone	Codes and data sent from integral terminal *to* the TS 802's internal processor
User Station	Codes and data sent from integral terminal *to* the TS 802's internal processor
Service Processor Terminal	Codes and data sent from integral terminal *through* the TS 802'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.

Figure 5-1   Rear Panel

5. TERMINAL OPERATION

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 8 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.
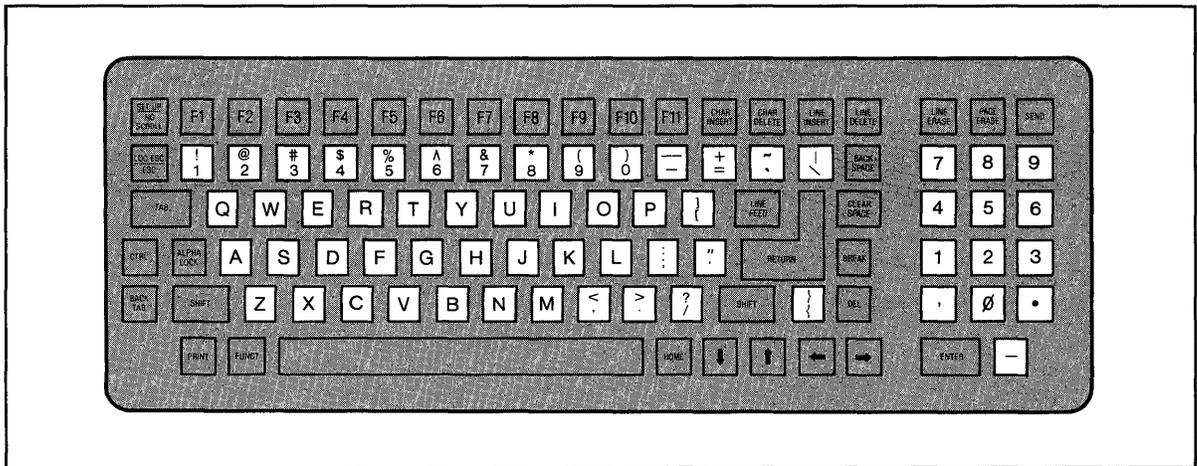
a   Character Keys
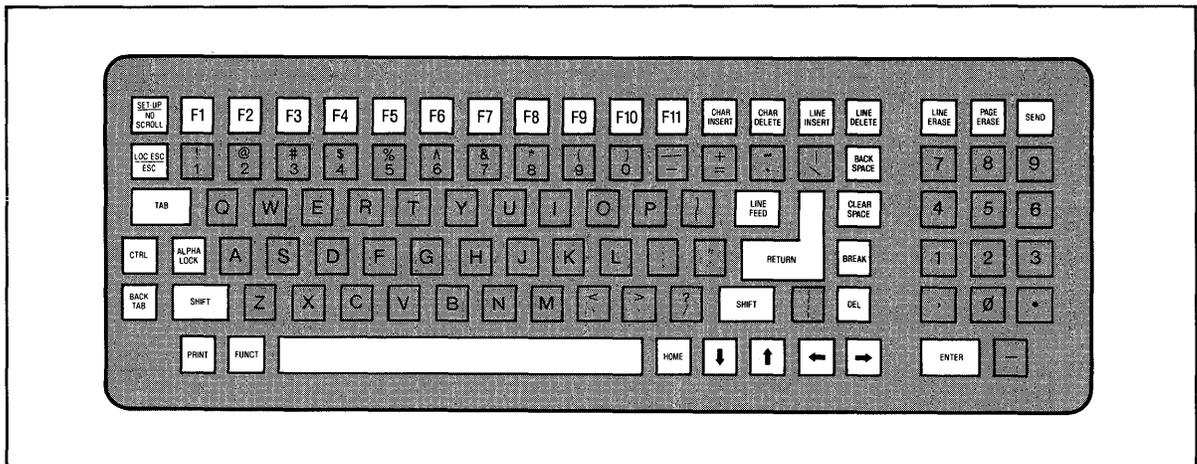
b   Special Keys

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.

△

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

Table 5-2   Function of Keys

Key Name	Trans-mitted? (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 ^.

Note
*Not transmitted if in local edit mode.

Table 5-2   continued

Key Name	Trans- mitted? (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 program or CP/M does not echo back escape codes, the LOCAL ESCAPE key (i.e., SHIFT and ESCAPE) 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 TS 802's 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.
LINEFEED	Y*	Y	Sends the ASCII code (OAH) for a linefeed (LF) to the 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.

Note
*Not transmitted if in local edit mode.

Table 5-2   continued

Key Name	Trans- mitted? (Y/N)*	Repeat Action? (Y/N)	Description
HOME	Y*	N	Moves the cursor to the first unprotected character position on the page (usually column one of row one). (Same as ^^.)
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.)
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 TS 802's internal processor.
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.

Note
*Not transmitted if in local edit mode.

Table 5-2   continued

Key Name	Trans-mitted? (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 reenabled, 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.
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.
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.

Note
*Not transmitted if in local edit mode.

Table 5-2   continued

Key Name	Trans- mitted? (Y/N)*	Repeat Action? (Y/N)	Description
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 if in local edit mode.

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 2-2) 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 4), 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 they are changed using the procedure described here. You can also change 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.

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 (2.5.2, 2.6.2, 2.7.2)
> Changing the status line (5.4)
> Using escape sequences (6.22)

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.

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.

```
PRC=00101          |   |  |   |  |  | MONT | DUPE | EDTL | KLOK | PROT | GRPH | FDX | 9600 |   |   |
```

SEND/blank

P3ER/blank
(interface wrong)

Terminal Baud Rate:
50, 75, 110, 135,
150, 300, 600, 1200,
2400, 3600, 4800,
7200, 9600, 19.2K

Communication:
Local (LOC)
Half Duplex (HDX)
Full Duplex (FDX)
Block (BLK)

H.I./blank/GRPH
(half intensity on/off)

PROT/blank
(Protect on/off)

KLOK/blank
(Keyboard lock on/off)

Editing Control:
Edit line (EDTL)
Edit page (EDTP)
Insert page (INSP)
Insert line (INSL)

LOCE/DUPE
(Local/duplex edit)

MONT/blank
(Monitor mode on/off)

Print Mode:
PRTO, PRT1, PRT2, PRT3, BDIR

Cursor Position:
PRC = prrcc
where p = Page
r = Row
c = Column

PBSY/blank
(Printer busy)

P4ER/blank
Handshaking error between
P4 port and terminal

Memory Error:
0000 through 07FF = System RAM
2000 through 3FFF = Display RAM

TBSY/blank
(Terminal busy)

Figure 5-3   Status Line Fields
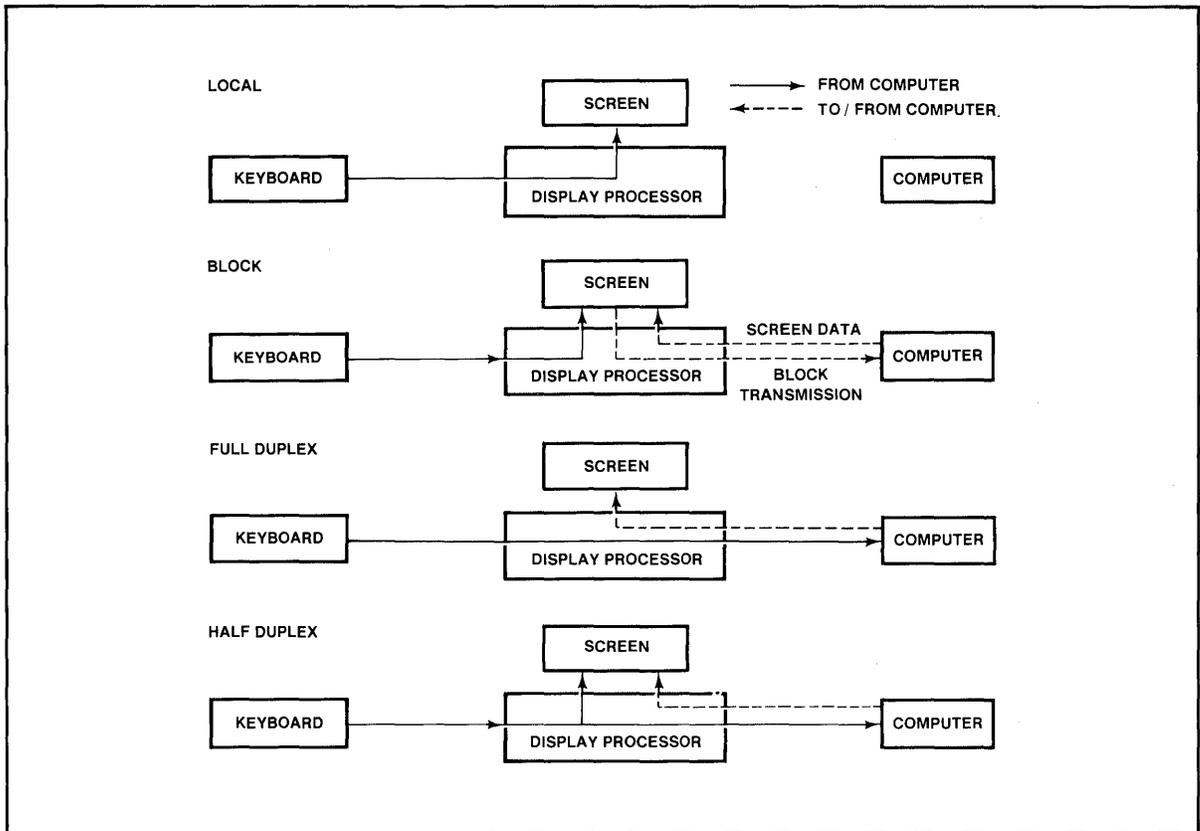
Figure 5-4 Communications Flow

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 802 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 802 is not used to send data to the printer.

6.   PROGRAMMING

6.1   INTRODUCTION

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

△

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 TeleVideo'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**.

△

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.

6.3.1   User Line

To display the user line, press

    ESC g

6. PROGRAMMING THE TERMINAL

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_O
^ 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	▒

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.
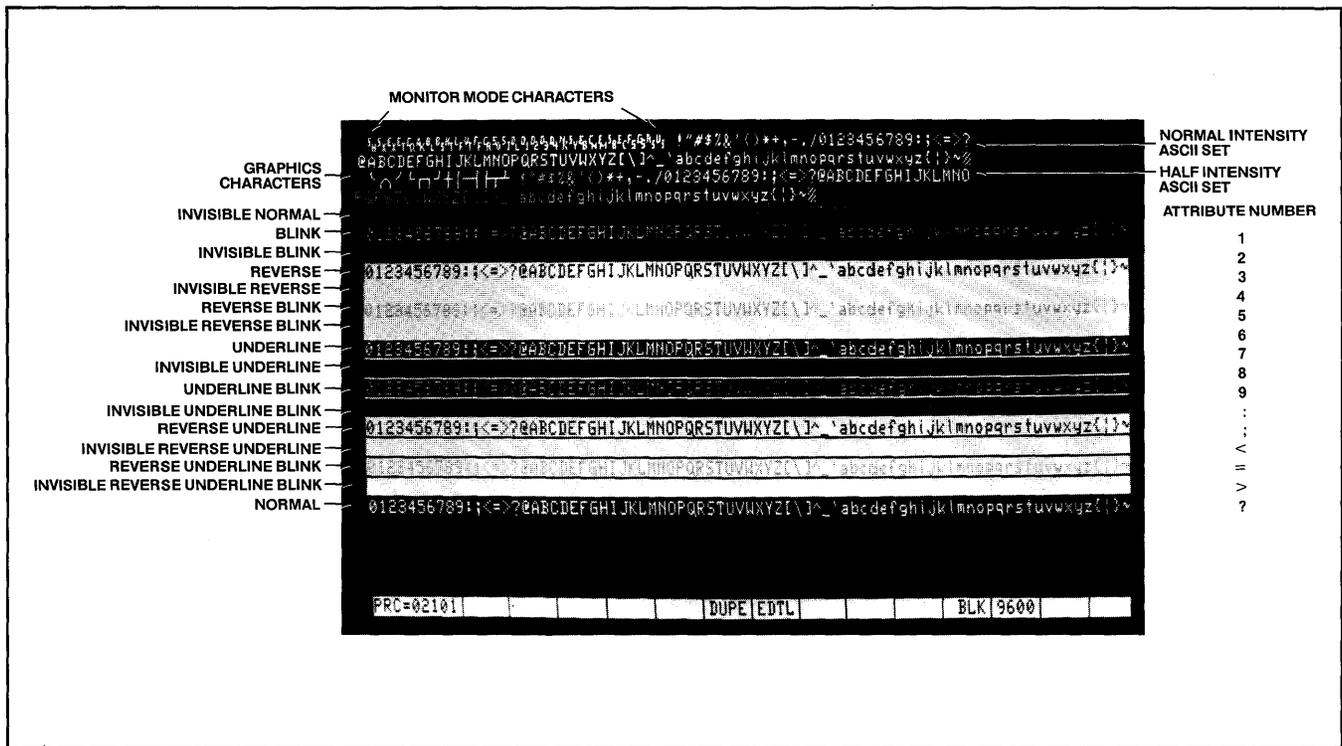
Figure 6-1   Video Attributes and Monitor Mode

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.

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

6.3.2   Status Line

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

ESC Z 1

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		
18	1	50	Q		
19	2	51	R		
20	3	52	S		
21	4	53	T		
22	5	54	U		
23	6	55	V		
24	7	56	W		
25	8	57	X		
26	9	58	Y		
27	:	59	Z		
28	;	60	[		
29	<	61	\		
30	=	62	]		
31	>	63	^		
32	?	64	−		

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

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This command will unlock the entire screen.

6.5 DISABLING/ENABLING THE KEYBOARD

You can disable (lock) all the 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.

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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

6.7 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

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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.

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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.

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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.

6. PROGRAMMING THE TERMINAL

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.

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)

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).

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.
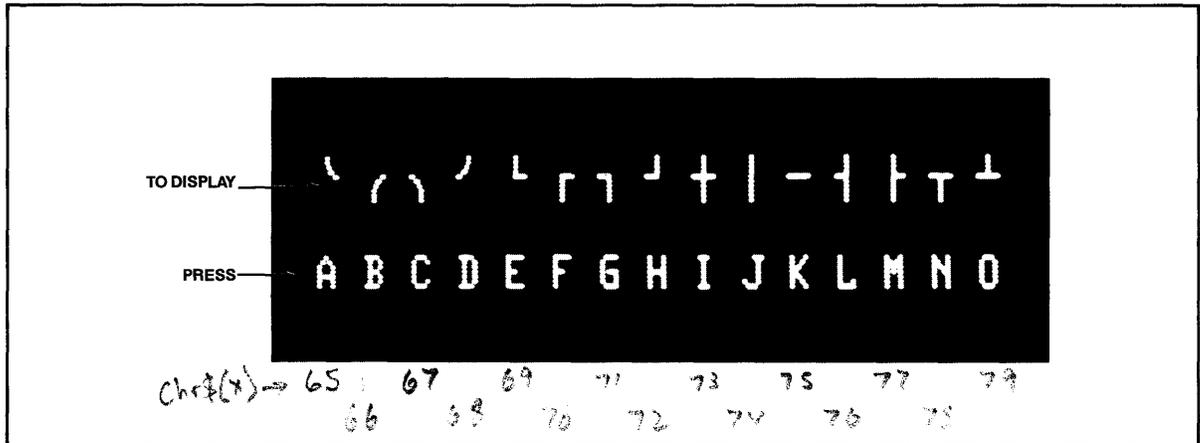
Figure 6-2   Special Graphics Characters

6.12   ADDITIONAL MEMORY

The TS 802 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 \ p 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.

6.14.3 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 arrow right or left. Arrow up, down, or linefeed 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.

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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 &

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   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.

6.15   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.

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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.

6.16   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
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 unprotected field of the preceding page. If the current page is page zero, the code has no 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.
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.

Table 6-8   continued

Cursor Control	Control Code	Auto Page	Protect Mode	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.
New Line	^ _ (underline)	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.

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

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.)

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

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 $^\wedge$ A (SOH) and a carriage return (CR). For example, if a $^\wedge$ 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 $^\wedge$ A C CR to the computer.

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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 if the chip for additional pages of memory has been installed. Possible values are:

    0 for page one
    1 for page two

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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.

6.21 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.

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 5.6.

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

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.
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.
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 position exists, 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.

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 THE TERMINAL

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 (i.e., 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 positon. 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 THE TERMINAL

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

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 THE TERMINAL

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 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)].

Table 6-15   continued

Data	Code	Effect
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 are 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 are 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 delimiter 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.
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.

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 802. All print functions on the TS 802 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 802.

7.1.1   Cleaning

Clean the TS 802 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, place a service call.

Your TS 802 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 802. 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 a qualified service technician for assistance.

7.2.1   Testing the TS 802 (Self Test)

You can perform a self test of the terminal portion 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 802) 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 a qualified service representative.

$$\triangle$$

Should you accidentally enter a numeral 2 (instead of a 1) to start the self-test, a test which appears to fail will be displayed. This test is not operative on the TS 802; the fail message does not indicate any hardware failure.

Table 7-1   Troubleshooting Procedures

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

   a. **TS 802 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**

      Insert copy of system diskette in Drive A and close drive door.

      While holding SHIFT down, press BREAK twice (to reset TS 802).

      Remove system diskette. Hold diskette so that label is facing up and on the side nearest you. Reinsert diskette.

      Insert master system diskette in Drive A and close door.

   c. **TS 802 FAN IS ON. SYSTEM MESSAGE "SYSTEM IPL FROM FLOPPY DISK IN PROGRESS" APPEARS BUT PROMPT DOES NOT APPEAR**

      Remove system diskette. Make sure label says CP/M (not CBIOS). Insert in Drive A (top drive) with label facing up and on side nearest you. Close drive door and push BREAK twice while holding down SHIFT (to reset).

      Insert a known good system diskette in Drive A (top drive), close drive door, and while holding SHIFT down, press BREAK twice.

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

      Insert appropriate diskette in active drive.

      Close drive doors.

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

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

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

   Reconnect all cables ancd 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.

Table 7-1   continued

4. **TS 802 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 802 P1 port.

Check parity, word structure, and stop bit settings on dip switches.

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

Adjust display contrast settings on rear panel.

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

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

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

Press BREAK twice while holding down SHIFT (to reset system).

Run self test.

Enter ESC " to enable keyboard.

8. **CRT DISPLAY IS WAVY**

Check power switch settings and set to match power frequency.

9. **PRINTER DOES NOT PRINT WHAT IS TYPED**

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

Check printer cable configuration.

10. **ESCAPE AND CONTROL COMMANDS DO NOT FUNCTION AS ANTICIPATED**

Re-enter commands, paying particular attention to whether upper- or lower-case characters are needed.
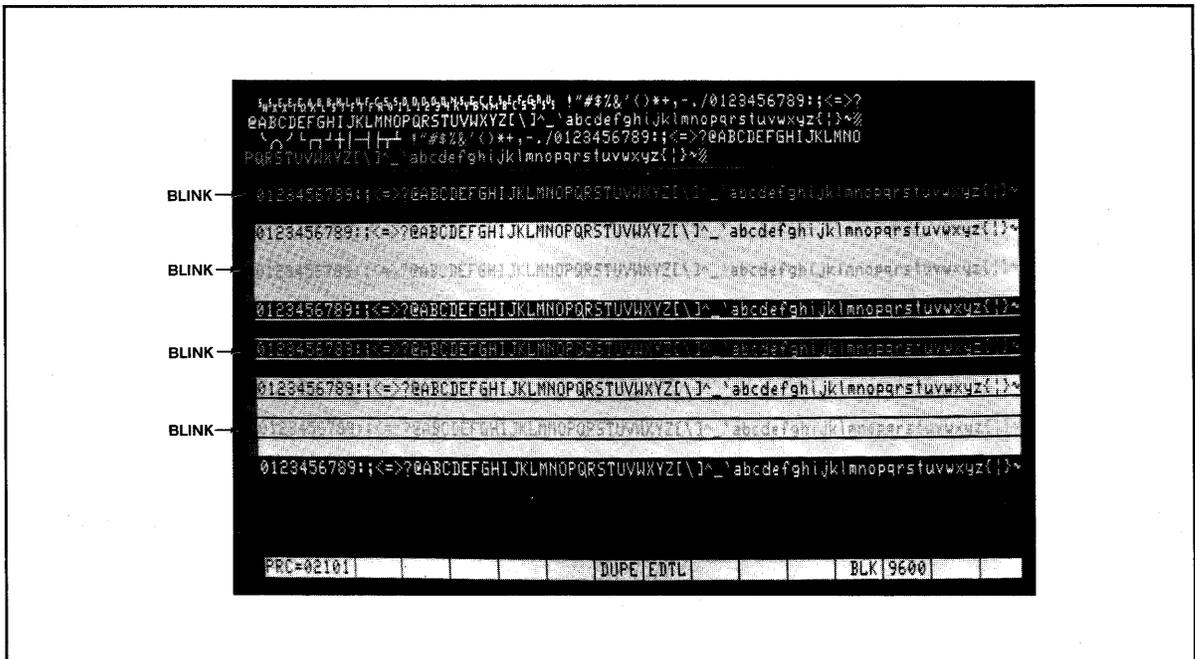
Figure 7-1   Display of Normal Self-Test

7.3   CHANGING THE FUSE

The TS 802 has one exterior fuse which is accessible from the rear panel.

To check or change the exterior 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 has burned out and must be replaced.
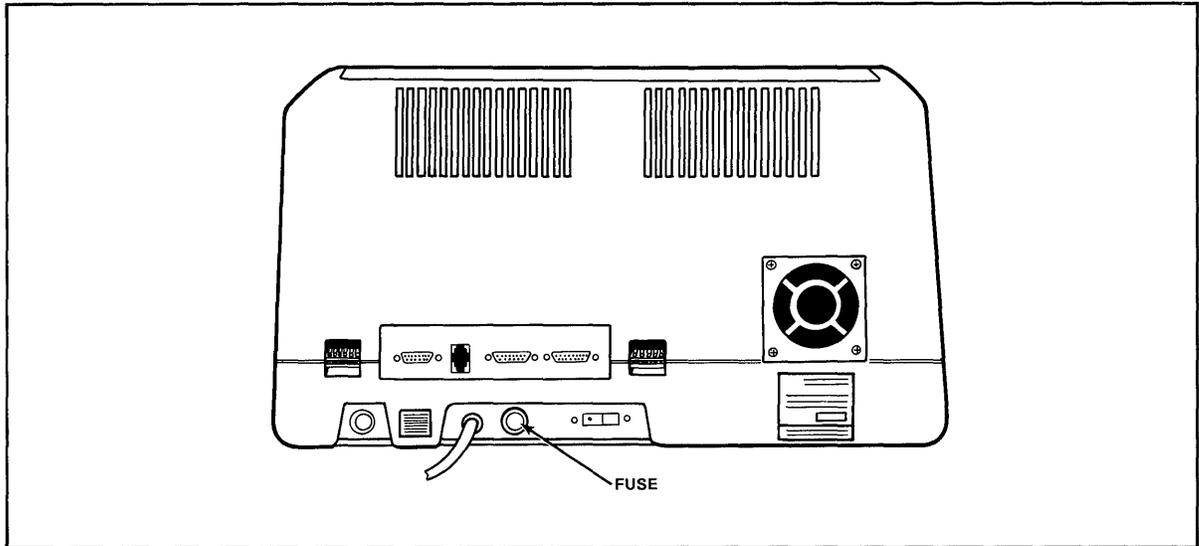
Figure 7-2   Exterior Fuse Location
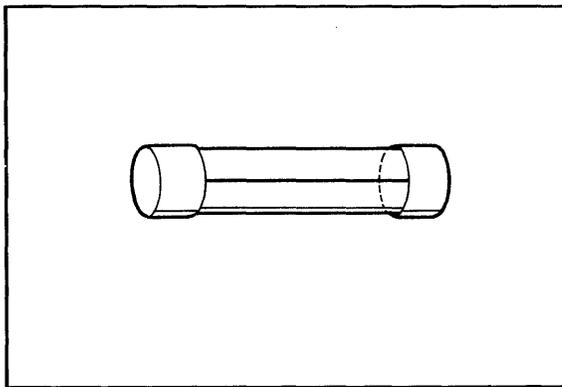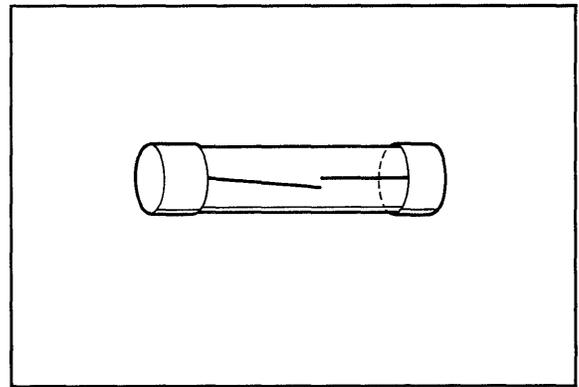
Figure 7-3   Good Fuse   *Figure 7-4   Burned Out Fuse*

To replace the fuse, slip the old fuse from 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.

7.4 HOW TO GET SERVICE

7.4.1 During Warranty

If you need service on your TS 802 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.

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 802 Serial No. _____   Delivery Date _____

Dealer _____   Phone No. _____

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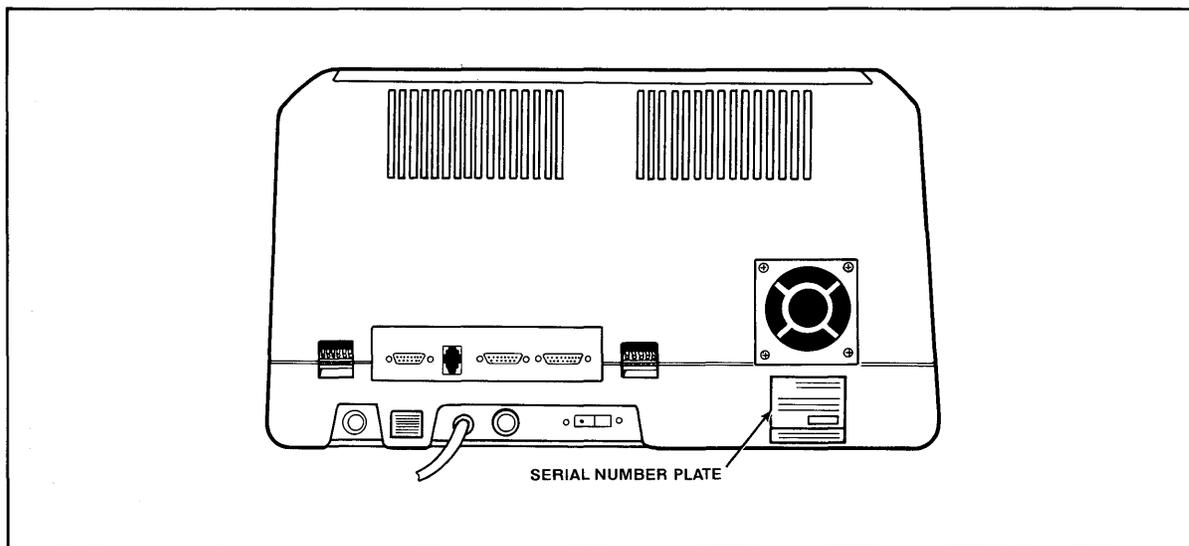
Figure 7-5   Location of Serial Number on Rear Panel

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 802

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

1. Open the case (see Appendix H).

2. Check the integrity of the internal cabling and security of internal mounting hardware.

3. Replace the cover, being careful not to overtighten the screws.

4. Leave the drive doors 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 802, call your dealer or distributor.

APPENDICES

A. TS 802 SPECIFICATIONS

B. STATEMENT OF LIMITED WARRANTY

C. BUYING ADDITIONAL DISKETTES

D. SUGGESTED CP/M REFERENCES

E. CABLE SPECIFICATIONS

F. PIN CONNECTOR ASSIGNMENTS

G. SWITCH SETTINGS

H. OPENING THE SYSTEM CASE

I. CHANGING THE PIN CONNECTOR ASSIGNMENTS

J. CHANGING THE DEFAULT LST: DEVICE

K. PORT ASSIGNMENTS

L. DEFAULT DEVICE ASSIGNMENTS

M. TS 802 UTILITY PROGRAMS

N. ASCII CODE CHART

O. MODIFYING CBIOS

APPENDIX A   TS 802 SPECIFICATIONS

MICROPROCESSOR/MEMORY

CPU	Z80A microprocessor (processor speed 4 MHz)
Memory	64K bytes dynamic RAM 4K bytes EPROM
Operating System	CP/M

DISK DRIVES

Type	Two floppy disk drives
Diskettes	Standard 5.25-inch floppy diskettes
	Soft sectored, 256 bytes/sector, 18 sectors/track, 40 tracks/side, 2 sides/diskette, skew rate 4
Storage Capacity	Double-density, double-sided diskettes
	368.6 kilobytes per drive (formatted) (total 0.74 megabytes)
Transfer Rate	250 kilobits/second
Access Time	6 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	0.65 amp maximum at 115 VAC 0.33 amp maximum at 230 VAC
Power Cord	NEMA standard 5-15R, 3-prong receptacle (US only)
Start Current	0.70 amps at 115 VAC 0.45 amps at 230 VAC

ENCLOSURE

Dimensions	Height 13.62 inches (34.6 cm) Width 22.47 inches (56.0 cm) Depth 14.37 inches (36.5 cm) deep plus 7.5-inch keyboard (19.05 cm)
Net Weight	44 pounds
Shipping Weight	54 pounds
Composition	Injection-molded plastic

APPENDIX A   TS 802 SPECIFICATIONS

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)

CRT SPECIFICATIONS

MONITOR

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

DISPLAYED CHAR-ACTER 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	14 x 10 resolution
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	Conversational: 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.

THE FOREGOING TELEVIDEO LIMITED WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, WHETHER ORAL, WRITTEN, EXPRESS, IMPLIED OR STATUTORY. IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE WILL NOT APPLY. TELEVIDEO'S WARRANTY OBLIGATIONS AND BUYER'S REMEDIES HEREUNDER ARE SOLELY AND EXCLUSIVELY AS STATED HEREIN. TELEVIDEO MAKES NO WARRANTY WHATSOEVER CONCERNING ANY SOFTWARE PRODUCTS, WHICH ARE SOLD "AS IS" AND "WITH ALL FAULTS."

TELEVIDEO'S LIABILITY, WHETHER BASED ON CONTRACT, TORT, WARRANTY, STRICT LIABILITY OR ANY OTHER THEORY, SHALL NOT EXCEED THE PRICE OF THE INDIVIDUAL UNIT WHOSE DEFECT OR DAMAGE IS THE BASIS OF THE CLAIM. IN NO EVENT SHALL TELEVIDEO BE LIABLE FOR ANY LOSS OF PROFITS, LOSS OF USE OF FACILITIES OR EQUIPMENT, OR OTHER INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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

RECOMMENDED BRAND(S)

Dysan Diskettes 104/2D
Part No. 800272 (40 tracks)

Manufactured by:

Dysan Corporation
Santa Clara, California
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 for several years. Many users automatically phase out diskettes periodically. Factors such as number of disk accesses, care, etc. can significantly affect diskette life. 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 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, 1980, $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

CONNECTOR HOUSING

10 CONDUCTOR CABLE 22 AWG
ATLAS 200-22-10L
BELDEN 8456 LL

P1	WIRING DIAGRAM	P2
1		1
2		2
3		3
4		4
5		5
6		6
7		7
8		8
9		9
10		10
11		11
12		12
13		13
14		14
15		15
16		16
17		17
18		18
19		19
20		20
21		21
22		22
23		23
24		24
25		25

PIN 1   PIN 13

P1   P2

SUB-MINI "D" TYPE CONNECTOR
25 PIN, MALE

L

NOTE:
15, 17, and 24 are optionally connected for synchronous modem interface.

Figure E-1   RS232C

CONNECTOR HOUSING

15 CONDUCTOR CABLE 222 AWG
ATLAS 200-22-15L

P1	WIRING DIAGRAM	P2
1		1
2		2
3		3
4		4
5		5
6		6
7		7
8		8
9		9
10		10
11		11
12		12
13		13
14		14
15		15

PIN 1   PIN 8

P1   P2

SUB-MINI "D" TYPE CONNECTOR
15-PIN, MALE

L

Figure E-2   RS422

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 F   PIN CONNECTOR ASSIGNMENTS

Table F-3   P4 Connector Assignments
(RS422 Computer Connector)

Pin No.	Description	
1	Ground	
2	Transmitted high	(Txd +)
3	Received high	(Rxd +)
4	Request to send high	(RTS +)
5	Clear to send high	(CTS +)
6	Transmit clock low	(Txck −)
7	Receive clock low	(Rxck −)
8	Ground	
9	Transmitted low	(Txd −)
10	Received low	(Rxd −)
11	Request to send low	(RTS −)
12	Clear to send low	(CTS −)
13	Transmit clock high	(Txck +)
14	Receive clock high	(Rxck +)
15	Test	

APPENDIX G

TABLE G-1

SWITCH SETTINGS

SWITCH	DIPSWITCH	OPEN (UP)	Closed (DOWN)	FUNCTION
S1	1	x		Duplex
(left)			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			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	X		Must be open
	5		X	TS 802 is a stand-alone
		X		TS 802 is a user-station
	6	X		Must be open

Notes
* When TS 802 is a terminal for TS 806/816

APPENDIX G

Table G-1   Switch Settings

[handwritten: See corrected page]

Switch	Dipswitch	Open (Up)	Closed (Down)	Function
S1 (left)	1	x	■	Duplex
			■	Local
	(2)	x	■	Blinking cursor
			■	Steady cursor
	3		x	Always closed
	4		x	Always closed
	5		x	Always closed
	6	x	■	Green characters on black
			■	Black characters on green
	7		■	See Table G-2
	8	x		See Table G-2
	9	x	■	60 Hertz (115 VAC)
			■	50 Hertz (230 VAC)
	(10)	x	■	Keyclick off
			■	Keyclick on
S2 (right)	1			Printer/terminal baud rate*; see Table G-3
	2			Printer/terminal baud rate*; see Table G-3
	3			Printer/terminal buad rate*; see Table G-3
	4	x		Must be open
	5	■	x	TS 802 is a stand-alone
		■		TS 802 is a user station
	6	x		Must be open
	(7)	x		TS 802 used as service processor terminal for TS 806/816
			x	TS 802 used as user station for TS 806/816 or stand-alone computer
	8	either		Not used
	9	either		Not used
	10	either		Not used

[handwritten annotations in right margin: "Up = 20MB", "off down", "H Disk or floppy", "down"]

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

Table G-2   Communication Modes

Switch	Dipswitches		
1	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

Switch	Dipswitches			
2	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)
Note
*When TS 802 is a service processor terminal for TS 806/816.
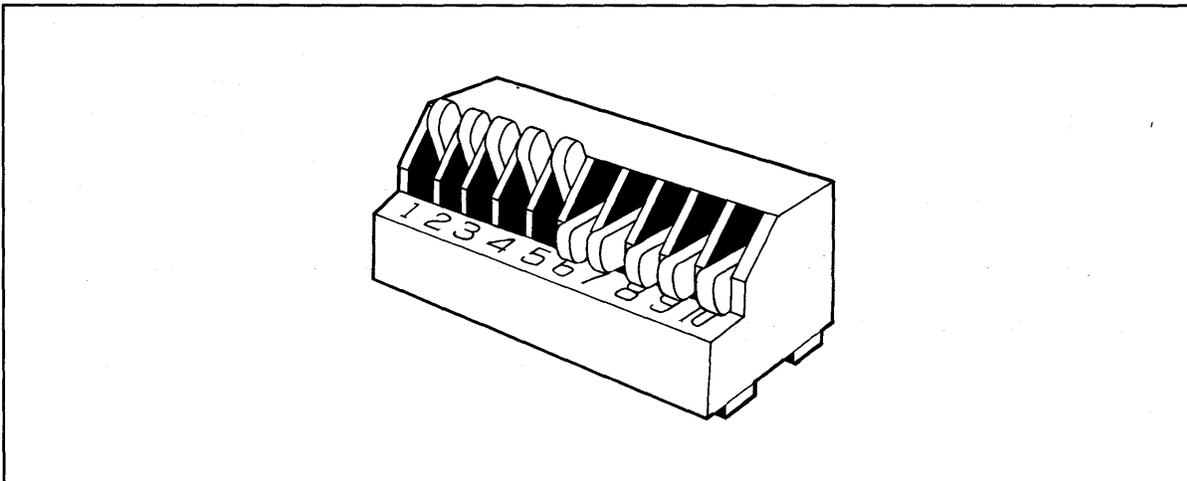
Figure G-1   Dipswitches 1 through 5 Open; 6 through 10 Closed

APPENDIX H   OPENING THE SYSTEM CASE

🛑 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 802 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 five Phillips screws (Figure H-1).
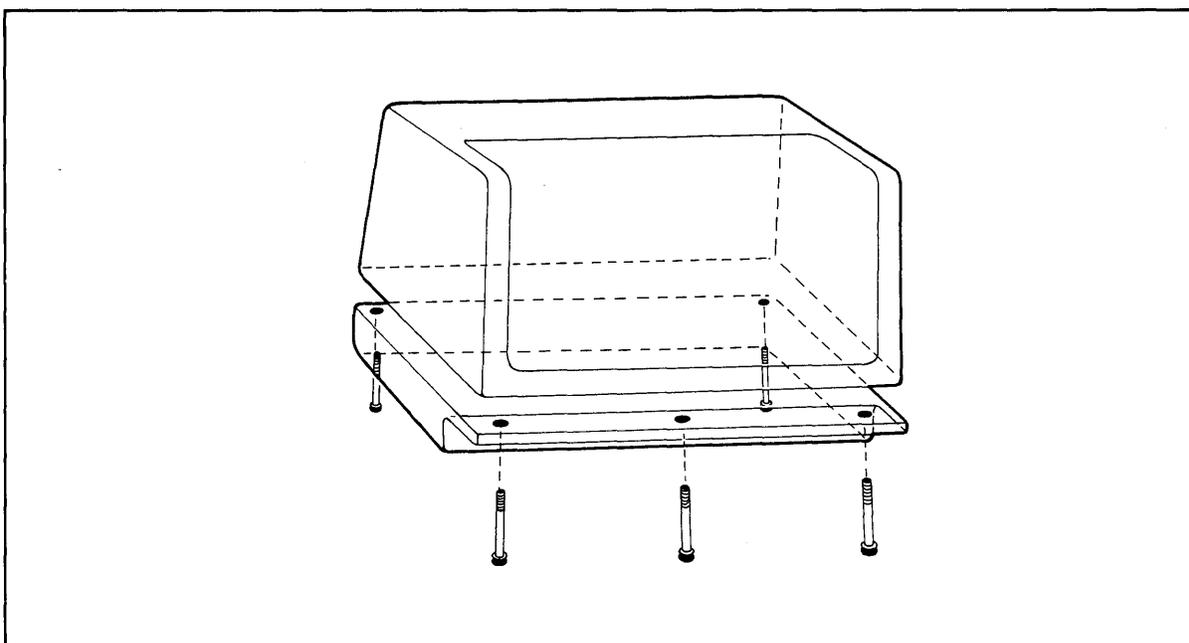
Figure H-1   Location of Screws in System Case

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 five 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
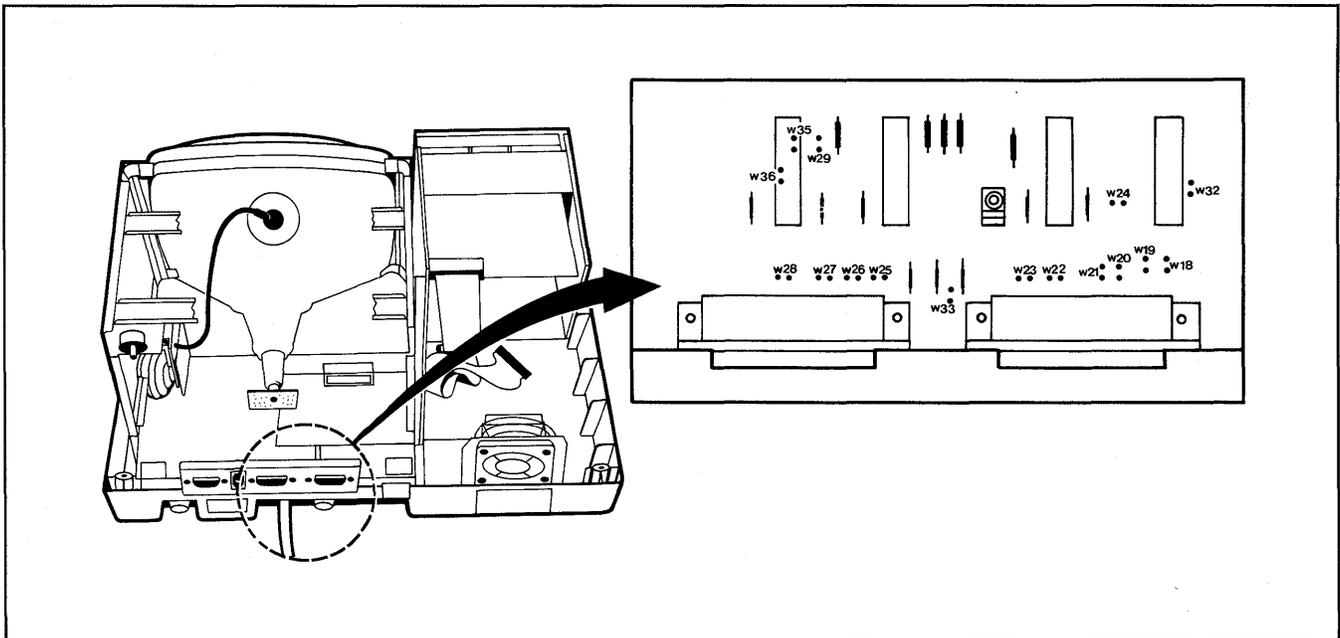
Figure I-1   Location of Traces on Printed Circuit Board

Your TS 802 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 couple of bytes in CP/M and save the modified CP/M on the system area of a disk.

Put the system disk containing the files DDT.COM and SYSGEN.COM in Drive A. Boot the system and enter the responses shown in bold print. Copy CP/M to memory by entering:

A>**SYSGEN** ⟨**CR**⟩
TELEVIDEO SYSTEM SYSGEN VX.X
SOURCE DRIVE NAME (OR RETURN TO SKIP)A

At this point the program will verify that the source is on Drive A. If this is correct, enter a carriage return.

SOURCE ON A, THEN TYPE RETURN ⟨**CR**⟩
FUNCTION COMPLETE

Specify the destination drive by entering

DESTINATION DRIVE NAME (OR RETURN TO REBOOT) ⟨**CR**⟩
A⟩**SAVE 50 CPMXXXXX.COM**⟨**CR**⟩

where CPMXXXXXX represents the file name of the modified CP/M.

Then invoke DDT by entering:

A⟩**DDT CPMXXXXX.COM**⟨**CR**⟩
DDT VERS 2.2
NEXT PC
3300 0100

Specify the next memory address to be altered (in this case, the address of the IOBYTE).

−**S2077**⟨**CR**⟩

2077 15 **D5**⟨**CR**⟩

where 15 is the code to enable the TTY device. 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

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

In this example we have selected device UL1:. The computer returns with the next sequential hexadecimal address. Since you don't want to change it, enter a period and a carriage return.

2078 32 .⟨**CR**⟩

Then enter a ^C to warm boot.

−^**C**

To regenerate the modified system, run SYSGEN again as shown here:

A)**SYSGEN**
SYSGEN VERS 2.0
SOURCE DRIVE NAME (OR RETURN TO SKIP)⟨**CR**⟩
DESTINATION DRIVE NAME (OR RETURN TO REBOOT)**A**
DESTINATION ON A, THEN TYPE RETURN⟨**CR**⟩
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT)⟨**CR**⟩

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

Description	Hexadecimal Value
Dip switch	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)	
data	20H
command/status	22H
Channel B (RS232C printer port)	
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

```
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 or Diablo daisywheel.

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

This appendix describes the utility programs contained on the system diskette. The program descriptions are in alphabetical order.

Software Utility Program   COPYDISK
Version 2.0
Release Date: September 1981
Copyright TeleVideo Systems, Inc. 1981

PURPOSE

COPYDISK copies the contents of a floppy diskette onto another floppy diskette. After the copying is completed, the program checks for data transfer errors.

COMMAND FORMAT

Before starting the COPYDISK program, make sure a copy of the system diskette is in Drive A. Type the message indicated in bold print:

A⟩**COPYDISK**⟨**CR**⟩

The system will respond with the following message:

TELEVIDEO SYSTEM COPYDISK VX.X

Next the system will ask you to designate which drive will contain the diskette to be copied and which will be the drive containing the new copy.

$$\triangle$$

Although you can designate either Drive A or B as the source drive, you may want to always copy in the same direction (i.e., from source Drive A to destination Drive B) in order to avoid accidentally copying onto your good diskette.

Another safeguard is to open both drive doors and check the diskette labels before pressing RETURN to start the copy process.

In the following display, your typical responses are indicated in bold print:

Source drive? (A or B, ESC to abort.)**A**
Destination drive? (A or B, ESC to abort.)**B**
Confirmation: COPYDISK from "A" to "B".
Warning: COPYDISK will destroy all data on destination drive with no chance of recovery.

At this time, remove your system diskette from Drive A and replace it with the diskette to be copied. Insert the diskette you want to copy onto in Drive B.

Press RETURN when ready. (ESC to abort, BAR to re-start.)⟨**CR**⟩

After you press RETURN, the system will display numbers as each track is copied.

Copying (TRACK)--⟩012345678901234567890123456789 0123456789

If the diskette is copied without error, you will see the message:

Disk Copy Completed.

Source Drive: (ESC to abort.)**ESC**

At this point you can either copy more diskettes or you can stop the program by inserting your system diskette in Drive A again and pressing ESC.

Should the message

    Data Transfer Error(s)

be displayed after Disk Copy Completed, the copy made is not accurate. Inaccuracies can occur due to defective or damaged diskettes. If this message appears, copy the diskette again, reversing the source and designation drives. Make sure that the diskette used as the designation is not defective or damaged; if necessary, use a new diskette. Copy the diskette using another system or copy another diskette. If you are unable to copy without data transfer errors, place a service call.

Software Utility Program   FORMAT
Version 2.0
Release Date: December 1981
Copyright TeleVideo Systems, Inc. 1981

PURPOSE

FORMAT formats floppy diskettes. Normally this program is used only on new diskettes. Since it erases any data on the diskette, it is possible to erase a diskette using FORMAT.

CAUTION!

FORMAT will overwrite all data presently on the diskette; any files and programs presently on the diskette will be erased.

COMMAND FORMAT

Put your system diskette in Drive A and shut the drive door. Insert the diskette to be formatted in Drive B and close the drive door.

To start the FORMAT program, type the response shown in bold print:

    A)**FORMAT⟨CR⟩**

In response the system will prompt you as indicated:

    TELEVIDEO SYSTEM FORMAT V2.0
    Drive?(A or B, ESC to abort.)**b**
    Press RETURN when ready (ESC to abort.)⟨**CR**⟩
    formatting............

(Each period which appears on the "formatting" line represents one track formatted.)

    Formatting Completed.
    Drive?(A or B, ESC to abort.)⟨**ESC**⟩

If you want to format more than one diskette, remove the formated diskette when you see the message Drive?(A or B, ESC to abort.) again and insert another diskette. Repeat the cycle until finished. To stop the program, press ESC.

    End of Execution

Bits: 7 6 5 →				Column → ↓ Row	0 (000)	1 (001)	2 (010)	3 (011)	4 (100)	5 (101)	6 (110)	7 (111)
4	3	2	1	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 CBIOS

To modify CBIOS, you must have:

The diskette labeled CBIOS (included with the TS 802), which contains the following files:

802FBIOS.MAC	802FBOOT.MAC	802FCONS.MAC	802FDISK.MAC
802FSUBS.MAC	802FEQU.MAC	802DATA.MAC	MAKESYS.COM
CPM62.COM	802FBOOT.COM		

A second diskette containing M80.COM, L80.COM, CREF80.COM (or equivalents), and an editor.

The procedure used to modify the CBIOS is as follows:

1. Insert the diskette labeled CBIOS in Drive B.

2. Insert the diskette containing M80 in Drive A.

3. Set the default drive to B: by typing B:.

4. Modify CBIOS source modules on the diskette in Drive B using an editor of your choice.

5. Assemble 802FBIOS.MAC using the M80 assembler, as follows:

   B)**A:M80 = 802FBIOS/C**

This will create two files:

   B:802FBIOS.REL

   B:802FBIOS.CRF

6. Run CREF80 as follows:

   A)**A:CREF80 = 802FBIOS**

This will create a cross reference listing in file B:802FBIOS.PRN.

7. Link 802FBIOS.REL using L80 as follows:

   A)**A:L80/P:100, 802FBIOS/N,802FBIOS/E**

This creates the file B:802FBIOS.COM, which contains your modifications to CBIOS.

Now you are ready to build a new user CP/M diskette which will incorporate your modifications.

8. Insert the diskette which will contain the new system into Drive A.

9. Run MAKESYS as follows:

   B)**MAKESYS**
   Destination Drive? **A**
   Bootstrap Filename? **802FBOOT**
   BDOS Filename? **CPM59**
   BIOS Filename? **802FBIOS**
   MAKESYS COMPLETED

The new system is now on the diskette in Drive A. Reset the system and run it.

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INDEX

READER COMMENTS

TeleVideo invites your comments regarding this manual. Your comments will help us develop documentation that will maximize the value of TeleVideo computers to our customers.

You may wish to comment on the manual's organization, clarity, accuracy, and completeness. If you have found any discrepancies, please list them by page, paragraph, figure, or table number. If you need more space, please attach a separate sheet.

Name of manual _____

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Check the description that applies to you:

_____ *OEM*   _____ *Distributor*   _____ *Dealer*   _____ *End User*

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TS 802 SWITCH SETTING REFERENCE CHART

TABLE 1

S1		1	2	3	4	5	6	7	8	9	10
		EDIT	CURSOR				DISPLAY	TRANSMSN		HZ	CLICK
	U	DPLX	BLINK				G ON BL	SEE TABLE		60	OFF
	D	LOCL	STEADY		*		BL ON G	2		50	ON

S2		1	2	3	4	5	6	7	8	9	10
		PRINTER BAUD RATE				CONFG		CONFG		NOT USED	
	U	SEE TABLE 3			**	USER ST	**	TERMNL			
	D					ST-AL		USER ST/ ST-AL			

*MUST BE DOWN
**MUST BE UP

TABLE 2

S1	7	8	TRANSMISSION
	DOWN	DOWN	HALF DUPFLEX
	DOWN	UP	FULL DUPFLEX
	UP	DOWN	BLOCK
	UP	UP	LOCAL

TABLE 3

S1	1	2	3	PRINTER BAUD RATE
	D	D	D	19200
	U	D	D	9600
	D	U	D	4800
	U	U	D	2400
	D	D	U	1200
	U	D	U	600
	D	U	D	300
	U	U	U	150

Addendum For: TS 802 User and Installation Guide

Addendum
Document Number: 2200400

Date Issued: August 20, 1982

This document contains software enhancements for the TS 802
computer system. Rear panel figures on pages 2-6, 3-1, and 5-1
of the TS 802 manual have been corrected, and Appendices G, J, K,
M, and Q have been revised and included in this addendum. New
information on various types of error messages and using the
modem port is also included.

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 802. The switch settings are described in Appendix G. Figure 2-6 shows the switch locations. Set the dipswitches of S2 for a terminal (as described in Appendix G).

Figure 2-6 Location of Switches on Rear Panel

The terminal which is contained in the TS 802 is set to operate at:

* Full duplex

* Eight bits

* One stop bit

* No parity

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

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

Attach one end of an RS422 interface cable to the TS 802 (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 operator's manual).

Set the S2 dipswitches (Appendix G) for a user station configuration.

2.4.6 Connecting a Serial Printer

Your TS 802 can be connected to an auxiliary serial printer to make a permanent hard copy of data. The TS 802's serial printer interface allows the TS 802 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.

3.1 START UP

3.1.1 Power On

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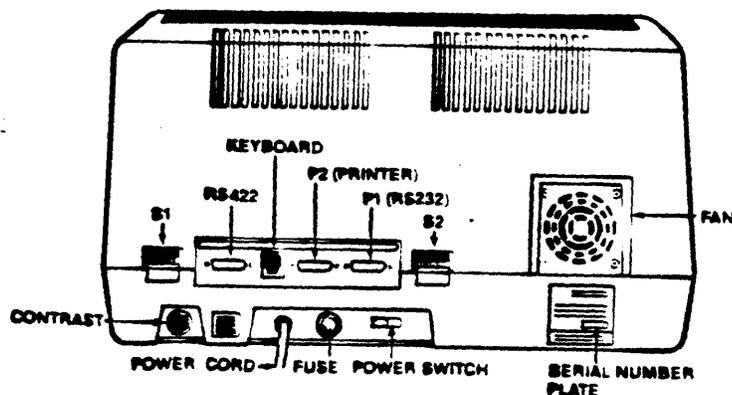
Figure 3-1   Rear Panel

3.1.2 Inserting the Diskette

One of the diskettes supplied with your TS 802 is labeled "CP/M Version 2.2"; this contains your copy of the CP/M operating system programs.

Drive A is the top drive. This is where the diskette labeled "CP/M" will be used. This diskette contains the basic operating instructions for the system and will be referred to as the system diskette. The bottom drive is Drive B.

Put your finger under the doorhandle of Drive A and flip it open gently.

NOTE!

BEFORE TURNING POWER ON OR OFF, ALWAYS MAKE SURE THE DRIVE DOORS ARE 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 doors are open, the disk head is away from the diskette surface.

Take the system diskette out of its white paper jacket. Hold the diskette by the edge of the black plastic cover.

3

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 802. 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 802's internal processor and the central service processor (TS 806/816). Data goes to one or both of these, depending on how the TS 802 is being used. Table 5-1 describes where data is sent.

Table 5-1   Data Destination

TS 802 Used As	Description
Stand-Alone	Codes and data sent from integral terminal to the TS 802's internal processor
User Station	Codes and data sent from integral terminal to the TS 802's internal processor
Service Processor Terminal	Codes and data sent from integral terminal through the TS 802'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.

Figure 5-1   Rear Panel

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			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	x		Must be open
	5		x	TS 802 is a stand-alone
		x		TS 802 is a user-station
	6	x		Must be open

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

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Table G-1 Switch Settings continued

Switch Dipswitch	Open (Up)	Closed (Down)	Function
7	x		TS 802 used as terminal for TS 806/816
		x	TS 802 used as user station for TS 806/816 or as a stand-alone computer
8	either		Not used
9	either		Not used
10	either		Not used

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CHANGING THE DEFAULT LST: DEVICE

USING THE SYSGEN AND DDT PROGRAMS

Your TS 802 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 couple of bytes in CP/M and save the modified CP/M on the system area of a disk.

Put the system disk containing the files DDT.COM and SYSGEN.COM in Drive A. Boot the system and enter the responses shown in bold print. Copy CP/M to a new file by entering:

        A>SYSGEN <CR>
        TELEVIDEO SYSTEM SYSGEN VER x.x
        SOURCE DRIVE NAME (OR RETURN TO SKIP)A

At this point the program will verify that the source is on Drive A. If this is correct, enter a carriage return.

        SOURCE ON A, THEN TYPE RETURN <CR>
        FUNCTION COMPLETE

Specify the destination drive by entering

        DESTINATION DRIVE NAME (OR RETURN TO REBOOT)<CR>
        A>SAVE 50 CPMXXXXX.COM<CR>

where CPMXXXXX represents the file name of the modified CP/M.

Then invoke DDT by entering:

        A>DDT CPMXXXXX.COM<CR>
        DDT VERS 2.2
        NEXT PC
        3300 0100

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

Specify the next memory address to be altered (in this case, the address of the IOBYTE).

   -1FC2<CR>

    1FC2 15 D5<CR>

where 15 is the code to enable the TTY device. 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 this example we have selected device UL1:. The computer returns with the next sequential hexadecimal address. Since you don't want to change it, enter a period and a carriage return.

    1FC3 00.<CR>

Then enter a ^ C to warm boot.

    -^ C

To regenerate the modified system, run SYSGEN again as shown here:

```
A>SYSGEN
SYSGEN VERS 2.2
SOURCE DRIVE NAME (OR RETURN TO SKIP)<CR>
DESTINATION DRIVE NAME (OR RETURN TO REBOOT)A
DESTINATION ON A, THEN TYPE RETURN<CR>
FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT)<CR>
```

A>

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

PORT ASSIGNMENTS

Description	Hexadecimal Value
Dip switch	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 (used for time and date routine)	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)

data	20H
command/status	22H

Channel B (RS232C printer port)

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

APPENDIX H

TS 802 UTILITY PROGRAMS

This appendix describes the utility programs contained on the
system diskette. The program descriptions are in alphabetical
order.

Software Utility Program   COPYDISK
Version 3.0
Release Date: August 1982
Copyright TeleVideo Systems, Inc. 1982

PURPOSE: COPYDISK copies the contents of a floppy diskette onto
another floppy diskette. During the copying, the program checks
for data transfer errors.

COMMAND FORMAT

Before starting the COPYDISK program, make sure a copy of the
system diskette is in Drive A. Type the message indicated in
bold print:

    A>COPYDISK<CR>

The system will respond with the following message:

    TELEVIDEO SYSTEM COPYDISK VX.X

Next the system will ask you to designate which drive will
contain the diskette to be copied and which will be the drive
containing the new copy.

                              NOTE!

Although you can designate either Drive A or B as the source
drive, you may want to always copy in the same direction (i.e.,
from source Drive A to destination Drive B) in order to avoid
accidentally copying onto your good diskette.
    •
Another safeguard is to open both drive doors and check the
diskette labels before pressing RETURN to start the copy process.

In the following display, your typical responses are indicated in
bold print:

    Source Drive: (ESC to abort.)A
    Destination drive: (ESC to abort.)B
    Confirmation: COPYDISK from "A" to "B".
    Warning: COPYDISK will destroy all data
    on destination disk with no chance of recovery.
    Press RETURN when ready. (ESC to abort, BAR to re-start.)<CR>

At this time, remove your system diskette from Drive A and
replace it with the diskette to be copied. Insert the diskette
you want to copy onto in Drive B.

                               13

Next, press <CR>. The system
track is copied.

Copying (TRACK)-->0123456789012345678901234567890123456789

If the diskette is copied without error;, you will see the
message:

Disk Copy Completed.

Source Drive: (ESC to abort.)ESC

At this point you can either copy more diskettes or you can stop
the program by inserting your system diskette in drive A again
and pressing ESC.

Should the message

Data Transfer Error(s)

be displayed after Disk Copy Completed, the copy made is not
accurate. Inaccuracies can occur due to defective or damaged
diskettes. If this message appears, copy the diskette again,
reversing the source and designation drives. Make sure that the
diskette used as the designation is not defective or damaged; if
necessary, use a new diskette. Copy the diskette using another
system or copy another diskette. If you are unable to copy
without data transfer errors, place a service call.

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PURPOSE: FORMAT formats floppy diskettes. Normally this program is used only on new diskettes. Since it erases any data on the diskette, it is possible to erase a diskette using FORMAT.

CAUTION!

FORMAT will overwrite all data presently on the diskette; any files and programs presently on the diskette will be erased.

COMMAND FORMAT

Put your system diskette in Drive A and shut the drive door.

To start the FORMAT program, type the response shown in bold print:

    A>FORMAT<CR>

In response, the system will display:

    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

Enter the correct system configuration number.   Options 1 and 2 are described below.

Option No. 1

User: 1. If your system is configured as a stand-alone, enter

        1<CR>

System: 2. ~~Displays~~

Drive? (A or B. ESC to abort.)

User: 3. Enter

B

System: 4. Displays

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

User: 5. Insert the diskette to be formatted into drive B.

6. Press

<CR>

System: 7. Displays

formatting . . . .

Formatting Completed.
Drive? (A or B, ESC to abort.)

If you want to format more than one diskette, remove the formatted
diskette when you see the message Drive?(A or B, ESC to abort.)
again, and insert another diskette. Repeat the cycle until
finished. To stop the program, press ESC.

System: 8. Displays

End of Execution
A>

Option No. 2

User: 1. If your system is configured as a user station,
enter

2

System: 2. Displays

Drive? (M or N. ESC to abort.)

Note!

M is the top drive; N is the bottom drive.

User: 3. Enter

                   M or N

System: 4. Displays

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

User: 5. Insert the diskette to be formatted into the
                   drive you selected.

               6. Enter

                   <CR>

System: 7. Displays

                   formatting . . . .

                   Formatting Completed.
                   Drive? (M or N, ESC to abort.)

If you want to format more than one diskette, remove the formatted
diskette when you see the message Drive?(M or N, ESC to abort.)
again, and insert another diskette. Repeat the cycle until
finished. To stop the program, press ESC.

System: 7. Displays

                   End of Execution
                   A>

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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

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 at power on/reset:

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, 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, 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 Q

MODIFYING CBIOS

To modify CBIOS, you must have:

The diskette labeled CBIOS (included with the TS 802), which contains the following files:

802FBIOS.MAC	802FBOOT.MAC	802FCONS.MAC	802FDISK.MAC
802FSUBS.MAC	802FEQU.MAC	802FDATA.MAC	MAKESYS.COM
CPM62.COM	TSFBOOT.COM		

Note!

Verify that all the above files are on the CBIOS diskette before beginning any modifications.

A second diskette containing M80.COM, L80.COM, (or equivalents) and an editor.

The procedure used to modify the CBIOS is as follows:

1. Insert the diskette labeled CBIOS in Drive B.

2. Insert the diskette containing M80 in Drive A.

3. Set the default drive to B: by typing B:.

4. Modify CBIOS source modules on the diskette in Drive B using an editor of your choice.

5. Assemble 802FBIOS.MAC using the M80 assembler, as follows:

   B>A:M80 =802FBIOS

Note!

Be sure to enter a space after typing M80.

This will create the file:

   B:802FBIOS.REL

6. Link 802FBIOS.REL using L80 as follows:

    A>A:L80 /P:100, 802FBIOS/N,802FBIOS/E

This creates the file B:802FBIOS.COM, which contains your
modifications to CBIOS.

Now you are ready to build a new user CP/M diskette which will
incorporate your modifications.

7. Insert the diskette which will contain the new system into
    Drive A.

8. Run MAKESYS as follows:

    ```
    B>MAKESYS
    Destination Drive? A
    Bootstrap Filename?  TSPBOOT
    BDOS Filename? CPM62
    BIOS Filename? 802FBIOS
    MAKESYS COMPLETED
    ```

The new system is now on the diskette in Drive A. Reset the
system and run it.

If the error message

> BIOS (READ/WRITE) ERROR ON (Current drive Name):
> TRACK = (xx), SECTOR = (xx), FDC status = (xx)H

appears on your screen, an error occured during the physical disk read/write activity. Refer to Table 3-2 to determine the cause of the error (using the FDC status code).

Table 3-2   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

Hex	Bit	Read Sector	Write Sector
8	S3	CRC	CRC
4	S2	LD	LD
2	S1	DRQ	DRQ
1	S0	BUSY	BUSY

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 not found.
S3	CRC	CRC error: If S4 is set, the error is in the ID fields. If S4 is not set, the 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.

The IOBYTE has been upgraded to support modem port for each
logical device; 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 802                              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 802
```

   (c) To send a file from printer port to a printer;
       if default is LST:=TTY:, then PIP LST:=file name
       otherwise, STAT LST:=TTY:
       PIP TTY:=file name
       Cable Needed: Straight

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(d) To send a file from 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:

```
        +---------+
        |         |
+---+---+---+     |
|   +---+   |     |   +--------+      +--------+      +----------+
|  RS-232   | +---+   |--------|      |--------|      |          |
|modem port | |   |   |        |      |        |      |          |
+-----------+ +---+   +--------+      +--------+      +----------+
    TS 802            modem            modem             DTE
```


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

Note: Pl indicates RS-232 port
       P2 indicates printer port

4) 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

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5) The following is a description of each of the logical devices as configured in the BIOS:

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 define 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

USING TIME AND DATE CAPABILITY IN APPLICATIONS PROGRAMS

INTERFACE TO THE LOCAL TIME AND DATE

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

Call this address to GET/SET 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 a 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 not initialized.

TO SET CURRENT DATE AND TIME:

Upon entry, a user program sets C-reg = 1 and DE = address of a 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 = user defined
        Upon return, the local date and time are set as specified
        in buffer, and 1/100 of second counter is reset to zero.

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