TeleVideo®
TS 803H User's Manual

**TeleVideo
TS 803H User's Manual**

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Disclaimer

Warning!

This equipment generates, uses, and can radiate radio frequency
energy, and if not installed and used in accordance with the
instruction manual may cause interference to radio
communications. It has been tested and found to comply with the
limits for a Class A computing device pursuant to Subpart J of
Part 15 of FCC Rules, which are designed to provide reasonable
protection against such interference when operated in a
commercial environment. Operation of this equipment in a
residential area is likely to cause interference, in which case
the user at his own expense will be required to correct the
interference.

TeleVideo Systems, Inc., 550 East Brokaw Road, San Jose, CA 95112

TeleVideo Systems, Inc.

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TeleVideo Systems, Inc.

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1. INTRODUCTION

INTRODUCTION TO THE TS 803H

Welcome to the TeleVideo world of CP/M personal microcomputers!
Your new system is designed to meet a wide variety of business
needs from programming and accounting to word processing and
graphics. The TS 803H is designed for easy installation and use.

The three software programs that are included with your system
are easy to learn and use. TeleWrite, an executive word
processor, makes it easy to write memos and reports. TeleCalc is
a spreadsheet that allows you to construct tables for
calculations and "what-if" figuring. TeleChart works with
TeleCalc to translate your figures and calculations into pie,
line, and bar graphs.

The system has two uniquely-designed components. The single-
board computer and all the memory are housed in the same case
with the fourteen-inch CRT screen. The P31 phosphor makes
viewing easy-on-the-eyes.The screen tilts for user comfort and
can be tightened into position. One slim-line floppy drive and
one slim-line Winchester (hard) disk are mounted vertically on
one side of the system case.

The detachable keyboard features all the keys found on any
typewriter plus a numeric keypad for accounting applications and
16 programmable function keys for added simplicity of input. The
keyboard is connected by a telephone-type coiled cable allowing
you to move the keyboard to a comfortable position. Its design
also features a handrest to help lessen user fatigue.

Figure 1-1
TS 803H
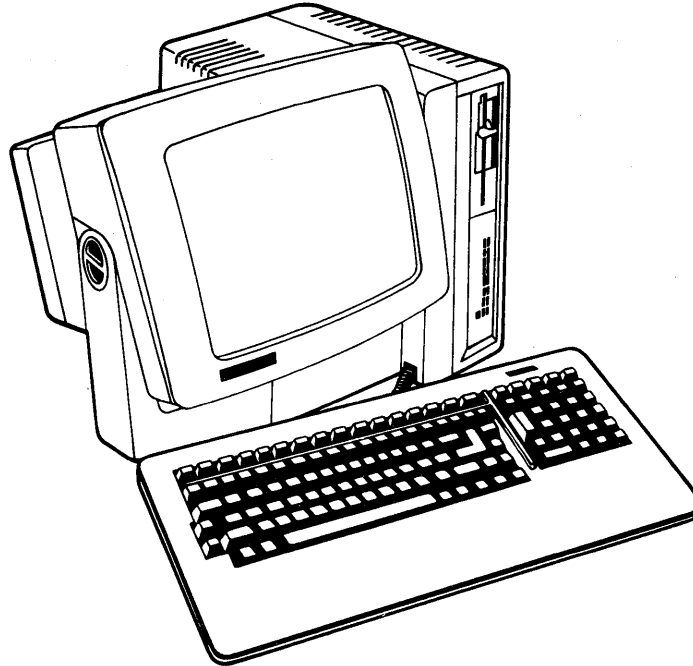
The TS 803H is designed as a single-user, stand-alone system. It can be adapted to the TeleVideo network computer system with the addition of a network interface card (RS-422 option card). Contact your computer store for further information about the 803HN upgrade kit for the TS 803H.

You do not need technical expertise to set up and install your system. This manual describes the installation procedure step-by-step and also teaches how to best utilize the many features of the system for your own needs.

Please take the time to read the installation instructions and familiarize yourself with the operation of your system. The special section on using CP/M gives you added information for using your system.

LIMITED WARRANTY

The TS 803H is covered by a limited warranty. The terms and conditions of the complete limited warranty are provided in in the front of the manual.

DESCRIPTION

The computer's processor is designed to allow both alphanumeric computing as well as standard business graphics. The alphanumeric display is 24 lines by 80 characters. The graphics display features a resolution of 640 x 240 pixels (squares on the screen, like a graph).

The standard system memory is 64 kilobytes (64K) which is expandable to 128K. If you want to use a printer for paper copies of your work, a modem for telecommunications, or a mouse for simpler computer interaction, there are ports, or connectors, on the rear panel to do this.

The TS 803H can be used for a variety of standard and unique applications. Some of the more common uses include:

*   Word processing
*   Data base management
*   Financial planning and analysis
*   Business calculations
*   General accounting
*   Medical and dental record keeping
*   Customization of applications programs
*   Programming
*   Graphics capabilities with many applications

The CP/M operating system allows you to use the many CP/M-based applications programs available on the market.

TeleChart takes advantage of the graphics capability and allows you to construct graphs, and bar, line and pie charts for business graphics presentations. You can also use graphics as an integral part of many applications programs.

By adding a mouse, many graphics and menu-driven applications programs become even easier to use. Contact your computer store for further information about TeleVideo's SuperMouse.

Hardware

Your system includes both hardware and software. Hardware refers to the physical parts of the computer. Software refers to the programs used to make the hardware run.

The hardware in the TS 803H includes the various parts of the computer. These include the main unit, the drives, and the keyboard.

Figure 1-2 shows the TS 803H with other possible hardware peripherals that your system can accept.

Figure 1-2
TS 803H with Hardware Peripherals

SUPERMOUSE   TS 803H   MODEM   PRINTER
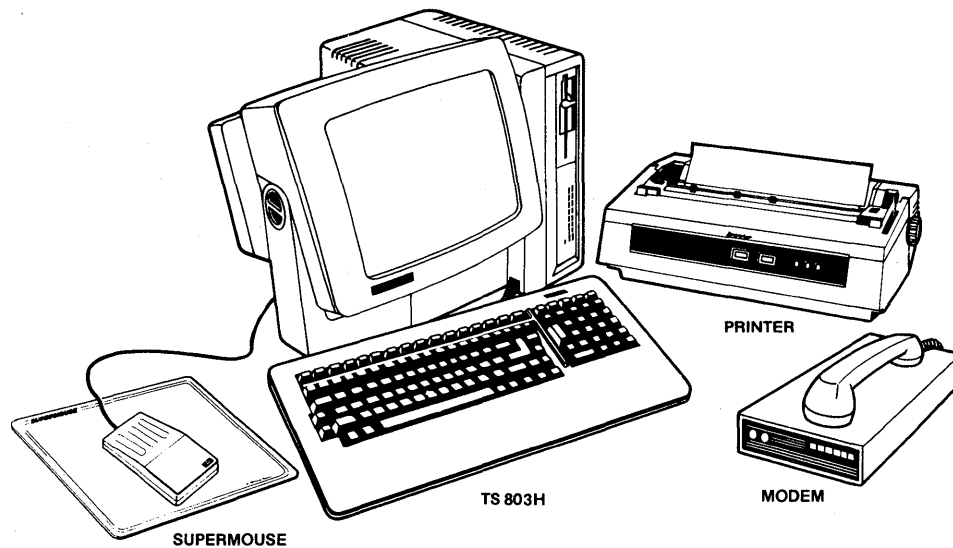
Software

Software refers to programs or routines for various applications
and programming, and for the operation of the computer.

Every computer needs instructions in order to operate. These
instructions are supplied by a group of programs collectively
called the **operating system. CP/M,** developed by Digital
Research, is the operating system for the TS 803H. This system
allows you to use CP/M-compatible applications program software.

The diskette that arrived with your system is labeled **CP/M
Version x.x.** This diskette is referred to as the **system diskette**
throughout this manual. See Chapter 3 for how to use the system
diskette and Chapter 6 for how to use CP/M.

Figure 1-3 shows a software package that you can use with the TS 803

Figure 1-3
Software
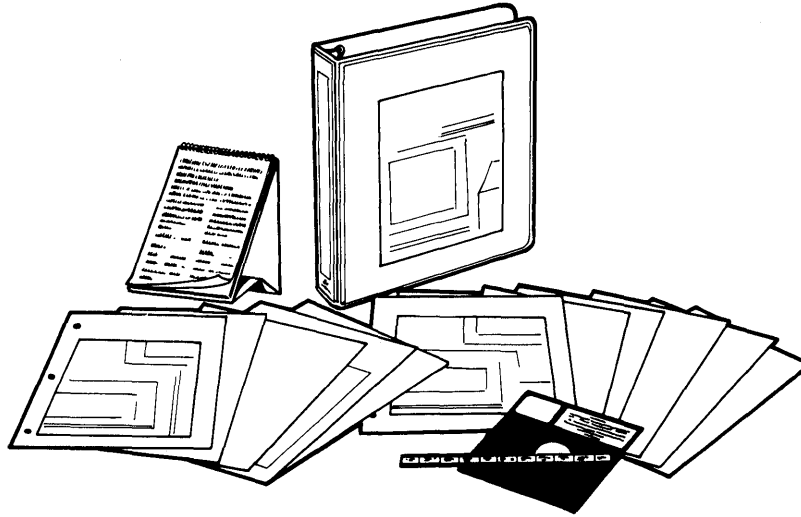
The TS 803H can use any high-level programming language designed
to run under CP/M. Some of the more popular languages that are
used on the TS 803H are BASIC, FORTRAN, COBOL, PASCAL, APL, ALGOL,
PL/1, FORTH and "C".

Besides TeleCalc, TeleChart, and TeleWrite, there are many other
applications programs commercially available for a wide range of
tasks from payroll to security. In addition, you may write your
own applications programs in any CP/M programming language.

FORMAT OF MANUAL

There are a few conventions used in this manual that you should
understand. Special notes throughout the manual draw your
attention to particular information. Symbols are used to indicate
particular keys in various instructions.

Special Notes

Two types of notes call attention to information of special
importance:

NOTE!   General note giving information to every operator.

STOP!   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!**

Notation Conventions

Throughout this manual, the following symbols are used to describe user actions.

Table 1-1
Notation Conventions

Symbol	Key	Action
<CR>	RETURN (Carriage Return)	This symbol indicates that you are to press the RETURN key.
^C	CTRL (Control) C	This symbol indicates that you are to press the CTRL and C keys simultaneously. The ^ symbol can be used with any alphanumeric character.
ESC	LOC ESC/ESC (Escape)	This notation indicates that you are to press the LOC ESC/ESC key.
/		This symbol, when used between two keys, indicates that you are to press the two keys simultaneously. For example, SHIFT/LOC ESC indicates to press the SHIFT and LOC ESC keys at the same time.

Step-by-step procedures are used in this manual to show how to perform various functions. These procedures show what the user types in and how the system responds to that action. The following is and example of the procedure format:

        USER: 1. **User Action**
                        (What you type in)

        System: 2.   Screen Display
                        (What you see on your screen)

Read the entire procedure before beginning the operation and completely read the step you are working in before entering a response. Many steps offer a choice. All user actions are shown in **bold print**.

2. SETTING UP YOUR TS 803H

INTRODUCTION

Your TS 803H was tested and inspected before it was packed for shipment. Inspect it carefully when you receive it.

After identifying the parts of your system, follow the directions to set it up. Setting it up includes finding a suitable location, and checking and attaching the components. This chapter gives these directions as well as instructions for changing the TS 803H to match international power standards. Also included in this chapter are directions for connecting a printer and a modem.

SELECTING THE RIGHT LOCATION

Select a sturdy, level surface. Leave at least four inches of free space around the enclosure for proper air flow.

Figure 2-1
Example Work Space
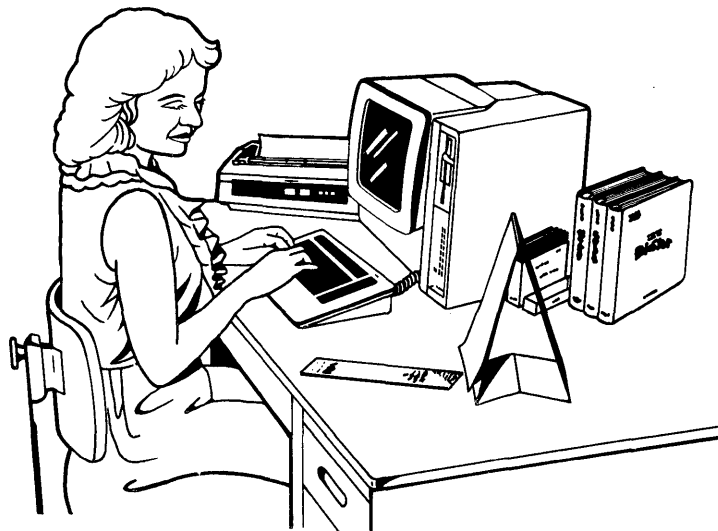
General Environment

The TS 803H operates 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 particles in the air can hinder the performance of the system.

Magnetic Interference

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

CHECKLIST OF COMPONENTS

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

1.   TS 803H including:

      Keyboard
      Main unit with CRT (screen)
      Power cord

2.   Documentation consisting of:

      TS 803H User's Manual
      TeleSolutions II User's Manual
      CP/M Software License Agreement and Registration Card

3.   Three diskettes labeled:

      TS 803H CP/M (system diskette containing the operating
      system, an add-on graphics module to CP/M called GSX, and a
      demonstration program)

      TeleWrite (executive word processor)

      TeleCalc/Chart (spreadsheet, business graphics)

STOP!   **IF ANY ITEM IS MISSING, CONTACT YOUR COMPUTER STORE
               BEFORE PROCEEDING WITH THE INSTALLATION.**

Software Registration

Included with your system are the CP/M Software License Agreement
and CP/M registration card. Read the agreement and sign the card
before using the system diskette. Signing the agreement and
returning the card gives you the following benefits:

1.   Entitle you to use the CP/M operating system and GSX
      extension on your TS 803H 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

Reader Comment Card

Your comments about this manual are welcome. To facilitate this, we have provided a Reader Comment Card in the back of the manual. Please take a moment to complete and return the card after you have installed your system.

INSTALLING YOUR SYSTEM

After selecting a good place for your computer and checking for all the parts of your system, it is time to install your TS 803H.

Position the computer where you want it and adjust the screen for your comfort by tilting it up and down. When it is in the position you wish, turn the flat knob on the left side of the screen in a clock-wise direction until it is tight. See Figure 2.2.

Figure 2-2
Screen Positioning Knob
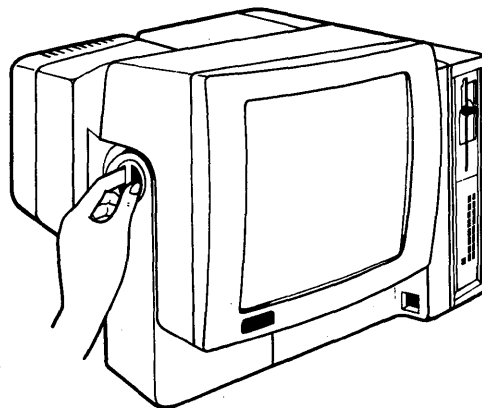
Place the keyboard for your comfort and then plug the telephone-
type coiled cable that is connected to the front of the main unit
into the phone jack outlet on the back of the keyboard as
illustrated.

Figure 2-3
Keyboard Connection
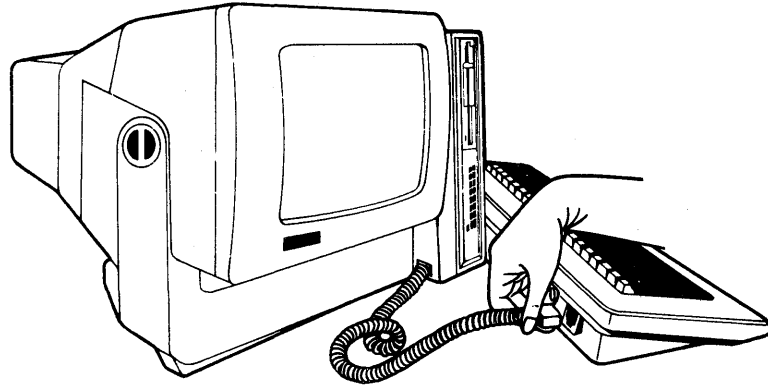
Locate the ON/OFF power switch on the rear panel of the main
unit. Be sure the power switch is turned off by pressing the
plain end of the switch.

Figure 2-4
Power Switch Off
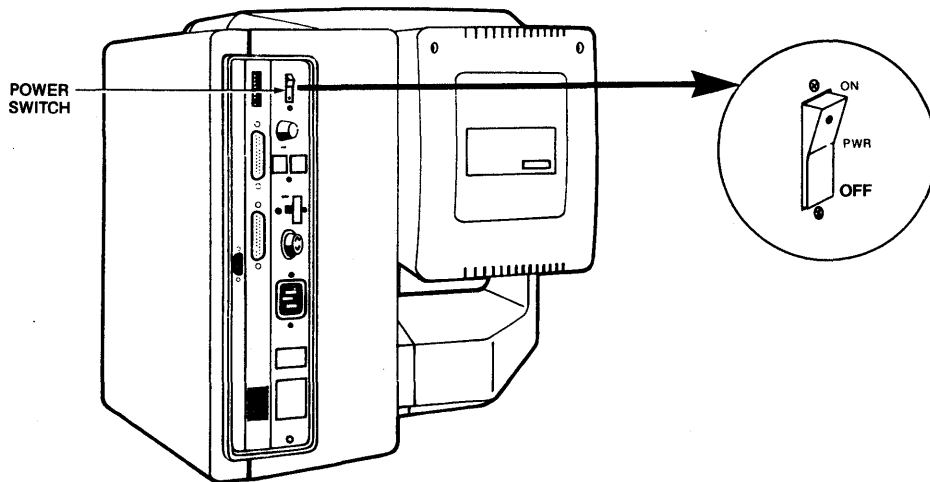
NOTE!   If you are using this computer on the U.S. standard
            electrical voltage (115 V), skip to the section,
            Power Cord Connection.

            The following sections give directions for changing the
            TS 803H to correspond to 230 volts, the international
            electrical power standard.

Inserting the Fuse For 230 Volts

The TS 803H is shipped with the fuse installed to correspond to
115. The fuse for 230 volts is included with the documentation
in an envelope marked 1A.

Table 2-1
Fuse Table

Amperes	Maximum Fuse Voltage	Power Standards
2 (fast blow)	250V	115V U.S.
1 (fast blow)	250V	230V International

To change the fuse to correspond to 230V, be sure that the power
is turned off and the power plug is not connected.

Unscrew the fuse holder from the back panel of unit and remove
the 2A fuse. Place one end of the 1V fuse into the holder
and insert the fuse into the unit. Press gently while screwing
the holder back into place. See Figure 2-5.

Figure 2-5
Fuse
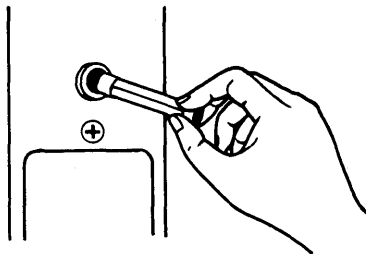
Changing the Voltage Switch to 230 Volts

The system is configured at the factory for 115 Vac.

To change the voltage configuration to 230 Vac you need to switch
the voltage switch on the back panel of the system.

The voltage switch is locked into place by a bar that is removable.   To remove the bar and switch from 115 Vac to 230 Vac, follow these directions:

    1.   Using a Phillips screw driver, remove the screw from the bottom of the bar that spans the 230V side of the switch. See Figure 2-6.

Figure 2-6
Voltage Switch
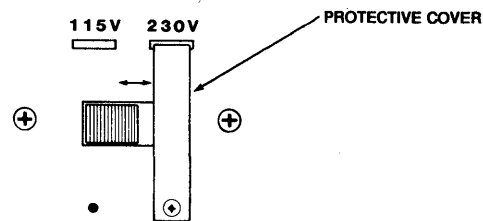
    2.   Carefully remove the bar.

    3.   Firmly push the switch to the 230V position (to the right).

    4.   Match the screw hole of the bar with that under the 115V position and fit the top horizontal section carefully into the slot above the 115V position.

    5.   Insert and tighten screw.

STOP!   Contact your dealer if you are not sure that your power requirements match that of the unit. **Trying to operate the unit with the wrong power configuration can seriously damage the system.**

Power Cord Connection

The power cord that came with your system plugs into the back of the main unit as shown in Figure 2-7. The source power supply and proper connections are described here.

The TS 803H requires a three-prong electrical outlet. If you do not have one and need an adapter, or if you are adapting the TS 803H for 230 volts, continue reading this section.

NOTE!   If you are ready to attach the power cord, skip to the section, Plugging in the Power Cord.

The power cord has a three-prong plug. If you use it with a two-prong adapter, ground it with a **pigtail.** See Figure 2-7.

Internally, the power cord wires are color-coded as follows:

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

The TS 803H requires the following source power:

International	230 Vac at 1 amperes
Domestic	115 Vac at 2 amperes

NOTE!   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.**

Plugging in the Power Cord

Take the power cord that you received with the TS 803H and plug it into the plug on the back of the unit as shown in Figure 2-7.

Plug the other end of the power cord into an electrical outlet as you would any appliance.

Figure 2-7
Power Cord Connection

TWO PRONG CONNECTION
WITH PIGTAIL GROUND

THREE PRONG
CONNECTION
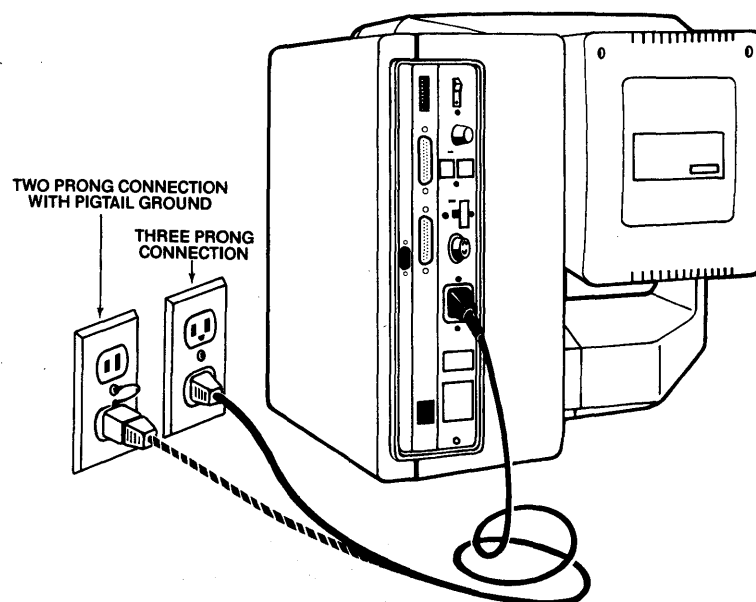
Line Voltage Regulator

We recommend using a line voltage regulator. By using a line voltage regulator, you can safeguard your system from power surges and voltage spikes that may interfere with the normal operation of your system. Contact your computer store for information on availability and installation.

Switch Settings

Switch settings control many functions including video display. Most switches can be set according to your preference, but others must be set in required positions.

During installation, it is important that you check the switch settings to match your system requirements.

The TS 803H has one switch, called a dip switch, located on the rear panel and labeled S1. See Figure 2-8. This switch contains ten sections (they look like small levers). These sections control various system functions. Figure 2-9 illustrates the positions of the sections as they are set by TeleVideo (default settings).

If you want to change any settings, see Table 2-2 for alternative switch settings.

STOP!   The sections of the dip switch are small individual switches. The top of each lever has a small recess that accepts the tip of a ball-point pen. Gently push the switch to the desired position with a pen, and always give the switch a second push to make certain that it is seated properly in the position you have chosen. DO NOT USE A PENCIL! Pencil lead is an electrical conductor, and any small grains of lead falling into the switch sections may cause a malfunction.

Figure 2-8
Rear Panel Switch
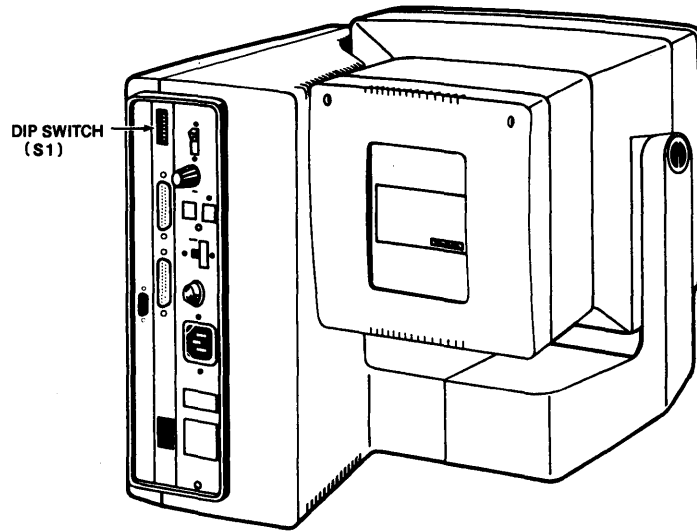
Figure 2-9
Default Switch Sections
(as set by TeleVideo)
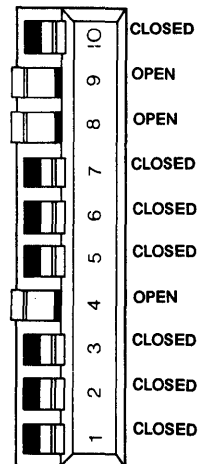
Table 2-2 lists all the possible settings for the dip switch. Read through the table, and set the sections according to your requirements. The starred (*) settings are default settings (set by TeleVideo).

Table 2-2
Switch Settings

Section	Setting (set to right or left)	Function
1	closed (right)	*Baud rate (see Table 2-3)
2	closed (right)	*Baud rate (see Table 2-3)
3	closed (right)	*Baud rate (see Table 2-3)
4	closed (right) open (left)	TS 803 *TS 803H
5	closed (right) open (left)	*Local Remote
6	closed (right)	*Required
7	closed (right) open (left)	*60Hz 50Hz
8	open (left)	*Required
9	open (left) closed (right)	*Green on black screen (default) Black on green screen
10	closed (right)	*Not used

* Default settings

NOTE!   If you are not connecting a printer or modem and are ready to use your system, go to the Checklist of Installation Procedures at the end of this chapter before continuing with Chapter 3, Power On.

If you wish to connect a printer or modem to your system, continue reading this chapter.

If you are adding a plotter or a mouse, please follow the installation instructions that accompany those devices. Also see Appendix K.

CONNECTING PERIPHERALS

Auxiliary serial devices such as printers, modems, plotters, and mice can be connected to the TS 803H. Instructions are given here for connecting a printer and a modem. The serial printer interface allows the TS 803H to be used with most RS-232C-compatible serial printers currently available on the market, including both character-by-character and buffered printers. The TS 803H is also equipped with a serial modem port for data transmission to another location over telephone lines.

The Setup Program allows you to quickly and easily change the baud rate, and the printer and modem port data format to adapt to a variety of peripherals. You can also indicate whether or not a mouse is attached. A complete description of the capabilities of the Setup Program as well as step-by-step instructions for using it are in Appendix K.

Attaching Cables

Cables are needed to connect the TS 803H to a printer or a modem. The types of cables needed are determined by the requirements of the type of devices attached to the TS 803H. You can obtain the appropriate cables for attaching peripheral devices at your computer store.

Cable connectors commonly have D-shaped end connectors. See Figure 2-10. These fit onto a D-shaped pin connector on the rear panel of the system. To install a cable, turn the connector end of the cable to fit the pin connector on the device, then gently push the cable on the pin connector. The screws can be finger tightened to prevent accidental cable disconnection.

Figure 2-10
D-Shaped Cable Connector
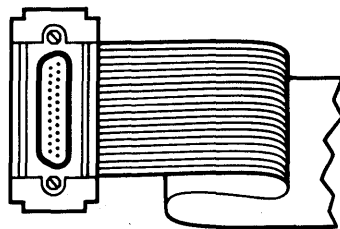
Leave some slack as you connect the cables. If you are using a round cable, coil it loosely and secure it with a rubberband. If you are using a flat, ribbon cable, fold it accordion-style as shown in Figure 2-11. Coiling the ribbon cable can adversely affect system performance.

Figure 2-11
Correctly Folded Excess Ribbon Cable
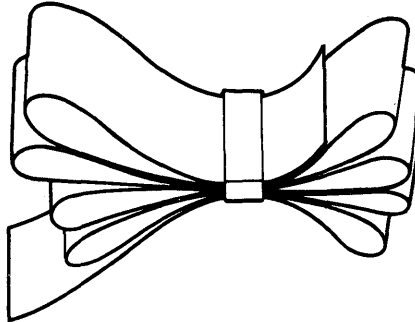
Connecting a Serial Printer

The RS-232C serial port labeled **Printer** is ready to connect to a
serial printer when the unit is shipped from the factory. The TS
803H is set to work with printers that run with DTR protocol. Be
sure to read the instructions that came with your printer for
correct interfacing information.

The TS 803H and printer should be within 50 feet of each other.

Attach one end of an RS-232C interface cable to the port labeled
Printer. Attach the other end to the RS-232C pin connector on
the printer.

The computer and the peripherals must run at the same speed in
order to work properly. This speed is called the baud rate.
Baud rates are determined by the switch settings. Table 2-3
shows the proper switch settings for changing the baud rate to
correspond with various printers and modems. The baud rate can
also be changed by using the Setup Program as described in
Appendix K.

Table 2-3
Printer and Modem Baud Rate Switch Settings

Dip Switch Section

1 2 3	Baud Rate
C C C	9,600 (default)
O C C	4,800
C O C	2,400
O O C	1,200
C C O	600
O C O	300
C O O	150
O O O	75

Legend
C = Switch closed (right)
O = Switch open (left)

Changing the Default Printer Device

To change the default printer device and to establish different
power-up default values, refer to the instructions in the Systems
Reference Manual, available for purchase from your computer
store.

Connecting a Modem

You can connect one or two modems to the TS 803H. The RS-232C
port labeled **RS 232** is ready to interface to a modem.

If you wish to attach two modems (and no serial printer), a cross
RS-232C cable must be used between the printer port and the modem.

The TS 803H and modem should be within 50 feet of each other.

Attach one end of an RS-232C interface cable to the port labeled
RS 232. Attach the other end to the modem's RS-232C pin
connector.

Modem baud rate at default is 9600 baud, but it can be changed by
the Setup program in Appendix K or by changing the switch
settings. See Table 2-3.

CHECKLIST OF INSTALLATION INSTRUCTIONS

Before you proceed with the operation of the system, check your installation.

1.   Did you check the TS 803H for possible shipping damage?

2.   Is the location that you selected:

      Free from magnetic interference?

      Supplied with a steady line of voltage?

      Within comfortable temperature and humidity levels?

      Clean?

      Providing sufficient ventilation around the case?

3.   Is the telephone-type coiled cord plugged into the keyboard?

4.   Is the power switch turned off?

5.   Is the power plug correct for the electrical power outlet?
      Is it plugged into a grounded electrical outlet?

6.   Is the switch S1 set correctly? For all peripheral devices?

7.   If the TS 803H is connected to a serial printer and/or a
      modem, are they connected and located within the distance
      limits specified?

If the answer to all of these is YES, then you are ready to go on
to Chapter 3, Power On.

3. POWER ON

INTRODUCTION

This chapter gives a step-by-step guide for turning on your
computer, adjusting the contrast, and understanding and using the
keys on the keyboard. There are also sections on how to run the
demo and how to use applications programs. The last section
shows you how to turn the computer off.

DRIVE IDENTIFICATION

There is one floppy disk drive and one Winchester (hard) drive on
the TS 803H which are mounted vertically on one side. The floppy
drive is on the top and is opened and closed by turning the latch
on the drive opening.

The hard drive is behind the flat space below the floppy drive.
It is organized (configured) so that it is divided into two
different drives. These are called **logical drives** and this
division makes it easier to store and find your files.

ACTIVATING THE SYSTEM

1.   Be sure the computer is set up correctly as described in
      Chapter 2.

2.   Remove the system diskette (the diskette that came with the
      TS 803H), labeled **CP/M**, from its dust jacket.

      To ensure that the system diskette does not get erased, you
      can put a write-protect tab (furnished with each package of
      blank diskettes) over the notch on the system diskette. See
      Figure 3-1. See Chapter 4 about write protecting diskettes.

Figure 3-1
Write Protecting System Diskette
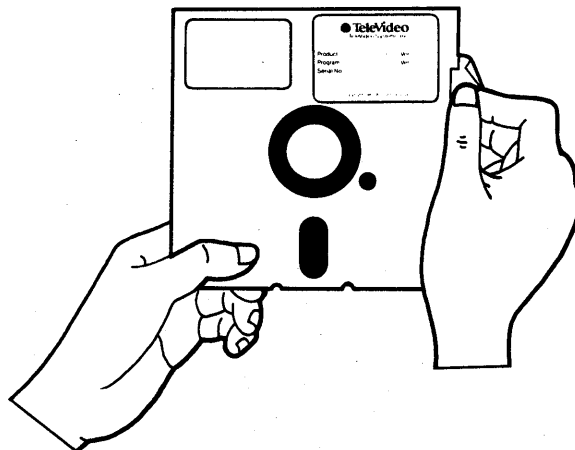
3.   Remove the shipping cardboard pieces that are in the
      diskette drives. Save the cardboard for shipping. Leave
      the floppy drive latch in the vertical position.

4.   Power up the TS 803H by pressing the white dot on one end of
      the power switch on the rear panel of the main unit. See
      Figure 3-2.

Figure 3-2
Power Switch
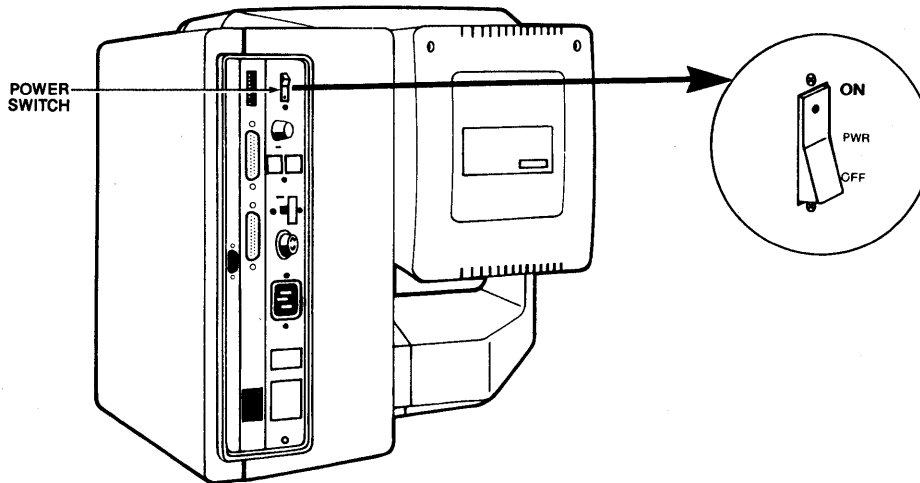
5.   Listen for a beep within one second (indicating that power
      is on and the processor has scanned the switch settings).

6.   Watch for the cursor (a blinking rectangle) to appear on the
      screen within 10 to 15 seconds to the right of this message:

      System "boot" (x-Rev.x) from floppy disk in progress_

7.   Insert the system diskette in the floppy drive holding the
      diskette so that the label faces to the left and the notch
      faces down and turn the drive latch till it is horizontal.

Figure 3-3
Inserting a Diskette
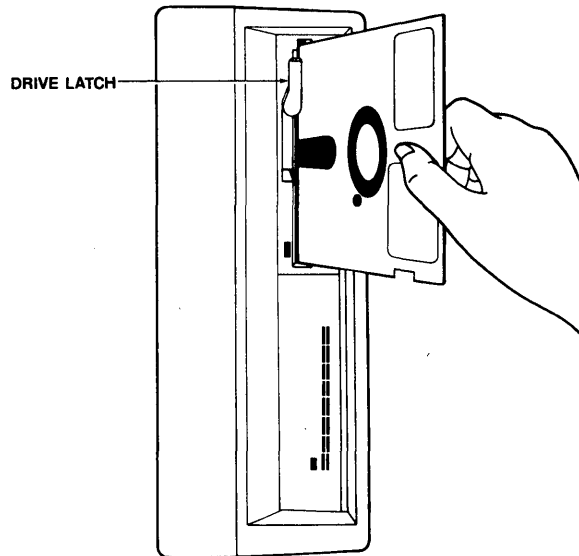
This starts up (boots) the operating system and the
following sign-on message appears if there is no boot
failure (see the section on Self-Tests During Power On and
Reset):

        TeleVideo System TS 803H Vx.x
        (c) 1983 TeleVideo Systems, Inc.
        Boot from floppy disk
        xxK CP/M version y.y

        A>

Booting Up

Boot is a term that describes the process of the computer
starting itself up.   It derives from the expression "pull
yourself up by the bootstraps."

There are two types of boots - a **cold boot** and a **warm boot**. Each
one affects your system in a different way.

A **cold boot, cold start,** and **reset** all refer to the same action.
It is referred to as a cold boot here for simplification. A cold
boot is done after the power is turned on for the first time. A
cold boot clears the system memory and loads the operating system
into the computer. If you turn the power off and on again, or
reset the system, any data in memory that has not been saved to
the diskette is lost.

You would only cold boot the system when you initially start up
your computer, if there is a problem with the program and you wish
to start over, or if the system is not responding correctly. For
example, you would cold boot the system when the cursor freezes.

To cold boot your system, turn the power off and on. To reset the system, press the CTRL and RESET (^RESET) keys simultaneously.

A **warm boot** is primarily used to interrupt and stop the execution of a CP/M command or to tell the system there is a new diskette in the drive. When you press ^C (the warm boot command), the system prompt appears on the screen. Applications programs have their own warm boot commands to allow you to return to the operating system prompt.

To warm boot the system, enter ^C (depress the CTRL and C keys simultaneously) either when it would be the first character entered in response to a system prompt or in applications programs when allowed.

Self-Tests During Power On and Reset

When the TS 803H is first powered on, several tests are performed to check the system functions. These tests make sure there are no hardware problems that could prevent the operating system from loading, damage the user programs, or destroy data.

If there are any parts that do not pass the tests, an error message appears on the screen. This message states the problem and then says to contact your distributor. Try to reset the system again before calling your computer store.

NOTE!   These tests are not performed when the TS 803H is warm booted--only at cold boot.

If no messages appear, reset the system by pressing ^RESET simultaneously. (If necessary, refer to the section Troubleshooting in Chapter 7.)

Cursor

The blinking rectangular block on the screen is called the **cursor.** The cursor shows you where data typed on the keyboard will appear on the screen. As the cursor reaches the end of a line, it automatically goes down, or **wraps around,** to the beginning of the next line.

System Prompts

The system prompt for drive A in your TS 803H looks like this:

    A>

Prompts vary from one computer system to another but almost
always indicate that the operating system is ready for your
response. While using an applications program, you may see a
different prompt symbol; this will be explained in the
applications program instructions. The letter before the prompt
itself (**A>**) tells which drive is currently being used.
This is called the **logged drive.**

Adjusting the Contrast

Adjust the contrast by turning the contrast knob on the rear
panel of the system for the desired screen intensity. See Figure
3-4.

Figure 3-4
Contrast Knob

CONTRAST KNOB
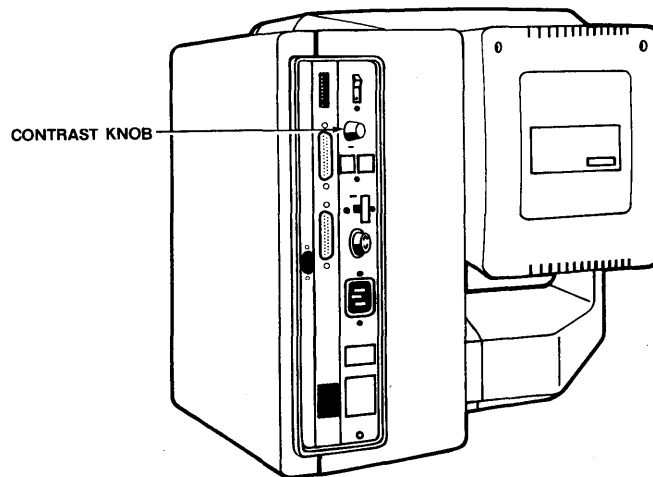
Logical Drives

The TS 803H can be booted from either the floppy drive or the
hard drive. The computer automatically first looks to the
floppy drive for the system boot files. If they are not in the
floppy drive, it looks to the hard drive.

You have booted the TS 803H from the system diskette in the
floppy drive but for continual use, you should transfer the
system diskette files to the hard drive and store the system
diskette as a back-up copy.

There is a special utility program called SUBMIT that correctly
and easily transfers all the necessary data from the system
diskette to the hard drive. Follow the SUBMIT program carefully.
The instructions are written in the script form as described in
the Notation Convention section of Chapter 1.

Transferring the Software onto the Hard Disk

The SUBMIT program may used to transfer all of the software from
the system diskette onto the hard disk. You need to have the
BUILDDSK.SUB file, which is on the system diskette, to run this
program. By using the BUILDDSK.SUB and SUBMIT programs, you
format the hard disk, run the FIXDISK program, and transfer all
the software from the floppy onto the hard disk.

USER: 1.   Boot the system from the floppy drive (turn on the
                  power, insert the system diskette in the floppy
                  drive, and close the drive).

SYSTEM: 2.   Displays

                  TeleVideo System TS 803H Vx.x
                  (c) 1983 TeleVideo Systems, Inc.
                  Boot from floppy disk.
                  xxK CP/M version y.y

                  A>

USER: 3.   Enter

                  SUBMIT BUILDDSK<CR>

SYSTEM: 4.   Displays

                  A>; TS-803H SOFTWARE INSTALLATION SUBMIT FILE
                  A>; FOR INSTALLATION OF THE TS-803H
                  A>;
                  A>; FORMAT THE TS-803H HARD DISK - TYPE '<CR>' FOR INTERNAL DIS
                  A>HFORMAT

                  TS 803H Hard Disk FORMAT Vx.y
                  10Mb Miniscribe III hard disk
                  (c) TeleVideo Systems, Inc.

 ** Caution: All data on the integral hard disk will be destroyed. **

                  Type RETURN when ready (ESC or CTRL-C to abort)

USER: 5.   Enter

                  <CR>

SYSTEM: 6.   Displays in approximately fifteen minutes after
                 FORMAT is complete, if <CR> was entered

                 A>; FIND AND MARK BAD DISK BLOCKS

                 A>FIXDISK C:

                 FIX DISK PROGRAM VER. x.y
                 CURRENT SCANNING BLOCK: #xxxx

                 FIX DISK COMPLETED WITH xxxx DATA BLOCKS ERROR

                 A>; TO INSTALL THE OPERATING SYSTEM
                 A>; TYPE 'A' AND '<CR>' KEYS FOR SOURCE DRIVE
                 A>; TYPE 'C' AND '<CR>' KEYS FOR DESTINATION DRIVE
                 A>; TYPE '<CR>' TO CONTINUE

                 A>SYSGEN
                 SYSGEN Vx.y
                 (c) 1982 TeleVideo Systems, Inc.

                 SOURCE DRIVE NAME (OR RETURN TO SKIP)

USER: 7.   Enter

                 A

SYSTEM: 8.   Displays

                 SOURCE ON A:, THEN TYPE RETURN

USER: 9.   Enter

                 <CR>

SYSTEM: 10.   Displays

                 FUNCTION COMPLETE
                 DESTINATION DRIVE NAME (OR RETURN TO REBOOT)

USER: 11.   Enter

                 C

SYSTEM: 12.   Displays

                 DESTINATION ON C:, THEN TYPE RETURN

USER: 13.   Enter

                 <CR>

SYSTEM: 14. Displays

FUNCTION COMPLETE
DESTINATION DRIVE NAME (OR RETURN TO REBOOT)

USER: 15. Enter

<CR>

SYSTEM: 16. Transfers all the files from the floppy disk onto
              hard disk drives B and C.

         17. Displays

A>PIP B:=A:*.*[VO]
A>PIP C:=A:*.*[VO]
A>ERA B:$$$.*
A>ERA C:$$$.*
A>; END OF SUBMIT PROGRAM

USER: 18. Remove the system diskette from the floppy drive
              and store in a safe place. You can use it for a
              back up should you ever need to reformat the hard
              disk.

         19. Reset the system to boot from the hard disk by
              leaving the floppy drive door open and pressing
              the ^**RESET**. Logical drive A in the hard disk is
              now drive A and the floppy disk is now drive C.

Drive Names

There are three drives in the TS 803H; one floppy drive, and two
on the hard drive. Their name designations differ according to
how you booted the system. If you booted the system from the
floppy drive, the floppy drive is called drive A. If you booted
from the hard drive, then drive A is on the hard drive. Table 3-
1 lists the changes as well as each drive capacity and the
maximum number of files (directory entries) you can have.

Table 3-1
Logical Drives

Loading Source	Logical Drive Assignments	Physical Device	Drive Capacity* (Kbytes)	Maximum Directory Entries
Floppy	A	Floppy	342	64
	B	Hard	4864	512**
	C	Hard	4848	512**
Hard	A	Hard	4848	512**
	B	Hard	4864	512**
	C	Floppy	342	64

*Excluding directory and operating system allocation
**Expandable to 1024 by modifying CBIOS

RUNNING THE TS 803H DEMO

The TS 803H demo program is on the system diskette and were
transferred to your hard disk with the rest of the system files.
It describes the features of the TS 803H and shows many of the
graphics capabilities.

Follow these directions to run the TS 803H demo.

SYSTEM: Displays

     A>

USER: Enter

     803hdemo<CR>

     (Type in **803hdemo** and press the RETURN key.)

SYSTEM: Displays after a pause

```
-----------------------------------------------------
GSX-80 x.x  15 Nov 82    Serial No 5000-0326-654321
Copyright (C) 1982
Digital Research, Inc.        All Rights Reserved
-----------------------------------------------------
Which output device-
1  - CRT
11 - plotter
21 - printer
?
```

NOTE!   To make this demo run on a plotter or a printer,
                   you must set the TS 803H by running the Setup
                   Program, and connect the computer to the plotter
                   or printer. See Appendix K for running the Setup
                   Program and Chapter 2 for connecting peripherals.

USER: Enter

           1<CR>

           (Type the numeral 1 and press the RETURN key.)

SYSTEM: Displays

           reading in data

SYSTEM: The TS 803H demonstration begins.

As the demo displays each screen, you can stop the program and
leave the current display on the screen. To do this, press any
key **except the D key.** The program will finish drawing the
current screen and stop. To start the program again, press any
key.

To stop the program and go back to the operating system, press
the **D key.**

RUNNING APPLICATIONS PROGRAMS

When you purchased the TS 803H, you received three applications
programs, TeleCalc, TeleChart and TeleWrite. Here are some
instructions as to how to get started on TeleWrite, the executive
word processing program. First transfer the program from the
floppy diskette to logical drive A. For instructions about how
to transfer your applications program diskette onto the hard
disk, please see the section on utility programs in Chapter 6

To be able to use your program, you must know the command to call
it up to the screen. That command is in the manual for the
program. The command to bring up TeleWrite is "TW."

Here's how you can bring it up on the screen and use it:

SYSTEM: Displays

           A>

USER: Enter

           TW<CR>

To continue with your applications program, see the directions in
the TeleWrite User's Manual.

USING CP/M, THE OPERATING SYSTEM

When you start the system, and you see the A> prompt, you are in CP/M, the operating system for the TS 803H. The operating system contains all the instructions that make the computer work. It also contains some programs and commands that can be useful to you as you use your applications programs.

When you type in commands, CP/M recognizes either upper- or lower-case letters even though its responses are in capital letters.

See Chapter 5 for a complete description of CP/M and its many uses.

TURNING THE COMPUTER OFF

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

1.   Turn the drive latch to the vertical position.

2.   Should you have a diskette in the floppy drive, remove it.

3.   Turn off the power.

STOP!   ALWAYS TURN THE DRIVE LATCH TO THE VERTICAL POSITION
          BEFORE TURNING THE POWER TO THE SYSTEM ON OR OFF.
          OTHERWISE, RESULTING POWER SURGES MAY DESTROY THE
          STORED INFORMATION.

4. THE KEYBOARD

INTRODUCTION

The TS 803H keyboard is detachable so that you can put it in a convenient position and the keys are arranged like a typewriter. This chapter discusses the three types of keys on the keyboard and lists each key and how it works. For a more technical description of the keys, see the chapter, Programming the Terminal Emulator.

KEY DESCRIPTIONS

The keyboard has a Selectric-style format with a separate numeric keypad for accounting applications. This means that the keyboard operates like a typewriter with many of the same special keys and capabilities to do tabbing and other typewriter functions. There are also special keys along the top of the keyboard called, function keys, that are used by program developers to customize applications software to the TS 803H.

Figure 4-1
Keyboard
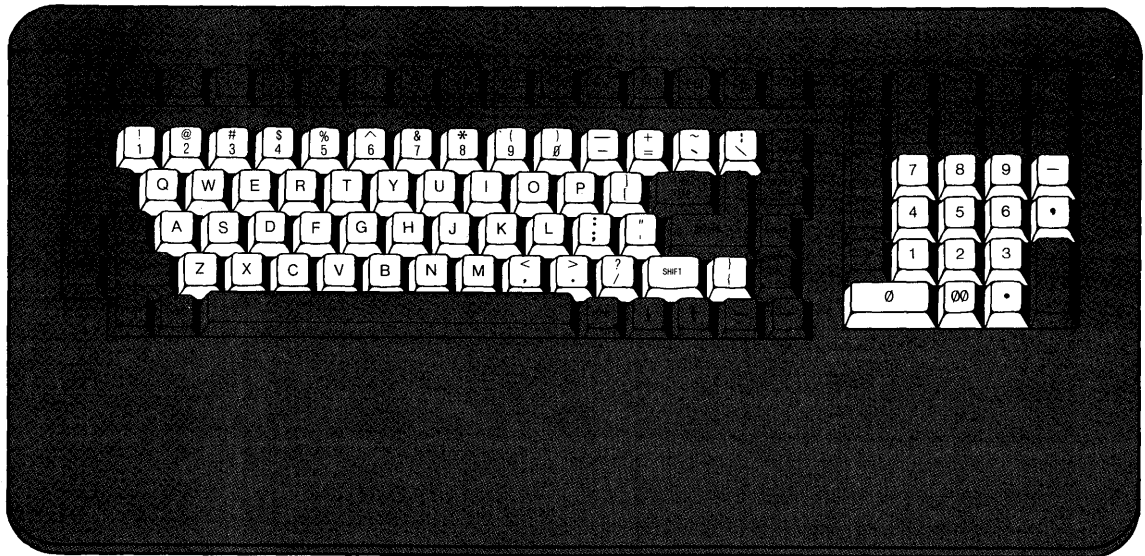
Character Keys

The character keys that are highlighted in Figure 4-1 are
arranged as they are on a typewriter.

The character keys include all alphabet characters (A through Z),
numbers (0 through 9), punctuation marks, and mathematical
symbols. All character keys repeat when pressed for more than
one-half second.

Special Keys

There are several special keys that make inputting information
easier. The three sections on the following pages include
descriptions of the special keys on each side of the main keypad
and the special keys on the numeric keypad.

Many of the special keys are not programmed to be used as labeled
when you are using CP/M, the operating system. They are
available for customization by a programmer to a specific
applications program. Therefore, if you use them, you may see
some symbols and characters on the screen that do not seem to
make any sense.

The following descriptions are a general guide for what each key
does when you are using CP/M. Programmers can refer to the
section, Keyboard in Chapter 8 for a more detailed description of
the keys.

All of these keys are operational as described when you are using
CP/M, the operating system. They may not be operational as
described if you are using an applications program.

Figure 4-2
Special Keys 1

Table 4-1
Special Keys 1

Key Name	Description
Space Bar	Works like the space bar on a typewriter.
SHIFT	Like the SHIFT key on a typewriter it selects the upper character inscribed on a key, changes operation of most special keys, and capitalizes alpha characters. Like the typewriter SHIFT key, it must be pressed down simultaneously with the key to be shifted. In this manual, when you see **SHIFT/** it means to simultaneously press SHIFT and the key that follows the slash.
ALPHA LOCK	Locks the SHIFT keys so that all alpha keys are upper-case characters. The key is pressed to lock and pressed again to release.
TAB	Moves the cursor forward one tab.
BACK TAB	Moves the cursor to the first column on the line when used in the key sequence SHIFT/LOC ESC, BACK TAB.
CTRL (Control)	The control key combinations are used for special action by the computer and/or the applications program in the computer. The CTRL key is always used **simultaneously** with the other character in the command; the CTRL key is pressed first and held down while the other key is pressed. **Use of the CTRL key is indicated in this manual by ^.**
LOC ESC/ESC	This key is generally used to momentarily leave (Escape) an applications program in order to use a special feature or function. ESC is unshifted. **LOC ESC is shifted.** The ESC key is used with another character(s) in the command sequence; **the ESC key is pressed and released before the second key is pressed.**
F1 through F16 (Function Keys)	Certain applications programs enable these keys to perform special functions.

PRINT   The PRINT key does not activate printing in
                           CP/M. All print functions are software
                           controlled.

FUNCT   The FUNCT key is not used on the TS 803H.

Figure 4-3
Special Keys 2

Table 4-2
Special Keys 2

Key Name   **Description**

RETURN and ENTER   The RETURN and ENTER keys can be used
                           interchangeably. When the RETURN key is
                           pressed, the action on the screen is like a
                           carriage return. In this manual, when you
                           are to press the RETURN or ENTER key, you
                           will see this:

                                   <CR>

LINEFEED   This key moves the cursor down one line on
                           the screen when used in the sequence
                           SHIFT/LOC ESC, LINEFEED. When pressed alone,
                           it works the same as the RETURN key.

BACKSPACE   Moves the cursor one character to the left
                           and deletes that character. Same as arrow
                           left.

CLEAR SPACE   When you press SHIFT/LOC ESC, CLEAR SPACE, all
                           characters on the screen are replaced with
                           spaces.

	Shifted CLEAR SPACE clears the graphics display whether or not the graphics is being displayed at the time.
DEL (Delete)	Deletes the character to the left. On the screen, the characters that are to be deleted are displayed.
HOME	Pressing SHIFT/LOC ESC, HOME moves the cursor to column one of row (line) one. This position is referred to as the **home** position.
Arrow Up	Moves the cursor up one line when pressed in the sequence SHIFT/LOC ESC, arrow up.
Arrow Down	Moves the cursor down one line when pressed in the sequence SHIFT/LOC ESC, arrow down.
Arrow Right	Moves the cursor one character to the right when pressed in the sequence SHIFT/LOC ESC, arrow right.
Arrow Left	Moves the cursor one character to the left without deleting that character when used in the sequence SHIFT/LOC ESC, arrow left.

Moves the cursor one character to the left and deletes that character when used alone. |
| BREAK | The BREAK key is not used in CP/M. |

Figure 4-4
Numeric Keypad Special Keys

Table 4-3
Numeric Keypad Special Keys

Key Name	Description
CHAR INSERT	When pressed in the sequence, SHIFT/LOC ESC, CHAR INSERT, causes character at the cursor to move right one column position and enters a space at the cursor position.
LINE INSERT	Inserts a line consisting of spaces at the cursor position when used in the sequence, SHIFT/LOC ESC, LINE INSERT.
LINE ERASE	Deletes all characters from the cursor to the end of the line when used in the sequence, SHIFT/LOC ESC, LINE ERASE.
CHAR DELETE	Deletes the character at the cursor position and moves all following characters left one position when used in the sequence, SHIFT/LOC ESC, CHAR DELETE.
LINE DELETE	Deletes the line at the cursor position and all following lines move up one line when used in the sequence, SHIFT/LOC ESC, LINE DELETE.
RESET	Used with the CTRL key to reset the system. In this manual, this sequence is written **^RESET.**
TAB	Causes the cursor to advance to the next set tab.
MODE	The MODE key enables the user to toggle the display from graphics to alphanumerics and vice versa without affecting the running program.
CE	The CE (clear entry) key erases the current line and moves the cursor back to the prompt.
PAGE	The PAGE key is not used on the TS 803H.
PAGE ERASE	The PAGE ERASE key is not used on the TS 803H.
SET UP/NO SCROLL	The SET UP/NO SCROLL key is not used on the TS 803H.

5. WORKING WITH DISKETTES

INTRODUCTION

Floppy diskettes contain the software or programs that run your system. This chapter describes what they look like, how to take care of them, and how to use them.

DESCRIPTION

Diskettes are used to store operating systems, applications programs, text, and data. Figures 5-1 and 5-2 show the parts of the diskette.

Figure 5-1
Floppy Diskette
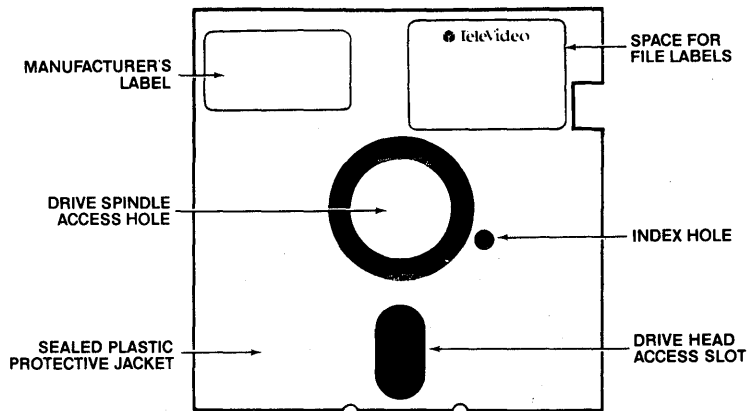
Figure 5-2
Inside the Diskette
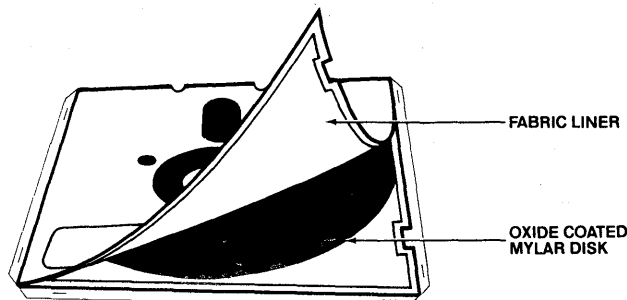
When you put a diskette in a drive and close the drive, the disk
drive spins the diskette around. There is a drive head on either
side of the diskette which lower when you close the drive. The
drive head moves back and forth along the diskette access slot as
it reads from or writes to the diskette.

STORING AND HANDLING DISKETTES

Diskettes can provide reliable service if you follow these simple
rules:

WHEN NOT IN USE
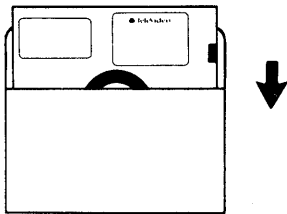
Return your diskettes to their dust jackets
when not in use. Store your diskettes in an
upright position in a dust-free storage
container.

**NO SUN
NOT TOO HOT**

Store your diskettes in a cool place, away
from direct sunlight or sources of heat.

DON'T TOUCH DISK
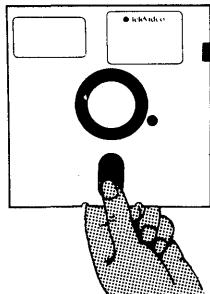
Do not touch the exposed recording surface of
the diskette. Small scratches, dust, food,
or tobacco particles may make your diskette
unusable.

FELT TIP ONLY
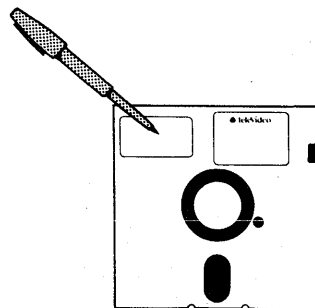
Use a felt-tip pen to write on the diskette
label and press very lightly. Never use a
pencil or ballpoint pen. Whenever possible,
write information on the label before placing
the label on the diskette.

NO PENCILS, NO CLIPS, NO BALLPOINTS
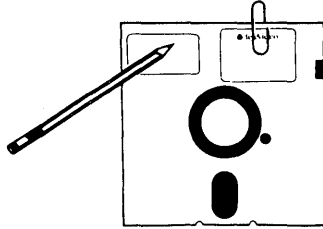
Never use paperclips or staples to attach
anything to the diskette or to its dust
jacket.

DON'T BEND
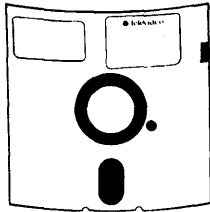
Never fold or bend your diskettes.

NO MAGNETS
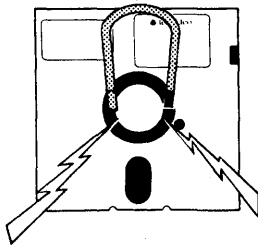
Keep diskettes away from anything that has a
magnetic field such as telephones, magnetic
paperclip holders, typewriters, and
electronic calculators.

INSERTING DISKETTES

After removing a diskette from its dust jacket, hold it so that
the notch faces down and the labels face left. Insert the
diskette in the drive as shown in Figure 5-3. Gently push the
diskette into the drive using your fingertip.

Figure 5-3
Inserting a Diskette
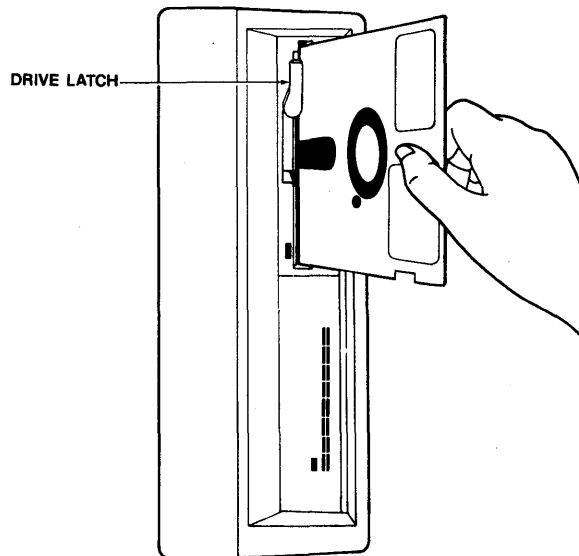
NOTE!   If the diskette seems to catch on an edge, pull it out
              slightly and push it in again. DO NOT FORCE IT IF IT
              RESISTS.

Close the drive by turning the drive latch to the horizontal
position.

Formatting Diskettes

Each computer manufacturer has its own format requirements for
diskettes which is why blank diskettes are not formatted by
diskette manufacturers. Before you use a new, blank diskette for
file storage, you have to format it for the TS 803H.

You format a diskette by running a special program, called a
utility program, that is one of your system files. The FORMAT
program prepares the diskette to receive TS 803H information,
checks the diskette for bad spots, and builds a directory to hold
information about the files that will be stored on the diskette.

STOP!   When you run the FORMAT program on a diskette that you
              have already used, it erases all the data that you
              might have on your diskette.

To learn how to run the FORMAT program, turn to the chapter,
Utility Programs.

COPYING MASTER DISKETTES

When you purchased the TS 803H, you received diskettes containing
the operating system and some applications software programs.
The diskettes that you receive from the manufacturer are called
master diskettes. You should have transferred the programs that
you received with the TS 803H onto your hard disk as described in
the chapter, Power On. It is also a good idea to save them plus a
copy for a back-up in case a copy of them wears out or gets
damaged.

You may also want to copy files from one diskette to another
without transferring files onto the hard disk. There is a
utility program called COPYDISK that quickly copies all files on
one diskette to another diskette. See the chapter called Utility
Programs for how to run the COPYDISK program.

WRITE-PROTECTING DISKETTES

When you copy files from one diskette to another, it can
overwrite files that are already on the destination diskette. If
you want to make sure that the files on a diskette can never be
written over, such as the files on your master diskettes, you can
write-protect them.

To write-protect a diskette, place one of the silver self-
adhesive tabs that are supplied with each box of blank diskettes
that you buy over the write-protect notch (See Figure 5-1). With
the tab in place, the drive cannot write information on the
diskette. When you want to remove the protection, remove the tab
from the diskette.

Backing Up Diskettes

Having a back-up copy of all of your files is very important
because accidental erasures do happen, and diskettes eventually
wear out. So that you never lose files, learn to make a back-up
copy of each file by using the COPYDISK utility program to copy
all the files on a diskette. You can also use the CP/M PIP
command to copy all the files or individual files from a diskette
to another diskette. See the CP/M section of the System
Reference Manual.

It is a good idea to back up your current files every day so that
you have at least one current copy on a diskette of all your
files on the hard disk.

Backing up your files often and on a regular basis, and careful
handling of your diskettes are two of the most important habits
you can develop.

6. USING CP/M, THE OPERATING SYSTEM

INTRODUCTION TO CP/M

CP/M stands for "Control Program/Monitor" or "Control Program for Microcomputers." CP/M is a computer program, just like a word processor or accounts payable package and comes on a floppy diskette just like other programs. CP/M is called an **operating system** because it controls all the operations and programs in your computer. The diskette that CP/M comes on is called the **system diskette** in this manual.

CP/M controls **all** of the operations in your computer. It controls the read and write operations to the disk drives. It loads the various applications programs that you want to run and supervises their execution. It organizes the data for communications to a printer or over a modem to a remote station. One way to think of CP/M is as the "personality" that resides in your computer: it is the over-all set of commands that you use to run everything else on your system.

CP/M TERMS

The following table describes some of the basic technical terms used in computing. By becoming familiar with them, you will more easily be able to master the use of your computer.

Table 6-1
Technical Terms

Term	Definition
System Diskette	The diskette that contains the CP/M operating system that came with the TS 803H. It contains the resident commands on tracks 0 and 1, and the transient commands in .COM files.
Operating System	A collection of programs that give instructions to the computer for the execution of applications programs on a computer.

Cold Boot

On power-up, or system reset, this is the process the computer goes through of checking itself for hardware failures, clearing memory, and loading the operating system program or programs from the system diskette in drive A (in the TS 803H). On the TS 803H, a cold-boot is started by turning on the power or by pressing ^RESET simultaneously.

Warm Boot

By entering a ^C you cause CP/M to re-start itself (press the CTRL and C keys simultaneously).

System Prompt

The system prompt looks like this:

A>

When it is displayed at the left side of your screen, CP/M is ready for you to enter your next command.

Logged Drive

The logged drive is the disk drive that CP/M is currently working from. The letter in the system prompt indicates the currently logged drive. If you enter a transient command, this is the drive that CP/M searches to load the command.

Resident Program

The kernel of CP/M is loaded once into a special area in memory, and resides there until memory is cleared with a cold boot or reset. The "resident commands" are a part of this kernel, so the system can execute them without referring to the disk for more information.

Transient Program

This is any applications program or CP/M command that is stored on the diskette in a .COM file. When you issue a command to use the programs in these files, the programs are loaded into the user memory area (transient program area), executed, and then cleared from memory.

Command Line

This is the text line that you type to the right of the system prompt. The format of the input line for each command is detailed in the description of each command in the Transient Commands and Utility Programs sections of this chapter. Commands for editing the command line before you send it to the computer with a <CR>, are described in the CP/M Command Lines section of this chapter.

User Memory Area   The user memory area is the central region of
                        the Random Access Memory (RAM) in your
                        computer. The areas above (high memory) and
                        below (low memory) are reserved for CP/M.

                        The user memory area is where transient
                        programs are loaded and executed, while CP/M
                        surrounds and supervises the execution. CP/M
                        transient commands (such as STAT and PIP)
                        and applications programs are held on the
                        diskette in .COM files until they are called
                        into memory by your command.

                        The user memory area is also called the
                        "transient program area" or TPA.

STARTING UP CP/M

There are several steps for starting your system and activating
the operating system. Most of them were described in previous
chapters. The following is a quick review of those steps as they
relate to CP/M.

System Diskette

In Chapter 2 you learned how to set up your TS 803H for
comfortable and safe operation. Chapter 3 showed you how to turn
on the power to your system, and how to install the operating
system onto the hard disk. Keep the original system diskette as
a back-up in case you need to reformat the hard disk.

Start Up Review

Open the floppy drive by turning the latch to the vertical
position and turn the computer's power switch ON. The computer
will automatically boot off the hard disk. This message followed
by a blinking cursor appears on the screen that tells you the
cold boot self-tests of the computer are running:

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

If no hardware errors occur (see Chapter 3, Self Tests During
Power-on and Reset), the computer automatically loads CP/M into
memory. CP/M displays this "sign-on" message:

    TeleVideo System TS 803H Vx.x
    (c) 1983 TeleVideo Systems, Inc.
    Boot from hard disk
    xxK CP/M version y.y

    A>

Reset Command

In the following paragraphs you learn how to use the CP/M commands. If you should enter a command that doesn't seem to work, or the system "freezes" after you enter a command, remember that you can always re-start (cold boot) CP/M by pressing the keys

   ^RESET

Press the CTRL and RESET keys simultaneously. This command causes the computer to clear memory and re-load the CP/M operating system. This is the same as turning the power on. If you still have problems, run through the installation procedure in Chapter 3 a few times and check the Troubleshooting section in Chapter 10. If the problem persists, contact your computer store.

SYSTEM PROMPT AND THE LOGGED DRIVE

When CP/M is successfully loaded into memory, the system prompt is displayed at the left margin of your screen:

   A>

The system prompt tells you that CP/M is waiting for your next command which will be displayed just to the right of the **greater-than** character as you type it in. The **A** in the prompt tells you that the **logged drive** is logical drive A.

The **logged** drive is the disk drive that CP/M is currently **working from**. For example, if you want to look up the status using the **STAT** command for a file on disk, and you don't specify which disk drive the file is on, CP/M assumes that you mean the logged drive. You can change the logged drive with this command:

   A>b:<CR>
   B>

The second line is CP/M's response, showing you that the logged drive is now B and that it is ready for another command.

CP/M COMMAND LINES

CP/M takes your commands in the form of a **command line.** A command line is a string of characters that names the command and supplies any data necessary (such as a filename). The command line is terminated and sent to the computer for processing when you press the RETURN (<CR>) key.

CP/M also accepts several "control" characters as commands such as ^C. These are directly interpreted without entering <CR>, and are useful for editing a command line or entering an override command.

Upper- and Lower-Case

You may have noticed that CP/M accepted a lower-case "b" in the
example above, but displayed an upper-case "B" in its response.
CP/M does not distinguish between cases on characters that you
type. You may find it convenient to enter commands in
lower-case so that you can distinguish your entries from CP/M
responses on the screen. When you name a file with lower-case
letters, the name is displayed in upper-case letters in the
diskette directory.

NOTE!   Please note that this is only a characteristic of CP/M:
             other programs such as BASIC do not behave in the same
             way.

Control Characters

The key marked **CTRL** (^) is the CONTROL key. To use the CTRL key,
press the CTRL and a character key simultaneously. For example,
the command to restart CP/M is:

     ^C

Press down the CTRL and C keys simultaneously.

You use this command often to abandon a program that is **running
away** and to restart CP/M. This form of restart is called a **warm-
boot** because CP/M is already loaded in memory and is not reloaded
from the system diskette.

Line Editing

CP/M has several control characters and single-key commands that
allow you to edit a complex command line before you send it to
the computer with a <CR>. Table 6-2 summarizes the available
functions.

Table 6-2
CP/M Control Functions

Key	Function
^C	System warm boot; doesn't clear user memory.
^E	Physical end of line; cursor wraps to beginning of next line, but <CR> not sent.
^H	Backspace; moves cursor back one space and deletes character that was there.
BACK SPACE	Same as ^H.
DEL	Delete character to the left of cursor when used in the sequence DEL<CR>. The character(s) that are to be deleted are displayed (echoed) on the screen.
^I	Moves the cursor to the next tab (8, 16, 24...).
^P	Activates the printer; deactivates the printer with a second ^P (toggle).
^R	Re-display command line; useful after DEL echoes deleted characters on command line.
^S	After a file or a list starts to display on the screen, ^S is pressed to start or stop (toggle) the scrolling of the display.
^U	Cancel current command line; positions cursor under command line for easy re-typing.
^X	Backspace to prompt (erases current line). Works the same as the CE key.
RETURN	Send command line to computer; <CR>.
^RESET	System cold-boot; clears memory and reloads CP/M from drive A.

DISK FILES

The **disk file** is the basic unit of organization in CP/M. All
resident commands refer to file operations. Each diskette
directory can hold up to 64 file entries, but large files may
prevent your using all 64. A file can hold any kind of
information whatsoever: text, machine language program code, or
graphics commands. Every file is labeled with a **unique filename,**
so that the computer can always find the exact file specified in
a given command.

Filenames

A filename is composed of three parts:

    drive prefix:filename.extension

A full unique filename might be:

    A:ACCOUNTS.BAS

The **drive prefix** is a single letter that corresponds to a specific drive. By leaving the drive prefix and colon off the unique filename, CP/M assumes the currently logged drive.

The **filename** is a unique combination of letters and numbers that identifies the file in the disk directory. You can use one to eight characters in the filename, mixing numbers and letters any way you want to arrive at a file-naming scheme that is useful to you.

The **extension** is designated by a period at the end of the filename followed by three characters. It is an extension of the filename, and is useful for identifying different types of files in the disk directory. Table 6-3 lists some common filetype extensions.

Table 6-3
Common Filetype Extensions

Extension	Definition
.ASM	Assembly program source file
.BAK	Back-up file
.BAS	BASIC program source file
.COB	COBOL program source file
.COM	CP/M executable file (transient command)
.DOC	Document file
.HEX	Intel hexadecimal code file
.REL	Relocatable machine code file
.SUB	SUBMIT command file
.TXT	Text file
.$$$	System temporary file

Wildcard File References

In the example above, you saw that you could leave off the drive prefix so that CP/M would supply the currently logged drive. This is handy for speeding up your file manipulation work. You can also insert special **wildcard** characters into a file specification so that CP/M can find multiple files based on a controlling prefix or extension.

      * (asterisk)   In the place of a filename or file extension means "substitute all directory entries here."

      ? (question mark)   In the place of one or several character positions in the file specification means "substitute all possible characters here."

When CP/M finds a wildcard in a file specification it tries to do a file-match. It performs the desired command on all files that match the specification. For example:

    A>STAT *.BAS<CR>

returns the status for all .BAS files on the logged drive (no drive prefix was given).

    A>stat b:sam.*<CR>

returns the status for all files named SAM on drive B, regardless of their filetype extension. (Remember, CP/M converts lower-case to upper-case when you enter a command.)

Use the "?" wildcard for single- and multiple-character substitutions:

    A>era d???.*<CR>

erases all files on the logged drive that begin with "d" followed by up to three characters. (It also erases files that begin with "d" and have less than four characters.) This is known as a file-match "mask." The following erases all files beginning with the letter d:

    A>era d*.*<CR>

RESIDENT COMMANDS

When CP/M is loaded into memory it includes a **kernel** (core group) of built-in or **resident** commands. These are executable directly from their "home" in memory.

CP/M also has a set of **transient commands** which stay on the
system disk until they are needed. Transient commands are
actually small programs that are loaded into memory when you call
them with a CP/M command line; they are cleared from memory when
they are through executing (that is why they are called
"transient"). This section describes the CP/M command line
format for each of the **resident commands.**

The resident commands discussed below are:

      DIR   List a diskette directory
      ERA   Erase a file
      REN   Rename a file
     TYPE   Display or list a file on the screen

Unrecognized Commands

If you type in a command that is not recognized by CP/M, usually
by making a typing error, CP/M repeats the command as you entered
it on the next line followed by a question mark:

    A>**statt<CR>**
    STATT?

    A>

DIR -- List a Directory

The DIR command displays a directory of the files on a diskette.

    A>**dir x:filename.ext<CR>**

By typing **dir<CR>** you get a full directory listing for the
currently logged disk. You can narrow the listing down, or list
the directory for a different drive by supplying a file
specification with or without "wildcard" characters.

ERA -- Erase a File

The ERA command erases the file or files specified.

    A>**era x:filename.ext<CR>**

In the special case of "erase all files" on a diskette:

    A>**era b:*.*<CR>**

ERA responds with a safety verification:

    ALL FILES(Y/N)?

Type **Y** to erase all the files, **N** to cancel the command, followed
by **<CR>.**

REN -- Rename a File

The REN command is used to rename a file in the diskette
directory.

> A>**ren newname.ext=oldname.ext<CR>**

Notice that the replacement goes right-to-left, that is, the
existing file comes second in the command line and will end up
with the name at the beginning. This "parameter order" is
important! See the transient command PIP also.

If you enter as a "new" name the name of a file that already
exists, you get the message:

> FILE EXISTS

If you enter an incorrect file to be renamed, the computer won't
be able to find it, and displays the message:

> NO FILE

TYPE -- List a File on the Screen

This command displays the contents of a file on the screen.

> A>**TYPE x:filename.ext<CR>**

The computer sends information to the screen as fast as it can
scroll, so a long file seems to fly by. Use the ^S command to
stop and start the scrolling action.

TRANSIENT COMMANDS

CP/M comes with a set of very useful utility programs called
transient commands. Some of them are powerful program
development aids such as the text editor ED, a dynamic debugging
monitor DDT, and a file printing routine called DUMP. You can
see a list of the transient commands that came on your CP/M
system diskette by typing:

> A>**DIR *.COM**

The filetype extension **.COM** is used to denote a file that
contains an executable CP/M program or "COMmand." Buying
programs is a matter of adding to the number of .COM files
available to your system. For example, the word processing
program TeleWrite is usually stored in a file called "TW.COM."
So the CP/M transient command to run TeleWrite is:

> A>**TW<CR>**

The program is loaded from disk into the user memory area, or
"Transient Program Area" (TPA), and begins execution. When you
leave TeleCalc, the TPA becomes available again for another
program.

Two of the transient command programs supplied with CP/M are
very useful to the beginning computer operator, and they are
described below. For a description of the more advanced program
development tools, refer to one of the books recommended in
Appendix B.

The two transient commands discussed below are:

> STAT   List the STATus of a file. Use this to get an
>   alphabetical column display of the files on your
>   disk.
>
> PIP   The Peripheral Interchange Program. Use this to
>   move and to copy files.

STAT -- List the Status of a File

The STAT command is used for a variety of tasks. The primary
function is to list the status for a file, or files, or an entire
diskette on the screen. STAT can also be used to change the
protection status on a file or group of files. Finally, STAT can
be used to change the status of the logical device assignments on
your system.

To list the status of the files on a diskette enter:

> A>stat *.*<CR>

This causes a column listing of the diskette files in
alphanumeric order. This is often more useful than the DIR all-
on-a-line listing. In addition to the sorted listing, STAT
displays other useful information about each file. The STAT
listing looks like this:

RECS	BYTES	EX	ACC	
4	12k	1	R/W	A:ASM.COM
13	62k	5	R/W	A:DUMP.COM
11	43k	3	R/O	A:PIP.COM
3	9k	1	R/W	A:STAT.COM

where:

> RECS   is the number of 128-byte records in the file.
> BYTES is the length of the file in bytes.
> EX   is the number of logical extents (16 Kbyte blocks) in
>   the floppy disk.
>   is the number of logical extents (32 Kbyte blocks) in
>   the hard disk.
> ACC   is the file access status.

The file access status can be used to protect valuable files from
unwanted overwriting or accidental erasure. **R/W** means that a
file can be Read from and Written to. **R/O** means that a file can
be Read Only. To change the access status of a file use the
command line:

          A>**stat x:filename.ext $R/O**

By adding the $R/O to the STAT you are adding a "parameter" to
the command line. STAT relabels the file as Read Only. You
can use the STAT command again to change the file back to
Read/Write.

PIP -- Peripheral Interchange Program

PIP is used to copy files from one disk drive to the other. The
basic format for a PIP command is:

          PIP y:file2.ext=x:file1.ext[zzz]<CR>

where:

file2.ext	is the "destination" file, where the copy will end up
file1.ext	is the "source" file, where the copy comes from
zzz	are "parameters" that allow special handling
x and y	are the disk drives

Notice that, like REN, the action proceeds from right-to-left on
the command line.

If you wanted to copy a file from drive A to drive B, the command
line would look like this:

          A>**pip b:=a:myfile.bas<CR>**

There are now two copies of the same data, one in the file
"MYFILE.BAS" on drive A, and one in file "MYFILE.BAS" on drive B.
You may, or may not want to ERAse the old copy (disk space is a
premium, so developing good housekeeping practices can help you
get the most out of your system. Don't wait for a disk-full
error!)

By omitting any drive specifications you can make copies of a file
on the same disk.

One special parameter is very useful, and easy to append to the
PIP command line:

> v   causes PIP to verify that the copy is an exact
>   duplicate of the original file by doing a byte-by-byte
>   comparison. This may cause delays on long (200K plus)
>   files.

If you wanted to use this parameter in the file transfer from the
above example, the command line would look like this:

> **A>pip b:=a:myfile.bas[v]<CR>**

This command assures that the file is copied with no errors. The
parameters are enclosed in square brackets, and appended directly
with no space to the end of the command line.

For more details about the PIP command, refer to one of the
excellent CP/M books listed in Appendix B.

APPLICATIONS SOFTWARE

CP/M is the most popular operating system for microcomputers.
This means that the widest possible library of applications is
available for your TS 803H. You may want to purchase software for
some of the following applications:

> *   word processing
> *   accounting
> *   financial analysis
> *   business graphics
> *   program development
> *   entertainment

Included with the TS 803H are three applications programs:

> *   TeleWrite for executive word processing
> *   TeleCalc for spreadsheet analysis
> *   TeleChart for graphics presentation of spreadsheet data

A minimum of nine CP/M-compatible programming languages including
ALGOL, APL, BASIC, C, COBOL, FORTH, FORTRAN, PASCAL, and PL/1 can
be used on TeleVideo's systems for your programming applications.

Ask the computer software specialists at your computer store
about what software programs and languages run well on your
TS 803H.

7.   UTILITY PROGRAMS

TeleVideo has supplied a set of **utility programs** to facilitate the use of the TS 803H. These programs perform several housekeeping functions such as installing the files on the system diskette onto the hard drive, formatting blank diskettes and the hard disk, and copying diskettes.

The utilities included on the system diskette are:

FORMAT   Formats a blank diskette for use on the TS 803H.

SYSGEN   Generates a resident CP/M system on tracks 0 and 1 of a new diskette or a master applications program diskette. Use this to copy the portion of CP/M that has the resident commands to another diskette.

COPYDISK   Copies data from one diskette to another diskette.

HFORMAT   Formats the hard disk.

PARK   Locks the head of the hard drive so that it is not in contact with the areas of the disk that hold data when it is necessary to move the computer.

FIXDISK   Fixes the bad or damaged sectors of the hard disk so that those sectors cannot be accessed.

SUBMIT   Chapter 3, Power On, has an example of how to use a SUBMIT program to install the TS 803H software onto the hard disk.

The utility programs differ from the standard transient CP/M commands in that they require more operator interaction than the single command line format. Each program is written in this manual in a SYSTEM/USER dialogue, or script.

FORMAT -- Format a Blank Diskette

FORMAT formats floppy diskettes. All new diskettes must be formatted before they can be used. Used diskettes containing data can also be formatted. If a used diskette is formatted, all data on the diskette is erased; once formatted, the used diskette is ready for new data.

NOTE!   When the TS 803H is booted from the floppy disk and the FORMAT program is run, the procedure for formatting a diskette is the same as when booting from the hard disk except for the following:

1.   You would boot with the system diskette in the floppy drive.

2.   In Step 9, you remove the system diskette and insert the diskette that you want to format

3.   In Step 16, you remove the newly formatted diskette and insert the system diskette.

STOP!   **FORMAT OVERWRITES ALL DATA PRESENTLY ON THE DISKETTE; ANY FILES AND PROGRAMS ON THE DISKETTE ARE ERASED.**

Hard Disk Boot Instructions

USER: 1.   If the system prompt is not displayed, reset the TS 803H by pressing ^RESET. If the system prompt is displayed, go to Step 3.

SYSTEM: 2.   Displays

                  TeleVideo System TS 803H Vx.x
                  (c) 1983 TeleVideo Systems, Inc.
                  Boot from hard disk.
                  xxK CP/M version y.y

                  A>

USER: 3.   Enter

                  FORMAT<CR>

SYSTEM: 4.   Displays

                   FLOPPY DISK FORMAT Vx.x
                   (C) 1983 TeleVideo Systems, Inc.

                   1.   TS-801/802 AS STAND ALONE
                   2.   TS-801/802 AS SATELLITE USERSTATION
                   3.   TS-802H AS STAND ALONE/SATELLITE USERSTATION
                   4.   TS-803/803H/TPC I AS STAND ALONE
                   5.   TS-803/803H/TPC I AS SATELLITE USERSTATION
                   6.   TS-806
                   7.   EXIT

                   Select system configuration option by number

USER: 5.   Enter

                   4

SYSTEM: 6.   Displays

                   TS 803/803H/TPC I AS STAND ALONE is selected.
                   Press RETURN if correct. (SPACE BAR to retry, ESC to abort.)

USER: 7.   Enter

                   <CR>

SYSTEM: 8.   Displays

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

USER: 9.   Put the diskette that you want to format into the
                   floppy drive.

            10.   Press

                   <CR>

SYSTEM: 11.   Displays

                   f o r m a t t i n g   ....

USER: 12.   Listen for a clicking sound as the program formats
                   the diskette.

SYSTEM: 13.   Displays

                   Formatting Completed.

                   Format another?
                   Insert an unformatted diskette into floppy disk drive.
                   Press RETURN when ready. (ESC to abort.)

USER: 14.   a.   To format another diskette, insert it into the
                      floppy drive and go to step 10.

                 b.   To end the program, press

                      ESC

SYSTEM: 15.   Displays (when system was booted from floppy disk)

                 Insert SYSTEM diskette back into the drive.
                 Press ANY key when ready.

USER: 16.   Press any key. It is not necessary to put the
                 system diskette back into the drive if booted from
                 the hard disk.

SYSTEM: 17.   Displays

                 End of Execution
                 A>

SYSGEN – Generate a "Resident" CP/M System

SYSGEN copies the system tracks (0 and 1) of the system diskette
to a new diskette. To boot from an applications program
diskette in the floppy drive you must run SYSGEN. This allows
you to boot from your applications program diskette.

There are two procedures for the SYSGEN program. One is for when
you boot from the hard drive and one is for when you boot from
the floppy drive. Please follow the correct instructions.

Hard Drive Boot Instructions

USER: 1.   Boot the system from the hard drive.

SYSTEM: 2.   Displays

                TeleVideo System TS 803H Vx.x
                (c) 1983 TeleVideo Systems, Inc.
                Boot from hard disk.
                xxK CP/M version y.y

                A>

USER: 3.   Insert a formatted diskette or an applications
                program master diskette into the floppy drive.

           4.   Enter

                SYSGEN<CR>

SYSTEM: 5.   Displays

                  SYSGEN Vx.x
                  (c) 1982 TeleVideo Systems, Inc.

                  SOURCE DRIVE NAME (OR RETURN TO SKIP)

USER: 6.   Enter

                  A

SYSTEM: 7.   Displays

                  SOURCE ON A:, THEN TYPE RETURN

USER: 8.   Press

                  <CR>

SYSTEM: 9.   Displays

                  FUNCTION COMPLETE
                  DESTINATION DRIVE NAME (OR RETURN TO REBOOT)

USER: 10.   Enter

                  C

SYSTEM: 11.   Displays

                  DESTINATION ON C:, THEN TYPE RETURN

USER: 12.   Press

                  <CR>

SYSTEM: 13.   Displays

                  FUNCTION COMPLETE

                  (The diskette in the floppy drive now contains the
                  CP/M resident program on tracks 0 and 1.)

                  DESTINATION DRIVE NAME (OR RETURN TO REBOOT)

USER: 14.   a)   To copy the CP/M tracks 0 and 1 on another
                       diskette, remove the diskette, insert another
                       diskette and go to Step 10.

                  b)   To end the program, press

                  <CR>

SYSTEM: 15.   Displays

                     A>

Floppy Drive Boot Instructions

USER: 1.   Insert a system diskette into the floppy drive and
                  reset the system by pressing ^RESET.

SYSTEM: 2.   Displays

                  TeleVideo System TS 803H Vx.x
                  (c) 1983 TeleVideo Systems, Inc.
                  Boot from floppy disk.
                  xxK CP/M version y.y

                  A>

USER: 3.   Enter

                  SYSGEN<CR>

SYSTEM: 4.   Displays

                  SYSGEN Vx.x
                  (c) 1982 TeleVideo Systems, Inc.

                  SOURCE DRIVE NAME (OR RETURN TO SKIP)

USER: 5.   Enter

                  A

SYSTEM: 6.   Displays

                  SOURCE ON A:, THEN TYPE RETURN

USER: 7.   Press

                  <CR>

SYSTEM: 8.   Displays

                  FUNCTION COMPLETE
                  DESTINATION DRIVE NAME (OR RETURN TO REBOOT)

USER: 9.   Remove the system diskette from the floppy drive
                  and insert a formatted diskette or an applications
                  program master diskette into the floppy drive.

           10.   Enter

                  A

SYSTEM: 11.   Displays

               DESTINATION ON A:, THEN TYPE RETURN

USER: 12.   Press

               <CR>

SYSTEM: 13.   Displays

               FUNCTION COMPLETE

               (The diskette in the floppy drive now contains the
               CP/M resident program on tracks 0 and 1.)

               DESTINATION DRIVE NAME (OR RETURN TO REBOOT)

USER: 14.   a)   To copy the CP/M tracks 0 and 1 on another
                     diskette, remove the diskette, insert another
                     diskette and go to Step 10.

               b)   To end the program, press

                     <CR>

SYSTEM: 15.   Displays

               A>

COPYDISK -- Copy an Entire Diskette

COPYDISK copies the contents of one floppy diskette onto another
floppy diskette. During the copying, the program checks for data
transfer errors. You cannot use the COPYDISK program to transfer
software to and from the hard disk.

NOTE!   Before you run COPYDISK, remember to format all new
             floppy diskettes before using them. If you do not know
             how to format a new diskette, refer to the utility
             program FORMAT.

NOTE!   When the TS 803H is booted from the floppy disk and the
             COPYDISK program is run, the procedure is the same
             except for the following:

             1.   You boot with the system diskette in the floppy
                  drive.

             2.   At Step 7, remove the system diskette and insert
                  source diskette.

             3.   To end the program, at Step 18 remove the
                  destination diskette, insert the system diskette
                  in the floppy drive and press **ESC.**

Hard Disk Boot Instructions

USER: 1.   Boot the system from the hard disk.

SYSTEM: 2.   Displays

                TeleVideo System TS 803H Vx.x
                (c) 1983 TeleVideo Systems, Inc.
                Boot from hard disk.
                xxK CP/M version y.y

                A>

USER: 3.   Enter

                COPYDISK<CR>

SYSTEM: 4.   Displays

                COPYDISK (TS 803/TS 803H/TPC I) Vx.x
                (c) 1983 TeleVideo Systems, Inc.

                Warning:COPYDISK will destroy all data
                on destination disk with no chance of recovery.
                If a destination disk is inserted as a master disk by
                mistake, all data on master disk will be destroyed.
                Press RETURN when ready.(ESC to abort.)

USER: 5.   Press

                <CR>

SYSTEM: 6.   Displays

                Copying (Track) -- >
                Insert "   MASTER   " diskette.   Press RETURN when ready

USER: 7.   Insert the source diskette to be copied into the
                floppy drive.

           8.   Press

                <CR>

SYSTEM: 9.   Displays

                Insert "DESTINATION" diskette. Press RETURN when ready.

USER: 10.   Remove the source diskette.

             11.   Insert the destination diskette into the floppy
                    drive.

             12.   Press

                    <CR>

SYSTEM: 13.   Displays alternately several times while copying

                    Insert " MASTER " diskette. Press RETURN when ready.

                    Insert "DESTINATION" diskette. Press RETURN when ready.

             14.   Displays when complete

                    Disk Copy Completed.

USER: 15.   Listen for a clicking sound as the program copies
                    the diskette.

SYSTEM: 16.   Displays

                    Copy another?
                    Warning:COPYDISK will destroy all data
                    on destination disk with no chance of recovery.
                    If a destination disk is inserted as a master disk by
                    mistake, all data on master disk will be destroyed.
                    Press RETURN when ready.(ESC to abort.)

USER: 17.   a.   To copy more diskettes, remove the
                          destination diskette and go back to Step 5.

                    b.   To end the program, press

                          ESC

SYSTEM: 18.   Displays (when system is booted from the floppy
                    drive)

        Insert SYSTEM diskette into the drive, Press ANY KEY when ready.

USER: 19.   Press any key.

SYSTEM: 20.   Displays

                    A>

COPYDISK Error Messages

If these error messages appear on the screen:

    Data Transfer Error(s) on "Diskette Name"
    Verification Error(s).

try one of the suggestions listed below.

USER: 1.   Run COPYDISK again.

            2.   Make sure that the diskette used as the
                 destination is not defective or damaged; if
                 necessary, use a new formatted diskette.

            3.   Try copying another diskette.

HFORMAT UTILITY PROGRAM

HFORMAT reformats the hard disk (includes both logical drives).
After you run HFORMAT, you must repeat the installation
instructions in Chapter 3 to reinstall the operating system from
the system diskette onto the hard disk. Because both drives of
the hard disk will be reformatted with HFORMAT, this program has
to be run from the system diskette in the floppy drive.

STOP!   HFORMAT will overwrite all data presently on the hard
            disk. All files, programs, and the operating system
            programs will be erased.

USER: 1.   Boot the system from the floppy drive.

SYSTEM: 2.   Displays

                 TeleVideo System TS 803H Vx.x
                 (c) 1983 TeleVideo Systems, Inc.
                 Boot from floppy disk.
                 xxK CP/M version y.y

                 A>

            3.   Enter

                 HFORMAT<CR>

SYSTEM: 4.   Displays

                TS-803H Hard Disk FORMAT Vx.y
                10Mb Miniscribe III hard disk
                (c) TeleVideo Systems, Inc.

    ** Caution: All data on the integral hard disk will be destroyed. **

                Type RETURN when ready (ESC or CTRL-C to abort)

USER: 5.   a.   To proceed with the program, press

                      <CR>

                or

                b.   To abort the program, press

                      ESC or **^C**

SYSTEM: 6.   Displays (in approximately fifteen minutes if <CR>
                was entered)

                FORMAT COMPLETE

                A>

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

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

    Abort HFORMAT?(Y/N)

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

FIXDISK UTILITY PROGRAM

FIXDISK inspects the hard disk for defective data areas. It
builds a file called FILE.BAD containing the pointers associated
with the defective data blocks. This file has a CP/M user
designation of User 15 and the attributes of Read Only and
System (no directory listing).

FIXDISK can be used on any CP/M-compatible disk drive. The
program should be run immediately after formatting or whenever a
disk is suspected of having defective areas. During the
execution of the program, no data is destroyed. Directory areas
are not scanned.

While the program does not retrieve data which already is on bad
data blocks, it does prevent the system from using those areas
for future data storage.

NOTE!   When you boot from the system diskette in the floppy
                  drive, the instructions are the same except you must
                  enter the name of the hard disk drive.

Hard Disk Boot Instructions

USER: 1.   Boot from the hard disk.

SYSTEM: 2.   Displays

                   TeleVideo System TS 803H Vx.x
                   (c) 1983 TeleVideo Systems, Inc.
                   Boot from hard disk.
                   xxK CP/M version y.y

                   A>

             3.   Enter

                   FIXDISK<BAR>(drive name):<CR>

                   (Drive name is the specified hard disk drive to be
                   checked. Use A: for drive A and B: for drive B,
                   C: for drive C. If no drive is specified, FIXDISK
                   checks the currently-selected disk drive.)

SYSTEM: 4.   Displays

                   FIX DISK PROGRAM VER. x.y
                   CURRENT SCANNING BLOCK: #xxxx

             5.   Displays the block numbers as they are scanned by
                   the program.

             6.   Displays

                   FIX DISK COMPLETED WITH xxxx DATA BLOCKS ERROR

                   A>

PARK UTILITY PROGRAM

This program positions the Read/Write heads of the TS 803H hard
disk over cylinder 656 which is defined as the landing zone for
this particular disk. This program will ensure that the
Read/Write heads will not be in contact with areas of the disk
that hold data, when it becomes necessary to move the unit.

USER: 1.   Boot from the floppy or hard drive.

SYSTEM: 2.   Displays

                  TeleVideo System TS 803H Vx.x
                  (c) 1983 TeleVideo Systems, Inc.
                  Boot from floppy (or hard) disk.
                  xxK CP/M version y.y

                  A>

USER: 3.   Enter

                  PARK<CR>

SYSTEM: 4.   Displays

                  PARK Program for TS-803H Ver. Vx.y
                  Positions Hard Disk R/W Heads to Cylinder 656
                  REMOVE floppy from drive and TURN POWER OFF

                  NOTE!   You will also hear BELL sound.

8. PROGRAMMING THE TERMINAL EMULATOR

INTRODUCTION

This chapter explains the procedures that a programmer must
follow to take advantage of the video attributes of the TS 803H.
Those users with little technical background need not read this
information. They should carefully read the earlier chapters of
this manual, as well as any documentation that accompanies the
applications programs they want to run on the TS 803H.

SUBSYSTEMS OVERVIEW

The TS 803H video display can be described as comprising several
basic subsystems:

    CPU
    Terminal Emulator/Graphics Driver (EPROM)
    System RAM
    Graphics RAM

These subsystems operate together to control the video display
for either screen I/O operations or display graphics. The
sections of this chapter describe the various functions that are
available to the programmer to control the video display. Figure
8-1 illustrates the relationships of these subsystems to one
another.

**Figure 8-1
Subsystems Communications**
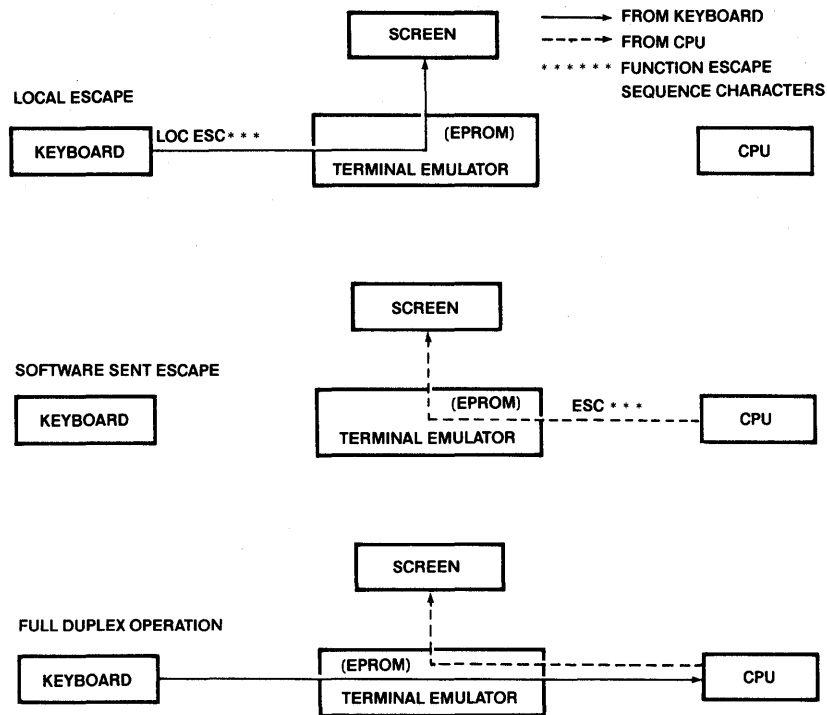
The CPU is a ZILOG Z80A operating at 4 MHz. The system has three different kinds of memory: an 8K EPROM containing the system boot, diagnostics, and display control; a 32K block of video display memory which is divided into a 12K alphanumerics section and a 640 x 240 pixel bit-map or 80 x 24 line display; and a 64K block of system RAM. System logic and BIOS enhancements control the memory bank switching which is illustrated in Figure 8-2.

Figure 8-2
Memory Architecture

```
FFFF HEX ┌─────────────────────────┐      FFFF ┌─────────────────────────┐
         │          BIOS           │           │          BIOS           │
CBASE+1600├─────────────────────────┤ CBASE+1600├─────────────────────────┤
         │          BDOS           │           │          BDOS           │
CBASE+0800├─────────────────────────┤ CBASE+0800├─────────────────────────┤
         │           CCP           │           │           CCP           │
  CBASE  ├─────────────────────────┤   CBASE  ├─────────────────────────┤
         │     PORTION OF TPA       │           │                         │
 C000 HEX├─────────────────────────┤           │                         │
         │                         │           │                         │
         │    ALPHANUMERIC RAM      │           │           TPA           │
 B800 HEX├─────────────────────────┤           │                         │
         │      GRAPHICS RAM        │           │                         │
 4000 HEX├─────────────────────────┤           │                         │
         │         NOT USED         │           │                         │
 1FFF HEX├─────────────────────────┤      0100 ├─────────────────────────┤
         │     GRAPHIC DRIVER       │           │                         │
         │      ALPHA DRIVER        │           │    SYSTEMS PARAMETERS    │
         │   DIAGNOSTICS EPROM      │      0000 └─────────────────────────┘
 0000 HEX└─────────────────────────┘
               PAGE 0                              PAGE 1
```
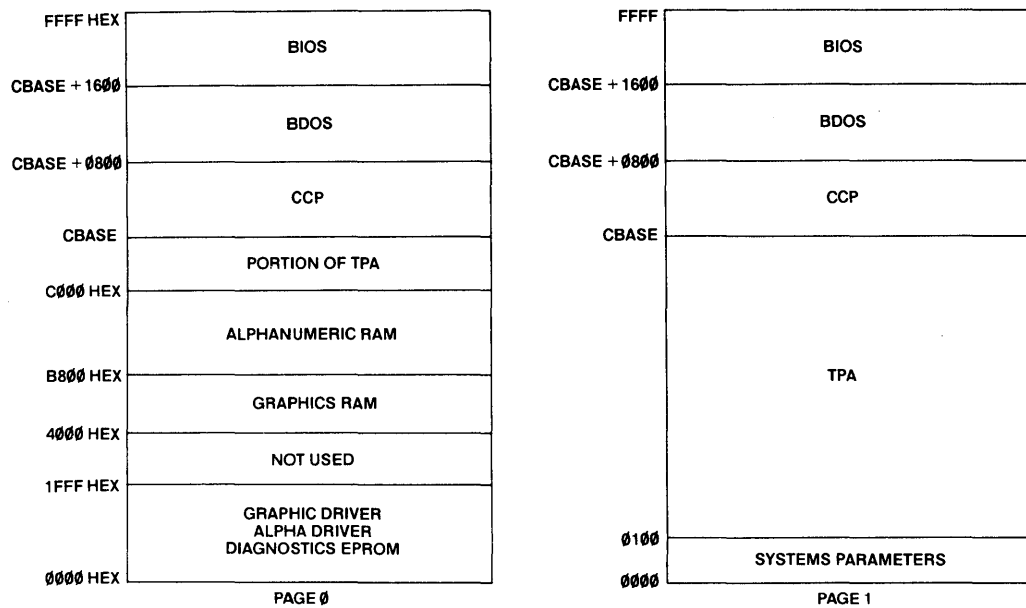
When power is first turned on, or after system reset, the
hardware automatically selects the memory configuration shown
on the left of Figure 8-2. This includes the system EPROM at
addresses 0000 - 1FFF, the graphics RAM block at 4000 - BFFF, and
finally the upper 16K of system RAM at C000 - FFFF.

The EPROM contains all necessary initialization logic for loading
the CP/M program. CP/M is loaded into the high RAM addresses
above 48K. When loading is complete, the control logic switches
to the full 64K RAM memory configuration and the software
initializes the lower RAM system scratch space.

The EPROM then serves as a video display graphics driver. When
special graphics functions, BIOS calls are made from applications
software, the graphics memory configuration (PAGE 0) is swapped
in, and the CPU fetches instructions from the EPROM firmware.
The CPU then updates the graphics/alphanumerics RAM which it
shares with the video controller on alternate cycles.

Terminal Attributes Emulator

The video display on your TS 803H is controlled by firmware stored
in the 8K on-board EPROM. The firmware has two sections: the
Terminal Attributes Emulator, and a Graphics Primitives Driver.
Both are easily accessed by the programmer. The Terminal
Emulator controls all standard video terminal display functions,
such as alphanumerics, as well as special video attributes and
cursor addressing. For a description of function calls to the
graphics driver, see Chapter 9, Video Graphics.

Default Video Attributes

The video display of the TS 803H can be set for "normal video" (green characters on a black background), which is the default setting, by opening the ninth section of the dip switch. Reverse video (black letters on a green background) can be set by closing the ninth section of the dip switch. Chapter 2 shows the location of the dip switch and illustrates the procedure for changing a switch setting. See Table 2-2 and Appendix M for the switch settings.

The display intensity (brightness) can be adjusted with the contrast knob on the back panel of the main unit. See the section called Adjusting the Contrast in Chapter 3.

Video Attributes

The video attributes of each character as well as the spaces (blanks) on the screen can be controlled to define the appearance of the screen. The following attributes are available.

Table 8-1
Video Attributes

Attribute	Description
Normal Video	Restores the background of the screen to that selected by rear 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.
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.
Blink	Causes all characters to blink. This attribute starts with the cursor position and continues until another attribute is encountered.

Invisible   Causes all data entered on the line to be
                        invisible to you although the cursor moves
                        and is 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.

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

                        NOTE!   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.

Setting Video Attributes

1. Your program should place the cursor one position **before** you
    want the attribute to start.

NOTE!   Remember that each attribute occupies a character
          position. If your program types over the attribute, it
          is lost.

2. Your program should send the appropriate escape sequence as
    listed in Table 8-2.

NOTE!   Escape sequences are shown with spaces. These spaces
          are included only for the sake of clarity and are not
          to be included in the sequence.

Escape Sequence Calls to the Terminal Emulator

The Terminal Emulator is a gate array processor that intercepts
escape sequences when they are sent from the CPU to the console
device and sets the appropriate terminal attribute or function.
These escape sequences are ASCII characters sent in a sequential
array just as in normal terminal communications.

The typical escape sequence is indicated by an ASCII character 27 (decimal value) ESC. Some of the cursor control functions are represented by ASCII control characters. For example, the **cursor up** function is ^K, ASCII character 11 (decimal).

You can send a **local escape** to the Terminal Emulator directly from the keyboard (by-passing the CPU) by pressing the SHIFT and LOC ESC (SHIFT/LOC ESC) keys simultaneously. This allows you to experiment with the terminal attributes without a code-compile-run overhead problem.

Table 8-2
Escape Sequences for Video 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 ?
Half intensity on	ESC)
Half intensity off	ESC (

Escape Sequences for Clearing the Screen

The clear function is used to clear data from screen memory. Clear commands are summarized in Table 8-3.

Table 8-3
Clear Commands Escape Sequences

Clear Command	Escape Sequence	Effect
Clear All to Nulls	ESC :	Clears all data on the page to nulls or to half-intensity nulls if half intensity is on.
Clear All to Half-Intensity	ESC ,	Clears all data on the page to half-intensity spaces.

Spaces

Clear All to Spaces	ESC + or ^Z	Clears all data on the page to spaces or to half-intensity spaces if half intensity is on.
Clear All to Nulls and Reset Half Intensity	ESC *	Clears all data on the page to nulls. Resets half intensity.

Escape Sequences for Cursor Display

The cursor display may appear any one of five ways. To change the appearance of the cursor, enter one of the following escape sequences in Table 8-4.

Table 8-4
Cursor Display 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

Cursor Control

The cursor can be directed to a location on the screen by using the cursor control commands in Table 8-5, or by sending the cursor to a screen address as described in the section on Cursor Addressing in this chapter.

Table 8-5
Cursor Control Commands

Cursor Control	Control Code	Effect
Up	^K	Moves the cursor up one line until it encounters the top of the screen. Once it reaches the top of the screen, receipt of further codes has no effect.
Down	^V	Moves the cursor down one line. If the cursor is on the bottom line of the screen, the code has no effect.

Left   ^H   Functions the same as BACKSPACE. Moves
                          the cursor to the left. If the cursor
                          is currently in the first column of the
                          line, it moves to the last column of the
                          preceding line. If the cursor is on
                          home, it has no effect.

Right   ^L   Moves the cursor right one column. If
                          the cursor is at column 80, the cursor
                          moves to the first column of the next
                          line. If the cursor is at the last
                          column of the last line, it causes the
                          screen to scroll up and moves the cursor
                          to the first column of the new line.

Home   ^^   Moves the cursor to column one of the
            (<CTRL>/^)   first line. If the cursor is already at
                          the home position, the code has no
                          effect.

Carriage   ^M   Moves the cursor left to column one of
Return   the current line.

Line Feed   ^J   Moves the cursor down one line. If the
                          cursor is on the bottom line, it causes
                          the screen to scroll up one line. The
                          cursor stays in the same position.

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

     ESC j

A reverse linefeed moves the cursor up one line for each reverse
linefeed code received. The screen scrolls down one line when
the cursor reaches the top line of the screen. As the display
scrolls down one line, a new line of data appears at line one of
the screen and the last line of the display is deleted. The data
consists of spaces.

Cursor Addressing

The computer can also position the cursor to a specific location
without repetitive cursor movement commands. This is called
"loading" or "addressing" the cursor.

To address the cursor, enter

    ESC = r c

where

       r is the desired row (line). Refer to Table 8-6 to find the
       ASCII code representing the desired row.

       c is the desired column. Refer to Table 8-6 to find the
       ASCII code representing the desired column.

NOTE!   If your applications program inserts nulls between
            characters, loading the cursor does not function as
            described. Instead, the cursor goes to an
            unpredictable position.

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

    ESC = (Q

Table 8-6
Cursor Coordinates

Row*/ Column	ASCII Code Transmitted	Column	ASCII Code Transmitted	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	—

*Row (line) value may not exceed 24.

Tabs

The cursor may be moved on the screen to preset typewriter-style tabs. Tab controls are summarized in Table 8-7.

Table 8-7
Tab Controls

Action	Control Code	Effect
Set tab*	ESC 1	Sets a typewriter-style column tab.
Tab	^I	Causes the cursor to advance to the next tab set. If no tabs are set, the code has no effect and the cursor does not move.
Back Tab	ESC I	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 line, this code moves the cursor to the first column on the line.
Clear Tab**	ESC 2	Clears the tab where the cursor is located when this code is entered.
Clear All Tabs***	ESC 3	Clears all tabs regardless of the position of the cursor when the code is entered.

  *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.**
  **Position the cursor at the tab to be cleared before
   entering the sequence.
 ***The position of the cursor when this code is entered is
   not important.

Text Editing Functions

Changing text can involve the following three actions:

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

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

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

Editing, inserting, and deleting can occur within the line on which the cursor is positioned. Text which reaches the beginning or the end of a line by these actions are, if moved **further,** lost (**fall off** that line).

Table 8-8 summarizes the effects of the available editing commands.

Table 8-8
Editing Commands

Edit Command	Escape Sequence	Effect
Character Insert	ESC Q	Causes character at the cursor to move right one column position and enters a space at the cursor position. As characters are inserted, characters reaching column 80 are lost. If half intensity is on, half-intensity spaces replace the erased characters.
Character Delete	ESC W	Deletes the character at the cursor position and moves all following characters left one position. At the end of the delete function, a space is written into the last position on the line. If half intensity is on, half-intensity spaces replace the erased characters.
Line Insert	ESC E	Inserts a line consisting of spaces 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. If half intensity is on, half-intensity spaces replace the erased characters.

Line Delete	ESC R	Deletes the line at the cursor position and all following lines move up one line. The cursor moves to column one of the line and spaces are loaded into the last line of the page. If half intensity is on, half-intensity spaces replace the erased characters.
Erase to End of Line	ESC T	Erases all characters from the cursor to the end of the line and replaces them with spaces. If half intensity is on, half-intensity spaces replace the erased characters.
Erase to End of Line with Nulls	ESC t	Erases all characters from the cursor position to the end of the line and replaces them with null characters. If half intensity is on, half-intensity nulls replace the erased characters.
Erase to End of Page	ESC Y	Replaces characters from the cursor position to the end of the screen with spaces. If half intensity is on, erased characters are replaced with half-intensity spaces.
Erase to End of Page with Nulls	ESC y	Erases all characters from the cursor position to the end of the page and replaces them with null characters. If half intensity is on, half-intensity nulls replace the erased characters.

You can erase characters **starting at the cursor position** to the end of the line or the page and replace them with either spaces or half-intensity spaces (if half intensity is on).

To erase all characters to the end of the line, send:

   ESC T

To erase all characters to the end of the page, send:

   ESC Y

Monitor Mode

You can display all characters (including all escape and control sequences) sent from the keyboard or generated by a program. This feature is called **monitor mode.** Having the escape and control commands on the screen provides visual clues to make program debugging easier.

To enable monitor mode, send:

ESC U

To terminate the display of the control commands, send either

ESC u or ESC X

Table 8-9 lists the monitor mode control characters and shows the monitor mode control characters as they appear.

Table 8-9
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

KEYBOARD

The keyboard itself can be programmed to suit applications
programs. This section discusses the functions of the
alphanumeric keys.

Character Keys

The character keys highlighted in Figure 8-3 include all alphabet
characters (A through Z), numerals (0 through 9), punctuation
marks, and mathematical symbols. All character keys repeat when
pressed for more than one-half second.

Figure 8-3
Character Keys
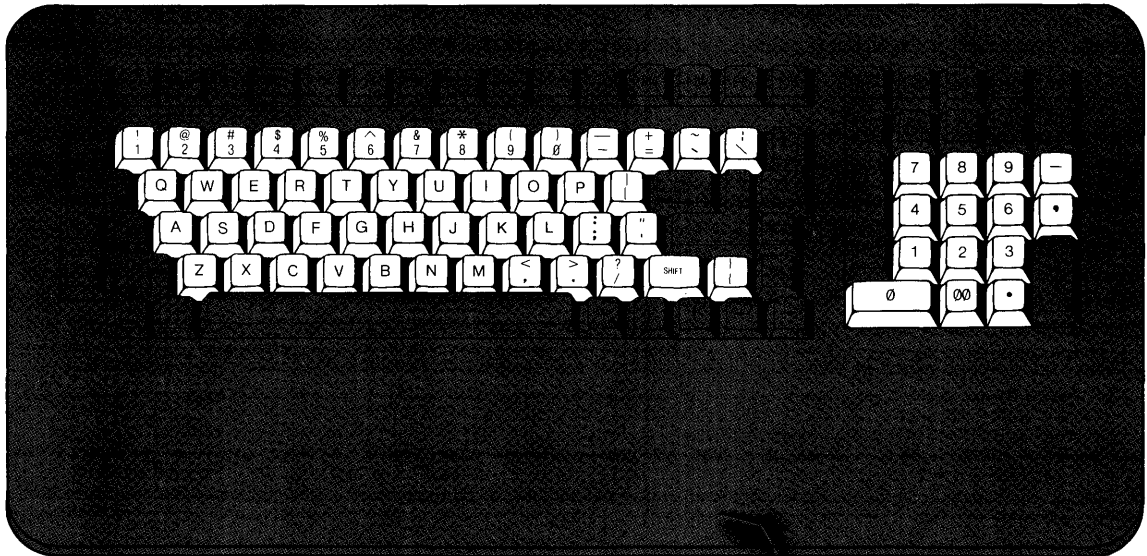
Figure 8-4
Special Keys

Special Keys

Table 8-10 summarizes the function of the special keys which are highlighted in Figure 8-4.

Table 8-10
Function of Special Keys

Key Name	Description
Space Bar	Causes a blank space to appear on the display and transmits an ASCII space code.
SHIFT	Selects upper character inscribed on a key, changes operation of most special keys, and capitalizes alpha characters.
ALPHA LOCK	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	Moves the cursor forward to typewriter tabs. The cursor moves to the next tab setting in that line. When it reaches the last tab setting in that line, it stops. If the cursor is beyond the last tab set on a line, pressing TAB has no effect.

BACK TAB   Moves the cursor backward to typewriter tabs.
                             If no tab has been set between the first
                             column position and the cursor position, the
                             cursor moves to the first column position.

CTRL (Control)   Generates normally-nondisplayed ASCII control
                             codes (32) when used with another key.

                             The control key combinations are used for
                             special action by the terminal and/or the
                             applications program in the computer.

                             When the CTRL key is used with an alpha or
                             symbol key, the output data of the character
                             which is typed becomes 00 through 3F Hex,
                             thus changing the code transmitted by that
                             character. For example, if **M** alone is
                             pressed, the code for **M** is sent. If you
                             press ^M, the code for <CR> is sent.

LOCAL ESC/ESC   The ESC key sends an ASCII code for escape to
(Escape)   the display processor. The key is generally
                             used to momentarily leave (escape) an
                             applications program in order to use a
                             special feature or function.

                             Another function of the ESC key is to display
                             on the screen the next control character
                             entered. This avoids having to use the
                             system mode monitor feature.

                             When the display is in the alphanumeric mode,
                             the SHIFT/LOC ESC key sequence allows you to
                             change or access the display attributes
                             without transmitting them to the computer.
                             After the SHIFT/ESC key sequence is pressed,
                             the next character entered will be
                             interpreted as a command by the terminal.

                             NOTE!   The ESC key is used with another
                                            character(s) in the command
                                            sequence; i.e., **the ESC key is
                                            pressed and released before the
                                            second key is pressed.**

RETURN and ENTER   The RETURN and ENTER keys can be used
                             interchangeably. They send the ASCII code
                             for a carriage return <CR> to the display
                             processor within the TS 803H. Depending on
                             the communication mode used, the code causes
                             the display processor to transmit a <CR> to
                             the computer.

NOTE!   The terminal features an auto
wraparound function that eliminates
the need to manually enter a <CR>
and a linefeed (LF) at the end of
each 80-character line.

HOME   Moves the cursor to column one of row (line)
                   one. This position is referred to as the
                   home position.

LINEFEED   The LINEFEED (LF) key sends an ASCII code for
                   a LF to the computer. The code causes the
                   processor to transmit a LF code to the
                   computer and/or the cursor to be moved down
                   one line on the screen when echoed by the
                   internal processor.

BACKSPACE   Moves the cursor one character to the left.
                   If the cursor is at home, it has no effect.

Arrow Left   Moves the cursor one character to the left.
                   If the cursor is at home, it has no effect.

Arrow Up   Moves the cursor up one line. If the cursor
                   is on the top line, it has no effect.

Arrow Down   Moves the cursor down one line. If the
                   cursor is on the bottom line of the screen,
                   it has no effect.

Arrow Right   Moves the cursor one character to the right.
                   If the cursor is at the end of the line, it
                   goes to the first column position of the next
                   line. If the cursor is at the end of the
                   screen, it scrolls up the screen.

DEL (Delete)   The DEL key sends an ASCII DEL character to
                   the computer. The cursor moves to the left
                   and deletes the character to the left.

CLEAR SPACE   Replaces all characters on the screen with
                   spaces. If half intensity is on, the screen
                   is cleared to half-intensity spaces. (Same
                   as ESC ; or ESC + or ^Z.)

                   Shifted CLEAR SPACE clears the graphics
                   display whether or not the graphics is being
                   displayed at the time.

F1 through F16
(Function Keys)
Each function key sends a three-code sequence to the computer. This sequence may initiate a special form or subroutine in the program that causes the video display to display or perform a particular function.

MODE
This key enables the user to toggle the display from graphics to alphanumerics and vice versa without affecting the running program.

CHAR INSERT
Causes the character at the cursor to move right one column position and enters a space at the cursor position. As characters are inserted, characters reaching column 80 are lost. If half intensity is on, half-intensity spaces replace the erased characters.

LINE INSERT
Inserts a line consisting of spaces 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 of the page. If half intensity is on, half-intensity spaces replace the erased characters.

LINE ERASE
Deletes all characters from the cursor to the end of the line.

CHAR DELETE
Deletes the character at the cursor position and moves all following characters left one position. At the end of the delete function, a space is written into the last position on the line. If half intensity is on, half-intensity spaces replace the erased characters.

LINE DELETE
Deletes the line at the cursor position and all following lines move up one line. The cursor moves to column one of the line and spaces are loaded into the last line of the page. If half intensity is on, half-intensity spaces replace the erased characters.

RESET
Used with the CTRL key to reset the system.

CE
Erases the current line and moves the cursor back to the prompt.

PRINT
The PRINT key is not supported on the TS 803H. All print functions are controlled by the computer.

These keys are not supported on the TS 803H:

    PAGE
    PAGE ERASE
    SETUP/NO SCROLL
    FUNCT
    BREAK

DISABLING/ENABLING THE KEYBOARD

You can disable (lock) all keys and the function keys by using a command sent from the computer.

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

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

To disable the keyboard, send:

    ESC ‡

The keyboard remains disabled until one of the following occurs:

    The terminal emulator receives an ESC " sequence.

    You reset the system by pressing ^RESET simultaneously. This might result in data loss.

KEYCLICK AND BELL

You can control the keyclick (the noise made as each key is activated) and sound the bell with the code sequences in Table 8-11.

Table 8-11
Keyboard Audio Commands

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

FUNCTION KEYS

The function keys (F1 through F16) send a user-defined or default code. For example, the user-defined code may be a frequently-used escape or control code sequence in a text editing application.

There are sixteen function keys; using them in combination with SHIFT allows up to 32 sets of codes to be transmitted.

Programming the Function Keys

When the terminal is first turned on, the function keys are already programmed with default messages. If you do not program the function keys, the default values shown in Table 8-12 are transmitted by each function key.

Table 8-12
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
F12	^ A K CR	^ A k CR
F13	^ A L CR	^ A l CR
F14	^ A M CR	^ A m CR
F15	^ A N CR	^ A n CR
F16	^ A O CR	^ A o CR

You may program the function keys by following the procedure described here.

Enter the following code in the exact sequence shown:

     SHIFT/LOC ESC ¦ p1 p2 message ^Y

where

        p1   is the number of the function key. The values of p1
              are in Table 8-13.

Table 8-13
Function Key Values

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
F12	G	L
F13	H	M
F14	I	N
F15	J	O
F16	K	P

p2   is the following value:

1 = Send to the computer

message   can contain up to 63 bytes per key

^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 is:

TURN ON THE PRINTER

Precede this message with the following:

SHIFT/LOC ESC!
The key number (1 for key F1)
The value 1 (for send to computer)

The entry is:

SHIFT/ESC ¦ 1 1 TURN ON THE PRINTER CR ^Y

NOTE!   1.   Entering the message followed be CR enters a <CR>
at the end of the function.

2.   Entering the message without CR, then requires the
user to manually press the <CR> to execute the
command.

9.   VIDEO GRAPHICS

INTRODUCTION

This chapter discusses how to access the graphics features, what graphics features are available, and how to access the SuperMouse support functions.

The functions described in this chapter are specific to the TS 803H. We recommend that you use the GSX-80 driver instead of these functions so that you can take advantage of the GSX-80 drivers for other devices that are supplied on the system diskette. Your programs will also be more portable. You can order a GSX-80 programmer's manual from TeleVideo through your computer store.

The GSX-80 driver for the TS 803H calls the functions described in this chapter, but provides much more functionality than is available in the firmware.

GSX

This section provides you with information about how a graphics system is built when using GSX.

It is intended for those who want to familiarize themselves with the basic capabilities of GSX.

For more specific information about how to fit the graphics capabilities into your system, you should consult the GSX User's Guide.

In this document you will find a description of the basic capabilities of GSX.

GSX (Graphics System Extension)

GSX-80 is the Graphic System Extension for the CP/M family of operating systems. It incorporates graphics capability into the operating system and provides a host-independent and device-independent interface to your applications programs. Graphics primitives are provided for implementing graphics applications with reduced programming efforts. In addition, GSX-80 offers program portability by allowing an applications program to run on any CP/M system with the GSX-80 option. GSX-80 also promotes programmer interface to graphics which is compatible with one of the world's most widely used operating systems, CP/M.

GSX-80 is implemented as an integral part of your operating
system. Applications programs interface to GSX-80 through a
standard calling sequence similar to the BDOS conventions.
Drivers for specific graphics devices translate the standard GSX-
80 calls to the unique characteristics of the device. In this
way, GSX-80 provides device-independence since the peculiarities
of the graphics device are not visible to the applications
program. GSX-80 consists of several parts that work together to
give your system graphics capability:

*   The Graphics Device Operating System (GDOS)

*   The Graphic Input/Output System (GIOS)

*   The Gengraf Utility

Graphic Device Operating System

The Graphic Device Operating System(GDOS) contains the basic host
and device independent graphics functions that can be called by
your application program. GDOS provides a standard interface to
graphics which is constant regardless of specific devices or host
hardware, just as the BDOS standardizes disk interfaces. Your
applications program accesses GDOS through a mechanism analogous
to the normal BDOS systems calls.

GDOS loads at run-time with your graphics applications program, so it consumes system memory space only when required, leaving the normal Transient Program Area for non graphic programs.

GDOS performs coordinate scaling so that your program can specify points in a normalized coordinate space. It uses device specific information to translate the normalized coordinates into the corresponding values for your particular graphics device.

Multiple graphics devices can be supported under GSX-80 within a single application. By referring to devices with a workstation indentification number, graphics information can be sent to any of the several resident devices. GDOS dynamically loads a specific device driver when requested by the application program, overlaying the previous driver. This technique minimizes memory size requirements since only one driver is resident at any time.

Graphic Input/Output System

The Graphic Input/Output System(GIOS) is similar to the basic I/O system or BIOS. It provides the device specific code required to interface your particular graphics device to GDOS.

GIOS consists of a set of device drivers that communicate directly with the graphic devices through the appropriate host ports. A unique device driver is required for each different graphics device on your system. The term GIOS refers to the collection of available device drivers as well as the particular driver that is loaded into memory when required by your application. Although a single program can use several graphic devices, only one driver is loaded by GDOS at a time.

GIOS performs the graphics primitives of GSX-80 consistent with the inherent capabilities of your graphics device. In some cases a device driver will emulate standard GDOS capabilities which are not provided by the graphics device hardware. For example, some devices may require that dashed lines be simulated by a series of short vectors generated in the device driver.

GSX-80 is supplied with drivers for many of the most popular graphics devices for microcomputer systems.

Later in this document you will find a list of devices supported by the GSX supplied by TeleVideo for TS 803, TS 1603, and TS 1602. Some manufacturers of graphics devices supply drivers for their devices.

GENGRAF UTILITY

The GENGRAF utility is used to combine your application program and the GSX loader into one executable .COM file. The GSX loader is a small program that loads the GDOS and GIOS into memory at run time and establishes the links between your applications program and GDOS. The GSX loader is attached to your applications program after it has been compiled/assembled and linked with the required external routines and libraries.

HOW GSX FITS INTO YOUR SYSTEM

Your applications program may be written in any language provided the GDOS protocol is observed. You may compile/assemble and link your application in the normal manner, yielding a .COM executable file. One additional step must be performed, however, before executing your graphics program: the GSX Loader must be attached to the front of your program so that it can prepare the operating system environment for your graphics application.

The GENGRAF utility (provided with the GSX-80 distribution) allows you to attach the loader to your program with one simple command:

        GENGRAF <filename>

For example, if your graphics application program were in an executable file named MYFILE.COM, then the following command string would attach the GSX Loader and place the result into file MYFILE.COM.

GENGRAF MYFILE

The resulting MYFILE.COM file would be ready to run.

You should be aware of the total memory space available to your applicaton program in the TPA. This will be less for graphics applications than for normal programs because of the GDOS and device driver requirements.

GSX Supported Peripherals

TeleVideo supplies the following device drivers for their systems with graphic capabilities, like the TS 803, TS 1602 and TS 1603:

GSX-80 supports:

*   Printers
            Epson MX-80 with graftrax Plus
            Epson MX-80 type III
            Epson FX-80

*   Plotters
            Hewlett-Packard 7470
            Hewlett-Packard 7220
            Houston Instruments HiPlot 7M
            Houston Instruments HiPlot 3M

*   CRT device drivers
            TeleVideo TS 803
            TeleVideo TS 803H

GSX-86 supports:

*   Printers
            Epson MX-80 with graftrax Plus
            Epson MX-80 type III
            Epson FX-80
            IDS MicroPrism 480
            IDS Prism 80/132 (monochrome)
            IDS Prism 80/132 (color)
            Okidata Microline 92
            Printronix MPV
            Printronix P300/P600

*   Plotters
            Hewlett-Packard 7470A
            Hewlett-Packard 7220
            Houston Instruments HiPlot DMP-3/4-443
            Houston Instruments HiPlot DMP-6/7
            Strobe Model 100

*   CRT device drivers
            TeleVideo TS 1602
            TeleVideo TS 1603 (plus graphic option)

GRAPHICS PRIMITIVES DRIVER

The EPROM firmware in the TS 803H serves three functions:

    System boot and diagnostic routines
    Alphanumerics Generator/Terminal Attributes Emulator
    Graphics Primitives Driver

The Graphics Primitives Driver is the lowest level interface to
the graphics memory. The Graphics Driver accesses the 20K
segment of the 32K graphic memory block as a 640 x 240 pixel bit
map through the CPU, mapping the graphics to be displayed by the
video controller. The CPU updates the display on alternate
cycles with video controller access.

The programmer can have programs access the display memory
with calls to the Graphics Primitives Driver. The following
sections describe the procedures by which calls can be made to
the graphics driver.

Figure 9-1
Graphics Display

```
          (Y)
           ^
           |
           |------------------------    (639, 239)
           |                       |
           |      Screen           |
           |                       |
           |                       |
   (0, 0)  -------------------------->(X)
```
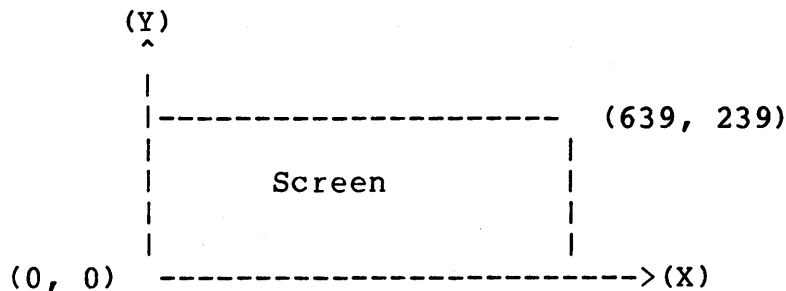
            X, Y coordinates in unit of pixel

The TS 803H is also equipped with an optical MOUSE interface. The
mouse has ten software-support functions which are described in
the Mouse Support Functions section of this chapter. These
functions can be directly accessed by the user through a single-
entry point.

CALLING THE GRAPHICS DRIVER

The following procedure enables you to access the graphics driver.

1.   Load register "C" with the desired graphics function
      identifier as listed in Table 9-1.

2.   Load the parameters as specified by Table 9-1 either into
      registers HL, and DE or into a **parameter array.**

NOTE!   The address of the parameter array mentioned above is
           contained in address OFF00h and OFF01h.

              OFF00h contains low byte of address.
              OFF01h contains high byte of address.

3.   Perform a Restart instruction (RST 28h in Z80 or RST 5 in
      8080). The restart instructions direct the call to a
      location in the BIOS. It then jumps to the graphics entry
      point in the EPROM where the graphics function will be
      carried out.

Notice that the array for an extended parameter list is stored in
high RAM memory so that it is still available after the memory
bank switches from graphics mode to alpha mode and vice versa.

The following is an example of how to access the graphics driver
in Z80 code. A complete list of examples of how to access the
graphics driver is listed in the section of this chapter called
"Sample Graphics Access Program Using 8080 Assembly Code."

Suggestion: it is very useful to create a macro for access to the

graphics output primitives.

```
grout       macro
            RST         28h         ;access graphics
            endm
```

This macro can be called each time the registers are set
appropriately for a particular graphics function call. Example
1: To draw a line in Z80 code.

```
            CSEG
            .Z80
            ld          C,1         ;"initialize to graphics mode"
            grout                   ;
            ld          C,2         ;clear graphic display
            grout
            ld          C, 11
            ld          HL, 1       ;set line style to solid.
            grout
            ld          C, 12
            ld          HL, 1       ;set line color to 1.
            grout
            ld          C, 14
            ld          HL, 1       ;set writing mode to replace.
            grout
            ld          C,4         ;"move to" 0,0
            ld          HL,0        ;
            ld          DE,0        ;
            grout                   ;
            ld          C,5         ;"line to" 639,239
            ld          HL,639      ;
            ld          DE,239      ;
            grout                   ;
            END
```

The preceding program draws a diagonal line across the bit map from
pixel 0,0 to pixel 639,239.

Example 2: To draw a graphics character string in Z80 code.

```
            CSEG
            .Z80
            ld          C,1
            grout
            ld          C,2         ; clear graphic display
            grout
            ld          C,13
            ld          HL,1        ; set character color to 1.
            grout
            ld          C,14
            ld          HL,1        ; set writing mode to replace.
            grout
            ld          HL,(0FF00h) ; get pointer to string array
            ld          (HL),5      ; put length of string into array
            INC         HL          ;
```

```
          INC     HL                 ; point at string
          ld      DE,string          ;
          ld      b,5                ;
loop:     ld      a,(DE)             ;
          ld      (HL),a             ; load characters onto parameter ar
          INC     DE
          INC     HL
          INC     HL                 ; load one character per word.
          DJNZ    loop               ;
          ld      C,6                ; "draw string"
          grout                      ;

string:   Db 'Hello'
          END
```

See Figure 9-2 for the parameter array whose address is contained
in FF00h and FF01h.

Figure 9-2
Parameter Array Contents

```
 _____
| Character count #     |    = byte 1
|-----------------------|
| Not Used              |    = byte 2
|-----------------------|
| Character #1  (H)     |    = byte 3
|-----------------------|
| Not Used              |    = byte 4
|-----------------------|
| Character #2  (e)     |    = byte 5
|-----------------------|
| Not used              |    = byte 6
|-----------------------|
| Character #3  (1)     |    = byte 7
|-----------------------|
| Not Used              |    = byte 8
|-----------------------|
| Character #4  (1)     |    = byte 9
|-----------------------|
| Not Used              |    = byte 10
|-----------------------|
| Character #5  (o)     |    = byte 11
|_____|
```

GRAPHICS DRIVER FUNCTIONS

The TS 803H Graphics Primitives Driver supports the following
functions. They are listed by function identification number
(passed in register C) in Table 9-1.

Table 9-1
Graphics Driver Functions

Function Number	Parameters	Description
0	C = 0	**Initialize to alphanumerics mode.** Does not clear display.
1	C = 1	**Initialize to graphics mode.** Does not clear display.
2	C = 2	**Clear** graphics screen (memory).

3	C = 3
	array
		Polyline. Draws a connected sequence of lines in the current line style, line color, and writing mode. The first point is taken as the current position. The last end-point of the sequence becomes the current position (CP).
		
		The parameters are passed in an array. The address of the array is contained in locations 0FF00h and 0FF01h.
		Maximum number of vertices (x,y) = 63
		Parameter array contents:
		
		        word 0 = count (n vertex points)
		
		        word 1 = x1 ;move to vertex (x1, y1)
		        word 2 = y1
		
		        word 3 = x2 ;line to vertex (x2, y2)
		        word 4 = y2
		
		        word 5 = x3
		        word 6 = y3 ;line to vertex
		                      (x3, y3)
		        (etc.)

4	C = 4 HL = x DE = y	**MoveTo.** Updates the current position. Used only with LineTo and DrawString.
5	C = 5 HL = x DE = y	**LineTo.** Draws a line from current position to x,y then updates the current position. The current linestyle, line color, and writing mode are used.

6   C = 6   **DrawString.** Draws character string
           (array)   starting at current position. It does
                            not update the current position when
                            done. The string is stored in an array
                            whose address is contained at memory
                            locations 0FF00h and 0FF01h.
                            Character count max = 80.

           NOTE!   Address of parameter array is
                         contained in 0FF00h, 0FF01h.

           Figure 9-3
           DrawString Parameter Array Contents

```
 _____
| Word 1 = Character count |
|                          |
| Word 2 = Character 1      |
|                          |
| Word 3 = Character 2      |
|                          |
|          "               |
|                          |
|          "               |
|                          |
| Word n = Character n      |
|_____|
```


           NOTE!   A graphics character is formed
                         by an 8-bit by 8-bit character
                         cell. The graphics character
                         string starts at the character
                         cell's baseline at the current
                         (X,Y) position. The current
                         position can be changed by the
                         MOVETO command.

Figure 9-4
8x8 Graphics Character Cell
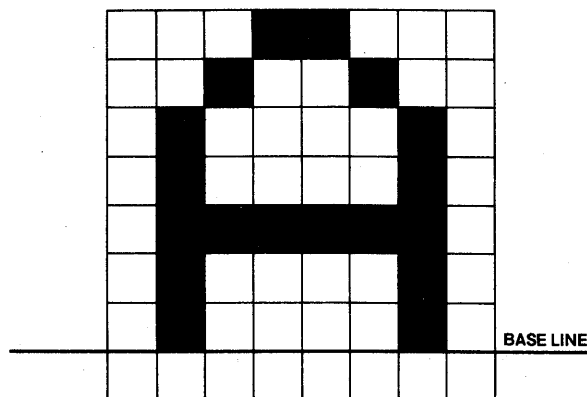
7

Scan Out Horizontal Line. This routine scans out a horizontal line with the current fill interior style, fill style index, and fill color. The end points of this horizontal scan line are passed in the array as shown in Figure 9-5.

Figure 9-5
Scan Out Parameter Array Contents

```
 --------------------
|  Y - Coordinate  | word 1
|------------------|
| X1 - Coordinate  | word 2
|------------------|
| X2 - Coordinate  | word 3
|_____|
```

NOTE!   Address of array is contained in 0FF00h and 0FF01h.

This routine internally adjusts the area style (i.e. pattern or crosshatch) according to the starting coordinate (X,Y) passed to it from the user. This routine is particularly useful for scanning out the horizontal sections of a polygon or bar fill.

NOTE!   X2 must be greater than or equal to x1.

8   C = 8
         HL = 0 or 1

Crosshr. This function can be used to draw a cross-hair cursor of size specified by the user. This function overrides the current line style, line color and writing mode with solid line style, white line color and XOR writing mode. The current attributes are restored when exiting this function.

Reg HL = 0   Use data passed in parameter array.

    HL = 1   Use data from last entry to this function (used for erasing)

NOTE!   The cross-hair is drawn using XOR writing mode, but the current writing mode remains the same.

The Parameters needed are passed in the **array** as follows:

Figure 9-6
Crosshr Parameter Array Contents

```
---------------------------------------------------------------
|Y Value of horizontal line of cross-hair              |  = Word 1
|------------------------------------------------------|
|X1 Value of left endpoint of horizontal line          |  = Word 2
|------------------------------------------------------|
|X2 Value of right endpoint of horizontal line         |  = Word 3
|------------------------------------------------------|
|X  Value of vertical line of cross-hair               |  = Word 4
|------------------------------------------------------|
|Y1 Value of bottom endpoint of vertical line          |  = Word 5
|------------------------------------------------------|
|Y2 Value of top endpoint of vertical line             |  = Word 6
---------------------------------------------------------------
```

Cross-hair Cursor

```
                       (X,Y2)
                         |
                         |
                         |
                         |
                         |
  (X1,Y) ----------------------------------(X2,Y)
                         |
                         |
                         |
                         |
                       (X,Y1)
```
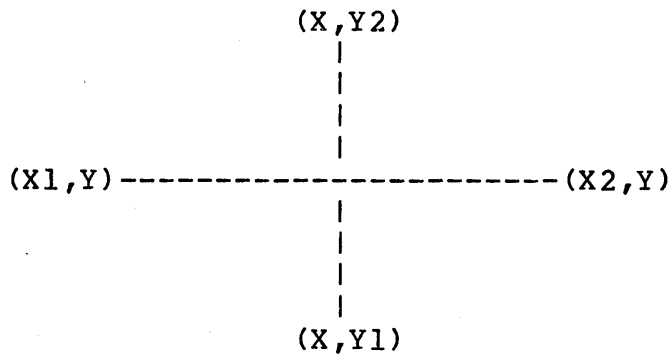
9   C = 9   This function fills a BAR with the currently selected fill attributes: fill interior style, fill-style index, and the fill-color index. The lower-left and upper-right corner coordinates are passed in the parameter array as in Figure 9-7.

Figure 9-7
Parameter Array Contents

```
------------------
| X1 - Coordinate  | Word 1
------------------
| Y1 - Coordinate  | Word 2
------------------
| X2 - Coordinate  | Word 3
------------------
| Y2 - Coordinate  | Word 4
------------------
```

```
                                  (X2,Y2)
        ------------------
       |                  |
       |      BAR         |
       |                  |
        ------------------
(X1,Y1)
```

10	RESERVED	RESERVED
11	C = 11 HL = style	**Set LineStyle.** Valid parameters are 1 through 8: 1 - solid 2 - dashed 3 - dotted 4 - dash-dot 5 - long-dash 6 - short-dash 7 - dot-dot-dash 8 - long-dot
12	C = 12 HL = color	**Set LineColor.** Valid parameters are 0 or 1: 1 - white 0 - black
13	C = 13 HL = color	**Set CharColor.** Sets the current character color. Valid parameters are 0 or 1: 1 - white 0 - black

14   C = 14   Set Write Mode. Sets the current
                            writing mode for all output primitives.
                            Valid parameters are 1 through 8.

                            1 - Replace
                            2 - Logical <OR>
                            3 - <XOR>
                            4 - <NOT>
                            5 - Complement then Replace
                            6 - Complement then logical <OR>
                            7 - Complement then <XOR>
                            8 - Complement then <NOT>

                            Writing Mode Logic

                            1 - Plane = (Color Index) AND (Pattern)

                            2 - Plane = (Plane) OR [(Color Index)
                                AND (Pattern)]

                            3 - Plane = (Plane) XOR [(Color Index)
                                AND (Pattern)]

                            4 - Plane = (Plane) AND [(Color Index)
                                AND (Pattern)]

                            5 - Plane = (Color Index) AND $\overline{(Pattern)}$

                            6 - Plane = (Plane) OR [(Color Index)

                                AND $\overline{(Pattern)}$]

                            7 - Plane = (Plane) XOR [(Color Index)

                                AND $\overline{(Pattern)}$]

                            8 - Plane = (Plane) AND [(Color Index)

                                AND $\overline{(Pattern)}$]

                            NOTE!   Plane refers to the Graphics
                                          Display. The Color Index and
                                          Pattern corresponds to the
                                          respective output primitive
                                          selected such as text, line,
                                          or fill.

15   C = 15   **Fill Interior Style.** This routine sets the type of interior style to be used in the horizontal scan routine. The style selected is passed on the first word of the parameter array:

```
                   ----------
array              | Style  # |  word 1
                   ----------
```

Table 9-2
Fill Interior Styles

Style #	Style
0	Hollow
1	Solid
2	Pattern
3	Cross-hatch

16   C = 16   **Fill-Style Index.** This routine sets the style index of the currently-selected interior style. The style index only affects the pattern and cross-hatch interior styles. The style index is passed on the first word of the parameter array.

```
                   -------------
array              | Style Index |  word 1
                   -------------
```

Table 9-3
Graphics Styles

Current Interior Style	Style Index	Comment
Hollow	None	Style Index has no effect.
Solid	None	Style Index has no effect.
Pattern	0 1 . . . 7	Low Intensity High Intensity

Cross-Hatch	0	Vertical
	1	Horizontal
	2	Diagonal 45 degrees
	3	Diagonal -45 degrees
	4	Vertical/Horizontal
	5	Vertical/Diagonal 45 degrees
	6	Vertical/Diagonal -45 degrees
	7	Cross Diagonals

17   C = 17   **Fill Color Index.** This routine affects the area style to be written into memory in the following way:

1 = white
2 = black

```
              ----------------
array        | Color Index | Word 1
              ----------------
```
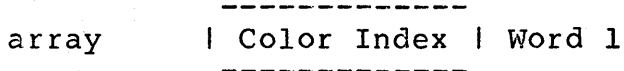
18   RESERVED   RESERVED

19   C = 19   **GetPix.** Returns all of a scan line
        HL = y scan of pixels. Returns the scan line in the
             line   array. Bytes in the array are packed
             value   with the most significant bit
             (0-239) corresponding to the lower x value. The
                     bytes are loaded into the array in order
                     of increasing x (from left to right) on
                     the scan line.

THE MOUSE

The TS 803H provides ten mouse support functions which you can access. The SETUP program allows you to attach or detach the mouse from the system. Once the mouse is attached, the mouse must be initialized (function 1) before all the support functions become operational. The mouse opens a completely new dimension in human interface to the computer.

Figure 9-8
SuperMouse
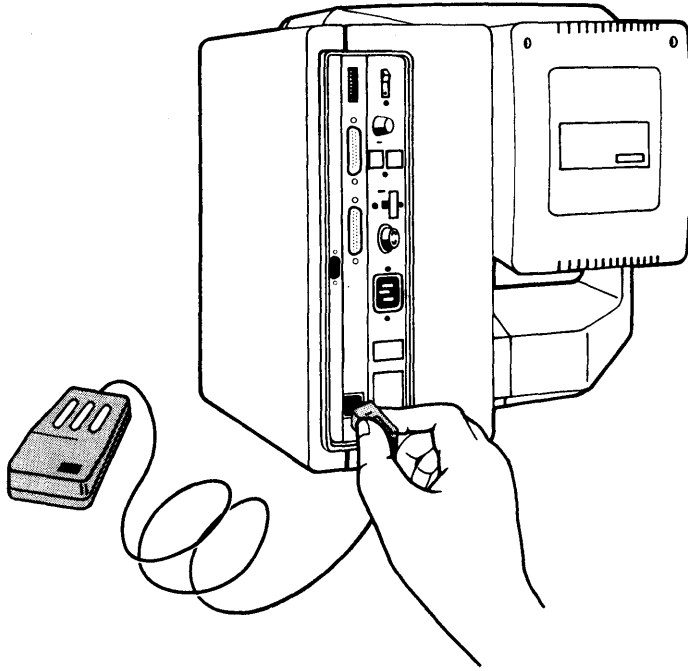
Once the mouse is attached through the SETUP program, the
following configuration is set automatically.

    Printer Baud Rate   1200

    Data Format   8 data bits
                           1 stop bit
                           No parity

The user may alter the system configuration through the SETUP
program on the TS 803H system diskette. When the mouse is
detached, the mouse configuration remains in memory. This can be
changed through the SETUP program.

MOUSE SUPPORT FUNCTIONS

You can access the mouse functions by following these instructions:

1.   Load register "C" with the function number identifier (see
       Table 9-4).

2.   Input/Output parameters are passed in registers HL, DE, and
       Register A as listed in the mouse functions below.

3.   Perform a RESTART instruction.

            RST 6   - for the 8080 instruction set.
            RST 30h - for the Z80 instruction set.

There are ten mouse support functions that the user may access.
These are listed in Table 9-4.

Table 9-4
Mouse Functions

Function
Number   Function

C = 0   INQUIRE. Inquire if Mouse is available.
                     Inquire if hardware cursor available.

           USER: Enters nothing
           SYSTEM: Returns
                       Reg A - 0   Mouse not available.
                             - 0FFh   Mouse available.

                       Reg B - 0   Hardware cursor not available.
                                        (Not applicable to current
                                        hardware)
                             - 0FFh   Hardware cursor available (Not
                                        applicable to current
                                        hardware)

           This function returns to the user a flag (Register A)
           which indicates if a mouse is available or not. This
           flag is initially set in the TS 803H SETUP program.

C = 1   INITIALIZE. This is to initialize the Mouse.

           USER: Enters

                      Reg. - HL   Initial X-coordinate position
                                       of mouse (0 to 639).

                      Reg. - DE   Initial Y-coordinate position
                                       of mouse (0 to 239).

                      SYSTEM: Returns nothing

           This function enables the mouse interrupt, and sets the
           initial position of the mouse.

NOTE!   When the mouse is initialized the default
                  ASCII characters for the mouse keys are
                  implemented and the mouse key mode is set at
                  0.

                  Mode 0 means that the pressing of the mouse
                  key is treated as a keyboard entry and that
                  the mouse stops tracking its movement until
                  the key is released.

                  The ASCII character associated with the mouse
                  key can be altered through mouse function 6.

                  The character placed in the keyboard queue
                  because of the mouse key depression can be
                  retrieved through a BDOS call such as BDOS
                  function 6.

                  Use a CP/M BDOS CALL to access the characters
                  placed in the keyboard queue.

                  For example: BDOS CALL FUNCTION 6

```
ld       c, 6        ;direct console
                      Input/Output
ld       e, 0ffh     ;set input flag.
call     5           ;BDOS CALL
                     ;BDOS returns character
                      in Register A or loads
                      Register A with 0 if no
                      character is available.
```

                  The current status of the mouse keys
                  (up/down) can be inquired through mouse
                  function 3.

                  The default ASCII characters are as follows:

                  Mouse Key(left)   - ASCII character 32 (space)
                  Mouse Key(middle) - ASCII character 33 (!)
                  Mouse Key(right)   - ASCII character 34 (")

C = 2   RANGE.   Inquires for the Mouse's coordinate range.

          USER: Enters nothing
          SYSTEM: Returns

                    Reg. - HL   Mouse's X-coordinate range
                                   (640).

                    Reg. - DE   Mouse's Y-coordinate range
                                   (240).

          This function returns to the user the (X,Y) coordinate
          range of the mouse.

C = 3   INPUT. This returns the mouse coordinates to the user.

         USER: Enters nothing
         SYSTEM: Returns

                  Reg. - HL   Mouse's current X-coordinate
                                   position.

                  Reg. - DE   Mouse's current Y-coordinate
                                   position.

                  Reg. A - 0   No change in mouse coordinate
                                   position since last input or
                                   no mouse key has been pressed.

                         - 0FFh   New mouse coordinate position
                                   or mouse key has been pressed
                                   since last input.

                  Reg B   Mouse Key Status. Contains
                                   mouse key status in bits 2, 1,
                                   and 0 for the left, middle,
                                   and right mouse keys
                                   respectively.

                                   If bit returned is:

                                   1 - key is depressed

                                   0 - key is not depressed

C = 4   TERMINATE. This terminates the mouse.

         USER: Enters nothing
         SYSTEM: Returns nothing

         This function terminates the mouse interrupt.

C = 5   Mouse Key Mode

          USER: Enters

                         Reg. A - 0   The tracking of movement by
                                              the mouse is discontinued
                                              until the mouse key is
                                              released. The ASCII character
                                              associated with the mouse key
                                              that is pressed is placed in
                                              the keyboard queue (single
                                              character per key depression).

                                 - 1   The tracking of movement by
                                              the mouse continues even while
                                              the mouse key is pressed. The
                                              ASCII character associated
                                              with the mouse key that is
                                              pressed is "not" placed in the
                                              keyboard queue.

          SYSTEM: Returns nothing.

          NOTE!   In both modes the status of the three mouse
                         keys can be inquired through mouse function 3.

C = 6   Mouse Key Programming

          USER: Enters

                         Reg. H   Contains ASCII character to be
                                         associated with left mouse
                                         key.

                         Reg. L   Contains ASCII character to be
                                         associated with middle mouse
                                         key.

                         Reg. D   Contains ASCII character to be
                                         associated with right mouse
                                         key.

          SYSTEM: Returns nothing.

C = 7   **Move.** This moves the mouse.

        USER: Enters

             Reg. HL   New X-coordinate position of
                          mouse.

             Reg. DE   New Y-coordinate position of
                          mouse.

        SYSTEM: Returns nothing.

        NOTE!   This function will clip the new coordinates
                  to the screen resolution.

                  X = 0-639
                  Y = 0-239

C = 8   Enable Hardware Cursor (Not applicable to current
           hardware)

C = 9   Disable Hardware Cursor (Not applicable to current
           hardware)

Example Mouse Program

This program is a graphics doodle routine that utilizes the mouse
as the pen. Pressing any key on the mouse or the keyboard
terminates the program and returns the control to CP/M.

To create MSCDRAW.COM (executable file)

USER: 1.   Check that the following files reside on your
                 system diskette:

                 ASM.COM
                 LOAD.COM

        2.   Type in the program as shown below under the
                 filename mscdraw.asm.

        3.   Type

                 ASM MSCDRAW<CR>

        4.   Type

                 LOAD MSCDRAW

        5.   Attach mouse to your system and initialize the
                 mouse through the SETUP program on your diskette.

        6.   Type

                 MSCDRAW<CR>

```
               7.    Move the mouse on its pad which in turn will
                     doodle on the graphics screen.

BDOS      EQU        0005H           ; BDOS entry point.
          ORG        100H
START:    MVI        C, 1            ; Initialize graphics display.
          RST        5
          MVI        C, 2            ; Clear Graphics screen.
          RST        5
          MVI        C, 11           ; Set solid line style.
          LXI        H, 1
          RST        5
          MVI        C, 12           ; Set to white line color.
          LXI        H, 1
          RST        5
          MVI        C, 14           ; Set to replace writing mode.
          LXI        H, 1
          RST        5
          MVI        C, 1            ; Initialize the mouse position (0,0).
          LXI        H, 0
          LXI        D, 0
          RST        6
          MVI        C, 4            ; Move to (0,0).
          LXI        H, 0
          LXI        D, 0
          RST        5
          LXI        H, 0
          LXI        D, 0
          CALL       DRAW            ; Draw dot at (0,0).
LOOP:     MVI        C, 3
          RST        6               ; Get mouse's current position.
          ANA        A               ; If mouse has moved then draw line.
          JZ         CHKKBD          ; Or else check for key press.
          CALL       DRAW            ; Draw line to new position.
CHKKBD:   MVI        C, 6            ; CP/M direct console I/O Bdos call.
          MVI        E, 0FFH         ; Set input flag.
          CALL       BDOS
          ANA        A               ; If key has been pressed then quit
          JZ         LOOP
          MVI        C, 0            ; Initialize display to alpha mode.
          RST        5
          JMP        0               ; Warm boot to operating system.
DRAW:     MVI        C, 5            ; Line to command.
          RST        5
          RET
          END
```

GRAPHIC CHARACTER FONT

Table 9-5 is a map of the graphic characters associated with each
ASCII character. The font is stored in the EPROM. Each cell of
the font can be individually accessed through the DRAWSTRING
function.

Internally, this is done as follows:

1.   The ASCII character sent by the USER through the DRAWSTRING
      routine in Table 9-1 is used as an index into the graphics
      character font as shown in Table 9-5.

2.   From the font, the graphics routines can access the bytes
      that comprise the graphics character desired (as shown in
      Figure 9-4).

NOTE!   Sixteen area fill styles have also been stored in the
                FONT. These styles were stored in place of sixteen
                non-printable control characters (as shown in Table 9-
                5).

Table 9-5
Character Font

Contents	ASCII Code	Description
NULL	0	Control codes
SOH	1	
STX	2	
ETX	3	
Fill Style Index 0 Fill Style Index 1	4	Half-tone patterns
Fill Style Index 2 Fill Style Index 3	5	
Fill Style Index 4 Fill Style Index 5	6	
Fill Style Index 6 Fill Style Index 7	7	
		Cross-hatch patterns
Fill Style Index 0	8	Vertical
Fill Style Index 1	9	Horizontal
Fill Style Index 2	10	Diagonal 45 degrees
Fill Style Index 3	11	Diagonal -45 degrees
Fill Style Index 4	12	Vertical/Horizontal
Fill Style Index 5	13	Vertical/Diagonal 45

Fill Style Index 6	14	Vertical/Diagonal -45
Fill StyleIndex7	15	Cross diagonals
		Marker symbols
.	16	Dot
+	17	Plus Sign
*	18	Star
(octagon)	19	Octagon
X	20	X
	21	
	22	
	23	
	24	
	25	
	26	
	27	
	28	
	29	
	30	
	31	

Printable ASCII characters

SP	32
!	33
.	
.	
.	
.	
~	126
DEL RUB	127

SAMPLE GRAPHICS ACCESS PROGRAM USING 8080 ASSEMBLY CODE

```
        ORG     100H


main:   call    start       ;initialize graphics, clear screen.
        call    text        ;draw graphic text.
        call    line        ;draw a line, using moveto and lineto.
        call    plylin      ;draw using poly-line.
        call    fill        ;fill a square using horizontal scan.
        jmp     0           ;exit to CP/M
```

How to initialize to graphics mode and clear the graphics
display.

```
start:  mvi     c, 1        ;initialize to graphic mode.
        rst     5
        mvi     c, 2        ;clear graphics display.
        rst     5
        mvi     c, 14       ;set writing mode
        lxi     h, 1        ; to replace mode.
        rst     5
        ret
```

How to set the line style attributes and then draw a line from
(x1,y1) to (x2,y2).

```
line:   mvi     c, 11       ;set line style
        lxi     h, 1        ;solid line style.
        rst     5
        mvi     c, 12       ;set line color
        lxi     h, 1        ;set to white.
        rst     5
        mvi     c, 4        ;move to (x1,y1) = (400,50)
        lxi     h, 400      ;load x1 coordinate
        lxi     d, 50       ;load y1 coordinate
        rst     5
        mvi     c, 5        ;line to (x2,y2) = (500,50)
        lxi     h, 500      ;load x2 coordinate
        lxi     d, 50       ;load y2 coordinate
        rst     5
        ret
```

How to execute the polyline function.
```
      move to (x1,y1) = (100,120)
      line to (x2,y2) = (150,150)
      line to (x3,y3) = (200,120)
      line to (x4,y4) = (250,150)
```

```
plylin:   mvi      c, 3        ;polyline function
          lxi      h, 0FF00h
          mov      e, m
          inx      h
          mov      d, m
          xchg                 ;hl now points to the top of
                               ;the parameter array.
          mvi      m, 4        ;load vertice's count.
          inx      h
          xra      a
          mov      m, a
          inx      h
          mvi      m, 100      ;load low byte of x1
          inx      h
          mvi      m, 0        ;load high byte of x1
          inx      h
          mvi      m, 120      ;load low  byte of y1
          inx      h
          mvi      m, 0        ;load high byte of y1
          inx      h
          mvi      m, 150      ;load low  byte of x2
          inx      h
          mvi      m, 0        ;load high byte of x2
          inx      h
          mvi      m, 150      ;load low  byte of y2
          inx      h
          mvi      m, 0        ;load high byte of y2
          inx      h
          mvi      m, 200      ;load low  byte of x3
          inx      h
          mvi      m, 0        ;load high byte of x3
          inx      h
          mvi      m, 120      ;load low  byte of y3
          inx      h
          mvi      m, 0        ;load high byte of y3
          inx      h
          mvi      m, 250      ;load low  byte of x4
          inx      h
          mvi      m, 0        ;load high byte of x4
          inx      h
          mvi      m, 150      ;load low  byte of ,4
          inx      h
          mvi      m, 0        ;load high byte of y4
          rst      5           ;perform polyline.
          ret
```

How to draw a string of graphic text. For example, draw 'Hello'
starting at location (x=400,y=120).

```
text:     mvi        c, 4         ;move to command
          lxi        h, 400       ;load x coordinate
          lxi        d, 120       ;load y coordinate
          rst        5
          mvi        c, 13        ;set character color
          lxi        h, 1         ;set to white.
          rst        5
          lxi        h, 0FF00h
          mov        e, m
          inx        h
          mov        d, m
          xchg                    ;hl points to parameter array
          mvi        m, 5         ;load character count.
          mov        b, 5
          lxi        d, string
loop1:    inx        h
          inx        h
          ldax       d
          mov        m, a         ;store character in array.
          inx        d
          dcr        b            ;decrement character count
          jnz        loop1
          mvi        c, 6
          rst        5            ;draw string...
          ret

string:   db         'Hello'      ;character string to be drawn.
```

How to fill a square with the selected fill attributes using the
horizontal scan routine (c=7). Square's corner points
(x1=100,y1=50), (x2=200,y2=50), (x3=200,y3=100), (x4=100,y4=100).

```
fill:     mvi        c, 15        ;Set fill interior style.
          lxi        h, 0FF00h
          mov        e, m
          inx        h
          mov        d, m
          xchg                    ;hl points to top of parameter table.
          mvi        m, 3         ;Select cross-hatch fill style
          rst        5
          mvi        c, 16        ;Set fill style index.
          lxi        h, 0FF00h
          mov        e, m
          inx        h
          mov        d, m
          xchg                    ;hl points at top of parameter table.
          mvi        m, 0         ;select vertical cross-hatch style.
          rst        5
          mvi        c, 17        ;Set fill color.
          lxi        h, 0FF00h
          mov        e, m
          inx        h
```

```
              mov         d, m
              xchg                    ;hl points to top of parameter table.
              mvi         m, 1        ;select color = white.
              rst         5
              lxi         h, 0FF00h
              mov         e, m
              inx         h
              mov         d, m
              xchg                    ;hl points to top of parameter table.
              mvi         m, 50       ;load y coordinate.
              inx         h
              mvi         m, 0
              inx         h
              mvi         m, 100      ;load x1 coordinate.
              inx         h
              mvi         m, 0
              inx         h
              mvi         m, 200      ;load x2 coordinate.
              inx         h
              mvi         m, 0
              mvi         b, 50       ;load scan line count.
loop2:        push        b           ;save count
              mvi         c, 7        ;select horizontal scan routine.
              rst         5
              pop         b
              lxi         h, 0FF00h
              mov         e, m
              inx         h
              mov         d, m
              xchg                    ;hl points to top of parameter table.
              inr         m
              dcr         b
              jnz         loop2       ;fill square from bottom to top.
              ret
              end
```

10. PREVENTIVE MAINTENANCE, TROUBLESHOOTING, AND SERVICE

INTRODUCTION

To keep your TS 803H in the best condition, it is a good idea for you to keep it clean, to inspect it periodically, and to know what to do if something seems to go wrong. This chapter talks about all of these topics plus how to service your TS 803H.

CLEANING

Clean the TS 803H periodically. 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.

STOP!   DO NOT use solvent-based or abrasive cleaners.

3. If you spill liquids on the keyboard, disassemble the keyboard and clean it with a soft cloth and water. Dry it thoroughly before using.

INSPECTION

Periodically check the cabinet and keyboard for damage or excessive wear.

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 the qualified service technician at your computer store.

TROUBLESHOOTING

The information provided in this section might help you 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 to your computer
store or service center.

Table 10-1
Troubleshooting Procedures

Problem	Action
TS 803H IS NOT OPERATIONAL AFTER POWER IS TURNED ON	Unplug power cord and plug it in again.
	Test for power by plugging something else in the same electrical outlet.
	Check the line fuse as described in the section, Changing the Fuse, in this chapter, and replace it if necessary. **If the fuse blows again, call your computer store.**
SYSTEM MESSAGE 'SYSTEM "BOOT" (X-REV.X) FROM FLOPPY DISK IN PROGRESS' APPEARS, BUT PROMPT DOES NOT APPEAR	Remove the diskette and reinsert it. Hold the diskette with the label to the left. Turn the drive latch to the horizontal position and reset the system by pressing ^RESET simultaneously.
	Use the master system diskette and then recopy it.
SCREEN DISPLAYS SYSTEM PROMPT BUT DOES NOT RESPOND TO OPERATOR COMMAND	Check to see that the appropriate diskette is in the active drive.
	Be sure the active drive latch is in the horizontal position.
TS 803H IS USED WITH MODEM AND DOES NOT RESPOND OR TRANSMIT TO CENTRAL SERVICE PROCESSOR	Unplug the modem and replug it. Turn its power on and off, and reconnect the modem to the TS 803H RS-232 port.
TS 803H APPEARS TO BE RUNNING BUT CURSOR DOES NOT APPEAR	Adjust contrast knob on rear panel.

TS 803H VIDEO DISPLAY ATTRIBUTES DO NOT CORRESPOND TO RECENTLY-CHANGED SWITCH SETTINGS	Reset the system by pressing ^RESET so software can scan new DIP switch settings.
TS 803H "LOCKED UP" (DOES NOT RESPOND TO KEYBOARD)	Turn the drive latches to the vertical position and power the TS 803H off and back on. Turn the latches back to the horizontal position. Check keyboard connector.
TS 803H SCREEN IS DEAD; CURSOR MIGHT APPEAR	Turn TS 803H off and check the fuses.
PRINTER DOES NOT PRINT WHAT IS TYPED	Reconnect printer cable, being sure it is completely on the pin connector. Check printer cable configuration. Check for printer fault (out of paper or ribbon).
HARDWARE ERROR MESSAGE APPEARS	Reset by pressing ^RESET.
ESCAPE AND CONTROL COMMANDS DO NOT FUNCTION AS ANTICIPATED	Reenter commands, paying particular attention to whether upper- or lower-case characters, ones or zeroes, are needed.

CHANGING THE FUSE

The TS 803H has one exterior fuse which is accessible from the rear panel.

To check or change the exterior fuse, turn the power off, pull the plug out of the power outlet, and unscrew the fuse holder (see Figure 10-1).

The fuse is a small glass cylinder. If the thin wire inside the fuse is still intact, the fuse should be functional (see Figure 10-2). If the thin strip is broken and/or if the glass is slightly black, the fuse has blown and must be replaced (see Figure 10-3). If the glass is totally black, do not replace the fuse. The problem could be with the system or with the power outlet. Call your computer store.

Figure 10-1
Exterior Fuse Location
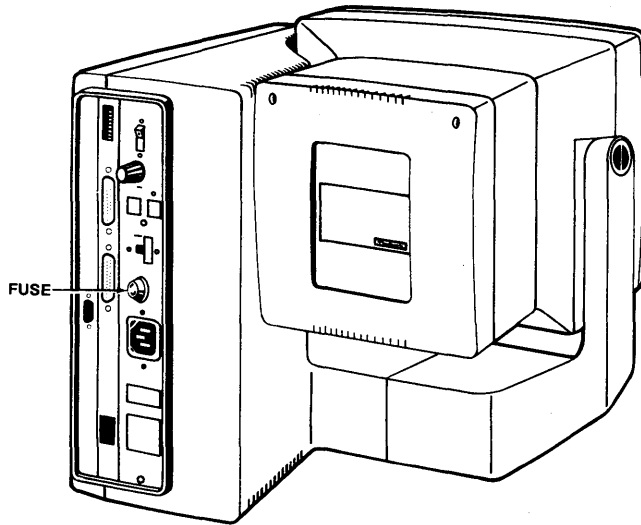
Figure 10-2
Good Fuse
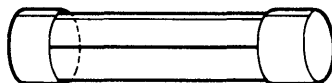
Figure 10-3
Blown Fuse
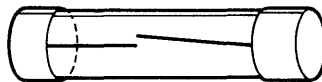
To replace the fuse, slip the old fuse from the fuse holder and insert a new fuse. The fuse rating is shown on a label above the fuse holder. See the section called Inserting the Fuse in Chapter 2 for more information about fuses. You can purchase new fuses from your computer store.

If the newly-replaced fuse blows out immediately, do not replace it with another fuse. Call your computer store.

HOW TO GET SERVICE

Your TS 803H is under a limited warranty as described in Appendix B.
Information about service before and after warranty is described in
the following sections.

Service During Warranty

If you need service on your TS 803H while it is under TeleVideo's
limited warranty, call your computer store. Computer store
personnel will obtain a Return Material Authorization (RMA) number
for you. (Refer to the Limited Warranty in Appendix B for a
detailed description of service provided under warranty.)

In cases of 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 computer store personnel can help you arrange
for emergency warranty repair.

On-Site Service After Warranty

You can obtain on-site service after warranty from any of the third-
party service centers.

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 10-4).

For future reference, note the serial number, the date you took
delivery, and the name and phone number of your computer store and
service center in the space below.

Model TS 803H Serial No._____   Delivery Date_____

Computer Store_____Phone No._____

Service Center_____Phone No._____

Figure 10-4
Serial Number

SERIAL NUMBER
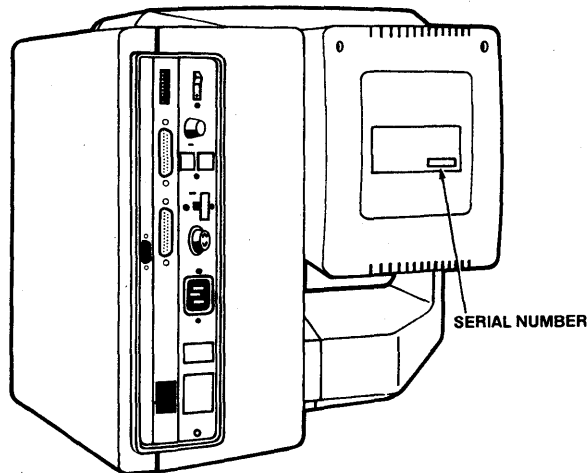
TECHNICAL ASSISTANCE

If you have any technical problems with your TS 803H, call your
computer store.

SHIPPING THE TS 803H

If you need to ship the TS 803H, follow these steps:

1.   Leave the drive latches in the vertical position. Place a
     piece of cardboard in each drive. Turn the drive latches to
     the horizontal position.

2.   Pack the unit in the original TeleVideo shipping container
     or use other suitable materials.

APPENDIX A
TS 803H SPECIFICATIONS

MICROPROCESSOR/MEMORY

CPU   Z80A 8-bit microprocessor
                     (processor speed 4 MegaHertz)

MEMORY   64 kilobyte dynamic RAM (expandable to 128K)
                     32K alpha and graphic display memory
                     8 kilobyte EPROM

OPERATING SYSTEM   CP/M with GSX

DISK DRIVES

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

DISKETTES   Standard double-sided, double-density
                     5 1/4-inch floppy diskettes

                     Soft sectored, 256 bytes/sector, 18
                     sectors/track, 40 tracks/side, 2 sides/
                     diskette, skew rate 6

STORAGE CAPACITY   Floppy: 368.6 kilobytes (formatted)
                                500 kilobytes (unformatted)
                     Hard: 10.4 megabytes (formatted)
                                12.8 megabytes (unformatted)

TRANSFER RATE   Floppy: 250 kilobits/second
                     Hard: 5 megabits/second

ACCESS TIME   Floppy: 84 milliseconds (average)
                                120 milliseconds (maximum)
                     Hard: 155 milliseconds (average)
                                420 milliseconds (maximum)

INPUT/OUTPUT

SERIAL I/O   Two RS-232C serial ports for printer and
                     modem
                     One RJ11C port for SuperMouse connection
                     Asynchronous: Switch-selectable baud rates
                     for printer port (75, 150, 300, 600, 1200,
                     2400, 4800, 9600)
                     Word structure: Eight data bits, one stop
                     bit

OPTIONAL   RS-422 port

POWER REQUIREMENTS

EXTERNAL
    U.S.   115 VAC (+/- 12 VAC)
    INTERNATIONAL   230 VAC (+/- 12 VAC)

POWER CONSUMPTION   2 amp (fast blow) maximum at 115 VAC
                        1 amp maximum at 230 VAC

POWER CORD   NEMA standard 5-15R, 3-prong receptacle
                        (US only)

ENCLOSURE

DIMENSIONS   Height: 14.25 inches (36 cm)
                        Width: 18.5 inches (47 cm)
                        Depth: 15 inches (38 cm) deep plus 8-inch
                                 keyboard (20 cm)

COMPOSITION   Injection-molded plastic

ENVIRONMENT

OPERATING   50 to 85 degrees Fahrenheit
                        10 to 30 degrees Celsius

                        Maximum humidity 95 percent relative,
                        non-condensing

                        Maximum altitude 10,000 ft above sea level

NONOPERATING   32 to 120 degrees Fahrenheit
(SHIPPING)   0 to 50 degrees Celsius

CRT SPECIFICATIONS

SCREEN   14 inches measured diagonally
                        Phosphor: P31

DISPLAYED   96-character ASCII upper- and lower-case
CHARACTER   alphabet
SET   32 control characters in monitor mode
                        24 lines
                        80 characters per line
                        1920 characters per screen
                        Video attributes:
                             Half intensity
                             Invisible fields
                             Blinking fields
                             Reverse video
                             Underlined fields

CHARACTER FONT	8 x 10 dot matrix 7 x 8 resolution
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 line or field Line edit
CURSOR CONTROLS	Left, right, up, down, address
REAL TIME CLOCK	Serial Timer Interrupt Controller (STI)

GRAPHICS FEATURES

RESOLUTION	640 pixels horizontal x 240 pixels vertical
FIRMWARE	Built-in firmware for graphics

APPENDIX B
SUGGESTED REFERENCES

The following books are useful references for using the CP/M
operating system in addition to the basic concepts presented in this
manual. Ask at your computer store for the availability of these
books

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

     (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, 2nd ed.,
     Osborne/McGraw-Hill, 630 Bancroft Way, Dept. UB, Berkeley,
     CA 94710.

     (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).

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

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

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

     (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, OR 97075.

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

7.   CP/M User Manual, Digital Research, P.O. Box 579, Pacific
      Grove, CA 93950.

      GSX-80 User Manual, Digital Research, P.O. Box 579, Pacific
      Grove, CA 95950.

      (Published by Digital Research, these references are
      available through your computer store from TeleVideo.)

8.   Mostek (for the STI chip), 1215 W. Crosby Rd., Carrollton,
      TX 75006.

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

APPENDIX C
BUYING ADDITIONAL DISKETTES

SOURCES

Any TeleVideo Systems dealer or distributor
Retail Computer Center

SPECIFICATIONS

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

Type   Floppy minidiskettes
Size   5 1/4-inch
Technology   Double sided, double density
Format   Soft sectored
                Guaranteed for 48 tpi drives
                40 tracks per side

RECOMMENDED BRAND(S)

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

QUALITY

You should purchase the best quality diskettes available to ensure
data integrity. Diskettes are not that expensive to replace, but
the time spent getting data onto them is very expensive.

LIFE EXPECTANCY

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

One of the first signs of diskette wear is 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
CABLE SPECIFICATIONS

The cables that you use should be no more than 50 feet long.

Use of improper cables can result in noncompliance with FCC regulations.

Figure D-1
RS-232C
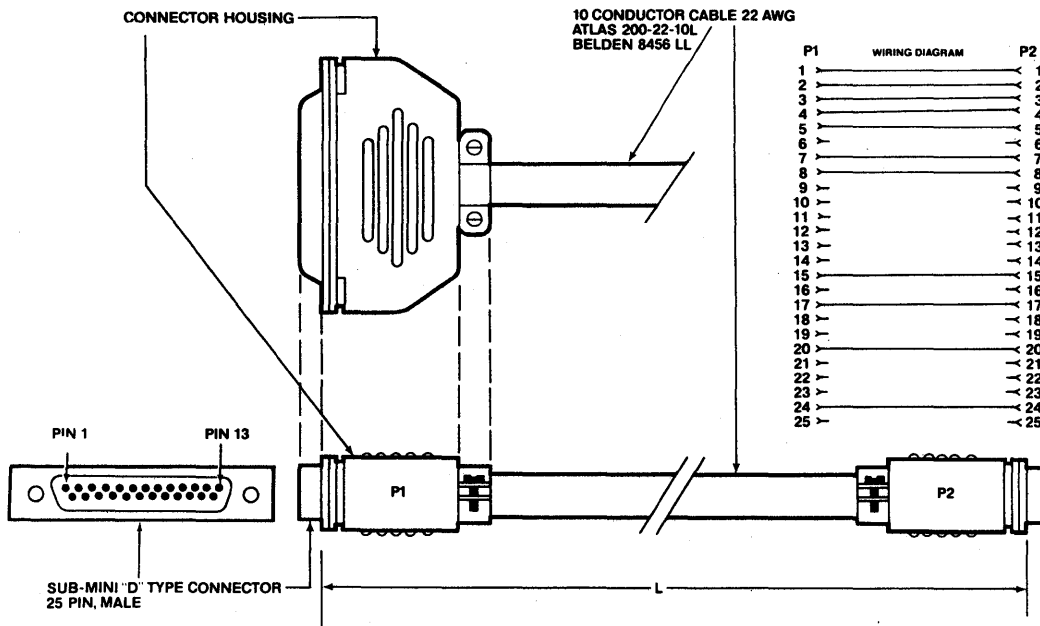
APPENDIX E
PORT ADDRESSES

Table E-1
Port Addresses

Description	Hex Address	Read/Write
Dip switch	OOH	
STI port*	20H - 2FH	(modem port)

Dart Channel Description

Dart Channel A (Data)	30H	R/W (keyboard)
Dart Channel A (Command/Status)	32H	R/W (keyboard)
Dart Channel B (Data)	31H	R/W (print ou†
Dart Channel B (Command/Status)	33H	R/W (mouse in)

SIO (Option Port)

    Channel A (RS-422)

data	40H	R/W
command/status	42H	R/W

    Channel B (not used)

data	41H	R/W
command/status	43H	R/W

Floppy Disk Drive Controller	90H	W

Bit No.	Description
D0	Ready (active high)
D1	Motor on (active low)
D2	Side select (active low)
D3	Double density (active low)
D4	Drive select 0 (active low)
D5	Drive select 1 (active low)
D6	Drive select 2 (active low)
D7	Drive select 3 (active low)

Floppy Disk Controller: West Drive select 2 (active low)
    D7   Drive select 3 (active low)

*See Appendix B for suggested references for the Mostek STI chip.
Floppy Disk Controller: (Western Digital 1793-02)

command/status	80H	R/W
track register	81H	R/W
sector register	82H	W
data register	83H	R/W

WDC Reset   AOH   W

WDC   BOH-BFH
                    (See WDC Manual)

Parallel Data Port (Option)   70H   W

System Control Port 1   10H   W

    DO   LED 0 (active low)
    Dl   LED 1 (active low)

System Control Port 2   11H   W

    DO   LED 2 (active low)
    Dl   LED 3 (active low)

System Control Port 3   12H   W

    DO   RS 422 enable (active low)
    Dl   RS 422 WAIT enable (active low)

System Control Port 4   13H   W

    DO = 0 and Dl = 0   Enable memory bank 0
    DO = 1 and Dl = 0   Enable memory bank 1
    DO = 0 and Dl = 1   Enable memory bank 2

Control Register for Alpha or Graphics Mode Selection

                                               C4H   W

        Bit 0 = 0   alpha mode
              1   graphics mode

        Bit 1 = 0   page 1 (alpha mode only)
              1   page 2 (alpha mode only)

        Bit 2 = 0   alpha memory access (round off)
              1   graphics memory access (normal CPU address)

Table E-2
CRT Controller Control Register Port

   Description   **Read/Write**

   R0   Horizontal total characters number   W
   R1   Horizontal displayed characters number   W
   R2   Position of horizontal sync pulse   W
   R3   Pulse width of horizontal sync pulse   W
   R4   Vertical total character number   W
   R5   Vertical total adjust   W
   R6   Vertical displayed character number   W
   R7   Position of vertical sync pulse   W
   R8   Mode control   W

         BIT 3 = 0   for video display RAM addressing
                          straight binary

   R9   Maximumscan line address   W
   R10   Cursor start raster   W

         bit 6,5 - 00   no blinking
                   01   no cursor
                   10   blink at 1/16 field rate
                   11   blink at 1/32 field rate

   R11   Cursor end raster   W
   R12   Start address high byte   R/W
   R13   Start address low byte   R/W
   R14   Cursor position high byte   R/W
   R15   Cursor position low byte   R/W

APPENDIX F
COMMUNICATIONS PORT DRIVER

TS 803H MODEM PORT BASED ON MOSTEK 3801

The following information provides an example of how to program
the MOSTEK 3801 STI UART/TIMER chip. This specific example is
more oriented for asynchronous communications, but could be
easily adapted for synchronous communications.

3801 STI REGISTER ADDRESSES

IDR	EQU	20H	;INDIRECT DATA REG
GPIP	EQU	21H	;GENERAL PURPOSE I/O REG
PVR	EQU	28H	;POINTER/VECTOR REG
TABCR	EQU	29H	;TIMER A AND B CONTROL REG
TADR	EQU	2BH	;TIMER A DATA REG
UCR	EQU	2CH	;USART CONTROL REG
RSR	EQU	2DH	;RECEIVER STATUS REG
TSR	EQU	2EH	;TRANSMITTER STATUS REG
UDR	EQU	2FH	;USART DATA REGISTER

COMMUNCATIONS PORT INITIALIZATION

Application calls the routine at absolute address 0200H to
initialize the communications port. This might be done when the
program is first loaded; or whenever to raise or lower DTR; etc.
On entry to the communications port initialization routine,
registers B through E specify how the communications port is to
be set up, as listed in Table F-1.

Table F-1
Registers B Through E

B = BAUD RATE	C = PARITY
0 = 110	0 = NONE
1 = 300	1 = ODD
2 = 600	2 = EVEN
3 = 1200	D = DATA BITS
4 = 2400	0 = 8 BITS/CHAR
5 = 4800	1 = 7 BITS/CHAR
6 = 9600	E = DTR STATUS
7 = 19200	ZERO = DROP
	NON-ZERO = ASSERT

Whenever the communications port initialization is done, any
pended input characters should be discarded.

```
COMIN:      PUSH D              SAVE D AND E
            MVI D,0
            IN TABCR            READ CURRENT TIMER
            STA TABD            SAVE FOR LATER
            LXI H,BRBTB         GET BIT PATTERN FOR CORRECT BAUD RATE
            MOV E,B
            DAD D
            MOV A,M
            STA TADRD           BAUD RATE
            POP D
            MVI B,0
            LXI H,PTYTB
            DAD B
            MOV A,M             GET PARITY
            LXI H,DTBTB
            MOV C,D
            DAD B
            ORA M               COMBINE WITH DATA BITS
            ORI 88H             DIVIDE BY 16 AND 1 START/STOP BIT
            STA UCRD
            LXI H,DTRD          INITIAL DTR STATUS
            MOV A,E
            ORA A
            JZ CMIN6
            MVI A,20H           ASSERT DTR
CMIN6:      ORA M
            STA DDRD
            MVI A,6
            OUT PVR
            LDA DDRD            SET DDR
            OUT IDR
            SUB A
            OUT GPIP            SET HANDSHAKE LINES
            MVI A,7
            OUT PVR
            MVI A,80H
            OUT IDR             RESET CHANNEL A
            MVI A,0
            OUT TABCR           STOP A AND B
            LDA TADRD
            OUT TADR            SET BAUD RATE
            LDA TABD
            OUT TABCR           RESTART
            LDA UCRD
            OUT UCR             SET FORMAT
            MVI A,01H
            OUT RSR             TURN ON RXD
            MVI A,05H
            OUT TSR             TURN ON TXD
            SUB A
            RET
```

```
TADRD:      DB 0            BAUD RATE STORAGE
TABD:       DB 0            A AND B CONTROL WORD STORAGE
UCRD:       DB 0            FORMAT STORAGE
DDRD:       DB 0            DTR AND RTS BITS
```

Table F-2
Baud Rate Bits

```
BRBTB:      DB 64           150
            DB 32           300
            DB 16           600
            DB 8            1200
            DB 4            2400
            DB 2            4800
            DB 1            9600
```

Table F-3
Parity Bits

```
PTYTB:      DB 0            NONE
            DB 04H          ODD
            DB 06H          EVEN
```

Table F-4
Character Length Bits

```
DTBTB:      DB 0            8 DATA BITS
            DB 20H          7 DATA BITS

DTRD:       DB 04H          RTS HI DTR LOW
```

RELEASE COMMUNICATIONS PORT

Application calls the routine at absolute address 0210H to release communications port, that is, to restore it to its original condition. This routine could be called immediately before application returns to CP/M.

```
COMRL:      RET
```

GET COMMUNICATIONS PORT INPUT STATUS

Application calls the routine at absolute address 0220H whenever it wishes to determine if there is an incoming byte on the communications port available to be read from the UART. On return from this routine, reg A should be zero if no byte is available and should be non-zero if a byte is available.

```
COMIS:      IN RSR          READ STATUS REGISTER
            ANI 80H         LOOK ONLY AT RELEVANT STATUS BIT
            RET
```

READ COMMUNICATIONS PORT INCOMING BYTE

Application calls the routine at absolute address 0230H to read the incoming data byte into register A (note that all 8 bits are read). This routine is not called unless a previous call to the routine at address 0220H has indicated that there is a byte available!

```
COMIB:      IN UDR          INPUT BYTE
            RET
```

GET COMMUNICATIONS PORT OUTPUT STATUS

Application calls the routine at absolute address 0240H whenever it wishes to determine if the communications port UART is ready to accept another byte to be transmitted. On return from this routine, register A should be zero if the UART is not ready and should be non-zero if the UART is ready.

```
COMOS:      IN TSR          READ STATUS REGISTER
            ANI 80H         LOOK ONLY AT RELEVANT STATUS BIT
            RET
```

OUTPUT BYTE TO COMMUNICATIONS PORT

Application calls the routine starting at absolute address 0250H whenever it wishes to output a byte via the communications port UART. The byte itself should be supplied in register A. Note that all 8 bits are setn. Application will not call this routine unless communications port readiness to accept a byte has been indicated by calling the status routine at 0240H above.

```
COMOB:      OUT UDR         OUTPUT BYTE
            RET

COMEN:      RET             ENABLE COMM PORT

COMDS:      RET             DISABLE COMM PORT
```

SEND BREAK

Application calls the routine at absolute location 0280H whenever it wishes to transmit a break condition for approximately one second.

```
COMBS:      MVI A,09H       SEND BREAK
            MVI B,255
COMB2:      OUT TSR
            DCR B
            JNZ COMB2
            MVI A,01H        STOP
            OUT TSR
            RET
```

CHECK CARRIER DETECT STATUS

Application calls the routine at absolute address 0290H whenever
it wishes to determine carrier detect (EIA PIN 8) status on the
communications port. On return, reg A is zero if carrier is not
asserted, non-zero if carrier is asserted.

```
COMCS:     IN GPIP       READ STATUS REGISTER
           ANI 01H       LOOK ONLY AT RELEVANT BIT
           XRI 01H       READY IF BIT 0 = 0
           RET
```

APPENDIX G
PIN CONNECTOR ASSIGNMENTS

Table G-1
Board Connectors

Connector No.	Description
P1	RS-232C Modem Connector
P2	Serial Printer Connector
P5	Power Connector
P6	Video Connector
P7	Floppy Disk Drive Connector
P8	WDC Board Connector
P9	Comp. Video Connector
P11	Keyboard Connector

Table G-2
RS-232C Modem Connector

Pin No.	RS-232C Designator	Description	I/O
1	AA	Frame Ground	G
2	BA	Transmit Data	O
3	BB	Receive Data	I
4	CA	Request to Send	O
5	CB	Clear to Send	I
7	BA	Signal Ground	C
8	CF	Data Carrier Detect	I
15	DB	Transmit Clock	I
17	DD	Receive Clock	I
20	CD	Data Terminal Ready	O
24	DA	Transmit Clock	O

Legend:
    G = AC chassis ground
    I = Input
    O = Output
    C = Signal common

Table G-2
Serial Printer Connector
(Configuration as Shipped is for Printer)

Pin No.	Description	DCE
1	Frame Ground	G
2	Transmit Data	I
3	Receive Data	O
4	Request to Send	I
5	Clear to Send	O
6	Data Set Ready	O
7	Signal Ground	C
8	Data Carrier Detect	O
20	Data Terminal Ready	I

Legend
    G = AC chassis ground
    I = Input
    O = Output
    C = Signal common

APPENDIX H
CHANGING THE DEFAULT LST: DEVICE

The TS 803H arrives with the default LST: device set to UL1: (for
devices using Data Terminal Ready as the printer busy status).*   The
following procedure allows you to change the default LST: device to
LPT: (for devices using ETX/ACK protocol).**

---

*   Examples of printers using this protocol are Epson, NEC
       Spinwriter, and Texas Instruments serial printers.
**   Examples of printers using this protocol are NEC Spinwriter
       and Diablo. ETX/ACK can only be supported if jumper W10 is
       altered.

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

USER: 1.   Boot the system.

            2.   Enter

                 SYSGEN<CR>

SYSTEM: 3.   Displays

                 SYSGEN Vx.x
                 (c) 1982 TeleVideo Systems, Inc.

                 SOURCE DRIVE NAME(OR RETURN TO SKIP)

USER: 4.   Enter

                 A

SYSTEM: 5.   Displays

                 SOURCE ON A:, THEN TYPE RETURN

USER: 6.   Press

                 <CR>

SYSTEM: 7.   Displays

                 FUNCTION COMPLETE
                 DESTINATION DRIVE NAME(OR RETURN TO REBOOT)

USER: 8.   Press

                 <CR>

SYSTEM: 9.   Displays

                 A>

USER: 10.   Enter

                 SAVE 60 CPMXX.COM<CR>

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

SYSTEM: 11.   Displays

                 A>

USER: 12.   Enter

                 DDT CPMXX.COM<CR>

SYSTEM: 13.   Displays

                 DDT VERS X.Y
                 NEXT   PC
                 3D00 0100
                 -

USER: 14.   Enter

                 S1FDA<CR>

SYSTEM: 15.   Displays

                 1FDA D5

USER: 16.   Enter

                 95<CR>

                 (where D5 is the code to enable the UL1 device and
                 95 changes it to LPT. Table I-1 lists the
                 available device codes.)

Table H-1
Available Device Codes

	Code		Device
	15		TTY: Serial printer, pin 20 for DTR
	55		CRT: Serial device using XOn/XOFF protocol through modem port
	95		LPT: Serial device using ETX/ACK protocol through modem port (jumper W10 must be altered)
	D5		UL1: Serial printer through printer port, pin 20 for DTR

> **NOTE!**   In the above procedure, we have selected device LPT.

SYSTEM: 17.   Displays

1FDB 0E

(this is the next hexadecimal address)

USER: 18.   Enter

.<CR>

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

SYSTEM: 19.   Displays

—

20.   Enter

^C

SYSTEM: 21.   Displays

A>

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

SYSGEN<CR>

SYSTEM: 23.   Displays

                SYSGEN Vx.x
                (c) 1982 TeleVideo Systems, Inc.

                SOURCE DRIVE NAME(OR RETURN TO SKIP)

USER: 24.   Press

                <CR>

SYSTEM: 25.   Displays

                DESTINATION DRIVE NAME(OR RETURN TO REBOOT)

USER: 26.   Press

                A

SYSTEM: 27.   Displays

                DESTINATION ON A:, THEN TYPE RETURN

USER: 28.   Press

                <CR>

SYSTEM: 29.   Displays

                FUNCTION COMPLETE
                DESTINATION DRIVE NAME(OR RETURN TO REBOOT)

USER: 30.   Press

                <CR>

SYSTEM: 31.   Displays

                A>

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

Crossover cable must be used to connect between modem port and
printer port when ETX/ACK protocol printer is used. Refer to
Appendix I for cable configuration.

APPENDIX I
DEFAULT DEVICE ASSIGNMENT

CON: = CRT:

RDR: = PTR:

PUN: = PTP:

LST: = UL1:

UL1: device uses Data Terminal Ready (DTR) as the response to the printer busy status. Types of printers supported include Epson, NEC Spinwriter, and Texas Instruments serial printers.

The cable to be used is an RS-232 straight cable.

Optional device assignment:

1.   LST: = TTY:

     TTY: device uses DTR protocol for a modem port. Crossover cable must be used.

2.   LST: = CRT:

     CRT: device uses XON/XOFF protocol for a modem port. Crossover cable must be used to connect modem port to the printer port.

3.   LST: = LPT:

     LPT: device uses ETX/ACK protocol for a modem port. Types of printer supported are NEC Spinwriter and Diablo daisywheel. Crossover cable must be used.

Table I-1
Crossover Cable Configurations

Modem Port Pin #	Printer Port Pin #
1	1
2	3
3	2
4	5
5	20
7	7
8	4
20	6 and 8

APPENDIX J
ASCII CODE CHART

Figure J-1
ASCII Code Chart

Bits	7	6	5			$^0{}_0{}_0$	$^0{}_0{}_1$	$^0{}_1{}_0$	$^0{}_1{}_1$	$^1{}_0{}_0$	$^1{}_0{}_1$	$^1{}_1{}_0$	$^1{}_1{}_1$
	4	3	2	1	Column → / Row ↓	0	1	2	3	4	5	6	7
	0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
	0	0	0	1	1	SOH	DC1	!	1	A	Q	a	q
	0	0	1	0	2	STX	DC2	"	2	B	R	b	r
	0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
	0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
	0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
	0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
	0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
	1	0	0	0	8	BS	CAN	(	8	H	X	h	x
	1	0	0	1	9	SKIP HT	EM	)	9	I	Y	i	y
	1	0	1	0	10(a)	LF	SUB	*	:	J	Z	j	z
	1	0	1	1	11(b)	VT	ESC	+	;	K	[	k	{
	1	1	0	0	12(c)	FF	FS	,	<	L	\	l		
	1	1	0	1	13(d)	CR	GS	−	=	M	]	m	}
	1	1	1	0	14(e)	SO	HOME RS	.	>	N	^	n	~
	1	1	1	1	15(f)	SI	NEW LINE US	/	?	O	_	o	DEL RUB

ASCII Code Table
Abbreviations For Control Characters

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

APPENDIX K
SET-UP PROGRAM

SETUP is a menu-driven utility software program for customizing the
CP/M operating system running under TS 803H hardware. SETUP
provides capability to change systems attributes such as baud rate
and printer protocol dynamically in semi-real time. For example, a
user need only to specify the new baud rate to change the baud rate
of the printer. SETUP makes the change to the system. This change
is permanent and is effective after the next reset.

The capability of the SETUP program is as follows:

1.   Change the default IOBYTE

      After power-on or reset, a default physical device is selected
      for each logical device based on the value of the default
      IOBYTE. The default IOBYTE may be changed to select any one of
      the four physical devices associated with logical devices.

2.   Configuration of modem port

      Modem port can be configured to be used as a second printer
      port for different printer protocols.

3.   Port attribute configuration

      Port attribute configuration allows baud rate specification for
      external device such as a printer or modem, and
      transmit/receive data format.

4.   Turning on/off mouse hardware flag for graphics.

5.   Autoload configuration

      Any command file may be automatically executed during the cold
      boot. Cold boot occurs after power-on or a system reset has
      been performed.

The following example illustrates how to change the baud rate for
the printer port.

Be sure that the file, SETUP.COM exists in the currently logged
drive.

USER: 1.   Enter

                  SETUP<CR>

SYSTEM: 2.   Displays

                  SYSTEM SETUP   Version 1.0   TeleVideo Systems, Inc.

                  Please select the following system type

                  1)   Stand alone TS-803
                  2)   Stand alone TS-803H
                  3)   Multi user TS-800
                  4)   Multi user TS-803
                  5)   Multi user TS-803H
                  6)   Abort SETUP and return to CP/M

                  - <--Enter appropriate number followed by <CR>
                          or CTRL-C to return to CP/M

USER: 3.   Enter

                  2<CR>

SYSTEM: 4.   Displays

                  SYSTEM SETUP   Version 1.0   TeleVideo Systems, Inc.

                  Current system: TS-803H
                  Operating system: Stand alone CP/M
                  Current mouse status   ON

                  Select modification category:
                    1)   To attach mouse
                    2)   To detach mouse
                    3)   To change CP/M default I/O byte
                    4)   To change Printer port Baud rate
                    5)   To change Modem port Baud rate
                    6)   To change Printer port data format
                    7)   To change Modem port data format
                    8)   To change Autoload file name
                    9)   To save current configuration permanently
                          and return to CP/M
                   10)   To save current configuration temporarily
                          and return to CP/M
                   11)   To abandon this setup

                    -- <--Enter appropriate number followed by <CR>
                            or CTRL-C to return to CP/M

USER: 5.   Enter

                  4<CR>

SYSTEM: 6.   Displays

                  SYSTEM   SETUP   Version 1.0   TeleVideo Systems, Inc.

                  Current system: TS-803H
                  Operating system: Stand alone CP/M
                  Current printer port baud rate: 9600

                  Please select the following baud rate

                      1)   9600 BAUD
                      2)   4800 BAUD
                      3)   2400 BAUD
                      4)   1200 BAUD
                      5)   600 BAUD
                      6)   300 BAUD
                      7)   150 BAUD
                      8)   75 BAUD
                      9)   Set BAUD rate from switch
                     10)   Use current BAUD rate and exit

                  -- <--Enter appropriate number followed by
                          <CR> or CTRL-C to return to CP/M

USER: 7.   Enter

                  4<CR>

                  (if you wish to change baud rate to 1200)

SYSTEM: 8.   Displays

SYSTEM   SETUP   Version 1.0   TeleVideo Systems, Inc.

Current system: TS-803H
Operating system: Stand alone CP/M
Current printer port baud rate: 1200

Please select the following baud rate

    1)   9600 BAUD
    2)   4800 BAUD
    3)   2400 BAUD
    4)   1200 BAUD
    5)   600 BAUD
    6)   300 BAUD
    7)   150 BAUD
    8)   75 BAUD
    9)   Set BAUD rate for switch
   10)   Use current BAUD rate and exit

    -- <--Enter appropriate number followed by
          <CR> or CTRL-C to return to CP/M

USER: 9.   Enter

           10<CR>

SYSTEM: 10.   Displays

SYSTEM   SETUP   Version 1.0   TeleVideo Systems, Inc.

Current system: TS-803H
Operating system: Stand alone CP/M
Current mouse status   ON

Select modification category
    1)   To attach mouse
    2)   To detach mouse
    3)   To change CP/M default I/O byte
    4)   To change Printer port baud rate
    5)   To change Modem port baud rate
    6)   To change Printer port data format
    7)   To change Modem port data format
    8)   To change Autoload file name
    9)   To save current configuration permanently
         and return to CP/M
   10)   To save current configuration temporarily
         and return to CP/M
   11)   To abandon this setup

    -- <--Enter appropriate number followed by <CR>
          or CTRL-C to return to CP/M

USER: 11.   Enter

                  9<CR>

                  (if you wish to save current configuration
                  permanently)

SYSTEM: 12.   Displays

                  End of execution

                  A>

                  (if the system currently logged is drive A.)

USER: 13.   Reset the system by pressing simultaneously

                  ^RESET

The baud rate for the printer should now be permanently changed.

APPENDIX L
SYSTEM DISKETTE FILE LIST

This is a list of the files that were on the TS 803H system
diskette when it was initially released. TeleVideo reserves the
right to change these files without notification to the customer.
If you have any questions about the files on your diskette,
contact your computer store.

Table L-1
System Diskette Files

Filename	Description
MOVCPM.COM*	Program to relocate the CCP and BDOS to generate a CPMxx.COM file.
DDT.COM*	Debug program (Dynamic Debug Tool) for the assembly language.
SYSGEN.COM*	CP/M utility program to copy system tracks 0 and 1.
COPYDISK.COM	Utility program to copy an entire diskette.
GENGRAF.COM*	Utility to combine applications program and GSX loader into executable .command file.
DD7220.PRL*	GSX graphics driver to support a plotter (Hewlett Packard 7220).
DDMX80.PRL*	GSX graphics drive to support a printer (Epson MX80).
DDTS803.PRL	GSX graphics driver to support the TS 803H.
PIP.COM*	CP/M utility program to copy files.
ED.COM*	CP/M text editing program.
LOAD.COM*	Program to generate an executable program (.command file) from the HEX file generated by the assembler.
SETUP.COM	Utility program to reconfigure the system parameters.
DD7470.PRL*	GSX graphics driver to support a plotter (Hewlett Packard 7470A).

DEMOSCRN	Contains the data for the TS 803H demo program.
GSX.SYS*	Graphics System Extension file (GSX loader).
SURF1	Graphics data for 803 demo program.
STAT.COM*	CP/M utility program. For capabilities of the STAT command, see Chapter 5.
SUBMIT.COM*	CP/M utility program for submitting CP/M commands in a batch mode. Works with XSUB.COM.
DUMP.COM*	Program to display a file in HEX numbers.
TOD.COM	Time of Day program.
DDHI3M.PRL*	GSX graphics driver to support a plotter (Houston Instruments DMP 3/4).
ASSIGN.SYS	Graphics file that works with the demo program for determining the output device of the demo.
DEMOTXT2.BIN	Data file used by the system demo.
ASM.COM*	8080 assembler program. Generates a HEX file which can be used by the load program.
XSUB.COM*	Works with the SUBMIT file submitting CP/M commands.
FORMAT.COM	Utility program to format a diskette.
DDHI7M.PRL*	GSX graphics driver to support a plotter (Houston Instruments DMP 6/7).
GSXREAD.ME	Explanation about GSX (Graphics System Extension) and the TS 803H demonstartion program.
803HDEMO.COM	System demo program.
PARK.COM	Utility program to lock the hard disk.
HFORMAT.COM	Utility program to format the hard disk.
FIXDISK.COM	Utility program to inspect the hard disk for defective data areas.
BUILDDSK.SUB	Utility program used with SUBMIT to install the operating system on the hard disk.

* Digital Research, Inc.(DRI) files

APPENDIX M
PROGRAMMER'S QUICK REFERENCE GUIDE

This information can also be found on the easy-to-use reference
card that came with the TS 803H User's Manual.

Table M-1
Escape Sequence List

Function	Command

MONITOR

Monitor mode ON	ESC U
Monitor mode OFF	ESC X or
	ESC u

DISABLE/ENABLE KEYBOARD

Disable keyboard	ESC #
Enable keyboard	ESC "

CURSOR

Home	^^
Carriage return	^M
Linefeed/cursor down	^J or ^V
Cursor up	^K or ESC j
Backspace/cursor left	^H
Cursor right	^L
Cursor off	ESC . 0
Blinking block cursor	ESC . 1
Steady block cursor	ESC . 2
Blinking underline cursor	ESC . 3
Steady underline cursor	ESC . 4

KEYCLICK AND BELL

Keyclick on	ESC >
Keyclick off	ESC <
Ring bell	^G

VISUAL ATTRIBUTES

Default video (green on black)	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 blink and underline	ESC G >
Invisible reverse and blink and underline	ESC G ?
Half Intensity ON	ESC)
Half Intensity OFF	ESC (

ADDRESS CURSOR

Address cursor (row column)	ESC = r c

TAB

Set (column) tab	ESC 1
Tab	^I
Back tab	ESC I
Clear tab	ESC 2
Clear all tabs	ESC 3

EDITING TEXT

Character insert	ESC Q
Character delete	ESC W
Line insert	ESC E
Line delete	ESC R
Erase to end of line	ESC T
Erase to end of line with nulls	ESC t
Erase to end of page	ESC Y
Erase to end of page with nulls	ESC y

CLEAR

Clear all to spaces	ESC + or ^Z
Clear all to nulls	ESC :
Clear all to half- intensity spaces	ESC ,
Clear all to nulls and reset half intensity	ESC *

FUNCTION KEYS

Program function keys   SHIFT/LOC ESC | p1 p2 message ^Y
(p1=number of function key
 p2=1
 ^Y= termination character)

Table M-2
Switch Setting List

Section	Setting	Function
1	closed (right)	Baud rate
2	closed (right)	Baud rate
3	closed (right)	Baud rate
4*	closed (right)	
5*	closed (right)	
6*	closed (right)	
7*	closed (right)	
8	Not used	
9	open (left)	Green on black screen(default)
	closed (right)	Black on green screen
10	Not used	

* required settings

Table M-3
Baud Rate List

Switch Section 1 2 3	Baud Rate
C C C	9,600
O C C	4,800
C O C	2,400
O O C	1,200
C C O	600
O C O	300
C O O	150
O O O	75

C=closed
O=open

APPENDIX N
TS 803H DEMONSTRATION PROGRAM

The Digital Research GSX (Graphics System eXtension) gives programs
the ability to easily display images on a number of different
graphics devices. It provides a standard interface so that
different graphics devices look the same to applications programs.

We have included a demonstration program to show some of the
capabilities of the GSX on the TS 803H. To run the program, you
need the following files on your logged disk:

    803hdemo.com   Demonstration program itself
    assign.sys   Explained below
    demotxt2.bin   Data for text fonts
    surf1   Data for a curved surface
    ddts803.prl   Software to talk to the TS 803H

NOTE!   Plotters must be connected to the modem port and
          printers must be connected to the printer port.

To run the program, enter

    803Hdemo<CR>

The program asks you if you want the demonstration displayed
on the CRT, a printer, or a plotter. To see the demonstration on
the TS 803H screen, follow these instructions.

USER: Enter

          1<CR>

SYSTEM: Displays

          reading in data

After about 30 seconds, the program will start displaying a series
of different screens giving information about the TS 803H. The
program runs unattended, and continues to run until you press the D
key. The program will then finish drawing the current page and
return to CP/M.

If you wish to look at any single page, press any key other than D
while the page is being drawn. That page stays on the screen until
you press any other key.

Hardcopy Options

For the following printers, you can see the screens from the demonstration on the printer by choosing option number 21 when the demonstration program starts running. The Epson must be plugged into the TS 803H printer port, located on the back panel of the main unit, and the baud rates on the printer and computer should be set to 1200 baud. See the section in Chapter 2 on baud rates.

    Epson MX-80 printer with Graftrax-Plus
    Epson MX-80 type 3
    Epson FX-80
    Epson MX-100

For the following plotter, you must plug it into the modem port of the TS 803H, and select number 11 when the program starts. If you do not get output on the plotter, you can use the Setup Program to check the baud rates and data formats and make sure that the PUN: logical device is set up to be the UR1: physical device.

    Hewlett Packard 7470 plotter

How the Assign.sys File Works

If you have a printer or plotter and wish to see output on it, you must make sure that software support is provided for that device. See Figures 1 and 2 for the printers and plotters that are supported.

Table 1
Supported Printers

Printer Name	File for Device
Epson MX-80 with Graftrax Plus*	ddmx80.prl
Epson MX-80 type 3	ddmx80.prl
Epson FX-80	ddmx80.prl
Epson MX-100	ddmx80.prl

Table 2
Supported Plotters

Plotter Name	File for Device
Hewlett-Packard 7470*	dd7470.prl
Hewlett-Packard 7220	dd7220.prl
Houston Instruments HiPlot 7M	ddhi7m.prl
Houston Instruments HiPlot 3M	ddhi3m.prl

* The Epson MX-80 with Graftrax Plus printer and the Hewlett-Packard 7470 plotter have been tested by TeleVideo to be fully compatible to the TS 803H. The other drivers have not been tested by TeleVideo System.

The file named "assign.sys" determines which device will get output.
The file comes set up to talk to the TS 803H screen, the Epson MX-80
printer or the Hewlett-Packard 7470 plotter, and should look like:

        21 @:ddmx80
        01 @:ddts803
        11 @:dd7470

The "dd" portion of the filename stands for device driver. The "@"
(at-sign) stands for the default drive. For example, if you are
running from drive A, CP/M takes the "@" to mean "A." The format of
the file must be as shown: two digits specifying the device number,
followed by a space, the disk letter and file name. GSX assumes a
".prl" extension, so you should not include the extension in
specification of the filename.

Note that the numbers at the beginning of each line correspond to
the numbers asked for by the demonstration program. When you
specify a number to the demonstration program, it tells the GSX to
look for that number in the assign.sys file. The GSX uses the file
name associated with that number to send graphics commands to the
device associated with the file.

The GSX assumes that device 0 is the default console, so 0 should
always be set to the TS 803H. Devices 1-10 are CRTs, 11-20 are
plotters and 21-30 are printers. The assign.sys file that comes
with the system uses 0, 11 and 21.

GSX assumes that the printer has been set up as the LST: device and
the plotter as the PUN: device. You can use the Setup Program to
make sure that the TS 803H is set up correctly.

Changing the Assign.sys File

If you have a printer other than the Epson MX-80, or a plotter other
than the HP 7470, you must edit the assign.sys file using a text
editor. For example, the Houston Instruments HiPlot 7M uses the
ddhi7m.prl file. You should change the third line in the file to
read

        11 @:ddhi7m

and save the new version of the file. The largest driver should be
on the first line in the assign.sys file, so use the stat program to
check the driver sizes if you change the assign.sys file. You must
plug the H1 plotter into the modem port on the back of the TS 803H,
and check the baud rates and data formats.