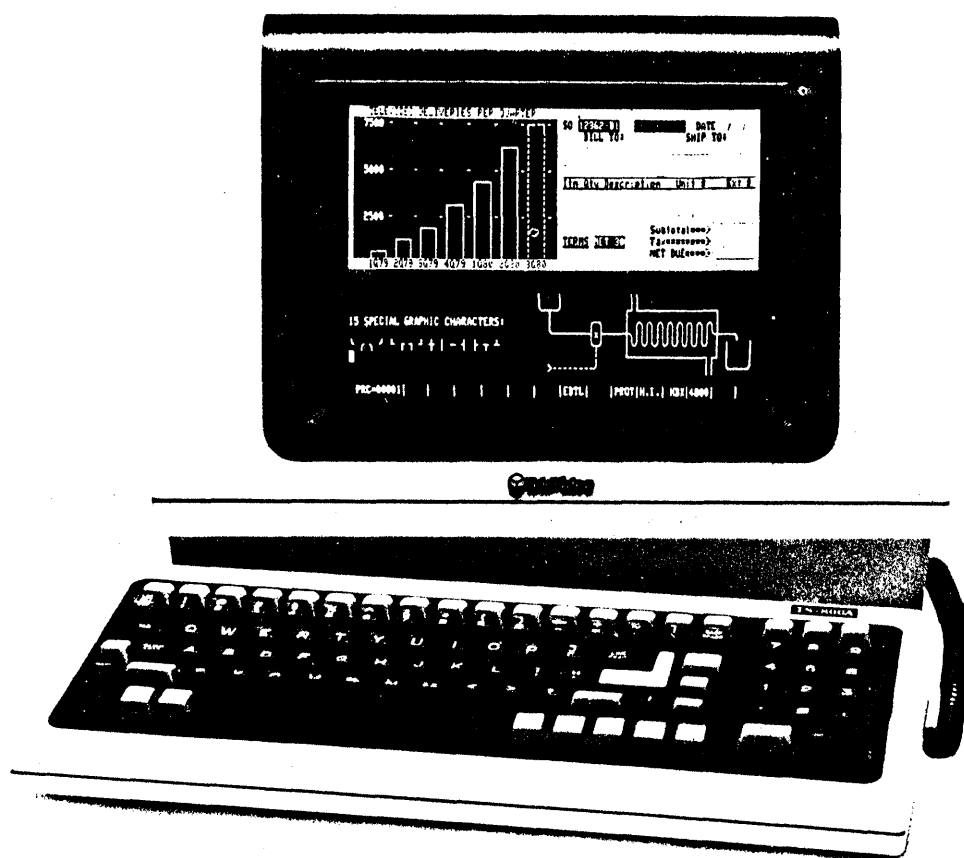

TeleVideo[®] **TS 800A Satellite User Station** **Installation and User's Guide**



TeleVideo® TS 800A Satellite User Station Installation and User's Guide

**TeleVideo No. B300017-001
Revision B
1 June 1982**

Copyright (c) 1982 by TeleVideo Systems, Inc. All rights reserved. No part of this publication may be reproduced, transmitted, transcribed, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, electronic, mechanical, magnetic, optical, chemical, manual, or otherwise, without the prior written permission of TeleVideo Systems, Inc., 1170 Morse Avenue, Sunnyvale, California 94086.

Disclaimer

TeleVideo Systems, Inc. makes no representations or warranties with respect to this manual. Further, TeleVideo Systems, Inc. reserves the right to make changes in the specifications of the product described within this manual at any time without notice and without obligation of TeleVideo Systems, Inc. to notify any person of such revision or changes.

"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. As temporarily permitted by regulation, it has not been tested for compliance with the limits for Class A computing devices pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. 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® is a registered trademark of TeleVideo Systems, Inc.
CP/M™ is a registered trademark of Digital Research, Inc.
MmmOST™ is a trademark of TeleVideo Systems, Inc.
Televideo COBOL™ is a trademark of TeleVideo Systems, Inc.
RM/COBOL™ is a trademark of Ryan-McFarland Corporation.

TeleVideo Systems, Inc., 1170 Morse Avenue, Sunnyvale, California 94086 408/745-7760

TABLE OF CONTENTS

	Page
LIST OF FIGURES	iv
LIST OF TABLES	v
1. INTRODUCTION	1-1
1.1 Introduction to the TS 800A	1-1
1.2 Limited Warranty	1-1
1.3 Hardware Configuration	1-1
1.4 Software Configuration	1-1
1.5 Using the Manual	1-3
2. INSPECTION AND INSTALLATION	2-1
2.1 Unpacking	2-1
2.2 Selecting the Right Location	2-2
2.3 General Installation	2-2
2.4 Connecting the TS 800A as a Service Processor Terminal	2-7
2.5 Installing the TS 800A as a User Station	2-8
2.6 Connecting a Serial Printer	2-8
2.7 Connecting a Modem	2-9
2.8 Plugging in the System	2-9
2.9 Checklist of Installation Instructions	2-9
TERMINAL OPERATION	3-1
3.1 Introduction	3-1
3.2 Turning on the Terminal	3-1
3.3 Keyboard Controls	3-2
3.4 Setting Up the Terminal	3-7
3.5 Editing	3-8
3.6 Communicating with the Computer	3-8
3.7 Printing	3-11
4. PROGRAMMING	4-1
4.1 Introduction	4-1
4.2 Monitor Mode	4-1
4.3 User and Status Lines	4-1
4.4 Line Lock	4-4
4.5 Disabling/Enabling the Keyboard	4-5
4.6 Cursor Display	4-5
4.7 Keyclick and Bell	4-6
4.8 Smooth Scroll	4-6
4.9 Video Display	4-6
4.10 Visual Attributes	4-6
4.11 Special Graphics	4-8
4.12 Additional Memory	4-10
4.13 Auto Page	4-10

TABLE OF CONTENTS

	Page
4.14 Protect Mode	4-10
4.15 Normal and Reverse Linefeed	4-12
4.16 Cursor Control Codes	4-13
4.17 The Function Keys	4-14
4.18 The FUNCT Key	4-16
4.19 Addressing and Reading the Cursor Position	4-16
4.20 Loading an Insert Character	4-17
4.21 Tab Programming	4-17
4.22 Communication Modes	4-19
4.23 Edit Keys	4-20
4.24 Editing Text	4-21
4.25 Clear Function	4-24
4.26 X-On/X-Off Control	4-25
4.27 Data Terminal Ready Control	4-25
4.28 Send Function	4-25
4.29 Print Function Programming	4-28
5. PREVENTIVE MAINTENANCE, TROUBLESHOOTING, AND SERVICE	5-1
5.1 Care	5-1
5.2 Troubleshooting	5-1
5.3 Changing the Fuse	5-4
5.4 How to Get Service	5-5
5.5 Reshipping the TS 800A	5-6
5.6 Technical Assistance	5-6
APPENDICES	
A. TS 800A Specifications	A-1
B. Statement of Limited Warranty	B-1
C. Suggested CP/M References	C-1
D. Cable Specifications	D-1
E. Pin Connector Assignments	E-1
F. Changing the Pin Connector Assignments	F-1
G. Port Assignments	G-1
H. ASCII Code Chart	H-1
I. Opening the System Case	I-1
INDEX	X-1
OPERATOR'S QUICK REFERENCE GUIDE	X-3

LIST OF FIGURES

	Page
1-1 Possible TS 800A Configurations	1-2
2-1 TS 800A as Packed in Container	2-1
2-2 Cable Connector	2-3
2-3 Correctly Folded Excess Cable	2-4
2-4 Rear Panel	2-4
2-5 Dipswitches 1 through 5 Open; 6 through 10 Closed	
2-6 Attaching the Terminal Connector	2-7
3-1 Rear Panel	3-1
3-2 Keyboard Layout	3-2
3-3 Status Line Fields	3-9
3-4 Communications Flow	3-10
4-1 Video Attributes and Monitor Mode	4-3
4-2 Special Graphics Characters	4-9
5-1 Display of Normal Self-Test	5-3
5-2 Exterior Fuse Location	5-4
5-3 Good Fuse	5-4
5-4 Burned Out Fuse	5-4
5-5 Location of Serial Number on Rear Panel	5-5
D-1 RS232C	D-1
D-2 RS422	D-1
F-1 Location of Traces on Printed Circuit Board	F-1
I-1 Anode on Rear of CRT Tube	I-1
I-2 Location of Screws in System Case	I-2

LIST OF TABLES

	Page
1-1 TS 800A Ports	1-2
2-1 Cable Specifications	2-3
2-2 Switch Settings	2-5
2-3 Communication Modes	2-6
2-4 Printer Baud Rate/Terminal Baud Rate	2-9
3-1 Functions of Keys	3-3
4-1 Monitor Mode Control Characters	4-2
4-2 Cursor Coordinates	4-4
4-3 Visual Attributes	4-7
4-4 Escape Sequences for Visual Attributes	4-8
4-5 Screen Attributes	4-9
4-6 Effects of Auto Page/Protect Mode on Linefeed Actions	4-12
4-7 Effects of Auto Page/Protect Mode on Reverse Linefeed Actions	4-13
4-8 Cursor Control Commands	4-13
4-9 Default Function Key Values	4-15
4-10 Tab Controls	4-18
4-11 Edit and Insert Modes	4-21
4-12 Editing Commands	4-22
4-13 Clear Commands	4-25
4-14 Default Delimiter Values	4-26
4-15 Data Transmission Commands	4-27
4-16 Transmit Commands	4-28
5-1 Troubleshooting Procedures	5-2
E-1 Connector Assignments for P1	E-1
E-2 Connector Assignments for P2	E-1
E-3 Connector Assignments for P4	E-2

1. INTRODUCTION

1.1 INTRODUCTION TO THE TS 800A

TeleVideo's TS 800A is a Z80A-based desktop intelligent user station for TeleVideo's multi-user TS 806 and TS 816 small business computer systems.

The TS 800A shares disk storage and central peripheral devices with other user stations. As a user station in a multi-processor environment, disk access and scheduling are supervised by TeleVideo's MmmOST operating system executive. Once CP/M and application programs are downloaded into the TS 800A's 64K bytes of dynamic RAM memory, the TS 800A becomes a stand-alone computer, efficiently avoiding the contention and throughput problems normally associated with timesharing systems.

Although you can use a serial printer or modem attached on the TS 800A's RS232C port, for greater economy you can share the three peripheral devices (printers or modems) attached to the central service processor. For added economy, the TS 800A easily serves as a service terminal for the central service processor to run central utility programs or diagnostics.

1.2 LIMITED WARRANTY

The TS 800A is covered by a limited warranty. The terms and conditions of the complete limited warranty are provided in Appendix B.

1.3 HARDWARE CONFIGURATION

1.3.1 Hardware Overview

The TS 800A is a tabletop computer that contains:

- A Z80A microprocessor
- 64K of RAM memory
- A 4K EPROM for diagnostics
- An integral terminal with the capabilities of a Model 950

The microprocessor within the TS 800A will be referred to as the **internal processor**. All I/O ports operate through this internal processor, enabling you to use all standard CP/M function commands.

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

1.3.2 Peripheral Devices

Three ports on the rear of the TS 800A allow you to connect a variety of peripheral devices (Table 1-1). Figure 1-1 shows possible TS 800A configurations.

1.4 SOFTWARE CONFIGURATION

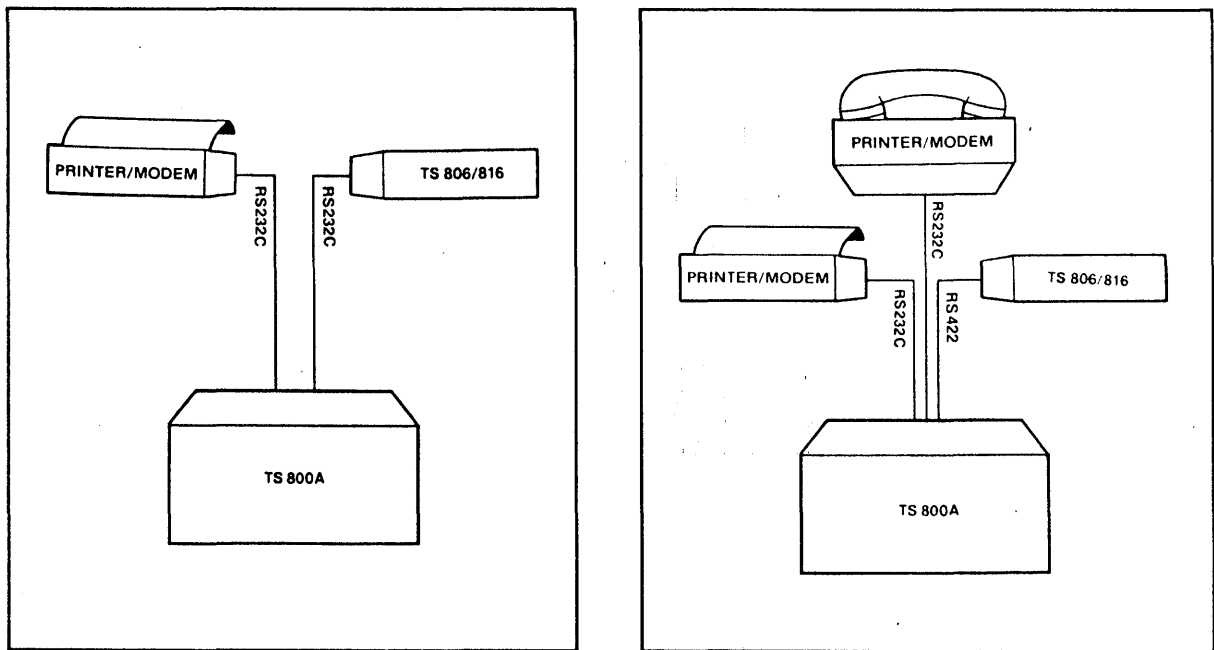
1.4.1 Operating System

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

1. INTRODUCTION

Table 1-1 TS 800A Ports

Port	Description
P2 (left)	This RS232C port is for a user-supplied serial device such as a printer or a modem. This port is originally configured for a printer, but cutting traces and making jumper connections allows a modem to be connected to this port instead.
P1 (right)	This RS232C port may be configured in three ways: <ol style="list-style-type: none">(1) When shipped, this port is configured for use with a modem.(2) Cutting traces and making jumper connections allow this port to be used with a serial printer.(3) Changing a dipswitch allows the TS 800A to be used as a terminal with the TS 806/816 console port.
RS422	This highspeed serial port connects the TS 800A to the TS 806 or TS 816 for use as a user station.



a. As a Terminal

b. As a User Station

Figure 1-1 Possible TS 800A Configurations

1. INTRODUCTION

The TS 800A's operating system is loaded into memory from the central service processor whenever they are both turned on. All TeleVideo computers use CP/M (Control Program for Microcomputers) Operating System software, developed by Digital Research.



If you are not already familiar with CP/M, TeleVideo highly recommends that you refer to the recommended reference books listed in Appendix C.

1.4.2 Programming Languages

The TS 800A can use any programming language which will run under CP/M. Among these are BASIC, ALGOL, APL, "C," CBASIC, COBOL, FORTH, FORTRAN, MBASIC, PL/I, AND RM/COBOL. When these are used in a multi-user environment with MmmOST, modifications which are described in the MmmOST Programmer's Manual allow them to take advantage of the features of MmmOST. In addition, TeleVideo COBOL allows application programs to be used with MmmOST with little or no modification.

1.4.3 Application Programs

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



Programs written specifically to take advantage of the features of terminals other than TeleVideo's Model 950 may need to be modified since the integral TS 800A terminal functions the same as a Model 950.

1.5 USING THE MANUAL

This manual will show you how to successfully install and use the TS 800A. The TS 806 or TS 816 Installation and User's Guide will also be of interest to you.

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

1.5.1 Organization

The manual contains the following chapters:

- 2 How to unpack and install the TS 800A
- 3 How to use the integral terminal
- 4 How to take advantage of the terminal features in your programs
- 5 How to care for the TS 800A and what to do if you have a problem with it

In the Appendices are the specifications, limited warranty, suggested references, and technical information associated with installation. The inside back cover contains the Operator's Quick Reference Guide, a summary of all control and escape commands used by the TS 800A's internal terminal.

1. INTRODUCTION

1.5.2 Special Information

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



General note giving information to every operator.



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

1.5.3 Format of Control Commands

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



Escape and control commands are shown with spaces. These spaces are included only for clarity and are not to be entered as part of the command sequence.

1.5.4 Carriage Returns

The symbol **<CR>** is used for **CARRIAGE RETURN** whenever the **RETURN** key should be pressed. (On TeleVideo terminals, the **ENTER** key can be pressed instead of the **RETURN** key.)

2. INSTALLATION

2.1 UNPACKING

2.1.1 How to Unpack

Before the TS 800A was shipped, it was placed in a large plastic bag and encased in rigid foam (Figure 2-1). To unpack it, lift the foam pieces out of the shipping carton, remove the foam from the sides, and slide the TS 800A gently out of the bag. The documentation is enclosed in an envelope.

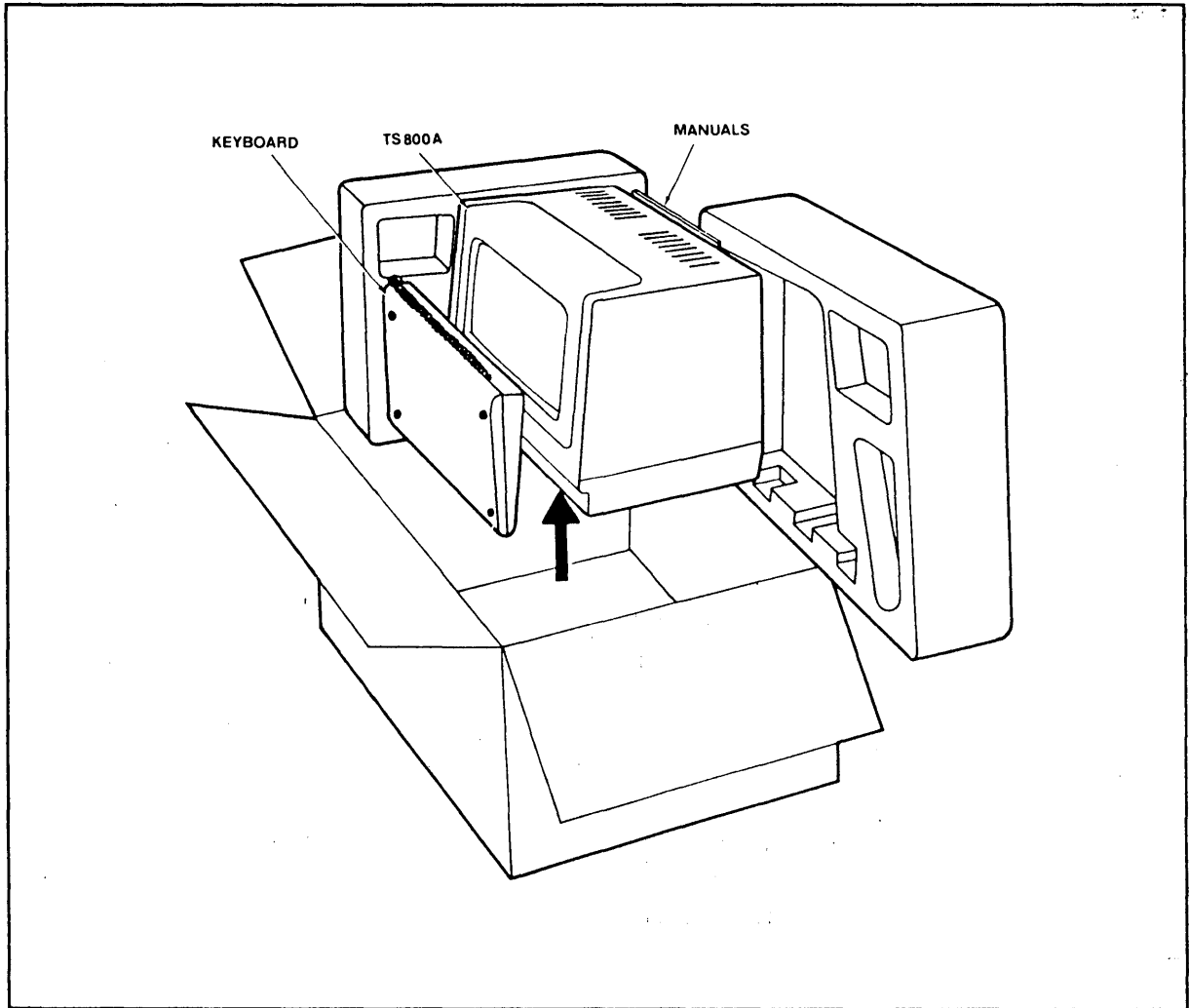


Figure 2-1 TS 800A as Packed in Container



Save all packing materials and the carton in case you need to ship the TS 800A in the future.

2. INSTALLATION

2.1.2 Shipping Damage

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

2.2 SELECTING THE RIGHT LOCATION

2.2.1 Power Requirements

The TS 800A requires a steady supply of power: 115 VAC 60 Hertz (domestic) at 0.54 amp or 230 VAC 50 Hertz (international) at 0.27 amp.



*If you have any doubt about the line voltages at your location, ask your dealer to check out your facility **before proceeding with the installation.***

2.2.2 Physical Requirements

The location you choose should be at least five feet from other computing equipment or any electrical appliances or equipment (such as elevators, radio transmitters, television sets) which generate magnetic fields.

Select a sturdy, level surface. The exterior dimensions of the TS 800A are provided in Appendix A.



Leave at least four inches of free space around the enclosure for proper air flow.

2.2.3 General Environment

The TS 800A will operate best at temperatures and humidity levels in which you are also comfortable.

The system requires a clean environment — free of contaminants such as dust, carpet fuzz, and smoke. Excessive moisture or oil particles in the air will hinder the performance of the system.

2.3 GENERAL INSTALLATION

General directions for all installation configurations are given in this section. Also included are directions for installing the TS 800A as a service processor terminal and as a user station and installing a serial printer or modem.

2.3.1 Cables

To connect the TS 800A and a central computer, printer, and any other peripheral device (such as a modem), you will need cables. The number and types of cables needed will be determined by the number of devices attached to the TS 800A. Your dealer can supply you with the appropriate cables. (The technical specifications for each type of cable are shown in Appendix D; specifications determined by distance are listed in Table 2-1.)

2. INSTALLATION

Table 2-1 Cable Specifications

Distance in Feet Between TS 800A and Peripheral	Type of Cable
1 to 20	Ribbon cable (shielded)*
20 to 100	24 gauge twisted pair with at least an overall shield
Over 100	24 gauge twisted pair (individually and overall shielded)

Note

*This is acceptable if the ribbon cable is not placed next to electrical devices or cables which could induce electrical interference in the ribbon cable.

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

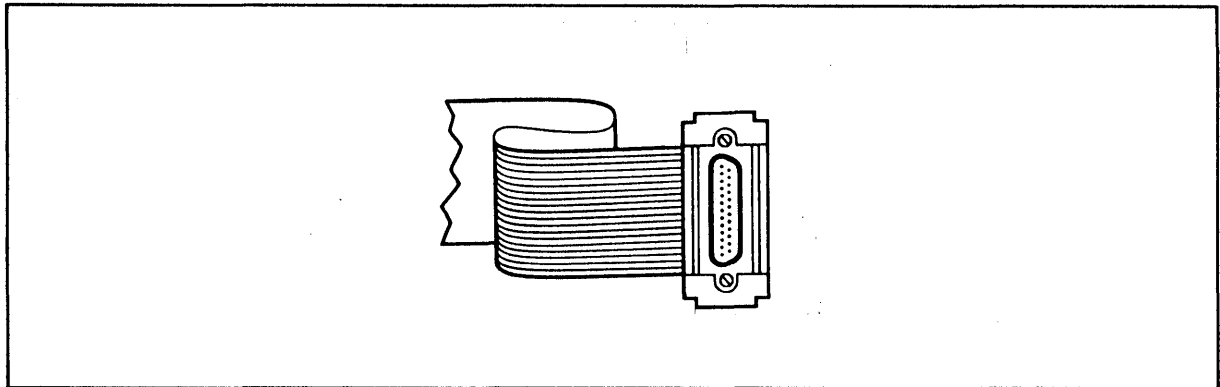


Figure 2-2 Cable Connector

As you connect the cables, leave some slack. If you have excess cable left, fold it loosely accordion-style (being careful not to crimp the cable) and secure it with a rubber band (Fig. 2-3). Place the cable out of the way.



If you are using a ribbon cable, do not roll up any excess cable. Rolled ribbon cable can create an inductor or choke which can adversely affect system performance.

2. INSTALLATION

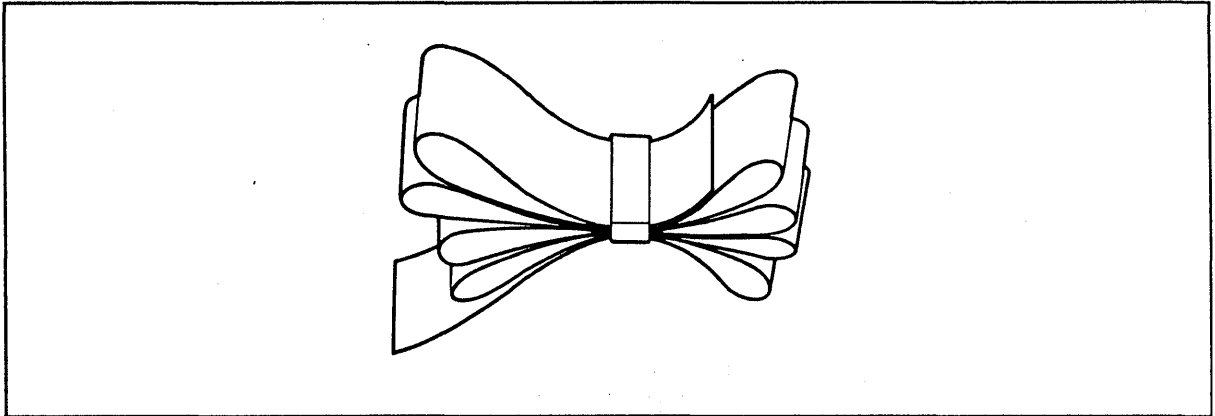


Figure 2-3 Correctly Folded Excess Cable

2.3.2 Power Configuration

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

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

Set the power select switch (Fig. 2-4) to match the power frequency used in your location (50 or 60 Hertz).

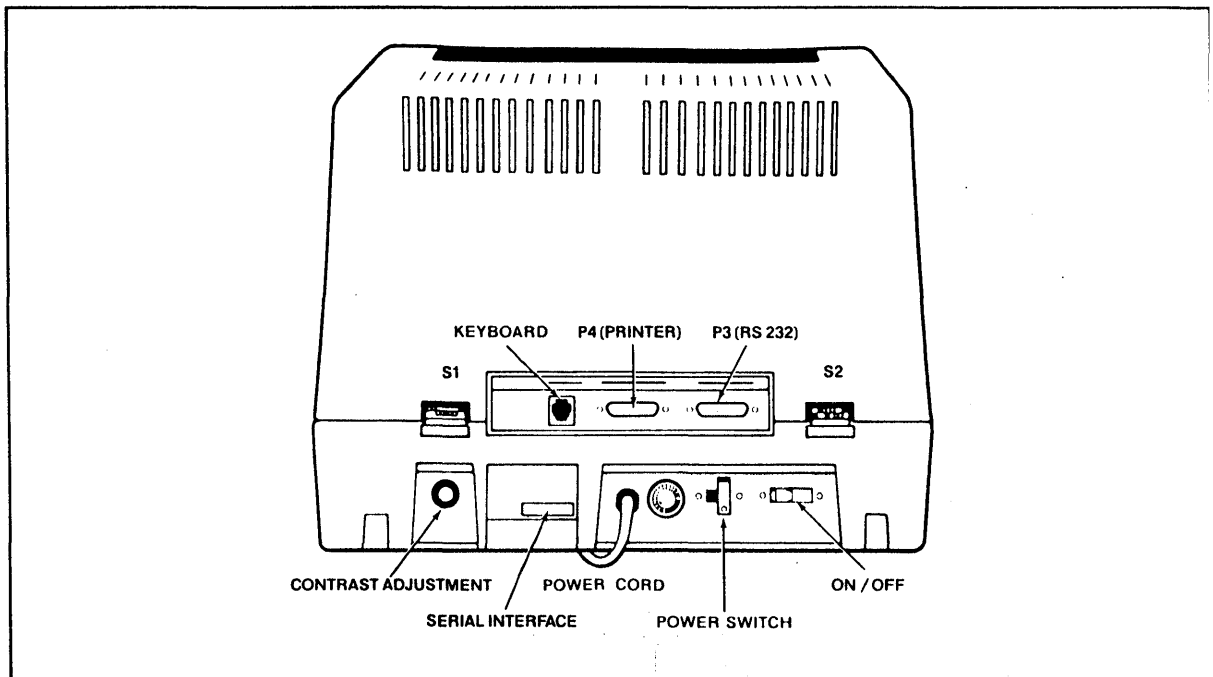


Figure 2-4 Rear Panel

2. INSTALLATION

2.3.3 General Switch Settings

Two switches are located on the rear panel (Figure 2-4). Each switch consists of ten dipswitches (Figure 2-5). Tables 2-2 and 2-3 list the values of the dipswitches.

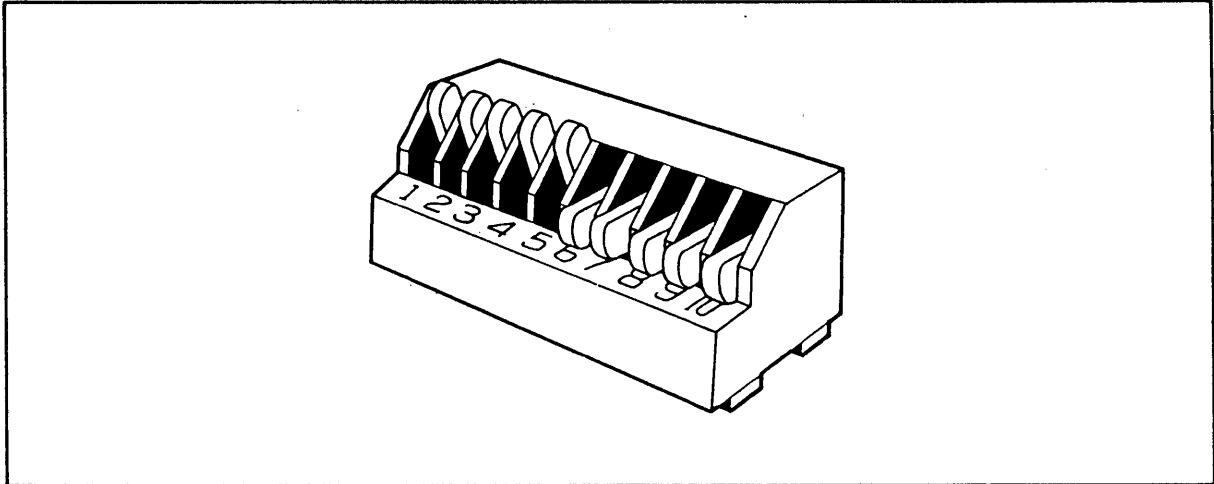


Figure 2-5 Dipswitches 1 through 5 Open; 6 through 10 Closed

The following switch settings apply to all installation configurations:

- S1-3 Must be closed
- S1-4 Must be closed
- S1-5 Must be closed
- S2-4 Must be closed
- S2-5 Must be open
- S2-6 Must be open
- S2-8 Can be either open or closed
- S2-9 Can be either open or closed
- S2-10 Can be either open or closed

Table 2-2 Switch Settings

Switch	Dipswitch	(Up) Open	(Down) Closed	Function
S1 (left)	1	x	x	• Duplex Local
	2	x	x	Blinking cursor Steady cursor
	3		x	Always closed

2. INSTALLATION

Table 2-2 Continued

Switch	Dipswitch	(Up) Open	(Down) Closed	Function
	4		x	Always closed
	5		x	Always closed
	6	x	x	Green characters on black Black characters on green
	7			See Table 2-3
	8			See Table 2-3
	9	x	x	60 Hertz (115 VAC) 50 Hertz (230 VAC)
	10	x	x	Keyclick off Keyclick on
S2 (right)	1			Printer/terminal baud rate see Table 2-4*
	2			Printer/terminal baud rate see Table 2-4*
	3			Printer/terminal baud rate see Table 2-4*
	4		x	Must be closed
	5	x		Must be open
	6	x		Must be open
	7	x	x	Service processor terminal User stations
	8		either	Not used
	9		either	Not used
	10		either	Not used

Table 2-3 Communication Modes

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

2. INSTALLATION

2.4 CONNECTING THE TS 800A AS A SERVICE PROCESSOR TERMINAL

2.4.1 Location

When the TS 800A is being used as a service processor terminal, it should be within 50 feet of the central service processor.

2.4.1 Cables

Attach one end of an RS232C cable (Fig. D-1 in Appendix D) to the connector labeled **TERMINAL** on the rear of the TS 806/816 case. Attach the other end to the RS232C connector labeled **P1** on the rear of the TS 800A. (The pin connector assignments for the terminal connector are furnished in Appendix E.)

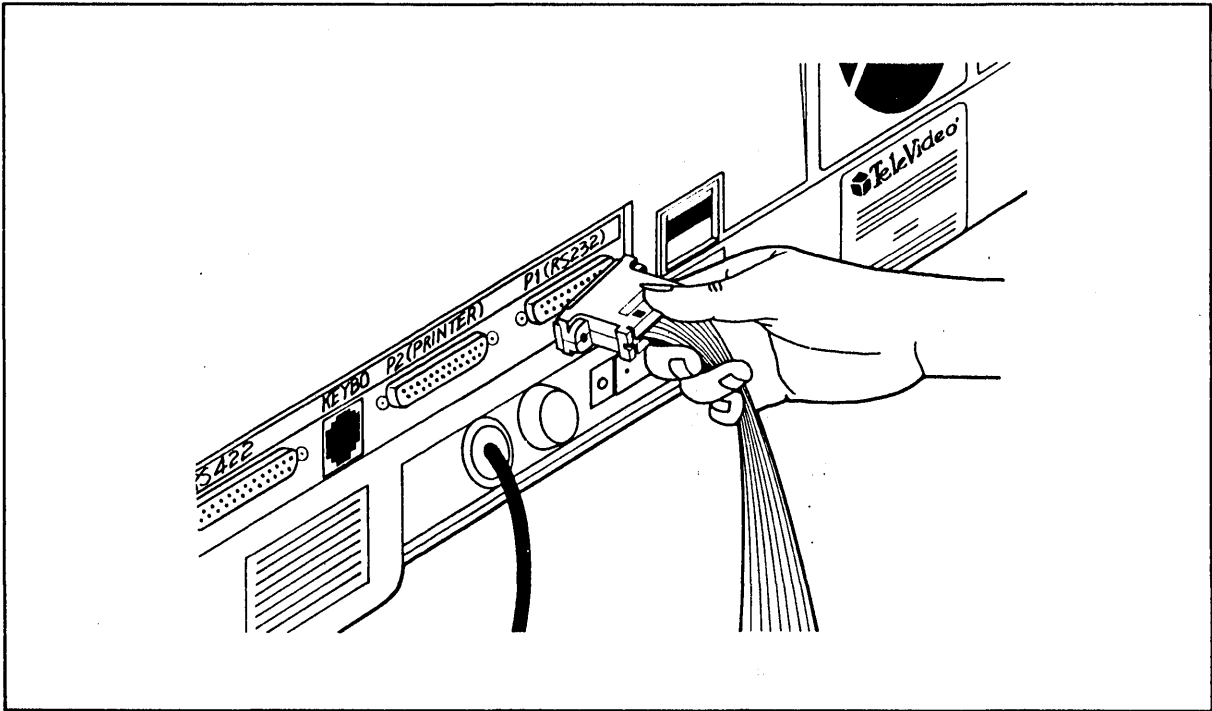


Figure 2-6 Attaching the Terminal Connector

2.4.3 Switches

Set the dipswitches on the rear of the TS 800A (Figures 2-5 and 2-6). S2-7 must be open. Set S2-1, 2, and 3 to match the baud rate of the central service processor (Table 2-4). (The TS 806 and TS 816 are normally set for 9600 baud at the factory; some early models may be set at 19.2K.)

The terminal which is contained in the TS 800A terminal is already set to operate at:

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

2. INSTALLATION

Table 2-4 Printer Baud Rate/Terminal* Baud Rate

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

Legend

0 = Switch closed (down)

1 = Switch open (up)

Note

*Service processor terminal configuration.

2.5 INSTALLING THE TS 800A AS A USER STATION

2.5.1 Location

When the TS 800A is a user station to a central service processor (e.g., TS 806/816), they should be within 300 feet of each other.

2.5.2 Cables

To connect the TS 800A as a user station, you will be using the RS422 port (**P4**) on the rear of the TS 800A. Attach one end of an RS422 interface cable (Fig. D-2 in Appendix D) to the TS 800A connector labeled **P4** and the other end to one of the ports labeled **User** ___ on the rear of the TS 806/816.

2.5.3 Switches

S2-7 must be closed. Setting S1-7 and S1-8 will determine the communication mode (half/full duplex, local, or block). Refer to Table 2-3.

2.6 CONNECTING A SERIAL PRINTER

Your TS 800A can be connected to one or two auxiliary serial printers. The TS 800A can be used with most RS232C-compatible serial printers currently available on the market. You can use a dot matrix printer, a highspeed line printer, or a letter-quality printer.

2.6.1 Location

The printer should be within 50 feet of the TS 800A.

2.6.2 Cables

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

2. INSTALLATION

2.6.3 Switches

Set dipswitches S2-1, 2, and 3 for the printer baud rate as listed in Table 2-4.

Addresses for RS232C ports are given in Appendix I.

2.7 CONNECTING A MODEM

You can connect one or two modems to the TS 800A. The RS232C port which is labeled P1 is ready to interface to a modem.

This port is controlled by dipswitches which allow the TS 800A to be used with a modem or as a service processor terminal. See Tables 2-2 and 2-4.

To install two modems to the TS 800A, cut traces and install jumpers on the printed circuit board (as described in Appendix F) before attaching the RS232C interface cables.

2.8 PLUGGING IN THE SYSTEM

After you have connected the RS422 and RS232C cables, plug the TS 800A into the wall outlet but *do not turn it on yet*.

2.9 CHECKLIST OF INSTALLATION INSTRUCTIONS

1. Did you check TS 800A for possible shipping damage?
2. Is the location which you selected
 - a. Magnetically isolated?
 - b. Supplied with steady line voltage?
 - c. Within comfortable temperature and humidity levels?
 - d. Clean?
 - e. Spacious enough for good ventilation around the case and on a sufficiently large table?
3. Is the power plug correct for your wall outlet?
4. If the TS 800A is connected to a serial printer and/or central service processor, are they connected and located within the distance limits specified? Were the correct cables used?
5. Did you set the switches for all peripheral devices? Did you make all necessary cuts and jumpers?
6. Did you plug the TS 800A and peripherals into the wall outlet?

If the answer to all of these steps is YES, then you are ready to use the TS 800A.

3. TERMINAL OPERATION

3.1 INTRODUCTION

This chapter provides step-by-step instructions for the operation of the terminal which is an integral part of the TS 800A. To program the integral terminal, refer to Chapter 4.

3.1.1 Terms

Terminal—In Chapters 3 and 4 of this manual, the term **terminal** will refer to the integral terminal.

Computer—Within this chapter and Chapter 4, the term **computer** can have two meanings: the TS 800A's internal processor and the central service processor. Data goes to one or both of these, depending on how the TS 800A is being used. Table 3-1 describes where data is sent.

Table 3-1 Data Destination

TS 800A Used As	Description
User Station	Codes and data sent from integral terminal to the TS 800A's internal processor
Service Processor Terminal	Codes and data sent from integral terminal <i>through</i> the TS 800A's internal processor to the central service processor

3.2 TURNING ON THE TERMINAL

1. Make sure the AC power plug is plugged into a grounded outlet.
2. Locate the ON/OFF rocker switch on the rear of the terminal (Figure 3-1). Push the end of the switch which is marked with a white dot.
3. Listen for a beep (indicating that power is on and the terminal has scanned the switch settings).
4. Watch for the cursor to appear in the upper lefthand corner of the screen within 10 to 15 seconds. [You can change the cursor display (block/underline, steady/blinking and control keyclick using dipswitches listed in Table 2-2.)]

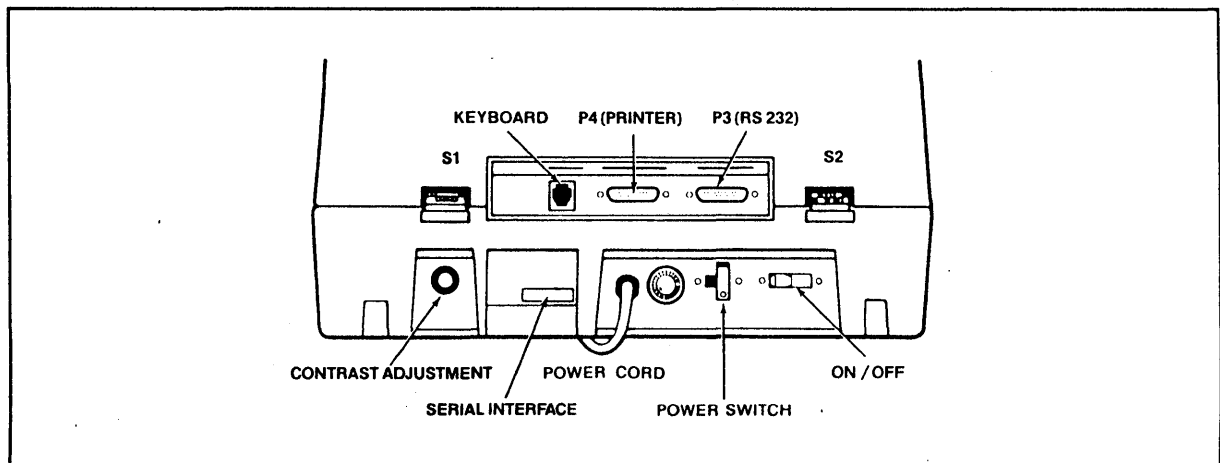


Figure 3-1 Rear Panel

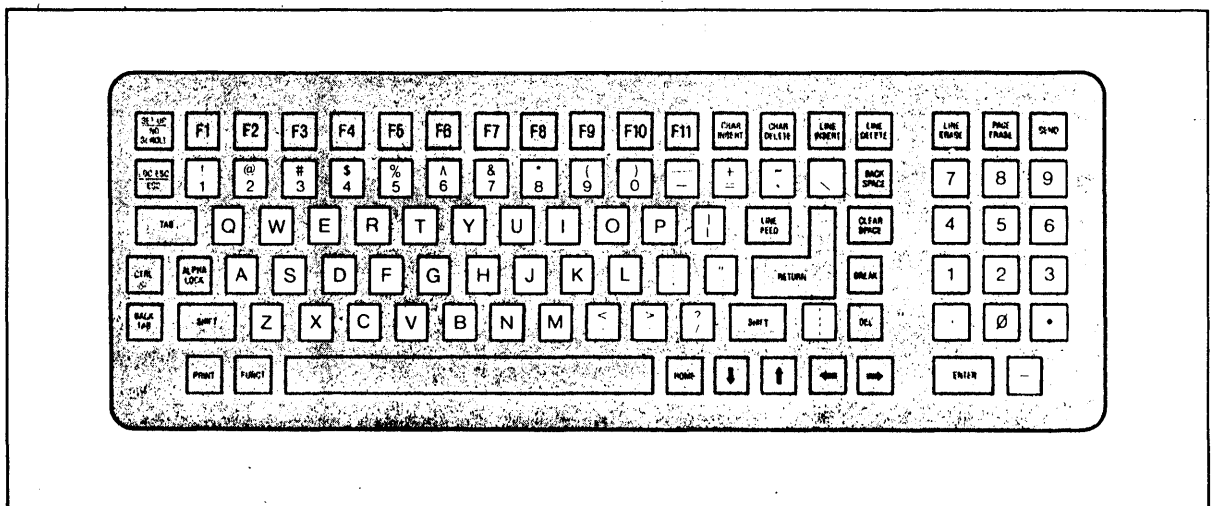
3. TERMINAL OPERATION

5. Adjust the contrast control on the rear panel for the desired screen intensity.
6. Adjust the tilt of the screen by unscrewing the knob which is between the two front legs of the case.
7. Refer to Chapter 5 if the installation does not proceed as indicated.

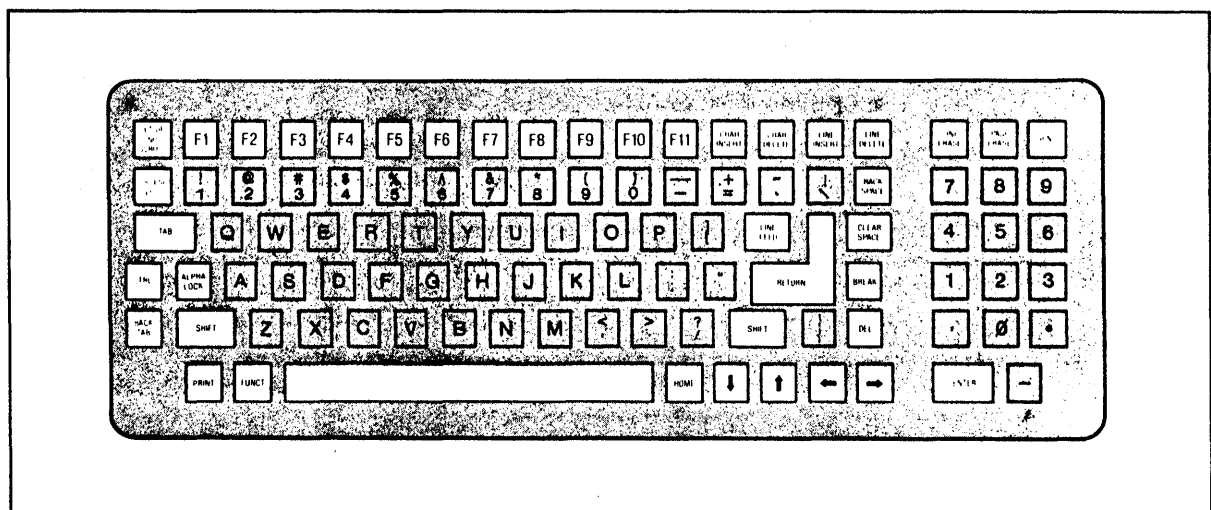
3.3 KEYBOARD CONTROLS

Figure 3-2 illustrates the keyboard layout. The character keys highlighted in Figure 3-2a include all alphabetic characters (a through z), numbers (0 through 9), punctuation marks, and mathematical symbols.

All alphanumeric keys repeat when pressed for more than one-half second.



a. Character Keys



b. Special Keys

Figure 3-2 Keyboard Layout

3. TERMINAL OPERATION

Table 3-2 summarizes the function of the special keys which are highlighted in Figure 3-2b. Many of these keys are also listed in the Operator's Quick Reference Guide on the inside back cover.



Protect mode, referred to frequently in Table 3-2, is explained fully in 4.14.

Table 3-2 Continued


Key Name	Transmitted? (Y/N)*	Repeat Action? (Y/N)	Description
Space Bar	Y	Y	Causes a blank space to appear on the display and transmits an ASCII space code (20 Hex).
SHIFT	N	N	Selects upper character inscribed on a key, changes operation of most special keys, and capitalizes alpha characters.
ALPHA LOCK	N	N	Locks the SHIFT keys so that all alpha keys transmit codes for upper-case characters. The key is pressed to lock and pressed again to release.
TAB	Y	Y	Moves the cursor forward to typewriter tabs (protect mode off; see 4.14) or to the start of the next unprotected field (protect mode on). (Same as I.)
BACK TAB	Y	Y	Moves the cursor backward to typewriter tabs (protect mode off) or to the start of the previous unprotected field (protect mode on). (Same as ESC I.)
CTRL (Control)	N	N	Generates normally-nondisplayed ASCII control codes when used with another key. The control key combinations are used for special action by the terminal and/or the application program in the computer. The CTRL key is always used <i>simultaneously</i> with the other character in the command; i.e., the CTRL key is pressed first and held down while the other key is pressed. (It is similar in action to the SHIFT key.) Use of the control key is indicated by .

Note

*Not transmitted in local edit mode.

3. TERMINAL OPERATION

Table 3-2 Continued

Key Name	Transmitted? (Y/N)*	Repeat Action? (Y/N)	Description
ESC (Escape)	Y	N	<p>The ESC key sends an ASCII code for escape to the display processor. The key is generally used to momentarily leave (escape) an application program in order to use a special feature or function.</p> <p>Another function of the ESC key is to cause the next control character entered to be displayed on the screen. This facilitates putting control characters on the screen without going into monitor mode.</p> <p style="text-align: center;"></p> <p><i>The ESC key is used in conjunction with one alphanumeric character in the command sequence; i.e., the ESC key is pressed and released before the second key is pressed.</i></p> <p>If your computer does not echo back escape codes, the LOCAL ESC key allows you to use the terminal features without transmitting them to the computer.</p>
RETURN/ENTER	Y	N	<p>The RETURN and ENTER keys can be used interchangeably. (Same as ^M.) They send the ASCII code for a carriage return (CR) to the TS 800A's terminal. Depending on the communication mode used, the code causes the terminal to transmit a CR to the computer and/or the cursor to be moved to the first unprotected position.</p> <p>If the entire current line is protected, the code moves the cursor to the next unprotected position on the page.</p> <p>The terminal's auto wraparound function eliminates the need to manually enter a CR and a LF at the end of each 80-character line.</p>
HOME	Y	N	<p>Moves the cursor to the first unprotected character position on the page (usually column one of row one). (Same as ^^.)</p>
LINEFEED	Y	Y	<p>Sends the ASCII code (OAH) for a linefeed (LF) to computer. The code causes the terminal to transmit an LF code to the computer and/or the cursor to be moved down one line on the screen in half duplex or to be echoed by the computer in full duplex. (Same as ^J.)</p> <p>See also 4.15 for descriptions of linefeed when protect mode is on.</p>

Note

*Not transmitted in local edit mode.

3. TERMINAL OPERATION

Table 3-2 Continued

Key Name	Transmitted? (Y/N)*	Repeat Action? (Y/N)	Description
BACKSPACE, ←	Y	Y	Moves the cursor one character to the left. (Same as ^H.)
↑	Y	Y	Moves the cursor up one line. (Same as ^K.)
↓	Y	Y	Moves the cursor down one line. If the cursor is on the bottom line of the screen, the display will roll up one line. (Same as ^V.)
→	Y	Y	Moves the cursor one character to the right. (Same as ^L.)
DEL (Delete)	Y	Y	The DEL key sends an ASCII DEL character to the computer. The computer echoes the code back to the terminal to be performed. This is usually interpreted by the computer as a character erase code.
CLEAR SPACE	Y	Y	Replaces all unprotected characters on the page with spaces. Shifted CLEAR SPACE (same as ESC *) clears the entire page to nulls and turns off protect and half-intensity modes.
BREAK	Y	N	Transmits a 250-millisecond break pulse to the computer. Pressing BREAK twice while holding down SHIFT resets (cold boots) the TS 800A's internal processor.
PRINT	N	N	The PRINT key does not function since printing is not controlled by the terminal, but by the computer.
FUNCT			The FUNCT key transmits a user-selected character bracketed by ^A (SOH) and a carriage return (CR) to the computer.
F1 through F11 (Function)	Y	N	Transmit a three-code default or user-programmed sequence to the computer. When received, may initiate a special form or subroutine in the program that causes the terminal to display or perform a special function.

Note

*Not transmitted in local edit mode.

3. TERMINAL OPERATION

Table 3-2 Continued

Key Name	Transmitted? (Y/N)*	Repeat Action? (Y/N)	Description
SET UP/NO SCROLL	Y	N	<p>NO SCROLL stops screen updating during normal operation. Manually sets the operating characteristics of the terminal through the status line. During normal operation, the no scroll function is active. When NO SCROLL is pressed once, the terminal stops screen updating; when pressed again, screen updating resumes.</p> <p>If the receive buffer fills up while update is disabled, the terminal will send X-Off to the computer, causing it to stop sending data. When update is re-enabled, the buffer will empty, X-On will be sent, and data will be transmitted to the computer.</p> <p>Shifted SET-UP/NO SCROLL displays the terminal operating characteristics and permits these values to be manually changed on the status line.</p>
CHARACTER INSERT	Y	Y	<p>Enters the insert character (normally a space) at the cursor position, causing all succeeding characters to shift one position to the right. All characters shifted past the 80th character will be lost (unless page edit is on).</p> <p>Shifted CHAR INSERT changes edit mode from edit to insert. (Table 4-11.)</p>
CHARACTER DELETE	Y	Y	<p>Deletes the character at the cursor position and causes all succeeding characters to shift one position to the left.</p> <p>Shifted CHAR DELETE changes edit mode from insert to edit.</p>
LINE INSERT	Y	Y	<p>LINE INSERT creates an entire line of insert characters on the cursor line. The data on the cursor line and all following lines will shift down one line (the last line on the page will be lost).</p> <p>Shifted LINE INSERT changes the edit mode from line to page.</p>
LINE DELETE	Y	Y	<p>LINE DELETE causes the entire line at the cursor position to be deleted. All following lines will shift up one line.</p> <p>Shifted LINE DELETE changes the edit mode from page to line.</p>

Note

*Not transmitted in local edit mode.

3. TERMINAL OPERATION

Table 3-2 Continued

Key Name	Transmitted? (Y/N)*	Repeat Action? (Y/N)	Description
LINE ERASE and PAGE ERASE	Y	Y	LINE ERASE and PAGE ERASE replace the unprotected data (from the cursor to the end of the line or page) with a space of the proper intensity. Shifted LINE ERASE and shifted PAGE ERASE cause a line erase to null or a page erase to null.
SEND	Y	N	Sends all unprotected data on the page from home through the cursor position to the computer. Shifted SEND sends all data from the first column through the cursor position.

Note

*Not transmitted in local edit mode.

3.3.1 Cursor

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

You can change the appearance of the cursor itself. To do this, either change the dipswitches on the rear (Table 2-2) or follow the instructions in 4.6.

The cursor can be moved around the screen by pressing one of the cursor control keys (marked with an arrow) if you are in the local edit mode, by entering an escape sequence (described in Chapter 4), or pressing LINEFEED (to move it down one line). To return the cursor quickly to the top left position on the screen (referred to as **home**), press the HOME key.

Cursor movement is affected by the use of protect mode. Refer to 4.14.

3.4 SETTING UP THE TERMINAL

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

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

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

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

3. TERMINAL OPERATION

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

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

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



At the next power on, the status line will return to default values.

3.5. EDITING

While entering or changing text on the screen in the local edit mode, you can delete or insert a character, a line (either partially or completely) or the data on the screen (either partially or completely) using the editing keys described in Table 3-2.

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

- CHAR INSERT
- CHAR DELETE
- LINE INSERT
- LINE DELETE
- LINE ERASE
- PAGE ERASE

These keys are described in detail in Table 3-2 and in 4.24.



Deletions will start with the column position of the cursor.

3.6 COMMUNICATING WITH THE COMPUTER

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

- Local
- Block
- Half duplex (conversational)
- Full duplex (conversational)

3. TERMINAL OPERATION

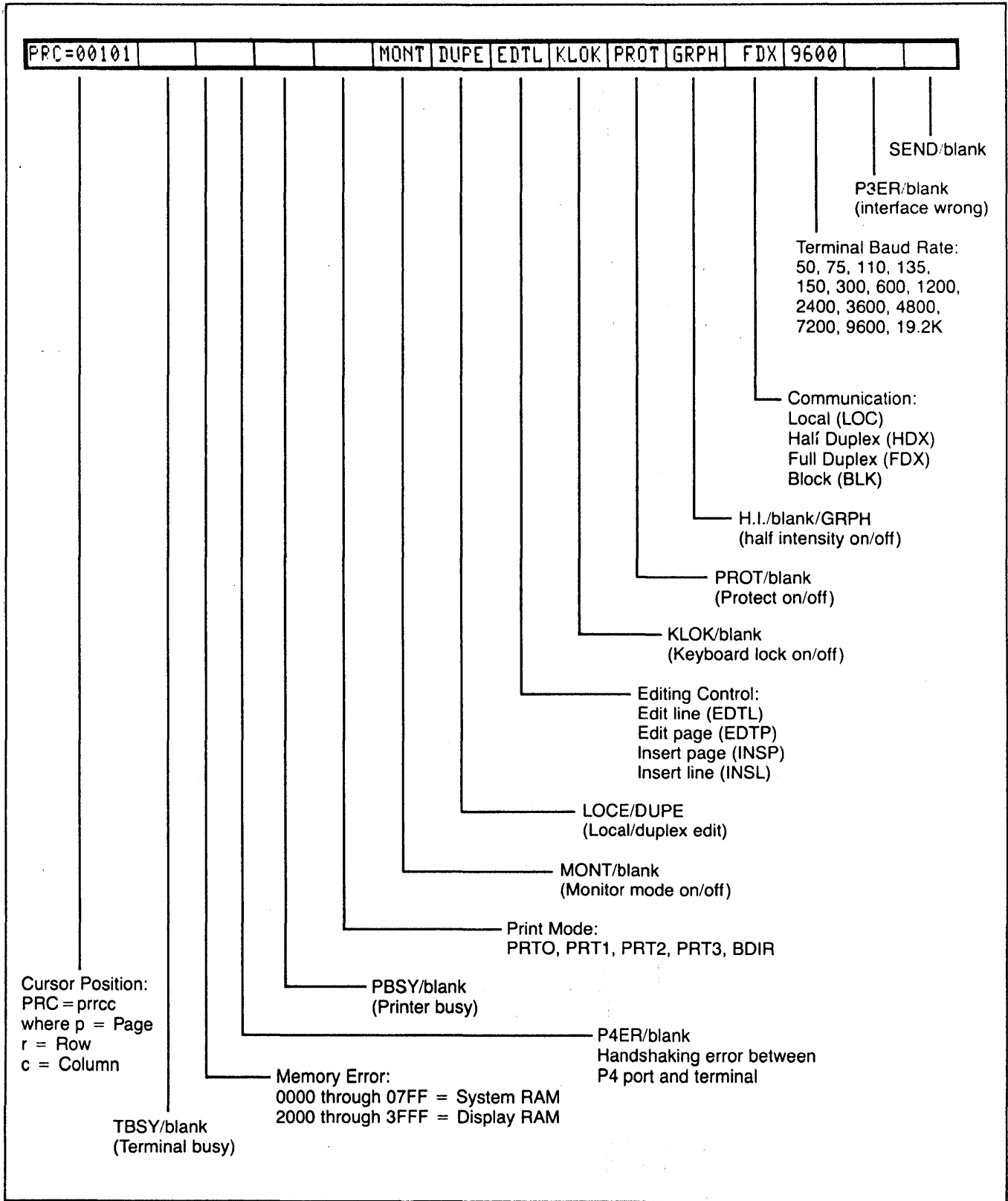


Figure 3-3 Status Line Fields

3. TERMINAL OPERATION

The selection can be made using one of three methods:

- Changing switch settings (Table 2-3)
- Changing the status line (3.4)
- Using escape sequences (4.22)

The communications flow caused by these modes is illustrated in Figure 3-4.

3.6.1 Local Mode

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

3.6.2 Block Mode

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

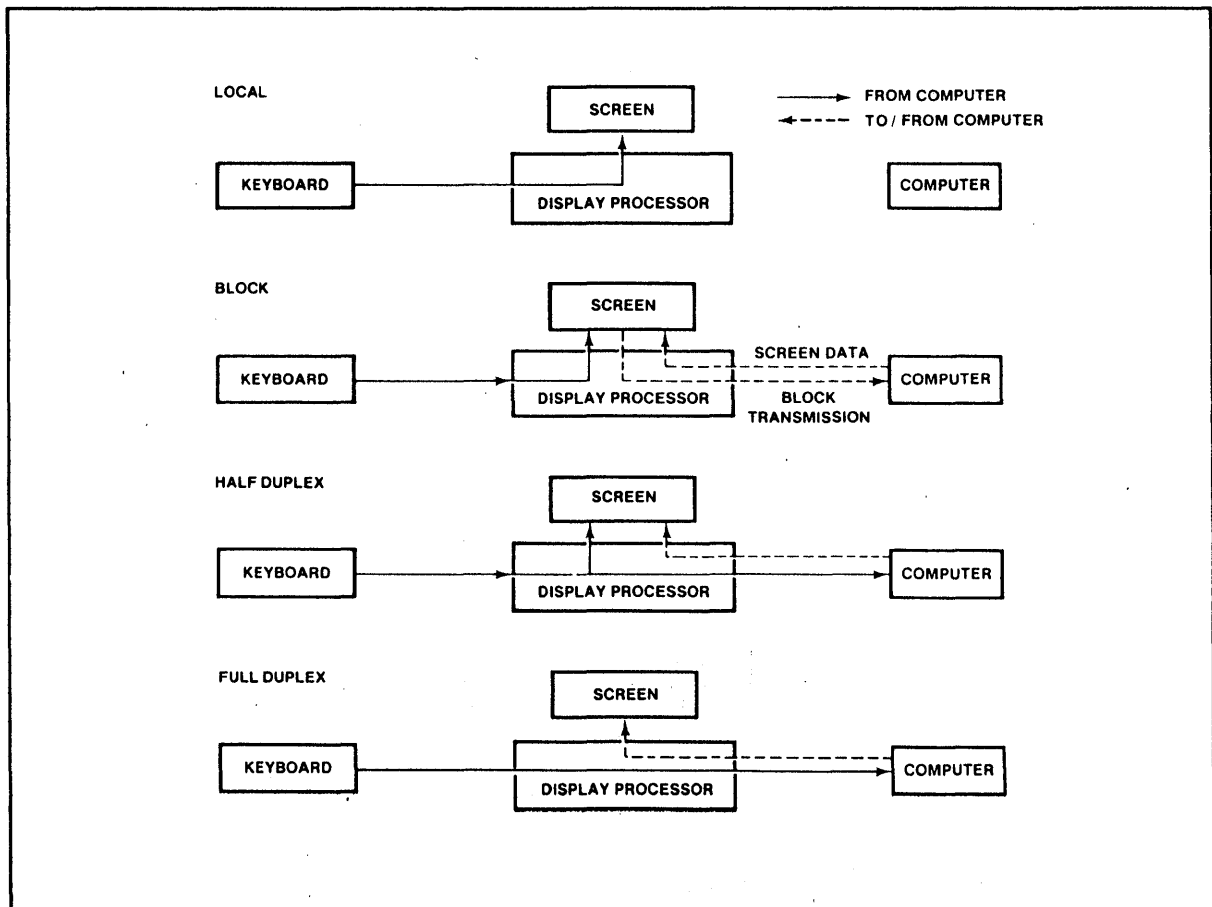


Figure 3-4 Communications Flow

3. TERMINAL OPERATION

3.6.3 Half Duplex

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

3.6.4 Full Duplex

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

3.6.5 Conversational Modes

In conversational modes, communication with the computer occurs continuously. The TS 800A is conversational in either half or full duplex modes.

3.7 PRINTING

To print, use the standard CP/M print commands. The PRINT key on the TS 800A is not used to send data to the printer.

4. PROGRAMMING

4.1 INTRODUCTION

Your computer programs can control the terminal within the TS 800A by transferring to it the appropriate ASCII codes. This chapter describes the features which can be utilized in your programs.



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

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

4.2 MONITOR MODE

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

To enable monitor mode via the computer, enter

ESC U

To terminate the display of the control commands, enter either

ESC u or ESC X

You can enter monitor mode while in local mode by entering

SHIFT/ESC U

To terminate monitor mode while in local mode, enter either

SHIFT/ESC X or SHIFT/ESC u

Table 4-1 lists the monitor mode control characters and Figure 4-1 shows the monitor mode control characters as they will appear.

4.3 USER AND STATUS LINES

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



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

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

4.3.1 User Line

To display the user line, press

ESC g

4. PROGRAMMING

Table 4-1 Monitor Mode Control Characters

Code	ASCII	Hex	Character Displayed
^@	NULL	00	none
^A	SOH	01	S _H
^B	STX	02	S _X
^C	ETX	03	E _X
^D	EOT	04	E _T
^E	ENQ	05	E _Q
^F	ACK	06	A _K
^G	BEL	07	B _L
^H	BS	08	B _S
^I	HT	09	H _T
^J	LF	0A	L _F
^K	VT	0B	V _T
^L	FF	0C	F _F
^M	CR	0D	C _R
^N	SO	0E	S _O
^O	SI	0F	S _I
^P	DLE	10	D _L
^Q	DC1	11	D ₁
^R	DC2	12	D ₂
^S	DC3	13	D ₃
^T	DC4	14	D ₄
^U	NAK	15	N _K
^V	SYN	16	S _Y
^W	ETB	17	E _B
^X	CAN	18	C _N
^Y	EM	19	E _M
^Z	SUB	1A	S _B
^[	ESC	1B	E _C
^\	FS	1C	F _S
^]	GS	1D	G _S
^^	RS	1E	R _S
^_	US	1F	U _S
DEL	DEL	7F	⋄

4. PROGRAMMING

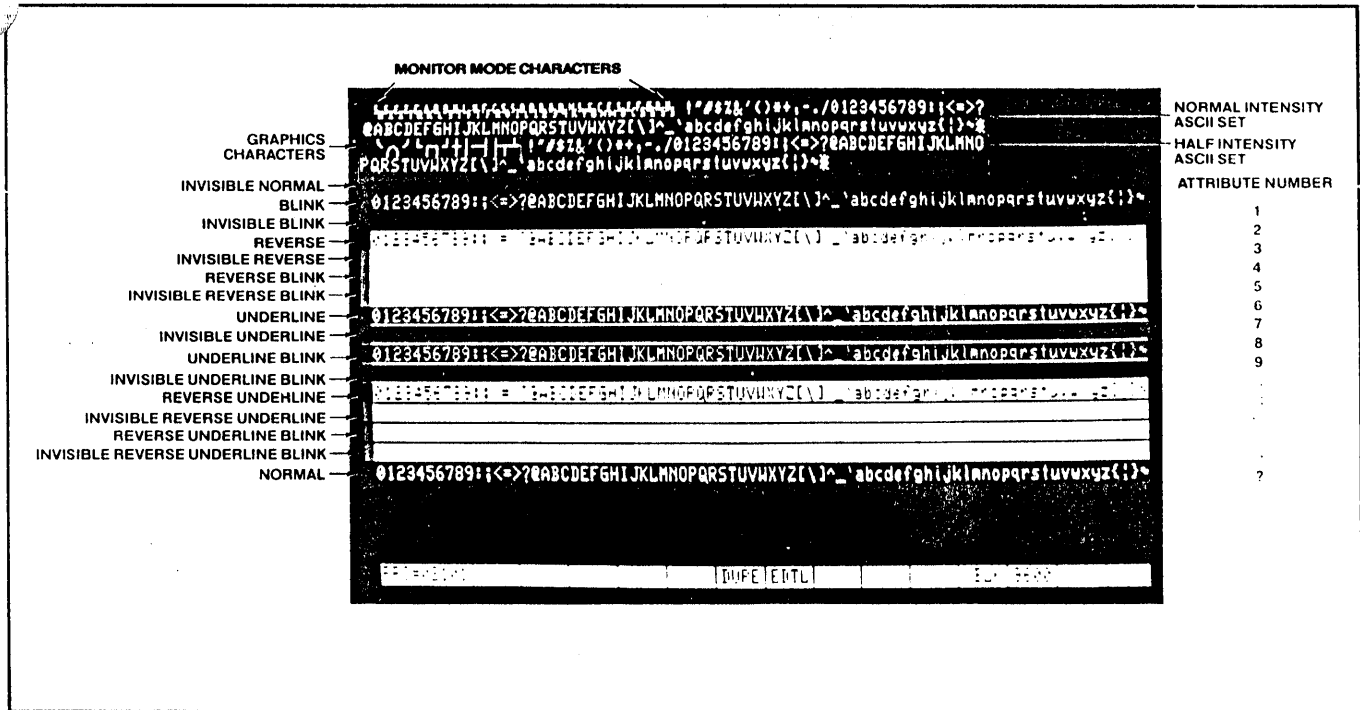


Figure 4-1 Video Attributes and Monitor Mode

To load the user line with data:

1. Display the user line (if desired) by entering ESC g.
2. Press
ESC f
3. The first character position is used for the video attribute for the user line. (Default is reverse video.) You can also add another attribute at any position in the line. To enter a video attribute for all or part of the user line, enter
ESC G n
where n is the position at which the attribute will begin and is a value from Table 4-2.
4. Enter up to 79 characters of text. (The message will appear on the user line as it is entered.)
5. You can move the cursor to any position by sending TAB plus the position (using a value from Table 4-2).
6. Press
RETURN
to end the programming mode.
To send the user line to the computer, press (in sequence)
ESC Z 0
To redisplay the status line after displaying the user line, press
ESC h

4. PROGRAMMING

Table 4-2 Cursor Coordinates

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

4.3.2 Status Line

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

ESC Z 1

4.4 LINE LOCK

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

4. PROGRAMMING

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

To enable line lock, enter

ESC ! 1

To disable line lock, enter

ESC ! 2



This command will unlock the entire screen.

4.5 DISABLING/ENABLING THE KEYBOARD

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

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



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

To disable the keyboard, enter

ESC #

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

The terminal receives an ESC " sequence

You press BREAK twice while holding down the SHIFT key

You change the status line

4.6 CURSOR DISPLAY

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

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

4. PROGRAMMING

4.7 KEYCLICK AND BELL

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

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

4.8 SMOOTH SCROLL

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

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

To activate smooth scroll, enter

ESC 8

To turn off smooth scroll, enter

ESC 9



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

4.9 VIDEO DISPLAY

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

Screen Display	Command
On	ESC n
Off	ESC o

4.10 VISUAL ATTRIBUTES

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

Two methods may be used to set visual attributes. The method used determines whether the attribute will occupy a space and how much of the display will be affected. The two methods are summarized in Table 4-3.

4. PROGRAMMING

Table 4-3 Visual Attributes

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

The following attributes are available:

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

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

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



Half intensity differs from other visual attributes in two ways:

1. *Once it is set, it affects all characters entered (regardless of cursor position) until it is turned off.*
2. *This attribute character never occupies a character space.*

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

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

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

Setting Visual Attributes

Method One

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

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

4. PROGRAMMING



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

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

Table 4-4 Escape Sequences for Visual Attributes

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

Method Two

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

The attribute occupies no space on the screen

The entire screen is affected

Table 4-5 summarizes the effect of these escape sequences in combination with the rear switch settings.

4.11 SPECIAL GRAPHICS

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

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

4. PROGRAMMING

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

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

The graphics characters which will be displayed are shown in Figure 4-2 with the corresponding alphanumeric characters.

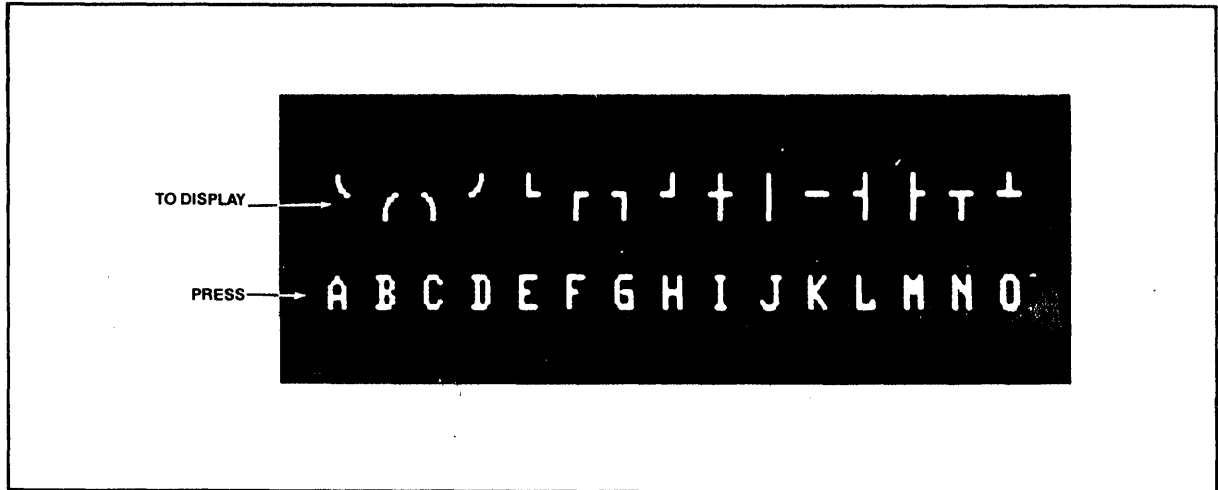


Figure 4-2 Special Graphics Characters

Table 4-5 Screen Attributes

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

4. PROGRAMMING

4.12 ADDITIONAL MEMORY

The TS 800A has a 48-line memory which can be divided into two 24-line pages or one 48-line page.

To set the number of lines per page, enter

ESC \ n

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

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

ESC K

To look at the previous page of memory, enter

ESC J

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

4.13 AUTO PAGE

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

To turn on auto page, enter

ESC v

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

To turn auto page off, enter

ESC w

4.14 PROTECT MODE

4.14.1 Introduction

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

- Protect designated areas of the page from future change by the operator
- Control transmission of those areas

Using protect mode involves two procedures:

- Creating the areas to be protected using protected writing
- Protecting all of those areas with protect mode

4.14.2 Application

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

4. PROGRAMMING

4.14.3 Effect

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

4.14.4 Input

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



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

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

ESC)

This turns on protected writing mode. Until the mode is reset, each character entered will be displayed at **half intensity**. The status line will display **H.I.**

3. Enter the information to be protected in that area of the screen.
4. Proofread the entry and correct it if necessary.
5. Enter

ESC (

to end data entry in that area and turn off protected writing mode.

6. Move the cursor to the next area to be protected and repeat.

4.14.5 Protection

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

1. To turn on protect mode, enter

ESC &



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

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

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

To disable protect mode (remove the protection), enter

ESC '

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

4. PROGRAMMING

4.15 NORMAL AND REVERSE LINEFEED

You can cause a normal linefeed with the sequence

`^J`

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

`ESC j`

Using auto page and/or protect mode can affect where the cursor will move when a linefeed and reverse linefeed are received. Tables 4-6 and 4-7 summarize the effect of auto page and protect mode when linefeed and reverse linefeed are used.



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

Table 4-6 Effects of Auto Page/Protect Mode on Linefeed Actions

Auto Page	Protect Mode	Description
Off	Off	With auto page off and protect mode off, a linefeed advances the cursor to the next line on the page. If the cursor is at the bottom of the screen, linefeeds cause the display to roll up one line for each linefeed. If the cursor is also at the bottom of the page, a linefeed causes a new line of data to appear at the bottom of the screen and results in the loss of the top line of data on the page. The new line contains the insert character (4.20), which is normally spaces but may be programmed to be any other character.
Off	On	A linefeed causes the cursor to return to the top of the current page when it reaches the last line of the page.
On	Off or On	Linefeed advances the cursor to the next line on the page. When the cursor reaches the bottom of the page, it will advance to the first line of the next page. When it reaches the last line of the last page, it advances to the first line of the first page (page zero).

Table 4-7 Effects of Auto Page/Protect Mode on Reverse Linefeed Actions

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

4. PROGRAMMING

4.16 CURSOR CONTROL CODES

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

The cursor control codes are summarized in Table 4-8.

Table 4-8 *Cursor Control Commands*

Cursor Control	Control Code	Auto Page	Protect Mode	Effect
Up	^K	Off/On	Off/On	Moves the cursor up one line until it encounters the top of the screen. If the cursor is not on the first line of the page, the display will roll down one line with each ^K until the cursor reaches the top of the page. Once it reaches the top of the page, receipt of further ^K codes has no effect.
Down	^V	Off/On	Off/On	Moves cursor down one line.
		Off	Off/On	If the cursor is on the bottom line of the page, the code has no effect.
Left	^H	Off	Off/On	Functions the same as BACKSPACE. Moves the cursor left to the next unprotected position on the page. if the cursor is currently in the first column of the line, it will move to the last column of the preceding line.
		On	Off/On	If the cursor is at the home position or the first unprotected position on the page, the cursor will move to the end of the preceding page or to the last position of the last unprotected field of the preceding page. If the current page is page zero, the code has no effect.
Right	^L	Off/On	Off/On	Moves the cursor right one column. If the cursor is at column 80, it moves the cursor to the first column of the next line.
		Off	Off	Causes the screen to scroll one line if the cursor is at column 80 of the last line.

4. PROGRAMMING

Table 4-8 Continued

Cursor Control	Control Code	Auto Page	Protect Mode	Effect
		Off	On	If the cursor is at the last unprotected position on the page, the cursor will move to the first unprotected position of the current page.
		On	Off/On	If the cursor is at the last unprotected position on the page, the cursor will move to the first unprotected position of the next page. If that page is the last page, the cursor will advance to the first unprotected position of the first page.
HOME	^^	Off/On	Off/On	Moves cursor to the first unprotected space on the screen. If the cursor is currently at the home position or the first unprotected position on the page, the code has no effect.
Carriage Return	^M	Off/On	Off	Moves the cursor left to column one of the current line.
		Off/On	On	Moves the cursor to the first unprotected position of the current cursor line.
New Line	^_ (underline)	Off/On	Off/On	Causes the terminal to perform a LF and a CR.

4.17 THE FUNCTION KEYS

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

4.17.1 Description

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

4.17.2 Default Messages

When the terminal is first turned on, the function keys are already programmed with default messages set to full duplex mode. If you do not program the function keys, the default values shown in Table 4-9 will be transmitted by each function key.

4. PROGRAMMING

Table 4-9 Default Function Key Values

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

4.17.3 Programming the Function Keys

You may program the function keys (i.e., not use the default values listed in Table 4-9) by following the procedure described here.

Enter the following code in the exact sequence shown:

```
ESC!p1 p2 message ^Y
```

where

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

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

p2 is one of the following values:

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

^Y is the termination character

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

4. PROGRAMMING

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

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

TURN ON THE PRINTER

Precede this message with the following:

The key number (1 for key F1)

The transmission mode (2 for local mode)

The entry will be:

ESC | 1 2 TURN ON THE PRINTER CR $\wedge Y$



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

4.17.4 Using Function Keys

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

4.18 THE FUNCT KEY

Not to be confused with the function keys described in 4.17, the FUNCT key transmits a user-selected character (the ASCII code of the depressed key) bracketed by $\wedge A$ (SOH) and a carriage return (CR). For example, if a $\wedge A C CR$ sequence is required for a special operation in a text editing program, press FUNCT and C at the same time to transmit $\wedge A C CR$ to the computer.



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

4.19 ADDRESSING AND READING THE CURSOR POSITION

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

To address the cursor, enter

ESC = r c

or

ESC - p r c

4. PROGRAMMING

where

r is the desired row (line). Refer to Table 4-2 to find the ASCII code representing the desired row.

c is the desired column. Refer to Table 4-2 to find the ASCII code representing the desired column.

p is the page number. Possible values are:

- 0 for page one
- 1 for page two



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

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

ESC = (Q

To read the cursor's row and column position (listed in Table 4-2), enter

ESC ?

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

ESC /

The page value will be

- 0 for page one
- 1 for page two

The row and column values sent (specified in Table 4-2) are followed by a carriage return.

4.20 LOADING AN INSERT CHARACTER

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

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

ESC e n

where n is the insert character.

4.21 TAB PROGRAMMING

Two types of tabs are available:

- Typewriter-style tabs
- Field tabs (used when protect mode is on)

4. PROGRAMMING

Table 4-10 summarizes all tab controls.

Table 4-10 Tab Controls

Action	Control Code	Auto Page	Protect Mode	Effect
Set tab ¹	ESC 1	Off/On	Off	Sets a typewriter-style column tab.
		Off/On	On	Generates a vertical column of half-intensity spaces from the cursor position down to the first write-protected character of the column or to the end of the page, whichever is first.
Typewriter (Column) Tab	^I	Off/On	Off	Causes the cursor to advance to the next typewriter-style tab set. If no tabs are set, the code has no effect and the cursor will not move.
		Off	On	Moves the cursor to the first character of the next unprotected field. If there are no following unprotected fields, the cursor moves to the first character of the first unprotected field at the top of the page. If there are no unprotected characters on the page, the cursor will move to the home position.
		On	On	If no unprotected field follows the cursor will advance to the first unprotected character on the next page. If no unprotected field exists on the next page, the cursor moves to home position on that page.
Field Tab	ESC i	Off/On	Off	No effect.
		Off	On	If there are no following unprotected fields, the cursor moves to the first character of the first unprotected field at the top of the page. If there are no unprotected characters on the page, the cursor will move to the home position.
		On	On	If no unprotected field follows, the cursor will advance to the first unprotected character on the next page. If no unprotected field exists on the next page, the cursor moves to home position on that page.

Notes

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

4. PROGRAMMING

Table 4-10 Continued

Action	Control Code	Auto Page	Protect Mode	Effect
Back Tab	ESC 1	Off/On	Off	Causes the cursor to go back to the previous tab position set. If no tabs are set or if the cursor is on the first tab position on the page, this code moves the cursor to the first column on the line.
		Off	On	Moves the cursor back to the start of the first preceding unprotected field. If no preceding positions exist, the cursor will not move.
		On	On	If the cursor is at the first unprotected position on the page, it will move the cursor to the first unprotected character of the last unprotected field of the previous page. If no protected fields exist, home position is considered the start of an unprotected field. If the cursor is on the first unprotected position of the first page, this code has no effect.
Clear Typewriter Tab ²	ESC 2	Off/On	Off	Clears the typewriter tab where the cursor is located when this code is entered.
		Off/On	On	No effect.
Clear All Tabs ³	ESC 3	Off/On	Off/On	Clears all typewriter tabs regardless of the position of the cursor when the code is entered.

Notes

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

4.22 COMMUNICATION MODES

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

- Local
- Block
- Half duplex (conversational)
- Full duplex (conversational)

These are described in detail in 3.4.

4. PROGRAMMING

4.22.1 Local

To operate in the local mode, enter

ESC c

4.22.2 Block

To operate in block mode, enter

ESC B

4.22.3 Half Duplex

To operate in half duplex mode, enter

ESC DH

4.22.4 Full Duplex

To operate in full duplex mode, enter

ESC DF

4.22.5 Conversation

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

ESC C

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

4.23 EDIT KEYS

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

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

4.23.1 Local Edit

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

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

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

ESC k

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

4. PROGRAMMING

4.23.2 Duplex Edit

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

ESC I (lower case "L")

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

4.24 EDITING TEXT

Changing text can involve the following three actions:

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

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

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

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

The four modes of operation available are:

Edit Page

Edit Line

Insert Page

Insert Line

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

Changing the status line (3.4)

Pressing some of the edit keys together with the SHIFT key (see Table 4-11)

Sending escape commands (see Table 4-11)

Table 4-11 summarizes the changes possible and the commands and keys which will cause those changes.

Table 4-11 Edit and Insert Modes

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

4. PROGRAMMING

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

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

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

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

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

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

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

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

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

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

Table 4-12 summarizes the effects of the available editing commands in conjunction with page edit, line edit, and protect mode.

Table 4-12 Editing Commands

Edit Command	Escape Sequence	Edit Mode	Protect On/Off	Effect
Character Insert	ESC Q	—	—	Causes character at the cursor to move right one column position and enters an insert character at the cursor position.
		EDTP	—	The character at column 80 wraps to column one of the next line.
		EDTP	On	This control will turn off Edit Page. A character insert will insert from the cursor position to the end of the line or to the first protected field.
		EDTL	—	As characters are inserted, characters reaching column 80 are lost.

4. PROGRAMMING

Table 4-12 Continued

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

4. PROGRAMMING

Table 4-12 Continued

Edit Command	Escape Sequence	Edit Mode	Protect On/Off	Effect
Erase to End of Line	ESC T	—	Off	Erases all characters from the cursor to the end of the line and replaces them with insert characters. If half intensity is on, half-intensity insert characters will replace the erased characters.
		—	On	Erases all unprotected characters from the cursor to the end of the field and replaces them with insert characters. If half intensity is on, half-intensity insert characters will replace the erased characters.
Erase to End of Line with Nulls	ESC t	—	Off	Erases all characters from the cursor position to the end of the line and replaces them with null characters.
		—	On	Erases all characters from the cursor position to the end of an unprotected field and replaces them with null characters.
Erase to End of Page	ESC Y	—	On	Replaces unprotected characters from the cursor position to the end of the screen with insert characters. If half intensity is on, erased characters will be replaced with half-intensity insert characters.
Erase to End of Page with Nulls	ESC y	—	On	Erases all unprotected characters from the cursor position to the end of the page and replaces them with null characters.

4.25 CLEAR FUNCTION

The clear function is used in one of four ways to clear data from screen memory. Clear commands are summarized in Table 4-13.

4. PROGRAMMING

Table 4-13 Clear Commands

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

4.26 X-ON/X-OFF CONTROL

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

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

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

At power on, X-On/X-Off is enabled. If X-On/X-Off is disabled, DTR control (4.27) is enabled.

4.27 DATA TERMINAL READY CONTROL

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

4.28 SEND FUNCTION

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

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

4. PROGRAMMING

4.28.1 Programming the SEND Key

To program the SEND key, enter the following code:

ESC 0 x y

where

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

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

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

4.28.2 Delimiter Programming

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

ESC x n p1 p2

where

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

p1 = A standard ASCII or control character

p2 = A standard ASCII or control character

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

ESC x 0 null null

The default delimiter values are shown in Table 4-14.

Table 4-14 Default Delimiter Values

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

4. PROGRAMMING

To send specific data to the computer, use the commands shown in Table 4-15.

Table 4-15 Data Transmission Commands

Data Sent	Code	Effect
Unprotected line from start of line to cursor	ESC 4	Sends all unprotected data on the line from column one through the cursor position. Also sends an FS code (1C Hex) as field delimiters in place of each protected field and end-of-text characters at the end of the send transmission.
Unprotected page from home to cursor	ESC 5	Sends all unprotected data on the page from home through the cursor position. Sends an FS code (1C Hex) as field delimiters in place of each protected field. Sends line delimiters at the end of a line and an end-of-text at the end of the send transmission.
Whole line from start of line to cursor	ESC 6	<p>Sends all data from the first column through the cursor position. Also sends ESC) at the beginning of each protected field and ESC (at the end of each protected field.</p> <p>If the character at the cursor position is protected, the terminal sends ESC ((end-protected field) to the computer. Sends the end-of-text characters at the end of the send transmission.</p> <p>If the data to be sent includes attribute characters, these will be sent also [the terminal will automatically include the suitable escape sequences (ESC Gn)].</p>
Send whole page	ESC 7	<p>Sends all data on the page from home through the cursor position. It also sends ESC) at the start of each protected field and ESC (at the end of each protected field.</p> <p>If the character at the cursor position is protected, the terminal sends an ESC (to the computer. This code also sends line delimiters at the end of each line and the end-of-text characters at the end of the send transmission.</p> <p>If the data to be sent includes attribute characters, these will be sent also [the terminal will automatically include the suitable escape sequences (ESC Gn)].</p>

4. PROGRAMMING

Table 4-15 Continued

Data Sent	Code	Effect
Send unprotected message (STX to ETX)	ESC S	Sends all unprotected data bracketed by the start of text (STX) and end of text (ETX) codes displayed on a page. After the data is sent, the terminal positions the cursor at the ETX code. If the page contains no STX codes, transmission begins from the home position. If the page contains no ETX code, the terminal sends to the end of the page and positions the cursor at home after the data is sent. If the page contains neither an STX nor an ETX code, the entire page will be sent. The code sends an FS code (1C Hex) as field delimiters in place of protected fields. It also sends line delimiters at the end of each line and an end-of-text delimiter at the end of the send transmission.
Send whole message (STX to ETX)	ESC s	Same as ESC S above except protected fields delimited by start-protected field ESC (and end-protected field ESC) are also transmitted.

Data other than text may also be sent to the computer using control sequences. Pressing SEND will not send that data. The commands to transmit other-than-text data are shown in Table 4-16.

Table 4-16 Transmit Commands

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

Notes

- The identification will include the software level and the number of lines in its memory, followed by a carriage return. The lines of memory will be indicated by the following values:
 - 1 for a 24-line memory
 - 2 for a 48-line memoryFor example, 1.0,2 CR would be sent for Level 1.0 firmware and 48 lines of memory.
- Transmission is followed by a carriage return.

4.29 PRINT FUNCTION PROGRAMMING

The print functions which are normally available on a Model 950 terminal (such as ESC P, ESC L, ESC ', ESC a, ESC @, ESC A, ^R, and ^T) do not function on the TS 800A. All print functions on the TS 800A are controlled by the computer.

5. PREVENTIVE MAINTENANCE, TROUBLESHOOTING, AND SERVICE

5.1 CARE

5.1.1 Cleaning

Clean the TS 800A periodically (about every three months). To clean the case:

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



DO NOT use solvent-based or abrasive cleaners.

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

5.1.2 Inspection

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

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

Refer any damage to a qualified service technician.

5.2 TROUBLESHOOTING

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

Your TS 800A is just one of several components in the entire computer system. A failure anywhere else in the system can cause the improper operation of the TS 800A. The service processor, memory systems, cables, and operational procedures should be checked if there has been a malfunction. Table 5-1 will be helpful in determining the cause of a problem. If this table does not help locate the cause of a problem, run the self test described in the next section or call a qualified service technician for assistance.

5.2.1 Testing the TS 800A (Self Test)

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

To start the self test, enter:

SHIFT/SET-UP/NO SCROLL

1

5. PREVENTIVE MAINTENANCE, TROUBLESHOOTING, AND SERVICE

Twenty lines (containing all the characters and attributes of the TS 800A) will immediately appear on the screen (Figure 5-1). This test checks character generation, the display RAM circuits (generally), the display processor, and the screen circuits. If any of the video attributes or display functions are inoperative, refer the problem to a qualified service representative.



Should you accidentally enter a numeral 2 (instead of a 1) to start the self-test, a test which appears to fail will be displayed. This test is not operative on the TS 800A; the fail message does not indicate any hardware failure.

Table 5-1 Troubleshooting Procedures

-
- | | |
|--|--|
| 1. IF TS 800A IS NOT ON AFTER POWER SWITCH IS TURNED ON | |
| a. TS 800A DISPLAY IS BLANK | |
| Unplug power cord and plug it in again. | |
| Plug something else into the same wall outlet and test for power. | |
| Check the line fuse (as described in Section 5.3) and replace it if necessary. | |
| b. CURSOR APPEARS BUT SYSTEM PROMPT DOES NOT APPEAR ON CRT SCREEN | |
| Push BREAK twice while holding down SHIFT (to reset TS 800A). | |
-
- | | |
|--|--|
| 2. TS 800A IS ON; CRT DISPLAY OPERATES BUT SHOWS GARBAGE CHARACTERS | |
| Check the dipswitch settings. | |
| Make sure cables and power cord are not intermingled. | |
| Make sure power line is grounded. | |
-
- | | |
|---|--|
| 3. TS 800A DOES NOT RESPOND TO TS 806/816 WHEN USED AS USER STATION/TERMINAL | |
| Reconnect all cables and check for cable damage. | |
| Check central service processor port (P1) connector pins for damage. | |
| Check dipswitch settings. | |
| If pin connector was cut and jumpered, check jumper connection. | |
-
- | | |
|---|--|
| 5. TS 800A IS USED WITH MODEM AND DOES NOT RESPOND OR TRANSMIT TO CENTRAL SYSTEM PROCESSOR | |
| Unplug and plug in modem; turn its power on and off, and reconnect modem to TS 800A RS232C port. | |
| Check parity, word structure, and stop bit settings on dip switches. | |
-
- | | |
|--|--|
| 6. TS 800A APPEARS TO BE RUNNING BUT CURSOR DOES NOT APPEAR | |
| Adjust display contrast settings on rear panel. | |
-

5. PREVENTIVE MAINTENANCE, TROUBLESHOOTING, AND SERVICE

Table 5-1 Continued

7. **TS 800A VIDEO DISPLAY ATTRIBUTES DO NOT CORRESPOND TO RECENTLY-CHANGED SWITCH SETTINGS**
Turn TS 800A off and back on so software can scan new switch settings.
8. **TS 800A "LOCKED UP" (DOES NOT RESPOND TO KEYBOARD OR CENTRAL PROCESSOR)**
Press BREAK twice while holding down SHIFT (to reset system).
Run self test.
Enter ESC " to enable keyboard.
9. **PRINTER DOES NOT PRINT WHAT IS TYPED**
Reconnect printer cable; make sure it is completely on pin connector.
Check printer cable configuration.
10. **ESCAPE AND CONTROL COMMANDS DO NOT FUNCTION AS ANTICIPATED**
Re-enter commands, paying particular attention to whether upper or lower case characters are needed.

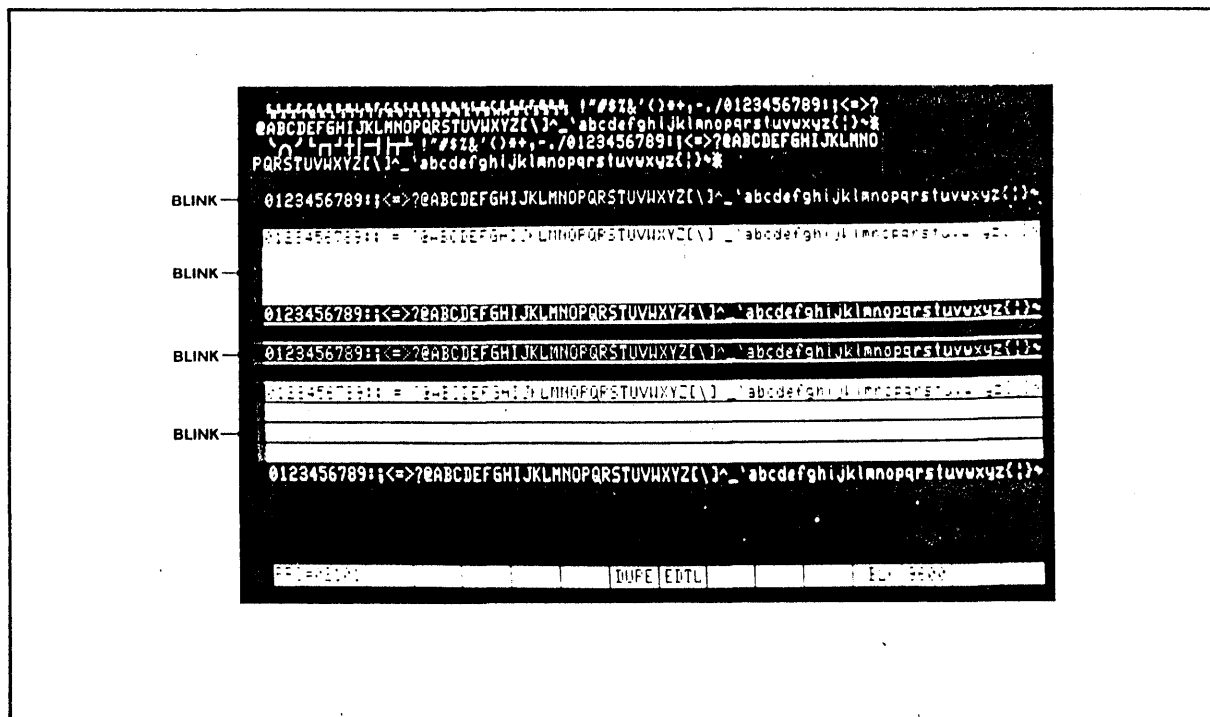


Figure 5-1 Display of Normal Self-Test

5. PREVENTIVE MAINTENANCE, TROUBLESHOOTING, AND SERVICE

5.3 CHANGING THE FUSE

The TS 800A has one exterior fuse which is accessible from the rear panel.

To check and or change the exterior fuse, unscrew the fuse holder (see Figure 5-2). The fuse is a small glass cylinder. If the thin wire inside the fuse is still intact, the fuse should be functional (Figure 5-3). If the thin strip is broken and/or if the glass is black, the fuse is burned out and must be replaced (Figure 5-4).

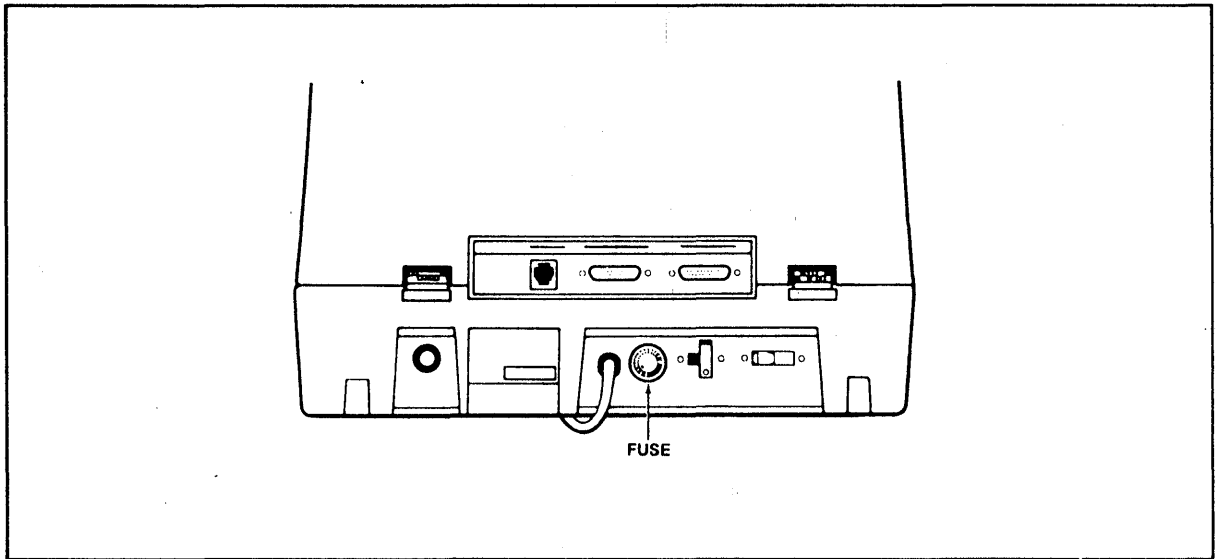


Figure 5-2 Exterior Fuse Location

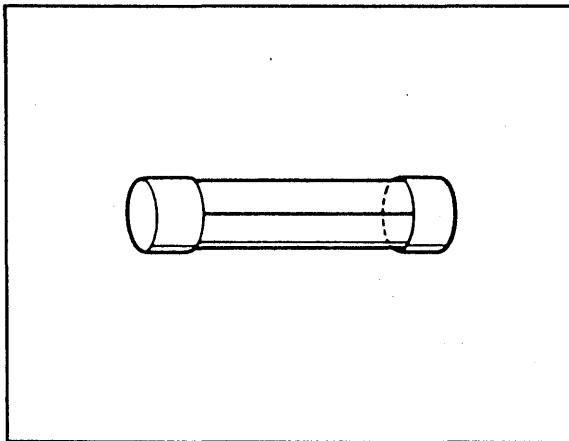


Figure 5-3 Good Fuse

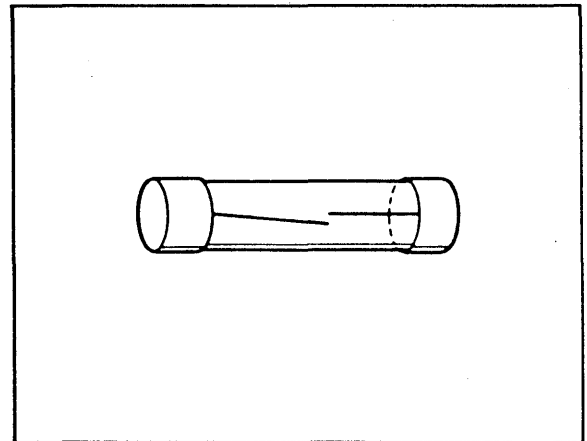


Figure 5-4 Burned-out Fuse

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

If the new fuse burns out, do not replace it—call your dealer.

5. PREVENTIVE MAINTENANCE, TROUBLESHOOTING, AND SERVICE

5.4 HOW TO GET SERVICE

5.4.1 During Warranty

If you need service on your TS 800A while it is under TeleVideo's limited warranty, call your dealer and he will obtain a Return Material Authorization number for you. (Refer to the Limited Warranty in Appendix B for a detailed description of service provided under warranty.) In cases of extreme emergency, you might want to either pay for overnight delivery to and from TeleVideo's factory or have the unit serviced by one of the third-party service centers. If a third-party service center repairs it under warranty, you will be invoiced by them for labor charges. Your dealer can help you arrange for emergency warranty repair.

5.4.2 On-Site Service After Warranty

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

5.4.3 Information Needed for Service

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

Model TS 800A Serial No. _____ Delivery Date _____

Dealer _____ Phone No. _____

Service Center _____ Phone No. _____

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

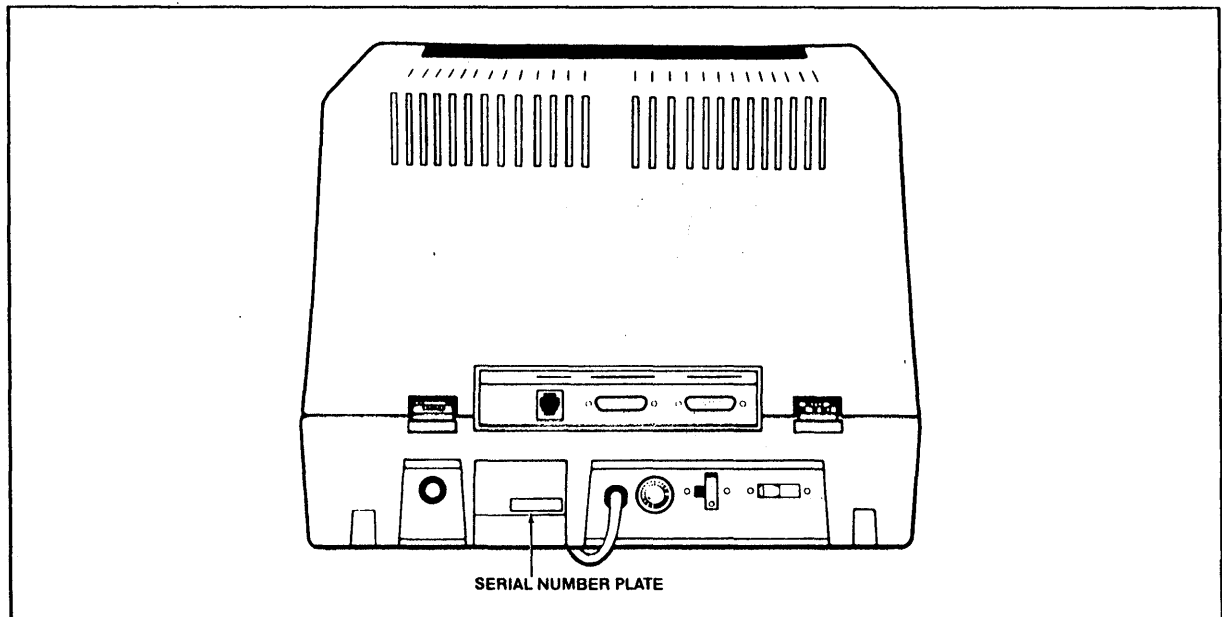


Figure 5-5 Location of Serial Number on Rear Panel

5. PREVENTIVE MAINTENANCE, TROUBLESHOOTING, AND SERVICE

5.5 RESHIPping THE TS 800A

Should you need to reship the TS 800A, follow these procedures:

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

5.6 TECHNICAL ASSISTANCE

If you have any technical problems with your TS 800A, call your dealer.

APPENDICES

- A. TS 800A SPECIFICATIONS
 - B. STATEMENT OF LIMITED WARRANTY
 - C. SUGGESTED CP/M REFERENCES
 - D. CABLE SPECIFICATIONS
 - E. PIN CONNECTOR ASSIGNMENTS
 - F. CHANGING THE PIN CONNECTOR ASSIGNMENTS
 - G. PORT ASSIGNMENTS
 - H. ASCII CODE CHART
 - I. OPENING THE SYSTEM CASE
-

APPENDIX A TS 800A SPECIFICATIONS

MICROPROCESSOR/MEMORY

CPU Z80A microprocessor (processor speed 4 MHz)
Memory 64K byte dynamic RAM
4K byte EPROM
Operating System CP/M (loaded automatically from central processor on power up)

INPUT/OUTPUT

Serial I/O Two RS232C serial ports
Asynchronous: 150 baud to 19.2 kilobaud
One RS422 serial port
800 kilobits per second

POWER REQUIREMENTS

External
Domestic 115 VAC (± 12 VAC) 50/60 Hertz
International 115/230 VAC (± 12 VAC) 50-60 Hertz
Power Consumption 0.54 amp maximum at 115 VAC
0.27 amp maximum at 230 VAC
Power Connection NEMA standard 5-15R, 3-prong receptacle (US only)

ENCLOSURE

Dimensions Height 14.25 inches (36.20 cm)
Width 16.50 inches (41.90 cm)
Depth 14.00 inches (35.65 cm)
Net Weight 34.5 lbs (15.9 kg)
Composition Injection-molded plastic

ENVIRONMENT

Operating 50 to 85 degrees Fahrenheit
Maximum humidity 95 percent relative noncondensing
Maximum altitude 10,000 ft above sea level
Nonoperating (shipping) 32 to 120 degrees Fahrenheit (0 to 50 degrees Centigrade)

CRT SPECIFICATIONS

MONITOR

Size: 12 inches measured diagonally
Phosphor: P31 green, nonglare display

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

CHARACTER FONT 7 x 10 dot matrix
10 x 14 resolution

APPENDIX A TS 800A SPECIFICATIONS

KEYBOARD FORMAT	Tab, Back tab
REPEAT	20 cps auto-repeat
EDITING FEATURES	Typeover Clear screen to space or null Character insert and character delete Line insert and line delete Absolute cursor addressing Erase to end of page Erase to end of line or field Line edit
CURSOR CONTROLS	↑, ↓, ←, →, New Line, Home, Tab, Back Tab
TRANSMISSION	Conversation: Full or half duplex Block: Formatted information transmitted by line or page, protected and unprotected, or unprotected only Local
BAUD RATES	8 baud rates: 150, 300, 600, 1200, 2400, 4800, 9600, 19200
INTERNAL SERIAL INTERFACES	CRT to computer

APPENDIX B LIMITED WARRANTY

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

EXCLUSIONS

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

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

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

APPENDIX C SUGGESTED CP/M REFERENCES

The following books will be useful references:

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

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

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

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

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

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

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

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

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

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

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

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

APPENDIX D CABLE SPECIFICATIONS

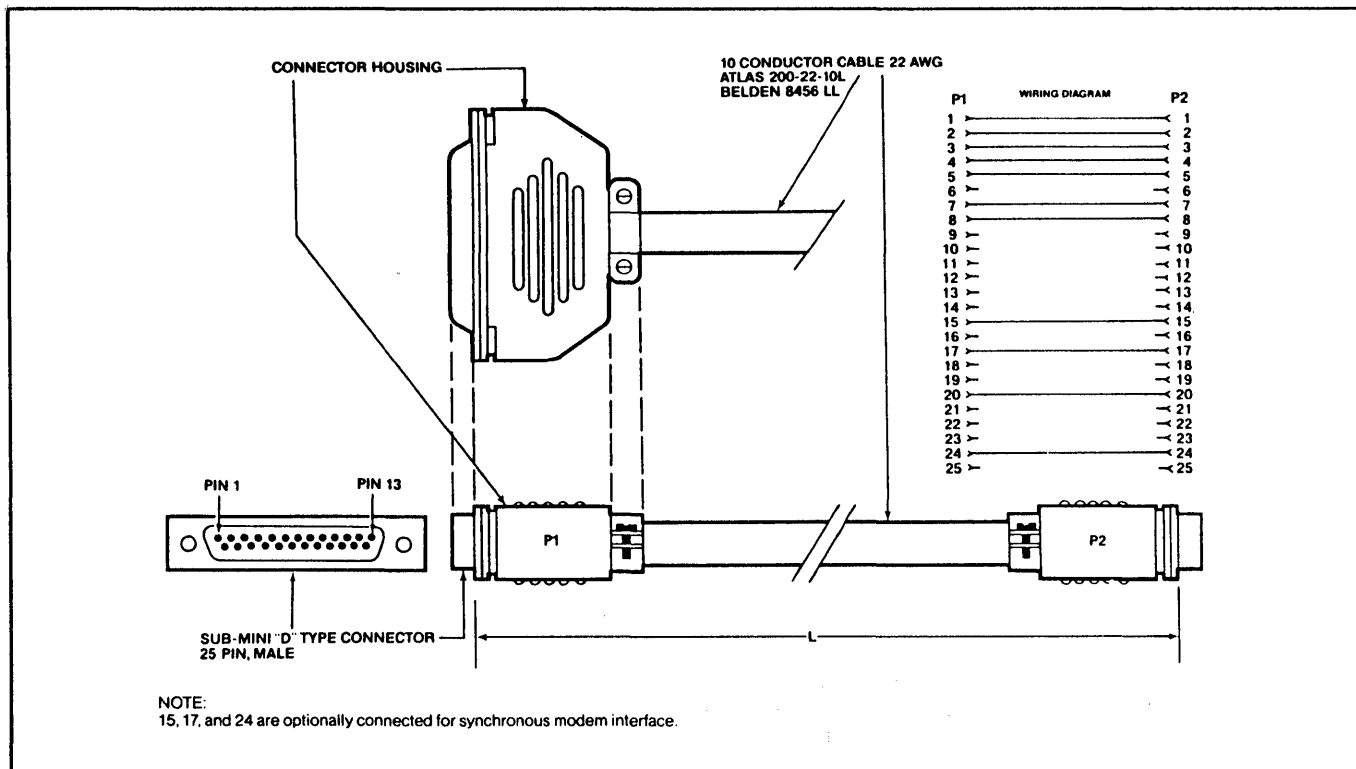


Figure D-1 RS232C

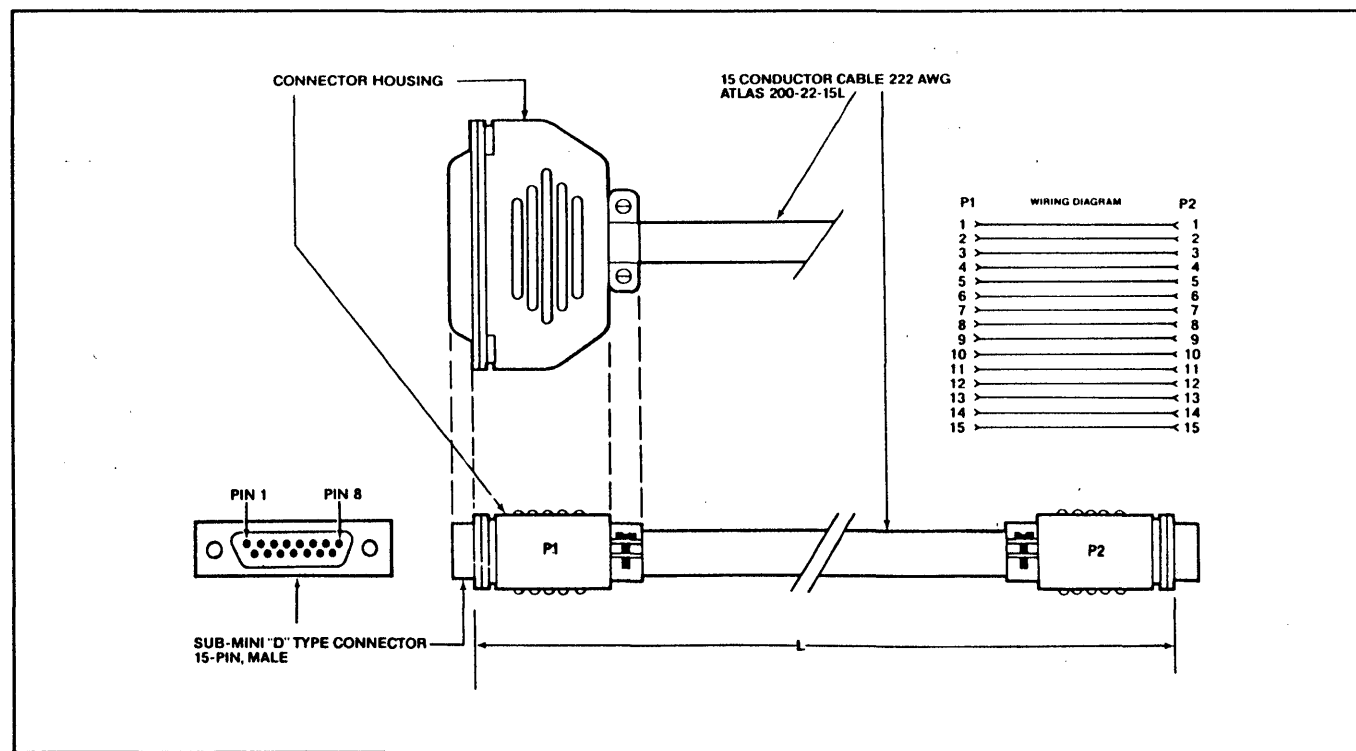


Figure D-2 RS422

APPENDIX E PIN CONNECTOR ASSIGNMENTS

*Table E-1 Connector Assignments For P1
(Configuration As Shipped Is For Modem)*

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

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

*Table E-2 Connector Assignments For P2 (DCE)
(Configuration As Shipped Is For Printer)*

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

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

APPENDIX E PIN CONNECTOR ASSIGNMENTS

*Table E-3 P4 Connector Assignments
(RS422 Computer Connector)*

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

APPENDIX F CHANGING THE CONNECTOR ASSIGNMENTS

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

Cut between both holes of the following traces:

W18 W19 W20 W21 W22 W23 W24 W32 W33

Install jumpers between the following areas:

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

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

Cut between both holes of the traces:

W25 W26 W27 W28 W29 W35 W36

Install jumpers between the following holes:

W25 right and W26 right
W29 right and W27 left
W36 top and W28 left
W25 left and W26 left
W36 bottom and W27 right
W29 left and W28 right

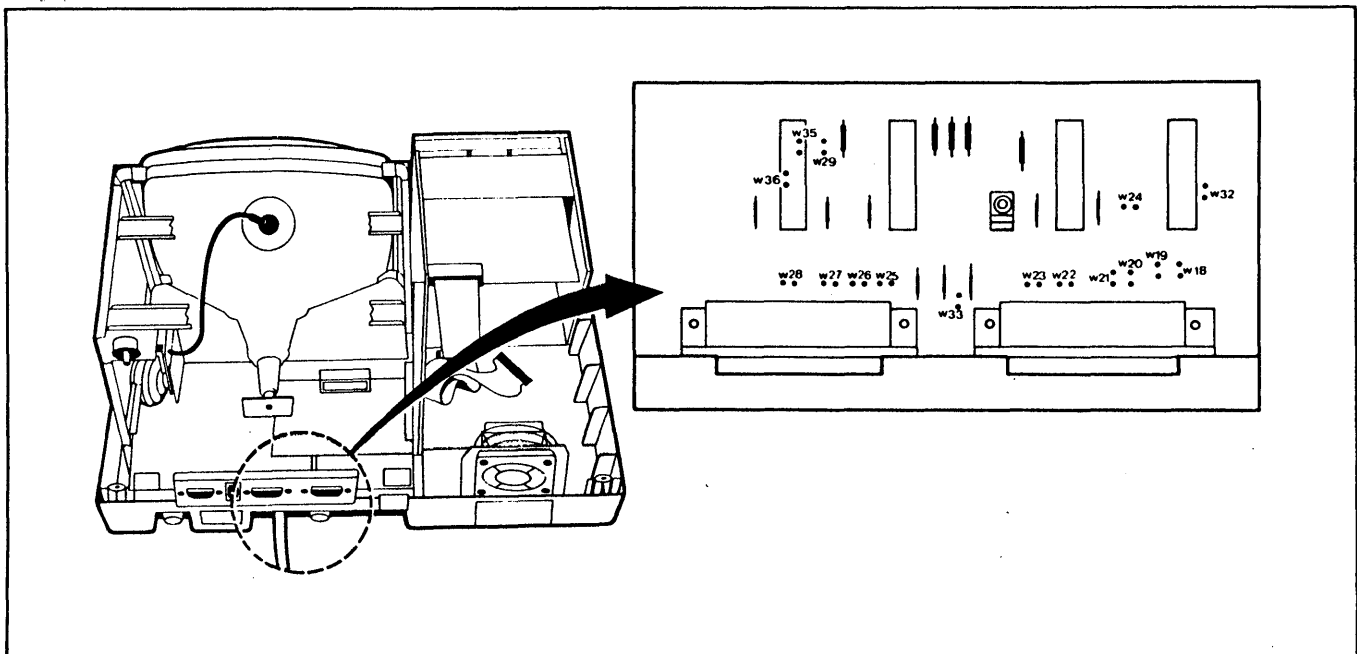


Figure F-1 Location Of Traces On Printed Circuit Board

APPENDIX G PORT ASSIGNMENTS

Description	Hexadecimal Value
Dipswitch	00H
Memory latch	04H
CTC:	
Channel	
0 (RS232C optional port P1 baud rate)	08H
1 (RS232C port P2 baud rate)	09H
2 (not used for port)	0AH
3 (not used for port)	0BH
SIO No. 1	
Channel A (RS422 port P4)	
data	0CH
command/status	0EH
Channel B (internal processor/terminal interface)	
data	0DH
command/status	0FH
SIO No. 2:	
Channel A (RS232C modem port)	
data	20H
command/status	22H
Channel B (RS232C printer port)	
data	21H
command/status	23H
DMA	10H

APPENDIX G CABLE SPECIFICATIONS

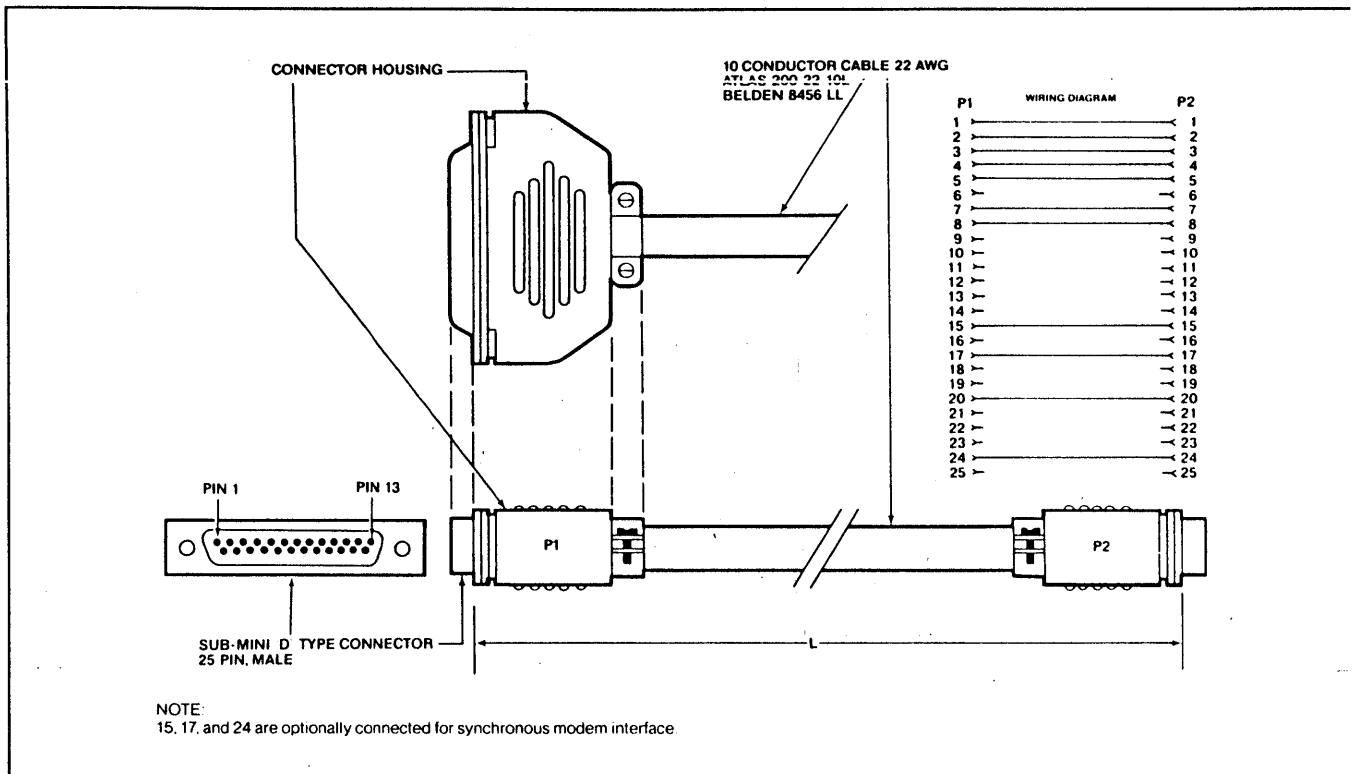


Figure G-1 RS232C

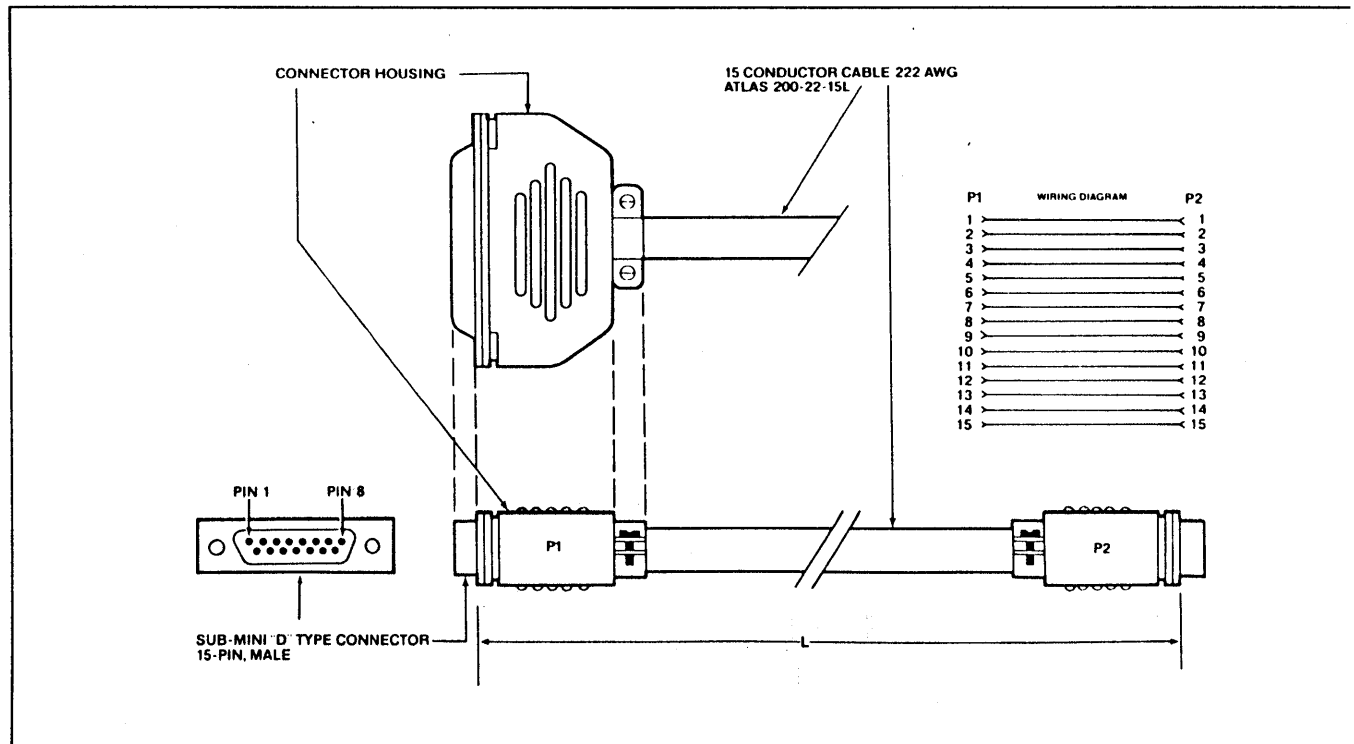
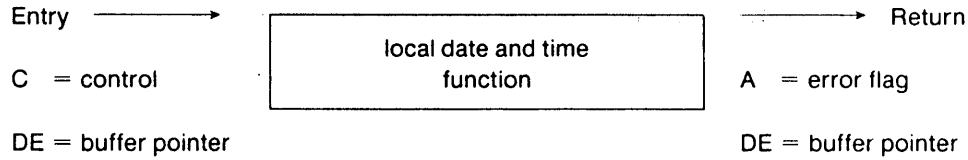


Figure G-2 RS422

APPENDIX H USING THE TIME AND DATE CAPABILITY IN APPLICATIONS PROGRAMS

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

Call this address to get or set current date and time:



TO GET THE CURRENT TIME AND DATE

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

Upon return, the buffer will contain the current date and time as follows:



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

If the error flag equals 0, then the date and time are initialized.

If the error flag equals 1, then the date and time are not initialized.

TO SET THE CURRENT TIME AND DATE:

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



Note: x = not defined

Upon return, the local time and date are set as specified in the buffer, and 1/100 of a second counter is reset to zero.

TO INTERFACE TO THE SYSTEM TIME AND DATE THROUGH MmmOST:

The system date and time in the TS 806 is available to all user stations through a special file named "MULTI.SYS," record #6 in drive "B:."

To set the system date and time from a user program:

- a) Open "B:MULTI.SYS" file
- b) Set current date and time into write buffer (first 22 bytes only)
- c) Write buffer to "B:MULTI.SYS" record #6

APPENDIX H ASCII CODE CHART

Bits	7 6 5 4 3 2 1				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	0	1	2	3	4	5	6	7
0	0	0	0	0	0	NUL	DLE	SP	@	P	.	p
0	0	0	1	1	1	SOH	DC1	!	A	Q	a	q
0	0	1	0	2	2	STX	DC2	"	B	R	b	r
0	0	1	1	3	3	ETX	DC3	#	C	S	c	s
0	1	0	0	4	4	EOT	DC4	\$	D	T	d	t
0	1	0	1	5	5	ENQ	NAK	%	E	U	e	u
0	1	1	0	6	6	ACK	SYN	&	F	V	f	v
0	1	1	1	7	7	BEL	ETB	'	G	W	g	w
1	0	0	0	8	8	BS	CAN	(	H	X	h	x
1	0	0	1	9	9	SKIP HT	EM	)	I	Y	i	y
1	0	1	0	10(a)	10	LF	SUB	*	J	Z	j	z
1	0	1	1	11(b)	11	VT	ESC	+	K	[	k	{
1	1	0	0	12(c)	12	FF	FS	,	L	\	l	|
1	1	0	1	13(d)	13	CR	GS	-	M	]	m	~
1	1	1	0	14(e)	14	SO	HOME RS	.	N	^	n	~
1	1	1	1	15(f)	15	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 I OPENING THE SYSTEM CASE



Whenever you open the case, observe standard safety precautions (as you would with any electrical or electronic equipment). Since high voltages are retained by the CRT tube and capacitors even after power has been turned off, care should be taken whenever the case is open.

Never reach into the enclosure unless someone capable of giving aid is present. Disconnect all power before performing any inspection or maintenance.

As soon as you open the case, clip one end of a wire to the chassis. Attach the other end of the wire to a plastic-handled screwdriver. Being careful not to touch the metal part of the screwdriver, gently slip the metal end of the screwdriver under the cap of the anode (Figure I-1). Observe standard safety precautions (as you would with any electrical or electronic equipment).

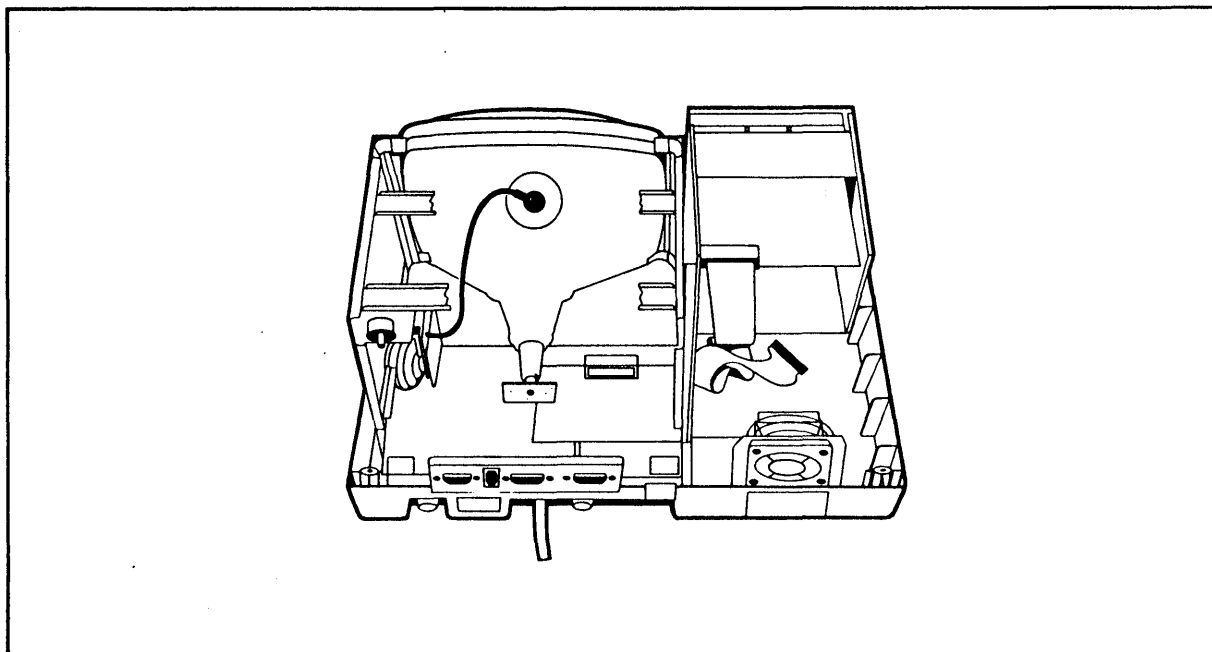


Figure I-1 Anode on Rear of CRT Tube

APPENDIX I OPENING THE SYSTEM CASE

Turn the TS 800A upside down on a soft surface (to prevent marring the cabinet). Remove the four Phillips screws as shown in Figure I-2. Turn the TS 800A right side up and lift off the cover. To reassemble the case, position the top over the base and re-insert the four screws.

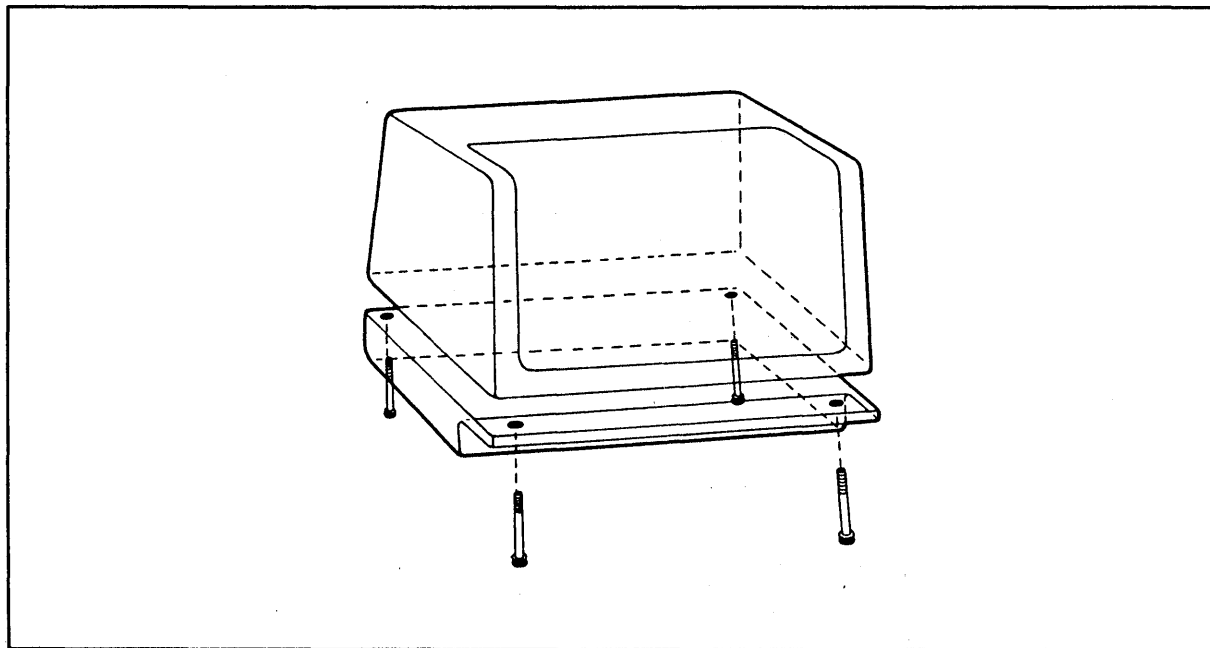


Figure I-2 Location of Screws in System Case

INDEX

- Additional memory 4.12
- Addressing cursor 4.19
- ALPHA LOCK 3.3.2.3
- Application languages 1.4.3
- ASCII code chart Appendix H
- Attributes, video 4.10
- Audible functions 4.7
- Auto page 4.13
- BACKSPACE key 3.3
- BACK TAB key 3.3
- Bell 4.7
- Block mode 3.6
- Boot 3.3
- BREAK key 3.3
- Cables 2.3, Appendix D
- Care 5.1
- Carriage return key 3.3
- CHAR DELETE key 3.3, 4.6
- CHAR INSERT key 3.3, 4.6
- Clear 4.2.5
- CLEAR SPACE key 3.3
- Component checklist 2.1
- Contrast adjustment 3.2
- Conversational mode 3.6
- CP/M 1.4, Appendix C
- CTRL (CONTROL) key 3.3
- Cursor
 - addressing 4.19
 - control 3.3
 - display Table 2-2, 3.2, 4.6
 - reading 4.19
- Damage, shipping 2.1
- DEL (Delete) key 3.3
- Delimiter programming 4.28
- Description of system 1.1
- Dimensions Appendix A
- Dipswitches 2.3, 2.4, 2.5, 2.6
- Disabling/enabling keyboard 4.5
- Duplex, edit mode 4.23
 - full 3.6
 - half 3.6
- Edit
 - keys 4.23
 - line 4.6.2.1.5
 - modes 4.6.2.1
- Editing 3.5, 4.24
- ENTER key 3.3
- Enabling/disabling keyboard 4.5
- Environment 2.2
- ESC (Escape) key 3.3
- Full duplex 3.6
- FUNCT (FUNCTION) key 3.3, 4.18
- Function keys 3.3, 4.17
- Fuse, changing 5.3
- Graphics, special 4.11
- Half duplex mode 3.6
- Hardware configuration 1.3
- HOME key 3.3
- Insert
 - character 4.20
 - modes 4.23
- Inspection 2.2
- Installation 3
 - general 2.3
 - modem 2.7
 - serial printer 2.6
 - summary 2.9
 - terminal 2.4
 - user station 2.5
- Isolation, magnetic 2.2
- Jumpers Appendix F
- Key functions 3.3
- Keyboard controls 3.3
 - enable/disable 4.5
 - set-up procedures 3.4
- Keyclick 4.7
- LINE DELETE key 3.3, 4.6.2.2
- LINE ERASE key, 3.3
- LINEFEED key 3.3
- Linefeed, normal/reverse 4.15
- LINE INSERT key 3.3
- Line lock 4.4
- Loading insert character 4.20
- Local edit mode 4.24
- Local mode 3.6
- Location, selecting correct 2.2
- Magnetic isolation 2.2
- Manual, using 1.5
- Memory, additional 4.12
- Modem installation 2.7
- Monitor mode 4.2
- Notes 1.5
- Opening case Appendix I
- Operating system 1.4
- Operator's Quick Reference Guide Inside back cover
- Overview
 - hardware 1.3
 - software 1.4
- Page edit mode 4.24

INDEX

- PAGE ERASE key 3.3
- Peripheral devices 1.3
- Physical requirements 2.2
- Pin connector assignments Appendix E
 - changing Appendix F
- Port
 - assignments Appendix G
 - description 1.3
- Power
 - configuration 2.3
 - requirements 2.2
- PRINT key 3.3, 3.7
- Programming
 - function keys 4.18
 - languages 1.4
 - PRINT function 4.29
 - tabs 4.21
 - user line 4.16
- Protect mode 4.14
- Reading cursor 4.19
- Repair 5.4
- Reset 3.3
- Reshipping 5.5
- RETURN key 3.3
- Return Material Authorization (RMA) 5.4
- References, CP/M Appendix C
- Safety precautions Appendix I
- Screen attributes 4.10
- Self test 5.2
- SEND key 3.3, 4.28
- Sending
 - data to the computer/screen 3.6
 - data to the printer 3.7
- Serial number 5.4
- Serial printer 2.6
- Service 5.4
- Service processor terminal 2.4
- SET-UP/NO SCROLL key 3.3
- SHIFT key 3.3
- Shipping damage 2.1
- Site selection 2.2
- Smooth scroll 3.3, 4.8
- Software configuration 1.4
- SPACE BAR 3.3
- Special graphics 4.11
- Specifications
 - cable Appendix D
 - TS 800A Appendix A
- Start-up procedures 3.2
- Status line 3.4, 4.3
- Summary of installation 2.4
- Switch settings 2.3, 2.4, 2.5, 2.6
- TAB key 3.3
- Tab controls 4.21
- Technical assistance 5.6
- Test, self 5.2
- Troubleshooting 5.2
- TS 800A
 - description 1.1, 1.3, 1.4
 - specifications Appendix A
- Turning on 3.2
- Unpacking 2.1
- User line 4.3
- User station installation 2.5
- Ventilation requirements 2.2
- Video attributes 4.10
 - display 4.9
- Warranty, limited 1.2, Appendix B
- X-On/X-Off 4.26

OPERATOR'S QUICK REFERENCE GUIDE

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

OPERATOR'S QUICK REFERENCE GUIDE

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