High Speed Asynchronous Terminal Emulator

Part No. 09835-10181

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Important

The tape cartridge or disc containing the programs is very reliable, but being a mechanical device, is subject to wear over a period of time. To avoid having to purchase a replacement medium, we recommend that you immediately duplicate the contents of the tape onto a permanent backup tape or disc. You should also keep backup copies of your important programs and data on a separate medium to minimize the risk of permanent loss.

Chapter 1
Introduction

Description

The High Speed Asynchronous Terminal Emulator Pack enables your HP 9835A to perform rapid and efficient data communication. The programs included in the software pack utilize the HP 98046 Datacomm Interface and the HP 98317A Datacomm ROM to provide you with asynchronous terminal emulation capability. The software pack contains three BASIC programs which are designed for different types of terminal emulation.

The line mode program lets you type an entire line before you send it to the host computer. In this mode you can edit a line and also have type-ahead and line recall capabilities. If the host computer does not accept burst data, or if you want immediate response from the host after a key is pressed, then the character mode program may better suit your application.

In character mode each character is sent to the computer as you type it and the cursor appears in the upper screen area of the CRT instead of in the keyboard area as in line mode. Consequently, when using character mode, emulator speed is slower; there is no recall capability offered by the 9835A in this mode; and many of the editing functions are also unavailable.

The graphics mode emulates a PLOT-10-compatible terminal. With this program, you can create plots, store them on a mass storage medium and then plot them offline later.

All three programs support ASCII code and operate on full duplex lines. The program can run with hosts that echo characters to terminals (referred to as echoplex) and those that don't.

Two types of connection, or handshaking, are provided in the line and character mode programs to ensure accurate sending and receiving: ENQ/ACK (enquiry/acknowledgement) or DC1/DC3 (transmit on/transmit off).

With ENQ/ACK handshaking, the host sends an ENQ character and then waits for the terminal to respond with an ACK character before continuing transmission. This type of handshake is common protocol for the HP 3000 and HP 1000 system and is enabled at power up.

If the DC1/DC3 handshake is enabled, the terminal directs the host to stop transmission by sending DC3 when enough data has been received and then requests a resumption of data transmission with DC1 when the first set of data has been emptied from the input buffer.

All three modes can operate at baud rates of up to 9600. At rates above 1200, it may be necessary to use a handshake, end-of-line delay, or pad character scheme to prevent data overruns. The default baud rate is 300.

Supplied Parts

The High Speed Asynchronous Terminal Emulator Pack (P.N. 09835-10180) includes the following:

Description	Part Number
Terminal Emulator manual	09835-10181
Program Cartridge	09835-10184
Special Function Key Overlay	7120-8688

System Configuration

To use the HP 9835A High Speed Asynchronous Terminal Emulator, you need the following items:

9835A Desktop Computer*
HP 98046 Datacomm Interface
HP 98317A Datacomm ROM

To use the graphics emulator (Graphics Mode Program) the following are required:

Opt. 201 128K Bytes of Memory
98337A Plotter ROM

A hardcopy printer is optional since the CRT is capable of displaying the computer's output. The HP 2631, HP 9876, HP 7245, or any printer which can print control characters (ASCII 0 through ASCII 31) enables you to use the Display Functions feature of the emulators (refer to the section on Special Function Keys).

There is a set of escape codes (explained later in the manual) which allows the main computer to access local mass storage devices via the 9835A. If the built-in tape cartridge does not satisfy your particular data storage/retrieval needs, additional mass storage devices (and the HP 98331A Mass Storage ROM) may be added to the system with no required changes in the terminal emulator programs.

* The HP 9835A High Speed Asynchronous Terminal Emulator does not run on the HP 9835B.

Interfacing Requirements

The terminal emulator software requires an HP 98046 Datacomm Interface to connect to the host computer. If you are using a modem, the interface connects to the modem. If you have a direct line, connect the interface cable to that. Refer to the HP 98046 Datacomm Interface manual (P/N 98046-90030) for information on cable options and connections.

The select codes are set with a switch on the 98046 Interface. The select code of the printer interface (if used) must be different from those of the 98046 Interface. Note that the Datacomm Interface select codes are selected in pairs. Select codes 2 & 3, 4 & 5, or 6 & 7 can be used with the terminal emulator programs.

Time-Share System Checklist

Before you use the terminal emulator programs, you should know the following information about the time-share service you intend to use:

1. What is the transmission speed or baud rate of your system? Some systems can use several different baud rates. (Default is 300 baud in the emulator programs.) _____
2. What are the parity requirements (odd, even, no parity, one or zero) for your system? (Default is odd parity.) _____
3. What sequence is sent to the host at the end of each line? (Default is carriage return.) _____
   What sequence does the host send to the terminal at the end of each line? (Default is carriage return/linefeed.) _____
4. Does the host system echo characters sent by the terminal back to the terminal? (Default is echo ON.) _____
5. What is the number of bits per character that your time-share system accepts not counting parity bits? This is normally 8 when no parity is used, and 7 when even or odd parity is used. (Default is 7 bits per character.) _____
6. What is the number of stop bits your system accepts? Stop bits are the "empty" bits sent between each character to separate the characters. Normal stop bit values are 2 for 110 baud and 1 for all other rates. (Default is 1.) _____
7. Is the connection made via a modem or a hardwired line? If a modem is used, the modem handshake must be turned on. (Default is off). _____

NOTE

The High Speed Asynchronous Terminal Emulator program runs only with full duplex, asynchronous modems or hardwired RS-232 lines.

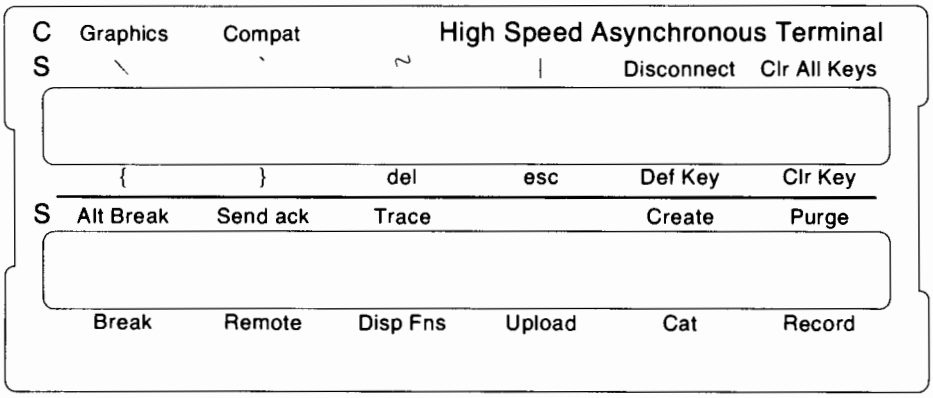
Half duplex modes cannot be used because they require a line turnaround sequence which is not provided in the program.

Current loop connections are not compatible with the 98046 Interface Card.

8. Does the system support an ENQ/ACK handshake or a DC1/DC3 handshake or neither? (Default is ENQ/ACK.) _____
9. What is the prompt character sent by the host when it is ready to receive an input from the terminal? (Default is DC1.) _____
10. What is the log on procedure for the time-share system? _____

Instructions

1. To prepare your 9835A for datacomm operation:
   a. Make sure the Basic Datacomm ROM and 98046 Interface are installed in your machine.
   b. Set the interface select codes to 2 & 3, 4 & 5, or 6 & 7.
   c. Turn the power ON.
   d. Insert the High Speed Asynchronous Terminal Emulator Cartridge into the tape drive and place the overlay (shown below) onto the Special Function Keys.



2. To load the specific program into memory:

   a. Type `LOAD "LINMOD"` for the line mode program or
      `LOAD "CHRMOD"` for the character mode program or
      `LOAD "GRPMOD"` for the graphics mode program

   b. Press EXECUTE

      When the program is loaded (the busy light on the CRT goes off and the tape stops moving), press RUN. If the line mode program has not been run previously, the message `Initializing` is displayed for a few seconds.

      At this time, the program scans for an interface select code.

   c. If there is only one interface installed, or you have previously specified an interface select code, the program automatically uses that select code.

   d. If there are no 98046 Interfaces installed, the message `No 98046 cards installed` is displayed. Turn off power to the computer, install an appropriate interface and go back to Step 1c above.

   e. If there are several interfaces available, the message `What is the select code you wish to use?` is displayed. Simply enter the desired interface select code and press CONTINUE.

The message `Terminal ready on` (S.C.) is then displayed. (S.C. is the active select code number).

NOTE

If the modem handshake is on, the messages and procedures vary. Refer to Chapter 3 of this manual for details.

The `Terminal ready on` message is followed by a display which indicates whether any of the following features are not currently set to their defaults:

- Local
- Echo
- Display Functions
- Hardcopy

If any of these appear on the screen, they are not set to their default conditions. This indicates the status of these options before you begin.

When the `Terminal ready on` message appears, you are ready to establish a communications link. Configure your system via the Edit mode using the Time-Share System Checklist just discussed and then perform appropriate log on procedures.

Time-Share Connection

If you are using a hardwired terminal port, you merely have to ensure that it is plugged into the cable leading from your computer; however, if you are using a modem or a data set, you should follow the sequence outlined here:

1. Start the program as shown in the previous section. Press EDIT and then press ▭ to move the cursor to the Modem field. Change the field to on by pressing STEP, then press STORE twice to exit Edit mode.
2. Turn on the modem or acoustic coupler.
3. If you are using:
   a. An Acoustic Coupler —
      1. Set the duplex switch to FULL. If the coupler has an Originate/Answer switch, set it to Originate.
      2. Dial the computer's telephone number.
      3. When the computer answers with a high-pitched tone, place the handset in the coupler. Be sure the receiver and the transmitter on the handset are in their proper places (this should be marked on the coupler). If the modem has a carrier indicator, it should light up signifying an adequate connection.
      4. If the coupler has a line switch, set it to ON-LINE.
   b. A Data Set/Modem
      1. Press the TALK button on the data set.
      2. Dial the computer's telephone number.
      3. When the computer answers with a high-pitched tone, press the DATA button until the DATA light is on. Replace the handset.
4. Most computers require a carriage return to initiate a session. Press STORE, CONTINUE or EXECUTE. The computer should respond with a prompt or command. At this point, follow the log-on procedure for your computer system. Be aware that if you fail to log-on within a certain time limit, some computers drop the communications link, requiring you to dial the number and try again.

   Once you are logged on to the system, most computers do not log you off until you give the log-off command, or until the communications link is broken. Just stopping the program will not necessarily cause you to be logged off the system. Indeed, it is possible to stop the terminal emulator program, make several modifications to it, and restart the program to resume interaction with the system without requiring a log-on procedure (assuming, of course, that you didn't hang the phone up). Pressing CONTROL-STOP may abort the connection.

Example Start-up Procedure

This section gives an example of how to log on to an HP 3000 and then configure the system based on these hypothetical parameters:

printer select code of 7 and device address of 1
bits per character = 7
stop bits = 1
odd parity
baud rate = 2400
echo is from host
hardwired line is used

To configure your system according to the previous specifications:

Press the EDIT Special Function Key. The following information will then appear along the lower edge of the CRT display:

```
Edit mode:              <--=left    -->=right    STEP=select    STORE=exit
Hardcopy HP-IB     Screen Bits/char Stop bits Parity Speed Echo Handshk Modem
0        off       16     7         1         odd    300   on   enq/ack off
```

Press the STEP key (located on the upper left portion of the keyboard) until the figure under the Hardcopy heading changes to 7.

Press the ⇨ key to move the cursor to the HP-IB parameter, off; press STEP to change off to 1.

Move the cursor to the Speed parameter of 300 and press STEP until 2400 appears.

Press STORE to store the new parameters. The display will then change to:

```
Edit mode:              use arrows, ASCII keys or STORE to exit
File  Dev      Protect  Alt break  OUTSEP INSEP PROMPT End file Size  Hard width
TEST  :T15              &          %      %%    %      //%      010   160
```

Press STORE again and your system is now configured according to the previously mentioned parameters which remain in effect until you execute SCRATCH C or SCRATCH ALL or turn off the 9835A.

The Edit Mode options you've seen, including the second set that appeared after you pressed STORE the first time, are explained in Chapter 2 of this manual. The keys referred to are also explained in that chapter.

To log on to an HP 3000:

a. Press STORE (or EXECUTE or CONTINUE)

b. When the ":" prompt appears in the input line:

   1. Type HELLO and your name and account.
   2. Press STORE (or EXECUTE)

c. If USER PASSWORD appears on the screen:

   1. Type your password.
   2. Press STORE (or EXECUTE)

d. The system responds with a message similar to the following:

```
SESSION NUMBER = #S135
FRI, APR 14, 1978, 9:10AM
HP 3200A.01.01
```

At this point you are logged on to the 3000 System.

NOTE

If you have problems logging on to your particular time-share device, check the configuration parameters to ensure they are correct for your system.

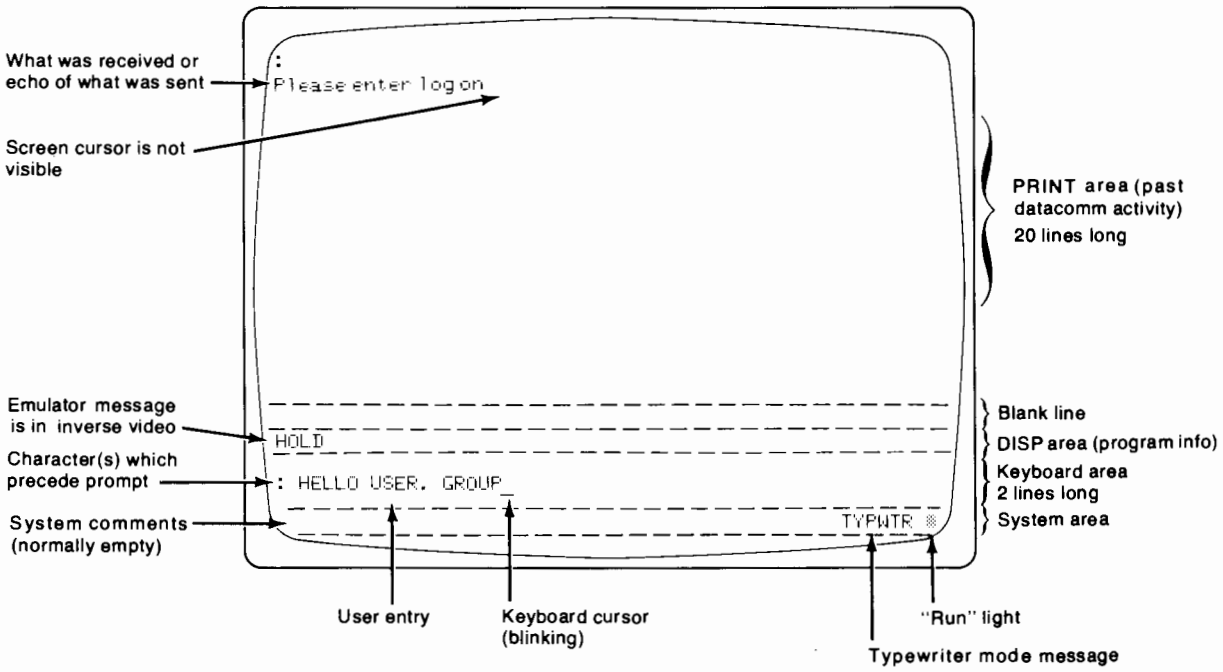
Program Modes

Line Mode

The Line Mode program gives you the advantages of type-ahead and local editing capabilities. You can type an entire line of characters, edit it locally, and then send the line to the host computer.

The keys, STORE, EXECUTE and CONTINUE are defined as end-of-line keys and are used to send a line of characters to the host computer. Lines sent from the host to the terminal are displayed on the CRT or printed on the internal printer.

Line Mode program information is displayed in the Keyboard Entry area of the CRT as indicated in the following illustration.

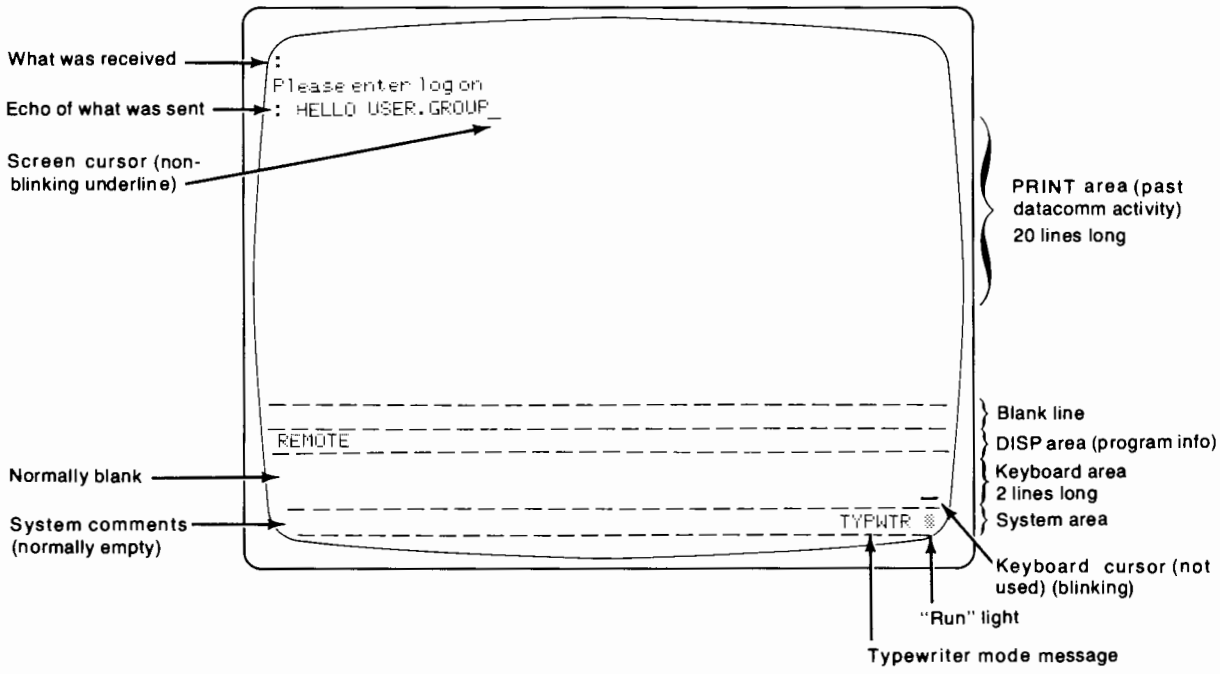


Character Mode

The Character Mode program does not provide type-ahead capability. Each character can be seen as the corresponding key is pressed. Because a character is sent to the host computer as it is typed, editing must be provided by the host.

In the Character Mode program, STORE, CONTINUE, and EXECUTE are defined to send the end-of-line character sequence.

Character Mode program information is displayed in the **print** area (upper portion of the CRT screen) as shown in this next illustration.



Graphics Mode

The Graphics Mode program enables the 9835A to act as a PLOT-10-compatible terminal, with 1024 x 780 displayable points and upper and lowercase characters of a single size. This assumes that the time-share host provides PLOT-10 software.

With the Graphics Mode program, you can create plots, label the plots and then store the data for the plots on a tape cartridge. Later the data can be retrieved and plotted offline onto a plotter such as the HP 9872. By plotting offline, which means a datacomm connection is not required, you save time-share costs.

The Graphics Mode program looks just like the Character Mode program. Since the 9835A does not support graphics display to the CRT screen, plotting information can be seen only when the 9835A is used in conjunction with an external plotter.

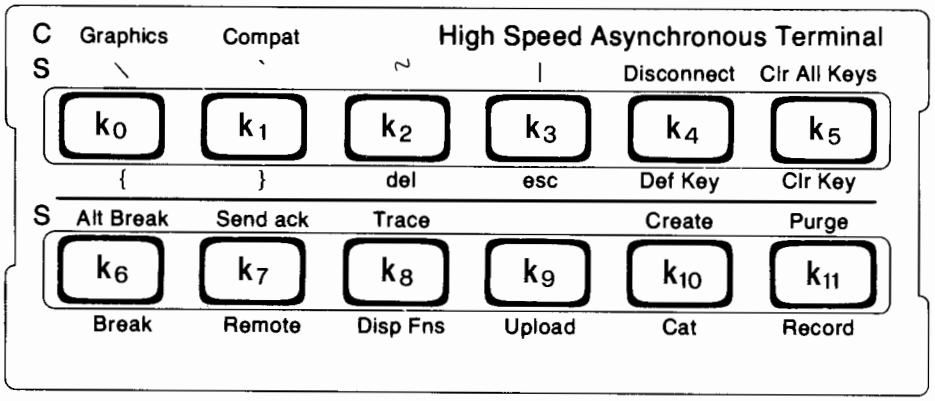
Chapter 2
Program Operations

This portion of the manual describes the operational features of the character mode, the line mode and the graphics mode of terminal emulator programs. These features govern the operation of the emulator program and allow you to redefine the program to fit your applications. The features are:

- Special Function Keys (SFKs) and program Mode keys. Definitions of these keys are described as they apply to the terminal emulator program.
- Program editing. The method used to modify various operational parameters is explained.
- Program status. This section lists the items and their related definitions that make up the program status description.
- Program escape codes. Escape codes used in the emulator programs are listed and described.
- Graphics mode. Three submodes and control codes, unique to the graphics mode, are explained.
- Mass storage operations. Escape codes and procedures necessary to utilize mass storage devices are explained.

Special Function Keys

The following list describes the 9835A Special Function Keys (SFKs) as they are defined for use with the terminal emulator program.



The SFKs representing Remote, Display Functions, Upload, Record, Hardcopy, Graphics and Compat are toggle keys. That is, they initiate two conditions; the first when pressed once, the second when pressed again.

Remote (k7)

Switches the terminal between "local" and "remote" mode. Local mode ignores data that is output from the host computer and displays keyboard entries on the screen as if they came from the host. When in local mode, the emulator responds to escape code sequences entered from the keyboard. Remote (the default) enables an active exchange of information between the terminal and the host computer.

Graphics* (CONT L k0)

Switches to graphics mode.

Disp Fns (k8)

Enables or disables the displaying of functions on the screen and/or on the hardcopy, if the printer is capable of printing control characters.

When Display Functions is on:

all ASCII control characters are displayed. However, in line mode, EO, NU and ▒ are removed from the data.

all escape codes (except EC Z) are displayed rather than executed. EC Z (which represents display functions disabled) is both displayed and executed.

Compat* (CONT L k1)

Turns graphics compatibility mode on or off. When the first ASCII GS is received from the host, graphics mode is entered if compatibility is on.

Trace (SHIFT k8)

Displays a representation of the recent information transferred to or from the interface card (Refer to Data Communiation Basics manual for explanation of information on display).

Disconnect (SHIFT k4)

Stops program and disconnects datacomm connection

Del (k2)

Produces a rubout character, a ▒ (CHR$(127)).

Rewind (REWIND)

Rewinds the tape cartridge in the tape drive.

Cat (k10)

Lists the catalog of files that are on the tape cartridge onto a printer or the screen.

Break** (k6)

Sends a break to the host computer.

Alt Break** (SHIFT k6)

Sends an End of Media character (EM or CHR$(25)) to the host computer. The character sent may be altered in Edit mode which is explained later in this Chapter.

Send Ack** (SHIFT k7)

Sends the ACK character (AK or CHR$(6)) to the host computer; you can press this key to recover the connection to the host if the ENQ/ACK handshake appears to be suspended.

Def Key (k4)

Enters Define Key mode which enables you to alter the definition of any non-ASCII key. (Procedure is explained in next section.)

Clr Key (k5)

Resets the definition of the next key pressed to its default function.

Clr All Keys (SHIFT k5)

Resets the definition of all keys back to their default functions.

Esc (k3)

Produces the EC character (CHR$(27)).

Create*** (SHIFT k10)

Creates a file on the mass storage medium according to the number of records specified with Edit mode.

Edit (EDIT)	Accesses Edit mode which enables you to alter some of the available options (refer to Edit Mode section).
Purge*** (SHIFT) (k11)	Purges the file from the specified mass storage medium.
List (LIST)	Lists the status of terminal emulator program, including Special Function key definitions (refer to Program Status section).
Upload (k9)	Begins loading information from the mass storage medium to the host computer; press this key again to terminate uploading (refer to Mass Storage Operations section). After Uploading, the emulator asks if you wish to use prompt handshaking for uploading. Press "Y" if you do "N", if you do not. (See Chapter 3 for an explanation of this handshake.) Uploading is terminated when end-of-file is reached or when an illegal data item is found in the file.
Hardcopy (PRT ALL)	Turns selected printing device on or off.
Record (k11)	Lets you record data onto a mass storage medium; press the key again to turn off recording (refer to Mass Storage Operations section).
Special Characters	Allows you to directly enter certain ASCII codes which are not included in the standard 9835A keyboard. By using shifted or unshifted Special Function Keys K0 through K31, you can enter the characters del, esc, \, `, ~, |, {, and }.

* Graphics mode only

** Break, Alternate Break and Acknowledge are not only character formulation keys, but immediate execute keys as well. They perform their functions when they are pressed which means you do not need to press STORE, EXECUTE or CONTINUE. The System 45 beeps several times to acknowledge execution of the functions.

*** After creating or purging a file the emulator asks for verification of the command. Press "Y" if you wish to create or purge and "N" if you do not. The file name, length, device and protect code are specified in Edit mode.

Define Key Mode

With Define Key mode you can alter the definitions of any non-ASCII key. This is advantageous when you use a command or a key sequence frequently. You can define one key to contain several commands or key definitions.

Procedure to enter Define Key mode:

1. Press the Define Key SFK.
2. Press the key whose definition you wish to alter. The name of this key then appears in the Keyboard Entry area of the CRT. (If you press an ASCII key, the Define Key mode is aborted with an appropriate message.)
3. A prompt instructs you to enter the necessary keystrokes in the new definition. As you enter keys, they appear in the Keyboard Entry area. All keystrokes are recorded even though they may scroll off the keyboard area.

   You may press any key except the key being defined, STOP or CONTROL-STOP. When operating in line mode, the TYPWTR, ↵ and ↵ keys cannot be entered in the definition. It is not possible to backspace or perform editing while entering definitions. Therefore, if you make an error, you must exit the Define Key mode and begin the procedure again. In this case, any previous definition is automatically erased.

4. When you are finished entering the definition, press the key being defined once more, and the Define Key mode is exited.

   You can obtain a list of the keys which have been redefined by pressing the List SFK.

   To reset the definition of a key, press the Clear Key SFK and the key to be reset. To reset the definitions of all keys, press the Clear All Key SFK.

Program Mode Key Definitions

	Line Mode Definition (Cursor referred to is the **keyboard** cursor)	**Character Mode Definition** (Cursor referred to is the **screen** cursor)	**Graphics Mode Definition** (Cursor referred to is the **graphics** cursor)
CONT'L TAB	Sets a tab stop at the cursor position	Not available in character mode	
CONT'L RECALL	Clears the tab stop at the cursor position	Not available in character mode	
TAB	Moves the cursor to the next tab stop on the line. When the program is first run, tab stops are initially set every eight characters beginning eight character positions from the left margin	Not available in character mode	NOTE: When not using the graphics features, this is similar to the character mode program
SHIFT TAB	Moves the cursor left, to the previous tab stop	Not available in character mode	
CONT'L TYPW'R	Clears all tabs in the Keyboard Entry area	Not available in character mode	
TYPW'R	Turns the typewriter-mode switch on or off	Same as in line mode	
STEP	Changes option to the next value each time STEP is pressed; used in Edit mode only.	Same as in line mode	
SHIFT STEP	Changes option to previous value. (Edit mode only)	Same as in line mode	
RECALL	Retrieves items sent to the recall buffer on a last-in, first-out order. All lines sent with STORE, EXECUTE, or CONTINUE are stored in the recall buffer.	Not available in character mode	
SHIFT RECALL	Retrieves items from the recall buffer stack in reverse order; SHIFT RECALL used after the RECALL key has been pressed.	Not available in character mode	**NOTE:** When not using the graphics features, this is similar to the character mode program

	Line mode	Char mode	Graphics mode
DEL CHR	Deletes the character at the cursor location.	Not available in character mode	**NOTE:** When not using the graphics features, this is similar to the character mode program
DEL LN	Not available in line mode	Deletes the line at the cursor position	
INS CHR	Turns on the insert mode which enables you to insert a character at the cursor position. The insert feature is turned off by pressing INS CHR, STORE, EXECUTE, CONTINUE, STOP, SHIFT RECALL, RECALL or CONTROL STOP also turned off when the cursor reaches the end of the keyboard Entry area.	Not available in character mode	
INS LN	Not available in line mode	Inserts a blank line at the cursor position	
CLEAR LINE	Clears Keyboard Entry area and the CRT DISPlay line	Transmits a cancel character (CN or CHR$(24)) to the host computer	
SHIFT + CLEAR LINE	Clears the print area and the CRT DISPlay line	Clears from cursor to end of screen	Resets the plotter and causes the program to re-enter ALPHA submode
CONT'L + CLEAR LINE	Clears Keyboard Entry area, the CRT DISPlay line and print area	Same as line mode	
↑	Scrolls screen up one line	Moves the cursor up one line	Moves cursor up one line
↓	Scrolls screen down one line	Moves the cursor down one line	Moves the cursor down one line
CONT'L + ↑	Not available in line mode	Moves the cursor to the top of the CRT screen	
CONT'L + ↓	Not available in line mode	Moves the cursor to the bottom of the CRT screen	
SHIFT + ↑	Moves the cursor to the top of the CRT memory	Scrolls screen up one line	Moves the cursor in smaller increments than ↑
SHIFT + ↓	Moves the cursor to the bottom of the CRT memory	Scrolls screen down one line	Moves the cursor in smaller increments than ↓
←	Moves the cursor left one position	Same as in line mode	Moves the cursor left (pressing SHIFT and ← moves the cursor in smaller increments)
→	Moves the cursor right one position	Same as in line mode	Moves the cursor right (pressing SHIFT and → moves the cursor in smaller increments)

	Line mode	Char mode	Graphics mode
SHIFT ←	Not available in line mode	Moves the cursor to the left margin of the CRT screen	
SHIFT →	Not available in line mode	Moves the cursor to the right margin of the CRT screen	
SHIFT DEL CHR	Clears that part of the entry starting at the cursor location to the end of the line	Clears line from cursor position	
SHIFT BACK	Moves the cursor to the left margin of the Keyboard Entry area	Moves the cursor to the left margin of the CRT screen	Sends cursor address to the host computer (pressing any ASCII character keys does the same thing)
BACK	Moves the cursor left one position and then clears entry to the end of the Keyboard Entry area	Transmits a backspace character (BS or CHR$(8)) to the host computer	
STOP	Stops execution of the BASIC program but does not disconnect datacomm activity	Stops the BASIC program and turns the cursor off; displays `Program stopped without disconnect`	Stops the BASIC program and exits graphics mode
CONT'L STOP	Performs a system reset which may abort datacomm activity	Same as in line mode	

NOTE

Pressing CONTROL-STOP may disconnect the datacomm line but program options remain in memory. Executing `SCRATCH C` destroys options but the datacomm line remains active. Executing `SCRATCH ALL` disconnects the datacomm line and also destroys the options.

In line mode, STORE and CONTINUE act as "send" keys which transmit contents of the input keyboard buffer to the host computer. If the computer is not ready to accept the input (no prompt), the program "holds" the line until a prompt is received. At that time, the message `Hold` appears (in inverse video) above the entry and further alteration to the line is locked out.

The EXECUTE key also acts as a "send" key, except that it does not wait for a prompt to be received. The keyboard line is always sent when EXECUTE is pressed. If STORE or CONTINUE has already been pressed, EXECUTE may be used to override `Hold`.

In character and line modes, STORE, CONTINUE and EXECUTE are defined to send the end-of-line character sequence specified by OUTSEP (refer to Edit mode discussion) but there is no "hold" feature.

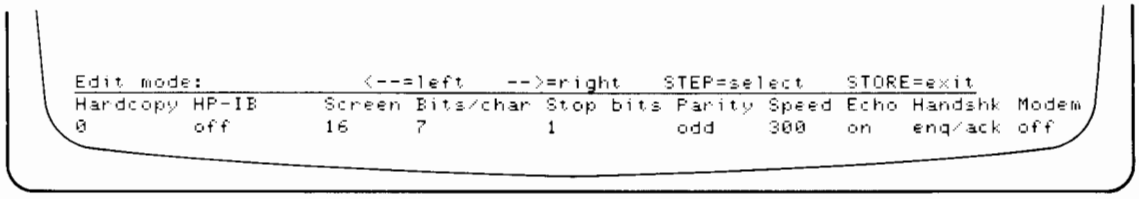
Edit Mode

The Edit mode allows you to alter many of the operational parameters of the terminal emulator programs such as baud rate, parity, echo, and so forth.

The datacomm channel between the terminal and the host computer remains active while the terminal is in the Edit mode. Therefore, escape sequences received from the host during editing are executed. (If the keyboard is disabled by means of an escape sequence while the terminal is in Edit mode, this escape sequence does not go into effect until you exit the Edit mode.)

Procedure to enter Edit mode:

1. Press the Edit SFK. A list of options and their current values appears in the Keyboard Entry area of the screen as shown here. Notice that the Edit mode is displayed in two parts.



Second Edit Mode Display after STORE is Pressed

The following list describes the options that appear in the Edit displays:

Hardcopy	Displays select code at which the hardcopy device interface is set; possible values are 0-16; default is 0; can also be a select code for HP-IB device.
HP-IB	Displays device address of HP-IB device; possible values are 0-30; default is off which indicates there is no HP-IB device.
Screen	Shows select code of device on which data is normally displayed; possible values are 0-16; default is 16.
Bits/char	Displays number of bits (excluding parity) per character for both sending and receiving; possible values are 5-8; default is 7
Parity	Displays parity check on both send and receive; possible values are even, odd, none, one and zero; default is odd. (One or zero indicates that the high bit is always set to this value.)
Speed	Shows baud rate at which the interface is running; possible values are EXT. (external – applicable if modem with clock is used), 50, 75, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 4800 and 9600; default is 300.
Echo	Indicates whether the echo is on or off. If echo is off, the terminal displays the transmitted data directly on the screen. If echo is on, the host is expected to display the transmitted data on the screen via an echo; default is on.

Handshk	Indicates type of handshake for connection with host computer; options are none, ENQ/ACK or DC1/DC3; default is ENQ/ACK
Modem	Indicates whether the modem handshake is on or off; default is off

(To access the next set of Edit options, press the STORE key)

2. Use the arrow keys (⇨, ⇦) to advance the cursor to the option you wish to modify.
3. Once the cursor is positioned under the specified option, press the STEP key to change the value. In this manner, you can STEP through the list of available values for the option. Simply select the one you wish to use.

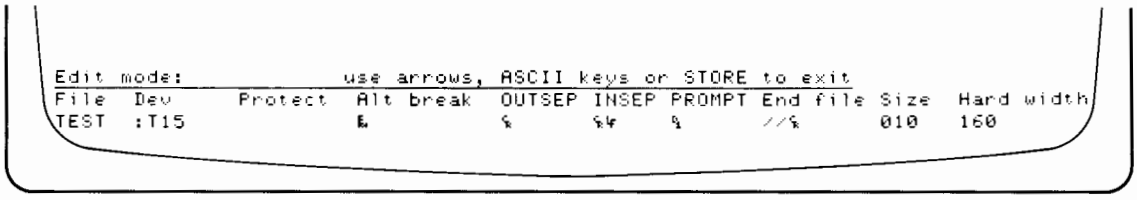
NOTE

In the first set of options, you may not type new values directly from the keyboard or use other editing keys on the option. Use the STEP key or SHIFT STEP to select a new value.

---

4. When you finish editing the desired options, press the STORE key. At this time,
   a. the changes you made are put into effect, and
   b. a second list of options and values appears in the Keyboard Entry area of the screen.

Edit mode displays for the line mode program



File	Displays the name of the mass storage file currently available for use (Purge, Create, Record, Upload); default file name is TEST.
Dev	Indicates the type code and select code of mass storage device; default is :T15.
Protect	Establishes a protect code for the mass storage file (optional); default is no protect code.
Alt break	Shows 1-10 characters which are to be sent to the host computer when the Alt Break SFK is pressed; default character is Em (End of Media – CHR$(25)).
OUTSEP	Shows the end-of-line character(s) placed in outgoing data; OUTSEP is sent by STORE, CONTINUE or EXECUTE; default is CR.
INSEP	Describes the end-of-line character(s) for incoming data; when INSEP is received a line is read; default characters are CR LF.
PROMPT	Shows the character(s) which indicate that the host computer is ready to receive data; pressing STORE or CONTINUE sends a line after a prompt is received; default is DC1.
End file	Shows which characters are to be sent when the end-of-file mark is reached on uploading; an OUTSEP character is not sent unless it is contained explicitly in the end-of-file character string; default is double slash (''/ /''), followed by a CR.
Size	Shows the number of records in any file which is subsequently created (default is 10). If the number is to be changed, it must be entered in a three-digit format; for example, 80 records would be entered as 080.
Hard width (line mode only)	Indicates the number of columns specified for the hardcopy device; default is 160; if this number is changed, it must follow the three-digit format as shown for the Size parameter.

5. Use the arrow keys (→, ←) to advance the cursor to the character you wish to modify. The options in this list are in fixed fields.
6. In the second set of options, once the cursor is positioned under the specified character, type in the new value from the keyboard (do not use the STEP key). When you are modifying this list of options, the special characters (EC, ~, {, }, |, \, ^, ^) remain defined so that you can produce any character from the keyboard. Option fields which are numeric accept only numeric keys in a three-digit format. When alpha keys are pressed the 9835A beeps.
7. Press the STORE key. At this time,
   a. the changes you have made are put into effect, and
   b. the Edit mode is automatically exited.

CAUTION

A LOSS OF INFORMATION FROM THE HOST COMPUTER MAY RESULT, IF ANY OF THE FOLLOWING OPTIONS ARE CHANGED: BITS/CHAR, STOP BITS, PARITY, SPEED, INSEP AND PROMPT.

Program Status

A program status display appears on the screen when the List SFK is pressed. The displays such as those shown in the following illustrations indicate the **current** state of various operational parameters of the terminal emulator programs.

```
-------------------------------- S T A T U S ---------------------------------
File in use:          T E S T : T 1 5
OUTSEP:               cr
INSEP:                cr lf
PROMPT:               dc1
End of file:          / / cr
Key definitions:
   Alternate break:   em
1 stop bit            Parity is odd       7 bits/character    Speed = 300 baud
98046 on 4            Handshake= enq/ack  Modem off           Verify mode off
Screen on 16          Hardcopy on 7,1     Uploading off       Echo is on
Remote                Recording off       Display fns off     File size = 10
CCOM used for this CMODEL: 1397           Compatibility on    Plotter is GRAPHICS
Prompt handshake on File not assigned     Background program not running
Datacomm status:
         ERR=0  RJ=0  WJ=0  SEP=0  MEM=482  LIN=2  R-ERR=0
         T-FUL=0  BREAK=0  DSR=0  SDCD=0  CD=0  CTS=0
--------------------------------------------------------------------------------
```

Example Status Display for Graphics Mode

```
-------------------------------- S T A T U S ---------------------------------

Tabs:    1         2         3         4         5         6         7         8
12345678901234567890123456789012345678901234567890123456789012345678901234567890
       *       *       *       *       *       *       *       *       *       *
       *       *       *       *       *       *       *       *       *       *
File in use:          T E S T : T 1 5
INSEP:                cr lf
OUTSEP:               cr
PROMPT:               dc1
End of file:          / / cr
Key definitions:
   Alternate break:   em
1 stop bit            Parity is odd       7 bits/character    Speed = 300 baud
98046 on 4            Handshake= enq/ack  Modem off           Verify mode off
Screen on 16          Hardcopy on 7,1     Uploading off       Echo is on
Remote                Recording off       Display fns off     File size = 10
CCOM used for this CMODEL: 1397           Hard width = 160
Prompt handshake on File not assigned     Background program not running
Datacomm status:
         ERR=0  RJ=0  WJ=0  SEP=0  MEM=482  LIN=2  R-ERR=0
         T-FUL=0  BREAK=0  DSR=0  SDCD=0  CD=0  CTS=0
--------------------------------------------------------------------------------
```

Example Status Display for Line Mode

```
--------------------------------- S T A T U S ---------------------------------
File in use:          T E S T : T 1 5
OUTSEP:               cr
INSEP:                cr lf
PROMPT:               dc1
End of file:          / / cr
Key definitions:
   Alternate break:   em
1 stop bit            Parity is odd        7 bits/character     Speed = 300 baud
98046 on 4            Handshake= enq/ack   Modem off           Verify mode off
Screen on 16          Hardcopy on 7,1      Uploading off       Echo is on
Remote                Recording off        Display fns off     File size = 10
CCOM used for this CMODEL: 1397            Compatibility off
Prompt handshake on File not assigned      Background program not running
Datacomm status:
         ERR=0  RJ=0  WJ=0  SEP=0  MEM=482  LIN=2  R-ERR=0
         T-FUL=0  BREAK=0  DSR=0  SDCD=0  CD=0  CTS=0
-------------------------------------------------------------------------------
```

Example Status for Character Mode

The following list describes the status display options of the line mode, and character/graphics modes. Options such as File in use, OUTSEP, INSEP and so forth have been described in the preceding Edit Mode section.

`Tabs` (line mode only) — Displays an asterisk for every screen tab position which is set (up to 160).

`Key definitions` — Lists all the key definitions currently in use.

NOTE

Status response, File in use, INSEP, OUTSEP, PROMPT, End of file and Key definitions are listed in the following format:

1. All units (keystrokes, characters) are listed with no spaces inside them but always with a space between them.
   Example: `T E S T : T 1 5`
2. Control characters are displayed by mnemonic ASCII code.
   Example: `cr`
3. Blank is dislayed as "spc" and all non-ASCII keystrokes are displayed by their name, including the CONTROL and SHIFT operations.
4. Rubout (CHR$(127)) is displayed as "`del`".

`98046 on` — Shows select code at which the 98046 Interface is set.

`Uploading` — Indicates whether the program is currently transferring data from the local mass storage device to the host computer.

Verify	Indicates whether the host computer has commanded the program to enter a write-then-verify mode when writing on a mass storage medium.
Remote/Local	Indicates whether the program is in Remote or Local mode.
Recording	Indicates whether the program is currently recording from the host computer to mass storage.
Display functions	Indicates whether the program is currently displaying all functions on the screen as they are received from the host computer.
CCOM used for this CMODEL	Indicates the amount of CCOM memory used for the present CMODEL. This enables you to reduce the amount of CCOM memory if desired.
Compatibility (graphics mode only)	Indicates whether graphics-compatibility mode is on or off.
Plotter is (graphics mode only)	Specifies which device is selected for plotter output.
Prompt handshake	Indicates whether prompt-checking is enabled for uploading (refer to Chapter 3 for explanation on handshake).
File is	Indicates whether the mass storage file is currently assigned for use.
Background	Indicates whether an alternate background program is currently running.
Datacomm status	Shows the current parameters or signals for the following: (Refer to the Asynchronous Data Communications Programming manual for more explanation.)

ERR = internal code of last error.
RJ = read justified flag.
WJ = write justified flag.
SEP = last level of separator passed.
MEM = estimate of remaining memory.
LIN = line state.
R-ERR = the count of received errors.
T-FUL = trace buffer full.
BREAK = break received by interface.
DSR = data-set-ready modem line.
SDCD = secondary-data-carrier-detect modem line.
CD = carrier detect modem line.
CTS = clear-to-send modem line.

One of these messages can also appear with or in place of the previously listed information. See the Asynchronous Data Communications Programming manual for a discussion of these.

```
Datacomm not active so CSTATUS could not be done.

Datacomm channel does not exist.
```

Escape Codes

The terminal emulator programs utilize several escape code sequences which implement various datacomm operational functions. Escape codes can be sent from the host computer or typed from the terminal in Local mode. The following list includes those escape codes which govern the terminal functions.

Ec1	Sets a screen tab at the column of the cursor.
Ec2	Clears the screen tab at the column of the cursor.
Ec3	Clears all screen tabs.
Ec@	Causes the program to pause one second
EcA	Moves the cursor up one row.
EcB	Moves the cursor down one row.
EcC	Moves the cursor right one column.
EcD	Moves the cursor left one column.
EcE	Resets CRT – clears control features.
EcF	Moves the cursor to the row after the last row of the CRT memory, first column.
EcH	Moves the cursor to first row of the CRT memory, first column.
EcJ	Clears the screen from the cursor position.
EcK	Clears the line from the cursor position.
EcL	Inserts a blank line before the cursor line.
EcM	Deletes the cursor line and closes up the gap.
EcP	Deletes the character at the cursor position.
EcQ	Turns on the insert character mode.
EcR	Turns off the insert character mode.
EcS	Rolls the screen up one line.
EcT	Rolls the screen down one line.
EcU	Rolls the screen printout area up 20 lines.
EcV	Rolls the screen printout area down 20 lines.
EcY	Enables the Display Functions mode.
EcZ	Disables the Display Functions mode.
Ec1	Freezes the screen lines above the cursor line.
Ecm	Unfreezes the display lines.
Ec&a...	Moves the cursor to the specified address. The ellipsis, "...", indicates that one or more of the following parameters are to be included. **The letter portion of the last parameter must be capitalized to indicate the end of the listed parameters.**

<num>r	Move to row number <num>.
<num>c	Move to column number <num>.
<num>y	Move to screen row number <num>.
<sign><num>r	Move up/down number <num> of rows. − is up, + is down.
<sign><num>y	Move up/down number <num> of screen rows.
<sign><num>c	Move left/right number <num> of columns. − is left, + is right.

For example, the escape code which would move the cursor two columns to the left is: Ec&a-2C.

the escape code to move the cursor one row down and two columns to the left is

Ec&a+1r-2C

and the escape code to move the cursor three rows up (on the print area of the CRT) is

Ec&a-3Y

Ec&d<char> Turns highlighting features on and off

This character (char):	Accesses this feature or these features:
@	Clears all highlight features
A	Blinking
B	Inverse Video
C	Inverse Video, Blinking
D	Underline
E	Underline, Blinking
F	Underline, Inverse Video
G	Underline, Inverse Video Blinking

This example shows how to send a message highlighted in inverse video and blinking modes, from the host to the 9835A.

```
PRINT "Ec&dCTESTING EXAMPLEEc&d@"
```

Ec&s0P
Ec&s1P

In graphics mode only, turns on (1) or off (0) graphics-compatibility mode switch

More escape codes to control mass storage operations are discussed in the following section.

NOTE

1. ESC Y and ESC Z are always recognized by the terminal emulator programs since the Display Function mode disables execution of all escape codes except ESC Z.

2. If a terminal emulator program does not recognize an escape code, that code is passed on to the screen, hardcopy and mass storage file.

Graphics Operations

After the graphics program has been loaded into the 9835A and Datacomm is properly connected, press the Graphics SFK.

You can then create and label plots, store the plots on a local mass storage device and then plot offline on the graphics device.

NOTE

Make sure that the host provides PLOT-10 compatible software before you attempt any graphics operations.

Submodes

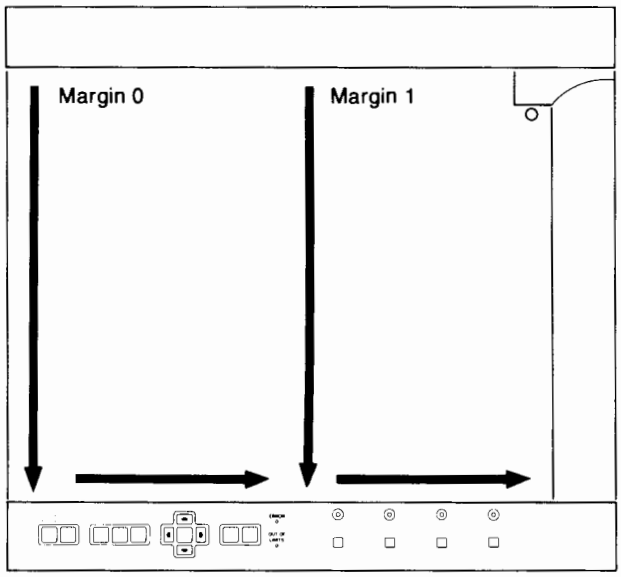
Graphics mode consists of three submodes:

- Alphanumeric (ALPHA)
- Graphic Display (GRAPH)
- Graphic Input (GIN)

ALPHA

ALPHA submode is initially accessed when the Graphics SFK is pressed. (It can be accessed by other means which are discussed later in the Graphics Operations section.) You can use the ALPHA submode to label plots and to communicate with the host without exiting graphics mode.

In ALPHA submode, characters are printed on the plotter in this format:



The upper left corner of the plotter is referred to as margin 0 and the middle of the top is margin 1. When the last character position in the left portion of the plotter is written on, printing continues at margin 1 as indicated by the arrows in the preceding illustration.

If printing that began at margin 0 has extended into the right portion of the plotter, over-printing results, as shown in this illustration:

```
LINE ONE                                    LINE THIRTY SIX
LINE TWO                                    LINE THIRTY SEVEN
LINE THREE                                  LINE THIRTY EIGHT
this is a rather long and verbose line fou  LINE THIRTY NINE
LINE FIVE                                   LINE FORTY
this sixth line (which goes to the seventh  LINE FORTY ONE
t around to the next line                   LINE FORTY TWO
LINE EIGHT                                  LINE FORTY THREE
LINE NINE                                   LINE FORTY FOUR
LINE TEN                                    LINE FORTY FIVE
LINE ELEVEN                                 Notice that line 41 over-wrote line six.
LINE TWELVE                                 Since this is plotting on a 9872 plotter
LINE THIRTEEN                               , both copies appear.
LINE FOURTEEN                               LINE FORTY NINE
LINE FIFTEEN                                LINE FIFTY
LINE SIXTEEN                                LINE FIFTY ONE
LINE SEVENTEEN                              LINE FIFTY TWO
LINE EIGHTEEN                               LINE FIFTY THREE
LINE NINETEEN                               LINE FIFTY FOUR
LINE TWENTY                                 LINE FIFTY FIVE
LINE TWENTY ONE                             Line fifty six is not too interesting ex
LINE TWENTY TWO                             cept for the fact that it shows how line
LINE TWENTY THREE                           s which start on the indented margin sta
LINE TWENTY FOUR                            y on the right side.
LINE TWENTY FIVE                            LINE SIXTY
LINE TWENTY SIX                             LINE SIXTY ONE
LINE TWENTY SEVEN                           LINE SIXTY TWO
LINE TWENTY EIGHT                           LINE SIXTY THREE
LINE TWENTY NINE                            LINE SIXTY FOUR
LINE THIRTY                                 LINE SIXTY FIVE
LINE THIRTY ONE                             LINE SIXTY SIX
LINE THIRTY TWO                             LINE SIXTY SEVEN
LINE THIRTY THREE                           LINE SIXTY EIGHT
LINE THIRTY FOUR                            Line sixty nine will go back to the uppe
LINE THIRTY FIVE                            r left hand corner if it gets much too l
```

35 lines can be entered in ALPHA submode; margin 1 starts at character position 37

To reset the plotter without disconnecting datacomm activity, press the SHIFT-CLEAR LINE keys and continue printing.

GRAPH

The GRAPH submode is used to draw plots, line-by-line. It is accessed by the host sending a ^G control character or by the terminal (in local mode) transmitting the ^G control character to the host.

In this submode characters are decoded as line-drawing information, keystrokes are transmitted to the host computer, and the lines are plotted on the graphics device. The first line, which is really a point, is unwritten and serves as the origin for the next line.

Each point from which a line starts is represented by four characters. For example these characters:

&h<D

represent the point at coordinates 900, 200.

To determine which series of characters represents a point, use the following format table and the coordinate code table in Appendix C.

Coordinates Wanted Low Order X	High Order (Y,X)	Y	Low Order Y	High Order X

To demonstrate how to find the coordinate codes, the previous example coordinates are used here to complete the format table:

Coordinates Low Order X	High Order (Y,X)	Y	Low Order Y	High Order X
D	200,900	&	h	<

Notice the coordinates for X and Y are reversed.

According to Appendix C, the high order Y character corresponding to 200 is & and the low order Y character is h; the high order for 900 is < and the low order X is D.

GIN

GIN submode is accessed by this host sending the escape character and a control code, both of which are explained later in this section. (The terminal, in local mode, can also access GIN mode by sending the escape character and the control code ^E or CHR$(26)).

In GIN submode, this message is displayed on the CRT:

```
Waiting for cursor information
```

GIN submode enables you to digitize one point by moving the cursor (using the arrow keys) to the point you want to input to the host and then pressing the SHIFT BACK keys or any ASCII key. At that time,

- the characters representing the point are transmitted to the host,
- the coordinates are transmitted to the host,
- the OUTSEP sequence (which is shown in the Status Display) is transmitted to the host, and
- ALPHA submode is entered.

Escape Codes and Control Characters

When graphics mode is entered, the escape codes that normally apply to the line and character modes are disabled. Instead, the following escape codes and control characters, unique to the graphics mode, are enabled:

Codes	Alphanumeric (ALPHA)	Submodes	
		Graphic Display (GRAPH)	Graphic Input (GIN)
^R	moves cursor to left margin	enters Alphanumeric submode	enters Alphanumeric submode
^]	enters Graphic Display submode	reenters Graphic Display submode	enters Graphic Display submode
^H	moves cursor right one space	no function	no function
^H	produces backspace	no function	no function
^J	produces linefeed	no function	no function
ESC ^B	enters Graphic Input submode	enters Graphic Input submode	no function
ESC ^G	returns cursor	returns cursor	returns cursor
ESC ^F	resets graphics*	resets graphics*	resets graphics*
^U	not applicable	enters Alphanumeric submode	not applicable

* ESC ^F Resets graphics – enters Alphanumeric submode, sets pen to the upper left corner of the plotter and resets the margin to margin 0.

NOTE

When the 9835A is in graphics mode, these keys are redefined:

SHIFT CLEAR LINE — Resets the plotter and causes program to re-enter ALPHA submode.

↑ ↓ → ← — Move the graphics cursor one position per key-stroke. Pressing SHIFT and an arrow key moves the graphics cursor in smaller increments.

SHIFT BACK or any ASCII key (applies to GIN submode only) transmits character, cursor coordinates and OUTSEP sequence to the host; causes program to re-enter ALPHA submode.

To exit graphics mode, press one of these keys:

Graphics SFK
Disconnect SFK
STOP

Mass Storage Operations

The Asynchronous Terminal Emulator pack enables you to press Special Function keys to access most mass storage operations from the keyboard. For host-to-terminal mass storage operations, you use the escape sequence as specified in the following table. Comments concerning each sequence or keyboard operation are given, if applicable.

The first operation in the table shows how to create a file. From the terminal keyboard, it is a straightforward procedure. The escape sequence given by the host can have several variations of that shown in the table. For example, each of these variations:

```
ESC,c CREATE FILE MYPROG ON RIGHT 10 CR
ESC,c CREA FILE MYPROG RIGHT CR
ESC,c CRE F MYPROG DEV :T15 CR
ESC,c CR F MYPROG R CR
```

creates a file named MYPROG on the tape cartridge 10 records long with 256 bytes per record (the default record size is 10 and the default for bytes per record is 256).

NOTE

ON RIGHT, RIGHT and R are related to device ":T15" on the System 45 Desktop Computer. Device :T15 on the System 45 is located on the right-hand side of the keyboard bezel, whereas on the 9835A, the tape drive :T15 is located on the left. Since the Async Emulator program is used on both machines, the references to the right-hand drive are necessary for the program to work with the 9835A except when the DEV :T15 reference is used.

Each variation has these same basic format characteristics:

- Begins with ESC,c and ends with CR
- Has spaces separating words in the sequence

These are two of the format characteristics required for each escape sequence. The remaining format characteristics are explained in Appendix B as are the remaining mass storage operations and related options.

Operation	from keyboard:	Follow this procedure/sequence from host, command is:	Comments
CREATE or open file space	Press the Edit SFK Press STORE Type file name and device type and select code under appropriate headings Press STORE Press Create SFK Press "Y" to verify	ESC, c CREATE file device LENGTH filesize CR	
PURGE a file	Press Purge SFK Press "Y" to verify	ESC, c PURGE file device CR	Press Edit SFK to change file name if you want to purge a file other than that shown on the Status Display
ASSIGN a source or destination file	Press Edit SFK Press STORE Type file name, device type and select code under appropriate headings Press STORE	ESC, c ASSIGN SOURCE file device CR or ESC, c ASSIGN DESTINATION file device CR	
ASSIGN a hardcopy printer	Press Edit SFK Press STEP until correct select code is found Press STORE twice	ESC, c ASSIGN LOG device CR	
Load information from source file to host	Press Edit SFK Press STORE Type file name, device type and select code Change End File parameter Press STORE Press Upload SFK	ESC, c COPY FILE SOURCE CR or ESC, c ENABLE SEND CR	End-of-file string is sent when end-of-file is reached or bad data is found
Record information from host onto source file	Press Edit SFK Press STORE Type file name, device type and select code Press STORE Press Record SFK	ESC, c COPY FILE DATACOMM CR or ESC, c ENABLE RECORD CR	Lines longer than 160 characters are split into blocks of 160 or less
Close file and terminate recording	Press Record SFK	ESC, c DISABLE RECORD CR	
FIND a record or move pointer to end of data on source	Cannot be done from terminal keyboard	ESC, c FIND RECORD CR or ESC, c FIND END DATA CR	Record zero is the beginning of the file; a number greater than the number of strings on file finds end of data

Operation	from keyboard:	Follow this procedure / sequence from host, command is:	Comments
DISABLE / ENABLE Hardcopy device	Press Hardcopy SFK	ESC,c DISABLE LOG CR ESC,c ENABLER LOG CR	
DISABLE / ENABLE Keyboard	Cannot be done from terminal keyboard	ESC,c DISABLE KEYBOARD CR ESC,c ENABLE KEYBOARD CR	
DISABLE / ENABLE Uploading Handshake	Can be done from terminal keyboard when upload key is pressed	ESC,c DISABLE HANDSHAKE CR ESC,c ENABLE HANDSHAKE CR	
DISABLE / ENABLE Verify	Cannot be done from terminal keyboard	ESC,c DISABLE VERIFY CR ESC,c DISABLE VERIFY ESC	Turns on or off CHECK READ mode (referred to as write-backspace-read)
Verify if last ESC,c command was successfully executed	Cannot be done from terminal keyboard	ESC,c REPORT STATUS COMMAND CR	If a zero is returned, the command was successfully executed; if a nonzero number is returned, the last command failed
REWIND tape cartridge	Press REWIND key	ESC,c REWIND RIGHT CR	
RUN a program	Cannot be done from terminal keyboard	ESC,c RUN file device CR	See Appendix D for an example

NOTE

The term "file device" refers to:
FILE filename DEVICE device specifier

Chapter 3

Troubleshooting and Comments

This part of the manual explains some conditions or areas of confusion you may encounter during the course of running the terminal emulator programs. (If you are starting up a connection for the first time, it is often easier to start with the character mode program.)

The first section is a table which describes some hardware error messages or conditions that may occur, their possible causes and suggested methods by which to correct the situations. Error messages for the terminal emulator programs appear in this format:

\# sc ERROR MESSAGE where sc is the select code

(Associated **software** error messages are listed in Appendix A of this manual.)

The second section of Chapter 3 briefly explains three types of handshake referred to at various times in this manual. For a more detailed discussion of datacomm handshakes, refer to the Asynchronous Data Communication Programming manual.

The last section explains the log-on procedure required when a modem is used.

Errors

Message / Condition	Probable Cause(s)	Suggested Changes / Areas to Check
Tape cartridge won't read or write	98046 card is set on a select code in the range of 8 to 13	Use a select code for the 98046 in the range of 2 to 7; execute a SCRATCH C and rerun program.
Data are underscored	Parity and / or framing parameter is incorrect	Change parity parameter, stop-bits parameter, character length parameter baud rate parameter, or modem handshake via Edit mode.
Host receives nothing or receives meaningless	Data transmitted incorrectly. information	Increase gap paramter (GAP=) in program;* change the baud rate (Speed) via Edit mode or in program; or turn modem handshake on.
Host does not recognize input when parameters are changed	You failed to sign off before changing parameters – host is still expecting old parameters.	Reset to old parameters and then sign off.
CRT displays highlighted characters or characters in other languages	Host is sending 7 bits + parity; terminal is set for 8 bits per character.	Change bits / char parameter via Edit mode or in program and also change parity via Edit mode.

Message/Condition	Probable Cause(s)	Suggested Changes/Areas to Check
Clear-to-send line false or missing clock	Modem is not operating properly.	Recheck modem connection or change baud rate parameter if it is set at EXT.
Channel MEMLIMIT overflow	Transmit or receive queues have overflowed.	Increase MEMLIMIT parameter* and increase CCOM also.
Input buffer overflow	Terminal cannot process input fast enough.	Change handshake via Edit mode to ENQ/ACK or DC1/DC3; increase INBUFFER parameter in program*; decrease baud rate (Speed) via Edit mode or in program*; configure host to delay between outputting lines or to send pad characters at the end of each line.
Internal buffer overflow	Modem signals change frequently.	Check modem to determine if it is non-standard; check the 98046 to determine if it is wired correctly; or redial to get a new line. (You can also execute a CDUMP which shows an information trace on the CRT. Refer to the Asynchronous Data Communication Programming manual for an explanation of CDUMP).
Autodisconnect forced	Data Set Ready (DSR) or Data Carrier Detect modem lines have become inactive within time limit specified by LOST CARRIER parameter.	Increase the LOST CARRIER parameter* in program or set it to 0 which means it is disabled.
NOACTIVITY timeout	Nothing received or transmitted within the time specified by the NOACTIVITY parameter.	Increase NOACTIVITY parameter or set it to 0 which disables the automatic disconnect.
98046 buffer overrun	98046 card cannot get interrupt service.	Reduce the number of I/O devices connected to your 9835A.

* For instructions on how to change parameters in the program, refer to Chapter 4, part five, Adding CMODEL/CCONNECT options.

Handshakes

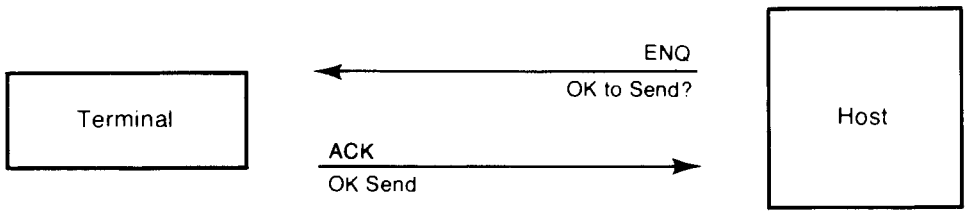
The term handshake as referred to in the terminal emulator programs and this manual can have various meanings depending on the areas being discussed. These areas are:

- ENQ/ACK or DC1/DC3
- Uploading
- Modems

ENQ/ACK – DC1/DC3 Handshake

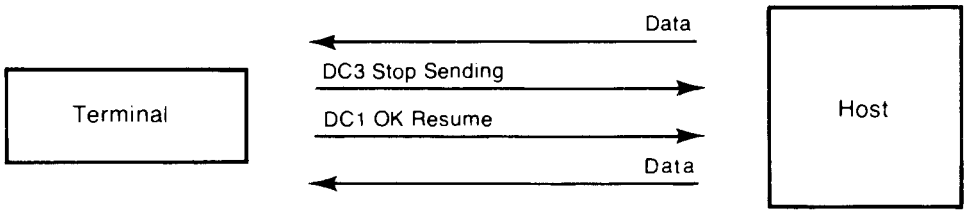
The ENQ/ACK or DC1/DC3 handshake refers to the type of protocol used in the host-to-terminal connection. The type of connection needed is determined during your preliminary investigation of the time-share device.

If ENQ/ACK is chosen (via the Edit mode), the host sends an ENQ character to the terminal, signaling that data is ready to be sent; then waits for the terminal to acknowledge with an ASCII character before continuing transmission.



Representation of ENQ/ACK Handshake Procedure

If DC1/DC3 handshake is specified, the terminal sends the host a transmit off (DC3) signal which stops the transmittal of data. When the terminal is ready to receive more data, it sends a transmit on (DC1) signal to the host and data is transmitted until another DC3 is sent.

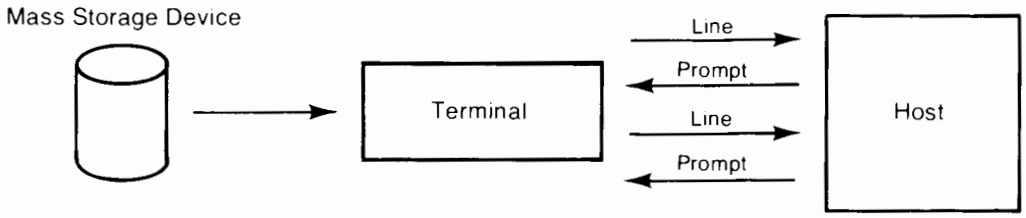


Representation of XON/XOFF Handshake Procedure

Uploading Handshake

Uploading is a mass storage operation in which data is read from a local mass storage device to the host. The uploading handshake determines whether the data is to be read one line at a time or an entire file at once.

If the uploading handshake is on (the default condition), data is transferred one line at a time. A prompt is sent after each line has been received to indicate the host is ready for the next line to be sent.



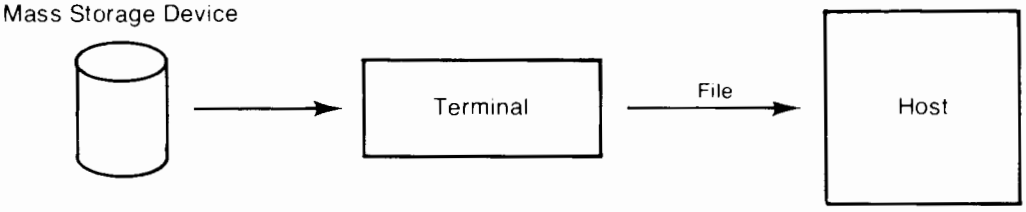
Representation of Uploading Handshake On

If the uploading handshake has been disabled by means of the escape sequence

ESC,c DISABLE HANDSHAKE CR

one entire file is sent.

To save time in uploading, you may turn the handshake off **provided the host is capable of receiving burst data.**



Representation of Uploading Handshake Off

Modem Handshake

The modem handshake, which can be turned on via Edit mode, establishes a connection and enables the timing and control signals between the terminal and the host. If the modem handshake is turned on by means of a program modification before the program is run, the initial display and log-on procedure differs from that given in Chapter 1 of this manual. That log-on procedure is explained in the next section.

Modem handshake establishes a hardwired handshake over the RS232 lines between the terminal and the modem. This handshake is needed whenever a modem is used.

Log-on Procedure with Modem Handshake On

If the modem handshake is on but the modem is not connected, the program displays this message after it scans for an interface select code:

```
Waiting for connection - press any key to abort.
```

At that time, connect the modem after which the `Terminal ready on` select code message will be displayed. If you decide you don't want the modem handshake on or you want to change other parameters, press any key to abort the connection.

If you abort, the message `Connection aborted by user` will be displayed followed by the message `Disconnecting`. This message may last up to 25 seconds before you can proceed further. You can then press the Edit SFK; turn off the modem handshake; change any other parameters if needed, then press RUN again.

Chapter 4
Program Modifications

Because there are parts of each program you may want to change, the Emulator program has been designed to enable you to make modifications easily. Described in this section are modification procedures for:

- Adding and deleting keyboard functions
- Modifying power-up options
- Establishing a default select code
- Deleting prompt checking
- Adding CMODEL/CCONNECT options

Instructions

1. Load the specific terminal emulator program into memory by
   a. Typing LOAD and the program name enclosed in quotes
   b. Pressing EXECUTE

2. Edit the proper line by
   a. Typing EDIT LINE xxx (where xxx is the number or label of the line you wish to edit).
   b. Pressing EXECUTE
   c. Making the desired modifications when the line appears on the screen.
   d. Pressing STORE

3. Repeat step 2 for each line you wish to modify. Once all modifications have been made, store the modified version of the program for future use by
   a. Typing STORE "filename" (where "filename" is a valid name and mass storage device code).
   b. Pressing EXECUTE

   In the future, to use the modified program, use the filename of the modified terminal emulator program at start-up instead of LINMOD, CHRMOD or GRPMOD.

4. If you wish to store the modified version and delete the original version:
   a. Type RE-STORE and the specific program name enclosed in quotes
   b. Press EXECUTE

Adding Keyboard Functions

Because alphanumeric keys are locked out during the programs' execution, you cannot execute commands or statements from the keyboard such as `CAT #0;":F8"` which lists directory information from the flexible disk to the internal printer. You can, however, add new keyboard functions to the program and access them by way of non-ASCII keys.

To add a new keyboard function, such as CAT #0; ":F8", first stop the program's execution and

1. Select a non-ASCII key from which you want to access the new function, such as CONTROL K3.
2. Refer to the following keyboard illustration table to find the decimal value of the selected key. In this case K3 has a decimal value of 3 and CONTROL adds 128, making the total value 131. This number is referred to as the **location** value.

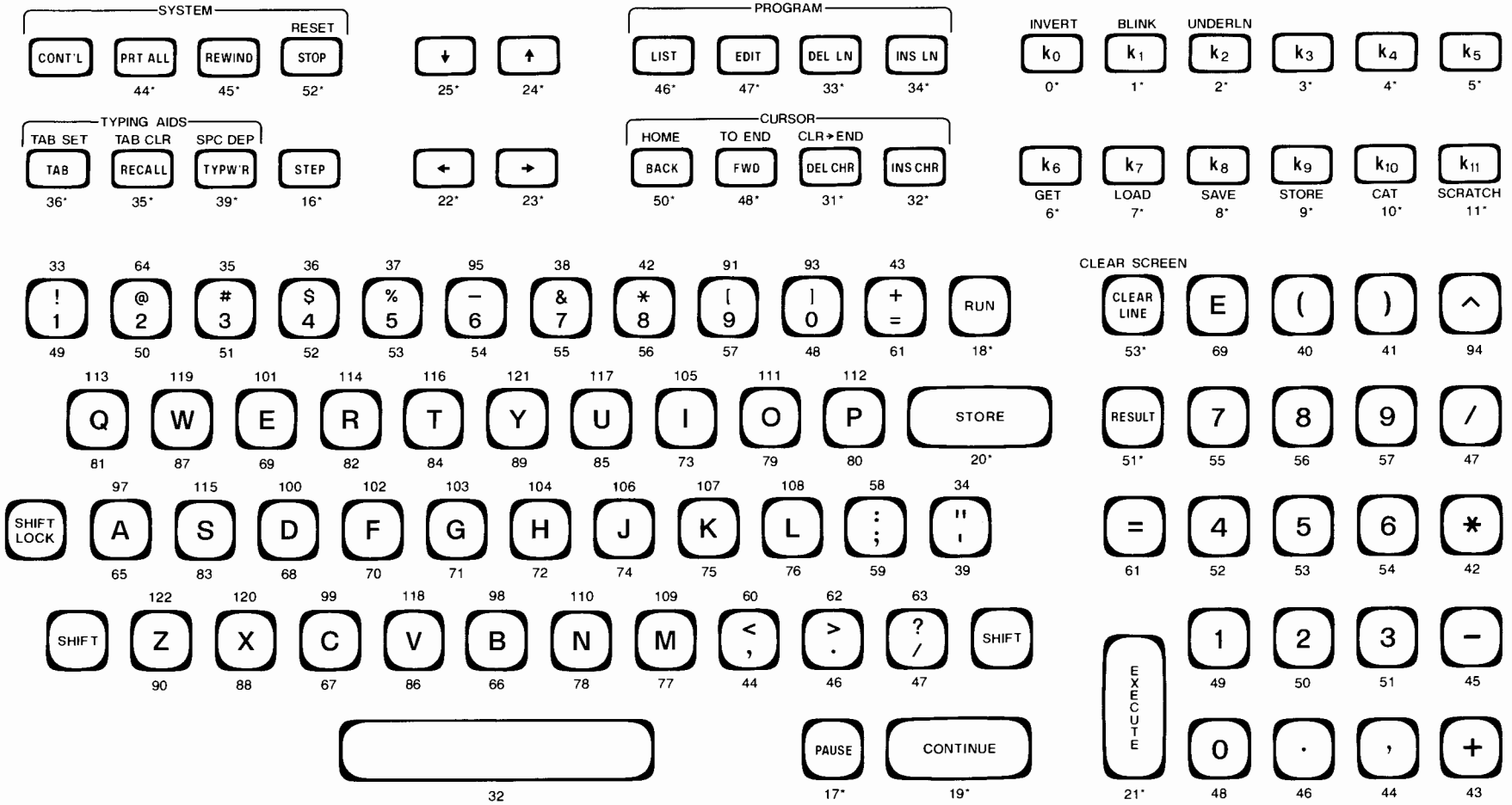
Each non-ASCII key, when pressed, returns a different decimal value if the SHIFT or CONTROL key is pressed. If SHIFT is pressed, add 64 to the decimal value; if CONTROL is pressed, add 128. If SHIFT and CONTROL are both pressed, add 192 to the decimal value.

3. Type `EDITLINE Map` and press EXECUTE. This accesses that part of the program at line label Map as shown in the following example printout (taken from the character mode program).

```
                                                                                 Location
                                                                                  Values
6715        ! Highest used is: 42
6720 Map:   DATA 34,34,34,34,31,-32,-17,-41,-36,-37,-40,-35,1,1,1,1 ------------> 0-15
6725        DATA 1,1,1,10,    10,-11,6,9,   1,1,1,1,      1,1,1,3                16-31
6730        DATA 2,1,1,29,    19,1,1,1,     1,1,1,1,      -24,-39,-23,28         32-47
6735        DATA 9,1,14,1,    1,12,1,1,     1,1,1,1,      1,1,1,1                48-63
6740        DATA 34,34,34,(34), -26,-33,-22,-42,-16,1,-15,-15,1,1,1,1            64-79
6745        DATA 1,1,1,10,    10,-11,6,9,   -8,-7,1,1,    1,1,1,18               80-95
6750        DATA 1,1,1,30,    25,1,1,1,     1,1,1,1,      -24,1,-23,28           96-111
6755        DATA 5,1,4,1,     1,-13,1,1,    1,1,1,1,      1,1,1,1                112-127
6760        DATA 1,1,1,1,     1,1,1,1,      1,1,1,1,      1,1,1,1                128-143
6765        DATA 1,1,1,10,    10,-11,1,1,   1,1,1,1,      1,1,1,1                144-159
6770        DATA 1,1,1,21,    20,1,1,1,     1,1,1,1,      1,1,1,1                160-175
6775        DATA 1,1,1,1,     1,-27,1,1,    1,1,1,1,      1,1,1,1                175-191
6780        DATA 1,1,1,1,     1,1,1,1,      1,1,1,1,      1,1,1,1                192-207
6785        DATA 1,1,1,10,    10,-11,1,1,   1,1,1,1,      1,1,1,1                208-223
6790        DATA 1,1,1,38,    20,1,1,1,     1,1,1,1,      1,1,1,1                224-239
6795        DATA 1,1,1,1,     1,-27,1,1,    1,1,1,1,      1,1,1,1 -------------> 240-255
6800        DATA 002,003,000,001,064,065,066,067,045,010,075,074
6805        DATA 127,027,123,125,092,096,126,124,015,015,001,002
6810        DATA -1
```

Location Value 67

Note that there are 16 integers per `DATA` line. Integers in the first line are assigned location values 0-15; integers in the section `DATA` line are assigned location values 16-31; location value 67 is found in the fifth `DATA` line, (location value range 64-79).



* Non ASCII Keys, see READBIN 0 and ON KBD

If (SHIFT) is held down when the key is pressed, add 64 to the key value shown.

If (CONT) is held down when the key is pressed, add 128 to the key value shown.

9835A Keyboard and Corresponding Decimal Values for Non-ASCII Keys (ASCII keys are shaded)

The line preceding the line label Map contains a comment showing the largest integer used in the map data (refer to previous printout).

4. Add one to this integer. According to the printout, 42 is the largest integer; the integer you use in the new function, then, is 43.
5. Scroll to the DATA line containing the location value and change the current integer to the new integer. In this example case, you scroll to the ninth DATA line where the first integer is in location 128; the second integer is in location 129. The fourth integer is in location 131. Change that integer to 43.*

Old line: `6760 DATA 1,1,1,1 1,1,1,1, 1,1,1,1, 1,1,1,1`
New line: `6760 DATA 1,1,1,43 1,1,1,1 1,1,1,1 1,1,1,1`

6. STORE the modified line.
7. Next, execute EDITLINE Dokey and scroll down one line to access the ON GOTO statement:

```
1810 Dokey: IF K>100 THEN Udf
1820        ON K GOTO Err,St,Hr,H,Cp,Ar,Ck,Dk,E,S,Tn,Rn,C,Z,Cak,Lt,Bk,Cnd,U,R,A,
Abk,Sts,P,Rm,Cat,Cal,Err,Err,Err,T,Stp
```

Add the line label of your new function to the end of that ON GOTO line and press STORE. Using Catalog_to_f8 as the line label for the example function, you would change the ON GOTO line to appear as:

```
1820        ON K GOTO Err,St,Hr,H,Cp,Ar,Ck,Dk,E,S,Tn,Rn,C,Z,Cak,Lt,Bk,Cnd,U,R,A,
Abk,Sts,P,Rm,Cat,Cal,Err,Err,Err,T,Stp,Catalog_to_f8
```

8. Insert your new function in the program. (Do not insert the function between lines of other functions. Place the new function before or after other functions.) You can, for example, add the Catalog_to_f8 function to the end of the program as shown here:

```
6211 Catalog_to_f8:  CAT #0;":F8"
6212                 GOTO Key1
```

Note that this function ends with a GOTO Key1 statement. All new functions must end with this statement.

9. RE-STORE the program if you want the new function to be permanent.
10. Before you run the program with the new function included, execute SCRATCH C to reset the key definitions. If the program is running, press the Clear All Keys SFK to reset the definitions.

* A positive integer locks out the keyboard. If the integer is negative, the key value is not locked out when transmission is in Hold

Deleting Keyboard Functions

To be able to include new keyboard functions, it may be necessary for you to delete other functions that are not applicable, thereby releasing memory space for the new functions. To delete a keyboard function:

1. Refer to the keyboard illustration in the Adding Keyboard Functions section, find the decimal (location) value in the Map section of the program, as described in Adding Keyboard Functions section.
2. Execute EDITLINE Map
3. Change the integer at that location value to 1. Note that all other locations which reference the selected key must also be changed to 1.
4. Remove the sections of the character or line mode program which are associated with the keyboard function which is to be deleted. The following chart indicates which sections should be removed.

To delete the function(s)	Delete these lines:		
	Line mode	Char mode	Graphics mode
Insert/Delete	2160-2210 2580-2600		
Trace	2605-2620	2070-2085	2100-2115
"Hold" feature	2320-2340		
Break, Alt Break, and ACK	2625-2685	2090-2150	2120-2180
Tabs	2690-2765 1300 1070		
Hardcopy	5365-5405 3190-3215 6195-6200	2555-2575 4735-4755 5585-5590	2595-2615 4835-4855 5715-5720
Recall	3220-3245 3265-3290 2410-2440 1075		
Recording	3295-3335 4985-5035 6030-6065 6125-6140 3355-3360	2580-2615 5440-5465 5525-5535 2630-2635 4255-4300 4340-4375	2620-2655 5570-5595 5655-5665 2670-2675 4355-4400 4440-4475
Create/Purge keys	3380-3510	2650-2780	2690-2825
Disp fns and escape codes	5535-5585 5610-6645 1080 1210-1240 3515-3540	4900-5025 5055-6025 1070 1215-1245 2785-2815	5000-5145 5175-6155 1070 1225-1255 2830-2860

To delete the function(s)	Delete these lines: Line mode	Char mode	Graphics mode
Uploading	1560-1635	1570-1650	1580-1660
	3545-3625	2820-2900	2865-2950
	6000-6025	5415-5435	5545-5565
	6175-6190	5570-5580	5700-5710
Rewind/Cat	3640-3685	2915-2955	2965-3005
Edit mode	3725-4560	2990-3815	3040-3895
Define key	4565-4895	3820-4145	3900-4235
	1085	1075	1075
	5270-5315	4645-4690	4745-4790
	6685-6710	6065-6090	6195-6220
List status	2770-3065	2180-2460	2215-2500
	3120-3185	2485-2550	2525-2590
	1065	1065	1065
	1090-1095	1080-1085	1080-1085
If both Def Key	1110-1140	1110-1140	1110-1140
and List Status are	1015	1015	1015
removed:	5505-5525	4870-4890	4970-4990

If you wanted to delete the CAT keyboard function (K10) in character mode, for example, you would stop the program execution and then:

1. Find the decimal (location) value for the CAT key which is 10 (on keyboard illustration shown in previous section).
2. Type `EDITLINE Map` and press EXECUTE; move the cursor to the eleventh integer on the first `DATA` line and change that integer as shown in this example printout:

Old line: `6720 Map: DATA 34,34,34,34,31,-32,-17,-41,-36,-37,-40,-35,1,1,1,1`
New line: `6720 Map: DATA 34,34,34,34 31,-32,-17,-41 -36,-37,  1,-35,1,1,1,1`

3. STORE the line
4. Refer to the previous table to find line numbers to be deleted.

   Type: `DEL 3640,3685` then press EXECUTE.

Modifying Power-up Options

All of the power-up default options are located after the label Defaults (refer to the next example printout taken from the character mode program). Several of the options are located in READ-DATA pairs and may be modified by simply changing the values in the DATA statement. Several more options are located in assignment statements within the Defaults section. These are modified by changing the appropriate assignment to the desired variable.

```
1245 Defaults:RESTORE Defaults
1250         READ Hard_sc,Hard_hpib,Screen,Recordfile$,Recorddev$,Recordprot$
1255         DATA    0,       0,         16,      TEST,         :T15,      ""
1260         READ Filesize,Bitsperchar,Check,Speed,Hardwidth,Prompthandshake
1265         DATA    10,        7,         3,     300,    160,       1
1270         Pr_seq$=Recallbuffer$=Defstorage$=""
1275         Insep$=CHR$(13)&CHR$(10)
1280         Outsep$=CHR$(13)
1285         Prompt$=CHR$(17)
1290         Alt_brk$=CHR$(25)
1295         Eof$="//"&Outsep$
1300         Tabs$=RPT$("       *",20)
1305         GOSUB Setall
1310         Hardcopy=Verify=Disp_fns=Modem=0
1315         Promptwaiting=Remote=Stopbits=Echo=Handshk=Commonok=1
```

The names of the options are self-explanatory. Note the following rules while modifying the options:

1. Screen must be a valid select code.
2. Bitsperchar must be in the range 5 to 8, inclusive.
3. Check may assume only one value 0, 1, 2, 3 or 4; Note: Check=0 or 1 when Bitsperchar=8 is illegal and the program sets Check=4.
4. Speed must be a legal baud rate: 50, 75, 100, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 4800, 9600 or 0 (EXT).
5. Stopbits may be only 1, 1.5 or 2.
6. Insep$ and Prompt$ are the delimiters for the CMODEL ASYNC statement and may contain up to two characters.
7. Outsep$ is the end-of-line sequence sent to the host to terminate each line. It may contain up to six characters.
8. Hard_sc must be a valid select code and Hard_hpib is secondary address (1-30) or 0 (off).

Specifying a Default Select Code

Unless the terminal emulator programs are modified, they do not use a default interface select code. Instead, the programs scan all select codes for the presence of a valid interface.

This can be changed by:

1. Executing EDITLINE
2. Typing 10 Sc= and the select code of the interface.
3. Pressing STORE and typing RE-STORE and the program name

The program then uses that select code unless the interface is not installed. In that case, the program scans for another valid select code.

Deleting the Prompt Checking

In the Line Mode Program only, to transmit lines directly instead of having to wait for a prompt from the host, you must redefine STORE and CONTINUE to contain the same location value as EXECUTE. You do this by:

Executing EDITLINE Map

According to the keyboard illustration in the Adding Keyboard Functions section, shown in a previous section of this chapter, the location value for STORE is 20 and the value for EXECUTE is 21. Scroll to the DATA line in the Map section that contains location values 20 and 21.

Change the integer in location value 20 to the integer that is in location value 21 and STORE the line. An example printout from the character mode program showing the specific location values and integers is:

Old line: 6725 DATA 1,1,1,10, 10,-11,6,9 1,1,1,1, 1,1,1,3
New line: 6725 DATA 1,1,1,-11,-11,-11,6,9, 1,1,1,1 1,1,1,3

Follow the same procedure for CONTINUE (location value 19) and if you want, for the SHIFT, CONTROL and CONTROL SHIFT also.

In instances where you want only a temporary redefinition of STORE and CONTINUE use the Define Key procedure.

Adding CMODEL/CCONNECT Options

To add more options or parameters to the CMODEL ASYNC or CCONNECT statements:

1. Execute EDITLINE Domodel, scroll to the CMODEL ASYNC statement, make the additions or corrections and STORE the line.

```
5055 Domodel:Cmodelerror=1
5060         IF (Check<2) AND (Bitsperchar=8) THEN Check=4
5065         DISP "Disconnecting"
5070         ON ERROR GOTO Do_5
5075         CDISCONNECT Sc;HOLD
5080         CMODEL ASYNC,Sc;INSEP=Insep$,PROMPT=Prompt$,ALERTN=160,CHARLENGTH=Bi
tsperchar,CHECK=Check,STOPBITS=Stopbits
5085         Ccomused=CSTAT(Sc,4)
```

The list of possible options for the CMODEL ASYNC statement includes:

INSEP=		CHARLENGTH=	MEMLIMIT=	for
OUTSEP=		STOPBITS=	INBUFFER=	Memory
PROMPT=	for	GAP=	TBUFFER=	Allocation
ALERTN=	Protocol	HALF DUPLEX/FULL DUPLEX		
CHECK=				

2. Scroll to the next IF-THEN statement containing a CCONNECT statement, make your changes/ additions, STORE the line and repeat the procedure for the next IF-THEN statement which contains a CCONNECT also.

```
5090         IF NOT Modem THEN CCONNECT Sc;SPEED=Speed,HANDSHAKE OFF,NO ACTIVITY=
0
5095         IF Modem THEN CCONNECT Sc;SPEED=Speed,HANDSHAKE ON
5100 Do_0:   ON INT #Sc,9 GOTO Do_3
5105 Do_1:   IF CSTAT(Sc,5)=2 THEN Do_2
5110         ON KBD 9 GOTO Do_kbd
5115         DISP "Waiting for connection - press any key to abort"
5120         GOTO Do_1
```

The options available for CCONNECT include:

SPEED=	HANDSHAKE ON/OFF
INSPEED=	LOST CARRIER=
OUTSPEED=	NO ACTIVITY=
EXTERNAL=	

Refer to the Asynchronous Data Communications Programming manual for explanations of the two sets of previously listed options.

If you increase the amount of memory for more buffering in your datacomm operation, change the CCOM statement at the beginning of the program by executing EDITLINE, scrolling to the CCOM statement, changing the numeric expression and storing the line.

To determine how much memory is really needed, check the Status Display in the "CCOM used" area.

Appendix A
Program Messages

The following list describes various messages which may be encountered during execution of the terminal emulator programs.

<file name> created to <file size> records.
A CREATE operation has been successfully completed. This tells how many records were created in the file.

<file name> purged.
A PURGE operation has been successfully completed.

<key name> key definition cleared
This verifies completion of the CLEAR SFK key. The <key name> is now back to its original definition.

All key definitions cleared
All key definitions have been reset to their original values.
(Verifies completion of CLEAR ALL KEYS SFK key.)

All tabs cleared
All tab positions have been cleared using the CLEAR ALL TABS SFK key.

Cannot define that key - aborted
You attempted to redefine an ASCII character key. This is not allowed; DEFINE KEY mode has been exited.

Connection aborted by user
This is displayed for one second if a key is pressed when a connection is attempted.

Datacomm not in active state resulted in error (<error number>)
Datacomm was not active so a CWRITE or CCONTROL statement could not be executed. STOP the program and press RUN again.

Define Key mode: Enter key to be changed
DEFINE KEY mode has been entered. You should now press the key which you want to redefine.

Define key mode: Hit <key name> key to exit
DEFINE KEY mode is in progress. If you press any key other than <key name>, it will be entered into the definition. If you press <key name>, DEFINE KEY mode will be exited and the definition complete.

`Definition buffer full - definition complete`

There are only a limited number of character positions available for redefinition and they have all been used. You may free more space by clearing definitions of other keys which are not being used. The key definition as entered is still kept, up to the point that it was aborted by the program.

`Definition buffer full - ignored`

DEFINE KEY mode cannot be entered because the redefinition buffer is full (Refer to preceding message).

`Definition complete`

Verifies that DEFINE KEY mode has been successfully exited.

`Disconnecting`

This informs you that a `CDISCONNECT` statement is being executed, which may take up to 25 seconds to complete.

`Display functions off`

Display-functions mode (which displays all control letters) has been disabled for both the screen and hardcopy device.

`Display functions on`

Display-functions mode (which displays all control letters) has been enabled for both the screen and hardcopy device.

`Do you want to use prompt handshake for uploading?`

Type "Y" if you wish to proceed with uploading using the one-line-per-prompt handshake. Otherwise, the file is sent all at once.

`Edit mode: ← =previous, → = next, STEP = select, STORE = exit`

Edit mode part one is in effect: Use ⇦ and ⇨ keys to move the cursor to the proper field, STEP or SHIFT STEP to select a different value; or STORE to move to Edit mode part two.

`Edit mode: use arrows, ASCII keys or STORE to exit`

Edit mode part two is in effect: Use ⇦ and ⇨ keys to move the cursor to the proper field and character; type an ASCII key or one of the SFK-ASCII (⌐ or ▒) keys to change the value of a field; or STORE to exit Edit mode.

`Edit mode exited`

Edit mode has been successfully exited and all new values installed.

`End of file reached`

The destination file during recording is too small and recording has been aborted. Try creating the file to a larger size and rerecording it.

`Enter key to be cleared`

Clr key mode has been entered: enter the key whose definition you want to clear.

File assignment of <file name> unsuccessful
Assignment of a file for recording or uploading ("send") has failed for one of the following reasons: (1) missing file, (2) missing device, (3) protected file for recording.

File creation/purge failed.
An attempted CREATE or PURGE from the keyboard failed for one of the following reasons: (1) file already exists for CREATE; (2) file doesn't exist for PURGE; (3) illegal file name; (4) missing device; (5) mass storage device is protected.

File recording aborted due to error #<error number>
Attempted start of recording from keyboard failed due to the BASIC error number specified.

File usage conflict
Attempted upload and record at the same time.

Graphics compatibility off (Graphics mode only)
Graphics-compatibility mode has been disabled from the keyboard.

Graphics compatibility on (Graphics mode only)
Graphics-compatibility mode has been enabled from the keyboard. If a ESC character is received, graphics mode will be entered.

Graphics mode entered (Graphics mode only)
Verifies that graphics mode is in effect.

Graphics mode exited (Graphics mode only)
Verifies that graphics mode is no longer in effect.

Hardcopy off
The hardcopy printer has been disabled.

Hardcopy on
The hardcopy printer has been enabled.

Hold
The user tried to send a line with STORE or CONTINUE but a prompt has not been received. If you want to send the line anyway, press EXECUTE. Otherwise, the line will be sent when a prompt is received (Line mode only).

Initializing
The program COMmon area was not recoverable so all variables are initialized to their default values.

Insert mode turned off
Insert-mode has been turned off because the cursor reached the end of the keyboard line (Line mode only).

Insufficient CCOM allowance for select code <select code> FATAL!!
There was not enough CCOM for the CMODEL statement as specified. Change the program so that CCOM is larger.

Keystroke buffer overflow
Key redefinitions resulted in a buffer overflow. This probably means that you have a recursive definition. Examine the definitions using List SFK.

Local
Local mode has been entered. Output from the host computer will be ignored and data from the keyboard will be executed as data from the host.

No 98046 installed
No interfaces were found when program started. Insert an interface or check for two interfaces on the same select code, then press RUN.

Program stopped and datacomm disconnected
The program has been exited with the Disconnect SFK and datacomm has been disconnected. If you are connected to a telephone line, you should hang up.

Program stopped without disconnect
The program has been stopped with the STOP key. The connection is still in effect, and if you press RUN, normal communications will resume (character mode only).

Purge/create not verified
An attempted PURGE or CREATE from the keyboard was not verified by pressing the "Y" key. No operation was done.

Recording on <file name>
Recording has been successfully begun on the file name specified.

Recording stopped
Recording has been stopped from the keyboard. The file is intact and the mass storage device may be removed with no harm.

Remote
Local mode has been exited and communications with the host computer resumed.

Terminal ready on <sel code> {Local} {Disp fns} {Echo off} {Hardcopy on}
The terminal program is ready for communications. If any of the four messages in braces appear, it merely reminds the user that these non-default values are in effect.

Type Y to verify CREATE of <file name>
A CREATE operation will be attempted if you type "Y" to verify it. Otherwise, no operation will be performed.

Type 'Y' to verify PURGE of <file name>
A PURGE operation will be attempted if you type "Y" to verify it. Otherwise, no operation will be performed.

Unexpected error in setting up CMODEL (<error message>) FATAL!!
An unexpected error happened in setting up datacomm, and the program has stopped. Inspect the line specified in the error message for any error.

Uploading <file name>
Uploading has successfully begun.

Uploading <file name> without handshake
Uploading has successfully begun without using prompt-handshake.

Uploading stopped
Uploading has been prematurely stopped from the keyboard.

Waiting for connection - press any key to abort
Program will not progress further until a line connection is made, or you press any key. In either case the program becomes active, but any action with the datacomm channel (which has been disconnected) will not be permitted

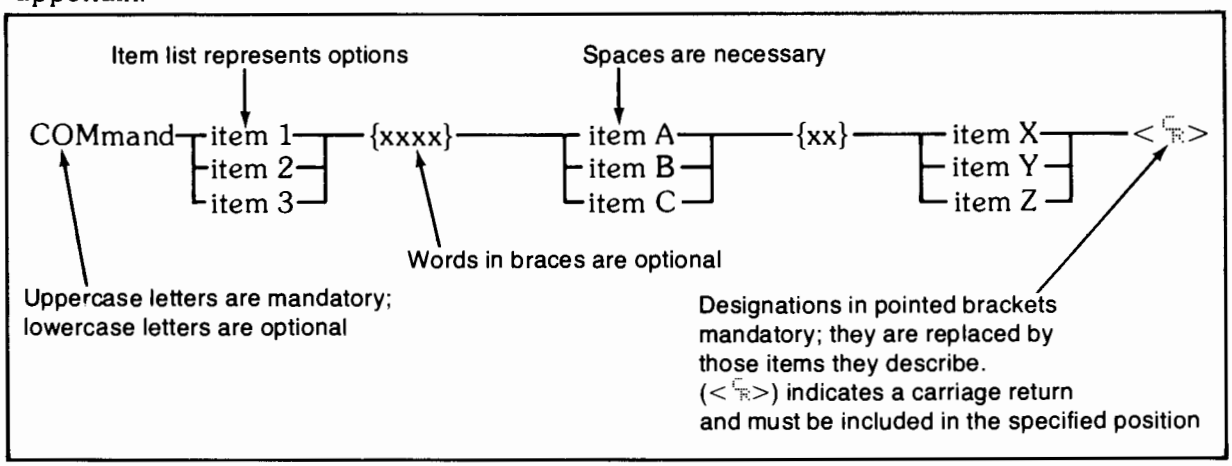
Waiting for cursor information
The graphics terminal program is waiting for the user to position the cursor and send the information to the host (GIN mode).

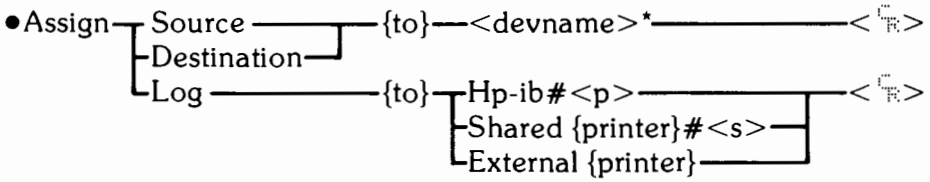
What is the select code you wish to use?
There are two or more datacomm interfaces installed in the backplane. Enter the select code of the you wish to use.

Appendix B

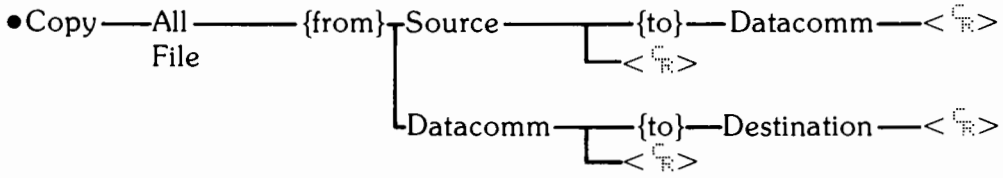
Complete Mass Storage Operations

The following format conventions are used to describe the Mass Storage operations in this appendix:

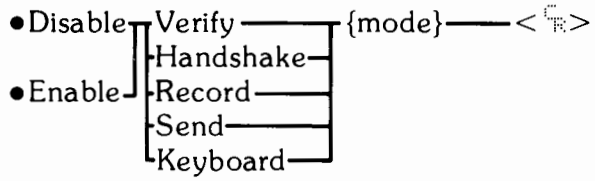




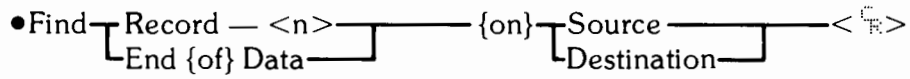
Assign... allows you to establish a source file for transmitting data or a destination file for receiving data. The Log parameter is used with this escape sequence for establishing a hardcopy printer device for use during datacomm operations. The parameter <s> represents the printer interface select code number.



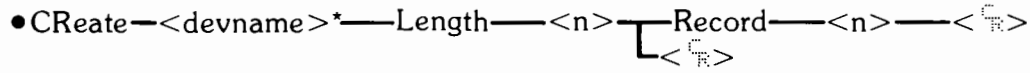
Copy... acts as an Enable Record (COPY ALL FROM DATACOMM...) or Enable Send (COPY ALL FROM SOURCE....). It is used to send data from the source file to the datacomm lines or record data from the lines into the source file.



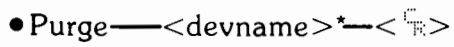
Disable/Enable sequence is used to enable/disable the listed features.



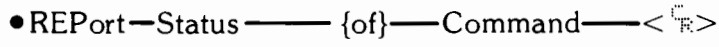
Find... is used to identify (with a pointer) a particular record or the end of data records with the source or destination file.



Create... allows you to create a file specifying file length in records and record length in bytes.

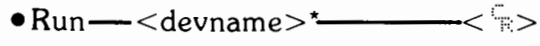


Purge... is used to purge specified files.



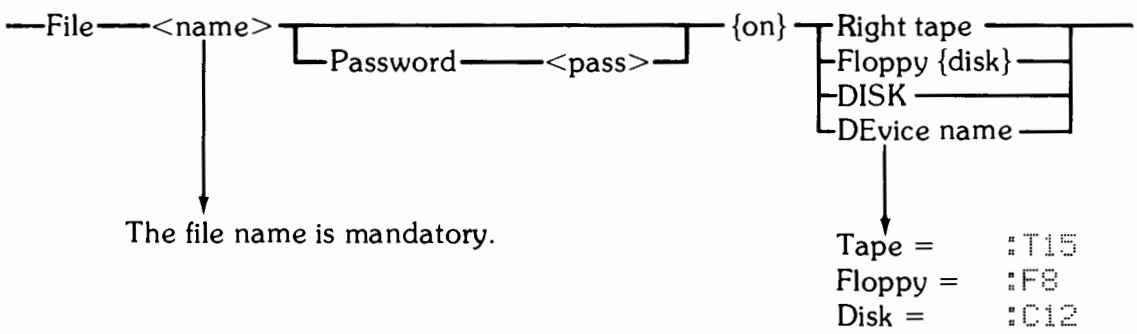
Report... is used to request the success or failure of a previously executed command.

Rewind... rewinds the tape drive.



Run.... initiates the execution of a program in a specified file.

* The term <devname> implies this structure:



Appendix C
Tables

ASCII Table

ASCII Char.	EQUIVALENT FORMS Binary	Octal	Dec
NUL	00000000	000	0
SOH	00000001	001	1
STX	00000010	002	2
ETX	00000011	003	3
EOT	00000100	004	4
ENQ	00000101	005	5
ACK	00000110	006	6
BEL	00000111	007	7
BS	00001000	010	8
H.T	00001001	011	9
LF	00001010	012	10
VT	00001011	013	11
FF	00001100	014	12
CR	00001101	015	13
SO	00001110	016	14
SI	00001111	017	15
DLE	00010000	020	16
DC_1	00010001	021	17
DC_2	00010010	022	18
DC_3	00010011	023	19
DC_4	00010100	024	20
NAK	00010101	025	21
SYN	00010110	026	22
ETB	00010111	027	23
CAN	00011000	030	24
EM	00011001	031	25
SUB	00011010	032	26
ESC	00011011	033	27
FS	00011100	034	28
GS	00011101	035	29
RS	00011110	036	30
US	00011111	037	31

ASCII Char.	EQUIVALENT FORMS Binary	Octal	Dec
space	00100000	040	32
!	00100001	041	33
"	00100010	042	34
#	00100011	043	35
$	00100100	044	36
%	00100101	045	37
&	00100110	046	38
'	00100111	047	39
(	00101000	050	40
)	00101001	051	41
*	00101010	052	42
+	00101011	053	43
,	00101100	054	44
-	00101101	055	45
.	00101110	056	46
/	00101111	057	47
0	00110000	060	48
1	00110001	061	49
2	00110010	062	50
3	00110011	063	51
4	00110100	064	52
5	00110101	065	53
6	00110110	066	54
7	00110111	067	55
8	00111000	070	56
9	00111001	071	57
:	00111010	072	58
;	00111011	073	59
<	00111100	074	60
=	00111101	075	61
>	00111110	076	62
?	00111111	077	63

ASCII Char.	EQUIVALENT FORMS Binary	Octal	Dec
@	01000000	100	64
A	01000001	101	65
B	01000010	102	66
C	01000011	103	67
D	01000100	104	68
E	01000101	105	69
F	01000110	106	70
G	01000111	107	71
H	01001000	110	72
I	01001001	111	73
J	01001010	112	74
K	01001011	113	75
L	01001100	114	76
M	01001101	115	77
N	01001110	116	78
O	01001111	117	79
P	01010000	120	80
Q	01010001	121	81
R	01010010	122	82
S	01010011	123	83
T	01010100	124	84
U	01010101	125	85
V	01010110	126	86
W	01010111	127	87
X	01011000	130	88
Y	01011001	131	89
Z	01011010	132	90
[	01011011	133	91
\	01011100	134	92
]	01011101	135	93
^	01011110	136	94
_	01011111	137	95

ASCII Char.	EQUIVALENT FORMS Binary	Octal	Dec
`	01100000	140	96
a	01100001	141	97
b	01100010	142	98
c	01100011	143	99
d	01100100	144	100
e	01100101	145	101
f	01100110	146	102
g	01100111	147	103
h	01101000	150	104
i	01101001	151	105
j	01101010	152	106
k	01101011	153	107
l	01101100	154	108
m	01101101	155	109
n	01101110	156	110
o	01101111	157	111
p	01110000	160	112
q	01110001	161	113
r	01110010	162	114
s	01110011	163	115
t	01110100	164	116
u	01110101	165	117
v	01110110	166	118
w	01110111	167	119
x	01111000	170	120
y	01111001	171	121
z	01111010	172	122
{	01111011	173	123
|	01111100	174	124
}	01111101	175	125
~	01111110	176	126
DEL	01111111	177	127

Coordinates Code Table for Graphics Mode

X or Y Coordinate																Low Order Y		Low Order X	
																DEC.	ASCII	DEC.	ASCII
0	32	64	96	128	160	192	224	256	288	320	352	384	416	448	480	96	`	64	@
1	33	65	97	129	161	193	225	257	289	321	353	385	417	449	481	97	a	65	A
2	34	66	98	130	162	194	266	258	290	322	354	386	418	450	482	98	b	66	B
3	35	67	99	131	163	195	227	259	291	323	355	387	419	451	483	99	c	67	C
4	36	68	100	132	164	196	228	260	292	324	356	388	420	452	484	100	d	68	D
5	37	69	101	133	165	197	229	261	293	325	357	389	421	453	485	101	e	69	E
6	38	70	102	134	166	198	230	262	294	326	358	390	422	454	486	102	f	70	F
7	39	71	103	135	167	199	231	263	295	327	359	391	423	455	487	103	g	71	G
8	40	72	104	136	168	200	232	264	296	328	360	392	424	456	488	104	h	72	H
9	41	73	105	137	169	201	233	265	297	329	361	393	425	457	489	105	i	73	I
10	42	74	106	138	170	202	234	266	298	330	362	394	426	458	490	106	j	74	J
11	43	75	107	139	171	203	235	267	299	331	363	395	427	459	491	107	k	75	K
12	44	76	108	140	172	204	236	268	300	332	364	396	428	460	492	108	l	76	L
13	45	77	109	141	173	205	237	269	301	333	365	397	429	461	493	109	m	77	M
14	46	78	110	142	174	206	238	270	302	334	366	398	430	462	494	110	n	78	N
15	47	79	111	143	175	207	239	271	303	335	367	399	431	463	495	111	o	79	O
16	48	80	112	144	176	208	240	272	304	336	368	400	432	464	496	112	p	80	P
17	49	81	113	145	177	209	241	273	305	337	369	401	433	465	497	113	q	81	Q
18	50	82	114	146	178	210	242	274	306	338	370	402	434	466	498	114	r	82	R
19	51	83	115	147	179	211	243	275	307	339	371	403	435	467	499	115	s	83	S
20	52	84	116	148	180	212	244	276	308	340	372	404	436	468	500	116	t	84	T
21	53	85	117	149	181	213	245	277	309	341	373	405	437	469	501	117	u	85	U
22	54	86	118	150	182	214	246	278	310	342	374	406	438	470	502	118	v	86	V
23	55	87	119	151	183	215	247	279	311	343	375	407	439	471	503	119	w	87	W
24	56	88	120	152	184	216	248	280	312	344	376	408	440	472	504	120	x	88	X
25	57	89	121	153	185	217	249	281	313	345	377	409	441	473	505	121	y	89	Y
26	58	90	122	154	186	218	250	282	314	346	378	410	442	474	506	122	z	90	Z
27	59	91	123	155	187	219	251	283	315	347	379	411	443	475	507	123	{	91	[
28	60	92	124	156	188	220	252	284	316	348	380	412	444	476	508	124	|	92	\
29	61	93	125	157	189	221	253	285	317	349	381	413	445	477	509	125	}	93	]
30	62	94	126	158	190	222	254	286	318	350	382	414	446	478	510	126	~	94	^
31	63	95	127	159	191	223	255	287	319	351	383	415	447	479	511	127	■	95	_
32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	← DEC.			
SP	!	"	#	$	%	&	'	(	)	*	+	,	-	.	/	← ASCII			
High Order X & Y																			

X or Y Coordinate																Low Order Y		Low Order X	
																DEC.	ASCII	DEC.	ASCII
512	544	576	608	640	672	704	736	768	800	832	864	896	928	960	992	96		64	@
513	545	577	609	641	673	705	737	769	801	833	865	897	929	961	993	97	a	65	A
514	546	578	610	642	674	706	738	770	802	834	866	898	930	962	994	98	b	66	B
515	547	579	611	643	675	707	739	771	803	835	867	899	931	963	995	99	c	67	C
516	548	580	612	644	676	708	740	772	804	836	868	900	932	964	996	100	d	68	D
517	549	581	613	645	677	709	741	773	805	837	869	901	933	965	997	101	e	69	E
518	550	582	614	646	678	710	742	774	806	838	870	902	934	966	998	102	f	70	F
519	551	583	615	647	679	711	743	775	807	839	871	903	935	967	999	103	g	71	G
520	552	584	616	648	680	712	744	776	808	840	872	904	936	968	1000	104	h	72	H
521	553	585	617	649	681	713	745	777	809	841	873	905	937	969	1001	105	i	73	I
522	554	586	618	650	682	714	746	778	810	842	874	906	938	970	1002	106	j	74	J
523	555	587	619	651	683	715	747	779	811	843	875	907	939	971	1003	107	k	75	K
524	556	588	620	652	684	716	748	780	812	844	876	908	940	972	1004	108	l	76	L
525	557	589	621	653	685	717	749	781	813	845	877	909	941	973	1005	109	m	77	M
526	558	590	622	654	686	718	750	782	814	846	878	910	942	974	1006	110	n	78	N
527	559	591	623	655	687	719	751	783	815	847	879	911	943	975	1007	111	o	79	O
528	560	592	624	656	688	720	752	784	816	848	880	912	944	976	1008	112	p	80	P
529	561	593	625	657	689	721	753	785	817	849	881	913	945	977	1009	113	q	81	Q
530	562	594	626	658	690	722	754	786	818	850	882	914	946	978	1010	114	r	82	R
531	563	595	627	659	691	723	755	787	819	851	883	915	947	979	1011	115	s	83	S
532	564	596	628	660	692	724	756	788	820	852	884	916	948	980	1012	116	t	84	T
533	565	597	629	661	693	725	757	789	821	853	885	917	949	981	1013	117	u	85	U
534	566	598	630	662	694	726	758	790	822	854	886	918	950	982	1014	118	v	86	V
535	567	599	631	663	695	727	759	791	823	855	887	919	951	983	1015	119	w	87	W
536	568	600	632	664	696	728	760	792	824	856	888	920	952	984	1016	120	x	88	X
537	569	601	633	665	697	729	761	793	825	857	889	921	953	985	1017	121	y	89	Y
538	570	602	634	666	698	730	762	794	826	858	890	922	954	986	1018	122	z	90	Z
539	571	603	635	667	699	731	763	795	827	859	891	923	955	987	1019	123	{	91	[
540	572	604	636	668	700	732	764	796	828	860	892	924	956	988	1020	124	|	92	\
541	573	605	637	669	701	733	765	797	829	861	893	925	957	989	1021	125	}	93	]
542	574	606	638	670	702	734	766	798	830	862	894	926	958	990	1022	126	~	94	^
543	575	607	639	671	703	735	767	799	831	863	895	927	959	991	1023	127	■	95	_
48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	← DEC.			
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?	← ASCII			
High Order X & Y																			

Appendix D
Background Program Feature

If you wish to use the "background program" feature, you should follow these guidelines:

1. The program should be error free and SAVEd on a mass storage medium (it could also be recorded by the emulator.)
2. The program **must** have a label Start: and should have a label End:.
3. First example: these lines execute the user routine once.

```
6810 End:   END
6820 Start: !
6830        !     User routine goes here
6840        !
6850        GOTO Resume
```

NOTE
Uploading is not allowed while the user routine is executing.

4. Second example: these lines execute the user routine repeatedly until it does a GOTO Resume.

```
6810 End:   END
6820 Start: !
6830        !     User routine goes here
6840        !
6850        !  If user routine is not ended
6860        GOTO Again
6870        !  If user routine is ended
6880        GOTO Resume
```

Appendix E
HP 1000 Connection

This example uses the HP 1000 Serial Interface 12966A with a 12966-60006 (male) cable. It is connected directly (no modem) to a 9835A with a 98046 Interface and standard (female) cable.

The HP 1000 Interface is hard-wired to 2400 baud and configured with the driver DVR05.

The HP 1000 requires uppercase input with 8-bits per character no parity.

Since this is a first connection attempt, we will use the character-mode program.

1. Type: `SCRATCH A` EXECUTE
2. Insert emulator cartridge into right tape drive.
3. Type: `LOAD "CHRMOD",1` EXECUTE
4. When program is done loading, it runs and displays:

   `Terminal ready on 4`

5. Press Edit. Press the right-arrow (⇨) until the cursor is in the `bits/char` field and change the value to `8` using the STEP key.
6. Move the cursor to the `Parity` field and change its value to `none`. Move the cursor to the `Speed` field and change its value to `2400`.
7. Press STORE twice to exit Edit mode. We are now ready for communication.
8. Make sure the interface is connected to the HP 1000, and press Break (K5). The 1000 should respond with:

   `PLEASE LOG ON:`

9. At this point simply enter your log on code, press STORE and you should be in communication.

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