DIGITAL MICROSYSTEMS

DMS-800 INTELLIGENT TERMINAL

SPECIFICATIONS

If you need a low-cost versatile intelligent terminal, the DMS-800 fills your requirements. The 12-inch high-resolution monochrome video display, ergonomically designed detachable keyboard, and small footprint make the DMS-800 the perfect office workstation.

DISPLAY:

12-inch (30.5 cm) diagonal monochrome CRT.

24 lines by 80 characters.

25th Status Line for set-up and keyboard programming.

Full tilt and swivel for maximum viewing comfort.

7 x 12 Character Matrix in 9 x 14 cell size.

128 ASCII display plus 128 graphic and international characters.

Cursor displayed as solid block, blinking block, steady or blinking underline, or invisible.

Non-embedded character attributes: normal, reverse, half-intensity, underline, blink, blank and in combinations.

Protected characters and fields.

Screen saving timeout feature dims screen after 5 minutes of inactivity; can be toggled off.

Battery backup for set-up features and programmed function keys.

KEYBOARD

Detachable low-profile keyboard.

Standard typist's QWERTY key arrangement.

Separate numeric/cursor control keypad.

93 (31 x 3) function keys programmable from keyboard or host.

1824 bytes of storage in function key buffer, 125 bytes per key.

COMMUNICATIONS

Host Port: RS-232, Half/Full Duplex, Local and Block Modes, DTR or XON/XOFF protocols, selectable BAUD 110 to 19.5K, Even/Odd/No Parity, 1/2 Stop Bits, 7/8 Word Length.

Printer Port: RS-232, selectable BAUD 110 to 19.5K, Even/Odd/No Parity checking, 1/2 Stop Bits, 7/8 Word Length. Page, transparent, and simultaneous print functions.

Monitor Mode displays Control and ESC characters in half intensity.

SCREEN EMULATIONS

TELEVIDEO 925
DMS-800 (enhanced TV-925)
HAZELTINE 1500
ADDS REGENT 25

PHYSICAL

Dimension: 13" x 12" x 13.5" (33cm x 30cm x 34cm).

Weight: 20 lbs. (9kg).

Power: 40 watts, 115/230 VAC switch selectable, 50/60 Hz.

1.0 INSTALLATION OF THE DMS-800 TERMINAL

1.1 PHYSICAL SET-UP

After unpacking the DMS-800 from its shipping carton, examine the unit for damage. Make sure that the CRT screen is not cracked or broken. (Do not touch any broken glass; the coating on the inside of the screen is toxic.) If there is any visible damage to the DMS-800, do not plug it into an electrical outlet. Contact your dealer or Digital Microsystems at once. You should also contact the shipping company if the damage seems to have occurred during transit.

You will find in the shipping carton, along with this manual, the CRT terminal and a detachable low profile keyboard.

Diagrams 1-1 and 1-2 illustrate the various external parts of the DMS-800. The parts mentioned in the following pages are labeled in the diagrams for clarity.

1.1.1 THE CRT SCREEN

The DMS-800's 12-inch CRT screen can display 24 lines with 80 characters per line. The 25th line on the screen, the status line, is used to display the operating characteristics of the terminal's host port, printer port and video display. Changing these

characteristics is discussed in the section on

configuring the terminal.

The brightness of the screen display can be adjusted by rotating the knob under the left-hand side of the CRT cabinet.

After several minutes have passed without keyboard input, the screen will dim very low with only the cursor showing. Any further input from the keyboard (including the Shift Key) or output from a program will bring the screen intensity back to normal along with whatever was on the screen. This feature preserves the life of the screen. (Note that the next character entered after the screen has dimmed is ignored.)

The CRT has a row of adjustment controls on the back of the cabinet. These adjustments are for service technicians; there should not be any need for you to use them.

1.1.2 KEYBOARD CORD

The DMS-800 comes with a detachable, low-profile keyboard that is connected to the main cabinet with a coiled 'telephone-like' cord. Plug the end of the cord with a plastic clip into the socket labeled KYBD on the back of the DMS-800's cabinet. The cord will fit only one way into the socket; the tab on the clip should face up. Plug the other end of the cord into the top of the keyboard. If you wish to detach the keyboard later, be sure to press the tab on the clip to release it from the cabinet.

1.1.3 CABLE CONNECTIONS

The DMS-800 connects to a computer through the Host Port on the back of the terminal's cabinet. A standard RS-232 cable with a male 25-pin connector plugs into the Host Port. Refer to your computer's manual for instructions on connecting the terminal to the computer.

An RS-232 Serial Port is located next to the Host Port should you wish to connect a printer to the DMS-800 terminal. To conform to FCC Class A regulations you must use a shielded RS-232 cable. This prevents any Radio Frequency (RF) radiation emitted by the Printer Port from disturbing nearby instrumentation (e.g., televisions, radios, test equipment or other computers).

1.1.4 LINE VOLTAGE SWITCH

The DMS-800 can operate on either 115V or 220V. You must set the voltage supply switch for the voltage in your area. The voltage switch is located on the rear of the CRT cabinet.

To select the proper voltage for the DMS-800, insert a pointed object such as a ball-point pen tip into the switch and slide the switch horizontally in the direction indicated on the cabinet.

----------WARNING----------
If you are not sure of the voltage in your area, do not plug in the workstation until you have

checked with a technician. Damage may result from an incorrect voltage setting.

1.1.5 POWER CORD

The power cord is permanently attached to the underside of the CRT cabinet, near the power switch. Plug the other end into a three-holed grounded electrical outlet. Make sure that the power switch is off (pushed in on the side without the white dot) before plugging in the unit.

1.2 TURNING ON THE DMS-800

The Power Switch is located under the CRT screen's cabinet on the right-hand side. Turn on the DMS-800 by pushing up on the switch on the side marked with a white dot.

----------NOTE----------
Do not turn the DMS-800 rapidly on and off. This could cause a bright dot to form in the center of the screen which might damage the CRT.

Before you can use the DMS-800 with a computer you may have to configure the Host Port and screen emulation. The DMS-800 is set at the factory for the following settings:

- o Host Port BAUD = 9600 bits per second,
- o Word length = 8 bits,
- o Stop bits = 2,

- o Parity checking = None,
- o Communications protocol= Full Duplex (FDX),
- o Handshaking = None
- o Screen emulation = ADDS REGENT 25

All of these operating characteristics can be changed to suit your applications; Section 2 explains how to do this. Section 1._ details information on the Host and Printer Port signals.

1.3 THE CURSOR

When the power is turned on, a short beep sounds from the speaker to indicate that the internal circuitry is operating. After about 15 seconds the cursor should appear in the upper left-hand corner.

The cursor is a rectangular block or underline of light on the screen that marks the position where the next character will appear. The next character could be sent from the keyboard or from the host computer. The computer can move the cursor anywhere on the screen by sending the appropriate command. These commands are discussed in Section 3.

If the cursor fails to appear after the beep, check that the screen intensity has not been turned down too far. Move the knob under the left-hand side of the CRT cabinet to alter the screen intensity. If this does not work, see Section 4, Troubleshooting.

At this point, without any input from the Host computer, the status line can be accessed,

operating settings can be changed and the function keys can be loaded. These functions are described in Section 2.

The way in which the DMS-800 terminal connects with and communicates with the main 'Host' computer can vary with each system. Some systems require a typed command to 'login' to the system. For example, the DMS-800 can connect to Digital Microsystems' HiNet Network Workstations and log in to the Network by typing BN (for Boot Network).

1.4 THE KEYBOARD

As you look at the keyboard you can see six groups of keys: the Main Section, the Numeric Pad, and four groups of four Function Keys along the top of the keyboard. Refer to Diagram 1-3.

1.4.1 NUMERIC PAD

On the right side of the keyboard unit is a keypad for entering numeric data. It is similar in layout to that of most adding machines or calculators, with the digits 0-9, a decimal point, and an ENTER key. The ENTER key has the same effect as the RETURN key.

The Numeric Pad number keys are the same as the numerals along the top row of the Main Keyboard Section, except that the Numeric Pad keys do not have the same SHIFT values as the Main Section keys. Most people find it easier to use the numeric keypad for entering a large

amount of numeric data. The numeric pad keys 2, 4, 6, and 8 are also used in some application programs to control the cursor.

1.4.2 FUNCTION KEYS

Across the top of the keyboard are four groups of four keys each, labeled F1 through F16. These are called Function Keys. These keys can be programmed with commands or sequences of characters from the keyboard. The number keys in the numeric keypad (along with the three blank keys in the main section) can also be programmed to perform as Function Keys. See Section 2.0 for information on programming the Function Keys.

1.4.3 MAIN KEYBOARD SECTION

For the most part, the main section of the keyboard is similar to that of a standard electric typewriter. However, some of the keys have special computer-related functions and these will be discussed here.

CTRL KEY

On the far left of the second row from the bottom is a key labled CTRL. This is the **CONTROL** key. When you hold down the CONTROL key, you alter the meaning of all the other keys, changing them from letters and numbers into codes that tell the computer what to do. In other words, just as holding down the SHIFT key changes lower case to upper case, holding down

the CONTROL key changes the keyboard from a typewriter keyboard to a computer command board. Just as with the SHIFT key, you hold down the CONTROL key while striking the other keys.

Control commands may or may not be displayed on the screen depending on the program involved; they will not appear in any text or numeric data you are entering into the computer. In this manual we will use the abbreviation **CTRL** to indicate when something is a Control Command. For example, **CTRL-C** would mean strike the C key while holding down the CONTROL key. Manuals for applications programs may use other symbols to indicate use of the CONTROL key, but no matter what symbol is used it always operates in the same way.

RETURN KEY

The **RETURN** key (short for Carriage Return) is on the right side of the main keyboard section. It is used both as a computer command key and an end-of-line carriage return (like an electric typewriter). Most commands that you give to the computer through the keyboard (or text you enter to answer its questions) will end with a RETURN. This signals the computer that you have finished typing in the command (or answer) and you want the computer to proceed.

This manual will use either the word **RETURN** or the symbol **<CR>** to indicate a Carriage Return in command sequences.

ESC KEY

The **ESC** (for Escape) key is located at the far left of the top (number) key row. It is a special key with functions that vary from program to program. In some programs it can be used as a second Control Key (though you do not hold it down while pressing another key); in other situations it may be used to 'escape' when an error has caused the computer to 'hang' (no longer respond to normal commands). Your application program manuals will describe their uses of ESC.

----------NOTE----------
It is important to **use the correct case of a letter when you use the ESC key.** If the command requires an upper-case letter or a lower-case letter, you must use the specified one or the results could be totally different.

DELETE KEY

Located at the far right of the second row from the top, the DELETE key is used (as you might suspect) for deleting letters. In a word processing program, hitting the DELETE key causes the Cursor to move one space to the **left** and erase that character (or space).

BACK SPACE KEY

The BACK SPACE Key (located at the far right of the bottom row) does just what you

would expect; it moves the Cursor one space to the left. In most word processing programs it does so without erasing any of the characters. However, in some types of applications, it may act as an 'Erase' key, eliminating the characters it backspaces over.

PAUSE KEY

The PAUSE Key is located at the far left of the bottom row. In some applications, the computer sends lines of data or text to the screen faster than you can read them. As new lines are added to the bottom of the screen all lines scroll upward and the top lines disappear. The PAUSE Key is programmed to send a CTRL-S which is used to stop and re-start this screen scrolling in some situations. When you hit the PAUSE Key the screen stops in place. When you hit the PAUSE Key again, the computer resumes adding lines to the bottom of the screen and everything continues scrolling upward.

CAPS LOCK KEY

Like a typewriter, the CAPS LOCK Key makes all of the letters type out as upper case. However, unlike a typewriter, the CAPS LOCK on the DMS-800 only affects the letter keys. It has no effect whatsoever on the symbol and number keys. When the CAPS LOCK is down, use of the SHIFT Key causes letters to be typed in lower case.

REPEATING KEYS

All of the keys on the DMS-800 (including the command keys) are repeating keys. If you hold them down they will automatically repeatttttttttt until you release them.

1.5 BATTERY POWER SUPPLY

The DMS-800 uses two batteries to supply constant backup power for the function key storage buffer. This means that when you turn the power off the values that you programmed into the function keys and the operating characteristics of the terminal (BAUD, cursor, screen emulation etc.) will not be erased. The next time you turn on the DMS-800 terminal, all of your function keys and operating settings will be as you left them.

The Alkaline 1.5V size AA batteries should last for over a year under normal use. If the DMS-800 loses some or all of the stored funciton keys or returns to the factory set status line values, it indicates that the batteries are low on power and should be changed.

1.5.1 CHANGING THE BACKUP BATTERIES

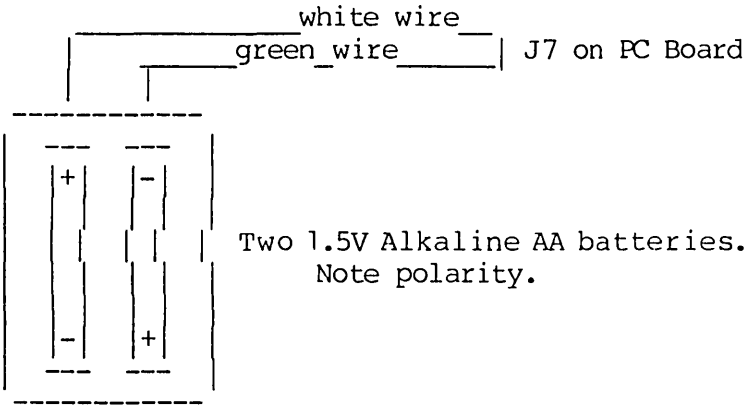
The batteries are in the flat base of the DMS-800 terminal's cabinet. DO NOT remove the casing from the top cabinet covering the CRT. There are high-voltage components near the CRT that retain a charge after the terminal is turned off. Only qualified service technicians

should open the top portion of the cabinet. The lower flat portion is safe to open.

To open the lower casing, uplug the terminal, grasp it by the base and the top cover--not just by the CRT portion--and carefully turn it over on its top. Remove the four phillips-head screws at each corner of the base then gently lift off the lower half of the base.

There will be two sets of wires connecting the base with the CRT. These two sets may have to be disconnected before you can easily access the batteries. They are conected to the circuit board at locations J9 ad J6 (Power and Video). Carefully pull the clips away from the circuit board. Notice that the white clip connects to J9 and the brown clip connects to J6. The clips are of different sizes and are keyed so that each will only fit on the appropriate connector in the correct way.

The two AA Alkaline 1.5V batteries are attached to the lower casing. Remove the old batteries carfully by holding the battery case with one hand while pulling a battery out with the other hand. The new batteries must be inserted in specific positions. Two wires lead from the battery holder to pins labelled J7 on the circuit board. One wire is colored white and the other is green. One battery must have the + (plus) side next to the connector with the white wire. The other battery must have its - (negative) side next to the green colored wire.



DMS-800 BATTERY PACK

When the batteries have been replaced, screw the base back on with the four screws; turn the terminal back on its base; plug the power in and turn on the terminal. Test the batteries by loading the function keys, turn off the terminal and then turn it back on to see if if the function keys are still loaded. If they are not you may have to double check the battery placement; make sure that the battery wires are connected to J7; and that the batteries are indeed good.

1.6 HOST PORT PIN SIGNALS

The Host Port connects the DMS-800 terminal to the 'Host' Computer with an RS-232 cable. Some of the pins in the Host Port carry specific signals to the Host Computer. If the Host expects these signals on pins different than what the DMS-800 uses, the cable may have to be

restructured to make the terminal work. Below are the pins and signals that the DMS-800 does use.

HOST PORT

PIN	SIGNAL
1	GROUND
7	GROUND
2	DATA --> HOST
3	DATA <-- HOST
4	RTS --> HOST
20	DTR --> HOST
5	CTS <-- HOST
12	DCD --> HOST

RTS -- REQUEST TO SEND
DTR -- DATA TERMINAL READY
CTS -- CLEAR TO SEND
DCD -- DATA CARRIER DETECTED

1.7 PRINTER PORT PIN SIGNALS

Like the Host Port, the Print Port uses specific pins to send signals to a printer (or other serial device). A printer's port may not have the same arrangements as the DMS-800's port so the cable may have to be altered. The following table gives the DMS-800's Print Port signals so that a technician can build an appropriate cable.

PRINTER PORT

PIN	SIGNAL
1	GRND
7	GRND
3	DATA --> HOST
20	DTR <-- HOST
5 & 12	+12V PULLED UP THROUGH 4.7 K OHM RESISTOR

1.8 CLEANING THE DMS-800'S CABINET

1) Never clean the cabinet or the CRT screen with anything but a mild soapy detergent such as IVORY Dish Washing Liquid. Place a little detergent on a damp cloth and rub gently. Do not use cleaning sprays or any solvent based chemical; they will ruin the cabinet over a period of time. Be careful not to drip any liquids into the cabinet through the ventilation slots.

2) When cleaning the CRT screen, use a damp cloth. If necessary, a little glass cleaner can be applied to a cloth and used on the screen. Do not spray the glass cleaner directly on the screen as it may splatter onto the cabinet.

2.0 CONFIGURING THE DMS-800 TERMINAL

This section will explain some of the features of the DMS-800, how to change its operating characteristics, load the function keys and customize the terminal to your own needs. These functions are all carried out from the keyboard by the operator. Programmable functions (from the host computer) are covered in Section 3.

2.1 CONTROL/SHIFT FUNCTIONS

Many of the operating functions on the DMS-800 are accessible through the keyboard. For example, loading function keys; changing Host Port and Printer Port BAUD Rates; screen emulations; protocols; cursor types; video display and more.

To access these functions a special sequence of keys is used. Three keys must be pressed at the same time: CONTROL, SHIFT and one other. The third key determines which function you want to access. For example, to program a function key you would hold down the CTRL key along with the SHIFT key and then press the F1 key. Once the third key is pressed, all three keys may be released. In this manual this sequence is written as CTRL/SHIFT F1.

2.2 STATUS LINE

The 25th line on the screen displays the current on-line status of the terminal. This status line can be turned off while you work if you find it distracting. To turn the display of the status line on and off press CTRL/SHIFT F5. This function is called a toggle because every time you press CTRL/SHIFT F5 the display alternates between two settings. Many of the CTRL/SHIFT functions work as toggles.

When the status line is displayed, three settings are visible:

```
TRANSMISSION MODE -- FDX or HDX
HOST PORT BAUD SETTING -- 9600 to 19
SCREEN EMULATION -- DMS-800,
                    TELEVIDEO  925,
                    HAZELTINE 1500,
                    ADDS REGENT 25
```

These settings and others can be changed by using the CTRL/SHIFT UP 5 key in the numeric keypad.

2.3 CHANGING SETTINGS WITH CTRL/SHIFT 5

To change the original settings for the DMS-800, press CTRL/SHIFT 5 (in the numeric keypad, not the one next to the space bar). Notice that the first part of the status line changes from reverse video half-intensity to normal video (green characters on black background).

Now press the Right Arrow key in the keypad. The normal video display will highlight the Communication Mode (FDX). Pressing the Right Arrow key again skips the BAUD setting and moves the highlight to the screen emulation description. Everytime you hit the right arrow key the highlight moves to the right until it returns to the beginning of the status line.

When the highlight is positioned over a setting (e.g., TVI 925) you can change it by hitting the UP ARROW key again (without the CTRL/SHIFT keys). Hitting the UP ARROW key toggles the setting to one of the alternate choices. For example, when the highlight is over the emulation setting, hit the UP ARROW key to change the setting from TVI 950 to HAZELTINE 1500. Hit the UP ARROW key again to change the setting to ADDS REGENT 25. Press the UP ARROW key once again to change the setting back to TELEVIDEO 925.

There are seven settings that you can change in the first status line:

ONLINE	FDX	NORMAL	KBD ON		TVI 925	DMS 800
LOCAL	HDX	CTRL MODE	KBD OFF	PROT	HAZELTINE 1500	SIMUL PRINT
					ADDS REGENT 25	

Each of these settings will be descibed later in this section. The settings can be changed as described in the previous example, by using the UP ARROW key to toggle between settings.

As previously noted, when you move the highlight along the status line, it bypasses the BAUD setting. How do you change the Host Port

BAUD setting? Use the LEFT ARROW key to change to a new status line. With the highlight at the first position, press the LEFT ARROW key. (Again, only the arrow in the keypad will work.) The status line changes from ONLINE to HOST PORT:. Here are the settings that you can change from the HOST PORT status line:

HOST PORT BAUD RATE	WORD LENGTH	STOP BITS	PARITY	PROTOCOL
9600	8 BITS	2	ODD	XON/XOFF
7200	7 BITS	1	EVEN	DTR
4800			NONE	NONE
3600				
2400				
1800				
1200				
600				
300				
150				
134				
110				
19				

Just as with the first status line, position the highlight over the setting you want to change with the RIGHT ARROW key. Then hit the UP ARROW key to toggle the setting to the other choices. When the setting you want is displayed move on to another setting or exit the status line by pressing CTRL/SHIFT 5 again. When you exit the status line the setting you selected goes into effect.

There are two more status lines that configure the terminal's operating characteristics. To access them, place the highlight over the first setting on the status line and hit the **LEFT ARROW** key. The next status line is for changing the Printer Port's settings.

When the Printer Port status line is displayed, you can change the following settings:

PRINTER PORT BAUD RATE	WORD LENGTH	STOP BITS	PARITY
9600	8 BITS	2	ODD
7200	7 BITS	1	EVEN
4800			NONE
3600			
2400			
1800			
1200			
600			
300			
150			
134			
110			
19			

Again, the method for changing the settings is the same as for the first two status lines. Place the highlight over the setting you wish to change and hit the UP ARROW key to toggle the settings. Exit the status line with the CTRL/SHIFT 5 key. The settings you have selected are now in effect.

The fourth status line is for changing the screen display. Position the highlight at the far left of the Printer Status Line and press the LEFT ARROW key. The status line changes to SCREEN. From here you can change the following settings:

CURSOR	VIDEO	LINE FEED	SELF TEST
SOLID BLOCK	NORMAL	AUTO ON	ON
UNDERLINE	REVERSE	AUTO OFF	OFF
INVISIBLE			
FAST BLINK BLOCK			
FAST BLINK UNDERLINE			
SLOW BLINK BLOCK			
SLOW BLINK UNDERLINE			

Use the same procedure for changing the settings as before, position the highlight and hit the UP ARROW key to toggle the settings.

2.4 PROGRAMMABLE FUNCTION KEYS

The DMS-800 has a total of 93 programmable keys. The top row of function keys labeled F1 - F16, each key in the numeric keypad and the ALT key can all be programmed with three different commands or strings of characters. The four arrow keys located next to the Space Bar have the same values as the four arrow keys in the numeric keypad (the shifted value of the 4, 8, 6, and 2 keys in the keypad).

When you press a function key, such as F16, that sends one value to the computer. By holding down the SHIFT key along with a function key,

F#
SHIFT F#
CTRL F#
CTRL/SHIFT F# - PREPROGRAMMED

another value can be sent. Still a third value can be sent by holding down the CTRL key along with a function key. Therefore you can store three values per function key. As discussed previously, the CTRL/SHIFT values of function keys have special values, therefore the fourth level is not programmable by a User.

To load a sequence of characters into a Function Key from the keyboard, follow this procedure:

1. Press CTRL/SHIFT F1.

o Notice that the status line clears and then displays the message "<<Key to program?>>". Anything you enter from the keyboard will be stored in the 'Function Key Buffer' (a portion of internal memory).

o Characters are displayed in normal video (green on black backgound). Control characters (e.g., CTRL X) are displayed in reverse video.

o Seventy-five characters can be stored in each of the three levels of function keys. Approximately 650 to 700 bytes (characters) **in total** can be stored in the 93 (31 x 3) function keys.

o Function keys can be 'nested'. That means that one function key can call another function key, thus increasing the length of a command that can be performed by one function key. However, there is a limit to the number of keys that can be nested depending on the functions that are being performed. A Function Key cannot

call call upon itself; this will created an error condition.

2. To correct a mistake in an entry, use the CTRL/SHIFT F3 key to backspace and erase characters one by one.

3. After entering the value for a function key, press CTRL/SHIFT F1 again. This stores the value in the function key memory. Now whenever you press that function key the characters will be sent to the computer to be processed. Depending on the nature of the computer the terminal is linked to and the characters you put in the function key, the result may or may not be displayed on the screen.

Once a function key is loaded it will keep that value until: 1) you change it through CTRL/SHIFT F1, 2) a Hard Reset is issued by pressing CTRL/SHIFT F6 or 3) the battery in the terminal loses power.

When you recall a function key to reprogram it, any new entry will erase the old entry completely. In other words, you cannot go back and edit an entry after you have exited the programming routine with CTRL/SHIFT F1.

To display the contents of all of the function keys press CTRL/SHIFT F6. The screen will clear and the contents of the function keys will be displayed at the top of the screen. The order in which you see them is the order in which you programmed them, not in numeric order. If you press RETURN the values will remain on the screen until those lines are scrolled up off

the top of the screen. If you hit any other key the entire screen will clear. You will still be at the point in the program or operating system where you left off. For example, if you are in a word processor you might have to scroll the screen completely to see where you left off.

2.5 MORE CTRL/SHIFT FUNCTIONS

There are seven different functions that can be accessed with the CTRL/SHIFT function keys. These are:

CTRL/SHIFT	FUNCTION
F1	LOAD FUNCTION KEYS
F3	BACKSPACE TO ERASE FUNCTION KEY STRING
F5	TOGGLE STATUS LINE DISPLAY ON/OFF
F6	DISPLAY CONTENTS OF ALL FUNCTION KEYS
F15	HARD RESET (TERMINAL)
F16	SOFT RESET (TERMINAL) Interrupt ?
KEYPAD 5	ACCESS STATUS LINE SETTINGS

Most of these functions have already been discussed. The index provides access to information on each function.

The Soft and Hard Reset functions have two different effects on the DMS-800 Terminal. They do not affect the host computer or the information being processed through the terminal. These reset functions are for the internal RAM buffers in the DMS-800.

CTRL/SHIFT F15 executes a Hard Reset. This erases all settings in the function key buffer

and resets the operating characteristics to the original default values (as they are set at the factory).

CTRL/SHIFT F16 executes a Soft Reset. This function is useful for stopping a looping or "stuck" function key. It does not erase the values in the Function Key Buffer or change the operating characteristics of the terminal.

2.6 DESCRIPTIONS OF STATUS LINE SETTINGS

This section will describe the settings that are displayed in the four status lines. Section __ described how to change these settings.

FIRST STATUS LINE:

```
---------------------------------------------------------------------------
ONLINE      FDX                                  DMS-800
LOCAL       HDX   CTL MODE  KBD OFF  PROT       TVI 925          SIMUL PRINT
                                                 HAZELTINE 1400
                                                 ADDS REGENT 25
---------------------------------------------------------------------------
```

ONLINE -- The normal communications mode. The terminal is "online" and communicating with the host computer.

LOCAL MODE -- In this mode, input from the keyboard is sent to the CRT screen but not to the host computer; the Host port is effectively turned off. This mode is also used for Local Edit features; see Section __.

FDX -- Full Duplex Mode. This form of communications sends characters directly to the host computer. If the computer is programmed to echo these characters they will appear on the screen; otherwise they will not. This is the most common mode for communicating with microcomputers. FDX permits simultaneous transmission and reception of data between the terminal and the host computer.

HDX -- Half Duplex Mode. This mode of communication sends keyboard entries to both the host computer and the terminal's screen. This mode does not allow simultaneous transmission and reception of data between the host computer and the terminal. HDX is a common mode for terminals linked to time-sharing computers where response time to keyboard input is not immediate.

CTL MODE -- In Control (or Monitor) Mode, CTRL and Escape commands are displayed along with data on the screen. Commands are not processed by the host computer. This mode is mostly used for debugging programs.

KBD OFF/ON -- This setting turns the keyboard off and on. When the keyboard is off no data is sent to either the screen or the host from the keyboard.

PROT -- Under the TVI 925 emulation, certain characters can be 'protected' from being overwritten on the screen. These characters are displayed in half intensity. When the status line is toggled to PROT, the characters are protected. This feature is most often controlled from an applications program. See Section 3.

SCREEN EMULATIONS -- The DMS-800 screen addressing (the manner in which it displays characters on the screen in response to a program's commands) emulates three popular terminals: TeleVideo 925, Hazeltine 1500 and Adds Regent 25. The DMS-800 setting is an almost exact emulation of the TeleVideo 925. However, the handling of screen attributes is more sophisticated than the TeleVideo. See Section 3 for more information on the DMS-800's screen handling. The screen addressing codes for each emulation are also documented in Section 3.

SIMUL PRINT -- In this mode all entries from the keyboard are sent to the Print Port as well as the Host Port. If nothing is connected to the Print Port or the Printer is not ready, the terminal will be unresponsive to any further commands.

HOST PORT STATUS LINE

HOST PORT:	BAUD	WORD LEGTH	STOP BITS	PARITY	PROTOCOL

HOST PORT SETTINGS:

BAUD -- This setting defines the transmission rate in bits per second between the terminal and the host computer. An incorrect Host Port BAUD setting will effectively stop communication between the Host computer and the DMS-800 terminal.

WORD LENGTH -- This setting defines the length of each word of data that the host computer expects to be transmitted from the terminal. The settings can be toggled between an 8-bit word and a 7-bit word.

STOP BITS -- This is another communication setting that must conform to the Host Computer's specifications. The Stop Bit signals the host computer that one complete word has been sent. There are two settings for Stop Bits: 1 Stop Bit or 2 Stop Bits.

PARITY -- This setting also must conform to the host computer's specifications. Parity checking is an error detection system that uses an even or odd number of 1 bits in a word to detect transmission errors. The DMS-800 can be set for odd parity, even parity or no parity (checking).

PROTOCOL -- The method in which the terminal and the host computer signal each other that they are ready to send or receive data is called the handshaking protocol. The DMS-800 provides for three different settings for transmission protocols: DTR (Data Terminal Ready), XON/XOFF and No Protocol. DTR protocol uses a specific electrical signal on pin 20 in the Host Port to signal that it is ready to receive data. XON/XOFF protocol sends CTRL Q when the terminal is ready to receive and CTRL S when the Host should stop transmitting data.

PRINT PORT STATUS LINE

```
-------------------------------------------------------------
PRINT PORT: BAUD  WORD LENGTH  STOP BITS  PARITY  PROTOCOL
-------------------------------------------------------------
```

These settings have the same definitions as the settings for the Host Port. They, of course, affect the printer port instead of the Host Port. Refer to your Printer's manual for the necessary settings.

DISPLAY STATUS LINE

```
-------------------------------------------------
SCREEN: CURSOR  VIDEO  AUTO LINE FEED  SELF TEST
-------------------------------------------------
```

CURSOR -- This setting allows the user to change the display of the cursor. The factory default for the cursor is a non-blinking block. It may be changed to appear as a blinking underline (fast or slow), a blinking block (fast or slow), a steady underline, or invisible.

VIDEO -- This setting lets you alternate between normal video display--green characters on black background--and reverse (or inverse) video--black characters on a green background.

AUTO LINE FEED -- Most applications provide for a line feed whenever a Return is entered. In other words, when the cursor reaches the end of the screen (the 80th column) it automatically moves down one line and to column 1. Some applications may not provide this line feed. There-

fore, the DMS-800 has a setting for AUTO LINE FEED. When OFF, the application is expected to provide a line feed when necessary. When AUTO LINE FEED is ON, the terminal inserts a line feed whenever RETURN is pressed.

SELF TEST -- (not implemented as of this release)

3.0 PROGRAMMING THE DMS-800

The DMS-800 can be controlled by a program by sending the appropriate ASCII codes from the host to the terminal. This section explains the programmable features of the DMS-800 and the codes used to access them. Since the DMS-800 can emulate three different terminals, the codes for each emulation will be given for each feature. The DMS-800 codes are exactly the same as the TeleVideo 925's. A table of all features and their access codes is given at the end of this section.

----------NOTE----------
HAZELTINE 1500 emulation requires a lead-in code for all commands except for Tab, Bell and moving the cursor left and right. The lead-in is ASCII ~ (7E HEX, 126 DECIMAL). Cursor addressing is by col and row for the Hazeltine 1500. Televideo 925 and Adds Regent 25 use row and column sequence when moving the cursor.

3.1 CURSOR ADDRESSING

The cursor can be positioned anywhere within the 24 by 80 column screen with the Cursor Addressing Codes. Each emulation has a different ASCII sequence for positioning the cursor:

Televideo 925	Hazeltine 1400	Adds Regent 25
ESC = row col	CTRL Q col row	ESC Y row col

TV 925 -- no offset for row or column; e.g., to address row 12, column 60 use the sequence: **ESC = +[** or in HEX, **1B 3D 2B 5B.**

Hazeltine 1400 -- needs lead-in code (~) followed by CTRL Q Col # and Row #.

ADDS 25 --

3.1.1 READ CURSOR POSITION

The position of the cursor on the screen can be determined by the host by sending the cursor report sequence to the terminal.

Televideo 925	Hazeltine 1400	Adds Regent 25
ESC ?	CTRL E	ESC ?

The cursor position is reported in ASCII in the following format:

Televideo 925	Hazeltine 1400	Adds Regent 25
Row, Col	Col, Row	Row, Col

3.1.2 CURSOR CONTROL

Moving the cursor on the screen is accomplished by sending ASCII codes from the host to the terminal.

CURSOR HOME -- moves the cursor to the upper right column of the screen.

CURSOR HOME		
Televideo 925	Hazeltine 1400	Adds Regent 25
CTRL ^	--------	CTRL A

CURSOR DOWN -- Moves the cursor one row down in the same column. If the cursor is in the last row the display will scroll up one line.

CURSOR DOWN		
Televideo 925	Hazeltine 1400	Adds Regent 25
CTRL V	CTRL K	CTRL J

CURSOR UP -- Moves the cursor up one row in the same column. If cursor is in the top row the display will scroll down one line.

CURSOR UP		
Televideo 925	Hazeltine 1400	Adds Regent 25
CTRL K	CTRL L	CTRL Z

CURSOR LEFT -- Moves the cursor one column to the left in the same row (same as BACKSPACE). If cursor is in the first column, it will move to the last column of the preceding line.

CURSOR LEFT		
Televideo 925	Hazeltine 1400	Adds Regent 25
CTRL H	CTRL H	CTRL H

CURSOR RIGHT -- Moves the cursor one column ot the right in the same row. If cursor is in the last column of the line, cursor will move to the first column of the next row down.

CURSOR RIGHT		
Televideo 925	Hazeltine 1400	Adds Regent 25
CTRL L	CTRL P	CTRL F

CARRIAGE RETURN -- Moves the cursor left to column one.

CARRIAGE RETURN		
Televideo 925	Hazeltine 1400	Adds Regent 25
CTRL M	CTRL M	CTRL M

LINE FEED -- Moves the cursor one line down in the same column.

LINE FEED		
Televideo 925	Hazeltine 1400	Adds Regent 25
CTRL J	CTRL J	CTRL J

REVERSE LINE FEED -- Moves the cursor one line up in the same column. If cursor is in the last line of the screen, thewhole screen will scroll up one line; the top line will be lost. The bottom line will be filled with nulls.

REVERSE LINE FEED		
Televideo 925	Hazeltine 1400	Adds Regent 25
ESC j	------	------

NEW LINE -- Combines a line feed with a Carriage Return.

NEW LINE		
Televideo 925	Hazeltine 1400	Adds Regent 25
CTRL _	---------	CTRL _

TAB -- Moves the cursor to the next TAB Stop. By default the Tabs are set every __ spaces.

----------TAB----------

Televideo 925	Hazeltine 1400	Adds Regent 25
CTRL I	CTRL I	CTRL I

BACK TAB -- Moves the cursor to the Tab Stop immediately to the left of the current position.

----------BACK TAB----------

Televideo 925	Hazeltine 1400	Adds Regent 25
ESC I		ESC I

FIELD TAB -- In Protect Mode this command moves the cursor exactly the same as TAB (CTRL I). When Protect MOde is off this command has no effect.

----------FIELD TAB----------

Televideo 925	Hazeltine 1400	Adds Regent 25
ESC i		

SETTING TABS -- When Protect Mode is off, this command sets a normal typewriter-like Tab stop in the current cursor column from top to bottom of screen. When Protect Mode is on, this command sets a Tab stop in the current cursor column

through every following row until a protected field is encountered. If no protected fields intersect that column, the Tab stop is in effect to the bottom of the screen. The tab stop column is displayed in half-intensity.

----------SETTING TABS----------
Televideo 925 Hazeltine 1400 Adds Regent 25

ESC 1

3.2 EDITING FUNCTIONS

LOCAL EDIT -- Local Mode or local edit can be set from the Host. In this mode transmission fromthe terminal to the Host is halted until a transmit signal is used (e.g., ESC 6 -- Transmit All).

----------LOCAL MODE----------
Televideo 925 Hazeltine 1400 Adds Regent 25

ESC ------- -------

CHARACTER INSERT -- moves the character at the cursor to the right one column and inserts a space character at the cursor position. The character in the same line at column 80 is lost. When protect mode is on character insert is to end of line or to first protected field.

----------CHARACTER INSERT----------

Televideo 925	Hazeltine 1400	Adds Regent 25
ESC Q	-------	-------

CHARACTER DELETE -- Deletes the character at the cursor position and moves all following characters in the line one space to the right. A space character is placed in the last column in the line. When Protect mode is on, characters are moved right until end of unprotected line or first protected field.

----------CHARACTER DELETE----------

Televideo 925	Hazeltine 1400	Adds Regent 25
ESC W	-------	-------

LINE INSERT -- Inserts a line consisting of fill characters at the cursor position. Cursor then moves to the new line. All following lines move down one row. The last line on the screen is lost. When Protect Mode is on, Line Insert has no effect.

----------LINE INSERT----------

Televideo 925	Hazeltine 1400	Adds Regent 25
ESC E	CTRL Z	-------

LINE DELETE -- Deletes the entire line currently occupied by the cursor. All following lines move up one row. Cursor moves to column one of line. Last line on screen loads with fill characters. Has no effect when Protect Mode is on.

LINE DELETE		
Televideo 925	Hazeltine 1400	Adds Regent 25
ESC R	CTRL S	-------

ERASE TO END OF LINE -- Erases all characters from the cursor position to the end of the line and replaces them with fill characters. When Protect Mode is on, erases to beginning of first protect field. If half intensity is on, fill characters will be displayed in half intensity.

ERASE TO END OF LINE		
Televideo 925	Hazeltine 1400	Adds Regent 25
ESC T	CTRL O	ESC K

ERASE TO END OF LINE WITH NULLS -- Erases all characters from the cursor position to the end of the line and replaces them with NULL characters. When Protect Mode is on, erases to beginning of first protect field. If half intensity is on, NULL characters will be displayed in half intensity.

--------ERASE TO END OF LINE WITH NULLS---------
Televideo 925 Hazeltine 1400 Adds Regent 25

ESC t ------ ------

ERASE TO END OF SCREEN -- Erases all unprotected characters from the cursor position to the end of the screen. Replaces characters with spaces. In half-intensity mode spaces are displayed in half-intensity.

--------------ERASE TO END SCREEN---------------
Televideo 925 Hazeltine 1400 Adds Regent 25

ESC Y CTRL W ------

ERASE TO END OF PAGE WITH NULLS -- Erases all unprotected characters from the cursor position to the end of the screen. Replaces erased characters with null characters. In half-intensity mode, null characters are displayed in half intensity.

----------ERASE TO END SCREEN WITH NULLS--------
Televideo 925 Hazeltine 1400 Adds Regent 25

ESC y ------ ------

CLEAR UNPROTECTED TO NULLS -- Clears all unprotected data on the screen to the null character Null are displayed in half-intensity if half-intensity mode is on.

----------CLEAR UNPROTECTED TO NULLS----------

Televideo 925	Hazeltine 1400	Adds Regent 25
ESC :	------	------

CLEAR UNPROTECTED TO INSERT CHARACTER -- Clears all unprotected data on the screen to the insert character. (Blank by default.) Insert characters will be in half-intensity if half-intensity mode is on.

-----CLEAR UNPROTECTED TO INSERT CHARACTERS-----

Televideo 925	Hazeltine 1400	Adds Regent 25
ESC ; ESC + CTRL Z	------	------

CLEAR PAGE TO HALF-INTENSITY -- Clears all unprotected data on the screen to half-intensity spaces.

----------CLEAR PAGE TO HALF-INTENSITY----------

Televideo 925	Hazeltine 1400	Adds Regent 25
ESC ,	------	------

CLEAR ALL DATA TO NULLS -- Clears all data on screen to the null character. Resets the half-intensity and protect modes.

----------CLEAR ALL DATA TO NULLS----------
Televideo 925 Hazeltine 1400 Adds Regent 25

ESC * ------ ------

3.3 SCREEN DISPLAY ATTRIBUTES

Normally characters and spaces are displayed on the DMS-800's screen as green characters on black background (spaces). The display attributes of both characters and spaces can be changed with the following ESC sequences:

DISPLAY ATTRIBUTE	ESCAPE SEQUENCE	
	DMS-800 TELEVIDEO 925	ADDS 25
NORMAL	ESC G0	ESC N
BLANK	ESC G1	
BLINK	ESC G2	
INVISIBLE BLINK	ESC G3	
REVERSE VIDEO	ESC G4	ESC R
INVISIBLE REVERSE	ESC G5	
REVERSE BLINK	ESC G6	
INVISIBLE REVERSE BLINK	ESC G7	
UNDERLINE	ESC G8	
INVISIBLE UNDERLINE	ESC G9	
UNDERLINE BLINK	ESC G:	
INVISIBLE UNDERLINE BLANK	ESC G;	
UNDERLINE REVERSE	ESC G<	(cont.)

INVISIBLE UNDERLINE REVERSE	ESC G=
UNDERLINE REVERSE BLINK	ESC G>
INVISIBLE UNDERLINE REV BLINK	ESC G?
HALF-INTENSITY ON	ESC G)
HALF-INTENSITY OFF	ESC G(

The DMS-800 screen-handling functions are very similar to the TeleVideo 925 emulation. However, there is one main difference that programmer's may wish to consider.

The TeleVideo 925 screen attributes occupy one character position on the screen (thus in memory); the DMS-800 screen attributes do not. The DMS-800's method is more efficient than the TV 925's and is therefore the recommended operating setting for most programs that would normally use the TV 925 emulation.

CLEAR AND RESTORE SCREEN -- The entire screen can be cleared of any display by sending an ESC sequence.

CLEAR SCREEN		
Televideo 925	Hazeltine 1400	Adds Regent 25
ESC O	------	------

RESTORE SCREEN		
Televideo 925	Hazeltine 1400	Adds Regent 25
ESC N	------	------

3.4 CURSOR DISPLAY ATTRIBUTES

The cursor's mode of display may be altered either from the keyboard via the status line (see Section 2.1) or from the host via an ESC sequence.

CURSOR DISPLAY	ESC SEQUENCE
	TELEVIDEO 925 & DMS-800
INVISIBLE	ESC.0
BLINKING BLOCK	ESC.1
STEADY BLOCK	ESC.2
BLINKING UNDERLINE	ESC.3
STEADY UNDERLINE	ESC.4

3.5 PROTECT MODE

Sections of the DMS-800's screen can be protected from being erased or overwritten by input from the keyboard. Characters in these write protected areas appear in half-intensity. This feature allows the programmer to load the screen with a form or other structured display and control where input from the keyboard is placed within the display. Unprotected or protected input may then be selectively transmitted to the host or printer port.

When a field is protected, the cursor cannot be moved into the field with the move cursor right or left commands. However, cursor up, down, linfeed, or reverse linefeed can move the cursor into a protected field. When the

cursor approaches a protected field it will skip to the next column after the field. When the whole screen is write protected the cursor will be locked into the Home position.

There are two steps to creating a write protected field:

1) Position the cusor at beginning of field that is to be protected. Send ESC) to identify beginning of field. Enter the appropriate characters. Send ESC (to signal end of protected field. Characters within field are displayed in half-intensity. Repeat this step to identify additional protected fields.

2) Turn on write protection by sending ESC &. All half-intensity characters in fields are now protected against erasure. Send ESC ' to turn off write protection.

3.6 SEND (TRANSMIT TO HOST) FUNCTIONS

Data that is locally (isolated from the host) entered and edited can be transmitted in block form with several different qualifications. In particular, protected fields can be isolated from unprotected fields and transmitted separately.

TRANSMIT UNPROTECTED LINE -- When Protect Mode is ON, this command transmits to the host all unprotected data in the cursor line from column one through the cursor position. Transmission includes field delimiters instead of protected

fields and an ETX character at the end of the transmission.

----------TRANSMIT UNPROTECTED LINE----------

Televideo 925	Hazeltine 1400	Adds Regent 25
ESC 4	------	------

TRANSMIT FULL UNPROTECTED SCREEN -- When protect mode is on this command transmits all unprotected data from the Home position through the cursor's position to the host. Transmission includes end of line delimiter and ETX character.

----------TRANSMIT UNPROTECTED SCREEN----------

Televideo 925	Hazeltine 1400	Adds Regent 25
ESC 5	------	------

TRANSMIT LINE ALL -- When Protect Mode is on this command transmits all data from the first column of the current cursor line through the cursor position. Transmission includes start and end protected field delimiters of each protected field. An end protected field delimiter is sent if the current cursor position is protected. The ETX character is sent at the end of the transmission.

----------TRANSMIT LINE ALL----------

Televideo 925	Hazeltine 1400	Adds Regent 25
ESC 6	------	------

TRANSMIT SCREEN ALL -- Transmits all data on the screen from the home position through the current cursor position. Transmission includes start and end protected field delimiters of each protected field. An end protected field delimiter is sent if the current cursor position is protected. The ETX character is sent at the end of the transmission.

----------TRANSMIT SCREEN ALL----------

Televideo 925	Hazeltine 1400	Adds Regent 25
ESC 7	------	------

TRANSMIT MESSAGE UNPROTECTED -- When Protect Mode is on, unprotected data within the STX (start of text) and ETX (end of text) in the screen boundaries is sent to host. Cursor is positioned as ETX code after transmission. If no STX is found, transmission begins at Home position. If no ETX is found transmission ends at end of screen. It neither STX or ETX are present the entire unprotected contents of the screen is sent. Transmission includes start and end protected field delimiters of each protected field. An end protected field delimiter is sent if the current cursor position is protected. The

ETX character is sent at the end of the transmission.

----------TRANSMIT MESSAGE UNPROTECTED----------

Televideo 925	Hazeltine 1400	Adds Regent 25
ESC S	------	------

TRANSMIT MESSAGE ALL -- Similar function as TRANSMIT FUNCTION UNPROTECTED (ESC S) but both protected and unprotected data are sent to the host.

--------------TRANSMIT MESSAGE ALL--------------

TeleVideo 925	Hazeltine 1400	Adds Regent 25
ESC s	------	------

3.7 MONITOR MODE

The Monitor Mode feature displays all characters from the host or the keyboard, including CTRL and ESC codes, on the screen. This mode facilitates the debugging of programs. See Table ___ for the screen display codes that represent each CTRL or ESC sequence.

----------------MONITOR MODE----------------

TeleVideo 925	Hazeltine 1400	Adds Regent 25
ON ESC U		CTRL 1
OFF ESC u or X	--------	CTRL 2

MONITOR MODE CODE ABBREVIATIONS

Displayed Character	ASCII Character	Hex Code	Description
N_U	NULL	00	Null character
S_H	SOH	01	start of heading
S_X	STX	02	start of text
E_X	ETX	03	end of text
E_T	EOT	04	end of transmission
E_Q	ENQ	05	enquiry
A_K	ACK	06	acknowledge
B_L	BEL	07	bell
B_S	BS	08	backspace
H_T	HT	09	horizontal tab
L_F	LF	0A	linefeed
V_T	VT	0B	vertical tab
F_F	FF	0C	formfeed
C_R	CR	0D	carriage return
S_O	SO	0E	shift out
S_I	SI	0F	shift in
D_L	DLE	10	data link escape
D_1	D1	11	device control 1
D_2	D2	12	device control 2
D_3	D3	13	device control 3
D_4	D4	14	device control 4
N_K	NAK	15	negative acknowledgment
S_Y	SYN	16	synchronous idle
E_B	ETB	17	end transmitted block
C_N	CAN	18	cancel
E_M	EM	19	end of medium
S_B	SUB	1A	substitute
E_C	ESC	1B	escape
F_S	FS	1C	file separator

G_S	GS	1D	group separator
R_S	RS	1E	record separator
U_S	US	1F	unit separator
	SP	20	space
	DEL	7F	delete

3.8 PRINT FUNCTIONS

Data may be sent to the print port through two methods: 1) SIMULTANEOUS (SIMUL) PRINT, 2) TRANSPARENT PRINT.

1) SIMUL PRINT -- In SIMUL Print Mode, characters are sent from the keyboard to the host and simultaneously to the Print Port. The BAUD setting for the Host Port and the Printer Port need NOT be the same if the terminal is set to either DTR or XON/XOFF.

----------NOTE----------
When using SIMUL Print with no handshaking protocols, the DMS-800 may shift into an 'overdrive' mode to accomodate the rapid flow of data from the host while waiting for the printer

G_S	GS	1D	group separator
R_S	RS	1E	record separator
U_S	US	1F	unit separator
	SP	20	space
	DEL	7F	delete

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----------NOTE----------
When using SIMUL Print with no handshaking protocols, the DMS-800 may shift into an 'overdrive' mode to accomodate the rapid flow of data from the host while waiting for the printer to catch up. This mode is indicated on the terminal by a flickering Status Line. This flickering will stop when printing is through.

----------SIMUL PRINT----------

	TeleVideo 925	Hazeltine 1400	Adds Regent 25
ON	ESC	-------	--------
OFF	ESC	-------	--------

2)TRANSPARENT PRINT -- In TRANSPARENT Print Mode, any data received by theterminal fromthe host (or keyboard) is sent directly to the Print Port, bypassing the CRT screen. The screen is not updated during the print process. The Host and Printer Port BAUD settings must be the same.

----------TRANSPARENT PRINT----------

	TeleVideo 925	Hazeltine 1400	Adds Regent 25
ON	ESC `	-------	--------
OFF	ESC a	-------	--------

PAGE PRINT -- All data on the screen from the Home position through the cursor position is sent to the Print Port. Carrige Return, Line Feed line delimiters and CTRL characters are sent along with the data. An ACK is sent to the host from the terminal to indicate that all data has been sent to the Printer.

----------PAGE PRINT----------

TeleVideo 925	Hazeltine 1400	Adds Regent 25
ESC p	-------	--------

PRINT TERMINATION SEQUENCE -- Normally (in TVI 925 and DMS-800 emulation) a data transmission through the Print Port is terminated by an ACK (CTRL F). The termination character at the end of the sequence can be changed to any ASCII character desired.

----------TRANSPARENT PRINT----------

TeleVideo 925	Hazeltine 1400	Adds Regent 25
ESC pn	-------	--------

where n is any ASCII character. (E.G., ESC p CTRL D for ETX.

3.9 HOST COMMUNICATION PROTOCOLS

Two communications protocols are available on the DMS-800: DTR and XON/XOFF. Alternately, no protocol can also be selected as a third option. The protocols may also be selected from the Keyboard via the Status Line.

DTR PROTOCOL -- This is a hardware dependant protocol that uses line __ of the Host Port to communicate with the Host. When this line is low it signals the Host to stop sending data to the terminal. When interna, buffer is 20% empty, the line is set high again and data transmission may continue.

XON/XOFF PROTOCOL -- This handshaking protocol is software dependant. When the DMS-800's receiving buffer is almost full it sends an XOFF

command to the Host to stop any further input of data. When the buffer is nearly empty again, the terminal sends an XON command to the Host to restart data transmission.

The two communication protocols may be switched back and forth or turned off altogether by sending commands from the Host.

----------COMMUNICATION PROTOCOLS----------

	TeleVideo 925	Hazeltine 1400	Adds Regent 25
ON	CTRL O	-------	--------
OFF	CTRL N		
NONE			

where ON = XON/XOFF, DTR is OFF; OFF = DTR ON, XON/XOFF is OFF; NONE = both off, no protocol.

3.10 KEYBOARD CONTROL

Several keyboard functions can be controlled from the Host computer: keyclick, key lock and load function keys.

KEYBOARD LOCK -- On command from the Host, the keyboard is locked; no further input from the keyboard will be processed.

----------KEYBOARD LOCK----------

	TeleVideo 925	Hazeltine 1400	Adds Regent 25
LOCK	ESC #	CTRL U	ESC 5
UNLOCK	ESC "	CTRL F	ESC 6

KEYCLICK -- As an optional typing aid, the speaker in the DMS-800 can be programmed to "click" whenever a key is pressed. This sound can be turned on and off from the Host.

KEYCLICK			
	TeleVideo 925	Hazeltine 1400	Adds Regent 25
ON	ESC #	CTRL U	ESC 5
OFF	ESC "	CTRL F	ESC 6

3.10.1 PROGRAMMABLE FUNCTION KEYS

The 93 available levels of function keys can be loaded from both the keyboard (by the operator) and from the Host via a program. This feature can be invaluable for customizing the terminal to specialized application programs.

Across the top of the keyboard are sixteen function keys. Each are programmable with up to three separate strings of variable length. In addition, the ten numeric keys, the decimal point, +, - and * keys on the numeric/cursor-control keypad and the ALT keys in the main key group, are all programmable. The four arrow keys next to the Space Bar always have the same values that the arrow keys in the keypad (shifted 2,4,6 and 8). Each key may hold three separate values, one for the key alone, one for the key with the SHIFT key held down, and one for the key with the CTRL key held down. This gives you 93 programmable keys in all. Diagram ___ shows which keys are programmable.

To reprogram the function key output strings the following code is used:

ESC 1
function key number
length of string
string

FUNCTION KEY NUMBER -- "Function key number" is the one-byte binary identifier of the function key you want to program. To calculate the function key number of a function key, add the hex value of the key (e.g., F1=1H, F16=10H) to 80H. For example, the function key number for F17 is:

17=11H 11H + 80H = 91H F17=91H.

To program the SHIFTED value of a function key, set bit 5 in its function-key number byte to one. To program the CONTROL value of a key, set bit 6 in the byte to one. See Diagram 3-2 for the byte structure of the function key numbers.

Diagram __. An illustration of the DMS-800 keyboard with all programmable function keys labeled.

To find the function key number for the shifted value of a function key, add A0H to the key number. For example:

SHIFT/F6 = 6 + A0H = A6H

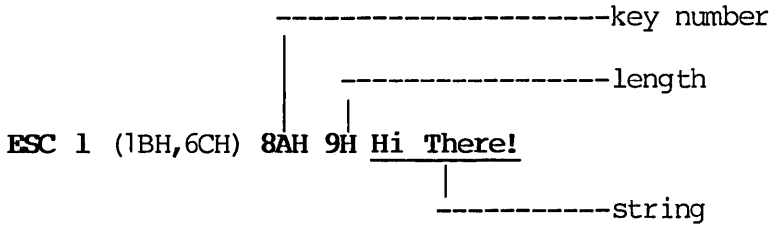
To find the function key number for a CTRL/Function key, add C0H to the key number. For example:

CTRL/F6 = 6 + C0H = C6H

As another example, if you wanted to program key F10 to output the string:

Hi There!

the programming command would look like this:



In BASIC the program code would be:

```
10 PRINT CHR$(1BH);CHR$(6CH);CHR$(8AH);CHR$(9H);
20 PRINT Hi There!;
```

Strings can be between 1 and 125 bytes. The maximum amount of RAM storage available for programming the function keys is 1K bytes. Any entries over the 1K limit will not be accepted.

Diagram 3-2. Byte structure of the Function Keys and examples for calculating the Function Key Number.

- o For all function keys, bit 7 is set to 1.
- o Bit 6 is set to 1 only for the CTRL value of a key.
- o Bit 5 is set to 1 only for the SHIFT value of a key.
- o Bits 4 through 0 are for the hex value of the function key label.

FUNCTION KEY NUMBER REPORT -- Normally, when a function key is pressed the string programmed into it is sent to the host CPU. A mode can be entered in which only the function key number (in hex) will be reported to the host CPU when a function key is pressed. For example, F1 will send 81H and F6 will send 86H.

ESC p (1BH,70H) - Report function key number only.

ESC P (1BH,50H) - Report function key's programmed string.

FUNCTION KEY REPORT -- When the host CPU sends the sequence:

ESC g (1BH,67H) **keynum**

to the CRT controller, the controller sends back the length of the string that is programmed into the function key and then the string.

3.11 KEYLOAD AND KEYSAVE

The previous keyboard programming functions can be used to develop utilities to save function key settings into files and later restore them. This feature allows a User to have several files that can load the function keys for different applications--an extremely handy capability.

The following code is an example of KEYLOAD and KEYSAVE as developed by Digital Microsystems

for the CP/M operating system. (Variations exist for MS-DOS and CP/M-86.)

4.0 TROUBLE SHOOTING, DIAGNOSTICS

If screen comes up blank, the video may have been inadvertently turned off by a command from the Host and preserved by the battery backup. To see if this is the reason behind a blank screen. press CTRL/SHIFT F15 to reset the keyboard controller. The cursor should then show in the upper corner of the screen. If this procedure does not help it may be necessary to turn off the power and remove the batteries from inside of the terminal. Wait 5 minutes for the CMOS RAM to clear. Turn on the power again to see if this solved the problem.

Function	TELEVIDEO 925	HAZELTINE 1500	ADDS REGENT 25
Back Tab	ESC I		ESC I
Bell	CTRL G	CTRL G	CTRL G
Blank Field, Start	ESC G1		
Blank Field, Stop	ESC G1		
Blank Screen	ESC O		
Blink Field, Start	ESC G2		
Blink/Blank, Stop	ESC G0		
Block Mode Off	ESC C		
Block Mode On	ESC B		
Buffer Print Off			ESC 4
Buffer Print On			ESC 3
Carriage Return	CTRL M	CTRL M	CTRL M
Character Delete	ESC W		
Character Insert	ESC Q		
Clear All Tabs	ESC 3		
Clear to Half Intensity	ESC ,		
Clear All to Nulls	ESC *	CTRL \	ESC *
Clear to Foreground		CTRL]	
Clear to Background		CTRL W	
Clear Tab at Cursor	ESC 2		ESC 2
Clear Unpr to Ins Char	CTRL Z		
Clear Unpr to Nulls	ESC :		
Clear Unpr to Space	ESC +		
Conversational Mode On	ESC C		
Cursor Address (Row Col)	ESC =	CTRL Q	ESC Y
Cursor Attribute	ESC n		
Cursor Home	CTRL ^		CTRL A
Cursor Down	CTRL V	CTRL K	CTRL J
Cursor Left	CTRL H	CTRL H	CTRL H
Cursor Right	CTRL L	CTRL P	CTRL F
Cursor Up	CTRL K	CTRL L	CTRL Z
Cursor Position, Read	ESC ?	CTRL E	ESC ?
Disable BiDir Port	CTRL T		CTRL T

Function	TELEVIDEO 925	HAZELTINE 1500	ADDS REGENT 25
Display CTRL code			ESC Z
Display Status Line			
Display User Line	ESC g		
Enable BiDir Port	ESC R		ESC R
End Write Protect	ESC (		
Erase EOL w/ Null	ESC t	CTRL O	
Erase EOL w/ Spaces	ESC T		ESC K
Erase EOP with Spaces	ESC Y		ESC k
Erase EOP with Nulls	ESC y	CTRL X	ESC *
Field Tab	ESC i		
Keyclick Off	ESC <		
Keyclick On	ESC >		
Keyboard Lock	CTRL R	CTRL U	ESC 5
Keyboard Unlock	CTRL T	CTRL F	ESC 6
Line Delete	ESC R	CTRL S	
Line Feed	CTRL J	CTRL J	CTRL J
Line Insert	ESC E	CTRL Z	
Load Insert Char	ESC e		
Load User Line	ESC f		
Monitor Mode Off	ESC u		CTRL 2
Monitor Mode On	ESC U		CTRL 1
Newline (CR+LF)	CTRL _		CTRL _
Normal Screen	ESC N		
Print Page	ESC P		
Reverse Line Feed	ESC j		
Reverse Video, start	ESC G4	CTRL _	ESC R
Reverse Video, stop	ESC G0	CTRL Y	ESC N
Reverse Video, full scr	ESC b		ESC T
Set Attrib. by Char.			
Set Display Attribute	ESC G		
Set Full Duplex			
Set Half Duplex			
Set Insert Mode			

Function	TELEVIDEO 925	HAZELTINE 1500	ADDS REGENT 25
Set Line Edit			
Set Local Edit	ESC k		
Set Local Mode			
Set Normal Video	ESC d	CTRL Y	ESC d
Print Termination Char	ESC pn		
Select Termin Char	ESC x4nn		
Set Tab at Cursor	ESC 1		ESC 1
Set W.P. Attribute			
Simul Print Off			CTRL O
Simul Print On			CTRL R
Status Line Off	ESC h		
TAB	CTRL I	CTRL I	CTRL I
Toggle Auto-Scroll			
Transparent Print On	ESC '		
Transparent Print Off	ESC a		
Underline, Start	ESC G8		
Underline, Stop	ESC G0		
Write Protect, On	ESC)		
Write Protect Off	ESC (		
XON/XOFF, Enable	CTRL O		
XON/XOFF, Disable	CTRL N		

----------NOTE----------

HAZELTINE 1500 emulation requires a lead in code for all commands except for Tab, Bell and moving the cursor left and right. The lead in is:

ASCII ~, (col 7, row 14 - decimal 126).

Cursor addressing is by col and row for the Hazeltine 1500. Televideo 925 and Adds Regent 25 use row and column sequence when moving the cursor.

Function	DMS-800/ TV 925	HAZELTINE 1500	ADDS REGENT 25
Back Tab	ESC I		
Bell	CTRL G	CTRL G	CTRL G
Blank Field, Start	ESC G1		
Blank Field, Stop	ESC G1		
Blank Screen	ESC O		
Blink Field, Start	ESC G2		
Blink/Blank, Stop	ESC G0		
Block Mode Off	ESC C		
Block Mode On	ESC B		
Carriage Return	CTRL M	CTRL M	CTRL M
Character Delete	ESC W		
Character Insert	ESC Q		
Clear All Tabs	ESC 3		
Clear to Half Intensity	ESC ,		
Clear All to Nulls	ESC *	CTRL \	ESC *
Clear to Foreground		CTRL]	
Clear to Background		CTRL W	
Clear Tab at Cursor	ESC 2		ESC 2
Clear Unpr to Ins Char	CTRL Z		
Clear Unpr to Nulls	ESC :		
Clear Unpr to Space	ESC +		
Conversational Mode On	ESC C		
Cursor Address (Row Col)	ESC =	CTRL Q	ESC Y
Cursor Attribute	ESC .n		
Cursor Home	CTRL ^		CTRL A
Cursor Down	CTRL V	CTRL K	CTRL J
Cursor Left	CTRL H	CTRL H	CTRL H
Cursor Right	CTRL L	CTRL P	CTRL F
Cursor Up	CTRL K	CTRL L	CTRL Z
Cursor Position, Read	ESC ?	CTRL E	ESC ?
Simul Print Off	CTRL T		CTRL T

Function	TELEVIDEO 925	HAZELTINE 1500	ADDS REGENT 25
Display CTRL code			ESC Z
Display User Line	ESC g		
Enable BiDir Port	ESC R		ESC R
End Write Protect	ESC (		
Erase EOL w/ Null	ESC t	CTRL O	
Erase EOL w/ Spaces	ESC T		ESC K
Erase EOP with Spaces	ESC Y		ESC k
Erase EOP with Nulls	ESC y	CTRL X	ESC *
Field Tab	ESC i		
Function Key Upload	ESC 9		
Function Key Download	ESC 8		
Keyclick Off	ESC <		
Keyclick On	ESC >		
Keyboard Lock	ESC #	CTRL U	ESC 5
Keyboard Unlock	ESC "	CTRL F	ESC 6
Line Delete	ESC R	CTRL S	
Line Feed	CTRL J	CTRL J	CTRL J
Line Insert	ESC E	CTRL Z	
Load Insert Char	ESC e		
Load User Line	ESC f(text)<CR>		
Monitor Mode Off	ESC u		CTRL 2
Monitor Mode On	ESC U		CTRL 1
Newline (CR+LF)	CTRL _		CTRL _
Normal Screen	ESC N		
Print Page	ESC P		
Print Termination Char	ESC p(n)		
Protect Mode On	ESC &		
Protect Mode Off	ESC '		
Reverse Line Feed	ESC j		
Reverse Video, start	ESC G4	CTRL _	ESC R
Reverse Video, stop	ESC G0	CTRL Y	ESC N
Reverse Video, full scr	ESC b		ESC T
Set Attrib. by Char.			
Set Display Attribute	ESC G		

Function	TELEVIDEO 925	HAZELTINE 1500	ADDS REGENT 25
Set Line Edit			
Set Local Edit	ESC k		
Set Duplex Edit Mode	ESC |		
Set Local Mode			
Set Normal Video	ESC d	CTRL Y	ESC d
Screen Timeout, Disable	ESC o		
Screen Timeout, Enable	ESC c		
Select Termination Char	ESC x4(nn)		
Set Tab at Cursor	ESC 1		ESC 1
Send Line Unprotected	ESC 4		
Send Page Unprotected	ESC 5		
Send Line All	ESC 6		
Send Page All	ESC 7		
Send Message Unprotected	ESC S		
Send Message All	ESC s		
Set Tabs Every 8th col.	ESC q		
Simul Print Off	ESC @		CTRL O
Simul Print On	ESC A		CTRL R
Status Line Off	ESC h		
TAB	CTRL I	CTRL I	CTRL I
Toggle Auto-Scroll			
Transparent Print On	ESC '		
Transparent Print Off	ESC a		
Underline, Start	ESC G8		
Underline, Stop	ESC G0		
Write Protect, On	ESC)		
Write Protect Off	ESC (		
XON/XOFF, Enable	CTRL O		
XON/XOFF, Disable	CTRL N		

----------NOTE----------

HAZELTINE 1500 emulation requires a lead in code for all commands except for Tab, Bell and moving the cursor left and right. The lead in is:

ASCII ~, (col 7, row 14 - decimal 126).

Cursor addressing is by col and row for the Hazeltine 1500. Televideo 925 and Adds Regent 25 use row and column sequence when moving the cursor.

Emulated Codes

Function	Freedom 100	TeleVideo 910	Hazeltine 1420	ADDS 25	ADM3/5
Back Tab	ESC I	ESC I	ESC I	ESC I	ESC I
Begin XON/XOFF	CTRL O				
Begin Write Protect	ESC)				
Bell	CTRL G	CTRL G	CTRL G	CTRL G	CTRL G
Bell OFF	ESC _				
Bell ON	ESC ^				
Block Mode OFF	ESC C				
Block Mode ON	ESC B				
Buffer Print OFF	ESC a	CTRL T	ESC /	ESC 4	ESC A
Buffer Print ON	ESC '	CTRL R	ESC *	ESC 3	ESC @
Carriage Return	CTRL M	CTRL M	CTRL M	CTRL M	CTRL M
Character Delete	ESC W				
Character Insert	ESC Q				
Clear All TABs	ESC 3	ESC 3	ESC 3		ESC 3
Clear to W.P. Space	ESC ,				
Clear All to Nulls	ESC *	ESC *		ESC *	ESC *
Clear Insert Mode	ESC r				
Clear Monitor Mode	ESC X	CTRL 2	CTRL 2	CTRL 2	CTRL 2
Clear Monitor Mode	ESC u	ESC u/X			ESC u/X
Clear TAB here	ESC 2	ESC 2	ESC 2	ESC 2	ESC 2
Clr Unpr to Ins Chr	CTRL-Z				
Clr Unpr to Nulls	ESC :				
Clr Unpr to Space	ESC ;				
Clr Unpr to Space	ESC +				
Configure Main Port	ESC { bspw				
Configure Aux. Port	ESC } bspw				
Convers. Mode ON	ESC C				
Cursor Down	CTRL V	CTRL J	CTRL J	CTRL J	CTRL J
Cursor Left	CTRL H	CTRL H	CTRL H	CTRL H/U	CTRL H
Cursor Right	CTRL L	CTRL L	CTRL P	CTRL F	CTRL L
Cursor Up	CTRL K	CTRL K	ESC CTL L	CTRL Z	CTRL K
Disable BiDir Port	CTRL T	ESC A	ESC ?	CTRL T	CTRL O
Display CTRL Code	ESC F {c}	ESC F {c}		ESC Z {c}	ESC f {c}
Display Status Line	ESC h				
Display User Line	ESC g				
Enable BiDir Port	CTRL R	ESC @	ESC /	CTRL R	CTRL N
End Write Protect	ESC (				
End XON/XOFF	CTRL N				
Erase EOL w/ Null	ESC t				
Erase EOL Ins Chr	ESC T	ESC T	ESC O	ESC K	ESC T
Erase EOP w/ Null	ESC y	ESC *		ESC *	ESC *
Erase EOP Ins Chr	ESC Y	ESC Y	ESC X	ESC k	ESC Y
Field Tab	ESC i				
Graphics Mode OFF	ESC %				
Graphics Mode ON	ESC $				
Home	CTRL^	CTRL^	ESC^ R	CTRL A	CTRL^
Keyclick OFF	ESC<				
Keyclick ON	ESC>				
Line Delete	ESC R				
Line Feed	CTRL J	CTRL J	CTRL J	CTRL J	CTRL J
Line Insert	ESC E				
Load Cursor Attrib	ESC . {n}	ESC .		ESC .	ESC.
Load Insert Char	ESC e {c}				
Load User Line	ESC f {t}				
Lock Keyboard	ESC #	ESC #	ESC U	ESC 5	ESC #
Monitor Mode OFF	ESC u	ESC u/X			ESC u/X
Monitor Mode OFF	ESC X	CTRL 2	CTRL 2	CTRL 2	CTRL 2
Monitor Mode ON	ESC U	ESC U			ESC U
Monitor Mode ON	CTRL 1	CTRL 1	CTRL 1	CTRL 1	CTRL 1
Newline (CR & LF)	CTRL _	CTRL _		CTRL _	CTRL _
Print	ESC P				
Program SEND Funct	ESC 0 {c}				
Random Cursor Addr	ESC = {n,n}	ESC=RC	ESC^ Q CR	ESC Y RC	ESC=RC
Read Cursor Pos	ESC ?	ESC ?	ESC^ E	ESC ?	ESC ?
Reverse Line Fee	ESC j				
Send Line All	ESC 6				
Send Line Unprotect	ESC 4				
Send Message All	ESC s				
Send Msg Unprotect	ESC S				
Send Page All	ESC 7				
Send Page Unprotect	ESC 5				
Set Attrib. by Char	ESC m				
Set Convers. Edit	ESC 1				
Set Cursor Col Posn	ESC] {n}	ESC] C		CTRL P C	ESC] C
Set Cursor Row Posn	ESC [{n}	ESC [R		CTRL K R	ESC [R
Set Display Attrib	ESC G {n}	ESC G {n}	ESC^ G n	ESC G	
Set Fixed Attribute	ESC c				
Set Full Duplex	ESC D F				
Set Half Duplex	ESC D H				
Set Insert Mode	ESC q				
Set Line Edit	ESC O				
Set Local Edit	ESC k				
Set Local Mode	ESC D L				
Set Normal Video	ESC d	ESC G0	ESC^ G0	ESC G0	ESC G
Set Page Edit Mode	ESC N				
Set Reverse Video	ESC b	ESC G4	ESC^ G4	ESC G4	ESC G
Set TAB at cursor	ESC 1	ESC 1	ESC 1	ESC 1	ESC 1
Set W.P. Attribute	ESC p {n}				
Simul Print OFF	ESC A	ESC ?	CTRL T	CTRL O	
Simul Print ON	ESC @	ESC @	ESC /	CTRL R	CTRL N
TAB	CTRL I	CTRL I	CTRL I/N	CTRL I	CTRL I
Toggle Auto-Scroll	ESC H	ESC H		ESC H	ESC H
Unformatted Protect OFF	ESC '				
Write Prot ON	ESC &				
Unlock Keyboard	ESC "	ESC "	ESC^ F	ESC 6	ESC "

3.3 SCREEN DISPLAY ATTRIBUTES

Normally characters and spaces are displayed on the DMS-800's screen as green characters on black background (spaces). The display attributes of both characters and spaces can be changed with the following ESC sequences:

DISPLAY ATTRIBUTE	ESCAPE SEQUENCE			
	FULL INT	HALF INT	GRAPHICS EXTENSION	HALF INT GRAPHICS EXTENSION
NORMAL	ESC G0	ESC G@	ESC GP	ESC Gp
BLANK	ESC G1	ESC GA	ESC GQ	ESC Gq
BLINK	ESC G2	ESC GB	ESC GR	ESC Gr
INVISIBLE BLINK	ESC G3	ESC GC	ESC GS	ESC Gs
REVERSE VIDEO	ESC G4	ESC GD	ESC GT	ESC Gt
INVISIBLE REVERSE	ESC G5	ESC GE	ESC GU	ESC Gu
REVERSE BLINK	ESC G6	ESC GF	ESC GV	ESC Gv
INVISIBLE REVERSE BLINK	ESC G7	ESC GG	ESC GW	ESC Gw
UNDERLINE	ESC G8	ESC GH	ESC GX	ESC Gx
INVISIBLE UNDERLINE	ESC G9	ESC GI	ESC GY	ESC Gy
UNDERLINE BLINK	ESC G:	ESC GJ	ESC GZ	ESC Gz
INVISIBLE UNDERLINE BLANK	ESC G;	ESC GK	ESC G[	ESC G{
UNDERLINE REVERSE	ESC G<	ESC GL	ESC G\	ESC G|
INVISIBLE UNDERLINE REVERSE	ESC G=	ESC GM	ESC G]	ESC G}
UNDERLINE REVERSE BLINK	ESC G>	ESC GN	ESC G^	ESC G~
INVISIBLE UNDERLINE REV BLINK	ESC G?	ESC GO	ESC G_	ESC G DEL
HALF-INTENSITY ON	ESC G)			
HALF-INTENSITY OFF	ESC G(			

The DMS-800 screen-handling functions are very similar to the TeleVideo 925 emulation. However, there is one main difference that programmer's may wish to consider.

To display a graphics character, send either ESC / or ESC \ (depending on the set) followed by the ASCII character equivalent. For example, to display the smiling face--which is in the Low-Bit set--send:

ESC/ CTRL A (01 Hex).

The international and graphic characters start at 80 Hex and end at FF Hex. To find the ASCII equivalent of these characters, they are mapped onto the lower bit set (00 to 7F). For example:

High-bit set character	--> is mapped onto --> Low bit set	to display High-Bit character, enter:
Cedilla (80 H)	--> Null (00 H)	--> ESC \ CTRL @
U umlaut (9A H)	--> (2A H)	--> ESC \ CTRL Z
Pound Sign (9C H)	--> (1A H)	--> ESC \ CTRL \
<< (AE H)	--> . (2E H)	--> ESC \ .
-- (C4 H)	--> D (44 H)	--> ESC \ D
Sigma (E4H)	--> d (64 H)	--> ESC \ d

DD

Notice that High-bit set characters 80 through 9F Hex are mapped onto Low-bit set 0 through 1F Hex. These characters need the CTRL value of characters @ (40 H) through __ (5F H).

In order to form connected lines and graphics on the screen, each graphics character must be extended to the edge of the next cell. This character extension is part of the display attributes that are set with the ESC G sequences described in Section 3.3. Each video attribute can be extended by adding 20 Hex to the

attribute number. For example, Normal Video is ESC G0 (30 Hex). Adding 20 Hex to ASCII 0 results in 50 Hex or ASCII P. Thus to begin extending characters in normal video display send ESC GP. For extended character mode in reverse video send ESC GT (ASCII 4 = 34 Hex + 20 Hex = 54 Hex or ASCII T). See the display attribute table in Section 3.3.

3.5 CURSOR DISPLAY ATTRIBUTES

The cursor's mode of display may be altered either from the keyboard via the status line (see Section 2.1) or from the host via an ESC sequence.

CURSOR DISPLAY	ESC SEQUENCE
	TELEVIDEO 925 & DMS-800
INVISIBLE	ESC .0
BLINKING BLOCK	ESC .1
STEADY BLOCK	ESC .2
BLINKING UNDERLINE	ESC .3
STEADY UNDERLINE	ESC .4

----------NOTE----------
The above ESC sequences are entered as **ESC period** followed by the appropriate number. Do not put a space between the ESC and the period.

3.6 PROTECT MODE

Sections of the DMS-800's screen can be protected from being erased or overwritten by

The TeleVideo 925 screen attributes occupy one character position on the screen (thus in memory); the DMS-800 screen attributes do not. The DMS-800's method is more efficient than the TV 925's and is therefore the recommended operating setting for most programs that would normally use the TV 925 emulation.

CLEAR AND RESTORE SCREEN -- The entire screen can be cleared of any display by sending an ESC sequence.

CLEAR SCREEN		
DMS-800/TV 925	Hazeltine 1500	Adds Regent 25
ESC O	------	------

RESTORE SCREEN		
DMS-800/TV 925	Hazeltine 1500	Adds Regent 25
ESC N	------	------

3.4 GRAPHIC CHARACTERS

In Graphics Mode the DMS-800 can display the full "IBM Extended Character Set". The 128 graphic and international characters are accessed in two "cases": Low-Bit and High-Bit. The Low-Bit set contain ASCII characters 0 - 1F Hex. The High-Bit set contain the extended characters 80 - FF mapped onto ASCII 0 - 7F Hex. The Low-Bit set is selected by sending ESC / (1BH,2FH); the High-Bit set by sending ESC \ (1BH,5CH).