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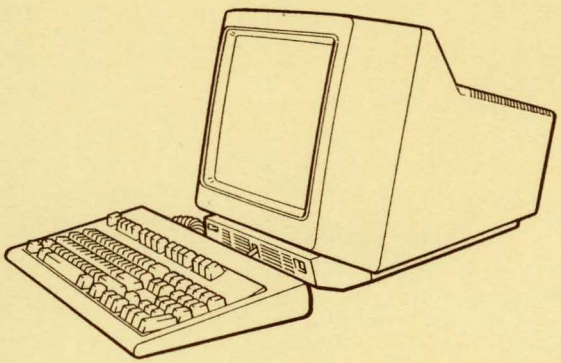
IBM

IBM 3151
ASCII Display Station

User's Guide for the Cartridge to Emulate IBM and DEC[1] Terminals



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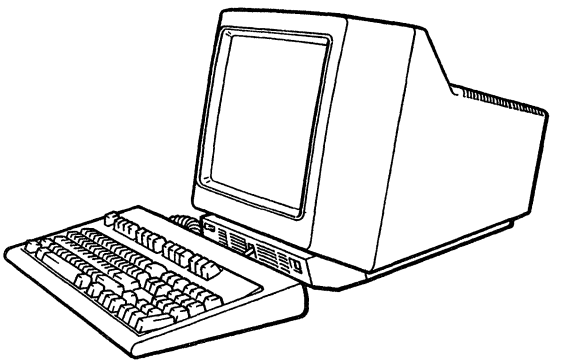

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First Edition (April 1987)

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Using This Guide

The "3151 cartridge to emulate IBM and DEC terminals" is available for IBM 3151 Models 31/41 and it is intended to provide enhancements to the base machine.

This cartridge supports:

- The EIA RS-422A interface (available in all modes that this cartridge supports)
- Emulation mode (mode to emulate the DEC VT220)

  Note: The DEC VT220 is a product of Digital Equipment Corporation.
- The system attachment mode (hereinafter referred to as *SYSTEM ATTACH mode*)

  The IBM 3151 can be attached to the IBM 3701 Network Conversion Unit or the IBM 3710 Network Controller.
- The IBM 3101 emulation mode
- The IBM 3151 native mode
- Ten ASCII terminals' emulation modes
  - ADM[2]-3A
  - ADM-5
  - ADDS[3] Viewpoint-A2
  - Hazeltine[4] 1500
  - TeleVideo[5] Model 910
  - TeleVideo Model 910+
  - TeleVideo Model 912

- TeleVideo Model 920
- TeleVideo Model 925
- TeleVideo Model 925E.

This guide provides information about the:

- Emulation mode (mode to emulate the DEC VT220)
- SYSTEM ATTACH mode.

This guide is intended for customers who will use:

- DEC system in the mode to emulate the DEC VT220
- IBM system
- Both IBM and DEC systems.

This guide does not include information for the IBM 3151 native mode, the IBM 3101 emulation mode, or the ten ASCII terminals' emulation modes. For information on these modes, refer to *IBM 3151 ASCII Display Station Guide to Operations.*

Note for customers who use this cartridge to select RS-422A for the interface: The Interface parameter is added in the COMMUNICATION menu. If you operate the 3151 in neither SYSTEM ATTACH mode nor the mode to emulate the DEC VT220, refer also to *IBM 3151 ASCII Display Station Guide to Operations* when defining setup values.

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2 Registered trademark of Zentec Corporation

3 Trademark of Applied Digital Data Systems, Incorporated

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This guide has five chapters:

- Chapter 1, "Introducing the U.S. English Cartridge to Emulate IBM and DEC Terminals" describes the two modes supported by this cartridge; SYSTEM ATTACH mode and the mode to emulate the DEC VT220. For the latter, several differences between the mode to emulate the DEC VT220 and the original terminal (the DEC VT220 terminal) are described.

- Chapter 2, "Setup Procedures" provides information for the setup procedures in IBM mode as well as in the mode to emulate the DEC VT220.

- Chapter 3, "Setup Menus and Setup Value Descriptions" describes the setup menus and setup values.

- Chapter 4, "Interpreting Operator Messages" provides the information that is needed to interpret operator messages and which actions to take.

- Chapter 5, "Reference Information" provides the information that is necessary for the programmer who works with IBM mode and the mode to emulate the DEC VT220.

Related Publications

- *DEC VT220 Owner's Manual*

- *DEC VT220 Programmer Reference Manual*

- *IBM 3151 ASCII Display Station Guide to Operations*, GA18-2633

  This guide explains how to install and set up the IBM 3151. It also provides introductory information and explains the key functions, indicators, and messages that are displayed at the bottom of the screen. The built-in emulations are described as well. The solving problems chapter is used to isolate failing elements.

- *IBM 3151 ASCII Display Station Reference Manual*, GA18-2634-0

Related Publications

This guide provides information on the IBM 3151 functions and commands. It also introduces the IBM 3151 ASCII Display Station; what it can do and how to use it.

Contents

Figures

Figures

Chapter 1. Introducing the U.S. English Cartridge to Emulate IBM and DEC Terminals

The "U.S. English cartridge to emulate IBM and DEC terminals" supports:

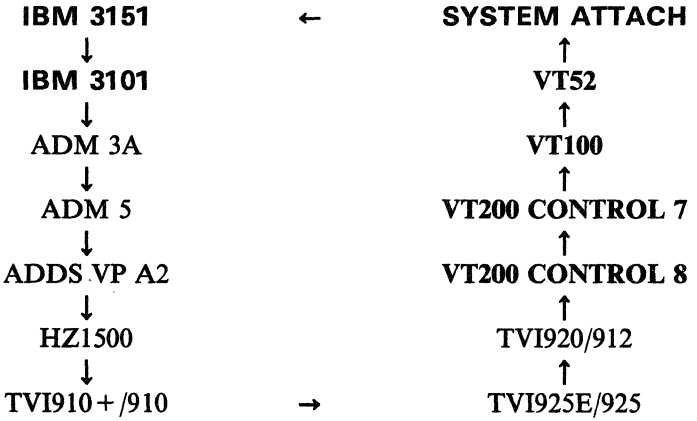
- The EIA RS-422A interface (available in all modes that this cartridge supports)
- Emulation mode (mode to emulate the DEC VT220)
- SYSTEM ATTACH mode
- The IBM 3101 emulation mode
- The IBM 3151 native mode
- Ten ASCII terminals' emulation modes.

This guide explains the:

- Emulation mode (mode to emulate the DEC VT220)
- SYSTEM ATTACH mode.

Changing the Machine Mode

The machine mode can be changed in the following order in the *setup menu.*



Machine modes are classified into five groups:

- IBM 3151
- IBM 3101
- Ten ASCII terminals (ADM 3A, ADM 5, ADDS VP A2, HZ1500, TVI910+/910, TVI925E/925, and TVI920/912)
- DEC VT220 (VT220 CONTROL 7/8, VT100, and VT52)
- SYSTEM ATTACH.

When the machine mode is changed to a new machine mode in a different group (from VT52 to SYSTEM ATTACH, SYSTEM ATTACH to IBM 3151, IBM 3151 to IBM 3101, IBM 3101 to ADM 3A, or TVI920/912 to VT200 CONTROL 8 in case of using the setup menu), a power-on reset (except the checking of the internal circuits) is performed. When the machine mode group is changed in the setup menu, the setup menu for the new machine mode is then displayed.

Note: The machine mode can also be changed by using the Set Control 1 command (see "Set/Read Control 1 Commands/Response" on page 5-12).

When SYSTEM ATTACH, IBM 3151, or IBM 3101 is selected for the machine mode in the setup menu, the new machine mode is immediately saved. That is, if you select SYSTEM ATTACH and exit setup menu without performing the **Save** function, the machine mode is set to SYSTEM ATTACH. The machine mode will also be set to SYSTEM ATTACH the next time power is turned on.

On the other hand, when one of the ten ASCII terminals or the DEC VT220 is selected for the machine mode in the setup menu, the new machine mode is not saved at this point. That is, if you select VT100 and exit setup menu without performing the **Save** function, the machine mode is set to VT100. However, the machine mode will not be set to VT100 the next time power is turned on. Instead, the latest saved machine mode for the DEC VT220 machine group will be set. You must perform the **Save** function to save the machine mode in this case.

When you power-on the display station the first time with the cartridge inserted, the machine mode is set to VT200 Control 7.

Machine Mode Switch Key

For the customers who use both IBM and DEC systems, this cartridge provides the support for a **Machine Mode Switch** function that allows you to switch the machine mode from DEC (VT52, VT100, VT200 CONTROL 7, or VT200 CONTROL 8) to IBM (IBM 3151, IBM 3101, or SYSTEM ATTACH) and vice versa. The Machine Mode Switch function is performed when the *Send* key is pressed while holding down the *Ctrl* and *Shift* keys (hereinafter referred to as Machine Mode Switch key). See Figure 1-3 on page 1-10 for the location of the Machine Mode Switch key.

To use the Machine Mode Switch key, the following setup is needed:

1. Select the machine mode and define the setup values for DEC (VT52, VT100, VT200 CONTROL 7, or VT200 CONTROL 8). (See "Step 12A. Defining Setup Values (emulation)" on page 2-26 for more information.)

2. Select the machine mode and define the setup values for IBM (IBM 3151, IBM 3101, or SYSTEM ATTACH). (See "Step 12B. Defining Setup Values (IBM Mode)" on page 2-29 for more information.)

Note: When you change the setup values after installation it is recommended that you first set the machine mode to the one whose values you want to change; enter the setup menu and change the values. That is, if the current machine mode is IBM and you want to change the setup values for DEC, first change the mode from IBM to DEC by using the Machine Mode Switch key; enter the setup menu.

If you enter the setup menu in IBM mode and change the setup values for DEC, the machine mode changes as described in "Changing the Machine Mode" on page 1-2 and IBM 3101 will become the new IBM mode when exiting the setup menu.

Changing the Mode between IBM and DEC

In daily operation, you can switch the machine mode, for example, from **SYSTEM ATTACH** to **VT200 CONTROL 7** and vice versa, using the Machine Mode Switch key as follows:

1. Sign off the current session.
2. Press the *Send* key while holding down the *Ctrl* and *Shift* keys (Machine Mode Switch key).
3. Sign on the new session.

Warning: Do not press the Machine Mode Switch key without first terminating the current session, otherwise the current session will be suspended and will not operate correctly. If pressed by mistake, press the Machine Mode Switch key again and sign off the current session to clear the suspended state.

Describing the Mode to Emulate the DEC VT220

Four machine modes are available for the mode to emulate the DEC VT220:

- VT200, 7-bit controls
- VT200, 8-bit controls
- VT100
- VT52.

In most instances, you can run the same application programs that were running the DEC VT220. However, the 3151 uses a different kind of connector for the main and auxiliary ports than the DEC VT220. Therefore, a cable is necessary to connect the 3151 to a host system or a printer. These cables should be readily available from a cable vendor. Chapter 8, "Installation Planning" in *IBM 3151 ASCII Display Station Reference Manual* provides information on the main and auxiliary ports.

This section describes the DEC VT220 functions that are *different* or *not* supported when operating in emulation mode. It also describes the *additional* functions and commands/response. Other DEC VT220 functions work as they normally do in the DEC VT220.

Functions Supported Differently in Emulation Mode

The following figure shows which emulated DEC VT220 functions are different and how they are different.

DEC VT220 Function	Difference in Emulation Mode
Tests (DECTST) command	Replaced with the internal check program, which is automatically run each time the display station is powered-on or test mode is started by pressing the *Do* key (when the key cap is changed; otherwise the *Hold* key) while holding down both the *Ctrl* key and the *Shift* key.
Keyboard layout	Key caps are provided to emulate the DEC VT220 keyboard. You should change the key caps during setup procedures. Figure 1-2 shows a keyboard layout to emulate the DEC VT220 after key caps have been changed.
Keyboard indicators; Hold Screen, Lock, Compose, and Wait	Replaced with the indications shown on the bottom line of the screen.
Main and auxiliary port connectors	The 3151 uses a different kind of connector than the DEC VT220.
Displayed characters	Shapes and sizes are different.
Setup menus	Menu layouts and definitions are different. See Chapter 3, "Setup Menus and Setup Value Descriptions" on page 3-1 and "Equivalent Setup Parameters" on page 3-20 for more information.

Figure 1-1 (Part 1 of 2). Functions Supported Differently in Emulation Mode

DEC VT220 Function	Difference in Emulation Mode
Tab settings	The DEC VT220 sets tab stops by the setup menu. The 3151 provides a *Tabs* key to set tab stops.
Cursor type selection	The DEC VT220 selects a cursor type by the setup menu. The 3151 provides a *Alt Csr* key to select the cursor type.

Figure 1-1 (Part 2 of 2). Functions Supported Differently in Emulation Mode

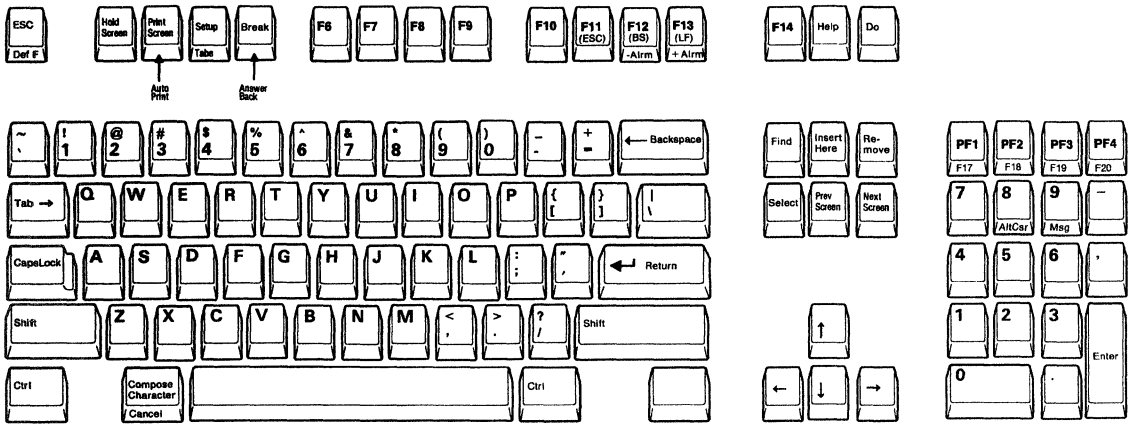


Figure 1-2. Keyboard Layout to Emulate the DEC VT220

Notes:

1. *Some labels of the keys are printed differently on the actual keyboard.*
2. *The **Break** key performs the disconnect function when pressed with the **Shift** key.*
3. *The function on the front of each key is performed when the key is pressed with the **Ctrl** key.*

Functions Not Supported in Emulation Mode

The following functions are not supported in emulation mode:

- Changeable power supply voltage
- Keyclick
- 20 mA current loop communication interface
- Speed indicator (pin 12) and speed select (pin 23) on the main port connector (EIA RS-232C interface)
- Video signal output port
- Data/Talk key

  An integrated modem cannot be attached.

- Selection of the receive line speed

  The receive line speed depends on the transmit line speed, that is, the latter is selectable but the former is not selectable, and a selected transmit line speed is applied to the receive line speed.

Additional Functions in Emulation Mode

The 3151 provides the following additional functions:

- EIA RS-422A interface for the main port
- 25 lines of 80 characters and 25 lines of 132 characters screen support

  You can select a screen format by the setup menu or by a CSI (Control Sequence Introducer) sequence. To use this function, see "Step 12A. Defining Setup Values (emulation)" on page 2-26, or "Select Screen Format" on page 5-1.

- Operator information area

  The Operator Information Area (OIA) is the bottom line of the screen where indicators and messages show the status of the display station.

- Break signal with two selectable time durations (170 or 500 ms)

- Keyboard functions.

Additional Commands/Response in Emulation Mode

The 3151 provides the following additional commands/response:

- Select Screen Format Command

  To use this command, see "Using the Select Screen Format Command" on page 5-2.

- Set Control 1 Command

- Read Control 1 Command

- Read Control 1 Response.

  These commands/response are used to set or read the machine and operating modes that this cartridge supports. To use these commands/response, see "Host Commands" on page 5-11.

Additional Keyboard Functions in Emulation Mode

Figure 1-3 on page 1-10 shows the location of the additional keys. Their functions are shown in Figure 1-4 on page 1-10. When you try to use any of the 3151 functions that are not explained here, but shown on the actual keyboard, the audible alarm will sound.

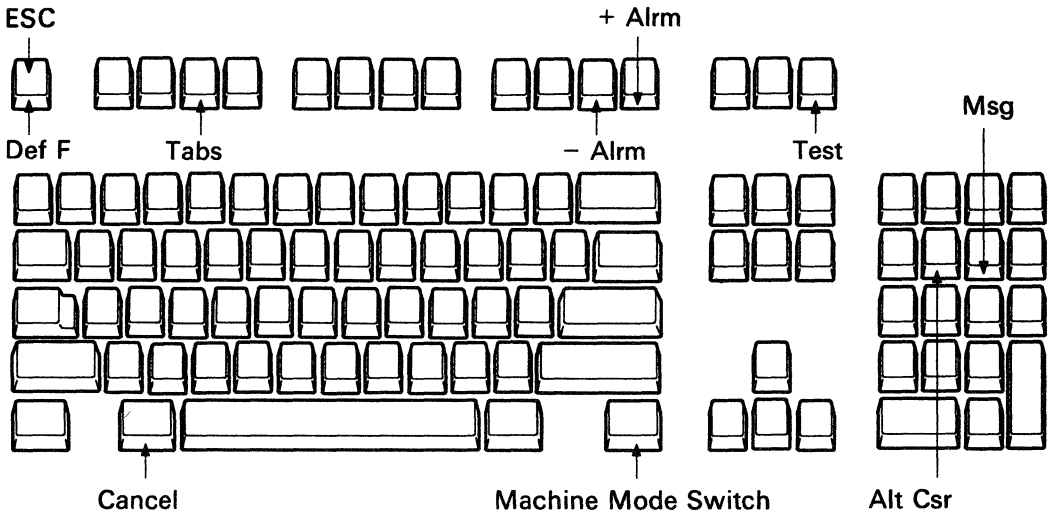


Figure 1-3. Location of Additional Keys

Key	Function
Alarm	Each time the – *Alrm* key is pressed while holding down the *Ctrl* key, the sound of the audible alarm decreases. Each time the + *Alrm* key is pressed while holding down the *Ctrl* key, the sound of the audible alarm increases. The alarm-level setting is saved for later use.
Alt Csr	Each time the *Alt Csr* key is pressed while holding down the *Ctrl* key, the cursor type changes to one of four: steady block, blinking block, steady bar, and blinking bar. The selected cursor is saved and used the next time power is turned on.

Figure 1-4 (Part 1 of 3). Additional Keyboard Functions in Emulation Mode

Key	Function
Cancel	Cancels the print operation that was requested by the host command, *Print* key, or Auto Print setting. This key also erases the message AUX NOT READY from the operator information area. *Note:* This function is not effective when CONTROLLER is selected for the Print Mode option.
Def F	Defines functions from the keyboard. See "Defining Function Keys (emulation)" on page 2-32.
ESC	Is used to key in an ESC sequence from the keyboard.
Machine Mode Switch	Is used to switch the mode from IBM to DEC and vice versa.
Msg	Each time the *Msg* key is pressed, the content of the OIA changes. At first the OIA displays operator messages; the first time the *Msg* key is pressed, the OIA indication turns off; the next time the *Msg* key is pressed, the OIA displays operator messages again. Whether or not to display operator messages in the OIA is saved for later use.
Tabs	Sets tab stops from the keyboard. See "Setting Tab Stops (emulation)" on page 2-34.

Figure 1-4 (Part 2 of 3). Additional Keyboard Functions in Emulation Mode

Key	Function
Test	**Warning:** During on-line operations, do not press the *Do* key (when the key cap is changed; otherwise the *Hold* key) while holding down both the *Ctrl* and *Shift* keys; data could be lost. The *Test* key does not exist as a single key. The test function is performed when the *Do* key (when the key cap is changed; otherwise *Hold* key) is pressed while holding down both the *Ctrl* and *Shift* keys. Pressing the three keys in the same order causes the display station to enter test mode and a test pattern appears. In this mode, internal circuits are checked. You can also check the keyboard using the test pattern. See Chapter 5, "Solving Problems" in *IBM 3151 ASCII Display Station Guide to Operations* for more information. Pressing the three keys again in the same order causes the display station to exit this mode while initializing the display station.

Figure 1-4 (Part 3 of 3). Additional Keyboard Functions in Emulation Mode

Describing SYSTEM ATTACH

SYSTEM ATTACH permits the display station to be attached to the IBM 3708/3710 without loosing any operator usability.

Note: When SYSTEM ATTACH is selected, 3151 ECHO' is displayed in the operator information area.

In SYSTEM ATTACH operation, the areas affected by the differences from the original 3151 functions are:

- Setup menus (see "Setup Menus and Setup Values (SYSTEM ATTACH)" on page 3-25.)
- Host commands (see "Host Commands" on page 5-11.)
- AID (attention identification) codes and keyboard functions. (see "AID Codes and Keyboard Functions" on page 5-34.)

Chapter 2. Setup Procedures

This chapter provides step-by-step procedures for setting up the 3151 both in the mode to emulate the DEC VT220 and in IBM mode. Before beginning the setup, the person responsible for the installation should have completed the preparations for installing the 3151. These preparations include:

- Site preparation
- Installation of communication cables, power receptacle, and wiring
- Determination of the setup values and competition of Figure 3-15 on page 3-23 (emulation), Figure 3-20 on page 3-30 (SYSTEM ATTACH), or Figure 3-21 on page 3-32 (3151/3101).

The above information is described in:

- Chapter 8, "Installation Planning" in *IBM 3151 ASCII Display Station Reference Manual.*
- "Setup Menus and Setup Values (emulation)" on page 3-2, "Setup Menus and Setup Values (SYSTEM ATTACH)" on page 3-25, which list the setup menus and setup parameters, and describe the meanings of the setup values.
- "Equivalent Setup Parameters" on page 3-20, which explains the equivalent 3151 setup parameters for the DEC VT220.

Setup Procedures

This chapter describes the following:

- Setting up the 3151, which shows the steps needed to install the 3151.
- Defining setup values, which shows the steps needed to define the setup values. You must define at least the communication values so that the display station can correctly communicate with the host system or printer.
- Defining function keys (optional), which shows the steps needed to define function keys.
- Setting tab stops (optional), which shows the steps needed to set tab stops.

Notes:

1. *If you have any problems in the following steps, see Chapter 5, "Solving Problems" in IBM 3151 ASCII Display Station Guide to Operations.*
2. *If needed, save the packing material which may be required when returning or relocating the 3151. Packing material can also be purchased from IBM.*

Setting Up the Display Station for This Cartridge

The key caps and two keyboard overlays are provided to emulate the DEC VT220 keyboard or the IBM 3270 type keyboard. Figure 2-1 shows the key caps that are shipped with this cartridge.

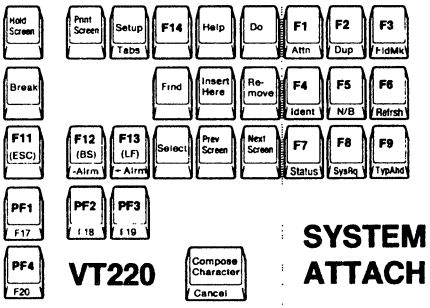


Figure 2-1. Key Caps

The use of the key caps and overlays depends on what you will do with the 3151. Figure 2-2 on page 2-4 shows the possible usages of the 3151 with this cartridge. For example, if your primary use of the 3151 is to emulate the DEC VT220 and the secondary use is a SYSTEM ATTACH mode operation, change the keyboard layout with the key caps (key caps left of the dotted line in Figure 2-1) to emulate the DEC VT220 keyboard. When you use the 3151 in SYSTEM ATTACH mode, use the keyboard overlay (GX18-2286).

Usage	Key Caps	Overlay
Primary: VT220 **Secondary:** IBM	VT220	GX18-2286
Primary: IBM (3151 or 3101) **Secondary:** VT220	Not used	GX18-2287
Primary: IBM (SYSTEM ATTACH) **Secondary:** VT220	SYSTEM ATTACH	GX18-2287

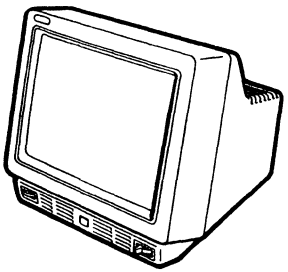
Figure 2-2. Using the Key Caps and Overlay

The following pages show the recommended steps when installing the 3151 for these uses.

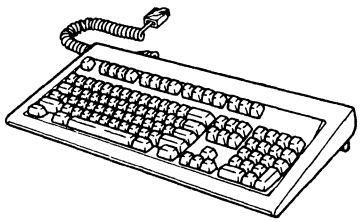
Setting Up the 3151

Check each box (☐) as you identify each item. If any required items are missing, call your IBM marketing representative or place of purchase.

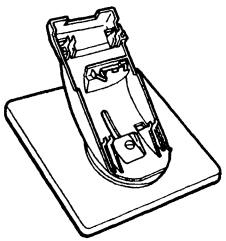
☐ Video Element



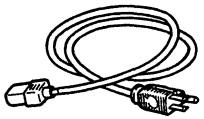
☐ Keyboard



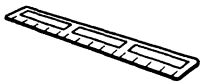
☐ Stand (optional)



☐ Power Cord



☐ Keyboard Overlay (blank)

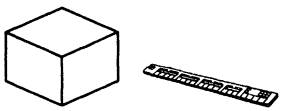


☐ Keyboard Overlay (for ten ASCII emulations)

Shipped with the Cartridge

☐ Cartridge and Cartridge Cap

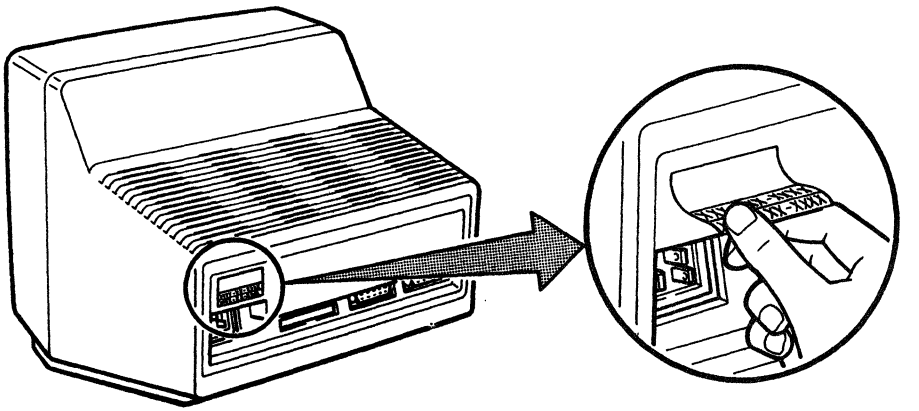
☐ Key Caps and Two Overlays



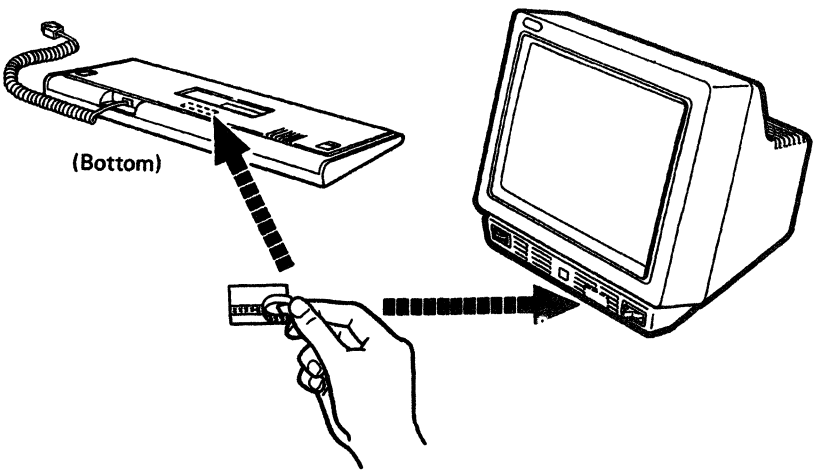
Step 2. Attaching the Label

Important: It is important that you attach the labels to avoid possible delay if it ever becomes necessary to return the unit to IBM.

a Tear off the labels from the back of the video element.



b Attach one label to the front of the video element and the other to the bottom of the keyboard.



If your primary use of the display station is to emulate the DEC VT220 and the secondary use is an IBM mode operation, go to page 2-8 (Step 3A).

If your primary use of the display station is a SYSTEM ATTACH mode operation and the secondary use is to emulate the DEC VT220, go to page 2-11 (Step 3B).

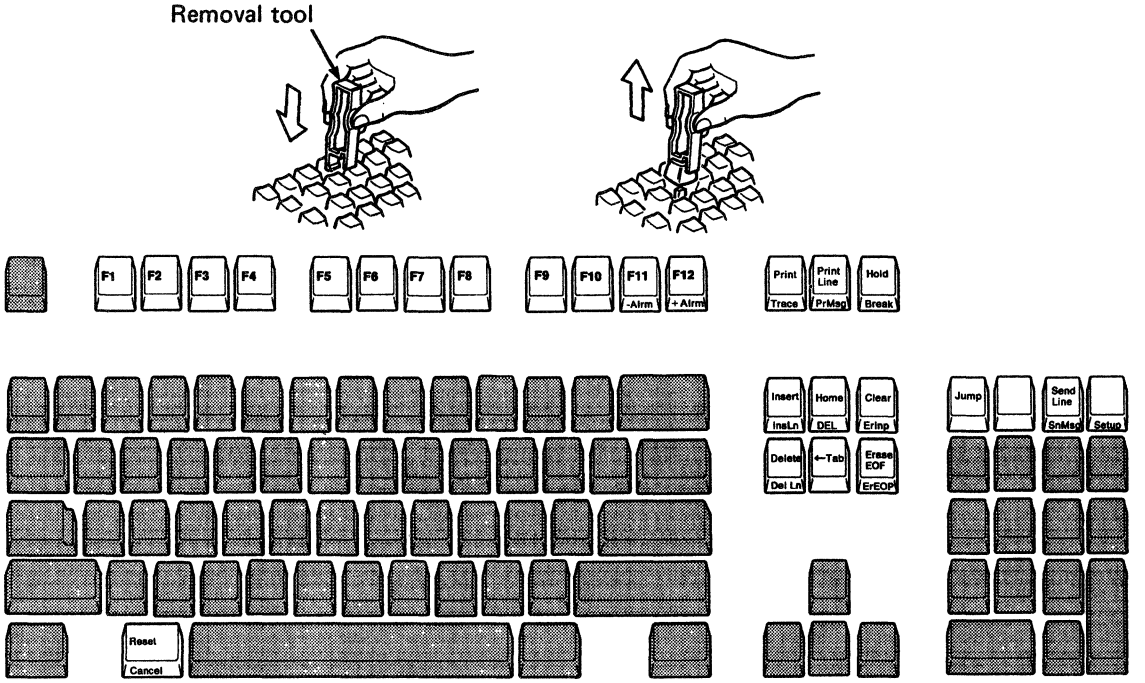
If your primary use of the display station is an IBM 3151 or IBM 3101 mode operation and the secondary use is to emulate the DEC VT220, skip steps 3A and 3B; go to page 2-14 (Step 4).

Step 3A. Changing the Key Caps (emulation)

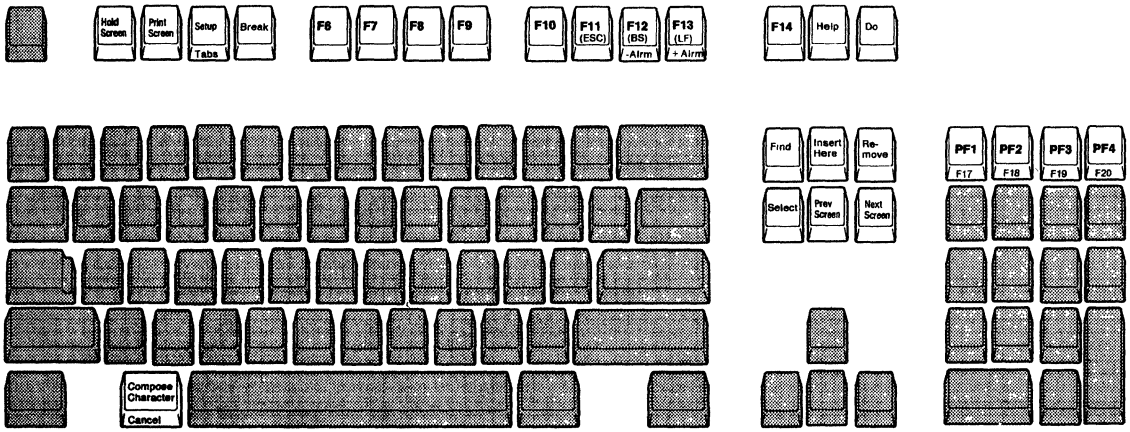
This step describes how to change key caps to emulate the DEC VT220 keyboard.

a **Using the key-cap-removal tool, remove the key caps shown below (non-shaded).**

*Keep **F6**, **F7**, **F8**, **F9**, and **F10** for the next step, and the other keys for possible later use. Key caps that you change here must be returned to their original positions before returning the keyboard to IBM.*

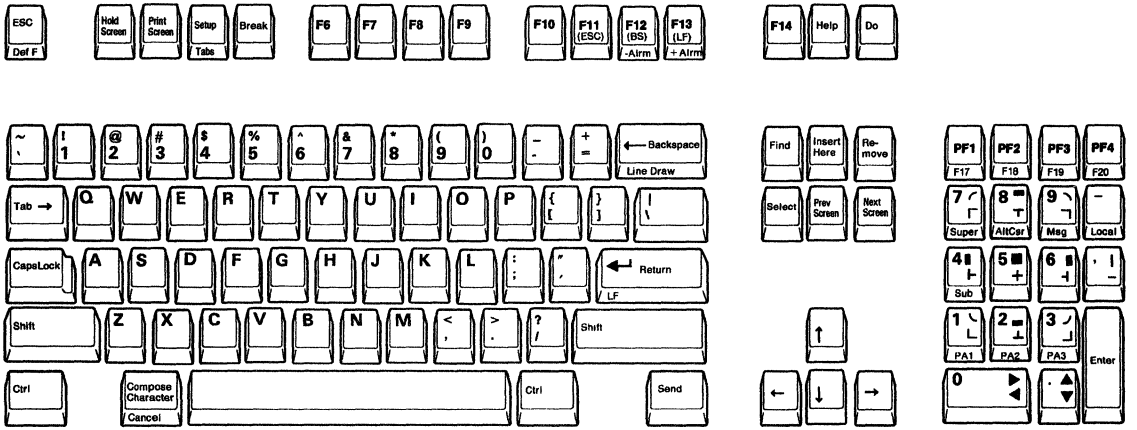


b Install the key caps in the positions shown on the keyboard below (non-shaded).



Step 3A. Changing the Key Caps (emulation)

c After making the changes, your keyboard should look like this.



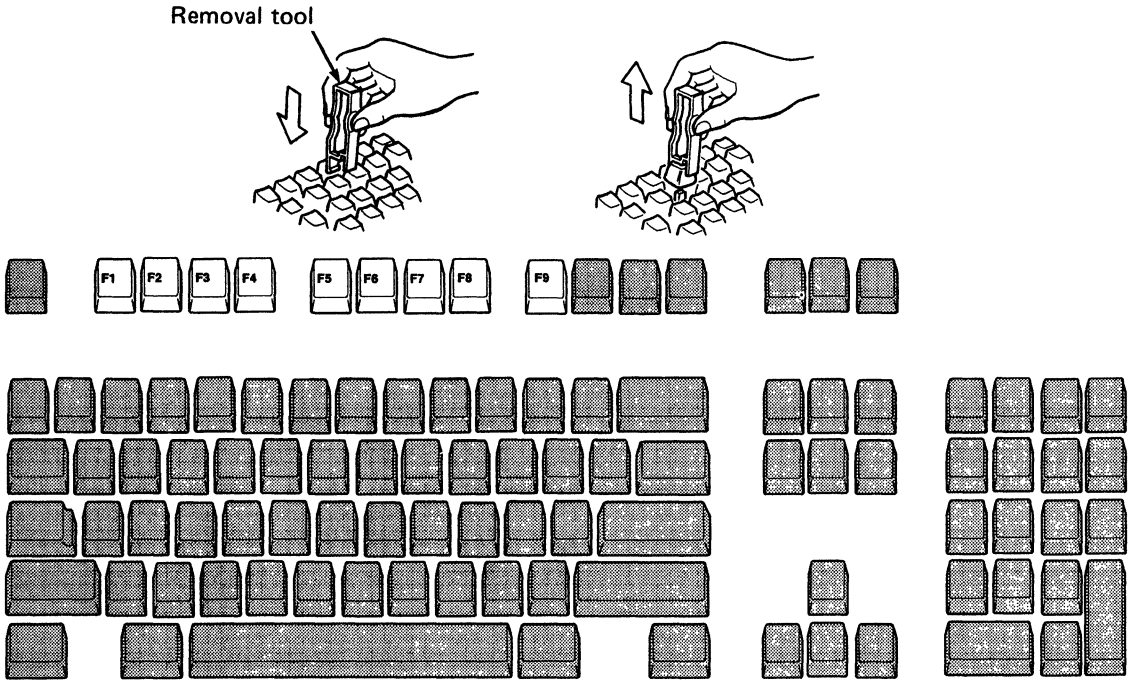
Go to page 2-14 (Step 4).

Step 3B. Changing the Key Caps (SYSTEM ATTACH)

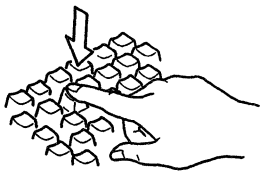
This section describes how to change key caps to emulate the IBM 3270 type keyboard.

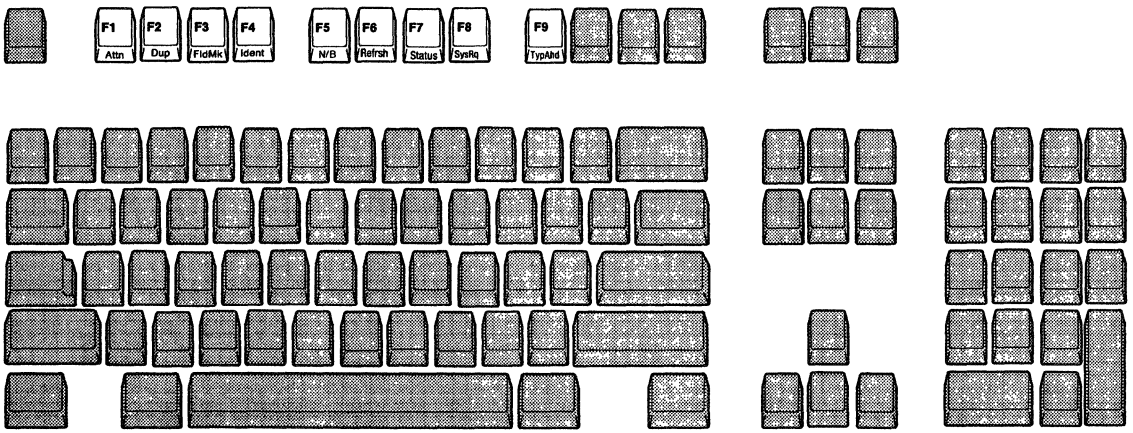
a Using the key-cap-removal tool, remove the key caps shown below (non-shaded).

*Keep **F1** through **F9** for possible later use. Key caps that you change here must be returned to their original positions before returning the keyboard to IBM.*

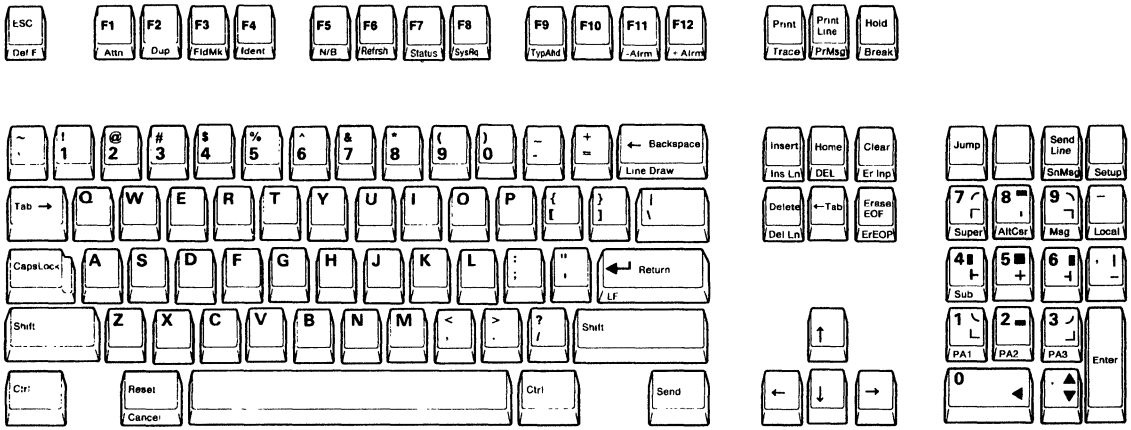


b Install the key caps in the positions shown on the keyboard below (non-shaded).





c After making the changes, your keyboard should look like this.



Go to page 2-14 (Step 4).

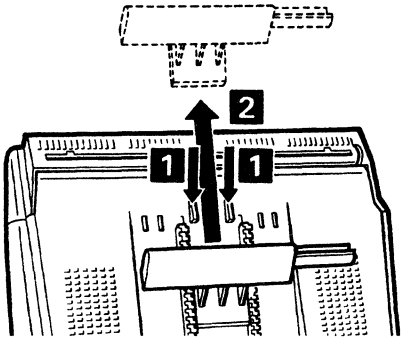
Step 4. Attaching the stand (optional)

a

Customers who do not have the stand:
Skip this step; go to page 2-16 .

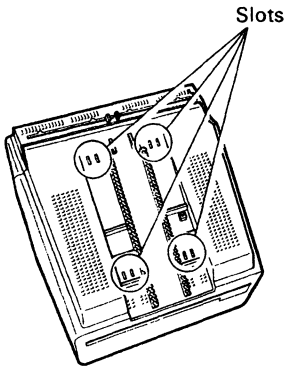
Customers who have the stand:
If a stand is available for the 3151, do this step.

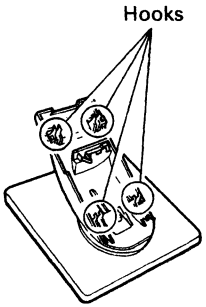
Turn the video element upside down. While pushing the two latches down 1 , slide the tilt foot in the direction of arrow 2 and remove it.



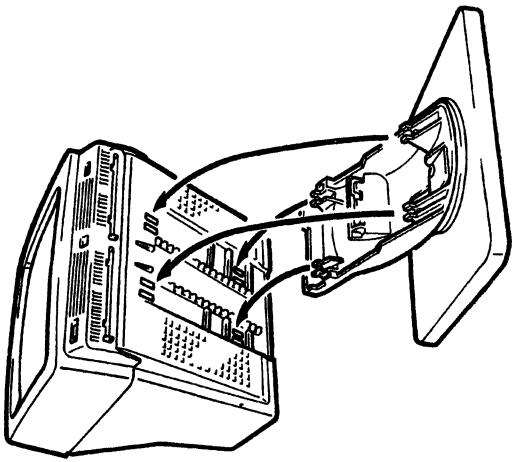
b

Locate the four slots on the video element and the four hooks on the stand.

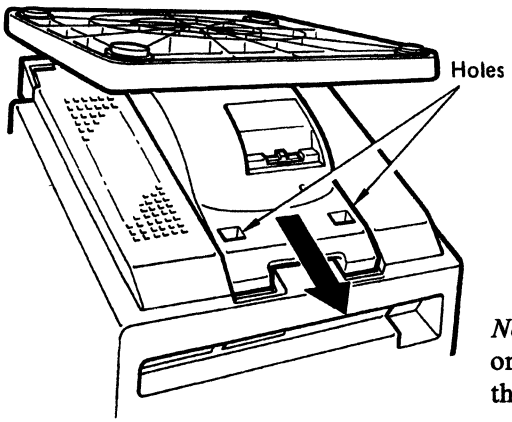




c Insert the four hooks of the stand into the four slots of the video element; then push the stand down slightly and slide it backward until it snaps into place.



d By looking through the two holes of the stand, ensure that the hooks go into the corresponding slots of the video element.

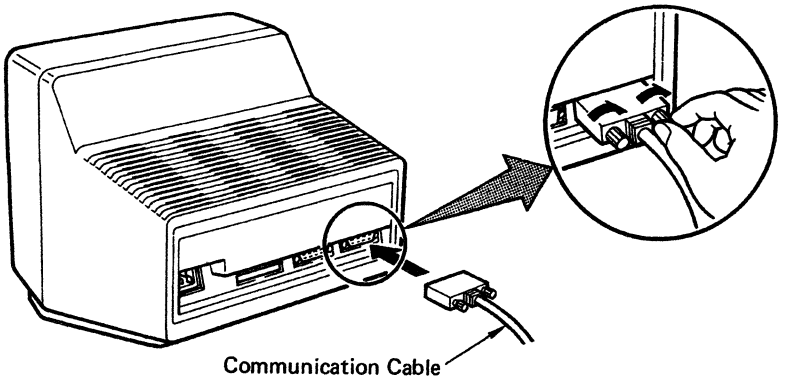


Note: Ensure that the stand is locked onto the video element by moving the stand forward and backward.

a

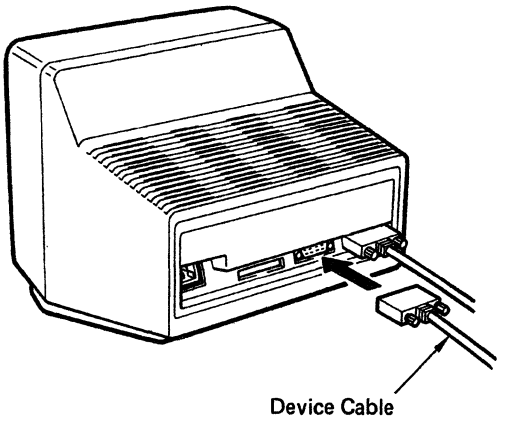
DANGER
Do not perform this step during an electrical storm. Communication cables can conduct lethal charges of electricity.

Insert the communication cable fully into the video element and tighten the screws.

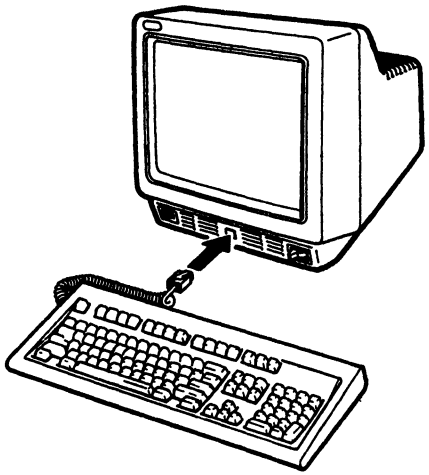


b

To connect a printer or any other optional device, insert its cable into the video element and tighten the screws.

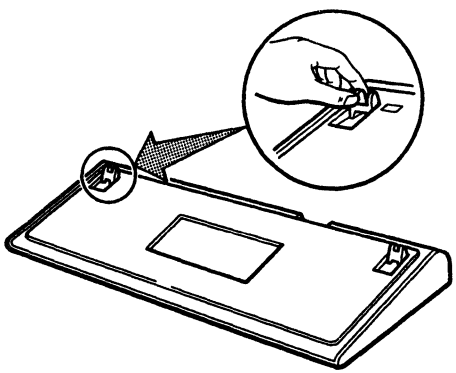


c Insert the keyboard cable into the video element.

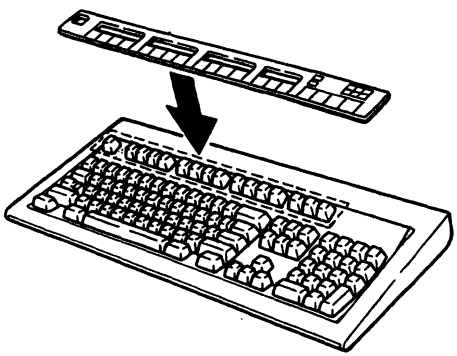


Step 6. Setting the Keyboard Angle and Placing the Overlay

a Adjust the legs as needed.

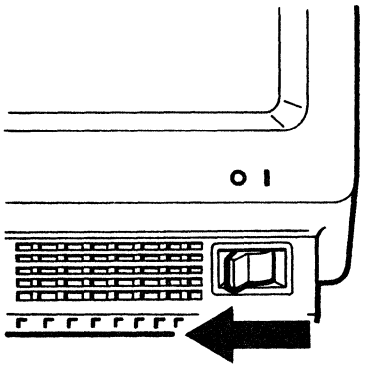


b Place the appropriate overlay on the keyboard.



Step 7. Inserting the Cartridge

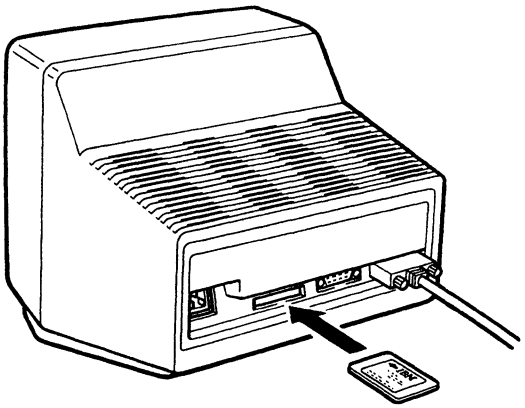
a Make sure the power switch is set to O (Off).



b

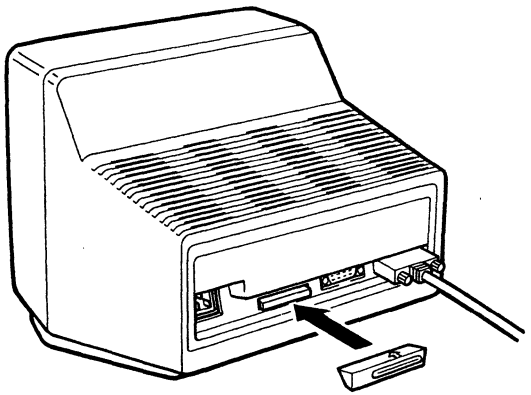
Warning: Do not remove or insert the cartridge when the display station is powered-on. Damage to the display station may result.

Fully insert the cartridge into the slot of the video element.



c

Place the cartridge cap on the end of the cartridge; then push it in as far as it will go.

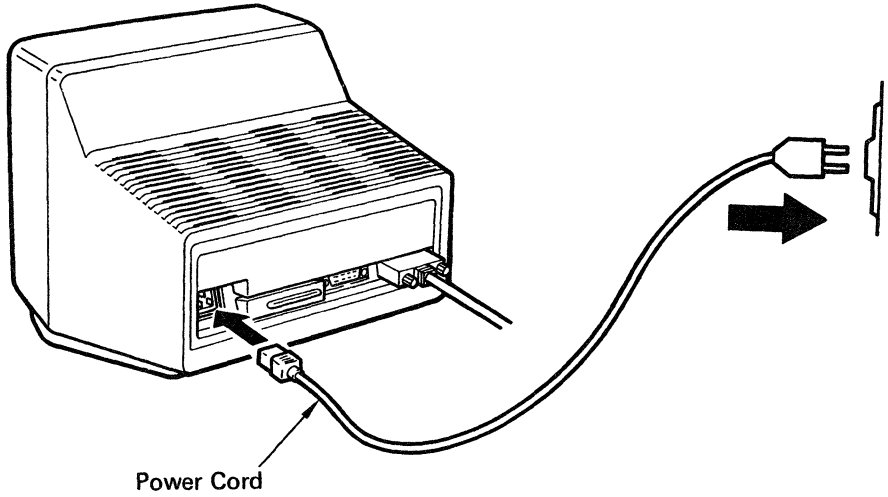


CAUTION

The power cord plug is approved for use with this display station and meets the relevant testing laboratory, country, or test-house standards. For your safety, the plug must be connected to a properly wired and grounded receptacle. An improperly wired receptacle could place a hazardous voltage on accessible metal parts of the display station. The customer is responsible for receptacle wiring.

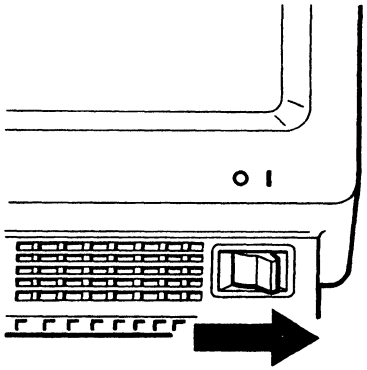
Notice for Customers in Chicago, Illinois: Use the 1.8 m (6 ft) power cord.

a Insert the power cord into the video element; insert the other end into a power outlet.



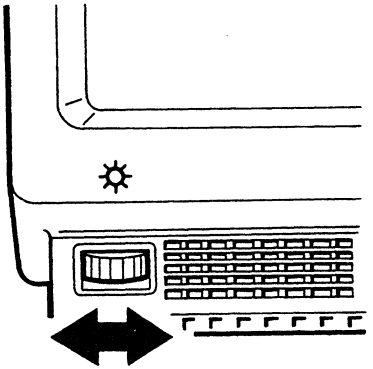
b Set the power switch to I (On).

The setup menu should appear and the audible alarm should sound.



Step 9. Adjusting the Screen Brightness

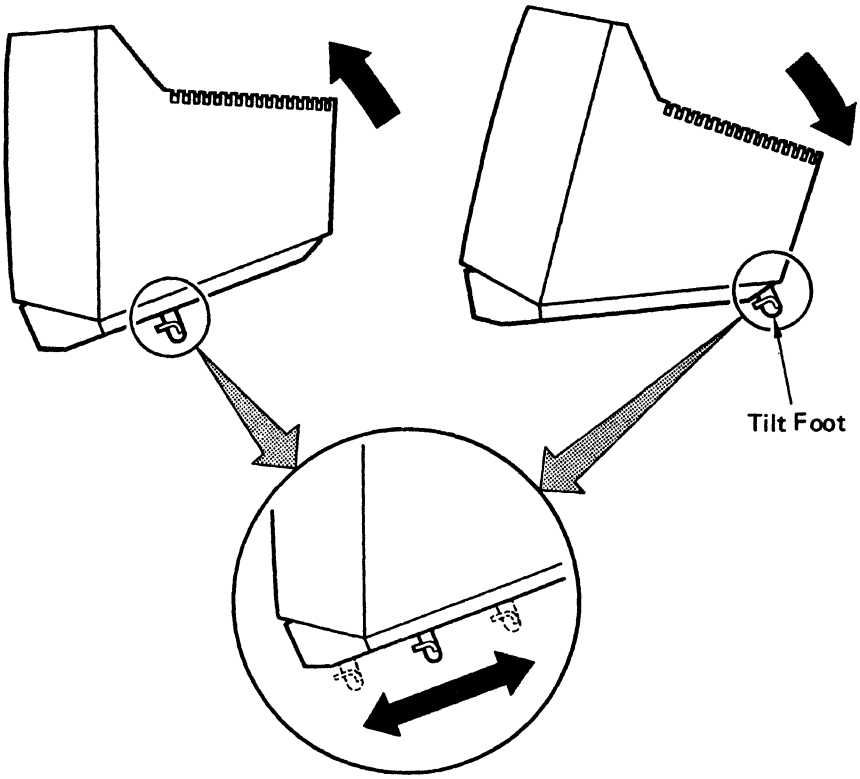
Adjust the (☼) brightness knob until the brightness is set to a comfortable viewing level.



Customers who do not have the stand (optional):
If a stand is not available for the 3151, do this step.

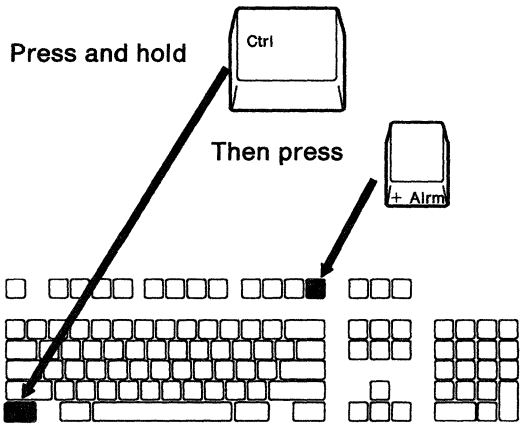
Customers who have the stand (optional):
Skip this step; go to page 2-24 .

Lift the rear of the video element to slide the tilt foot as needed.

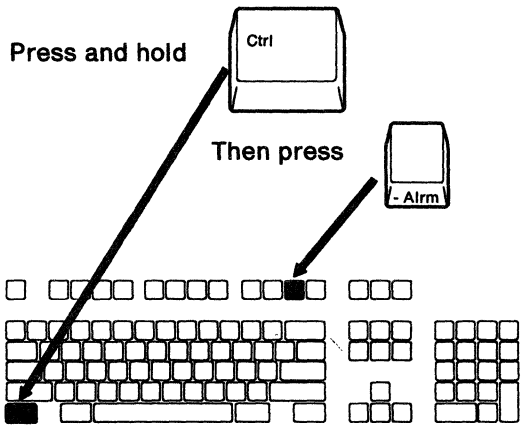


Step 11. Adjusting the Audible Alarm Sound

a To increase the sound of the audible alarm:



b To decrease the sound of the audible alarm:



Repeat these steps until the alarm is set to a comfortable sound level.

Step 12. Defining Setup Values

You must define the setup values so that the display station can correctly communicate with the host system or printer. The person responsible for setting up the display station should have selected the values for your installation.

"Setup Parameters List (emulation)" on page 3-23 lists all possible values for the mode to emulate the DEC VT220. "Setup Parameters List (SYSTEM ATTACH)" on page 3-30 lists all possible values for SYSTEM ATTACH mode. "Setup Parameters List (IBM 3151/3101)" on page 3-32 lists all possible values for IBM 3151 and IBM 3101 modes. The explanation of the values for the mode to emulate the DEC VT220 is provided in "Setup Menus and Setup Values (emulation)" on page 3-2. The explanation of the values for SYSTEM ATTACH mode is provided in "Setup Menus and Setup Values (SYSTEM ATTACH)" on page 3-25. The explanation of the values for IBM 3151 and 3101 modes is provided in *IBM 3151 ASCII Display Station Guide to Operations.*

If you use only a DEC system, go to page 2-26 and do step 12A.

If you use only an IBM system, go to page 2-29 and do step 12B.

If you use both DEC and IBM systems, go to page 2-26 and do steps 12A and 12B.

Note: The location of the *Setup* key in the mode to emulate the DEC VT220 and other modes differs. For the location, see page 2-27 for the mode to emulate the DEC VT220 and page 2-30 for other modes.

Step 12A. Defining Setup Values (emulation)

This step describes how to define the setup values for the mode to emulate the DEC VT220.

a *As described in Step 8, the setup menu (*GENERAL*) should appear as shown below.*

Note: If you have already defined the setup values, the GENERAL menu will not appear. Press the *Setup* key.

```
                    S E T U P    M E N U

 GENERAL  DISPLAY  COMMUNICATION    KEYBOARD  PRINTER    FUNCTION

On-Line/Local              ON-LINE  Auto Answerback            OFF
Transparent Mode              OFF   Answerback
Machine Mode        VT200 CONTROL 7 ________________________________
Operation Mode                ECHO  Answerback Concealed       OFF
VT100 ID                      VT220 Characters          MULTINATIONAL
User Features               UNLOCK
```

b Refer to Figure 3-15 on page 3-23; select the field and change the value, if needed.

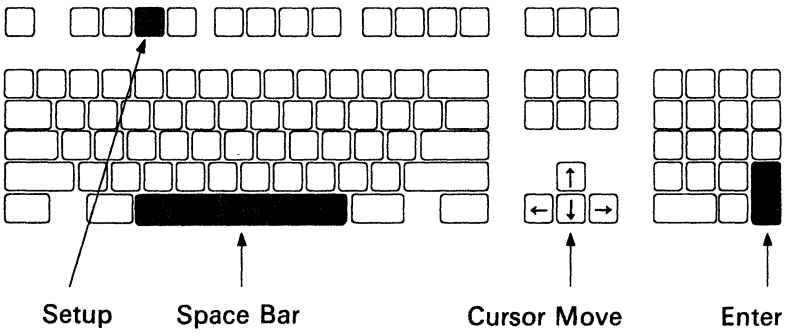
1 Using the *Cursor Move* keys (↑ ↓ ← →), select any field (high-intensity box) whose value you want to change.

2 Press the *Space Bar* to display each value. Do this until the desired value appears.

3 Repeat steps **1** and **2** until you have changed all necessary values.

Note: For the answerback message, key in the characters (up to 30 characters) instead of pressing the *Space Bar*.

4 Select the next menu by pressing the *Enter* key, and change all necessary values. Follow the same procedures for all menus (GENERAL, DISPLAY, COMMUNICATION, KEYBOARD, and PRINTER), except the FUNCTION menu, which has different purposes.



If You Need Help

If you do not understand the above procedures, see "How to Define Setup Values" on page 3-33 for a more detailed explanation.

C Select the FUNCTION menu to save the definitions that you have made on the GENERAL, DISPLAY, COMMUNICATION, KEYBOARD, and PRINTER menus.

1 Select the FUNCTION menu by pressing the *Enter* key from the PRINTER menu.

The FUNCTION *menu should look like this.*

```
                    S E T U P    M E N U

GENERAL   DISPLAY  COMMUNICATION    KEYBOARD  PRINTER  FUNCTION

   Clear Display          Clear Comm          Reset Terminal

   Recall                 Save                Default
```

2 Select the Save field using the *Cursor Move* keys (↑ ↓ ← →).

3 Press the *Space Bar* to save the definitions (a blinking Completed should appear).

4 If you use only a DEC system, press the *Setup* key to exit this mode.

Setup Procedures are now complete.

If you use an IBM system also, go to page 2-29 and do step 12B.

Step 12B. Defining Setup Values (IBM Mode)

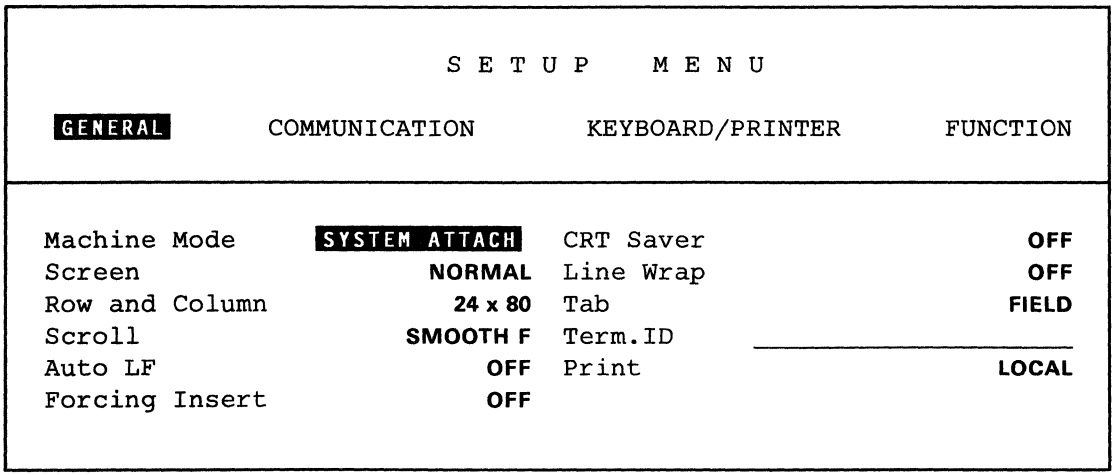
This step describes how to define the setup values for IBM mode. SYSTEM ATTACH is taken as an example.

a If the 3151 displays the FUNCTION menu for the mode to emulate the DEC VT220, select the GENERAL menu by pressing the *Enter* key; select SYSTEM ATTACH for the Machine Mode by repeatedly pressing the *Space Bar*.

If the 3151 displays the GENERAL menu for the mode to emulate the DEC VT220, select SYSTEM ATTACH for the Machine Mode by repeatedly pressing the *Space Bar*.

At this point, the GENERAL *menu will appear as shown below.*

Note: If you have already defined the setup values, the GENERAL menu will not appear. Press the *Setup* key.



b Refer to Figure 3-20 on page 3-30; select the field and change the value, if needed.

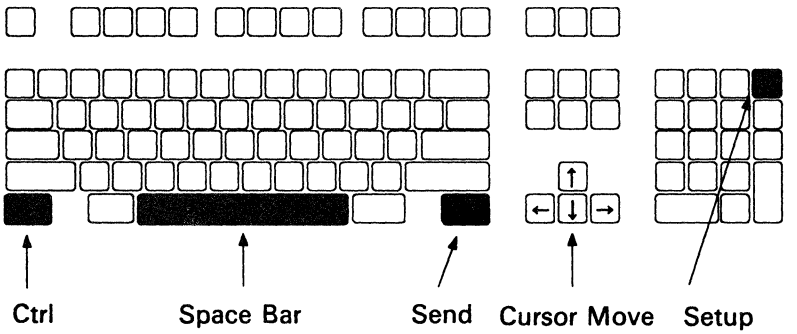
1 Using the *Cursor Move* keys (↑ ↓ ← →), select any field (high-intensity box) whose value you want to change.

2 Press the *Space Bar* to display each value. Do this until the desired value appears.

3 Repeat steps **1** and **2** until you have changed all necessary values.

Note: For the Term. ID message, key in the characters (up to 20 characters) instead of pressing the *Space Bar*.

4 Select the next menu by pressing the *Send* key, and change all necessary values. Follow the same procedures for all menus (GENERAL, COMMUNICATION, KEYBOARD/PRINTER), except the FUNCTION menu, which has different purposes.



If You Need Help

If you do not understand the above procedures, see "How to Define Setup Values" on page 3-33 for a more detailed explanation.

C

Select the FUNCTION menu to save the definitions that you have made on the GENERAL, COMMUNICATION, KEYBOARD/PRINTER menus.

1 Select the FUNCTION menu by pressing the *Send* key from the KEYBOARD/PRINTER menu.

The FUNCTION *menu should look like this.*

```
                    S E T U P    M E N U

GENERAL        COMMUNICATION        KEYBOARD/PRINTER        FUNCTION

    Recall                    Save                    Default

    Reset Terminal
```

2 Select the Save field using the *Cursor Move* keys (↑ ↓ ← →).

3 Press the *Space Bar*.

A blinking Completed *should appear telling you that the setup-value definitions are saved.*

4 Press the *Setup* key to exit this mode.

Setup Procedures are now complete.

Defining Function Keys (emulation)

You can define function keys *F6* through *F20* from the keyboard or by the host command, however, the definitions will be lost when power is turned off.

ESC sequences, CSI sequences in 7-bit extended form, or character strings can be assigned to each function key.

Figure 2-3 shows location of the keys used for this step.

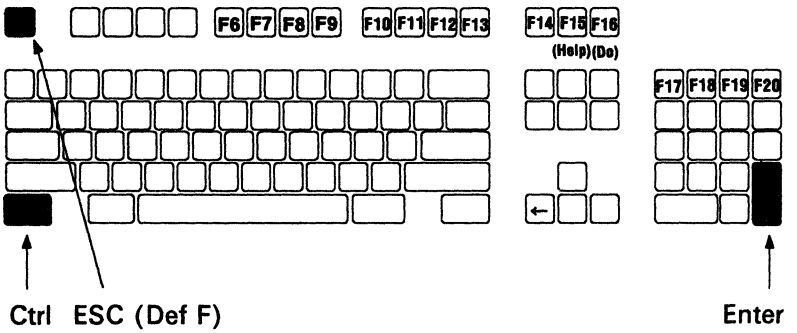
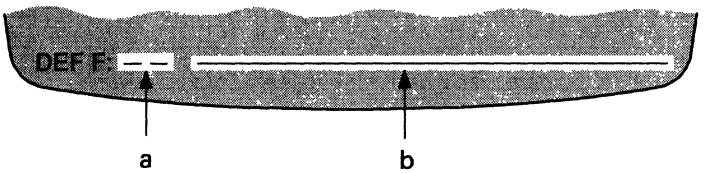


Figure 2-3. Keys Used for Defining Function Keys (emulation)

A Press and hold the *Ctrl* key; then press the *Def F* key.

The function key menu should appear as shown below.



a: A two-digit number (06 through 20) of a function key is entered here.
b: The function is entered here (up to 70 characters).

B In area **a**, type a two-digit key number and press the *Enter* key.

C In area **b**, type one or more ESC sequences, CSI (ESC [) sequences, or a character string; then press the *Enter* key. (Use the ← key to move the cursor to the left to erase unwanted characters.)

The defined function key is stored.
Repeat steps **B** and **C** until you have defined all necessary function keys.

D To exit this mode, press and hold the *Ctrl* key; then press the *Def F* key.

Notes:

1. *The operation in step A is ignored if you select* LOCK *for the User Defined Keys option in the KEYBOARD menu.*

2. *The display station can store up to 256 characters for all function-key definitions. If the total exceeds 256, overflow characters are discarded, and area **a** will blink at step **C**.*

3. *If you assigned more than 70 characters to a single function key by the host command and display them in step **B**, area **a** will blink. If you have changed the definition at this point but do not want to save the definition, press the **Def F** key while holding down the **Ctrl** key. If you have changed the definition and press the **Enter** key, only 70 characters will be stored in the display station.*

4. *During defining of function keys, communication with the host system is not interrupted. That is, data sent from the host system are displayed on screen and commands issued from the host system are executed.*

Setting Tab Stops (emulation)

You can set tab stops for later use from the keyboard or by a host command. Figure 2-4 shows the locations of the keys used for this step.

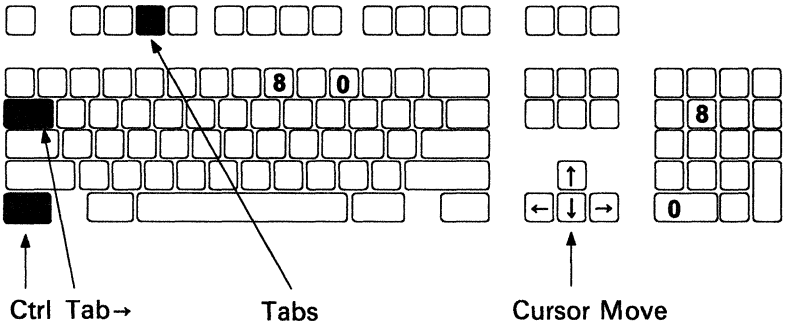


Figure 2-4. Keys Used for Setting Tab Stops (emulation)

Do the following to set the tab stops using the *Tabs* key.

A Press and hold the *Ctrl* key; then press the *Tabs* key.

The scale line should appear on the current line. In 80-column mode, the scale line is graduated up to the 80th column as shown in the figure below, and in 132-column mode, it is graduated up to the 132nd column. On the scale line, the current tab stops are displayed in reverse video. You can move the scale line to any line using the Cursor Move keys (↑ ↓). The instructions also appear at the bottom of the screen.

<---+----1----+----2----+----3----+----4----+----5----+----6----+----7----+---->

Setting tab stops

1 Using the *Cursor Move* keys (← →), move the cursor to the desired tab-stop location on the scale line.

2 Then press the *Tab* → key.

The tab stop is set and displayed in reverse video.

Resetting tab stops

1 Using the *Cursor Move* keys (← →), move the cursor to the desired tab-stop location on the scale line (displayed in reverse video).

2 Then press the *Tab* → key.

The tab stop is cleared and the video returns to normal.

Clearing all tab stops

Press either *Numeric 0* key.

Setting default tab stops

Press either *Numeric 8* key.

Tab stops are set every eight columns.

B To exit this mode, press and hold the *Ctrl* key; then press the *Tabs* key.

If you want to save the tab settings that you have made here, perform the **Save** operation in the FUNCTION menu.

Defining Function Keys (IBM Mode)

You can define function keys *F1* through *F36* from the keyboard or by the host command. The operation of defining function keys is exactly the same as that in native mode.

After making the definition of each function key, *F13* through *F24* are selected when *F1* through *F12* are pressed respectively, with the *Shift* key; *F25* through *F36* are selected when *F1* through *F12* are pressed with the *Shift* key and *Ctrl* key.

ESC sequences, or character strings can be assigned to each function key.

Figure 2-5 shows location of the keys used for this step.

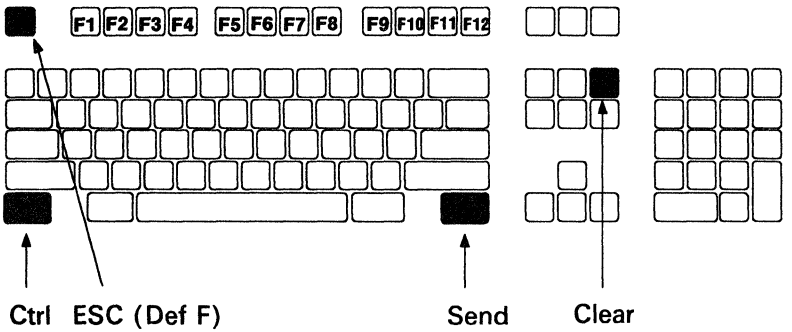
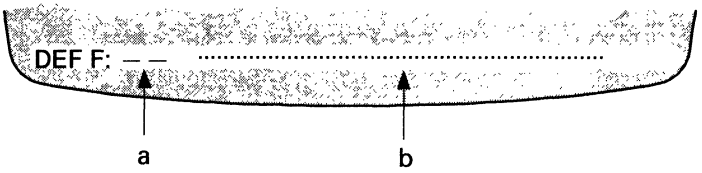


Figure 2-5. Keys Used for Defining Function Keys (IBM Mode)

A Press and hold the *Ctrl* key; then press the *Def F* key.

The function key menu should appear as shown below.



a: A two-digit number (01 through 36) of a function key is entered here.
b: The function is entered here (up to 64 characters).

B In area **a**, type a two-digit key number and press the *Send* key.

C In area **b**, type one or more ESC sequences, or a character string; then press the *Send* key.

The defined function key is stored.
Repeat steps **B** and **C** until you have defined all necessary function keys.

D To exit this mode, press and hold the *Ctrl* key; then press the *Def F* key.

Notes:

1. *The display station can store up to 512 characters for all function-key definitions. If the total exceeds 512, overflow characters are discarded, and area **a** will blink at step **C**.*

2. *If you assigned more than 64 characters to a single function key by the host command and display them in step **B**, area **a** will blink. If you have changed the*

definition at this point but do not want to save the definition, press the ***Def F*** *key while holding down the* ***Ctrl*** *key. If you have changed the definition and press the* ***Send*** *key, only 64 characters will be stored in the display station.*

Chapter 3. Setup Menus and Setup Value Descriptions

This chapter describes setup menus; what the setup menus are; what the setup values mean; and how you can change the setup values.

Before you can use the display station, certain information (such as the type of communication interface, line speed, and parity) must be set correctly. Such information, called *setup values*, is necessary before you can communicate with a host system or an optional device (such as a printer) on the auxiliary port. You may also want to define the type of scrolling or screen appearance (normal or reverse video) to be used. You can define setup values by using the setup menus. Most setup values can also be defined by host commands.

Warning: The setup values are stored in the video element, which means that when you first install the display station or if you ever replace the video element, you must define these values. Otherwise, the display station may not work correctly.

Setup Menus and Setup Values (emulation)

In the mode to emulate the DEC VT220, the 3151 provides the following setup menus that you use to define setup values.

- GENERAL
- DISPLAY
- COMMUNICATION
- KEYBOARD
- PRINTER
- FUNCTION.

Each menu, except the FUNCTION menu, contains the setup-value-definition fields. The FUNCTION menu is used, for example, to save the setup-value definitions or to reset the setup-value definitions to the factory-set default values.

When you power-on the display station the first time with the emulation cartridge inserted, the GENERAL menu appears. You can also display the menu by pressing the *Setup* key.

Some setup parameters are different in emulation mode. These differences are described in "Equivalent Setup Parameters" on page 3-20. This section describes the meanings of the setup parameters in the menus.

Note: During setup mode,

- the instructions for the menu are displayed at the bottom of the screen.
- on-line operations are suspended (the incoming data is stored in the display station).

GENERAL Menu (emulation)

Figure 3-1 shows the GENERAL menu. Figure 3-2 on page 3-4 explains the setup parameters, their possible values, and their meanings.

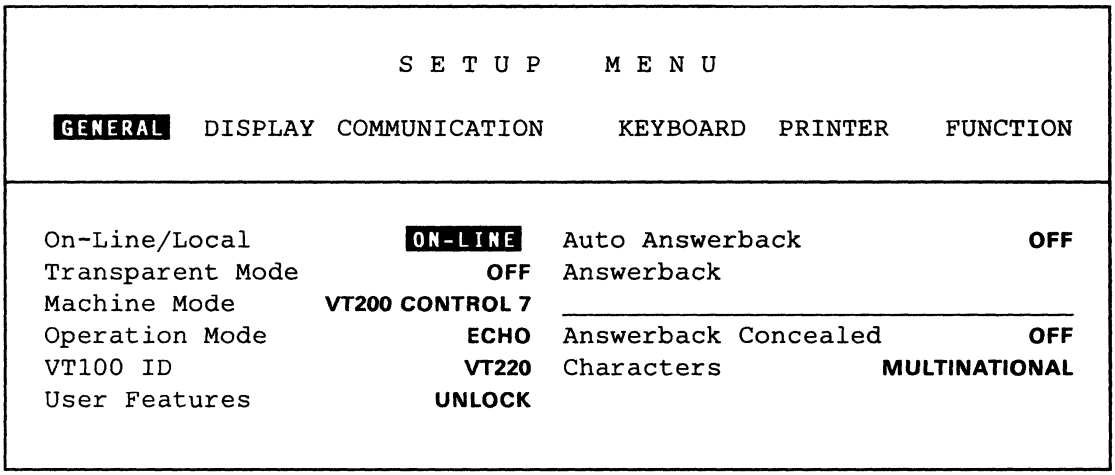


Figure 3-1. GENERAL Menu (emulation)

Setup Parameters	Possible Values	Meanings
On-Line/Local	ON-LINE	The display station operates in on-line mode and can communicate with a host system.
	LOCAL	The display station operates in local mode. Data entered from the keyboard is displayed only on the screen. Data cannot be sent, and data received from the host system is not displayed until ON-LINE is selected.
Transparent Mode	OFF | ON	Transparent mode is equivalent to display control mode in the DEC VT220. When ON is selected, commands are handled as character strings. This means that the control characters (except the LF, VT, and FF characters) are displayed on the screen without performing their functions. This mode may be used for debugging programs.
Machine Mode	VT200 CONTROL 7 VT100 VT52 VT200 CONTROL 8	The display station operates in the selected machine mode.
Operation Mode	ECHO	Data entered from the keyboard is sent only to the host system; it is not displayed. Echo mode is equivalent to no local echo mode in the DEC VT220.
	CHAR	Data entered from the keyboard is sent to the host system and displayed on the screen. Character mode is equivalent to local echo mode in the DEC VT220.
VT100 ID	VT220 VT100 VT101 VT102	This parameter is only effective when you select VT100 for the machine mode. The display station returns the selected response for the Device Attribute command.

Figure 3-2 (Part 1 of 2). Setup Parameters in the GENERAL Menu (emulation)

Setup Parameters	Possible Values	Meanings
User Features	UNLOCK LOCK	When LOCK is selected, an application program cannot define the following setup parameters: • Auto Repeat • Scroll • Screen • Tab Stops • Keyboard Lock.
Auto Answerback	OFF | ON	When ON is selected, the answerback message is automatically sent to the host system when the communication is started.
Answerback		You can enter up to 30 characters for the answerback message.
Answerback Concealed	OFF | ON	When ON is selected, the answerback-message entry is not displayed on the screen.
Characters	MULTINATIONAL	The DEC supplemental character set can be used.

Figure 3-2 (Part 2 of 2). Setup Parameters in the GENERAL Menu (emulation)

DISPLAY Menu (emulation)

Figure 3-3 shows the DISPLAY menu. Figure 3-4 on page 3-7 explains the setup parameters, their possible values, and their meanings.

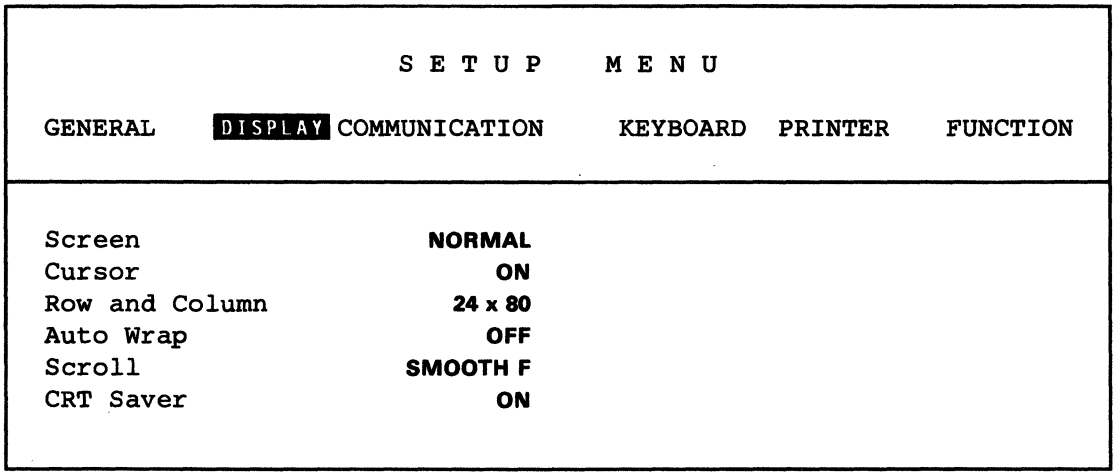


Figure 3-3. DISPLAY Menu (emulation)

Setup Parameters	Possible Values	Meanings
Screen	NORMAL	The whole screen is displayed in normal video.
	REVERSE	The whole screen is displayed in reverse video.
Cursor	ON | OFF	When OFF is selected, the cursor is not displayed.
Row and Column	24 x 80 24 x 132 25 x 80 25 x 132	The display station uses a screen size based on the selected rows (lines) and columns (characters). The contents of the screen are cleared when the value is changed.
Auto Wrap	OFF	A character received beyond the right margin is written over the last character of the current line.
	ON	A character received beyond the right margin is displayed at the first position of the next line.
Scroll	SMOOTH F	For example, when the last character of the last line is entered or received, all lines move up slowly.
	SMOOTH S	For example, when the last character of the last line is entered or received, all lines move up slowly (slower than SMOOTH F).
	JUMP	For example, when the last character of the last line is entered or received, all lines move up rapidly.
CRT Saver	ON | OFF	When ON is selected, the screen goes blank if no data is received from the host system or entered from the keyboard for 15 minutes. When data is received or entered and this function is active, the screen displays the data again. *Note:* CRT means cathode ray tube.

Figure 3-4. Setup Parameters in the DISPLAY Menu (emulation)

COMMUNICATION Menu (emulation)

Figure 3-5 shows the COMMUNICATION menu. Figure 3-6 on page 3-9 explains the setup parameters, their possible values, and their meanings.

Note: The Line Control parameter is not effective when RS-422A is selected for the interface.

```
                    S E T U P    M E N U

GENERAL   DISPLAY  COMMUNICATION   KEYBOARD  PRINTER   FUNCTION

Transmit                 4800   XOFF                      64
Receive                TRANSMIT Interface                 RS-232C
Data Length                 8   Line Control              IPRTS
Parity                     NO   Break                     NORMAL
Parity Check               ON   Disconnect Delay          2 s
Stop Bit                    1   Limited Transmit          ON
```

Figure 3-5. COMMUNICATION Menu (emulation)

Setup Parameters	Possible Values	Meanings
Transmit	See page 3-23	The display station sends data to the host system at the selected line speed (bps).
Receive	TRANSMIT	The transmit line speed (bps) is used for the display station to receive data from the host system.
Data Length	8 | 7	The display station uses the selected data length (7-bit or 8-bit).
Parity	NO EVEN ODD MARK SPACE	The display station uses the selected parity. Parity is not added when NO is selected.
Parity Check	ON | OFF	When ON is selected, parity is checked.
Stop Bit	1 | 2	The display station places one or two bits after each data character.
XOFF	64 128 300 NO	The display station sends an XOFF character to the host system when the buffer of the display station is filled with the selected number of characters, or no XOFF character is sent (when NO is selected).
Interface	RS-232C RS-422A	The display station communicates with the host system using the EIA RS-232C or RS-422A interface.

Figure 3-6 (Part 1 of 2). Setup Parameters in the COMMUNICATION Menu (emulation)

Setup Parameters	Possible Values	Meanings
Line Control	IPRTS	The display station controls the RS-232C signal line using IPRTS (induced permanent request to send). IPRTS handles the CTS (clear to send), RLSD (received line signal detect), and DSR (data set ready) signals as if the signals were always on. This parameter is effective when RS-232C is selected for the interface. IPRTS is equivalent to "EIA Port, Data Leads Only" in the DEC VT220.
	PRTS	The display station controls the RS-232C signal line using PRTS (permanent request to send). PRTS handles the CTS, RLSD, and DSR as modem signals. This parameter is effective when RS-232C is selected for the interface. PRTS is equivalent to "EIA Port, Modem Control" in the DEC VT220.
Break	NORMAL	The display station sends a 500 ms break signal to the host system when the *Break* key is pressed.
	SHORT	The display station sends a 170 ms break signal to the host system when the *Break* key is pressed.
	NO	The display station does not send a break signal to the host system when the *Break* key is pressed.
Disconnect Delay	2 s | 60 ms	Communication with the host system is disabled for the selected period after the RLSD signal is lost.
Limited Transmit	ON | OFF	When ON is selected, the number of characters sent to the host system is limited to 150 to 180 per second, regardless of the line speed.

Figure 3-6 (Part 2 of 2). Setup Parameters in the COMMUNICATION Menu (emulation)

KEYBOARD Menu (emulation)

Figure 3-7 shows the KEYBOARD menu. Figure 3-8 on page 3-12 explains the setup parameters, their possible values, and their meanings.

```
                    S E T U P    M E N U

GENERAL   DISPLAY  COMMUNICATION     KEYBOARD  PRINTER    FUNCTION

New Line                    CR   Numeric Keypad          NORMAL
Keys                  TYPEWRITER   Cursor Keys           NORMAL
Lock                        CAPS   User Defined Keys      UNLOCK
Auto Repeat                 ON
Margin Bell                 ON
Warning Bell                ON
```

Figure 3-7. KEYBOARD Menu (emulation)

Setup Parameters	Possible Values	Meanings
New Line	CR	A CR (carriage return) character is generated when the *Return* key is pressed.
	CR/LF	Both the CR and LF (line feed) characters are generated when the *Return* key is pressed.
Keys	TYPEWRITER DATA PROCESSING	TYPEWRITER is assumed regardless of the setting.
Lock	CAPS	The alphabetic keys generate uppercase characters only.
	SHIFT	The alphabetic keys generate uppercase characters only and numeric/symbol keys generate the upper half label character of each key.
Auto Repeat	ON | OFF	When ON is selected, most keys continue to generate the character while being pressed.
Margin Bell	ON | OFF	When ON is selected, an audible alarm will sound when the cursor reaches the right margin; either column 73 (80-column mode) or column 125 (132-column mode).
Warning Bell	ON | OFF	When ON is selected, an audible alarm will sound when an operation error occurs or the display station receives the control-G code.
Numeric Keypad	NORMAL	The display station generates the corresponding ASCII character when a numeric keypad key is pressed.
	APPLICATION	The display station generates the application control function when a numeric keypad key is pressed.
Cursor Keys	NORMAL	The display station generates the corresponding ASCII character when a cursor key is pressed.
	APPLICATION	The display station generates the application control function when a cursor key is pressed.
User Defined Keys	UNLOCK LOCK	When LOCK is selected, neither an application program nor the *Def F* key can define the function keys.

Figure 3-8. Setup Parameters in the KEYBOARD Menu (emulation)

PRINTER Menu (emulation)

Figure 3-9 shows the PRINTER menu. Figure 3-10 on page 3-14 explains the setup parameters, their possible values, and their meanings.

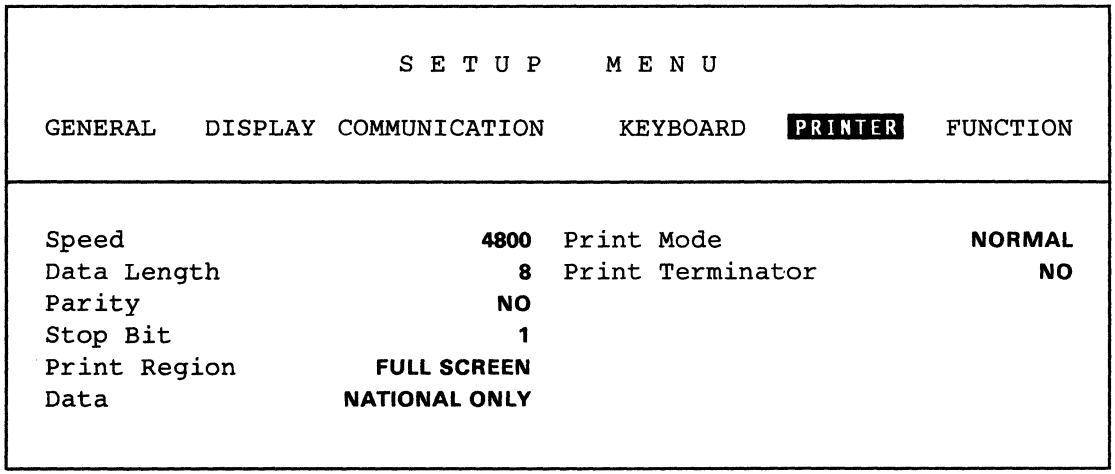


Figure 3-9. PRINTER Menu (emulation)

Setup Parameters	Possible Values	Meanings
Speed	See page 3-24	The display station sends data to the optional device on the auxiliary port at the selected line speed (bps).
Data Length	8 | 7	The display station uses the selected data length (7-bit or 8-bit).
Parity	NO EVEN ODD MARK SPACE	The display station uses the selected parity. Parity is not added when NO is selected.
Stop Bit	1 | 2	The display station places one or two bits after each data character.
Print Region	FULL SCREEN	The display station sends the complete screen data to the printer (optional device) when a print operation is requested.
	SCROLL REGION	The display station sends a part of the screen data (top margin through bottom margin) to the printer (optional device) when a print operation is requested.
Data	NATIONAL ONLY	The display station uses the national code page (NCP) to map the code to the character and the resulting character is sent to the printer (optional device). For example, Ä is regarded as A.
	NATIONAL & LINE DRAWING	The display station uses NCP to map the code to the character and the resulting character is sent to the printer (optional device). The DEC line-drawing characters are also sent to the printer (optional device).
	ALL	The display station sends all characters, including the control characters and diacritical characters (for example, Ä), to the printer (optional device).

Figure 3-10 (Part 1 of 2). Setup Parameters in the PRINTER Menu (emulation)

Setup Parameters	Possible Values	Meanings
Print Mode	NORMAL	A print operation is performed when requested from the keyboard.
	AUTO	The current line is sent to the printer (optional device) when a line feed, a form feed, or a vertical tab character is received from the host system; or an auto wrap condition occurs.
	CONTROLLER	Data from the host system is sent to the printer (optional device), but not displayed on the screen.
Print Terminator	NO | FF	When FF is selected, the form feed character is sent to the printer (optional device) after the screen data is printed. *Note:* This option is effective only for the print screen operation.

Figure 3-10 (Part 2 of 2). Setup Parameters in the PRINTER Menu (emulation)

IBM 4201 Proprinter or IBM 4202 Proprinter XL Connection

The IBM 4201 Proprinter (or IBM 4202 Proprinter XL) with a serial interface can be attached to the 3151 via an I/O cable (part 6343373). Figure 3-11 shows an example of the printer switch settings (on the serial interface module) when the Proprinter is attached to the 3151. Switches A7, B3, B4 must be set as in Figure 3-11; other switches may be set differently.

Parameter	Switch	Setting
Line Speed (19200)	A1	On
	A2	On
	A3	On
Parity (EVEN)	A4	On
	A5	On
Pacing (enable)	A6	Off
-	A7	Off
Word Length (8 bit)	B1	Off
Stop Bit (1)	B2	Off
Mode (Normal)	B3	Off
-	B4	Off

Figure 3-11. Example of the Proprinter (XL) Switch Settings

For the above example, the setup parameters for the printer must be set in the PRINTER menu as follows:

- **Speed**: 19200
- **Data Length**: 8
- **Parity**: EVEN
- **Stop Bit**: 1
- **Print Region**: FULL SCREEN or SCROLL REGION

- **Data**: NATIONAL ONLY (always)
- **Print Mode**: NORMAL, AUTO, or CONTROLLER*
- **Print Terminator**: NO (always)

* If CONTROLLER is selected for the Print Mode, the printer is controlled by the host system; not by the 3151.

FUNCTION Menu (emulation)

Figure 3-12 shows the FUNCTION menu. Figure 3-13 explains each function.

The 3151 has two storage areas for saving the setup-value definitions: VM (volatile memory) and NVM (non-volatile memory). The contents of VM are lost when power is turned off; the contents of NVM are retained.

When you power-on the 3151 for the first time, NVM contains no values and factory-set, setup-value definitions are copied to VM. These are called *default* values and are used unless you redefine them.

When you power-on the 3151 after saving your setup-value definitions (in NVM), the contents of NVM are copied to VM. The 3151 operates **using the setup values in VM.** The contents of VM are immediately changed when you select the other setup value by pressing the *Space Bar* in the setup menus. If you perform the save function at this time, the contents of VM are copied to NVM enabling them to be used later.

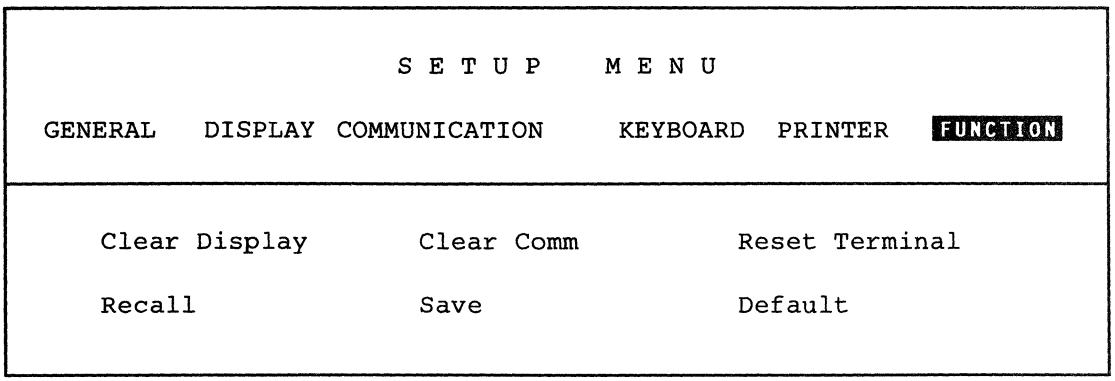


Figure 3-12. FUNCTION Menu (emulation)

If you select this field and press the space bar	this will occur
Clear Display	Screen is erased.
Recall	The contents of NVM are copied to VM and the screen is erased. Power-on reset (except checking the internal circuits) is performed.
Clear Comm	Communications are initialized.
Save	The setup-value definitions and tab settings (defined now and saved in VM) are also saved in NVM.
Reset Terminal	The display station's operating parameters (such as the scroll region and the character set) are reset to their default values. Some setup-value definitions in NVM are also changed, but communications are not initialized.
Default	The setup-value definitions and tab settings set in the factory are copied to VM.

Figure 3-13. Functions in the FUNCTION Menu (emulation)

Equivalent Setup Parameters

The center column in Figure 3-14 on this page shows the DEC VT220 setup parameters and the right column shows their equivalent ones in emulation mode.

Note: DEC VT220 does not define CRT Saver and Interface. CRT Saver is always on and RS-232C is used for the interface.

DEC VT220 Menus	DEC VT220 Parameters	IBM 3151 Parameters
SetUp Directory	On-Line/Local	On-Line/Local in the GENERAL menu
	Setup	Not available
	Keyboard	Not available
Display Setup	Columns	Row and Column
	Controls	Transparent Mode in the GENERAL menu
	Auto Wrap	Auto Wrap
	Scroll	Scroll
	Text/Screen	Screen
	Text Cursor	Cursor
	Cursor Style	*Alt Csr* key
General Setup	Mode	Machine Mode
	VT100	VT100 ID
	User Defined Keys	User Defined Keys in the KEYBOARD menu
	User Features	User Features
	Keypad	Numeric Keypad in the KEYBOARD menu

Figure 3-14 (Part 1 of 3). Equivalent Setup Parameters (emulation)

DEC VT220 Menus	DEC VT220 Parameters	IBM 3151 Parameters
General Setup	Cursor Keys	Cursor Keys in the KEYBOARD menu
	New Line	New Line in the KEYBOARD menu
	Multinational/National	Not available
Communications Setup	Transmit	Transmit
	Receive	Receive
	XOFF	XOFF
	Bits/Parity	Data Length, Parity, and Parity Check
	Stop Bit	Stop Bit
	Local Echo	Operation Mode
	Port	Line Control
	Disconnect Delay	Disconnect Delay
	Limited Transmit	Limited Transmit
Printer Setup	Speed	Speed
	Mode	Print Mode
	Bits/Parity	Data Length and Parity
	Stop Bit	Stop Bit
	Print	Print Region
	Printed Data Type	Data
	Print Terminator	Print Terminator

Figure 3-14 (Part 2 of 3). Equivalent Setup Parameters (emulation)

DEC VT220 Menus	DEC VT220 Parameters	IBM 3151 Parameters
Keyboard Setup	Keys	Keys
	Lock	Lock
	Auto Repeat	Auto Repeat
	Keyclick	Not available
	Margin Bell	Margin Bell
	Warning Bell	Warning Bell
	Break	Break in the COMMUNICATION menu
	Auto Answerback	Answerback in the GENERAL menu
	Answerback=	Answerback entry in the GENERAL menu
	Concealed	Answerback Concealed in the GENERAL menu
Tab Setup	Clear All Tabs Set 8 Column Tabs Tab Fields and Ruler	*Tabs* key

Figure 3-14 (Part 3 of 3). Equivalent Setup Parameters (emulation)

Setup Parameters List (emulation)

Circle the selected value for each parameter in the following list. This information will be the source used to define the setup values.

GENERAL

On-Line/Local	ON-LINE* | LOCAL
Transparent Mode	OFF* | ON
Machine Mode	VT200 CONTROL 7* | VT100 | VT52 | VT200 CONTROL 8
Operation Mode	ECHO* | CHAR
VT100 ID	VT220* | VT100 | VT101 | VT102
User Features	UNLOCK* | LOCK
Auto Answerback	OFF* | ON
Answerback (up to 30 chars.)	_____
Answerback Concealed	OFF* | ON
Characters	MULTINATIONAL

DISPLAY

Screen	NORMAL* | REVERSE
Cursor	ON* | OFF
Row and Column	24 x 80* | 24 x 132 | 25 x 80 | 25 x 132
Auto Wrap	OFF* | ON
Scroll	SMOOTH F* | SMOOTH S | JUMP
CRT Saver	ON* | OFF

COMMUNICATION

Transmit (bps)	75 | 110 | 134.5 | 150 | 300 | 600 | 1200 | 1800 | 2400 | 4800* | 9600 | 19200
Receive (bps)	TRANSMIT
Data Length (bits)	8* | 7
Parity	NO* | EVEN | ODD | MARK | SPACE
Parity Check	ON* | OFF
Stop Bit	1* | 2
XOFF	64* | 128 | 300 | NO
Interface	RS-232C* | RS-422A
Line Control	IPRTS* | PRTS
Break	NORMAL* | SHORT | NO
Disconnect Delay	2 s* | 60 ms
Limited Transmit	ON* | OFF

* Indicates the default values (same values as set in the factory).

Figure 3-15 (Part 1 of 2). Setup Parameters and Their Possible Values (emulation)

Setup Parameters List (emulation)

KEYBOARD

New Line	CR* | CR/LF
Keys	TYPEWRITER* | DATA PROCESSING
Lock	CAPS* | SHIFT
Auto Repeat	ON* | OFF
Margin Bell	ON* | OFF
Warning Bell	ON* | OFF
Numeric Keypad	NORMAL* | APPLICATION
Cursor Keys	NORMAL* | APPLICATION
User Defined Keys	UNLOCK* | LOCK

PRINTER

Speed (bits)	75 | 110 | 134.5 | 150 | 300 | 600 | 1200 | 1800 | 2400 | 4800* | 9600 | 19200
Data Length (bits)	8* | 7
Parity	NO* | EVEN | ODD | MARK | SPACE
Stop Bit	1* | 2
Print Region	FULL SCREEN* | SCROLL REGION
Data	NATIONAL ONLY* | NATIONAL & LINE DRAWING | ALL
Print Mode	NORMAL* | AUTO | CONTROLLER
Print Terminator	NO* | FF

* Indicates the default values (same values as set in the factory).

Figure 3-15 (Part 2 of 2). Setup Parameters and Their Possible Values (emulation)

Setup Menus and Setup Values (SYSTEM ATTACH)

This section describes the changes of the setup menus and setup values from 3151 native mode when SYSTEM ATTACH mode is selected for the machine mode.

GENERAL Menu (SYSTEM ATTACH)

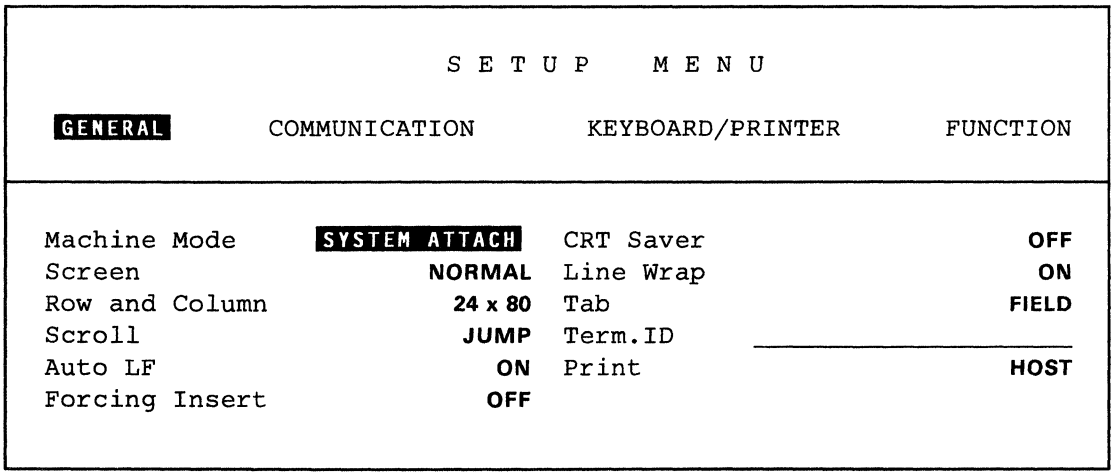


Figure 3-16. GENERAL Menu (SYSTEM ATTACH)

The Print parameter is added.

LOCAL	Print keys work the same as in other machine modes.
HOST	• A DLE character is sent to the IBM 3708/3710 when one of the print keys is pressed; no local function is performed. • A CAN character is sent to the IBM 3708/3710 when the *Cancel* key is pressed; no local function is performed.

COMMUNICATION Menu (SYSTEM ATTACH)

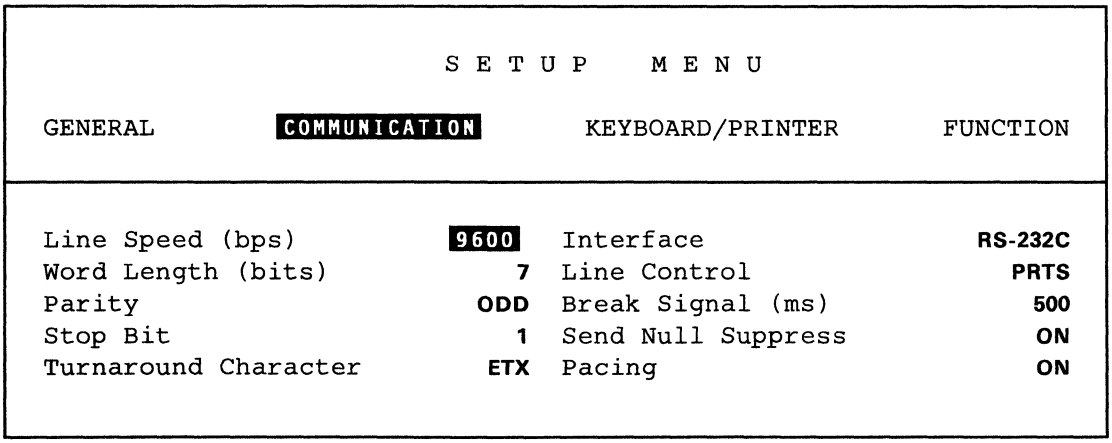


Figure 3-17. COMMUNICATION Menu (SYSTEM ATTACH)

- The operating mode parameter does not appear on the COMMUNICATION Menu because the operating mode is assumed to always be Echo Mode.
- Under SYSTEM ATTACH mode, the inbound pass-through function is not supported.

KEYBOARD/PRINTER Menu (SYSTEM ATTACH)

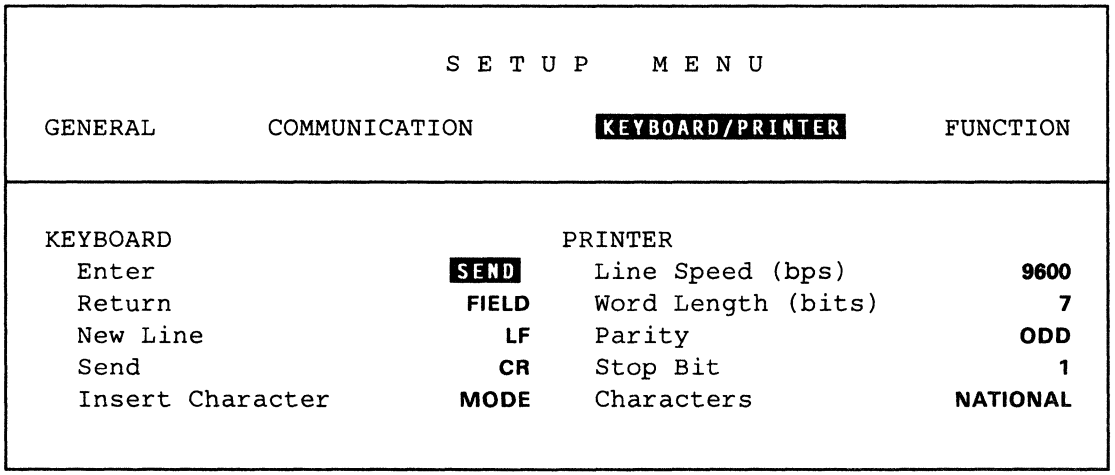


Figure 3-18. KEYBOARD/PRINTER Menu (SYSTEM ATTACH)

- Values for the following parameters are changed.

Parameter	Values
Enter	Send | LF
New Line	CR | LF
Send	CR | CR/LF

FUNCTION Menu (SYSTEM ATTACH)

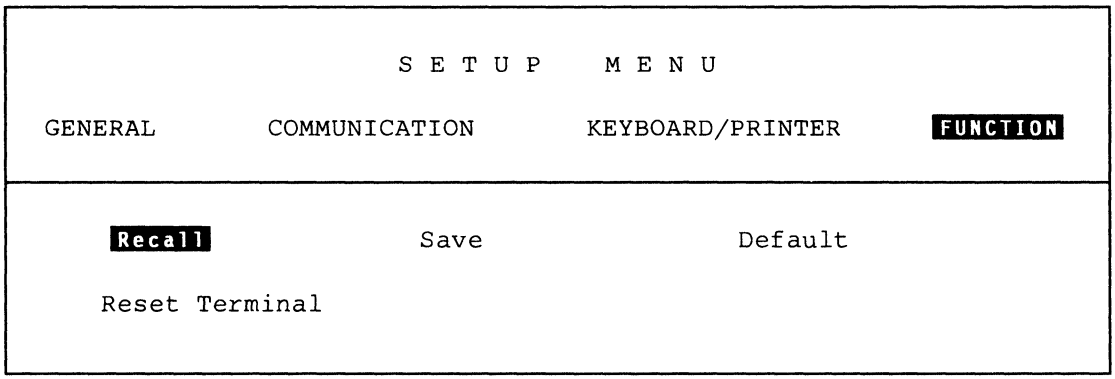


Figure 3-19. FUNCTION Menu (SYSTEM ATTACH)

Setup Parameters List (SYSTEM ATTACH)

Circle the selected value for each parameter in the following list. This information will be the source used to define the setup values.

GENERAL

Machine Mode	SYSTEM ATTACH
Screen	NORMAL* | REVERSE
Row and Column	24 x 80* | 25 x 80 | 24 x 132 | 25 x 132
Scroll	JUMP* | SMOOTH F | SMOOTH S | NO
Auto LF	ON* | OFF
Forcing Insert	OFF* | LINE | CHARACTER | BOTH
CRT Saver	OFF* | ON
Line Wrap	ON* | OFF
Tab	FIELD* | COLUMN
Term.ID (up to 20 characters)	_____
Print	HOST* | LOCAL

COMMUNICATION

Line Speed (bps)	50 | 75 | 110 | 134.5 | 150 | 200 | 300 | 600 | 1200 |1800 | 2400 | 3600 | 4800 | 9600* | 19200 | 38400
Word Length (bits)	7* | 8
Parity	ODD* | EVEN | NO | SPACE | MARK
Stop Bit	1* | 2
Turnaround Character	ETX* | CR | EOT | DC3**
Interface	RS-232C* | RS-422A
Line Control	PRTS* | IPRTS | CRTS
Break Signal (ms)	500* | 170
Send Null Suppress	ON* | OFF
Pacing	OFF* | ON

* Indicates the default values (same values as set in the factory).
** When DC3 is selected, the pacing option is assumed to be OFF (disabled).

Figure 3-20 (Part 1 of 2). Setup Parameters and Their Possible Values (SYSTEM ATTACH)

KEYBOARD

Enter	SEND* | LF
Return	FIELD* | NEW LINE
New Line	CR* | LF
Send	CR* | CR/LF
Insert Character	MODE* | SPACE

PRINTER

Line Speed (bps)	50 | 75 | 110 | 134.5 | 150 | 200 | 300 | 600 | 1200 | 1800 | 2400 | 3600 | 4800 | 9600* | 19200
Word Length (bits)	7* | 8
Parity	ODD* | EVEN | NO | SPACE | MARK
Stop Bit	1* | 2
Characters	NATIONAL* | ALL

* Indicates the default values (same values as set in the factory).

Figure 3-20 (Part 2 of 2). Setup Parameters and Their Possible Values (SYSTEM ATTACH)

Setup Parameters List (IBM 3151/3101)

Circle the selected value for each parameter in the following list. This information will be the source used to define the setup values.

GENERAL	
Machine Mode	IBM 3151*| IBM 3101
Screen	NORMAL* | REVERSE
Row and Column	24 x 80* | 25 x 80 | 24 x 132 | 25 x 132
Scroll	JUMP* | SMOOTH F | SMOOTH S | NO
Auto LF	ON* | OFF
CRT Saver	OFF* | ON
Line Wrap	ON* | OFF
Forcing Insert	OFF* | LINE | CHARACTER | BOTH
Tab	FIELD* | COLUMN
Term.ID (up to 20 characters)	_____
COMMUNICATION	
Operating Mode	BLOCK* | ECHO | CHAR
Line Speed (bps)	50 | 75 | 110 | 134.5 | 150 | 200 | 300 | 600 | 1200 | 1800 | 2400 | 3600 | 4800 | 9600* | 19200 | 38400
Word Length (bits)	7* | 8
Parity	ODD* | EVEN | NO| SPACE | MARK
Stop Bit	1* | 2
Turnaround Character	ETX* | CR | EOT | DC3**
Interface	RS-232C* | RS-422A
Line Control	PRTS* | IPRTS | CRTS
Break Signal (ms)	500* | 170
Send Null Suppress	ON* | OFF
Pacing†	OFF* | ON
KEYBOARD/PRINTER	
Enter	RETURN* | SEND
Return	FIELD* | NEW LINE
New Line	CR* | CR/LF
Send	PAGE* | LINE
Insert Character	MODE* | SPACE
Line Speed (bps)	50 | 75 | 110 | 134.5 | 150 | 200| 300 | 600 | 1200 | 1800 | 2400 | 3600 | 4800 | 9600* | 19200
Word Length (bits)	7* | 8
Parity	ODD* | EVEN | NO | SPACE | MARK
Stop Bit	1* | 2
Characters	NATIONAL* | ALL

* Indicates the default values (same values as set in the factory).
** When **DC3** is selected, Pacing option is assumed to be disabled.
† The **Pacing** option applies only to IBM 3101 emulation mode; it is always set to on in IBM 3151 mode.

Figure 3-21. Setup Parameters and Their Possible Values (IBM 3151 and IBM 3101)

How to Define Setup Values

This section illustrates how the setup menus are organized and how you can change the setup values through the menus.

Selecting a Menu

The GENERAL menu appears whenever you press the *Setup* key. You can select the next menu by pressing the *Enter* key (in emulation mode), or the *Send* key (in IBM mode). The respective menus appear in the order as shown in Figure 3-22 (emulation) or Figure 3-23 on page 3-34 (IBM mode). The current menu appears in reverse video on the second line of each menu. To quit a menu without saving the definitions, use the *Setup* key.

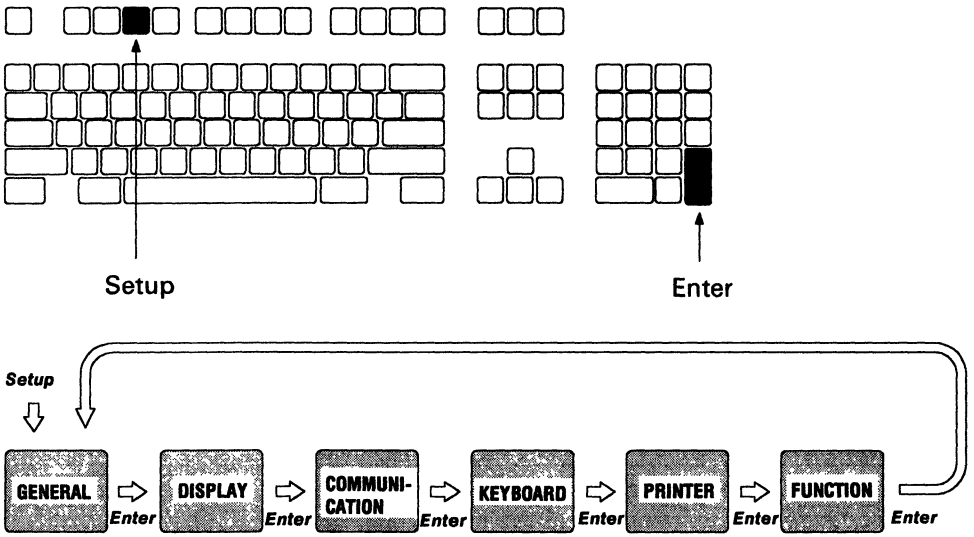


Figure 3-22. Selecting a Menu (emulation)

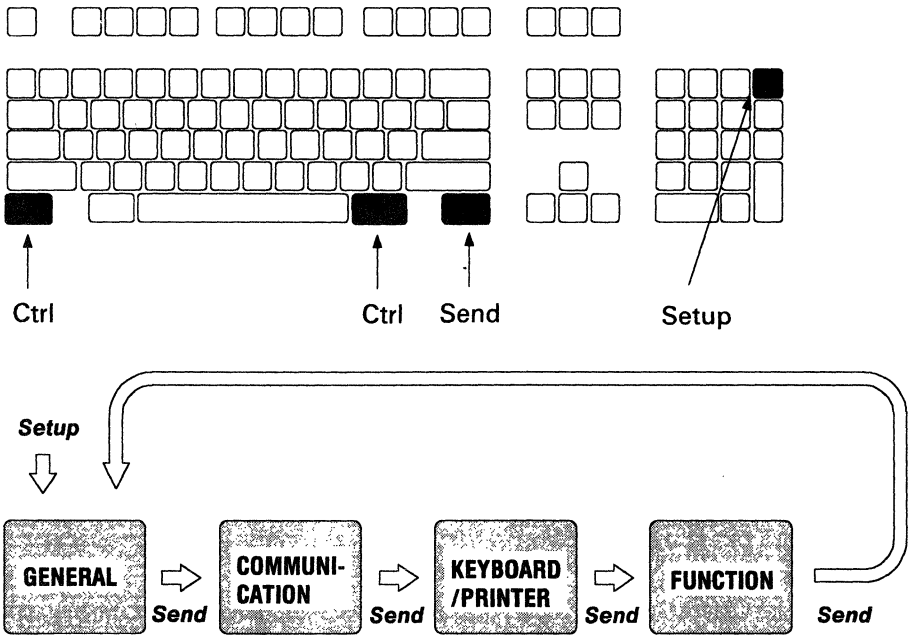


Figure 3-23. Selecting a Menu (IBM Mode)

Selecting a Field in the Menu

You can select a field using the *Cursor Move* keys. The setup value of the current field is displayed in high-intensity, reverse video.

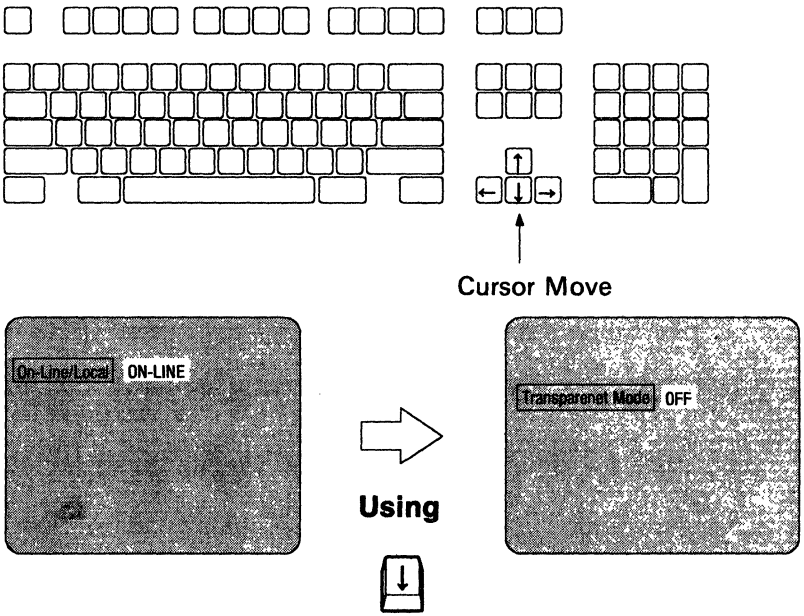


Figure 3-24. Selecting a Field

Selecting Values in the Fields

You can select a value for any field using the *Space Bar*. Press the *Space Bar* until the desired value appears. You only key in characters when defining the answerback message or term.ID. If you try to key in characters in any other field, the audible alarm will sound.

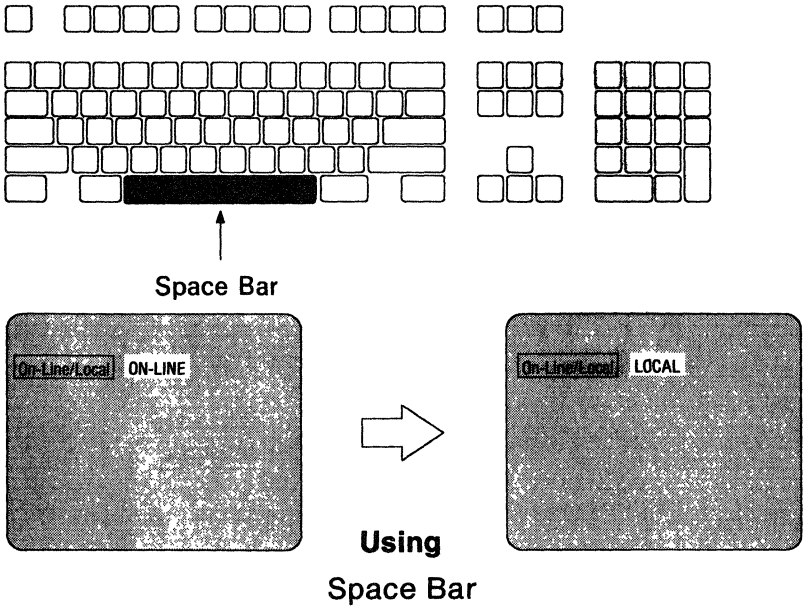


Figure 3-25. Selecting Values

Saving the Definitions

When you complete the setup-value definitions for each menu, select the FUNCTION menu to save the values. Select the **Save** field and then press the *Space Bar*. When the save operation successfully completes, A blinking **Completed** is displayed. Notice that the function of the *Space Bar* is different here from the other menus.

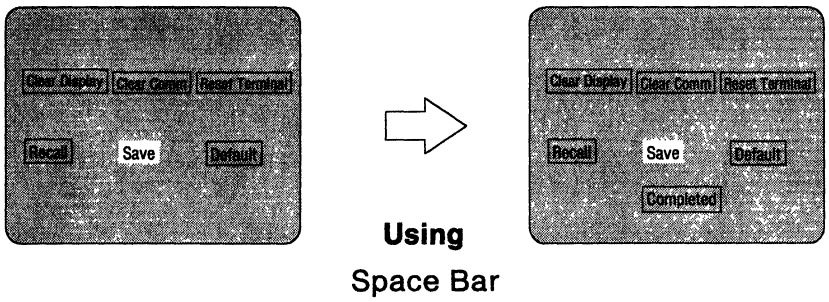


Figure 3-26. Saving the Definitions (emulation)

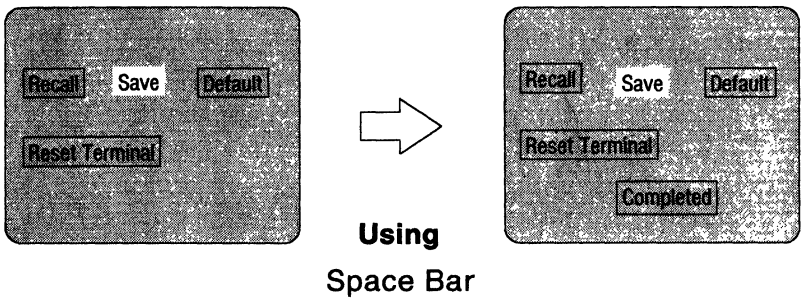


Figure 3-27. Saving the Definitions (IBM Mode)

Chapter 4. Interpreting Operator Messages

This chapter describes the messages displayed at the bottom of the screen (OIA) in the mode to emulate the DEC VT220. The operator messages in 3151 native, 3101 emulation, SYSTEM ATTACH, and ten ASCII terminals' emulation modes are described in *IBM 3151 ASCII Display Station Guide to Operations.*

Notes:

1. *The operator messages in SYSTEM ATTACH mode are the same as 3151 native mode. In SYSTEM ATTACH mode,* 3151 ECHO' *is always displayed in the leftmost area of the OIA.*

2. *In IBM 3151 native mode or IBM 3101 mode with this cartridge,* 3151 *or* 3101 *is displayed in the leftmost area of the OIA.*

This area is used to display:

- The operating status of the display station
- The communication status
- Warning messages if a problem is detected.

Messages are displayed in predefined areas depending on their type. Figure 4-1 on page 4-2 shows OIA, and Figure 4-2 on page 4-3 explains what the operator messages are, what they mean, and what action, if any, is required for each.

Notes:

1. *You can turn off the indications of this area by pressing the* ***Msg*** *key while holding down the* ***Ctrl*** *key.*

2. *The OIA is also used to display one-line menus for defining setup values, function keys, and tab stops.*

3. *If two or more messages exist in each area, the message with the higher priority is displayed. Messages in area* ***4*** *are displayed in the following order:*

   a. COMM NOT READY 2
   b. COMM NOT READY 1
   c. AUX NOT READY
   d. AUX NONE
   e. KEYS LOCKED
   f. HOST BUSY
   g. AUX BUSY
   h. HOLD SCREEN
   i. PRINTING
   j. INVALID KEY
   k. KEYBOARD ERROR
   l. PRINT CONTROLLER
   m. AUTO PRINT.

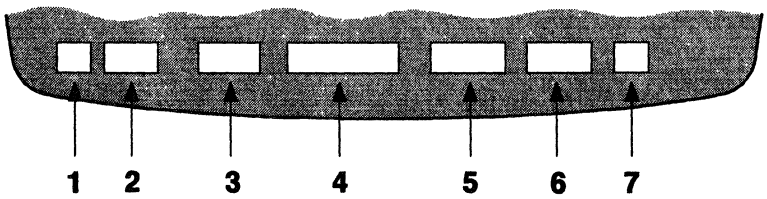


Figure 4-1. Operator Information Area (OIA)

Area	Message	Meaning	Action
OIA	PROBLEM IN KEYBOARD	Shows that a problem was detected in the keyboard.	See Chapter 5, "Solving Problems" in *IBM 3151 ASCII Display Station Guide to Operations.*
	PROBLEM IN VIDEO ELEMENT OR KEYBOARD	Shows that a problem was detected in the video element or the keyboard.	See Chapter 5, "Solving Problems" in *IBM 3151 ASCII Display Station Guide to Operations.*
1	200/7 200/8 100 52	Shows the current machine mode.	None.
2	CHAR ECHO LOCAL TEST	Shows the current operating mode. *Note:* CHAR is equivalent to local echo mode in the DEC VT220.	None.
3	TRANSP	Shows that the display station is in display control mode.	None.
4	AUTO PRINT	Shows that the display station is in auto print mode. The display station enters this mode when (1) AUTO is selected for the Print Mode in the PRINTER menu, (2) receiving the Auto Print Mode command, or (3) the *Auto Print* key is pressed.	None.

Figure 4-2 (Part 1 of 6). Operator Messages

Area	Message	Meaning	Action
4	AUX BUSY	Appears when an XOFF condition occurs at the optional device on the auxiliary port.	Wait. This message disappears when the display station receives an XON character or you perform Clear Comm in the FUNCTION menu.
	AUX NONE	Appears when an operator or an application program tries to send data to the optional device while it is not attached to the auxiliary port, or it has not been powered-on since the display station was last powered-on.	This message disappears when you press any valid key. Check the optional device. If the message appears again, see "Analysis Procedures" in Chapter 5, "Solving Problems" of *IBM 3151 ASCII Display Station Guide to Operations.*
	AUX NOT READY	Appears when an operator or an application program tries to send data to the optional device on the auxiliary port while the optional device is not ready to operate (DTR signal of the optional device is off).	This message disappears (1) when the optional device becomes ready, (2) you perform Clear Comm in the FUNCTION menu, (3) or you press the *Cancel* key. Check the optional device. If the message appears again, see Chapter 5, "Solving Problems" in *IBM 3151 ASCII Display Station Guide to Operations.*

Figure 4-2 (Part 2 of 6). Operator Messages

Area	Message	Meaning	Action
4	COMM NOT READY 1	Appears when the DTR (data terminal ready) signal is turned on and the DSR (data set ready) signal is present, but the RLSD (received line signal detector) or CTS (clear to send) signal or both of them are not present on the main port. *Note:* This message does not appear if both RS-232C and PRTS are not selected for the Interface and Line Control, respectively, in the COMMUNICATION menu.	See "Communication Problems" in Chapter 5, "Solving Problems" of *IBM 3151 ASCII Display Station Guide to Operations.*
	COMM NOT READY 2	Appears when the DTR signal is turned on and the DSR signal is not present on the main port. *Note:* This message does not appear if both RS-232C and PRTS are not selected for the Interface and Line Control, respectively, in the COMMUNICATION menu.	See "Communication Problems" in Chapter 5, "Solving Problems" of *IBM 3151 ASCII Display Station Guide to Operations.*

Figure 4-2 (Part 3 of 6). Operator Messages

Area	Message	Meaning	Action
4	HOLD SCREEN	Shows that the screen update is suspended when the *Hold Screen* key is pressed. *Note:* This message does not appear if NO is selected for the XOFF option. In this case, the screen update cannot be suspended.	To release the hold-screen status, press the *Hold Screen* key again.
	HOST BUSY	Appears when an XOFF condition occurs at the host system. *Note:* This message does not appear if NO is selected for the XOFF option.	Wait. This message disappears when the display station receives an XON character or you perform Clear Comm in the FUNCTION menu.
	INVALID KEY	Appears when you press any invalid key.	Press any valid key.
	KEYBOARD ERROR	Appears when any key is pressed and a keyboard scan code error or keyboard overrun occurs.	Retry the operation.
	KEYS LOCKED	Appears when the keyboard is locked by the Set Keyboard Action Mode command or when the keyboard buffer becomes full.	None. This status is removed by the Reset Keyboard Action Mode command or the keyboard-buffer-full condition is removed.

Figure 4-2 (Part 4 of 6). Operator Messages

Area	Message	Meaning	Action
4	PRINT CONTROLLER	Shows that the display station is in printer controller mode when ON-LINE is selected for the On-Line/Local option. Shows that the display station is in local controller mode when LOCAL is selected for the On-Line/Local option.	None.
	PRINTING	Shows that data is being sent to the optional device on the auxiliary port. *Note:* This message does not appear in printer control mode.	None.
5	INSERT	Shows that insert mode was selected by the Set Insert Mode command. The display station exits this mode by the Reset Insert Mode command.	None.

Figure 4-2 (Part 5 of 6). Operator Messages

Area	Message	Meaning	Action
6	CAPS LOCK	Shows that caps-lock mode is selected when the *Caps Lock* key is pressed.	To exit this mode, press the *Caps Lock* key again.
	COMPOSE	Shows that compose-key mode is selected when the *Compose Character* key is pressed. This message disappears after the completion of the compose-sequence creation.	None.
	CONTROL	Appears when the *Ctrl* key is pressed and held down.	None.
	SHIFT LOCK	Shows that shift-lock mode is selected when the *Caps Lock* key is pressed.	To exit this mode, press the *Caps Lock* key again or press the *Shift* key.
	UP SHIFT	Appears when the *Shift* key is pressed and held down.	None.
7	(xxx,yyy)	*xxx* and *yyy* indicate the row and column addresses of the cursor, respectively.	None.

Figure 4-2 (Part 6 of 6). Operator Messages

Chapter 5. Reference Information

This chapter provides reference information for the mode to emulate the DEC VT220 and the SYSTEM ATTACH mode.

Mode to Emulate the DEC VT220

This section provides information that is useful when writing or modifying application programs that are used with the 3151 in emulation mode. It describes the use of the Select Screen Format and Down-Line Loading Characters (DRCS) commands.

Select Screen Format

The following four screen formats are available:

- 80 columns and 24 rows (1920 characters)
- 80 columns and 25 rows (2000 characters)
- 132 columns and 24 rows (3168 characters)
- 132 columns and 25 rows (3300 characters).

You can select a screen format by using the Select Screen Format or Column Mode (DECCOLM) command, or through the DISPLAY menu. When this function is performed, the content of the screen is erased, the scroll region is reset to full screen, and all line attributes are reset to single-width and single-height.

Using the Select Screen Format Command

The following CSI (control sequence introducer) sequence is provided in emulation mode for selecting a screen format.

```
CSI Pr ; Pc p
```

Parameter	Name	Description
Pr	Number of Rows	Specifies the height of the screen. **0** Default (24 rows) **1** 24 rows **2** (not used) **3** 25 rows
Pc	Number of Columns	Specifies the width of the screen. **0** Default (80 columns) **1** 80 columns **2** 132 columns

Figure 5-1. Select Screen Format Parameters

Using the Column Mode Command (DECCOLM)

The Column Mode CSI sequence operates the same as the DEC VT220. The following Select 80 Column Mode CSI sequence is used for selecting a screen sequence of 80 columns and 24 rows.

```
CSI ? 3 l
```

The following Select 132 Column Mode CSI sequence is used for selecting a screen format of 132 columns and 24 rows.

```
CSI ? 3 h
```

In both CSI sequences, the 25-row selection cannot be specified.

Additional Commands and Response

The Set/Read Control 1 commands and response can be used to set or read the machine and operating modes of the 3151. See "Set/Read Control 1 Commands/Response" on page 5-12.

Dynamically Re-definable Character Set

The dynamically re-definable character set (DRCS) is a set of 94 characters that you can create for your own purposes. You can load them into the display station from the host system or the keyboard by using the DECDLD device control string. You can use this function also in emulation mode, but two differences exist because of the different sizes of a cell[1] between the DEC VT220 and the 3151. They are:

- Designing a DRCS character
- Loading a DRCS character.

Designing Your DRCS Characters

The 3151 uses 8 dots in width and 15 dots (24-row mode) or 14 dots (25-row mode) in height to display each character. The area represented by these dots is called a cell. Figure 5-2 shows a cell used in the 3151. The DEC VT220 uses an 8 by 10 dot arrangement for each cell. Figure 5-3 on page 5-5 shows a cell used in the DEC VT220.

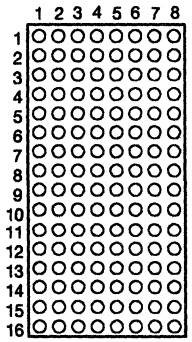


Figure 5-2. Cell Used in the 3151

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1 A cell is a box area in which specified dots exist to form a character.

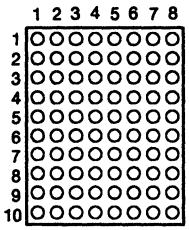

Figure 5-3. Cell Used in DEC VT220

Using the characters created for the DEC VT220 will not cause any problems when used in emulation mode, because a large cell (8 by 16 dots) can hold a small cell (8 by 10). You can load the DRCS characters in the same way as you do when using a DEC VT220. A DEC VT220 DRCS character is automatically placed in the DEC VT220 area as shown in Figure 5-4. This area is equivalent to a DEC VT220 cell.

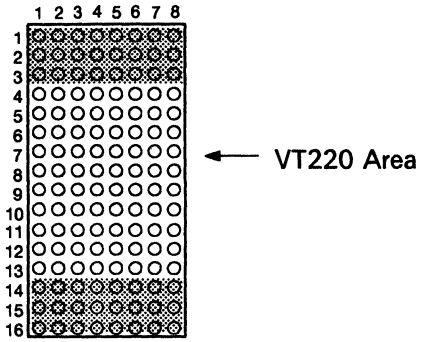

Figure 5-4. DEC VT220 Cell Area in the 3151 Cell

A large cell can provide enhanced capability. You can use the additional dots in Figure 5-4 to design a more complex character. When designing a character using additional dots, note that:

- Dots in column 8 of the previous character continue to the dots in column 1 of the next character on the screen

- 25-row mode does not display the 15th and 16th rows of dots of the character.

Figure 5-5 shows an example of a character (a musical note) that uses the whole area of a cell. To load this type of character, you must use a different form of dot pattern definition in the DECDLD device control string as shown in the next section.

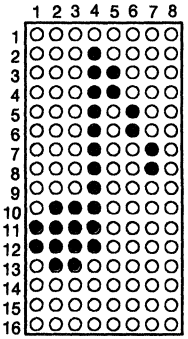

Figure 5-5. Designing a Musical Note

Loading Your DRCS Characters

To load DRCS characters, you can use the following DECDLD device control string.

```
DCS Pfn;Pcn;Pe { Dscs Sxbp1;Sxbp2;...;Sxbpn ST
```

The format and the definition of each parameter is the same as DEC VT220.

Note: Parameters Pcms, Pw, and Pt are not used and ignored if they are specified. The form for Sxbp1, Sxbp2, ..., Sxbpn is also different.

DEC VT220 Type DRCS Character

When you load a DEC VT220 type DRCS character, the dot pattern for the DRCS character, which is represented as Sxbp1, Sxbp2, ..., Sxbpn (n is up to 94), has the following form.

```
uc1 uc2 ... uc8 / lc1 lc2 ... lc8
```

A dot pattern is divided into 8-upper and 8-lower columns as shown in Figure 5-6. Each upper column consists of 6 dots (6 bits) and each lower column consists of 4 dots (4 bits). You should convert the binary value of each column into an equivalent graphic character to be used in the DECDLD device control string. Use the same conversion procedures as you do in the DEC VT220.

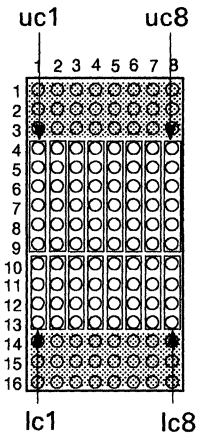

Figure 5-6. Column Definition in DEC VT220 Type DRCS Character

DRCS Character using the Whole Area of a Cell

When you want to design and load the 3151 enhanced type DRCS character, the following different form for Sxbp1, Sxbp2, ..., Sxbpn should be used while using the same DECDLD device control string.

```
uc1 uc2 ... uc8 / mc1 mc2 ... mc8 / lc1 lc2 ... lc8
```

A dot pattern is divided into 8-upper, 8-middle, and 8-lower columns as shown in Figure 5-7. Each upper and middle columns consists of 6 dots (6 bits) and each lower column consists of 4 dots (4 bits). Figure 5-7 also shows a musical note character.

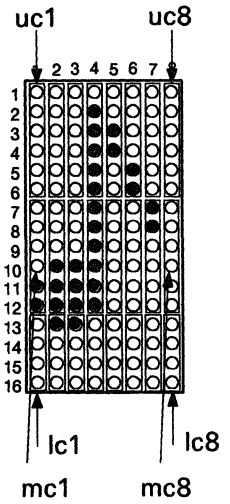

Figure 5-7. Column Definition and Musical Note in DRCS Character Using the Whole Area of a Cell

The following shows how to convert a dot pattern of a musical note into the form used in the DECDLD device control string.

Note: In this example, column 8 is not used.

Step 1 Divide the dot pattern into 7-upper, -middle, and -lower columns.

Figure 5-7 on page 5-8 shows the divided columns.

Step 2 Represent the content (dot pattern) of each column in the form of binary bits.

Note: The top dot of each column is the least significant bit.

In this case, the results are:

```
uc1 = B'000000'  mc1 = B'110000'  lc1 = B'0000'
uc2 = B'000000'  mc2 = B'111000'  lc2 = B'0001'
uc3 = B'000000'  mc3 = B'111000'  lc3 = B'0001'
uc4 = B'111110'  mc4 = B'111111'  lc4 = B'0000'
uc5 = B'001100'  mc5 = B'000000'  lc5 = B'0000'
uc6 = B'110000'  mc6 = B'000000'  lc6 = B'0000'
uc7 = B'000000'  mc7 = B'000011'  lc7 = B'0000'
```

Step 3 Convert the binary form into the hexadecimal form; then add an offset value of X'3F'.

Note: The offset value is necessary to assign the hexadecimal code to the DRCS character that can be began from X'3F'.

In this case, the results are:

```
uc1 = X'3F'   mc1 = X'6F'   lc1 = X'3F'
uc2 = X'3F'   mc2 = X'77'   lc2 = X'40'
uc3 = X'3F'   mc3 = X'77'   lc3 = X'40'
uc4 = X'7D'   mc4 = X'7E'   lc4 = X'3F'
uc5 = X'4B'   mc5 = X'3F'   lc5 = X'3F'
uc6 = X'6F'   mc6 = X'3F'   lc6 = X'3F'
uc7 = X'3F'   mc7 = X'42'   lc7 = X'3F'
```

Step 4 Convert the resultant hexadecimal code to the equivalent graphic character.

In this case, the results are:

```
uc1 = ?    mc1 = o    lc1 = ?
uc2 = ?    mc2 = w    lc2 = @
uc3 = ?    mc3 = w    lc3 = @
uc4 = }    mc4 = ~    lc4 = ?
uc5 = K    mc5 = ?    lc5 = ?
uc6 = o    mc6 = ?    lc6 = ?
uc7 = ?    mc7 = B    lc7 = ?
```

The form used in the DECDLD device control string for representing a musical note is:

```
???}Ko?/oww~??B/?@@????
```

SYSTEM ATTACH Mode

Host Commands

This section describes the 3151 commands and responses that are different when used in SYSTEM ATTACH mode. They are:

- Set/Read Control 1 commands/response
- Set/Read Control 2 commands/response
- Set/Read Control 4 commands/response
- Set/Read Control 5 commands/response
- Set/Read Control 7 commands/response
- Write Host Message command.

The other 3151 commands and responses are not changed. For the commands and responses that are not shown here, see "Commands and Responses" in *IBM 3151 ASCII Display Station Reference Manual.*

Set/Read Control 1 Commands/Response

Differences

The choice of SYSTEM ATTACH mode is added to the Operating Mode parameter when IBM 3151 is selected for the Machine Mode parameter. This command is available in all modes; IBM 3151 native mode, IBM 3101 emulation mode, the mode to emulate the DEC VT220, and ten ASCII terminals' emulation modes.

Function

Sets or reads the machine and operating modes of the 3151.

Format

- Set Control 1 command

  ESC SP 9 `pa1 pa2 op`

- Read Control 1 command

  ESC SP 7

- Read Control 1 response

  ESC SP 7 `pa1 pa2` LTA

Note: `pa2` must be used to select TVI-925E/925, TVI-920/912, VT200 Control 7, VT200 Control 8, VT100, or VT52; otherwise it must be omitted.

Parameters

pa1:

Bit	Content	Description
7	B'1' B'0'	When pa2 is not used When pa2 is used
6	B'0' B'1'	When pa2 is not used When pa2 is used
5-3	 B'000' B'001' B'010' B'011' B'100' B'101' B'110' B'111'	Machine Mode IBM 3151* IBM 3101 ADM-3A ADM-5 ADDS VP-A2 HZ-1500 TVI-910+/910 When pa2 is used
2-1	 B'00' B'01' B'10' B'11'	Operating Mode Echo Character Block* SYSTEM ATTACH (only when Machine Mode (Bits 5-3) is the 3151)

* means the default setting.

pa2:

Bit	Content	Description
7	B'1'	Always 1
6	B'0'	Always 1
5	B'0'	Reserved
4-1		Machine Mode
	B'0000'	TVI-925E/925
	B'0001'	TVI-920/912
	B'0010'	
	B'0011'	Reserved
	B'0100'	
	B'0101'	VT200 Control 7
	B'0110'	VT200 Control 8
	B'0111'	VT100
	B'1000'	VT52
	B'1001'	
	|	Reserved
	B'1111'	

op:

The operation-specifier parameter op can be added. This parameter must be placed at the end of the parameter field. If this parameter is specified, bits 7 and 6 of the parameter pa must be B'0' and B'1', respectively. For more information, refer to "Operation Specifier" in *IBM 3151 ASCII Display Station Reference Manual.*

---

* means the default setting.

Usage Note

This command takes approximately 500 ms to be processed. Specify a 500 ms interval before issuing the next command.

Machine modes are classified into five groups; IBM 3151, IBM 3101, ten ASCII terminals, DEC VT220, and SYSTEM ATTACH. If the machine mode is changed to a new machine mode in a different group, setup-value definitions that are in use are replaced with the ones for the new machine modes and the power-on reset (except the checking of the internal circuits) is performed.

Set/Read Control 2 Commands/Response

Differences

The choices for the Enter Key and New Line parameters are changed.

Function

Sets or reads the machine status of the 3151.

Format

- Set Control 2 command

  ESC ! 9 `pa1 pa2 op`

- Read Control 2 command

  ESC ! 7

- Read Control 2 response

  ESC ! 7 `pa1 pa2` LTA

Parameters

pal:

Bit	Content	Description
7	B'0'	Always 0
6	B'1'	Always 1
5		Forcing Insert Line
	B'0'	Disabled*
	B'1'	Enabled
4		Enter Key
	B'0'	Works as the *Send* key*
	B'1'	Works as the *LF* key
3	B'0'	Reserved
2-1		CRT Saver
	B'00'	No saver*
	B'01'	15 minutes
	B'10'	15 minutes
	B'11'	15 minutes

* means the default setting.

pa2:

Bit	Content	Description
7	B'1'	Always 1
6	B'0'	Always 0
5		Forcing Insert Character
	B'0'	Disabled*
	B'1'	Enabled
4	B'0'	Reserved
3		Operator Initiated Transparent Mode
	B'0'	Enabled*
	B'1'	Disabled
2		New Line
	B'0'	Generates a LF character when the *Return* key is pressed (when the Return Key parameter is New Line or in an unformatted page)
	B'1'	Generates a CR character when the *Return* key is pressed* (when the Return Key parameter is New Line or in an unformatted page)
1	B'0'	Reserved

op:

The operation-specifier parameter op can be added. This parameter must be placed at the end of the parameter field. If this parameter is specified, bits 7 and 6 of the parameter pa2 must be B'0' and B'1', respectively. For more information, refer to "Operation Specifier" in *IBM 3151 ASCII Display Station Reference Manual.*

---

* means the default setting.

Usage Note

You can omit parameters `pa2` by specifying B'1' for bit 7 and B'0' for bit 6 of parameter `pa1`, respectively.

Set/Read Control 4 Commands/Response

Differences

Bit 5 of pa is assigned as the Send Key parameter. Bit 4 of pa is reserved.

Function

Sets or reads the Send parameters of the 3151.

Format

- Set Control 4 command

  ESC # 9 pa op

- Read Control 4 command

  ESC # 7

- Read Control 4 response

  ESC # 7 pa LTA

Parameters

pa:

Bit	Content	Description
7	B'1'	Always 1
6	B'0'	Always 0
5		Send Key
	B'0'	Generates a CR character when the *Send* key is pressed*
	B'1'	Generates a CR/LF character when the *Send* key is pressed
4	B'0'	Reserved
3		Send Null Suppress
	B'0'	Off
	B'1'	On*
2		Lock Keyboard and Keep MDT Bit
	B'0'	Off*
	B'1'	On
1		Send Data Format
	B'0'	Text LTA*
	B'1'	AID LTA

op:

The operation-specifier parameter op can be added. This parameter must be placed at the end of the parameter field. If this parameter is specified, bits 7 and 6 of the parameter pa must be B'0' and B'1', respectively.

---

* means the default setting.

Set/Read Control 5 Commands/Response

Differences

Bit 5 of pa2 can be used to select the EIA RS-422A interface.

Function

Sets or reads the communication values on the main port.

Format

- Set Control 5 command

  ESC $ 9 pa1 pa2 pa3 pa4 op

- Read Control 5 command

  ESC $ 7

- Read Control 5 response

  ESC $ 7 pa1 pa2 pa3 pa4 LTA

Parameters

pa1:

Bit	Content	Description
7	B'0'	Always 0
6	B'1'	Always 1
5		Stop Bits
	B'0'	1*
	B'1'	2
4-1		Line Speed
	B'0000'	50 bps when bit 3 of pa3 is B'0' 38400 bps when bit 3 of pa3 is B'1'
	B'0001'	75 bps
	B'0010'	110 bps
	B'0011'	134.5 bps
	B'0100'	150 bps
	B'0101'	200 bps
	B'0110'	300 bps
	B'0111'	600 bps
	B'1000'	1200 bps
	B'1001'	1800 bps
	B'1010'	2400 bps
	B'1011'	3600 bps
	B'1100'	4800 bps
	B'1101'	Reserved
	B'1110'	9600 bps*
	B'1111'	19200 bps

* means the default setting.

pa2:

Bit	Content	Description
7	B'0'	Always 0
6	B'1'	Always 1
5		Interface
	B'0'	EIA RS-422A
	B'1'	EIA RS-232C*
4		Word Length
	B'0'	7-bit*
	B'1'	8-bit
3-1		Parity
	B'000'	No
	B'001'	Space
	B'010'	Mark
	B'011'	Odd*
	B'100'	Even
	B'101'	Reserved
	B'110'	Reserved
	B'111'	Reserved

* means the default setting.

pa3:

Bit	Content	Description
7	B'0'	Always 0
6	B'1'	Always 1
5	B'0'	Reserved
	B'1'	100 ms response delay is returned in response to the Read Control 5 command
4	B'0'	Reserved
3		Line Speed Extension
	B'0'	Not extended*
	B'1'	Extended
2-1		Line Control
	B'00'	CRTS
	B'01'	PRTS*
	B'10'	IPRTS
	B'11'	Reserved

* means the default setting.

pa4:

Bit	Content	Description
7	B'1'	Always 1
6	B'0'	Always 0
5	B'0'	Reserved
	B'1'	Enable outbound pacing is returned in response to the Read Control 5 command
4	B'0'	Reserved
	B'1'	Enable inbound pacing is returned in response to the Read Control 5 command
3		Break Signal
	B'0'	170 ms
	B'1'	500 ms*
2-1		Turnaround Character
	B'00'	ETX*
	B'01'	CR
	B'10'	EOT
	B'11'	DC3

op:

The operation-specifier parameter op can be added. This parameter must be placed at the last of the parameter field. If this parameter is specified, bits 7 and 6 of the parameter pa4 must be B'0' and B'1', respectively. For more information, refer to "Operation Specifier" in *IBM 3151 ASCII Display Station Reference Manual.*

---

* means the default setting.

Usage Note

The inbound and outbound pacing are disabled when DC3 is selected for the turnaround character.

The DTR signal on the main port turns off for approximately 350 ms when either the word length or parity is changed by the Set Control 5 command.

You can omit parameter `pa2` through `pa4` by specifying B'1' for bit 7 and B'0' for bit 6 of each previous parameter.

Set/Read Control 7 Commands/Response

Differences

Bit 5 of `pa1` is assigned as the Host/Local Print parameter.

Function

Sets or reads the information used for a print operation.

Format

- Set Control 7 command

  ESC & 9 `pa1 pa2 pa3 op`

- Read Control 7 command

  ESC & 7

- Read Control 7 response

  ESC & 7 `pa1 pa2 pa3` LTA

Parameters

`pal:`

Bit	Content	Description
7	B'0'	Always 0
6	B'1'	Always 1
5	 B'0' B'1'	Host/Local Print Local Host*
4-3	B'00'	Not used
2-1	B'00'	Not used

* means the default setting.

pa2:

Bit	Content	Description
7	B'0'	Always 0
6	B'1'	Always 1
5	B'0'	Not used
4	B'0'	Not used
3	B'0'	Not used
2-1		Characters
	B'00'	National*
	B'01'	Reserved
	B'10'	Reserved
	B'11'	All

* means the default setting.

pa3:

Bit	Content	Description
7	B'1'	Always 1
6	B'0'	Always 0
5	B'0'	Reserved
4-1	B'0000'	Not used

op:

The operation-specifier parameter op can be added. This parameter must be placed at the end of the parameter field. If this parameter is specified, bits 7 and 6 of the parameter pa3 must be B'0' and B'1', respectively. For more information, refer to "Operation Specifier" in *IBM 3151 ASCII Display Station Reference Manual.*

Usage Note

You can omit parameters pa2 through pa3 by specifying B'1' for bit 7 and B'0' for bit 6 of each previous parameter.

Write Host Message Command

Differences

The command syntax is changed.

Function

Writes a host message into the OIA.

If the message is longer than 80 or 132 characters (80- or 132-column mode, respectively), the overflow characters are written at the cursor position (when in cursor address mode) or the buffer address (when in buffer address mode).

Format

ESC # = `message` ESC =

Parameters

message:

Content	Description
Host message	The host message can include: • ASCII graphic characters (X'20' through X'7E') • ASCII graphic characters (X'A0' through X'FE') in 8-bit mode • SI and SO control characters in 7-bit mode • Select Character Set G0/G1 commands • Set Character Attribute command

Usage Note

When the host message is displayed in the OIA, the following conditions are assumed:

- The U.S. ASCII character set is assigned to the G0 space and the special graphic character set is assigned to the G1 space
- The U.S. ASCII character set is selected
- The character attributes are set as follows:
  - Normal video
  - Normal intensity
  - Non-underline
  - Non-blinking.

AID Codes and Keyboard Functions

This section describes the AID codes and keyboard functions that are different in SYSTEM ATTACH mode. An AID code is transmitted to the host system when the key is pressed. For the AID codes that are not shown here, see "AID Codes Generated by Keys" in *IBM 3151 ASCII Display Station Reference Manual.*

The following notation is used:

ESC: Escape character
LTA: Turnaround character

Key	AID Code	Local Function
Reset	DC2	The reset operation is also performed. The Enable/Disable Reset Key Attention commands are ignored.
Insert	ESC DEL	The display station enters insert mode. The insert operation is controlled by the IBM 3708/3710. The Insert Character parameter set by the setup menu or by the Set Control 3 command is ignored. Press the *Reset* key to exit insert mode.
Insert Line	None	The audible alarm sounds.
Send	CR (if the Send Key parameter is CR) CR/LF (if the Send Key parameter is CR/LF)	No

Figure 5-8 (Part 1 of 4). AID Codes and Keyboard Functions

Key	AID Code	Local Function
Return	CR • If the Return Key parameter is New Line in a formatted page and the New Line parameter is CR • If the New Line parameter is CR in an unformatted page CR/LF • If the Return Key parameter is New Line in a formatted page and the New Line parameter is CR/LF • If the New Line parameter is CR/LF in an unformatted page ESC M • If the Return Key parameter is Field in a formatted page	No
← Tab	ESC HT	No
Cancel	CAN (if the Host/Local Print parameter is Host)	If the Host/Local Print parameter is Host, no local function is performed. If the Host/Local Print parameter is Local Print, the *Cancel* key performs the same function as in normal 3151 mode.

Figure 5-8 (Part 2 of 4). AID Codes and Keyboard Functions

Key	AID Code	Local Function
Print	DLE (if the Host/Local Print parameter is Host)	If the Host/Local Print parameter is Host, no local function is performed. If the Host/Local Print parameter is Local Print, the *Print* key performs the same function as in normal 3151 mode.
Enter	LF (if the Enter Key parameter is LF)/Send	No
Attn	SOH	No
Dup	EOT	No
FldMk	ACK	No
Ident	SUB	No
N/B	ESC N	No
Refrsh	ESC r	No
Status	ETB	No
SysRq	ESC s	No
TypAhd	ESC t	No
F13	ESC ~ LTA	No
F14	ESC @ LTA	No
F15	ESC # LTA	No
F16	ESC $ LTA	No
F17	ESC % LTA	No
F18	ESC ^ LTA	No
F19	ESC & LTA	No
F20	ESC * LTA	No
F21	ESC (LTA	No

Figure 5-8 (Part 3 of 4). AID Codes and Keyboard Functions

Key	AID Code	Local Function
F22	ESC) LTA	No
F23	ESC _ LTA	No
F24	ESC + LTA	No

Figure 5-8 (Part 4 of 4). AID Codes and Keyboard Functions

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