



Workstation

8220

1.0

GENERAL DESCRIPTION

The Datapoint® 8220 Workstation is a general purpose, interactive video terminal designed for comfortable and easy operation. Used with Datapoint's DOS or RMS™ operating systems, the 8220 is ideal for applications processing, program development, and word processing functions.

The ergonomic features of the 8220 include a large, 24 line by 80 column screen with an easy to read high-contrast amber display, a 7 by 9 dot character matrix, a detached keyboard that can be positioned up to a meter from the workstation enclosure, and an optional tilt/rotate base. The display angle and keyboard positions can be adjusted by the operator for the most comfortable keying and viewing angles. In addition, display brightness can be set by the operator via the keyboard to any of 16 levels.

The 8220 is shipped with an ASCII standard 7 X 9 dot matrix character set, but user-defined character fonts can be down-line loaded by the host processor for special characters and international character sets. The 8220 also offers a subscreen mode that lets the user specify that only a portion of the screen be used for vertical scroll, horizontal roll, and home up or erase functions. The subscreen mode is particularly useful for menu-driven applications when the menu is constantly displayed and only the defined "window" changes with keyboard entry.

The 8220 Workstation uses standard EIA RS 232C and CCITT V.24 voltage levels. Serial asynchronous protocol is used to communicate to the host processor with direct or modem connection. The I/O connector provides for the attachment of a local printer with serial asynchronous interface. Data received from the host processor can be routed to the printer as well as being displayed on the 8220 screen.

Five types of terminal functions can be specified by the operator or down-line loaded by the host processor.

- Operator Convenience Options

The 8220 allows the operator to adjust permanent display brightness to any of sixteen levels while in the configuration mode. Also, a Double Key option allows certain function keys to act as extensions of their adjacent keys to prevent keying errors if experienced 3600 operators use an 8220

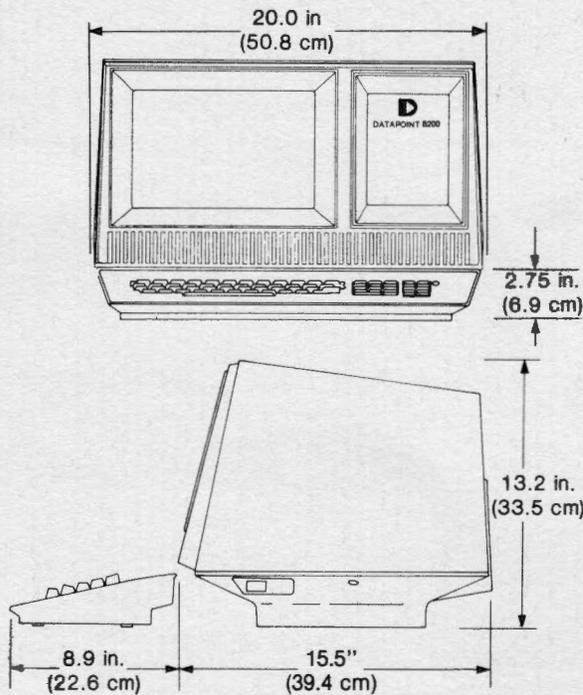


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with a Universal keyboard. The General Purpose keyboard is standard.

- **Communication Options**

The communication options permit the selection of various baud rates, selection of parity format (even or odd, 0 or 1), and the generation of ASCII control characters for transmission to the host processor as system keycodes.

- **Character Options**

The character options allow the operator to display additional characters, special character sets, or upper case character sets only. In addition, the 8220 supports an ALPHA key configuration which allows an operator to display unshifted characters when in the SHIFT LOCK mode.

- **Cursor, Line Spacing, and Bell Options**

These options permit the operator to select alternative controls and commands over cursor movement, line spacing, and the "bell" function.

- **Local Control Options**

These options permit the operator to control the translation and transmission of keycodes to the host processor.

Two advanced modes of operation are available in the Configuration Option Mode: Escape and Subscreen Mode. The Escape and Subscreen modes can enable more flexible operator action on the 8220 Workstation. Refer to Section 3.5 for a detailed description of the Escape and Subscreen modes.

2.0 SYSTEM REQUIREMENTS

The 8220 Workstation uses standard EIA RS 232C (also CCITT V.24) voltage levels. Serial asynchronous protocol and control is used to communicate to the host processor using direct or modem connection. When the workstation is transmitting, two stop bits are generated. When the workstation is receiving, only one stop bit is required.

2.1

Direct Connection

The data drivers in the 8220 are capable of driving 250 feet at 9600 baud, 500 feet at 4800 baud, and 1000 feet at 2400 baud or less. The cables used in these applications are standard Datapoint cables. Ask your Datapoint Customer Service Representative for the exact cables needed. The data drivers in the remote device may restrict the cable length to less than these limits. Requirements for cable lengths which exceed these limits must be submitted to Datapoint Customer Service Technical Support for review and approval.

2.2

Modem Connection

The 8220 Workstation can communicate through any EIA RS 232C or CCITT V.24 compatible full duplex, asynchronous modem at the specified baud rates. Maximum cable length between the terminal and a modem is 50 feet using shielded twisted pairs. Permissible cable length between modems varies with the vendor and product selected by the user.

2.3

Local Printer

A connection on the I/O connector provides for the attachment of a printer with a serial RS 232C (CCITT V.24) ASCII interface. Data received from the host processor is routed to the printer in addition to being displayed on the screen. Receipt of the special control characters, Printer On and Printer Off, control gating of the data to the printer. The printer must operate at the same baud rate as the workstation to which it is attached.

2.4

Communication Options

The 8220 Workstation has two types of communications options: parity and baud rate selections.

The parity options include:

- 1) Select even parity and 7 bit word.
- 2) Select odd parity and 7 bit word.
- 3) Select "1" parity and 7 bit word.
- 4) Select "0" parity and 7 bit word.

The baud rate selection options include:

50	200	600	4800
75	220	1200	9600
110	300	1800	19200
150	440	2400	

3.0

TECHNICAL DESCRIPTION

3.1

Technical Specifications

DISPLAY SIZE	8.9" wide by 5.4" high 12" diagonal
CHARACTERS PER LINE	80
NUMBER OF LINES	24
CHARACTER SIZE	Not less than 0.08" x 0.15"
CHARACTER GENERATION METHOD	7 x 9 dot matrix in 9 x 12 field (with descenders)
DEFLECTION TYPE	Magnetic
CHARACTER GENERATOR	RAM
TYPE OF SCREEN	frame memory
REFRESH RAM MEMORY	
DISPLAY REFRESH RATE	60/50 times per second (determined by line frequency)
CHARACTER SET	ROM, PROM, or Down-Line Loaded
CURSOR	Non destructive, blinking
SERIAL DATA	EIA RS 232C and CCITT V.24 signal levels

3.2

Operator Controls

3.2.1

ON/OFF Switch

The ON/OFF switch is located on the right side of the 8220 base plate. A red light to the right of the keyboard indicates when power is on.

3.2.2

Display Brightness

The operator can temporarily adjust the brightness level of the screen by taking the following actions:

To increase brightness, hold down the CTRL key and press the key above the CTRL key.

To decrease brightness, hold down the CTRL key and press the key below the CTRL key.

Note: Long term operation at maximum brightness is not recommended.

3.2.3

Repeat Action Keys

If the local display option is enabled, the repeat action feature causes a character to be displayed on the screen at the rate of 15 per second after its key has been held down for one-half second. If the local display option is disabled, the host processor must echo back the repeated codes.

3.3

Keyboard

Data transmitted from the 8220 Workstation originates from the keyboard except for configuration/interrogation data from a down-line load. The General Purpose Keyboard is standard on the 8220 Workstation: the Universal Keyboard is optionally available. The keyboard has ten function keys, an eleven-key numeric pad, and 55 alphanumeric keys. The keyboard is shown in Figure 3-1. The octal character codes sent by these keys are shown in Figure 3-2.

3.3.1

Roll Over

The keyboard has an n-key rollover capability. The n-key rollover capability allows keys to be depressed sequentially or simultaneously. A valid code is generated for each

depression, whether or not previously depressed keys are released. Codes are generated in the order that the keys are depressed.

3.3.2

Repeat

The 8220 keyboard provides an automatic repeat function. All alphanumeric keys and the backspace key generate a repeating code. Control and function keys (Shift, Shift Lock, Enter, Cancel) do not generate repeating codes. The automatic repeat function is inhibited whenever two or more keys are depressed. There is a delay of one half second from the time a key is depressed until the repeating function begins. Thereafter, the keycode is repeated at a rate of 15 codes per second until the key is released. Note that when a key has been held down long enough to begin generating repeated codes, depressing another key not only cancels generation of repeating codes on the first key, but also suppresses generation of repeated codes on the second keycode. After such a key rollover, all keys must be released before any further repeated keycodes can be generated.

3.3.3

Keycodes

The keyboard generates a unique keycode for each key. Function keys generate different "Key Up" and "Key Down" codes. Shifted and Unshifted keys generate different keycodes, except for the space bar and the decimal point. The "Key Down" code on function keys is changed when shifted, but the "Key Up" code is not changed. The control logic translates these codes to system keycodes which are stored in RAM. The codes shown in Figure 3-2 are the standard 8220 Workstation keycodes.

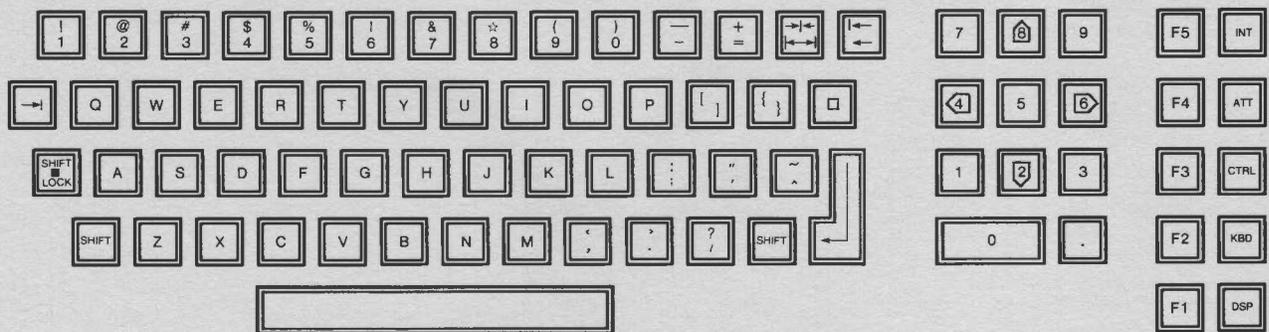


Figure 3-1: General Purpose Keyboard

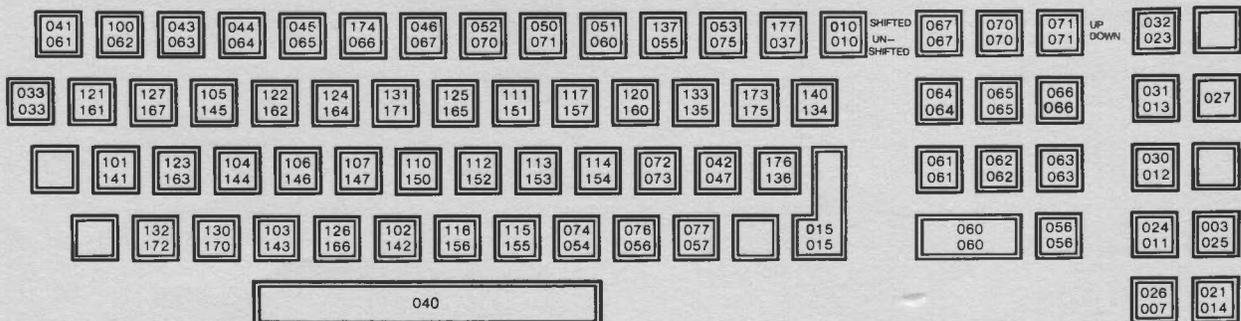


Figure 3-2: Octal Character Code Transmission (ESC KBD=N)

Keyboard Function Keys

The function keys, except for the CTRL key, can be programmed by the user via a down-line load to transmit characters. A list of keys and their default functions, and any special options they permit, is below.

F5—Can be an extension of the INT key if the DBL KEY option is selected. (See Section 3.6.1, Configuration Option Mode.)

F4—Can be programmed by the user.

F3—(LINE FEED) Causes each line displayed to move up one line when the cursor is on the 24th line. This key transmits an octal 012 to the host processor. (See Section 3.6.1, Configuration Option Mode.)

F2—Causes a break condition if the BREAK option is selected. (See Section 3.6.1, Configuration Option Mode.)

F1—Can be an extension of the NEW LINE key, if the DBL KEY option is selected. (See Section 3.6.1, Configuration Option Mode.)

INT (Interrupt)—Causes transmission of an octal 034.

ATT—(key between INT and CTRL keys) Causes the screen to be erased from the current cursor position to the end of the screen if the LOC ERASE option has been selected. This key causes an EEOF system keycode to be transmitted if the TX ERASE option is selected. (See Section 3.6.1, Configuration Option Mode.)

CTRL (Control)—Causes the transmitted code to be logically "anded" with a 037, giving the equivalent of a control character, if the CTRL key option is enabled. This control function is not latched, so this key must be held down whenever used and when repeating a control code. (See Section 3.6.1, Configuration Option Mode.)

KBD—(key between the CTRL and NEW LINE keys) Causes the cursor to be positioned in the "Home" position (leftmost position in the top line), if the LOC HOME option is selected. If the TX HOME option is selected, a "Home Up" system keycode will be transmitted. (See Section 3.6.1, Configuration Option Model.)

NEW LINE or DSP—Causes an octal 014 to be transmitted to the Datapoint processor. No local action occurs.

Bit 8 of each character transmitted is the parity bit. Transmitted parity is even (the number of "1's" or mark bits in each character, including bit 8, is even). Transmitted parity may be changed during the Configuration Option Mode to transmit odd parity, even parity, 1 mark, or 0 space.

Keyboard Lockout

The 8220 keyboard may be locked with the following key sequence:

- Press the CTRL key
- While holding the CTRL key down, press the following keys:
- CANCEL or 

- Up to 4 keys of your choice (excluding CANCEL, , ENTER, or the function keys)
- Press the ENTER key
- Release the CTRL key

To unlock the keyboard, the sequence must be repeated in the same order. If any mistakes are made, the 8220 will beep when the CTRL key is released and the operator must repeat the sequence correctly. While the keyboard is locked, pressing any key (except the unlock sequence) will cause the 8220 to beep. If the 8220 is powered off, it will power back on with the keyboard unlocked.

Control Codes and Display Characters

The control codes, display characters, and their respective functions are listed below with the exception of ESC (033), DLC (034) and DLR (021), which are described in following sections. Unused codes will have no effect on the terminal if the PRINT ALL option is disabled. If the PRINT ALL option is enabled, the unused codes below 040 will be printed on the screen. These unused character codes can be down-line loaded to obtain additional printable characters (as in the KataKana character set).

All characters above 040, except 0177, will print their respective ASCII characters on the screen. Refer to the code chart (Figure 3-1) for the octal character codes. The 0177 character can either be a displayable character or a PAD character depending on the setting of the PRINT DEL option. If the PRINT DEL option is not set, 0177 becomes a PAD character. The PAD character is completely ignored by the terminal. It is useful for implementing time delays so that the terminal or printer can finish a function that it has been commanded to perform.

Bell (BEL) 007

Causes a 1200 Hz tone to be generated.

Backspace (BSP) 010

Causes the cursor to move one character to the left, unless the cursor is already at the first character position on a line (leftmost character position of the subscreen if the Subscreen option is enabled — see Section 3.5). If the cursor is in the first character position of a line, no action will be taken.

Tab (TAB) 011, x, y

Causes the cursor to be positioned at the screen location addressed by the two octal coordinates following the TAB control character. The first coordinate is the horizontal location (000-117); the second coordinate is the vertical location (000-027).

If the cursor is positioned off the screen, displaying will be inhibited until a command is received that positions the cursor back on the screen. If the Subscreen option is in effect, the x and y coordinates are relative to the top left corner of the subscreen. The cursor is considered off the screen if it does not reside within the subscreen (See Section 3.5). The tab will be aborted if more than 5 seconds elapse between receipt of the x and y coordinates.

Line Feed (LF)**012** *0A H*

Causes the cursor to move down one line unless the cursor is currently on the bottom line of the screen, or the last line of the subscreen if the Subscreen option is enabled. If the Auto Roll option is enabled, the Subscreen option is disabled, and the cursor is on the bottom line; receipt of this character causes the displayed data to move up one line. If the Auto Roll and Subscreen options are enabled, receipt of this character causes the displayed data on the subscreen's bottom line to move up one line.

Roll Up (ROLL UP)**013** *0B H*

Causes data to move up one line and erases the bottom line. If the Escape options are enabled, the Roll Up will occur only on those lines defined by the Set Roll Window command. If the inverted video is active at the time of the Roll Up, the bottom line erased is filled with highlighted spaces. If the Subscreen option is in effect (Section 3.5), the Roll Up affects only those characters residing within the subscreen.

Roll Down (ROLL DN)**003**

Causes the data displayed on the screen to move down one line leaving the top line blank. The Roll Down command will not affect the cursor position. If the Escape options are in effect, the Roll Down occurs only on those lines defined by the Set Roll Window command. If the inverted video or two-level video is being used at the time of the Roll Down, the top line erased will be filled with highlighted spaces. If the Subscreen option is in effect, the only characters affected by the Roll Down are those residing in the subscreen. (See Section 3.5 for information concerning the Subscreen option.)

Carriage Return (CR)**015** *0D*

Causes the cursor to return to the first character position of the current line. If the Subscreen option is in effect, the cursor returns to the left window position of the current line.

Cursor On (CUR ON)**030** *18 h*

Turns on the blinking cursor if it was previously turned off. If the cursor is already on, this command will have no effect.

Cursor Off (CUR OFF)**031** *19 H*

Turns off the cursor if the CURSOR OFF option is enabled. The cursor will remain off until another Cursor On character is received. Received characters can be displayed and transmission from the keyboard is possible while the cursor is off. If the CURSOR OFF option is disabled, this command will have no effect.

Home Up (HOME UP)**025** *15 H*

Causes the cursor to return to the home-up position (first character position on the top line of the screen). If the Subscreen option (see Section 3.5) is being used, the cursor will go to the top left edge of the subscreen.

Erase to End-of-Line (EEOl)**026** *16 H*

Causes the current line to be erased from and including the current cursor position to the end of the line. The cursor position will not change. If inverse or two-level video is in use upon receipt of this command, the line is filled with highlighted spaces. If the Subscreen option is enabled, the end of the line will be the right edge of the subscreen. If the cursor is off the screen, or subscreen, no action will be taken by the 8220 Workstation.

Erase to End-of-Frame (EEOF)**027** *17 H*

Causes the screen to be erased from and including the current cursor position through the last character position of the last line. The cursor position will not change. If inverse video or two-level video is being used, the frame will be erased with highlighted spaces. If the Subscreen option is active (see Section 3.5), the end-of-line is defined as the right edge of the subscreen. If the cursor is off the screen or subscreen, no action is taken by the 8220.

Printer On (PRT ON)**032** *1A H*

Causes data received by the workstation to be sent to an attached serial printer as it is being displayed. The 8220 requires 2 milliseconds of "dead time" on the serial line after receipt of the Printer On character. The "dead time" is defined as the time between the stop bit of the Printer On character and the start bit of the next character.

Printer Off (PRT OFF)**024** *14 H*

Inhibits printing of received data on an attached serial printer. Printing will be inhibited until a Printer On character is received. The 8220 requires 2 milliseconds of "dead time" on the serial line after receipt of the Printer Off character.

3.5

Escape and Subscreen Operation

The 8220 Workstation has two advanced modes of operation: Escape Mode and Subscreen Mode. These modes can be specified in the Configuration Option Mode (see Section 3.6.1).

If the Escape option (ESC OPTS) is enabled and the Subscreen Option is disabled, the 8220 Workstation will be in Escape Mode. Figure 3-3 describes the screen variables used in the Escape Mode.

Variable	Description	Range
W1	Top line of screen for vertical rolls (roll up, roll down)	0 -027
W2	Bottom line of screen for vertical rolls (roll up, roll down)	0 -027
W3	Top line of screen for horizontal scrolls (left side scroll, right side scroll)	0 -027
W4	Bottom line of screen for horizontal scrolls (left side scroll, right side scroll)	0 -027

Figure 3-3: Escape Mode Variables

In the Escape or Subscreen modes, a Reset Window command is automatically executed during power up, after receipt of a new configuration, and after a configuration restore command. In the Escape mode, the Reset Window Command then sets W1 = 0, W2 = 027, W3 = 0, and W4 = 027.

If the Subscreen option is enabled, the Escape functions are automatically enabled (regardless of the value of ESC OPTS see Section 3.6.1). In Subscreen mode, control characters affect only the subscreen, with the exception of standard video, inverse video, and two-level video which affect the entire screen. The variables used in the Subscreen Mode are described in Figure 3-4.

Variable	Description	Range
W1	Top line of subscreen	0 - 027
W2	Bottom line of subscreen	0 - 027
W3	Left edge of subscreen	0 - 0117
W4	Right edge of subscreen	0 - 0117

Figure 3-4: Subscreen Mode Variables

All control codes are executed relative to the subscreen. For example, a Home Up command positions the cursor to the left corner of the subscreen. In a tab x, y sequence, the x and y must be relative to the top left corner of the subscreen. The cursor is considered off the screen whenever it does not reside within the subscreen. The vertical rolls and horizontal scrolls are controlled by the same top and bottom lines of the subscreen. Characters outside the subscreen are unaffected by any control code executed within the subscreen. In the subscreen mode, a Reset All Windows command sets the variables W1, W2, W3, and W4 back to the full screen values. See Figure 3-5 for an example of subscreen operation. A reset is automatically executed during power up, after a new configuration is loaded, and after a configuration restore command is executed.

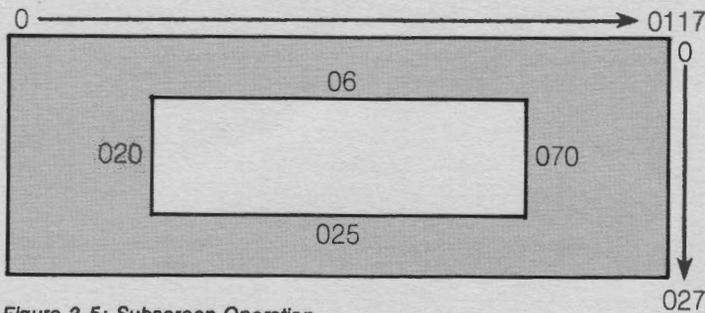


Figure 3-5: Subscreen Operation

Where: W1 = 06 (top of subscreen)
W2 = 025 (bottom of subscreen)
W3 = 020 (left side of subscreen)
W4 = 070 (right side of subscreen)

Shaded area indicates the part of the workstation screen not affected by subscreen operation. Screen coordinates are in octal notation.

3.5.1

Escape Sequences

The following commands are invoked by sending an Escape character (033) before the command. This enables a number of additional commands to be implemented in the terminal. All Escape commands may be disabled in the Configuration Mode by specifying "NO" to the SUB SCRN and ESC OPT questions, or by down-line loading a new configuration that disables both the Escape and the Subscreen options. See Figure 3-6 for an example of a Roll operation in the Escape Mode. See Figure 3-7 for an example of a Scroll operation in the Escape Mode.

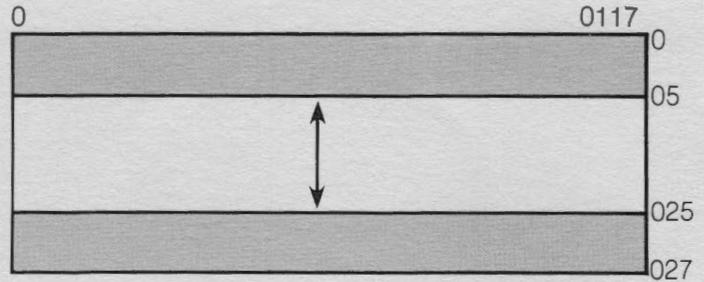


Figure 3-6: Roll Operation in Escape Mode

Where W1 = 05
and W2 = 025

Shaded area indicates the part of the workstation not affected by the roll operation. Screen coordinates are in octal notation.

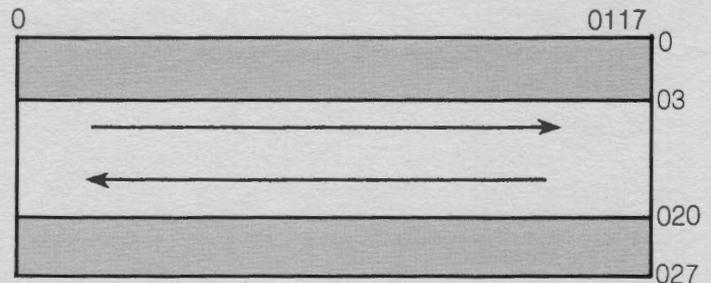


Figure 3-7: Scroll Operation in Escape Mode

Where W3 = 03
and W4 = 020

Shaded area indicates the part of the workstation screen not affected by a scroll operation. Screen coordinates are in octal notation.

Set Roll Window (ROLL WNDO)

033, 017, W1, W2

IB, OF H

When the Subscreen option is disabled and a Set Roll Window is performed, W1 defines the top line and W2 defines the bottom line of the screen to be affected in the vertical roll operation. W1 and W2 must be in the range of $0 \leq W1 \leq W2 \leq 027$. If the preceding equation is not met, W3 is set to 0 and W4 is set to 027. If the Subscreen option is enabled, W1 defines the top line of the subscreen and W2 defines the bottom line of the subscreen.

W1 and W2 must each be received within five seconds from the time that 033, 017 is processed. If W1 and W2 are not received in the specified time period, this sequence will be aborted.

Set Scroll Window (SCRL WNDO)

033, 020, W3, W4

IB, ID H

When the Subscreen option is disabled and a Set Scroll Window operation is performed, W3 defines the top line and W4 defines the bottom line of the screen to be affected by a horizontal scroll operation. W3 and W4 must be in the range of $000 \leq W3 \leq W4 \leq 027$. If the preceding equation is not met, W3 is set to 0 and W4 is set to 027. If the Subscreen option is enabled, this command defines the left (W3) and right (W4) boundaries of the subscreen. In this case, W3 and W4 must be in the range $000 \leq W3 \leq W4 \leq 0117$.

If W3 and W4 are not received within 5 seconds from the time the 033, 020 is processed, this sequence is aborted. However, if the timeout occurs while processing W3 and W4, W1 and W2 will remain updated.

Set All Windows (ALL WND0)

033, 016, W1, W2, W3, W4 *18, 0E H*

When the Subscreen option is disabled, the Set All Windows command defines both the Vertical Roll Window (W1 and W2) and the Horizontal Scroll Window (W3 and W4). If the Subscreen option is enabled, this command defines the Subscreen coordinates: W1 = TOP, W2 = BOTTOM, W3 = LEFT, and W4 = RIGHT. This command executes in pairs. W1 and W2 are processed first, followed by W3 and W4.

NOTE: If W1 and W2 or W3 and W4 are not received within 5 seconds from the time that 033, 016 is processed, this sequence is aborted. However, if the timeout occurs while processing W3 and W4, W1 and W2 will remain updated.

Reset All Windows (RSTWND0)

033, 014 *18, 0C H*

If the Subscreen option is not in effect, the Reset All Windows command sets the Vertical Roll and Horizontal Scroll Windows both to TOP (W1, W3) = 000 and BOTTOM (W2, W4) = 027. If the Subscreen option is in effect, this command defines the subscreen as the full screen: TOP (W1) = 0, BOTTOM (W2) = 027, LEFT (W3) = 0, RIGHT (W4) = 0117. A Reset All Windows command is automatically executed by the 8220 Workstation during power up, after exiting the off line mode, and after receiving a configuration load or restore sequence.

Horizontal Scroll Left (LSCROLL)

033, 001, CHARtop, CHARtop + 1, ..., CHARbot-1, CHARbot

The Horizontal Scroll Left command causes each column of the screen to shift left by one character position beginning with the line defined as TOP (W1 for Subscreen option, W3 for Escape option) through and including the line defined as BOTTOM (W2 for Subscreen option, W4 for Escape option). The characters in column 0 (LEFT edge, W3, if Subscreen option is enabled) will be lost. The character positions in column 0117 (RIGHT edge, W4, of subscreen if Subscreen option is enabled) that were filled with blanks as a result of the shift will be replaced by the characters supplied (CHARtop, ..., CHARbot). No escape sequences may be imbedded within the characters supplied except for the following:

1. Set Standard Video Mode (033, 004)
2. Set Inverse Video Mode (033, 005)
3. Set Two-Level Video Mode (033, 006)
4. Force Display of Next Character (033, 033, Char)

Horizontal Scroll Right (RSCROLL)

033, 002, CHARtop, CHARtop + 1, ..., CHARbot-1, CHARbot

The Horizontal Scroll Right command causes the screen beginning with the line defined as TOP to shift right by one character position (W1 for Subscreen option, W3 for Escape option) through and including the line defined as BOTTOM (W2 for Subscreen option, W4 for Escape option). The characters in column 0117 will be lost (RIGHT edge, W4, of the subscreen if the Subscreen option is enabled).

The character positions in column 0 (Left edge, W3, of subscreen if the Subscreen option is enabled) that were filled with blanks as a result of the shift will be replaced by the characters supplied (CHARtop, ..., CHARbot). No escape sequences, other than the following, may be embedded with the characters supplied:

1. Set Standard Video Mode (033, 004)
2. Set Inverse Video Mode (033, 005)
3. Set Two-Level Video Mode (033, 006)
4. Force Display of Next Character (033, 033, Char)

Insert Character into Field (FLD INS)

033, 021, x, y

The Insert Character Into Field command causes all characters within a specified field to be shifted to the right by one character position. The field starting point is defined by the current cursor position, and the field end point is defined by the x and y coordinates supplied with the command. The Insert command shifts the character behind the cursor to the right one location, along with all characters up to the end of the field.

Line wrap-around is in effect when the field spans more than one line. The last character of a line appears as the first character of the next line. Screen wrap-around will also be in effect when the field end point is above the cursor. The last character of the bottom line will appear as the first character of the top line. The character at the x, y location is lost. A space character (040) is placed under the cursor. The inserted space character will have the same highlighting as the character that was previously under the cursor.

This command cannot be executed if the field end point defined by the x and y coordinates points to a location that is off the screen, or if the cursor is off the screen. If the Subscreen option is disabled, the following equations must be satisfied:

$$0 \leq x \leq 0117$$
$$0 \leq y \leq 027$$

If the Subscreen option is enabled, x and y are relative to the top left corner of the Subscreen, hence:

$$0 \leq x \leq W4 - W3$$
$$0 \leq y \leq W2 - W1$$

W1, W2, W3, W4 are the four windows that define the subscreen. Characters outside the subscreen are unaffected.

Delete Character From Field (FLD DEL)

033, 022, x, y

The Delete Character From Field command shifts all characters within a specified field to the left by one character position. The field starting point is defined by the current cursor position, and the field end point is defined by the x and y coordinates supplied with the command. The character under the cursor is lost, and the character to the right of the cursor is moved behind the cursor. All characters up to and including the end of the field are shifted, and a space is inserted at the x,y location.

Line wrap-around and screen wrap-around are in effect. The inserted space character has the same highlighting as the character that was previously at the x,y location. This

command cannot be executed if the field end point defined by the x and y coordinates points to a location that is off the screen (or subscreen), or if the cursor is off the screen. If the Subscreen option is disabled, the following equations must be satisfied:

$$0 \leq x \leq 0117$$
$$0 \leq y \leq 027$$

If the Subscreen option is enabled, x and y are relative to TOP, LEFT corner of the subscreen, hence:

$$0 \leq x \leq W4-W3$$
$$0 \leq y \leq W2-W1$$

W1, W2, W3, and W4 define the subscreen.

Set Standard Video Mode (STND VD)

033, 004

The Set Standard Video Mode command displays all succeeding characters in standard video until a highlighting command is received. During power up and after a Configuration Load or Restore Command sequence, the 8220 Workstation automatically enters standard video mode.

Set Inverse Video Highlighting Mode (INV VD)

033, 005

The Set Inverse Video Highlighting Mode command causes all succeeding characters to be displayed in inverse video until another highlighting command is received. If any characters previously on the screen were placed there in highlighted mode, they will be changed to inverse video highlighting even if they were placed on the screen in two-level video highlighting mode. Erase, Roll Up, and Roll Down commands executed while inverse video is active place spaces on the screen in inverted video mode. Characters placed on the screen due to a horizontal scroll command are displayed in inverse video.

Set Two-Level Video Highlighting Mode (2LEV VD)

033, 006

The Set Two-Level Video Highlighting Mode command displays all succeeding characters in two-level video (brighter than standard video) until another highlighting command is received. If any characters previously on the screen were put there in highlighted mode, they are changed to two-level video highlighting even if they were placed on the screen in inverse video highlighting mode.

Set Character Behind Cursor To Standard Video (STD

CUR) 033, 035

The Set Character Behind Cursor To Standard Video command converts the character behind the cursor to standard video. This command does not change the highlighting mode of the 8220 Workstation.

Set Character Behind Cursor To Inverse Video (INV CUR)

033, 036

The Set Character Behind Cursor To Inverse Video command displays the character behind the cursor in inverse video mode. This command changes the highlighting mode to inverse video only if the 8220 is in the two-level video mode when this command is received.

Set Character Behind Cursor To Two-Level Video (2LEV

CUR) 033, 037

The Set Character Behind Cursor To Two-Level Video command displays the character behind the cursor in two-level video (brighter than standard video). This command

changes the highlighting mode to two-level video only if the 8220 is in the inverse video mode when this command is received.

Insert Line (INS LIN)

033, 024

The Insert Line command causes a Roll Down to be performed between the line containing the cursor and the last line of the screen (bottom edge, W2, of subscreen if the Subscreen option is enabled). The bottom line is lost; all lines between the line containing the cursor and the bottom line are shifted down by one line; the line containing the cursor is erased. If the cursor is off the screen (outside the subscreen) or if the cursor is not within the roll window, this command is ignored.

Delete Line (DEL LIN)

033, 032

The Delete Line command causes a Roll Up to be performed between the line containing the cursor and the last line of the screen (bottom edge of subscreen if the Subscreen option is enabled). The line containing the cursor is lost, and the bottom line is erased. If the cursor is off the screen (outside the subscreen) or not within the roll window, this command will be ignored.

Duplicate Character (DUP CHAR)

033, 023, CHARACTER, COUNT

The Duplicate Character command displays a number (COUNT) of characters (CHARACTER) where $0 \leq \text{CHARACTER} \leq 0177$ and $0 \leq \text{COUNT} \leq 0177$. This sequence may not be used whenever another escape sequence is active, such as a left or right scroll. If the character is less than 040 and is usually a control character, the character is displayed, and not the function executed.

Open Line (OPENLN)

033, 010

The Open Line command causes 80 character spaces to be inserted on the screen beginning with the cursor and continuing to a point one line below the cursor. When the screen rolls down to accommodate the extra 80 character spaces, the bottom line of the screen will be lost. The characters from and including the cursor character are copied to the line directly below the cursor.

If the cursor is on the bottom line of the screen when this command is received, an erase to end of line is performed. If the Subscreen option is enabled, the number of spaces inserted on the screen is relative to the width of the current subscreen line. If the cursor is off the screen or subscreen, the command will have no effect. If the Escape option is in effect, the scope is the roll window.

Close Line (CLOSELN)

033, 011

The Close Line command has the opposite effect as the open line command. It removes one line (80 character positions) of characters from the screen starting with the current cursor location and continuing to the next line directly below the cursor position. The bottom line of the screen becomes blank, and all lines between the bottom line of the screen and the line below the cursor will appear to roll up one line. If the Close Line command is performed while the cursor is on the bottom line of the screen, then the effect will be that of an erase to end of line command.

If the cursor is positioned off the screen when this command is received, then no action is taken. If the Subscreen option is enabled, the character spaces removed are relative to the current subscreen line width. If the Escape option is in effect, the scope is limited to the roll window.

Force Display of Next Character (F DISP)

033, 033, CHAR

The Force Display of Next Character command causes CHAR to be treated as a display character independent of ASCII value. If the cursor is off the screen or subscreen, the character will not be displayed.

Click

033, 07

Causes a click to be generated by the 8220 firmware. This click is independent of the click generated by the keyboard ROM due to key depressions. If a beep or another click is active when this command is received, it is ignored.

Click ON

033, 030

If the click option of the 8220 is enabled, this command allows the keyboard ROM to generate clicks on key depressions. If the click option is disabled, this command is ignored. If the keyboard is actively processing a previous click on/off command, this command is ignored. If the click option is enabled, the 8220 performs a click on command during power-up and after a configuration load or restore command.

Click OFF

033, 031

If the click option of the 8220 is enabled, this command inhibits clicks from the keyboard ROM on key depressions. If the click option is disabled, this command is ignored. If the keyboard is actively processing a previous click on/off command, this command is ignored. If the click option is disabled, the 8220 will perform a click off command during power up and after a configuration load or restore command.

3.6

Off-Line Operation

The 8220 has two submodes of operation which are accessible through the Off-Line Mode: Configuration Option Mode and Diagnostic Mode. Off-Line operation can be selected through the 8220 keyboard.

To cause the 8220 to operate off-line, the following keyboard actions must be taken:

- Hold down the CTRL key,
- Depress the INT key twice in succession, then
- Release the CTRL key.

Any data displayed on the screen prior to going off-line will be erased, and the display shown will appear as in Figure 3-8.

To return to on-line operation, the Off-Line Access Sequence must be repeated. The display will be erased and the cursor will appear in the first character position of the first line (Home Up position). The 8220 will also return to on-line operation after it is powered OFF and then powered ON again.

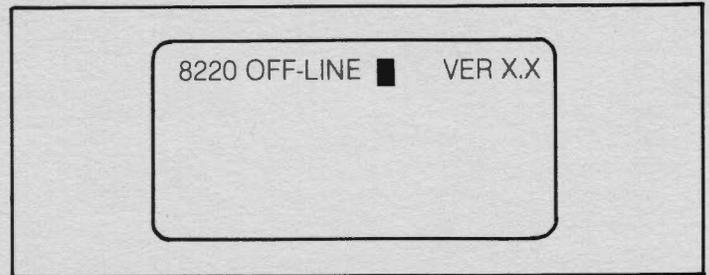


Figure 3-8: Workstation Screen in the Off-Line Mode

3.6.1

Configuration Option Mode

The Configuration Option Mode is designed to permit the user to tailor the response of the 8220 so it can take advantage of the capabilities of the host processor. The Configuration Options provide five general areas of terminal features: Operator Convenience Options, Communication Options, Character Options, Cursor, Line Spacing and Bell Options, and Local Control Options. (See Sections 3.6.1.1 through 3.6.1.5.)

When the workstation is in the off-line mode, the Configuration Option Mode may be selected by keying in "(OPT)". Previously displayed data will be erased. An illegal key entered before or during the access sequence causes a beep, but leaves the workstation in the off-line mode.

NOTE: The SHIFT key must be held down when entering the parantheses, but not when entering OPT.

After the workstation enters the configuration mode, the CRT display shown in Figure 3-9 appears. A message describing each option is displayed along with the current setting of the option. Baud rate information is displayed in its numeric value. If the receive baud rate is set at 9600 baud, the display will show "RX BAUD 9600". Parity option information is displayed with the word "PARITY" followed by a 1 for one parity, a 0 for zero parity, an E for even parity, or an O for odd parity. The remaining options are displayed with a brief message followed by a "Y" or an "N" to indicate whether or not a particular option is enabled.

To set each option, enter the setting desired in the same manner it is displayed. (To set baud rates, enter the numeric value desired.) To skip an option where no change is required, press ENTER. When all the options have been selected, an "ADJUST BRIGHTNESS" message is displayed, followed by a "DONE?". To adjust brightness, hold the CTRL key down. Press the key above it to increase brightness one level. Press the key below it to decrease brightness one level. Release the CTRL key when the appropriate brightness level is reached.

After adjusting the display brightness, enter a Y in response to the "DONE?" message if no further changes are needed on the configuration option display. If a Y is entered, the display screen will go blank and the new option settings will be written to the nonvolatile memory. If any other response is entered, the cursor is repositioned to the first option. Each option may then be corrected or changed as necessary.

8220 OFF-LINE		VER X.X	
RX BAUD	9600	GP KBD	N
TX BAUD	1200	SP RPT	N
PARITY	E	ESC KBD	N
ERR TRAP	N	CLICK	N
DBL KEY	Y	ANSWER BACK	N
UP CASE	N		
BREAK	N		
LOC ERASE	N		
TX ERASE	N		
LOC HOME	N		
TX HOME	N		
LOC DISP	N		
CTRL KEY	N		
AUTO ROLL	N		
AUTO CR/LF	N		
ROLL DN	N		
PRINT ALL	N		
PRINT DEL	N		
CURS OFF	N		
BELL	N		
ESC OPTS	N		
SUB SCRN	N		
ALPHA OPT	N		
		ADJUST BRIGHTNESS	
		DONE?	

Figure 3-9: 8220 Sample Display Screen During Configuration Option Mode

3.6.1.1

Operator Convenience Options

These options allow the operator to change the display brightness or make the keyboard similar to a Datapoint 3600 keyboard.

Brightness Control

While in the configuration mode, brightness can be permanently adjusted. To increase the brightness one level, hold the control key (CTRL) down, and press the key above it once. Each momentary depression of the key above the CTRL key increases brightness one level. To decrease brightness one level, hold the control key (CTRL) down, and press the key below it once. Each momentary depression of the key below the CTRL key decreases brightness one level.

When the 8220 is powered off and powered on again, the brightness level will default to that specified during the Configuration Option Mode.

Double Key (DBL key)

The Double Key option may be used to prevent keying errors if experienced 3601 operators are using the 8220 Workstation. This option causes the F5 key to act as an extension of the INT key, and the F1 key to act as an extension of the NEW LINE key.

When this option is disabled, the F5 key and the F1 key return to the respective codes assigned to them. This option is not available if the general purpose keyboard option is set.

Click

This option allows the operator the convenience of controlling the click generated by the keyboard ROM on key depression. If the operator responds with N to CLICK, the keyboard ROM will not click on key depressions nor will the host processor software be allowed to turn on the keyboard ROM click. If the operator responds with Y to CLICK, the keyboard ROM will click on key depression and the software executing at the host processor is allowed to enable or disable the click from key depression as desired.

The state of this option does not control the click command (033, 07); the option controls only the clicks generated by the keyboard ROM on key depression. The state of this option is not reported to the host processor during configuration/interrogation load response.

3.6.1.2

Communications Options

The communications options allow the operator to select baud rates, parity format, and modifications to character codes transmitted.

Baud Rates (RX BAUD and TX BAUD)

The baud rate option permits selection of the transmit and receive baud rates independently for the communications channel. These baud rates are listed below:

50	75	110	150
200	220	300	440
600	1200	1800	2400
4800	9600	19200	

When the terminal is in the configuration mode and the cursor is flashing next to the "RX BAUD" or "TX BAUD" messages, the baud rate may be changed by entering the desired baud rate from the list above. If no change to the baud rate is necessary, press the ENTER key to advance the cursor to the next option. Baud rate options cannot be changed by a down-line load.

Parity Options (PARITY)

The parity option permits selection of the type of parity bit to be appended to the seven bits of data transmitted to the host processor. When the 8220 is in the configuration mode and the cursor is flashing next to the "PARITY" message, the parity options may be entered.

Even Parity: "E"

Enter the character "E" for even parity. An even parity bit will be appended to the seven data bits.

Odd Parity: "O"

Enter the character "O" for odd parity. An odd parity bit will be appended to the seven data bits.

1 Parity: "1"

Enter the character "1" for 1 Parity. A "1" bit will be appended to the seven data bits.

0 Parity: "0"

Enter the character "0" for 0 Parity. A "0" bit will be appended to the seven bits transmitted to the host processor.

Error Trap (ERR TRAP)

The Error Trap option allows the workstation to check data transmitted from the host processor for even or odd parity, framing errors, receiver overrun, and input FIFO overflow. If one of these conditions occurs while the option is enabled, the input character will be replaced with a rub-out character (0177) signaling the operator that an error condition exists. If the error condition should occur during a control sequence, that sequence will be aborted and the rub-out character will be displayed on the screen in the current cursor location. Error conditions in downline load sequences will cause that sequence to be aborted. Escape sequences with errors will become undefined and result in no action.

Even or odd parity must be selected in the Parity option when the Error Trap option is enabled. Do not enable the Error Trap option if parity characters are not being transmitted by the host processor.

Control Key (Control Code Generation — CTRL KEY)

The Control Key option enables the operator to generate all the ASCII control characters for system keycode transmission to the host processor.

When a Y is entered in response to the "CTRL KEY" message, the workstation alters the system key code of any alphanumeric key depressed when the CTRL key is held down. The keycode will be logically "anded" with a 037 and transmitted to the host processor. Other functions of the CTRL key do not change.

3.6.1.3

Character Options

The character options allow the operator to either display additional characters or display only upper case characters.

Upper Case Character Set Only (UP CASE)

If the Upper Case Only option is selected by entering a Y to the "UP CASE" message, the workstation will substitute upper case system key codes for lower case codes before transmitting them to the host processor. The 26 alphabetic keycodes are the only codes which are modified. Display data received from the host processor is not affected.

Print Additional Characters (PRINT ALL)

The Print Additional Characters option allows the operator to increase the number of displayable characters. By entering a Y to the "PRINT ALL" option, the workstation will display ASCII characters below octal 040.

If this option is disabled, the workstation will ignore all ASCII characters received from the host processor below 040 except the control characters.

General Purpose Keyboard Option (GP KBD)

The General Purpose Keyboard option lets the 8220 Workstation support either a Datapoint Universal keyboard or a General Purpose keyboard. A response of Y indicates that the 8220 is equipped with a General Purpose keyboard. A response of N indicates a Universal keyboard. The General Purpose keyboard is standard on the 8220 Workstation.

SHIFT and ALPHA Configuration

The right shift key has two configuration options: SHIFT and ALPHA. If a Y is entered in response to the "ALPHA OPT" message, the right shift key will be changed to the Alpha configuration. If an N is entered, the right shift key will be in shift configuration.

The 8220 keyboard can operate in two modes of shift operation: SHIFTED and UNSHIFTED. The SHIFT key provides a momentary shift mode while it is held down. The SHIFT LOCK key, when pressed, places the keyboard in shift mode. The keyboard will remain in the shift mode until the SHIFT key is pressed again. An indicator light in the shift key signals the operator when the keyboard is in shift lock mode. The keyboard is initialized to the unshifted mode when the workstation is powered on.

The SHIFT and SHIFT LOCK keys do not generate a keycode, but do cause the codes generated by the other

keys to be altered. The space bar and decimal point on the numeric pad are unaffected by the shift/unshift mode. The control keys generate separate codes for shifted and unshifted keys on depression.

The right SHIFT key can operate as a shift key as described above or as an Alpha key. The SHIFT key can be set to the Alpha key option by specifying the ALPHA KEY option while in the configuration mode. The Alpha key when held down momentarily returns the keyboard to the unshifted mode when in the shift lock mode. The keyboard returns to the shift lock mode when the alpha key is released. The shift lock indicator light remains lit when the alpha key is depressed or released.

The left hand shift key will always operate as a standard SHIFT key, regardless of the configuration of the right shift key.

Special Repeat Option (SP RPT)

The Special Repeat option (SP RPT) provides the capability of receiving a special repeat code (000) for repeated key strokes. A value of 000 is loaded into the keyboard translation table for value 0357. The status code for value 0357 is set to 003 which enables transmit and display and disables generation of an escape sequence. Thus, whenever the special value 0357 is received from the keyboard, the corrected translated value 000 is sent to the host.

If a repeat code value other than 000 is desired, simply downline load the keyboard translation table for 0357 to the desired value, making sure that the transmit bit of the associated status code is set. If repeated codes need to be suppressed, change the status code for 0357 (through a downline load of the keyboard translation table) to 0 which will inhibit repeated codes from being transmitted to the host.

If the local display option is enabled, this option is ignored. A response of N to this option causes the 8220 to send repeated keycodes as if the keys had been individually pressed.

Escape Sequences from Keyboard Option (ESC KBD)

This option provides for the transmission of escape sequences from the keyboard for certain keys. A response of Y causes the depression of the number pad keys, the function keys, backspace, cancel, and enter to be translated as shown in Figure 3-10 rather than as shown in Figure 3-11. With a response of Y any key depression can be translated into an escape sequence by down-line loading the keyboard translation table.

b7	0	0	0	0	1	1	1	1
b6	0	0	1	1	0	0	1	1
b5	0	1	0	1	0	1	0	1
b4321								
0000	RPT	S BSP	SPACE	MK 0	@	P	\	p
0001	NP1	DLR	!	MK1	A	O	a	q
0010	NP2	NP7	"	MK2	*S NP 0	* INT	*F5 up	
0011	KBD UP	F5 dn	#	MK3	B	R	b	r
0100	NP4	NP9	\$	MK4	*S NP 1	* ATT	*F4 up	
0101	NP8	KBD dn	%	MK5	C	S	c	s
0110	NP6	DSP up	&	MK6	*S NP 2		*F3 up	
0111	F1 dn	NP 0	'	MK7	D	T	d	t
					*S NP 3		*F2 up	
					E	U	e	u
					*S NP 4		*F1 up	
					F	V	f	v
					*S NP 5			
					G	W	g	w
					*S NP 6	*SINT dn		

1000	BSP	CANCEL (	MK8	H	X	h	x
1001	F2 dn	DECIMAL POINT)	MK9	*S NP 7 i	*SATT dn Y	i	y
1010	F3 dn	.	.	J	Z	j	z
1011	F4 dn	+	.	K	[	k	{
1100	DSP dn	.	<	*S F5 dn L	\	l	l
1101	ENTER	S ENTER —	=	*S F4 dn M	]	m	}
1110	NP3	S CANCEL	^	*S F3 dn N	\	n	—
1111	NP5	|←→| /	?	*S F2 dn O	*S KBD —	o	DEL
				*S F1 dn	*S DSP		

Figure 3-10: ESC KBD On Code Definition

b7	0	0	0	0	1	1	1	1
b6	0	0	1	1	0	0	1	1
b5	0	1	0	1	0	1	0	1
b4321								
0000	RPT		SPACE	NP0 MK0	@	P	␣	p
0001		DSP up DLR	!	NP1 MK1	A	Q	a	q
0010			"	NP2 MK2	B	R	b	r
0011	KBD UP	F5 dn	#	NP3 MK3	C	S	c	s
0100		F2 up	\$	NP4 MK4	D	T	d	t
0101		KBD dn	%	NP5 MK5	E	U	e	u
0110		F1 up	&	NP6 MK6	F	V	f	v
0111	F1 dn	ATT	'	NP7 MK7	G	W	g	w
1000	BSP	F3 up	(	NP8 ML8	H	X	h	x
1001	F2 dn	F4 up	*	NP9 MK9	I	Y	i	y
1010	F3 dn	F5 upN	.	J	Z	j	z	
1011	F4 dn	CANCEL	+	K	[	k	{	
1100	DSP dn	INT	,	L	\	l	l	
1101	ENTER	—	=	M	]	m	}	
1110			v	N	v	n	—	
1111		|←→| /	?	O	—	o	DEL	

NP = number pad; MK = main keypad

Figure 3-11: ESC KBD Off Code Definition

This option can be disabled with a response of N and can be disabled by the host processor by a down-line load of the terminal's configuration with the ESC SEQ from the keyboard bit not set in the option flag 4 byte (see section 3.6.3.2, Figure 3-12).

If this option is enabled, the local display option is ignored. Whenever the CTRL key option and the ESC KBD option are both enabled, the CTRL key option will alter the character code of the second character of the escape sequence. This provides a method of transmitting escape sequences with the second character code less than 040.

During power-up and after a configuration restore command is received, the 8220 workstation will initialize the escape code to be used with the ESC KBD option to 033 (the standard default escape code value). If the sequence 034,0106,LSN,MSN is received from the host computer, the escape code will be changed to the byte obtained from LSN and MSN. LSN is the low order 4 bits of the new escape code added to 0100; MSN is the high order 4 bits of the new escape code shifted right 4 bits and added to 0100. For example, if the terminal receives the sequence 034,0106,0114,0100, the ESC KBD sequences will be changed from 033,x to 014,x where x is the translated value of the key.

If the 8-bit value (ESCNEW) formed by LSN and MSN has the sign bit reset (0), then 2-character sequences will be formed as in the above example.

However, if the 8-bit value (ESCNEW) formed by LSN and MSN has the sign bit set, the terminal will generate 3-character escape sequences of the form 033,ESCNEW,x. For example, if the terminal receives the sequence 034,0106,0113,0115, the ESC KBD sequences will be changed from 033,x to 033,0133,x where x is the translated value of the key.

3.6.1.4

CURSOR, LINE SPACING, and BELL Options

These options allow the user to select alternative controls over cursor movement, line spacing and the bell function.

Line Feed and Carriage Return After Printing Rightmost Character of Line (AUTO CR/LF)

Each time a character is received by the terminal and displayed on the screen, the cursor is moved to the next character position on the screen. The AUTO CR/LF option controls the character display after the rightmost character is received.

If the AUTO CR/LF option is not enabled and the rightmost character of a line has already been received, the last character of any additional characters received is displayed in the last character position. Characters previously in that position will be lost. All other characters in the line are not disturbed.

If the AUTO CR/LF option is enabled and the rightmost character of a line has already been received, the cursor will move to the next line and display any additional characters received. Upon displaying a character in the rightmost position of the 24th line (or the bottom line of the subscreen if the Subscreen option is enabled), the cursor moves to the first position of the current line. Additional characters received overwrite the line. However, if the AUTO ROLL UP with bottom line feed option is enabled, a character displayed in the right most position of the last line causes the screen to be rolled up one line within the roll window. The cursor is positioned at the first character position of the 24th line (bottom line of subscreen if the Subscreen option is enabled).

Auto Roll Up with Bottom Line Feed (AUTO ROLL)

The AUTO ROLL option causes the displayed data to move up one line when the cursor is on the 24th line (bottom line of subscreen if the Subscreen option is enabled) and a LINE FEED control character is received.

If the AUTO ROLL option is enabled and the terminal receives a Line Feed control character while the cursor is on the 24th line (bottom line of subscreen), each displayed line moves up one line leaving the 24th line blank (bottom line of subscreen). The data previously displayed on the first line of the screen (top line of subscreen) will be lost.

If the AUTO ROLL option is disabled, the terminal will ignore Line Feed control characters received when the cursor is on the 24th line or bottom line of the subscreen.

Roll Down (ROLL DN)

The ROLL DOWN option causes displayed data to move down one line, leaving line one blank (top line of subscreen if Subscreen option is enabled). If the ROLL DOWN option is enabled, and a Roll Down control character is received, each displayed line will move down one line. Data previously displayed on line 24 (bottom line of subscreen) is lost. The cursor position is not affected.

If the ROLL DOWN option is disabled and a Roll Down control character is received, the workstation ignores the character.

Cursor Increment with Delete Character (PRINT DEL)

The PRINT DEL option selects alternate controls over cursor movement when it receives a Delete character (0177). If this option is enabled and a Delete character is received, the Delete symbol is displayed, and the cursor moves to the next character position.

If the PRINT DEL is disabled and a Delete character is received, the cursor position is not affected.

Cursor Off (CURS OFF)

The CURSOR OFF option allows the host processor to turn the cursor on or off. If this option is enabled, the workstation will respond to the Cursor On or Cursor Off commands from the host processor. Cursor positioning will not be affected by those commands. If this option is disabled, the cursor is displayed whenever it is on the workstation screen or subscreen. Cursor On or Off commands are ignored while the CURSOR OFF option is disabled.

Bell on Printing Character 64 (BELL)

The BELL option allows the operator to select alternate controls over the sounding of the bell. If the bell option is enabled, the workstation sounds a bell whenever a character is displayed in the 64th character position of any line, and responds to the Bell character received from the host processor. If this option is disabled, the workstation sounds a bell only when the Bell character is received from the host processor.

3.6.1.5

Local Control Options

The Local Control Options include Local Display (half-duplex), Local Erase, Local Home, Break and Answerback.

Local Display (LOC DISP)

The LOCAL DISPLAY option provides an echo mode capability for the workstation. Characters generated by the keyboard may be displayed on the CRT screen as well as sent to the host processor. This option should only be selected when the host processor is not echoing characters back to the workstation.

If the LOCAL DISPLAY option is enabled, the workstation transmits system keycodes to the host processor and displays those keycodes on the screen. The workstation continues to display characters received from the host processor. If the Local Display option is disabled, the workstation transmits system keycodes to the host processor, but will display only those characters received from the host processor.

Local Erase (LOC ERASE)

The LOCAL ERASE option allows the operator to initiate the Erase to End of Frame function. This causes the screen to be erased from the current cursor position to the last line. If the LOCAL ERASE option is enabled, the workstation erases the screen from the current cursor position to the end of the frame whenever the operator depresses the erase key (key above CTRL key).

Transmit Erase (TX ERASE)

The TRANSMIT ERASE option allows the operator to

transmit an EEOF system keycode to the host processor. If the TX ERASE option is enabled, the terminal generates an EEOF system keycode and transmits it to the host processor whenever the operator depresses the designated ERASE key (key above the CTRL key).

Local Home (LOC HOME)

The LOCAL HOME option permits the operator to move the cursor to the "home up" position (first character of first line). If the LOCAL HOME option is enabled, the cursor moves to the home up position whenever the operator depresses the HOME key (key below the CTRL key).

Transmit Home (TX HOME)

The TRANSMIT HOME option allows the operator to transmit a Home Up system key code whenever the operator depresses the designated Home key (key below the CTRL key).

Local Break (BREAK)

The LOCAL BREAK option generates a break condition at the 8220 Workstation. A break occurs when the transmit data line (pin 2) in the communications interface connector goes to the spacing condition (positive voltage: all data bits are zero) for a period of time longer than the normal character time. This condition is sometimes used as a means of signaling between devices that communicate serially.

If this option is enabled, the workstation generates a break condition whenever the BREAK (F2) key is depressed. The duration of the break condition is independent of the time length that the BREAK key is depressed. If this option is disabled, the workstation will take no local action when the BREAK key is depressed, but transmits whatever system keycode has been assigned to the key.

Answerback (ANSWERBACK)

The Answerback option allows the workstation to transmit a user-defined character string to the host processor. The operator can be prompted to press the F2 and CTRL keys together at any time by the program running on the workstation; the Answerback character string is then transmitted to the host processor.

To enable or change the Answerback character string, give a Y response to the option in the Configuration Option mode. A prompt of 'A = ' will then appear.

- First, key in any character (except ENTER) that will not be a part of the message. This same character must also be used to terminate the string.
- Key in the Answerback message (up to 20 characters). To generate characters with a value < 040, hold down the CTRL key while keying. These characters will be displayed so that the operator may detect keying errors.
- Key in the character from the first step to terminate the string.

The Answerback characters will be overwritten on the screen with "*" when the terminating character is received. Note that the Answerback message is displayed only when it is being entered so that it can be used as part of a security package.

3.6.2

Diagnostic Mode

After the workstation has entered the Off-Line mode, the

various diagnostic routines may be selected as follows:

While holding down the CTRL key, momentarily press the
M key for Memory Diagnostic
V key for Video Display Diagnostic
K key for Keyboard Loop Diagnostic
Y key for Interactive Keyboard Diagnostic
I key for Internal Loopback Diagnostic
E key for External Communications Diagnostic
L key for External Loopback Diagnostic
S key for Terminal Self-Test Diagnostic
D key for Serial Communications Diagnostic
BACKSPACE key to terminate diagnostic and remain in off-line mode

Release the CTRL key.

After a diagnostic test has been run, another may be selected as described earlier. The diagnostic test can be terminated by holding down the CTRL key and pressing the BACKSPACE key or by repeating the off-line sequence to return to on-line operation. If an error is detected, the diagnostic test will be terminated.

3.6.2.1

Memory Diagnostic

The Memory Diagnostic tests the character generator and screen refresh RAM memories with rotating bit patterns. An LRC/SLRC test is performed on the ROM memory. The diagnostics identify memory errors to the chip level. The CRT display cannot be used during the character generator or screen RAM memory tests. The memory diagnostic maintains a six digit decimal pass counter.

If an error is detected, the diagnostic prints "MEMERRn" on the top line of the screen, and returns to the off-line mode. The number "n" printed after the error message indicates what type of error was encountered. Listed below are the possible numbers found after the error message:

- 0 = Firmware ROM 0
- 1 = Character set ROM
- 2 = RAM0 Z19
- 3 = RAM1 Z18
- 4 = Character Generator RAM

3.6.2.2

Video Display Diagnostic

The Video Display Diagnostic begins by asking the operator for a character to be entered from the keyboard. Next the video mode is prompted for standard, inverse, or 2-level video. That character is then printed in all positions on the screen. This diagnostic routine can be used to adjust the screen monitor.

3.6.2.3

Keyboard Loop Diagnostic

The Keyboard Loop Diagnostic provides a check on the proper functioning of the keyboard logic and connections between it and the workstation. This diagnostic routine transmits a series of characters to the keyboard and checks the characters that are echoed back. A six-digit decimal pass counter is maintained. If an error is detected, the diagnostic prints KBDERR on the top line of the display and returns to the off-line mode.

Note: This diagnostic requires an unlocked keyboard to execute properly. Do not initiate a keyboard lockout sequence while it is executing.

3.6.2.4

Interactive Keyboard Diagnostic

The Interactive Keyboard Diagnostic requires an operator to press the keys in response to the diagnostic display. The diagnostic routine loads a U.S. ASCII character set and keyboard translate table and then prints a line of 64 characters on the top line of the workstation screen.

The operator must press every key from top row through bottom row, left to right, following the precise sequence displayed. If a wrong key is pressed, the cursor is not incremented to the next character, and a beep sounds. When testing the function keys, each function key generates both a down and an up code. Therefore, the cursor increments not only on key depression but on key release as well. The entire test should then be repeated with upper case characters.

The normal exit for the Interactive test is completion of the depression of all keys in the appropriate sequence. However, by pressing the CTRL key once and the INT key twice, the sequence aborts and returns the workstation to the on-line mode.

Note: This diagnostic requires an unlocked keyboard to execute properly. Do not initiate a keyboard lockout sequence while it is executing.

3.6.2.5

Internal Loopback Diagnostic

The Internal Communications Diagnostic provides an internal communications loopback test of the communications logic. Characters are transmitted and received by the USART (Universal Synchronous/Asynchronous Receive/Transmit). A six-digit decimal pass counter is incremented and displayed through each pass of the diagnostic routing.

If an error is detected, COMERR is displayed on the top line of the screen, and the 8220 will re-enter the off-line mode.

3.6.2.6

External Communications Diagnostic

The External Communications Diagnostic allows the 8220 to receive data from the host processor and transmit it back. The data is displayed on the 8220 screen and routed to the local printer if available. A symbol is displayed for control characters received (Serial Communications Diagnostic fashion) and no function is performed. The diagnostic routine tests the communications channel between the processor and the 8220.

The diagnostic routine may be entered and exited only by local operator action. It supports split baud rate operation. In applications where the receive baud rate is higher than the transmit baud rate, the 8220 has a 1760 character FIFO buffer. This buffer allows the processor to send blocks of data with minimal timing overhead for the processor.

3.6.2.7

External Loopback Diagnostic

The External Loopback Diagnostic checks the RS 232C drivers and receivers and internal cabling. A loopback plug must be installed on the communications receptacle at the rear of the 8220 for this test to be performed. This test should normally be done only by qualified service personnel. If an error is detected, COMERR is displayed on the

top line of the screen and the 8220 re-enters the off-line mode.

3.6.2.8

Terminal Self-Test Diagnostic

The Terminal Self-Test Diagnostic executes the memory diagnostic, the internal communications diagnostic, and the keyboard loopback diagnostic. The display is active and a pass counter is maintained.

If errors are detected, the error counter displayed on the screen is incremented, and an error message is displayed. If more than one error is detected, the error messages on the screen indicate the composite of all errors.

Note: This diagnostic requires an unlocked keyboard to execute properly. Do not initiate a keyboard lockout sequence while it is executing.

3.6.2.9

Serial Communications Diagnostic

The Serial Communications Diagnostic is similar to the External Communications Diagnostic except that characters received from the processor are displayed but are not sent back. If a character is keyed in from the keyboard, the character (if transmittable) is displayed and transmitted to the host processor. This process permits keyins while in the diagnostic mode and allows interactive communications testing. The keyed-in characters are displayed in inverse video.

3.6.3

Down-Line Configuration Commands

The 8220 Workstation responds to a Configuration Interrogate Command (CIC), a Configuration Load Command (CLC), and a Configuration Restore Command (CRC).

The CIC sequence allows the host processor to interrogate the workstation and determine the status of the configuration options. The CLC sequence allows the host processor to down-line load a temporary configuration option set. The down-line loaded set of options is stored in RAM memory, and the option data stored in nonvolatile memory is not altered. The workstation restores the original option configuration whenever it is powered down and then back up again, or when it is sent a Configuration Restore Command (CRC). The internal coding for the configuration option is detailed in Figure 3-12.

The CRC sequence permits the host processor to restore the workstation to its power-up configuration, character set, and keyboard translation table. Each character of the CIC, CLC, CRC, LCGC, and/or LKTC must be received within 5 seconds from receipt of the preceding character. If each character is not received within the specified time period, the sequence is aborted.

3.6.3.1

Configuration Interrogate Command (CIC) Sequence

The host processor interrogates the status of the configuration option table in the workstation by means of the Configuration Interrogate Command Sequence. The command sequence is shown below:

CIC

Sequence	Description
034	Down-line command
0105	CIC identification character
N _L	Dummy character (0100)
N _H	Dummy character (0100)
034	Down-line command character
0100	Termination character
CS1	Checksum character (0111)
CS2	Checksum character (0101)
CS3	Checksum character (0101)
CS4	Checksum character (0100)

Each character in this sequence (and the other sequences) has seven bits and (except for 034 from the host and 021 from the workstation) each character must be in the range 0100 to 0137. The checksum is actually two 8-bit bytes that are transmitted as the four least significant bits (LSB) of four characters. Checksum compilation begins with the Identification character and ends with the Termination character.

3.6.3.2

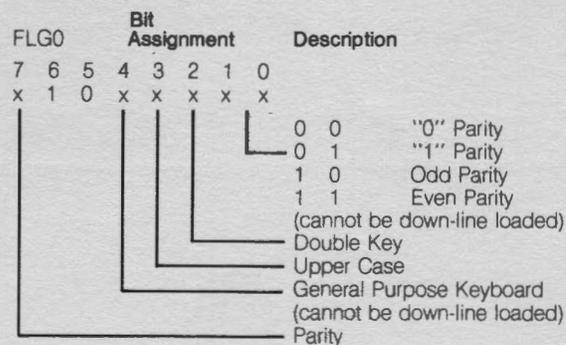
Configuration Status Response Sequence

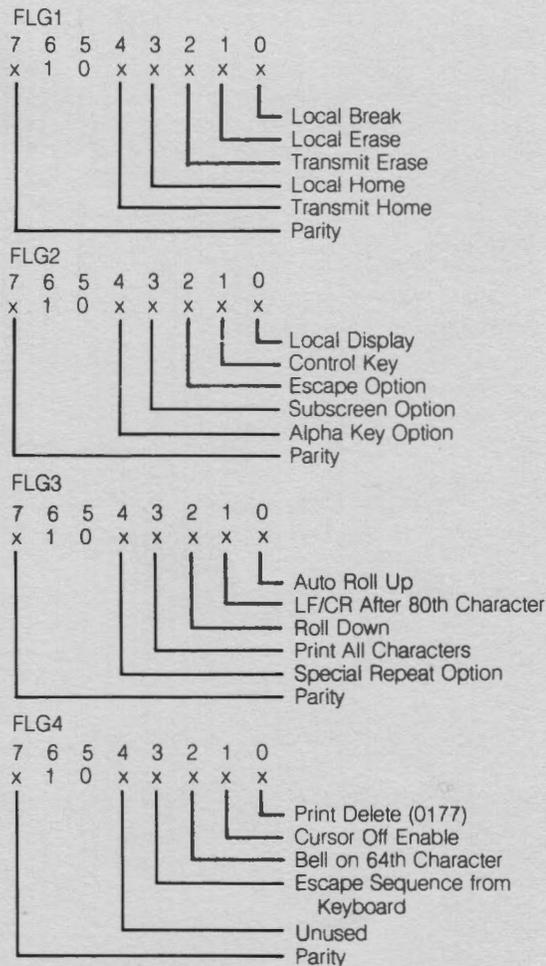
The 8220 Workstation responds to the CIC sequence by transmitting a 16-character Configuration Status Response (CSR) Sequence to the host processor. A description of this sequence is shown below:

CSR

Sequence	Description
021	Down-line response character
0101	CSR identification character
N _L	Dummy character (0100)
N _H	Dummy character (0100)
ID	Terminal type character (0102)
FLG0	Option flag 0
FLG1	Option flag 1
FLG2	Option flag 2
FLG3	Option flag 3
FLG4	Option flag 4
021	Down-line response character
0100	Termination character
CS1	Checksum character
CS2	Checksum character
CS3	Checksum character
CS4	Checksum character

The coding for the option flags is described in detail in Figure 3-12. Information concerning the baud rates and brightness setting is not provided to the host processor.





NOTE: FLG Range = 0100 to 0137

Figure 3-12: Configuration Option Flag Coding

3.6.3.3

Configuration Load Command Sequence

The format of the CLC sequence is shown below:

Sequence	Description
034	Down-line command character
0103	CLC identification character
N _L	Dummy character (0100)
N _H	Dummy character (0100)
FLG0	Option flag 0
FLG1	Option flag 1
FLG2	Option flag 2
FLG3	Option flag 3
FLG4	Option flag 4
034	Down-line command character
0100	Termination character
CS1	Checksum character
CS2	Checksum character
CS3	Checksum character
CS4	Checksum character

The option flag coding in the CLC sequence is the same as that in the CSR sequence (see Figure 3-12). Even though the bits which identify parity are transmitted and received, the workstation does not respond to a parity change command. Parity is only set following a power up operation or during Configuration Option mode operation. The host processor cannot change baud rates, brightness level, or the general purpose keyboard option configuration.

3.6.3.4

Configuration Load Response

The 8220 Workstation responds to a Configuration Load Command sequence in two ways. Before performing any action on the Configuration Load Command data, the 8220 computes checksum for the data received and compares it with the checksum characters received. If the checksums match, the configuration data is stored in RAM memory and the configuration status is transmitted to the host processor (See Section 3.6.3.6). If the checksums do not match, the load command is ignored and status is not transmitted to the host.

3.6.3.5

Configuration Restore Command

When the 8220 receives a Configuration Restore Command (CRC) from the host processor, it sets the configuration options last specified either by a Configuration Load Command or during the Configuration Option Mode:

CRC Sequence	Description
034	Down-line load command character
0104	CRC identification character
N _L	Dummy character (0100)
N _H	Dummy character (0100)
034	Down-line load command
0100	Termination character
CS1	Checksum character (0110)
CS2	Checksum character (0101)
CS3	Checksum character (0111)
CS4	Checksum character (0100)

The Configuration Restore Command will be acknowledged by the 8220 if the checksum computed matches the checksum received.

Acknowledgement

021	Down-line response character
0100	Acknowledge character

3.6.3.6

Checksum Compilation

The checksum for each command consists of a Longitudinal Redundancy Character byte (LRC) and a Shift-right-circular Longitudinal Redundancy Character byte (SLRC) computed and transmitted as described below.

Checksum Algorithm

1. Clear LRC and SLRC registers
2. For each character transmitted, compute the binary exclusive-or of the LRC and the character and load the result in the LRC.
3. For each character transmitted, compute the binary exclusive-or of the SLRC and the character. Then shift the 8-bit result to the right one place (shift right circular), and load the result in the SLRC.
4. At the end of the character string encode the LRC and SLRC as follows:

- CS1 = 0100 plus the four least significant bits of the LRC.
- CS2 = 0100 plus the four most significant bits of the LRC.
- CS3 = 0100 plus the four least significant bits of the SLRC.
- CS4 = 0100 plus the four most significant bits of the SLRC.

5. Check validity by comparing the computed checksums with the received checksums.

An example of an algorithm to validate checksums is shown below in Figure 3-13.

```

DE 000 Clear LRC and SLRC registers, D and E,
      respectively.
.
.
      Assume character in A register
.
.
LBA Store character in B register
XRD Exclusive-or with LRC store
LDA Put new LRC value back in D register
LAB Get character back
XRE Exclusive-or with SLRC register
SRC Perform circular shift
LEA Put New SLRC back in E register
.
.

```

Figure 3-13: Sample Checksum Algorithm

3.7

Down-Line Loaded Character Sets

The 8220 Workstation will accept down-line loaded character sets from the host processor. Character set data may be altered by a Load Character Generator RAM Command sequence (LCGC). System keycodes may be changed by a Load Keyboard Translate Table Command sequence (LKTC). The 8220 will store the data received and transmit a Load Response sequence to the host processor.

3.7.1

Load Character Generator RAM Command Sequence

The Datapoint processor may load each character with a separate LCGC or it may load a contiguous string of characters with a single LCGC. The address for each character corresponds to the ASCII code for that character. Each character in the command sequence is made up of five bits or less of significant data which is ORed with an octal 0100 to make a 7-bit character (except for the command character). The 8220 receives the dot rows in two 5-bit nibbles. The five least significant bits of the dot row are sent in the first nibble, and the other three are sent in the second nibble. The unused bits in the second nibble are zeroes.

The Load Character Generator Command sequence begins with 034, 0101. This is followed by the least significant nibble (LSN) of the first character generator address to be loaded (ORed with 0100), then the most significant nibble (MSN) of the first character generator address to be loaded (ORed with 0100). The address is followed by an inter-character delimiter (040) and a block of data. The block of data must be an even number of bytes, since the dot lines are sent in pairs of bytes. There is no other restriction on the number of bytes in a block of character generator data. Blocks longer than expected will be truncated at the last byte expected, and blocks shorter than expected will cause the rest of the bytes that were expected to be set to zeroes. An intercharacter delimiter (040) must be sent between adjacent characters.

If two intercharacter delimiters are encountered without any intervening bytes, the firmware will skip to the next

character font starting address without altering the current character font block.

LCGC	Description
034	Down line command character
0101	LCGC identification character
N _L	LSN of the first character address
N _H	MSN of the first character address
040	Intercharacter Delimiter
C _{1L}	LSN of Top Row Character Display Dot
C _{1H}	MSN of Top Row Character Display Dot
C _{2L}	LSN of Row 2 Character Display Dot
C _{2H}	MSN of Row 2 Character Display Dot
C _{3L}	LSN of Row 3 Character Display Dot
C _{3H}	MSN of Row 3 Character Display Dot
C _{4L}	LSN of Row 4 Character Display Dot
C _{4H}	MSN of Row 4 Character Display Dot
C _{5L}	LSN of Row 5 Character Display Dot
C _{5H}	MSN of Row 5 Character Display Dot
C _{6L}	LSN of Row 6 Character Display Dot
C _{6H}	MSN of Row 6 Character Display Dot
C _{7L}	LSN of Row 7 Character Display Dot
C _{7H}	MSN of Row 7 Character Display Dot
C _{8L}	LSN of Row 8 Character Display Dot
C _{8H}	MSN of Row 8 Character Display Dot
C _{9L}	LSN of Row 9 Character Display Dot
C _{9H}	MSN of Row 9 Character Display Dot
C _{10L}	LSN of Row 10 Character Display Dot
C _{10H}	MSN of Row 10 Character Display Dot
C _{11L}	LSN of Row 11 Character Display Dot
C _{11H}	MSN of Row 11 Character Display Dot
C _{12L}	LSN of Row 12 Character Display Dot
C _{12H}	MSN of Row 12 Character Display Dot
040	Intercharacter Delimiter
.	Additional groups of character display dots for contiguous character address
034	Down-line command character
0100	Termination character
CS1	Checksum character
CS2	Checksum character
CS3	Checksum character
CS4	Checksum character

Figure 3-14 contains an example of the Load Character Generator RAM Command sequence for loading character "B".

The 8220 computes a checksum for the data it receives and the checksum is compared with the checksum characters received. If the checksums match, the 8220 transmits an acknowledgement to the Datapoint processor:

```

Acknowledge
021 Down-line load response character
0100 Acknowledgement character

```

If the checksums do not match, the 8220 does not acknowledge the LCGC. If the host processor does not receive a response from the 8220 following a LCGC, it should transmit a CRC sequence to restore the 8220 to its power up configuration and character sets. The processor must then repeat the entire down-line load sequence.

OCTAL	BINARY	DESCRIPTION
	6 5 4 3 2 1 0	
034	0 0 1 1 1 0 0	Down-line load command
0101	1 0 0 0 0 0 1	Identification
0102	1 0 0 0 0 1 0	N _L
0104	1 0 0 0 1 0 0	N _H
040	0 1 0 0 0 0 0	Intercharacter Delimiter Orig.

	Code	Dot Matrix
0100	1 0 0 0 0 0 0	0000
0100	1 0 0 0 0 0 0	0 0 0 | 0 0 0 0 0
0136	1 0 1 1 1 1 0	0 1 | 1 1 0
0103	1 0 0 0 0 1 1	
0101	1 0 0 0 0 0 1	0 1 0 | 0 0 0 0 1
0102	1 0 0 0 0 1 0	
0101	1 0 0 0 0 0 1	0 1 0 | 0 0 0 0 1
0102	1 0 0 0 0 1 0	
0101	1 0 0 0 0 0 1	0 1 0 | 0 0 0 0 1
0102	1 0 0 0 0 1 0	
0136	1 0 1 1 1 1 0	0 1 | 1 1 0
0103	1 0 0 0 0 1 1	
0101	1 0 0 0 0 0 1	0 1 0 | 0 0 0 0 1
0102	1 0 0 0 0 1 0	
0101	1 0 0 0 0 0 1	0 1 0 | 0 0 0 0 1
0102	1 0 0 0 0 1 0	
0101	1 0 0 0 0 0 1	0 1 0 | 0 0 0 0 1
0102	1 0 0 0 0 1 0	
0136	1 0 1 1 1 1 0	0 1 | 1 1 0
0103	1 0 0 0 0 1 1	
0100	1 0 0 0 0 0 0	0000
0100	1 0 0 0 0 0 0	0 0 0 | 0 0 0 0 0
0100	1 0 0 0 0 0 0	0000
0100	1 0 0 0 0 0 0	0 0 0 | 0 0 0 0 0
034	0 0 1 1 1 0 0	Command
0100	1 0 0 0 0 0 0	Termination
0106	1 0 0 0 1 1 0	CS1 LRC=0 0 1 0 0 1 1 0
0102	1 0 0 0 0 1 0	CS2
0107	1 0 0 0 1 1 1	CS3 SLRC=1 0 0 1 0 1 1 1
0111	1 0 0 1 0 0 1	CS4

Figure 3-14: Load Character Generator RAM Command Sequence Example

The LRC for loading character "B" is the binary exclusive-or of the LCGC code from the LCGC Identification character to the Termination character, inclusive. The binary exclusive-or of those characters must match the byte composed of the four least significant bits of CS2 and CS1:

LRC			
CS2			CS1
0 0 1 0			0 1 1 0

The SLRC for loading character B is the shifted right binary exclusive-or of the LCGC code from the Identification character to the Termination character, inclusive. The shifted right circular sum of those characters must match the byte composed of the four least significant bits of the CS4 and CS3:

SLRC			
CS4			CS3
1 0 0 1			0 1 1 1

3.7.2

Load Keyboard Translate Table Command Sequence

The host processor may load each entry in the keyboard translate table with a LKTC, or it can load a contiguous string of entries with a single LKTC. The address for each table entry is the key code generated by the keyboard for a key switch depression. If intercharacter delimiters are found without intervening data, the 8220 firmware will skip to the next entry of the table without altering the previous contents. The LKTC sequence is described below.

LKTC	Description
034	Down-line command character
0102	LKTC identification character
N _L	Four least significant digits of the first keyboard address

N _H	Four most significant digits of the first keyboard address
040	Intercharacter delimiter
KCODES	Status of key value
KCODEL	Four least significant digits of key value
KCODEH	Four most significant digits of key value
040	Intercharacter delimiter
.	Additional contiguous keyboard translate table entries
.	
034	Down-line command character
0100	Termination character
CS1	Checksum character
CS2	Checksum character
CS3	Checksum character
CS4	Checksum character

The 8220 responds to receipt of the LKTC in the same manner it responds to receipt of LCGC (see Section 3.6.1).

Figure 3-15 contains an example of the Load Keyboard Translate Table Command sequence for loading keyboard address 0102 with key value 0102.

Load keyboard address 0102 with key value 0102 and activate display and transmit bits.

OCTAL	BINARY	DESCRIPTION
	6 5 4 3 2 1 0	
034	0 0 1 1 1 0 0	Command
0102	1 0 0 0 0 1 0	Identification
0102	1 0 0 0 0 1 0	N _L
0104	1 0 0 0 1 0 0	N _H
040	0 1 0 0 0 0 0	Intercharacter Delimiter
0103	1 0 0 0 0 1 1	KCODES
0102	1 0 0 0 0 1 0	KCODEL
0104	1 0 0 0 1 0 0	KCODEH
034	0 0 1 1 1 0 0	COMMAND
0100	1 0 0 0 0 0 0	Termination
0115	1 0 0 1 1 0 1	CS1
0107	1 0 0 0 1 0 1	CS2
0112	1 0 0 0 1 1 0	CS3
0117	1 0 0 0 1 0 0	CS4

Figure 3-15: Load Keyboard Translate Table Command Sequence Example

KCODES = 100EFD
 KCODEL = 100LLLL
 KCODEH = 100HHHH

KCODE Bit Definitions:

- E 1 = Send escape code (033) before KCODE if ESC KBD is enabled
- 0 = Use KCODE without sending (033)
- F 1 = Local Function Key (only Local Home, Erase, or Break.
- 0 = Not a Local Function Key
- D 1 = Displayable Character (with local display option)
- 0 = Nondisplayable Character
- T 1 = Transmittable Character (send KCODE on key depression)
- 0 = Nontransmittable Character (do not send a character code to the host when this key is depressed)

The LRC for loading keyboard address 0102 with key value 0102 is the binary exclusive-or of the LKTC code from the Identification character through the Termination character,

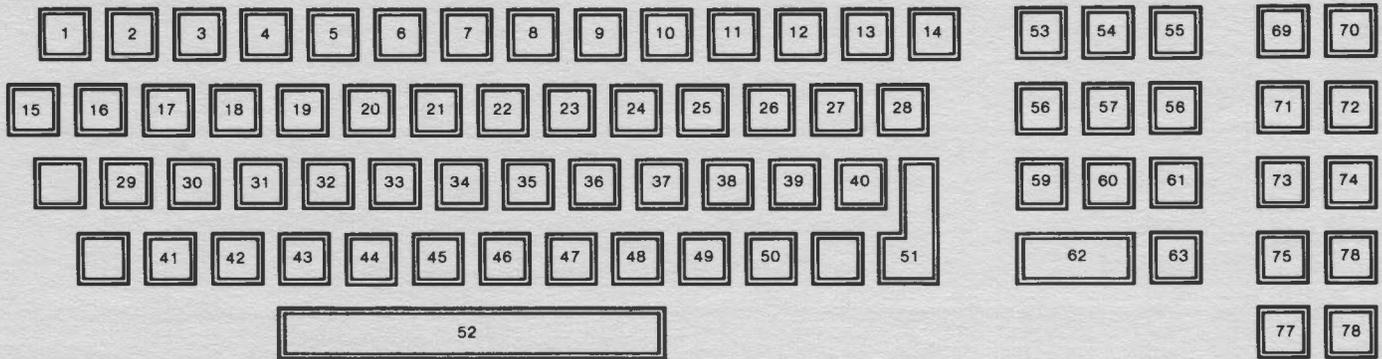


Figure 3-16: Numbered Switch Location

inclusive. The binary exclusive-or of those characters must match the byte composed of the four least significant bits of CS2 and CS1:

```

          LRC
        CS2   CS1
    0 1 0 1   1 1 0 1
  
```

The SLRC for loading keyboard address 0102 with key value 0102 is the shifted right circular binary exclusive-or of the LKTC code from the Identification character through the termination character, inclusive. The shifted right circular binary exclusive-or of those characters must match the byte composed of the four least significant bits of CS4 and CS3:

```

          SLRC
        CS4   CS3
    0 1 0 0   0 1 1 0
  
```

Figure 3-16 contains a numbered switch location for the General Purpose Keyboard. Figures 3-17A and 3-17B show the keycode switch addresses and the octal code emitted by each key address. Each octal code shown signifies the untranslated code sent to the logic assembly. These are the keyswitches and keycodes that will be changed when using the LKTC sequence.

KEY	KEY CODE	KEY	KEY CODE	KEY	KEY CODE	KEY	KEY CODE
1	061	17	0167	33	0147	49	056
S1	041	S17	0127	S33	0107	S49	076
2	062	18	0145	34	0150	50	057
S2	042	S18	0105	S34	0110	S50	077
3	063	19	0162	35	0152	51	015
S3	043	S19	0122	S35	0112	S51	0215
4	064	20	0164	36	0153	52	040
S4	044	S20	0124	S36	0113	S52	040
5	065	21	0171	37	0154	53	0267
S5	045	S21	0131	S37	0114	S53	0367
6	066	22	0165	38	073	54	0270
S6	046	S22	0125	S38	053	S54	0370
7	067	23	0151	39	072	55	0271
S7	047	S23	0111	S39	052	S55	0371
8	070	24	0157	40	0135	56	0264
S8	050	S24	0117	S40	0175	S56	0364
9	071	25	0160	41	0172	57	0265
S9	051	S25	0120	S41	0132	S57	0365
10	060	26	0140	42	0170	58	0266
S10	000	S26	0100	S42	0130	S58	0366
11	055	27	0134	43	0143	59	0261
S11	075	S27	0174	S43	0103	S59	0361
12	0137	28	0136	44	0166	60	0262
S12	0177	S28	0176	S44	0126	S60	0362
13	0133	29	0141	45	0142	61	0263
S13	0173	S29	0101	S45	0102	S61	0363
14	0010	30	0163	46	0156	62	0260
S14	0210	S30	0123	S46	0116	S62	0360
15	033	31	0144	47	0155	63	0256

KEY	KEY CODE						
S15	0233	S31	0104	S47	0115	S63	0256
16	0161	32	0146	48	054		
S16	0121	S32	0106	S48	074		

"S" preceding a key switch number indicates the shift function.

Figure 3-17A: Untranslated Keycodes Sent On Depression From Keyboard (All keycodes are in octal notation)

KEY	KEYCODE	KEY	KEYCODE
69D	0300	74D	0305
69R	0320	74R	0325
S69D	0340	S74D	0345
S69R	0320	S74R	0325
70D	0301	75D	0306
70R	0321	75R	0326
S70D	0341	S75D	0346
S70R	0321	S75R	0326
71D	0302	76D	0307
71R	0322	76R	0327
S71D	0342	S76D	0347
S71R	0322	S76R	0327
72D	0303	77D	0310
72R	0323	77R	0330
S72D	0343	S77D	0350
S72R	0323	S77R	0330
73D	0304	78D	0311
73R	0324	78R	0331
S73D	0344	S78D	0351
S73R	0324	S78R	0331

"D": following a key switch number indicates a code sent on depression.

"R": following a key switch number indicates a code sent on release.

"S": preceding a key switch number indicates the shift function.

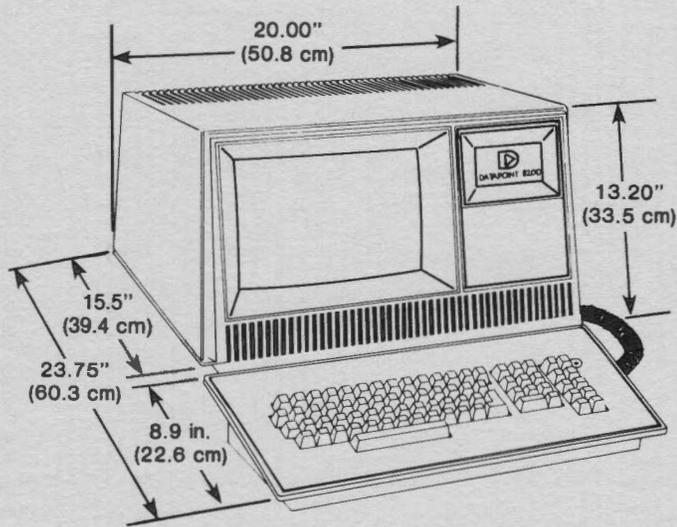
Figure 3-17B: Untranslated Keycodes Sent on Depression/Release From Keyboard (All keycodes are in octal notation)

4.0

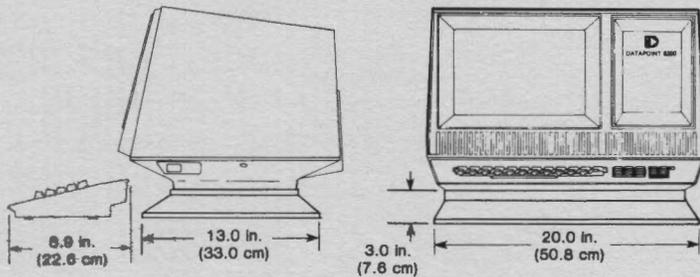
PHYSICAL DESCRIPTION

The 8220 Workstation consists of a CRT and detached keyboard mounted in a case designed to rest on a desk or table top.

Width:	20.00 inches (50.8 cm)
Height:	13.20 inches (33.5 cm)
Depth:	23.75 inches (60.3 cm)
Weight:	30 pounds (16.5 kg)



Optional Tilt/Rotate Base



5.0

ENVIRONMENTAL REQUIREMENTS

Temperature: 50 — 100° F (10 — 38° C)
 Humidity: 10% — 90% non-condensing
 Heat Dissipation: 232 Btu/hour (No fan required)

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

6.0

INTERFACE REQUIREMENTS

SERIAL DATA (Input and Output) Signal levels: RS 232C and CCITT v.24

CONNECTOR TYPE: Amphenol 50 pin

6.1

Primary Power

The 8220 Workstation, as supplied from Datapoint, will operate at 120 VAC. However, internationally the 8220 Workstation is field configurable for operation with input

voltages of 100, 120, 220, 230, or 240 VAC at a frequency of 50 or 60 Hz +1-2%.

Current: 0.5 amps @ 120 VAC

Power: 68 watts, maximum

6.2

Connector Pin Assignments

Pin	Signal		
1	Ground	8	Printer data
2	Transmit data	9	Ground
3	Ground	10	Not used
4	Receive data	11	Ground
5	Ground	12	Data terminal
6	Not used	13-49	Not used
7	Ground	50	Chassis ground

7.0

OPTIONS

The brightness level of the 8220 display can be adjusted by the operator. Holding the CTRL key down and pressing the key above it will cause brightness to increase one level. Holding the CTRL key down and pressing the key below it will cause brightness to decrease one level.

A tilt-rotate base (Model Code 0612) is optionally available for maximum operator comfort.

7.1

Configuration Option Mode

An array of options are available to programmer and operator through the Configuration Option Mode. Options which may be specified include the following:

- Receive Baud Rate
- Transmit Baud Rate
- Parity (0 or 1, odd or even)
- Double Key
- Upper Case
- Break
- Local Erase
- Transmit Erase
- Local Home
- Transmit Home
- Local Display
- Control Key
- Auto Roll
- Auto CR/LF
- Roll Down
- Print All
- Print Del
- Cursor Off
- Bell
- Escape Option
- Subscreen Option
- Alpha Option
- General Purpose Keyboard Option
- Special Repeat Option
- Escape Sequences from Keyboard
- Click Option

8.0

SHIPPING LIST

The following items are shipped with each 8220 Workstation:

Quantity	Item
1	8220 Workstation
1	Power Cable
1	8220 Product Specification (Document No. 61295)

NOTE: This shipping list is offered for information only the current Datapoint Shipping List prevails in all cases.