

# Hazeltine ESPRIT Display Terminal

## MANAGEMENT SUMMARY

Hazeltine's entry in the low-end ASCII terminal market is the ESPRIT (pronounced Espree). Announced at the National Computer Conference in Chicago during May, 1981, the ESPRIT is a buffered terminal with editing capabilities. With a single quantity selling price of \$695, the ESPRIT is Hazeltine's response to ADDS' Viewpoint terminal. By comparison, the viewpoint offers a detachable keyboard and a tiltable display screen, but has no editing capabilities and accommodates only character mode transmission.

Standard features on the ESPRIT include a 12" non-glare diagonal display screen with a 24-line by 80-column display format, and a typewriter-style keyboard with a 14-key numeric pad. The 128 ASCII character set is displayed in green. The ESPRIT is compatible with many existing Hazeltine 1500, Lear Siegler ADM-3A, and ADDS Regent 25 applications (switch-selectable).

Editing capabilities available through the terminal's block mode of operation include insert/delete line, erase field, erase to end-of-line, erase to end-of-screen, erase foreground, and erase all. Format control provides for protected fields, unprotected fields, background, and foreground. Video attributes available include dual intensity, underline, and reverse video.

In order to offer the ESPRIT at its low price, Hazeltine is utilizing offshore manufacturing. The unit is manufactured by Disco Electronics of Taiwan, under an exclusive agreement with Hazeltine. □

A low-priced, buffered ASCII display terminal.

The ESPRIT features transmission in both character and block modes. Editing capabilities are available in block mode. The terminal features a 12" diagonal display screen with a 24-line by 80-column format. The typewriter-style keyboard is attached, and includes a 14-key numeric pad. An RS-232-C or 20mA current loop interface is provided, and transmission rates up to 9600 bps are accommodated. The Esprit is compatible with existing Hazeltine 1500 Series applications.

List price for the ESPRIT is \$695 in single quantities. Volume discounts are available.

## CHARACTERISTICS

**VENDOR:** Hazeltine Corporation, Computer Terminal Equipment, Greenlawn, New York 11740. Telephone (516) 549-8800.

**DATE OF FIRST DELIVERY:** June 1981.

**NUMBER DELIVERED TO DATE:** 1,000.

**SERVICED BY:** Hazeltine Corporation.

## CONFIGURATION

The ESPRIT is a stand-alone, buffered display terminal. The unit is available in the standard attached keyboard configuration only. ▶



The Hazeltine ESPRIT is a buffered display terminal with editing capabilities. The unit offers switch-selectable compatibility with the ADDS Regent 25 and the Lear Siegler ADM-3A, as well as the Hazeltine 1500 Series. It's a lot of terminal for the money.

## Hazeltine ESPRIT Display Terminal

### ► TRANSMISSION SPECIFICATIONS

Transmission is asynchronous, in half- or full-duplex, at speeds of 110, 300, 600, 1200, 2400, 3600, 4800, or 9600 bits per second. Odd, even, mark, or space parity can be selected. An RS-232-C or 20mA current loop interface is provided, as well as a bidirectional RS-232-C auxiliary interface.

### DEVICE CONTROL

The ESPRIT features four operating modes: Interactive (character), Block, Monitor, and Local. In the Interactive mode, data is transmitted on a character-by-character basis as it is keyed. A partial or complete line or page can be transmitted in Block mode. In Monitor mode, all 128 ASCII codes, as well as control codes, are displayed. The unit ignores all encoded sequences in monitor mode. Local mode is the ESPRIT'S off-line mode of operation.

Cursor controls move the cursor up, down, left, right, and home; direct absolute addressing and incremental cursor addressing are standard. The cursor appears as a steady or blinking block or underline. Tab and line feed functions are also provided.

Editing functions include: line insert/delete, erase field, erase to end-of-line, erase to end-of-screen, erase foreground, and erase all. Format control allows the following fields to be designated: protected, unprotected, background, and foreground. Video attributes include dual intensity, underline, and reverse video.

### COMPONENTS

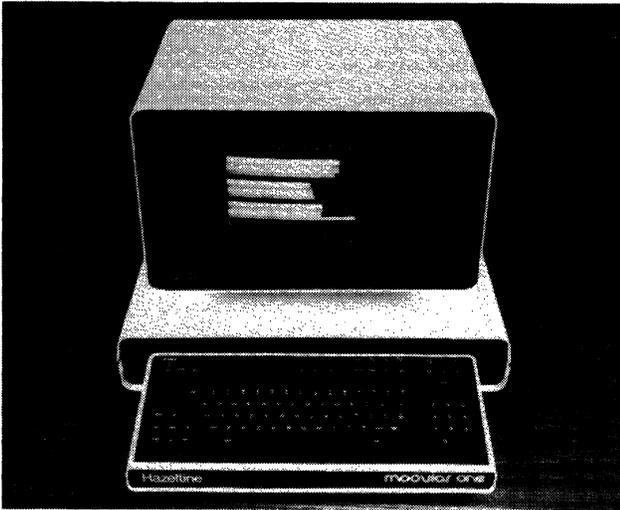
**CRT DISPLAY UNIT:** A 12-inch (diagonally measured) non-reflective display screen, featuring a display format of 24 lines of 80 characters each, for a total display capacity of 1920 characters. Characters are displayed in green (P31 phosphor) on a dark background, and formed utilizing a 7 x 11 dot matrix. The ASCII character set consists of 96 alphanumeric character, plus 32 control codes.

**KEYBOARD:** An attached, 81-key typewriter-style keyboard. A separate numeric/cursor control/edit function keypad is included. LEDs on the keyboard indicate power-on, auxiliary port status, and block mode. Keyboard lock/unlock is standard.

### PRICING

The end-user quantity-one price for the ESPRIT is \$695. Volume discounts are available.■

# Hazeltine Modular One



## MANAGEMENT SUMMARY

Hazeltine Corporation has been marketing display terminals since 1970. The Modular One, introduced in 1975, is a microprocessor-based terminal available with basic features only, with editing capabilities, or with editing and polling capabilities. The polling version provides compatibility with Burroughs, Honeywell, IBM 2260, or Sperry Univac communications protocols.

The Modular One features data entry functions, expanded cursor control (including an addressable cursor), and eight switchable transmission speeds. Extensive editing capabilities are provided on all versions except the basic version.

Data entry functions include protected format operation, tabulation, and partial screen transmission. The user can call for any of several formats that can be stored on a tape cassette or at the remote computer. When requested, the format is transmitted to the terminal and displayed. The format's field descriptors are protected from inadvertent typeover and are displayed at diminished intensity to contrast with the data keyed into the "blank" spaces. A tab function allows the operator to tab to the next format entry after completing an entry. Clearing or transmitting the completed page clears or transmits only the entered data and not the format.

Editing functions include character insertion and deletion, line insertion and deletion, and screen, format, and line erasure.

The Modular One can operate in either a character or block mode. In the character mode, one character at a time is transmitted. In the block mode, an entire message can be composed and edited prior to transmission. In a multipoint environment, this off-line data composition helps to improve the efficiency of line usage.

A display terminal designed to operate in a multipoint network. Emulators are available for Burroughs, Honeywell, IBM 2660, and Sperry Univac communications protocols.

Transmission rates are user selectable and range from 110 to 9600 bps in half- or full-duplex mode. The Modular One supports asynchronous and synchronous transmission.

The Modular One is available in three versions: a basic terminal priced at \$1,650, a terminal with editing capabilities priced at \$2,050, and a terminal with editing and polling capabilities priced at \$2,250. Quantity discounts are available.

## CHARACTERISTICS

**VENDOR:** Hazeltine Corporation, Computer Peripheral Equipment, Greenlawn, New York 11740. Telephone (516) 549-8800.

**DATE OF ANNOUNCEMENT:** December 1975.

**DATE OF FIRST DELIVERY:** January 1976.

**NUMBER DELIVERED TO DATE:** Specific figures are not available.

**SERVICED BY:** Hazeltine Corporation and TRW.

## CONFIGURATION

The microprocessor-based Modular One is currently available in three versions: a basic terminal with no editing features, an expanded terminal with editing features, and a version with editing and polling features. The polling terminal provides protocol compatibility with Burroughs, Honeywell, IBM 2260, or Sperry Univac communications disciplines. The Modular One features eight user-specified transmission rates of 110 to 9600 bits per second.

## DEVICE CONTROL

The Modular One operates in either character mode or block mode. In the character mode, transmission occurs on a character basis; data is transmitted as keyed and displayed as received. In the block mode, keyed or received data is displayed as in the character mode, but transmission occurs only on a block or message basis, where the entire contents of the display buffer or the variable fields within a fixed format are transmitted on operator or computer command. The block mode must be selected in order to compose and edit messages and to operate with a fixed format.

The cursor is character-addressable. Manual controls position the cursor in any of four directions: up, down, left, and right. Repetitive operation is provided for these functions, but screen wrap-around is inhibited. The Up and Down cursor controls move the cursor up and down one line until it stops on the first or last displayed line. The Left and Right cursor controls advance or backspace the cursor by one character position. The cursor can be returned to the first character position of the next line (Carriage Return) or to the first character position of the display (Home). The cursor can also be moved to any character position by a received cursor address command.

## Hazeltine Modular One

➤ Transmission rates from 110 to 9600 bits per second can be selected, thus providing transmission compatibility with more than one remote facility.

Service is provided by Hazeltine and TRW. Hazeltine quotes a maximum 24-hour response time to service calls.

### USER REACTION

Datapro's 1979 survey of alphanumeric display terminal users yielded responses from four users of Modular One terminals. In May 1979, we talked with two additional users. These six users had a total of 703 units installed. The users' ratings are summarized in the table below.

	Excellent	Good	Fair	Poor	WA*
Overall performance	1	5	0	0	3.2
Ease of operation	1	5	0	0	3.2
Display clarity	3	2	1	0	3.3
Keyboard feel & usability	1	4	1	0	3.0
Hardware reliability	0	3	2	1	2.3
Maintenance service	0	1	3	1	2.0
Technical support	0	2	1	2	2.0

\*Weighted Average on a scale of 4.0 for Excellent.

The Modular One was used in a single station configuration in three installations, in a clustered station configuration in two installations, and in both configurations in one installation.

All six users cited low cost as the major advantage of the Modular One. One user also liked the different modes of operation offered with the terminal and commented that the Modular One made it possible to put together an inexpensive network. □

➤ Edit functions provided by the Modular One include both character and line insertion and deletion. Character insertion or deletion affects all data to the right of the cursor up to the end of a variable field (format operation) or the last displayable position of the screen. This editing function is line limited.

Erasure functions include screen erasure, which clears all displayed data and returns the cursor to the Home position, and format erasure, which erases only the variable fields within a fixed format. The erasure functions are programmable. Line erasure (clear to end of line) is also provided.

The Modular One features split-screen operation, which permits the use of fixed formats for data entry applications that require the operator to key pertinent data into blank spaces within the displayed format. Formats received from the remote computer or read from tape are displayed at a diminished intensity to contrast with the data entered in the variable fields. Entry is restricted to variable fields; field descriptors are protected. The Tab function is used to position the cursor at the beginning of each variable field; as each entry is completed, the operator keys Tab to begin entry in the next variable field. This function is automatic upon entering the last character of a variable field. Character insert and delete functions are applicable to variable fields only; line insert and delete functions do not apply to format operations. When clearing or transmitting the displayed data, only the variable data is cleared or transmitted.

Other features include Roll and Break. The Roll feature automatically rolls all displayed lines up by one line after the last line has been completely filled. Data rolled off the top of the screen is lost. A selective roll-up feature permits the Roll function to be initiated at any operator-designated line

under computer control. The Break feature transmits a space sequence to request interruption of an incoming message.

Data attributes can be defined to control operations on specific fields, including blinking, reverse video, or low/high intensity to highlight data. Alpha only, numeric only, or alphanumeric fields can be selected. A nondisplay feature is provided for data security.

### TRANSMISSION SPECIFICATIONS

Transmission is asynchronous in the half- or full-duplex mode. A synchronous communications interface is available as an option. Eight user-specified transmission rates are available: 110, 200, 300, 600, 1200, 2400, 4800, and 9600 bits per second.

The transmission code is 8-level ASCII (including parity). A 10- or 11-bit character consisting of 7 data, 1 parity, 1 start, and 1 or 2 stop bits is used for asynchronous transmission.

The Modular One provides an EIA standard RS-232 modem interface and a 20 mA dc current loop interface. The terminal is transmission-compatible with the Teletype Model 33 or 35 teletypewriters. The Modular One polling terminal provides compatibility with Burroughs, Honeywell, IBM 2260, or Sperry Univac communications protocols. Virtually any communications discipline can be implemented through microprogramming. Bell system or equivalent modems can be used, including the 103 series and the 202 series.

Character parity is generated for each keyed character and accompanies the transmitted characters. Parity checking is performed on received data. A character found to be in error is replaced by a special symbol, which is displayed on the screen in place of the incorrect character.

### COMPONENTS

**CRT DISPLAY:** The Modular One features a 1920-character display with 80 characters per line and 24 lines per display. The viewing area measures 8.5 inches wide by 5.75 inches high.

The terminal displays a standard character set of 64 symbols, including upper case alphabets, numerics, and special symbols. Available as an option is a 96-character set that includes lower case alphabets and 6 additional special symbols.

Either a white-on-black or black-on-white display can be defined by the host computer. Characters are formed via a 7-by-9 dot matrix. The display unit employs a standard 525-line raster-scan display technique.

**KEYBOARD:** The Modular One is equipped with a Teletype-style keyboard with an 11-key numeric key group located to the right of the main key group. Program function keys are also included.

The Modular One can generate any of the 128 ASCII characters, including upper and lower case alphabets, numerics, punctuation, and control codes. Repetitive entry of data or initiation of control functions is performed by sustained key depression in conjunction with the keyed Repeat function.

### PRICING

The Modular One is available for purchase only. End-user and OEM quantity discounts are provided.

	Purchase	Monthly Maint.
Modular One		
Basic terminal	\$1,650	\$25
Editing terminal	2,050	25
Polling terminal	2,250	25■

# Hazeltine Display Terminals

## MANAGEMENT SUMMARY

Hazeltine Corporation, a leading manufacturer of Teletype-compatible display terminals, now offers a product line of six terminals, which range from a simple Teletype replacement to units that feature compatibility with Burroughs, Honeywell, and Univac protocols and provide considerable flexibility through the use of an integral microprocessor. Hazeltine introduced its first terminal, the highly popular 2000, in May 1970 and since that time has added five additional models aimed at both the end user and OEM (original equipment manufacturer) markets. The company currently has a total of more than 36,500 units installed, which includes approximately 23,000 Model 2000's.

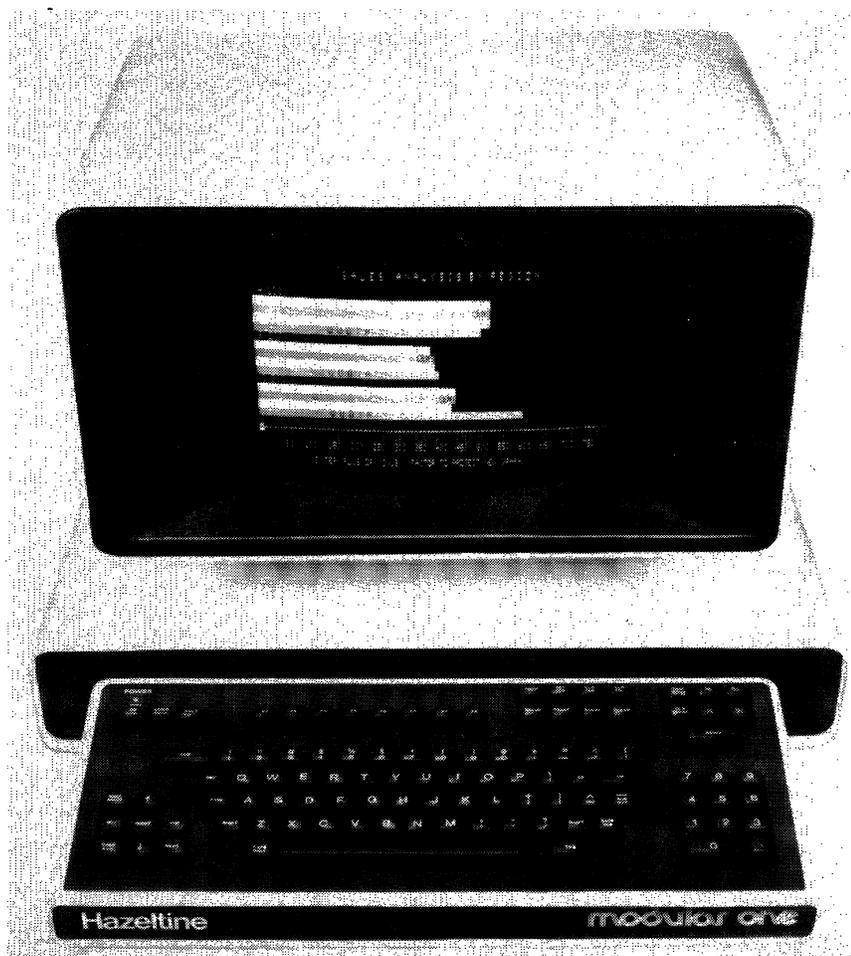
Hazeltine's latest additions are the Model 1500, a low-priced terminal with a substantial complement of features, and the Modular One, which is now available with emulators for Burroughs, Honeywell or Univac communications protocol and can operate in a multipoint environment. Model 1500 is available on a purchase basis only and sells for as low as \$1860 on a 100-unit quantity OEM order. The Modular One is modular with respect to ➤

**A family of low-priced display terminals for use as "Teletype" replacements or for operation in a multipoint network with Burroughs, Honeywell, or Univac protocol compatibility.**

**Optional peripherals include printers and a tape cassette recorder. Transmission rates are user selectable and range from 110 bps to 19,200 bps in half- or full-duplex mode. Asynchronous and synchronous transmission is supported. Models, with appropriate features, are compatible with each other.**

**Typical monthly rentals range from a low of \$49 per month for the Model 1000 to \$127 for a full-blown Modular One under a one-year lease, including maintenance.**

**Hazeltine sells OEM and to end-users; quantity discounts are available.**



*Hazeltine's Modular One shown above, was originally announced as available to the OEM market only; it is now available to end users with extended lease terms. The Modular One is now available with Burroughs, Honeywell, or Univac protocol compatibility for use in multipoint networks.*

## Hazeltine Display Terminals

▷ features and is available with basic features only, with editing, or with editing and polling capabilities. The polling version is available with one of the three emulators. The Modular One is available for lease or purchase; full-payout leases are offered for one through five years.

Other Hazeltine terminals include Models 1000, 1200, 2000, and 3000. Model 1000, a bare-bones terminal is no longer in production, but is available on a "returned and refurbished" basis. Model 1200 is essentially the same unit, but Model 3000 is designed for a multi-station environment and features a polling/addressing capability. The Model 3000 can emulate virtually any specified communications discipline via microprogram control.

Because pricing is usually the most important single factor affecting user reaction in the highly cost-conscious display terminal market, it presents a valid starting point for analysis. On this basis alone, the Hazeltine terminals offer strong user appeal as a result of their strikingly low price tags, which are probably the lowest among the competing terminals in their respective classes.

Now let's examine and compare the salient features of the six Hazeltine terminals.

Models 1000 and 1200 are both basic terminals and do not provide edit or data entry functions. The only differences between the two are in display capacity and provision for hard-copy output. Model 1200 provides twice the display capacity of Model 1000, which can display up to 960 characters. Model 1200 can optionally accommodate the Hazeltine printers, whereas Model 1000 is not equipped with a printer interface. However, a serial auxiliary interface (RS-232) is optional for both Models 1000 and 1200 (and all other Hazeltine display terminals) to permit attaching a user-supplied printer.

Model 1500 is a "smart glass Teletype". The basic microprocessor-based terminal includes several features (such as basic editing, full cursor control, cursor addressing and sensing, and display highlighting) found on more expensive models.

In contrast to the bare-bones 1000 and 1200 terminals, the 2000, 3000, and the Modular One terminals feature extensive editing capabilities, data entry functions, expanded cursor control (including an addressable cursor), and five switchable transmission speeds (eight on the Modular One). These top-of-the-line features greatly extend the terminals' usefulness and provide significantly increased operating flexibility over the other models.

Data entry functions include protected format operation, tabulation, and partial screen transmission. The user can call for any of several formats that can be stored on a tape cassette or at the remote computer. When requested, the format is transmitted to the terminal and displayed. The format's field descriptors are protected from inadvertent typeover and are displayed at diminished intensity to contrast with the data keyed into the "blank" spaces. A tab ▷

## CHARACTERISTICS

**VENDOR:** Hazeltine Corporation, Computer Peripheral Equipment, Greenlawn, New York 11740. Telephone (516) 549-8800.

### DATE OF ANNOUNCEMENT:

Model 1000 — March 1973;  
Model 1200 — July, 1974;  
Model 1500 — March, 1977;  
Model 2000 — May, 1970;  
Model 3000 — December, 1973;  
Modular One — December, 1975.

### DATE OF FIRST DELIVERY:

Model 1000 — June, 1973;  
Model 1200 — October, 1974;  
Model 1500 — 3rd qtr. 1977;  
Model 2000 — October, 1970;  
Model 3000 — March, 1974;  
Modular One — January, 1976.

**NUMBER DELIVERED TO DATE:** A total of over 36,500 units.

**SERVICED BY:** Hazeltine Corporation and Syntonic Technology, Inc. (Pennsauken, New Jersey).

## MODELS AND CONFIGURATION

The six models and a brief description of the display terminals offered by Hazeltine are as follows.

**Model 1000:** A basic terminal without the microprocessor, with a 960-character display consisting of twelve 80-character lines. Transmission speeds are switch selectable to 9600 bps.

**Model 1200:** The same as the Model 1000, except for a larger screen size of 1920 characters consisting of 24 80-character lines and an optional printer interface for attachment of the Hazeltine thermal or impact printer.

**Model 1500:** A microprocessor-based terminal with 1920-character display, upper/lower case alphabets, standard numeric pad, switch-selectable transmission speeds to 19,200 bps, and a standard RS-232C printer interface.

**Model 2000:** A microprocessor-based system with 1998-character screen size consisting of 27 74-character lines. Five switch selectable transmission rates are available to 9600 bps with editing capability. Peripheral options include the thermal or impact printers, the tape cassette unit, remote monitors, and an acoustic coupler.

**Model 3000:** A microprocessor-based system incorporating all the features of the 2000 including the same screen size. This unit is designed for multi-station environment through a polling/addressing capability. It can emulate virtually any specified communications discipline.

**Modular One:** A versatile terminal designed for multidrop arrangements and currently available in three versions: a basic terminal with no editing features, an expanded terminal with editing features, and a fully-expanded terminal with editing and polling features. The polling version features protocol and communications compatibility with Burroughs, Honeywell, or Univac computers. The microprocessor-based terminal is equipped with a 1920-character display and features eight standard transmission rates from 110 to 9600 bps and is available with a number of options.

## DEVICE CONTROL

Model 2000 operates in either character or block mode; Model 1500, Model 3000 and the Modular One operate in

## Hazeltine Display Terminals

➤ function allows the operator to tab to the next format entry after completing an entry. Clearing or transmitting the completed page clears or transmits only the entered data and not the format.

Cursor controls on Models 1000 and 1200 are somewhat limited as compared with those on the other models, which feature a character-addressable cursor in addition to discrete controls for each of five cursor movements.

Keyboards also differ among the six models. Models 1000 and 1200 provide a typewriter-style keyboard, as do the Models 1500, 2000, 3000 and the Modular One; but the 1000 and 1200 do not provide the additional numeric key group or the separate cursor controls associated with the other models. Additionally, the Modular One offers eight optional program function keys.

Models 1000 and 1200 are restricted to operation on a character-only basis; i.e., one character at a time is transmitted. Model 2000 can operate in either character or block mode, as selected by the operator, while Models 1500 and 3000 operate in the block mode only. The Modular One can be configured either way. In the block mode, an entire message can be composed and edited prior to transmission. In a multipoint environment, this "off-line" data composition promotes increased line usage efficiency.

Transmission rates from 110 bps to 9600 bps or 19,200 bps (Model 1500 only) can be specified. Models 1000 and 1200 can employ any two rates via switch selection; Models 2000 and 3000 can employ any of five rates via switch selection; and Modular One and Model 1500 have eight switchable speeds. Speed selection increases the terminal's operating flexibility by providing transmission compatibility with more than one remote facility.

Hard-copy options for Models 1200, 1500, 2000, 3000 and the Modular One include a 30-cps non-impact, thermal printer (NCR), a 120-cps impact printer (GE TermiNet 1200), and a 120-cps impact printer with an off-line maximum print speed of 240 cps (GE TermiNet 120).

Auxiliary storage via a dual magnetic tape cassette unit is available for Models 2000 and 3000 only. The option can be used to batch data or to store record formats for data entry applications. The cassette unit responds to either programmed or keyed commands and operates in either of two modes.

Service is provided by Hazeltine and Syntonic Technology, Inc. Syntonic, headquartered in Pennsauken, New Jersey, has service locations in principal U.S. cities. Hazeltine is quoting a maximum 24-hour response time to service calls, but it anticipates that most calls within a reasonable distance of a service point will be serviced within four hours.

### USER REACTION

In Datapro's 1977 survey of alphanumeric display terminal users, 39 users reported on their experience with 479 ➤

➤ the block mode only. These models provide extensive editing capabilities and feature split-screen operation with format protection. Models 1000 and 1200 operate in the character mode only and do not provide local editing or split-screen features.

In the character mode, transmission occurs on a character basis; data is transmitted as keyed and displayed as received. In the block mode, keyed or received data is displayed as in the character mode, but transmission occurs only on a block or message basis, where the entire contents of the display buffer or the variable fields within a fixed format are transmitted on operator or computer command. The block mode must be selected in order to compose and edit messages and to operate with a fixed format.

Cursor controls differs among the six models. In Models 1000 and 1200, cursor control is limited to four functions: Home, which positions the cursor to the initial character position on the screen; Space, which moves the cursor one step to the right; Carriage Return, which positions the cursor at the beginning of the current line; and Line Feed, which moves the cursor down one line. The controls are not repetitive, but the functions can be programmed and can be interspersed with data in a received message.

In Models 1500, 2000, 3000 and the Modular One, the cursor is character-addressable. Model 1500 also provides cursor sensing. Manual controls position the cursor in any of four directions: up, down, left, and right. Repetitive operation is provided for these functions, but screen wrap-around is inhibited. The Up and Down cursor controls move the cursor up and down one line until it stops on the first or last displayed line. The Left and Right cursor controls advance or backspace the cursor by one character position. The cursor can be returned to the first character position of the next line (Carriage Return) or to the first character position of the display (Home). The cursor can also be moved to any character position by a received cursor address command.

Edit functions provided by Models 2000, 3000 and the Modular One include both character and line insertion and deletion. Model 1500 provides line insertion and deletion, but does not feature character insertion and deletion. Character insertion or deletion affects all data to the right of the cursor up to the end of a variable field (format operation) or the last displayable position of the screen. On the Modular One, this editing function is line limited.

Erasure functions include screen erasure (provided by all models), which clears all displayed data and returns the cursor to the Home position, and format erasure (Models 2000, 3000, and Modular One only), which erases only the variable fields within a fixed format. The erasure functions are programmable. Model 1500 and the Modular One also provide line erasure (clear to end of line). In addition, Model 1500 includes an erase-to-end-of-screen function.

Models 2000, 3000 and Modular One feature split-screen operation, which permits the use of fixed formats for data entry applications that require the operator to key pertinent data into blank spaces within the displayed format. Formats received from the remote computer or read from tape are displayed at a diminished intensity to contrast with the data entered in the variable fields. Entry is restricted to variable fields; field descriptors are protected. The Tab function is used to position the cursor at the beginning of each variable field; as each entry is completed, the operator keys Tab to begin entry in the next variable field. On the Modular One this function is automatic upon entering the last character of a variable field. Character insert and delete functions are applicable to variable fields only; line insert and delete functions do not apply to format operations. When clearing or transmitting the displayed data, only the variable data is cleared or transmitted. ➤

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The Hazeltine 2000 is the most popular display terminal of the six models offered by the company. Included with the terminal shown above is the optional 30 cps thermal printer. The Hazeltine 2000 is marketed as a direct replacement for Teletype Model 33 and 35 units.

- ▷ Hazeltine display terminals, grouped as follows: Model 1000 — 35, Model 1200 — 22, Model 2000 — 328, and Modular One — 78; undefined models totalled 16. Combined user ratings for the Hazeltine display terminals are presented below.

	Excellent	Good	Fair	Poor	WA*
Overall performance	12	17	9	0	3.1
Ease of operation	16	20	2	0	3.4
Display clarity	17	13	8	0	3.2
Keyboard feel & usability	11	13	12	2	2.9
Hardware reliability	13	12	10	3	2.9
Maintenance service	6	9	12	8	2.4
Software & technical support	0	6	9	10	1.8

\*Weighted Average on a scale of 4.0 for Excellent.

As reflected by the Weighted Averages, responding users were generally pleased with their Hazeltine terminals. As in last year's survey, the predominant advantage cited was low cost. Other advantages cited were applicability and compact size. Reliability of the terminal was generally a plus for the terminals. Few users expressed concern with the reliability of their particular terminal.

A few users indicated some dissatisfaction with the company's maintenance service and support; however, no supportive statements were offered in any of these cases. □

- ▶ Other features provided by all models include Roll and Break. The Roll feature automatically rolls all displayed lines up by one line when data is received after the last line has been completely filled; data rolled off the top of the screen is lost. Models 2000, 3000, and Modular One also feature selective roll-up, which permits the function to be initiated at any operator-designated line under computer control. The Break feature transmits a space sequence to request interruption of an incoming message.

Answerback, optional for Models 1000 and 1200 only, responds with a programmed 16-character sequence to a keyed command or received WRU. Rubout transmits a mark sequence on all models.

For the Modular One and Model 1500, data attributes can be defined to control operations on specific fields including blinking (Modular One only), reverse video, or low/high intensity to highlight data. The Modular One also features format protection as described above; alpha, numeric or alphanumeric only for data checking; and display or nondisplay for security.

The optional magnetic tape cassette unit (used with Models 2000 and 3000 only) contains two cassette recorders and operates in either of two modes. Paper Tape Emulation Mode records data character-by-character as it is keyed or received from the remote computer at data rates up to 1200 bits/second (up to 9600 bps with use of padding characters). Page Mode records a complete "page" of data as displayed on the CRT screen; this mode permits data to be keyed and edited prior to recording it from the terminal's 2048-character buffer. In the Page Mode, data is transferred between terminal and cassette at a fixed rate of 2400 bits/second. The cassette unit can be controlled locally via keyed commands or remotely via received control codes. Either recorder can be selected to read, writer, rewind, or write an end-of-file mark. Extra functions, including a duplicate capability, are provided via the unit's manual controls.

The optional printer (impact or non-impact) operates in either of two modes. Conversational Mode prints all data exchanged between the terminal and remote computer at the selected transmission rate. Page Mode prints a complete "page" of data as displayed on the CRT screen. This operating mode, which can be initiated manually or by a received control code, permits data to be keyed and edited prior to printing from the terminal's buffer. The printing rate is determined by the selected transmission rate; however, data cannot be transferred at a rate exceeding that of the printer (30 cps for the non-impact printer and 120 cps for the Model 1200 and 120 impact printers).

Options for the impact printer only include horizontal tab and vertical tab with form feed. Horizontal tab stops can be set at each print position either manually or by the operator or under program control.

### TRANSMISSION SPECIFICATIONS

Transmission is asynchronous in the half- or full-duplex mode for Models 1000, 1200, 1500, and 2000. Model 3000 and the Modular One are available with either an asynchronous or a synchronous communications interface and can also operate in the half- or full-duplex mode. Transmission rates are user-specified for all models and range from 110 to 9600 bits/second and up to 19,200 bits/second for Model 1500. Models 1000 and 1200 provide two switch-selectable transmission rates; any two can be specified. Models 2000 and 3000 provide five switch-selectable rates; any one of the following three groups of transmission rates can be specified:

- 110, 150, 300, 600, or 1200 bits/second.
- 110, 300, 1200, 2400, or 9600 bits/second.
- 110, 1200, 2400, 4800, or 9600 bits/second.

The Modular One provides a choice of 8 transmission rates up to 9600 bps. The 1500 provides 8 switch-selectable speeds including 110, 300, 1200, 2400, 4800, 9600, and 19,200 bits/second.

The transmission code is 8-level ASCII (including parity). A 10- or 11-bit character consisting of 7 data, 1 parity, 1 start, ▶

## Hazeltine Display Terminals

► and 1 or 2 stop bits is transmitted for asynchronous transmission.

All models provide an EIA Standard RS-232 modem interface. The 1500 and Modular One also provide a 20 ma dc current loop interface. All except the Model 3000 are transmission-compatible with the Teletype Model 33 or 35 teletypewriters. The Modular One is available in pollable models that provide protocol compatibility with Burroughs, Honeywell, and Univac communications disciplines. Hazeltine can implement virtually any communication discipline, including polling, on the Model 3000 and the Modular One via microprogramming. Bell System or equivalent modems can be used, such as the 103 series (300 bps), 202 series (1200 bps), 201 series (2400 bps), 208 series (4800 bps), and 209A (7200 and 9600 bps).

Character parity is generated for each keyed character and accompanies the transmitted characters. Parity checking is performed on received data. A character found to be in error is replaced in Models 1000, 1200, and 1500 and the Modular One by a special symbol, which is displayed on the screen in place of the incorrect character; Models 2000 and 3000 alert the operator via a lighted indicator. Parity is switch-selectable on the 1500; odd or even parity or a mark ("P") or space ("O") condition can be selected.

### COMPONENTS

**CRT DISPLAY:** The display characteristics of the six models are presented in the following table.

Hazeltine Terminal Model	Viewing Area		Display Format		Screen Capacity, Chars.
	Width, inches	Height, inches	Char/Line	Lines/Display	
1000	9.2	4.6	80	12	960
1200	9.2	4.6	80	24	1920
1500	8.5	5.75	80	24	1920
2000	8.5	5.75	74	27	1998
3000	8.5	5.75	74	27	1998
Modular One	8.5	5.75	80	24	1920

All models, except the 1500, display a standard character set of 64 symbols, including upper case alphabets, numerics, and special symbols. Model 1500 displays 95 ASCII symbols, including lower case alphabets. As an option, all other models are available with a 96-character set that includes lower case alphabets and 6 additional special symbols.

Data is displayed in white on Models 1000 and 1200, in green on Models 2000 and 3000, and in either white-on-black or black-on-white on the 1500 and Modular One. Characters are formed via a 5-by-7 dot matrix on all models, except the Modular One (7-by-9 dot matrix) and the 1500 (7-by-10 dot matrix). Lower case characters are formed by a 5-by-8 dot matrix on Models 1200, 2000, and 3000. All models use the standard 525-line raster-scan display technique.

**KEYBOARD:** All models have a typewriter-style keyboard; however, Models 1500, 2000 and 3000 also include a 12-key numeric keygroup (adding-machine key arrangement) and Models 2000 and 3000 also provide a separate group of function keys (including cursor control) located to the right of the main keygroup. The Modular One offers an 11-key numeric key group with standard and optional function key groupings located strategically about the main key group.

Models 1500, 2000, 3000, and the Modular One can generate any of the 128 ASCII characters, including upper and lower case alphabets, numerics, punctuation, and control codes. Repetitive entry of data or initiation of control functions is performed by sustained key depression in conjunction with the keyed Repeat function. Models 1000 and 1200 can generate any of 97 ASCII characters, including upper case alphabets, numerics, punctuation, and control codes. As an option, Models 1000 and 1200 can be equipped to generate 123 ASCII characters, including lower case alphabets.

**CASSETTE RECORDER (Models 2000 and 3000 only):** Records data on a "Philips-type" cassette, which contains 300 feet of 0.15-inch magnetic tape recorded at 400 bits/inch. Total cartridge capacity is rated at 150,000 characters. The self-contained unit, which is cable-connected to the terminal, contains two cassette recorders that can be individually selected.

**PRINTER:** Two types printers are available: a non-impact (electrothermal) printer and an impact printer. Either printer can be used with the Model 1200, 2000, 3000 or Modular One display terminal. Model 1000 cannot accommodate either printer, but a serial (RS-232) interface is available for a user-supplied printer.

The non-impact printer employs an electrothermal printing mechanism manufactured by NCR. Characters are formed within a 5-by-7 dot matrix and are printed in upper case format at rates up to 30 characters/second. The printer has a friction-feed platen and accommodates a 100-foot roll of thermographic printing paper, stored within the unit. Line length is 80 characters (8 inches). Horizontal spacing is 10 characters/inch; vertical spacing is switch selectable between 3 and 6 lines/inch.

The Model 1200 impact printer is rated at 120 characters/second and is produced by General Electric as the TermiNet 1200. It has 120 print positions and prints any of 94 ASCII characters, including upper and lower case alphabets, numerics, and specials. Horizontal and vertical spacing are 10 characters/inch and 6 lines/inch, respectively. The standard tractor feed accommodates 7-part continuous forms from 3 to 12-27/32 inches wide and includes an external paper handler. Options include horizontal tab and vertical tab with form feed, implemented via a user-programmable disk. This printer is available for rental only.

Hazeltine also offers the GE TermiNet 120 in place of the TermiNet 1200. The TermiNet 120 is rated at 240 characters/second in the off-line mode (120 lines/minute for upper and lower case; 180 lines/minute for upper case only) and prints up to 120 (or optionally 80) characters per line. Character set, spacing, acceptable paper widths, and paper handling mechanism are all identical with those of the TermiNet 1200. Vertical tabulation is optional. This printer is available for rent or purchase.

### PRICING

The Hazeltine terminals are available for purchase. End-user and OEM quantity discounts are provided. A separate maintenance contract is available for purchased units. Models 1000, 1200, 2000, and 3000 are available on a month-to-month rental basis including maintenance under a minimum one-year rental. The Modular One is also available on a 1-, 2-, 3-, 4-, or 5-year full-payout lease, which includes maintenance. The Hazeltine 1000, Dual Cassette Unit, and Thermal Printer are no longer in production, but are available as "returned and refurbished." ►

## Hazeltine Display Terminals

	<u>Monthly Charge*</u>	<u>Purchase</u>	<u>Monthly Maint.</u>
Model 1000	\$ 49	\$ 750	\$20
Model 1200	65	1,590	20
Model 1500	N/A	1,125	17
Model 2000	98	1,950	25
Model 3000	125	3,900	30
<b>Modular One:</b>			
Basic terminal	99; 76	1,650	25**
Edit terminal	118; 89	2,050	25**
Polling terminal	127; 96	2,250	25**
Dual Cassette Unit	89	1,100	20
Thermal Printer	83	2,350	15
Model 1200 Printer	150	N/A	35
Horizontal Tab	8	N/A	0
Vertical Tab/FF	8	N/A	0
Program Punch	50	N/A	0
Model 120 Printer	N/A	4,350	35
Vertical Tab/FF	N/A	150	0
Program Tape	N/A	50	0
<b>Model 1000/1200 Options</b>			
Lower Case Alphabetics	N/A	100	0
Answerback (16 characters)	N/A	100	0
Auxiliary RS-232 Interface	N/A	50	0
Bell 202C Interface	N/A	100	0
Parallel Printer Interface (1200 only)	N/A	100	0
20/40/60 ma dc Interface	N/A	100	0
<b>Model 2000/3000 Options</b>			
Lower Case Alphabetics	12	200	0
80 Character Line	12	135	0
Field Blink	N/A	100	0
20/40/60 ma dc Interface	N/A	150	0
Automatic Tabulation	N/A	100	0
Auxiliary RS-232 Interface	N/A	150	0

\*Includes prime-shift maintenance. Monthly charges for all terminals but the Modular One are rental rates; those for the Modular One are for a two-year lease (first number) or three-year lease (second number).

\*\*A 12-month maintenance contract is available for \$125.

N/A — Not Available. ■

# Hazeltine Display Terminals



*The Hazeltine 2000 is the most popular display terminal of the five models offered by the company. Included with the terminal shown above is the optional 30 cps thermal printer. The Hazeltine 2000 is marketed as a direct replacement for Teletype Model 33 and 35 units.*

## MANAGEMENT SUMMARY

Hazeltine Corporation, a leading manufacturer of Teletype-compatible display terminals, now offers a product line of five terminals, which range from a simple Teletype replacement to units that feature considerable flexibility through the use of an integral microprocessor. Hazeltine introduced its first terminal, the highly popular 2000, in May 1970 and since that time has added four additional models aimed at both the end user and OEM (original equipment manufacturer) market places. The company currently has a total of more than 27,000 units installed, which includes approximately 23,000 Model 2000's.

Family members range from the bare-bones Model 1000 to the microprocessor-based Model 3000. The other members are the Model 1200, essentially a large-screen version of the 1000; the Model 2000; and the newest addition, the Modular One. Models 2000 and 3000, now both microprocessor-based, are essentially the same unit, but Model 3000 is designed for a multi-station environment and features a polling/addressing capability. Also, Model 3000 can emulate virtually any specified communications discipline via microprogram control. The Modular One is a microprocessor-based system expandable in module form to allow for customized applications for the OEM as well as the end user.

Hazeltine, like many other vendors, is reaping the benefits of modern technology by using a microprocessor in place of hard-wired logic to provide terminal control. Microprocessor control directly benefits the vendor by reducing production costs and by substantially increasing product flexibility and adaptability through micro- ➤

A family of display terminals that range from a straight forward Teletype replacement to a microprocessor-based, modular unit.

Optional peripherals include printers, and a tape cassette recorder. Transmission rates are user selectable and range from 110 bps to 9600 bps in half- or full-duplex mode. Asynchronous and synchronous transmission is supported. Models, with appropriate features, are compatible with each other.

Typical monthly rentals range from a low of \$49 per month for the Model 1000 to \$275 per month for a one-station Model 3000 with impact printer, including maintenance.

The newest terminal from Hazeltine, the Modular One, features modular ROM expansion capability for specific user applications; this model is now available on either an OEM or end user basis.

## CHARACTERISTICS

**VENDOR:** Hazeltine Corporation, Computer Peripheral Equipment, Greenlawn, New York 11740. Telephone (516) 549-8800.

**DATE OF ANNOUNCEMENT:**  
Model 1000 – March 1973;  
Model 1200 – July, 1974;  
Model 2000 – May, 1970;  
Model 3000 – December, 1973;  
Modular One – December, 1975.

**DATE OF FIRST DELIVERY:**  
Model 1000 – June 1973;  
Model 1200 – October, 1974;  
Model 2000 – October, 1970;  
Model 3000 – March, 1974;  
Modular One – January, 1976.

**NUMBER DELIVERED TO DATE:** A total of over 27,000 units.

**SERVICED BY:** Hazeltine Corporation and Syntonic Technology, Inc. (Pennsauken, New Jersey).

## MODELS AND CONFIGURATION

The five models and a brief description of the display terminals offered by Hazeltine are as follows.

**Model 1000:** A basic terminal without the microprocessor, with a 960-character display consisting of twelve 80-character lines. Transmission speeds are switch selectable to 9600 bps.

**Model 1200:** The same as the Model 1000, except for a larger screen size of 1920 characters consisting of 24 ➤

## Hazeltine Display Terminals

▷ programmed functions, thus greatly extending product viability. The user, of course, also benefits from the use of microprocessors in terms of potentially lower equipment costs and delayed product obsolescence. But in most cases, the microprocessor is transparent to the user; i.e., the user cannot make any changes to the microprogram. Nor is user programmability provided. In some instances, however, as in the case of the Hazeltine 3000 or the polling version of the Modular One, the vendor permits the user to specify the communications protocol.

Because pricing is usually the most important single factor affecting user reaction in the highly cost-conscious display terminal market, it presents a valid starting point for analysis. On this basis alone, the Hazeltine terminals offer strong user appeal as a result of their strikingly low price tags, which are probably the lowest among the competing terminals in their respective classes.

Now let's examine and compare the salient features of the five Hazeltine terminals.

Models 1000 and 1200 are both basic terminals and do not provide edit or data entry functions. The only differences between the two are in display capacity and provision for hard-copy output. Model 1200 provides twice the display capacity of Model 1000, which can display up to 960 characters. Model 1200 can optionally accommodate the Hazeltine printers, whereas Model 1000 is not equipped with a printer interface. However, a serial auxiliary interface (RS-232) is optional for both Models 1000 and 1200 (and all other Hazeltine display terminals) to permit attaching a user-supplied printer.

In contrast to the bare-bones 1000 series terminals, the 2000, 3000, and the Modular One terminals feature extensive editing capabilities, data entry functions, expanded cursor control (including an addressable cursor), and five switchable transmission speeds (eight on the Modular One). These top-of-the-line features greatly extend the terminals' usefulness and provide significantly increased operating flexibility over the other models.

Data entry functions include protected format operation, tabulation, and partial screen transmission. The user can call for any of several formats that can be stored on a tape cassette or at the remote computer. When requested, the format is transmitted to the terminal and displayed. The format's field descriptors are protected from inadvertent typeover and are displayed at diminished intensity to contrast with the data keyed into the "blank" spaces. A tab function allows the operator to tab to the next format entry after she completes an entry. Clearing or transmitting the completed page clears or transmits only the entered data and not the format.

Cursor controls on Models 1000 and 1200 are somewhat limited as compared with those on the other models, which feature a character-addressable cursor in addition to discrete controls for each of five cursor movements. ▷

▶ 80-character lines and an optional printer interface for attachment of the Hazeltine thermal or impact printer.

**Model 2000:** A microprocessor-based system with 1998-character screen size consisting of 27 74-character lines. Five switch selectable transmission rates are available to 9600 bps with editing capability. Peripheral options include the thermal or impact printers, the tape cassette unit, remote monitors, and an acoustic coupler.

**Model 3000:** A microprocessor-based system incorporating all the features of the 2000 including the same screen size. This unit is designed for multi-station environment through a polling/addressing capability. It can also emulate virtually any specified communications discipline.

**Modular One:** A versatile terminal offering a range of capabilities from teletypewriter replacement to editing and polling. Display size is 1920 characters consisting of 24 80-character lines. It is a microprocessor-based unit with modular ROM (read only memory) capability designed for customized applications in the OEM and end user markets. Peripheral options include a choice of printers and an acoustical coupler.

### TRANSMISSION SPECIFICATIONS

Transmission is asynchronous in the half- or full-duplex mode for Models 1000, 1200, and 2000. Model 3000 and the Modular One are available with either asynchronous or synchronous communications interface, and can also operate in the half- or full-duplex mode. Transmission rates are user-specified for all models and range from 110 to 9600 bits/second. Models 1000 and 1200 provide two switch-selectable transmission rates; any two can be specified. Models 2000 and 3000 provide five switch-selectable rates; any one of the following three groups of transmission rates can be specified:

- 110, 150, 300, 600, or 1200 bits/second.
- 110, 300, 1200, 2400, or 9600 bits/second.
- 110, 1200, 2400, 4800, or 9600 bits/second.

The Modular One provides a choice of 8 transmission rates up to 9600 bps.

The transmission code is 8-level ASCII (including parity). A 10- or 11-bit character consisting of 7 data, 1 parity, 1 start, and 1 or 2 stop bits is transmitted for asynchronous transmission.

All models provide an EIA Standard RS-232 modem interface. Modular One also provides 20-60 ma current loop. All except the Model 3000 are transmission-compatible with the Teletype Model 33 or 35 teletypewriters. Hazeltine can implement virtually any communications discipline, including polling, on the Model 3000 and the Modular One via microprogramming. Bell System or equivalent modems can be used, such as the 103 series (300 bps), 202 series (1200 bps), 201 series (2400 bps), 208 series, (4800 bps), and 209A (7200 and 9600 bps).

Character parity is generated for each keyed character and accompanies the transmitted characters. Parity checking is performed on received data. A character found to be in error is replaced in Models 1000 and 1200 and the Modular One by a special symbol, which is displayed on the screen in place of the incorrect character; Models 2000 and 3000 alert the operator via a lighted indicator. ▶

## Hazeltine Display Terminals

➤ Keyboards also differ among the five models. Models 1000 and 1200 provide a typewriter-style keyboard, as do the Models 2000, 3000 and the Modular One; but the 1000 and 1200 do not provide the additional numeric key group or the separate cursor controls associated with the other models. Additionally, the Modular One offers eight optional program function keys.

Models 1000 and 1200 are restricted to operation on a character-only basis; i.e., one character at a time is transmitted. Model 2000 can operate in either character or block mode, as selected by the operator, while Model 3000 operates in the block mode only. The Modular One can be configured either way. In the block mode, an entire message can be composed and edited prior to transmission. In a multipoint environment, this "off-line" data composition promotes increased line usage efficiency.

Transmission rates from 110 bps to 9600 bps can be specified. Models 1000 and 1200 can employ any two rates via switch selection; Models 2000 and 3000 can employ any of five rates via switch selection; and Modular One has eight switchable speeds. Speed selection increases the terminal's operating flexibility by providing transmission compatibility with more than one remote facility.

Hard-copy options for Models 1200, 2000, 3000 and the Modular One include a 30-cps non-impact, thermal printer (NCR), a 120-cps impact printer (GE TermiNet 1200), and a 120-cps impact printer with an off-line maximum print speed of 240 cps (GE TermiNet 120).

Auxiliary storage via a dual magnetic tape cassette unit is also available for Models 2000 and 3000 only. The option can be used to batch data or to store record formats for data entry applications. The cassette unit responds to either programmed or keyed commands and operates in either of two modes.

Service is provided by Hazeltine and Syntonic Technology, Inc. Syntonic, headquartered in Pennsauken, New Jersey, has service locations in principal U.S. cities. Hazeltine is quoting a maximum 24-hour response time to service calls, but it anticipates that most calls within a reasonable distance of a service point will be serviced within four hours.

### USER REACTION

In Datapro's 1976 survey of alphanumeric display terminal users, 50 users reported on their experience with a total of 442 Hazeltine display terminals. The 442 terminals can be grouped as follows: Model 1000—22, Model 1200—37, Model 2000—383, and Model 3000—3. Combined user ratings for the Hazeltine display terminals are presented below.

	<u>Excellent</u>	<u>Good</u>	<u>Fair</u>	<u>Poor</u>	<u>WA*</u>
Overall performance	21	21	7	1	3.2
Ease of operation	17	31	2	0	3.3
Display clarity	14	19	6	1	3.2

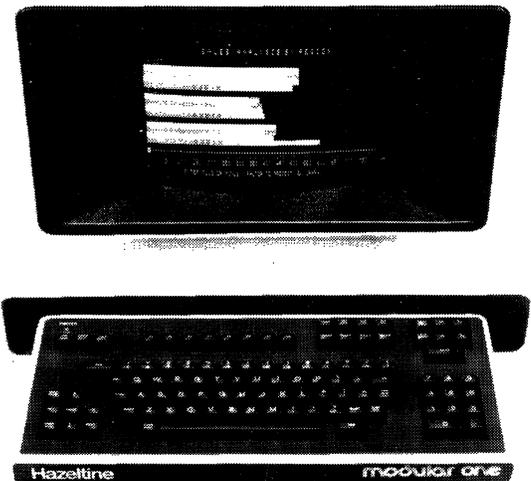
### ➤ DEVICE CONTROL

Model 2000 operates in either character or block mode, while Model 3000 and the polling version of the Modular One operate in the block mode only. These models provide extensive editing capabilities and feature split-screen operation with format protection. Models 1000 and 1200 operate in the character mode only and do not provide local editing or split-screen features.

In the character mode, transmission occurs on a character basis; data is transmitted as keyed and displayed as received. In the block mode, keyed or received data is displayed as in the character mode, but transmission occurs only on a block or message basis, where the entire contents of the display buffer or the variable fields within a fixed format are transmitted on operator or computer command. The block mode must be selected in order to compose and edit messages and to operate with a fixed format.

Cursor control differs among the five models. In Models 1000 and 1200, cursor control is limited to four functions: Home, which positions the cursor to the initial character position on the screen; Space, which moves the cursor one step to the right; Carriage Return, which positions the cursor at the beginning of the current line; and Line Feed, which moves the cursor down one line. The controls are not repetitive, but the functions can be programmed and can be interspersed with data in a received message.

In Models 2000, 3000 and the Modular One, the cursor is character-addressable. Manual controls position the cursor ➤



*Hazeltine's newest product, the Modular One shown above, was originally announced as available to the OEM market only; it is now being sold to end users. Built around a microprocessor, as is the Hazeltine 2000 and 3000, the Modular One offers custom tailored ROM (read only memory) for specific applications. This is a lower cost method of providing programmability than developing assemblers, compilers, utilities, and other supporting software, but it requires the user to determine his needs carefully before procurement, rather than buying a programmable terminal and then trying to figure out what to do with it. In effect, it allows Hazeltine to conserve its systems programming resources while allowing the company to compete with the "intelligent" terminal vendors.*

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	Excellent	Good	Fair	Poor	WA*
Keyboard feel and usability	14	26	9	1	3.1
Hardware reliability	18	17	11	4	3.0
Maintenance service	11	15	18	5	2.7
Software and technical service	3	12	15	3	2.5

\*Weighted Average on a scale of 4.0 for Excellent.

As reflected by the Weighted Averages, responding users were generally pleased with their Hazeltine terminals. As in last year's survey, the predominant advantage cited was low cost. Other advantages cited were editing and data entry functions, Teletype compatibility, and the selectable speed feature. Reliability of the terminal was generally a plus for the terminals. However, some users expressed concern with the reliability of their particular terminal; in these cases, the cause was often either a start up problem or a faulty peripheral unit.

A few users indicated some dissatisfaction with the company's maintenance service and support; however, no supportive statements were offered in any of these cases. □

► in any of four directions: up, down, left, and right. Repetitive operation is provided for these functions, but screen wrap-around is inhibited. The Up and Down cursor controls move the cursor up and down one line until it stops on the first or last displayed line. The Left and Right cursor controls advance or backspace the cursor by one character position. The cursor can be returned to the first character position of the next line (Carriage Return) or to the first character position of the display (Home). The cursor can also be moved to any character position by a received cursor address command.

Edit functions, provided only by Models 2000, 3000 and the Modular One, include both character and line insertion and deletion. Character insertion or deletion affects all data to the right of the cursor up to the end of a variable field (format operation) or the last displayable position of the screen. On the Modular One, this editing function is line limited.

Erasure functions include screen erasure (provided by all models), which clears all displayed data and returns the cursor to the Home position, and format erasure (Models 2000, 3000, and Modular One only), which erases only the variable fields within a fixed format. The erasure functions are programmable. The Modular One also provides EOL (erase to end of line).

Models 2000, 3000 and Modular One feature split-screen operation, which permits the use of fixed formats for data entry applications that require the operator to key pertinent data into blank spaces within the displayed format. Formats received from the remote computer or read from tape are displayed at a diminished intensity to contrast with the data entered in the variable fields. Entry is restricted to variable fields; field descriptors are protected. The Tab function is used to position the cursor at the beginning of each variable field; as each entry is completed, the operator keys Tab to begin entry in the next variable field. On the Modular One this function is automatic upon entering the last character of a variable field. Character insert and delete functions are applicable to variable fields only; line insert and delete functions do not apply to format operations. When clearing or transmitting the displayed data, only the variable data is cleared or transmitted.

Other features provided by all models include Roll and Break. The Roll feature automatically rolls all displayed lines up by one line when data is received after the last line has been completely filled; data rolled off the top of the screen is lost. Models 2000, 3000, and Modular One also feature selective roll-up, which permits the function to be initiated at any operator-designated line under computer control. The Break feature transmits a space sequence to request interruption of an incoming message.

Answerback, optional for Models 1000 and 1200 only, responds with a programmed 16-character sequence to a keyed command or received WRU. Rubout transmits a mark sequence on all models.

For the Modular One, data attributes can be defined to control operations on specific fields including blinking, reverse video, or low/high intensity to highlight data; format protection as described above; alpha, numeric or alphanumeric only for data checking; and display or nondisplay for security.

The optional magnetic tape cassette unit (used with Models 2000 and 3000 only) contains two cassette recorders and operates in either of two modes. Paper Tape Emulation Mode records data character-by-character as it is keyed or received from the remote computer at data rates up to 1200 bits/second (up to 9600 bps with use of padding characters). Page Mode records a complete "page" of data as displayed on the CRT screen; this mode permits data to be keyed and edited prior to recording it from the terminal's 2048-character buffer. In the Page Mode, data is transferred between terminal and cassette at a fixed rate of 2400 bits/second. The cassette unit can be controlled locally via keyed commands or remotely via received control codes. Either recorder can be selected to read, write, rewind, or write an end-of-file mark. Extra functions, including a duplicate capability, are provided via the unit's manual controls.

The optional printer (impact or non-impact) operates in either of two modes. Conversational Mode prints all data exchanged between the terminal and remote computer at the selected transmission rate. Page Mode prints a complete "page" of data as displayed on the CRT screen. This operating mode, which can be initiated manually or by a received control code, permits data to be keyed and edited prior to printing from the terminal's buffer. The printing rate is determined by the selected transmission rate; however, data cannot be transferred at a rate exceeding that of the printer (30 cps for the non-impact printer and 120 cps for the Model 1200 and 120 impact printers).

Options for the impact printers only include horizontal tab and vertical tab with form feed. Horizontal tab stops can be set at each print position either manually by the operator or under program control.

### COMPONENTS

CRT DISPLAY: The display characteristics of the five models are presented in the following table.

Hazeltine Terminal Model	Viewing Area		Display Format		Screen Capacity, Chars.
	Width, inches	Height, inches	Char/Line	Lines/Display	
1000	9.2	4.6	80	12	960
1200	9.2	4.6	80	24	1920
2000	8.5	5.75	74	27	1998
3000	8.5	5.75	74	27	1998
Modular One	8.5	5.75	80	24	1920

## Hazeltine Display Terminals

► All models display a standard character set of 64 symbols including upper case alphabets, numerics, and special symbols. As an option, all models are available with a 96-character set that includes lower case alphabets and six additional special symbols.

Data is displayed in white on Models 1000 and 1200, in green on Models 2000 and 3000, and in either white-on-black or black-on-white on the Modular One. Characters are formed via a 5-by-7 dot matrix on all models except the Modular One which uses a 7-by-9 dot matrix. Lower case characters are formed by a 5-by-8 dot matrix on Models 1200, 2000, and 3000. All models use the standard 525-line raster-scan display technique.

**KEYBOARD:** All models have a typewriter-style keyboard; however, Models 2000 and 3000 also include a 12-key numeric keygroup (adding-machine key arrangement) and a separate group of function keys (including cursor control) located to the right of the main keygroup. The Modular One offers an 11-key numeric key group with standard and optional function key groupings located strategically about the main key group.

Models 2000, 3000 and the Modular One can generate any of the 128 ASCII characters, including upper and lower case alphabets, numerics, punctuation, and control codes. Repetitive entry of data or initiation of control functions is performed by sustained key depression in conjunction with the keyed Repeat function. Models 1000 and 1200 can generate any of 97 ASCII characters, including upper case alphabets, numerics, punctuation, and control codes. As an option, Models 1000 and 1200 can be equipped to generate 123 ASCII characters, including lower case alphabets.

**CASSETTE RECORDER (Models 2000 and 3000 only):** Records data on a "Philips-type" cassette, which contains 300 feet of 0.15-inch magnetic tape recorded at 400 bits/inch. Total cartridge capacity is rated at 150,000 characters. The self-contained unit, which is cable-connected to the terminal, contains two cassette recorders that can be individually selected.

**PRINTER:** Two types printers are available: a non-impact (electrothermal) printer and an impact printer. Either printer can be used with the Model 1200, 2000, 3000 or Modular One display terminal. Model 1000 cannot accommodate either printer, but a serial (RS-232) interface is available for a user-supplied printer.

The non-impact printer employs an electrothermal printing mechanism manufactured by NCR. Characters are formed within a 5-by-7 dot matrix and are printed in upper case format at rates up to 30 char/second. The printer has a friction-feed platen and accommodates a 100-foot roll of thermographic printing paper, stored within the unit. Line length is 80 characters (8 inches). Horizontal spacing is 10 char/inch; vertical spacing is switch selectable between 3 and 6 lines/inch.

The Model 1200 impact printer is rated at 120 char/second and is produced by General Electric as the TermiNet 1200. It has 120 print positions and prints any of 94 ASCII characters, including upper and lower case alphabets, numerics, and specials. Horizontal and vertical spacing are 10 char/inch and 6 lines/inch, respectively. The standard

tractor feed accommodates 7-part continuous forms from 3 to 12-27/32 inches wide and includes an external paper handler. Options include horizontal tab and vertical tab with form feed, implemented via a user-programmable disk. This printer is available for rental only.

Hazeltine also offers the GE TermiNet 120 in place of the TermiNet 1200. The TermiNet 120 is rated at 240 char/second in the off-line mode (120 lines/minute for upper and lower case; 180 lines/minute for upper case only) and prints up to 120 (or optionally 80) characters per line. Character set, spacing, acceptable paper widths, and paper handling mechanism are all identical with those of the TermiNet 1200. Vertical tabulation is optional. This printer is available for rent or purchase.

### PRICING

Hazeltine Model 1000 is available for rental only and the 1200 is available for purchase or rental only. Models 2000 and 3000 are available for purchase, rental, or on a one-, two-, three, four- or five-year full-payout lease. Modular One is currently available for purchase only. Rental includes prime-shift maintenance and is contracted on a yearly basis. A separate maintenance contract is available for leased or purchased units.

	Monthly Rental*	Purchase	Monthly Maint.
Model 1000	\$ 49	—	\$20
Model 1200	65	\$1,590	20
Model 2000	98	2,995	25
Model 3000	125	3,900	30
Modular One (1)	—	1,650(2)	25
Dual Cassette Unit	89	1,990	20
Thermal Printer	83	2,350	15
Model 1200 Printer	150	—	35
Horizontal Tab	8	200	0
Vertical Tab/FF	8	150	0
Program Punch	50**	50	0
Model 120 Printer	150	4,350	35
Vertical Tab/FF	8	50	0
Program Tape	150**	150	0

#### Model 1000/1200 Options

Lower-Case Alphabets	100**	100	0
Answerback (16 chars.)	100**	100	0
Auxiliary RS-232 Interface	50**	50	0
Bell 202C Interface	100**	100	0
Parallel Printer Interface (1200 only)	50**	50	0
20/40/60 ma. dc Interface	100**	100	0

#### Model 2000/3000 Options

Lower-Case Alphabets	12	200	0
80-Character Line	12	135	0
Field Blink	100**	100	0
20/40/60 ma. dc Interface	150**	150	0
Automatic Tabulation	100**	100	0
Auxiliary RS-232 Interface	150**	100	0

\* Monthly rental (12 months minimum) includes maintenance for 8 hours/day, 5 days/week.

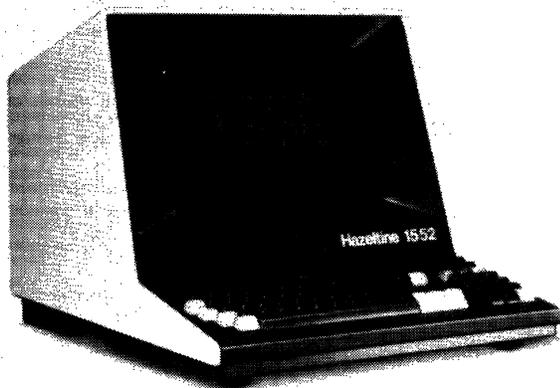
\*\*One-time charge.

(1) Prices for Modular One options were not available as of this writing.

(2) The OEM price for 100 unit quantity is \$1,275 each. ■



# Hazeltine 1500 Series Display Terminals



## MANAGEMENT SUMMARY

The Hazeltine 1500 series is a family of low-cost, microprocessor-based keyboard/display terminals. Four models are currently available: Model 1500, Model 1510, Model 1520, and Model 1552. All models feature a 12-inch CRT screen and integral keyboard. The 1500 series terminals are identical in appearance, except for slight differences in the keyboards.

The Model 1500, at the low end, is not a "bare-bones" unit, but provides a number of useful features that are not typically found in conversational displays, such as full cursor control, remote and local editing, highlighting, and a numeric keypad. Although Model 1500 does not provide a format mode, a fixed format can be sent to the terminal and displayed in reduced intensity. Keyed data, displayed in full intensity, is independently erasable; when erased, the low intensity data remains displayed.

Models 1510 and 1520 progressively add features to those of the 1500.

The 1510 provides a protected format mode; more sophisticated tabulation; character, line, or page mode transmission; and the use of a "status byte" to inform the host computer of the terminal's current operating status.

Model 1520 adds a 2K-byte, microprocessor-controlled print buffer and on/off line mode to all of the functions of the 1500 and 1510. This useful feature combination supports printed output directly from the communications facility or the terminal screen without interfering with keyboard operation. This means that printed copy can be produced from a host computer message or previously displayed data, while the operator is keying fresh data into the screen. The 1520 is equipped with a switch-selected serial or parallel interface that will accommodate most printers offered by prominent printer vendors, such as Centronics, General Electric, Tally, and Diablo.

Model 1552 is a DEC VT-52-compatible terminal that offers the standard features of the Model 1500. In addi-

A family of microprocessor-based display terminals that can be used in a local or remote environment.

All models feature a 1920-character display, integral keyboard with numeric keypad, full cursor control, cursor sensing and addressing, editing, highlighting, and keyboard lock/unlock. Selectable data rates of up to 9600 or 19,200 bps are available depending on the model. Additional features offered on some models include a protected format mode; transmission by character, line, or page; a print buffer; and DEC VT-52 emulation.

End-user purchase prices range from \$1,225 to \$1,650 for single units. OEM and end-user discounts are available, as are full-payout leases for one, two, or three years.

## CHARACTERISTICS

**VENDOR:** Hazeltine Corporation, Computer Terminal Equipment, Greenlawn, New York 11740. Telephone (516) 549-8800.

**DATE OF ANNOUNCEMENT:** Model 1500—March 1977; Models 1510 and 1520—June 1977; Model 1552—May 1979.

**DATE OF FIRST DELIVERY:** Model 1500—June 1977; Models 1510 and 1520—September 1977; Model 1552—May 1979.

**NUMBER DELIVERED TO DATE:** 15,000 (all models).

**SERVICED BY:** Hazeltine Corporation and TRW.

## MODELS

The Hazeltine 1500 series display terminals include four stand-alone models equipped with an integral keyboard and 12-inch CRT screen. Models 1500, 1510, 1520, and 1552 are microprocessor-based (Intel 8080) terminals that differ in functional capabilities only. An auxiliary serial (RS-232C) interface for a read-only device (such as a printer) is standard on all models. Model 1520 is equipped with a microprocessor-controlled 2K-byte RAM print buffer and a serial (RS-232C) or parallel printer interface as a standard feature. Model 1552 is compatible with the DEC VT-52 terminal.

## TRANSMISSION SPECIFICATIONS

Transmission is asynchronous in the half- or full-duplex mode at one of eight switch-selectable data rates: 110, 300, 1200, 1800, 2400, 4800, 9600, or 19,200 bits/second. Model 1552 provides seven selectable transmission rates of 110 to 9600 bits/second. The 10- or 11-unit, 8-level ASCII transmission code is used. Odd or even parity, space or mark is switch selectable. Parity checking is performed when selected; detected errors are displayed as a special symbol. Each terminal is equipped with a switch-selectable RS-232C and 20 mA dc current loop interface.

## Hazeltine 1500 Series Display Terminals

tion, the 1552 provides separate cursor control keys, function keys, a graphics mode, a hold-screen mode, and an alternate keypad mode that transforms the numeric keypad into a function keypad. Features offered on the Model 1552 that are not available on the standard VT-52 include added key functions, programmable key switch audio feedback, keyboard lock/unlock, field tab, and line insertion/deletion.

### USER REACTION

In Datapro's 1979 survey of alphanumeric display terminal users, six users reported on their experience with a total of 112 Hazeltine 1500 series terminals. The users' reactions are presented in the following table.

	Excellent	Good	Fair	Poor	WA*
Overall performance	0	5	1	0	2.8
Ease of operation	2	2	2	0	3.0
Display clarity	2	2	2	0	3.0
Keyboard feel & usability	1	3	1	1	2.7
Hardware reliability	0	1	5	0	2.2
Maintenance service	0	3	1	2	2.2
Technical support	0	2	3	0	2.4

\*Weighted Average on a scale of 4.0 for Excellent.

All six users cited low cost as the key advantage of the 1500 series terminals. The only negative comment came from a user who complained that the need to shift before using the Delete key was an inconvenience. □

### ► DEVICE CONTROL

Except for a few key differences, all 1500 series models share many common operating functions, described in the following paragraphs.

Models 1500 and 1552 transmit on a character-by-character basis as each character is keyed. Models 1510 and 1520 can transmit in either character or block mode. A partial or complete line or page can be transmitted in block mode. Cursor addressing and sensing are standard features. The 1510, 1520, and 1552 provide separate cursor control functions for up, down, left, right, and home. Edit functions include line insertion and deletion, full or partial screen erase, full or partial line erase, and erasure of foreground (variable) data displayed at full intensity. The keyboard can be locked and unlocked by a keyed or received command. Audible alarm is also standard.

Models 1510 and 1520 provide a Format mode, which permits formats to be keyed or received. Format descriptors can be displayed in reduced intensity and are protected from inadvertent entry or erasure. The terminals can transmit unprotected data only, or all data in a line, block, or page can be transmitted by remote command.

Tabulation, a standard 1500 Series feature, moves the cursor from a high-intensity field to the beginning of the next high-intensity field. Models 1510 and 1520 also provide back tab and automatic tabulation as standard features. Tab and back tab functions move the cursor between unpro-

TECTED fields. Automatic tabulation skips the cursor from the end of an unprotected field to the beginning of the next. Scrolling is a standard feature for all models. Data entered into a full screen causes all data to move up by one line; the first line is lost as it moves off the screen, and the new data is entered on the last line.

Models 1510 and 1520 feature a switchable wraparound function that enables or disables cursor movement from the last position of the last line. When disabled, the cursor is moved by a carriage-return/line-feed sequence.

Models 1510 and 1520 also provides a read status feature, which transmits a status byte in response to a received command. The status byte defines the current terminal operating status, including parity, operating mode (half-/full-duplex), format mode, and terminating control character (ETX, EOT, or CR).

Model 1520 is equipped with a 2K-byte, microprocessor-controlled (Intel 8048) print buffer and an On/Off Line mode switch. In the On Line mode, data received from the line can be transferred directly to the print buffer for printed output (without being displayed), while the operator is keying data into the display memory. Data can be transferred from display memory to print buffer in the Off-Line mode. Printer speed is independent of the communications data rate.

The Model 1552 provides software compatibility with the DEC VT-52 and includes standard VT-52 features, such as column tabs, a hold-screen mode, a graphics mode, and an alternate keypad mode that enables the numeric keypad to operate as a function keypad. Model 1552 also features programmable key switch audio feedback.

### COMPONENTS

**CRT DISPLAY UNIT:** A 12-inch (diagonal measurement) CRT screen with a viewing area 8.5 inches wide by 5.75 inches high. The display arrangement is 24 lines of 80 characters each for a total screen capacity of 1920 characters. The character set consists of 95 displayable symbols, including upper and lower case alphabets, numerics, and specials. Model 1552 also provides a set of 31 graphics symbols. Each character is formed within a 7-by-10 dot matrix. Data is displayed in white. The cursor is displayed as a block and alternates with a character when both occupy the same display position. Highlighting functions include full- or low-intensity in either normal or reverse video.

**KEYBOARD:** A 58-key, typewriter-style, integral keyboard. The keyboard also includes a 12-key numeric keypad and a set of 4 function keys. The keyboard can generate any of 128 ASCII character codes.

### PRICING

The Hazeltine 1500 series terminals are available for purchase or on a one-, two-, or three-year full-payout lease. A separate maintenance contract is available for leased or purchased units. Maintenance is priced at \$17 (Model 1500) or \$20 (Models 1510, 1520, or 1552) per month per terminal. Quantity discounts are provided. End user quantity prices are given below. For OEM prices and discounts, contact Hazeltine. Installations at the same location on the same day are priced at \$20 for the second unit and \$15 for each subsequent unit.

#### End User Purchase Prices

	1-10 Units	11-25 Units	26-50 Units	51-99 Units	100-499 Units
Model 1500	\$1,225	\$1,175	\$1,125	\$1,090	\$ 950
Model 1510	1,395	1,350	1,295	1,225	1,100
Model 1520	1,650	1,595	1,530	1,455	1,330
Model 1552	1,500	1,300	1,180	1,125	1,025■

# Hazeltine 1500 Series Display Terminals



## MANAGEMENT SUMMARY

Hazeltine's 1500 series terminals form its new economy family of high-performance, low-priced display terminals. The terminals are equipped with an Intel 8080 microprocessor and feature a 12-inch CRT screen and integral keyboard. Except for slight keyboard differences, all models have the same attractive physical appearance and weigh only 35 pounds.

The Model 1500, at the low end, is not a "bare-bones" unit, but provides a number of useful features that are not typically found in conversational displays, such as full cursor control, remote and local editing, highlighting, and a numeric keypad. Although Model 1500 does not provide a format mode, a fixed format can be sent to the terminal and displayed in reduced intensity. Keyed data, displayed in full intensity, is independently erasable; when erased, the low intensity data remains displayed.

Models 1510 and 1520 progressively add features to those of the 1500.

The 1510 provides a protected format mode; more sophisticated tabulation; character, line, or page mode transmission; and the use of a "status byte" to inform the host computer of the terminal's current operating status.

Model 1520 adds a 2K-byte, microprocessor-controlled print buffer and on/off line mode to all of the functions of the 1500 and 1510. This useful feature combination supports printed output directly from the communications facility or the terminal screen without interfering with keyboard operation. This means that printed copy can be produced from a host computer message or previously displayed data, while the operator is keying fresh data into the screen. The 1520 is equipped with a switch-selected serial or parallel interface that will accommodate most printers offered by prominent printer vendors, such as Centronics, General Electric, Tally, and Diablo. ➤

An economy family of Teletype-compatible display terminals.

Standard features include editing, full cursor control, cursor sensing and addressing, format protection, tabulation, highlighting, scrolling, a print buffer, and selectable data rates up to 19,200 bps.

Purchase prices range from \$1,225 to \$1,650. OEM and end-user discounts are available, as well as full payout leases for one, two, and three years.

## CHARACTERISTICS

**VENDOR:** Hazeltine Corporation, Computer Terminal Equipment, Greenlawn, New York 11740. Telephone (516) 549-8800.

**DATE OF ANNOUNCEMENT:** Model 1500—March 1977; Models 1510 and 1520—June 1977.

**DATE OF FIRST DELIVERY:** Model 1500—June 1977; Models 1510 and 1520—September 1977.

**NUMBER DELIVERED TO DATE:** 1000.

**SERVICED BY:** Hazeltine Corporation and Syntonic Technology, Inc. (Pennsauken, New Jersey).

## MODELS

The Hazeltine 1500 series display terminals include three stand-alone models equipped with an integral keyboard and 12-inch CRT screen. Models 1500, 1510, and 1520 are microprocessor-based (Intel 8080) terminals that differ in functional capabilities only. An auxiliary serial (RS-232C) interface for a read-only device (such as a printer) is standard on all models. Model 1520 is equipped with a microprocessor-controlled 2K-byte RAM print buffer and a serial (RS-232C) or parallel printer interface as a standard feature.

## TRANSMISSION SPECIFICATIONS

Transmission is asynchronous in the half- or full-duplex mode at one of eight switch-selectable data rates: 110, 300, 1200, 1800, 2400, 4800, 9600, or 19,200 bits/second. The 10- or 11-unit, 8-level ASCII transmission code is used. Odd or even parity, space or mark is switch selectable. Parity checking is performed when selected; detected errors are displayed as a special symbol. Each terminal is equipped with a switch-selectable RS-232C and 20 ma dc current loop interface.

## DEVICE CONTROL

Except for a few key differences, all 1500 series models share many common operating functions, described in the following paragraphs.

Model 1500 transmits on a character-by-character basis as each character is keyed. Models 1510 and 1520 can transmit in either character or block mode. A partial or complete line or page can be transmitted in block mode. ➤

## Hazeltine 1500 Series Display Terminals

➤ Salient features of the 1500 series terminals include:

- A 1920-character screen.
- Upper and lower case display symbols.
- Full cursor controls.
- Cursor sensing and addressing.
- Editing (line only).
- Tabulation.
- Format protection (1510 and 1520 only).
- A dual-intensity display.
- Reverse video display.
- A numeric keypad.
- Keyboard lock and unlock.
- Switch-selectable transmission rates from 110 to 19,200 bps.
- An auxiliary interface.
- A buffered printer interface (1520 only). □

➤ Cursor addressing and sensing are standard features. The 1510 and 1520 provide separate cursor control functions for up, down, left, right, and home.

Edit functions include line insertion and deletion, full or partial screen erase, full or partial line erase, and erasure of foreground (variable) data displayed at full intensity.

The keyboard can be locked and unlocked by a keyed or received command. Audible alarm is also standard.

Models 1510 and 1520 provide a Format mode, which permits formats to be keyed or received. Format descriptors can be displayed in reduced intensity and are protected from inadvertent entry or erasure. Only unprotected data is erased or transmitted. All data in a line, block, or page can be transmitted by remote command.

Tabulation, a standard Model 1500 feature, moves the cursor from a high-intensity field to the beginning of the next high-intensity field. Models 1510 and 1520 also provide back tab, and automatic tabulation as standard features. Tab and back tab functions move the cursor between unpro-

TECTED fields. Automatic tabulation skips the cursor from the end of an unprotected field to the beginning of the next.

Scrolling is a standard feature for all models. Data entered into a full screen causes all data to move up by one line; the first line is lost as it moves off the screen, and the new data is entered on the last line.

Models 1510 and 1520 feature a switchable wraparound function that enables or disables cursor movement from the last position of the last line. When disabled, the cursor is moved by a carriage-return/line-feed sequence.

Models 1510 and 1520 also provide a read status feature, which transmits a status byte in response to a received command. The status byte defines the current terminal operating status, including parity, operating mode (half-/full-duplex), format mode, and terminating control character (ETX, EOT, or CR).

Model 1520 is equipped with a 2K-byte, microprocessor-controlled (Intel 8048) print buffer and an On/Off Line mode switch. In the On Line mode, data received from the line can be transferred directly to the print buffer for printed output (without being displayed), while the operator is keying data into the display memory. Data can be transferred from display memory to print buffer in the Off-Line mode. Printer speed is independent of the communications data rate.

### COMPONENTS

**CRT DISPLAY UNIT:** A 12-inch (diagonal measurement) CRT screen with a viewing area 8.5 inches wide by 5.75 inches high. The display arrangement is 24 lines of 80 characters each for a total screen capacity of 1920 characters. The character set consists of 95 displayable symbols, including upper and lower case alphabets, numerics, and specials. Each character is formed within a 7-by-10 dot matrix. Data is displayed in white. The cursor is displayed as a block and alternates with a character when both occupy the same display position. Highlighting functions include full- or low-intensity in either normal or reverse video.

**KEYBOARD:** A 58-key, typewriter-style, integral keyboard. The keyboard also includes a 12-key numeric keypad and a set of 4 function keys. The keyboard can generate any of 128 ASCII character codes.

### PRICING

The Hazeltine 1500 series terminals are available for purchase or on a one-, two-, or three-year full-payout lease. A separate maintenance contract is available for leased or purchased units. Maintenance is priced at \$17 (Model 1500) or \$20 (Models 1510 or 1520) per month per terminal. Quantity discounts are provided. End user quantity prices are given below. For OEM prices and discounts, contact Hazeltine. Installations at the same location on the same day are priced at \$20 for the second unit and \$15 for each subsequent unit.

#### End User Purchase Prices

	<u>1-10 Units</u>	<u>11-25 Units</u>	<u>26-50 Units</u>	<u>51-99 Units</u>	<u>100-499 Units</u>
Model 1500	\$1,225	\$1,175	\$1,125	\$1,090	\$ 950
Model 1510	1,395	1,350	1,295	1,225	1,100
Model 1520	1,650	1,595	1,530	1,455	1,330

# Hazeltine 1500 Series Display Terminals



A DEC VT-52-compatible Hazeltine terminal providing the user with additional key functions not available with the VT-52, programmable key switch, audio feedback, field tab, and line insertion/deletion features.

## MANAGEMENT SUMMARY

The Hazeltine 1500 series is a family of low-cost, microprocessor-based keyboard/display terminals. Four models are currently available: Model 1500, Model 1510, Model 1520, and Model 1552. All models feature a 12-inch CRT screen and integral keyboard. The 1500 series terminals are identical in appearance, except for slight differences in the keyboards.

The Model 1500, at the low end, is not a "bare-bones" unit, but provides a number of useful features that are not typically found in conversational displays, such as full cursor control, remote and local editing, highlighting, and a numeric keypad. Although Model 1500 does not provide a format mode, a fixed format can be sent to the terminal and displayed in reduced intensity. Keyed data, displayed in full intensity, is independently erasable; when erased, the low intensity data remains displayed.

Models 1510 and 1520 progressively add features to those of the 1500.

The 1510 provides a protected format mode; more sophisticated tabulation; character, line, or page mode transmission; and the use of a "status byte" to inform the host computer of the terminal's current operating status.

Model 1520 adds a 2K-byte, microprocessor-controlled print buffer and on/off line mode to all of the functions of the 1500 and 1510. This useful feature combination supports printed output directly from the communications facility or the terminal screen without interfering with keyboard operation. This means that printed copy can be produced from a host computer message or previously displayed data, while the operator is keying fresh data into the screen. The 1520 is equipped with a switch-selected serial or parallel interface that will accommodate most ➤

A family of microprocessor-based display terminals that can be used in a local or remote environment.

All models feature a 1920-character display, integral keyboard with numeric keypad, full cursor control, cursor sensing and addressing, editing, highlighting, and keyboard lock/unlock. Selectable data rates of up to 9600 or 19,200 bps are available depending on the model. Additional features offered on some models include a protected format mode; transmission by character, line, or page; a print buffer; and DEC VT-52 emulation.

End-user purchase prices range from \$1,095 to \$1,500 for single units. OEM and end-user discounts are available.

## CHARACTERISTICS

**VENDOR:** Hazeltine Corporation, Computer Terminal Equipment, Greenlawn, New York 11740. Telephone (516) 549-8800.

**DATE OF ANNOUNCEMENT:** Model 1500—March 1977; Models 1510 and 1520—June 1977; Model 1552—May 1979.

**DATE OF FIRST DELIVERY:** Model 1500—June 1977; Models 1510 and 1520—September 1977; Model 1552—May 1979.

**NUMBER DELIVERED TO DATE:** 15,000 (all models).

**SERVICED BY:** Hazeltine Corporation and TRW.

## MODELS

The Hazeltine 1500 series display terminals include four stand-alone models equipped with an integral keyboard and 12-inch CRT screen. Models 1500, 1510, 1520, and 1552 are microprocessor-based (Intel 8080) terminals that differ in functional capabilities only. An auxiliary serial (RS-232-C) interface for a read-only device (such as a printer) is standard on all models. Model 1520 is equipped with a microprocessor-controlled 2K-byte RAM print buffer and a serial (RS-232-C) or parallel printer interface as a standard feature. Model 1552 is compatible with the DEC VT-52 terminal.

## TRANSMISSION SPECIFICATIONS

Transmission is asynchronous in the half- or full-duplex mode at one of eight switch-selectable data rates: 110, 300, 1200, 1800, 2400, 4800, 9600, or 19,200 bits/second. Model 1552 provides seven selectable transmission rates of 110 to 9600 bits/second. The 10- or 11-unit, 8-level ASCII transmission code is used. Odd or even parity, space or mark is switch selectable. Parity checking is performed when selected; detected errors are displayed as a special symbol. Each terminal is equipped with a switch-selectable RS-232-C and 20 mA dc current loop interface.

## DEVICE CONTROL

Except for a few key differences, all 1500 series models share many common operating functions, described in the following paragraphs. ➤

## Hazeltine 1500 Series Display Terminals

▷ printers offered by prominent printer vendors, such as Centronics, General Electric, Tally, and Diablo.

Model 1552 is a DEC VT-52-compatible terminal that offers the standard features of the Model 1500. In addition, the 1552 provides separate cursor control keys, function keys, a graphics mode, a hold-screen mode, and an alternate keypad mode that transforms the numeric keypad into a function keypad. Features offered on the Model 1552 that are not available on the standard VT-52 include added key functions, programmable key switch audio feedback, keyboard lock/unlock, field tab, and line insertion/deletion.

### USER REACTION

In Datapro's 1980 survey of alphanumeric display terminal users, eight users reported on their experience with a total of 906 Hazeltine 1500 series terminals. A compilation of the ratings reported by these users is summarized below.

	Excellent	Good	Fair	Poor	WA*
Overall performance	2	5	1	0	3.1
Ease of operation	2	4	1	1	2.9
Display clarity	4	2	2	0	3.3
Keyboard feel & usability	1	4	2	1	2.6
Hardware Reliability	1	5	1	1	2.8
Maintenance Service	1	4	3	0	2.8
Technical Support	1	4	1	1	2.7

\*Weighted Average based on a scale of 4.0 for Excellent.

To expand on what we learned from the mail survey about the 1500 series, we contacted four of the eight respondents to the survey at random to comment on their experiences with the 1500 series terminals. The users included two data service bureaus and two colleges.

The first user, a firm which provides digitized data on oil well areas to the major petroleum companies, has had their 1500 terminal installed for over three years. The terminal alternately operates on-line to the firm's DEC 20/40 and PDP/11-60. This installation also includes a DEC VT-100 and a General Terminal GT 41.

One nagging problem occurred continuously during the first few months of installation. A particular component burned out if the terminal was left on while not in use for any extended period of time, within an eight hour shift. But since the user has narrowed it down to a simple matter of overheating, the terminal is now turned off when not in use and is given a chance to power-down so not to over tax the components.

The user also felt that the keyboard requires some improvement to alleviate a few "little annoyances" such as the delete function requiring a shift before it is activated. Although this is a minor difficulty, the user would like to see it corrected before he would purchase additional 1500's in the future. ▷

▶ Models 1500 and 1552 transmit on a character-by-character basis as each character is keyed. Models 1510 and 1520 can transmit in either character or block mode. A partial or complete line or page can be transmitted in block mode. Cursor addressing and sensing are standard features. The 1510, 1520, and 1552 provide separate cursor control functions for up, down, left, right, and home. Edit functions include line insertion and deletion, full or partial screen erase, full or partial line erase, and erasure of foreground (variable) data displayed at full intensity. The keyboard can be locked and unlocked by a keyed or received command. Audible alarm is also standard.

Models 1510 and 1520 provide a Format mode, which permits formats to be keyed or received. Format descriptors can be displayed in reduced intensity and are protected from inadvertent entry or erasure. The terminals can transmit unprotected data only, or all data in a line, block, or page can be transmitted by remote command.

Tabulation, a standard 1500 Series feature, moves the cursor from a high-intensity field to the beginning of the next high-intensity field. Models 1510 and 1520 also provide back tab and automatic tabulation as standard features. Tab and back tab functions move the cursor between unprotected fields. Automatic tabulation skips the cursor from the end of an unprotected field to the beginning of the next. Scrolling is a standard feature for all models. Data entered into a full screen causes all data to move up by one line; the first line is lost as it moves off the screen, and the new data is entered on the last line.

Models 1510 and 1520 feature a switchable wraparound function that enables or disables cursor movement from the last position of the last line. When disabled, the cursor is moved by a carriage-return/line-feed sequence.

Models 1510 and 1520 also provide a read status feature, which transmits a status byte in response to a received command. The status byte defines the current terminal operating status, including parity, operating mode (half-/full-duplex), format mode, and terminating control character (ETX, EOT, or CR).

Model 1520 is equipped with a 2K-byte, microprocessor-controlled (Intel 8048) print buffer and an On/Off Line mode switch. In the On Line mode, data received from the line can be transferred directly to the print buffer for printed output (without being displayed), while the operator is keying data into the display memory. Data can be transferred from display memory to print buffer in the Off-Line mode. Printer speed is independent of the communications data rate.

The Model 1552 provides software compatibility with the DEC VT-52 and includes standard VT-52 features, such as column tabs, a hold-screen mode, a graphics mode, and an alternate keypad mode that enables the numeric keypad to operate as a function keypad. Model 1552 also features programmable key switch audio feedback.

### COMPONENTS

CRT DISPLAY UNIT: A 12-inch (diagonal measurement) CRT screen with a viewing area 8.5 inches wide by 5.75 inches high. The display arrangement is 24 lines of 80 characters each for a total screen capacity of 1920 characters. The character set consists of 95 displayable symbols, including upper and lower case alphabets, numerics, and specials. Model 1552 also provides a set of 31 graphics symbols. Each character is formed within a 7-by-10 dot matrix. Data is displayed in white. The cursor is displayed as a block and alternates with a character when both occupy the same display position. Highlighting functions include full- or low-intensity in either normal or reverse video. ▶

## Hazeltine 1500 Series Display Terminals

➤ The reasons given by this user for purchasing the Hazeltine terminal were price performance and Hazeltine providing the shortest delivery time. Overall performance was rated as good.

A computer center for an eastern mid-city college has their series 1500 terminals at both local and remote sites. The remote stations are connected to the center's IBM 370 Model 145 mainframe via public telephone lines and transmit at a speed of 300 bits per second.

Used for interactive data entry, text editing, and program development, these terminals have been operating successfully for four years. The units are serviced through a third party, but have required little repair since installation. The user was impressed with the convenience of the keyboard and noted the old standby, "price/performance," as the decision maker in purchasing the Hazeltine terminals.

A state community college has two 1500's and two 1520's hardwired to its PDP/11-70 system. The terminals are utilized for interactive data entry and program development.

The user rated their performance as good, but felt that they are "limited in what they can do". The terminals were purchased on a state-wide contract and were chosen solely on their low price. The user would rather be using DEC VT-100, but said, "although the VT-100 is more versatile and provides more features, they are also a great deal more expensive than the 1500".

The final user we contacted was a firm which provides both municipal and medical data processing services. The terminals, numbering over 1,000, are utilized for interactive data entry, text editing and word processing, program development, and inter-business message traffic. The remote stations located at client installations are tied into the firm's IBM 370 Model 145 via public telephone lines.

The firm switched from their original Teleray terminals because of unacceptable service. Hazeltine was then chosen because they offered the lowest priced terminals at the time which filled the user's requirements.

The user has since stopped purchasing terminals from Hazeltine because of the high incidence of inoperability upon arrival. It seems that 20-30 percent of the terminals are inoperable when they arrive from Hazeltine. When the terminals which *were* operable when checked by the user, were then re-shipped to client locations, another 20-30 percent of the terminals were inoperable upon arrival. The user feels that the Hazeltine components are far too sensitive to external conditions.

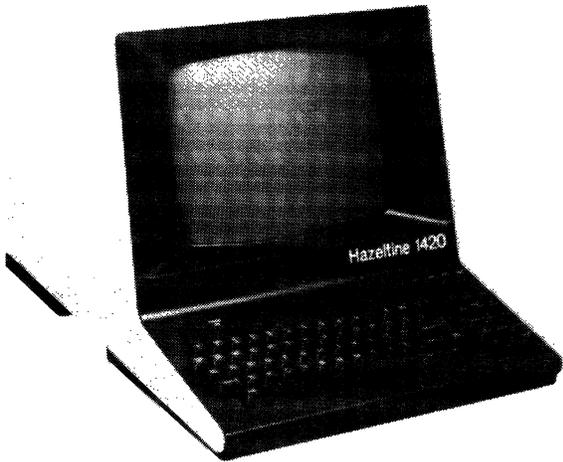
▶ **KEYBOARD:** A 58-key, typewriter-style, integral keyboard. The keyboard also includes a 12-key numeric keypad and a set of 4 function keys. The keyboard can generate any of 128 ASCII character codes.

### PRICING

The Hazeltine 1500 series terminals are available for purchase or on a one-, two-, or three-year full-payout lease. A separate maintenance contract is available for leased or purchased units. Maintenance is priced at \$17 (Model 1500) or \$20 (Models 1510, 1520, or 1552) per month per terminal. Quantity discounts are provided. End user prices are: Model 1500—\$1095; Model 1510—\$1195; Model 1520—\$1450; Model 1552—\$1500. For OEM prices are quantity discount, contact Hazeltine. Installations at the same location on the same day are priced at \$20 for the second unit and \$15 for each subsequent unit. ■



# Hazeltine 1410 and 1420 Display Terminals



The 1420 is a high quality, economy terminal designed to support small business systems using both data and word processing software. This TTY-compatible terminal features a typewriter-style keyboard with both upper and lower case characters.

## MANAGEMENT SUMMARY

The 1410 and 1420 Display Terminals are Hazeltine's economy models of microprocessor-driven CRT terminals. Both models feature a 12-inch display screen, integral keyboard with separate numeric keypad, and switch-selectable ASCII transmission at rates from 110 to 9600 bits per second.

The 1410 and 1420 were designed to fall into a marketing position below that of Hazeltine's 1500 series in respect to both cost and performance. The 1410 replaces the 1400 model which was the original "bare-bones" model. Because of the 1410's extremely low price, it is a viable teletype-compatible competitor.

The 1420 is an upgraded model of the 1410 featuring a typewriter-style keyboard with both upper and lower case characters, and 12 operator function keys. It also offers blink or non-display modes, high intensity, and column and field tabs.

Both the 1410 and 1420 use single-board construction and modular sub-assemblies for easy replacement. Their cooler operation is a result of using a small number of components. Terminals are shipped directly to the user, eliminating installation charges, and maintenance is performed at the factory level for defective components.

Salient features of both models include:

- Standard EIA RS-232-C interface.

Rock-bottom-priced, Teletype-compatible CRT display terminals.

Both models include a 1920-character screen, cursor sensing and addressing, 128 ASCII codes, separate numeric keypad, and switch-selectable transmission speeds ranging from 110 to 9600 bits per second.

The 1410 and 1420 models are priced at \$900 and \$995, respectively. Quantity discounts are provided for these user-installed terminals.

## CHARACTERISTICS

**VENDOR:** Hazeltine Corporation, Computer Terminal Equipment, Greenlawn, New York 11740. Telephone (516) 261-7000.

**DATA OF ANNOUNCEMENT:** Model 1410: 6/79; Model 1420: 6/79.

**DATE OF FIRST DELIVERY:** Model 1410: 9/79; Model 1420: 9/79.

**NUMBER DELIVERED TO DATE:** Both models under 10,000 each.

**SERVICED BY:** Hazeltine Corporation.

## MODELS

The 1410 and 1420 are stand-alone, Teletype-compatible display terminals featuring a 12-inch CRT screen, separate numeric keypad, and single logic board construction.

The 1410 provides a TTY-style keyboard layout. The 64 displayable characters are formed by a 5 x 7 dot matrix.

Model 1420 features a non-glare screen, 12 operator function keys, and a typewriter-style keyboard. The 94 displayable characters are formed by a 5 x 8 dot matrix. The 1420 also adds user-definable video presentation, hi/lo intensity, and Blink or Non-Display.

## TRANSMISSION SPECIFICATIONS

In both the 1410 and 1420, transmission is performed asynchronously in the half- or full-duplex mode at switch-selectable data rates of 110, 300, 600, 1200, 1800, 2400, 4800, and 9600 bits per second. The 10- or 11- unit, 8-level ASCII code is used. Odd or even parity, a space, or a mark is also switch-selectable. An RS-232-C interface is standard.

## DEVICE CONTROL

In both models, transmission is performed on a character-by-character basis as each character is keyed. Cursor addressing and sensing are standard features. The cursor can be spaced forward or backward or positioned at home via keyed or received commands. The keyboard can be locked or unlocked, the screen can be cleared, and a test pattern can be generated via a keyed or received command. Automatic

## Hazeltine 1410 and 1420 Display Terminals

- • A 1920-character screen.
- Displays all 128 ASCII codes.
- Self-diagnostics.
- Cursor sensing and addressing.
- Keyboard lock and unlock.
- Automatic line feed. □
- line feed is standard. Model 1420 also provides twelve function keys programmable by the operator via the keyboard.

### COMPONENTS

**CRT DISPLAY UNIT:** A 12-inch diagonal CRT with a display arrangement of 24 lines of 80-characters each for a

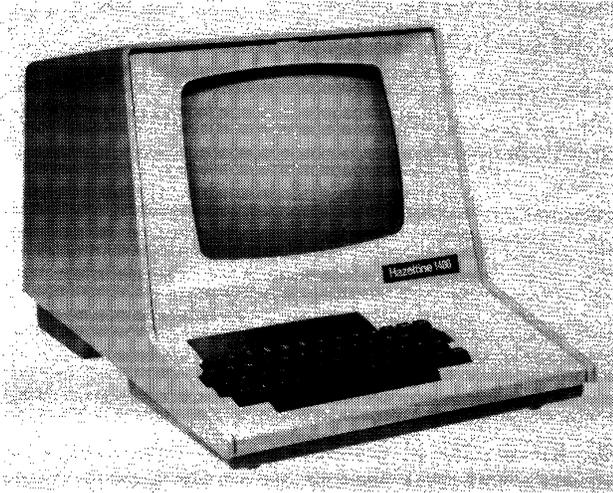
total display of 1920 characters. The Model 1410 has a standard ASCII character set of 64 upper case symbols which are formed using a 5 x 7 dot matrix. The Model 1420 displays an ASCII character set of 96 upper and lower case symbols using a 5 x 8 dot matrix. Each character is displayed in white (P4 phosphor). The cursor is displayed as a block in reverse video.

**KEYBOARD:** The Model 1410 keyboard uses an ANSI Standard bit paired TTY-style format. A separate numeric keypad in an adding-machine format is provided. The Model 1420 keyboard is a typewriter-style format. A separate 15-key numeric keypad includes (+), (-), and Enter. The twelve function keys are imbedded in the numeric keypad and are enabled by depressing a separate function key.

### PRICING

The Hazeltine 1410 and 1420 are available for purchase only at \$900 and \$995, respectively. Quantity discounts are provided. ■

# Hazeltine 1400 Display Terminal



## MANAGEMENT SUMMARY

Hazeltine's 1400 Display Terminal is the latest member of the vendor's economy line of low-priced display terminals. The microprocessor-based terminal features a 12-inch CRT screen and integral basic keyboard. The Hazeltine 1400 is a "bare-bones," cost-effective unit that falls in position below the Hazeltine 1500 with respect to cost/performance. As a Teletype-compatible terminal, however, its low price makes it a formidable competitor with similar terminals from other leading vendors. Quantity orders of 1000 units are priced at an astonishing \$550 per terminal. The Hazeltine 1400 uses single-board construction and modular sub-assemblies for easy replacement. Its potentially higher reliability and cooler operation than other terminals is a result of using a small number of components. Terminals are shipped directly to the user, eliminating installation charges, and maintenance is performed at the factory level for defective components. Salient features of the 1400 are:

- A 1920-character screen.
- High resolution display.
- Upper case displayable symbols.
- Cursor sensing and addressing.
- Eight selectable transmission rates from 110 to 9600 bps.
- Keyboard lock and unlock.
- Automatic line feed.
- Self-test.

Hazeltine plans overseas shipments in the fourth quarter of 1978. □

A rock-bottom-priced, Teletype-compatible display terminal.

Features include a 1920-character screen, cursor sensing and addressing, 64 display symbols, eight selectable transmission speeds, and keyboard lock/unlock.

The terminal is priced at \$850 in single-unit quantities. Quantity discounts are provided for these user-installed terminals.

## CHARACTERISTICS

**VENDOR:** Hazeltine Corporation, Computer Terminal Equipment, Greenlawn, New York 11740. Telephone (516) 549-8800.

**DATE OF ANNOUNCEMENT:** June 1978.

**DATE OF FIRST DELIVERY:** July 1978.

**NUMBER DELIVERED TO DATE:** Information not available.

**SERVICED BY:** Hazeltine Corporation.

## CONFIGURATION

The Hazeltine 1400 Display Terminal is a microprocessor-based stand-alone unit with 12-inch CRT screen and an integral Teletype-style keyboard. The unit features single logic board construction.

## TRANSMISSION SPECIFICATIONS

Transmission is performed asynchronously in the half- or full-duplex mode at switch-selectable data rates of 110, 300, 600, 1200, 1800, 2400, 4800, and 9600 bits/second. The 10- or 11-unit, 8-level ASCII code is used. Odd or even parity, a space, or a mark is also switch-selectable. An RS-232C interface is standard.

## DEVICE CONTROL

Transmission is performed on a character-by-character basis as each character is keyed. Cursor addressing and sensing are standard features. The cursor can be spaced forward or backward or positioned at home via keyed or received commands. The keyboard can be locked or unlocked, the screen can be cleared, and a test pattern can be generated via a keyed or received command. Automatic line feed is standard.

## COMPONENTS

**CRT DISPLAY UNIT:** A 12-inch (diagonal measurement) CRT with a display arrangement of 24 lines of 80 characters each for a total display capacity of 1920 characters. The standard character set consists of 64 upper case ASCII symbols. Each character is displayed in white (P4 phosphor) ▶

## Hazeltine 1400 Display Terminal

► and is formed via a 5-by-7 dot matrix. The cursor is displayed as a block in reverse video.

**KEYBOARD:** A 53-key, Teletype-style, integral keyboard. Key functions include Break, Clear, Line Feed, Return, Rub Out, Home, Escape, Shift, Control Shift, and Space. The keyboard can generate any of the 128 ASCII character codes.

### PRICING

The Hazeltine 1400 is currently available for purchase only and sells for \$850 in unit quantities. Quantity discounts are provided; in 1000-unit quantities, the Hazeltine 1400 is priced at \$550. Factory service is provided for these customer-installed terminals.■

## Hazeltine Executive 80 Series



*The Executive 80 Series offers a variety of configurations and is designed for data entry, data inquiry, systems control, software development, and other applications.*

### MANAGEMENT SUMMARY

Hazeltine entered the high-end TTY-compatible market in May 1980 with the introduction of the Executive 80 Series, a two-model family of intelligent terminals designed for both high performance and operator convenience.

The Executive 80 Series consists of two models, which are based on the Intel 8088 microprocessor. The Model 20 is a buffered conversational terminal providing an extensive set of video highlighting and formatting capabilities. The Model 30 is an editing terminal with additional features such as expanded function key capability, additional transmission modes, paging, and validation.

Both Executive 80 models are equipped with a 15-inch diagonal, yellow-green phosphor CRT that displays 2000 characters in a format containing 24 data lines of 80 characters plus a 25th status line. Characters are formed by a 7-by-10 dot matrix with lower-case descenders in a 9-by-12 window.

A 15-degree tiltable display is standard on the Model 30 and optional on the Model 20. Video attributes include high/low intensity, blink, reverse video, blank, and (on the Model 30 only) underline. Other display features include line drawing graphics, horizontal split-screen, monitor mode, and selectable cursor.

An Enhanced Video Option is available for both models. This provides 80/132 column selection; smooth scroll; and double-sized characters.

The typewriter-style keyboard features programmable function keys (eight for the Model 20, 16 for the Model 30), a 17-key numeric pad, and separate editing and control clusters. A detachable keyboard is standard on the Model 30 and optional on the Model 20.

As it has with past models, Hazeltine continues to place emphasis on the ergonomic features it has incorporated into its Executive 80 terminals. The detachable keyboard

Hazeltine's most sophisticated CRT display terminals.

The Model 20 is a buffered video display terminal with extensive highlighting and formatting features. The Model 30 is a multi-featured editing terminal with a detachable keyboard. Some of the standard features provided by both models of the Executive 80 Series include line drawing, status line display, programmable function keys, selectable data speed transmission up to 19,200 bits per second in half- or full-duplex mode, and horizontal split screen.

The Model 20 carries an end-user purchase price of \$1,595 and the Model 30 sells for \$1,815. Volume discounts are available.

### CHARACTERISTICS

**VENDOR:** Hazeltine Corporation, Computer Terminal Equipment, Greenlawn, New York 11740. Telephone (516) 261-7000.

**DATE OF ANNOUNCEMENT:** May 19, 1980.

**DATE OF FIRST DELIVERY:** February 1981.

**NUMBER DELIVERED TO DATE:** Approximately 2,000 Executive 80s.

**SERVICED BY:** Hazeltine, TRW, and Western Union.

### MODELS

The Executive 80 Series consists of two models:

- **Model 20**—A stand-alone CRT display terminal designed for the buffered or conversation environments. The units consist of a typewriter format keyboard with eight programmable function keys and a 17-key numeric keypad, and a 15" diagonal CRT display screen. The Model 20 can be equipped with an optional Auxiliary I/O Interface which permits the user to selectively turn a slave printer on and off via remote commands. A tiltable screen and detachable keyboard are both optional.
- **Model 30**—A stand-alone CRT display terminal designed for high-performance editing. The unit consists of a detachable keyboard with 16 programmable function keys and a 17-key numeric pad, and a 15" diagonal tiltable CRT display screen. The Model 30 provides an additional page of memory and four standard transmission modes. It can also be equipped with a 2K buffered printer interface.

Both models can be ordered with the Enhanced Video Option which provides the capability of displaying 3300 characters in a 132 column x 25 line format.

### TRANSMISSION SPECIFICATIONS

Asynchronous data transmission is performed at user-selectable speeds of 110, 300, 600, 1200, 2400, 4800, 9600 or

## Hazeltine Executive 80 Series

➤ can be moved to a position comfortable for the individual operator. The yellow-green display monitor, the tiltable screen, and the non-glare finish of the screen and casing lessen eye strain. The sculptured key caps and audible and tactile feedback are designed to promote more efficient and accurate keyboard entry. Built-in diagnostics aid in the location of failures, and plug-in circuit cards are designed for convenient component replacement.

The Executive 80 Series together with its new low-cost Esprit model and its older ASCII terminal offerings (Models 1410 and 1420, and the 1500 Series) continues to maintain Hazeltine's well-established position as a major vendor in the TTY-replacement marketplace, with over 100,000 ASCII terminals installed.

Hazeltine declined to supply Datapro with a list of users of the Executive 80 Series, and no Executive 80 Series users responded to our 1981 display terminal survey. As a result, no User Reaction section appears in this report. □

➤ 19,200 bits per second via a standard RS-232-C interface in either half- or full-duplex mode. Datasets utilized include 202 C/D/T, 212A, 102A, or equivalent. An EIA RS-422 or 20mA current loop interface is optional. Parity is switch-selectable; odd or even parity, a mark ("1") or space ("0") condition can be selected. One or two stop bits for each character generated by the terminal is also switch-selectable.

### DEVICE CONTROL

Both models of the Executive 80 Series operate in two basic modes of operation: Standard Transmission (Interactive Half- or Full-Duplex); or Batch Transmission (Forms, Line or Block Mode). These modes may be either switch-selectable or set and reset via remote command from the host computer.

When the unit is operating in either Half- or Full-Duplex Interactive mode, data that is keyed is sent directly to the computer and any editing or correction that takes place becomes a function of the computer program.

In the Forms, Line or Block mode, the data that is keyed is held in terminal memory until the operator chooses to transmit to the host computer. Editing can be performed by one line or several lines of data through the use of the cursor control and editing keys prior to transmission. After editing, data transmission can be initiated by the depression of the SEND key or receipt of the remote transmit command.

The cursor is controlled by five control keys: Left, Up, Right, Down and Home. The cursor can be displayed as a blinking underline or a block.

### COMPONENTS

**DISPLAY:** A 15-inch diagonal CRT (P146 phosphor) with a display format of 24 data lines of 80 characters each and a 25th status line for a total displayable capacity of 2000 characters. A tiltable screen is standard on the Model 30 and optional on the Model 20. Standard display features include high/low intensity, blink, reverse video, blank and underline.

A full 128 ASCII character set plus 28 continuous line and graphic characters are formed by a 7-by-8 dot matrix plus two lower case descenders in a 9-by-12 window.

An Enhanced Video Option displays 25 data lines of 132 characters each for a total of 3300 characters. Characters can be displayed either in standard size or double width, or double width/double height. This option also provides smooth scrolling.

**MODEL 20 KEYBOARD:** A typewriter format consisting of 75 alphanumeric and special character keys, eight program function keys, 18 editing and cursor control keys and a 17-key numeric keypad. A detachable keyboard can be obtained as an option.

**MODEL 30 KEYBOARD:** A detachable typewriter format unit consisting of 75 alphanumeric and special character keys, 16 programmable function keys, 18 editing and cursor control keys, and a 17-key numeric keypad.

All keys on both keyboard models except for clear, break, local, send print, page, function key, home, clear, unprotected, and insert character, when depressed for greater than 0.7 second, will cause the function of character to be repeated at a rate of 15 repetitions per second or at the transmission rate, whichever is slower. Each key also provides the operator with an audio click feedback.

Typematic and n key rollover are standard keyboard features. A European national character set is optional.

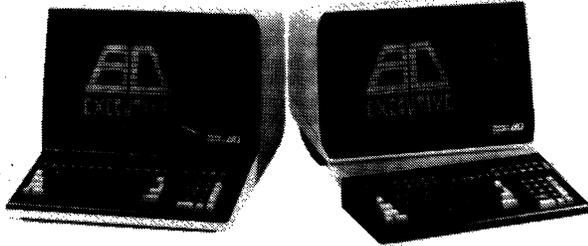
**AUXILIARY I/O INTERFACE:** Available as an option, it permits the user to selectively turn a slave printer on and off via four remote commands: On-Line Print, On-Line Print/Display, Exit On-Line Print, or Print All.

**PRINTER BUFFER:** Available as an option on the Model 30, it supports parallel and serial interfaces. Switches select parallel or serial operation speeds of 110, 300, 1200, 2400, or 9600 bits per second and automatic insertion of LF code. The terminal's logic will monitor the printer's busy line to ensure that data stored in the 2K buffer is transferred without loss to the printer.

### PRICING

The Hazeltine Executive 80 Series is available for purchase only. The end-user price for quantity one for the Model 20 is \$1,595 and for the Model 30, \$1,815. ■

# Hazeltine Executive 80 Series



Both models of the Executive 80's provide advanced technology along with a design specifically geared toward operator convenience and accurate keyboard entry.

## MANAGEMENT SUMMARY

Hazeltine has made its bid for the sophisticated TTY-replacement marketplace with the introduction of its new Executive Series 80. This new family of CRT display terminals is designed with both performance and operator convenience in mind. It offers a wide variety of configurations and options for data entry, data inquiry, systems control, software development and various other applications.

At present, the Executive 80 series consists of two models, which are based on the Intel 8080 microprocessor. The Model 20 is a buffered video display terminal providing an extensive set of video highlight and formatting capabilities. The Model 30 is an editing terminal with additional features such as expanded function key capability, additional transmission modes, paging, and validation.

Both models with the attached keyboard measure 15" high by 18 $\frac{5}{8}$ " wide by 23 $\frac{7}{8}$ " deep. The Model 30 with the optional detachable keyboard measures 15" high by 18 $\frac{5}{8}$ " wide by 15 $\frac{7}{8}$ " deep for the console, and 8 $\frac{1}{4}$ " deep for the keyboard.

The standard 12" diagonal, green/yellow phosphor CRT screen displays the full 128 ASCII character set in 24 data lines of 80 characters each with a 25th status line. An Enhanced Video option provides a 15" diagonal screen, smooth scroll, and selectively displays characters in normal font size in 80 or 132 column format. Characters are formed by a 7 by 8 dot matrix technique plus two lower case descenders in a 9 by 12 window. Double width and double height characters can also be displayed.

The typewriter style keyboard consists of eight to sixteen programmable function keys, plus a 17 key numeric pad. The Model 30 provides a no cost, optional detachable keyboard for operator convenience.

A line of sophisticated, microprocessor-based CRT display terminals designed to offer a wide variety of application configurations as well as convenient operating features.

The Model 20 is a buffered video display terminal with extensive highlighting and formatting features. The Model 30 is a multi-featured editing terminal with a detachable keyboard. Some of the standard features provided by both models of the Executive 80 series include line drawing, status line display, programmable function keys, selectable data speed transmission up to 19,200 bits per second in half- or full-duplex mode, and a horizontal split screen feature.

The Model 20 carries an end-user purchase price of \$1,295 and the Model 30 sells for \$1,695. Volume discounts are available.

## CHARACTERISTICS

**VENDOR:** Hazeltine Corporation, Computer Terminal Equipment, Greenlawn, New York 11740. Telephone (516) 549-8800.

**DATE OF ANNOUNCEMENT:** May 19, 1980.

**DATE OF FIRST DELIVERY:** None delivered with the exception of beta-test models.

## MODELS

The Executive 80 Series consists of two models:

- **Model 20** — A stand-alone CRT display terminal designed for the buffered or conversation environments. The units consist of a typewriter format keyboard with eight programmable function keys and a numeric keypad, and a 12" diagonal CRT display screen. The Model 20 can be equipped with an optional Auxiliary I/O Interface which permits the user to selectively turn a slave printer on and off via remote commands. A tiltable screen and detachable keyboard are both optional.
- **Model 30** — A stand-alone CRT display terminal designed for high performance editing. The unit consists of a detachable or attached keyboard with 16 programmable function keys and a numeric keypad, and a 12" diagonal tiltable CRT display screen. The Model 30 provides an additional page of memory and four standard transmission modes. It can also be equipped with a 2K buffered printer interface.

Both models can be ordered with the Enhanced Video Option which provides a 15" diagonal CRT screen capable of displaying 3300 characters in a 132 column x 25 line format.

## Hazeltine Executive 80 Series

- ▷ Data transmission is performed via a standard EIA RS-232-C interface or optionally via an EIA RS-449 or 20mA current loop interface. Asynchronous transmission speeds are selectable at 110 to 19,200 bits per second in a half- or full-duplex mode.

As are many of the CRT display vendors, Hazeltine is emphasizing "ergonomics" or operator comfort and convenience. The detachable keyboard can be moved to a position comfortable for the individual operator. The green display monitor, tiltable screen, and the non-glare finish of the screen are all geared toward less eye strain. The sculptured key caps and audible feedback are designed for operator convenience resulting in more efficient and accurate keyboard entry.

Some of the Executive 80 standard features include:

- Video highlighting.
- Line drawing.
- Horizontal split screen display.
- Programmable function keys, 8 in Model 20 and 16 in Model 30.
- Self-diagnostics.
- Multiple terminal status response to CPU inquiry.
- Multimode operation — interactive, local, block, and page (line and forms).
- Monitor Mode — displays all received characters including control codes which can be useful in debugging procedures.□

### ▶ TRANSMISSION SPECIFICATIONS

Asynchronous data transmission is performed at user-selectable speeds of 110, 300, 600, 1200, 4800, 9600 or 19,200 bits per second via a standard RS-232-C interface in either half- or full-duplex mode. Datasets utilized include 202 C/D/T, 212A, 102A, or equivalent. An EIA RS-449 or 20mA current loop interface is optional. Parity is switch-selectable; odd or even parity, a mark ("1") or space ("0") condition can be selected. One or two stop bits for each character generated by the terminal is also switch-selectable.

### DEVICE CONTROL

Both models of the Executive 80 series operate in two basic modes of operation: Standard Transmission (Interactive Half- or Full-Duplex); or Batch Transmission (Forms, Line or Block Mode). These modes may be either switch-selectable or set and reset via remote command from the host computer.

When the unit is operating in either Half- or Full-duplex in the Interactive mode, data that is keyed is sent directly to

the computer and any editing or correction that takes place becomes a function of the computer program.

In the Forms, Line or Block mode, the data that is keyed is held in terminal memory until the operator chooses to transmit to the host computer. Editing can be performed by one line or several lines of data through the use of the cursor control and editing keys prior to transmission. After editing, data transmission can be initiated by the depression of the SEND key or receipt of the remote transmit command.

The cursor is controlled by five control keys: Left, Up, Right, Down and Home. The cursor can be displayed as a blinking underline or a block.

### COMPONENTS

**CRT DISPLAY:** A 12-inch diagonal CRT with a display format of 24 data lines of 80 characters each and a 25th status line for a total displayable capacity of 2000 characters. A tiltable screen is standard on the Model 30 and optional on the Model 20. Standard display features include hi/lo intensity, blink, reverse video, blank and underline.

A full 128 ASCII character set including 96 alphanumeric, 19 continuous line and graphics, and 13 control characters are formed by a 7 by 8 dot matrix plus two lower case descenders in a 9 by 12 window.

An Enhanced Video Option displays 25 data lines of 132 characters each for a total of 3300 characters on a 15-inch diagonal display. Characters can be displayed either in standard size or double width, or double width/double height. This option also provides smooth scrolling.

**MODEL 20 KEYBOARD:** A typewriter format consisting of 75 alphanumeric and special character keys, eight program function keys, 17 editing and cursor control keys and a 17-key numeric keypad. A detachable keyboard can be obtained as an option.

**MODEL 30 KEYBOARD:** A detachable typewriter format unit consisting of 75 alphanumeric and special character keys, 16 programmable function keys, 18 editing and cursor control keys, and a 17-key numeric keypad. All keys on both models except for clear, break, local, send print, page, function key, home, clear, unprotected, and insert character, when depressed for greater than 0.7 second will cause the function of character to be repeated, at a rate of 15 repetitions per second or at the transmission rate, whichever is slower. Each key also provides the operator with an audio click feedback.

**AUXILIARY I/O INTERFACE:** Available as an option with the Model 20. It permits the user to selectively turn a slave printer on and off via four remote commands: On-Line Print, On-Line Print/Display, Exit On-Line Print, or Print All.

**PRINTER BUFFER:** Available as an option on the Model 30, it supports parallel and serial interfaces. The switches select parallel or serial operation speeds of 110, 300, 1200, 2400, or 9600 bits per second and automatic insertion of LF code. The logic will monitor the printers busy line to ensure that data stored in the 2K buffer is transferred without loss to the printer.

### PRICING

The Hazeltine Executive 80 Series is available for purchase only. The end-user price for quantity one (1) for the Model 20 is \$1,295 and for the Model 30, quantity one (1), end-user price is \$1,695.■