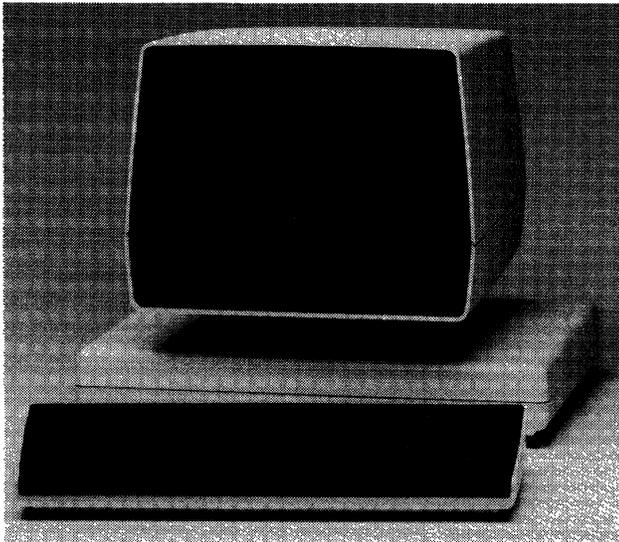


Zentec Series 8000 Intelligent Terminals



The Zentec Series 8000 Intelligent Terminals are modularly designed, consisting of a logic box, video module, and keyboard module. Model 8001 contains a 12-inch display, while Model 8002 contains a 15-inch display. Both models feature display tilt and swivel capabilities. Zentec terminals are easily customized to suit OEM and end-user needs.

MANAGEMENT SUMMARY

Zentec introduced the Series 8000 intelligent terminals in February 1981. The 8000 terminals feature a new modular design, an improvement over the design of the company's successful ZMS series of intelligent terminals. The 8000 terminals consist of three components: the logic box housing an Intel 8085A microprocessor; the video module, featuring either a 12-inch or 15-inch display; and the keyboard. The new design implements improved ergonomic features, including a ball and joint mechanism which connects the video module to the logic box, providing tilt and swivel capability for the display. The terminals also feature a movable keyboard.

The Series 8000 consists of two models: the 8001 and 8002. The 8001 features a 12-inch display, while the 8002 contains the 15-inch display. Both models are configured with 16K bytes of RAM as standard, with 64K bytes optionally available. Also available are 2K, 4K, 6K, 8K, 12K, or 16K bytes of user ROM or EPROM, providing additional flexibility. Synchronous or asynchronous interfaces are provided, and transmission is accommodated at speeds up to 19,200 bits per second.

Characters are displayed in green on both the 12-inch and 15-inch keyboards. Standard screen capacity is 2000 characters, arranged in 25 lines of 80 characters each (the 25th line displays system status information). A range of visual attributes (normal, dim, reverse, underscore, blink, blank, and double wide) are available as is split screen capability. The keyboard features a typewriter-style 

Modularly-designed intelligent display terminals for the OEM market.

Models are available featuring a 12-inch (8001) display and a 15-inch (8002) display. The terminals are configured with 16K bytes of RAM as standard, with 64K bytes optional. From 2K to 16K bytes of user ROM or EPROM is also available. The display features a screen capacity of 2000 characters, arranged in 24 lines of 80 characters each, plus a 25th line for status information.

The 8000 terminals consist of three modular components: the 8201 Logic box; the 8301 (12-inch) or 8302 (15-inch) Video Module; and the 8401 Keyboard Module. The display can be tilted or swiveled, and the keyboard is detached.

Purchase prices for the 8000 terminals begin at \$1,312 in quantities of 100.

CHARACTERISTICS

VENDOR: Zentec Corporation, 2400 Walsh Avenue, Santa Clara, CA 95050 Telephone (408) 727-7662.

DATE OF ANNOUNCEMENT: January 1981.

DATE OF FIRST DELIVERY: January 1981.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: Zentec and distributors.

MODELS

Two models are available, differing only in display screen size. Model 8001 contains a 12-inch (measured diagonally) display screen while Model 8002 contains a 15-inch display screen. Both models contain a logic box and a keyboard. The display module is connected to the logic box via a ball and joint mechanism, providing the display with tilt and swivel capabilities. The keyboard is detached.

TRANSMISSION SPECIFICATIONS

Transmission is performed asynchronously or synchronously, in half- or full-duplex modes. Asynchronous speeds are switch-selectable at 110, 150, 300, 600, 1200, 1800, 2400, 4800, 9600, and 19,200 bits per second. Synchronous speeds are externally clocked from 110 to 19,200 bits per second. Two communications ports are standard. The primary port can be selected as an RS-232-C or 20mA current loop interface. The secondary port can be RS-232-C only (asynchronous transmission only). Odd, even, or no parity can be selected. Character length is 7 or 8 bits.

DEVICE CONTROL

Terminal control is implemented via ROM/PROM-resident firmware. The 8000 terminals employ a list-driven display 

Zentec Series 8000 Intelligent Terminals

▷ format, is detached, and includes 16 program function keys providing a total of 32 separate functions when in shift mode.

Multiple printed circuit boards can be mounted in the logic box to form a stack. The 8000 terminals come equipped with a single PC board. Customers and OEMs can customize the terminals by adding their own PC boards or custom PC boards designed and supplied by Zentec.

Most end-users will not deal directly with Zentec, but with its distributors and OEMs. Zentec's direct customers include Western Union Data Services, RCA Service Company, and other major computing service organizations. □

▶ technique. This technique permits multiple independent data display windows to be constructed and manipulated. The display list points to the beginning address of each line to be displayed. Scrolling and paging can be performed in the forward or backward direction in both models. Both models also provide full cursor control, including up, down, left, right, and home.

The terminals provide a down-line program load routine by which user-created application programs can be received from a remote source, loaded in RAM memory, and executed.

A built-in, keyboard-initiated self-test routine is provided that verifies all system circuitry upon power-up. All memory and/or addressing failures are isolated and reported on the 25th line of the display.

The 8000 terminals are equipped with 16 general purpose program function keys; in shift mode, the 16 keys provide up to 32 separate functions. Visual attributes available on the 8000 terminals include: normal, dim, reverse, underscore, blink, blank, and double width characters (on a per row basis). Normally, these visual attributes take up a single (blank) space on the screen; optionally, visual attributes can be hidden off screen. Split screen capability is also available.

Teletype mode, a down-line loader, and a debugger are optionally available. All other device control firmware is customer-specified. Desired communications emulations are also customer-specified.

COMPONENTS

8201 LOGIC BOX: Standard on both the 8001 and 8002. Based on an Intel 8085A microprocessor, the logic box supplies 2K, 4K, 6K, 8K, 12K, or 16K bytes of user EPROM/ROM, and either 16K bytes (standard) or 64K

bytes (optional) of RAM. The logic box is equipped with one printed circuit board. Additional PC boards can be added by the customer or by Zentec.

8301 VIDEO MODULE: For the 8001. Contains a 12-inch (diagonal) display screen, capable of displaying 2000 characters arranged in 25 lines of 80 characters each. Characters are displayed in green (P31 phosphor); white or amber phosphor characters are optional. Characters are formed utilizing a 7-by-9 dot matrix in a 10-by-10 cell. The standard character set provides 128 ASCII symbols; a 224-symbol set is optional. The video module is connected to the logic via a ball and joint mechanism, giving the display module a tilt capability of ± 10 degrees (vertical to 20 degrees up), and a swivel capability of ± 30 degrees (from straight ahead).

8302 VIDEO MODULE: For the 8002. Contains a 15-inch (diagonal) display screen, capable of displaying 2000 characters arranged in 25 lines of 80 characters each. Characters are displayed in green (P31 phosphor); white or amber phosphor characters are optional. Characters are formed utilizing a 7-by-9 dot matrix in a 10-by-10 cell. The standard character set provides 128 ASCII symbols; a 224-symbol set is optional. The video module is connected to the logic box via a ball and joint mechanism, giving the display module a tilt capability of ± 10 degrees (vertical to 20 degrees up), and a swivel capability of ± 30 degrees (from straight ahead).

8401 KEYBOARD MODULE: Standard on both the 8001 and 8002. Includes a typewriter-style format and 103 keys, including a 14-key numeric pad, 12 special keys, cursor control grouping, and 16 program function keys (shiftable to 32 functions). The keyboard generates 96 ASCII upper- and lower-case characters. The keyboard module is detached, and connected to the logic box via a 4-foot coiled cord.

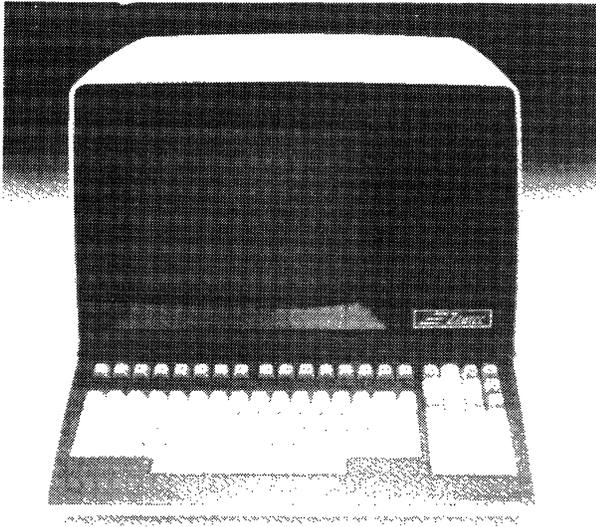
PRICING

The 8000 terminals are available on a purchase-only basis. Quantity discounts are available.

Typically, there are no installation charges, since the equipment is shipped to the customer and is unpacked and installed by the customer. Customer service is limited to factory repair/replacement of terminal components; no maintenance contract is available directly from Zentec.

Prices for the 8001 and 8002 terminals begin at \$1,312, in quantities of 100. Shipment is generally 30 days ARO. ■

Zentec ZMS Display Terminal Family



The ZMS 40 is Zentec's newest user-programmable terminal. Designed for the custom OEM and system builder, the ZMS 40 provides up to 32K bytes of RAM for display memory and user program storage. Standard software support includes only a system executive, a program loader, and self-diagnostics; all other terminal functions are implemented on a custom-order basis.

MANAGEMENT SUMMARY

The ZMS family is a series of display terminals designed for OEM and large end-user customers and currently consists of five models. The low end of the family, the ZMS 30 (dubbed the "Zephyr") is a non-user-programmable editing/formatting terminal (see Report # C25-950-101). The remaining four models are user-programmable and are the subject of this report. Each of these models is based on a microprocessor-controlled system bus architecture that permits implementation of various features and functions by plugging in appropriate printed circuit boards. The PC boards may contain standard Zentec ROM/PROMs or custom-specified firmware, depending on user requirements. In two models, the ZMS 70 and the ZMS 90, several PC board slots are left empty so that custom-specified boards may be added.

Two models, the ZMS 40 and the ZMS 50, are specifically oriented towards a host-driven environment. Each provides a 12-inch CRT screen and attached keyboard. The ZMS 50 comes with 4K bytes of RAM, expandable to 16K bytes; the ZMS 40 comes with 16K bytes of RAM, expandable to 32K bytes. Although either unit can be customized, the ZMS 40 is more totally oriented towards customization and offers a minimum of standard operating software. The ZMS 50 can be equipped with Zentec's text editor and/or forms generation firmware. Programs must be downline loaded from the host on both models. The newer ZMS 40 offers significantly improved price/performance when compared to the ZMS 50, and can be ➤

A series of four user-programmable display terminals aimed at the OEM and custom systems market.

Terminal specifications vary widely depending on the model and options selected, and any model can be enhanced to include custom-specified functions. Features include a 12-inch or 15-inch CRT display, a typewriter-style keyboard with 12 or 16 program function keys, 4K to 64K of RAM, and a 128- or 256-character displayable character set. Standard software support includes a basic system executive, a self-test routine, and a program loader. Support for the CP/M operating system is provided for diskette-based systems.

The ZMS terminals are available from Zentec on a purchase-only basis. The basic ZMS 70, a semi-packaged system that comes closest to an "off-the-shelf" model and includes a 15-inch display, a detached keyboard, two integral minidiskette drives, and the CP/M operating system, is priced at \$5,695. Quantity discounts are available.

CHARACTERISTICS

VENDOR: Zentec Corporation, 2400 Walsh Avenue, Santa Clara, California 95050. Telephone (408) 246-7662.

DATE OF ANNOUNCEMENT: ZMS 50, 70 & 90—March 1978; ZMS 40—March 1980.

DATE OF FIRST DELIVERY: ZMS 50 and 70—July 1978; ZMS 90—October 1978; ZMS 40—October 1980.

NUMBER DELIVERED TO DATE: 8000.

SERVICED BY: Zentec and third party.

MODELS

The Zentec ZMS family of stand-alone display terminals consists of the following programmable members:

- **Model ZMS 40**—An entry-level programmable terminal equipped with a 12-inch CRT screen, an attached keyboard, an Intel 8085A microprocessor, and an RS-232-C/current loop communications interface. The ZMS 40 is totally oriented towards the custom OEM and systems builder and provides only a minimum of standard operating features. The basic ZMS 40 comes with 16K bytes of RAM, expandable to 32K bytes, which is used for display memory and user program storage, and 2K bytes of ROM or PROM, expandable to 16K bytes, which is used to store the ZMS 40 system executive, a self-test routine, and a program loader. All other firmware routines are implemented on a custom-order basis. User application programs are loaded downline from the host for execution. ➤

Zentec ZMS Display Terminal Family

► configured to provide all ZMS 50 capabilities (plus some additional ones) at a lower price.

The ZMS 70 is a semi-packaged system capable of stand-alone or distributed processing and provides a 15-inch CRT screen, detachable keyboard, and dual integral minidiskette drives. It features 16K to 64K bytes of RAM and can support a second free-standing dual minidiskette unit. Each minidiskette can store up to 268K bytes of data, for a system maximum of just over one megabyte. Zentec provides the CP/M operating system, a product of Digital Research, for use with the ZMS 70. This popular software package is widely used with many small business and personal computers and numerous CP/M-based programs are available through Digital Research, distributors, and custom software houses (Zentec itself only supports the basic CP/M operating system).

At the top of the ZMS line, the ZMS 90 represents the largest and most flexible of the ZMS products. It provides a 15-inch CRT screen, detachable keyboard, and 16K to 64K bytes of RAM. Like the ZMS 40, the ZMS 90 is totally custom-oriented and provides a minimum of standard operating software. Although no mass storage or other peripherals are standard, the ZMS 90 can handle more peripherals than any other ZMS product, including either 8-inch (standard) or 5¼-inch (mini) diskette units.

The ZMS terminals are available from Zentec on a purchase-only basis, and although price discounts are available, large contracts are frequently negotiated on an individual basis. Because of the nature of their customer base, Zentec offers no leasing plans, no maintenance contracts, and no field service organization. Customer service is limited to factory repair/replacement of terminal components, and purchase of spare parts is recommended.

Most of the ZMS terminals, including the ZMS 40, 50, and 90, are marketed as custom-specified units. Although it does not plan to eliminate this made-to-order equipment orientation, Zentec is slowly moving towards offering more standardized products. Two ZMS models, the Zephyr (ZMS 30), introduced in December 1979, and the CP/M-based ZMS 70 are currently available "off-the-shelf", and a third standardized model is expected to be released in 1981.

Most ZMS end-users will not deal directly with Zentec, but with its distributors and OEMs. Zentec's direct customers include Western Union Data Services, RCA Service Company, and other major computing service organizations. RCA Service Company, for example, leases, sells, and maintains a base of approximately 1000 ZMS terminals, which are ordered from Zentec on a custom-specified basis and configured to end-user requirements by RCA.

Because of the OEM nature of this product line, we have received no responses from Zentec ZMS users for Datapro surveys on either alphanumeric displays or user-programmable terminals. Zentec did provide us with the ►

► A second RS-232-C interface is optionally provided for connection of a customer-supplied printer or other peripheral device.

- **Model ZMS 50**—An entry-level programmable terminal equipped with a 12-inch CRT screen, an attached keyboard, an Intel 8080A microprocessor, and an RS-232-C communications interface. Although the ZMS 50 is provided with some standard features and basic options, it can be enhanced to include custom-specified functions. The basic ZMS 50 comes with 4K bytes of RAM, expandable to 16K bytes, which is used for display memory and user program storage, and 2K bytes of ROM or PROM, expandable to 8K bytes, which is used to store the ZMS 50 system executive, self-test routine, program loader, and other firmware routines. Optional firmware available through Zentec includes a text editor and a forms generation package. User application programs are loaded downline from the host for execution. An RS-442/449 communications interface or 20 mA current loop interface can optionally be substituted for the standard RS-232-C interface. A second RS-232-C interface is optionally provided for connection of a customer-supplier printer or other peripheral device, and requires the 16K-byte RAM option.

- **Model ZMS 70**—An expanded terminal equipped with a 15-inch CRT screen, a detachable keyboard, dual integral minidiskette drives, an Intel 8080A-1 microprocessor, and an RS-232-C communications interface. The ZMS 70 is a semi-packaged system that is generally marketed "off-the-shelf"; however, as with all Zentec terminals, it can be modified to meet special customer requirements. The basic ZMS 70 comes with 2K bytes of ROM or PROM, expandable to 12K bytes, and 16K bytes of user-addressable RAM, expandable to 32K, 48K, or 64K bytes (minus ROM/PROM capacity). The integral disk controller can optionally support an additional free-standing dual-drive minidiskette unit. Each minidiskette can store up to 268K bytes of data. An optional RS-442/449 communications interface or 20 mA current loop interface can optionally be substituted for the standard RS-232-C interface.

Three empty logic card slots are available to house printed circuit boards for additional peripheral and communications interfaces, memory expansion, and custom electronics provided by Zentec or the customer. Peripheral interface options include an RS-232-C interface for connection of a customer-supplied printer or other peripheral device, or a Qume- or Centronics-compatible parallel printer interface. Zentec also provides complete printer subsystems, consisting of a Qume 30- or 45-cps correspondence-quality printer or a Centronics 165- or 330-cps matrix printer, printer stand, and power supply. Specialty data communications interfaces are also capable through Zentec.

Zentec provides the CP/M operating system, a product of Digital Research, for use with the ZMS 70. Programs may be loaded from the keyboard, minidiskettes or downline from the host.

- **Model ZMS 90**—An expanded terminal equipped with a 15-inch CRT screen, a detachable keyboard, an Intel 8080A-1 microprocessor, and an RS-232-C communications interface. Like the ZMS 40, the ZMS 90 is totally oriented towards the custom OEM and systems builder and provides only a minimum of standard operating features. The basic ZMS 90 comes with 2K bytes of ROM or PROM, expandable to 12K bytes, and 16K bytes of user-addressable RAM, expandable to 32K, 48K, or 64K bytes (minus ROM/PROM capacity). An RS-442/449 communications interface or a 20 mA current loop interface can optionally be substituted for the standard RS-►

Zentec ZMS Display Terminal Family

► company names of several of their direct end-user customers, including the L.A. Times Mirror, Lockheed Aerospace, Ford Aerospace, and McAuto, but were not able to supply us with a list of user representatives from these companies that we could contact. Therefore, no User Reaction section is included in this report. □

► **232-C interface.** Five logic card slots (two more than provided by the ZMS 70) for peripheral and communications interfaces, memory expansion, and custom electronics. Although the ZMS 90 is not equipped with the integral minidiskette drives of the ZMS 70, it can support any of the peripherals and interfaces available with the ZMS 70, including the free-standing dual minidiskette subsystem, the printer subsystems, and printer and communications interfaces. Zentec also provides a free-standing dual-drive 8-inch diskette subsystem for use with the ZMS 90, and a diskette subsystem interface.

Standard software consists of a system executive that controls basic terminal functions, a self-test, and a program loader. All other software is implemented on a custom-order basis. Programs may be loaded from the keyboard, diskette, or downline from the host. For ZMS 90 systems configured with diskette, the CP/M operating system is available for customers who do not wish to provide their own control program.

TRANSMISSION SPECIFICATIONS

Transmission is performed asynchronously, synchronously, or is synchronously in the half- or full-duplex mode at 110, 150, 300, 600 (ZMS 40 only), 1200, 1800, 2400, 3600 (ZMS 40 only), 4800, 9600, or 19,200 bits/second. The data rates are switch-selectable on the ZMS 40 and 50 and programmable on the ZMS 70 and 90. Block or character mode transmission is selectable. The 8-level, 10- or 11-unit ASCII code is standard, but other word lengths and code structures are programmable. Odd, even, or no parity is switch- or program-selectable. The ZMS 50, 70, and 90 are equipped with a standard RS-232-C communications interface, for which an RS-442/449 or current loop communications interface may optionally be substituted. The ZMS 40 is equipped with a combination RS-232-C/current loop connector, which provides either type of interfacing (but not simultaneously). In addition to the basic interface, the ZMS 70 and 90 can also be equipped with a variety of specialty interfaces, including a second single RS-232-C interface, a dual asynchronous RS-232-C interface, a dual asynchronous RS-232-C and current loop interface, and a synchronous RS-232-C interface.

DEVICE CONTROL

Terminal control is implemented via ROM/PROM-resident firmware in the ZMS 40 and 50 and by the CP/M operating system executive in the ZMS 70; depending on its configuration, the ZMS 90 system executive may be ROM/PROM- or diskette-resident. All models employ a list-driven display technique that scrolls through the terminal's entire RAM memory (minus that portion reserved for the list) in the sequence defined by a user-created software list; the list points to the beginning address of each line to be displayed. Scrolling and paging can be performed in the forward or backward direction in all models. All models also provide full cursor control, including up, down, left, right, and home.

The terminals provide a program load routine by which user-created application programs can be received from a remote source, loaded in RAM memory, and executed. On the ZMS 70 and appropriately equipped ZMS 90, programs may also be loaded locally from the keyboard or diskette.

All models also provide a built-in keyboard-initiated self-test routine that verifies all system circuitry upon power-up. All

memory and/or addressing failures are isolated and reported on the 25th line of the display.

The ZMS 50 is equipped with 12 program function keys; the ZMS 40, 70, and 90 each have 16 PF keys. Each key provides the capability for two functions via the shift function. The Mode function key switches among different sets of assigned key functions for the program function keys.

Except for the ZMS 50, all other device control firmware is custom-specified.

Optional firmware for the ZMS 50 includes a Text Editor and Forms Generator. The Text Editor mode provides scrolling and paging; line insertion; character, line, or block deletion; partial or full line or screen erasure; tabulation (tab set and clear, tab forward, and tab backward); and capability to define block length, to move, copy or cancel blocks, and to mark the end of a paragraph. Complete forward or reverse word wraparound is provided. Text Editor functions are executed via the terminal's program function keys. The Forms Generate mode provides forms definition and screen-prompted entry/validation functions. Protected characters and fields can be created and highlighted via attribute codes that define underline, reverse video, blinking, blanking, and half intensity. When operating in block mode, complete operator-defined blocks or unprotected fields only may be transmitted. Functions provided in Form Generate mode are initiated via Escape sequences.

Other ZMS 50 firmware functions, such as cursor addressing, keyboard enable/disable, printer on/off, character-by-character or block transmission, etc., are initiated in response to commands received from the host or keyed by the terminal operator.

SOFTWARE

Zentec provides Digital Research's popular CP/M operating system for use with the ZMS 70; for customers who want it, CP/M is also available for diskette-based ZMS 90 systems. The CP/M package consists of a basic I/O system, a disk-oriented operating system, a command processor, and a series of optional editing, assembly, and debugging tools. Numerous CP/M-based programs, including COBOL, BASIC, and FORTRAN compilers, program development packages, utilities, and applications packages, are available from Digital Research, Zentec's distributors, and independent software firms (Zentec itself provides only the basic CP/M control program).

COMPONENTS

ZMS 40 and 50 DISPLAY UNIT: A 12-inch (diagonal measurement) CRT screen with a viewing area 5.5 inches high by 8.25 inches wide. The display arrangement is 24 lines of 80 characters each, plus a 25th line for status and control information. Characters are displayed in white (P4 phosphor) on a dark background; optionally, on the ZMS 40 only, green characters (P39 phosphor) may be selected. A 128-character user-defined, firmware-encoded character set (typically ASCII) is displayable; optionally up to 256 characters can be displayed. Characters are formed by a 7-by-9 dot matrix in a 10-by-10 dot field. Double width characters may be displayed. Highlighting includes dual intensity, blinking, underscore, blanking, and reverse video attributes.

ZMS 70 and 90 DISPLAY UNIT: A 15-inch (diagonal measurement) CRT screen with a viewing area 8 inches high by 11 inches wide. The display arrangement is 24 lines of 80 characters each, plus a 25th line for status and control information. Characters are displayed in white (P4 phosphor) on a dark background; optionally P31 or P39 phosphor may be selected. A 128-character user-defined character set (typically ASCII) is displayable; characters are defined at the

Zentec ZMS Display Terminal Family

► keyboard using the terminal's character generator software. Optionally, up to 256 characters can be displayed. Characters are formed via a 10-by-8 dot matrix in a 10-by-10 dot cell, permitting contiguity of user-defined horizontal line drawing characters. A half-dot shift permits higher density 10-by-16 dot matrix characters to be displayed within the space provided by the character cell. Double width characters may also be displayed. Highlighting includes dual intensity, blinking, underscore, blanking, and reverse video attributes.

ZMS 40 KEYBOARD: An attached typewriter-style keyboard that consists of a 61-key main keygroup, a 12-key cursor/control cluster, a 14-key numeric pad, and 16 program function keys. The keyboard generates a 128-character (or, optionally, 256-character) firmware-encoded character set.

ZMS 50 KEYBOARD: An attached typewriter-style keyboard that consists of a 61-key main keygroup, a 12-key cursor/control cluster, and 12 program function keys. The keyboard generates a 128-character (or, optionally, 256-character) firmware-encoded character set.

ZMS 70 AND 90 KEYBOARD: A detachable typewriter-style keyboard that consists of a 61-key main keygroup, a 12-key cursor/control cluster, an 11-key numeric pad, and 16 program function keys. The keyboard generates a 128-character (or, optionally, 256-character) user-defined character set; characters are defined using the terminal's character generator software.

MINIDISKETTE STORAGE: The dual-drive minidiskette unit (currently a Micropolis 1015 Model 2) comes in integral or free-standing versions. The integral drives are a standard feature of the ZMS 70 and are housed to the right of the screen. The free-standing drives are attached to the ZMS 70 via the integral drives' controller and to the ZMS 90 via the diskette subsystem interface option. Each drive accommodates a single-sided, double-density 5¼-inch minidiskette. The minidiskette is organized into 77 tracks, each of which contains 26 128-byte sectors. The formatted storage capacity is 268K bytes per diskette. The average rotational delay (latency) is 100 milliseconds. Positioning time is 40 milliseconds track-to-track and 463 milliseconds average. Head settling and load times are 10 and 75 milliseconds, respectively. The data transfer rate is 15,625 bytes per second.

DISKETTE STORAGE (ZMS 90 ONLY): The optional dual diskette drive subsystem (currently including a Shugart SA 3800) consists of a controller, power supply, and dual diskette drives housed in a desk-top cabinet. Each drive accommodates a single-sided, single-density 8-inch diskette.

The subsystem provides compatibility with the IBM 3740 and a total on-line storage capacity of 500,000 bytes. Data is organized into 77 tracks consisting of 73 data tracks, 3 spare tracks, and 2 index tracks. The standard IBM 3740 format divides each track into 26 sectors of 128 bytes each (except for index sectors which contain 80 bytes each). Diskette rotation is 360 rpm with a resultant average rotational delay of 83 milliseconds. Positioning time is: track-to-track—10 milliseconds; average—250 milliseconds. Head settling time is 8 milliseconds. Data is transferred at 31,250 bytes/second. The diskette unit is attached to the ZMS 90 via the diskette subsystem interface option.

SERIAL PRINTERS: Printers available through Zentec for the ZMS 70 and ZMS 90 include the Qume 30-/45- cps (switchable) full-character printer and Centronics 101, 102, and 103 matrix printers; the 101 and 103 printers operate at 165 cps; the 102, at 330 cps. All printers provide 132 print positions. The Centronics printers provide spacing of 10 char./inch at 6 lines/inch vertically and provide a character set of 64 standard or 128 optional print symbols. The Qume printer provides spacing of 10 or 20 char./inch at 6 or 8 lines/inch vertically and provides a character set of 96 print symbols. The Qume printer is equipped with interchangeable print wheels to permit changed type styles. Friction feed is standard with the Qume printer; pin and adjustable tractor feed is optional. Pin feed is standard with the Centronics printers. The Zentec parallel printer interface is required to attach the printer to the terminal.

PRICING

The ZMS terminals are available from Zentec on a purchase-only basis. Quantity discounts are available. Typically, there are no installation charges, since the equipment is shipped to the customer and is unpacked and installed by the customer. Customer service is limited to factory repair/replacement of terminal components; no maintenance contract is available directly from Zentec. Zentec provides the following end-user and OEM quantity discounts:

Quantity Taken During 12-Month Period	Discount
1	0%
2 to 24	10
25 to 49	15
50 to 99	20
100 to 249	25
250 and up	Negotiated

	List Purchase Price*
ZMS 40; basic terminal with 16K-byte RAM memory RAM Increment; 12K bytes; max. 1 per terminal Second 128-Character Set RS-232-C/Printer Interface; provides one additional serial asynchronous RS-232-C I/O port	1,695 250 Contact vendor** 240
ZMS 50; basic terminal with 4K-byte RAM memory RAM Increment; 12K bytes; max. 1 per terminal Second 128-Character Set RS-442/449 Interface; in lieu of standard RS-232-C interface Current Loop Interface; in lieu of standard RS-232-C interface RS-232-C/Printer Interface; provides one additional serial asynchronous RS-232-C I/O port	2,395 500 425** Contact vendor 50 395
ZMS 70; basic terminal with 16K-byte RAM memory and integral dual mini-diskette drives	5,695
ZMS 90; basic terminal with 16K-byte RAM memory	3,900

*All prices include software support.

**Includes microcoded chip only. Development of custom character sets requires an additional one-time engineering charge. Custom keyboard layouts, keycap sets, and other related hardware are also available. Contact Zentec for pricing.

Zentec ZMS Display Terminal Family

**List
 Purchase
 Price***

ZMS 70/90 Options

Character Set Storage; for second 128-character set	300**
RAM Increments:	
16K bytes; max. 1 per terminal	300
32K bytes; max. 1 per terminal	1,000
RS-442/449 Interface; in lieu of standard RS-232-C interface	Contact vendor
Current Loop Interface; in lieu of standard RS-232-C interface	Contact vendor
Single Asynchronous Interface; provides one additional serial asynchronous RS-232-C I/O port	450
Dual Asynchronous Interface; provides two additional serial asynchronous RS-232-C I/O ports	800
Dual Asynchronous Interface; provides one additional serial asynchronous RS-232-C I/O port plus one 20 mA current loop interface	800
Single Synchronous Interface; provides one synchronous RS-232-C I/O port	450
Parallel Printer Interface; for connection of printer subsystem or customer-supplied parallel printer	875
Diskette Subsystem Interface; for ZMS 90 only; required for connection of diskette or minidiskette subsystem	1,550

ZMS 70/90 Peripherals

Printer Subsystem; includes 30-cps full-character printer, controller, printer stand, power supply, interface, and cable	4,050***
Minidiskette Subsystem; free-standing dual-drive unit; 268K bytes of storage per drive; attaches to ZMS 70 via integral minidiskette controller; requires Diskette Subsystem Interface for attachment to ZMS 90	Contact vendor
Standard-Diskette Subsystem; for ZMS 90 only; free-standing dual-drive unit; 500K bytes of total storage; requires Diskette Subsystem Interface	5,200***

*All prices include software support.

**Includes microcoded chip only. Development of custom character sets requires an additional one-time engineering charge.

Custom keyboard layouts, keycap sets, and other related hardware are also available. Contact Zentec for pricing.

***Nondiscountable costs for the printer and diskette subsystems are \$2,200 and \$4,000, respectively. ■

Zentec 9003 Microcomputer Terminal System



MANAGEMENT SUMMARY

Zentec introduced itself to the alphanumeric display terminal market in mid-1974 when it unveiled its initial product, the Zentec 9002, which was one of the earlier microprocessor-based terminals in the industry. Full production deliveries of the 9002 began the following June (1975). The 9003, unveiled in July 1975, is essentially an upgraded 9002 with a more powerful microprocessor (an Intel 8080 instead of the 9002's Intel 8008) and added software. About 3500 of the 9002's and 9003's have been delivered to date. Zentec's market thrust is primarily to the OEM market, but it also encourages large end-user sales. All maintenance is performed by Zentec and by users.

The Zentec 9003 terminal is highly modular and provides extensive operating flexibility. Memory ranges from a minimum of 6K bytes to 64K bytes and is composed of ROM, PROM, and RAM memories arranged according to user requirements. A maximum of 40K bytes of RAM is available for user applications when diskette and printer subsystems are added. The microprocessor can accommodate a host of peripheral devices via its data bus, including diskette drives, cassette tape units, printers, industry-compatible magnetic tape drives, disk drives, etc. These devices can be attached via an increasing variety of Zentec device interfaces. Zentec currently offers several models of serial impact printers, a line printer, and a diskette subsystem that includes two diskette drives. Several data communications options are available. Compatibility with IBM's SDLC communications protocol is currently available, in addition to differential and loop current interfaces.

The striking difference between the Zentec terminal and many other microprocessor-based terminals is that the Zentec 9003 is truly user-programmable. Zentec-supplied software enables the user to create application programs ➤

A user-programmable, general-purpose alphanumeric display terminal with a text editing option.

Standard features include microprogram control, selectable transmission rates to 9600 bps, block or character transmission, full editing, display enhancements, format creation and formatted operation, application program modes, and a numeric keypad. Options include up to 64K bytes of memory, dual diskette drives, serial or line printers, block transfer, Teletype interface, paging and scrolling, a second processor, and several software options.

The basic stand-alone terminal is priced at \$3,900. A typical configuration including dual diskette drives and a printer subsystem with the minimum 6K bytes of memory paging and required software increase the basic terminal price to about \$14,500. Liberal quantity discounts are available.

Zentec's market is almost exclusively OEM, although sales are also directed to large end-users.

CHARACTERISTICS

VENDOR: Zentec Corporation, 2400 Walsh Avenue, Santa Clara, California 95050. Telephone (408) 246-7662.

DATE OF ANNOUNCEMENT: July 1975.

DATE OF FIRST DELIVERY: July 1975.

NUMBER DELIVERED TO DATE: About 3000 Zentec 9003 Terminals.

SERVICED BY: Zentec and third party.

CONFIGURATION

The basic 9003 Microcomputer Terminal System is a stand-alone terminal with detachable keyboard. The basic terminal contains 7 slots within its logic library; 4 are available for options. I/O options include a 30-cps impact printer, a 300-lpm line printer and a dual diskette drive, housed within a desk unit, that is used to support the display terminal as an operator station. Each peripheral requires one option slot. The 9003 terminal contains an Intel 8080 microprocessor with up to 64K (65,536) bytes of memory for microprogram and data storage. Memory consists of various combinations of ROM (Read-Only Memory), PROM (Programmable ROM), and RAM (Random Access Memory). RAM memory modules are available in increments of 2K, 4K, 6K, 8K, 12K, 16K, and 32K bytes. Each RAM module (except the 2K-byte option) requires one ➤

Zentec 9003 Microcomputer Terminal System

▷ and to store them at the host computer or the optional diskette storage facility that provides a total on-line capacity of 500K bytes.

The diskette subsystem with a minimum of 6K bytes of RAM is a requirement for user programmability. All software options reside on diskette, including the Zentec Assembly Method (which includes the assembler, editor, relocatable loader, and catalog), the Disk Catalog, and the Debug Program. Application programs are written in Zentec Assembly Method (ZAM) using hexadecimal notation. However, a macro assembler and compiler are in the works. A set of more than 40 closed subroutines designed for basic system operation is also provided for application programming.

Programming can be performed on a machine language level with the Zentec Interrogation Module (ZIM), a firmware option. However, this method is not recommended for any significant amount of programming. It can be used to some degree to develop small routines and for software debugging.

Other significant firmware options include the Expanded Text Editor, which is designed for text editing and word processing applications, and TCOM-IV, which supports teleprinter operation to 9600 bps.

Other key options include Mercury Move, which transfers a block of data from one memory location to another, and the second 2K bytes of display memory, which supports paging and scrolling features. The feature can be used to scan, edit, or perform data entry on a file of sequential pages.

The Zentec 9003 with its hardware, firmware, and software options is an attractive package that offers a high degree of performance and operating flexibility, and can be geared to virtually any user environment. And Zentec plans to expand its support with additional software in the future.

USER REACTION

Datapro interviewed five users who reported on their experience with a total of 147 Zentec 9003 terminals. Their ratings are summarized as follows:

	Excellent	Good	Fair	Poor	WA*
Overall performance	4	1	0	0	3.8
Ease of operation	3	2	0	0	3.6
Display clarity	2	3	0	0	3.4
Keyboard feel & usability	3	2	0	0	3.6
Hardware reliability	2	2	1	0	3.2
Maintenance service	**	**	**	**	**
Software & technical support	1	4	0	0	3.2

*Weighted Average on a scale of 4.0 for Excellent.

**Maintenance service was being performed by each of the interviewed users.

These well-satisfied users cited low cost, flexibility, and programmability as key advantages of the Zentec ▷

▷ option slot. The basic microprogram (firmware) requires 2560 bytes of ROM/PROM (which can include up to 10,250 bytes of storage). The basic display memory occupies 2K bytes of RAM; a second 2K-byte segment can be added to store two pages simultaneously.

COMMUNICATIONS

Transmission is performed in the half- or full-duplex mode either character-by-character (as each character is keyed) or by block. The standard communications interface is asynchronous and is designed for point-to-point transmission. The data transmission rate is switch-selectable at 110, 300, 1200, or 2400 bits/second; rates of 4800 or 9600 bps can be specified in place of the 2400 bps rate as a no-cost option.

A half-duplex synchronous interface that supports data rates up to 20,000 bits/second is optional.

An RS-232C interface is standard with asynchronous or synchronous operations. The asynchronous interface can be equipped with an optional 20 or 60 ma dc current loop interface in place of the standard RS-232C interface as an option.

The transmission code is 8-level ASCII, including odd, even, or no parity (switch-selectable). For asynchronous transmission, the unit code structure is 10 or 11 bits per character including one start bit and one or two (at 110 bps) stop bits. The unit code structure is 8 bits/character for synchronous transmission.

The standard asynchronous interface is compatible with Bell System 103, 113, and 202 series modems. For synchronous operation, Bell System 201, 208, and 209 series modems or equivalent modems from independent vendors can be used.

TCOM-IV, a firmware option, supports the terminal as a teletype teleprinter at asynchronous rates up to 9600 bps.

DEVICE CONTROL

The Zentec 9003 is an interactive, stand-alone terminal that features as its nucleus a microprogram-controlled microprocessor that executes all terminal operations. The microprograms (firmware) reside in ROM and PROM and include the Executive Firmware, supplied with the basic terminal, and any of several microprogram options, which are defined in the Software section of this report. The Executive Firmware supports basic terminal operations involving keyboard and display functions, provides basic text and forms handling functions, supports user-created programs, and serves as a base for extending the system capabilities with supplemental programs.

The terminal communicates with the operator via the 25th display line on the CRT screen. The operator is alerted to operating mode and program and is directed via displayed messages that can be implemented via program or received from the host computer or another terminal. A special 16-character "Wake Up" sequence can be transmitted from the host computer and displayed on the 25th line when the terminal is in the off-line mode.

The Executive Firmware provides nine operating modes: Control, Edit, Form, Form Generation, Disk IPL, Self Test, and 3 user-defined Program modes.

The Control mode is an entry/exit mode for all other modes.

Data is keyed in the Form mode and altered in the Edit mode. These off-line operating modes are used in conjunction with one another, and keyboard entry provides selection ▷

Zentec 9003 Microcomputer Terminal System

▷ terminals. Negative comments were few and relatively insignificant. One user felt that a pedestal-mounted display would be more convenient. Another user commented that the keyboard was susceptible to dirt, and that a ghosting effect was produced for an instant during scrolling.

One impressed user commented that Zentec was the best small company he had ever dealt with. Another user reported several component failures over a period of several months, but said that the reliability of components is improving. He also said that the "terminal is excellent" and indicated that he will probably order more. □

▶ between them. The Format mode displays a fixed format, generated in the Form Generation mode or one of the three Program modes. Data is keyed into the unprotected fields and Auto Tab or Back Tab keys are used to move the cursor between the unprotected fields. The protected fields contain format descriptors and are protected from inadvertent data entry. Display enhancement attributes can be used to define protected and unprotected fields in the Form Generation mode. The attributes include normal and half-display intensity, blinking, reverse video, and underscore. These attributes can be used in any combination to define or draw attention to special fields. Formats can be stored on diskette or transmitted to the host computer for retrieval when required.

The Disk IPL mode is a routine that loads the Disk Catalog into memory from diskette.

Self Test initiates a diagnostic program that checks micro-processor, memory, and display for correct operation.

The three user Program modes are each entered via corresponding keys, which are used to direct (branch) program control to different locations within memory to access user-created application programs. If a user program is not resident, control will revert to the Format mode. Additional branch points can be implemented via the numeric keypad. User programs are generated at the terminal in assembly language and can be retrieved from diskette via the Disk IPL or from the host computer and loaded into RAM memory.

Mercury Move (MM), a plugable option, supports block transfers of one to 64K bytes from any one memory area to another. Its typical transfer rate is 10 microseconds per byte. The entire contents of the 2K-byte display memory can thus be moved in 20 milliseconds. The option also supports string handling via the Reverse Load feature. Any two groups of data can be strung together, or conversely, a string of data can be broken and scattered into smaller segments of data. The MM option is a direct memory access device that moves data based on the following parameters: a 2-byte word count, a 2-byte source address, and a 2-byte destination address. The Reverse Load feature is based on two additional parameters: a word count "to" address, and a word count "from" address. The "to" address gathers data, while the "from" address scatters data.

Manual cursor controls position the cursor in any of four directions: up, down, left, or right. Repetitive operation is provided for these functions, and the cursor skips over protected fields. Screen wraparound is provided for cursor functions. In addition, the cursor can be returned to Home (initial displayable character position), moved to the first character position of the next line (Return), and tabbed forward or backward to the next character position to the right of the following or preceding columnar tab stop within an unprotected field (or to Home position if a tab stop is not encountered).

Standard edit functions include line, screen, and memory erasure and character and line insertion or deletion. Memory erasure clears all data (protected and unprotected) from the display buffer. Line and screen erasure replaces all data with blanks from the existing cursor location to the end of the line or screen, respectively. Character insertion or deletion automatically expands or contracts the data within a line or unprotected field to accommodate the added or deleted character. Line insertion and deletion affect all data from the line occupied by the cursor to the end of the display.

Paging and scrolling functions include Page Up, Page Down, Scroll Up, and Scroll Down. Paging and scroll functions are applicable *only* if the optional second display buffer is incorporated. Page Down displays the first page or initial 24 lines of display memory; Scroll Up and Scroll Down functions move the displayed text up or down by the number of lines specified by the program. Scrolling is inhibited if the Scroll Up function is initiated when the full first page is displayed or if the Scroll Down function is initiated when the full second page is displayed.

Forms-related functions include Auto Tab, Auto Back Tab, and Erase Field. Auto Tab positions the cursor at the first character position of the next unprotected (variable) field or at Home if a variable field is not present before the end of the display. Auto Back Tab positions the cursor at the first character position of the variable field occupied by the cursor, the first character position of the preceding variable field, or at Home if neither of the first two conditions is present. Erase Field erases all unprotected data between the beginning of a line occupied by the cursor and the first character of a protected field, all data in a variable field occupied by the cursor between two protected fields on the same line, all data in a variable field occupied by the cursor between the last character of the rightmost protected and the end of the line, or the entire line occupied by the cursor if no protected fields exist on the line. The cursor is returned to the initial character position of the leftmost unprotected field.

The Extended Text Editor firmware option provides word processing functions, including character insertion (with overflow at the end of the display); tab-on-character (where any non-control character can be specified as a tab character); paragraph formatting; paragraph mark deletion; and word, sentence, and paragraph deletion.

Hardware and software registers are provided for system and application-related functions. These include 48 single-byte registers located in the first 2048-byte segment of RAM, which also contains the initial display buffer. Hardware functions include cursor address storage, single-character keyboard buffering, display parameter storage (for reverse video, blinking, and 2-level brightness), paging or scrolling, error tone generation, and RS-232 Interface storage and control. Software registers provide storage for program operating parameters.

SOFTWARE

Zentec software currently includes the Executive Firmware (basic program) supplied with the standard 9003 terminal and optional programs that include Telecommunicational Program IV (TCOM-IV); the Extended Text Editor, a program that expands the editing capabilities of the Executive Firmware and is particularly suitable for word processing applications; ZIM, a firmware program generation and debugging aid; the Zentec Assembler, a two-pass assembler for use with Zentec Assembler Method (ZAM); the Disk Catalog, a disk cataloguer for the diskette sub-

Zentec 9003 Microcomputer Terminal System

▶ system that stores and retrieves diskette data via call names; and the 9003 Debug Program.

Executive Firmware consists of a set of closed subroutines, five offset lists and one branch list, and an executive. Programs are list-structured. Designed around the set of closed subroutines, the programs are accessed via the lists under overall control of an executive. The list structure permits ease of program expansion and generation of application programs based on the existing system subroutines. The set of subroutines supplied with the Executive Firmware implements key entry, data display, and basic text editing functions. Optional programs complement the basic set of subroutines, providing added capabilities.

The *ZIM (Zentec Interrogation Module)* program, a firmware option, permits the contents of any location of ROM, PROM, or RAM to be displayed in hexadecimal form on the CRT screen. Also, the contents of RAM can be altered. Indexing through memory is controlled by the cursor move keys or by keying the exact memory address. ZIM also provides memory branching.

The *Zentec Assembler Method*, loaded from diskette, consists of a repertoire of hexadecimal commands that form a one-to-one relationship with the Intel instruction set. Zentec plans to introduce a macro assembler and a compiler in the immediate future. All programs are written in Zentec Assembler Method and are stored in the RAM segment of memory. The basic subroutines are stored in 2048-byte ROM; the lists and executive are stored in 256-byte PROMs. The Executive Firmware can be expanded or modified by adding or interchanging PROMs without disturbing the system subroutines.

COMPONENTS

CRT DISPLAY UNIT: A 15-inch (diagonal measurement) CRT screen with a viewing area 11 inches wide by 8 inches high provides a standard display arrangement of 24 lines of 80 characters each, totaling 1920 displayable character positions. A 25th line displays operator information only and is not available for data. A character set of 96 ASCII symbols, including upper and lower case alphabets, numerics and special symbols, is displayed in white (P-4) or, as an option, green (P-39). Characters are formed by a 7-by-9 dot matrix within a 10-by-10 dot cell so that symbols such as the lower case alphabetical p, q, g, j, and y are displayed in true lower case with the descenders on the bottom two rows of the matrix. Upper case characters are formed via a 7-by-7 dot matrix.

Standard display parameters include normal or half-intensity display, blinking, reverse video and underscore. The cursor is displayed as a blinking underscore.

KEYBOARD: The typewriter-style keyboard can generate any of 128 ASCII characters, including upper and lower case alphabets, numerics, specials, and control codes. Character repeat is standard; the character is repeated when the key remains depressed for more than half a second. The keyboard provides 32 function keys that, used separately or in combination, can generate a minimum of 75 discrete functions. A 12-key function pad located to the right of the main keygroup includes 5 cursor-control, page, and scroll keys. An 11-key (including decimal point) numeric keypad is located to the right of the function keypad. A row of five

Program Select keys is located over the function and numeric keypads. Also, a row of nine function keys is located directly over the main keygroup. These keys include 6 edit keys, an upper-case lock, and a reset key. A row of seven lighted indicators is imbedded in the keyboard over the row of nine keys and a 4-by-6 matrix of indicators is located in the upper right portion of the keyboard. These indicators furnish information such as the active operating mode, program, and special functions.

DISKETTE STORAGE: The optional dual diskette drive subsystem (currently including a Shugart SA 3800) consists of a controller, power supply, and dual diskette drive housed in a desk-top cabinet. The subsystem provides compatibility with the IBM 3740 and a total on-line storage capacity of 500,000 bytes. Diskette rotation is 360 rpm with a resultant average rotational delay of 83 milliseconds. Positioning time is: track-to-track—10 milliseconds; average—250 milliseconds. Head settling time is 8 milliseconds. Data is transferred at 31,250 bytes/second.

Data is organized into 77 tracks consisting of 73 data tracks, 3 spare tracks, and 2 index tracks. The standard IBM 3740 format divides each track into 26 sectors of 128 bytes each (except for index sectors which contain 80 bytes each).

SERIAL PRINTERS: Available serial printers include the Qume and Diablo 30- and 45-cps full-character printers and Centronics 101, 102, and 103 matrix printers; the 101 and 103 printers operate at 165 cps; the 102, at 330 cps. All printers provide 132 print positions. Centronics printers provide spacing of 10 char./inch at 6 lines/inch vertically and provide a character set of 64 standard or 128 optional print symbols. Qume and Diablo printers provide spacing of 10 or 20 char./inch at 6 or 8 lines/inch vertically and provide a character set of 94 or 96 print symbols. Qume and Diablo printers are equipped with interchangeable print wheels to permit changed type styles. Friction feed is standard with Qume and Diablo printers; pin and adjustable tractor feed is optional. Pin feed is standard with the Centronics printers. The Zentec printer interface can also accommodate user-supplied serial printers.

LINE PRINTER: The Dataproducts 2230, a drum printer, is rated at 300 lines/minute and provides 136 print positions. The standard character set includes 64 symbols; 86 and 96 character sets are optional. Horizontal and vertical spacing is 10 char./inch and 6 or 8 lines/inch, respectively. The printer accommodates pin-fed, 6-part, continuous form from 4 to 16.75 inches wide. Slew rate is 20 inches/second; single line advance is 50 milliseconds.

PRICING

The Zentec 9003 is available on a purchase-only basis. Third-party maintenance is available through Zentec and is typically \$20 and \$30 per month per terminal (without diskette and printer). Quantity discounts of up to 35 percent of the unit purchase price are available. The investment tax credit is passed on to the customer. Typically, there are no installation charges since the equipment is shipped to the customer and is unpackaged and installed by the customer. Zentec offers training courses at its own training center at no extra charge for a maximum of five students; on-site training is charged extra. ▶

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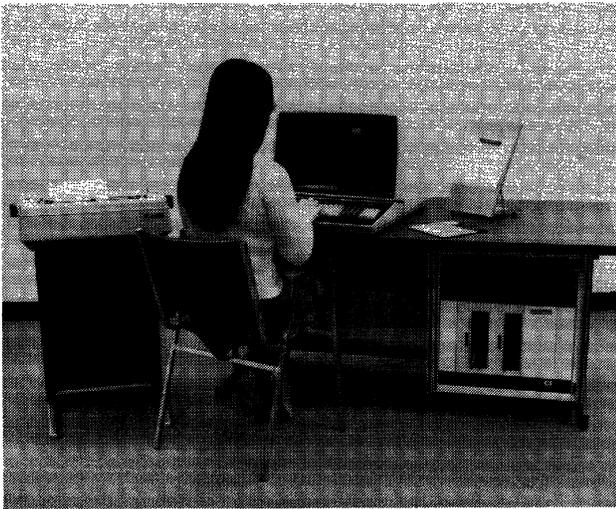
	<u>Purchase Price*</u>
Basic 9003 Terminal (includes microprocessor, ROM/PROM, a separate 256-byte RAM for stack operation, a Disk Boot Strap Loader, and Executive Firmware; 4 option slots available)	\$3,900
Universal Clock (a programmable interval timer; 0.55 msec or 0.275 msec; mounts on processor board)	250
Dual Processor Option (a second processor added to basic unit, requires one slot)	850
Video RAM Refresh Option (provides a second 2K-byte page of display memory; mutually exclusive with 2K-byte added RAM)	525
Additional RAM Modules (each requires one option slot):	
2K Bytes	300
4K Bytes	750
6K Bytes	950
8K Bytes	1,150
12K Bytes	1,550
16K Bytes	1,950
32K Bytes	Contact Vendor
Mercury Move Option (requires one option slot)	375
General Purpose Interface (bus interface, requires two option slots)	125
Dual Disk Drive Subsystem (includes two diskette drives and controller housed in desk-top cabinet, includes interface and cable; requires one option slot)	4,135
Dual Diskette Drive Mechanism (includes two diskette drives and controller housed in desk-top cabinet)	3,100
Diskette Drive Interface (for Dual Diskette Drive Mechanism; requires one option slot)	950
Diskette Interface Cable (10 feet)	85
Printer Subsystem (includes 30 cps printer, printer stand with power supply, printer interface, and cable; requires one option slot)	4,050
Basic Printer Unit (30-cps printer with case)	2,200
Printer Stand (provides pedestal for basic printer and contains power supply and control panel for printer)	890
Printer Interface (for basic printer; requires one option slot)	875
Data Products Printer Interface (with Synchronous Interface; requires one option slot)	950
Synchronous Interface (for half-duplex transmission up to 20,000 bytes/second; requires one option slot)	900
Baud Rate Option (4800 bps or 9600 bps in place of 2400 bps position on Baud Rate Selector Switch)	No charge
Teletype Current Loop Option (20 or 60 ma dc; replaces RS-232C interface)	95
Teletype Current Loop Cable (10 feet)	55
Teletype Current Loop Cable (25 feet)	85
RS-232C Cable (10 feet)	55
RS-232C Cable (25 feet)	85
Software Options—	
Zentec Interrogation Module (ZIM)**	300
Extended Text Editor***	600
Telecommunications Program IV (TCOM IV)***	350
Disk Catalog (requires diskette subsystem)**	150
Zentec Assembly Method (ZAM; requires diskette subsystem)**	300
Debug Program (require diskette subsystem, ZAM, & ZIM)**	100

* Quantity discounts up to 35 percent are available.

** Supplied on diskette.

***Firmware option.■

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The Zentec 9003 terminal is highly modular and provides extensive operating flexibility. Memory ranges from a minimum of 6K bytes to 64K bytes and is composed of ROM, PROM, and RAM memories arranged according to user requirements. A maximum of 40K bytes of RAM is available for user applications when diskette and printer subsystems are added. The microprocessor can accommodate a host of peripheral devices via its data bus, including diskette drives, cassette tape units, printers, industry-compatible magnetic tape drives, disk drives, etc. These devices can be attached via an increasing variety of Zentec device interfaces. Zentec currently offers several models of serial impact printers, a line printer, and a diskette subsystem that includes two diskette drives. Data communications options are currently limited to Teletype and ASCII compatibility. Compatibility with IBM's BSC or SDLC communications protocol is currently not available, and to date, Zentec has announced no plans for its future availability.

The striking difference between the Zentec terminal and many other microprocessor-based terminals is that the ➤

A user-programmable, general-purpose alphanumeric display terminal with a text editing option.

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CONFIGURATION

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Zentec 9003 Microcomputer Terminal System

- Zentec 9003 is truly user-programmable. Zentec-supplied software enables the user to create application programs and to store them at the host computer or the optional diskette storage facility that provides a total on-line capacity of 500K bytes.

The diskette subsystem with a minimum of 6K bytes of RAM is a requirement for user programmability. All software options reside on diskette including Zentec Assembly Method (which includes the assembler, editor, relocatable loader, and catalog), the Disk Catalog, and the Debug Program. Application programs are written in Zentec Assembly Method (ZAM) using hexadecimal notation. However, a macro assembler and compiler are in the works. A set of more than 40 closed subroutines designed for basic system operation is also provided for application programming.

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Other significant firmware options include the Expanded Text Editor, which is designed for text editing and word processing applications, and TCOM-IV, which supports teleprinter operation to 19,200 bps.

Other key options include Mercury Move, which transfers a block of data from one memory location to another, and the second 2K bytes of display memory, which supports paging and scrolling features. The feature can be used to scan, edit, or perform data entry on a file of sequential pages.

The Zentec 9003 with its hardware, firmware, and software options is indeed an attractive package that offers a high degree of performance and operating flexibility, and can be geared to virtually any user environment. And Zentec plans to expand its support with additional software within the near future. □

- 32K bytes. Each RAM module (except the 2K-byte option) requires one option slot. The basic microprogram (firmware) requires 2560 bytes of ROM/PROM (which can include up to 10,250 bytes of storage). The basic display memory occupies 2K bytes of RAM; a second 2K-byte segment can be added to store two pages simultaneously.

TRANSMISSION SPECIFICATIONS

Transmission is performed in the half- or full-duplex mode either character-by-character (as each character is keyed) or by block. The standard communications interface is asynchronous and is designed for point-to-point transmission. The data transmission rate is switch-selectable at 110, 300, 1200, or 2400 bits/second; rates of 4800 or 9600 bps can be specified in place of the 2400 bps rate as a no-cost option.

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The transmission code is 8-level ASCII, including odd, even, or no parity (switch-selectable). For asynchronous transmission, the unit code structure is 10 or 11 bits per character including one start bit and one or two (at 110 bps) stop bits. The unit code structure is 8 bits/character for synchronous transmission.

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The Control mode is an entry/exit mode for all other modes.

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The Disk IPL mode is a routine that loads the Disk Catalog into memory from diskette.

Zentec 9003 Microcomputer Terminal System

- Self Test initiates a diagnostic program that checks microprocessor, memory, and display for correct operation.

The three user Program modes are each entered via corresponding keys, which are used to direct (branch) program control to different locations within memory to access user-created application programs. If a user program is not resident, control will revert to the Format mode. Additional branch points can be implemented via the numeric keypad. User programs are generated at the terminal in assembly language and can be retrieved from diskette via the Disk IPL or from the host computer and loaded into RAM memory.

Mercury Move (MM), a plugable option, supports block transfers of one to 64K bytes from any one memory area to another. Its typical transfer rate is 10 microseconds per byte. The entire contents of the 2K-byte display memory can thus be moved in 20 milliseconds. The option also supports string handling via the Reverse Load feature. Any two groups of data can be strung together, or conversely, a string of data can be broken and scattered into smaller segments of data. The MM option is a direct memory access device that moves data based on the following parameters: a 2-byte word count, a 2-byte source address, and a 2-byte destination address. The Reverse Load feature is based on two additional parameters: a word count "to" address, and a word count "from" address. The "to" address gathers data, while the "from" address scatters data.

Manual cursor controls position the cursor in any of four directions: up, down, left, or right. Repetitive operation is provided for these functions, and the cursor skips over protected fields. Screen wraparound is provided for cursor functions. In addition, the cursor can be returned to Home (initial displayable character position), moved to the first character position of the next line (Return), and tabbed forward or backward to the next character position to the right of the following or preceding columnar tab stop within an unprotected field (or to Home position if a tab stop is not encountered).

Standard edit functions include line, screen, and memory erasure and character and line insertion or deletion. Memory erasure clears all data (protected and unprotected) from the display buffer. Line and screen erasure replaces all data with blanks from the existing cursor location to the end of the line or screen, respectively. Character insertion or deletion automatically expands or contracts the data within a line or unprotected field to accommodate the added or deleted character. Line insertion and deletion affect all data from the line occupied by the cursor to the end of the display.

Paging and scrolling functions include Page Up, Page Down, Scroll Up, and Scroll Down. Paging and scroll functions are applicable *only* if the optional second display buffer is incorporated. Page Down displays the first page or initial 24 lines of display memory; Scroll Up and Scroll Down functions move the displayed text up or down by the number of lines specified by the program. Scrolling is inhibited if the Scroll Up function is initiated when the full first page is displayed or if the Scroll Down function is initiated when the full second page is displayed.

Forms-related functions include Auto Tab, Auto Back Tab, and Erase Field. Auto Tab positions the cursor at the first character position of the next unprotected (variable) field or at Home if a variable field is not present before the end of the display. Auto Back Tab positions the cursor at the first character position of the variable field occupied by the cursor, the first character position of the preceding variable field, or at Home if neither of the first two conditions is present. Erase Field erases all unprotected data between the beginning of a line occupied by the cursor and the first

character of a protected field, all data in a variable field occupied by the cursor between two protected fields on the same line, all data in a variable field occupied by the cursor between the last character of the rightmost protected and the end of the line, or the entire line occupied by the cursor if no protected fields exist on the line. The cursor is returned to the initial character position of the leftmost unprotected field.

The Extended Text Editor firmware option provides word processing functions, including character insertion (with overflow at the end of the display); tab-on-character (where any non-control character can be specified as a tab character); paragraph formatting; paragraph mark deletion; and word, sentence, and paragraph deletion.

Hardware and software registers are provided for system and application-related functions. These include 48 single-byte registers located in the first 2048-byte segment of RAM, which also contains the initial display buffer. Hardware functions include cursor address storage, single-character keyboard buffering, display parameter storage (for reverse video, blinking, and 2-level brightness), paging or scrolling, error tone generation, and RS-232 Interface storage and control. Software registers provide storage for program operating parameters.

SOFTWARE

Zentec software currently includes the Executive Firmware (basic program) supplied with the standard 9003 terminal and optional programs that include Telecommunicational Program IV (TCOM-IV); the Extended Text Editor, a program that expands the editing capabilities of the Executive Firmware and is particularly suitable for word processing applications; ZIM, a firmware program generation and debugging aid; the Zentec Assembler, a two-pass assembler for use with Zentec Assembler Method (ZAM); the Disk Catalog, a disk cataloger for the diskette subsystem that stores and retrieves diskette data via call names; and the 9003 Debug Program.

Executive Firmware consists of a set of closed subroutines, five offset lists and one branch list, and an executive. Programs are list-structured. Designed around the set of closed subroutines, the programs are accessed via the lists under overall control of an executive. The list structure permits ease of program expansion and generation of application programs based on the existing system subroutines. The set of subroutines supplied with the Executive Firmware implements key entry, data display, and basic text editing functions. Optional programs complement the basic set of subroutines, providing added capabilities.

The *ZIM (Zentec Interrogation Module)* program, a firmware option, permits the contents of any location of ROM, PROM, or RAM to be displayed in hexadecimal form on the CRT screen. Also, the contents of RAM can be altered. Indexing through memory is controlled by the cursor move keys or by keying the exact memory address. ZIM also provides memory branching.

The *Zentec Assembler Method*, loaded from diskette, consists of a repertoire of hexadecimal commands that form a one-to-one relationship with the Intel instruction set. Zentec plans to introduce a macro assembler and a compiler in the immediate future. All programs are written in Zentec Assembler Method and are stored in the ROM/PROM segment of memory. The basic subroutines are stored in 2048-byte ROM; the lists and executive are stored in 256-byte PROMs. The Executive Firmware can be expanded or modified by adding or interchanging PROMs without disturbing the system subroutines. ►

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► COMPONENTS

CRT DISPLAY UNIT: A 15-inch (diagonal measurement) CRT screen with a viewing area 11 inches wide by 8 inches high provides a standard display arrangement of 24 lines of 80 characters each, totaling 1920 displayable character positions. A 25th line displays operator information only and is not available for data. A character set of 96 ASCII symbols, including upper and lower case alphabets, numerics and special symbols is displayed in white (P-4) or, as an option, green (P-39). Characters are formed by a 7-by-9 dot matrix within a 10-by-10 dot cell so that symbols such as the lower case alphabetical p, q, g, j, and y are displayed in true lower case with the descenders on the bottom two rows of the matrix. Upper case characters are formed via a 7-by-7 dot matrix.

Standard display parameters include normal or half-intensity display, blinking, reverse video and underscore. The cursor is displayed as a blinking underscore.

KEYBOARD: The typewriter-style keyboard can generate any of 128 ASCII characters, including upper and lower case alphabets, numerics, specials, and control codes. Character repeat is standard; the character is repeated when the key remains depressed for more than half a second. The keyboard provides 32 function keys that, used separately or in combination, can generate a minimum of 75 discrete functions. A 12-key function pad located to the right of the main keygroup includes 5 cursor-control, page, and scroll keys. An 11-key (including decimal point) numeric keypad is located to the right of the function keypad. A row of five Program Select keys is located over the function and numeric keypads. Also, a row of nine function keys is located directly over the main keygroup. These keys include 6 edit keys, an upper-case lock, and a reset key. A row of seven lighted indicators is imbedded in the keyboard over the row of nine keys and a 4-by-6 matrix of indicators is located in the upper right portion of the keyboard. These indicators furnish information such as the active operating mode, program, and special functions.

DISKETTE STORAGE: The optional dual diskette drive subsystem (currently including a Shugart SA 3800) consists of a controller, power supply, and dual diskette drive housed in a desk-top cabinet. The subsystem provides compatibility with the IBM 3740 and a total on-line storage capacity of 500,000 bytes. Diskette rotation is 360 rpm with a resultant average rotational delay of 83 milliseconds.

Positioning time is: track-to-track—10 milliseconds; average—250 milliseconds. Head settling time is 8 milliseconds. Data is transferred at 31,250 bytes/second.

Data is organized into 77 tracks consisting of 73 data tracks, 3 spare tracks, and 2 index tracks. The standard IBM 3740 format divides each track into 26 sectors of 128 bytes each (except for index sectors which contain 80 bytes each).

SERIAL PRINTERS: Available serial printers include the Qume and Diablo 30- and 45-cps full-character printers and Centronics 101, 102, and 103 matrix printers; the 101 and 103 printers operate at 165 cps; the 102, at 330 cps. All printers provide 132 print positions. Centronics printers provide spacing of 10 char./inch at 6 lines/inch vertically and provide a character set of 64 standard or 128 optional print symbols. Qume and Diablo printers provide spacing of 10 or 12 char./inch at 6 or 8 lines/inch vertically and provide a character set of 94 or 96 print symbols. Qume and Diablo printers are equipped with interchangeable print wheels to permit changed type styles. Friction feed is standard with Qume and Diablo printers; pin and adjustable tractor feed is optional. Pin feed is standard with the Centronics printers. The Zentec printer interface can also accommodate user-supplied serial printers.

LINE PRINTER: The Dataproducts 2230, a drum printer, is rated at 300 lines/minute and provides 136 print positions. The standard character set includes 64 symbols; 86 and 96 character sets are optional. Horizontal and vertical spacing is 10 char./inch and 6 or 8 lines/inch, respectively. The printer accommodates pin-fed, 6-part, continuous form from 4 to 16.75 inches wide. Slew rate is 20 inches/second; single line advance is 50 milliseconds.

PRICING

The Zentec 9003 is available on a purchase-only basis. Third-party maintenance is available through Zentec and is typically \$20 to \$30 per month per terminal (without diskette and printer). Quantity discounts of up to 35 percent of the unit purchase price are available. The investment tax credit is passed on to the customer. Typically, there are no installation charges since the equipment is shipped to the customer and is unpackaged and installed by the customer. Zentec offers training courses at its own training center at no extra charge; on-site training is charged extra.

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	<u>Purchase Price*</u>
Basic 9003 Terminal (includes microprocessor, ROM/PROM, a separate 256-byte RAM for stack operation, a Disk Boot Strap Loader, and Executive Firmware; 4 option slots available)	\$3,900
Universal Clock (a programmable interval timer under CPU control; specify interval: 0.55 msec or 0.275 msec; mounts on processor board)	250
Dual Processor Option (a second processor added to basic unit, requires one slot)	850
Video RAM Refresh Option (provides a second 2K-byte page of display memory; mutually exclusive with 2K-byte added RAM)	525
Additional 2K Byte RAM (mutually exclusive with video RAM refresh option)	300
Additional RAM Modules (each requires one option slot):	
4K Bytes	750
6K Bytes	950
8K Bytes	1,150
12K Bytes	1,550
16K Bytes	1,950
32K Bytes	Contact Vendor
Mercury Move Option (requires one option slot)	375
General Purpose Interface (bus interface, requires two option slots)	125
Dual Disk Drive Subsystem (includes two diskette drives and controller housed in desk-top cabinet, includes interface and cable; requires one option slot)	4,135
Dual Diskette Drive Mechanism (includes two diskette drives and controller housed in desk-top cabinet)	3,100
Diskette Drive Interface (for Dual Diskette Drive Mechanism; requires one option slot)	950
Diskette Interface Cable (10 feet)	85
Printer Subsystem (includes 30 cps printer, printer stand with power supply, printer interface, and cable; requires one option slot)	4,050
Basic Printer Unit (30-cps printer with case)	2,200
Printer Stand (provides pedestal for basic printer and contains power supply and control panel for printer)	890
Printer Interface (for basic printer; requires one option slot)	875
Data Products Printer Interface (with Synchronous Interface; requires one option slot)	950
Synchronous Interface (for half-duplex transmission up to 20,000 bytes/second; requires one option slot)	900
Baud Rate Option (specify 4800 bps or 9600 bps in place of 2400 bps position on Baud Rate Selector Switch)	No charge
Teletype Current Loop Option (specify 20 or 60 ma dc; replaces RS-232C interface on basic terminal)	95
Teletype Current Loop Cable (10 feet)	55
Teletype Current Loop Cable (25 feet)	85
RS-232C Cable (10 feet)	55
RS-232C Cable (25 feet)	85
Software Options—	
Zentec Interrogation Module (ZIM)***	300
Extended Text Editor***	600
Telecommunications Program IV (TCOM IV)***	350
Disk Catalog (requires diskette subsystem)**	150
Zentec Assembly Method (ZAM; requires diskette subsystem)**	300
Debug Program (require diskette subsystem, ZAM, & ZIM)**	100

* Quantity discounts up to 35 percent are available.

** Supplied on diskette.

*** Firmware option. ■

Zentec ZMS Display Terminal Family



MANAGEMENT SUMMARY

Thrusting ahead with its expertise in microprocessor technology as one of the industry's initial manufacturers of microprocessor-based terminals, Zentec introduced a family of three display terminals designed around the Intel 8080A-1 microprocessor. The three members of Zentec's ZMS family include the ZMS 50, a low-priced intelligent terminal that can be downline loaded; the ZMS 70, a programmable terminal with substantially extended capabilities; and the ZMS 90, a modular terminal that can incorporate many of the design features of the ZMS 50 and ZMS 70. Zentec directs its market emphasis to the OEM and volume end-user market.

The ZMS 50, the basic member of the ZMS family, is supported by a basic ROM- or PROM-resident Zentec firmware package that provides a comprehensive set of edit functions, forms generation, character- or block-mode asynchronous or synchronous communications routines, and self-testing. Edit commands are initiated via a set of six program function keys. A second set of six program function keys, completing a row of 12 keys at the top of the keyboard, initiate video attribute (highlighting) functions for format generation. The Mode feature extends the flexibility of the program function keys by switching among assigned functions. A key feature of the ZMS 50 is its list-driven display technique that scrolls through the unit's entire RAM memory in the sequence defined by a user-created software list. Another important feature of the ZMS 50 is its download capability. User-created programs can be downline-loaded from a remote source into the unit's RAM memory and executed automatically or in response to a keystroke. This feature is enhanced with the optional 16K RAM memory in place of the basic terminal's

A family of user-programmable, general-purpose display terminals that permit user customization. Software support is provided.

Standard features include microprogram control via ROM/PROM- or minidiskette-resident control programs, expandable RAM memory from 4K to 64K bytes, scrollable memory, paging, editing, formatting, extensive use of program function keys for program execution, dual integral minidiskette drives, character or block transmission up to 19,200 bps, and a numeric keypad. A standard software package provides the operating system, program development package, and utilities. BASIC is planned.

Pricing ranges from \$2,395 for the basic member with 4K-byte RAM memory to \$8,795 for a dual minidiskette terminal with 64K bytes of memory.

Zentec offers a program development system that includes a Zentec terminal, software support, and Prolog PROM Programmer for \$8,995.

CHARACTERISTICS

VENDOR: Zentec Corporation, 2400 Walsh Avenue, Santa Clara, California 95050. Telephone (408) 246-7662.

DATE OF ANNOUNCEMENT: March 1978.

DATE OF FIRST DELIVERY: ZMS 50 and 70—July 1978; ZMS 90—October 1978.

NUMBER DELIVERED TO DATE: —

SERVICED BY: Zentec and third party.

MODELS

The Zentec ZMS family of stand-alone display terminals consists of the following members:

- **Model ZMS 50**—An entry-level terminal equipped with a 12-inch CRT screen, attached keyboard, an Intel 8080A-1 microprocessor with up to 8K bytes of RAM/PROM memory and 4K or 16K (optional) bytes of RAM memory, an optional RS-232C printer interface for a customer-supplied printer, and an optional RS 449 communications interface (in place of the standard RS 232C communications interface).
- **Model ZMS 70**—An expanded terminal equipped with a 15-inch CRT screen detachable keyboard, dual integral mini-diskette drives, an Intel 8080A-1 microprocessor with up to 12K bytes of ROM/PROM program memory and 16K to 64K bytes of RAM memory (minus ROM/PROM capacity) expandable in 16K-byte increments, an optional RS-232C printer interface for a customer-supplied printer, and an optional RS 449 communications

Zentec ZMS Display Terminal Family

▷ 4K RAM, which also serves as a paging memory, storing up to two full pages of display data. The terminal's self-test program checks memory for errors when invoked and displays the location of the error on the display's 25th or status line. A printer interface for a user-supplied serial printer is optional. An RS 449 interface with balanced data circuits (RS422) can be specified in place of the terminal's standard RS 232C communications interface. Zentec offers a program development system for users who choose to develop their own application programs for the ZMS 50 via PROM-resident firmware.

The more-powerful, directly-programmable ZMS 70 features dual minidiskette storage for up to 143,000 (formatted) bytes of on-line storage contained within the terminal's cabinet; a larger screen size than the ZMS 50 (15 inches diagonally instead of 12); an expanded keyboard with 16 program function keys and a numeric pad; and a basic 16K RAM memory (expandable to 64K bytes less up to 12K bytes of ROM/PROM program memory). Zentec-supplied diskette-resident software including an Executive, a Software Development Package, and a set of utilities are "booted" into RAM via a ROM-resident disk bootstrap routine on power-up. Besides the bootstrap program, ROM firmware includes a self-test program and the optional ZIM program, a diagnostic aid that displays the contents of any location of ROM, PROM, or RAM in hexadecimal form and permits the alteration of the contents of RAM. The ZMS 70 Executive supports two concurrent tasks and includes a File Manager for minidiskette support which provides routines for sequential and direct access methods, automatic blocking/deblocking of user-defined files, etc. The Program Development Package consists of the Assembler, Debug Program, and Link Editor for generating application programs executed from the keyboard. An optional utility program lets the user define his own customized character set that can include mathematical symbols and foreign languages. The same list-driven display technique of the ZMS 50 is provided with the ZMS 70. Printer and interface options are also the same as the ZMS 50. Zentec also offers application software including a Text Editor and its Z-Form, a format development program for data entry applications.

The ZMS 90, with its modular construction, can assume a wide variety of capabilities within the basic parameters of its bus architecture and card-cage capacity. An extremely flexible terminal, the ZMS 90 can accommodate custom user-designed interface boards and can be configured as a firmware or software terminal. Moreover, many of the Zentec 9003 interface boards can be used with the ZMS 90, as well as with the ZMS 70. Zentec offers the Shugart 3800, a dual-drive diskette subsystem for use with the ZMS 90.□

▶ interface (in place of the standard RS 232C communications interface).

- Model ZMS 90—A modular terminal that contains additional logic card slots and can be configured according to user specifications. It can provide all of the same basic features of the ZMS 50 or ZMS 70, but can also

accommodate a larger number of peripherals including a dual diskette drive and serial printer.

TRANSMISSION SPECIFICATIONS

Transmission is performed asynchronously, synchronously, or isochronously in the half- or full-duplex mode at 110, 150, 300, 1200, 1800, 2400, 4800, 9600, or 19,200 bits/second.

The data rates are switch selectable on the ZMS 50 and programmable on the ZMS 70 or 90. Block or character mode transmission is selectable. The 8-level, 10- or 11-unit ASCII code is used. The terminal is supplied with an RS 232C or optional RS 449 communications interface.

DEVICE CONTROL

Terminal control is implemented via ROM/PROM-resident firmware in the ZMS 50 and by a diskette-resident multi-task executive in the ZMS 70. Both models employ a list-driven display technique that scrolls through the terminal's entire RAM memory (minus that portion reserved for the list) in the sequence defined by a user-created software list; the list points to the beginning address of each line to be displayed. Scrolling and paging can be performed in the forward or backward direction in both models. Both models also provide full cursor control including up, down, left, right, and home.

The ZMS 50 is equipped with 12 program function keys; the ZMS 70 contains 16. Each key provides the capability for two functions via the shift function. The Mode function key switches among different sets of assigned key functions for the program function keys.

The ZMS-50 firmware includes a Text Editor and Forms Generator. The Text Editor provides line insertion; character, word, line, or block deletion; partial or full line or screen erasure; tabulation (tab set and clear, tab forward, and tab backward); and the capability to define block length. Complete forward or reverse word wraparound is provided. Text Editor functions are executed via six of the terminal's program function keys. The second group of six program function keys are used to initiate execution of Form Generator functions. In the Form Generate mode, protected characters and fields can be created and highlighted via attribute codes that define underline, reverse video, blinking, blanking, and half intensity. Telecommunications routines recognize and respond to specific control characters and Escape sequences received from a remote source. The received commands initiate such functions as cursor sensing or addressing, keyboard enable/disable, printer on/off, etc. The routines also support character-by-character transmission as each character is keyed or block transmission in which a complete operator-defined blocks or only the unprotected fields within the block are transmitted. The ZMS 50 also provides a downline load capability that extends the terminal's basic features. Implemented via a firmware downline load routine, user-created application programs can be received from a remote source, loaded in RAM memory, and executed. Control is transferred to the loaded program either automatically or via key depression as directed by the program's header instructions.

SOFTWARE

Zentec software for the ZMS 70 includes a multi-task operating system, a program development package, diskette-oriented utilities, and two applications programs—Z-Form, a data entry program for format creation, and Text Editor, an editing program.

The operating system consists of the File Manager, Memory Manager, and Command Processor. The File Manager supports the mini-diskette system and includes routines for ▶

Zentec ZMS Display Terminal Family

► sequential and direct access methods, automatic blocking/ deblocking, user-defined files, etc. The Memory Manager directs the control of two concurrent application programs or tasks via Wait and Post routines. The Command Processor executes keyed operator commands and provides the operator with full terminal control.

The Program Development Package supports the creation, assembly, debugging, and execution of application programs entered from the keyboard. The package consists of an Assembler, a Debug Program, and a Linkage Editor.

The utilities include Self Test, Disk Initialization, and Disk Copy. An optional extra-cost utility, Define Displayable Character Set, lets the user define his own character set. The option permits the alteration of character shapes for existing characters and permits definition of new special characters or foreign character sets.

COMPONENTS

DISPLAY UNIT: A 12- (ZMS 50) or 15- (ZMS 70/90) inch (diagonal measurement) CRT screen with a viewing area 8 inches high by 10.5 inches wide (ZMS 50) or 8 inches high by 11 inches wide (ZMS 70/90). The display arrangement is 25 lines of 80 characters each. The 25th line is used for control information. A total of 128 upper and lower case alphanumeric and control characters are displayed in white (P4 phosphor). Each character is formed via a 7-by-9 dot matrix within a 10-by-10 dot cell on the ZMS 50. On the ZMS 70/90, each character is formed via a 8-by-10 dot matrix within a 10-by-10 or 10-by-16 (optional) dot cell. Highlighting includes dual intensity, blinking, underscore, and reverse video attributes.

ZMS 50 KEYBOARD: A 62-key, typewriter-style attached keyboard. The keyboard is also equipped with a 12-key control cluster to the right of the main keygroup and a row of 12 program function keys at the top. The control cluster contains cursor, scroll, paging, mode and edit keys. The keyboard generates 128 ASCII character codes.

ZMS 70/90 KEYBOARD: A 62-key, typewriter-style detachable keyboard. The keyboard is also equipped with a 12-key control cluster and a 12-key dual function numeric/function keypad to the right of the main keygroup. The control cluster contains cursor, scroll, paging, mode, and edit keys. A row of 16 program function keys is located at the top.

MINIDISKETTE STORAGE: Dual minidiskette drives are housed in the terminal case to the right of the screen. The Shugart SA 400 drives each accommodate a single-sided, standard-density minidiskette. The minidiskette is organized into 36 tracks including 1 index track. Each track contains 18 128-byte sectors. The formatted storage capacity is 80.6K bytes per diskette. The average rotational delay (latency) is 100 milliseconds. Positioning time is 40 milliseconds track-to-track and 463 milliseconds average.

Head settling and load times are 10 and 75 milliseconds, respectively. The data transfer rate is 15,625 bytes per second.

DISKETTE STORAGE (ZMS 90): The optional dual diskette drive subsystem (currently including a Shugart SA 3800) consists of a controller, power supply, and dual diskette drive housed in a desk-top cabinet. The subsystem provides compatibility with the IBM 3740 and a total on-line storage capacity of 500,000 bytes. Diskette rotation is 360 rpm with a resultant average rotational delay of 83 milliseconds. Positioning time is: track-to-track—10 milliseconds; average—250 milliseconds. Head settling time is 8 milliseconds. Data is transferred at 31,250 bytes/second.

Data is organized into 77 tracks consisting of 73 data tracks, 3 spare tracks, and 2 index tracks. The standard IBM 3740 format divides each track into 26 sectors of 128 bytes each (except for index sectors which contain 80 bytes each).

SERIAL PRINTERS: Available serial printers include the Qume and Diablo 30- and 45-cps full-character printers and Centronics 101, 102, and 103 matrix printers; the 101 and 103 printers operate at 165 cps; the 102, at 330 cps. All printers provide 132 print positions. Centronics printers provide spacing of 10 char./inch at 6 lines/inch vertically and provide a character set of 64 standard or 128 optional print symbols. Qume and Diablo printers provide spacing of 10 or 20 char./inch at 6 or 8 lines/inch vertically and provide a character set of 94 or 96 print symbols. Qume and Diablo printers are equipped with interchangeable print wheels to permit changed type styles. Friction feed is standard with Qume and Diablo printers; pin and adjustable tractor feed is optional. Pin feed is standard with the Centronics printers. The Zentec printer interface can also accommodate user-supplied serial printers.

PRICING

The Zentec ZMS terminals are available on a purchase-only basis. Quantity discounts of up to 33 percent are available. Typically, there are no installation charges, since the equipment is shipped to the customer and is unpacked and installed by the customer. A separate maintenance contract is available for purchased equipment. Zentec provides the following end-user and OEM quantity discounts:

Number of Units	Discount
2 to 5	5 percent
6 to 9	10
10 to 24	15
25 to 49	20
50 to 99	25
100 to 149	27
150 to 199	29
200 to 250	33



Zentec ZMS Display Terminal Family

	<u>Purchase Price*</u>
ZMS 50; basic terminal with 4K-byte RAM memory	\$2,395
ZMS 50, expanded terminal with 16K-byte RAM memory and serial printer interface	2,895
ZMS 70 with dual minidiskette drives and a memory capacity of:	
16K bytes	6,495
32K bytes	7,195
48K bytes	8,095
64K bytes	8,795
ZMS 90 with a memory capacity of:	
4K bytes	3,795
16K bytes	4,295
32K bytes	4,995
48K bytes	5,895
64K bytes	6,595
Dual Diskette Drive and Controller in desk-top cabinet	4,135**
Printer and Controller, 30 cps	4,050**
RS-232C Serial Printer Interface	395
RS422/449 Interface	
ZMS 50 Development System; includes ZMS 70 with dual minidiskette drives, 32K bytes of RAM, software support and a Prolog PROM Programmer	8,995

* All prices include software support.

** Nondiscountable costs for the Dual Diskette Drive/Controller and Printer/Controller are \$3,100 and \$2,200, respectively.■