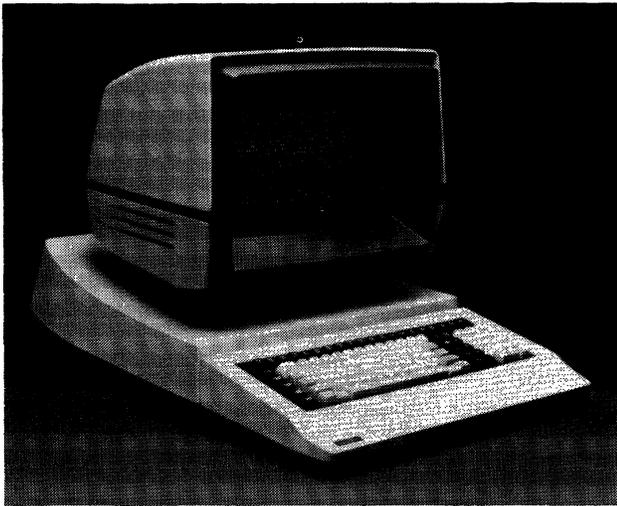


Racal-Milgo 4270 Series Terminal System



Racal-Milgo's Model 4278 Display Station is functionally compatible with the IBM 3278 Model 2 Display Station. The 4278 attaches to the Racal-Milgo Model 4274 System Controller in a cluster configuration of up to 32 devices. The 4278 features a 15-inch (diagonal) screen with tilt and swivel adjustments, and a detachable keyboard.

MANAGEMENT SUMMARY

The 4270 Series is Racal-Milgo's family of IBM 3270-compatible components. The 4270 Series offers functional compatibility with the corresponding IBM equipment; the Racal-Milgo components are not, however, fully plug-compatible with the IBM components. Racal-Milgo offers compatibility with the IBM 3274 Control Unit, 3275 Display, 3276 Control Unit Display, and the 3278 Display. In addition, several printer models are available for use with the 4270 Series.

The 4270 Series consists of the 4274 System Controller, the 4276 Stand-alone Display Station, the 4278 Display Station, and a choice of optional printers. The system links to the host computer system using either IBM's Binary Synchronous Communications (BSC) or Systems Network Architecture/Synchronous Data Link Control (SNA/SDLC). User activities are supported in a cluster configuration of display stations and optional printers up to a total of 32 devices.

The 4274 System Controller maintains communications with the host system and controls the clustered devices. A factory programmed 16-bit microprocessor with 32K RAM performs the central control functions. Dedicated 8-bit microprocessors perform the I/O functions for the controller, display stations, and printers. A single diskette drive unit is housed in the controller cabinet, and serves as the program load and storage device for the communications emulator and the various utility programs used to configure or operate the system. The controller attaches to a modem via an RS-232-C interface, and ➤

A family of controllers, display stations, and printers offering emulation of IBM 3270 second-generation components.

The series consists of a controller featuring IBM 3274 compatibility; a cluster display station featuring IBM 3278 compatibility; a stand-alone display station featuring IBM 3275/3276 compatibility; and a variety of printers. A total of 32 devices, display stations and/or printers, are supported in the cluster configuration. Both BSC and SNA/SDLC communications protocols are supported by the 4270 Series.

All 4270 Series components are available for purchase or lease. The 4274 System Controller is priced at \$3,949. The 4278 Display Station sells for \$2,560, while the 4276 Stand-alone Display Station is priced at \$3,950. Quantity discounts are available for purchased equipment.

CHARACTERISTICS

VENDOR: Racal-Milgo, Computer Products Division, 6250 N.W. 27th Way, Fort Lauderdale, FL 33309. Telephone (305) 979-4000.

DATE OF ANNOUNCEMENT: Models 4274/4278—March 1980. Model 4276—September 1980.

DATE OF FIRST DELIVERY: Models 4274/4278—June 1980; Model 4276—January 1981.

NUMBER DELIVERED TO DATE: Over 4200 display stations (as of February 1982).

SERVICED BY: Racal-Milgo.

CONFIGURATION

The 4270 Clustered Terminal System consists of the 4274 System Controller, 4278 Display Station, and a choice of optional printers. User activities are supported in a cluster configuration combining display stations and printers in any combination up to a total of 32 devices.

The Model 4276 Stand-Alone Display Station operates in a stand-alone environment; it can be configured with one printer.

TRANSMISSION SPECIFICATIONS

The 4270 System supports synchronous communications using IBM's Binary Synchronous Communications (BSC) or Systems Network Architecture/Synchronous Data Link Control (SNA/SDLC), at line speeds from 2,000 to 9,600 bps over leased lines. The controller attaches to a modem via an RS-232-C interface. EBCDIC code is used. ➤

Racal-Milgo 4270 Series Terminal System

➤ supports communications over dedicated lines at speeds from 2,000 to 9,600 bits per second.

The 4278 Display Station attaches to the 4274 System Controller. It features a 15-inch diagonal display screen that can accommodate a total of 1,920 characters in a 24-line by 80-column format. A 25th line for status information appears at the bottom of the display. Characters are displayed in green on a dark background, and the console has tilt and swivel adjustments. The 87-key typewriter-style keyboard is similar in design to the IBM 3278 keyboard, and is detachable. A 16-key numeric pad and 24 function keys are included.

The 4276 Stand-alone Display Station is the newest member of the 4270 Series. The 4276 is a microprocessor-controlled stand-alone terminal offering emulation of the IBM 3275 or 3276. Configuration is accomplished on-site, via local commands entered at the keyboard. The 4276 contains the same display features as the 4278, including a 15-inch tilt and swivel display, and a detachable keyboard.

A variety of printers are available for use with the 4270 Series. These include: the Model 4287, featuring 160-cps operation; the Models 4293 and 4294, featuring 200-cps operation; and two models that were introduced as this report was going to press, Model 4285 (120 cps) and Model 4295 (300 lpm).

Both the 4274 Controller and 4276/4278 Display Stations feature integrated diagnostics that are executed each time display power is turned on or an initial program load is performed. Racal-Milgo has nationwide service locations, including remote field stocking of spare parts in approximately 20 locations.

Datapro received an insufficient number of responses on the Racal-Milgo 4270 Series in the 1982 display terminal user survey; therefore, we are unable to include a User Reaction Section. □

➤ DEVICE CONTROL

Control functions for the 4270 Series are performed by a 16-bit microprocessor utilizing 32K of RAM. Dedicated 8-bit microprocessors perform the I/O functions for the display stations, printer, and system controller.

Operation of the cluster system is initiated by an Initial Program Load (IPL) performed at the control panel of the 4274 Controller. The IPL procedure loads the system programs from the integral diskette in preparation for execution. The 4276 Stand-alone system is configured on-site via local commands entered at the keyboard.

Three modes of operation are offered.

In normal mode, the 4270 Series and all of its components are on-line with the remote host system and the applications running on it. Applications such as inquiry/response and data entry are supported in this mode.

In off-line mode, a number of operations or functions may be performed without host system or remote application control. Each display station may interrupt the normal mode to enter

the off-line mode, with all other stations on the system continuing normal operation. The station in the off-line mode appears "busy" to the host until the function is completed. Most, but not all, off-line functions will not disturb the data display section of the screen. Off-line commands are given through the use of the function keys or keyboard entered commands. Off-line commands include local copy of a screen to a printer, inter-station communications between 4278 Display Stations attached to the same 4274 Controller, automatic statistical gathering and reporting, and maintenance and support commands designed to test and diagnose the system.

Utility mode provides access to four system support utility programs:

The Configuration Utility gives the user the ability to specify the software and equipment configuration under which the 4270 Series will operate. The utility operation involves modifying a configuration table stored on the diskette. Some of the information available for user modification includes the host-recognized address for the 4274 Controller, the host-recognized address for each display station or printer, the operational status of each device, and the security password, if any, assigned to each display.

The Copy Utility provides the user with a method of reproducing the system diskette to provide backup copies or to provide additional copies on which different system configurations can be specified.

Diskette Initialize Utility prepares a new diskette to receive and store data during a copy operation.

Modification Utility allows minor modifications to be made to system programs if they are required on the user's site. This utility program is primarily designed for Racal-Milgo service personnel.

COMPONENTS

MODEL 4274 SYSTEM CONTROLLER: Offers the operating characteristics and features of the IBM 3274 Control Unit. The controller supports up to 32 devices, in any mix of display stations and printers, in a cluster configuration. The unit is based on a 16-bit, factory programmed microprocessor with 32K of RAM. Dedicated 8-bit microprocessors perform the I/O functions for the controller and its attached devices. A single diskette drive unit is housed in the controller cabinet. It serves as the program load and storage device for the communications emulator and for the various utility programs available. A communications adapter and a station adapter are included.

MODEL 4276/4278 DISPLAY STATIONS: A 15" diagonal display capable of displaying 1,920 characters in a 24-line by 80-column format. A 25th line appears at the bottom of the normal display and is used for posting display and system status, information and error messages, and entering off-line mode commands. The 25th line brings the total of displayable characters to 2,000.

Characters are displayed in green phosphor on a dark background, and are formed utilizing a 7 x 9 dot matrix in a 9 x 15 cell. The monitor is adjustable for 15 degrees of tilt and 30 degrees of swivel. An anti-glare screen, non-destructive cursor, and reverse video are standard features. The 4278 connects to the controller via coaxial cable which can extend to up to 5,000 feet.

KEYBOARD: An 87-key, typewriter-style keyboard includes a 16-key numeric pad and 24 function keys. The keyboard is similar to the IBM 3278 keyboard with the following exceptions: frequently used function keys have been moved to an upper row, and keyboard shifting for the Clear and Erase

Racal-Milgo 4270 Series Terminal System

► Input functions has been eliminated. An EBCDIC character set is generated. The keyboard is detachable and features audio feedback. The keyboard is available with either an EBCDIC or ASCII character set.

MODEL 4285 PRINTER: A bi-directional dot matrix printer with a rated speed of 120 characters per second. Characters are formed via a 9-by-9 dot matrix. Forms are advanced via a tractor feed, or optional friction feed mechanism, and up to 80-column line widths are standard. Horizontal character spacing is 10 cpi; vertical line spacing is switch-selectable at 6 or 8 lpi. A 96-character upper/lower case ASCII set is generated.

MODEL 4287 PRINTER: A bi-directional dot matrix printer with a rated speed of 160 cps. The 4287 is available in two models: BSC and BSC/SDLC (4287N). Characters are formed via a 7-by-7 dot matrix. Forms are advanced via an adjustable tractor feed mechanism, and up to 132-column line widths are standard. Horizontal character spacing is 10 cpi; vertical line spacing is selectable at 6 or 8 lpi. A 96-character upper/lower case ASCII set is generated. The 4287 is compatible with the IBM 3287 Model 2.

MODEL 4293/4294 PRINTERS: Bi-directional dot matrix printers with a rated speed of 200 cps. Model 4293 features a friction feed paper handling mechanism; Model 4294 features a tractor feed paper handling mechanism. Line widths range from 136 columns at 10 cpi to 224 columns at 16.5 cpi. Vertical line spacing is selectable at 6 or 8 lpi. A 94-character upper/lower case ASCII set is generated.

MODEL 4295 PRINTER: A line printer with a print speed of 300 lpm. Print line width is 132 columns. Standard features include variable line spacing, dynamic paper positioning, forms thickness control, line feed, form feed, continuous feed, and out-of-paper alarm. A self-test feature has 16 switch-selectable off-line test routines.

PRICING

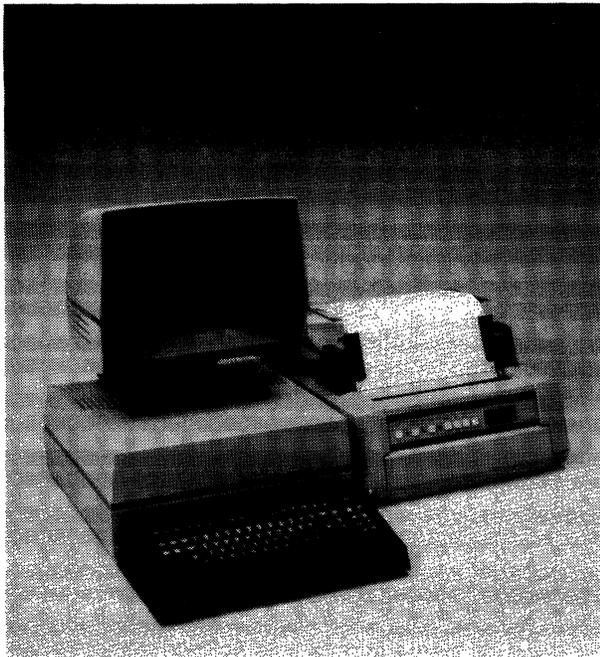
The components of the 4270 Series are available for purchase, or on a 12-, 24-, 36-, or 60-month lease. Discounts for purchased equipment in quantities of 25 or more are available.

Purchase prices, monthly maintenance charges for purchased units, and monthly charges on the 36-month lease are listed below. For additional pricing, contact Racal-Milgo.

	Monthly Charge*		
	36-Month Lease	Purchase	Monthly Maint.
4274 System Controller (BSC)	\$117	\$3,949	\$32
4274N System Controller (BSC/SDLC)	146	4,724	32
4276 Stand-alone Display Station	148	3,950	35
4278 Display Station	70	2,560	14
4901 Terminal Adapter (from 9 to 16 devices)	65	2,520	10
4902 Terminal Adapter (from 17 to 24 devices)	61	2,090	10
4903 Terminal Adapter (from 25 32 devices)	17	410	8
4285 Printer	59	824	30
4287 Printer (BSC)	127	3,099	40
4287N Printer (BSC/SDLC; 4550 not required)	178	3,399	50
4293 Printer	146	3,599	50
4294 Printer	143	3,399	50
4295 Printer	223	6,333	50
4550 Printer Interface	43	1,200	—

*Includes prime-shift maintenance.■

Racal-Milgo 40+ Data Display System



MANAGEMENT SUMMARY

The Racal-Milgo 40+ Data Display System is a stand-alone terminal consisting of three units: CRT display monitor, keyboard, and controller. Modular construction permits the units to be attached or separated. The display monitor can be mounted on a swivel stand of its own. In addition, Racal-Milgo offers two serial printers (160 and 240 characters per second) and a line printer (200 lines per minute).

The 40+ currently can be configured in two ways. The 40+K1 is a plug-compatible replacement for Teletype Models 40/1, 40/2, and 40/3; equivalent Bell Dataspeed 40 service; or any other Teletype-compatible terminals for basic interactive communications and timesharing. The 40+MPL is a plug-compatible replacement for the Bell Dataspeed 40 operating with a Selective Calling Agreement (9140) under 8A1 protocol for message switching applications.

Not a user-programmable terminal, the Racal-Milgo 40+ utilizes a microprogram-controlled microprocessor (currently an Intel 8080) as a terminal controller. The microprogram (or "firmware") resides in an 8K ROM (read-only memory). An 8K RAM (random-access memory) is used for display memory.

The firmware for the Racal-Milgo 40+ implements all the key features of the Teletype Models 40/1, 40/2, and 40/3, including identical text editing, optional paging and scrolling, cursor manipulation, optional tabbing, optional format protection, and optional printing capabilities. In addition, Racal-Milgo has added some facilities of its own that can enhance the terminal's operations. These include:

Stand-alone display terminals plug-compatible with Teletype Models 40/1, 40/2, and 40/3 and their Bell Dataspeed counterparts.

The "plus" signifies features not available on the Teletype and Dataspeed models, such as switch-selectable synchronous transmission, additional text editing functions, and an optional underline feature.

The basic Model 40+ CRT terminal with a display and keyboard costs \$3,750, about the same as a similarly-configured Teletype Model 40. Lease prices are \$140, \$125, or \$81 per month for a 1-, 2-, or 5-year lease respectively, including maintenance; this compares with a month-to-month charge of \$139 for comparable Dataspeed equipment.

CHARACTERISTICS

VENDOR: Racal-Milgo Information Systems, Inc., 8600 N.W. 41st Street, Miami, Florida 33166. Telephone (305) 592-8600.

DATE OF ANNOUNCEMENT: July 1974.

DATE OF FIRST DELIVERY: Fourth quarter 1974.

NUMBER DELIVERED TO DATE: Approximately 3,000.

SERVICED BY: Racal-Milgo; Western Union maintains the 40+ units it markets.

CONFIGURATION

The basic 40+ is composed of three discrete modules which include a control module containing a microprocessor with 8K of ROM (read-only memory) and 8K of RAM (random-access memory), a keyboard module, and a display module. The 40+ can be configured as follows:

- 40+K1—a plug-compatible replacement for the Teletype Models 40/1, 40/2, and 40/3, and comparable Bell Dataspeed equipment.
- 40+MPL—a plug-compatible replacement for the Bell Dataspeed 40 operating with the Selective Calling Arrangement (9140).

Separate interfaces provide connections for a serial or line printer and an external modem.

TRANSMISSION SPECIFICATIONS

The system operates in either asynchronous or synchronous mode, using ASCII code in all cases, with selectable parity. Model 40+K1 supports transmission speeds of 110 to 1200 bits per second; Model 40+MPL transmission speeds range from 1200 to 4800 bits per second. The modem interface is compatible with EIA standard RS-232C. For all speeds of 1200 bits per second and above, Racal-Milgo provides optional modems, although any acceptable modem or acoustic coupler may be used. The 40+ can be used in either switched or leased networks or with Digital Data

Racal-Milgo 40+ Data Display System

- Additional text editing functions, including word insert and delete functions and a line erase function as standard features.
- The option to specify synchronous transmission as a standard alternative to asynchronous transmission.
- An optional underline feature, permitting important data to be displayed with an underscore to alert the operator's attention.

Like its Teletype counterparts, the Racal-Milgo 40+ provides a self-diagnostic capability implemented by the terminal firmware. This operator-initiated feature probes the terminal logic for failures, which, when located, are identified via operator messages and display patterns. Although some failures can be resolved by the operator, others will require a customer engineer. Indicator lamps (LED's) are used to indicate normal voltage levels.

The basic Racal-Milgo 40+ keyboard/display is priced about 10 percent more than the purchase price of a comparable Teletype 40/1, 40/2, or 40/3 (without OEM and quantity discount). Rentals under a one-year lease match monthly charges under AT&T's Dataspeed 40 Service; two- and three-year leases offer substantial savings over Dataspeed prices.

Racal-Milgo provides its own maintenance service for the 40+ through its nationwide service organization, which consists of more than 70 computer engineers and service points in more than 38 cities.

USER REACTION

Datapro conducted telephone interviews with seven users of the Racal-Milgo 40+ terminals, who reported on their experience with a total of 24 units. Their ratings are summarized below.

	Excellent	Good	Fair	Poor	WA*
Overall performance	4	2	0	0	3.7
Ease of operation	4	2	0	0	3.7
Display clarity	5	0	1	0	3.7
Keyboard feel and usability	2	4	0	0	3.3
Hardware reliability	2	3	1	0	3.2
Maintenance service	1	3	1	0	3.0
Technical support	1	4	0	0	3.2

*Weighted Average on a scale of 4.0 for Excellent.

Two users would not supply ratings on maintenance service and technical support, which accounts for the variation in number of responses for those characteristics.

Key advantages cited by more than one user included ease of operation, availability of paging (though several users wished for *more* pages of memory), keyboard layout, and low cost. Other strengths mentioned were a good selection of editing features, Teletype compatibility, operating flexibility, and reliability.

On the negative side, problems with the printers and with service were mentioned as disadvantages. Three users found that the printer offered with their 40+ system performed less than satisfactorily in terms of speed and/or reliability; one user had the 40+10 printer (an Okidata CP110) and two had the 40+20 (a GE TermiNet ➤

- Service. Depending upon the configuration selected, the 40+ family will operate in point-to-point, multi-point, and/or multi-drop environments. Both attended and unattended operation are also supported.

Character parity is generated for each keyed character and accompanies the transmitted characters. Parity checking is performed on received data. A character found to be in error is replaced with a special symbol, which is printed and/or displayed on the screen in place of the incorrect character. The 40+MPL has an optional retransmission capability.

DEVICE CONTROL

The 40+ is a stand-alone terminal that features as its nucleus a microprogram-controlled microprocessor, which directs all terminal operations. The microprogram (firmware), which resides in read-only memory (ROM), is divided into five main categories: data entry, which permits formatted and free-form text entry; communications, which permits formatted or selected transmission; format control, which permits formatted or selected transmission; format control, which permits the user creation of display formats for data entry; local off-line printing, which permits printing a displayed message; and self-diagnostics, which permit system failures to be isolated by exercising the system components.

Transmission is performed by block, message, or character at user option, depending upon the selected configuration. The entire contents or a selected part of the display memory is transmitted upon operator command. Messages are composed and edited prior to transmission. Send and receive functions can be manually initiated; and the optional send/receive function automatically switches the unit to the receive mode following message transmission to a host computer in either Dataspeed 40-compatible mode.

The cursor may be manually moved in any of four directions: up, down, left, or right. Repetitive operation is provided for these functions. In addition, the cursor can be returned to Home, or to the first character position of the line occupied by the cursor or the next line, and spaced forward or backward. The cursor can also be moved to any character position by a received two- or four-character sequence of cursor commands that correspond to the cursor functions provided by the manual controls or to a line and a column address for direct cursor movement.

Fixed formats can be employed for data entry applications that require the operator to key pertinent data into designated areas within the displayed format. The protected format feature prevents format descriptors from modification, limiting key entry to specified fields within the displayed format (i.e., blank spaces). Only the keyed data is transmitted or cleared when operating with a protected format. Provision is made for entering or transmitting a fixed format when the 40+K1 is selected.

Up to eight functions, including character, word, and line insertion and deletion, line erase, and clear, are offered in various models.

Character and word insertion and deletion affect all data to the right of the cursor up to the end of the line or to the beginning of a protected field; the character function permits the insertion or deletion of a single character for each depression of the insertion or deletion key, whereas the word function permits a complete word or words to be inserted or deleted. The displayed text expands (to the right) for each character entered and contracts for each character deleted. An attempted insertion is inhibited when a line (or variable field) is filled with text, and the operator is alerted.

Line insertion and deletion affect all lines of text from the cursor to the end of display memory or a line occupied by a protected field. An attempted line insertion is inhibited when display memory has been filled with partial or complete lines of data, or when the insertion is attempted into a segment preceding a protected field where all lines are occupied; i.e., ➤

Racal-Milgo 40+ Data Display System

▷ 1200). (Racal-Milgo has discontinued the 40+10 printer. Two new printers have been added to the 40+ line, the TP403 and TP404, both manufactured by Tally, which Racal-Milgo expects to be much more reliable.) Concerning service, one user mentioned that service, which is coordinated out of Chicago, was difficult to schedule, and felt that his serviceman's territory is too large.□

▶ the line containing the protected field will not move downward.

The line erase functions erase all displayed data from the position occupied by the cursor to the end of the line. The clear function erases the entire contents (excluding protected fields when the protected format feature is activated) of display memory, beginning at the first character position to the right of the cursor.

Scrolling Memory, an optional feature consisting of one or two additional 1920-character display memory segments that provide storage for a total of 48 or 72 lines of data, is available on both models. Data storage is divided into two or three contiguous 24-line segments. By means of the Scroll Up and Scroll Down key functions, any consecutive 24 lines of memory can be displayed at one time; data is moved continuously, one line for each key depression. The Segment Advance key function displays each consecutive 24-line segment of the display memory through successive key depressions. Page numbering is denoted by dots displayed in the left margin.

The 40+K1 and 40+MPL have, as options, a group of extended edit functions. Horizontal Tab provides a keyboard or computer-controlled tab function. Tab stops are line-independent; i.e., individual tab stops can be located at different positions on each line. When setting Tab stops, all stops are simultaneously set in a column throughout display memory. Clearing of tab stops affects all locations to the right of and below the cursor, and is accomplished with a single depression of the clear key.

Highlight and underline features are optional. These features direct the operator's attention to display information of a critical nature. Highlighting blinks a character or field of data between full and half intensity once every second. Underlining underscores the data as it is displayed. Both functions can be initiated by the operator or host computer.

The optional printer operates in either on-line or off-line mode, depending on the terminal configuration selected. When the printer is operating on-line, all received messages are printed. Because printing is performed from the display

memory, the received messages are also displayed. When operating off-line, the printer is under operator control as a local copy printer. Displayed messages are printed only when the Print Local key is depressed.

COMPONENTS

CRT DISPLAY: The display is a 15-inch (diagonal measurement) CRT with a viewing area 10½ inches wide by 5¾ inches high. The screen is arranged in 24 lines of 80 characters each for a total of 1920 character positions. A character set of up to 127 ASCII characters, including upper and lower case alphabets, numerics, and special symbols, is displayed in white against a dark background. Characters are formed in a 7-by-9 dot matrix. Lower case alphanumeric characters such as p, q, g, j, and y are displayed in true lower case via a 7-by-11 dot matrix; the added matrix positions are used to display the lower case descenders. The viewing screen can be tilted vertically through 20 degrees and rotated horizontally through 60 degrees for operator convenience.

KEYBOARD: The typewriter-style keyboard can generate any of 127 ASCII characters, including upper and lower case alphabets, numerics, specials, and control codes.

SERIAL PRINTERS: The TP404 serial printer operates at 160 characters per second over a print width of 132 print positions. Characters are formed by a 7-by-7 dot matrix for standard sized characters and 3-by-7 dot matrix for narrower characters, such as i, l, t, etc. A set of 64 ASCII characters is standard; a 96-character set is available.

The 40+20 serial printer, available for use with the 40+MPL only, operates at 240 characters per second over a print width of 80 columns or, optionally, 120 columns; a tractor feed mechanism is standard. Fully formed characters, including upper and lower case alphabets, are printed.

LINE PRINTER: The TP403 line printer operates at 200 lines per minute over a print width of 132 characters. Characters are formed by a 7-by-8 dot matrix. A set of 64 ASCII characters is standard; a 96-character set is also available.

PRICING

The Racal-Milgo 40+ Data Display System is available for lease or purchase. Racal-Milgo provides lease terms of one to five years. Lease arrangements for all components except the TP403 and TP404 printers include prime-shift maintenance. The TP403 and TP404 printers may be leased with or without maintenance. The lease price is reduced by \$40 per month for TP404, or \$48 per month for TP403, for a lease without maintenance.

	Monthly Charges*				Monthly Maint.
	1-Year	2-Year	5-Year	Purchase**	
Model 40+ K1	\$140	\$125	\$81	\$3,750	\$20
Model 40+ MPL	140	125	81	3,750	20
Printers (including interface)—					
TP404; 132 col.	160	140	110	4,250	40
40+20, 80 col.; for 40+ MPL only	130	117	75	3,320	20
40+ 20, 120 col.; for 40+ MPL only	140	125	81	3,600	20
TP403; 132 col.	200	170	125	5,460	48

* Includes prime-shift maintenance.

**Prices are for a quantity of 1; quantity discounts are available.■

Racal-Milgo System 400



MANAGEMENT SUMMARY

Introduced in September 1976, the Racal-Milgo System 400 display terminals are plug-compatible replacements for Honeywell, IBM, and Univac equipment. Four separate models provide emulation for the various vendors' terminals.

The System 400 has the same styling and physical appearance, and is controlled by the same Intel 8080 microprocessor, as Racal-Milgo's Teletype 40 replacement, the 40+ terminal (Report C25-708-101).

The System 400 provides combined PROM and RAM storage capacities totaling 16K bytes, in any combination. The PROM contains the operating and emulation firmware for the System 400; the RAM provides one page of display memory, printer buffering, and storage for the Integrated Communications Monitor, a line monitoring feature. The System 400 supports an optional printer for hard copy output. The user can provide his own printer or select one of the available printers that Racal-Milgo buys from prominent printer manufacturers.

The System 400 is available in two standard screen capacities: 960 or 1920 characters. True lower case alphabets are displayed. And, like the 40+, the 400's screen can be tilted or swiveled for operator viewing convenience. Because the 400, like the 40+, is composed of three

A family of microprocessor-based terminals plug-compatible with Honeywell VIP 7700, Univac Uniscope 100 and 200, and IBM 3275 (BSC) and 2265.

Standard editing features include formatting, protected data, character and line insertion and deletion, and forward/backward tabulation. Optional hard-copy output can be provided through line printer or serial printer attachment.

A System 400 terminal costs \$4,550 to \$4,950, depending on the compatibility required; discounts are available for quantities of 10 or more. Racal-Milgo offers lease terms up to five years; maintenance is automatically included for some units and optionally included for others. Monthly rentals range from \$120 to \$130 for a three-year lease, including maintenance.

CHARACTERISTICS

VENDOR: Racal-Milgo, Inc. (formerly ICC/Milgo), 8600 N.W. 41st Street, Miami, Florida 33166. Telephone (305) 592-7654.

DATE OF ANNOUNCEMENT: September 1976.

DATE OF FIRST DELIVERY: Racal-Milgo 400 Model 1—October 1976; Model 2—November 1976; Model 3—February 1977; Model 4—October 1976.

NUMBER DELIVERED TO DATE: Over 3000.

SERVICED BY: Racal-Milgo.

MODELS

The Racal-Milgo System 400 is a microprocessor-based, stand-alone display terminal with optional printer that features full functional and protocol compatibility with prominent terminals from leading mainframe vendors. The System 400 is currently available in the following four models that differ in compatibility.

- Model 1—compatible with the Honeywell VIP Series.
- Model 2—compatible with the UNIVAC Uniscope 100 and 200.
- Model 3—compatible with the IBM 3275 using BSC protocol. When a printer is added to the System 400-3, it can operate as a single 3271 workstation.
- Model 4—compatible with the IBM 2265.

All models are available with a printer. The terminals can be equipped with a Centronics-compatible parallel printer interface and will accommodate a compatible user-supplied printer.

TRANSMISSION SPECIFICATIONS

Transmission is synchronous or asynchronous, half- or full-duplex at rates up to 9600 bits/second. Transmission para-

Racal-Milgo System 400

➤ separate modules, the display screen can be positioned anywhere on the work surface, and the separate keyboard can be arranged for operator convenience.

Many of the functional features of the Racal-Milgo 40+ are retained in the 400, including full cursor control, format protection, field delimiting, tabbing, text editing, and highlighting. A special feature not available in the 40+ is the Integrated Communications Monitor; it is extremely useful in pinpointing troubles. This feature displays all character codes transmitted and received so that the user can determine an invalid or missing code or code sequence that may be causing problems. What's more, the user can "freeze" the screen at any point and take a "snapshot" with the printer.

Printer addressability, an optional feature, increases operational flexibility by allowing data entry to be performed concurrently with printing of a computer message.

The printers supplied by Racal-Milgo are a good choice. Both printers are manufactured by Tally and are designed to operate in a 100% duty cycle and to be relatively maintenance-free. The user can elect to supply his own printer provided that it has a Centronics-compatible parallel interface.

Racal-Milgo provides its own maintenance service through its nationwide service organization, which consists of more than 100 customer engineers and service points in more than 40 cities.

USER REACTION

Datapro conducted telephone interviews with six users of the Racal-Milgo System 400 terminals, who reported their experience with a total of 195 units. Their ratings are summarized below:

	Excellent	Good	Fair	Poor	WA*
Overall performance	1	4	1	0	3.0
Ease of operation	1	3	1	0	3.0
Display clarity	4	2	0	0	3.7
Keyboard feel and usability	2	2	2	0	3.0
Hardware reliability	2	3	1	0	3.2
Maintenance service	2	1	2	0	3.0
Technical support	1	3	2	0	2.8

*Weighted Average on a scale of 4.0 for Excellent.

Two users would not supply ratings on maintenance service and ease of operation respectively, which accounts for the variation in number of responses for those characteristics.

Among the six users, there were three users of Honeywell emulation, two of IBM 3270, and one of IBM 2265.

Most of these users supported Racal-Milgo's general reputation for well-designed equipment. Key System 400 advantages they cited included low cost, display clarity, availability of a numeric pad, and suitability to the appli-

➤ meters including code, speed, format, and protocol are a function of the communications emulation firmware. An EIA RS-232C interface is standard. The terminals can be used on a dial-up facility or leased point-to-point or multi-point arrangement.

DEVICE CONTROL

The System 400 is a microprocessor-based terminal that features an Intel 8080 microprocessor for terminal control. All functions are firmware-controlled. The operating firmware, including control and emulator microprograms, resides in 8K bytes of ROM. An 8K-byte RAM provides buffering for display, printer, and communications line monitoring. A single page of buffering is used for display.

The cursor can be manually moved in any of four directions; up, down, left, or right. Repetitive operation is provided for these functions. In addition, the cursor can be returned to Home, or to the first character position of the line occupied by the cursor or the next line, and spaced forward or backward. The cursor can also be moved to any character position by a received two- or four-character sequence of cursor commands that correspond to the cursor functions provided by the manual controls or to a line and a column address for direct cursor movement.

Fixed formats can be employed for data entry applications that require the operator to key pertinent data into designated areas within the displayed format. The protected format feature prevents format descriptors from modification, limiting key entry to specified fields within the displayed format (i.e., blank spaces). Numeric only or alphanumeric fields can be delimited. Only the keyed data is transmitted or cleared when operating with a protected format.

Character insertion and deletion affect all data to the right of the cursor up to the end of the line or to the beginning of a protected field or end of screen; the character function permits the insertion or deletion of a single character for each depression of the insertion or deletion key. The displayed text expands (to the right) for each character entered and contracts for each character deleted. An attempted insertion is inhibited when a line (or variable field) is filled with text, and the operator is alerted. Line insertion and deletion affect all lines of text from the cursor to the end of display memory but is inactive in Format mode operations to protect format integrity.

The line erase functions erase all unprotected data from the position occupied by the cursor to the end of the line. The clear function erases the entire contents of display memory, beginning at the first character position.

Horizontal Tab provides a keyboard or computer-controlled tab function. Tab stops are line-independent; i.e., individual tab stops can be located at different positions on each line. In the Format mode, the horizontal tab moves the cursor to the beginning of the next unprotected field.

The optional printer operates as a local copy printer to produce a printed copy of the displayed data on command. Printer addressability, an option, enables the printer to be directly addressed by the host computer. With this option installed, the printer can produce a received message concurrent with data entry. The printer is fully buffered and has no delaying effect on operator keying activities.

The terminal can also be used as a communications line monitor to pinpoint troubles during transmission. In this mode, the terminal displays all transmitted or received data, including control codes such as STX or ETX. Received data is underscored to distinguish it from transmitted data. The display can be frozen at any time and a printed copy can be produced for detailed analysis.

Racal-Milgo System 400

➤ cation. The self-diagnostics capability and detachability of components were also mentioned as strengths.

Problems were encountered in only two areas: keyboard layout and compatibility. Three of the users mentioned that the keyboard layout is different from the keyboards of the terminals being emulated, causing problems in adjustment for those people who had been trained on Honeywell or IBM equipment. Four of the users had intermittent problems with communications or emulation firmware and several stated that the equipment does not completely live up to its advertised "plug-compatibility." Although a number of modifications were made to their units' firmware, permanent solutions have not been found in two cases.

Most of these users were well satisfied with the service Racal-Milgo has supplied. However, two felt that the response time was too long when their equipment was down (overnight in one case, and 2 to 3 days in the other). One user felt that the local field technicians were excellent for hardware repairs, but that they were not supported well by Racal-Milgo for the firmware problems encountered. □

➤ COMPONENTS

DISPLAY UNIT: A 15-inch (diagonal measurement) CRT with a viewing area 10½ inches wide by 5¾ inches high. Either of the following two display arrangements is available:

Characters/display:	960	1920
Lines/display:	12	24
Characters/line:	80	80

Three character sets are available: 64, 96, or 127 ASCII characters. The 96- and 127-character sets include upper and lower case alphabets. Characters are formed by a 7-by-9 dot matrix. Lower case alphabets such as p, q, g, j, and y

➤ are displayed in true lower case via a 7-by-11 dot matrix; the added matrix positions are used to display the lower case descenders.

Data is displayed in white. Standard display highlighting features include half and full intensity, zero intensity (blank), reverse video, blinking, and underscore.

The viewing screen can be tilted vertically through 20 degrees and rotated horizontally through 60 degrees for operator convenience.

KEYBOARD: A 92-key, typewriter-style detachable keyboard. The keyboard can generate any of 127 characters including upper and lower case alphabets, numerics, and control codes. Options include a 16-key numeric cluster and 16 function keys. Operator lock-out of selected keys is standard; system lock-out of selected keys is optional.

PRINTERS: Two Tally printers are currently offered: the TP403 line printer and the TP404 serial printer. Both feature adjustable forms tractor feed, 132-column print width, and switchable vertical spacing of 6 or 8 lines per inch. A 64-character set is standard on each; a 96-character set, including true lower case alphabets, is optionally available. The TP403 prints at a rate of 200 lines per minute; characters are performed by a 7-by-8 dot matrix. The TP404 prints at a rate of 160 characters per second using a 7-by-7 dot matrix for standard-width characters and a 3-by-7 dot matrix for narrower characters (such as i, l, and t).

PRICING

The Racal-Milgo 400 is available for lease or purchase. Racal-Milgo provides lease terms of one, two, three, four and five years. Lease agreements for Models 400-1, 400-2, and 400-4 include prime-shift maintenance; Model 400-3 and the two printers may be leased with or without maintenance. The lease price is reduced by \$25, \$48, and \$40 for a Model 400-3, TP403 printer, and TP404 printer, respectively, for a lease without maintenance. A separate maintenance contract is available for purchased units. There is no installation charge for any System 400 component. Quantity discounts are available on purchased units only.

Monthly Charge*

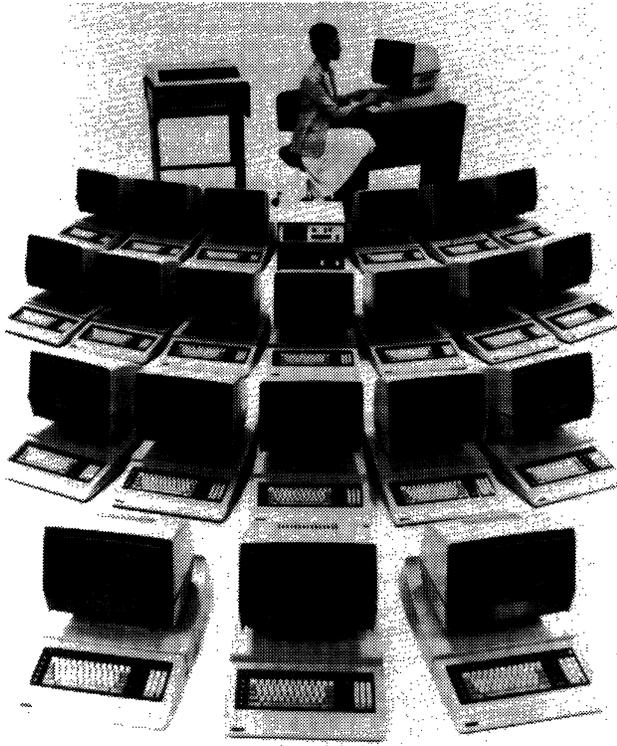
		1-Year Lease	3-Year Lease	5-Year Lease	Purchase**	Monthly Maint.
400-1	(Honeywell VIP 7700)	155	130	115	4,850	25
400-2	(UNIVAC Uniscope 100/200)	155	130	115	4,850	25
400-3	(IBM 3275, 3271, BSC)	160	130	105	4,950	25
400-4	(IBM 2265)	150	120	100	4,550	25
Printers (including buffering and interface)						
TP403	Line Printer	200	149	125	5,460	48
TP404	Serial Printer	160	118	110	4,250	40

*Including prime-shift maintenance. Leases without maintenance are also available for Model 400-3 and the printers.

**Unit quantity price; volume discounts are provided for 10 or more units. ■



Racal-Milgo 4270 Clustered Terminal System



MANAGEMENT SUMMARY

Racal-Milgo's 4270 Series is a microprocessor controlled, factory programmed, clustered terminal system. The system emulates the IBM 3270 Information Display System, with the operating characteristics and features of an IBM 3274 Control Unit and an IBM 3278 Model 2 Display Station.

The 4270 Series consists of the 4274 System Controller, the 4278 Display Station, and a choice of two optional printers. The system links to the host computer system using either IBM's Binary Synchronous Communications (BSC) or Systems Network Architecture/Synchronous Data Link Control (SNA/SDLC). User activities are supported in a cluster configuration of display stations and optional printers up to a total of 32 devices.

The 4274 System Controller maintains communications with the host system and controls the clustered devices. A factory programmed 16-bit microprocessor with 32K RAM performs the central control functions. Dedicated 8-bit microprocessors perform the I/O functions for the controller, display stations, and printers. A single diskette drive unit is housed in the controller cabinet, and serves as the program load and storage device for the communications emulator and the various utility programs used to configure or operate the system. The controller attaches to a modem via an RS-232-C interface, and supports communications over dedicated lines at speeds from 2,000 to 9,600 bits per second.

An interactive clustered terminal system designed for IBM 3270 emulation.

The system consists of a controller, display station, and two models of printer. All components are microprocessor controlled. A total of 32 devices, display stations and/or printers, are supported in a cluster configuration.

All components of the system are available for lease or purchase. The 4274 System Controller can be purchased for \$3,949, and the 4278 Display Station sells for \$2,560. Quantity discounts are available.

CHARACTERISTICS

VENDOR: Racal-Milgo Information Systems, Inc., 8600 N.W. 41st Street, Miami, FL 33166. Telephone (305) 592-8600.

DATE OF ANNOUNCEMENT: March 1980.

DATE OF FIRST DELIVERY: June 1980.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: Racal-Milgo.

CONFIGURATION

The 4270 Clustered Terminal System consists of the 4274 System Controller, 4278 Display Station, and a choice of two optional matrix printers, the 4287 or 4289. User activities are supported in a cluster configuration combining display stations and printers in any combination up to a total of 32 devices.

TRANSMISSION SPECIFICATIONS

The 4270 System supports synchronous communications using IBM's Binary Synchronous Communications (BSC) or Systems Network Architecture/Synchronous Data Link Control (SNA/SDLC), at line speeds from 2,000 to 9,600 bps over leased lines. The controller attaches to a modem via an RS-232-C interface. EBCDIC code is used.

DEVICE CONTROL

Control functions for the 4270 Series are performed by a 16-bit microprocessor utilizing 32K of RAM. Dedicated 8-bit microprocessors perform the I/O functions for the display stations, printer, and system controller.

Operation of the system is initiated by an Initial Program Load (IPL) performed at the control panel of the 4274 Controller. The IPL procedure loads the system programs from the integral diskette in preparation for execution. Three modes of operation are offered.

In normal mode, the 4270 Series and all of its components are on-line with the remote host system and the applications

Racal-Milgo 4270 Clustered Terminal System

▷ The 4278 Display Station features a 15" diagonal display screen that can accommodate a total of 1,920 characters in a 24-line by 80-column format. A 25th line for status information appears at the bottom of the display. Characters are displayed in green on a dark background, and the console has tilt and swivel adjustments. The 87-key typewriter-style keyboard is similar in design to the IBM 3278 keyboard, and is detachable. A 16-key numeric pad and 24 function keys are included.

The system can be configured with either of two optional matrix printers, the Model 4287 providing 160 cps operation, or the Model 4289 providing 200 lpm operation. Both models feature 132 print positions per line and an adjustable tractor feed.

Both the 4274 Controller and 4278 Display Station feature integrated diagnostics that are executed each time display power is turned on or an initial program load is performed. Racal-Milgo has nationwide service locations, including remote field stocking of spare parts in approximately 20 locations. □

▶ running on it. Applications such as inquiry/response and data entry are supported in this mode.

In off-line mode, a number of operations or functions may be performed without host system or remote application control. Each display station may interrupt the normal mode to enter the off-line mode, with all other stations on the system continuing normal operation. The station in the off-line mode appears "busy" to the host until the function is completed. Most, but not all, off-line functions will not disturb the data display section of the screen. Off-line commands are given through the use of the function keys or keyboard entered commands. Off-line commands include local copy of a screen to a printer, inter-station communications between 4278 Display Stations attached to the same 4274 Controller, automatic statistical gathering and reporting, and maintenance and support commands designed to test and diagnose the system.

Utility mode provides access to four system support utility programs:

The Configuration Utility gives the user the ability to specify the software and equipment configuration under which the 4270 Series will operate. The utility operation involves modifying a configuration table stored on the diskette. Some of the information available for user modification includes the host-recognized address for the 4274 Controller, the host-recognized address for each display station or printer, the operational status of each device, and the security password, if any, assigned to each display.

The Copy Utility provides the user with a method of reproducing the system diskette to provide backup copies or to provide additional copies on which different system configurations can be specified.

Diskette Initialize Utility prepares a new diskette to receive and store data during a copy operation.

Modification Utility allows minor modifications to be made to system programs if they are required on the user's site. This utility program is primarily designed for Racal-Milgo service personnel.

COMPONENTS

MODEL 4274 SYSTEM CONTROLLER: Offers the operating characteristics and features of the IBM 3274 Control Unit. The controller supports up to 32 devices, in any mix of display stations and printers, in a cluster configuration. The unit is based on a 16-bit, factory programmed microprocessor with 32K of RAM. Dedicated 8-bit microprocessors perform the I/O functions for the controller and its attached devices. A single diskette drive unit is housed in the controller cabinet. It serves as the program load and storage device for the communications emulator and for the various utility programs available. A communications adapter and a station adapter are included.

MODEL 4278 DISPLAY STATION: A 15" diagonal display capable of displaying 1,920 characters in a 24-line by 80-column format. A 25th line appears at the bottom of the normal display and is used for posting display and system status, information and error messages, and entering off-line mode commands. The 25th line brings the total of displayable characters to 2,000.

Characters are displayed in green phosphor on a dark background, and are formed utilizing a 7 x 9 dot matrix in a 9 x 15 cell. The monitor is adjustable for 15 degrees of tilt and 30 degrees of swivel. An anti-glare screen, non-destructive cursor, and reverse video are standard features. The display station is microprocessor-based and connected to the controller via coaxial cable which can extend up to 5,000 feet.

KEYBOARD: An 87-key, typewriter-style keyboard includes a 16-key numeric pad and 24 function keys. The keyboard is similar to the IBM 3278 keyboard with the following exceptions: frequently used function keys have been moved to an upper row, and keyboard shifting for the Clear and Erase Input functions has been eliminated. An EBCDIC character set is generated. The keyboard is detachable and features audio feedback.

PRINTERS: Two microprocessor-controlled printers are available, featuring 160 cps and 200 lpm printing. Both models advance paper through the use of an adjustable tractor feed, and have full 132-character line widths with 6 or 8 lines per inch vertical spacing. The 4287, a 160 cps printer, can print on up to 5-part forms, and generates a 96-character EBCDIC set, including upper and lower case. The 4289, a 200 lpm printer, can print on up to 6-part forms, and generates a 64-character ASCII set. Both printers may be located up to 5,000 feet from the controller.

PRICING

The components of the 4270 Series are available for purchase or lease.

	Monthly Charge*				Purchase
	12-Month Lease	24-Month Lease	36-Month Lease	60-Month Lease	
4274 System Controller	\$ 84	\$ 79	\$ 74	\$62	\$3,949
4278 Display Station	64	52	47	42	2,560
4287 Printer (160 cps)	128	110	84	75	4,250
4289 Printer (200 lpm)	160	140	109	77	5,460
4901 Terminal Adapter (enables user to go from 9 to 16 devices attached)	120	104	97	87	4,200

*Prices include maintenance. ■