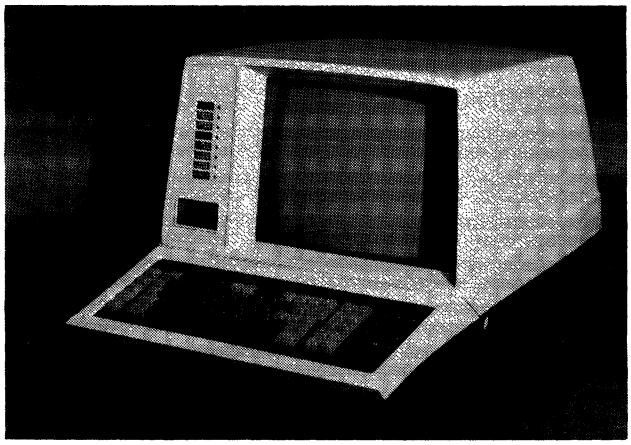
Raytheon PTS 100
Programmable Terminal System



A PTS 100 system can include from 1 to 32 CRT display units, as well as a variety of auxiliary I/O devices. Display screen capacities of 480, 960, and 1920 characters are available.

A user-programmable, minicomputer-based, family of display/keyboard terminals offered in both stand-alone and clustered system configurations.

The system is a direct replacement for the IBM 3270 and 2260 display terminal. Peripherals include printers, teletypewriters, card readers, disk drives and tape cassette recorder.

Software support for the terminals includes an operating system and utility programs, as well as IBM emulation.

Transmission can be synchronous or asynchronous in half- or full-duplex mode at speeds up to 9600 bps using ASCII or EBCDIC.

A two display, IBM 3270 emulation system rents for $284 per month, including maintenance.

A larger system with 32 displays, emulating the IBM 3270 rents for $2,300 per month, including maintenance.

MANAGEMENT SUMMARY

The Raytheon PTS 100 is a minicomputer-based, stand-alone or clustered display terminal that supports remote processing under the direction of user-created application programs. Raytheon offers the PTS 100 as a replacement for IBM's 3270 Information Display System (BSC version) and 2260 Display Station in both local and remote environments. Raytheon-provided software emulators support all functions of the PTS 100 terminals and provide compatibility with IBM communications software. A leading supplier of reservation and departure control systems to major airlines, Raytheon also offers the PTS 100 as an add-on or replacement terminal (also via software emulation) for IBM's 2948/2915 display terminals used in its PARS/IPARS airline reservation system.

The PTS 100 is available in a stand-alone version with 1 or 2 display units and in clustered versions that accommodate up to 32 display units. Screen capacities include 480-, 960-, and 1920-character displays; by comparison, IBM offers only the 480- and 1920-character screen sizes for its 3270, and sizes up to 960 characters for its 2260. Users can specify either of two display arrangements for the 960- and 1920-character screen capacities when ordering the PTS 100.

A host of available peripherals—including line and serial printers, card readers, and disk (cartridge) storage—strengthen the PTS 100 as a terminal and provide the necessary support for remote file processing. Disk storage capacity is impressive; up to 8 drives provide storage for 2.5 to 20.5 million bytes of data. The terminal's peripheral-handling capability is determined by the number of multiplexer subchannels included. The basic terminal provides 7, while an expanded terminal provides as many as 23. Each subchannel can operate in either simplex or half-duplex mode and can handle one data stream at a time. Communications and low-speed I/O devices interface the multiplexer subchannels; disk storage attaches directly to the mini-computer's ➢

CHARACTERISTICS

VENDOR: Raytheon Data Systems Company, Division of Raytheon Company, 1415 Boston-Providence Turnpike, Norwood, Massachusetts 02062. Telephone (617) 762-6700.

DATE OF ANNOUNCEMENT: May 1971.

DATE OF FIRST DELIVERY: October 1972.

NUMBER DELIVERED TO DATE: 5000.

SERVICED BY: Raytheon Data Systems Company.

MODELS

Four models are available—two stand-alone and two clustered terminals.

- **Model 1005—a stand-alone terminal with separate processor, 16K bytes of memory, one or two keyboard/display units, and an optional printer.**
- **Model 1014—a stand-alone terminal with separate processor, 16K to 32K bytes of memory, one or two keyboard/display units, and support for optional I/O devices.**
- **Model 1015—a medium-scale clustered terminal system with 16K or 32K bytes of memory that can accommodate up to 8, 16, or 32 keyboard/display units and support several I/O devices.** ➢

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high-speed I/O bus, which can also interface a host computer via a channel interface.

The PTS 100 provides a high degree of flexibility with respect to data communications. Speeds range to 9600 bps. Codes supported via software translation include EBCDIC, ASCII, SBT, and BCD.

Raytheon provides strong software support for the PTS 100. Besides emulator programs for the IBM 3270, IBM 2260, and IBM PARS/IPARS, Raytheon provides two macro assemblers (to support user creation of applications programs), an operating system, and a library of utility programs. The assemblers permit the user to generate application programs for the PTS 100 on a Raytheon Model 704 or 500 minicomputer or on an IBM System/360 or 370 computer under OS or DOS. The utility programs provide strong assistance to the user in loading, debugging, and maintaining his application programs.

Raytheon introduced the PTS 100 in May 1971, and production deliveries began during the last quarter of 1972. Raytheon currently has about 5,000 systems (22,000 displays) installed, consisting mainly of PTS 100 systems plus some of the newer PTS 1200 systems.

Service is provided by Raytheon Data Systems, with 52 service locations nationwide.

USER REACTION

In April 1976, Datapro conducted telephone interviews with six users of the Raytheon PTS 100 system. These users reported on their experience with a total of 1,932 display units. Their ratings, which follow, indicate a high degree of satisfaction with all aspects of the PTS 100.

	Excellent	Good	Fair	Poor	WA*
Overall performance	5	1	0	0	3.8
Ease of operation	6	0	0	0	4.0
Display clarity	2	4	0	0	3.3
Keyboard feel & usability	5	1	0	0	3.8
Hardware reliability	3	3	0	0	3.5
Maintenance service	3	3	0	0	3.5
Software & technical support	3	2	0	0	3.6

*Weighted Average on a scale of 4.0 for Excellent.

The users unanimously cited price/performance, reliability, and IBM compatibility as the key advantages of the PTS 100. Just half of the users we contacted were taking advantage of the terminal's programmability. Strong vendor support scored another big plus for the PTS 100. According to the users, Raytheon has been very responsive to their needs, and on-site spare parts are available at most locations. Not one of the respondents could point to a single disadvantage—not even screen glare.

Three of the six respondents were large users with from 450 to 800 displays; the other three reported on system sizes of 12 to 30 displays. All but one of the six had been using the Raytheon terminals for over a year; the other, a new installation of 600 displays, had been in use for six months. All six were planning to add more of the Raytheon displays.

- Model 1020—A large-scale clustered terminal system with 16K to 64K bytes of memory that can accommodate up to 24 or 32 keyboard/display units and support several I/O devices.

CONFIGURATION

The basic PTS 100 system (all models) is built around a 16-bit minicomputer with 16K bytes of MOS semiconductor memory, expandable to 32K or 64K bytes in 16K-byte increments. In addition to its complement of CRT display units, the system can include a variety of peripheral devices, including printers, teletypewriters, card readers, and magnetic disk drives. A magnetic tape cassette recorder is included with each terminal for program loading.

The minicomputer features a bidirectional I/O bus with a maximum transfer rate of 1 million bytes/second. The I/O bus can support up to eight high-speed I/O devices including disk storage, magnetic tape units, host processor channel interfaces, and special user interfaces.

Low-speed I/O devices are attached via a multiplexer channel with a maximum transfer rate of 9600 bits/second. By means of an adapter, each of eight multiplexer subchannels can accommodate one peripheral device or communications interface operating in the half-duplex or simplex mode; full-duplex operation requires two subchannels. One multiplexer subchannel is dedicated to input from all keyboards associated with the attached display units, while a second is used for communications; therefore, six subchannels are available for external device usage. Model 1020 can accommodate 1 or 2 additional multiplexer channels to provide a total of 14 or 22 usable subchannels.

The PTS 100 System is designed for remote operation in a communications environment or for local operation as a computer peripheral subsystem for an IBM System/370 or System/360 via the computer's byte or block multiplexer or selector channel. The data transfer rate in this mode is 200,000 bytes/second.

The parameters of each of the models of the PTS 100 System are listed below:

Model	Memory Size, bytes	Multiplexer Subchannels	Maximum Display Units 1920 Char.	960 Char.	480 Char.
1005	16K	1	2	or 2	or 2
1014	16K or 32K	4	2	or 2	or 2
1015	16K or 32K	7	8	or 16	or 32
1020*	16K to 64K	6/14/22	24	or 32	or 32

*Can accommodate one or two additional multiplexer channels up to a maximum of 22 subchannels.

TRANSMISSION SPECIFICATIONS

Synchronous or asynchronous in the half- or full-duplex mode. Four modem adapters are each designed to accommodate specific transmission codes and code levels, including 6-level, 6-unit code; 8-level, 8-unit code; and 10-level, 8-unit code. Each adapter provides an EIA Standard RS-232C or CCITT V.24 modem interface and can operate at speeds up to 9600 bits/second. The adapter designed for 10-level, 8-unit code supplies its own clocking; however, clocking derived from an external modem must be applied to the other adapters.

DEVICE CONTROL

The nucleus of the PTS 100 is a display-oriented minicomputer that executes all terminal operations under program control. Keyboards are not connected to their corresponding display monitors; data keyed and data displayed is entirely controlled by the stored program. All peripheral devices are interrupt-driven, and, except for the displays, transfer data through the arithmetic-logic unit of the processor. Programs can be loaded from cassette tape,

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These high scores and complimentary remarks for the PTS 100 and its vendor make it clear that the PTS 100 is a cost-effective alternative to the IBM 3270 that merits serious consideration by other prospective users.□

punched cards, or cartridge disk. Programs can also be loaded remotely via the communications facility.

Communications compatibility is a function of the program loaded into main memory. Under Raytheon-supplied emulator programs, the PTS 100 can operate as a local or remote IBM 2260 Display Station, as a local or remote IBM 3270 Information Display System, or as an IBM PARS/IPARS airlines reservation terminal.

Off-line processing is also supported by the PTS 100, but processing cannot be performed concurrently with communications. User programs are written in a macro-level assembly language.

SOFTWARE: Raytheon provides a full complement of software packages for the PTS 100, including an operating system, two versions of an assembler, a library of utility programs, and four emulator programs.

The operating system for the PTS 100 is called the Input/Output Control System (IOCS) Monitor. The IOCS Monitor controls all I/O operations, error detection and handling, servicing user program requests for control operations on the I/O devices, and handling I/O activity to maintain maximum I/O speeds without burdening the user program. Four macro commands initiate all I/O operations.

Utility programs include: an absolute or relocatable loader, which loads either kind of program and links independently assembled program segments; a file update program, which features program or line insert, program correct, program or line delete, program or line replace, program output, and file directory creation; a debug program, which provides debugging aids for programmers; a system generator, which permits the user to generate a specialized IOCS Monitor from user-supplied parameters such as memory size, interrupt level assignments, logical and physical device assignments, and monitor modules required; a dump (list) program for peripheral devices; a memory dump program; and three disk utility programs, which permit the user to initialize a disk, to allocate new files and delete existing ones, and to dump (list) disk-allocated files.

Source programs can be assembled by means of cross-assemblers on a Raytheon Model 704 or 500 minicomputer or on an IBM System/360 or 370 computer under OS or DOS. Each assembler requires 16K bytes and provides the same assembly-language statements, which can define and use macro instructions. Macro definitions fall into two categories: those that relate the object program to facilities of the PTS 100 software, and those created for the current program and for inclusion in the macro library for future use.

Emulator programs include the 2260/2848 Local and Remote Emulators, the 3270 Local and Remote Emulators, and the PARS/IPARS Emulator. The emulator programs are compatible with existing IBM software for the corresponding IBM products; each runs under the IOCS Monitor. The 2260 and 3270 Remote Emulators operate at speeds up to 9600 bps in a point-to-point or multipoint arrangement. The 3270 emulator will not operate in the Transparent Text mode, although it can be used in a multipoint arrangement with IBM BSC terminals operating in the Transparency mode. The 3270 Emulator operates with either ASCII or EBCDIC transmission code. The PARS/IPARS Emulator transforms the PTS 100 into a replacement for the IBM 2946 or 2948 and is compatible with the IBM 1006 line control discipline.

KEYBOARD: Two typewriter-style keyboards (both ASCII), one without and one with a numeric keyset, are available with the 2260 Emulator. A 69-key data entry and a 69- or 81-key typewriter keyboard are available with the 3270 Emulator. EBCDIC-only keyboards are provided with the Local 3270 Emulator; while EBCDIC or ASCII keyboards are available with the Remote 3270 Emulator. The 69-key format includes 2 Program Attention keys, and the 81-key format adds 12 Program Function keys. A special keyboard is provided with the PARS/IPARS Emulator.

PRINTERS: Teletype Model 33 ASR or RO at 10 char/second (Report C27-830-101), GE TermiNet 300 at 30 char/second (Report C27-450-101), Centronics Model 101A at 165 char/second (Report C27-127-101), or Extel at 15 char/second. A Dataproducts Model 2230 line printer with 136 print columns and a rated speed of 300 lpm is also available.

COMPONENTS

CRT DISPLAY: Via a 15-inch (diagonal measurement) CRT. The standard display arrangements are as follows:

Characters/Display	480	960	960	1920	1920
Lines/Display:	12	15	12	24	30
Characters/Line:	40	64	80	80	64

A character set of 64 ASCII symbols, including upper-case alphabetics, numerics, and special characters, is displayed in green against a dark background. An optional 96-character set of displayable symbols includes lower-case alphabetics. Characters are generated by a 7-by-7 (64-character set) or 7-by-9 (96-character set) dot matrix.

CARD READER: Reads 80-column cards punched in Hollerith or binary code at a rated speed of 300 cards/minute. Input hopper and output stacker capacities are 600 cards each.

DISK STORAGE: Disk cartridge drive (Diablo) provides storage for 2,560,000 bytes via an IBM 2315-compatible disk cartridge. Up to 8 drives can be accommodated for a total capacity of 20,480,000 bytes. The average positioning time and average rotational delay are 70 and 20 milliseconds, respectively.

CASSETTE TAPE RECORDER: Included in each PTS 100 for program loading. Records data on a "Philips-type" cassette, which contains 300 feet of 0.15-inch magnetic tape recorded at 800 bits/inch. Record length is variable, with 60 bytes/record minimum. Total cassette capacity is rated at 120,000 bytes for 80-byte records or 307,000 bytes for 960-byte records. Read/write and rewind tape speeds are 10 and 40 inches/second, respectively. Maximum rewind time is about 90 seconds.

PRICING

The Raytheon PTS 100 is available for purchase or on a one- to five-year lease. Raytheon declined to supply complete pricing information, but furnished prices for the following representative systems and auxiliary devices. All processor configurations include a cassette drive for program loading and system interfacing. The quoted rental prices are for a one-year lease and include prime-shift maintenance. Purchase prices include installation. Maintenance prices are for a one-year contract covering eight hours per day, five days per week.

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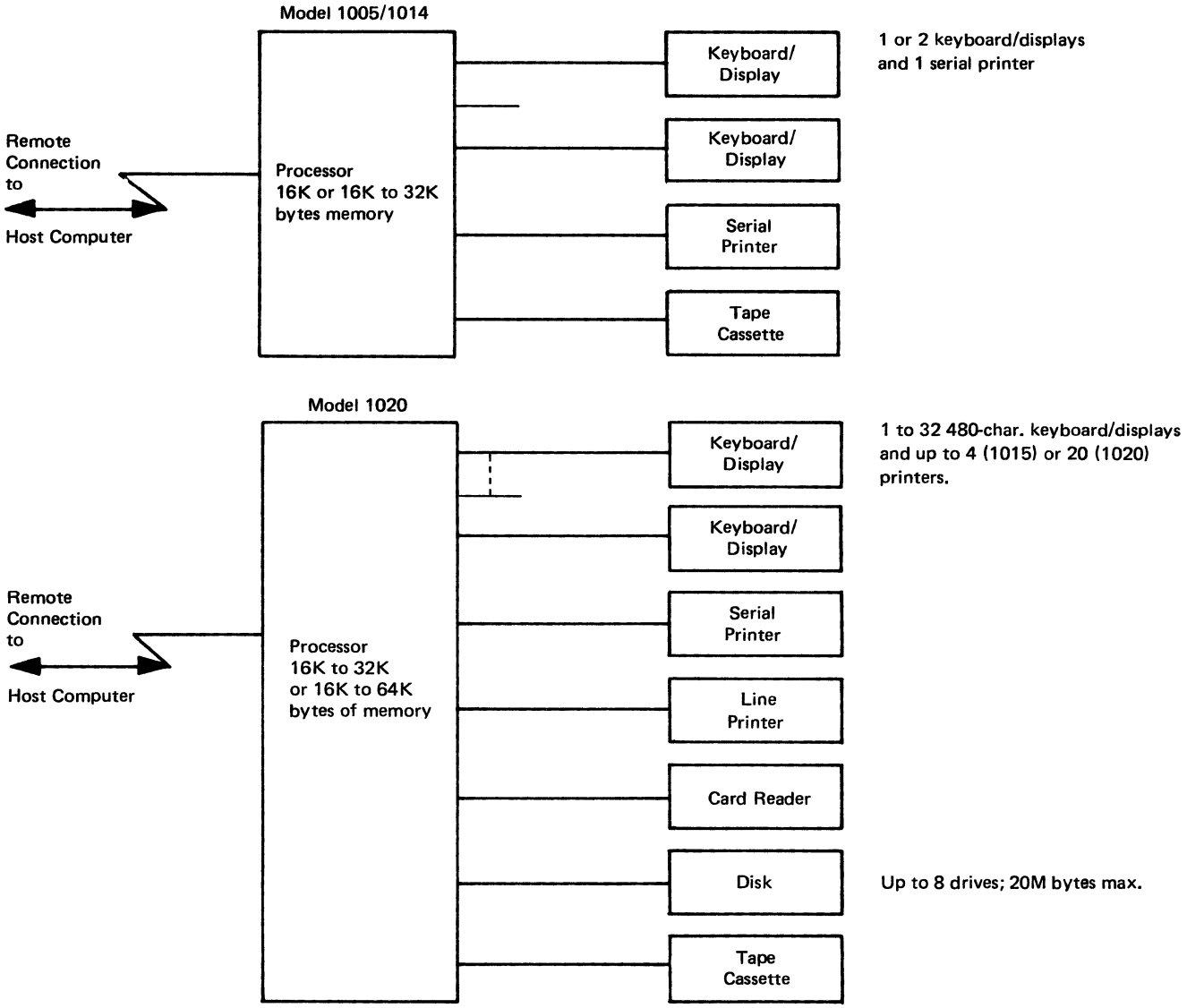
Configuration



		Monthly Rental*	Purchase	Monthly Maint.
1014	IBM 2260 Remote Emulation; 16K bytes, one 480- or 1920-char. display	$ 240	$ 8,650	$ 47
1005	IBM 3270 Remote Emulation; 16K bytes, one 480- or 1920-char. display	198	7,300	36
1014	IBM 2260 Remote Emulation; 16K bytes, two 480- or 1920-char. displays	350	10,900	56
1005	IBM 3270 Remote Emulation; 16K bytes, two 480- or 1920-char. displays	284	9,700	45
1015R	IBM 2260 or 3270 Remote Emulation; 24K bytes, eight 480-char. displays	758	24,940	135
1015R	IBM 2260 or 3270 Remote Emulation; 32K bytes; 32 480-char. displays	2,300	73,910	419
1015R	IBM 2260 or 3270 Remote Emulation; 32K bytes; eight 1920-char. displays	939	30,290	167
1020L	IBM 2260 or 3270 Local Emulation; 24K bytes, 16 480-char. displays	1,571	47,330	282
1020L	IBM 2260 or 3270 Local Emulation; 32K bytes, 32 480-char. displays	2,592	79,460	469
1020L	IBM 2260 or 3270 Local Emulation; 48K bytes, 16 1920-char. displays	1,945	59,230	347
Auxiliary Devices				
3401	Character Printer; 30 cps	160	4,000	35
3412	Printer; 165 cps	215	6,250	50
3301	Line Printer; 300 lpm	495	12,800	79
3711	Disk Storage; 2.5 million bytes	Contact vendor	Contact vendor	Contact vendor

*Includes prime-shift maintenance.■