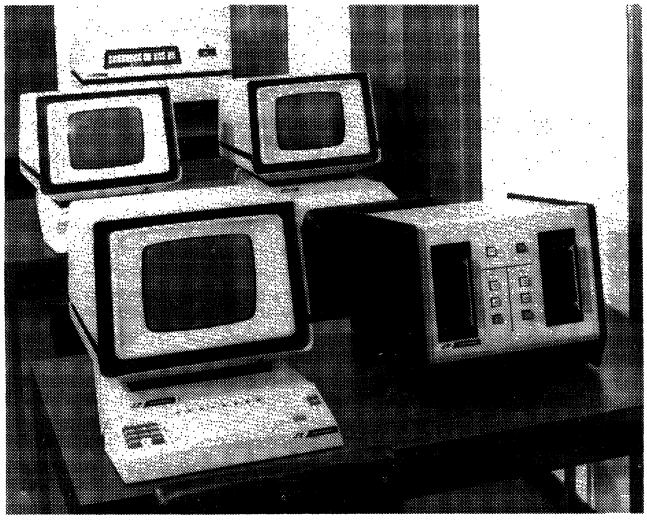
Incoterm SPD Family of Intelligent Terminals



The SPD 20 Family of terminals includes a cluster of display stations such as those shown above. The Terminal Processing Unit (TPU) is in the background; the dual-diskette unit, in the foreground.

A broad family of single-station and clustered intelligent display terminals that support data entry/validation, batch communications, file maintenance, and off-line processing for data entry and distributed processing applications. Emulators support transmission compatibility with the IBM 3270, 3275, 2770, and 2780 plus other IBM and non-IBM devices.

Standard hardware features include a diskette and fixed disk for program and data storage. Standard software includes symbolic assemblers, a disk operating system, a data entry/validation system, utilities, emulators, BASIC language support, and a program development/file management system for cartridge disk. Options include up to 1.5 million bytes of diskette storage and 40 million bytes of fixed disk storage, plus a host of peripherals.

Typical 8-station general purpose terminals without printers range from $1,013 to $1,690 per month, including maintenance, under a three year lease.

Typical 8-station IBM-compatible terminals without printers range from $854 to $1,074 per month including maintenance under a three year lease.

Configurations can include as many as 32 keyboard/displays and 16 printers.

MANAGEMENT SUMMARY

Incoterm was one of the early vendors of intelligent terminals and was probably the first to merge minicomputer, communications interface, CRT display, and keyboard into a single programmable unit. Deliveries began on its initial product, the SPD 10/20—one of the most significant of the early entrants in the intelligent terminal market—in 1970. Over 8000 of these terminals have been installed. Since then, Incoterm's product line has blossomed into a broad family of display terminals that boast intelligence, user-programmability, emulation, multiple display stations, diskette and disk storage, a diversity of peripherals, and strong software support.

Incoterm has installed more than 17,000 display units to date. Its customer base lies primarily within the transportation industry—airlines, trucking firms, and railroads. Most recently, Incoterm has been awarded major contracts by users in the banking and insurance industries, hospitals, and state government. United Airlines is one of its larger customers for passenger reservation systems (PARS).

Incoterm's broad base of products currently stretches over five product lines divided into two logical groupings: stand-alone and clustered terminals. The stand-alone terminals are designated as the SPD 10 Family; the clustered terminals, as the SPD 20 Family.

The nucleus of each terminal system is Incoterm's own small computer, called a Terminal Processing Unit. Except for its core memory, this unit exhibits total MSI/LSI construction; however, all models other than the SPD 10/20 contain separate 2K or 4K increments of MOS display memory. The 16-bit processor, initially introduced as the heart of the SPD 10/20 terminal, has been upgraded ▷

CHARACTERISTICS

VENDOR: Incoterm Corporation, 65 Walnut Street Wellsley, Massachusetts 02181. Telephone (617) 237-2100.

DATE OF ANNOUNCEMENT: SPD 10/20: early 1970; 20/20 and 320: February 1974; 10/25 and 325: September 1974; 20/30 and 20/40: April 1976; 904: June 1973.

DATE OF FIRST DELIVERY: SPD 10/20: 1970; 20/20: April 1974; 10/25: November 1974; 320: December 1974; 325: January 1975. 904: June 1973; 20/30: September 1976; 20/40: October 1976.

NUMBER DELIVERED TO DATE: Over 8300 SPD 10/20 and SPD 10/25 stand-alone terminals and over 1150 SPD 20/20 cluster terminals comprising over 17,000 display units.

SERVICED BY: Incoterm. ➤

Incoterm SPD Family of Intelligent Terminals

Family, Series, & Model	Application				
	General Purpose	PARS	RBT	IBM 3270	IBM 3270 w/LFC
SPD 10 Family					
Series 20–					
SPD 10/20	●				
SPD 10/20 P		●			
SPD 904			●		
Series 25–					
SPD 10/25	●				
SPD 10/25P		●			
SPD 325				●	
SPD 20 Family–					
Series 20–					
SPD 20/20	●				
SPD 20/20P		●			
SPD 320				●	
SPD 320 LFC					●
Series 30–					
SPD 20/30	●				
SPD 20/30P		●			
SPD 330				●	
SPD 330 LFC					●
Series 40–					
SPD 20/40	●				

and housed in a separate cabinet for use in Incoterm's other terminal systems.

THE SPD 10 FAMILY

The SPD 10 Family includes the SPD 10/20, its successor, the SPD 10/25, the IBM 3275-compatible SPD 325, and the SPD 904 series of remote batch terminals. The SPD 10/20 is available as a single-station or dual-station display terminal that consists of a master and slave display station. Both stations can operate independently and concurrently in the dual station version, which offers increased flexibility at a lower per-station cost. The memory capacity of the SPD 10/20 is limited to 4K bytes and includes the refresh memory for the display screen. Because its keyboard is under program control, the function of any and all keys can be user-defined. The SPD 10/20 includes software support and can accommodate a host of peripherals.

The SPD 10/25, introduced in September 1974 with production deliveries beginning in November of the same year, is a newer single- or dual-station version of the SPD 10/20. Unlike its predecessor, the SPD 10/25 includes a 2K- or 4K-byte MOS display memory in addition to its core main memory.

When the SPD was first announced, mentioning its programmability was sufficient. Today, intelligent terminals abound, and CRT display terminals with extensive editing capabilities are relatively inexpensive and readily available. The Incoterm terminal has thus lost some of its early glamour, and the evaluations must now be based on its actual capabilities.

CONFIGURATION

Incoterm's programmable terminal systems are divided into two families: the SPD 10, a family of stand-alone terminal systems, and the SPD 20, a family of clustered terminal systems.

The six members of the *SPD 10 family* of stand-alone terminals are equally split between the Series 20 and 25 and include the following models (the suffix P designates those terminals designed for PARS):

- **SPD 10/20 and 10/20P–a processor-controlled, single- or dual-station CRT terminal system with 4K bytes of non-expandable main memory, a 64-character-per-line display, a variety of peripherals including diskette storage, a synchronous or asynchronous communications capability, and extensive software support including emulation packages, assemblers, and a disk-resident operating system implemented via diskette storage.**

- **SPD 904–a remote batch terminal that can emulate several prominent batch terminals via emulator packages, is built around the SPD 10/20, and can include a card reader, cassette recorder, line printer, asynchronous or synchronous communications capability, and a printing card reader/punch.**

The SPD 904 series models are listed below with their rated card reader and printer speeds.

Model	Card Reader, cards/min.	Printer, char/sec.
904	250	165
904A	Cassette	165
904B	250	100
904C	200/45*	165

***A reader/punch unit that reads at 200 cpm and punches and prints at 45 to 75 cpm.**

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The key word for placing the SPD 10/20 in perspective is not programmability but *adaptability*. Within its basic orientation as a conversational-type terminal, it can replace just about any other typewriter or CRT terminal without changing the applications programs in the central computer. New editing or data checking functions can also be added as the need occurs with minimum impact on the existing system.

Incoterm achieves this adaptability in the SPD 10/20 not just by including a programmable processor in the terminal, but also by making the display unit independent of the keyboard. There are no standard function keys that control the cursor or editing functions. There are numerous keys that can be used for this purpose, or any other, by simply coding a routine that responds to the data code generated when a key is depressed. Even the data keys are not directly linked to what is to be displayed.

Adaptability is a two-way street. It gives the user flexibility in designing the original system and in making changes as needs are changed. It also provides Incoterm with a single product that can be competitively bid in almost any conversational terminal environment.

IBM 3275 COMPATIBILITY

The SPD 325 system, a specialized version of the SPD 10/25, was introduced in September 1974 as a remote stand-alone version of the SPD 320 and a direct replacement for the IBM 3275 Information Display System. Production deliveries began in January 1975. Salient characteristics of the SPD 325 system include:

- Display capacity—a choice of three screen sizes: 480, 960, and 1920 characters. By comparison, IBM offers two screen sizes: 480 and 1920 characters.
- System configuration—available as a single- or dual-station arrangement consisting of one or two display units, respectively. The single-station arrangement can include a serial impact printer rated at 100 or 165 cps, but the printer precludes a second display unit. By contrast, the IBM 3275 consists of one display unit, an optional serial impact printer rated at 40 or 66 cps, and an optional magnetic stripe card reader (badge reader).

The SPD 325 provides complete compatibility with the IBM 3275 with respect to line discipline, commands and command-code structure, and addressing sequence. It can utilize all existing IBM software for the 3270 system. The SPD 325 can be multidropped on the same line as an SPD 320 or an IBM 3270.

THE SPD 904 REMOTE BATCH TERMINALS

Having achieved success with its SPD 10/20 terminals, Incoterm introduced a family of terminals with fixed I/O configurations that can serve as replacements for several of the more prominent remote batch terminals produced by the leading mainframe manufacturers. While their principal function is to serve as batch terminals for remote job entry, the Incoterm terminals also provide useful interactive capabilities. Deliveries of these terminals began in June 1973.

- **SPD 10/25 and 10/25P—a processor-controlled, single- or dual-station CRT terminal system with 4K bytes of non-expandable main memory, a software-selectable 64- or 80-character-per-line display, 2K or 4K bytes of display memory, a variety of peripherals including diskette storage, a synchronous or asynchronous communications capability, and extensive software support including emulation packages, assemblers, and a disk-resident operating system implemented via diskette storage. The major differences between the 10/20 and 10/25 are the display arrangement and the additional display memory of the 10/25.**
- **SPD 325—a processor-controlled, stand-alone single- or dual-station CRT terminal system that emulates a remote IBM 3275 terminal. The SPD 325 is a specialized version of the SPD 10/25 that uses the 10/25's Terminal Processing Unit (TPU) and is designed for compatibility with the IBM 3275. The SPD 325 TPU contains a synchronous communications controller and can accommodate a second independent display unit or serial impact printer.**
- **SPD 904: The SPD 904 is built around the SPD 10/20 with 4K bytes of core memory, and is currently available in four models. The various models include a printer and either a card reader, cassette recorder, or card reader/punch.**

The basic SPD 10/20 terminal consists of a Terminal Processing Unit (TPU) housed in the cabinet of a CRT display and a separable keyboard. The TPU accommodates up to 8 controllers for peripheral devices and features; the basic keyboard uses one controller position.

The basic SPD 10/25 terminal consists of a Terminal Processing Unit (TPU) that is available as a physically separate unit or contained in the cabinet of a CRT display unit with separate keyboard. The TPU accommodates up to 8 controllers for peripheral devices and features; the basic keyboard uses one controller position. The SPD 10/25 contains a separate 4K-byte core memory for program and data storage and a 2K- or 4K-byte MOS display buffer.

A two-display version, called a Dual, splits the MOS display buffer between two independent CRT displays, providing 960 or 1920 characters of buffering per display. The second display unit normally includes a keyboard and can be located up to 2000 cable feet from the TPU.

The SPD 10/20's 4K-byte core memory is equally partitioned between display buffer storage and program and data storage. In the dual configuration, the display buffer provides 960 characters of buffering for each display.

Multi-display configurations are normally constructed through the use of interconnected single or dual versions.

The Party Line Controller can be used to provide intercommunications among a group of SPD 10/20 or 10/25 terminals at one location. In effect, this option permits cable-connected data communications at up to 9600 bits per second. An asynchronous technique, complete with start and stop bits, is employed. Terminal-to-terminal distance can be up to 1000 feet. Each terminal connected to a party line requires a controller. The chief use for this option is to enable of group of peripheral devices to be shared among multiple terminals.

In general, each peripheral device, including auxiliary core storage, requires one controller position. Full-duplex data communications requires two communications controllers. In addition, certain features, such as Remote Program Load and Cyclic Redundancy Check, also require a controller.

Thus, an SPD 10/20 or 10/25 can assume a wide variety of configurations, from a display terminal to a processing terminal complete with data storage peripherals to a multi-line communications processor.

Standard peripherals include a punched tape reader, two card reader models, a single- or dual-spindle diskette unit, seven printer models, industry-compatible 7- and 9-track magnetic tape drives, and a printing card reader/punch.

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The SPD 900 family originally included eight members, but now consists of four. Each model provides punched card or cassette tape input and printed output, but the models differ in I/O equipment and performance. Incoterm's successful SPD 10/20 terminal forms the nucleus for each of the family members and serves as both controller and operator's console. The integral minicomputer, with supporting software, permits the SPD 904 terminals to behave as other manufacturers' terminals via software emulation. Currently, Incoterm supports the SPD 904 terminals as replacements for the IBM 360/20 HASP multileaving terminal, IBM 3780, IBM 2780, IBM 2770, CDC 200 User Terminal, or UNIVAC 1004 under EXEC 8. Software emulation for any one of these terminals is included in the cost of the SPD 904 terminal, and additional emulators are priced at a one-time charge of $1,000 each.

But how does the SPD 904 differ from the SPD 10/20 and 10/25, which also offer auxiliary I/O capabilities? Incoterm is marketing its SPD 9004 terminals as complete turnkey systems specifically for applications with a need for both interactive and remote batch capabilities. On the other hand, Incoterm has taken the "Tinkertoy" approach with the SPD 10/20 and SPD 10/25 terminals, which it offers with assorted software packages and auxiliary devices and markets for a wide variety of applications. The two product lines are not software-compatible with one another.

As an alternative to punched card output or printed output, the SPD 904's operating software supports the use of a single-drive cassette unit produced by Sykes, which has an excellent reputation for its cassette drives.

THE SPD 20 FAMILY

The SPD 20 Family of clustered terminals is composed of Series 20, 30, and 40 terminal members. The initial member of the Series 20, the SPD 20/20, was introduced in February 1974 as a clustered version of the SPD 10/20. Salient features of the SPD 20/20 include:

- An upgraded Terminal Processing Unit with 16K bytes of main memory, expandable to 32K bytes, and a modular refresh memory expandable to 16K bytes in 2K increments.
- Accommodation for up to sixteen 480- or 960-character or up to eight 1920-character keyboard/display units.
- Accommodation for up to 16 printers consisting of any mix of serial printer models rated at 15, 100, and 165 cps and line printer models rated at 125, 250, and 300 lpm.
- Accommodation for up to 8 peripheral devices, including asynchronous and synchronous communications controllers that range in speed from 50 to 9600 bps.
- A host of peripheral devices, including 250-cpm and 500-cpm card readers, 7- and 9-track magnetic tape drives, single- or dual-spindle diskette units, a punched tape reader, four serial printer models, three line printers, and an 80-column printing card reader/punch (data recorder).

The nine members of the *SPD 20 family* of clustered terminals include eight members equally divided between the Series 20 and 30 and one member of the Series 40. These members include the following models (the suffix "P" designates those terminals designed for PARS):

- **SPD 20/20 and 20/20P–a processor-controlled, clustered CRT terminal system that accommodates up to 8 or 16 keyboard/displays and provides 16K bytes of main memory (expandable to 32K bytes in one 16K-byte increment), a software-selectable 64- or 80-character-per-line display, a variety of peripherals including diskette storage, and a synchronous or asynchronous communications capability. The SPD 20/20 features a disk-resident operating system implemented via optional diskette storage.**

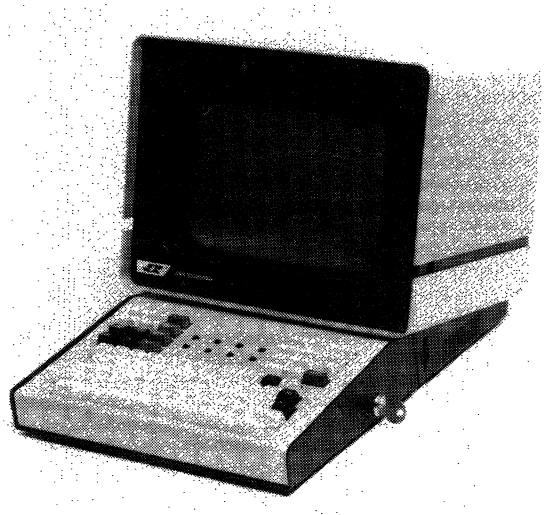
  The SPD 20/20 system is built around a Terminal Processing Unit (TPU) that contains a basic 16K-byte core memory, expandable to 32K bytes, a modular MOS refresh memory that provides up to 16K bytes of display storage in 2K-byte modules, and an integral tape cassette unit for program loading. The TPU can accommodate up to eight 1920-character or up to sixteen 960-character display units, up to 16 printers, and 8 communications and peripheral controllers.

  Standard peripherals include a punched tape reader, two card reader models, a single- or dual-spindle diskette unit, four serial printer models, three line printer models, and industry-compatible 7- or 9-track magnetic tape drives.

- **SPD 320–a processor-controlled, clustered CRT terminal system that emulates a remote IBM 3270 system, accommodates up to 8 or 16 keyboard/display units and as many printers, and provides 16K (basic) or 32K (optional) byte of main memory.**

- **The SPD 320 system is a specialized configuration of the SPD 20/20 that uses a modified version of the SPD 20/20's Terminal Processing Unit (TPU). The SPD 320 TPU includes an integral cassette tape program loader and contains a synchronous communications controller and can accommodate up to eight 1920-character or up to sixteen 480- or 960-character display units and up to 16 serial printers.**

- **SPD 320 LFC–a processor-controlled, clustered CRT terminal system that emulates a remote IBM 3270 system, accommodates up to 8 1920-character keyboard/display units, as many printers, and provides 32K bytes of main memory. The SPD 320 LFC includes an integral cassette tape program loader and one dual diskette unit; one or two additional dual diskette units are optional. The Local Forms Control software is standard.**



This Executive model display station is available with the SPD 10/25 or SPD 20 Family terminals.

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The SPD 20/20, like its single- or dual-unit counterparts, the SPD 10/20 and SPD 10/25, is user-programmable and is supported by symbolic assemblers that can be run on the SPD 20/20 itself or on large-scale computers, and by an optional disk-resident operating system implemented via a single- or dual-spindle diskette unit.

Additional software includes a basic data entry program and an IBM 3270 emulator, with or without local forms control support. The SPD 20/20 software, however, is not directly compatible with that for the SPD 10/20 or SPD 10/25.

The Series 30 and 40 terminals, spawned from the Series 20 terminals, were introduced in April 1976 as upward compatible models. Salient features of the SPD 20/30 that differ from the SPD 20/20 include:

- Optional core memory expansion up to 64K bytes.
- Support for up to 16 1920-character or 32 960-character display stations.
- Standard support for one dual diskette drive and two optional drives for a maximum of 1.5 million bytes of diskette storage. (Cassette storage is *not* provided.)
- Standard software support includes all software available for the SPD 20/20 plus an expanded data entry/validation program superior to that offered with the 20/20, remote batch emulators, and a BASIC language compiler.

Incoterm offers specialized versions of the SPD 20/20 and SPD 20/30 designed for airline passenger reservation systems. These include up to 16 or 32 960-character display stations, up to 16 printers, a PARS emulator, and a Vogue 810 Ticket Printer interface; boarding pass and ticket printers and a magnetic strip card reader are optional.

The SPD 20/30 can be upgraded to an SPD 20/40.

The SPD 20/40 is currently the largest terminal system of the SPD 20 Family. Like the SPD 20/30, it is available with up to 64K bytes of core memory and supports the same number of display stations as the SPD 20/30—up to 16 1920-character or 32 960-character displays. But the SPD 20/40 is equipped with 10 million bytes of fixed disk storage, expandable to 40 million bytes in 10 million-byte increments. Diskette storage is optional, however, the SPD 20/40 can accommodate the same diskette storage capacity of the SPD 20/30. No cassette loader is provided. Besides all standard software support for the 20/20 and 20/30, the 20/40 is supported by a specialized software package designed for program development and file management. This sophisticated package supports multi-task operations with preemptive or non-preemptive priority and a variety of access methods and is equipped with an extensive library of assembly language subroutines for program development. This software supports all standard peripherals.

IBM 3270 COMPATIBLE TERMINALS

The other members of the SPD 20 Family include IBM 3270-compatible versions of the Series 20 and 30 terminals. SPD 20/20 versions include the SPD 320 and an

- **SPD 20/30 and SPD 20/30P—a processor-controlled clustered CRT terminal system that accommodates up to 16 or 32 keyboard display units and provides a basic 16K bytes of main memory, expandable to 32K, 48K, or 64K bytes. The TPU can accommodate up to 16 1920-character display units or up to 32 960-character display units and 8 communications and peripheral controllers. One dual diskette unit is standard; one or two additional dual units are optional. No cassette tape unit is provided. Peripherals available for the SPD 20/20 are also available for the SPD 20/30 and 20/30P. The 20/30 can be field-upgraded to an SPD 20/40.**
- **SPD 330—a processor-controlled clustered CRT terminal system that emulates a remote IBM 3270 system, accommodates up to 16 or 32 keyboard/display units and up to 16 printers, and provides a basic 16K-byte main memory, expandable to 32K or 48K bytes. The TPU includes an integral cassette tape program loader and can accommodate up to 16 1920-character or 32 480- or 960-character display units.**
- **SPD 330 LFC—a processor-controlled, clustered CRT terminal system that emulates a remote IBM 3270 system. The SPD 330 LFC accommodates up to 16 1920-character keyboard/display units and as many printers, and provides a basic 32K-byte memory, expandable to 48K or 64K bytes. A dual diskette unit is standard; one or two additional dual units are optional. No cassette tape loader is provided.**
- **SPD 20/40—a processor-controlled clustered terminal system that accommodates up to 16 or 32 keyboard/display units and provides 32K bytes of memory, expandable to 48K or 64K bytes. Fixed cartridge disk storage provides 10 million bytes standard and up to 40 million bytes in 10 million-byte increments as an option. No cassette tape loader is provided. The SPD 20/40 accommodates all peripherals available for Models 20/20 and 20/30 plus diskette storage. The TPU can accommodate up to 16 1920-character display units or up to 32 960-character display units and 8 communications and peripheral controllers.**

TRANSMISSION SPECIFICATIONS

Asynchronous or synchronous, half-duplex communications controllers are available for the SPD 10/20, SPD 10/25, SPD 20/20, SPD 20/30, SPD 20/40, and SPD 904. The SPD 320, SPD 320 LFC, SPD 325, SPD 330, and SPD 330 LFC employ a synchronous communications control designed for compatibility with IBM's BSC communications discipline. IBM SDLC compatibility is available under RPQ as a subset of SDLC called IDLC which provides complete compatibility with IBM's SDLC protocol.

The Asynchronous Controller operates in half-duplex mode at any speed from 50 to 9600 bits per second. It is compatible with the RS-232C interface standard. The code unit structure is adaptable to meet most situations with 5 to 8 data bits per character. No-cost options available with the Asynchronous Controller include capabilities for automatic answering and automatic dialing (with appropriate common-carrier dialing units).

The Synchronous Controller also operates in half-duplex mode at any speed from 1200 to 9600 bits per second, with clocking provided by the external modem. It is compatible with the RS-232C interface standard.

Full-duplex operation can be achieved by using two Controllers; assignment and control for using one Controller to transmit only and the other to receive only is performed by the program.

Either of these Controllers can be used up to 50 feet from the modem or 1000 feet from the SPD-M Multiplexer.

The SPD-M Multiplexer, an option permitting multiple terminal systems to alternately share a common communications line via a single modem, is usable with all SPD terminal systems. The SPD-M can accommodate up to 4, 8, or 16 terminal systems and can be cascaded to a maximum

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enhanced model, the SPD 320 LFC. SPD 20/30 versions include the SPD 330 and its enhanced counterpart, the SPD 330 LFC. These terminals are supported by IBM 3270 emulators and are comprised of a cluster of display stations and printers; *no* peripherals other than diskette drives are supported. The 320 and 330 models differ in system size only.

- Model 320–supports up to 8 1920-character or 16 480- or 960-character displays and up to 16 printers.
- Model 320 LFC–supports up to 8 1920-character displays and up to 16 printers.
- Model 330–supports up to 16 1920-character or 32 480- or 960-character displays and up to 16 printers.
- Model 330 LFC–supports up to 16 1920-character displays and up to 16 printers.

Note that although the total number of displays supported by the 330 models is twice that of the 320 models, the total number of printers supported is the same for all models.

The SPD 320 LFC and SPD 330 LFC, enhanced versions of the SPD 320 and SPD 330, respectively, feature off-line data entry/validation and local forms storage via diskette. Both models can accommodate up to three dual-diskette drives; one dual drive is standard. A basic data entry program, Local Forms Control (LFC), supports the creation and local storage and retrieval of record formats, format directories, and data. And validated records can be batched for later transmission to the host comptuer.

These IBM 3270-compatible models provide complete compatibility with the IBM 3270 with respect to line discipline , commands and command-code structure, and addressing sequence. They can utilize all existing IBM software for the 3270 and can be multidropped on the same line as an IBM 3270 or as SPD 325.

USER REACTION

In Datapro's 1976 survey of alphanumeric display terminal users, four users reported on their experience with 130 Incoterm SPD 10/20 and 20/20 terminal systems. The ratings of these users are presented as follows:

	Excellent	Good	Fair	Poor	WA*
Overall performance	2	2	0	0	3.5
Ease of operation	1	2	1	0	3.0
Display clarity	2	2	0	0	3.5
Keyboard feel and usability	2	1	1	0	3.3
Hardware reliability	0	4	0	0	3.0
Maintenance service	0	3	1	0	2.8
Software and technical support	0	3	1	0	2.8

*Weighted Average on a scale of 4.0 for Excellent.

These satisfied users cited low cost, flexibility, and programmability as the key advantages of the Incoterm terminals. One user cited the additional advantages of

of 4 levels, permitting up to 64 terminal systems to share one line. Except in unusual situations, the full configurational flexibility is used primarily to provide redundant or alternate data paths to multiple central computers or among several communications lines. A terminal is connected to the Multiplexer through a Communications Controller; the Multiplexer itself is not an addressed peripheral and does not require a separate controller position. Each terminal can be located up to 1000 feet from the Multiplexer, and the modem can be located up to 50 feet from the Multiplexer.

For the SPD 904, transmission compatibility (including communications line discipline) and transmission parameters such as asynchronous or synchronous operation, data rate, and code type and level are a function of the program emulation package; these parameters differ among the available emulators. Hardware compatibility is provided for half- or full-duplex, asynchronous or synchronous operation at transmission rates up to 9600 bits/second. Six- through eight-level codes are accommodated. All SPD terminals provide two EIA Standard RS-232C interfaces. Modem requirements are also determined by the operating software. The two modem interfaces permit switching between modems when the optional Modem Switch is installed.

The following table shows the relationships between transmission speed and modem type; although Bell System modems are shown, equivalent modems from independent manufacturers can be used.

Transmission Rate	Bell System Modem
0-300 bps	103A/E/F; 113A/B
1200 bps	202C/D/E/R
2400 bps	201B/C
4800 bps	208A/B
7200 bps	209A
9600 bps	209A

COMPONENTS

PROCESSORS: For *SPD 10 Family*, The Terminal Processing Unit is a rather conventional (in today's terms) 16-bit, single-address unit, specially adapted to work with a CRT display. It provides relative addressing within 256-word pages, direct addressing to any location, and indirect addressing to any number of levels. Instructions are one or two words long, depending on whether they contain a direct or relative address.

Main memory capacity is 2048 words (4096 bytes), and cycle time is 1.6 microseconds per one-word access; it cannot be expanded. The TPU for Models 10/25 and 325 also includes a 2K- or 4K-byte (as specified) display memory in addition to the 4K-byte main memory. All I/O transfers, except to the display, are handled through the accumulator. Typical execution times are 1.6 microseconds for a one-word instruction and 3.2 microseconds for arithmetic and two-word instructions. A real-time clock is included that, when enabled, creates an interrupt every 66.7 milliseconds.

Program loading is normally initiated by a bootstrap process from punched tape, a magnetic tape cassette (904 only), or a diskette. Optionally, a Remote Program Load feature (actually a separate controller) can permit the bootstrap sequence to be initiated from the communications line.

For the *SPD 20 Family*, the Terminal Processing Unit is an upgraded version of the one used in the SPD 10 Family. Unlike the internal packaging approach used in the SPD 10 Family the SPD 20 Family TPU is a self-contained unit incorporating core memory, an arithmetic-logic unit, a real-time clock, an input-output subsystem, and a CRT refresh memory. Like its SPD 10 Family counterpart, the 16-bit, single-address unit provides relative addressing within 256-word pages, direct addressing to any location, and indirect addressing to any number of levels.

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strong vendor support and equipment reliability. Only one user who rated maintenance service as Fair noted it as a weakness. Another user noted high cost as a disadvantage. The Incoterm terminals also scored reasonably high in Datapro's 1975 survey of alphanumeric display terminal users. In this survey, 11 users responded on 2957 terminals. Few negative remarks were received and these were scattered complaints that did not seriously impact the terminal's reputation as solid, adaptable, dependable systems that have demonstrated their effectiveness over the past six years.□

Instructions are one or two words in length, depending on whether they contain a direct or relative address. Main memory capacity is 8,192 words (16,384 bytes), expandable in 16K-byte increments to 65,536 bytes. Cycle time is 1.6 microseconds per one-word access. Typical execution times are 1.6 microseconds for a one-word instruction and 3.2 microseconds for arithmetic and two-word instructions.

Program loading is performed in the same manner as with the SPD 10 Family.

CRT DISPLAY: Via a 12-inch (diagonal measurement) CRT with a viewing area 6.5 inches high by 9 inches wide. The display screen arrangement is dependent on the model, as shown below.

	Char. per Display	Lines per Display	Char. per Line
320-1, 325-1, & 330-1	480	12	40
10/25, 20/20, 20/30, 20/40, 320-3, & 325-3	960	12	80
10/20*, 10/25, 20/20, 20/30, & 20/40	960	15	64
20/20, 20/30, 20/40, 320-2, 325-2, & 330-2	1920	24	80
10/20*, 10/25, 20/20, 20/30, & 20/40	1920	30	64
10/25	2000	25	80

*Also part of each SPD 904 system.

A character set of 64 ASCII characters, including upper case alphabetics, numerics, and special symbols, is displayed in green against a dark background. Each character is formed via a standard matrix of 7 by 10 dots. A matrix of 8 by 12 dots is optional for the SPD 10/25, SPD 20/20, SPD 20/30, and SPD 20/40; an 8 by 14 dot matrix is optional for the SPD 10/20.

Blinking is a standard feature of the SPD 10/20. Underlining is included in the Expanded Character Set feature.

Dual intensity is standard on the SPD 10/25, 20/20, 20/30, 20/40, 320, 325, and 330; intensity, under program control, can be switched between normal and bright intensity levels, or the beam can be turned off (blanked).

KEYBOARD: The standard key arrangement for all models consists of 52 keys arranged in an expanded typewriter layout, flanked on either side by an array of 12 additional keys. None of the keys except the shift keys causes any direct action to be performed; depression of a key causes generation of a code that can be transferred to the processor memory. Above the keys is an array of eight indicator lamps that are lighted under program control.

A data entry keyboard is optional for all models.

The SPD 20/20 is available with any of three keyboards, including ASCII, EBCDIC, and Upper/Lower Case.

The SPD 320, SPD 325, and SPD 330 keyboard includes 12 Program Function and 3 Program Attention keys plus cursor, erase, and edit control keys. Edit, erase, and cursor-control keys are located in the 12-key array at the left of the main group.

PUNCHED TAPE INPUT: The SPD PTR150 Paper Tape Reader reads standard 8-level, 1-inch-wide punched tape at up to 150 characters per second. This unit contains an Addmaster mechanism and is housed in a small cabinet and designed to handle small rolls of tape. It is normally used to load programs, but can also be used for data. Programs are normally prepared on a Teletype Model 33 ASR; the SPD 10/20 currently has no provision for a punch.

CASSETTE TAPE INPUT/OUTPUT: The SPD 904 can be equipped with a single-drive cassette unit (Sykes mechanism). The unit accommodates a Philips-type cassette containing 300 feet of 0.15-inch-wide magnetic tape. Phase-encoded data is recorded serially at 1000 bits/inch. Two recording tracks each provide a maximum capacity of 288,000 bytes. The data transfer rate is 4000 bytes/second. Tape speeds are: read/write–5 inches/second; search/record–100 inches/second.

The SPD 20/20, SPD 320, SPD 320 LFC, and SPD 330 each include an integral single-drive cassette unit contained within the housing of the Terminal Processing Unit. The unit accommodates a cassette containing 300 feet of 0.15-inch-wide magnetic tape. The per-cassette storage capacity is 180,000 bytes recorded at 50 characters per inch. The data transfer rate is 100 bytes/second. Tape speeds are: read/write–1-7/8 inches/second; rewind–48 inches/second.

DISKETTE STORAGE: Provided by the SPD D-250 Diskette System, a single- or dual-spindle diskette unit that contains a Memorex mechanism. The diskette unit records 64 tracks on one surface of a 7.5-inch diskette. Each track contains 32 records, for a maximum storage capacity of 2048 records per diskette. Record length is 133 bytes, including 128 data bytes, 2 cyclic check bytes, and 3 control bytes. The rotational speed and average latency time are 375 rpm and 80 milliseconds, respectively. Access time is 10 milliseconds track-to-track plus a 10-millisecond settling time. The data transfer rate is 31,250 bytes per second between the diskette and diskette buffer, and 62,500 bytes per second between the diskette buffer and Terminal Processing Unit. The diskette buffer, shared by both spindles, stores 256 bytes of data. Features include Write Protect and a bootstrap capability for up to 2048 bytes of storage.

CARTRIDGE DISK STORAGE (SPD 20/40 only): The Series 40 Cartridge Disk Storage System consists of one or two cabinets each containing one or two 10-million-byte IBM 2315-style drives for a total storage capacity of 40 million bytes. Each drive consists of one fixed disk and one removable disk providing a total of four recording surfaces. Access time is 10 milliseconds track-to-track, 40 milliseconds average, and 65 milliseconds maximum. Rotational delay is 13.3 milliseconds. The data transfer rate is 312.5K bytes/second between disk and buffer and 78K bytes/second between buffer and the TPU. The disk buffer capacity is 1K byte. The drives are produced by Pertec. Each drive is organized into 408 cylinders of four tracks per cylinder. Each track contains 32 sectors consisting of 194 data bytes and one control byte.

CARD INPUT: Provided by either of two 80-column punched card readers. Speeds are 250 and 500 cards/minute, and cards are read on a column-by-column basis. Hopper and stacker capacities are 500 cards each for both models. Both are small, table-top units produced by Peripheral Dynamics, Inc. (PDI).

CARD INPUT/OUTPUT: Provided by an 80-column printing reader-punch (Decision Data Model 8045) that reads 200 cards/minute and punches 45 to 75 cards/minute. The unit contains primary and secondary input hoppers with capacities of 600 and 400 cards, respectively, and two stackers with capacities of 400 cards each.

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PRINTED OUTPUT: Provided by any of four serial printers (Models SPD-P15B, SPD-P100, SPD-P120C, and SPD-P165B) and three line printers.

The SPD-P15B is an impact printer, obtained from Extel Corporation, that operates at up to 15 characters per second. It prints up to 72 characters per line at 10 characters per inch. Vertical spacing is 4.5 lines per inch.

The SPD-P100, SPD-P120C, and SPD-P165A are the well-regarded Centronics 306, 306C, and 501 printers, respectively. They are impact printers with respective rated speeds of 100, 100 or 165 (switch and software selectable), and 165 characters per second. Line length is 80 characters for the SPD-P100, 80 or 132 characters for the SPD-P120C, and 132 characters for the SPD-P165B. The printers employ the dot matrix printing technique. A 5-by-7 dot matrix is standard, and a 9-by-7 dot matrix is optional. Horizontal pitch and vertical spacing are 10 characters per inch and 6 lines per inch, respectively. The printers incorporate sprocket feed mechanisms, which are adjustable up to 9½ inches (SPD-P100 and SPD-P120C) or 14 inches (SPD-P165B).

The line printers are designated Models LP125, LP250, and LP300 and are rated at 125, 250, and 300 lines/minute, respectively. The fully buffered belt printers each provide 132 print positions and are equipped with a 64-character set of ASCII symbols. Horizontal and vertical spacings are 10 characters/inch and 6 or 8 (selectable) lines/inch respectively. The printers accommodate 6-part, continuous pin-fed forms from 4 to 16 inches wide via adjustable tractors. Vertical format control, implemented via an IBM-compatible 1-5/8 inch paper tape loop, and automatic motor control are standard features. The automatic motor control feature disables the belt motor 30 seconds after the last print or paper movement command and automatically enables the motor upon receipt of the next print or paper movement command. The printers are produced by Odec Computer Systems, Inc.

TAPE INPUT/OUTPUT: Provided by 7- or 9-track industry-standard magnetic tape drives that accommodate 10.5-inch reels. The three floor-model SPD-MT drive models and their parameters are listed below.

Model	Tape Tracks	Tape Speed R/W, ips	Tape Speed Rewind, ips	Tape Density, bits/inch	Transfer Rate, bytes/sec
810-7	7	25	150	556/800	20K
810-9	9	25	150	800	20K
1610-9	9	25	150	1600	40K

The tape controller, located in the Terminal Processing Unit, accommodates a single drive and contains a 1024-byte buffer; an additional 1024-byte buffer is optional. The magnetic tape drives are produced by Pertec.

All terminal operations are executed under the direction of the operating software that resides in the main memory of the Terminal Processing Unit. The organization of the terminal can best be summarized by calling it a minicomputer with attached peripherals. The keyboard is not directly connected to the display; i.e., the relationship between the data keyed and the data displayed is entirely controlled by the stored program. All peripheral devices are interrupt-driven and, except for the display, transfer data through the arithmetic/logic unit of the processor. Programs can be loaded from punched tape, diskette, magnetic tape, or punched cards. Programs can also be loaded remotely, via the communications facility.

Compatibility is a function of the program loaded into main memory. Both synchronous and asynchronous interfaces are provided. As long as the basic communications interface (RS-232C) is met and the speeds are within the acceptable range (up to 9600 bps), problems of line discipline involving control-character sequences can be solved with appropriate programming.

Incoterm has developed about 40 to 50 routines for emulating various terminals such as the IBM 2741, UNIVAC Uniscope 100, IBM PARS (airline reservation) terminals, Teletype 33/35, IBM 3270, and many others—including the controller functions of many major computers. These emulation routines can be run on the SPD 10/20. An IBM 3270 emulation program is available for all members of the SPD 20 Family, and an IBM 3275 emulator is offered for the SPD 10/25.

Incoterm has also developed several symbolic assemblers, which can run on the SPD 10/20, SPD 10/25, or SPD 20/20, SPD 20/30, or SPD 20/40 under Incoterm's Disk Resident Operating System, SPD DOS (which requires a diskette unit) or on any of several major computers including the IBM System/360 and 370, Burroughs B 2500/3500, and Honeywell 316, 516, or 716. The SPD 20 Family assemblers differ from those for the SPD 10/20 and SPD 10/25 in expanded capabilities only. The assemblers that run on the large computers are written in FORTRAN, making conversion to a particular computer fairly simple. Assembled programs can be maintained on punched tape, magnetic tape cassettes, or diskettes. Editor and debug programs are available as programming aids. A complete set of diagnostics is also available, including diagnostic programs for the memory, Terminal Processing Unit, printer, keyboard, and communications controller.

The optional Disk Resident Operating System (SPD DOS) features file updating and control for source, object, and data files; utilities for file maintenance; an assembler for program preparation; a dump/debug capability for program development; source and object program input from a variety of media; and assembler/loader facilities for multiple-segment overlay programs.

Data entry software is available for the SPD 20/20, SPD 20/30, and SPD 20/40. Incoterm offers two data entry packages: Level I and Level II. Level I, an early version, was introduced as Incoform in April 1975 and has been succeeded by Level II, which was introduced in April 1976 as IDES.

Level I is a combined data entry system and IBM 2780 (RJE) emulator that features local forms storage and recall for up to 320 forms per diskette. Form attributes define alpha and numeric fields, auto tabulation, "must-fill" and "mandatory-enter" fields and optional high-intensity protect fields. Keyed data is stored in diskette under format control. Level I includes a continuous forms mode where one format calls another, and provides a forms directory. Formats can be added, deleted, or changed. And system status can be displayed. Level I software includes two programs: LA 165, an interactive forms editor which allows forms to be added, deleted, or modified, and VDU 2780 IBM 2780 emulator which interacts with the forms file created by LA 165. Level I requires a minimum of 32K bytes of memory and diskette storage and supports up to 8 keyboard/display units and printers and up to 3 multi-dropped half-duplex synchronous communications lines.

Level II is a comprehensive data entry system and IBM 2770 emulator that is available for 64K-byte SPD 20/30 and SPD 20/40 systems only. It supports up to 8 display stations and printers. Level II is divided into two parts, Forms Generation Procedures and Data Entry Programming, that provide data entry, editing, and control with local data storage, local printing, and batch or interactive data transmission.

Forms Generation Procedures (FGP) provides a high-level statement oriented language for creating forms. The language is used to specify all control and editing functions of the forms and form pages and fields. A compiler translates the format program to forms that reside on diskette. A form can contain up to 255 sequentially-linked pages; each page can contain up to 250 fields. Editing can be specified for each field, and calculations can be carried across fields. Fields can be divided into subfields with separate input characteristics. FGP features include arithmetic calculations, batch totals, table lookup; translation tables, range checking, conditional execution,

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optional or required field specification, right justification (left default) and fill, override fields, forms edit, data field specification, check digit operation (Modulo 10), forms name and label rename and copy and rename, diskette storage allocation control, data field labeling, and directory control (catalog of all existing forms). Six arithmetic registers carry results of calculations across fields; each contains up to 10 digits, floating decimal point, and sign. Arithmetic functions include add, subtract, multiply, divide, increment, and decrement. These can be performed on screen data, constants, and the results of previous calculations. A total of 16 32-byte registers store data for conditional branching. Ten balance registers can be associated with each batch to accumulate totals across all forms in the batch, count of items processed, dollar amount totals, etc.

The Data Entry Program (DEP) guides the operator through all tasks and controls and validates the keyed data via diskette-resident forms. When initialized, the program enters the date, time, sequence numbers, and other control constants, and when completed, directs an operator ID message to each display station. The operator "signs on" via her own ID code, selects the appropriate formats for the task via the directory, and specifies an operating mode such as data entry, data edit, or print or display form. During data entry, the operator is guided from field to field via the cursor and use of the tab key and prompted through special conditions and errors via the display's 25th control lines. When an invalid entry is keyed, an audible beep is produced and entry is inhibited until the correct entry is keyed. Editing operations can be performed during data entry or data edit. During data entry, editing errors are caught as they occur and the operator is notified to make immediate corrections. These errors could include an alphabetic entry in a numeric field, an incorrect value, or totals fail to crossfoot after completion of a page. Completed forms can be assigned one of three status codes by the operator: "await release," "unreleasable," or "release for transmission." Released forms cannot be recalled for editing. Editing is performed on a page basis and begins with the initial field; tabbing advances the edit process from field to field. All data entered during the edit mode is validated according to the attributes specified in the form. A completed form can be displayed or printed; printing can be performed concurrently with data entry. Released forms are automatically batch transmitted upon receipt of a poll message from the host computer.

The Local Forms Control software combines parameter-driven data entry and IBM 3270 emulation; the emulator features local forms storage. The LFC package is available for 32K-byte SPD 20/20, SPD 20/30, SPD 20/40, SPD 320 LFC and SPD 330 LFC systems with one dual diskette drive, and supports up to 16 display stations and printers on the SPD 20/30 and SPD 20/40 systems and up to 8 display stations and printers on the other systems. LFC operation is enhanced if one or two additional dual diskette units are incorporated.

The Program Development/File Management System (PD/FMS) includes an assembler, a multi-task disk operating system, and a library of subroutines that support file maintenance. The PD/FMS is designed exclusively for a SPD 20/40 system with a minimum of 32K bytes of memory, 10 to 40 million bytes of fixed disk storage, and an 80-character line display format. The PD/FMS supports single task, or multi-task operations with preemptive or non-preemptive priority scheme. Task control supports both foreground and multiple background tasks with preemption controlled via priority assignment. Support is provided for six file access methods: basic direct or sequential, record direct or sequential, and indexed direct or sequential. Most peripherals are supported.

For the SPD 904 series terminals, Incoterm currently offers five program emulation packages that emulate the following remote batch terminals:

- IBM System/360 Model 20–for communication with IBM System/360 or 370 computers as a HASP, ASP/HASP, or HASP III multileaving terminal. The multileaving feature of HASP is supported; this feature permits transmitting and receiving independent data streams or receiving intermixed data blocks from multiple data files being output on different terminal devices, and tacks ACKS and NACKS onto data blocks being transmitted in the opposite direction in place of using separate transmissions for them.

- IBM 3780/2770–for communication with an IBM System/360 or 370 computer in a point-to-point or multipoint arrangement with other IBM bisynchronous terminals sharing the same facility. This package provides transmission compatibility with IBM's bi-synchronous communications discipline (BSC) and supports IBM data rates of 2000, 2400, 4800, and 7200/3600 bits/second. (The 7200/3600 bps rate represents a leased-line facility with the telephone network used at the lower speed for backup.) Both EBCDIC and ASCII transmission codes are supported. EBCDIC transparency is a standard feature for reception and transmission.

- IBM 2780–for communication with an IBM System/360 or 370 computer in a point-to-point or multipoint arrangement with other IBM bisynchronous terminals sharing the same facility. This package provides transmission compatibility with IBM's bisynchronous communications discipline (BSC) and supports IBM data rates of 2000, 2400, and 4800 bits/second.

PRICING

Incoterm's SPD Series terminal systems are available for purchase or under a monthly rental or lease arrangement, depending on model. Rental agreements are available for periods of 1 or 2 years and include installation charges and prime-shift maintenance. Lease arrangements are available for 3 or 5 years and include installation charges; maintenance is priced separately. Models SPD 10/20, 10/25, and 325 are available on a 1-year rental basis or under a 3- or 5-year lease.

All models of the SPD 904 Series are available on a 3- or 5-year lease only. Models SPD 20/20, SPD 20/30, and SPD 20/40 are available on a 2-year rental basis or under a 3- or 5-year lease. Models SPD 320, 320 LFC, 330 and 330 LFC are available on a 1- or 2-year rental or under a 3- or 5-year lease.

The investment tax credit is passed on to the customer for purchased equipment only. Training is typically five days at Incoterm for up to three customer personnel. The customer can purchase additional on-site training.

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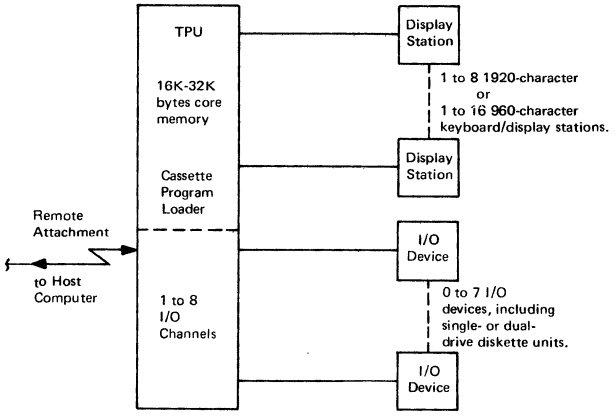
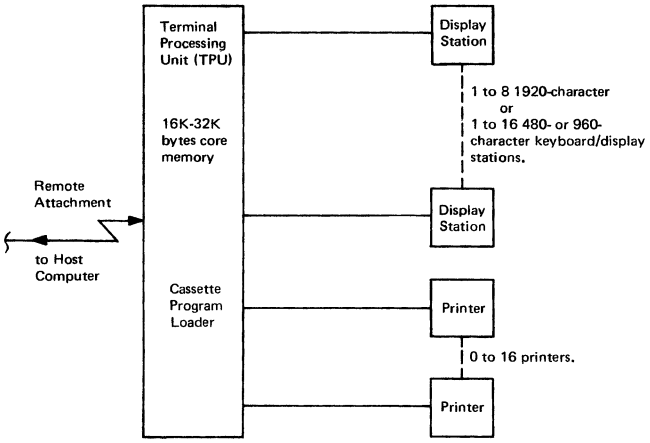
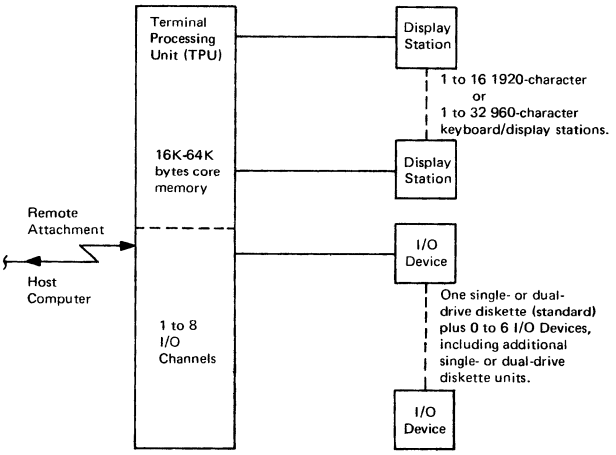
SPD 20/20 Configuration



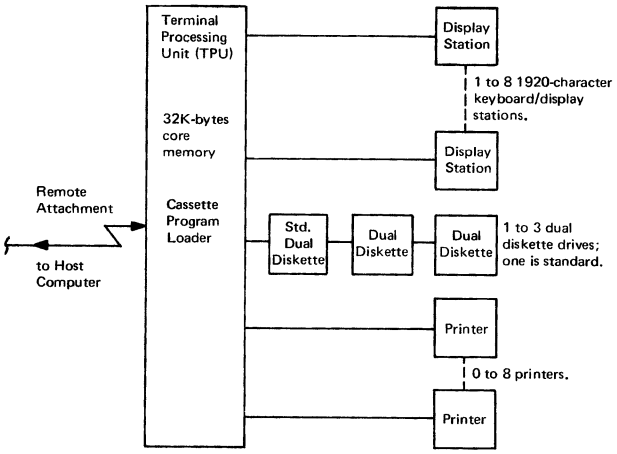
SPD 320 Configuration



SPD 20/30 Configuration



SPD 320 LFC Configuration



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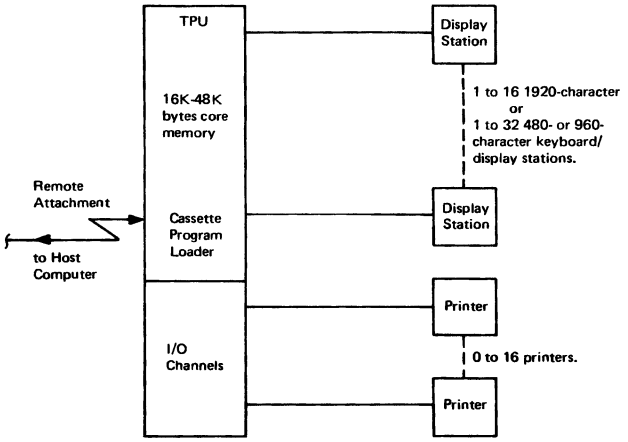
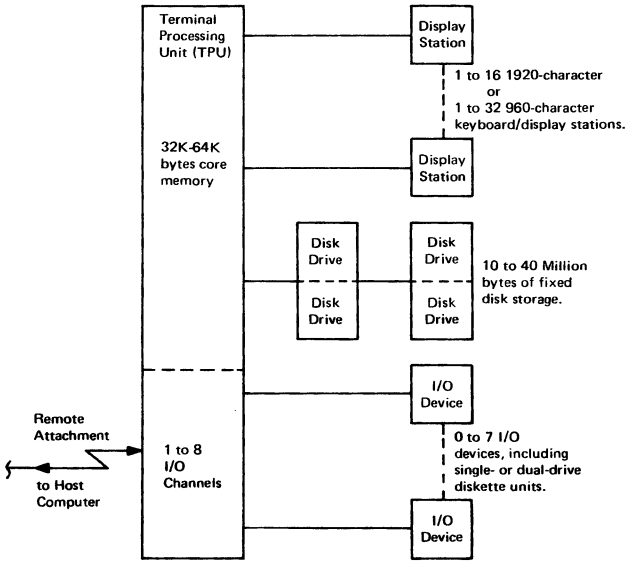
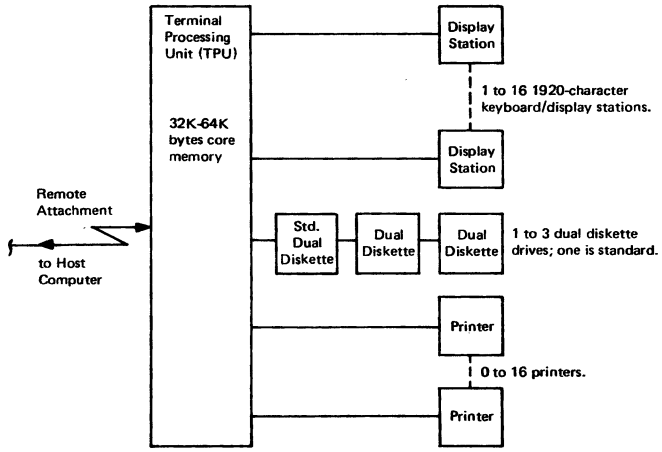
SPD 330 Configuration



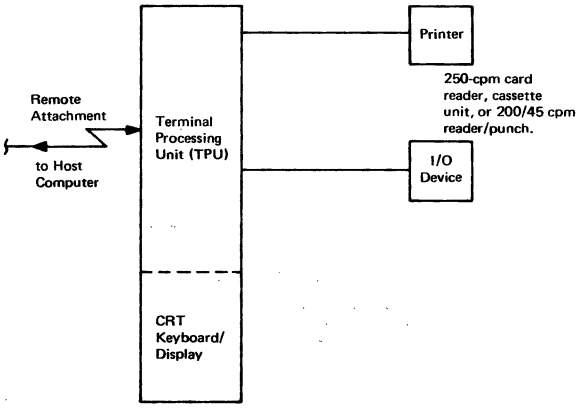
SPD 20/40 Configuration



SPD 330 LFC Configuration



SPD 904 Configuration



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	Monthly Charge (1)					
	1-Year Rental	2-Year Rental	3-Year Lease	5-Year Lease	Purchase	Monthly Maint.
SPD 10 Family						
SPD 10/20:						
Single 960/1920-char.	215	—	241	184	6,090	40
Dual 960/1920-char., each	270	—	311	237	7,875	51
SPD 10/25:						
Single 1920-char.	240	—	285	214	7,405	40
Dual 960-char., each	305	—	348	263	9,030	50
Dual 1920-char., each	310	—	357	269	9,295	50
SPD 904 Remote Batch Systems: (2)						
SPD 904	—	—	610	476	14,110	145
SPD 904A	—	—	608	475	14,060	145
SPD 904B	—	—	533	417	12,225	130
SPD 904C	—	—	1,093	856	24,920	271
1024-byte Buffer	—	—	32	25	815	5
2048-Byte Buffer	—	—	47	35	1,265	5
Modem Switch	—	—	7	5	200	0
SPD 325 Stand-Alone Systems:						
Single 1920-char. display stations	235	—	219	166	5,565	35
Dual 960-char. display stations	295	—	279	213	6,930	50
Single 480-char. display station with 165-cps printer	435	—	431	333	10,295	90
SPD 20/20 Family						
SPD 20/20 (includes processor with 16K memory & cassette tape drive):						
4 960-char. display stations	—	(3)	684	517	17,565	104
8 960-char. display stations	—	(3)	1,013	768	25,875	159
16 960-char. display stations	—	(3)	1,614	1,223	41,155	255
SPD 320 (incudes processor with 16K memory & cassette tape drive):						
8 480/960 char. display stations	(3)	(3)	806	620	19,580	159
16 480/960-char. display stations	(3)	(3)	1,293	995	31,450	255
8 1920-char. display stations	(3)	(3)	854	654	21,065	159
SPD 320 LFC (includes processor with 32K memory, cassette tape unit, and one dual diskette drive):						
4 1920-char. display stations	(3)	(3)	827	639	19,834	172
8 1920-char. display stations	(3)	(3)	1,095	843	26,499	220
SPD 20/30 (includes processor with 16K memory & single diskette drive):						
8 1920-char. display stations	—	(3)	1,181	897	29,925	193
16 1920-char. display stations	—	(3)	2,084	1,578	53,255	326
SPD 330 (includes processor with 16K memory & cassette tape unit):						
16 1920-char. display stations	(3)	(3)	1,576	1,206	38,884	292
24 480-char. display stations	(3)	(3)	1,958	1504	47,759	381
SPD 330 LFC (includes processor with 32K memory and a dual diskette drive):						
8 1920-char. display stations	(3)	(3)	1,074	827	26,056	214
16 1920-char. display stations	(3)	(3)	1,789	1,372	43,885	340
SPD 20/40 (includes processor with 32K memory and 10 million byte fixed disk):						
8 1920-char. display stations	—	—	1,690	1,279	43,190	264
16 1920-char. display stations	—	—	2,593	1,961	66,520	397
SPD 10 and SPD 20 Family Options						
Party Line Controller	21	21	22	17	465	6
Remote Load Controller	11	11	10	8	235	2
Expanded Character Set:						
SPD 10 Family	15	—	8	6	235	0
SPD 20 Family	—	26	25	20	555	6

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	Monthly Charge (1)					
	1-Year Rental	2-Year Rental	3-Year Lease	5-Year Lease	Purchase	Monthly Maint.
Peripherals for SPD 10 and SPD 20 Family						
SPD 250 Diskette:						
Single drive	—	—	134	107	2,835	40
Dual drive	—	—	179	142	3,890	50
Card Readers:						
SPD CR 250 (250 cpm)	—	—	139	113	2,675	50
SPD CR 500 (500 cpm)	—	—	162	134	2,925	65
Serial Printers:						
SPD P15B (15 cps)	129	129	133	105	2,945	35
SPD P100 (100 cps)	140	140	144	114	3,145	40
SPD P120C (100/165 cps)	161	161	166	130	3,790	40
SPD P165B (165 cps)	221	221	228	178	5,220	55
Line Printers:						
SPD LP125 (125 lpm)	—	—	362	279	8,680	75
SPD LP250 (250 lpm)	—	—	478	369	11,440	100
SPD LP300 (330 lpm)	—	—	571	446	13,200	135
Tape Drives:						
SPD-MT 810-7 (7-track, 556/800 bpi)	—	—	330	259	7,575	80
SPD-MT 810-9 (9-track, 800 bpi)	—	—	330	259	7,575	80
SPD-MT 1610-9 (9-track, 1600 bpi)	—	—	387	298	9,275	80
Paper Tape Reader, SPD PTR150 (150 cps)	60	60	47	38	950	15
Printing Reader/Punch, SPD PRP-45/200	(3)	(3)	(3)	(3)	(3)	(3)
SPD-M Multiplexer:						
4 channels	77	77	83	66	1,840	22
8 channels	77	77	95	74	2,205	22
16 channels	102	102	126	98	2,995	27

A dash indicates that component or feature is not available for that rental period.
(1) Monthly charges include installation and prime-shift maintenance.
(2) Includes peripheral devices and one software emulator; each additional emulator package is priced at $1,000 each.
(3) Contact vendor for complete pricing. ■

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New Product Announcement

Incoterm introduced the SPD 15/25 Terminal Processing Unit in September 1977. It is a programmable controller that provides on-line communications with a host processor for a small cluster of display terminals. The SPD 15/25 can accommodate one or two 1920-character display stations or one to four 960-character display stations, as well as printers. Multiple TPU's can be multiplexed to share a common modem where more display stations are needed. The SPD 15/25 utilizes existing Incoterm display stations and printers.

The SPD 15/25 TPU contains an industry standard 8080A microprocessor and up to 64K bytes of addressable memory. Memory can be configured from RAM, EPROM, or core. The TPU also provides 4K bytes of directly-addressable RAM refresh memory for screen data.

Data can be displayed in upper or lower case symbols. Highlighting functions include dual intensity, blink, and blank. Other SPD 15/25 features include a fully programmable interrupt system with 15 levels of priority interrupts and interfaces for a wide variety of peripherals; an arithmetic-logical processor; real time clock; and a communications controller.

Communications are asynchronous or synchronous in the half- or full-duplex mode at rates ranging from 75 to 9600 bits per second. All standard 5-through 8-level codes are supported, including ASCII, EBCDIC, and Baudot. Emulator programs are available for the IBM 3270 (BSC), Honeywell VIP 7700, UNIVAC Uniscope 100/200, and Burroughs TD 820.

The SPD D-251, a single- or dual-spindle diskette unit produced by Shugart, is also available for use with the SPD 15/25 for local storage and program loading. The SPD 15/25 can accommodate one to four spindles. Single density is available now, but Incoterm plans to introduce double-density and double-side recording.

The optional Serial I/O Controller provides four I/O channels, each with an RS-232C and 20 ma dc current loop interface for attaching printers or other I/O devices.

The SPD 15/25 is offered in three configurations—as a user-programmable terminal where application programs are generated via Incoterm-provided assembly langauge and executive routines; as a PARS airline reservation terminal; and as a terminal emulating other vendor's terminals. One PROM-based emulator program is provided at no charge. Applications that require more than one emulator program can load emulators from diskette or via down-line loading, which will be available by mid-1978. Additional emulator programs are priced separately. Incoterm also plans to introduce Local Forms Control software, a disk operating system, and SDLC protocol for the SPD 15/25 by mid-1978. First customer deliveries are scheduled to begin in January 1978.

The SPD 15/25 is available for purchase, rental, or lease. Rental agreements are available for 1 or 2 years and include installation charges and prime-shift maintenance. Lease agreements are available for 3 or 5 years and include installation charges; maintenance is priced separately. Quantity discounts are available.

	3-year* Lease	Purchase	Monthly Maint.
User Programmable Configurations			
SPD 15/25 with dual 1920-character keyboard/display stations, 4K bytes of refresh memory, 5K bytes of EPROM, and 8K bytes of RAM; does not include software	$286	$7,235	$50
SPD 15/25 with single 1920-character keyboard/display stations, 4K bytes of refresh memory, 5K bytes of EPROM, and 8K bytes of RAM; does not include software	222	5,570	40
Emulation Terminals			
SPD 15/25 with dual 1920-character keyboard/display stations, 4K bytes of refresh memory, 10K bytes of EPROM, and 8K bytes of RAM; includes one emulator	244	5,633	60
SPD 15/25 with single 1920-character keyboard/display stations, 4K bytes of refresh memory, 10K bytes of EPROM, and 8K bytes of RAM; includes one emulator	193	4,400	50

*Includes prime shift maintenance.

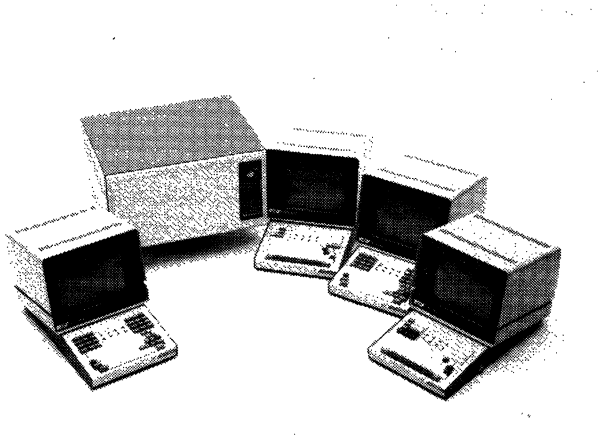
Incoterm SPD Family of Intelligent Terminals

New Product Announcement

Options	3-year* Lease	Purchase	Monthly Maint.
First 4K bytes of RAM	22	486	5
Each additional 4K bytes of RAM	9	200	2
First 1K bytes of EPROM	27	602	6
Each additional 1K bytes of EPROM	8	200	1
Serial I/O Controller; 4 I/O channels	26	550	8
Single Diskette Drive	133	2,835	40
Dual Diskette Drive	177	3,890	50

*Includes prime-shift maintenance.□

Incoterm SPD Family of Intelligent Terminals



Introduced in September 1977, the microprocessor-based SPD 15/25 marks a dramatic departure from Incoterm's own minicomputer-based architecture. The terminals processor (center) accommodates up to four 960-character display stations and is available with emulator programs for IBM, Honeywell, Burroughs, and Univac protocols.

MANAGEMENT SUMMARY

On October 13, 1977, Incoterm and Honeywell, Inc. jointly announced that a definitive agreement had been entered into by both parties which provides for a merger of Incoterm into a subsidiary of Honeywell. The proposed merger is subject to approval by the boards of directors of both companies and the stockholders and will be acted on January 24, 1978. The merger will enable Honeywell to offer customers total systems solutions through the use of its own computers and general purpose terminals and Incoterm's applications-oriented terminals.

Incoterm was one of the early vendors of intelligent terminals and was probably the first to merge minicomputer, communications interface, CRT display, and keyboard into a single programmable unit. Deliveries began on its initial product, the SPD 10/20—one of the most significant of the early entrants in the intelligent terminal market—in 1970. Over 9000 of these terminals have been installed. Since then, Incoterm's product line has blossomed into a broad family of display terminals that boast intelligence, user-programmability, emulation, multiple display stations, diskette and disk storage, a diversity of peripherals, and strong software support.

Incoterm has installed more than 29,000 display units to date. Its customer base lies primarily within the transportation industry—airlines, trucking firms, and railroads. Incoterm has been awarded major contracts by users in the banking and insurance industries, hospitals, and state government. United Airlines is one of its larger customers for passenger reservation systems (PARS).

Incoterm's broad base of products currently stretches over 10 product lines divided into three logical groupings: stand-alone and clustered terminals. The stand-alone terminals are designated as the SPD 10 and SPD 15 Family; the clustered terminals, as the SPD 20 Family.

A broad family of single-station and clustered intelligent display terminals that support data entry/validation, batch communications, file maintenance, and off-line processing for data entry and distributed processing applications. Emulators support transmission compatibility with the IBM 3270, 3275, 2770, and 2780 plus other IBM and Burroughs, Honeywell, and Univac terminals.

Standard hardware features include a diskette and fixed disk for program and data storage. Standard software includes symbolic assemblers, a disk operating system, a data entry/validation system, utilities, emulators, BASIC language support, and a program development/file management system for cartridge disk. Options include up to 1.5 million bytes of diskette storage and 40 million bytes of fixed disk storage, plus a host of peripherals.

Typical 8-station general purpose terminals without printers range from $1,000 to $1,700 per month, including maintenance, under a three year lease.

Typical 8-station IBM-compatible terminals without printers range from $844 to $1,061 per month including maintenance under a three year lease.

Configurations can include as many as 32 keyboard/displays and 16 printers.

CHARACTERISTICS

VENDOR: Incoterm Corporation, 65 Walnut Street, Wellesley, Massachusetts 02181. Telephone (617) 237-2100.

DATE OF ANNOUNCEMENT: SPD 10/20: early 1970; 20/20 and 320: February 1974; 10/25 and 325: September 1974; 20/30 and 20/40: April 1976; 904: June 1973. SPD 15/25: September 1977.

DATE OF FIRST DELIVERY: SPD 10/20: 1970; 20/20: April 1974; 10/25: November 1974; 320: December 1974; 325: January 1975. 904: June 1973; 20/30: September 1976; 20/40: October 1976. SPD 15/25: December 1977.

NUMBER DELIVERED TO DATE: Over 9100 SPD 10/20 and SPD 10/25 stand-alone terminals and over 2625 SPD 20/20 cluster terminals comprising over 29,000 display units.

SERVICED BY: Incoterm.

CONFIGURATION

Incoterm's programmable terminal systems are divided into three families: the SPD 10, an early family of stand-alone terminal systems; the SPD 15, a new family of microprocessor-based stand-alone terminal systems; and the SPD 20, a family of clustered terminal systems.

Incoterm SPD Family of Intelligent Terminals

INCOTERM SPD FAMILY MODELS AND APPLICATIONS

	Application									
				Emulation of:*						
				IBM 3270		Burroughs 820		Honeywell VIP 7700		Univac 100/200
	General Purpose	PARS	RBT	w/o LFC	w/LFC	w/o LFC	w/LFC	w/o LFC	w/LFC	w/o LFC
SPD 10 Family—										
Series 20	10/20	10/20P	904	—	—	—	—	—	—	—
Series 25	10/25	10/25P	—	325	—	—	—	—	—	—
SPD 15 Family—										
Series 15	15/25	15/25P	—	315	—	815	—	715	—	115
SPD 20 Family—										
Series 20	20/20	20/20P	—	320	320 LFC	820	820 LFC	720	720 LFC	120
Series 30	20/30	20/30P	—	330	330 LFC	—	—	—	—	—
Series 40	20/40	—	—	—	—	—	—	—	—	—

LFC—Local Forms Control.
*Many emulators are also available for general purpose members of SPD 10 and SPD 20 families.

The nucleus of the SPD 10 and 20 terminal systems is Incoterm's own small computer, called a Terminal Processing Unit. Except for its core memory, this unit exhibits total MSI/LSI construction; however, models SPD 10/25 and SPD 20/20 contain separate 2K or 4K increments of MOS display memory. The 16-bit processor, initially introduced as the heart of the SPD 10/20 terminal, has been upgraded and housed in a separate cabinet for use in Incoterm's other terminal systems.

THE SPD 10 FAMILY

The SPD 10 Family includes the SPD 10/20, its successor, the SPD 10/25, the IBM 3275-compatible SPD 325, and the SPD 904 series of remote batch terminals. The SPD 10/20 is available as a single-station or dual-station display terminal that consists of a master and slave display station. Both stations can operate independently and concurrently in the dual station version, which offers increased flexibility at a lower per-station cost. The memory capacity of the SPD 10/20 is limited to 4K bytes and includes the refresh memory for the display screen. Because its keyboard is under program control, the function of any and all keys can be user-defined. The SPD 10/20 includes software support and can accommodate a host of peripherals.

The SPD 10/25, introduced in September 1974 with production deliveries beginning in November of the same year, is a newer single- or dual-station version of the SPD 10/20. Unlike its predecessor, the SPD 10/25 includes a 2K- or 4K-byte MOS display memory in addition to its core main memory.

When the SPD was first announced, mentioning its programmability was sufficient. Today, intelligent terminals abound, and CRT display terminals with extensive editing capabilities are relatively inexpensive and readily available. The Incoterm terminal has thus lost some of its early glamour, and the evaluations must now be based on its actual capabilities.

The key word for placing the SPD 10/20 in perspective is not programmability but *adaptability*. Within its basic orientation as a conversational-type terminal, it can replace just about any other typewriter or CRT terminal without changing the applications programs in the central

SPD 10 FAMILY

The six members of the *SPD 10 family* of stand-alone terminals are equally split between the Series 20 and 25 and include the following models (the suffix P designates those terminals designed for PARS):

- **SPD 10/20 and 10/20P—a processor-controlled, single- or dual-station CRT terminal system with 4K bytes of non-expandable main memory, a 64-character-per-line display, a variety of peripherals including diskette storage, a synchronous or asynchronous communications capability, and extensive software support including emulation packages, assemblers, and a disk-resident operating system implemented via diskette storage.**

- **SPD 904—a remote batch terminal that can emulate several prominent batch terminals via emulator packages, is built around the SPD 10/20, and can include a card reader, line printer, asynchronous or synchronous communications capability, and a printing card reader/punch. The SPD 904 series models are listed below with their rated card reader and printer speeds.**

	Card Reader, cards/min.	Printer char./sec.
904	250	165
904B	250	100
904C	200/45*	165

***A reader/punch unit that reads at 200 cpm and punches and prints at 45 to 75 cpm.**

- **SPD 10/25 and 10/25P—a processor-controlled, single- or dual-station CRT terminal system with 4K bytes of non-expandable main memory, a software-selectable 64- or 80-character-per-line display, 2K or 4K bytes of display memory, a variety of peripherals including diskette storage, a synchronous or asynchronous communications capability, and extensive software support including emulation packages, assemblers, and a disk-resident operating system implemented via diskette storage. The major differences between the 10/20 and 10/25 are the display arrangement and the additional display memory of the 10/25.**

- **SPD 325—a processor-controlled, stand-alone single- or dual-station CRT terminal system that emulates a remote IBM 3275 terminal. The SPD 325 is a specialized version of the SPD 10/25 that uses the 10/25's Terminal Processing Unit (TPU) and is designed for compatibility with the IBM 3275. The SPD 325 TPU contains a synchronous communications controller and can accommodate a second independent display unit or serial impact printer.**

Incoterm SPD Family of Intelligent Terminals

computer. New editing or data checking functions can also be added as the need occurs with minimum impact on the existing system.

Incoterm achieves this adaptability in the SPD 10/20 not just by including a programmable processor in the terminal, but also by making the display unit independent of the keyboard. There are no standard function keys that control the cursor or editing functions. There are numerous keys that can be used for this purpose, or any other, by simply coding a routine that responds to the data code generated when a key is depressed. Even the data keys are not directly linked to what is to be displayed.

Adaptability is a two-way street. It gives the user flexibility in designing the original system and in making changes as needs are changed. It also provides Incoterm with a single product that can be competitively bid in almost any conversational terminal environment.

IBM 3275 COMPATIBILITY

The SPD 325 system, a specialized version of the SPD 10/25, was introduced in September 1974 as a remote stand-alone version of the SPD 320 and a direct replacement for the IBM 3275 Information Display System. Production deliveries began in January 1975. Salient characteristics of the SPD 325 system include:

- Display capacity—a choice of three screen sizes: 480, 960, and 1920 characters. By comparison, IBM offers two screen sizes: 480 and 1920 characters.

- System configuration—available as a single- or dual-station arrangement consisting of one or two display units, respectively. The single-station arrangement can include a serial impact printer rated at 100 or 165 cps, but the printer precludes a second display unit. By contrast, the IBM 3275 consists of one display unit, an optional serial impact printer rated at 40 or 66 cps, and an optional magnetic stripe card reader (badge reader).

The SPD 325 provides complete compatibility with the IBM 3275 with respect to line discipline, commands and command-code structure, and addressing sequence. It can utilize all existing IBM software for the 3270 system. The SPD 325 can be multidropped on the same line as an SPD 320 or an IBM 3270.

THE SPD 904 REMOTE BATCH TERMINALS

Having achieved success with its SPD 10/20 terminals, Incoterm introduced a family of terminals with fixed I/O configurations that can serve as replacements for several of the more prominent remote batch terminals produced by the leading mainframe manufacturers. While their principal function is to serve as batch terminals for remote job entry, the Incoterm terminals also provide useful interactive capabilities. Deliveries of these terminals began in June 1973.

The SPD 900 family originally included eight members, but now consists of three. Each model provides punched card input and printed output, but the models differ in I/O equipment and performance. Incoterm's successful SPD 10/20 terminal forms the nucleus for each of the

The basic SPD 10/20 terminal consists of a Terminal Processing Unit (TPU) housed in the cabinet of a CRT display and a separable keyboard. The TPU accommodates up to 8 controllers for peripheral devices and features; the basic keyboard uses one controller position.

The basic SPD 10/25 terminal consists of a Terminal Processing Unit (TPU) that is available as a physically separate unit or contained in the cabinet of a CRT display unit with separate keyboard. The TPU accommodates up to eight controllers for peripheral devices and features; the basic keyboard uses one controller position. The SPD 10/25 contains a separate 4K-byte core memory for program and data storage and a 2K- or 4K-byte MOS display buffer.

A two-display version, called a Dual, splits the MOS display buffer between two independent CRT displays, providing 960 or 1920 characters of buffering per display. The second display unit normally includes a keyboard and can be located up to 2000 cable feet from the TPU.

The SPD 10/20's 4K-byte core memory is equally partitioned between display buffer storage and program and data storage. In the dual configuration, the display buffer provides 960 characters of buffering for each display.

Multi-display configurations are normally constructed through the use of interconnected single or dual versions.

The Party Line Controller can be used to provide intercommunications among a group of SPD 10/20 or 10/25 terminals at one location. In effect, this option permits cable-connected data communications at up to 9600 bits per second. An asynchronous technique, complete with start and stop bits, is employed. Terminal-to-terminal distance can be up to 1000 feet. Each terminal connected to a party line requires a controller. The chief use for this option is to enable of group of peripheral devices to be shared among multiple terminals.

In general, each peripheral device, including auxiliary core storage, requires one controller position. Full-duplex data communications requires two communications controllers. In addition, certain features, such as Remote Program Load and Cyclic Redundancy Check, also require a controller.

Thus, an SPD 10/20 or 10/25 can assume a wide variety of configurations, from a display terminal to a processing terminal complete with data storage peripherals to a multiline communications processor.

Standard peripherals include a punched tape reader, two card reader models, a single- or dual-spindle diskette unit, seven printer models, industry-compatible 7- and 9-track magnetic tape drives, and a printing card reader/punch.

SPD 15 FAMILY

The SPD family of microprocessor-based terminals currently consists of the general purpose 15/25, the PARS (Passenger Airline Reservation System) 15/25P, and four models that emulate other vendor's terminals.

The SPD 15/25 is equipped with an Intel 8080A microprocessor with up to 64K bytes of addressable memory and an asynchronous or synchronous communications controller. The 15/25 TPU accommodates one or two 1920-character, or one to four 960-character display stations. A single- or dual-spindle diskette unit can be attached via the DMA channel. The optional Serial I/O Controller (SIOC) provides four I/O channels, each with an RS-232C and 20 ma dc current loop interface for attaching printers or other serial I/O devices. Multiple TPU's can be multiplexed to share a common modem where more display stations are needed.

The four emulation models include:

- **SPD 115—emulates the Univac Uniscope 100/200.**
- **SPD 315—emulates the IBM 3275.**

Incoterm SPD Family of Intelligent Terminals

family members and serves as both controller and operator's console. The integral minicomputer, with supporting software, permits the SPD 904 terminals to behave as other manufacturers' terminals via software emulation. Currently, Incoterm supports the SPD 904 terminals as replacements for the IBM 360/20 HASP multileaving terminal, IBM 3780, IBM 2780, IBM 2770, CDC 200 User Terminal, or Univac 1004 under EXEC 8. Software emulation for any one of these terminals is included in the cost of the SPD 904 terminal, and additional emulators are priced at a one-time charge of $100 each.

But how does the SPD 904 differ from the SPD 10/20 and 10/25, which also offer auxiliary I/O capabilities? Incoterm is marketing its SPD 904 terminals as complete turnkey systems specifically for applications with a need for both interactive and remote batch capabilities. On the other hand, Incoterm has taken the "Tinkertoy" approach with the SPD 10/20 and SPD 10/25 terminals, which it offers with assorted software packages and auxiliary devices and markets for a wide variety of applications. The two product lines are not software-compatible with one another.

THE SPD 15 FAMILY

The SPD 15 Family of stand-alone terminals includes the SPD 15/25 and four vendor-compatible models equipped with emulator programs for IBM (BSC), Burroughs, Honeywell, and Univac communications protocols. Introduced in September 1977, the Intel 8080A microprocessor-based terminals mark a significant departure from Incoterm's use of its own minicomputer design and Auto Executive interrupt structure.

The SPD 15/25 supports one or two large-screen 1920-character display stations or one to four 960-character displays. RAM and EPROM memory can be added in any combination up to 64K bytes to satisfy user requirements. RAM is available in 4K-byte increments. EPROM is available in 1K-byte increments. The microprocessor's DMA bus supports high-speed peripherals such as diskette storage. An optional I/O controller (SIOC) accommodates up to four serial I/O devices such as printers. User programs can be loaded from paper tape or diskette, or via downline loading. They can also be EPROM-resident.

THE SPD 20 FAMILY

The SPD 20 Family of clustered terminals is composed of Series 20, 30, and 40 terminal members. The initial member of the Series 20, the SPD 20/20, was introduced in Feburary 1974 as a clustered version of the SPD 10/20. Salient features of the SPD 20/20 include:

- An upgraded Terminal Processing Unit with 16K bytes of main memory, expandable to 32K bytes, and a modular refresh memory expandable to 16K bytes in 2K increments.
- Accommodation for up to sixteen 480- or 960-character or up to eight 1920-character keyboard/display units.
- Accommodation for up to 16 printers consisting of any mix of serial printer models rated at 15, 100, and

- SPD 715—emulates the Honeywell VIP 7700.

- SPD 815—emulates the Burroughs TD 820.

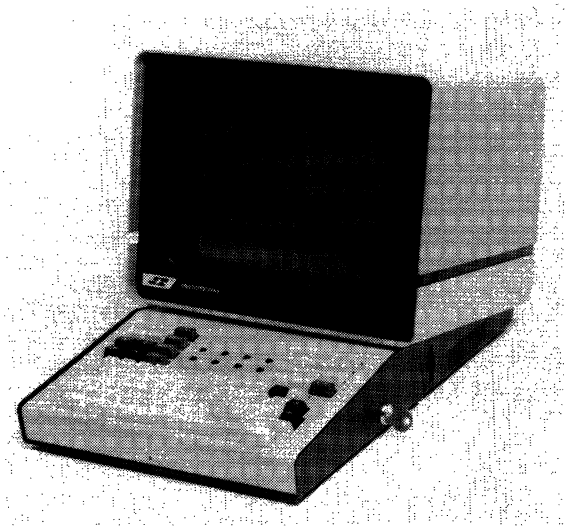
SPD 20 FAMILY

The SPD 20 family of clustered terminals include the SPD 20/20 and 20/20P, the SPD 20/30 and 20/30P, and the SPD 20/40, plus special configurations of the SPD 20/20 and SPD 20/30 designed to emulate other vendor's terminals. The suffix "P" designates terminals designed for PARS.

The SPD 20/20 (and 20/20P) system is built around a Terminal Processing Unit (TPU) that contains a basic 16K-byte core memory (expandable to 32K bytes in one 16K-byte increment), a modular MOS refresh memory that provides up to 16K bytes of display storage in 2K-byte modules, an asynchronous or synchronous communications controller, and an integral tape cassette unit for program loading. The TPU can accommodate up to 8 1920-character or up to 16 960-character display stations, up to 16 printers, and 8 communications and peripheral controllers for a variety of peripherals. Standard peripherals include a punched tape reader, two card reader models, a single- or dual-spindle diskette unit, four serial printer models, three line printer models, and industry compatible 7- or 9-track magnetic tape drives. The SPD 20/20 features a disk-resident operating system implemented via optional diskette storage.

The following models are specialized configurations of the SPD 20/20 that emulate the more popular terminals of prominent mainframe vendors via software emulations:

- **SPD 120—a 16K-byte processor-controlled clustered CRT terminal system that emulates a remote UNIVAC Uniscope 100/200 series display terminal, and accommodates up to 8 1920-character or 16 960-character keyboard/display units and up to 8 100- or 165-cps matrix printers.**
- **SPD 320—a 16K- or 32K-byte, processor-controlled, clustered CRT terminal system that emulates a remote IBM 3270 system and accommodates up to 8 1920-character or up to 16 480- or 960-character display stations and up to 16 100- or 165-cps matrix printers.**
- **SPD 320 LFC—a special version of the SPD 320 equipped with Local Forms Control software and one to four D-251 dual diskette units for data entry applications. The 320 LFC accommodates up to 8 1920-character display stations and up to 8 100- or 165-cps matrix printers.**



This Executive model display station is available with the SPD 10/25 or SPD 20 Family terminals.

Incoterm SPD Family of Intelligent Terminals

165 cps and line printer models rated at 125, 250, and 300 lpm.

- Accommodation for up to 8 peripheral devices, including asynchronous and synchronous communications controllers that range in speed from 50 to 9600 bps.

- A host of peripheral devices, including 250-cpm and 500-cpm card readers, 7- and 9-track magnetic tape drives, single- or dual-spindle diskette units, a punched tape reader, four serial printer models, three line printers, and an 80-column printing card reader/punch (data recorder).

The SPD 20/20, like its single-, or dual-unit counterparts, the SPD 10/20 and SPD 10/25, is user-programmable and is supported by symbolic assemblers that can be run on the SPD 20/20 itself or on large-scale computers, and by an optional disk-resident operating system implemented via a single- or dual-spindle diskette unit.

Additional software includes a basic data entry program and an IBM 3270 emulator, with or without local forms control support. The SPD 20/20 software, however, is not directly compatible with that for the SPD 10/20 or SPD 10/25.

The Series 30 and 40 terminals, spawned from the Series 20 terminals, were introduced in April 1976 as upward compatible models. Salient features of the SPD 20/30 that differ from the SPD 20/20 include:

- Optional core memory expansion up to 64K bytes.

- Support for up to 16 1920-character or 32 960-character display stations.

- Standard support for one dual diskette drive and two optional drives for a maximum of 1.5 million bytes of diskette storage. (Cassette storage is *not* provided.)

- Standard software support includes all software available for the SPD 20/20 plus an expanded data entry/validation program superior to that offered with the 20/20, remote batch emulators, and a BASIC language compiler.

Incoterm offers specialized versions of the SPD 20/20 and SPD 20/30 designed for airline passenger reservation systems. These include up to 16 or 32 960-character display stations, up to 16 printers, a PARS emulator, and a Vogue 810 Ticket Printer interface; boarding pass and ticket printers and a magnetic strip card reader are optional.

The SPD 20/30 can be upgraded to an SPD 20/40.

The SPD 20/40 is currently the largest terminal system of the SPD 20 Family. Like the SPD 20/30, it is available with up to 64K bytes of core memory and supports the same number of display stations as the SPD 20/30—up to 16 1920-character or 32 960-character displays. But the SPD 20/40 is equipped with 10 million bytes of fixed disk storage, expandable to 40 million bytes in 10 million-byte increments. Diskette storage is optional, however, the SPD 20/40 can accommodate the same diskette storage capacity of the SPD 20/30. No cassette loader is provided.

- **SPD 720—a 32K-byte processor-controlled clustered CRT terminal system that emulates a Honeywell VIP 7700 and accommodates up to 8 1920-character keyboard/display units and as many 100- or 165-cps matrix printers.**

- **SPD 720 LFC—a special version of the SPD 720 equipped with Local Forms Control software and one to four D-251 dual diskette units for data entry applications. The 720 LFC accommodates the same number of display stations and printers as the SPD 720.**

- **SPD 820—a 16K-byte processor-controlled clustered CRT terminal system that emulates a Burroughs TD-820 series display terminal and accommodates up to 8 1920-character keyboard/display units and as many 100- or 165-cps matrix printers.**

- **SPD 820 LFC—a special version of the SPD 820 equipped with Local Forms Control software and one to four D-251 dual diskette units for data entry applications. The 820 LFC accommodates the same number of display stations and printers as the SPD 820.**

The SPD 20/30 (and 20/30P) is a processor-controlled clustered CRT terminal system that accommodates up to 16 or 32 keyboard display units and provides a basic 16K bytes of main memory, expandable to 32K, 48K, or 64K bytes. The TPU can accommodate up to 16 1920-character display units or up to 32 960-character display units and 8 communications and peripheral controllers. One dual diskette unit is standard; one or two additional dual units are optional. No cassette tape unit is provided. Peripherals available for the SPD 20/20 are also available for the SPD 20/30 and 20/30P. The 20/30 can be field-upgraded to an SPD 20/40.

The SPD 20/30 is available in the following two special configurations:

- **SPD 330—a processor-controlled clustered CRT terminal system that emulates a remote IBM 3270 system, accommodates up to 16 keyboard/display units and up to 16 printers, and provides a basic 16K-byte main memory, expandable to 32K or 48K bytes. The TPU includes an integral cassette tape program loader and can accommodate up to 16 1920-character display units.**

- **SPD 330 LFC—a special version of the SPD 330 equipped with Local Forms Control software, 32K to 64K bytes of memory, and one to four D-251 dual diskette units for data entry applications.**

The SPD 20/40 is a processor-controlled clustered terminal system that accommodates up to 16 or 32 keyboard/display units and provides 32K bytes of memory, expandable to 48K or 64K bytes. Fixed cartridge disk storage provides 10 million bytes standard and up to 40 million bytes in 10 million-byte increments as an option. No cassette tape loader is provided. The SPD 20/40 accommodates all peripherals available for Models 20/20 and 20/30 plus diskette storage. The TPU can accommodate up to 16 1920-character display units or up to 32 960-character display units and 8 communications and peripheral controllers.

TRANSMISSION SPECIFICATIONS

Asynchronous or synchronous, half-duplex communications controllers are available for the SPD 10/20, SPD 10/25, SPD 15/25. SPD 20/20, SPD 20/30, SPD 20/40, and SPD 904.

The SPD 320, SPD 320 LFC, SPD 325, SPD 330, and SPD 330 LFC employ a synchronous communications control designed for compatibility with IBM's BSC communications discipline. IBM SDLC compatibility is available by RPQ as a subset of SDLC called IDLC which provides complete compatibility with IBM's SDLC protocol.

The SPD 115, SPD 120, and SPD 120 LFC employ an asynchronous communications controller designed for protocol compatibility with the UNIVAC Uniscope 100 and 200.

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Besides all standard software support for the 20/20 and 20/30, the 20/40 is supported by a specialized software package designed for program development and file management. This sophisticated package supports multi-task operations with preemptive or non-preemptive priority and a variety of access methods and is equipped with an extensive library of assembly language subroutines for program development. This software supports all standard peripherals.

IBM 3270 COMPATIBLE TERMINALS

The other members of the SPD 20 Family include IBM 3270-compatible versions of the Series 20 and 30 terminals. SPD 20/20 versions include the SPD 320 and an enhanced model, the SPD 320 LFC. SPD 20/30 versions include the SPD 330 and its enhanced counterpart, the SPD 330 LFC. These terminals are supported by IBM 3270 emulators and are comprised of a cluster of display stations and printers; *no* peripherals other than diskette drives are supported. The 320 and 330 models differ in system size only.

- Model 320—supports up to 8 1920-character or 16 480- or 960-character displays and up to 16 printers.
- Model 320 LFC—supports up to 8 1920-character displays and up to 16 printers.
- Model 330—supports up to 16 1920-character or 32 480- or 960-character displays and up to 16 printers.
- Model 330 LFC—supports up to 16 1920-character displays and up to 16 printers.

Note that although the total number of displays supported by the 330 models is twice that of the 320 models, the total number of printers supported is the same for all models.

The SPD 320 LFC and SPD 330 LFC, enhanced versions of the SPD 320 and SPD 330, respectively, feature off-line data entry/validation and local forms storage via diskette. Both models can accommodate up to three dual-diskette drives; one dual drive is standard. A basic data entry program, Local Forms Control (LFC), supports the creation and local storage and retrieval of record formats, format directories, and data. And validated records can be batched for later transmission to the host computer.

These IBM 3270-compatible models provide complete compatibility with the IBM 3270 with respect to line discipline, commands and command-code structure, and addressing sequence. They can utilize all existing IBM software for the 3270 and can be multidropped on the same line as an IBM 3270 or as SPD 325.

USER REACTION

In Datapro's 1977 survey of alphanumeric display terminal users, only 3 users reported on their experience with a total of 156 Incoterm display terminals. To supplement this small sampling, Datapro interviewed 5 additional users who reported on 3446 Incoterm terminals (one of the users reported on 2200 terminals). Their combined ratings are presented as follows.

The SPD 715, SPD 720, and SPD 720 LFC employ a synchronous communications controller designed for protocol compatibility with the Honeywell VIP 7700.

The SPD 815, SPD 820, and SPD 820 LFC employ a synchronous communications controller designed for protocol compatibility with the Burroughs TD 820 series terminals.

The Asynchronous Controller operates in half-duplex mode at any speed from 50 to 9600 bits per second. It is compatible with the RS-232C interface standard. The code unit structure is adaptable to meet most situations with 5 to 8 data bits per character. No-cost options available with the Asynchronous Controller include capabilities for automatic answering and automatic dialing (with appropriate common-carrier dialing units).

The Synchronous Controller also operates in half-duplex mode at any speed from 1200 to 9600 bits per second, with clocking provided by the external modem. It is compatible with the RS-232C interface standard.

Full-duplex operation can be achieved by using two Controllers; assignment and control for using one Controller to transmit only and the other to receive only is performed by the program.

Either of these Controllers can be used up to 50 feet from the modem or 1000 feet from the SPD-M Multiplexer.

The SPD-M Multiplexer, an option permitting multiple terminal systems to alternately share a common communications line via a single modem, is usable with all SPD terminal systems. The SPD-M can accommodate up to 4, 8, or 16 terminal systems and can be cascaded to a maximum of 4 levels, permitting up to 64 terminal systems to share one line. Except in unusual situations, the full configurational flexibility is used primarily to provide redundant or alternate data paths to multiple central computers or among several communications lines. A terminal is connected to the Multiplexer through a Communications Controller; the Multiplexer itself is not an addressed peripheral and does not require a separate controller position. Each terminal can be located up to 1000 feet from the Multiplexer, and the modem can be located up to 50 feet from the Multiplexer.

For the SPD 904, transmission compatibility (including communications line discipline) and transmission parameters such as asynchronous or synchronous operation, data rate, and code type and level are a function of the program emulation package; these parameters differ among the available emulators. Hardware compatibility is provided for half- or full-duplex, asynchronous or synchronous operation at transmission rates up to 9600 bits/second. Six- through eight-level codes are accommodated. All SPD terminals provide two EIA Standard RS-232C interfaces. Modem requirements are also determined by the operating software. The two modem interfaces permit switching between modems when the optional Modem Switch is installed.

The following table shows the relationships between transmission speed and modem type; although Bell System modems are shown, equivalent modems from independent manufacturers can be used.

Transmission Rate	Bell System Modem
0-300 bps	103A/E/F; 113A/B
1200 bps	202C/D/E/R
2400 bps	201B/C
4800 bps	208A/B
7200 bps	209A
9600 bps	209A

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	Excellent	Good	Fair	Poor	WA*
Overall performance	6	2	0	0	3.8
Ease of operation	6	2	0	0	3.8
Display clarity	0	7	1	0	2.9
Keyboard feel and usability	3	4	1	0	3.3
Hardware reliability	3	5	0	0	3.4
Maintenance service	1	4	3	0	2.8
Software and technical support	1	4	1	1	2.7

*Weighted Average on a scale of 4.0 for Excellent.

These satisfied users unanimously cited low cost as the key advantage of the Incoterm terminals. Other advantages mentioned were flexibility (6 responses), reliability (5), strong vendor support (4), programmability (5), applicability (4), and compact size (3). Disadvantages or limitations were cited as inflexibility (2 responses) and poor support (2). Each of the interviewed users was well pleased with Incoterm's products and were planning to expand their networks with Incoterm equipment in the future.□

COMPONENTS

SPD 10 PROCESSOR: The Terminal Processing Unit is a rather conventional (in today's terms) 16-bit, single-address unit, specially adapted to work with a CRT display. It provides relative addressing within 256-word pages, direct addressing to any location, and indirect addressing to any number of levels. Instructions are one or two words long, depending on whether they contain a direct or relative address.

Main memory capacity is 2048 words (4096 bytes), and cycle time is 1.6 microseconds per one-word access; it cannot be expanded. The TPU for Models 10/25 and 325 also includes a 2K- or 4K-byte (as specified) display memory in addition to the 4K-byte main memory. All I/O transfers, except to the display, are handled through the accumulator. Typical execution times are 1.6 microseconds for a one-word instruction and 3.2 microseconds for arithmetic and two-word instructions. A real-time clock is included that, when enabled, creates an interrupt every 66.7 milliseconds.

Program loading is normally initiated by a bootstrap process from punched tape, a magnetic tape cassette (904 only), or a diskette. Optionally, a Remote Program Load feature (actually a separate controller) can permit the bootstrap sequence to be initiated from the communications line.

SPD 15 PROCESSOR: The Terminal Processing Unit contains an Intel 8080A microprocessor with up to 64K bytes of memory configured from RAM, EPROM, and/or core memory. The basic TPU consists of a processor board that can contain up to 8K bytes of EPROM in 1K-byte increments (a minimum of 5K bytes is required for the operating system and program loader) and 4K or 8K bytes of RAM, and a refresh board that contains 4K bytes of RAM for display refresh memory. The basic TPU can accommodate up to eight additional controller or memory boards. The I/O controller can accommodate a maximum of three memory boards consisting of any combination of up to three RAM boards and one or two EPROM boards. MOS RAM memory is available in increments of 4K, 8K, 12K, or 16K bytes/board. EPROM memory is available in 1K-byte increments up to 16K bytes/board.

The optional Serial I/O controller (SIOC) provides four independent channels under software control. Bit rates are programmable up to 14.4K bits/second (asynchronous) or 56K bits/second (synchronous) clocked by an external source. Each channel is equipped with an RS-232C and 20 ma dc current loop interface.

The standard DMA channel supports transfer rates up to 62.5K bytes/second without degrading processor speed, and up to one million bytes/second with processor speed degradation. The DMA channel is intended for use by high-speed peripherals such as diskette drives, etc.

Programs can be loaded via paper tape, via downline loading, via diskette, or via EPROM (resident programs).

The 15/25 TPU is equipped with a real-time clock and a fully-programmable interrupt structure with eight levels of priority interrupts.

SPD 20 PROCESSOR: The Terminal Processing Unit is an upgraded version of the one used in the SPD 10 family. Unlike the internal packaging approach used in the SPD 10 Family the SPD 20 Family TPU is a self-contained unit incorporating core memory, an arithmetic-logic unit, a real-time clock, an input-output subsystem, and a CRT refresh memory. Like its SPD 10 Family counterpart, the 16-bit, single-address unit provides relative addressing within 256-word pages, direct addressing to any location, and indirect addressing to any number of levels.

Instructions are one or two words in length, depending on whether they contain a direct or relative address. Main memory capacity is 8,192 words (16,384 bytes), expandable in 16K-byte increments to 65,536 bytes. Cycle time is 1.6 microseconds for a one-word instruction and 3.2 microseconds for arithmetic and two-word instructions.

Program loading is performed in the same manner as with the SPD 10 Family.

CRT DISPLAY: Via a 12-inch (diagonal measurement) CRT with a viewing area 6.5 inches high by 9 inches wide. The display screen arrangement is dependent on the model, as shown below.

	Display Arrangement		
Models Supported	Display Capacity, Chars.	Lines/ Display	Chars./ Line
SPD 320-1 only	480	12	40
SPD 10/25; 15/25, 115, 815; 20/20, 120, 20/30	960	12	80
SPD 904, 10/20; 10/25; 15/25; 20/20, 120; 20/30	960	15	64
All models, except SPD 10/20, 904	1920	24	80
All models, except SPD 315, 715, 815, 325	1920	30	64
All models, except SPD 10/20, 904, 10/25, 325	2000	25	80

A character set of 64 ASCII characters, including upper case alphabetics, numerics, and special symbols, is displayed in green against a dark background. Each character is formed via a standard matrix of 7 by 10 dots. A matrix of 8 by 12 dots is optional for the SPD 10/25, SPD 20/20, SPD 20/30, and SPD 20/40; an 8 by 14 dot matrix is optional for the SPD 10/20.

Blinking is a standard feature of the SPD 10/20. Underlining is included in the Expanded Character Set feature.

Dual intensity is standard on the SPD 10/25, 15/25, 20/20, 20/30, 20/40, 320, 325, and 330; intensity, under program control, can be switched between normal and bright intensity levels, or the beam can be turned off (blanked).

KEYBOARD: The standard key arrangement for all models consists of 52 keys arranged in an expanded typewriter layout,

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flanked on either side by an array of 12 additional keys. None of the keys except the shift keys causes any direct action to be performed; depression of a key causes generation of a code that can be transferred to the processor memory. Above the keys is an array of eight indicator lamps that are lighted under program control.

A data entry keyboard is optional for all models.

The SPD 20/20 is available with any of three keyboards, including ASCII, EBCDIC, and Upper/Lower Case.

The SPD 320, SPD 325, and SPD 330 keyboard includes 12 Program Function and 3 Program Attention keys plus cursor, erase, and edit control keys. Edit, erase, and cursor-control keys are located in the 12-key array at the left of the main group.

CASSETTE PROGRAM LOADER: The SPD 20/20, 120, 320, 320 LFC, 720, 820, and 330 each include an integral single-drive cassette unit contained within the housing of the Terminal Processing Unit. The unit accommodates a cassette containing 300 feet of 0.15-inch-wide magnetic tape. The per-cassette storage capacity is 180,000 bytes recorded at 50 characters per inch. The data transfer rate is 100 bytes/ second. Tape speeds are: read/write—1-7/8 inches/ second; rewind—48 inches/second.

PUNCHED TAPE INPUT: The SPD PTR150 Paper Tape Reader reads standard 8-level, 1-inch-wide punched tape at up to 150 characters per second. This unit contains an Addmaster mechanism and is housed in a small cabinet and designed to handle small rolls of tape. It is normally used to load programs, but can also be used for data. Programs are normally prepared on a Teletype Model 33 ASR; the SPD 10/20 currently has no provision for a punch.

DISKETTE STORAGE: Provided by the SPD D-2510 Diskette System, a single- or dual-spindle diskette unit that contains a Shugart mechanism. The diskette unit records 64 tracks on one surface of a 7.5-inch diskette. Each track contains 32 records, for a maximum storage capacity of 2048 records per diskette. Record length is 133 bytes, including 128 data bytes, 2 cycle check bytes, and 3 control bytes. The rotational speed and average latency time are 360 rpm and 88.5 milliseconds, respectively. Access time is 10 milliseconds track-to-track plus an 8-millisecond settling time. The data transfer rate is 31,250 bytes per second between the diskette and diskette buffer, and 62,500 bytes per second between the diskette buffer and Terminal Processing Unit. The diskette buffer, shared by both spindles, stores 256 bytes of data. Features include Write Protect and a bootstrap capability for up to 2048 bytes of storage.

CARTRIDGE DISK STORAGE (SPD 20/40 only): The Series 40 Cartridge Disk Storage System consists of one or two cabinets each containing one or two 10-million-byte IBM 2315-style drives for a total storage capacity of 40 million bytes. Each drive consists of one fixed disk and one removable disk providing a total of four recording surfaces. Access time is 10 milliseconds track-to-track, 40 milliseconds average, and 65 milliseconds maximum. Rotational delay is 13.3 milliseconds. The data transfer rate is 312.5K bytes/ second between disk and buffer and 78K bytes/second between buffer and the TPU. The disk buffer capacity is 1K byte. The drives are produced by Pertec. Each drive is organized into 408 cylinders of four tracks per cylinder. Each track contains 32 sectors consisting of 194 data bytes and one control byte.

CARD INPUT: Provided by either of two 80-column punched card readers. Speeds are 250 and 500 cards/ minute, and cards are read on a column-by-column basis. Hopper and stacker capacities are 500 cards each for both models. Both are small, table-top units produced by Peripheral Dynamics, Inc. (PDI).

CARD INPUT/OUTPUT: Provided by an 80-column printing reader-punch (Decision Data Model 8045) that reads 200 cards/minute and punches 45 to 75 cards/minute. The unit contains primary and secondary input hoppers with capacities of 600 and 400 cards, respectively, and two stackers with capacities of 400 cards each.

PRINTED OUTPUT: Provided by any of four serial printers (Models SPD-P15B, SPD-P100, SPD-P120C and SPD-P165B) and three line printers.

The SPD-P15B is an impact printer, obtained from Extel Corporation, that operates at up to 15 characters per second. It prints up to 72 characters per line at 10 characters per inch. Vertical spacing is 4.5 lines per inch.

The SPD-P100, SPD-P120C, and SPD-P165B are the well-regarded Centronics 306, 306C, and 501 printers, respectively. They are impact printers with respective rated speeds of 100, 100 or 165 (switch and software selectable), and 165 characters per second. Line length is 80 characters for the SPD-P100, 80 or 132 characters for the SPD-P120C, and 132 characters for the SPD-P165B. The printers employ the dot matrix printing technique. A 5-by-7 dot matrix is standard, and a 9-by-7 dot matrix is optional. Horizontal pitch and vertical spacing are 10 characters per inch and 6 lines per inch, respectively. The printers incorporate sprocket feed mechanisms, which are adjustable up to 9½ inches (SPD-P100 and SPD-P120C) or 14 inches (SPD-P165B).

The line printers are designated Models LP125, LP250, and LP300 and are rated at 125, 250, and 300 lines/minute, respectively. The fully buffered belt printers each provide 132 print positions and are equipped with a 64-character set of ASCII symbols. Horizontal and vertical spacings are 10 characters/inch and 6 or 8 (selectable) lines/inch respectively. The printers accommodate 6-part, continuous pin-fed forms from 4 to 16 inches wide via adjustable tractors. Vertical format control, implemented via an IBM-compatible 1-5/8 inch paper tape loop, and automatic motor control are standard features. The automatic motor control feature disables the belt motor 30 seconds after the last print or paper movement command and automatically enables the motor upon receipt of the next print or paper movement command. The printers are produced by Odec Computer Systems, Inc.

TAPE INPUT/OUTPUT: Provided by 7- or 9-track industry-standard magnetic tape drives that accommodate 10.5-inch reels. The three floor-model SPD-MT drive models and their parameters are listed below.

		Tape Speed			
Model	Tape Tracks	R/W, ips	Rewind, ips	Tape Density, bits/inch	Transfer Rate, bytes/sec
810-7	7	25	150	556/800	20K
810-9	9	25	150	800	20K
1610-9	9	25	150	1600	40K

The tape controller, located in the Terminal Processing Unit, accommodates a single drive and contains a 1024-byte buffer; an additional 1024-byte buffer is optional. The magnetic tape drives are produced by Pertec.

SOFTWARE

All terminal operations are executed under the direction of the operating software that resides in the main memory of the Terminal Processing Unit. The organization of the terminal can best be summarized by calling it a shared processor with attached peripherals. The keyboard is not directly connected to the display; i.e., the relationship between the data keyed and the data displayed is entirely controlled by the stored program. All peripheral devices are interrupt-driven and, except for the display, transfer

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data through the arithmetic/logic unit of the processor. Programs can be loaded from punched tape, diskette, magnetic tape, or punched cards. Programs can also be loaded remotely, via the communications facility.

Compatibility is a function of the program loaded into main memory. Both synchronous and asynchronous interfaces are provided. As long as the basic communications interface (RS-232C) is met and the speeds are within the acceptable range (up to 9600 bps), problems of line discipline involving control-character sequences can be solved with appropriate programming.

Incoterm has developed about 40 to 50 routines for emulating various terminals such as the IBM 2741, Univac Uniscope 100, IBM PARS (airline reservation) terminals, Teletype 33/35, IBM 3270, and many others—including the controller functions of many major computers. These emulation routines can be run on the SPD 10/20. An IBM 3270 emulation program is available for all members of the SPD 20 Family, and an IBM 3275 emulator is offered for the SPD 10/25. Specific emulators are offered with the models that emulate the IBM 3270, (315, 320, 325, 330, 320 LFC, and 330 LFC), the Burroughs 820 (815, 820, and 820 LFC) the Honeywell VIP 7700 (715, 720, and 720 LFC) and the Univac Uniscope 100/200 (115 and 120).

Incoterm has also developed several symbolic assemblers, which can run on the SPD 10/20, SPD 10/25, or SPD 20/20, SPD 20/30, or SPD 20/40 under Incoterm's Disk Resident Operating System, SPD DOS (which requires a diskette unit) or on any of several major computers including the IBM System/360 and 370, Burroughs B 2500/3500, and Honeywell 316, 516, or 716. The SPD 20 Family assemblers differ from those for the SPD 10/20 and SPD 10/25 in expanded capabilities only. The assemblers that run on the large computers are written in FORTRAN, making conversion to a particular computer fairly simple. Assembled programs can be maintained on punched tape, magnetic tape cassettes, or diskettes. Editor and debug programs are available as programming aids. A complete set of diagnostics is also available, including diagnostic programs for the memory, Terminal Processing Unit, printer, keyboard, and communications controller.

The optional Disk Resident Operating System (SPD DOS) features file updating and control for source, object, and data files; utilities for file maintenance; an assembler for program preparation; a dump/debug capability for program development; source and object program input from a variety of media; and assembler/loader facilities for multiple-segment overlay programs.

The SPD 15/25 runs under control of firmware called Monitor 15 that resides in EROM. Programs are coded in assembly language and cross assembled on an SPD 20/20 or equivalent under PD/FMS; the assembler generates object code that can be loaded and executed by the SPD 15/25.

Level II data entry software is available for the SPD 20/20, SPD 20/30, and SPD 20/40. Level I, an early version, was introduced as Incoform in April 1975 and has been superseded by Level II, which was introduced in April 1976 as IDES.

Level II is a comprehensive data entry system and IBM 2770 emulator that is available for 64K-byte SPD 20/30 and SPD 20/40 systems only. It supports up to 8 display stations and printers. Level II is divided into two parts, Forms Generation Procedures and Data Entry Programming, that provide data entry, editing, and control with local data storage, local printing, and batch or interactive data transmission.

Forms Generation Procedures (FGP) provides a high-level statement oriented language for creating forms. The language is used to specify all control and editing functions of the forms and form pages and fields. A compiler translates the format program to forms that reside on diskette. A form can contain up to 255 sequentially-linked pages; each page can contain up to 250 fields. Editing can be specified for each field, and calculations can be carried across fields. Fields can be divided into subfields with separate input characteristics. FGP features include arithmetic calculations, batch totals, table lookup; translation tables, range checking, conditional execution, optional or required field specification, right justification (left default) and fill, override fields, forms edit, data field specification, check digit operation (Modulo 10), forms name and label rename and copy and rename, diskette storage allocation control, data field labeling, and directory control (catalog of all existing forms). Six arithmetic registers carry results of calculations across fields; each contains up to 10 digits, floating decimal point, and sign. Arithmetic functions include add, subtract, multiply, divide, increment, and decrement. These can be performed on screen data, constants, and the results of previous calculations. A total of 16 32-byte registers store data for conditional branching. Ten balance registers can be associated with each batch to accumulate totals across all forms in the batch, count of items processed, dollar amount totals, etc.

The Data Entry Program (DEP) guides the operator through all tasks and controls and validates the keyed data via diskette-resident forms. When initialized, the program enters the date, time, sequence numbers, and other control constants, and when completed, directs an operator ID message to each display station. The operator "signs on" via her own ID code, selects the appropriate formats for the task via the directory, and specifies an operating mode such as data entry, data edit, or print or display form. During data entry, the operator is guided from field to field via the cursor and use of the tab key and prompted through special conditions and errors via the display's 25th control lines. When an invalid entry is keyed, an audible beep is produced and entry is inhibited until the correct entry is keyed. Editing operations can be performed during the data entry or data edit. During data entry, editing errors are caught as they occur and the operator is notified to make immediate corrections. These errors could include an alphabetic entry in a numeric field, an incorrect value, or totals fail to crossfoot after completion of a page. Completed forms can be assigned one of three status codes by the operator: "await release," "unreleasable," or "release for transmission." Released forms cannot be recalled for editing. Editing is performed on a page basis and begins with the initial field; tabbing advances the edit process from field to field. All data entered during the edit mode is validated according to the attributes specified in the form. A completed form can be displayed or printed; printing can be performed concurrently with data entry. Released forms are automatically batch transmitted upon receipt of a poll message from the host computer.

Local Forms Control software combines parameter-driven data entry and emulation; the emulator features local forms storage. The LFC feature is available with the 3270 emulator (20/20, 20/30, 20/40, 320 LFC, and 330 LFC); the Burroughs 820 emulator (820 LFC); and the Honeywell VIP 7700 (720 LFC). The LFC package requires a 32K-byte system with one dual diskette drive. It supports up to 16 display stations and printers on the SPD 20/30, 330, and 20/40 systems and up to 8 display stations and printers on the other systems. LFC operation is enhanced if one or two additional dual diskette units are incorporated.

The *Program Development/File Management System* (PD/FMS) includes an assembler, a multi-task disk operating system, and a library of subroutines that support file maintenance. The PD/FMS is designed exclusively for a SPD 20/40 system with a minimum of 32K bytes of memory, 10 to 40 million bytes of fixed disk storage, and an

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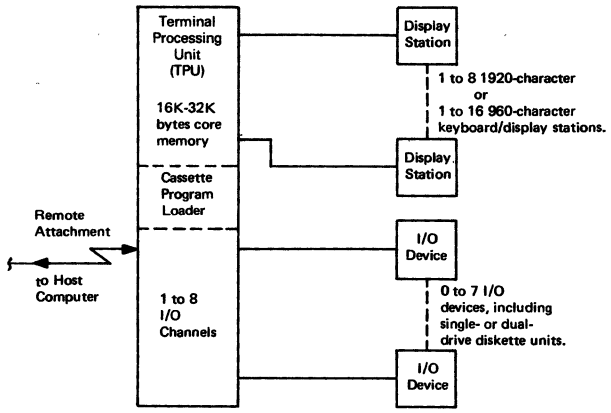
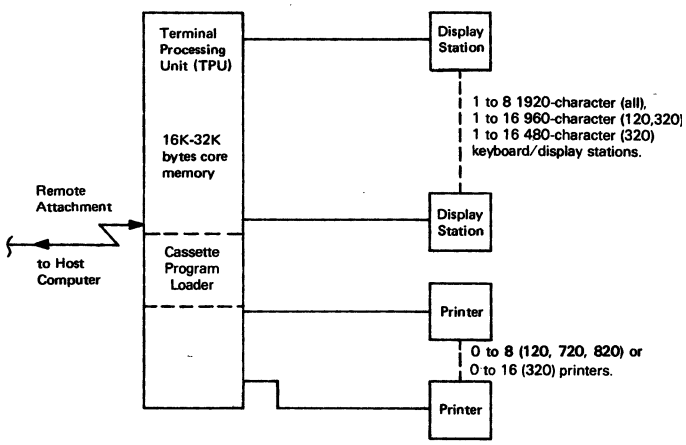
Configurations

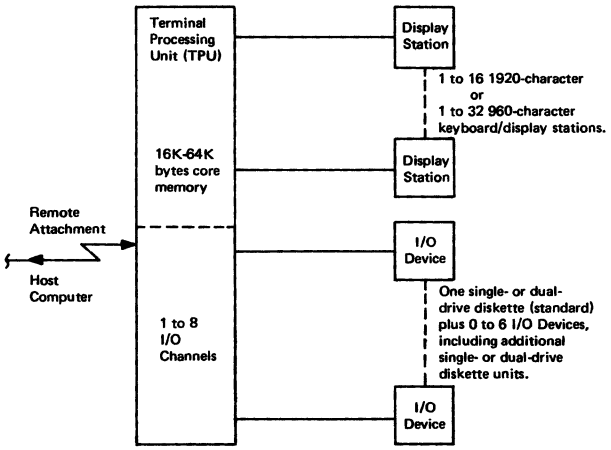
SPD 20/20



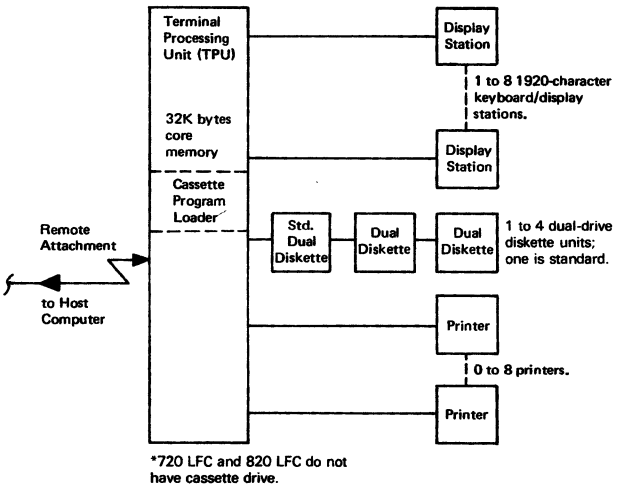
SPD 120, 320, 720, 820



SPD 20/30

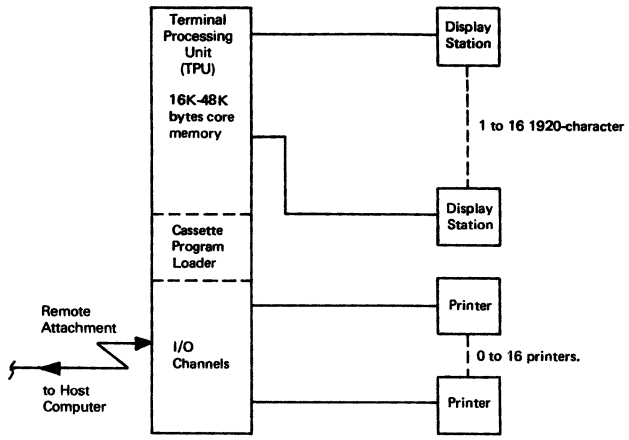


SPD 320 LFC, 720 LFC, 820 LFC

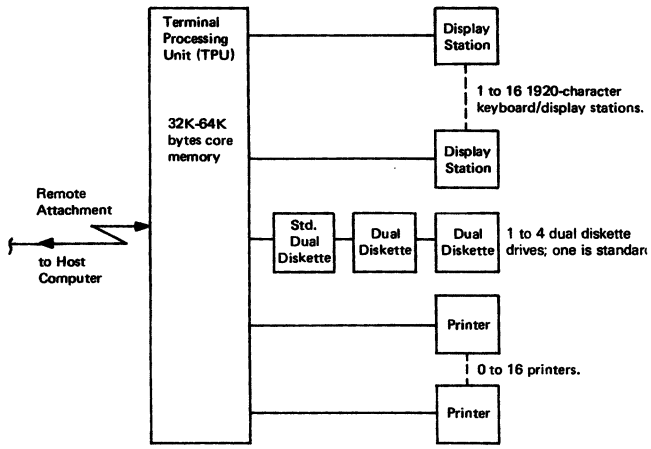


*720 LFC and 820 LFC do not have cassette drive.

SPD 330



SPD 330 LFC



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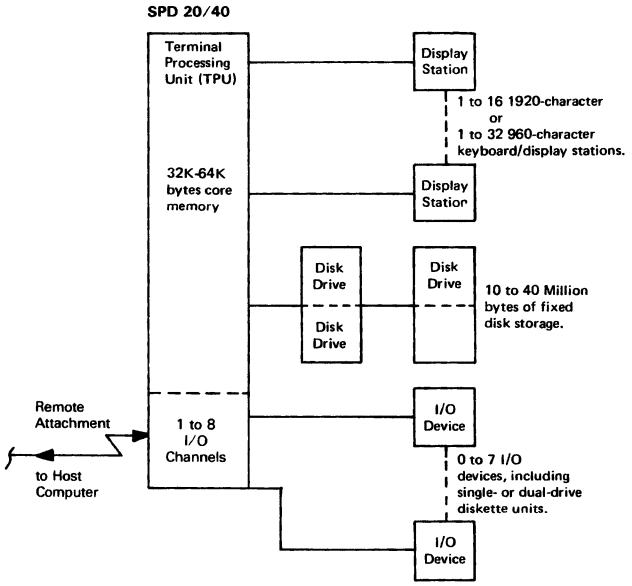
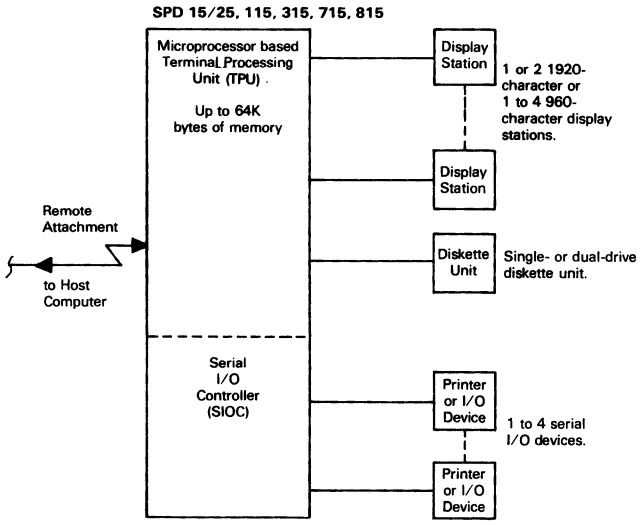
Configurations





80-character line display format. The PD/FMS supports single task, or multi-task operations with preemptive or non-preemptive priority scheme. Task control supports both foreground and multiple background tasks with preemption controlled via priority assignment. Support is provided for six file access methods: basic direct or sequential, record direct or sequential, and indexed direct or sequential. Most peripherals are supported.

For the *SPD 904 series* terminals, Incoterm currently offers five program emulation packages that emulate the following remote batch terminals:

- **IBM System/360 Model 20—for communication with IBM System/360 or 370 computers as a HASP, ASP/HASP, or HASP III multileaving terminal. The multileaving feature of HASP is supported; this feature permits transmitting and receiving independent data streams or receiving intermixed data blocks from multiple data files being output on different terminal devices, and tacks ACKS and NACKS onto data blocks being transmitted in the opposite direction in place of using separate transmissions for them.**
- **IBM 3780/2770-for communication with an IBM System/360 or 370 computer in a point-to-point or multipoint arrangement with other IBM bisynchronous terminals sharing the same facility. This package provides transmission compatibility with IBM's bisynchronous communications discipline (BSC) and supports IBM data rates of 2000, 2400, 4800, and 7200/3600 bits/second. (The 7200/3600 bps rate represents a leased-line facility with the telephone network used at the lower speed for backup.) Both EBCDIC and ASCII transmission codes are supported. EBCDIC transparency is a standard feature for reception and transmission.**
- **IBM 2780-for communication with an IBM System/360 or 370 computer in a point-to-point or multipoint arrangement with other IBM bisynchronous terminals sharing the same facility. This package provides transmission compatibility with IBM's bisynchronous communications discipline (BSC) and supports IBM data rates of 2000, 2400, and 4800 bits/second.**

PRICING

Incoterm's SPD Series terminal systems are available for purchase or under a monthly rental or lease arrangement, depending on model. Rental agreements are available for periods of 1 or 2 years and do not include installation charges and prime-shift maintenance. Lease arrangements are available for 3 or 5 years and include installation charges; maintenance is priced separately. Models SPD 10/20; 10/25, and 15/25 are available on a 1-year rental basis or under a 3- or 5-year lease.

All models of the SPD 904 Series are available on a 3- or 5-year lease only. Models SPD 20/20, 20/30, and 20/40 are available on a 2-year rental basis or under a 3- or 5-year lease. Models SPD 315, 320, 320 LFC, 330 and 330 LFC are available on a 1- or 2-year rental or under a 3- or 5-year lease.

The investment tax credit is passed on to the customer for purchased equipment only. Training is typically five days at Incoterm for up to three customer personnel. The customer can purchase additional on-site training.

	Monthly Charge*					
	1-Year Rental	2-Year Rental	3-Year Lease	5-Year Lease	Purchase	Monthly Maint.
SPD 10 Family						
SPD 10/20:						
Single 960/1920-char.	284	—	238	174	6,090	40
Dual 960/1920-char., each	366	—	307	125	7,875	51

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	Monthly Charge*					
	1-Year Rental	2-Year Rental	3-Year Lease	5-Year Lease	Purchase	Monthly Maint.
SPD 10 Family (Continued)						
SPD 10/25:						
Single 1920-char.	337	—	281	203	7,405	40
Dual 960-char., each	413	—	345	250	9,070	50
Dual 1920-char., each	429	—	358	259	9,470	50
SPD 904 Remote Batch Systems	**	—	**	**	**	**
SPD 325 Stand-Alone Systems:						
Single 1920-char. display stations	263	246	221	163	5,565	40
Dual 1920-char. display stations	339	318	286	210	7,170	52
SPD 15 Family						
SPD 15/25 (includes 4K bytes refresh memory and 8K bytes RAM):						
With 5K bytes EPROM, no emulator—						
Single 1920-char. display station	263	—	222	163	5,570	40
Dual 1920-char. display stations	340	—	286	210	7,235	50
With 10K bytes EPROM, one emulator (115, 315, 715, and 815)—						
Single 1920-char. display station	226	213	193	147	4,400	50
Dual 1920-char. display stations	286	269	244	184	5,633	60
Serial I/O Controller; provides 4 I/O channels	30	29	26	21	550	8
Memory Options:						
RAM Memory Module; 4K bytes	10	10	9	7	200	2
EPROM Memory Module; 1K bytes	9	9	8	6	200	1
RAM Memory Board; accommodates up to 16K bytes of RAM memory (3 maximum)	15	14	13	10	286	3
EPROM Memory Board; accommodates up to 16K bytes of EPROM memory (2 maximum)	22	20	19	14	402	5
SPD 20/20 Family						
SPD 20/20 (includes processor with 16K memory and cassette tape drive):						
4 960-char. display stations	—	(3)	675	491	17,565	104
8 960-char. display stations	—	(3)	1,000	729	25,875	159
16 960-char. display stations	—	(3)	1,593	1,161	41,155	255
SPD 120 (includes processor with 16K memory and cassette tape drive):						
4 1920-char. display stations	717	665	599	443	14,801	117
8 1920-char. display stations	1,024	960	863	638	21,466	165
SPD 320 (includes processor with 16K memory and cassette tape drive):						
8 480/960 char. display stations	942	884	769	590	19,570	159
16 480/960-char. display stations	1,512	1,418	1,276	947	31,415	255
8 1920-char. display stations	1,002	939	844	623	21,055	159
SPD 320 LFC (includes processor with 32K memory, cassette tape unit, and one dual diskette drive):						
4 1920-char. display stations	966	906	817	609	19,834	172
8 1920-char. display stations	1,280	1,201	1,082	803	26,499	220
SPD 720 (includes processor with 32K memory and cassette tape drive):						
4 1920-char. display stations	762	714	642	474	15,986	122
8 1920-char. display stations	1,077	1,009	907	669	22,651	170
SPD 720 LFC (includes processor with 32K memory and dual diskette drive):						
4 1920-char. display stations	966	906	817	609	19,834	172
8 1920-char. display stations	1,280	1,201	1,082	803	26,499	220
SPD 820 (includes processor with 16K memory and cassette tape drive):						
4 1920-char. display stations	687	644	579	428	14,390	111
8 1920-char. display stations	1,002	939	844	623	21,055	159
SPD 820 LFC (includes processor with 32K memory and dual diskette drive):						
4 1920-char. display stations	966	906	817	609	19,834	172
8 1920-char. display stations	1,280	1,201	1,082	803	26,499	220
SPD 20/30 (includes processor with 16K memory and single diskette drive):						
8 1920-char. display stations	—	(3)	1,166	852	29,925	193
16 1920-char. display stations	—	(3)	2,057	1,498	53,255	326
SPD 330 (includes processor with 16K memory and cassette tape unit):						
16 1920-char. display stations	1,848	1,731	1,556	1,148	38,884	292
SPD 330 LFC (includes processor with 32K memory and a dual diskette drive):						
8 1920-char. display stations	1,257	1,179	1,061	788	26,056	214
16 1920-char. display stations	2,103	1,971	1,774	1,313	43,885	347

Incoterm SPD Family of Intelligent Terminals

	1-Year Rental	2-Year Rental	3-Year Lease	5-Year Lease	Purchase	Monthly Maint.
SPD 20/20 Family (Continued)						
SPD 20/40 (includes processor with 32K memory and 10 million byte fixed disk):						
8 1920-char. display stations	—	—	1,668	1,215	43,190	264
16 1920-char. display stations	—	—	2,559	1,861	66,520	397
Party Line Controller	25	24	22	17	465	6
Remote Load Controller	12	11	10	8	235	2
Expanded Character Set:						
SPD 10 Family	10	—	8	6	235	0
SPD 15 Family	10	—	8	6	235	0
SPD 20 Family	—	27	25	19	555	6
SPD 251 Diskette:						
Single drive	—	—	134	107	2,835	40
Dual drive	—	—	179	142	3,890	50
Card Readers:						
SPD CR 250 (250 cpm)	—	—	139	113	2,675	50
SPD CR 500 (500 cpm)	—	—	162	134	2,925	65
Serial Printers:						
SPD P15B (15 cps)	153	144	131	100	2,945	35
SPD P100 (100 cps)	166	157	143	110	3,145	40
SPD P120C (100/165 cps)	192	181	164	124	3,790	40
SPD P165B (165 cps)	264	249	225	170	5,220	55
Line Printers:						
SPD LP125 (125 lpm)	—	—	358	266	8,680	75
SPD LP250 (250 lpm)	—	—	472	352	11,440	100
SPD LP300 (330 lpm)	—	—	564	426	13,200	135
Tape Drives:						
SPD-MT 810-7 (7-track, 556/800 bpi)	—	—	345	259	8,125	80
SPD-MT 810-9 (9-track, 800 bpi)	—	—	345	259	8,125	80
SPD-MT 1610-9 (9-track, 1600 bpi)	—	—	400	297	9,825	80
Paper Tape Reader, SPD PTR150 (150 cps)	53	51	46	36	950	15
Printing Reader/Punch, SPD PRP-45/200	(3)	(3)	(3)	(3)	(3)	(3)
SPD-M Multiplexer:						
4 channels	96	91	82	63	1,840	22
8 channels	111	104	94	71	2,205	22
16 channels	147	138	125	93	2,995	27

A dash indicates that components or feature is not available for that rental period.
* Monthly charges include installation and prime-shift maintenance.
**Contact vendor for complete pricing.■