

Northern Telecom Model 585 and 503 DDP/WP Systems

MANAGEMENT SUMMARY

Northern Telecom introduced the Model 585 Distributed Data/Word Processing System in February 1981. Compared to the company's established Model 400 family of DDP systems, the 585 was introduced with a new processor, new operating system, Winchester-based disk technology, and twice the maximum memory capacity available on the most powerful 400 family system, the 445. In August 1981, Northern Telecom unveiled the Model 503, a desktop system intended for use in small distributed office environments. These systems have effectively replaced the 400 family.

The 585 is fully compatible with Northern Telecom's predecessor DDP system family, the 400 Series, and can communicate with these systems via Northern Telecom's Omnilink communications network package. Omnilink allows disk-files and peripheral devices on one system to be accessed by all other systems on the network.

Model 585 features a maximum main memory capacity of 512K bytes. The system can be configured with up to 16 devices, either CRT terminals or Sprinter or Striker printers, in any combination. Disk storage consists of one or two integral, eight-inch Winchester-type disks which contain 22 megabytes of storage each, plus up to four optional external disk drives with 74.5 megabytes of storage each, for a total disk storage capacity of 342 megabytes. A high-speed cartridge tape drive for use as a back-up device is built into the processor, and contains 15 megabytes of storage. A 300-lpm Strider line printer is supported as a system printer.

The 585's Omnitask operating system's features include multitasking, multibuffering, resident transient support, ▷

Northern Telecom's current DDP system offerings.

Model 585 is a medium cluster DDP/WP system which can accommodate up to 16 devices in any combination of displays and printers. Maximum main memory capacity is 512K bytes, and total disk storage capacity is 342 megabytes.

Model 503 is a desktop system for stand-alone or small distributed office environments. The typical system consists of a workstation with a built-in processor, a diskette unit, and a printer. Standard main memory capacity (non-expandable) is 256K bytes. Maximum disk capacity is 3.2 megabytes.

Northern Telecom makes its Omniword word processing software package available for both the Model 585 and 503.

A typical Model 585 configuration, including 256K bytes of main memory, 22 megabytes of disk storage, the back-up cartridge tape unit, four data stations, one Sprinter printer, and a communications adapter, sells for \$35,890.

The base list purchase price for the 503 is \$7,090, including processor, 256K RAM, dual diskettes, and keyboard/display.



Northern Telecom's Model 585 is a medium cluster DDP/WP system. The 585 processor has a main memory capacity of up to 512K bytes; total disk storage capacity is 342 megabytes. The 585 can support up to 16 displays or printers, and is compatible with previous Northern Telecom DDP systems, including the 405, 435, and 445.

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▷ and multiple transient buffers. Two programming languages are supported: Cobol and TAL 2000. Other software system features include a command language, file and disk maintenance utilities, and a Suspend option. Emulators available on the 585 include IBM 3270, 2770, 2780/3780, 3774, Burroughs TC3500, and Control Data UT200.

The display stations for use with the 585 system features a 15-inch display screen with a display capacity of 2000 characters, arranged in 25 lines of 80 characters each. The keyboard is detachable, and features a typewriter-style layout. Northern Telecom also provides two printer models for use as data stations: the Sprinter, a bidirectional matrix printer with speeds of 144 or 180 cps; and the Striker, a letter-quality matrix printer for use in word processing applications. Data stations may be located up to 5000 feet from the processor; in addition, up to six of the data stations in the configuration may be remote units.

The Model 503 is a desktop system which can operate as a stand-alone system or in a small distributed office environment. The 503 consists of a workstation with a built-in processor, a keyboard/display, a diskette unit, and a Sprinter or Striker printer. Standard main memory is 256K bytes and is not expandable. Disk storage consists of two or four 5¼-inch, dual-sided double-density diskettes with 819K bytes of storage each. The display station features a 15-inch display with a 2000-character screen capacity. Either the Sprinter or Striker printer may be used with the 503. The 503 features the Omnitask operating system, and provides two programming languages: Cobol and TAL 2000. Communications emulators available include IBM 3270, 2780/3780, 3774, and 360/20, Burroughs TC3500, and Control Data UT200, as well as Interactive Teletype Simulation (ITS) for asynchronous applications. The 503 is fully compatible with all other Northern Telecom DDP systems.

Northern Telecom's Omniword software package is available for use on both the Model 585 and Model 503. Omniword provides the DDP systems with full word processing capabilities, which may be run separately or concurrently with data processing functions. □

CHARACTERISTICS

VENDOR: Northern Telecom Incorporated, Electronic Office Systems, P.O. Box 1222, Minneapolis, MN 55440. Telephone (612) 932-8000.

DATE OF ANNOUNCEMENT: Model 585—February 1981; Model 503—August 1981.

DATE OF FIRST DELIVERY: Model 585—June 1981; Model 503—November 1981.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: Northern Telecom Inc.

MODELS

Model 585 is a medium-cluster distributed data processing/word processing system. The system processor contains from 128K to 512K bytes of main memory. One or two integral eight-inch, Winchester-type disks with 22 megabytes each of storage are standard, as is a 15-megabyte cartridge tape back-up. Up to four optional external disk drives, with 74.5 megabytes of storage, may be added. Total disk capacity is 342 megabytes. A 300 lpm Strider line printer may be added as a system printer.

Other optional storage media include a free-standing magnetic tape unit, and a choice of either a cassette tape or diskette unit. The Model 585 can support up to 16 data stations, in any combination of display terminals and Sprinter or Striker printers. (The data station mix must include at least one display.) Up to six of the data stations can be remote from the processor. Local data stations may be located up to 5000 feet from the processor. The display station includes a 15-inch CRT screen with a display capacity of 2000 characters arranged in 25 lines of 80 characters each, and a detachable keyboard, in either typewriter or keypunch layouts. Printers for use as data stations include the Sprinter, a dot matrix unit available in speeds of 144 or 180 cps; and the Striker, a letter-quality serial printer.

The Model 585 is compatible with Northern Telecom 400 Series DDP systems, and can communicate with these systems through the company's Omnilink network.

Model 503 is a desktop computer for use in stand-alone or small distributed office environments. The 503 consists of a workstation (CRT display and keyboard) with a built-in processor, a diskette unit, and a serial printer. The 503 processor contains 256K bytes of RAM (non-expandable). The display consists of a 15-inch, 2000-character display screen and a detachable, typewriter-style keyboard. The diskette unit can accommodate two or four 5¼-inch, dual-sided, double-density, double-track diskettes which contain 819K bytes of storage each. The 503 can be configured with either the Sprinter or Striker printer.

TRANSMISSION SPECIFICATIONS

Transmission is asynchronous or synchronous in half- or full-duplex mode. Asynchronous rates range from 37.5 to 9600 bits per second. Synchronous interfaces are available at speeds from 600 to 9600 bits per second for BSC or SDLC protocol. The 8-level ASCII (with parity) or EBCDIC transmission code can be specified for synchronous operation; the 8-level ASCII code is used for asynchronous operation. Autodial is available on the 585 system for synchronous operation over dial-up lines.

SOFTWARE

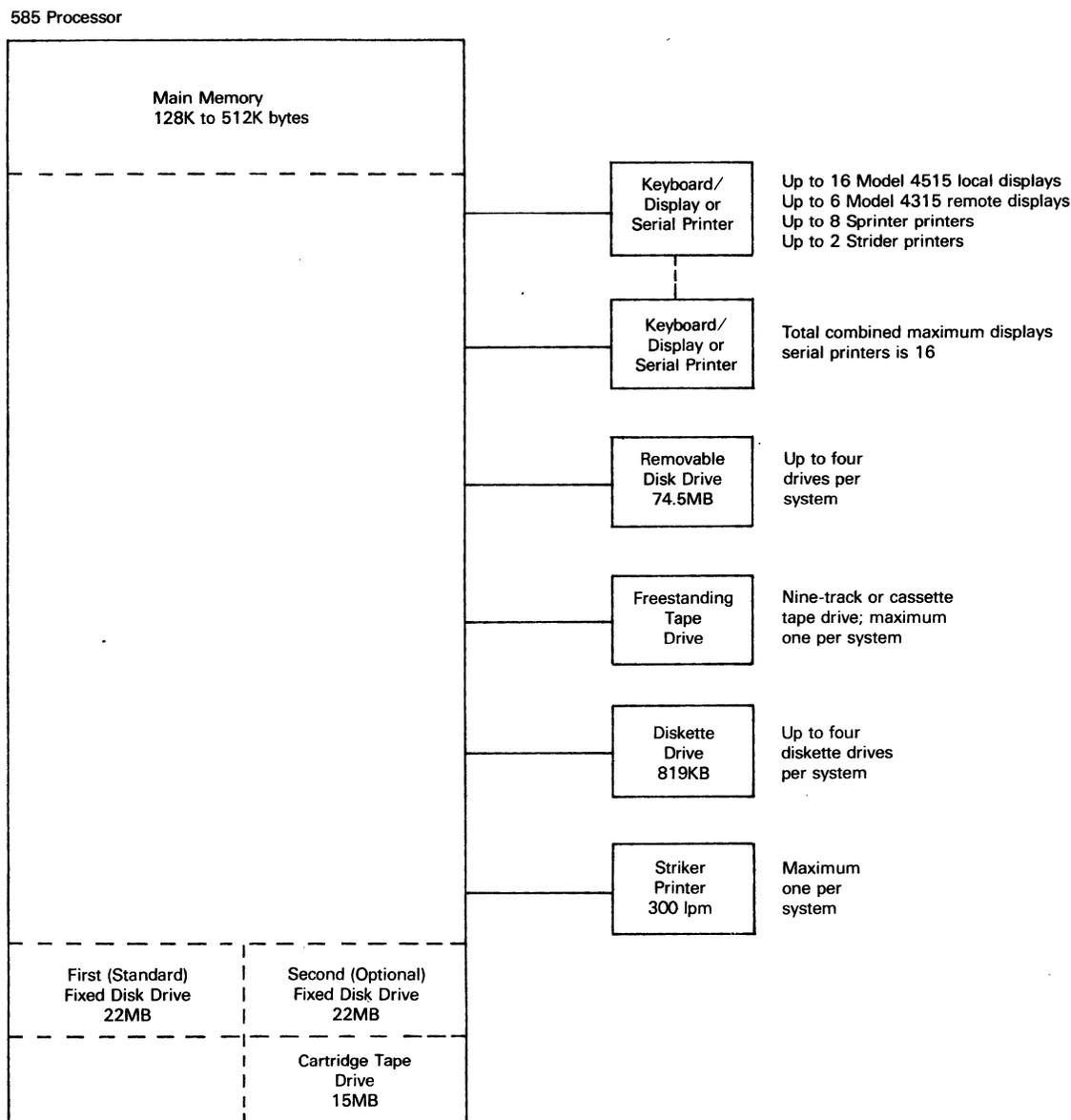
Both the Model 585 and the 503 feature Northern Telecom's Omnitask operating system. The Omnitask operating system package includes: Cobol and TAL 2000 programming languages, a command language, utilities, the Suspend option, and communications software. Both the 585 and 503 support NTI's Omniword word processing software package.

The *Omnitask Operating System* features include multi-tasking, multibuffering, resident transient support, and multiple transient buffers. The system's command language provides English language commands to allow any task to be implemented. Utility programs include File Maintenance Utility (FMU) and Disk Maintenance Utility (DMU). The Suspend option allows a data station to act as two data stations by allowing the user to suspend one task and return to a previous task. ▶

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585 Configuration



► **TAL 2000**, is an expanded version of TAL II, Northern Telecom's data entry language. TAL 2000 features include screen formats; data storage locations; I/O buffer capacity; program overlays, I/O features; and clocking, security, and logging support features. Screen formats are designed for a 1920-character screen and can be processed by the TAL 2000 Assembler. A key feature of TAL 2000 is the use of four general storage locations: a 22-byte display area; a 1920-byte screen storage area; an I/O buffer area with user defined length and location; and all memory that is not used by the TAL 2000 program. TAL 2000 supports up to 4K bytes. The I/O buffer can reside in any memory location (including the screen) that is not used by the TAL 2000 program. Buffer length and location can be altered as often as necessary during program execution. Program load modules include the disk address of each overlay, precluding the need to perform a program file search for a specific overlay. The disk address of the specific overlay is used to call the named overlay directly. Up to 10 logical devices can be specified.

TAL 2000 supports four access methods: sequential (SAM), relative (RELAM), indexed (IAM), and indexed sequential

(ISAM). ISAM features multiple key (up to 11) and duplicate key access. Also, ISAM files can be read sequentially by key. TAL 2000 features file access methods implemented via restructured read commands. Five read commands include Read Indexed (RDI), Read Next Key (RDN), Read Relative (RDR), Read Sequential (RDS), and Read Indexed Sequential (RDX). Records can be locked in all file types. Locking a file precludes a user at another terminal (in the resource sharing configuration) from altering the contents of a record while it is being accessed by the terminal program. Spooled files are treated as input devices. The Spool Wait command suspends TAL program execution while waiting for more information to be written to a spooled file. After the information has been written, program execution is resumed. The command requires no operator intervention and does not unreasonably burden the processor. The TAL 2000 program can access the system clocks and calendar to provide time/date stamping on output. The TAL 2000 program can test user ID to determine authorization for file access for execution of a particular sequence of operation within a TAL program. Messages can be written to the system log directly from a TAL 2000 program for later retrieval.

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► NTI's interactive Cobol is a subset of ANSI Cobol, Level 3, and features the four basic program divisions: Identification, Environment, Data, and Procedure. Random, Indexed, and sequential file access is supported, plus program segmentation (overlays), subscripting, numeric editing, figurative constants (zeros, spaces, high/low values), and other fundamental language statements common to ANSI Cobol. NTI Cobol is display oriented and can be used to create data entry programs at the display station. Data entry requirements such as displaying formats for keying data into the screen, accepting and editing data keyed by the operator, and displaying data on the screen that has been retrieved from system files or calculated by the Cobol program, are supported. Features include an alarm statement for keying-error recognition and highlighting attributes for dual intensity. Foreground data entry operations on several display stations concurrently with execution of utilities or a separate noninteractive Cobol program running in the background (such as report printing or transmitting data to a host computer), is supported. Cobol programs can interact with one another. Up to 90 characters of memory can be shared by all displays, and documents can be keyed to batch number and date.

Communications packages available on the 585 include:

- Autodial—allows the 585 to act as an unattended bisynchronous master station with automatic dialing;
- BSC440—supports unattended RJE operation;
- BSCAUT—allows the 585 to act as an unattended slave station;
- BSCMST—allows the 585 to act as a synchronous attended master station;
- IRJE—supports interactive remote job entry (IBM 2780, 2770, and 3780) operation;
- ITS—provides an interactive Teletype simulator;
- RJE BUR—supports Burroughs TC3500-compatible RJE operation;
- RJE MLV—supports IBM 360/20 multileaving RJE operation;
- SDLC3774—provides an IBM 3774 SDLC emulator;
- UT200—provides a Control Data UT200 User Terminal emulator;
- 3270 Emulator—allows the 585 cluster to emulate an IBM 3271 Model 2 or 12 controller with 3277 Model 2 display stations: 3270 Emulator may be linked to resident programs in the 585 using a 3270 Pass Through mode.

NTI's *Omnivord* software package provides the Model 585 and 503 with word processing capabilities. The package is designed to produce memos, letters, and reports. *Omnivord* is comprised of four functional modules, all under the command of a single common menu. The four modules are: Use Document Catalog, which enables the user to set up the space to store documents; Enter/Change Document, which allows the user to edit and make changes to the document; Print Document, which prints a previously entered document; and the Document Utilities, which allow a user to rename, copy, delete, and append a document.

COMPONENTS

MODEL 585 PROCESSOR UNIT: Includes the system logic; memory; one or two fixed disks; a cartridge tape unit for software loading and back-up of disk files; device interfaces;

system status panel; and power supply assembly. The processor supports up to 16 devices (CRT terminals or Sprinter or Striker printers), six of which may be remote stations. The processor can be configured with 128K to 512K of random access memory.

MODEL 4515/4315 DISPLAY STATIONS (for the Model 585): A 15-inch (diagonally measured) CRT display unit. The display arrangement is 24 lines of 80 characters each, plus a 25th line for display of status information, for a total display capacity of 2000 characters. The display screen is glare resistant, and includes an adjustable stand. Characters are formed utilizing a 7-by-9 dot matrix within a 7-by-11 character cell, for upper and lower case, and are displayed in green. The unit's keyboard features a typewriter-style layout, and is detachable. Each style includes a ten-key numeric pad, ten program function keys, and cursor control keys. Optional word processing key caps are also available.

The 4515 Data Station is designed for local attachment to the 585 and may be located up to 5000 feet from the processor. The 4315 Data Station is the remote version of the display; up to six remote stations can be included in the 585 cluster.

585 FIXED DISK STORAGE: One or two integral, eight-inch Winchester-type disk drives with 22 megabytes of storage each. The standard drive is mounted near the rear of the processor on a fixed mount. The second (optional) drive is mounted in front of the first on a swing-out bracket. The fixed disk employs embedded servo techniques that allows precise head positioning without head alignment and temperature difficulties.

585 CARTRIDGE TAPE DRIVE: Built-in to the processor and designed to serve as a back-up device. The tape drive uses a quarter-inch tape cartridge and has a formatted storage capacity of 15 megabytes, which can be dumped at a rate of one megabyte per minute.

585 REMOVABLE DISK STORAGE: Up to four removable disk drives may be optionally configured with the system, each of which contains 74.5 megabytes of storage. Disks are available in single or dual drive units; total removable disk storage capacity is 298 megabytes.

585 MAGNETIC TAPE DRIVE: Available as a floor standing unit. The tape drive comes in a nine-track 1600 bpi version only, and accommodates a 2400-foot reel. Recording speed is 12.5 ips, and parity may be odd or even.

585 CASSETTE TAPE DRIVE: Designed for systems that require low-volume storage capabilities allowing sequential file access. Data may be recorded in two-track phase encoded, 800 bpi ECMA format, or two-track NRZI, 800 bpi format.

585 FLEXIBLE DISKETTE STORAGE: Supports three different media formats: 585, Model 350, and IBM 3741. The diskette offers sequential, indexed, indexed-sequential, and relative record access. Dual drives are included, with 250K bytes of storage each, for a total of 500K bytes.

503 WORKSTATION: Consists of a keyboard/display with a built-in processor. The processor contains 256K bytes of random access memory. The display consists of a 15-inch, 2000-character CRT screen, with a display arrangement of 25 lines of 80 characters each plus a 25th line that displays status information. Characters are formed utilizing a 7-by-9 dot matrix in a 7-by-11 character cell, for upper and lower case, and are displayed in green. A typewriter-style detachable keyboard is also standard.

503 DISKETTE STORAGE: A table-top unit which can accommodate two or four 5¼-inch, dual-sided, double

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► density, double track diskettes. Each diskette contains 819K bytes of storage, for a total storage capacity of 3.2 megabytes. The unit supports any of three media formats: Northern Telecom 585/503, Northern Telecom 350, and IBM 3741. Data may be accessed using sequential, indexed, indexed-sequential, or relative record access methods.

SPRINTER SERIAL PRINTER: A bidirectional dot matrix printer available in print speeds of 144 or 180 cps, with 132 print columns. The Sprinter is controlled via an integral microprocessor with 5K bytes of memory. The 96-character ASCII set (upper and lower case) is standard. The Sprinter utilizes a cartridge ribbon. The printer accommodates six-part continuous feed forms; forms are advanced via either tractor pin or friction feed mechanisms. Standard horizontal spacing is 10 cpi; 16½ cpi spacing is optional. Standard vertical spacing is 6 lpi, with optional vertical spacing of 8 lpi. The Sprinter can be used with both the 585 and 503 systems.

STRIDER LINE PRINTER: A line printer with a rated speed of 300 lpm, and 132 print columns. An upper/lower case ASCII set is standard. Up to six-part continuous feed forms are accommodated, and advanced via a tractor feed

mechanism. Horizontal spacing is 10 cpi; vertical spacing is 6 or 8 lpi. The Strider cannot be used with the 503.

STRIKER SERIAL PRINTER: A letter-quality printer for use in conjunction with the Omniword word processing software package. Rated print speed is 40 cps. The Striker prints bidirectionally, and is controlled by a built-in microprocessor. Interchangeable plastic or metallized daisy print wheels enable the user to change print fonts; print wheels are available in proportional spacing formats of 10, 12, or 15 cpi. Vertical density is 6 or 8 lpi. Three paper feed mechanisms are available: friction feed, forms tractor, or sheet feeder. The Striker can be used with both the 585 and 503 systems.

PRICING

The Northern Telecom Model 585 and 503 are available for purchase or on a lease arrangement. One-year, two-year, and three-year lease plans are available. A separate maintenance contract is available for purchased or lease equipment.

Northern Telecom declined to provide component prices but did supply the following sample configuration pricing:

	<u>Purchase</u>	<u>Monthly</u>	
		<u>1-Year</u>	<u>3-Year</u>
Model 503, including processor, 256K RAM, dual diskettes, and keyboard/display	\$7,090	Contact	vendor
Same as above, but with quad diskettes and letter-quality printer	\$10,090 to \$13,000	Contact	vendor
Model 585, including processor with 256K bytes of main memory, 22 megabytes of fixed disk storage (single disk), back-up cartridge tape unit, four 4515 data stations, one Sprinter printer, and a communications adapter	\$35,890	\$1,269	\$1,022

*Includes maintenance.■

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Northern Telecom's Model 585 is a medium cluster DDP/WP system. The 585 processor, shown here in the foreground, has a main memory capacity of up to 512K bytes. Total disk storage capacity is 342 megabytes. The 585 can support up to 16 data stations or printers. The 585 is compatible with previous Northern Telecom DDP systems, including the 350, 405, 435, and 445.

MANAGEMENT SUMMARY

Northern Telecom introduced the Model 585 Distributed Data/Word Processing System in February 1981. Compared to the company's established Model 400 family of DDP systems, the 585 was introduced with a new processor, new operating system, Winchester-based disk technology, and twice the maximum memory capacity available on the most powerful 400 family system, the 445. In August 1981, Northern Telecom unveiled the Model 503, a desktop system intended for use in small distributed office environments. These systems have effectively replaced the 400 family.

Both systems are fully compatible with Northern Telecom's predecessor DDP system families, the 300 Series and the 400 Series, and can communicate with these systems, as well as with each other, via Northern Telecom's Omnilink communications network package. Omnilink allows disk-files and peripheral devices on one system to be accessed by all other systems on the network.

Northern Telecom's current DDP system offerings.

Model 585 is a medium cluster DDP/WP system which can accommodate up to 16 data stations in any combination of displays and printers. Maximum main memory capacity is 512K bytes, and total disk storage capacity is 342 megabytes. Cobol and TAL 2000 programming languages are provided, and communications emulators include IBM 3270, 2780/3780, 3774, 360/20, Burroughs TC3500, and Control Data UT200.

Model 503 is a desktop system for stand-alone or small distributed office environments. The system consists of a workstation with a built-in processor, a diskette unit, and a printer. Maximum main memory capacity is 256K bytes; disk capacity is 3.2 megabytes. Cobol, Basic, and TAL 2000 programming languages are provided, and communications emulators include IBM 3270, 2780/3780, 3774, and interactive Teletype emulation.

Northern Telecom makes its Omniword word processing software package available for both the Model 585 and 503.

A typical Model 585 configuration, including 256K bytes of main memory, 11 megabytes of disk storage, the back-up cartridge tape unit, four data stations, one Sprinter printer, and a communications adapter, sells for \$46,900.

The base list purchase price for the 503 is \$6,490, including processor, 64K RAM, dual diskettes, and keyboard/display.

CHARACTERISTICS

VENDOR: Northern Telecom Incorporated, Electronic Office Systems, P.O. Box 1222, Minneapolis, MN 55440. Telephone (612) 932-8000.

DATE OF ANNOUNCEMENT: Model 585—February 1981; Model 503—August 1981.

DATE OF FIRST DELIVERY: Model 585—June 1981; Model 503—November 1981.

NUMBER DELIVERED TO DATE: Model 585—Over 200.

SERVICED BY: Northern Telecom Inc.

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➤ Model 585 features a maximum main memory capacity of 512K bytes. The system can be configured with up to 16 data stations, either CRT terminals or Sprinter or Striker printers, in any combination. Disk storage consists of one or two integral, eight-inch Winchester-type disks which contain 22 megabytes of storage each, plus up to four optional external disk drives with 74.5 megabytes of storage each, for a total disk storage capacity of 342 megabytes. A high-speed cartridge tape drive for use as a back-up device is built into the processor, and contains 15 megabytes of storage. A 300-lpm Strider line printer is supported as a system printer.

The 585's Omnitask operating system's features include multitasking, multibuffering, resident transient support, and multiple transient buffers. Two programming languages are supported: Cobol and TAL 2000. Other software system features include a command language, file and disk maintenance utilities, and a Suspend option. Emulators available on the 585 include IBM 3270, 2770, 2780/3780, 3774, Burroughs TC3500, and Control Data UT200.

The display stations for use with the 585 system features a 15-inch display screen with a display capacity of 2000 characters, arranged in 25 lines of 80 characters each. The keyboard is detachable, and is available in either typewriter- or keypunch-style layouts. Northern Telecom also provides two printer models for use as data stations: the Sprinter, a bidirectional matrix printer with speeds of 72, 144, or 180 cps; and the Striker, a letter-quality matrix printer for use in word processing applications. Data stations may be located up to 5000 feet from the processor; in addition, up to six of the data stations in the configuration may be remote units.

The Model 503 is a desktop system which can operate as a stand-alone system or in a small distributed office environment. The 503 consists of a workstation with a built-in processor, a keyboard/display, a diskette unit, and a Sprinter or Striker printer. Standard main memory is 64K bytes, expandable to 256K bytes. Disk storage consists of two or four 5¼-inch, dual-sided double-density diskettes with 819K bytes of storage each. The display station features a 15-inch display with a 2000-character screen capacity. Either the Sprinter or Striker printer may be used with the 503. The 503 features the Omnitask operating system, and provides three programming languages: Cobol, Basic, and TAL 2000. Communications emulators available include IBM 3270, 2780/3780, and 3774, as well as Interactive Teletype Simulation (ITS) for asynchronous applications. The 503 is fully compatible with all other Northern Telecom DDP systems.

Northern Telecom's Omniword software package is available for use on both the Model 585 and Model 503. Omniword provides the DDP systems with full word processing capabilities, which may be run separately or concurrently with data processing functions. □

➤ MODELS

Model 585 is a medium-cluster distributed data processing/word processing system. The system processor contains from 128K to 512K bytes of main memory. One or two integral eight-inch, Winchester-type disks with 22 megabytes each of storage are standard, as is a 15-megabyte cartridge tape back-up. Up to four optional external disk drives, with 74.5 megabytes of storage, may be added. Total disk capacity is 342 megabytes. A 300 lpm Strider line printer may be added as a system printer.

Other optional storage media include a free-standing magnetic tape unit, and a choice of either a cassette tape or diskette unit. The Model 585 can support up to 16 data stations, in any combination of display terminals and Sprinter or Striker printers. (The data station mix must include at least one display.) Up to six of the data stations can be remote from the processor. Local data stations may be located up to 5000 feet from the processor. The display station includes a 15-inch CRT screen with a display capacity of 2000 characters arranged in 25 lines of 80 characters each, and a detachable keyboard, in either typewriter or keypunch layouts. Printers for use as data stations include the Sprinter, a dot matrix unit available in speeds of 72, 144, or 180 cps; and the Striker, a letter-quality serial printer.

Model 503 is a desktop computer for use in stand-alone or small distributed office environments. The 503 consists of a workstation (CRT display and keyboard) with a built-in processor, a diskette unit, and a serial printer. The 503 processor contains 64K bytes of RAM as standard, and is expandable to 256K bytes. The display consists of a 15-inch, 2000-character display screen and a detachable, typewriter-style keyboard. The diskette unit can accommodate two or four 5¼-inch, dual-sided, double-density, double-track diskettes which contain 819K bytes of storage each. The 503 can be configured with either the Sprinter or Striker printer.

Both the Model 585 and 503 are compatible with Northern Telecom 300 and 400 Series DDP systems, as well as with each other, and can communicate with these systems through the company's Omnilink network.

TRANSMISSION SPECIFICATIONS

Transmission is asynchronous or synchronous in half- or full-duplex mode. Asynchronous rates range from 37.5 to 9600 bits per second. Synchronous interfaces are available at speeds from 600 to 9600 bits per second for BSC or SDLC protocol. The 8-level ASCII (with parity) or EBCDIC transmission code can be specified for synchronous operation; the 8-level ASCII code is used for asynchronous operation. Autodial is available on the 585 system for synchronous operation over dial-up lines. Northern Telecom provides the Model 2240 modem, a Bell 201C-compatible, 2400 bps model, for use with Models 585 and 503.

SOFTWARE

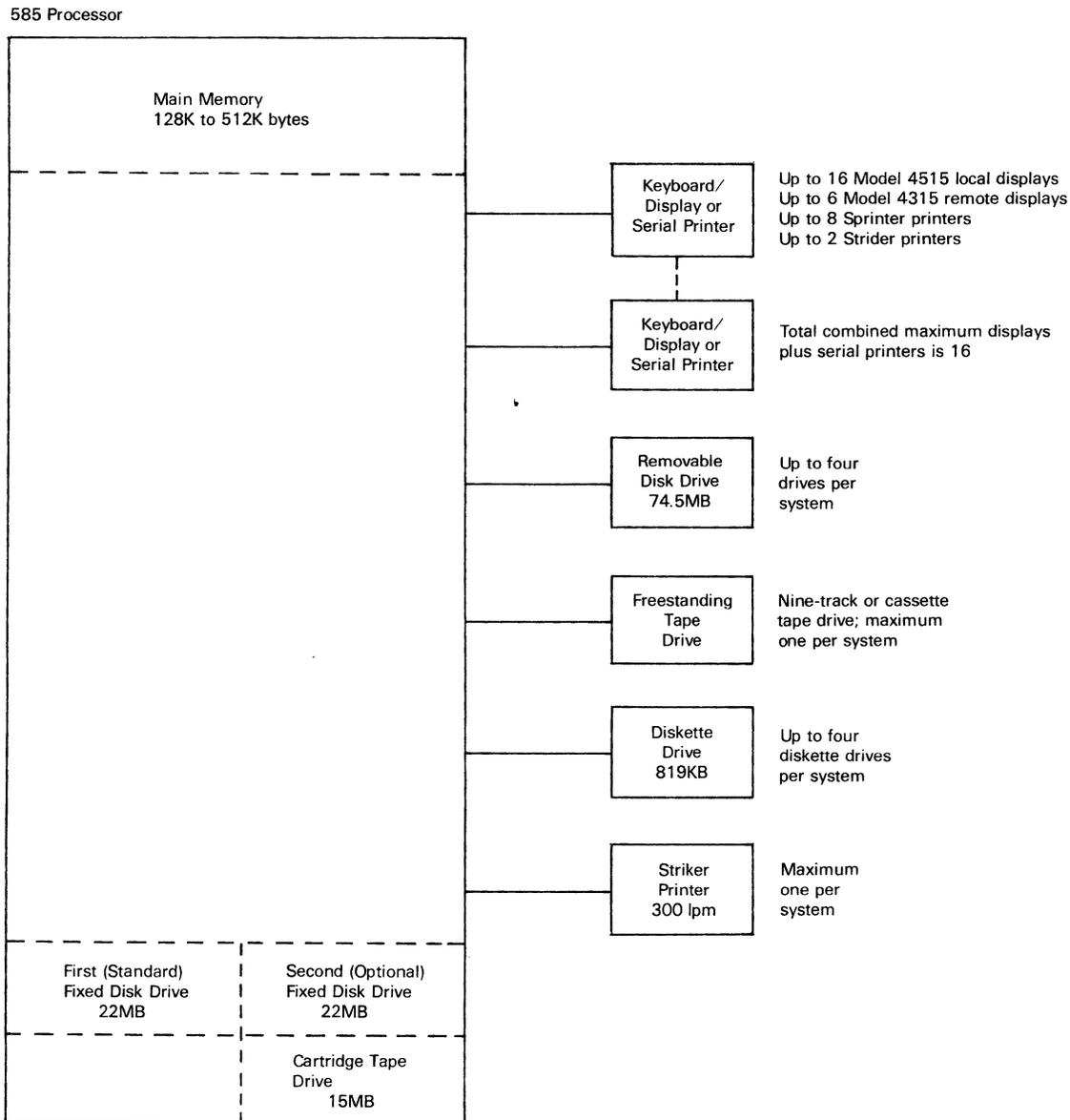
Both the Model 585 and the 503 feature Northern Telecom's Omnitask operating system. The 585 operating system package includes: Cobol and TAL 2000 programming languages, a command language, utilities, the Suspend option, and communications software. The 503 operating system package includes Basic, Cobol, and TAL 2000 programming languages, utilities, and communications software. Both the 585 and 503 support NTI's Omniword word processing software package.

The 585 *Operating System* features include multitasking, multibuffering, resident transient support, and multiple transient buffers. The system's command language provides English language commands to allow any task to be

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585 Configuration



► implemented. Utility programs include File Maintenance Utility (FMU) and Disk Maintenance Utility (DMU). The Suspend option allows a data station to act as two data stations by allowing the user to suspend one task and return to a previous task.

TAL 2000, is an expanded version of *TAL II*, Northern Telecom's business language. *TAL 2000* features include screen formats; data storage locations; I/O buffer capacity; program overlays, I/O features; and clocking, security, and logging support features. Screen formats are designed for a 1920-character screen and can be processed by the *TAL 2000* Assembler. A key feature of *TAL 2000* is the use of four general storage locations: a 22-byte display area; a 1920-byte screen storage area; an I/O buffer area with user defined length and location; and all memory that is not used by the *TAL 2000* program. *TAL 2000* supports up to 4K bytes. The I/O buffer can reside in any memory location (including the screen) that is not used by the *TAL 2000* program. Buffer length and location can be altered as often as necessary during

program execution. Program load modules include the disk address of each overlay, precluding the need to perform a program file search for a specific overlay. The disk address of the specific overlay is used to call the named overlay directly. Up to 10 logical devices can be specified.

TAL 2000 supports four access methods: sequential (SAM), relative (RELAM), indexed (IAM), and indexed sequential (ISAM). ISAM features multiple key (up to 11) and duplicate key access. Also, ISAM files can be read sequentially by key. *TAL 2000* features file access methods implemented via restructured read commands. Five read commands include Read Indexed (RDI), Read Next Key (RDN), Read Relative (RDR), Read Sequential (RDS), and Read Indexed Sequential (RDIX). Records can be locked in all file types. Locking a file precludes a user at another terminal (in the resource sharing configuration) from altering the contents of a record while it is being accessed by the terminal program. Spooled files are treated as input devices. The Spool Wait command suspends *TAL* program execution while waiting ►

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► for more information to be written to a spooled file. After the information has been written, program execution is resumed. The command requires no operator intervention and does not unreasonably burden the processor. The TAL 2000 program can access the system clocks and calendar to provide time/date stamping on output. The TAL 2000 program can test user ID to determine authorization for file access or execution of a particular sequence of operation within a TAL program. Messages can be written to the system log directly from a TAL 2000 program for later retrieval.

NTI BASIC features sequential and direct file access; all of the common algebraic operators, including arithmetic, relational, concatenation, logical, and others; exponents (to a power of +62 and -62); three-dimensional arrays (with no limit on the number of array elements except available memory size); floating point (with single precision numbers up to 12 digits); trigonometric functions; logarithms; and square roots. Program logic is governed by such statements as If, Else, O, Go To and On, and Go-Sub (for conditional branching or for Basic subroutine linkage).

NTI's interactive Cobol is a subset of ANSI Cobol, Level 3, and features the four basic program divisions: Identification, Environment, Data, and Procedure. Random, Indexed, and sequential file access is supported, plus program segmentation (overlays), subscripting, numeric editing, figurative constants (zeros, spaces, high/low values), and other fundamental language statements common to ANSI Cobol. NTI Cobol is display oriented and can be used to create data entry programs at the display station. Data entry requirements such as displaying formats for keying data into the screen, accepting and editing data keyed by the operator, and displaying data on the screen that has been retrieved from system files or calculated by the Cobol program, are supported. Features include an alarm statement for keying-error recognition and highlighting attributes for dual intensity. Foreground data entry operations on several display stations concurrently with execution of utilities or a separate noninteractive Cobol program running in the background (such as report printing or transmitting data to a host computer), is supported. Cobol programs can interact with one another. Up to 90 characters of memory can be shared by all displays, and documents can be keyed to batch number and date.

Communications packages available on the 585 include:

- Autodial—allows the 585 to act as an unattended bisynchronous master station with automatic dialing;
- BSC440—supports unattended RJE operation;
- BSCAUT—allows the 585 to act as an unattended slave station;
- BSCMST—allows the 585 to act as a synchronous attended master station;
- IRJE—supports interactive remote job entry (IBM 2780, 2770, and 3780) operation;
- ITS—provides an interactive Teletype simulator;
- RJE BUR—supports Burroughs TC3500-compatible RJE operation;
- RJE MLV—supports IBM 360/20 multileaving RJE operation;
- SDLC3774—provides an IBM 3774 SDLC emulator;
- UT200—provides a Control Data UT200 User Terminal emulator;

- 3270 Emulator—allows the 585 cluster to emulate an IBM 3271 Model 2 or 12 controller with 3277 Model 2 display stations: 3270 Emulator may be linked to resident programs in the 585 using a 3270 Pass Through mode.

The 503 operating system includes utility programs, and the following communications packages: BSCAUT, BSCMST, IRJE, ITS, SDLC3774, and 3270 Emulator.

NTI's *Omniword* software package provides the Model 585 and 503 with word processing capabilities. The package is designed to produce memos, letters, and reports. *Omniword* is comprised of four functional modules, all under the command of a single common menu. The four modules are: Use Document Catalog, which enables the user to set up the space to store documents; Enter/Change Document, which allows the user to edit and make changes to the document; Print Document, which prints a previously entered document; and the Document Utilities, which allow a user to rename, copy, delete, and append a document.

COMPONENTS

MODEL 585 PROCESSOR UNIT: Includes the system logic; memory; one or two fixed disks; a cartridge tape unit for software loading and back-up of disk files; device interfaces; system status panel; and power supply assembly. The processor supports up to 16 data stations (CRT terminals or Sprinter or Striker printers), six of which may be remote stations. The processor can be configured with 128K to 512K of random access memory.

MODEL 4515/4315 DISPLAY STATIONS (for the Model 585): A 15-inch (diagonally measured) CRT display unit. The display arrangement is 24 lines of 80 characters each, plus a 25th line for display of status information, for a total display capacity of 2000 characters. The display screen is glare resistant, and can be optionally configured with an adjustable stand. Characters are formed utilizing a 7-by-9 dot matrix within a 7-by-11 character cell, for upper and lower case, and are displayed in green. Keyboards are available with typewriter- or keypunch-style layouts, and are detachable. Each style includes a ten-key numeric pad, ten program function keys, and cursor control keys.

The 4515 Data Station is designed for local attachment to the 585 and may be located up to 5000 feet from the processor. The 4315 Data Station is the remote version of the display; up to six remote stations can be included in the 585 cluster.

585 FIXED DISK STORAGE: One or two integral, eight-inch Winchester-type disk drives with 22 megabytes of storage each. The standard drive is mounted near the rear of the processor on a fixed mount. The second (optional) drive is mounted in front of the first on a swing-out bracket. The fixed disk employs embedded servo techniques that allows precise head positioning without head alignment and temperature difficulties.

585 CARTRIDGE TAPE DRIVE: Built-in to the processor and designed to serve as a back-up device. The tape drive uses a quarter-inch tape cartridge and has a formatted storage capacity of 15 megabytes, which can be dumped at a rate of one megabyte per minute.

585 REMOVABLE DISK STORAGE: Up to four removable disk drives may be optionally configured with the system, each of which contains 74.5 megabytes of storage. Disk are available in single or dual drive units; total removable disk storage capacity is 298 megabytes.

585 MAGNETIC TAPE DRIVES: Available in floor standing or table-top models. The table-top unit comes in nine-track 1600 bpi or nine-track 800 bpi models and ►

Northern Telecom Model 585 and 503 DDP/WP Systems

► accommodates a 1200-foot reel. The floor standing unit comes in a nine-track 1600 bpi version only, and accommodates a 2400-foot reel. Recording speed is 12.5 ips, and parity may be odd or even.

585 CASSETTE TAPE DRIVE: Designed for systems that require low-volume storage capabilities allowing sequential file access. Data may be recorded in two-track phase encoded, 800 bpi ECMA format, or two-track NRZI, 800 bpi format.

585 FLEXIBLE DISKETTE STORAGE: Supports three different media formats: 585, Model 350, and IBM 3741. The diskette offers sequential, indexed, indexed-sequential, and relative record access. Dual drives are included, with 250K bytes of storage each, for a total of 500K bytes.

503 WORKSTATION: Consists of a keyboard/display with a built-in processor. The processor contains 64K bytes of random access memory, expandable to 256K. The display consists of a 15-inch, 2000-character CRT screen, with a display arrangement of 25 lines of 80 characters each plus a 25th line that displays status information. Characters are formed utilizing a 7-by-9 dot matrix in a 7-by-11 character cell, for upper and lower case, and are displayed in green. A typewriter-style detachable keyboard is also standard.

503 DISKETTE STORAGE: A table-top unit which can accommodate two or four 5¼-inch, dual-sided, double density, double track diskettes. Each diskette contains 819K bytes of storage, for a total storage capacity of 3.2 megabytes. The unit supports any of three media formats: Northern Telecom 585/503, Northern Telecom 350, and IBM 3741. Data may be accessed using sequential, indexed, indexed-sequential, or relative record access methods.

SPRINTER SERIAL PRINTER: A bidirectional dot matrix printer available in print speeds of 72, 144, or 180 cps, with 132 print columns. The Sprinter is controlled via an

integral microprocessor with 5K bytes of memory. The 96-character ASCII set (upper and lower case) is standard. The Sprinter utilizes a cartridge ribbon. The printer accommodates six-part continuous feed forms; forms are advanced via either tractor pin or friction feed mechanisms. Standard horizontal spacing is 10 cpi; 16½ cpi spacing is optional. Standard vertical spacing is 6 lpi, with optional vertical spacing of 8 lpi. The Sprinter can be used with both the 585 and 503 systems.

STRIDER LINE PRINTER: A line printer with a rated speed of 300 lpm, and 132 print columns. A 64-character ASCII set (upper case) is standard. Up to six-part continuous feed forms are accommodated, and advanced via a tractor feed mechanism. Horizontal spacing is 10 cpi; vertical spacing is 6 or 8 lpi. The Strider cannot be used with the 503.

STRIKER SERIAL PRINTER: A letter-quality printer for use in conjunction with the Omniword word processing software package. Rated print speed is 40 cps. The Striker prints bidirectionally, and is controlled by a built-in microprocessor. Interchangeable plastic or metallized daisy print wheels enable the user to change print fonts; print wheels are available in proportional spacing formats of 10, 12, or 15 cpi. Vertical density is 6 or 8 lpi. Three paper feed mechanisms are available: friction feed, forms tractor, or sheet feeder. The Striker can be used with both the 585 and 503 systems.

PRICING

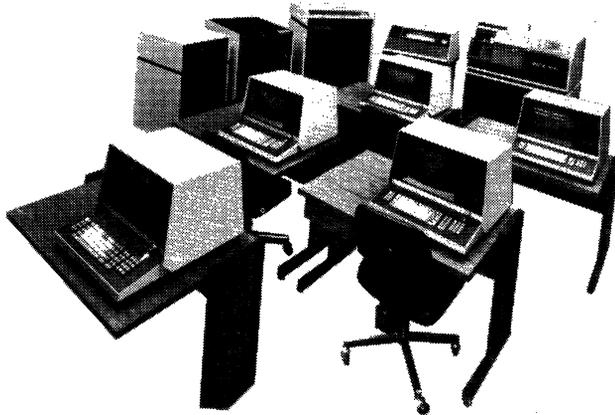
The Northern Telecom Model 585 and 503 are available for purchase or on a lease arrangement. One-year, two-year, and three-year lease plans are available. A separate maintenance contract is available for purchased or lease equipment.

Northern Telecom declined to provide component prices but did supply the following sample configuration pricing:

	Purchase	Monthly Lease*	
		1-Year	3-Year
Model 503, including processor, 64K RAM, dual diskettes, and keyboard/display	\$6,490	Contact	vendor
Same as above, but with quad diskettes and letter-quality printer	\$10,090 to \$13,000	Contact	vendor
Model 585, including processor with 256K bytes of main memory, 11 megabytes of fixed disk storage (single disk), back-up cartridge tape unit, four 4515 data stations, one Sprinter printer, and a communications adapter	\$46,900	\$1,966	\$1,573

*Includes maintenance. ■

Northern Telecom Systems Corporation Model 85 Attached Applications Processor



MANAGEMENT SUMMARY

Northern Telecom Systems Corporation (NTSC) introduced in 1978, a new family of multifunction terminals for the distributed processing environment. The new family, called Remote Information Systems (RIS), supports batch communications, data entry, IBM 3270-compatible on-line file inquiry, stand-alone processing, and file management activities at locations remote from the host computer. The Remote Information Systems are based on the Model 85 Attached Applications Processor (AAP), which performs high-level language processing using interactive RPG II and COBOL and operates in conjunction with an attached NTSC Model 74 (Keybatch), or 76 terminal system, which provides the communications support.

Model 85, built around a controller with 128K or 256K bytes of memory, can be equipped with 10 to 245.6 megabytes of disk storage and supports up to 15 1920-character display stations with typewriter or data entry keyboards and up to five printers. Two versions of the Model 85 AAP are available to satisfy entry level to volume applications. One features 10 megabytes of removable disk. The other features up to 245.6 megabytes of fixed disk with one or two 9-track, 800- or 1600-bpi magnetic tape drives as backup. A belt printer (225 lpm) and six models of drum printers (300 to 1250 lpm) provide strong printer flexibility. Local or remote arrangements are available for belt printers. A remote belt printer can be located up to 2000 feet from the Model 85 controller.

Peripheral sharing is a cost effective feature of the NTSC processors. Peripherals as well as display stations can be shared by the Model 85 and the attached communications terminal via the Peripheral Selector and Display Station Switch features.

Application programs can be written in RPG II or COBOL. NTSC provides a pseudo compiler for RPG II ➤

The central member of NTSC's Remote Information Systems, the Model 85 provides a distributed processing capability for NTSC Model 74 (Keybatch), or 76 terminal systems.

The multi-tasking Model 85 supports data entry, file management, and stand-alone processing; languages include RPG II and COBOL. Features include 128K or 256K bytes of user memory, 10 to 245.6 megabytes of removable and fixed disk storage, 9-track magnetic tape, a variety of printers, support for up to 15 large-screen display stations and five printers, and peripheral sharing. As many as eight user tasks or programs can be run concurrently.

A Model 85 AAP configured with 49 megabytes of disk, a 300 lpm printer, eight interactive displays, an 800 bpi magnetic tape drive, 245K bytes of memory and software support leases for \$2,533 per month including maintenance under a 2-year lease, and sells for \$86,166.

CHARACTERISTICS

VENDOR DATA: Northern Telecom Systems Corporation, Data Park, P.O. Box 1222, Minnetonka, Minnesota 55343. Telephone (612) 932-8000. Mailing Address: P.O. Box 1222, Minneapolis, Minnesota 55440.

DATE OF ANNOUNCEMENT: March 1978.

DATE OF FIRST DELIVERY: First quarter, 1979.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: NTSC.

CONFIGURATION

The Model 85 Attached Applications Processor (AAP) is available in one of two basic configurations that differ only in backup for the fixed disk (9-track magnetic tape or removable disk):

- Model 85 with disk backup (A series)—includes one 10-megabyte cartridge disk drive in a separate cabinet, 5 megabytes of which are fixed and 5 megabytes removable.
- Model 85 with tape backup (B series)—includes a 9-track, 800- or 1600-bpi magnetic tape drive and 49, 61.4, 122.8, 184.2, or 245.6 megabytes of fixed disk storage at 61.4 megabytes per cabinet. A second tape drive can be included with the first in the same cabinet.

The basic controller includes 128K bytes of memory, expandable to 256K bytes with one 128K-byte increment, and can accommodate up to 16 display workstations; one ➤

Northern Telecom Systems Corporation Model 85 Attached Applications Processor

➤ and two pseudo compilers for ANSI Level 2 1974 COBOL. The local COBOL compiler operates under the 85's operating system; the other is a COBOL cross compiler that runs as a job on an IBM System/370 host computer under OS/VS. Executable object code created by the cross compiler can be downline loaded to the Model 85 for subsequent execution. The Multi-Tasking Operating System supports up to four concurrent tasks or application programs with the Model 85's basic 96K-byte memory and up to eight concurrent tasks or programs with the expanded memory. Multitasking is implemented via memory partitioning with each partition ranging in size from 8K to 45K bytes. A sizable portion of memory is required for system support software; it uses up to 64K bytes including the re-entrant Run Time Control modules that interpret the pseudo object code produced by the compilers. The RTC modules themselves require a minimum of 12K bytes for RPG and 14K bytes for COBOL. System support utilities include a linkage editor, library management, memory dump, and maintenance utilities. Application support utilities feature file management, disk sort/merge, format generation, etc.

NTSC's Remote Information Systems concept represents a different approach to distributed processing than that of its competitive terminal vendors. For NTSC, with an existing broad line of remote batch terminals, key/disk systems, and display terminal systems and a large installation base, the attached processor concept is an expedient approach that puts NTSC in the distributed-processing "ball game" without the necessity to develop a wholly-new product line. And it arms NTSC with a marketing advantage because of its installation base. While it is marketing its Remote Information Systems concept, NTSC can concentrate its efforts on a new family of terminals that includes the capabilities provided by the dual-processor RIS, perhaps at an even better price/performance ratio. □

➤ display station is reserved for use as a system console. One to five printers can be added. A belt printer is available with a rated speed of 225 lines/minute. Drum printers are available with rated speeds of 300, 400, 600, 925, 1000, and 1250 lines/minutes.

Model 85 is equipped with a Dual Controller Channel for attachment to an NTSC Model 74 or 76 terminal. A second Dual Controller Channel is optional. Peripherals can be shared between the two attached processors via an optional Peripheral Selector, which provides four rocker switches for attachment selection. Multiple Selectors are permitted. Display stations can be shared via a similar selector unit called the Display Station Switch Controller.

TRANSMISSION SPECIFICATIONS

All communications control (except IBM 3270) is handled by the terminal attached to the Model 85. IBM 3270 capabilities can be ordered for the Model 85 itself.

SOFTWARE

Systems and application support software consists of control and service programs and language translators. System

management is provided by the Multi-Tasking Operating System (MTOS), which supports one to four or eight concurrent application programs or tasks, and a group of service programs that include routines and utilities for system support. MTOS with five through eight partitions requires the 128K-byte Memory Expansion feature. An RPG II compiler and an ANSI 1974 Level 2 COBOL compiler provide application support. Both are pseudo compilers. A set of service programs aid in program development and operation. The RPG II pseudo compiler runs as a batch task under MTOS. Two versions of the COBOL pseudo compiler are provided. One version runs as a batch task under MTOS; the other version is a cross compiler that runs as a job on an IBM System/370 under OS/VS. Run Time Control programs are provided for RPG II and COBOL and are required to interpret the pseudo code produced by the compilers.

MTOS occupies 72K to 80K bytes of memory and currently consists of three functional components: The Task and I/O Supervisor, the File Access Method, and the Task Control Language Processor; a fourth component, 3270 Communications Emulation, is an orderable option.

The Task and I/O Supervisor allocates the resources of the system to more than one task by directing control from one task to another in response to a hardware I/O or to programmed interrupts. The functions performed by the Task and I/O Supervisor include loading programs and routines into main storage, scheduling the execution of memory-resident programs and routines by switching processor control from one function or task to another based on I/O or linear operations, and controlling the execution of tasks or functions in accordance with a defined hierarchy of priorities.

The File Access Method satisfies the varied file access requirements of concurrently-executing application programs. Sequential and indexed file organizations with fixed- or variable-length records and direct file organizations with fixed-length records are supported. Dynamic key addition and deletion are supported for indexed file organization.

The IBM 3270 Remote System Emulator will support one point-to-point or multipoint communications facility using IBM 3270 protocol at rates up to 9600 bps. This emulator can be used for 3271 device emulation or COBOL passthrough.

The Task Control Language Processor responds to Task Control Language (TCL) statements entered via the system console or operator workstation and provides the primary interface between MTOS and the user. TCL statements define the partitions to be started and the system logical devices and memory allocated to them; the job to be run in a partition and the system resources assigned to it, the programs to be executed in a job and the sequence they are executed; the program and procedure libraries to be used for the job; the disk space to be allocated to new files and libraries; and the disk file space or assigned devices to be released. The system can be generated to support a maximum of eight partitions from 8K to 38K bytes per partition with the actual partition number and sizes determined by application and service program requirements.

System support service programs, except for the Stand-Alone Utilities, run as tasks under MTOS and service programs and include the following:

- Linkage Editor—converts pseudo object code from compiler to an absolute executable form cataloged in an absolute program library for later execution.
- Library Manager—maintains the various source code, procedure, object code, and absolute program libraries established by the user. ➤

Northern Telecom Systems Corporation Model 85 Attached Applications Processor

- ▶ • **System Utilities**—a set of utilities that include Copy, Log Display, Directory Display, and Syschange. The Copy utility copies a file from one media to another. Log Display displays the system error log, disk error log, or the TCL log. The Directory Display utility is used to alter or display disk, volume information, to display a disk Volume Table of Contents, or to display a Program Library Directory. Syschange is used to change selected system options without requiring a new system generation.
- **Stand-Alone Utilities**—a set of utilities that run as stand-alone memory image programs and include Initialize/Format, Save/Restore, Edit/Display, Disk Compress, and Memory Dump. Initialize/Format is used to initialize a system or data disk for use with MTOS. Save/Restore saves or restores the operating system, data files, or the entire contents of a system or data disk to either another disk or magnetic tape. Edit/Display edits, displays, or modifies the contents of a system or disk. Disk Compress reorganizes the location of files on disk to compress unused space into a single area on the disk. The Memory Dump utility is actually part of the IPL code and resides in low memory in the system as part of MTOS. Manually initiated, it dumps the contents of main memory.

Application support service programs are a group of programs designed to aid the development and processing of application programs and include:

- **Disk Sort/Merge**—sorts or merges up to nine files into one output file. Up to 12 sort keys can be specified with the keys in ascending, descending, or mixed sequence. Input files are processed in consecutive order and can consist of any organization and format acceptable to MTOS, i.e., sequential, direct, or indexed organization with fixed or variable-length records. DSM provides six operating modes: a normal record sort, a gather sort, an address output sort, an address and key output sort, the calculate mode, and the merge mode. Input file type and media provided by TCL statements, are transparent to DSM.
- **Text Editor**—allows programs to be retrieved, edited locally, transmitted in batch and stored on disk, either individually or concurrently. Disk capacity ranges from 10 mb to 245 million characters. Up to 8 CRT's can operate concurrently. Features full-page layout with dynamic cursor control and menu-driven selection. All primary commands and the 12 function keys are enabled and operated exactly like IBM TSO/SPF.
- **Large Screen Format Generator**—a set of two discrete programs for the creation, cataloging, and testing of screen formats. The formats are stored in libraries on disk and referenced or accessed via RPG application programs. One of the two programs test the formats on a workstation without requiring the use of an application program. The other program generates format shells and field descriptor tables from simplified format descriptions entered at a workstation, or via SEP, and catalogs them on disk in a user-defined library. LSFG is written in RPG and requires the RPG Run Time Control modules for execution. It runs as interactive tasks under MTOS.
- **Display Station Utilities**—a set of utilities designed to create display panels, and to search, create, update, and list data files using one as an overlay. The utilities run as interactive task under MTOS.
- **COBOL Large Screen Formats**—supports the creation of screen formats in COBOL Data Division Definition form that can be accessed by COBOL programs via the Copy verb.

The RPG and COBOL Run Time Control programs are a set of absolute re-entrant routines that interpret and execute the pseudo object code produced by the RPG or COBOL compiler. The RTCM routines are not loaded into memory until required—when loaded, the routines can be used by several RPG- or COBOL-coded, concurrently executing applications. When loaded, the routines normally reside in the MTOS area of main storage (lower 64K bytes). In cases where a program is converted from RPG to COBOL (or vice versa), both sets of RTCM routines are memory resident, one in the MTOS memory area, the other in the higher memory area, which reduces the amount of space available to the user.

COMPONENTS

WORKSTATION: A keyboard/display unit equipped with a 14-inch (diagonal measurement) CRT screen with a viewing area 9½ inches high by 12 inches wide and a detachable keyboard. Five keyboard styles are available: typewriter, data entry, keypunch, Keybatch/typewriter, and Keybatch/keypunch. The two Keybatch styles are switchable. The typewriter-style keyboards are equipped with 12 program function keys and a numeric pad; data entry and keypunch styles are equipped with 5 program function keys. A total of 1920 characters are displayed in an 80-character by 24-line format. A character set of 96 ASCII characters including upper and lower case alphabets, numerics, and special symbols is displayed in blue-white at half- or full-intensity as programmed. Each character is formed via a 7-by-9 dot matrix. The cursor is displayed as a blinking underscore.

CARTRIDGE DISK STORAGE: A free-standing unit consisting of a top-loaded, removable, 5-megabyte disk cartridge and a 5-megabyte fixed disk for a unit storage capacity of 10 million bytes. Four surfaces are recorded at a recording density of 2200 bits/inch and a track density of 200 tracks/inch. Each surface contains 400 tracks and is serviced by one head. The average rotational delay is 12.5 milliseconds. Access time in milliseconds is: track-to-track, 10; average, 45; full stroke, 80. The data transfer rate is 312,500 bytes per second.

FIXED DISK STORAGE: A free-standing unit that uses sealed disk technology. It is available in 49- or 61.4-megabyte capacity. On the 61.4-megabyte drive, five surfaces are recorded at a density of 6038 bits/inch and a track density of 384 tracks/inch; each surface contains 823 tracks and is serviced by one head each. On the 49-megabyte drive, one surface is unused. The average rotational delay is 10.1 milliseconds. Access time in milliseconds is: track-to-track, 10; average, 30; full-stroke, 60. The data transfer rate is 1,210,000 bytes/second. Up to 61.4 megabytes of storage is contained in a single cabinet.

MAGNETIC TAPE DRIVES: The tape drives record in 9-track industry-compatible formats at 800 or 1600 bits/inch. Dual-density operation is not available. Tape speed is 12.5 inches/second for the 1600-bpi drives and 25 inches/second for the 9-track 800-bpi drives. Reel size is 10.5 inches for both drives. Two drives can be contained in the same cabinet with the tape controller.

BELT PRINTERS: One model belt printer is available with a rated speed of 225 lines/minute, and providing 132 print positions.

Characteristics of the belt printer are as follows: the character set contains 63 EBCDIC print symbols. Horizontal spacing is 10 char./inch; vertical spacing is 6 or 8 lines/inch. Pin-fed, continuous forms with up to 6 parts and from 4 to 16 inches wide are accommodated. Vertical formatting, implemented via a multichannel tape loop, is standard. Horizontal tabulation, implemented via a stored horizontal ▶

Northern Telecom Systems Corporation Model 85 Attached Applications Processor

► format record composed of space characters interspersed with horizontal tab character, is also standard.

DRUM PRINTERS: Six drum printers are rated at 300, 400, 600, 925, 1000, and 1250 lines/minute, and provide 132 print positions. The printer rated at 600 lpm has 80 print positions with options for 120 or 132 positions. The 925-, 1000-, and 1250-lpm printers have 132 print positions and are equipped with a power stacker and static eliminator as standard features; these printers are produced by Data-products.

Printers are available with ASCII or EBCDIC character sets, as specified. ASCII provides 63 print symbols; EBCDIC, 63 or 52 standard or 96 optional. As a standard feature, the 925-lpm printer provides 96 EBCDIC symbols. A reduced-character option is available for all printers except the 225- and 925-lpm models. This option reduces character height by 17 percent from the standard size.

The following characteristics are common to all drum printers. Horizontal spacing is 10 char./inch; vertical spacing is 6 or 8 lines/inch. Marginally punched, continuous forms with up to 6 parts and from 3.6 to 20.6 inches in width are accommodated. Vertical formatting, implemented via a 12-channel tape loop, is standard. Horizontal tabulation, implemented via a stored horizontal format record composed of space characters interspersed with horizontal tab characters, is a no-charge option.

PRICING

The Model 85 AAP is available for lease or purchase. Lease terms include installation and prime-shift maintenance. A separate maintenance contract is available for purchased equipment. Leases are available for 1 or 3 years.

Datapro was unable to obtain from NTSC detailed component pricing; however, included below is pricing for certain representative configurations. Detailed pricing information is available from the vendor.

	Monthly Charge*			Monthly Maint.
	1-Year Lease	2-Year Lease	Purchase	
Model 85				
1-49 megabyte single fixed disk, 1-800 bpi magnetic tape drive, 1-300 lpm printer, 8 interactive displays, 256K memory, and COBOL	\$4,032	\$2,533	\$ 86,166	\$775
2-61.4 megabyte fixed disks, 1-800 bpi magnetic tape drive, 1-300 lpm printer, 8 interactive displays, 256K memory, COBOL and Text Editor	4,621	2,991	103,391	885
1-10 megabyte removable disk, (5 mb fixed, 5 mb removable), 1-300 lpm printer, 6 interactive displays, 128K memory and RPG II	2,098	1,814	66,578	435

SOFTWARE

3270 Emulator feature	64	2,100
Output Spooler	32	1,050
Text Editor	115	3,750

*Includes maintenance.■

Northern Telecom Model 340 and 350 Series Data Entry Terminals



The Model 350 Intelligent Terminal provides a 576-character CRT display, a typewriter-style keyboard, and an integral dual diskette drive, for data entry and validation. Batch data communications can be performed via IBM 2770, 2780, 3741, 3770, and 3780 emulators.

MANAGEMENT SUMMARY

Northern Telecom Systems Corporation (NTSC) was founded in 1978 by its parent company, Northern Telecom Limited, from the merger of two of its acquisitions, Sycor Inc. and Data 100 Corporation. The new company, under whose name the product lines of both Sycor and Data 100 including the Model 340 and 350 Series data entry terminals, are now being marketed, has sales representatives in over 50 U.S. cities and more than 50 countries abroad and provides service from over 200 U.S. Service Centers.

The 340 and 350 terminals are the oldest members of NTSC's current intelligent terminal product line, which also includes Models 445 and 405 (See Report C21-792-401) and Models 440 and 410 (See Report C21-792-301). Although the highly popular 340 and 350 are no longer in new production, NTSC refurbishes returned units and plans to continue to offer them as long as a demand exists.

The Model 340 Intelligent Terminal is primarily oriented towards source data entry applications and employs the kind of programming associated with keypunch equipment, i.e., record format control. The basic Model 340 is firmware-driven and contains a microprocessor with an 8K-byte read-only memory (ROM) plus a 1K-byte random access memory (RAM) for internal buffering. An Extended Memory feature is available that provides an additional 2K-, 3K-, or 7K-bytes of user-accessible RAM and permits the 340 to use a variety of Sycor-supplied software facilities, among which are its TAL (for Terminal Application Language) data entry language and a wide selection of communications packages, including emulators for the IBM 2770, 2780, 3770, and 3780, and Teletype 33/35. The Model 340 comes with one or (optionally) two cassette tape drives (either NRZI or ECMA/ANSI compatibility may be specified). A free-standing dual diskette unit can be optionally added to the system (in addition to the cassette drives). An enhanced ➤

Single-station, programmable display terminal family for data entry/validation and batch communications.

Hardware features include microprocessor control with up to 16K bytes of user memory; single or dual cassette or diskette storage; 72-, 144-, or 180-cps serial printers; 300- or 600-lpm line printers, industry compatible magnetic tape drives, and a 250-cpm card reader. Software includes the TAL language for data entry applications, \$RG (an RPG subset), and various communications emulators.

A typical Model 340 with 8K bytes of memory, arithmetic capability, dual cassette drives, a 72-cps printer, and a synchronous communications adapter is priced at \$16,720. Comparable monthly lease rates are \$567 and \$417 per month for one and four years, respectively, including maintenance.

A typical Model 350 with 16K-byte memory, dual diskette drives, a synchronous communications adapter and a 144-cps printer is priced at \$13,800. Comparable monthly lease rates are \$616 and \$493 per month for one and four years, respectively, including maintenance.

CHARACTERISTICS

VENDOR: Northern Telecom Systems Corporation, Computer Systems Group, P.O. Box 1222, Minneapolis, MN 55440. Telephone (612) 932-8133.

DATE OF ANNOUNCEMENT: Model 340—February 1971; Model 350—June 1975.

DATE OF FIRST DELIVERY: Model 340—1971; Model 350—September 1974.

NUMBER DELIVERED TO DATE: Over 60,000 terminals (all NTSC models).

SERVICED BY: NTSC, from over 200 U.S. Service Centers.

MODELS

The NTSC 300 Series of intelligent data entry terminals include Models 340, 340D, and 340E, which are cassette-and/or diskette-based terminals, and Model 350, a diskette-based terminal.

CONFIGURATION

The basic *Model 340 Terminal* is a stand-alone firmware-driven unit that contains a microprocessor with 8K bytes of read-only memory and 1K bytes of random-access memory ➤

Northern Telecom Model 340 and 350 Series Data Entry Terminals

➤ version, Model 340D, provides both dual cassette and dual diskette drives, plus 16K bytes of user-accessible RAM.

The Model 350 Intelligent Terminal is a software-driven unit and is equipped with a fully-configurable operating system. It contains an integral front-loaded dual diskette drive instead of the 340's cassette drives. Each drive can store up to 240K bytes of data (compared to 200K bytes per cassette drive). Optionally, a second free-standing dual diskette unit can be added to the system. The 350 provides 16K bytes of RAM (non-expandable), of which a maximum of 8K bytes is available to the user. Software support includes all communications packages available on the 340 plus an IBM 3741 emulator, an enhanced diskette-oriented version of TAL called TAL II, and SRG, programming language developed by NTSC from a subset of the RPG report program generator language.

USER REACTION

In early May 1980, Datapro conducted telephone interviews with eight Model 340 and 350 users. Five of these users were respondents to Datapro surveys on User-Programmable Terminals or RJE/Batch Terminals; the other three were supplied to us by Northern Telecom. The users reported their experiences on a total of 2138 Model 340 or 350 units, which have been installed an average of 4½ years. Five of these users lease their terminals directly from NTSC, two purchased their units outright, and one acquired some by lease from NTSC or a third party and others by purchase. NTSC is providing maintenance service in most installations.

Two of the users are information distribution firms that use Model 340's to collect data from and provide data to their customers. Some of their Model 340's (one company utilizes 325 units, the other 1250 units) are installed inhouse; however, the majority are leased out to their client bases. Two more users are insurance companies, one with 370 Model 340's and 350's and the other with 130 Model 350's, that have installed the units in their district offices to collect policy information from their agents. The other four users, who have an average of 16 Model 350's each, represent industrial firms that use their terminals for a variety of general purpose business applications, such as inventory control, order entry, shipping control, billing, and payroll, in RJE and batch environments.

These user's ratings are tabulated below:

	Excellent	Good	Fair	Poor	WA*
Overall performance	2	4	2	0	3.0
Ease of operation	5	3	0	0	3.6
Display clarity	4	4	0	0	3.5
Keyboard feel and usability	7	1	0	0	3.9
Ease of programming	3	2	2	0	3.1
Manufacturer's software	3	3	1	0	3.3
Hardware reliability	2	3	2	1	2.8
Maintenance service	2	4	0	2	2.8
Technical report	2	2	1	1	2.8

*Weighted Average on a scale of 4.0 for Excellent.

➤ (for internal buffering only), keyboard, CRT display screen, and one or (optionally) two magnetic tape cassette recorders. The unit can accommodate a synchronous or asynchronous communications interface or both. The Model 340 can be equipped with an additional 2K, 3K, or 7K bytes of random-access memory (the Extended Memory feature) to allow implementation of user programs.

Optional diskette storage for the 340 is provided by a 0.5-million-byte dual diskette drive, which requires the Extended Memory feature with 7K bytes of added memory. I/O options include a 250-cpm card reader, serial impact printers rated at 72, 144, or 180 cps, a 300- or 600-lpm line printer, and 7- or 9-track industry-compatible magnetic tape drives.

The basic *Model 340D Terminal* is essentially a Model 340 with a dual diskette drive and 16K bytes of random-access memory (RAM). I/O options are the same as those for the Model 340.

Model 340E is a Model 340 with ECMA-compatible cassette drives. The 340E drives outperform those of the 340.

The basic *Model 350 Terminal* is a stand-alone software-driven unit that contains a microprocessor, 16K bytes of random-access memory (of which 8K bytes is available to the user), keyboard, CRT display screen, and an integral dual diskette drive. A second dual-diskette unit is optional. Diskette storage, CRT screen capacity, keyboard styles, and I/O options (except for cassette) are the same as those provided by Model 340. The 350's operating system is loaded from diskette and fully configurable by the user.

TRANSMISSION SPECIFICATIONS

Transmission is half-duplex, synchronous or asynchronous. The asynchronous interface is rated at 37.5 to 1200 bits/second; synchronous interfaces are available for operation at up to 9600 bits/second using 8-level ASCII (with parity) or EBCDIC transmission codes. Synchronous transmission employs the IBM Binary Synchronous Communications (BSC) technique and is compatible with IBM Binary Synchronous terminals such as the 2770, 2780, 3780, 3770, and 3741. The EBCDIC Transparency feature, however, is not provided.

All models are equipped with an EIA Standard RS-232C interface and can be used over a dialed, leased, or private-line communications facility via an external modem. NTSC offers its own modems, which are compatible with the Bell System Data Set 201 B/C and 202C (without reverse channel), for use at 1200 bps. The 202C-compatible modem provides automatic answering as a standard feature. The 201 B/C-compatible modems are available with or without Autodial.

All communications are point-to-point. Communications features include automatic answering, automatic disconnect, data (space) compression/decompression, auto restart, autodial, etc.

DEVICE CONTROL

MODELS 340/340D/340E: A stored format program, keyed or read from tape or diskette, controls the format of data recording by delimiting alphabetic, numeric, and alphanumeric fields and by initiating automatic field skipping, right justification (left zero or left blank fill), check digit validation (optional), or the generation of totals, subtotals, or zero balances (optional).

The program also includes format descriptors, which are displayed on the CRT to aid the operator during a keying operation. The format descriptors are displayed to the left of each variable field, which begins with a displayed symbol to define the type of field; e.g., A for alphanumeric, N for

Northern Telecom Model 340 and 350 Series Data Entry Terminals

➤ All but two of these users were pleased with the performance of their NTSC 340's and 350's. Among the advantages they mentioned were the ease with which the TAL language is learned, the ease with which the system is used by personnel not experienced in data processing, the ability of the unit to operate unattended, and the extensive communications facilities. One Model 340 user pointed out that the TAL language is much more powerful than most users give it credit for; when utilized to its full potential, the terminal can be (and frequently is, at his installations) used as a stand-alone miniprocessor. Another user stated that although they may be considered a little out-of-date by state-of-the-art standards, his 350's are totally adequate for the application in which he uses them.

Several usage considerations were considered strengths by some users and weaknesses by others. For example, hardware reliability was considered a distinct advantage by three of these users; three others felt that hardware problems, particularly diskette drive failure, have caused an unacceptable amount of downtime. (No other hardware problems were consistently mentioned by these users.) Five users point out that their experience with NTSC's maintenance service has been excellent, even in remote locations, while two others reported frequently poor maintenance service.

Four users cited system growth limitations as a disadvantage, the mentioning of which should not come as a surprise for terminals that have been in service as long as these have. Three of these users already have plans underway to replace their Model 340's and 350's (not necessarily on a one-for-one basis) with IBM Series/1, IBM System/34, and Raytheon PTS 100 systems. □

➤ **numeric.** All format descriptors are protected from accidental erasure or over-recording. When transmitting, only the selected variable data is transmitted; the displayed format remains.

The basic 340 Terminal provides the following operating modes: Format mode, Batch mode, Search mode, Automatic Unattended mode, Program mode, various Communications modes, and Master Station mode.

The Format mode is used when entering data from the keyboard or for reformatting previously-recorded data. Under program control, data entering the display buffer goes into variable fields that follow format descriptors. Once entered, individual fields or the entire record can be edited prior to its transfer to a selected output device such as the second recorder, printer, or communications lines. Alternately, records can be written on the selected output medium as soon as the last data field is entered.

The Batch mode is used for data transfer between selected input and output devices. In this mode, the display buffer operates as two 256-character buffers that are toggled between input and output.

The Search mode is used to locate a specific record or program (record format) recorded on cassette tape or diskette by comparing a keyed identifier of up to 256 characters with the data read from tape. Any portion of a record can be used as an identifier. A program to be loaded from a cassette

or diskette is located via a Search operation that searches the recorded formats for the identifier that compares with the one keyed by the operator; the selected format is then loaded.

The Automatic Unattended mode is similar to the Batch mode, except that the terminal responds to a selection sequence received from a remote NTSC terminal operating as a master station or a remote computer such as an IBM System/360 or 370. The selection sequence identifies the terminal, the terminal peripheral, and the desired mode of operation (e.g., read from cassette tape or print a message).

The Program mode is usable only on terminals equipped with Extended Memory and is defined by the program loaded in memory. The program can be loaded from cassette tape, diskette, computer tape, or punched cards.

Communications modes direct the terminal to emulate as IBM 2780, 3780, 2770, 3770, or a Teletype 33/35. While in a selected communications mode, a 340 terminal can communicate with a terminal of the model being emulated, an IBM System/360 or 370, or another NTSC 340, 350, or 400 Series unit. The basic emulation control programs can be combined with program modules from the System Library to provide additional capabilities. The program modules include: Multiple Record feature, Terminal ID feature, Secondary Terminal feature, and Peripheral Drivers.

The Master Station mode permits one terminal to poll and address all other stations connected to the dial network.

Advance and Backspace keys move the cursor forward or backward to allow for correcting errors or modifying data. These controls are repetitive when key pressure is sustained.

File maintenance is performed by inserting the cassette or diskette containing the file to be updated or modified. Each record to be modified is retrieved and displayed via a Search operation. Then, by using the Advance and Backspace keys to position the cursor, data within the existing text can be deleted or changed and new data added. The modified record can then be reinserted into the position previously occupied by the original record on tape or disk.

Spooling can be performed when the terminal is equipped with a second cassette recorder. Selected records from any number of cassettes can be consolidated on one cassette tape, or an entire field can be copied onto a second cassette tape. The second cassette recorder can also be used to enter records formats from a program cassette.

Totals or subtotals can be generated and zero balancing performed under program control by the addition of two 10-digit accumulators (the Arithmetic option).

Vacant or incomplete data fields, as a result of omitted or missing data, are detected and an error message is displayed on the screen when the Omission Detection and Capacity Control option is included. To continue, the operator must reenter the data correctly.

Large formats can be segmented into pages (program chaining). The chaining feature, included with the second recorder, automatically displays the next "page" of format descriptors when the previous "page" is completed.

The Tab Compression option permits the insertion of a horizontal tab character following data in a partially filled or skipped field; the remaining positions within the field are filled with spaces, which are eliminated when the field is transmitted or transferred to an output device.

MODEL 350: The Model 350 operates under the direction of NTSC-supplied terminal control programs, loaded from diskette. The terminal control programs provide several

Northern Telecom Model 340 and 350 Series Data Entry Terminals

- operating modes: Data Entry, Batch, various Communications modes, Sort, Index, TAL or TAL II Program Generation, Blocking, Attended and Unattended modes, and Master Station operation.

The Data Entry and Batch modes are similar in operation to the Format and Batch modes of the Model 340. The data entry program recognizes the same format characters as the Format mode of the Model 340. In the Batch mode, I/O operations are overlapped only if the input and output devices differ. A complete file is read from diskette, including deleted records unless deletion is manually selected. All non-deleted records are pushed up within the output file, and relative positions of all records within their file are changed.

The Communications modes are similar to the Communications modes on the 340, except that IBM 3741 emulation is also provided for the 350.

The Sort mode supports generation of an index file from an ordered or unordered data file. Each entry in the generated index file includes a 1- to 16-character alphanumeric key and the track and sector addresses of the record in the data file that contains the key. File generation input includes the data file from which the index is generated, key parameters including key length and relative position within the data record, and file description (i.e., ordered in an ascending or descending manner or unordered). The index file must be on the same diskette volume as the related data file, and the indexed data file must contain fixed-length records. The index file must be regenerated to reflect any modifications within the corresponding data file. More than one index file can be generated per data file.

The Index mode is used to access and modify the file directory as a result of file creation or maintenance. A new file ID can be added for each new corresponding data file or deleted for each deleted data file. An existing file ID is changed to reflect any modifications in file name, record length, file type, and the next available record pointer. Emptying a file resets the record pointer from the next available record to the beginning of the file (useful for transaction files). Initializing a volume clears all existing ID's and builds a directory (track) in an IBM-compatible format.

The TAL and TAL II Generator modes are used to generate a TAL object program from a source program and TAL library. The object program is stored on diskette.

The Blocking model allows several records to be blocked on diskette and accessed via the TAL program.

The Master Station mode is similar in operation to the 340's Master Station mode.

SOFTWARE

NTSC provides a simple but flexible data entry language called TAL (Terminal Application Language), which consists of macro statements that can be linked to data entry fields defined in the displayed data entry format. The TAL instruction repertoire includes check digit, range checking, table checking, data manipulation, arithmetic (addition, subtraction, multiplication, and division), test, branching, verify, and I/O instructions. The keyed TAL source statements are converted to machine language by the Program Generator (in one pass) and are written on cassette tape or diskette. The result is the desired application program.

NTSC introduced an enhanced version of its proprietary Terminal Application Language for use with the Model 350. Called TAL II, the programming language includes the full complement of existing TAL instructions plus additional instructions and programming features and a new source-code format. NTSC also provides a TAL-to-TAL II trans-

lator program. Besides the original TAL instructions that provide arithmetic, logical branching, data transfer, I/O, and data verification functions, the TAL II instructions permit naming programs and field programs, defining overlay statements, including input/output drivers in the program, and skipping to the top of a new page in the source listing.

The TAL II source program is written in single statements, omitting separate entries for instructions and tables. Source statements can be given labels and interspersed with comments for program documentation. Statement labels permit jumping to a subroutine and returning to the existing (calling) program, an enhancement over the original TAL software, which only supported jumps within the same program. The source program is entered in a single data stream under control of the TAL II generator. Source output can be either an object program, a generator listing, or both. Thus, during initial program generation, an error list can be produced for program debugging. After corrections are made, a clean object program with corresponding listing can be produced.

The TAL-to-TAL II translator produces a TAL II source program with its separate tables and groups of field programs. The TAL II source program is then processed by the TAL II generator to obtain a TAL II object program and listing.

TAL support for diskette is file-oriented and handles up to eight files concurrently. Diskette TAL includes three access methods—sequential, "random," and indexed; miscellaneous instructions including backspace, rewind, search, close file, home, and delete; and declarative instructions including open file. Sequential access includes read, write, and update instructions. Random access applies to files containing fixed-length records only; addressing is performed on a relative record basis. Indexed access is based on a 16-character key and is implemented by combining the base and index file addresses.

The disk operating system, loaded from diskette or cassette via a 128-byte ROM bootstrap loader, provides disk operating modes. The modes include data entry (equivalent to the format mode on the basic 340), communication control, edit/search, batch (equivalent to the batch mode on the basic 340), directory, and program. Directory mode provides user access to the disk directory to allocate disk files (file parameters include name, record length, write protect status, file type, and file length), delete files, modify file parameters, empty a file, and initialize a disk volume. Program mode is supported as a sub-mode that includes all modes except the directory mode.

NTSC has also introduced a report generation programming language, SRG, for use with the Model 350. SRG consists of a subset of the RPG programming language that contains most RPG II commands and capabilities. Among the capabilities *excluded* from SRG are the ability to update files, to output to indexed files, to process blocked records, and to use any sequence other than the ASCII collating sequence for "greater than" and "less than" comparisons.

A NTSC-supplied software library, contained on cassette tape or diskette, includes TAL, the Program Generator, a loader, and several device control routines. Support programs for diskette include programs for index file creation, volume copying (which allows selective copying of files on the input volume under keyboard control), file copying, and a sort/merge function.

COMPONENTS

DISPLAY STATION: A 9-inch (diagonal measurement) CRT and a typewriter-style keyboard. The display provides a viewing area 5.5 inches high by 4.75 inches wide. The display arrangement is 9 lines of 64 characters each, providing a total of 576 display positions. The last line of 64 characters is reserved for operating status, leaving 512 positions for data entry. A character set of 62 ASCII characters, including ►

Northern Telecom Model 340 and 350 Series Data Entry Terminals

► upper case alphabets, numerics, punctuation, and special characters, is generated via a 5-by-7 dot matrix and is displayed in green against a dark background. An anti-glare shield is standard.

The typewriter and data entry style keyboards include a 10-key numeric cluster at the right of the main keygroup. Three groups of keys above the main keygroup provide manual control of I/O and control functions. Any of 64 ASCII characters can be generated, including upper case alphabets, numerics, punctuation, and special symbols.

CASSETTE TAPE RECORDER (340 Series): One or (optionally) two cassette tape recorders each accommodate a "Philips-type" cassette, which contains 280 feet of 0.15-inch magnetic tape recorded at 800 bits/inch. Total cassette capacity is rated at 200,000 characters. Data is recorded serially by bit on 2 complementary parallel tracks in the form of 9 bits/character, which includes 1 parity bit. Record gaps are 1 inch long. Record length is variable from 1 to 256 characters. A cassette can store up to 800 256-character records or up to 1400 80-character records.

The cassette tape recorders on the basic 340 and 340D Terminals move tape at 3.9 inches/second except when the terminal is transmitting or receiving data, in which case the tape speed is 12.5 inches/second. A Fast Recorder Option provides the 12.5-inches/second speed for all terminal operations. The data transfer rate at 3.9 inches/second is 350 or 116 char/second for read or write operation, respectively; at 12.5 inches/second, the data transfer rate is 1000 or 333 char/second for read or write operations, respectively. The lower transfer rate when writing is an effective rate that results from the unit's read-after-write checking feature, which backs up the tape and rereads each block written. Rewind speed is 120 inches/second.

The ECMA-compatible Model 340E is equipped with higher-performance cassette drives that provide a standard read/write speed of 12.5 inches/second and a data transfer rate (read or write) of 1000 char/second. Read-after-write checking "on the fly" is implemented via a separate read head. Tape marks are compatible with the ECMA standard.

Data transcription between cassette tape and computer-compatible magnetic tape is performed via the terminal and a separate magnetic tape unit under program control.

DISKETTE STORAGE: The optional diskette unit accommodates two IBM 3740-compatible diskettes, providing a maximum storage capacity of 485,888 bytes (242,944 bytes per diskette). The diskettes are rotated at 360 rpm for an average rotational delay of 83 milliseconds.

Positioning time is 2.5 milliseconds per track. Seek time is 27.5 milliseconds track-to-track, 93 milliseconds average, and 218 milliseconds maximum. Data is transferred at 31,250 bytes/second. The recording technique is compatible with that of the IBM 3740 when an optional EBCDIC software module is used.

The diskette unit organizes a diskette into 73 data tracks plus 2 spare tracks and 1 index track. Each track is divided into 26 sectors, and each sector into 128 bytes.

COMPUTER TAPE DRIVES: Available tape formats are 7-track, 556/800 bits/inch; 9-track, 800 bits/inch; or 9-track, 1600 bits/inch. All models record data on 1/2-inch tape in industry-compatible formats. Each of these computer-compatible tape drives is a separate, desk-top unit with a read/write speed of 12.5 inches/second. Rewind speed is

40 inches/second. The tape drives are manufactured by Wangco, and each accommodates an 8.5-inch reel (1200 feet).

CARD READER: A desk-top unit reads 80-column cards at 250 cards/minute. A single input hopper and output stacker have a rated capacity of 600 cards each.

SERIAL PRINTERS: Three models of bidirectional impact matrix printers provide rated speeds of 72-, 144-, and 180 cps and 132 print columns. Each is controlled via an integral microprocessor with 5K bytes of memory. The printers feature a standard 96-character set of ASCII symbols (each formed via a 7-by-7 dot matrix), a cartridge ribbon, and a tractor pin feed mechanism. The printers accommodate 6-part continuous feed forms from 2 to 14 7/8 inches wide via tractor feed or 4 or 4 7/8 inches wide via tear-bar tractor feed. The head position is adjustable for paper thickness. Standard horizontal and vertical spacing is 10 characters/inch and 6 lines/inch. Optional spacing provides 16 1/2 characters/inch horizontally and/or 8 lines/inch vertically. A re-inking mechanism extends ribbon life. Vertical slewing at high speed over blank lines is standard. A fast horizontal slew option on the 180 cps model performs high-speed skipping over blank fields. Each model is equipped with a 12-key function pad for setting margin widths, forms length, vertical and horizontal tab positions; for initiating commands such as "top-of-form"; and for setting forms alignment for pre-printed forms. The keys can also initiate generation of two diagnostic test patterns. One is a continuous printout of the character set on 132-character lines; the other is alternate X's and O's on 16 character lines.

BELT AND LINE PRINTERS: The belt printer, called Strider and produced by General Electric as the TerminiNet 340, is rated at 300 lines per minute and provides 132 print positions. The printer provides a standard character set of 64 ASCII characters and accommodates 6-part continuous, pin-fed forms from 3 to 15 inches wide via adjustable tractor feed. Horizontal and vertical spacing is 10 characters per inch and 6 lines per inch, respectively.

The line printer, a drum printer produced by Data Printer is rated at 300 or 600 lines per minute and provides 132 print positions and a standard 64-character print set. Horizontal and vertical spacing is 10 characters per inch and 6 or 8 (optional) lines per inch, respectively. The printer accommodates 6-part, pin-fed continuous forms from 3 1/2 to 19 1/2 inches wide.

PRICING

The NTSC 300 Series terminals are available for purchase or lease. Lease arrangements are available for one, two, or four years for the Model 340 and for one, three, or four years for the Model 350.

Maintenance is priced separately for both leased and purchased equipment. (For your convenience, we have added maintenance charges to the lease prices shown). Prime shift maintenance is provided; however, service for 24 hours per day 7 days per week is available on a negotiable basis. NTSC provides quantity discounts up to 25 percent for purchased units. A purchase credit plan is available to convert from lease to purchase.

Installation charges for Models 340 and 350 are \$100 per terminal.

NTSC provides training at its own training centers. Two to four days of training are provided at a charge of \$110 per day per person. NTSC also offers on-site training at a customer location for \$750 per day for 10 students or less plus \$75 per day for each additional student up to a maximum of 16. ►

Northern Telecom Model 340 and 350 Series
 Data Entry Terminals

	Monthly Charges*				Purchase	Monthly Maint.
	1-Year Lease	2-Year Lease	3-Year Lease	4-Year Lease		
▶ Model 340 with dual cassette drives, 2 accumulators, 8K RAM, synchronous communications adapter, and 72-cps Sprinter printer	\$ 567	\$451	\$ NA	\$ 417	\$16,720	\$119
Model 340 with dual cassette drives, 2 accumulators, 8K RAM, synchronous communications adapter, 300 lpm Strider line printer, and 9-track 800-bpi magnetic tape drive	1,027	900	NA	815	31,660	202
Model 350 with dual diskette drives (.5MB), 16K RAM, synchronous communications adapter, and 144 cps Sprinter printer	616	NA	493	493	13,800	147
Model 350 with dual diskette drives (.5MB), 16K RAM, synchronous communications adapter, 600 lpm printer, and 9-track 1600-bpi magnetic tape drive	1,535	NA	1,274	1,274	44,700	314

*Includes maintenance charges.■

Northern Telecom 410 and 440 Data Entry and Processing Systems



MANAGEMENT SUMMARY

Northern Telecom Systems Corporation's (NTSC) cluster arrangement can accommodate up to eight CRT keyboard/display operator stations equipped with either data entry or typewriter-style keyboards; the two cannot be mixed. Disk storage provides 2.5, 5, or 10 million bytes and can be expanded to 20 million bytes via a second fixed-disk cabinet. A single cassette or diskette drive provides compatibility with the other NTSC terminals and also serves as a program loader. Ample memory capacity is provided—32K to 64K bytes. I/O flexibility is provided via a host of I/O devices including a card reader, 7- and 9-track industry compatible magnetic tape drives, and printers that offer a range of print speeds from 72 cps to 300 lpm. Transmission compatibility is provided with IBM 2780 and 3780 via program emulation and with other NTSC Model 300 and 400 family members.

NTSC introduced a high-speed cartridge tape drive for the 440 in March 1977. The drive accommodates 3M-type cartridges and is designed as a backup device to save and restore disk files. The cartridge can store up to 5.76 million characters.

Strong data entry support is furnished by TAL II, which is designed for data entry and data validation.

However, the 440 is not just supported as a data entry system. A subset of ANSI COBOL (announced May 1976) provides a strong batch processing language that supports file maintenance and report generation. TAL and COBOL programs can run concurrently—TAL in the foreground, COBOL in the background. The combination of TAL and COBOL support transforms the 440 into a product that can serve the growing trend toward distributed processing.

The single-station 410 is intended to satisfy low-volume requirements in a data entry or distributed processing network. Its maximum disk storage capacity of 10 million bytes should be more than adequate for this application. ➤

Single-station or clustered, programmable terminals that support up to 8 display stations for data entry/validation, batch communications, and file maintenance operations.

Hardware features include 32K to 64K bytes of user memory; 5 to 20 megabytes of disk storage; cassette or diskette storage; cartridge-tape backup for disk storage; industry compatible tape drives; a card reader; 60-, 120- or 180-cps bi-directional printers; a 300-lpm belt printer; and asynchronous or synchronous communications adapters with data rates up to 4800 bps. Software features include TAL-II, ANSI COBOL, and BASIC languages; utilities; and emulators.

A 410 system with 48K bytes of memory, disk drive, cassette, communications, a single display and a 72 cps printer is priced at \$23,960 and rents for \$655 per month on a 3-year lease.

CHARACTERISTICS

VENDOR: Northern Telecom Systems Corporation, Computer Systems Group, P.O. Box 1222, Minneapolis, MN 55440. Telephone (612) 932-8000.

DATE OF ANNOUNCEMENT: Model 440—July 1975; Model 410—June 1976.

DATE OF FIRST DELIVERY: Model 440—February 1976; Model 410—October 1976.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: NTSC at over 175 U.S. locations.

MODELS

The *Model 440 Clustered Terminal Processing System* is a shared-processor remote data entry system that consists of a microprocessor-based controller and one to eight CRT keyboard/display units. The separate controller contains 32K to 64K bytes of random-access memory, 5.3 or 10.6 million bytes of fixed disk storage, and a single cassette or diskette drive. A second 10.6 million byte disk drive is optional. Each keyboard/display unit provides a screen capacity and display arrangement identical with those of the older NTSC Models 340 and 350. A typewriter or data entry style keyboard can be specified. Cassette and diskette drives are identical with those of the other NTSC 300/400 models.

The *Model 410 Data Entry and Processing System* is a single-station remote data entry terminal that consists of a microprocessor-based controller, a Binary Synchronous communications interface, a CRT keyboard/display unit, and a printer. The separate controller contains 40K to 64K bytes of random-access memory, 2.5, 5, or 10.6 million ➤

Northern Telecom 410 and 440 Data Entry and Processing Systems

➤ And it is available with the same range of printer speeds as the 440 (72 cps to 300 lpm).

The TAL II data entry language consists of a comprehensive repertoire of instructions that are implemented in the form of macro statements that can be linked to data entry fields in the display format. The TAL source program is converted to machine language in one pass of the NTSC Program Generator and written on diskette or fixed disk. The TAL II repertoire consists of arithmetic, branching, data transfer, editing, and I/O instructions. Disk or diskette access methods include sequential, random, and indexed. Typical applications for the use of TAL include payroll, data entry, order entry, and inventory control.

USER REACTION

Datapro's 1980 computer survey yielded nine responses from users of Northern Telecom 405, 410, 440 and 445 systems. These were not tabulated as part of the computer survey but we retained the responses for use in reports such as this. These users had a total of 69 systems installed. Most of the systems had been installed over two years. The ratings assigned are as follows:

	Excellent	Good	Fair	Poor	WA*
Overall satisfaction	0	6	2	1	2.5
Ease of operation	2	3	4	0	2.7
Hardware reliability	3	4	1	1	3.0
Ease of programming	1	5	2	0	2.8
Maintenance service	1	6	1	0	3.0
Technical support	1	4	2	1	2.7

*Weighted average on a scale of 4.0 for excellent.

On the plus side of comments checked, four users checked that users were happy with the response time, and also that the system was easy to expand and reconfigure. An equal number, however, checked that the system proposed by the vendor was too small and had to be expanded, and also that delivery of the equipment was late.

Six users checked that they would recommend this system to another user in the same situation. Three checked that they would not. □

➤ bytes of fixed-disk storage, and a single cassette (standard) or diskette drive (optional). The keyboard/display unit provides a screen capacity and display arrangement identical with NTSC Model 440. A typewriter or data entry style keyboard can be specified. Cassette and diskette drives are identical with those of other NTSC models. The 410 is available in four models:

- Model 410-1—includes a 72 cps printer.
- Model 410-2—includes a 144 cps printer.
- Model 410-3—includes a 180 cps printer.
- Model 410-5—includes a 300 lpm printer.

Any model of the 410 can accommodate a second printer, but cannot include two line printers.

TRANSMISSION SPECIFICATIONS

Transmission is half-duplex, synchronous or asynchronous. The asynchronous interface is rated at 75 to 1200 bits/second; synchronous interfaces are available for operation at 1200, 2000, 2400, 3600, or 4800 bits/second using 8-level ASCII (with parity) or EBCDIC transmission codes. Binary Synchronous Communications (BSC) technique is compatible with IBM Binary Synchronous terminals such as the 2770, 2780, 3780, and 3735. The EBCDIC Transparency feature, however, is not provided.

All models are equipped with an EIA Standard RS-232-C interface and can be used over a dialed, leased, or private-line communications facility via an external modem. NTSC offers its own modem (Model 3460), which is compatible with the Bell System Data Set 202C (without reverse channel), for use at 1200 bps. The Model 3460 provides automatic answering as a standard feature. Bell System 201, 203 or 208 series modems can be used for synchronous transmission at 2000/2400, 3600, or 4800 bps, respectively. Equivalent modems from independent manufacturers can be used in place of the Bell System modems.

All communications are point-to-point. Communications features include automatic answering, automatic disconnect, data (space) compression/decompression, auto restart, autodial, etc.

DEVICE CONTROL

The systems operate under the control of systems programs and user-created programs. Control programs are divided into two groups: those that supervise the operation of all control unit functions and those that interact with an operator.

Supervisory functions include task management, timer maintenance, interrupt handling, and program or program segment loading from disk. Initial loading is performed automatically during power-on and reset sequences.

The system control program interacts with operators via the Command Language Interpreter to start and stop jobs, create and delete files, and display internal information. Three types of commands are provided: Job Control, File Control, and Information Requests.

Job Control commands are used to: 1) load the 340 emulator; 2) load a program from disk to begin a batch processing task; 3) direct the system to obtain subsequent commands from a file (control returns to the operator after the file is processed); and 4) halt batch processing (all open files are closed).

File Control Commands are used to: 1) create a sequential, random, or indexed disk file with fixed or variable record length; 2) delete a disk file; 3) remove the contents of a disk file; and 4) change the access characteristics of a disk file from read-only to read-write or vice versa.

Information Requests are used to: 1) display the status of each task; and 2) display all file directory entries on disk.

Data entry is performed by means of a 340 Emulator program, which provides nearly identical emulation of the NTSC 340's data entry facility. Three modes of data entry are supported: free-form, formatted, and format-extended; the latter is the formatted mode with added user-written TAL edit routines. Each of these modes is operator-initiated by keying a Job Control command.

SOFTWARE

Three programming languages are available for the 410 and 440 terminals: TAL-II (an enhanced version of TAL), BASIC, and ANSI COBOL. ➤

Northern Telecom 410 and 440 Data Entry and Processing Systems

► TAL II includes the full complement of TAL instructions plus additional instructions and programming features and a new source-code format. NTSC provides a TAL-to-TAL II translator (TAL II Reformatter) for conversion of TAL user programs. Utility programs include Search/Edit, Batch, Sort, Logcopy, Compress/Free Space, Dump/Restore, Construct, and the TAL II Reformatter. Communications software includes emulators for IBM 2770, 3770, 2780 and 3780 as well as the IBM 360/20 and Teletype 33/35. HASP workstation NTSC communications software also includes its Network Control System (NCS) which supports communications among all NTSC 300 and 400 serial terminal systems.

The TAL II source program is written in single statements, omitting separate entries for instructions and tables. Source statements can be given labels and interspersed with comments for program documentation. Statement labels permit jumping to a subroutine and returning to the existing (calling) program, an enhancement over the original TAL software, which only supported jumps within the same program. The source program is entered in a single data stream under control of the TAL II generator. Source output can be either an object program, a generator listing, or both. Thus, during initial program generation, an error list can be produced for program debugging. After corrections are made, a clean object program with corresponding listing can be produced.

The TAL-to-TAL II translator produces a TAL II source program with its separate tables and groups of field programs. The TAL II source program is then processed by the TAL II generator to obtain a TAL II object program and listing.

TAL support for diskette is file-oriented and handles up to eight files concurrently. Diskette TAL includes three access methods—sequential, "random," and indexed; miscellaneous instructions including backspace, rewind, search, close file, home, and delete; and declarative instructions including open file. Sequential access includes read, write, and update instructions. Random access applies to files containing fixed-length records only; addressing is performed on a relative record basis. Indexed access is based on a 16-character key and is implemented by combining the base and index file addresses.

The disk operating system, loaded from diskette or cassette via a 128-byte ROM bootstrap loader, provides disk operating modes. The modes include data entry (equivalent to the format mode on the basic 340), communication control (essentially the same as the 2780 emulator), edit/search, batch (equivalent to the batch mode on the basic 340), directory, and program. Communication control includes support for the IBM 2770, master station, or auto dialer. Director mode provides user access to the disk directory to allocate disk files (file parameters include name, record length, write protect status, file type, and file length), delete files, modify file parameters, empty a file, and initialize a disk volume. Program mode is supported as a sub-mode that includes all modes except the directory mode.

A NTSC-supplied software library, contained on cassette tape or diskette, includes TAL, the Program Generator, a loader, and several device control routines. Support programs for diskette include programs for index file creation, volume copying (which allows selective copying of files on the input volume under keyboard control), file copying, and a planned sort/merge function.

NTSC BASIC features sequential and direct file access; all of the common algebraic operators including arithmetic, relational, concatenation, logical operators, and others; exponents (to a power of +38 and -39); three-dimensional arrays (with no limit on the number of array elements

except available memory size); floating point (with single precision numbers up to seven digits); trigonometric functions; logarithms; and square root. Program logic is governed by such statements as If, Else, On, Go To and On, and Go-Sub (for conditional branching or for BASIC subroutine linkage).

NTSC interactive COBOL is a subset of ANSI COBOL and features the four basic program divisions: Identification, Environment, Data, and Procedure. Random, indexed, and sequential file access is supported, plus program segmentation (overlays), subscripting, numeric editing, figurative constants (zeros, spaces, high/low values), and other basic COBOL language statements common with ANSI COBOL. NTSC's COBOL is display oriented and can be used to create data entry programs at the display station. Data entry requirements, such as displaying formats for keying data into the screen, accepting and editing data keyed by the operator, and displaying data on the screen that has been retrieved from system files or calculated by the COBOL program, are supported by NTSC's COBOL. Features include an alarm statement for keying error recognition and highlighting attributes for dual intensity. NTSC COBOL supports foreground data entry operations on several display stations concurrently with utilities or a separate noninteractive COBOL program running in the background, such as report printing or transmitting data to a host computer. COBOL programs can interact with one another. Up to 90 characters of memory can be shared by all displays and documents can be keyed to batch number and date.

COMPONENTS

DISPLAY STATIONS: The CRT keyboard/display unit includes a 12-inch CRT and a typewriter or data entry style keyboard. The display provides a viewing area 7 inches high by 9.5 inches wide.

The display arrangement is 9 lines of 64 characters each, providing a total of 576 display positions. The last line of 64 characters is reserved for operating status, leaving 512 positions for data entry. A character set of 62 ASCII characters, including upper case alphabets, numerics, punctuation, and special characters, is generated via a 5-by-7 dot matrix and is displayed in green against a dark background. Models 440 and 410 have a bonded anti-glare screen.

The typewriter and data entry style keyboards include a 10-key numeric cluster at the right of the main keygroup. Three groups of keys above the main keygroup provide manual control of I/O and control functions on all keyboards except the Model 440. Any of 64 ASCII characters can be generated, including upper case alphabets, numerics, punctuation, and special symbols.

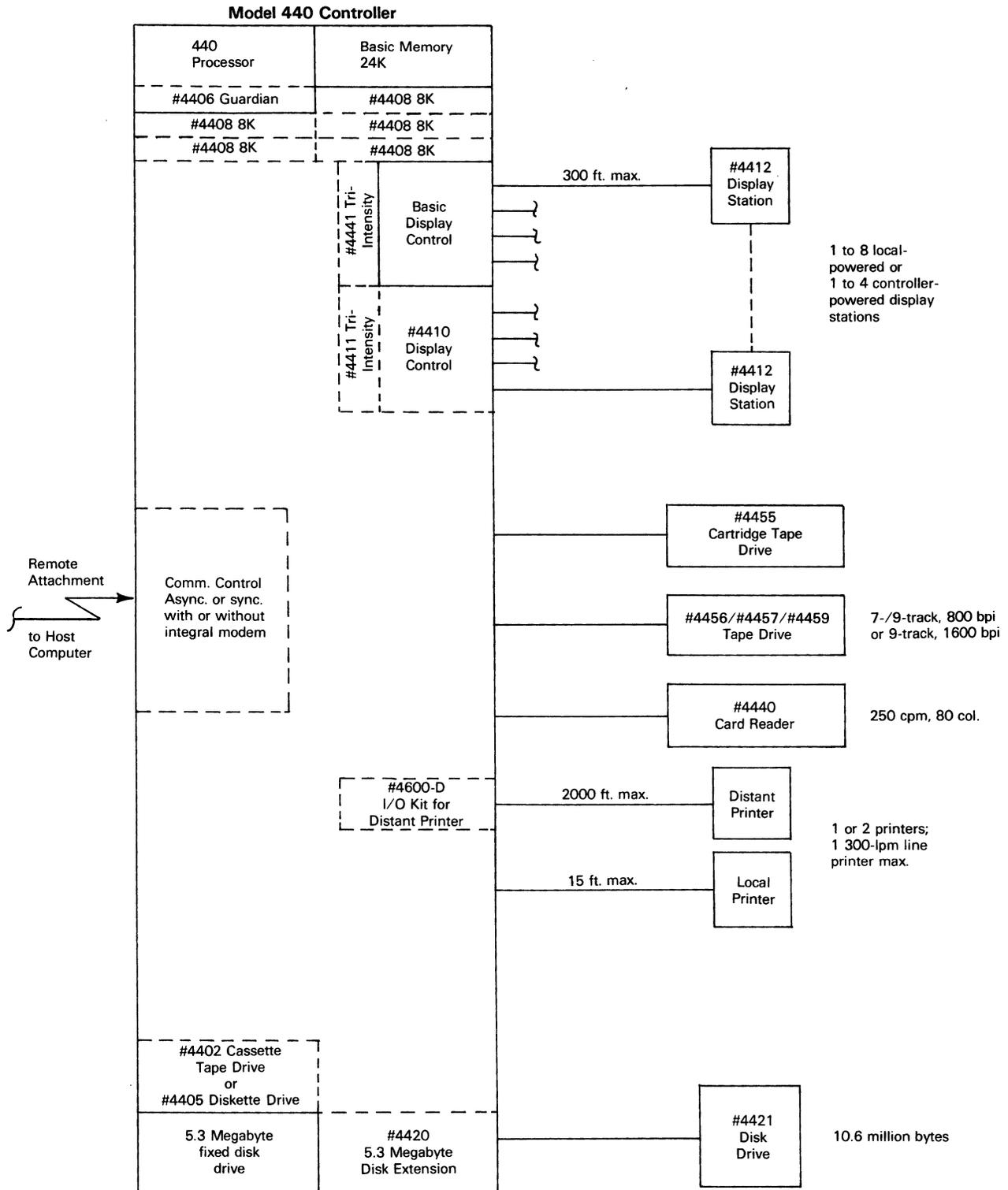
DISKETTE STORAGE: The single drive accommodates an IBM 3740-compatible diskette. The diskettes are rotated at 360 rpm for an average rotational delay of 83 milliseconds. Positioning time is 2.5 milliseconds per track. Seek time is 27.5 milliseconds track-to-track, 93 milliseconds average, and 218 milliseconds maximum. The standard data transfer rate is 31,250 bytes/second.

The recording technique is compatible with that of the IBM 3740. An NTSC utility program converts between IBM 3740 and NTSC formats. The IBM 3740 format organizes the diskette into 74 data tracks, 2 spare tracks, and 1 index track. Each track is divided into 26 sectors, and each sector into 128 bytes. NTSC Models 410 and 440 record single-sided, standard density diskettes. Diskette data storage capacity is 242,944 bytes.

CASSETTE TAPE STORAGE: Accommodates a "Philips-type" cassette, which contains 280 feet of 0.15-inch magnetic

Northern Telecom 410 and 440 Data Entry and Processing Systems

Model 440 Configuration



A #4402 cassette or #4405 diskette drive is required for terminal operation.

▶ tape recorded at 800 bits/inch. Total cassette capacity is rated at 200,000 characters. Data is recorded serially by bit on 2 complementary parallel tracks in the form of 9 bits/character, which includes 1 parity bit. Record gaps are 1 inch long. Record length is variable from 1 to 256 characters.

A cassette can store up to 800 256-character records or up to 1400 80-character records.

The cassette tape recorder moves tape at 3.9 inches/second except when the terminal is transmitting or receiving data, ▶

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in which case the tape speed is 12.5 inches/second. The data transfer rate at 3.9 inches/second is 350 or 116 char/second for read or write operation, respectively; at 12.5 inches/second, the data transfer rate is 1000 or 333 char./second for read or write operations, respectively. The lower transfer rate when writing is an effective rate that results from the unit's read-after-write checking feature, which backs up the tape and rereads each block written. Rewind speed is 120 inches/second.

Data transcription between cassette tape and computer-compatible magnetic tape is performed via the terminal and a separate magnetic tape unit under program control.

CARTRIDGE TAPE DRIVE (Model 440 only): The drive accommodates a 3M-type, 4-track cartridge containing 300 feet of 0.25 inch magnetic tape. The drive has a read/write speed of 60 inches/second and a recording density of 3200 bits/inch. The data storage capacity is 5.76 million characters. Data is transferred at 24,000 characters/second and is recorded sequentially on each of the four tracks; tape direction is reversed at the end of each track and recording is performed in the opposite direction.

FIXED DISK STORAGE: Storage capacities of 5.3, 10.6, and 21.2 million bytes are provided for the Model 440; storage capacities of 2.5, 5, or 10.6 million bytes are provided for the Model 410. All fixed-disk storage except for the optional second 10.6 million bytes of storage (contained in a separate cabinet) for Model 440 is contained within the terminal controller. The disk mechanism was designed and is produced by NTSC. The drive contains a single disk recorded on both surfaces. Head positioning time is 10 milliseconds track-to-track, 70 milliseconds average, and 100 milliseconds maximum. Average rotational delay is 12.5 milliseconds. The data transfer rate is 5 million bytes/second.

COMPUTER TAPE DRIVES (Model 440 only): Available tape formats are 7-track, 556/800 bits/inch; 9-track, 800 bits/inch; or 9-track, 1600 bits/inch. All models record data on 1/2-inch tape in industry-compatible formats. Each of these computer-compatible tape drives is a separate, desk-top unit with a read/write speed of 12.5 inches/second. Rewind speed is 40 inches/second. The tape drives are manufactured by Wangco, and each accommodates an 8.5-inch reel (1200 feet).

CARD READER (Model 440 only). A desk-top unit reads 80-column cards at 250 cards/minute. A single input hopper and output stacker have a rated capacity of 600 cards each.

SPRINTER PRINTERS: Three models of bi-directional impact matrix printers provide rated speeds of 72, 144, and

180 cps and 132 print columns. Each is controlled via an integral microprocessor with 5K bytes of memory. The printers feature a standard 64-character set of ASCII symbols (each formed via a 7-by-7 dot matrix), a cartridge ribbon, and "snap-out" tractor pin or friction feed mechanisms. The printers accommodate 6-part continuous feed forms from 2 to 14 7/8 inches wide via tractor feed or 4 to 4 7/8 inches wide via tear-bar tractor feed. The head position is adjustable for paper thickness. Standard horizontal and vertical spacing is 10 characters/inch and 6 lines/inch. Optional spacing provides 16.5 characters/inch horizontally and/or 8 lines/inch vertically. A re-inking mechanism extends ribbon life. Vertical slewing at high speed over blank lines is standard. A horizontal slew option performs high-speed skipping over blank fields. Each model is equipped with a 12-key function pad for setting margin widths, forms length, vertical and horizontal tab positions; for initiating commands such as "top-of-form"; and for setting forms alignment for pre-printed forms. The keys can also initiate generation of two diagnostic test patterns. One is a continuous printout of the character set on 132-character lines; the other is alternate X's and O's on 16 character lines.

STRIDER PRINTER: NTSC offers an impact belt printer rated at 300 lines/minute with 132 print positions. Produced as the GE TermiNet 340, the printer provides a standard character set of 64 ASCII characters and accommodates 6-part, continuous pin-fed forms from 3 to 15 inches wide via adjustable tractor feed. Horizontal and vertical spacing is 10 characters/inch and 6 lines/inch, respectively.

PRICING

The NTSC 410 and 440 terminals are available for purchase or lease. Lease arrangements are available for one, three, or four years.

Maintenance is priced separately for both leased and purchased equipment. Prime shift maintenance is provided; however, service for 24 hours per day 7 days per week is available on a negotiable basis. A purchase credit plan is available to convert from lease to purchase.

Installation charges are equivalent to the cost of one month's maintenance with a \$100 minimum charge.

NTSC provides training at its own training centers, and also offers on-site training at a customer location for a minimum of four persons and in major cities as required.

	Monthly Charge*			
	1-Year Lease	3-4-Year Lease	Purchase	Monthly Maint.
Model 410				
48K memory, 2.5 megabyte disk, NR21 cassette, display, communications and 72 cps printer	\$ 745	\$655	\$23,960	\$144
Model 440				
64K memory, 5 megabyte disk, NR21 cassette, 4 displays, communications and 72 cps printer	1,143	943	32,140	213

*Includes maintenance. ■

Northern Telecom 405, 435, and 445 Distributed Data Entry/Processing Systems

PRODUCT DESCRIPTION

Northern Telecom has announced the Model 585 Distributed Data Entry/Processing System. The Model 585 features a new processor, a new operating system, and Winchester-based disk technology. It provides up to 512K bytes of main memory, and supports any combination of 16 CRT terminals and printers. Total disk storage capacity is 342 megabytes.

RELATIONSHIP TO CURRENT PRODUCT LINE:

The Model 585 is the largest and most powerful model in Northern Telecom's DDP line. The 512K-byte memory capacity is double the maximum available on the next highest model, the Model 445. Any combination of up to 16 CRT terminals and printers may be configured as data stations with the Model 585, compared to a maximum of 8 CRT terminals plus 8 printers for the Model 445. Cable-connected data stations may be located up to 5000 feet from the processor, compared to a maximum of 2000 feet for the Model 445's cable-connected data stations.

New integral eight-inch Winchester-type disks replace the Model 445's integral 14-inch cartridge disk drives. The new drives provide up to 22 megabytes of storage, double that of the Model 445's integral drives, increasing maximum disk capacity from 308 megabytes on the Model 445 to 342 megabytes on the Model 585. Support for other peripheral offerings, such as the back-up cartridge tape unit, external disk, cassette, and diskette drives, stand-alone type units, CRTs, and printers is the same as for the Model 445.

Some new software is offered with the Model 585, including a new operating system, a complete system ➤

PRODUCT ANNOUNCEMENT: Model 585, a new high-end system in Northern Telecom's distributed data processing systems family.

ANNOUNCEMENT DATE: February 9, 1981.

DELIVERY SCHEDULE: First customer shipments are scheduled for May 1981.

BASIC SPECIFICATIONS

VENDOR: Northern Telecom, Inc., Data Park, P.O. Box 1222, Minneapolis, MN 55440. Telephone (612) 932-8000.

CONFIGURATION: The Model 585 provides a new processor and is based on a multiprocessor architecture that provides for a central cpu with 128K to 512K bytes of main memory, plus additional microprocessor-based peripheral controllers that relieve the central cpu from routine peripheral handling tasks. The new operating system handles up to 32 concurrent COBOL or TAL 2000 tasks, features a disk spooling capability that improves data traffic flow and allows multiple data stations to share one or more printers, and provides a job streaming capability that allows a sequence of job steps to be run automatically without human intervention.

The Model 585 accommodates any combinations of up to 16 CRT terminals and printers as data stations, which may be connected locally via a cable of up to 5000 feet in length, or remotely via communications lines.

The system contains new integral eight-inch Winchester-type disks. The new disk units each provide an "intelligent" servo and up to 22 megabytes of storage. One or two of the integral Winchester drives, plus up to four of the previously available 74.5 megabyte external disk drives, can be configured with the system, for a total disk capacity of 342 megabytes.

The system utilizes the previously available integral high-speed cartridge tape drive for program loading and software back-up. Other previously available peripherals that can be added to the system include an external cassette or diskette drive and a 9-track, 800- or 1600-bps tape drive. Three communications ports are provided for connection to independent communications facilities. ➤



The Model 585 includes a new processor with integral Winchester-type disk storage for program loading and storage. The system supports up to 512K bytes of main memory, up to 342 megabytes of disk storage (internal plus external drives), and up to 16 CRT terminals and printers in any combination.

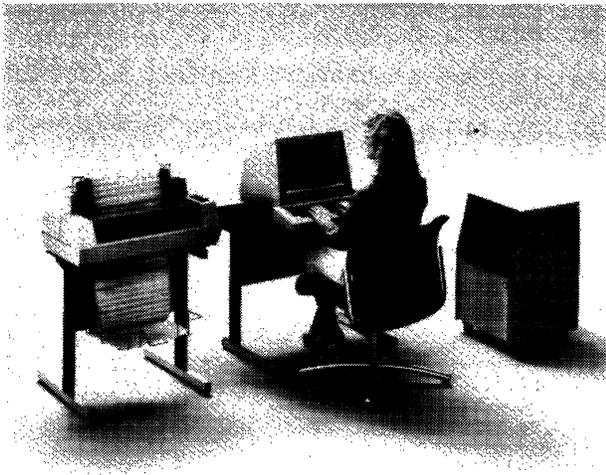
Northern Telecom 405, 435, and 445 Distributed Data Entry/Processing Systems

▷ diagnostics package, and a dual IBM 3270 emulator. However, the Model 585 is also completely compatible with most software packages previously available for Northern Telecom's other DDP systems, such as Omnilink (Northern Telecom's resource sharing feature), all communications emulators, and the recently introduced Omniword word processing package.□

▶ PRICING

A typical Model 585 configuration, consisting of 256K bytes main memory, 11 megabytes of disk storage, the back-up cartridge unit, four data stations, one Sprinter printer, and communications adapter, is priced at \$46,900; one- and three-year lease rates, including maintenance, are \$1,966 and \$1,573 per month, respectively.■

Northern Telecom 405, 435, and 445 Distributed Data Entry/Processing Systems



MANAGEMENT SUMMARY

In December 1977, Northern Telecom Systems Corp., (then Sycor) announced the 445 as the most powerful member of its familiar 400 family. Designed for distributed data entry and processing, the 445 is a disk-based clustered terminal system that supports as many as 8 large-screen display stations with as many printers and can be equipped with 5 to 308 million bytes of disk storage. The key to the announcement is a resource-sharing feature that permits peripherals and disk-based files to be shared among as many as nine 405, 435, and 445 terminal systems in a closed loop, interlinked by up to 2500 feet of cable.

In the wake of its December announcement, NTSC introduced an entry-level member of the 400 family, designated the 405. The NTSC 405 is a diskette-based terminal that accommodates one or two large-screen display stations, one printer, and can be equipped with 0.5 to 1 million bytes of diskette storage. The 405 is available with two or four diskette drives that feature single-sided recording. The 405 is upward compatible with the 445 and can also be linked with Model 405's, 435's and 445's in a resource sharing network.

In May 1980, NTSC announced its Model 435 system. This mid-sized 400 family member offers most of the hardware and software features of the larger 445, however it is restricted to a maximum of 10 megabytes of disk storage, 128K bytes of user memory, and a maximum of one or two each data stations and printers.

NTSC offers three programming languages for use with the 405, 435, and 445 terminals: ANSI COBOL, BASIC, and TAL 2000—an upgraded version of TAL II, NTSC's own business language that serves as a common bond among its products. TAL II programs can be converted to TAL 2000 programs by recompiling. NTSC also provides several utility programs for sort, edit, batch, and ➤

Single-station or clustered, programmable terminals that support up to eight display stations for operation in a shared distributed data entry and processing environment. Resource sharing is supported, permitting as many as nine terminal systems in a closed loop to share data bases and peripherals.

Hardware features include 48K to 256K bytes of user memory; 0.5 to 1 megabyte of diskette storage or 5 to 308 megabytes of disk storage; 15-inch, 2000-character display screens with typewriter or data entry keyboards; 70-, 144- or 180-cps bi-directional printers; 300- and 600-lpm line printers; cartridge tape backup for disk storage; and industry-compatible tape drives. Software features include TAL-2000, ANSI COBOL, and BASIC languages, utilities, and emulators. Asynchronous or synchronous BSC or SDLC communications are supported with data rates of up to 9600 bps.

A typical 445 system with 128K bytes of memory, 10 megabyte disk drive, high speed processor with communications, four display stations and a 180 cps printer sells for \$43,440 or leases for \$1,321 on a 3-year lease.

A 405 system with 48K bytes of memory, .5 megabytes of diskette storage, one 12-inch display, communications and a 144 cps printer sells for \$11,200 and leases for \$426 on a 3-year lease.

CHARACTERISTICS

VENDOR: Northern Telecom Systems Corporation (NTSC), P.O. Box 1222, Minneapolis, MN 55440. Telephone (612) 932-8000.

DATE OF ANNOUNCEMENT: Model 445—December 1977; Model 405—January 1978; Model 435—May, 1980.

DATE OF FIRST DELIVERY: Models 445 and 405—third quarter 1978.

NUMBER DELIVERED TO DATE: Information not available.

SERVICED BY: NTSC at over 175 locations.

MODELS

The Model 435 and 445 Distributed Data Entry and Processing System are shared-processor terminals with multiple display stations.

The Model 445's processor is available with 64K to 256K bytes of memory in 32K-byte increments and accommodates ➤

Northern Telecom 405, 435, and 445 Distributed Data Entry/Processing Systems

▷ other operations. Also, several communications packages are available, including IBM HASP, 3270, and 3774 (SDLC) emulators.

The NTSC 445 and 435 are equipped with an integral, high-speed cartridge tape drive for fast disk backup, software loading, and special disk files. The 3M-type cartridge drive can copy the entire contents of a 5.76-million-character disk in less than 7 minutes. Further security is provided by the Guardian option, a hardware/software feature that automatically dumps the contents of memory to disk in the case of a power failure or inadvertent power-down and automatically restores the contents of memory when power returns. Guardian's parity option detects memory parity errors and displays the memory address and program where they occurred.

USER REACTION

Datapro's 1980 computer survey yielded nine responses from users of Northern Telecom 405, 410, 440 and 445 systems. These were not tabulated as part of the computer survey but we retained the responses for use in reports such as this. These users had a total of 69 systems installed. Most of the systems had been installed over two years. The ratings assigned are as follows:

	Excellent	Good	Fair	Poor	
Overall satisfaction	0	6	2	1	2.5
Ease of operation	2	3	4	0	2.7
Hardware reliability	3	4	1	1	3.0
Ease of programming	1	5	2	0	2.8
Maintenance service	1	6	1	0	3.0
Technical support	1	4	2	1	2.7

*Weighted average on a scale of 4.0 for excellent.

On the plus side of comments checked, four users checked that users were happy with the response time, and also that the system was easy to expand and reconfigure. An equal number however checked that the system proposed by the vendor was too small and had to be expanded, and also that delivery of the equipment was late.

Six users checked that they would recommend this system to another user in the same situation. Three checked that they would not. □

▶ one to eight keyboard/display stations plus one to eight printers. The printer mix can be one to eight Sprinter printers or one to six Sprinter printers plus one 300-lpm Strider belt printer and either a second Strider printer or a 600-lpm drum printer.

The Model 435's processor is available with 64Kb to 128Kb of memory and accommodates only one or two keystations plus one or two printers. It is also limited to only 5 or 10 megabytes of internal disk storage.

Both processor models contain an integral high-speed cartridge tape drive for disk backup. Both are available with 5 or 10 million bytes of cartridge disk storage. The 445 can accommodate an additional 10 or to 298 million bytes of

disk storage for a maximum disk storage capacity of 308 million bytes. To both the 435 and 445 an external cassette or diskette drive can be added as well as a 9-track, 800- or 1600- bpi tape drive. Three communications ports are provided for connection to independent communications facilities.

The Model 405 Distributed Data Entry and Processing System is a shared-processor terminal with one or two display stations and one printer. The 405 control unit is available with 48K or 64K bytes of memory and two or four single-sided diskette drives. The controller accommodates a 9-track, 800- or 1600-bpi magnetic tape drive and one Sprinter, Strider, or line printer. Two communication ports are provided for connection to a communications facility.

NTSC's resource sharing feature is a "local" network feature that permits multiple 435, 445 and 405 systems to be linked together via cable connections in a closed-loop, SDLC-based network. Up to 9 NTSC 445, 435, and 405 systems can be attached by cables up to 2500 feet in length.

TRANSMISSION SPECIFICATIONS

Transmission is asynchronous or synchronous in the half- or full-duplex mode. Asynchronous rates range from 37.5 to 9600 bits/second. Synchronous interfaces are available at 600 to 9600 bits/second for BSC or SDLC protocol. The 8-level ASCII (with parity) or EBCDIC transmission code can be specified for synchronous operation. The 8-level, 10- or 11-unit ASCII code is used for asynchronous operation. Autodial is available for synchronous operation over dial-up lines. NTSC provides its own 201 B/C-type and 202C-type modems for use over dial-up or private lines at 1200 or 2400 bps. Dial-up models are available with or without the autodial feature. Registered protective circuitry is available on uncertified modems. NTSC's Model 2240 is available as a 2400 bps certified modem.

Model 405 is equipped with two communication ports. Model 445 is equipped with three RS-232-C communications ports and can accommodate any two communications adapters.

SOFTWARE

NTSC software for Models 405, 435, and 445 include TAL 2000, BASIC, and ANSI COBOL programming languages; utilities; and communications software.

TAL 2000, an expanded version of TAL II, is designed for use with Models 405, 435, and 445. Design enhancements over TAL II include screen formats; data storage locations; I/O buffer capacity; program overlays, I/O features; and clocking, security, and logging support features.

Screen formats are designed for a 1920-character screen and can be processed by the TAL 2000 Assembler. Data storage locations provide almost the same capacity and are used about the same as with TAL II. A key feature of TAL 2000 is the use of four general storage locations in place of the memory page/byte addressing of TAL II. The four are 1) a 22-byte display area (previously used as accumulator), 2) a 1920-byte screen storage area, 3) an I/O buffer area with user defined length and location, and 4) all memory that is not used by the TAL 2000 program.

TAL 2000 supports larger records than TAL II. Record length can range up to 4K bytes. The I/O buffer can reside in any memory location (including the screen) that is not used by the TAL 2000 program. Buffer length and location can be altered as often as necessary during program execution. Overlay processing is more efficient with TAL 2000 than with TAL II. Program load modules include the disk address of each overlay, precluding the need to perform a program ▶

Northern Telecom 405, 435, and 445 Distributed Data Entry/Processing Systems

► file search for a specific overlay. The disk address of the specific overlay is used to call the named overlay directly. Up to 10 logical devices can be specified.

TAL 2000 supports four access methods: sequential (SAM), relative (RELAM), indexed (IAM), and indexed sequential (ISAM). ISAM features multiple key (up to 11) and duplicate key access. Also, ISAM files can be read sequentially by key. TAL 2000 features enhanced file access methods implemented via restructured read commands. Five read commands include Read Indexed (RDI), Read Next Key (RDN), Read Relative (RDR), Read Sequential (RDS), and Read Indexed Sequential (RDX). Also, records can be locked in all file types, rather than only some types or with TAL II. Locking a file precludes a user at another terminal (in the resource sharing configuration) from altering the contents of a record while it is being accessed by the terminal program. Spooled files are treated as input devices. The Spool Wait command (new) suspends TAL program execution while waiting for more information to be written to a spooled file. After the information has been written, program execution is resumed. The command requires no operator intervention and does not unreasonably burden the processor. The TAL 2000 program can access the system clocks and calendar to provide time/date stamping on output. The TAL 2000 program can test user ID to determine authorization for file access or execution of a particular sequence of operation within a TAL program. Messages can be written to the system log directly from a TAL 2000 program for later retrieval.

NTSC *BASIC* features sequential and direct file access; all of the common algebraic operators, including arithmetic, relational, concatenation, logical, and others; exponents (to a power of +62 and -62); three-dimensional arrays (with no limit on the number of array elements except available memory size); floating point (with single precision numbers up to 12 digits); trigonometric functions; logarithms; and square roots. Program logic is governed by such statements as If, Else, O, Go To and On, and Go-Sub (for conditional branching or for BASIC subroutine linkage).

NTSC's interactive *COBOL* is a subset of ANSI COBOL and features the four basic program divisions; Identification, Environment, Data, and Procedure. Random, indexed, and sequential file access is supported, plus program segmentation (overlays), subscripting, numeric editing, figurative constants (zeros, spaces, high/low values), and other fundamental language statements common to ANSI COBOL. NTSC COBOL is display oriented and can be used to create data entry programs at the display station. Data entry requirements such as displaying formats for keying data into the screen, accepting and editing data keyed by the operator, and displaying data on the screen that has been retrieved from system files or calculated by the COBOL program, are supported. Features include an alarm statement for keying-error recognition and highlighting attributes for dual intensity. Foreground data entry operations on several display stations concurrently with execution of utilities or a separate noninteractive COBOL program running in the background (such as report printing or transmitting data to a host computer), is supported. COBOL programs can interact with one another. Up to 90 characters of memory can be shared by all displays, and documents can be keyed to batch number and date.

COMPONENTS

DISPLAY STATIONS: A 15-inch (diagonal measurement) CRT display unit for use with terminal models 405, 435 and 445. It provides a viewing area of 10.4 inches wide by 7.75 inches high. The display arrangement is 24 lines of 80 characters each for data, plus a 25th line of 80 characters for status information for a total display capacity of 2000 characters. A character set of 64 or 96 (optional) symbols

including upper case and lower case (optional) alphabets, numerics, and special symbols is displayed in green (P42 phosphor). Each character is formed via a 7-by-9 dot matrix within a 7-by-12 dot character cell to allow for lower case descenders. The display screen is equipped with an anti-glare shield.

The typewriter and data entry style keyboards are detachable. Each includes a 10-key numeric pad, 10 program function keys, and full cursor control keys. The keyboards are designed for IBM 3270 compatibility.

FIXED DISK STORAGE (Model 435): Storage capacities of 5.3 and 10.6 million bytes are available in the controller cabinet. Specifications for the 5.3 and 10.6 megabit drives are given below.

FIXED DISK STORAGE (Model 445): Storage capacities of 5.3 and 10.6 million bytes are available in the controller cabinet accommodates storage capacities of 5.3 or 10.6 million bytes. A second controller cabinet is required to house the second 10.6 million byte drive for a 21.2-million byte installation. An 80-million byte installation requires a 10.6 million byte drive and a separate 74.5 million byte drive housed in a separate cabinet. Specifications for the 5.3- and 10.6-million-byte drives are: average seek time—50 milliseconds; average rotational delay—12.5 milliseconds; and data transfer rate—625K bytes/second. Specifications for the 74.5 million-byte drive are: average seek time—30 milliseconds; average rotational delay—8.3 milliseconds; data transfer rate—1.2 megabytes per second.

CARTRIDGE TAPE DRIVE: The drive accommodates a 3M-type, 4-track cartridge containing 300 feet of 0.25 inch magnetic tape. The drive has a read/write speed of 60 inches/second and a recording density of 3200 bits/inch. The data storage capacity is 5.76 million characters. Data is transferred at 24,000 characters/second and is recorded serially on each of the four tracks; tape direction is reversed at the end of each track and recording is performed in the opposite direction.

DISKETTE STORAGE: Each drive accommodates an IBM 3740-compatible diskette. The diskettes are rotated at 360 rpm for an average rotational delay of 83 milliseconds. Positioning time is 2.5 milliseconds per track. Seek time is 27.5 milliseconds track-to-track, 93 milliseconds average, and 218 milliseconds maximum. The standard data transfer rate is 31,250 bytes/second.

Diskettes are recorded via the NTSC format, which packs diskette data. An NTSC utility program converts between IBM 3740 and NTSC formats. The IBM 3740 format, also used with other NTSC 300 and 400 series units, organizes the diskette into 74 data tracks, 2 spare tracks, and 1 index track. Each track is divided into 26 sectors, and each sector into 128 bytes. Models 445 and 405 record single-sided, standard density diskettes. Diskette data storage capacity (NTSC format) is 242,944 bytes for standard recording density.

COMPUTER TAPE DRIVES: Available tape formats are 9-track, 800 bits/inch; or 9-track, 1600 bits/inch. Both models record data on 1/2-inch tape in industry-compatible formats. Each of these computer-compatible tape drives is a separate, desk-top unit with a read/write speed of 12.5 inches/second. Rewind speed is 40 inches/second. The tape drives are manufactured by Wangco, and each accommodates an 8.5-inch reel (1200 feet).

BELT AND LINE PRINTERS: The belt printer, called Strider and produced by General Electric as the TerminiNet 340, is rated at 300 lines per minute and provides 132 print positions. The printer provides a standard character set of 64

Northern Telecom 405, 435, and 445 Distributed Data Entry/Processing Systems

► ASCII characters and accommodates 6-part continuous, pin-fed forms from 3 to 15 inches wide via adjustable tractor feed. Horizontal and vertical spacing is 10 characters per inch and 6 lines per inch, respectively.

The line printer, a drum printer produced by Data Printer, is rated at 600 lines per minute and provides 132 print positions and a standard 64-character print set. Horizontal and vertical spacing is 10 characters per inch and 6 or 8 (optional) lines per inch. The printer accommodates 6-part, pin-fed continuous forms from 3½ to 19½ inches wide.

SPRINTER SERIAL PRINTERS: Three models of bidirectional impact matrix printers provide rated speeds of 72, 144, and 180 cps with 132 print columns. Each is controlled via an integral microprocessor with 5K bytes of memory. The printers feature a standard 64-character set of ASCII symbols (each formed via a 7-by-7 dot matrix), a cartridge ribbon, and "snap-out" tractor pin or friction feed mechanisms. The printers accommodate 6-part continuous feed forms from 2 to 14⅞ inches wide via tractor feed or 4 to 4⅞ inches wide via tear-bar tractor feed. The head position is adjustable for paper thickness. Standard horizontal and vertical spacing is 10 characters/inch and 6 lines/inch. Optional spacing provides 16½ characters/inch horizontally and/or 8 lines/inch vertically. A re-inking mechanism extends ribbon life. Vertical slewing at high speed over blank lines is standard. A horizontal slew option performs high-speed skipping over blank fields. Each model is equipped with a 12-key function pad for setting margin widths, forms length, vertical and horizontal tab positions; for initiating commands such as "top-of-form"; and for setting forms alignment for pre-printed forms. The keys can also initiate generation of two diagnostic test patterns. One is a continuous printout of the character set on 132-character lines; the other is alternate X's and O's on 16-character lines.

PRICING

The NTSC intelligent terminals are available for purchase or on lease. Lease arrangements are available for one, three or four years for all models. NTSC declined to provide detailed component pricing but supplied the configuration pricing shown below.

Maintenance is priced separately for both leased and purchased equipment. Prime shift maintenance is provided;

however, service for 24 hours per day 7 days per week is available on a negotiable basis. A purchase credit plan is available to convert from lease to purchase.

The investment tax credit is passed on to the customer for purchased equipment only.

NTSC provides training at its own training centers. NTSC also offers on-site training at a customer location for a minimum of ten persons and in major cities as required.

	Monthly Charge*			Monthly Maint.
	1-year Lease	3-year Lease	Purchase	
MODEL 435				
64kb memory, 5 meg disk, 1 data station, 1 72 cps Sprinter & communication adapter	\$ 950	\$ 775	\$20,500	\$243
64kb memory, 10 meg disk, 2 data stations, 1 144 cps Sprinter & communication adapter	1,099	899	24,260	280
128kb memory, 10 meg disk, 2 data stations, 1 144 cps Sprinter & communications adapter	1,133	306	25,380	306
MODEL 445				
128K memory, 10 meg disk, cartridge, high speed processor, 4 display, comm and 180 cps printer	1,580	1,321	43,440	350
256K memory, 84.5 meg disk, cartridge, high speed processor, 8 display, comm. and 300 lpm printer	3,099	2,579	86,915	704
MODEL 405				
48K memory, .5 meg diskette storage, 1 12" display, comm., 144 cps printer	511	426	11,200	129
64K memory, 1 meg diskette storage, comm., 1 15" display, 144 cps printer	644	532	14,550	157
64K memory, 1 meg diskette storage, comm., 2 15" display, 180 cps printer	773	629	19,450	178

*Includes maintenance. ■