Model 771
Intelligent Terminal

TEXAS INSTRUMENTS

Model 771 Intelligent Terminal

The Model 771 Intelligent Terminal is a single-station, video terminal system employing diskette storage and supporting batch and remote data entry communications to a host computer or another Series 700 family member. The system provides a versatile, low-cost solution to problems associated with distributed processing applications such as:

- Source data entry and update
- Local file inquiry and response
- Local file maintenance
- Data communications
- Local printing
- Local data preprocessing.

With processing capabilities based on TI's 16-bit TMS 9900 microprocessor, the 771 terminal incorporates a 1920-character video display, dual diskette drives, 24K bytes of random-access user memory, integral communications, and a typewriter-style keyboard in a functionally designed unit. The user-oriented keyboard features separate numeric pad, cursor control pad, eight programmable function keys and eight terminal-status indicator lights. Also included is a self-test feature to allow operator verification of terminal operation.

An alternate configuration provides a built-in 30-cps, 80-column thermal printer with a 96 ASCII character set for a totally integrated system.

For applications requiring multicopy printing, the TI Model 810 150-cps printer is available as an external option with the 771 terminal.

Figure 1. Model 771 Intelligent Terminal

TERMINAL EXECUTIVE

System operation on the Model 771 is supported by a multitasking executive. This executive provides operator communications, basic file management, task scheduling, and device input/output. The memory-resident executive does not require a dedicated diskette drive.

TPL 700

TPL 700 is the application programming language developed specifically for VDT-oriented data entry and local preprocessing. It combines a powerful fill-in-the-blanks forms package for data-entry applications, with a high-level, English-like procedure language for data processing applications. The two modules may be used separately, or the resulting object programs can be merged or linked into a total system. Thus, the advantages of each module can be realized in any type of applications task.

Communications

Optional industry-compatible communications are available for the Model 771 which supports two ports for remote communications via modems. One of the two ports may be used for serial communication to local EIA devices. The 771 may act as a remote terminal to a host computer or may act as host to other remote 771 systems, Model 774 systems, or Model 770s. Automatic dialing is supported. Several communications packages are offered that enable the Model 771 to communicate with host computers concurrently with practical use of diskette drives, the video display terminal, and optional serial printer or internal thermal printer.

Options—

Graphics Kit

The 771's graphics option is an additional video display character set providing characters for drawing lines and graphs or creating special enlarged characters. This capability permits the creation of display formats that closely match printed forms, improving operator acceptance.

Printer Kits

The Model 771 Intelligent Terminal supports the 150-cps Model 810A serial printer, which is attached to the 771 via the local serial communications port. The Model 810A Printer kit incudes the Model 810 Printer, internal 771 interface, printer ribbon, and 3.6-meter (12-foot) cable. Standard printer features provided with the kit are 150-cps bidirectional printing, 132 characters per line, 96-character ASCII set, standard character spacing (ten characters per inch), slanted ribbon for extended ribbon life, six or eight vertical lines per inch (which is software or hardware selectable), and printing of up to six-part, high-quality printed forms. In addition, each is equipped with a quietized enclosure, which effectively reduces the operating noise of the printer. An imbedded TI microprocessor, other MOS/LSI integrated circuits, and TI-built wire matrix printhead are the keys to performance and reliable, long-life operation.

The options package provided with the Model 810B Printer kit consists of the basic kit described above with the addition of compressed print and vertical forms control features. The compressed print feature allows the operator or the application program to select a character spacing of 10

characters per inch or 16.5 characters per inch. A full 132-column width may be printed on a 203.2-mm (8-inch) line length. The vertical forms control feature provides up to eight separate vertical formats that can be programmed and selected by either the operator or the application program.

Internal Modem Kits

Available as an internal option on the 771 for remote communications are the following modem kits:

- Asynchronous 1200 bps (Bell 202S and T compatible)
  — 202 type, with auto-answer for switched network operation
  — 202 type, same as above, with auto-call unit
  — 202 type, for leased line operation

- Synchronous 2400 bps (Bell 201C compatible)
  — 201 type, with auto-answer for switched network operation
  — 201 type, same as above, with auto-call unit
  — 201 type, for leased line operation

Kits include internal 771 interface, modem and auto-call unit (if specified), and required cable with proper termination. The auto-call unit supports pulse or tone mode. A Bell compatible CBS1001F Data Access Arrangement is required for switched network operation.

Interface Kit for External Modem

For use with Bell-compatible modems and Bell-compatible 801A6 and 801C6 auto-call units, located external to the 771 for remote

communications, are the following interface kits:

- Asynchronous up to 300 bps
  — 103/113 Modem
  — 103/113 Modem with auto-call unit
- Asynchronous 1200 bps
  — 202 Modem
  — 202 Modem with auto-call unit
- Synchronous 2400/4800 bps
  — 201/208 Modem
  — 201/208 Modem with auto-call unit

Kits include 771 modem interface and auto-call unit interface (if specified), and required cables with proper termination for connection to external units. The modem interfaces and auto-call unit interfaces meet EIA specifications RS-232-C and RS-366, respectively.

Conversion Kit (Model 770 to Model 771)

A dual diskette drive upgrade kit is available for the Model 770 Intelligent Terminal. This option kit, which is designed for field installation, allows the Model 770 with minicartridge mass storage to be converted to a Model 771 with diskette mass storage. Included in the kit are memory and controller boards to provide the converted system with 64K bytes of memory (24K bytes of user memory), two diskette drives in a tabletop chassis, two cartridge transport covers, and miscellaneous hardware and cables to perform the conversion. Also included is a *Model 771 Operator's Instruction Manual* and a diskette with the system test. After conversion has been performed, the system will have all of the standard features, capabilities, and field-installable options of the Model 771 Intelligent Terminal.
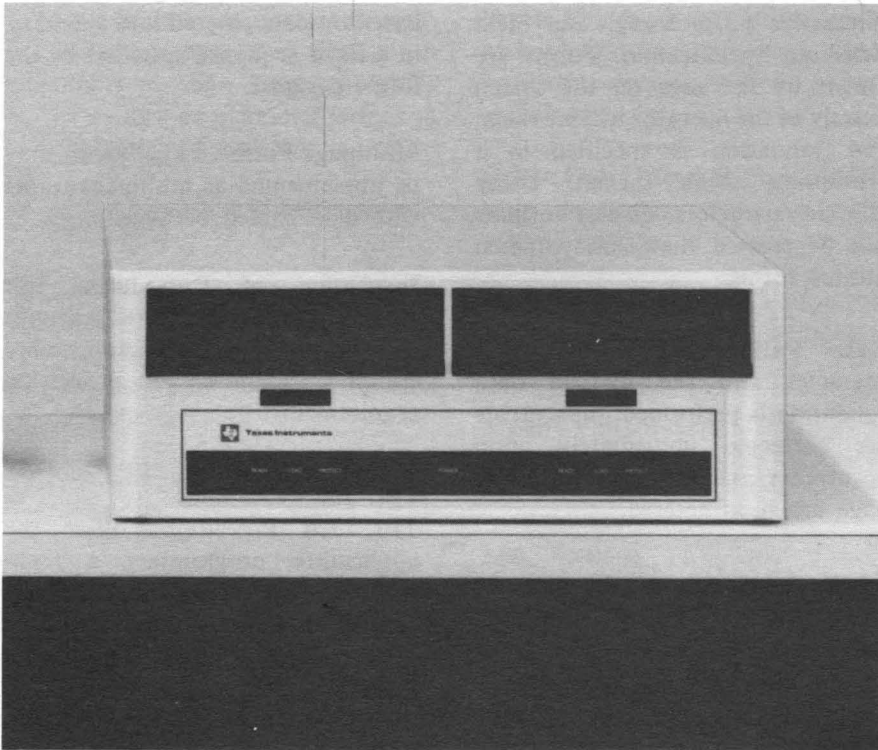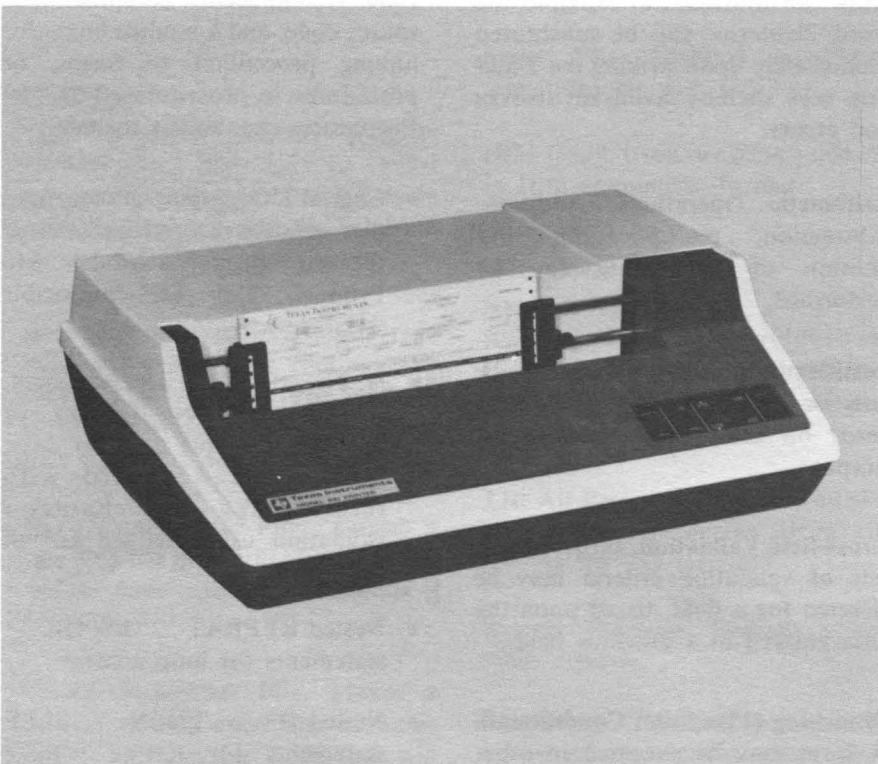
Figure 2. Dual Diskette System

Figure 3. Model 810 Printer

STANDARD CONFIGURATIONS

Model 771/1

- 64K-byte memory (24K bytes of user memory)

- 1920-character video display with 96 ASCII character set

- Typewriter-style keyboard (U.S.)

- Dual diskette drives

- One diskette with operating system (software version only) and system test

- Operator's instruction manual

Model 771/2

- 64K-byte memory (24K bytes of user memory)

- 1920-character video display with 96 ASCII character set

- Typewriter-style keyboard (U.S.)

- Dual diskette drives

- One diskette with operating system (software version only) and system test

- Operator's instruction manual

- Integral 30-cps, 80-column thermal printer

Software

The software available for use with the Texas Instruments Model 771 Intelligent Terminal provides a complete set of tools for fast, easy development of application software on the 771. The software makes use of the 771 memory-resident, multitasking executive to provide user-oriented support of the following:

- TPL 700—A high-level language specifically designed to enable source data entry and perform efficient stand-alone data processing

- Utilities—A complete set of system support and program development utilities

- Communications—Includes easily used emulators for IBM 3780, Teletype* terminals, and Texas Instruments Model 742 terminals.

User applications programs can maintain the terminal system under program control at all times, relieving the operator of tasks normally associated with the operation of a computer system.

The software system provides capability to obtain automatically a hard copy of the screen image.

TPL 700
TPL 700 Forms
TPL 700 Forms allows a non-computer-oriented operator to draw a form on the video display unit for subsequent data-entry transactions. It is not necessary to write a program. After the form is drawn, a set of field attributes, which test the operator entries for each field, are displayed in a menu fashion for selection by the form designer. TPL 700 Forms capabilities include:

Interactive Form Design and Field Attribute Specification. Forms are drawn by the user on the screen exactly as the operator will see them, and validation is specified in a prompting menu format. Using graphic characters, display formats can be created that closely match printed forms.

Data Validation. Character-by-character and field-by-field data validation is performed; thus, errors are corrected immediately upon occurrence and not after an entire page has been entered.

Range Checking. Fields may be tested to be within (or without) user-specified limits.

Table Lookup. Entered data can be compared with user-specified data.

Data Substitution. For example, the word *Tennessee* can be substituted immediately upon striking the *T* and skip keys, thereby saving key strokes and errors.

Arithmetic Operations. Addition, subtraction, multiplication, and division of field data can be performed.

Justification. Numeric data may be left- or right-justified with leading zeros on the display and in the output.

Cross-field Validation. Either of two sets of validation criteria may be selected for a field, based upon the data entered in a previous field.

Branching (Fixed and Conditional). A form may be executed in other than a left-to-right, top-to-bottom manner. Form execution may be based on data entered into a field or in a fixed sequence specified by the forms designer.

Multipage Forms. Large forms may be implemented as multipage forms with data passed between pages.

Invocation of Procedures. For special cases, procedure language code may be invoked to handle more complex validation or processing requirements.

TPL 700 Procedures
TPL 700 Procedures offers the application programmer a high-level, English-like language for easy generation, compilation, and testing of processing programs and complex field-validation programs directly on the 771. It is fully supported with an interactive general-purpose editor for generation and editing of source code, a compiler for compilation of source code, and a module linker for linking procedures to forms, or procedures to procedures. TPL 700 Procedures capabilities include:

- Logical I/O support of sequential files, relative record files, internal thermal printer, Model 810 Printers, and EIA-compatible serial devices

- A powerful ENTER statement, which provides display of operator prompts or other data, input from keyboard with reformatting and character validation using defined sets of characters

- Nested REPEAT . . . UNTIL . . . statements for loop control

- Nested IF . . . THEN . . . ELSE statements for testing with a choice of six different relational operators

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- Data transfers with reformatting, including character strings to binary numbers, binary numbers to strings, or character strings to character strings

- Single and triple precision integer arithmetic

- Generation of source using the interactive 771 text editor utility, which provides scrolling, insert and delete of character or line, tabbing, and full cursor control

- The TPL 700 compiler generates complete source listing with syntax-error reporting

- Record level locking to allow multiple programs to share common files

- Chaining by programs to other forms or procedures in a fixed or operator-selected sequence.

Utilities
The following general purpose utilities are provided to assist programmers in maintaining files on diskette. Utilities are selected from menus and are menu-driven.

Backup and Initialize. Initializes a diskette, deletes all files on an initialized diskette, copies and or verifies individual files or groups of files from one diskette to another.

Copy/Concatenate Files. Copies a specified file to another file or copies up to three specified files into a single file.

Create Sequential File. Makes a volume catalog entry and allocates diskette storage for a file that will accommodate blank-compressed, variable-length, sequential records.

Create Relative Record File. Creates a random-access file in a given volume using record length specified.

Delete File. Deletes the specified file from the volume and updates the volume catalog.

Modify File Name. Changes the name of a file in volume catalog to a new name.

Modify File Protection. Changes the type of protection, such as "delete" or "write", for a special file.

List Catalog. Displays diskette volume catalog giving ID, description, amount of diskette remaining, and file information (name, type, and amount of diskette storage used).

Modify Volume Name. Changes the name of a specified volume.

Show File. Displays a selected sequential file with scrolling.

IBM Copy. Used to create a diskette in IBM-compatible format.

System Control
System control provides the operator with information necessary to determine the operating status of the 771 system.

List All Programs. Provides a list of the currently active programs serving the 771 terminal.

System Start-up. Reloads system from diskette.

List Status. Provides the operating status of the configuration along with accumulated keystroke statistics.

Compatibility
The Model 771 Intelligent Terminal is a member of the Series 700 Distributed Processing Systems family, which includes the Model 770 Intelligent Terminal, the Model 771 Intelligent Terminal, and the Model 774 Intelligent Terminal System. The 770 is a single-station terminal employing minicartridge tape storage; the 771 is a single-station terminal with diskette storage; and the 774 is a multistation intelligent terminal system offering diskette and/or hard disk storage.

Users of Series 700 systems may easily and efficiently move from one member of the family group to another because of the functional and operational compatibility between systems. Compatibility offers: file structure which is addressed by all systems; identical keyboard layout; the same menu approach to program development; and familial sharing of TPL700, the programming language used by all systems. Only a minimum of time and effort is necessary when changing from one Series 700 system to another or when mixing models to fulfill varying needs at different locations. The family gives a user a direct path to total systems growth, growth with minimum effort in the areas that count:

- **Operator.** Same keyboard layout on all three systems which allows operators the flexibility to move from one system to another with a minimum of cross-training

- **Programmer.** Common TPL700 programming language on all three systems for easy operation and consistency. Instruction sets are virtually identical with enhancements for diskette or hard disk systems to take full advantage of these media

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- **TPL Source Code.** Source code transportability between the 770 and 771 by means of utility software and EIA interface cable (P/N 0993210-0001); diskettes directly compatible between the 771 and 774

- **Data Transportability.** Data file transportability between 770 and 771 using standard communication emulator; diskettes directly compatible between the 771 and 774.

Communications
Model 771
Communications
Several communications packages are offered that enable the Model 771 to communicate with host computers. An interactive utility program is provided with each package, which allows a user to specify the particular set of communications characteristics required by the host computer. This special set of characteristics is recorded in a diskette file so that each time the communications program is loaded into memory these characteristics may be selected.

IBM 3780 Emulator
The IBM 3780 Emulator package enables a Model 771 with a synchronous communication kit option to communicate with a host computer, other 771s, 770s, 774s, or other terminals with corresponding emulators using IBM Binary Synchronous Communications protocol. The emulator is controlled by a file of commands. Before using the emulator an operator can build a command file from a configuration menu. Alternatively, the command file may be prepared using the text editor, or by a user program. The entire emulator may be activated by a user program. Special features include support of transparency mode, destination device selection, and space compression/decompression. If the auto-call unit is selected, the 771 can operate in an unattended mode by automatically dialing user-specified telephone numbers.

TTY*Emulator
The TTY Emulator package enables the Model 771 to communicate with time-sharing services and host computers that use TTY protocol, half- or full-duplex up to 1200 bps. The operator may communicate interactively using the keyboard and display or may cause data to be transmitted from or recorded onto user-specified files on the diskettes. The terminal will also operate in an unattended mode and automatically answer a phone call from a host computer.

742 Emulator
The 742 Emulator package enables the Model 771 to communicate with the Terminal Polling System offered by TI, using an asynchronous block protocol. The TPS will automatically poll 771 and 742 terminals via the switched telephone network, and record the received data on IBM-compatible magnetic tape. This system allows the tasks of data collection and distribution to be removed from the host computer, resulting in a completely independent terminal network.

Software Kits
Software is available for the Model 771 in the following packages.

System Software Kit
Included in the standard configuration with software, this kit consists of (1) the system diskette containing the memory-resident system executive; (2) the program development diskette containing the TPL 700 Forms generator/editor, text editor, TPL compiler, and TPL module linker; (3) the utility diskette containing file management and system control utilities; and (4) the library diskette containing commonly used functional subroutines which are linkable to TPL 700 Procedures and/or Forms.

IBM 3780 Communications Kit
The IBM 3780 Communications Kit includes a user's manual and diskette with the emulator and parameter-selection utility program.
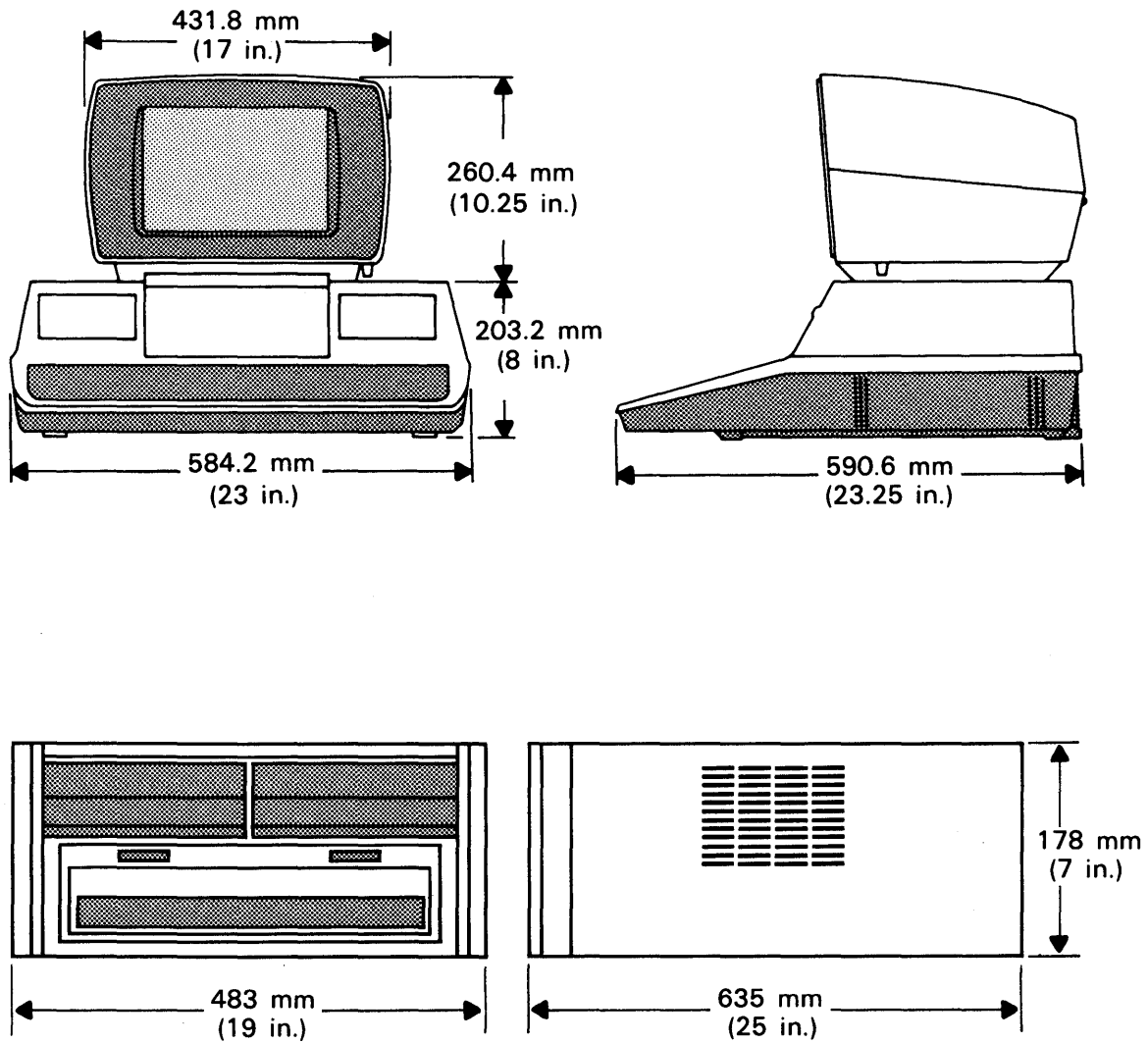
TTY Communications Kit
The TTY Communications Kit includes a user's manual and diskette that contains both the TTY emulator and the TTY parameter-selection utility program.

742 Communications Kit
The 742 Communications kit includes a user's manual and diskette that contains both the 742 emulator and the 742 parameter-selection utility program.

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Overall Dimensions

431.8 mm
(17 in.)

260.4 mm
(10.25 in.)

203.2 mm
(8 in.)

584.2 mm
(23 in.)

590.6 mm
(23.25 in.)

178 mm
(7 in.)

483 mm
(19 in.)

635 mm
(25 in.)

Model 771 Intelligent Terminal Configurator

771/1	OR	771/2
64K-byte Memory Video Display Unit Diskette Drives (2) Keyboard Diskette with Operating System (software version only) and system test Operator's Instruction Manual		Identical to Model 1 with the addition of: Internal Thermal Printer Printing paper (one 30-m, 100-ft. roll)

OPTIONS

VIDEO DISPLAY

- Graphics Kit

AUXILIARY I/O PORT OPTIONS

Select Only One
- Interface kit for external asynchronous EIA devices
- Interface kit for external synchronous EIA devices
- Interface kit for external 103/113 modem
- Interface kit for external 202 modem
- Interface kit for external 201/208 modem
- External 810A printer w/interface
- External 810B printer w/options and interface

Printer kit includes 3.6 m (12 ft.) cable.

All interface kits will operate at speeds up to 9600 bps and include the appropriate cable (1.8 m; 6 ft.)

PRIMARY I/O PORT OPTIONS

Select Only One

103/113-compatible Communications Kits for asynchronous speeds up to 300 bps
- Interface kit for external 103/113 modem
- Interface kit for external 103/113 modem and external 801 auto-call unit

202-compatible Communications Kits for asynchronous speeds up to 1200 bps
- Interface kit for external 202 modem
- Interface kit for external 202 modem and external 801 auto-call unit
- Internal 202 modem kit w/auto-answer—for D.D.D. network
- Internal 202 modem kit w/auto-answer and internal 801 auto-call unit—for D.D.D. network
- Internal 202 modem kit for leased line

201/208 Compatible Communications Kits for synchronous speeds up to 4800 bps
- Interface kit for external 201/208 modem
- Interface kit for external 201/208 modem and external 801 auto-call unit
- Internal 201 modem kit w/auto-answer—for D.D.D. network
- Internal 201 modem kit w/auto-answer and internal 801 auto-call unit—for D.D.D. network
- Internal 201 modem kit for leased line

All modem kits include appropriate interface kit.
All kits include appropriate cable(s) 1.8 m (6 ft.) long.

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Specifications

Terminal

Power Requirements
Voltage—115 Vac, 50/60 Hz, 1
Power—250 W max.
Power Cord Length—1.8 m
(6 ft.)

Physical Dimensions
Size—457.2 mm H ×
584.2 mm W × 590.6 mm D
(18 in. × 23 in. × 23.25 in.)
Weight—29.25 kg (65 lbs.) (average)

Environmental (Operating)
Temperature—10°C to 35°C
Relative Humidity—20% to 80%
Altitude—to 2400 m (8000 ft.)

Keyboard
Number of Keys—88
Rollover—N-key
Layout—Typewriter
Clusters—Separate for numeric
pad, cursor control pad,
and eight programmable
function keys
Lights—Eight terminal
status indicator lights

Cathode Ray Tube
Screen Size—305 mm
diagonal
Screen Format—24 lines × 80
characters per line
Screen Viewing Area—
150 mm H × 230 mm W
Refresh Rate—50 or 60 Hz
Intensity—High, Low, and Off
(for nondisplayed characters)
Character Set—96 ASCII
Character Dot Matrix—5 × 7
upper case, 5 × 5 lower case
Controls—Brightness
Graphics Option—32 graphic
characters

Audio Alarm
Frequency—3200 Hz

Diskette Drives
Capacity—256,256 bytes
formatted
Transfer Rate—250K bps
Access Time—8 ms track to
track; 8 ms head stabili-
zation; 35 ms head load; 167
ms maximum rotational
latency
Rotational Speed—360 rpm
Densities—3200 bpi (3200
bits/25.4 mm) 48 tracks/in.
(1.5 tracks/mm); inside
track; 131 (3328) formatted
Diskette—1 recording surface;
77 tracks; 1 index mark;
26 sectors/track; 128
bytes/sector
Dimensions—178 mm H ×
483 mm W × 635 mm D (19
in. × 7 in. × 25 in.)
Weight—20.4 kg (45 lbs.)
Power (Max.)—2A 115 Vac

Integral Printer
Printing Method—Matrix
thermal
Speed—30 cps printing, 60
cps spacing
Paper Drive—Friction feed
Character Set—96 ASCII
Characters per Line—80
Characters Per Line—10
(10 c/25.4 mm)
Lines per Inch—6
(6 1/25.4 mm)
Paper Capacity—31 m (100 ft.)
roll

Communications
Asynchronous—Up to 1200
bps using 8-bit ASCII code
supported by internal or
external modem and auto-
call unit options
Synchronous—2400 to 4800
bps using 8-bit EBCDIC code,
BSC protocol with CRC
checking or supported by
internal and external modem
and auto-call unit options.

Model 810 Printer
Printing Method—Matrix
impact, bidirectional
Speed—150 cps (64 lpm at
132 char/line)
Paper drive—Tractor pin feed
Characters per Line—80
Characters per Inch—10
(10 c/25.4 mm)
Lines per Inch—6 or 8 (6 or 8
1/25.4 mm) selectable
Number of Copies—Up to five,
plus original
Character Set—96 ASCII
(Standard)
Size—203.2 mm H × 654 mm
W × 508 mm D (8 in. ×
25.75 in. × 20 in.)
Power (Max.)—5A 115-120 Vac

Option Package for Model 810
Characters per Inch—10 or 16.5
(10 or 16.5 c/25.4 mm)
(program or switch selectable)
Vertical Forms Control—Eight
programmable formats
(program or switch selectable)

Work Station Table
Physical Dimensions—686 mm
H × 914 mm W × 762
mm D (27 in. × 36 in. ×
30 in.)

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