



# Tandy Corp/Radio Shack TRS-80 Series 4, 4P, 12, 16, 16B & 100 Microcomputers

## ■ PROFILE

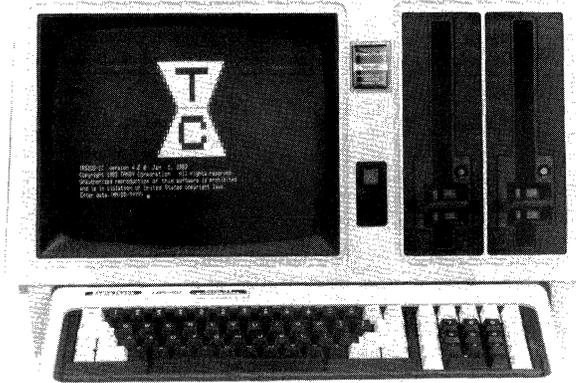
**Operating Systems** • TRSDOS disk operating system, CP/M Plus, and monitors in read-only memory support single-user interactive processing in standalone environments; multiuser TRS-XENIX disk operating system for Model 16 computer supports up to 3 concurrent users.

**Data Management** • no database management system • includes, as appropriate, file handling facilities for diskette, hard disk, and cassette tape files including IBM/TRS-80 diskette format conversion; high-level languages support single- or multiple-key indexed-sequential files • profile database management system for 12 and 16.

**Communications/Networks** • IBM 3270 and IBM 2770/2780/3741/3780 terminal emulation • communications utilities supporting access to VIDEOTEX-compatible electronic information services, Electronic Mail, and ASCII terminal communications • Radio Shack ARCNET Local Area Network for Model 12; VIS and Office Information System with multiplexers.

**Languages** • interpreter BASIC is standard on all models except 16 and 16B; compiler BASIC, COBOL, FORTRAN, Pascal MT+, CBASIC, BASCOM, BASIC compiler, and assembler optional for TRS-80 Model 12; compiler BASIC and COBOL, assembler language development system, BASCOM, Alcor Pascal, and Pascal interpreter options for TRS-80 Model 4; TRS-80 Model 16 runs TRS-80 Model 12 software plus optional 16-bit compiler COBOL; TRS-XENIX Development System provides C compiler, FORTRAN compiler, BASIC Interpreter; 16-bit assembler is standard on Model 16.

**Models** • TRS-80 Model 4 and 4P portable single-user



microcomputer system, Models 12 and 16 single-user or multiuser desktop systems with monochrome displays; Zilog Z80A microprocessor is standard on all models; Motorola MC68000 is standard on Models 16 and 16B, optional on Model 12 • TRS-80 Model 100 portable based on Intel 80C85 CMOS microprocessor • TRS-80 Models I, II, and III replaced by Models 4 and 12 • PC-1, -2, -3, and -4 Pocket Computers, Micro Color Computer, and Standard Color Computer not in this report.

**CPU** • Zilog Z80A 8-bit microprocessor on Models 4P, 4, 12, 16, and 16B at 4 MHz; 2.03 MHz on cassette-based Model 4; Intel 80C85 CMOS 8-bit microprocessor at 2.4 MHz for Model 100; Motorola MC68000 16-/32-bit CPU running at 6 MHz on Model 16 and 16B; optional on Model 12.

**Memory** • 8K- to 32K-byte RAM and 32K-byte ROM on TRS-80 Model 100 • 16K to 128K bytes for cassette-based systems and 64K- to 128K-byte RAM on disk-based TRS-80 Model 4 and 4P • 80K- to 144K-byte (8-bit mode using VisiCalc) or 80K- to 768K-byte (with MC68000 enhancement option) RAM on TRS-80 Model 12 • 128K- to 512K-byte RAM on the TRS-80 Model 16 • 256K- to 768K-byte RAM on the TRS-80 Model 16B.

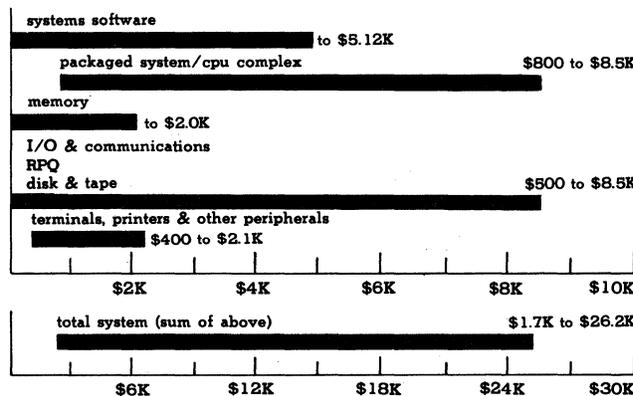
**Chassis Slots** • 4 slots on Models 16, 16B, and 12; optional 6-slot chassis card cage on Model 12; no slots on Model 100, 4 or Model 4P.

**Ports** • parallel printer port on Models 4, 4P, 12, 16, 16B, and 100; two serial RS-232C printer ports on Models 12, 16, and 16B, single serial RS-232C port on Model 100 and dual-disk version Model 4.

**Mass Storage** • all capacities quoted are formatted • no mass storage capability for cassette-based TRS-80 Model 100 • up to 736K bytes on 4 184K-byte diskette drives and up to 20M bytes on 4 5M-byte hard disk drives for TRS-80 Model 4, 2 184K-byte diskettes on 4P standard for maximum of 368K bytes • up to 4 8M bytes on 4 12M-byte hard disks and up to 5M bytes on 4 1.25M-byte diskette drives for TRS-80 Models 12, 16, and 16B.

**Terminals/Workstations** • single terminal; all models use display and keyboard for operator interaction; multiuser version of TRS-80 Models 12, 16, and 16B supports up to 3 users • TRS-80 Models 4, 12, and 16 include 12-inch CRT display, 9-inch display on 4P.

## PURCHASE PRICE RANGE hardware & software



**TANDY CORP/RADIO SHACK TRS-80 PURCHASE PRICING** bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing • **SMALL SYSTEM** is based on TRS-80 Model 100 Portable packaged system (includes CPU, 4K-byte memory, integrated keyboard, CRT and modem, and integrated BASIC, word processing), and the following options: cassette tape drive and printer • **LARGE SYSTEM** is based on TRS-80 Model 16B packaged system (includes CPU, 256K-byte main memory, Winchester hard disk, 1-diskette TRSDOS operating system, and interpreter BASIC) and the following options: extensive supporting system software, and applications software including word processing, file management, communications, and accounting; 512K-byte additional memory, 1 diskette and 3 disk drives totaling 50M bytes of storage, and 1 letter-quality dot-matrix character/graphics printer.



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### 4, 4P, 12, 16, 16B & 100 Microcomputers

#### TRS-80 PROFESSIONAL MODEL DIFFERENCES

SYSTEM MODELS	4	4P	12	16/16B	100
<b>BASIC SYSTEM UNIT</b>					
Size/Type	Desktop	Portable	Desktop	Desktop	Portable
Integral CRT, Char					320
Integral Keyboard	Fixed	Detachable	Movable	Movable	Fixed
Integral Diskette	1	2	1	1	No
<b>CPU</b>					
Zilog Z80A	Standard	Standard	Standard	Standard	
Motorola MC68000			Optional	Standard	
Intel 80C85					Standard
Clock Speed, MHz	2.0 or 4.0	4.0	4.0; 6.0	4.0; 6.0	4.0
Word Size, Bits	8	8	8; 32	8; 32	8
Data Path Width, Bits	8	8	8; 16	8; 16	8
Technology	NMOS	NMOS	NMOS	NMOS	CMOS
<b>MASS STORAGE DRIVES</b>					
Cassette	1		1	1	1
Diskette, 1.25M Bytes	1-4	2	1-4	1-4	—
Winchester, 12M Bytes	1-4		1-4	1-4	—
<b>MAXIMUM I/O PORTS</b>					
Internal Expansion	1		6	2	1
External Parallel	1	1	1	1	1
External RS-232C Serial	1		2	2	—
<b>OPERATING SYSTEMS</b>					
TRSDOS 6.0					
TRSDOS 4.1					
CP/M Plus	Yes	Yes	Yes		
LDOS	Yes	Yes			
XENIX			Yes	Yes	

**Printers** • all TRS-80 computers support at least 1 parallel printer, serial port can be used to attach additional printers on TRS-80 Models 4, 12, 16, and 16B; available printer models include a wide selection of word processing, high-speed matrix, and printer/plotter models for the TRS-80.

**First Delivery** • TRS-80 Model 100, March 1983; TRS-80 Model 4, April 1983; TRS-80 Model 12, January 1983; TRS-80 Model 16, May 1982; TRS-80 Model 16B, July 1983; TRS-80 Model 4P, November 1983.

**Systems Delivered** • over 450,000 of all TRS-80 model types, including Models I, II, and III, which are no longer actively marketed.

**Comparable Systems** • TRS-80 ranges from a business portable up to a multiuser microcomputer • over 50 different vendors sell over 100 systems in this product range • see our survey report.

**Vendor** • Radio Shack, Division of Tandy Corporation; 1300 One Tandy Center, Fort Worth, TX 76102 • 817-390-3011.

**Canada** • Radio Shack Canada; 279 Bayview Drive, P.O. Box 34000, Barrie, ONT L4M 4W5 • 705-782-6242.

**Distribution** • worldwide through over 8,700 Radio Shack retail outlets; distribution of Model 12 and 16 systems is through over 400 computer centers and additional retail outlets.

#### ■ ANALYSIS

The currently marketed Radio Shack TRS-80 microcomputer product lines can be divided into 4 groups based on component size and system type. The smallest monochrome systems, the PC-1, -2, -3, and -4 are pocket computers, which border on being programmable calculators, but with game capabilities when attached to home TVs. The 2 color computers, the Micro Color Computer and the Standard Color Computer are also designed to attach to home TVs. Although they both have

some professionally oriented word processing, spreadsheet analysis, and similar software, most of their hardware and software is oriented toward the home computer and educational markets. Since this report is focused on business and professional microcomputers, none of the above models are discussed.

The next most powerful system is Radio Shack's new cassette-based Model 100, a notebook-size portable with extensive flexibility for its size and price. Model 100 is a TRSDOS-based system with integrated word processing, graphics, Interpreter BASIC, communications, and professional scheduling packages. RAM ranges from 8K to 32K bytes; a ROM memory stores part of the operating control logic. The unit includes a 320-character display, keyboard, cassette interface, integrated modem, and serial I/O port.

The fourth group of systems is and has been the core of the Radio Shack TRS-80 product lines. The current Models 4, 4P, and 12, introduced in 1983, replace and extend Models II and III, which in turn replaced the Model I. The Model I had a short life because it emitted radio waves that disturbed other pieces of radio-sensitive equipment. It is, in fact, the system that caused the Federal government to set up radio emission standards for many types of equipment in addition to computers.

The TRS-80 Model 4 line is an 8-bit system that can run all Model III TRSDOS software without a mode change. The 4P portable is software compatible with the 4. Model 12, an 8-bit system also introduced in 1983, can run Model II TRSDOS software in its basic configuration, but also has



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an optional expansion capability (with a second 16-bit processor) that effectively field upgrades it to a Model 16-compatible multiple-mode system. The expanded Model 12 can run TRSDOS in a single-user configuration or XENIX in a multiuser configuration with diskette and/or hard disk storage. The Model 16 introduced in 1981, and Model 16B introduced in 1983, are dual-processor configurations, running TRSDOS 4.1 in single-user mode or XENIX in multiuser mode, as the user chooses. Radio Shack has announced that Models 16 and 16B are destined to become primarily XENIX systems and that it intends to announce a single-user version of XENIX in the future.

Radio Shack also supports, as an option, Models 4, 4P, 12, and 16 functioning under CP/M and Model 4 and 4P under OS single-user operating systems instead of the standard TRSDOS single-user configurations.

The Model 16 is a little more compact than the Model 12 with expansion capability within the main system unit. The Model 12, on the other hand, can extend I/O and memory to greater capacity by adding an external expansion unit not currently available to the Model 16.

The Model 16B uses the same housing and keyboard as the Model 12. It can be expanded to 768K bytes of memory, equal to that of the Model 12 with MC68000 option.

Radio Shack systems are distinctive in the microcomputer marketplace in that they are distributed only through the large Radio Shack network of retail stores. In spite of single-dealer exclusivity, Radio Shack has claimed a sizable market share for both business and home computer markets. Even IBM has multiple distribution arrangements and contends with other vendors for space on multivendor computer retail stores, department stores, and so on. Radio Shack's success is due, in part, to the fact that there were already large numbers of stores selling electronic components to end users before they entered the computer business, so that their single network is equivalent in size to multiple dealerships. Other factors are that they entered the market early with the right type of product and advertised well.

### □ Strengths

Although its exclusive marketing methods differ from other vendors, Radio Shack has shown that it knows how to successfully market microcomputer-based systems. Many computer systems are immediately available through all 8,700 Radio Shack retail outlets nationwide, and nonstocked items in their standard catalog can be quickly obtained. In addition, more than 400 Radio Shack Computer Centers market the entire TRS-80 product line with 69 percent providing complete support services as well.

The large TRS-80 user base has spurred numerous compatible products from third-party vendors, both in hardware and software areas. However, even with the activity of third-party vendors, past marketing strategy appeared to be designed to lock users into Radio Shack as the single source for software, since the operating system and disk formats were proprietary. In today's market, this is

a deviation from other manufacturers' practice of using de facto standard software from third parties. Potential difficulties have probably been avoided in view of Radio Shack's adoption of the CP/M Plus and TRS-XENIX operating systems. These operating systems will provide the opportunity for the TRS-80 user to avail himself to a large number of programs written to run under these products.

Another plus for all Radio Shack systems is the training facility offered to users. Although not unique in the industry, it can be said that few microcomputer vendors have the capacity to offer the kind of hands-on training that Radio Shack provides nationwide.

Radio Shack's cooperative venture with Datapoint in the use of ARCnet for local area networking shows some intelligence since ARCnet is one of the few LANs that is presently up and running and has a past history of successful use.

A quietly introduced yet attractive system for users interested in Model 4 capabilities in a portable is the Model 4P. Tandy claims the Model 4P is totally compatible with all Model 4 programs. It contains dual disk drives and weighs 26 pounds. Although the screen is only 9 inches (diagonal), it offers the same resolution as the Model 4.

The new Model 100 is a particularly interesting product because of the extensive features for the price and because of its complete portability. Since it can be powered from both batteries and standard electrical outlets, it is portable in every sense of the word. The price is extremely low, since it includes a 320-character CRT, full keyboard, program function keys, a modem, and integrated software that includes word processing, spreadsheet, communications support, professional support software, and of course, BASIC, TRSDOS 6.0, on the high end of the product line, also supports the Model 100 as a terminal.

### □ Limitations

Some TRS-80 systems fail to provide extensive soft-key (user-programmable key) facilities. This feature, which is available on most other microcomputers, can save considerable user time when implemented as many microsystems have done. The high end of the line, Model 16, provides just 2 soft keys; the Model 4 provides 3; and the Model 100, Model 12, and Model 16B have 8 keys.

Ergonomic design and aesthetics have become major considerations in micro-based products, particularly those involving keyboards and displays. Although Radio Shack has gotten rid of their original gun-metal gray, so far, it has failed to consider a display tilt-and-swivel capability for user convenience. Only 3 models (12, 16, and 16B) have a movable keyboard. Furthermore, the anti-glare panel and anti-glare mask offered by Radio Shack are extra-cost items.

While it may appear that we are nitpicking with our design-related comments, design has become an important marketing tool and something that Radio Shack should consider in future product development. Other vendors have realized the potential for that competitive edge and have done something about it.



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### ■ SOFTWARE

#### □ Terms & Support

**Terms** • nearly all basic TRS-80 computer systems include operating software and BASIC language processor at no additional charge; exceptions are Model 16 and 16B packages which do not include BASIC language processor • optional software products are available on a one-time license fee basis.

**Support** • software is provided on as-is basis, without warranty; no service plans are currently available from Radio Shack • updates on selected software items available from Radio Shack outlets.

#### □ Software Overview

The TRS-80 computers were originally designed to run with TRSDOS, a single-user proprietary operating system, but like many microcomputer vendors, Radio Shack is moving towards compatibility with several cross-vendor third-party operating systems which are becoming de facto standards. The Model 100 portable uses Interpreter BASIC integrated with several word processing, communications, graphics, and TRSDOS-like system control and applications software. The correct version of TRSDOS is usually defined by the model number, i.e., TRSDOS 4, TRSDOS 12, and TRSDOS 16. Single-user Model 4 systems can run TRSDOS 6.0, which supports Model 100 as a communications terminal and is compatible with Model 100 cassettes. Models 12, 16, and 16B can also run older TRSDOS 2.0 and 4.2, which are compatible with the older Model II; Model 4 can also run TRSDOS 3.0, originally developed for Model III.

Models 4, 4P, 12, 16, and 16B single-user systems can alternatively run CP/M Plus 3.0, but Radio Shack does not itself support CP/M-compatible software other than the operating system itself.

The dual-processor, multiuser versions of Models 12, 16, and 16B must run under XENIX, a version of UNIX; TRSDOS does not support multiple users. Radio Shack has announced it is developing a single-user version of XENIX and that XENIX will be the primary operating system of larger systems—which will presumably also lead to the development of supporting software. At present, only the multiuser XENIX, its development system, and limited application software are available. Models 16 and 16B can run all Model 12 software in single-user (8-bit) mode.

#### □ Packaged Software

**Model 100 Standard Operating Firmware** • includes ROM-based, TRSDOS-compatible operating logic integrated with Interpreter BASIC, TEXT word processing, SCHEDL personal scheduling program, TELCOM communications control program, and ADDRSS personal contact file • included in the packaged system price.

**TRSDOS Standard Operating Software** • packaged together with Interpreter BASIC • included as standard in Model 4, 4P, and 12 single-user system packaged price.

**TRS-XENIX Operating Software** • packaged with Interpreter BASIC • included in Model 16 and 16B multiuser system price.

#### □ Operating Systems

**TRSDOS** • versions are available for TRS-80 Models 4, 12, 16, and 16B • general-purpose, single-user disk proprietary operating system; provides operator and program interfaces for system services, including file manipulation and general I/O • current version of Model 16/16B TRSDOS supports all 8-bit Model II/12 software as well as 16-bit software written for the Models 16 and 16B • some features described below are not included in TRSDOS versions for TRS-80 Model 4 • system commands include ATTRIB to change file password; CREATE to preallocate disk file space; COPY and MOVE to transfer files; DEBUG to support machine language programming and error isolation; DO to execute predefined command sequences; FORMS to set printer parameters; HELP to clarify command syntax; PATCH to modify operating system code; RENAME to change file names; SPOOL to redirect printer output to disk files and to perform background printing • communications-oriented commands include ECHO to echo keyboard input to display;

HOST to allow keyboard and display I/O for a remote terminal; RECEIVE to store data from RS-232C interface in main memory; SETCOM to set RS-232C interface parameters • utilities include BACKUP to copy diskettes; FORMAT to initialize diskettes; MEMTEST to test memory; TERMINAL to support ASCII data communications • machine language programs can execute Supervisor Calls to alter system functions/parameters; access files; and perform display, keyboard, and printer I/O • type-ahead buffer stores up to 80 characters, permitting keyboard input during program/command processing • additional features include positive feedback for operator commands; error messages; password security for diskettes • Editor/Assembler package is supplied with Model 16/16B TRSDOS operating system, includes line- and character-oriented editor, MC68000 assembler and macro-assembler linking loader, cross-reference utility, and debugger • TRSDOS is included in TRS-80 Model 12, Model 16, and Model 16B basic configurations, and TRS-80 Model 4 32K Desktop Business Computer system; TRSDOS is also available as part of package for upgrading basic TRS-80 Model 4 configurations to disk.

26-4912 • backup copy of TRSDOS 4.2 diskette for TRS-80 Model 12, Model 16, or Model 16B:

\$25 lcnr

26-6105 • backup copy of TRSDOS diskette including Editor/Assembler package; for TRS-80 Model 16 or 16B:

40

**26-2214 LDOS** • for the TRS-80 Model 4 • TRSDOS-compatible operating system with enhancements • supports data transportability from a TRS-80 Model II/12 to a TRS-80 Model III or 4; includes job control language, terminal utility, keyboard type ahead, disk or memory print spooling, and formatting program for printer output • I/O device independence • extensive file management utilities • LDOS is a product of Logical Systems Inc:

129

**26-6401 TRS-XENIX Development System** • 250-module system for the TRS-80 Model 16, Model 16B, or Model 12 with Model 16 upgrade kit • TRS-XENIX is an interactive multitasking/multiuser operating system for up to 3 users; utilizes foreground/background program execution; adaptation of Bell Laboratories UNIX Version 7; includes reliability and performance improvements in automatic recovery of files after a crash and swapping intelligence; provides enhancements to UNIX such as record and file locks, semaphores, improved priority assignments, scatterloaded kernel, nonblocking reads, synchronous (blocking) writes, and better interprocess communications • TRS-XENIX uses tree-structured directories • all TRS-XENIX I/O is device independent; program I/O is chained; written in C language • development system includes C language compiler, BASIC interpreter, C-compatible FORTRAN compiler, structured FORTRAN preprocessor, compiler generators, assembler interactive program debugger, also text processor, text editor, text print formatter, typesetting capability, 20,000-word spelling dictionary, electronic mail facility, relocating program loader, program group maintenance facility, print spooler, sort utility, stream editor, and command processor • TRS-XENIX and its development system are products of Microsoft Corporation:

750

**26-4740 CP/M Plus (CP/M 3.0)** • advanced version of Digital Research's CP/M; can run on single-user configurations of Models 4, 12, 16, and 16B:

150

#### □ Utilities

No additional utilities packages provided by Radio Shack.

#### □ Data Management

**26-1562 Profile** • for TRS-80 Model 4 • general-purpose file management system; handles names/addresses, accounts,

*LCNS: one-time license fee. Prices effective as of January 1984.*



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records, personal references; display and print formatting; editing; interfaces with BASIC programs • requires 32K-byte main memory and diskette drive:

\$80 linc

**26-4512 Profile II** • for TRS-80 Model 12 • general-purpose file management system; handles up to 3,000 single-segment records on a single drive, up to 20,000 individual records or 1,800 multisegmented records on multiple drives; supports file reviews and updates using up to 36 user-defined criteria; multiparameter performs sorting; search keys permit multiple label and report selections within single screen format • types of information field include alphanumeric, numeric, decimal, protected • performs addition and subtraction; up to 5 screen formats per file • print formatting features include movable 132-column window for forms design; up to 5 different user-defined reports with automatic page numbering; up to 5 user-defined labels per file • limited-menu capability provides access control:

179

**26-6412 Profile Multiuser** • for TRS-80 Model 16 • general-purpose file management system with features of 26-4515 Profile II Plus and added multiuser capabilities; storage to 16 million records per file with up to 999 fields per second and up to 4,608 characters per second • requires TRS-XENIX:

499

**26-4515 Profile II Plus** • for TRS-80 Model 12 • enhanced version of Profile II; facilities include arithmetic operations of up to 16 equations of 63 characters each; indexing of files in logical order for high-speed access to recover; customized menus; selectable record lengths:

299

26-4517 Profile Upgrade • for TRS-80 Model 12 • upgrades 26-4512 to 26-4515:

120

**26-1592 Profile III Plus** • for TRS-80 Model 4 • general-purpose file management system; handles up to 2,400 records; record length of up to 1,020 characters; as many as 99 fields per record; up to 5 different data entry screens; search criteria may include up to 36 fields; includes math package; interfaces with VisiCalc and SuperSCRIPT • requires 48K-byte memory, 2 diskette drives suggested:

199

**26-1593 Hard Disk Profile III Plus** • like Profile III Plus but with extra sorting features and capacity for hard disk • requires hard disk:

299

26-4558 Profile Prosort • for TRS-80 Model 12 • indexing program for Profile II Plus • allows sorting and record selection from file segment on 1 field and 4 subfields in ascending or descending order • record selection on up to 16 criteria:

149

26-4556 Profile Forms • for TRS-80 Model 12 • Profile II Plus print program allowing 1 detail record per sheet • up to 5 formats per file • 66 lines per sheet up to 132 characters wide:

125

26-4557 Profile Archive • purges inactive records from Profile II Plus files using up to 16 criteria for record selection:

49

### □ Communications/Networks

#### Radio Shack Communications/Networks Software

**26-4715 Online 3270 Binary Synchronous Communications** • for TRS-80 Model 12 • IBM 3270 Series terminal-emulation program supports interactive communications with IBM host mainframes; IBM 3270 functions include screen formatting, response to polling, data link control, time-out control, and cyclic redundancy checking; half-duplex communication at rates of up to 19,200 baud • package includes hardware for serial port modification • requires 64K-byte main memory; installation of mandatory serial port modification not included:

\$1,495 linc

**26-4716 IBM- & DEC-Compatible Batch 3780 Binary Synchronous Communications** • for TRS-80 Model 12 • IBM 2770/2780/3741/3780 terminal-emulation program supports batch communications and remote job entry with IBM host mainframes • also permits communications with DEC VAX-11 and PDP-11 computers supporting BSC protocols • half-duplex communication at rates of up to 19,200 baud • package includes hardware for serial port modification • requires 64K-byte main memory; installation of mandatory serial port modification not included:

995

**26-222X TRS-80 VIDEOTEX Software** • for TRS-80 Models 4 and 12 and VIDEOTEX Terminal • supports access to VIDEOTEX-compatible information services using 300-baud telephone interface • package includes 1-hour connection to CompuServe and Dow Jones information services; user ID number; user password; operator's manual.

TRS-80 VIDEOTEX Terminal Package • included in basic VIDEOTEX Terminal configurations.

26-2220 TRS-80 Model 4 Package:

30

26-2221 TRS-80 Model 12 Package:

30

26-1588 TRS-80 VIDEOTEX Plus • for TRS-80 Model 4 • enhanced version of 26-222X designed to minimize connection time • provides on-screen editing of auto-log-on sequence • requires 32K memory and 1 diskette drive:

50

**26-6502 Arcnet File Processor Software** • includes software operation manual and system manager's manual:

499

**26-6470 VIS Software** • Videotex and Office Information System, 2-way interactive electronic information carrier, allows Videotex access to public information bases:

3,500

**26-6471 VIS Multiplexer Software** • requires VIS Software 26-6470, controls 16-line multiplexer:

1,000

**26-1589 MICRO/Courier for Communication** • communication package for access to services such as CompuServe and Dow Jones News/Retrieval; supports auto-dialing features of Modem II (required); menu driven; can transfer any TRSDOS file to other computers with MICRO/Courier protocol:

150

### □ Program Development/Languages

#### TRS-80 Model 12 & 8-bit Model 16 Radio Shack Languages

TRS-80 Model 12 languages will also run on TRS-80 Model 16 systems in 8-bit mode.

**BASIC Interpreter** • disk-based interpreter supporting implementation of Dartmouth BASIC; enhanced version of TRS-80 Model I Level II BASIC • language features include direct and sequential disk file access; TRSDOS operating system function calls; machine language subroutine calls; string handling; multidimensional arrays; error trapping/recovery; line-oriented editing program, line renumbering, multidimensional arrays • interpreter runs under TRSDOS operating system; occupies 17K bytes of main memory; included in TRS-80 packaged systems.

**26-4705 Compiler BASIC** • single-pass compiler supporting implementation of Dartmouth BASIC; some incompatibilities with Model II BASIC described above • language features include editor, single-key indexed-sequential disk file access; interactive debugging mode; 14-digit floating-point operands; display control functions • requires 64K-byte main memory:

\$199 linc

26-4706 Compiler BASIC Run-Time Package • required for



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sale/distribution of Compiler BASIC object code: 30

**26-4725 BASCOM BASIC Compiler** • MS-BASIC Compiler by Microsoft; includes BASRUN runtime module; compiles normally interpreted BASIC code into fast-running machine code: 199

**26-4752 CBASIC** • compiler/interpreter of dialect of BASIC; requires CP/M Plus Model 12 or II; for business applications; binary coded decimal (BCD) arithmetic to insure integrity of fractional parts of a dollar, integer arithmetic for speed, string manipulation: 99

**26-4703 COBOL Development System** • package includes single-pass compiler supporting subset implementation of ANSI COBOL Standard X3.23-1974; runtime and print software • language features include multiple-key indexed-sequential disk file access; Level 2 input/output commands; display control functions with extended ACCEPT/DISPLAY commands; interactive DEBUG with address stop, single step, and variable display • requires 64K-byte main memory: 299

26-4704 COBOL Run-Time Package • for TRS-80 Model 12 • required for resale/distribution of COBOL object code: 40

**26-4707 COBOL Generator** • source program generator and editor • requires Model 12 system with 64K-byte main memory, 2 diskette drives, and 26-4703 COBOL Development System: 995

**26-4701 FORTRAN** • package includes single-pass compiler supporting implementation of ANSI FORTRAN 1966; EDIT-80 line-/character-oriented text editor, LINK-80 linking loader and FORTRAN subroutine library • requires 64K-byte main memory: 299

**26-2013 Editor/Assembler, Series I** • rudimentary Z80 editor/assembler supports up to 6-character label lengths, 8 pseudo-ops; editor features automatic line numbering and renumbering, single-letter commands, and global search • requires 64K-byte memory • for Model 4: 35

**26-4713 Editor Assembler Series I** • for Models II/12 and 16: 50

**26-4702 Editor/Assembler** • macro assembler supports Z80 and 8080 mnemonics; package includes EDIT-80 line-/character-oriented text editor, LINK-80 linking loader, Cross Reference Facility, and FORTRAN subroutine library • requires 64K-byte main memory: 199

**26-4712 Assembly Language Development System** • macro assembler development system; full-screen editor with find/change; assembler supports IX and IY registers, separately linkable multiple program sections, relocatable/absolute object, macros and sorted cross-references list, enhanced mnemonic op codes; supports standard Zilog Z80 and undocumented mnemonics; linker, debugger with find/examine/change facility; automatic multifile transfers between any TRS-80 models • requires 64K-byte main memory: 249

**26-4711 Pascal MT+** • by Digital Research; full implementation of ISO Standard Pascal; includes compiler, linker, and programming tools; editor, reformatter, and fast compiler options; has chaining, assembly subroutine, and supervisory calls: 425

**26-4710 Program Editor** • line-/character-oriented editor supports entry/modification of TRS-80 Model 12 and 16 programs • features include global search/replace and automatic tab setting • requires 64K-byte main memory: 79

### TRS-80 Model 4 Radio Shack Languages

**Level I BASIC** • 4K-byte read-only memory (ROM) based interpreter supporting simplified implementation of Dartmouth BASIC • language features include most standard BASIC commands; support for 16-line x 64-character uppercase alphanumeric display and 48x128 dot-graphic display; support for 250-baud cassette tape input/output; 6-digit numeric operands, including floating point; single-dimension arrays; limited string variables; error codes; LPRINT/LLIST commands; command abbreviations • included in TRS-80 Model 4 26-1061 4K Basic System.

**Model 4 BASIC** • 14K-byte read-only memory (ROM) based interpreter supporting implementation of Dartmouth BASIC; downward compatible with Level I BASIC described above; 30-percent faster execution speed than Level I BASIC • language features include support for 16-line x 32- or 64-character upper- and lowercase alphanumeric display and 48x128 dot-graphic display; support for 500- and 1500-baud cassette tape I/O; 16-digit numeric operands, including floating point; 6-digit accuracy with intrinsic functions, multidimension arrays; string variables up to 255 characters in length; error codes; machine language subroutine calls; PEEK/POKE commands; printer commands; compressed program storage; program/logical lines up to 255 characters in length • included in TRS-80 Model 4 26-1062 16K Basic System; available as part of upgrade kit for TRS-80 Model 4.

**Disk BASIC** • disk-based interpreter supporting implementation of Dartmouth BASIC; downward compatible with Model 4 BASIC described above • language features include random and sequential disk file access; LOAD/CLOAD/OPEN/CLOSE/MERGE/SAVE file commands; user-defined functions • included in TRS-80 Model 4 26-1063 32K Desktop Business Computer System; available as part of upgrade kit for TRS-80 Model 4 16K Basic System (see Hardware—Disk).

**26-2204 Compiler BASIC** • single-pass compiler supports implementation of Dartmouth BASIC; incompatible with TRS-80 Model 4 BASIC interpreters described previously • language features include single-key indexed-sequential disk file access • requires TRS-80 Model 4 with 48K-byte main memory and 2 disk drives: \$149 lcns

**26-2216 CBASIC** • compiler/interpreter of dialect of BASIC; requires CP/M Plus on Model 4; for business applications; binary coded decimal (BCD) arithmetic to insure integrity of fractional parts of a dollar, integer arithmetic for speed, string manipulations: 100

**26-2210 BASCOM BASIC Compiler** • MS-BASIC Compiler by Microsoft; includes BASRUN runtime module; compiles normally interpreted BASIC code into fast-running machine code: 195

**26-2012 Assembly Language Development System** • macro assembler development system; full-screen editor with find/change; assembler supports IX and IY registers, separately linkable multiple program sections, relocatable/absolute object macros and sorted cross-reference list, enhanced mnemonic op codes; supports standard Zilog Z80 and undocumented mnemonics; linker, debugger with find/examine/change facility; automatic multifile transfers between any TRS-80 models • requires 64K-byte main memory: 195

**26-2203 COBOL** • single-pass compiler supports subset implementation of ANSI COBOL Standard X3.23-1974 • language features include multiple-key indexed-sequential disk file access; interactive DEBUG • requires TRS-80 Model 4 with 48K-byte main memory and 2 disk drives: 199

**26-2200 FORTRAN** • for Model 4 • includes compiler, editor, linking loader, library • requires 48K-byte memory and 2 diskette drives: 100



## Tandy Corp/Radio Shack TRS-80 Series

### 4, 4P, 12, 16, 16B & 100 Microcomputers

**26-2013 Editor/Assembler** • includes editor/assembler and sample programs • requires 32K-byte main memory and diskette drive:

35

**26-2011 Series I Editor/Assembler** • includes editor/assembler • requires computer with Model 4 BASIC, cassette drive, and 16K-byte memory:

30

**26-2000 Debug** • for entering, testing, and debugging machine language programs • requires Model 4 computer with Model 4 BASIC, cassette drive, and 16K-byte memory:

20

**26-2020 Tiny Pascal** • for Model 4 • fixed-point, non-array version of Pascal; includes sample programs • requires 16K Model 4 BASIC and cassette drive:

20

**26-2212 Alcor Pascal** • p-code, optimized p-code or native code compiler; includes compiler, interpreter, linking loader, full-screen text editor, routine library, documentation:

250

**26-1704 Double-Precision Routines** • providing 15-digit accuracy with sine, cosine, arctangent, natural logarithm, exponential, and square root functions in Model 4 BASIC programs:

10

**26-2008 Cross-Reference Utility** • providing listing by variable, reserved word, or line number for Model 4 BASIC programs:

15

#### TRS-80 16-bit Model 12 & 16 Radio Shack Languages

Radio Shack supports properly configured Models 12 and 16 running all 8-bit Radio Shack TRSDOS, LDOS, and CP/M language packages as well as 16-bit Radio Shack TRSDOS and XENIX language facilities running on the 16-bit MC68000 processor.

**Editor/Assembler** • includes line- and character-oriented editor, MC68000 assembler and macro assembler, linking loader, cross-reference, and debugger • packaged with all Model 16 systems and with the MC68000 extension to Model 12.

**26-6100 COBOL Development System** • for TRS-80 Model 12 or 16 computer • single-pass compiler supports subset implementation of ANSI COBOL Standard X3.23-1974 • language features include interactive DEBUG, ANSI level 2 input/output commands, multiple-key indexed-sequential disk file access:

\$299 lcns

26-6455 COBOL Development System • multiuser version of 26-6100:

699

26-6101 COBOL Run-Time Package • for TRS-80 Model 16 • required for resale/distribution of COBOL object code:

40

**26-6457 TRS-XENIX BASIC** • MBASIC interpreter under XENIX; complete implementation, includes chaining, string variables, string and record lengths to 32K bytes, integer, and double-precision math operations:

299

#### □ Applications Packages

#### TRS-80 Model 4 & 4P Radio Shack Disk-Based Business Packages

Business packages described below require TRS-80 Model 4 systems with a minimum of 1 diskette drive unless otherwise indicated.

**26-156X VisiCalc** • management package features spreadsheet calculations for sales projections, income tax

problems, financial ratios, and engineering; recalculates and displays updated information; editing feature allows modifications, insertion, and deletion of titles, numbers, or formulas; formatting commands permit definition of charts and tables.

26-1569 VisiCalc • for TRS-80 Model 4 • includes logical and comparison operators to perform testing and branching • requires 48K-byte memory:

\$199 lcns

**26-1520 Enhanced VisiCalc** • same as 26-1569 VisiCalc with ability to handle 128K memory; enhancements include: logical and relational operators, and an entry editor:

250

26-1521 VisiCalc Forecasting Model • provides the facility to produce reports based on VisiCalc spreadsheet calculations • reports include balance sheets, income statements, asset and depreciation schedules:

100

**26-1594 Desktop/Plan-80** • financial planning program that interfaces with VisiCalc files; plots points for line charts, automatically formats printed reports, consolidates sub-models into 1 summary module • requires Model 4 with 48K-byte memory and VisiCalc:

199

**26-1582 Time Manager** • electronic notebook and calendar reminder • searches for appointments or information on events or phone calls by either keyword or by category; includes accounting feature that totals hours worked • includes facilities for sharing information with 26-1581 Personnel Manager and 26-1580 Project Manager • requires 48K-byte memory and 2 diskette drives:

100

**26-1581 Personnel Manager** • data management system that manages information about employees, business contacts, or clients; maintains information on individuals including salary, schedule, address, and phone number; prepares telephone, address, and mailing lists by category • includes facilities for sharing information with 26-1582 Time Manager and 26-1580 Project Manager • requires 48K-byte memory and 2 diskette drives:

100

**26-1580 Project Manager** • aid for scheduling and evaluation of work projects • includes facilities for sharing information with 26-1581 Personnel Manager and 26-1582 Time Manager • requires 48K-byte memory and 2 diskette drives:

100

**26-1584 Checkwriter-80** • handles checks and transaction register, expense tracking, and reconciliation of bank statements; up to 9 bank accounts, 75 payees, 31 expense categories, and 2,500 active transactions • requires 48K TRS-80 Model 4 with 2 diskette drives and 80-column line printer:

100

**26-1559 Manufacturing Inventory Control** • handles up to 1,900 raw materials, up to 20 finished goods per diskette; prints bill of materials, material requirement, pull sheets, finish goods list, inventory worksheets • requires 32K-byte main memory and 2 diskette drives:

200

**26-1568 Medical Office System** • prints monthly statements, insurance forms, daily log, transaction review, aged accounts receivable; up to 3,960 patient accounts with Model I, 4,200 patient accounts with Model III; up to 200 different procedures and diagnoses • requires 48K-byte memory and 4 diskette drives:

299

**26-1558 Business Mailing List** • sorts in zip code or other sequence; 990 names with 32K-byte main memory; 2,970 names with 48K-byte main memory • requires 32K-byte main memory and 2 disk drives:

100



## Tandy Corp/Radio Shack TRS-80 Series 4, 4P, 12, 16, 16B & 100 Microcomputers

**26-1554 Accounts Payable** • handles checks, transaction register, cash flow analysis, and summaries for posting to general ledger; handles 75 vendors with 1,000 transactions, or 200 vendors with 800 transactions per month • requires 32K-byte main memory and 2 disk drives:

150

**26-1555 Accounts Receivable** • handles aging reports, monthly statements, and summaries for posting to general ledger; handles 300 customers with 1,000 transactions, or 100 customers with 2,000 transactions per month • requires 32K-byte main memory and 2 disk drives:

150

**26-1552 General Ledger I** • supports up to 240 entries per session and 1,830 entries per month with up to 100 accounts • requires 32K-byte main memory and 2 disk drives:

100

**26-1560 Fixed Asset Accounting** • provides control over fixed asset depreciation • requires 32K-byte main memory and 2 disk drives:

80

**26-1556 Disk Payroll** • prints payroll checks and W-2 forms; handles up to 100 employees; 14 user-defined earnings and deductions categories • requires 32K-byte main memory and 2 disk drives:

200

**26-1603 Budget Management** • handles up to 60 personal budget accounts with 25 cash expenses, 20 savings transactions, 50 checks per month; prints various reports • requires TRS-80 Model I with 16K-byte main memory and Level II BASIC interpreter; or TRS-80 Model III with 32K-byte main memory, disk drive, and Model III BASIC interpreter:

20

**26-1510 Disk Trendex Stock Package** • diskette version of 26-1509 which is for Model 4 cassette systems:

60

**26-1530 Multiplan** • electronic spreadsheet with multiple window capability • provides spreadsheet up to 63 columns wide and 255 rows • includes 14-digit precision for calculations:

199

**26-1518 pfs:File** • electronic filer for flexible data entry and retrieval of forms, forms are customized by user and can be modified without loss of data:

125

**26-1512 Target Planner Calc** • electronic spreadsheet package; supports mathematical and conditional operations; English formulas; process data by row, column, or individual location:

100

**26-1563 SCRIPSIT** • for TRS-80 Models 4 and 12 • document-oriented word processing system supporting text entry, editing, storage, and printing • features include block manipulation, automatic page numbering; horizontal/vertical centering; header/footer formatting; buffered input for high-speed typing • user interaction is via simplified menu and prompts • requires 32K-byte main memory and disk drive:

100

**26-4835 SCRIPSIT** • for thin-line floppy or hard disk on TRS-80 Model 12 • additional features include automatic pagination; floating formats; reverse indentation; global search/replace; underlining; sub-/superscripts; boldface printing; dynamically updated status line; document merging/spooling • requires 64K-byte memory and diskette drive • merging/spooling requires 2 diskette drives:

399

**26-1590 SuperSCRIPSIT** • for TRS-80 Model 4 • document-oriented word processing system; includes all the facilities of SCRIPSIT plus true proportional space printing, multiple second half-line spacing; 10 user-defined keys allow individual keys to be assigned to frequently used words or phrases • requires Model

I with 2 diskettes and 48K-byte memory or Model III with 1 diskette and 48K-byte memory:

199

**26-1591 SCRIPSIT Spelling Dictionary** • for TRS-80 Model 4 • checks text for spelling, highlights spelling errors; contains spelling library of over 73,000 or 34,000 words for use with Model III or I respectively; user may add words to spelling library; can be used with text material prepared with SCRIPSIT, SuperSCRIPSIT or ASCII files • requires 32K-byte memory and 2 diskette drives; Model I using SuperSCRIPSIT requires 48K-byte memory and 3 diskette drives:

149

**26-4834 SCRIPSIT Spelling & Hyphenation Dictionary** • for thin-line floppy or hard disk on TRS-80 Model 12 • checks text for spelling, and highlights spelling errors; contains library of over 100,000 words; user may add an additional 2,000 words to dictionary • requires Model II SCRIPSIT and 2 diskette drives:

199

**26-4532 SCRIPSIT Utilities** • moves columns of numerical or text data, copies commonly used paragraphs, with an additional modem transfers documents to and from other Model II or 12 SCRIPSIT systems:

129

**26-1507 Standard & Poor's STOCKPAK System** • stock management system; helps review a portfolio of up to 100 securities; sample database provided includes 900 NYSE, AMEX, and OTC stocks; monthly update of database available on an annual subscription basis from Standard and Poor's • requires 32K-byte memory and 2 diskette drives:

50

**26-1579 Real Estate Finance** • for Model III • provides stepped income analysis, compound interest, internal rate of return, mortgage analysis, detailed property income calculations, appreciation/depreciation estimates, Ellwood analysis, overall capitalization rate, graphic analysis, sensibility analysis, decision tree and time-trend analysis, Monte Carlo analysis • requires 48K-byte memory and 2 diskette drives:

100

**26-1602 Personal Finance Level I** • personal application program for balancing checkbook and maintaining monthly budget • requires 4K-byte main memory and Level I BASIC interpreter:

15

**26-1553 Inventory Control** • handles up to 1,000 items; tracks vendors; manages back orders, order dates, out-of-stock items, and in-order items • requires 32K-byte main memory and 2 disk drives:

100

### TRS-80 Model 4 Radio Shack Cassette-Based Business Packages

Business packages described below require TRS-80 Model 4 systems with a tape cassette drive.

**26-1503 Cassette Mailing List** • mailing list management system • requires TRS-80 Model 4 with 32K-byte main memory and Model 4 BASIC interpreter:

\$20 lcms

**26-1504 Level II Cassette Payroll** • handles checks and transaction register; calculates fixed-percentage state and city tax • requires TRS-80 Model 4 with 32K-byte main memory, and Model 4 BASIC interpreter:

50

**26-1705 Advanced Statistical Analysis** • user-oriented business programs for tape and disk data files; supports random sampling, descriptive statistics, histograms, frequency distributions, analysis of variance, T-tests for matched pairs, correlation and linear regression, multiple linear regression, time-series analysis, and chi-square analysis • requires TRS-80 Model 4 with 32K-byte main memory and Model 4 BASIC interpreter:

40



## Tandy Corp/Radio Shack TRS-80 Series

### 4, 4P, 12, 16, 16B & 100 Microcomputers

**26-1571 Real Estate I** • provides stepped income analysis, compound interest, internal rate of return, resale price • requires TRS-80 Model 4 with 32K-byte main memory and Model 4 BASIC interpreter:

30

**26-1572 Real Estate II** • provides mortgage analysis • requires TRS-80 Model 4 with 32K-byte main memory and Model 4 BASIC interpreter:

30

**26-1573 Real Estate III** • provides detailed property income calculations, appreciation/depreciation estimates • requires TRS-80 Model 4 with 32K-byte main memory and Model 4 BASIC interpreter:

30

**26-1574 Real Estate IV** • offers Ellwood analysis, overall capitalization rate, graphic analysis, sensibility analysis • requires TRS-80 Model 4 with 32K-byte main memory and Model 4 BASIC interpreter:

30

**26-1575 Real Estate V** • provides straight line, declining balance, and sum-of-the-year digits depreciation estimates • requires TRS-80 Model 4 with 32K-byte main memory and Model 4 BASIC interpreter:

30

**26-1577 Surveying** • converts field measurements into final dimensions and coordinates • requires TRS-80 Model 4 with 32K-byte main memory and Model 4 BASIC interpreter:

50

**26-1603 Budget Management** • handles up to 60 personal budget accounts with 25 cash expenses, 20 savings transactions, 50 checks per month; prints various reports; includes facilities for diskette-based operation • requires TRS-80 Model 4 with 32K-byte main memory and Model 4 BASIC interpreter:

20

**26-1509 Trendex Stock Package** • supports statistical analysis to determine trends for various data, including stock prices; includes facilities for diskette-based operation • requires TRS-80 Model 4 with 32K-byte main memory and Model 4 BASIC interpreter:

50

**26-1506 Cassette Portfolio** • investment management aid; keeps records on 20 stocks, 10 bonds, 5 funds, and 10 options • requires TRS-80 Model 4 with 16K-byte main memory and Model 4 BASIC interpreter:

50

**26-1564 Mailgram** • sends messages directly to United States Post Office via Western Union Electronic Mail for delivery next business day • requires TRS-80 Model 4 with 16K-byte main memory and Model 4 BASIC interpreter and acoustic coupler:

40

#### **TRS-80 Model II/12 Radio Shack Business & Accounting Software**

Business and accounting packages described below require a TRS-80 Model II or 12 system with a minimum of 64K-byte main memory, 15-inch 132-column printer, and 1 diskette drive. They can also run on a Model 16 in single-user, TRSDOS-based mode.

**26-4502 Inventory Management System (IMS)** • stores up to 3,000 inventory items; 200 vendors; on-hand quantities up to 999,999; projects re-orders based on past performance records and trends analysis; generates reports such as master inventory list, vendor listing, suggested order list, transaction posting report, ABC code analysis, physical inventory worksheets, physical inventory error report, and inventory performance report which includes total performance summary:

\$199 lcn\$

**26-4540 Statistical Analysis** • menu-oriented data analysis system includes programs for descriptive statistics, graphic histogram, frequency distribution, 1- and 2-way analysis of

variance, 1-way analysis of covariance, correlation matrix, chi-square analysis, time series analysis, multiple regression, random data samples and item analysis and test/survey scoring; data input from keyboard or disk files; interactive utility program allows preparation, updating, testing, and printing of data files; option of printing results on line printer:

99

**26-4503 Payroll** • payroll package with 200-employee file capacity; calculates state tax, 1 city withholding tax as percent of gross wages or Federal tax, earned income credit payments; prints checks and W-2 forms at year end as well as check register before or after printing; offers 9 user-defined earnings and deductions categories, 7 user-defined workman compensation classifications, such voluntary deductions as savings, Christmas clubs, etc; maintains monthly, quarterly, and annual journals; provides error correction and recovery, multidrive update to general ledger, and optional time-card calculations with automatic overtime:

399

**26-4501 General Ledger** • produces balance sheets and profit/loss statements, including user-defined chart of up to 504 accounts, user-defined 4-digit account numbers; automatic out-of-balance detection, entry totaling and document balancing, and well-defined audit trails; 7 optional expense categories; prints totals with 16-digit accuracy (17-digit internal accuracy), up to 50 entries per document; up to 3,072 documents per month, up to 11,420 entries per month; reports generated include chart of accounts, trial balance, document list, posting summaries, ledger detail report, income statement, and balance sheet; daily operation includes sales information, cost-of-goods sold, checks, purchases, payroll, and posting multidrive update from payroll, accounts receivable, and accounts payable:

199

**26-4505 Accounts Payable** • manages up to 500 vendor accounts and 3,000 invoices with invoice selection feature for flexible operations; prints checks, cash requirements, aging reports, and totals for posting to General Ledger (GL); offers maximum check discount and cash position determinations; compatible with either cash or accrual accounting methods; reports include general ledger codes, vendor listing, invoice listing, posting report with GL totals, general ledger recap, cash requirements, aging status, check preview, check register, discount lost report, GL totals after check printing, end-of-period processing with GL totals, and year-end report

299

**26-4504 Accounts Receivable** • invoicing and monthly statement system generating current and aged accounts receivable; interactive, menu-driven; supports open item and balance forward accounts; summary aging and detail aging reports; automatic customer billing option; optional additional drives for increased quantities and automatic update of General Ledger (requires 2 disk drives); selectable record capacities:

299

**26-4514 Order Entry with Inventory Control** • maintains up to 650 accounts in accounts receivable and up to 2,000 items in inventory • interfaces with and requires 26-4504 Accounts Receivable; requires 4 diskette drives:

199

**26-4554 Accounts Receivable, Series I** • subset of 26-4504 Accounts Receivable package; features customer file maintenance and verification, including changeable DU/Y messages on invoices, activity query invoice generation, transaction editing, and open credit reconciliation; 1,700 entries include accounts plus transactions:

200

**26-4601 3-Disk General Ledger** • produces balance sheets and profit/loss statements; up to 400 accounts and 4,300 year-to-date entries; utilizes ISAM filing system • written in COBOL, source code is available at extra cost after signing a special license agreement • interacts with 26-4605 Accounts Payable, 26-4603 Payroll, and 26-4604 Accounts Receivable • requires 3 diskette drives:

499



## Tandy Corp/Radio Shack TRS-80 Series 4, 4P, 12, 16, 16B & 100 Microcomputers

**26-4605 3-Disk Accounts Payable** • accrual system that manages up to 1,500 vendors, 800 open payable items, 5,000 General Ledger distributions; utilizes ISAM filing system • written in COBOL, source code is available at extra cost after signing a special license agreement • interacts with 26-4601 General Ledger, 26-4603 Payroll, and 26-4604 Accounts Receivable • requires 3 diskette drives:

499

**26-4603 3-Disk Payroll** • payroll package with 200-employee file capacity; handles both hourly and salaried employees permitting 7 pay frequencies; tracks vacation and sick pay, maintains 1-year pay history; maintains tables for federal, state, and local withholding taxes, prints Federal, state, and local withholding reports, W-2 forms, payroll worksheets checks and check register; utilizes ISAM filing system • written in COBOL, source code is available at extra cost after signing a special license agreement • interacts with 26-4601 General Ledger, 26-4605 Accounts Payable, and 26-4604 Accounts Receivable • requires 3 diskette drives:

499

**26-4604 3-Disk Accounts Receivable** • invoicing and monthly statement system generating current and aged accounts receivable; provides general ledger distribution report; prints cash application worksheet; stores up to 800 accounts, 2,500 transactions; utilizes ISAM filing system • written in COBOL, source code is available at extra cost after signing a special license agreement • interacts with 26-4601 General Ledger, 26-4605 Accounts Payable, and 26-4603 Payroll • requires 3 diskette drives:

499

**26-4608 3-Disk Order Entry/ICS** • provides single-pass invoicing and 2-pass open entry with separate billing; will run in conjunction with 26-4604 Accounts Receivable; maintains 1,500 items • written in COBOL, source code is available at extra cost after signing a special license agreement • requires 3 diskette drives:

499

**26-4608 3-Disk Sales Analysis** • examines and evaluates sales information; data is obtained from the customer file of 26-4604 Accounts Receivable or item file of 26-4607 Order Entry/ICS programs; program prints 8 types of sales activity reports, reports show sales, percent of sales, cost of sales, profit and percent of profit for both period-to-date and year-to-date • written in COBOL, source code is available at extra cost after signing a special license agreement • requires 3 diskette drives:

299

**24-4602 Inventory Control System (ICS)** • inventory management system; posts receipts, prepares labels; prints purchase orders by P.O. number and prints 6 major reports; handles up to 3,000 inventory items using 2 diskette drives, 6,000 inventory items with 3 diskette drives, and 9,000 items with 4 diskette drives:

299

**26-4509 Manufacturing Inventory System** • reviews inventory, processes inventory transactions, describes part required to produce finished goods, tracks work in progress, estimates order completion date, labor and material requirements • requires 3 diskette drives:

750

**26-4621 Personnel Search** • matches employers with potential employees; up to 246 records with up to 5 referral and placement positions and 5 client contacted companies; up to 66 characters for employer benefits, 227 characters for employee duties; prints reports and mailing labels:

299

**26-4525 Electronic Broker** • maintains securities transaction records for professional stock brokers and counselors; up to 500 accounts, up to 500 securities:

995

**26-4507 Mailing List-II System** • handles up to 3,000 names/addresses with revise or update capability; expanded

format stores up to 2,000 names with additional comment line; each name can be assigned up to 8 special categories and any number of names can be selected/printed for future reference; alphabetical and ZIP code filing • prints selected address labels; 5 label sizes with up to 5 labels across a page • names and addresses can be merged with SCRIPSIT word processor; merging requires 2 disk drives:

119

**26-4520 Legal Time Accounting** • provides time analysis of jobs performed by up to 14 legal professionals; handles up to 1,000 clients, 500 jobs, 2,950 transactions, and 99 charge code categories; tracks billable and non-billable time; cost of each individual's time; billable and non-billable expenses, amounts billed, amounts paid • requires 3 external diskette drives:

499

**26-4545 WESTLAW** • interactive communications facility provides access to the WESTLAW legal research library, Shepard's Citations, West's Bankruptcy Reporter, Federal court decisions, Federal tax files, and the United States Code • requires registration with the WESTLAW system and 1200-baud modem:

249

**26-4545 Litigation Support** • legal filing system; stores up to 350 client records, each with up to 12 pleas, 10 memos; includes report generation facilities; names and addresses may be merged into form letters using SCRIPSIT and 2 diskette drives:

299

**26-4508 Medical Accounts Receivable** • invoicing and monthly statement system handles records and billing for up to 3,000 accounts and 9,000 transactions per month; up to 450 procedures and diagnoses, 4 recall medications, 2 recall dates and 2 insurance companies per patient, produces monthly statements, insurance forms, daily recap, transaction review, aged accounts receivable, procedure and diagnosis reports; complete audit trails and detailed reports may be generated; letters and mailing labels may be produced using 26-4512 Profile II and 26-4531 SCRIPSIT • requires 2 diskette drives; use of Profile II and SCRIPSIT requires 3 diskette drives:

750

**26-4513 Construction Job Costing** • tracks progress and cost of construction jobs and calculates summary information; maintains year-to-date profit and loss records on diskette:

149

**26-4511 VisiCalc** • enhanced version of the 26-1566/67 VisiCalc packages (see TRS-80 Model 4 Disk-Based Business Packages section):

299

**26-4550 Business Graphics Analysis Pak** • generates pie, bar, line, or scatter charts from data input in table form; menu-driven parameter options; ability to perform arithmetic or trend, growth, moving average, consolidation, or logarithmic operations; compatible with VisiCalc Files; requires Radio Shack matrix printer or multipen plotter for hard copy:

249

### TRS-80 Model 16 Multiuser Business & Accounting Software

26-6201 General Ledger • similar in function to 26-4601 for Model II/12:

\$599 lens

26-6203 Payroll • print checks and distributes to 26-6201 G/L:

699

26-6204 Accounts Receivable • open item and/or balance forward system • interfaces to 26-6201 G/L, 26-6207 Order Entry/ICS, and 26-6208:

599

26-6205 Accounts Payable • similar to 26-4605 for Model II/12 • interfaces to 26-6201 G/L:

599

26-6207 Order Entry/ICS • requires 26-6204 A/R • provides



## Tandy Corp/Radio Shack TRS-80 Series

### 4, 4P, 12, 16, 16B & 100 Microcomputers

both single-pass invoicing and 2-pass open order entry with separate billing • operates with hard disk drive or 3 diskette drives:

599

26-6208 Sales Analysis • requires 26-6204 A/R or 26-6207 Order Entry/ICS • operates with hard disk or 3 diskette drives:

399

26-6480 Multiplan • electronic spreadsheet with multiple window capability • provides spreadsheet up to 63 columns wide and 255 rows • includes 14-digit precision for calculations:

349

#### ■ HARDWARE

##### Terms, Support & Documentation

**Terms** • all hardware products are available for purchase; TRS-80 systems valued over \$1,500 are available for 39-month lease with 90-day evaluation period • some hardware products require separately priced installation.

**Support** • Carry-In Service Agreements available nationally; On-Site and Limited On-Site Service Agreements available in some areas • over 400 Radio Shack Service Centers nationwide provide hardware maintenance; Radio Shack Computer Centers nationwide provide sales, service, and classroom training • toll-free telephone inquiry service for product-related questions.

**Documentation** • system comes with documentation for the hardware, operating system, and a user's guide in paperback and spiral-bound form; additional publications on programming, graphics, and application packages are available from Radio Shack.

##### Physical Specifications (H x W x D); Weight

**CPU** • 13 x 21 x 28 inches; weight not available.

**Display** • integrated with CPU unit.

**Keyboard** • integrated with CPU unit.

##### Systems Overview & Configurability

The Radio Shack product lines have been nearly entirely replaced or expanded in the last year. The primary product line, Models II and III had been expanded by the Model 16 in 1981; in 1983, the Model 12 and 4P were added as a compatible replacement for Model III, and the Model 12 replaced the II and served as an entry-level system for the Model 16.

In 1983, the new portable TRS-80 Model 100 was added, with links to Model 12 and 16, since TRSDOS 6.0 supported it as a terminal and with compatible cassette handling.

The cassette-based, portable Model 100 with a memory capacity of 32K bytes can be viewed as an entry level to the entire line since it runs a version of the primary single-user system TRSDOS and can communicate with the other models. The diskette-based Model 4 line is the next step up, with a memory capacity ranging up to 128K bytes, a low-end cassette-based system that can be field upgraded into diskettes, and a portable dual disk system. Model 12 is the bridge system, having at once, single-user systems, lower entry-level point (80M-byte memory), and Model II compatibility, and yet a growth path to systems that slightly exceed Model 16 in power, memory, and I/O capacity. Model 16, a multiuser system and a dual-processor system, may be expanded or replaced, since its memory ceiling of 512K bytes and 2 expansion slots is less than the 768K-byte and 6-slot ceiling of Model 12.

Maximum configurability is stated below; minimum configurations are discussed under Packaged Systems.

**Model 100 System Maximums** • single 4-MHz CPU in portable unit containing 320-character display, keyboard, 8K- to 32K-byte memory, cassette interface, parallel printer port, and RS-232C serial port.

**Model 4 & 4P System Maximums** • single Zilog Z80A CPU in rigid desktop unit with 12-inch, 9-inch on portable, 1024-character display, 16K- to 128K-byte RAM, cassette or diskette interface, parallel port; serial port on desktop only.

**Model 16 System Maximums** • dual CPUs, single- or multiuser environment; 256K- to 512K-byte main memory, 128K-byte increments; asynchronous RS-232C interface, asynchronous/ bisynchronous RS-232C interface, parallel interface, 1.25- to 5M-byte diskette storage; up to 48M bytes of disk storage using 4 12M-byte hard disk drives; up to 3 terminals per system • 2 available internal slots.

**Model 16B System Maximums** • dual CPUs, single- or multiuser environment; 256K- to 768K-byte main memory, 128K-byte increments; otherwise the same as Model 16 above.

**Model 12 System Maximums** • single or dual CPUs with single- or multiuser environment; 80K- to 768K-byte memory • diskette subsystem with or without hard disks up to a combined total of 53M bytes • 6 available user slots with expansion unit; up to 3 terminals per system.

##### Packaged Systems

#### TRS-80 Model 4 Desktop Computers

**26-1067 Cassette-Based Model 4** • monolithic system unit includes CPU; 16K-byte RAM; 14K-byte ROM with Model III-level cassette BASIC, 12-inch display, rigid typewriter keyboard with numeric pad, audio cassette interface and parallel printer interface • also includes slots for field upgrade to disk-based systems, which requires a master drive and corresponding upgrade to 64K-byte memory (see Disks) • cassette-based systems operate in Model III mode only:

\$999 prch

**26-1068 Single Disk-Based Model 4** • monolithic system unit includes CPU, 64K-byte RAM, 14K-byte ROM with Microsoft Disk BASIC, TRSDOS 6.0, MemDisk Cache and audio support, 12-inch display, rigid typewriter keyboard, audio cassette interface, diskette and hard disk subsystem interfaces with 1 master 184K-byte diskette drive implemented, parallel printer interface, RS-232C serial interface, audio output • operates in Model III as well as Model 4 mode:

1,699

**26-1069 Dual Disk-Based Model 4** • same as 26-1068 Model 4 configuration, except that a second diskette drive and the RS-232C interface are standard features:

1,999

**26-1080 Dual Disk-Based Model 4 Portable** • same as 26-1069 but with 9-inch screen, transportability and parallel printer port; weighs 26 pounds:

1,799

#### TRS-80 Model 12 Desktop Computers

**26-4004 Single Disk Model 12** • system unit with CPU, 12-inch CRT, 80K-byte RAM expandable to 768K bytes, bootstrap ROM, movable typewriter keyboard with numeric pad, parallel printer port, 2 RS-232C serial interfaces, integrated single double-sided disk master drive • expandable to a 4-drive diskette subsystem plus a 4-drive hard disk subsystem; space inside system unit for optional card cage with 6 internal expansion slots, optional 16-bit processor:

\$3,199 prch

**26-4005 Dual Disk Model 12** • same as 26-4004 except with 2 integrated diskette drives totaling 2.5M bytes:

3,999

**26-4004 Hard Disk Model 12** • includes 26-4004 as previously described, 26-6017 Card Cage (see I/O), and 26-4152 primary hard disk (see Disks):

6,893

**26-4004 Word Processing Model 12** • includes 26-4004 single hard disk packaged system as previously described, 26-4152 primary hard disk (see Disks), 26-1252 DMP-500 printer (see Printers), cable, printer stand, and desk • requires word processing software:

8,948

*PRCH: purchase price. RPQ: request price quotation. NA: not available. Prices effective as of January 1984.*



## Tandy Corp/Radio Shack TRS-80 Series 4, 4P, 12, 16, 16B & 100 Microcomputers

**26-4005 Basic Business Model 12** • includes 26-4005 dual hard disk packaged system as previously described, 26-1251 DMP-400, 26-4401 printer cable • requires business software; desk optional:

5,233

**26-4005 Professional Business Model 12** • includes 26-4005 dual hard disk packaged system as previously described, 26-1252 DMP printer, 26-4401 printer cable • requires appropriate software; may require additional hard disks:

5,833

### TRS-80 Model 16

**26-6001 1-Disk TRS-80 Model 16** • includes 2 standard CPUs, a 6-MHz MC68000 processor and 4-MHz Z80A processor, 128K-byte main memory, plus 16K I/O memory and 2K video memory; asynchronous RS-232C interface, asynchronous/bisynchronous RS-232C serial interface, parallel interface; 12-inch green display screen with 40 or 80 characters per line x 24 lines; typewriter-style keyboard with numeric keypad; 8-inch, 1.25M-byte "slim-line" diskette drive, system diskette containing TRSDOS operating system:

\$4,999 prch

**26-6004 1-Disk TRS-80 Model 16B** • same as 26-6001 except memory is 256K-byte and keyboard is detachable with 8 function keys • housing is similar to Model 12:

4,999

**26-6006 1-Disk Model 16B with 15M-Byte Hard Disk** • identical to 26-6004 but with added integral 15M-byte hard disk:

6,999

**26-6002 2-Disk TRS-80 Model 16** • same as 26-6001 1-Disk Model 16 system except with 2 8-inch, 1.25M-byte "slim-line" diskette drives:

5,798

**26-6005 2-Disk TRS-80 Model 16B** • same as 26-6004 1-Disk Model 16B system except with 2 8-inch, 1.25M-byte diskette drives:

5,798

**TRS-80 Model 16 or 16B Multiuser System** • same as Hard Disk System but with 2 26-6050 DT-1 Terminals:

8,397

### TRS-80 Model 100 Portable Computers

**26-3801 Model 100 System Unit** • includes CPU, 8K-byte RAM expandable to 32K bytes, 320-character LCD (40x8) display, typewriter keyboard, auto-dial modem, cassette interface, RS-232C serial interface, parallel printer interface, nickel cadmium battery for memory • also includes TRSDOS integrated with Microsoft BASIC, TEXT, TELCOM, SCHEDL, and ADDRSS software • requires 4 AA alkaline batteries and/or AC adapter:

\$799 prch

**26-3802 Model 100 System Unit** • same as 26-3801 except includes 24K-byte RAM expandable to 32K bytes:

999

### □ CPUs

**Model 4 & 4P CPU** • 8-bit Z80A microprocessor with 2-MHz clock cycle in Model III mode (standard on cassette-based systems, optional on disk-based systems), 4-MHz clock cycle in Model 4 mode • integrated 105 to 103 VAC, 60-Hz, UL-listed power supply.

**Model 12 CPU** • 8-bit Z80A microprocessor standard with 4-MHz clock cycle; optional 6-MHz MC68000 • DMA facility, vectored interrupts • integrated, filtered 120 VAC, 60-Hz power supply.

**Models 16 & 16B CPU** • 2 microprocessors standard; 8-bit, 4-MHz Z80A microprocessor with 4-MHz clock cycle plus 6-MHz MC68000 hybrid CPU with 32-bit operations but 16-bit data paths • dual-CPU, multiuser design fully utilized in Model 16 mode under TRS-XENIX; single-user Model II/12 possible under single-user TRSDOS • DMA, vectored interrupts, protect system,

3 user partitions, memory management features.

**Model 100 CPU** • 8-bit 80C85 CMOS microprocessor with 2.4-MHz clock cycle • power supply for CPU can be 4 AA alkaline batteries supporting 20 hours of operations or optional UL-listed AC power adapter; power for memory is nickel-cadmium battery, which is automatically recharged from batteries or AC power; memory battery maintains memory contents for up to 30 days with power off.

**26-3804 AC Adapter** • allows Model 100 to be plugged into standard electrical outlets in addition to battery-driven operation:

\$6 prch

### □ Memory

Each basic system package comes with both read-only memory (ROM) and read/write random-access memory (RAM). Basic and expanded capacities of both are model dependent.

**Model 4 Cassette-Based System Memory** • 14K-byte ROM, 16K-byte RAM standard; memory upgrade or MemDisk require system upgrade to Model 4 disk-based system (see Packaged Systems, Disks).

**Model 4 & 4P Disk-Based System Memory** • 14K-byte ROM, 64K-byte RAM standard expandable to 128K bytes.

**26-1122 64K-Byte RAM Kit** • for expanding disk-based systems from 64K to 128K bytes:

\$149 prch

### TRS-80 Model 12 & 16 Memories

**Model 12 Memory** • 80K bytes on internal memory board; any additional memory requires addition of card cage, which allows 6 more internal slots and capacity of 768K bytes variously configured with 26-6011 128K-byte boards each allowing 128K-byte memory kits added; 64K-byte memory board (which can only be used for VisiCalc).

**Model 16 Main Memory** • 128K-byte programmable main memory on system memory board (equivalent to 26-6011) available to MC68000 processor supporting program/data storage; 16K-byte I/O memory and 2K-byte video memory; memory board will support addition of 128K-byte memory kit; second 128K-byte memory board and second 128K-byte memory kit may be added for a total memory of 512K bytes • 64K-byte programmable main memory available to Z80A processor supporting program/data storage.

**Model 16B Main Memory** • 256K-byte minimum; otherwise same as Model 16 above.

**26-6011 128K Memory Board** • 1 is standard, 1 optional; standard on Model 16; 2 are optional on Model 12 but require 26-6017 Card Cage:

\$699 prch

**26-6012 128K Memory Kit** • requires 26-6011 board:

299

**26-4105 64K-Byte VisiCalc Memory** • only available to enhance VisiCalc spreadsheet calculations:

399

**Model 12 & 16 Read-Only Memory (ROM)** • contains bootstrap and power-up diagnostic programs; automatically bank switched out of address space after cold start.

### TRS-80 Model 100 Memory

**Main Memory** • 8K bytes expandable to 32K bytes.

**26-3816 8K-Byte Memory Kit** • 3 may be added to Model 100:

\$120 prch

### □ I/O & Communications

All TRS-80 systems are packaged systems with most of the configuration limits defined by number and type of expansion slots and the capacity of integral controllers. Communications devices like the Network Controllers or T-76 Controller vie with serial printers and other types of serial I/O devices for attachment by means of (an) RS-232C standard serial I/O port(s).



## Tandy Corp/Radio Shack TRS-80 Series 4, 4P, 12, 16, 16B & 100 Microcomputers

**Model 4 & 4P** • 1 internal memory expansion slot, 1 external RS-232C serial port, and 1 external parallel printer port available  
 • diskette subsystem master drive can attach 1 internal and 2 external drives; 4P does not have a serial RS-232C port.

**Model 12 I/O** • basic system provides no internal expansion slots, but has 2 external serial I/O ports and 1 parallel printer port as well as disk bays for 1 4-drive diskette subsystem (2 drives internal, 2 external) and 1 external 4-drive hard disk subsystem; I/O capabilities can be expanded by means of an optional card cage.

**26-6017 Card Cage** • card cage mounts inside Model 12 case; provides 6 slots for second 16-/32-bit CPU, additional memory, enhanced VisiCalc and memory support board, high-resolution graphics board, etc:  
\$199 prch

**Model 16 I/O** • basic external system expansion same as Model 12; however, there already are 2 internal slots available, whereas the 6-slot card cage addition is not available.

**Model 100 I/O** • 1 cassette interface, 1 parallel printer port, and 1 RS-232C serial port provide I/O expansion options.

**71-3013T-76 Communications Controller** • allows Models 12 and 16 microcomputers and DT-1 terminal devices to emulate an IBM 3278 SDLC terminal; attached Radio Shack printers function as 3287 printers; includes diagnostics for monitoring SDLC status and communications link • provides ports for connecting up to 7 devices directly or through asynchronous modems:  
RPO

26-1211 Network 2 Controller • connects up to 16 TRS-80 Model I, III, 4, or Color Computer systems to a host Model 4; Model 4 can download programs:  
499

26-1212 Network 3 Controller • connects up to 16 TRS-80 Model III or 4 systems to a host model; satellites can request programs from the host:  
599

**76-1005 DC 1200 Direct-Connect Modem** • connects directly to telephone jack; manual originate and auto-answer; RS-232C interface; up to 1200 baud:  
699

76-1009 Auto-Dial • for DC 1200 Modem:  
149

43-233 Multiline Controller • for DC 1200 Modem:  
40

279-357 Duplex Jack • for DC 1200 Modem:  
7

**26-1174 AC-3 Acoustic Coupler** • allows transmission by means of a standard home telephone handset:  
150

**26-1172 Direct-Connect Modem I** • plugs into telephone jack; up to 300 baud; full-duplex:  
149

**26-1173 Auto-Answer Auto-Dial Direct-Connect Modem II** • similar to 26-1172 specifications, except programmable:  
249

Arcnet • Radio Shack version of Datapoint Arcnet • see report D363-0010 Datapoint ARC Systems • designed for use with TRS-80 Models II and 12 in local area network (LAN) • maximum configuration 255 processors.

Arcnet Interface Card • 1 required for each processor in LAN:  
399

Arcnet Passive Hub • controls up to 4 processors:  
79

Arcnet Active Hub • controls up to 8 processors:  
995

Arcnet Cable • required to interconnect processors in Arcnet LAN.

20 Feet: 16

100 Feet: 40

26-1499 SW-303 RS-232C Selector Switch • provides 2 switched ports for connecting RS-232C devices to TRS-80:  
150

**Mass Storage**

Model 100 is a cassette-based system and does not have mass storage options. Models 4, 12, and 16 can all include the same type of diskette subsystem expandable from 1.25M to 5M bytes on 1 to 4 drives. Models 12 and 16 can have an optional Winchester disk subsystem of up to 48M bytes on 4 drives.

**TRS-80 Model 4 Disks**

**26-1127 Master Diskette Drive** • 184K, 5.25-inch double-density diskette drive packaged together with TRSDOS 6.0 operating system with MemDisk cache control; Disk BASIC, sound • master drive can control 1 internal and 2 external slave drives for subsystem capacity of 736K bytes:  
NA prch

26-1130 Hard Disk System for Model 4 Computers • 5M-byte Winchester-type disk drive:  
1,999

26-1131 Secondary Hard Disk Drive • up to 3 allowed per system • requires 26-1130:  
1,799

**TRS-80 Models 12 & 16 Disks**

TRS-80 Model 12 or 16 configurations include 1 to 4 8-inch, 1.25M-byte, slim-line, double-sided, double-density diskette drives. Basic systems have 1 or 2 integrated drives built into the system cabinet. A second internal drive may be added to configurations originally equipped with 1 diskette drive; 2 more external drives bring the subsystem capacity to 5M bytes. In addition, up to 4 12M-byte hard disk drives may be added to the system providing a total of 48M bytes of storage.

**26-4167 Internal Disk Expansion** • second disk drive for single integrated diskette in Model 12 or Model 16 system; 8-inch, 1.25M-byte diskette drive; drive is installed in system cabinet:  
\$799 prch

**26-4165 Single-Drive External Unit** • expands internal subsystem to 3 drives; cabinet includes space for expansion using 26-4167 drive:  
1,299

**26-4166 Dual-Drive External Unit** • expands internal subsystem to 4 drives:  
2,098

**26-4152 Primary Hard Disk System** • for Model 12 and Model 16 computers • 12M-byte, 5.25-inch, 2-platter, 4-surface, Winchester-type disk drive; each of 6 disk surfaces has 1 movable read/write head to access data tracks on that surface; 5M-bps data transfer rate; 3600-rpm disk rotation speed; 3-millisecond track access time; 8.3-millisecond latency; supports all current TRSDOS library commands plus SAVE and RESTORE • 1 Primary drive may be supported by Model 12 or 16 computer; up to 3 Secondary drives may be added for a total storage of over 48M bytes per subsystem • Primary drive also contains TRSDOS 6.0 hard disk support logic:  
3,495

26-4153 Secondary Hard Disk System • add-on hard disk drive for Model 12 and Model 16 computers; up to 3 Secondary drives require 26-4152 Primary Hard Disk System:  
2,495

**Tape**

The TRS-80 systems can be equipped with an audio-quality cassette tape drive for program/data storage. Minisette-9



# Tandy Corp/Radio Shack TRS-80 Series

## 4, 4P, 12, 16, 16B & 100 Microcomputers

Recorder is suggested, but the cassette interfaces, when present, will handle any drive.

**26-1208 CCR-81 Computer Cassette Recorder** • cassette recorder designed specifically for computer operations; cue/review and tape counter for searching and easy indexing of record locations include both AC and DC operating capabilities • 500 or 1500 bpi, 2 tracks, read rate of 1.875 inches per second • DC operation requires 4 C batteries:

\$60 prch

### □ Terminals/Workstations

The Model 100 Portable and Model 4 Desktop are both single-user systems that can function as terminals when communications lines are attached. Models 12 and 16 are single-user systems that can be expanded to 3 users by the addition of terminals. In addition, all systems can communicate with other terminals such as the Radio Shack Videotex. The following first presents the Radio Shack basic system unit details as to CRT and keyboard characters, then presents add-on Radio Shack terminals.

### TRS-80 Model 4, 12, 16 & 16B Radio Shack Display & Keyboard

**Display** • 24-line x 40-/80-character, 12-inch, high-resolution CRT display built into system cabinet • features include upper- and lowercase characters with descenders, 32 business graphics characters, automatic scrolling • included in basic Model 4, 12, or 16 configurations.

**Keyboard** • 76-key, typewriter-style keyboard with numeric keypad • features include HOLD, ESCape, BREAK, CTRL, CAPS REPEAT, 2 programmable special function keys, and Up, Down, Right, Left arrow keys • included in basic configurations; Model 4 keyboard is an integral part of the system unit; Model 12, 16, and 16B keyboards are movable.

### TRS-80 Model 100 Display & Keyboard

**Display** • 8-line x 40-character LCD display built into the 4-pound system unit • upper- and lowercase characters, graphics and European characters, and dot-addressable graphics.

**Keyboard** • full-size typewriter keyboard with numeric pad, 4 cursor keys, 4 command keys, and 8 programmable function keys.

**26-6050 TRS-80 DT-1 Terminal** • for use with local or remote multiuser configurations • 12-inch, 24-line x 80-character display terminal with 70-key typewriter-style keyboard and 12-key datapad; 10 keyboard-selectable line rates from 75 to 19,200 baud; 4 keyboard-selectable cursor types; normal, reverse, invisible, blink, underline, and half-intensity video display; non-volatile memory retains keyboard configuration between power-up periods; 1 RS-232C communications port, serial port, 1 parallel printer port; Televideo 910, Lear Siegler ADM-5, ADDS 25, or Hazeltine 1410 terminal emulation:

\$699 prch

**26-5001 VIDEOTEX Terminal System** • 0.894-MHz 6809E processor; 16K-byte buffer memory; read-only memory (ROM) containing information-service interface software; video receiver (TV) interface; direct-connect modem; includes 53-key keyboard with typewriter-style layout and calculator-style keys; built into system housing • special keys include BREAK, CLEAR, cursor control • system uses separately available, standard, 300-ohm color video receiver (TV) • 16-line x 32-character, uppercase alphanumeric display format; graphics • purchase price includes free 1-hour connection to CompuServe and/or Dow Jones information services • requires standard TV/video receiver:

399

76-1001 Portable Data Terminal • full-size ASCII typewriter-style keyboard and dot-matrix thermal printer • built-in acoustic coupler:

995

761002 RS-232C Interface Module:

70

### □ Printers/Graphics

Radio Shack provides 6 models of dot-matrix printers, all with dot-addressable graphics capability, all but 1 with choice of pin-fed or friction-fed paper, and choice of serial or parallel interfaces. One of the dot-matrix printers is claimed to produce letter-quality printing equal to that of a daisywheel printer. Radio Shack also offers 3 daisywheel printers, both with parallel interfaces, and a compact color graphics strip printer.

**26-1253 DMP-100 Dot-Matrix Printer** • 50-cps, unidirectional, character or graphics printing; 5 or 10 cpi, 80 characters per line • 60x63 dots per square inch, 480 7-dot columns; fanfold paper up to 9.5 inches wide (no friction feed) • 96 ASCII character set, 480-byte buffer transmits at 600/1200 baud:

\$399 prch

**26-1255 DMP-120 Dot-Matrix Printer** • 120-cps, character or graphics printing, 80 characters per 8-inch line; bidirectional; 60x72 dots per square inch in bit image graphics mode; 5, 8.3, 11, or 16.7 characters per inch; 96 ASCII character set plus international and block graphics characters:

500

**26-1254 DMP-200 Dot-Matrix Printer** • 120-cps, character or graphics printing, 80 or 132 characters per 8-inch line; bidirectional; 60 to 100 dots per inch; 480 to 800 dots per line in bit-addressable graphics mode • word processing mode emulates proportional or fixed pitch, boldface, double-size characters, multiple fonts • 96 ASCII characters, 32 special and 32 block graphics characters; 10, 12, or 16.7 cpi in 9x9 or 15x9 dot matrix; resolution up to 100 dots per inch for 16.7 cpi • 2K-byte RAM buffer • serial or parallel interface; transmits at 600/1200 baud • includes both removable friction-fed platen and removable pin-fed tractor up to 9.5-inch forms; prints original and 2 copies for use with TRS-80 Models 4, 12, and 16:

799

**26-1267 DMP-420** • dot-matrix printer, 132 characters on 15-inch line; 140 cps at 10 characters per inch; three print modes, at 10, 12, or 16.7 characters per inch; tractor or friction feed, makes the two carbon copies:

999

**26-1251 DMP-400 Dot-Matrix Printer** • same type of printer as DMP-200 except 140 cps at 10 cpi, up to 15-inch fanfold paper tractor; for use with TRS-80 Models 4, 12, and 16:

1,195

**26-1252 DMP-500 Dot-Matrix Printer** • same type of printer as DMP-200 except 220 cps at 10 cpi, up to 15-inch fanfold paper tractor; prints original plus 3 copies • parallel interface only • for use with TRS-80 Models 12 or 16:

1,295

**26-1256 DMP 2100 Dot-Matrix Printer** • 160 cps in DP mode; 100 cps in WP mode, with print-quality rivaling daisywheel printers, according to Radio Shack • 32,400 dots per square inch allows letter quality in single-pass, programmable fonts; pitch allows 5-, 10-, 12-, 16.6-cpi proportional spacing, elongating • 96 ASCII characters plus 31 international, 31 graphics • up to 15-inch-wide paper, friction-feed forms standard, pin-fed forms tractor optional:

1,995

26-1441 Bidirectional Tractor • for use with fanfold forms, labels, and multipart forms on DMP 2100:

170

26-1440 Sheet Feeder • automatically feeds up to 200 sheets into DMP 2100:

995

**26-1257 DWP-20** • daisywheel printer, 115 characters per line at 10 cpi on 11.5-inch line, 18 characters per second; underline, backspace, forward, reverse, and half-line feed, auto-test; interchangeable 100-character print wheel:

799



## Tandy Corp/Radio Shack TRS-80 Series 4, 4P, 12, 16, 16B & 100 Microcomputers

<p><b>26-1467 Courier 10</b> • print wheel for DWP-210: _____ 10</p> <p><b>26-1468 Prestige Elite 12</b> • print wheel for DWP-210: _____ 10</p> <p><b>26-1469 Venizia PS</b> • print wheel for DWP-210: _____ 10</p> <p><b>26-1443 Bidirectional Tractor</b> • 13-inch tractor feed option for DWP-210: _____ 150</p> <p><b>26-1250 DWP-410 Daisy Wheel Printer</b> • 25 cps; 10 or 12 fixed pitch cpi or proportional pitch letter-quality printer paper up to 15 inches wide, friction feed up to 5 carbons • 8-bit data parallel interface, 36-pin Amphenol connector: _____ 1,295</p> <p>26-1459 Bidirectional Tractor Feed • for DWP-410 only; for handling pin-fed forms: _____ 240</p> <p>26-143X Print Wheels • Courier 10, Prestige Elite 12, Madeleine PS, Cubic PS, or Tile italic 12 font daisywheels: _____ 30</p> <p>26-143X Print Wheels • OCR-B 10, Letter Gothic 12, Cubic 15, or Bold PS font daisywheels: _____ 40</p> <p><b>26-1158 Daisy Wheel II</b> • for all TRS-80 systems except Color and Pocket Computers • 19.5-lpm (43 cps) full-character impact printer • uses 124-character print wheels; includes 10-cpi Courier print wheel • friction feed; up to 16-inch paper; switch-selectable 10-cpi, 12-cpi proportional spacing • features include interchangeable print wheel and cartridge ribbon, forward, reverse, and 0.5-line paper feed, underline, boldface, backspace • requires cable: _____ 1,995</p> <p>26-1448 Automatic Sheet Feeder • feeds up to 200 sheets into Daisy Wheel II printer: _____ 1,495</p> <p>26-1260 Automatic Envelope Feeder • automatically feeds up to 200 size 6 to 10 envelopes into Daisy Wheel II printer; up to 1,200 envelopes per hour: _____ 1,195</p> <p>26-1447 Bidirectional Tractor Feed • handles up to 15-inch tractor-fed paper; bidirectional control prevents jams when paper is moved forward or backward: _____ 290</p> <p>26-1455 Acoustic Cover: _____ 399</p> <p>26-128X Print Wheels • Courier 10, Prestige Elite 12, Madeleine PS, Cubic PS, or Tile italic 12 font daisywheels: _____ 30</p> <p>26-128X Print Wheels • OCR-B 10, Letter Gothic 12, Cubic 15, or Bold PS font daisywheels: _____ 40</p> <p><b>73-1003 Forms Decollator</b> • manual decollator including attachment for carbonless forms; handles up to 350 feet per minute; to 16.5-inch wide paper: _____ 250</p> <p><b>73-1001 ES-1 Paper Shredder</b> • shreds up to five sheets of 8.5-inch x 11-inch paper: _____ 250</p>	<p><b>73-1002 Shredder Basket</b> • basket for ES-1: _____ 30</p> <p><b>74-551 Paper Caddy</b> • paper-dolly and printer forms rack on wheels: _____ 80</p> <p><b>26-1269 Printer Controller</b> • 62K RAM printer buffer with standard parallel interface; Z80A microprocessor driven; clear, pause, and copy function for up to 10 consecutive duplicates; downloading capabilities for alternate character sets and graphics data: _____ 250</p> <p><b>26-1498 SW-302 Parallel Printer Switch</b> • connects either two computers to one printer or two printers to one computer, manual switch: _____ 120</p> <p><b>26-1499 SW-303 RS-232C Selector Switch</b> • connects to three RS-232C devices to microcomputer, one port configurable for communications between two microcomputers: _____ 150</p> <p><b>26-1192 CGP-115 Compact Color Graphics Printer</b> • 4 colors: red, blue, green, and black; prints graphics and alphanumerics • text mode 12 cps, 40 or 80 characters per line; 4.5-inch-wide paper roll for printing 3.8-inch-wide X-axis; no limit to Y-axis • plot speed 2.05 ips; graphics mode can also plot/print any size character • color via replaceable ink cartridges • requires parallel interface: _____ 250</p> <p>26-1498 SW-302 Parallel Printer Switch • allows 2 printers to be connected to a computer or 2 computers to a printer: _____ 120</p> <p>Radio Shack supplies plotters, a digitizer and an input "X PAD" for graphics applications. A printer particularly designed for color graphics printing is in the printer section.</p> <p><b>26-1195 Digitizer</b> • graphics digitizer; digitizing area is 11x17 inches; operates in both horizontal and vertical planes; point and continuous modes; 100 lpi; up to 100 points per second • requires RS-232C Serial Port: _____ 449</p> <p><b>26-1191 Multi-Pen Plotter</b> • for all TRS-80 systems • graphic plotting in 8 colors under software control with stepper drive; automatic change of plotting pen color • 7-inch x 10-inch plot size on 8.5-inch x 11-inch paper • RS-232C interface: _____ 1,995</p> <p><b>26-1268 CGP-220</b> • color graphics printer; drop on demand ink-jet printer supports seven colors: yellow, violet, red, green, cyan, magenta, and black; 560 monochrome to 640 color dots per line, selectable parallel and serial interfaces: _____ 699</p> <p><b>26-1193 FP-215 Flatbed Plotter/Printer</b> • plots in 4 colors from BASIC ASCII command codes and parameters; can print horizontal or vertical text using BASIC LPRINT command; single-pen plotting with manual change of pens; (red, blue, green, black included); self test; automatic print • attaches to either parallel or RS-232C serial interfaces • paper size 8x11.5 or 10.12x14.3 inches with plot size of 7.32x10.63 or 8.5x11.73 inches: _____ 995</p>
<p>• END</p>	





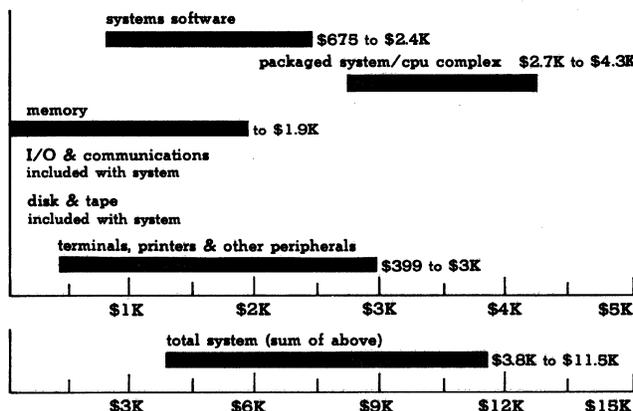
# Tandy Corp/Radio Shack TRS-80 Model 2000 & 2000 HD

## ■ PROFILE

- Operating Systems** • MS-DOS 2.0 single-user by Microsoft.
- Data Management** • only MS-DOS file manipulation capabilities, data management software available for additional cost from Tandy and third-party vendors.
- Communications/Networks** • RS-232C serial port and parallel printer port; for additional cost Tandy provides communication software.
- Languages** • options for purchase include MS-Pascal, MS-GW BASIC, MS-FORTRAN, MS-Assembler by Microsoft, RM-COBOL by Ryan/McFarland.
- Models** • Tandy Model 2000, Tandy Model 2000 HD.
- CPU** • Intel 80186 16-bit processor, 8 MHz, accesses memory without wait states.
- Memory** • 128K-byte RAM standard to 768K bytes, up to 256K bytes of memory on motherboard.
- Chassis Slots** • 4 proprietary Tandy slots.
- Ports** • single RS-232C serial and parallel printer ports.
- Mass Storage** • 2 integral 5.25-inch double-sided, double-density, thin-line diskette drives; 720K bytes formatted; Model 2000 HD replaces one of the 2 diskette drives with 5.25-inch 10M-byte formatted hard disk.
- Terminals/Workstations** • single terminal system with detached keyboard, monochrome or color display, and optional vertical



## PURCHASE PRICE RANGE hardware & software



**TANDY MODEL 2000 & 2000 HD PURCHASE PRICING** bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing. **SMALL SYSTEM** is based on a Model 2000 packaged system (includes MS-DOS 2.0; 128K-byte RAM; a serial RS-232C port, a parallel port, two 720K-byte half-height floppy disk drives, detached keyboard) and the following options: Microsoft-Word word processor, GW BASIC, monochrome monitor without graphics, dot-matrix parallel printer. **LARGE SYSTEM** is based on a Tandy Model 2000 HD packaged system (includes MS-DOS 2.0; 128K-byte RAM; a serial RS-232C port, a parallel port, one 720K-byte half-height floppy disk, one 10M-byte hard disk drive, detached keyboard) and the following options: Microsoft-Word word processor, Microsoft-Multiplan spreadsheet, dBase II, Videotex Plus; GW BASIC, MS-Assembler, R/M COBOL, PFS:Graph, additional 740K-byte RAM, color monitor with color graphics adapter, dot-matrix printer.

floor stand for system unit and pedestal for monitor.

**Printers** • Tandy supports 1 or more parallel and serial printers; broad array of printer types available from vendor including personal and professional letter quality daisywheel and dot matrix; color printers and flatbed color plotter also available.

**First Delivery** • December 1983.

**Systems Delivered** • information not available.

**Comparable Systems** • Tandy 2000 competes for market share with MS-DOS machines in the \$2,750 to \$5,000 price range; Tandy 2000 HD competes with hard disk microcomputers running MS-DOS in the \$4,250 to \$9,000 price range.

**Vendor** • Radio Shack Division of Tandy Corporation; 1300 One Tandy Center, Fort Worth, TX 76102 • 817-390-3011.

**Canada** • Radio Shack Canada; 279 Bayview Drive, P.O. Box 34000, Barrie, ONT L4M 4W5 • 705-782-6242.

**Distribution** • worldwide through over 8,700 Radio Shack retail outlets; distribution of Tandy 2000 is through over 400 computer centers and additional retail outlets.

## ■ ANALYSIS

Tandy has departed markedly from its usual line of TRS-80 microcomputers in its design of the Model 2000. It does not run TRS-DOS, nor CP/M Plus, nor does it have the Z80A as its central processor. The system does not come in



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a gun-metal gray integrated box and does not even mention "Radio Shack" on its nameplate. In fact, except for the name "Tandy" and the vast distribution and support network backing this system, it is almost unrecognizable as a Radio Shack product.

The Model 2000 runs MS-DOS 2.0 on an Intel 80186 microprocessor. It runs applications more than twice as fast as its competing IBM-PC. It is also Radio Shack's first business-oriented microcomputer with color graphics. Ergonomically, the Model 2000 features modular design with detached keyboard and monitor and an optional floor stand for the system unit. Diskette storage is 720K bytes formatted per 5.25-inch disk, double that of the IBM-PC. The price of a Model 2000 is \$700 less than a similarly configured IBM-PC.

The Model 2000 comes in a 10M-byte hard disk version called the 2000 HD. Both systems can run approximately fifty percent of the IBM-PC software. Tandy has not yet signed agreements with Vision, DesQ, and Lotus 1-2-3.

### Strengths

The Tandy Model 2000 is a very fast microcomputer. It has high resolution color graphics, very high capacity diskette drives (1.4M bytes total), and a sleek design. Incorporating the Intel 80186, Tandy has positioned itself above IBM with respect to MS-DOS processing power. The IBM-PC's Intel 8088 at 4.77 is no competition to the Model 2000's Intel 80186 running at 8 MHz.

With an optional floor stand it is possible to reduce the system footprint to that of the monitor and the keyboard. The keyboard fits neatly under the system unit while not in use.

The Model 2000 can presently run about half of all IBM-PC compatible software. In addition to the packages distributed by Tandy and listed below, the Model 2000 will run such notable packages as: Bottom Line Strategist by Ashton-Tate and Accounts Payable, Receivable, General Ledger, SuperCalc III by Sorcim, and Payroll by IBM.

### Limitations

Because of the ultra-high density diskette format Tandy selected, software and data files are not immediately interchangeable with other standard-density MS-DOS formats. Programs and data files must first be copied into the 720K-byte or 360K-byte formats to be transferred to or from a standard MS-DOS machine. This problem is most conspicuous when moving data from the Tandy Model 2000 to another 360K-byte capacity diskette machine, and could be a critical limitation to some users.

The prospective buyer should be aware that about half of the IBM-PC compatible software **will not run** on the Model 2000. These currently include: Lotus 1-2-3 by Lotus, WordStar and InfoStar by MicroPro, and the Visi series by VisiCorp. These software titles were extracted from a list of non-compatible IBM-PC software that Tandy makes available to potential customers. Tandy has stated that modifications to a majority of incompatible software is minor and that the list of compatible software is growing rapidly.

## SOFTWARE

### Terms & Support

**Terms** • for license from Tandy Corporation and/or individual software vendors distributed by Tandy.

**Support** • Tandy sales and service and classroom training provided at over 420 Radio Shack Computer Centers nationwide.

### Software Overview

The Tandy TRS-80 Model 2000 and 2000 HD are **not** software compatible with any prior Tandy TRS-80 machine. This incompatibility includes all applications running under TRS-DOS or CP/M-80. Tandy provides no facility for moving datafiles from these machines to the Model 2000.

The Model 2000 and 2000 HD are among the fastest MS-DOS microcomputers in production. MS-DOS compatible software will run from 2 to 4 times faster than on the IBM-PC and its compatibles. Typically the increase in speed is most noticeable during searching, sorting, or calculations.

After copying programs from standard MS-DOS format to the Tandy 720K-byte disk format, most application packages that adhere to the MS-DOS standard should run. Tandy claims modification of MS-DOS programs that do not transport immediately is a simple procedure for vendors. If this is accurate, it would be reasonable to expect a rapid increase in the amount of software available for the Model 2000.

Tandy has announced its intent to support Microsoft Windows and plans to distribute the software with a mouse input device. This would insure availability of state-of-the-art windowing software as it is developed for MS-Windows.

### Packaged Software

Tandy does not bundle software other than the operating system with the Model 2000. See Application Packages section for software available for license from Tandy.

### Operating System

**MS-DOS 2.00** • single user, interactive, and batch processing operating system with Unix-like hierarchical directories, piping functions, filters, and hard disk support; equivalent to IBM-PC DOS 2.0 • supports up to 180K bytes in up to 64 different files in single-sided format and up to 360K bytes in up to 112 files double-sided, and 5M or 10M bytes with thousands of file names on hard disk; handles records from 1 to 65,535 bytes long in file transfer; executes external (disk based) commands giving the user ability to expand the DOS vocabulary to limits of disk space • batch processing capabilities with automatic execution on power-up; user commands include: DATE, TIME, COPY, ECHO, PATH, MKDIR, RMDIR, CHDIR, TREE, RECOVER, GRAPHICS, BREAK, and CTTY • additions in performance over DOS 1.25 include hierarchical directories to facilitate hard disk use, numerous performance enhancements, redirection of input/output I/O, piping of functions (sequentially rather than concurrently as in Unix), higher sector density per track (9 sectors per track vs. 8 in DOS 1.25), and installable device drivers • MS-DOS is divided into four parts: a device-independent I/O handler, an I/O processor, reference and jump vectors in low memory, and a command processor; the device independent I/O handler on hidden file MSDOS.SYS is the core of MS-DOS through which I/O must be directed; the I/O processor physically moves data and instructions by means of hidden file IO.SYS as commanded by MSDOS.SYS; the command processor using the COMMAND.COM program is responsible for interface between user and MS-DOS, error trapping, batch file processing, interpreting user commands, and executing file names • MS-DOS 2.00 will read earlier MS-DOS diskettes; there are several unique system interrupt calls and file descriptors that make programs utilizing these features non-transportable between MS-DOS 2.00 and earlier versions; an editor, debugger, and other utilities are provided • MS-DOS 2.0 is somewhat enhanced over earlier versions • bundled with system.



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### Utilities

There are no general utilities except those provided by the operating system and individual separately purchased packages.

### Data Management

**26-5305 pfs:File** • an electronic filer by Software Publishing; supports generation and rearrangement of a screen-oriented filing system, search capabilities with qualifiers including any combination of greater than, less than, equal to, and not descriptors, useful in applications requiring list and data management: \_\_\_\_\_ 595

\$140 lens

**26-5306 pfs:Report** • report generator by Software Publishing; outputs data stored in pfs:File; organizes data into tables; provides averages, totals, and counts; automatically sorts rows of information alphabetically or numerically: \_\_\_\_\_ 125

125

**26-5352 dBase II** • relational database manager with query and data entry facilities by Ashton-Tate; programmable query language allows user to add, delete, edit, display, print, and manipulate data in 1 or more databases: \_\_\_\_\_ 595

595

### Communications/Networks

**25-5260 Videotex Plus** • communication program supports access to major information network by phone; includes free hour of connect time on Dow Jones News/Retrieval and CompuServe; requires modem: \_\_\_\_\_ \$50 lens

\$50 lens

### Program Development/Languages

**26-5251 MS-GW BASIC Compiler** • implementation of BASIC-86 by Microsoft • provides graphics capabilities and drawing statements for creating lines and circles or painting the screen • screen editor implements special function keys and multistatement lines • allows calling of machine language subroutines, merging of multiple programs, and transferring control to specific program lines during certain events; IF/THEN/ELSE constructs are supported as well as trace/no trace for easier debugging • compiler produces machine language code: \_\_\_\_\_ \$300 lens

\$300 lens

**26-5256 MS-Pascal Compiler** • version of Pascal by Microsoft; generally compatible with ISO proposed standards with extensions; compiler generates native machine code and provides low-level escapes to the machine level; provides 8087-emulation software for computers without an Intel 8087 coprocessor • supports address types, ARRAY and RECORD type constants and functions, SUPER ARRAYS, control flow features, separately compiled UNITS, and variable length strings; MS-Pascal code can be linked with macro-assembly and MS-FORTRAN code to produce a single program: \_\_\_\_\_ 300

300

**26-5255 MS-FORTRAN** • an implementation of FORTRAN-77 for 16-bit computers by Microsoft; meets X3.9-1978 ANSI subset level standard requirements; accuracy to 14 significant digits, IEEE floating-point arithmetic; interactive applications using extended I/O operations; includes library manager: \_\_\_\_\_ 350

350

**26-5252 MS-Assembler** • Macro-86 macro assembler, MS-LINK linker, MS-LIB library, and MS-CREF cross reference facilities by Microsoft; provides full assembly language development facilities • assembled code usable by any language that supports machine language calls; can be run directly from operating system or monitor: \_\_\_\_\_ 100

100

**26-5257 R/M COBOL** • a high-level implementation of the ANSI-74 COBOL (X3.23 1974) standard • features include Level 2 sequential relative and indexed file access methods; full arithmetic capability; standard DISPLAY and COMPUTATIONAL data-type support extended to include binary as well as packed

decimal extended ACCEPTDISPLAY operations for CRT control; interactive debug at the source statement level; undermarked errors with self-explanatory messages; cross-reference listing; single pass compilation; segmentation at the source language level; and built-in security features for source language library control • runs under MP/M-F6 and Xenix • developed by Ryan/McFarland: \_\_\_\_\_ 595

595

### Applications Packages

**26-5302 pfs:Write** • full-feature word processor by Software Publishing prints text with reports and graphs generated by pfs:Report and pfs:File; features plan English functions. "Help," boldfacing, underlining, centering, justification, page headings and footings, and automatic page numbering: \_\_\_\_\_ \$140 lens

\$140 lens

**26-5314 Microsoft Word** • multiple-window full-feature word processor; includes formatting features of other word processors; text is displayed exactly as it is printed, including type style: \_\_\_\_\_ 375

375

**26-5330 MultiMate** • Wang-like word processor by Softword Systems; provides print queue, utility for insertion of specific elements into form letters, library function for standard file of text, mail merge, 31 different functions using Corona's 10 function keys, formatting, repagination, "help" messages, and tutorials • written in assembly language and utilizes own I/O; bypasses operating system basic input/output system (BIOS) • standard with system: \_\_\_\_\_ 250

250

**26-5307 pfs:Graph** • by Software Publishing; creates up to 4 graphs on single set of axes of data from keyboard, pfs:File, or VisiCalc; features auto-formatting, scaling, legend labeling, and pattern filling; produces bar, pie, and line graphs of various types: \_\_\_\_\_ 140

140

**26-5311 Microsoft-Multiplan** • second generation electronic spreadsheet can transfer information between different worksheets; features multiple windows, sort, online reference guide, and format options for printing reports: \_\_\_\_\_ 249

249

**MAI/Basic Four Small Business Accounting** • integrated software series for small business; features clear, concise documentation, and similar command structure between programs simplifying learning.

26-5210 MAI/Basic Four General Ledger: \$495.

26-5212 MAI/Basic Four Accounts Payable: \$495.

26-5213 MAI/Basic Four Accounts Receivable: \$495.

26-5214 MAI/Basic Four Inventory Control: \$495.

26-5215 MAI/Basic Four Order Entry: \$495.

26-5217 MAI/Basic Four Purchase Orders: \$395.

26-5218 MAI/Basic Four Payroll: \$495.

**26-5340 The Home Accountant Plus** • personal finance package by Continental Software; features graphing, reporting, check printing, and forecasting; keeps track of multiple savings and checking accounts; produces net-worth statements: \_\_\_\_\_ 125

125

**Other Facilities** • no other facilities provided by Tandy.

### HARDWARE

### Terms, Support & Documentation

**Terms** • Tandy 2000 and associated products are available for purchase; packaged systems are available for 39-month lease with 90-day evaluation period; volume purchase discounts available.

*LCNS: license fee. NC: no charge. Prices effective as of December 1983.*



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**Support** • on-site and limited on-site service contracts available in many areas; carry-in service agreement available nationally • over 20 Radio Shack service centers; toll-free hot-line available; sales, service, and classroom training provided at Radio-Shack Computer Centers; Radio Shack has over 2600 trained field marketing and management personnel.

**Documentation** • manuals for each system include hardware and software technical references.

**Physical Specifications (H x W x D); Weight**

**CPU** • 4.24 x 18.75 x 21.25 inches; information not available.

**Display** • 14 x 8.5 x 12.25; weight not available.

**Keyboard** • 3 x 16 x 5.25; weight not available.

**Pedestal** • 25 x 18 x 18 inches; weight not available.

**Systems Overview & Configurability**

Tandy's careful selection of processor, disk drives, keyboard, and graphics features reveals an intent to produce the fastest, highest performance system that current microcomputer technology can affordably achieve.

The selected Intel 80186 central microprocessor runs at 8 MHz. Tandy incorporated this with fast memory allowing the processor to access it with no wait states. The 80186 instruction set can execute all 8086/8088 object code. By integrating 15 to 20 separate chips into the 80186, Intel has allowed a reduction in components and cost of machines using this technology.

Disk capacity is 720K bytes per drive on 5.25-inch disks. This is double that of the IBM-PC running MS-DOS/PC-DOS 2.0. The drives are half-height, direct drive, with twice the industry standard track-to-track step speed. The hard disk model is configured with a new LSI (large scale integration) controller resulting in a high performance/cost ratio.

The keyboard is detached, with programmable function and low-profile sculpted keys. The desk-top footprint is reduced significantly by using a system unit floor stand option.

Tandy has incorporated some very advanced features into its high resolution graphics displays. The end result is a 640x400, 8-color or monochrome display with an 800x400 pixel text mode. Provided, as well, are reverse video, underline, blank, blink, intensity, and double-width/double-height features. A 256K customized character font can be loaded from disk into RAM to allow alternate fonts or foreign languages. Display also features smooth scroll and split-screen capabilities.

Maximum configurability is stated below; minimum configurations are discussed under Packaged Systems.

**TRS-80 Model 2000 & 2000 HD System Maximums** • single Intel 80186 8-MHz CPU in floppy and hard disk systems, 768K-byte memory, 10M-byte hard disk storage, 1.44M-byte floppy disk storage, four chassis slots, serial RS-232C and Centronics parallel ports, detached keyboard, system unit stand, 640x400 pixel 8-color graphics.

**Packaged Systems**

**26-5103 Tandy Model 2000** • 16-bit/16-bit data path, 8-MHz Intel 80186, 2 720K-byte 5.25-inch diskette drives, detached keyboard, 128K-byte RAM, display/printer adapter, RS-232C serial port, 4 chassis slots:

\$2,750 prch

**26-5104 Tandy Model 2000 HD** • 16-bit/16-bit data path, 8-MHz Intel 80186, 720K-byte 5.25-inch diskette drive, 10M-byte formatted hard disk, detached keyboard, 128K-byte RAM, display/printer adapter, RS-232C serial port, 4 chassis slots:

4,250

**CPU**

**Intel 80186 Processor** • 16-bit data bus interface; 16-bit internal architecture, direct addressing to 1M bytes of memory; 16-bit register set with symmetrical operations; 24 operand addressing modes; 8-bit and 16-bit signed and unsigned arithmetic with binary and decimal operands; extensive string and block move facilities • powerful segmentation facilities allow

memory partitioning for multitasking, concurrent, or multiuser capabilities • a pseudo-superset of the Intel 8080 instruction set where translation to 80186 is straight forward • a superset of the Intel 8086/8088, its instruction set is the same with 10 additional instructions; enhancements include single commands to push or pop all general registers, string input and output using DX register for port; procedure enter and exit (LEAVE) commands; immediate modes added to push; integer multiply and shift/rotate instructions; and check array against boundary command • in addition to improved execution of original 8086/8088 instructions; ten added commands; and an additional interrupt type • the Intel 80186 includes major hardware additions on a single chip, these include: a clock generator for internal and external clocks; 2 external and 1 internal 16-bit programmable timer/counters, 2 DMA (Direct Memory Access) channels with 2M-byte-per-second transfer rate; local bus controller; data-bus transceiver; programmable memory and I/O chip for up to 7 peripherals and 6 totally independent memory blocks; and programmable multilevel interrupt controller • these Intel 8086/8088 design changes improve the Intel 80186's performance • 8 MHz.

**Memory**

Memory is expandable to 256K bytes on the motherboard and to 768K total using an expansion card. High memory speed allows the microprocessor to access memory with no wait states.

**26-5160 Internal 128K RAM Kit** • expands motherboard to 256K RAM; does not require a chassis slot; installation not included:

\$299 prch

**26-5161 External 128K RAM Board** • 128K-byte chassis slot board with room for an additional 128K, 1 or 2 boards can be added:

499

**26-5162 128K RAM Board Upgrade Kit** • expands #26-5161 RAM Board to 256K bytes, requires installation, not included:

299

**I/O & Communication**

Included with system are a display/printer adapter and an RS-232C serial port for communication; ports are supported by communication software and programming languages; 4 chassis slots.

**Mass Storage**

Tandy 2000 contains 2 diskette drives; Tandy 2000 HD contains single diskette drive and single hard disk.

**5.25-Inch Diskette Drive** • 96 tracks per inch; 80 tracks per side, 9 512-byte sectors per track for a 720K-byte capacity; double-sided quad density, average seek time is 175 milliseconds track-to-track access time, 6 milliseconds with data transfer rates of 250K bits per second • included with 2000 system.

**5.25-Inch Hard Disk Drive** • 306 tracks at 345 tracks per inch, 17 512-byte sectors per track for a 10M-byte formatted capacity; average seek time is 85 milliseconds with data transfer rates of 5M bits per second, track-to-track access time of 3 milliseconds; internally mounted, included with 2000 HD system.

**Terminals/Workstations**

There are several options of input and screen output devices available. Displays are not bundled with system giving purchaser choice of monochrome or color.

**Keyboard** • detached 90-key with low-profile sculpted keys, 12 user-programmable function keys, 10-key numeric keypad, cursor control keys.

**26-5111 VM-1 High-Resolution Monochrome Monitor** • 12-inch nonglare, green phosphor screen, 80 characters x 25 lines; adjustable 5 to 10 degree tilt:

\$249 prch

*PRCH: purchase price. Prices effective as of December 1983.*



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**26-5140 High-Resolution Monochrome Graphics** • 640x400 pixel monochrome graphics option for VM-1 or VM-1 monitors:  
449

**26-5112 CM-1 High Resolution Color Monitor** • 14-inch color screen; tilts 5 to 10 degrees; requires 26-5140:  
799

**26-5142 TV/Joystick Option** • permits connection of most TV sets or monitors • includes sound generator, graphics, and support for optional joysticks:  
250

**26-5141 High-Resolution Color Graphics** • 640x400 pixel color graphics, choice of 8 out of 16 colors; requires 26-5140:  
199

**26-5144 Digi-Mouse/Clock Board** • Digi-Mouse controller and clock; includes MS-Windows at no extra cost:  
120

**26-1197 Digi-Mouse** • digital mouse; requires 26-5144; facilitates input through easy cursor movement and selection:  
100

**Printer/Graphics**

Tandy offers a number of letter-quality and dot-matrix printers and plotters that are compatible with all TRS-80 computers.

**26-1253 DMP-100** • dot-matrix printer; 5x7 dot matrix; 80 characters per 8-inch line; 50 characters per second (cps) at 10 characters per inch; underline, graphics, full-line buffer; selectable parallel or serial (600/1200 bps) interface; 4.5-inch to 9.5-inch tractor; includes ribbon cassette:  
\$399 prch

**26-1255 DMP-120** • dot-matrix printer; 9x9 dot matrix; 80 characters per 8-inch line; 120 cps at 10 characters per inch; underline, graphics, elongated and condensed fonts, graphics; selectable parallel or serial interface:  
500

**26-1254 DMP-200** • dot-matrix printer; all features of DMP-120 above plus correspondence mode; prints 10/12/16.7 characters per inch; mode and pitch manually or software selectable; 2 carbon copies; bi-directional, logic-seeking line; removable tractor and friction platen; 120 characters per second:  
699

**26-1267 DMP-420** • dot-matrix printer; 132 characters on 15-inch line; 140 cps at 10 characters per inch; prints 10/12/16.7 characters per inch; tractor or friction feed; 2 carbon copies:  
999

**26-1252 DMP-500** • dot-matrix printer; 132 characters on 15-inch line; 220 characters per second, bi-directional, logic-seeking; 3 print modes and 3 pitches, software or switch selectable:  
1,295

**26-1265 DMP-2100** • dot-matrix printer; 132 characters on 15-inch line; 160 characters per second, 24-wire printhead with 32,400 dots per square inch resolution; 3 print models and 3 pitches software or switch selectable:  
1,995

**26-1441 Bi-Directional Tractor** • for DMP-2100:  
170

**26-1440 Sheet Feeder** • automatic stacking and insertion of paper, snaps on and off:  
995

**26-1257 DWP-210** • daisywheel printer, 115 characters per line at 10 cpi on 11.5-inch line; 18 characters per second; underline, backspace, forward, reverse and half-line feed, auto-test; interchangeable 100-character print wheel:  
799

**26-1467 Courier 10** • print wheel for DWP-210:  
10

**26-1468 Prestige Elite 12** • print wheel for DWP-210:  
10

**26-1469 Venizia PS** • print wheel for DWP-210:  
10

**26-1443 Bi-Directional Tractor** • 13-inch tractor feed option for DWP-210:  
150

**26-1250 DWP-410** • daisywheel printer; 136 characters per line at 10 cpi; 25 characters per second; programmable backspace, underline, boldface capabilities; Automatic Paper Set paper insertion; 124-character print wheel:  
1,295

**26-1459 DWP-410 Bi-Directional Tractor** • 15-inch automatic fanfold paper feeder for DWP-410:  
240

**26-1158 Daisy Wheel II** • daisywheel printer; 136 characters per line at 10 characters per inch; 43 cps; 124-character print wheel, external program mode facilitates varied pitch of special characters; up to 5 carbon copies:  
1,995

**26-1447 Bi-Directional Tractor** • 15-inch automatic fanfold paper feeder for Daisy Wheel II:  
290

**26-1448 Automatic Sheet Feeder** • microprocessor controlled alignment, up to 200 sheets, for Daisy Wheel II:  
1,495

**26-1260 Automatic Envelope Feeder** • 1200 envelope-per-hour feeder; accepts sizes 6 to 10; for Daisy Wheel II:  
1,195

**26-1430/26-1420 Courier 10 Pitch** • print wheels for DWP-410/Daisy Wheel II:  
30

**26-1431/26-1421 Prestige Elite 12 Pitch** • print wheels for DWP-410/Daisy Wheel II:  
30

**26-1432/26-1422 Madeleine PS** • print wheels for DWP-410/Daisy Wheel II:  
30

**26-1433/26-1423 Cubic PS** • print wheels for DWP-410/Daisy Wheel II:  
30

**26-1434/26-1424 Tile Italic** • print wheels for DWP-410/Daisy Wheel II:  
30

**26-1435/26-1484 OCR B 10 Pitch** • print wheels for DWP-410/Daisy Wheel II:  
40

**26-1436/26-1485 Letter Gothic 12 Pitch** • print wheels for DWP-10/Daisy Wheel II:  
40

**26-1438/26-1487 Cubic 15+** • print wheels for DWP-410/Daisy Wheel II:  
40

**26-1439/26-1488 Bold PS** • print wheels for DWP-410/Daisy Wheel II:  
40

**26-1269 Printer Controller** • 62K RAM printer buffer with standard parallel interface; Z80A microprocessor driven; clear, pause, and copy function for up to 10 consecutive duplicates; downloading capabilities for alternate character sets and graphics data:  
250

**26-1455 Daisy Wheel Acoustic Cover** • reduces printer noise



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for DW II of DWP-410 and DWP-210 without tractors:

- 399
- 73-1003 Forms Decollator** • manual decollator including attachment for carbonless forms; handles up to 350 feet per minute; to 16.5-inch wide paper:  
250
- 73-1001 ES-1 Paper Shredder** • shreds up to five sheets of 8.5-inch x 11-inch paper:  
250
- 73-1002 Shredder Basket** • basket for ES-1:  
30
- 74-551 Paper Caddy** • paper dolly and printer forms rack on wheels:  
80
- 26-1498 SW-302 Parallel Printer Switch** • connects either 2 computers to 1 printer or 2 printers to 1 computer, manual switch:  
120
- 26-1499 SW-303 RS-232C Selector Switch** • connects 3

RS-232C devices to microcomputer, single port configurable for communication between two microcomputers:

- 150
- 26-1268 CGP-220** • color graphics printer; drop on demand ink-jet printer supports seven colors, yellow, violet, red, green, cyan, magenta, and black; 560 monochrome to 640 color dots per line; selectable parallel and serial interfaces:  
699
- 26-1192 CGP-115** • color graphics pen printer; supports 4 colors: red, blue, green, and black; paper width is 4.5 inches wide; 12 characters per second in text mode:  
200
- 26-1193 FP-215** • flat-bed plotter/printer; 100 mm per second plot speed; to 10x14-inch paper; step size 1 mm; requires manual pen change for multicolor plots:  
995

• END



# TeleVideo Systems 8-bit Computers

## TS 802, TS 802H/20, TS 803, TS 803H, TPC I, TS 804, TS 806/20 & TS 816/40

### ■ PROFILE

**Operating Systems** • single-user CP/M 2.2, 3.0, and multiuser MP/M II by Digital Research; MmmOST 2.11 multiuser/network service operating system by TeleVideo; Oasis by Phase One Systems.

**Data Management** • TeleDBMS data management system by UVEON Computer Systems, originally OPTIMUM DBMS customized for TeleVideo.

**Communications/Networks** • Tele3780 for 3780 and 2780 remote batch workstation emulation; Tele3270 IBM 3270 emulation; TeleAsync terminal program • TeleVideo Personal Computer Network is based on TS 806/20 or TS 816/40 network computers for up to 16 workstations, local or remote.

**Languages** • TeleCOBOL (Ryan-McFarland) optional; third-party CP/M-compatible languages including: CBASIC, CB-80, PL/1 80, and Pascal MT+ from Digital Research; MBASIC, COBOL 80, and FORTRAN 80 from Microsoft.

**Models** • TeleVideo TS 802, TS 802H/20, TS 803, TS 803H, TPC I, TS 804, TS 806/20, TS 816/40.

**CPU** • Zilog Z80A running at 4 MHz.

**Memory** • 64K bytes of RAM on TS 802, TS 802H/20, TS 803, TS 803H, TS 806/20; TPC I, TS 803, and TS 803H are expandable to 128K bytes and have 32K bytes of alpha/graphic display RAM;



TS 804 comes with 320K bytes of RAM and 64K bytes of cache; TS 816/40 comes with 128K bytes of RAM.

**Chassis Slots** • none.

**Ports** • 2 serial ports on all systems except TPC I which has one and the TS 804 which has three; Centronics-compatible parallel ports on TPC I, TS 804, TS 806/20, and 816/40; one RS-422 port standard on the TS 802 and TS 802H, 6 on the TS 806/20, and 16 on the TS 816/20; RS-422 ports are optional on the TS 803, TS 803H, and TPC I.

**Mass Storage** • one 5.25-inch 368K-byte floppy disk on the TS 802H/20, TS 803H, and 806/20; 2 5.25-inch 368K-byte floppy disks on TS 802 and TS 803; one 15M-byte 5.25-inch Winchester on the TS 806/20 and TS 802H; one 10M-byte Winchester on the TS 803H; one 33M-byte Winchester on the TS 816/40; the TPC I comes with one or 2 5.25-inch 368K-byte floppy disk drives; one 96-tpi density, 767K-byte, 5.25-inch floppy and one 10M-byte 5.25-inch hard disk are on the TS 804.

**Terminals/Workstations** • the TS 802, 802H, 803, 803H, 804, and TPC I are single-user systems with detached keyboards and integral disk drives and monitors; the TS 806/20 is a 6-user and the 816/40, a 16-user system which require terminals or personal computer workstations.

**Printers** • thimble- and print-wheel letter-quality printers with serial or parallel interfaces are available.

**First Delivery** • TS 802 January 1982; TS 802H/20 February 1982; TS 803 June 1983; TS 803H June 1983; TS 804 March 1984; TS 806/20 September 1981; TS 816/40 January 1982; TPC I November 1983.

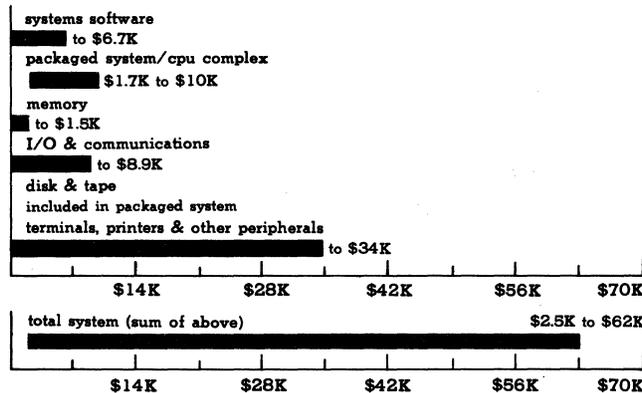
**Systems Delivered** • information not available.

**Comparable Systems** • the TeleVideo 8-bit systems compete for market share with other CP/M-based single-user machines; the TeleVideo multiuser and network computers are comparable to multiuser 8-bit systems like the Altos, North Star Horizon, CompuPro, and Cromemco.

**Vendor** • TeleVideo Systems, Inc; 1170 Morse Avenue, Sunnyvale, CA 94086 • 800-538-1780, 408-745-7760.

### PURCHASE PRICE RANGE

hardware & software



**TELEVIDEO 8-BIT SYSTEMS PURCHASE PRICING** bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing • **SMALL SYSTEM** is based on a TPC I packaged system (includes CP/M 2.2 by Digital Research; TeleWrite, TeleCalc, and TelePlan software; 64K-byte RAM; 8K-byte ROM memory, one RS-232C serial port, one RS-422 serial port, one Centronics-compatible parallel port, one 5.25-inch, 368K-byte floppy) and the following options: one TP 720 parallel printer and cable • **LARGE SYSTEM** is based on TS 816/40 Network packaged system (includes one TS 816/40 network processor; one RWP remote workstation processor; 2 TS 800R terminals and boards; 2 TS 803s and one TS 803H; 3 TS 803N RS-422 options; 16 RS-422 cables; 2 RS-232 cables; 4 modems; MmmOST operating system and TeleWrite, TeleCalc, and TeleChart) and the following options: one high-speed parallel printer and cable; one TS 750 printer with serial cable; 16 TS 720 printers; 8 modems; TeleAsync communications software; TeleFast Accounting System software; TelePlan, TeleDBMS, and WordStar software.



## TeleVideo Systems 8-bit Computers

TS 802, TS 802H/20, TS 803, TS 803H, TPC I, TS 804, TS 806/20 & TS 816/40

TABLE 1: 8-BIT TELEVIDEO SPECIFICATIONS SUMMARY

MODEL	TS 802	TS 802H/20	TS 803	TS 803H	TPC I	TS 804	TS 802/20	TS 816/40
<b>CPU</b>								
Processor	Z80A	Z80A	Z80A	Z80A	Z80A	Z80A	Z80A	Z80A
Processor speed	4MHz	4MHz	4MHz	4MHz	4MHz	4MHz	4MHz	4MHz
<b>MEMORY</b>								
Standard								
RAM, bytes	64K	64K	64K	64K	64K	320K	64K	128K
Maximum								
RAM, bytes	64K	64K	128K	128K	128K	320K	64K	128K
ROM, bytes	4K	4K	8K	8K	8K	4K	4K	4K
<b>MASS STORAGE</b>								
Standard								
5.25" Floppy	2 368K	368K	2 368K	368K	1 or 2 368K	1 737K	368K	14.5M (tape)
Hard Disk								
Storage, bytes	—	15M	—	10M	—	10M	15M	33.2M
Maximum Disk								
Storage, bytes	737K	15.4M	737K	10.4M	737K	43M	30.4M	47.7M
<b>I/O</b>								
RS-232C								
Serial Ports	2	2	2	2	1	3	2	2
Parallel Ports	0	0	0	0	1	1	1	1
RS-422 Serial Ports	1	1	1 opt	1 opt	1 opt	0	6	16
<b>NUMBER OF USERS</b>								
	1	1	1	1	1	4	6	16

**Canada** • TeleVideo Systems, Inc; 1170 Morse Avenue, Sunnyvale, CA 94086 • 800-538-1780, 408-745-7760, 617-890-3282.

**Distribution** • the TeleVideo 8-bit systems are distributed via an international network of distributors and dealers divided into 12 regions; local regional sales offices can be located by calling TeleVideo at 800-538-1780.

### ■ ANALYSIS

Since 1978 TeleVideo Systems has been manufacturing and marketing low-cost/high-performance computer terminals. Under the leadership of its president, Dr. K. Philip Hwang, a Korean entrepreneur, the company has penetrated into the personal computer field and is successfully catering to the single- and multiuser 8- and 16-bit microcomputer marketplaces. Its 8-bit systems are competing successfully against those of older, more established companies such as Altos, North Star, and CompuPro.

The 8-bit TeleVideo microcomputers are positioned to compete directly with single- and multiuser CP/M, MP/M II, and Oasis systems. TeleVideo's displays and keyboards have ergonomic features of its top-of-the-line terminals. Many of the machines are available for a very attractive price. With a base system price of only \$1,699, the TPC I offers a high-performance/cost ratio and transportability. TeleVideo hopes that these features, along with networking capability under MmmOST 2.11 and its network processors, will help its 8-bit systems to capture a significant portion of the still prospering 8-bit marketplace.

The TS 804 system is a departure from TeleVideo's other 8-bit designs in that it is a multiuser environment running MP/M II by Digital Research or Oasis by Phase One Systems. TeleVideo indicates that it is software compatible

with the Altos Computer Series 5 micros. It would be reasonable to surmise, therefore, that the TS 804 exists to compete directly with the Seies 5. In acquiring compatibility with Altos, the TS 804 lost a portion of its compatibility with other TeleVideo micros and all its connectivity to the TeleVideo network. The TS 804 does provide, however, multiuser capability under either MP/M II or Oasis.

TeleVideo publishes two catalogs to assist users in locating TeleVideo-compatible software and hardware. The software catalog comes in multiple 3-ring bound volumes. It is priced at \$100 which includes 3 or 4 updates a year. The software and hardware catalogs itemize both TeleVideo and third-party products. The hardware catalog comes in pamphlet form for \$10.

Since the first delivery of 8-bit machines, TeleVideo has introduced more advanced 16-bit products. These include an IBM PC-compatible series. TeleVideo has made it clear to its dealers, and it hopes, to the public, that it intends to continue to support and develop its 8-bit line. It seems prudent to remind ourselves that, as has been true so many times in the past, only time will tell.

### □ Strengths

The TeleVideo computers are geared to be affordable alternatives to other more expensive systems. TeleVideo claims a substantially configured TS 804 multiuser system has a low \$1,650 cost per user. These cost advantages can be attributed to advanced manufacturing techniques and inexpensive circuitry used in constructing an 8-bit, as opposed to 16-bit, line of microcomputers.

The 2 TeleVideo network processors provide immediate



## TeleVideo Systems 8-bit Computers

TS 802, TS 802H/20, TS 803, TS 803H, TPC I, TS 804, TS 806/20 & TS 816/40

utility to those requiring a networked environment. TeleVideo claims its MmmOST 2.11 operating system provides such attractive features as print spooling and remote communications capabilities. The network processors are capable of integrating 8- and 16-bit TeleVideo microcomputers. TeleVideo claims that with appropriate communications software, each networked node can participate in interactive and batch IBM mainframe communications.

Because many of TeleVideo's personal computers are based on the physical system units of its top-of-the-line terminals, they have superb ergonomic features and high-quality construction.

### □ Limitations

TeleVideo's solution to meeting the computing public's demand for networking is partial. TeleVideo Network is not a full-featured network but, rather, an advanced file-sharer running under a proprietary operating system called MmmOST. Whether its capabilities are adequate enough to match the powers of up-and-coming networking technologies is uncertain. To its advantage, the TeleVideo network is an existing, installed technology with software available.

Many users speculate about the dim future of the unglamorous 8-bit systems. The industry seems to have peaked as far as CP/M goes. This peak, though, includes thousands of existing applications and thousands more of installed systems.

Since it introduced a line of IBM PC compatibles, TeleVideo has selected specific qualified dealers and distributors under their DAVAD (Distributed-Affiliated Value-Added Dealer) program to carry these new machines. This has left many previously faithful TeleVideo dealers without TeleVideo's hottest products. The extent to which this will affect marketing efforts and restocking enthusiasm for these potentially insulted dealers is unpredictable. This move by TeleVideo is most assuredly going to have a negative effect on 8-bit sales.

### ■ SOFTWARE

#### □ Terms & Support

**Terms** • available for one-time license fee; several software packages come with update policies on an individual basis; source code for most packages is not available.

**Support** • TeleVideo dealers are responsible for a majority of user technical support; TeleVideo provides individual dealers with appropriate materials and technical assistance via telephone.

#### □ Software Overview

All 8-bit TeleVideo computers can run the CP/M 2.2 operating system by Digital Research. Most operating systems for the TeleVideo must be purchased separately. In fact, TeleVideo does not distribute many of them. MP/M II is bundled with its multiuser TS 804, but most other operating systems must be purchased from dealers carrying the correct versions. As expected, almost all TeleVideo dealers have appropriate versions of operating systems in stock.

TeleVideo's solution to providing a "network" for its personal computers is original. TeleVideo has developed a central network operating system called MmmOST 2.11 which can download appropriate versions of CP/M 2.2 or CP/M-86 to network members. The two network processors, the TS 806/20 and the TS 816/40, are actually just sophisticated file sharers; they do not

run application programs under CP/M 2.2 or CP/M-86. Data and program files of networked computers are stored on their 15M- or 33M-byte hard disks. Neither network processor has more than 128K bytes of RAM. There is no indication of the MmmOST configuration supporting communications between "networked" processors other than through disk file data interchange.

In actual use, the network processor functions as a private A: drive and public B: drive to CP/M applications. The B: drive is common for all users. Unless implemented for multiuser applications, files in use by one "network" member on the B: drive cannot be opened by other members. This requires duplicate copies of commonly used applications such as word processors or spreadsheets to be stored on the private A: drive of every interested user. This duplication creates unnecessary storage overhead which becomes more critical as users are added.

The TS 804 varies from other 8-bit TeleVideo computers in that it is truly multiuser and runs MP/M II and Oasis operating systems. Its software environment is designed to be similar to that of the Altos 8-bit multiuser series, its microcomputer arch rival. This system, with 3 additional terminals, is targeted to the small multiuser office.

TeleCOBOL, an OEM RM/COBOL, is available for software development. TeleVideo supplies a list of third-party vendor development languages that run under compatible operating systems. These languages include: CBASIC, CB-80, PL/1 80, and Pascal MT+ from Digital Research; MBASIC, COBOL 80, and FORTRAN 80 from Microsoft. Also available under the CP/M 2.2 environment are "C" language and assembler development packages.

#### □ Packaged Software

**TeleFAST** • OEM version of MBSI MicroBusiness Software financial accounting system; general business application package comes in 6 modules and is written in TeleCOBOL (RM/COBOL) for single- and multiuser 8- and 16-bit TeleVideo microcomputers; utilizes MmmOST facilities when run with the TS 806/20 or 816/40 network computers; some program modules interface automatically with other modules; for example, Order Entry with Inventory Control can optionally interface with Sales Analysis; use of a hard disk with this system is recommended.

**TeleFast Order Entry with Inventory Control Module** • must work in conjunction with Accounts Receivable system; provides item receivings, order entry, order pricing, and invoice printing; optional online inventory control during order entry; can interface with Sales Analysis system • provides editing and posting of receivings transaction entry; file maintenance and listing; order entry and editing interacts with inventory control; online inquiry of order status; one- or 2-step order processing; invoicing; credit memos; picking slips; price lists; purchasing advice; stock status and report printing; back order history and report printing; automatic posting to Accounts Receivables package of billing information; password protection; backup/restore and integrity check facilities:

\$750 linc

**TeleFAST General Ledger Module** • can be interfaced with Accounts Receivables or Payables and Payroll modules; can handle up to 13 accounting periods • provides multiple profit center support; accounts maintenance and list chart; standard or general journal transaction entry, posting, and editing; source cross-reference report generation; password protection and file integrity check; and backup facilities:

750

**TeleFAST Accounts Receivable Module** • interfaces with General Ledger or can be used alone; generates customer files; handles sales transactions, cash receipts, report aging, finance charges, customer account inquiries, and statements; open item file retains record of each invoice, credit memo, debit memo, finance charge, cash receipt, sales commission control, and balance forward:

750

**LCNS: one-time license fee. Prices effective as of February 1984.**



## TeleVideo Systems 8-bit Computers

TS 802, TS 802H/20, TS 803, TS 803H, TPC I, TS 804, TS 806/20 & TS 816/40

**TeleFAST Payroll Module** • interfaces with General Ledger; electronic payroll filer, calculator, and worksheet, interactive attendance data input; daily, weekly, bi-weekly, semi-monthly, monthly, and quarterly periods; special deductions and earnings handling; check printing; handles union deductions, history, and hours report printing; quarterly reporting; non-employee compensation; year-end W-2 form report printing; includes password protection and backup facilities:

450

**TeleFAST Accounts Payable Module** • interfaces with General Ledger or can be used alone; can maintain vendor files, perform entry, editing, and posting of new payables, cancellations, adjustments and pre-paid transactions; online inquiry of vendor accounts; versatile payment selection; password protection and backup facilities:

450

**TeleFAST Sales Analysis Module** • interfaces with Accounts Receivables and Order Entry modules; features sales analysis by customer, customer type, customer sales volume, salesman, state, item, item category, and by item sales volume:

375

### □ Operating Systems

TeleVideo 8-bit computer operating systems are single- and multiuser. Some systems as indicated below run under CP/M 2.2, CP/M 3.0 (Plus), or MP/M II by Digital Research. TeleVideo has its own proprietary operating system called MmmOST 2.11. Additionally, Oasis from Phase One Systems is available.

**MmmOST 2.11 TeleVideo Network Operating System** • TeleVideo proprietary multitasking, multiuser, multiprocessor operating system; allows integration of TeleVideo 8- and 16-bit personal computers and CP/M workstations; installed in the TeleVideo TS 806/20 and 816/40 network microcomputers • has print spooling capabilities with selective queueing of documents; this allows multiple copies of one file with a single print command; TeleVideo claims print spooling occurs at full speed regardless of the level of network activity • remote communications capabilities using RWP (remote workstation processor) enable long-distance communications to the TS 800R remote workstation; the RWP connects up to 4 800Rs to MmmOST 2.11 on an 806/20 or 816/40 • MmmOST downloads either CP/M or CP/M-86 by Digital Research onto a connected workstation which then runs with its own CPU and RAM; computers which can connect to the MmmOST network include the TS 802, TS 802H/20, TS 803 and TS 803H (both 803 models require RS-422 serial port option card), TS 1602, and TS 1603 • MmmOST 2.11 provides logical drive tape backup facilities that can save an entire TS 806/20 disk drive in under 20 minutes; MmmOST facilitates restoring of lost data by mapping out bad sectors on the network processor's hard disk • MmmOST 2.11 is compatible with all TeleVideo personal computer network application packages • record and file locking features have been optimized for speed, reducing the high networking overhead of previous versions • bundled with network computer systems, TS 806/20 and TS 816/40; includes CP/M 2.2 and CP/M-86 versions; price indicated is upgrade charge from MmmOST 2.10:

\$25 lenc

**CP/M 2.2** • single-user, single-tasking, general-purpose operating system designed to support the Intel and Zilog families of 8-bit processors; features and facilities of this basic system are all upward compatible and are present in all other versions of CP/M; consists of 4 elemental structures: Basic I/O System (BIOS), Basic Disk Operating System (BDOS), Console Command Processor (CCP), and a Transient Program Area (TPA) • BIOS is the modifiable portion of the operating system enabling users to tailor CP/M systems to meet specific configurations; allows users to define all hardware-independent elements of the system by defining low-level interface and the peripheral I/O for the system • BDOS provides all the disk management control; supports up to 16 logical devices, containing up to 65,536 records, with up to an 8M-byte capacity • CCP provides the interface between the user's console and the rest of the CP/M system; it reads, interprets, and executes commands entered from the console; commands are both built-in commands and transient commands;

transient commands are loaded into TPA and executed • TPA is the area designated to hold programs that are loaded from disk and then executed • standard utilities provided include: DDT interactive debugger, PIP file transfer utility; DUMP utility; SUBMIT/XSUB batch control utilities; ED command-oriented text editor; ASM assembler; and STAT system status utility • bundled with 8-bit single-user systems.

**CP/M Plus (3.0)** • fully compatible, enhanced implementation of CP/M 2.2; single-user, single-tasking, general-purpose operating system designed to support the Intel and Zilog families of 8-bit processors; supports either banked or non-banked memory; in banked memory environment will support up to 16 64K-byte banks of memory; includes all features and facilities of CP/M 2.2 operating system • some of the system extensions provided are: the expansion of disk-handling capabilities to 16 logical drives of up to 512M bytes each, and file sizes up to 32M bytes; enhanced I/O capability providing hashed directory access, record buffering, and multiselector disk I/O; multiselector disk I/O that supports reading/writing up to 16K bytes of program or data records in single operation; time and date stamping on user files; automatic log-in of removable media; console redirection of serial device input/output to or from a disk file; a HELP facility for system commands; and the ability to trap and recover system errors in application programs • additional system utilities provided are: symbolic instruction debugger (SID); macro assembler (MAC); relocating macro assembler (RMAC); and LINK-80 linkage editor with overlay capabilities • memory requirements are 64K bytes of memory for unbanked operations, or 2 64K-byte banks for banked operations; either implementation requires diskette storage and a console device; runs on TS 804:

150

**MP/M II** • multiuser, multitasking, multiprogramming operating system designed to support the Intel and Zilog families of 8-bit processors; an enhanced, upward-compatible version of CP/M supporting up to 400K bytes of user memory; up to 7 users can be supported using 48K-byte banks of memory • consists of Basic Disk Operating System (BDOS), Extended Disk Operating System (XDOS), Extended Input/Output System (XIOS), Terminal Message Processor (TMP), and Command Line Interpreter (CLI) • BDOS provides the capabilities for managing files and directories, consoles, and printers; supports up to 16 logical drives, each containing up to 512M bytes, for a maximum of 8G bytes of online storage; supports files up to 32M bytes; and supports up to 16 list devices (typically printers and teletypes) • XDOS is the real-time nucleus of MP/M II which monitors the execution of processes and arbitrates conflicts for system resources; it provides facilities for dispatching, queue, flag, and time base management • XIOS is the portion of the operating system that contains all physical hardware-dependent code, such as Input/Output device handlers; maintains disk definition tables which translate logical drive, directory, and file structure to physical characteristics of a disk • TMP provides the interface between users and the system; reads user's commands and repeats them to the CLI • CLI interprets user commands and loads programs based on user command line • includes all commands (utilities) which are common to CP/M, as well as additional commands unique to MP/M II; some of the additional commands include: MPMSTAT, which displays runtime system status; RDT, a relocatable version of the Dynamic Debugging Tool; SCHED, which allows a specified program to be executed on a specified date and time; ATTACH, which attaches a program to a console; and over 15 others • requires 48K bytes of memory, an ASCII console, and a real-time clock; CP/M 2.2 or MP/M 1.1 must also be implemented • developed by Digital Research, Inc • bundled with TS 804.

**Oasis** • multiuser operating system by Phase One Systems; configured to support 4 users on the TeleVideo 804; features password protection levels, file and record locking, print spooler, assembler, linker, and editor • supports BASIC, COBOL, FORTRAN, and Pascal; Microsoft MBASIC to Oasis BASIC translator is available; for license from Phase One Systems for TS 804.

### □ Utilities

TeleVideo provides a listing of third-party utilities in the TeleVideo Software Catalog. Individual operating systems also provide their



## TeleVideo Systems 8-bit Computers

### TS 802, TS 802H/20, TS 803, TS 803H, TPC I, TS 804, TS 806/20 & TS 816/40

own file handling utilities, debuggers, line editors, and other such facilities.

#### Data Management

**TeleDBMS** • customized version of a UVEON Computer Systems OPTIMUM database management system; operates on TeleVideo single-, multiuser, or network microcomputer systems; was designed and customized to suit users and applications builders; forms and files are variable and user definable; the system provides a reporting and storing facility, cross-referencing features, and dictionaries of record files:

\$600 licns

#### Communications/Networks

Networking is supported by the MmmOST software described under the Operating Systems category. There are various emulation packages available for communications described below. TeleVideo has informally endorsed several third-party vendor communications facilities. These include Micro-ez-LNK by Micro Technique, which provides communications to Western Union's Easylink for transmission and reception of telegrams, cablegrams, and Telex messages. Also mentioned by TeleVideo are Micro E.COM by the Redding Group for United States Postal ECOM service linkage, and Hermenet's ComNet-8 electronic mail packages which run on TeleVideo Personal Computer Networks. TeleVideo has indicated it will make available other asynchronous emulators including DEC VT-52/100, IBM 3101, Data General, Honeywell, Lear Siegler, Adds, and Hazeltine terminals.

**TeleAsync** • OEM version of BLAST by Communications Research Group; menu-driven asynchronous communications program which functions on standard or auto-dial modems using standard dial-up telephone lines; using this package, 2 TeleVideo computers can transfer disk files or parts of disk files between any two 8- or 16-bit TeleVideo microcomputers in full-duplex protocol; this protocol saves connect time by transferring files simultaneously in both directions; TeleAsync supports unattended operation with auto-dial modems and automatic error detection and restart at point of interruption; TeleAsync provides communication facilities to videotex services such as CompuServe, Dow Jones News Retrieval Service, NewsNet, and The Source; several free hours of connect time are included with TeleAsync when you subscribe to CompuServe or NewsNet • TeleAsync is compatible with BLAST protocol developed by Communications Research Group; this permits communication to any BLAST communicating computer; these include: DEC VAX, IBM MVS mainframes, Data General minicomputers, HP 3000, IBM PC, Apple II, and many CP/M machines • TeleAsync can interface with third-party vendor communications hardware including Irmaline (IBM 3270 Coax Interface) by Technical Analysis Corporation and the 10XX series of IBM protocol converters from Protocol Computer • requires modem:

\$150 licns

**Tele3780** • an IBM remote batch emulator for the TS 802, TS 802H, TS 803, TS 803H, and the TPC I personal computers; permits transmission of and reception from any host supporting the IBM 2780 and 3780 protocol; features queued files, command file processing, diagnostic utilities, space compression, data rates to 9600 bps in BSC binary synchronous protocol; permits remote users to access host through network processor; requires TS 803 System Diskette Version 1.5, (software part #122828-00):

500

**Tele3270** • an interactive IBM mainframe link through 3270 emulation; links 8- and 16-bit TeleVideo computers operating in a TeleVideo network with IBM applications including TSO, CMS, IMS, or CICS, configured for 3276 control units; all networked TeleVideo computers share a single telephone line and can dynamically interact with either 3270 or CP/M applications:

795

#### Program Development/Languages

TeleVideo provides TeleCOBOL for its 8-bit personal computers. Other languages are available from third-party vendors. These include: CBASIC, CB-80, PL/1 80, and Pascal MT+ from Digital

Research; MBASIC, COBOL 80, and FORTRAN 80 from Microsoft; and Oasis languages from Phase One Systems for the TS 804.

**TeleCOBOL** • OEM version of RM/COBOL developed by Ryan/McFarland; a high-level implementation of the ANSI-74 COBOL (X3.23-1974) standard • features include Level 2 sequential, relative, and indexed file access methods; full arithmetic capability; standard DISPLAY and COMPUTATIONAL data-type support, extended to include binary as well as packed decimals; extended ACCEPT DISPLAY operations for CRT control; interactive debug at the source statement level; undermarked errors with explanatory messages; cross-reference listing; single-pass compilation; segmentation of the source language level; and built-in security features for source language library control:

\$750 licns

#### **TeleCOBOL Runtime Monitor:**

275

#### Applications Packages

**TeleDRAW** • for TS 803, TS 803H, TPC I, and TS 1603 computers; interactive, menu-driven drawing program for business graphics; can be keyboard or SuperMouse optical mouse driven; based on Graphics System Extension (GSX) which can produce output for a variety of printers and plotters; screens can be edited, saved, printed, and retrieved; provides a variable-size grid for polygons and lines; shapes can be moved, copied, deleted, modified, or filled with text; lines can be solid, dotted, or dashed; zoom features allow detailed editing of specific regions on the screen; requires graphics option card on TS 1603; price does not include \$20 charge for manual:

\$295 licns

**TelePLAN** • OEM version of MicroPlan by Chang Labs; electronic spreadsheet which prompts user through a series of questions; programmable with business and financial functions suited for corporate environment; includes sophisticated report generator; multiuser implementation allows spreadsheet swapping between private and public drives; includes a number of pre-programmed overlays including mortgage amortization, forecasting, budget and variance analysis, and pricing:

995

**TeleWrite** • OEM version of MemoPlan by Chang Labs; word processor designed for ease of use in corporate environment; comes bundled with TeleVideo computers as indicated in Packaged Systems section.

**TeleCalc** • OEM version of ProfitPlan from Chang Labs; electronic spreadsheet with report-generating facilities; interfaces with TeleChart for graphic output of spreadsheet data; comes bundled with TeleVideo computers as indicated in Packaged Systems section.

**TeleChart** • business graphics extension to TeleCalc; uses GSX extensions to CP/M for bar, point, line, and pie chart output of TeleCalc electronic spreadsheet data; comes bundled with TeleVideo computers as indicated in Packaged Systems section.

#### HARDWARE

##### Terms, Support & Documentation

**Terms** • available for purchase with 90-day warranty on parts and labor; units are returned to the factory for repair.

**Support** • support from TRW Service; maintenance contracts available for on-site support from TRW for 90-day and yearly periods.

**Documentation** • TeleVideo provides documentation for operating systems, technical reference, and user's guides for all systems; installation guides and quick reference sheets are available in many instances.

##### Physical Specifications (H x W x D); Weight

#### **TS 802 & TS 802H**

**System Unit** • 13.5 x 22 x 14.4 inches; 44 pounds.



## TeleVideo Systems 8-bit Computers

TS 802, TS 802H/20, TS 803, TS 803H, TPC I, TS 804, TS 806/20 & TS 816/40

**Display** • integrated with system unit.

**Keyboard** • 2.5 x 16.5 x 7.5 inches; 3 pounds, 15 ounces.

### TS 803, TS 803H & TS 804

**System Unit** • 14.5 x 18.5 x 14 inches; 52 pounds.

**Display** • integrated with system unit.

**Keyboard** • 2.5 x 18 x 9 inches; 4 pounds, 14 ounces.

### TPC I

**System Unit** • 8 x 18 x 15 inches; 30 pounds.

**Display** • integrated with system unit.

**Keyboard** • 1 x 18 x 8 inches; 1 pound, 8 ounces.

### TS 806/20

**System Unit** • 7.3 x 17.5 x 16.9 inches; 50 pounds.

**Display** • none provided with the system.

**Keyboard** • none provided with the system.

### TS 816/40

**System Unit** • 8 x 17.5 x 21.9 inches; 55 pounds.

**Display** • none provided with the system.

**Keyboard** • none provided with the system.

### □ Systems Overview & Configurability

All TeleVideo 8-bit systems use the Zilog Z80A as their main processor. This uniformity, and a host of other similarities between systems, results in a highly compatible software and media environment.

Two systems come without either a monitor or a keyboard. The 806/20 and the 816/40 are what TeleVideo calls "network processors." These sophisticated file sharers, when run under MmmOST 2.11, allow connection of up to 6 and 16 users, respectively. The user is actually an independent processor that uses the network processor as an A: and B: disk drive. Disk read/write performance varies from the equivalent of hard disk speed with one user to sub-floppy speed as you approach a fully populated "network." Storage capacities are 15M bytes of hard disk with 64K bytes of RAM for the 806/20, and 33M bytes with 128K bytes of RAM for the 816/40. Backup is performed using a 5.25-inch 367K-byte floppy drive system on the 806/20 and a 14.5M-byte cartridge tape drive on the 816/40. While backing up an entire 816/40 would take three tape cartridges at most, a fully utilized 806/20 could require up to 41 floppy diskettes.

The other 8-bit TeleVideo systems are either dual floppy, floppy and hard disk, or single floppy systems. Please refer to the system differences table for further specifications.

The portable TPC I is actually the internal TS 803 hardware design repackaged into a portable case. It comes with one or 2 floppy disk drives. The TS 802 series is similar to the TS 803 series, although its memory is not expandable to the 803's 128K-byte maximum. The TS 802 series includes the 800A and R intelligent workstations and is based on the TeleVideo 950 terminal. The TS 803 is a departure from the TS 802 by the addition of true graphics, elimination of the 25th status line, replacement of the TS 802 fan with a cooling tower, and substitution of dual-switching capabilities with a menu-driven set-up sequence. The 806/20 and 816/40 require a terminal for initial configuration. Since the TS 803 cannot be switched to terminal mode, an all-TS 803 network cannot be configured without communications software. Intelligent workstations like the 800A and R are described in the Terminals/Workstations section. These workstations do not have any mass storage or semi-permanent RAM facilities of their own and function as workstations on the "network processor."

TeleVideo provides hardware options and publishes a catalog of third-party hardware as well. These added facilities include a mouse device, RS-422 interfaces, and touch screen from TeleVideo or third-party sources.

Maximum configurability is stated below; minimum configu-

rations are discussed under Packaged Systems.

**TS 802 System Maximums** • single-user system; 64K bytes of RAM; 4K bytes of ROM; detached keyboard and 12-inch, integral, green monochrome monitor; 737K bytes on 2 5.25-inch floppy disk drives; 2 serial devices such as printers or plotters; satellite connection to TS 806/20 with 15M bytes of hard disk and 367K bytes of floppy disk storage, or to TS 816/40 network processor with 33M bytes of hard disk and 14.5M bytes of cartridge tape storage.

**TS 802H/20 System Maximums** • single-user system; 64K bytes of RAM; 4K bytes of ROM; detached keyboard and 12-inch, integral, green monochrome monitor; 367K bytes on one 5.25-inch floppy disk drive, 15M bytes of hard disk storage; 2 serial devices such as printers or plotters; satellite connection to TS 806/20 with 15M bytes of hard disk and 367K bytes of floppy disk storage, or to TS 816/40 network processor with 33M bytes of hard disk and 14.5M bytes of cartridge tape storage.

**TS 803 System Maximums** • single-user system; 128K bytes of RAM; 32K bytes of display memory; 8K bytes of ROM; detached keyboard and 14-inch, green, tilt-adjustable monochrome monitor; 737K bytes of storage on 2 floppy disks; 2 serial devices such as printers or plotters; satellite connection via TS 803N RS-422 option card for connection to TS 806/20 with 15M bytes of hard disk and 367K bytes of floppy disk storage, or to TS 816/40 network processor with 33M bytes of hard disk and 14.5M bytes of cartridge tape storage.

**TS 803H System Maximums** • single-user system; 128K bytes of RAM; 32K bytes of display memory; 8K bytes of ROM; detached keyboard and 14-inch, green, tilt-adjustable monitor; 367K bytes of storage on one floppy disk; 10M bytes of hard disk storage; 2 serial devices such as printers or plotters; satellite connection via TS 803N RS-422 option card for connection to TS 806/20 with 15M bytes of hard disk and 367K bytes of floppy disk storage, or to TS 816/40 network processor with 33M bytes of hard disk and 14.5M bytes of cartridge tape storage.

**TPC I System Maximums** • single-user system; 128K bytes of RAM; 32K bytes of display memory; 8K bytes of ROM; detached keyboard and integral 9-inch yellow monochrome monitor; 737K bytes of storage on 2 floppy disks; 1 serial device such as printer; satellite connection via TS 803N RS-422 option card for connection to TS 806/20 with 15M bytes of hard disk and 367K bytes of floppy disk storage, or to TS 816/40 network processor with 33M bytes of hard disk and 14.5M bytes of cartridge tape storage.

**TS 804 System Maximums** • 4-user system with 3 terminals and one integral, 14-inch, green, tilt-adjustable display and detached keyboard; 320K bytes of RAM; 64K bytes of cache memory; one 737K-byte floppy disk (96 tpi) and one 10M-byte hard disk; 3 serial devices and one Centronics-compatible parallel printer port; one additional 15M-byte hard disk expansion unit.

**TS 806/20 System Maximums** • 6-user network processor; 64K bytes of RAM; 4K bytes of ROM; one 367K-byte floppy disk drive; 2 15M-byte hard disk drives; one serial terminal port; one serial printer port, and one Centronics parallel port; 6 RS-422 satellite ports.

**TS 816/40 System Maximums** • 16-user network processor; 128K bytes of RAM; 4K bytes of ROM; one 14.5M-byte cartridge tape drive; one 33.2M-byte, 8-inch Winchester drive; one serial terminal port; 1 serial printer port; 16 RS-422 satellite ports.

### □ Packaged Systems

**TS 802** • single-user system based on 4-MHz Zilog Z80A microprocessor; 64K bytes of RAM, 4K bytes of EPROM; CP/M operating system by Digital Research; 2 slim-line 368K-byte 5.25-inch floppy diskette drives; detached keyboard with 11 function keys; 2 RS-232C serial ports, one RS-422 port option for networking; 12-inch P31 phosphor screen:

**\$3,495 prch**

*PRCH: purchase price. LCNS: one-time license fee. Prices effective as of February 1984.*



## TeleVideo Systems 8-bit Computers

### TS 802, TS 802H/20, TS 803, TS 803H, TPC I, TS 804, TS 806/20 & TS 816/40

**TS 802H/20** • single-user system based on 4-MHz Zilog Z80A microprocessor; 64K bytes of RAM, 4K bytes of EPROM; CP/M operating system by Digital Research; one 15M-byte Winchester hard disk and one slim-line 368K-byte 5.25-inch floppy diskette drive; detached keyboard with 11 function keys; 2 RS-232C serial ports, one RS-422 port option for networking; 12-inch P31 phosphor screen:

5,995

**TS 803** • single-user system based on 4-MHz Zilog Z80A microprocessor; 64K bytes of RAM expandable to 128K bytes, 8K bytes of EPROM, 32K bytes of alpha and graphic display memory; CP/M 2.2 operating system and GSX-80 (Graphics System Extension) graphics extensions by Digital Research, TeleWrite, TelePlan, TeleCalc; 2 slim-line 368K-byte 5.25-inch floppy diskette drives; detached Selectric-style keyboard; 2 RS-232C serial ports, one RS-422 port for networking optional; 14-inch P31 phosphor screen:

2,495

**TS 803H** • single-user system based on 4-MHz Zilog Z80A microprocessor; 64K bytes of RAM expandable to 128K bytes, 8K bytes of EPROM, 32K bytes of alpha and graphic display memory; CP/M 2.2 operating system and GSX-80 graphics extensions by Digital Research, TeleWrite, TelePlan, TeleCalc; one 10M-byte 5.25-inch Winchester disk drive, one slim-line 368K-byte 5.25-inch floppy diskette drive; detached Selectric-style keyboard; 2 RS-232C serial ports, one RS-422 port for networking optional; 14-inch P31 phosphor screen:

3,995

**TPC I Single Drive** • portable, single-user system based on 4-MHz Zilog Z80A microprocessor; 64K bytes of RAM expandable to 128K bytes, 8K bytes of EPROM, 32K bytes of alpha and graphic display memory; CP/M 2.2 operating system and GSX-80 graphics extensions by Digital Research, TeleWrite, TeleCalc, and TeleChart; one slim-line 368K-byte 5.25-inch floppy diskette drive; detached IBM PC-style keyboard; one RS-232C serial port, one RS-422 port for networking optional, one Centronics-compatible parallel port; 14-inch P31 phosphor screen:

1,699

**TPC I Dual Drive** • portable, single-user system based on 4-MHz Zilog Z80A microprocessor; 64K bytes of RAM expandable to 128K bytes, 8K bytes of EPROM, 32K bytes of alpha and graphic display memory; CP/M 2.2 operating system and GSX-80 graphics extensions by Digital Research, TeleWrite, TeleCalc, and TeleChart; 2 slim-line 368K-byte 5.25-inch floppy diskette drives; detached IBM PC-style keyboard; 1 RS-232C serial port, one RS-422 port for networking optional, one Centronics-compatible parallel port; 14-inch P31 phosphor screen:

1,999

**TS 804** • 4-user system based on 4-MHz Zilog Z80A microprocessor; 320K bytes of RAM with 64K bytes of cache memory; 737K-byte 5.25-inch floppy disk drive, one 10M-byte 5.25-inch Winchester hard disk, 14.5M-byte cartridge tape option; concurrent DMA; 3 serial RS-232C ports, one Centronics-compatible parallel port; integral 14-inch P31 phosphor screen; MP/M II operating system by Digital Research and Oasis operating system by Phase One Systems standard; CP/M 3.0 by Digital Research optional:

4,495

**TS 806/20** • 6-user network processor based on 4-MHz Zilog Z80A microprocessor; 64K bytes of RAM and 4K bytes of ROM; one 367K-byte 5.25-inch floppy disk drive, one 15M-byte 5.25-inch Winchester hard disk drive; MmmOST 2.11 operating system which includes CP/M 2.2 and CP/M-86 versions for all TeleVideo networked workstations; 2 RS-232C ports, 6 RS-422 serial ports, one Centronics-compatible parallel port; requires terminals or satellite stations:

6,995

**TS 816/40** • 16-user network processor based on 4-MHz Zilog Z80A microprocessor; 128K bytes of RAM and 4K bytes of ROM; one 14.5M-byte cartridge tape drive, one 33.2M-byte 8-inch floppy Winchester hard disk drive; MmmOST 2.11 operating system which includes CP/M 2.2 and CP/M-86 versions for all

TeleVideo networked workstations; 3 RS-232C ports, 16 RS-422 serial ports, one Centronics-compatible parallel port; requires terminals or satellite stations:

12,995

#### □ CPU

**Zilog Z80A Processor** • 4-MHz clock speed; 8-bit internal architecture, 8-bit data bus interface; direct addressing to 64K bytes of memory; 4 registers include 16-bit program and stack pointers, 2 index registers, and a duplicate set of an 8-bit accumulator and a 7-bit flag register; upward compatible with the Intel 8080, it provides binary coded decimal (BCD) arithmetic, double-precision operations, multiple indexing with address registers, multiple interrupt, increment, decrement and move capabilities • in addition to being able to execute all 78 Intel 8080 instructions, 50 enhancements to the instruction set include advanced block move and search macros, relative jump and 3 types of selectable response interrupts, for a total of 128 operations.

#### □ Memory

Models TS 802, TS 802H, and TS 806/20 contain 64K bytes of RAM and 4K bytes of ROM and are not upgradeable. Models TS 803, TS 803H, and TPC I are upgradeable from the 64K bytes of RAM supplied in the package's system to 128K bytes. These memory increments must be purchased from third-party vendors. Each of these 3 models also has 8K bytes of system ROM and 32K bytes of alpha and graphic display memory. Model TS 804 is packaged with its maximum of 320K bytes of RAM, 64K bytes of cache memory, and 4K bytes of ROM. The Model TS 816/40 is also packaged with its maximum of 128K bytes of RAM and 4K bytes of ROM.

#### □ I/O & Communications

The TeleVideo 8-bit microcomputers come packaged with various combinations of serial, parallel, and satellite station ports. For some computers, like the 803, the RS-422 satellite station port is optional and requires the TS 803N option card.

**TS 802 & TS 802H Ports** • 2 standard RS-232C serial ports, 1 RS-422 satellite station port.

**TS 803 & TS 803H Ports** • one standard RS-232C serial port for asynchronous printer, one RS-232C modem port; one optional RS-422 satellite station port; one RJ11C connector for SuperMouse.

**TPC I Ports** • one standard RS-232C serial port, one optional RS-422 satellite station port.

**TS 804 Ports** • 3 standard RS-232C serial ports, one Centronics-compatible parallel port.

**TS 806/20 Ports** • one standard RS-232C serial port, one RS-232C ASCII terminal port, one Centronics-compatible parallel port, 6 RS-422 satellite station ports.

**TS 816/40 Ports** • 2 standard RS-232C serial ports, one RS-232C ASCII terminal port, one Centronics-compatible parallel port, 16 RS-422 satellite station ports.

**TS 803N & TPC I-N RS-422 Option Card** • connects via ribbon cable onto logic board of TS 803, TS 803H, or TPC I for RS-422 satellite connection to network computer:

\$99 prch

**Remote Workstation Processor (RWP)** • connects up to 4 remote TS 800R (see Terminals/Workstations section) intelligent workstations to TS 806/20 or TS 816/40 network computers; intelligent processor board of TS 800R is inserted into RWP, TS 800R terminal is then interfaced to processor board:

695

#### □ Mass Storage

**TS 802, TS 802H, TS 803, TS 803H, TPC I & TS 806/20 Floppy Disk Drive** • 5.25-inch soft sectored; 367K-byte capacity; 256 bytes per sector; 18 sectors per track; 40 tracks per side; 2 sides per diskette; 250K-bps data transfer rate; 84-millisecond average access time; 120-millisecond maximum access time; one or 2 drives included with TPC I:

\$499 prch



## TeleVideo Systems 8-bit Computers

TS 802, TS 802H/20, TS 803, TS 803H, TPC I, TS 804, TS 806/20 & TS 816/40

**TS 803H Hard Disk Drive** • 5.25-inch Winchester disk drive; 10M bytes formatted, 12.8M bytes unformatted; average access time 155 milliseconds, maximum access time 420 milliseconds; 5M-bps data transfer rate.

**TS 806/20 Hard Disk Drive** • 8-inch Winchester disk drive; 15.04M bytes formatted, 19.14M bytes unformatted; 3-millisecond track-to-track average access time; 5M-bps data transfer rate.

**TS 816/40 Hard Disk Drive** • 8-inch Winchester disk drive; 33.20M bytes formatted, 42.70M bytes unformatted; 15-millisecond track-to-track minimum access time; 4.34M-bps data transfer rate.

**TS 816/40 Tape Cartridge Drive** • 0.25-inch tape cartridge; start-stop; 14.5M bytes formatted, 17.4M bytes unformatted; 192K-bps data transfer rate.

**TS 802H Hard Disk Drive** • 8-inch Winchester disk drive; 15.04M bytes formatted, 19.14M bytes unformatted; 3-millisecond track-to-track access time; 5M-bps data transfer rate • includes manual and software for installation • included in purchase price of TS 802H.

**TS 806H/20 Hard Disk Drive Expansion Unit** • functionally equivalent to the TS 802H Hard Disk Drive; used as an expansion drive for models TS 804 and TS 806/20:

3,600

**806C Cartridge Tape Unit** • expansion for TS 804; cartridge tape addition; 0.25-inch tape cartridge; start-stop; 14.5M bytes formatted, 17.4M bytes unformatted; 192K-bps data transfer rate; requires TS 806C Software Kit:

2,995

**TS 806C Software Kit** • required for installation of above 806C cartridge tape unit:

\$150 lens

### □ Terminals/Workstations

**Display** • TS 802 and 802H/20 have 12-inch P31 phosphor displays; the TS 803, 803H, and 804 come with tilt-adjustable 14-inch P31 phosphor displays; TPC I has a 9-inch yellow phosphor non-glare screen; the TS 806/20 and 816/40 are multiuser microcomputers that do not come with monitors and require terminals.

**Keyboard** • TS 802 and 802H/20 have detached Selectric-style keyboards with programmable function keys and switch-selectable key-click; the keyboards of the TS 803 and 803H are detached Selectric-style with numeric keypad, cursor edit keys, palm rest, and function keys; the TS 804 main user keyboard is Selectric type with numeric keypad and function keys; the TPC I keyboard is similar to the TS 804 main keyboard but with function keys on the left side rather than along the top; TeleVideo TS 806/20 and TS 816/40 do not come packaged with keyboards and require a terminal of the user's choice.

**TeleVideo SuperMouse** • optical cursor device with pad; interfaces with software specifically designed for SuperMouse use, such as TeleDRAW; rolling SuperMouse on the optical pad results in corresponding movement of on-screen cursor; for use with TS 802 and TS 803 8-bit, and TS 1602 and TS 1603 16-bit systems • price includes interface but does not include \$10 manual:

\$248 prch

**TS 800, TS 800A & TS 800R Workstations** • intelligent workstations connect to TeleVideo TS 806/20 and 816/40 network computer systems; each workstation can receive an operating system (CP/M) and an application, downloaded from the network computer system • workstation is comprised of a

terminal with 14-inch tilt-adjustable screen and Selectric-style keyboard and a Zilog Z80A CPU with 64K bytes of RAM, expandable to 128K bytes of RAM on the TS 800; connection to the network processor is made via an RS-422 port, and each system includes 2 serial ports • the TS 800R is used with the Remote Workstation Processor (RWP) which handles up to 4 intelligent workstations.

**TS 800 Intelligent Workstation:**

1,795

**TS 800A Intelligent Workstation:**

1,395

**TS 800R Intelligent Workstation Intelligent Board** • requires TS 800R terminal:

495

**TS 800R Intelligent Workstation Terminal** • requires TS 800R intelligent board:

1,395

### □ Printer/Graphics

TeleVideo provides several letter-quality printers. Dot-matrix printers and plotters must be acquired from third-party vendors and can interface to available serial or parallel ports.

**Letter-Quality Printer** • OEM of NEC 3500R; 35-cps thimble printer; 128-character set; 136 columns in 10-cpi mode to 203 columns in 15-cpi mode; handles paper to 16 inches; horizontal and vertical tabbing; serial RS-232C interface; 110- to 1200-bps transmission; 256-byte character buffer:

\$2,195 prch

**TP 720 Parallel Printer** • 18-cps letter-quality print-wheel printer; 110, 132, or 165 columns at 10, 12, or 15 pitch, respectively; English, French, German, Spanish, Italian, Swedish, and Danish character sets; proportional spacing and graphics support; parallel interface with 500-cps transmission speed:

699

**TP 720 Serial Printer** • 18-cps letter-quality print-wheel printer; 110, 132, or 165 columns at 10, 12, or 15 pitch, respectively; English, French, German, Spanish, Italian, Swedish, and Danish character sets; proportional spacing and graphics support; serial interface with 300- to 2400-bps transmission speed preset at 1200 bps:

785

**TP 720 Serial Interface Card** • inserted into TP 720 parallel printer; provides serial interface for RS-232C connection with personal computers:

99

**TP 750 Letter-Quality Printer** • 42-cps, bidirectional, letter-quality, print-wheel printer; 136 columns at 10 pitch; 10, 12, 15 pitch and proportional spacing; handles paper width to 15 inches; cartridge ribbon; optional RS-232C, Diablo, Qume, or IEEE-488 parallel communications; comes standard with Centronics-compatible parallel interface:

1,595

### □ Training Material

**Network Operator Training Package** • manual, audio, tape, and diskette tutorial; for operator training of TS 806/20 and 816/40 network computers and MmmOST operating system:

\$125 prch

• END



# TeleVideo Systems 16-bit Computer Model TS 1603

## ■ PROFILE

**Operating Systems** • single-user CP/M-86, GSX-86 optional by Digital Research; MmmOST 2.11 multiuser/network service operating system by TeleVideo; MS-DOS optional.

**Data Management** • TeleDBMS data management system by UVEON Computer Systems, originally OPTIMUM DBMS customized for TeleVideo.

**Communications/Networks** • Tele3780 for 3780 and 2780 remote batch workstation emulation; Tele3270 IBM 3270 emulation; TeleAsync-86 terminal program • TeleVideo Personal Computer Network is based on TS 806/20 or TS 816/40 network computers for up to 16 workstations, local or remote.

**Languages** • TeleCOBOL (Ryan-McFarland) optional; third-party CP/M-86 and MS-DOS-compatible languages including BASIC, PL/1, Pascal, COBOL, "C," and FORTRAN.

**Models** • TeleVideo TS 1603.

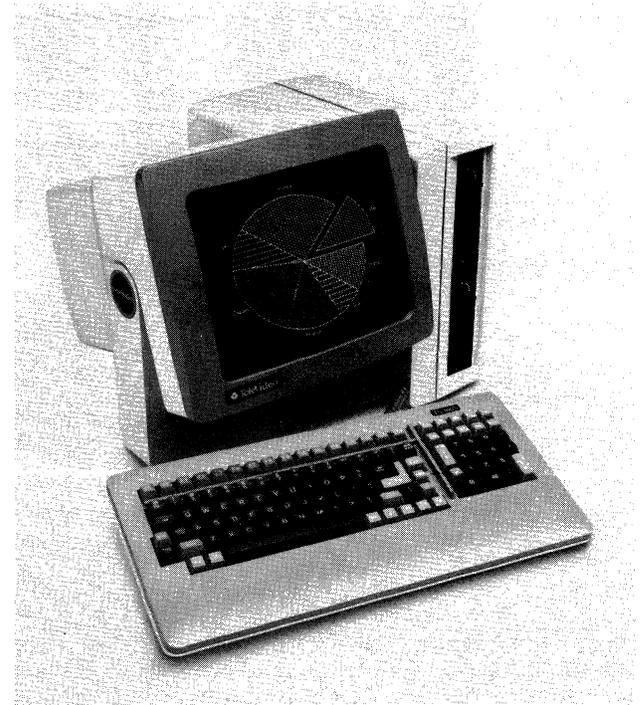
**CPU** • Intel 8088 running at 4.77 MHz.

**Memory** • TS 1603 has 128K bytes of RAM, 32K bytes of video graphics display RAM card option, 4K bytes of ROM.

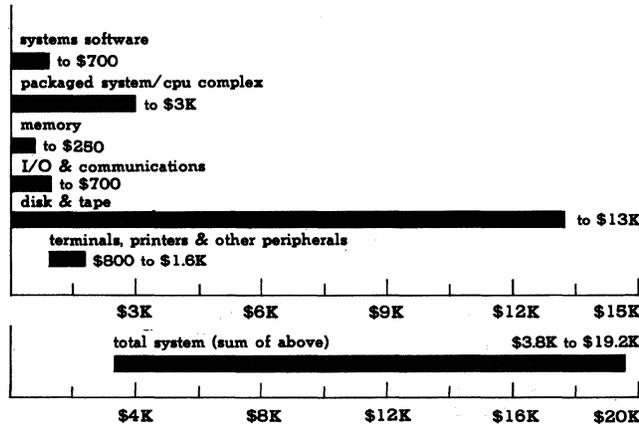
**Chassis Slots** • video card option.

**Ports** • TS 1603 has 2 standard RS-232C serial ports and 1 RS-422 serial satellite port.

**Mass Storage** • 2 737K-byte, quad-density, 5.25-inch floppy



## PURCHASE PRICE RANGE hardware & software



**TS 1603 PURCHASE PRICING** bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing • **SMALL SYSTEM** is based on TS 1603 packaged system (includes CP/M-86 system software by Digital Research; TeleWrite, TelePlan, and TeleCalc applications software; 128K bytes of RAM and 4K bytes of ROM memory; one RS-422 serial and two RS-232C serial I/O ports; two 737K-byte, 5.25-inch floppy disk drives; 14-inch green monitor) and the following options: TP 720 serial printer • **LARGE SYSTEM** is based on TS 1603 packaged system (includes CP/M-86 system software by Digital Research; TeleWrite, TelePlan, and TeleCalc applications software; 128K bytes of RAM, 4K bytes of ROM memory; one RS-422 serial and two RS-232C serial I/O ports; two 737K-byte, 5.25-inch floppy disk drives; 14-inch green monitor and detached keyboard) and the following options: MS-DOS by Microsoft, database and communications software; additional 128K bytes of RAM; serial modem; TP 750 letter-quality printer; TS 816/40 network processor.

drives.

**Terminals/Workstations** • the TS 1603 is a single-user system with a detached keyboard and integral disk drives and monitor; the TS 806/20 is a 6-user and the 816/20 a 16-user network processor which can attach TS 1603s or other personal computer workstations and terminals.

**Printers** • thimble and print-wheel letter-quality printers with serial or parallel interfaces are available.

**First Delivery** • June 1983.

**Systems Delivered** • information not available.

**Comparable Systems** • the TeleVideo 16-bit system competes for market share with other CP/M-86 and MS-DOS-based single-user machines; when used with TS 806/20 or TS 816/40 network processors, the TS 1603 competes with other file-sharing networks like the NCR Personal Computer Modus system.

**Vendor** • TeleVideo Systems, Inc; 1170 Morse Avenue, Sunnyvale, CA 94086 • 800-538-1780, 408-745-7760.

**Canada** • TeleVideo Systems, Inc; 1170 Morse Avenue, Sunnyvale, CA 94086 • 800-538-1780, 408-745-7760, 617-890-3282.

**Distribution** • the TeleVideo 16-bit system is distributed via an international network of distributors and dealers divided into 12 regions; local regional sales offices can be located by calling TeleVideo at 800-538-1780.

## ■ ANALYSIS

TeleVideo Systems was founded in 1978 to manufacture



## TeleVideo Systems 16-bit Computer Model TS 1603

and market low-cost/high-performance computer terminals. Its president, Dr. Philip K. Hwang, a Korean entrepreneur, has led TeleVideo into the 8-bit and now 16-bit microcomputer marketplace. Currently, TeleVideo has computer products that include 8-bit and 16-bit CP/M single-user micros, networked systems under the MmmOST operating system, IBM PC compatibles, workstations, and a 4-user Oasis and MP/M micro.

The 16-bit TeleVideo microcomputer is positioned to compete directly with 16-bit, single-user and networked, CP/M-86 and MS-DOS systems. Its display and keyboard have ergonomic features of TeleVideo's top-of-the-line terminals. Networking capability under MmmOST 2.11 on TeleVideo's network processors permits functional interconnection with most 8-bit TeleVideo microcomputers or workstations.

Since the introduction of the TS 1603, TeleVideo has announced a more advanced series of products, the IBM PC-compatible series. TeleVideo has made it clear to its dealers, and it hopes the public, that it intends to continue to support and develop all of its 8-bit and 16-bit lines. It seems prudent to remind ourselves that, as has been true so many times in the past, only time will tell. Case in point: the TeleVideo's TS 1602 16-bit micro, differentiated by its Intel 8087 coprocessor and advanced NEC 7220 chip graphics, has been terminated by TeleVideo.

The future of the TS 1603 is in doubt, as well. The demand for plain vanilla CP/M-86 or MS-DOS machines without IBM PC compatibility has been weak industry wide. Usually, machines in this category require a gimmick to set them apart. Portability or bundled best-selling software is a common strategy. The 1603 has neither of these features.

### Strengths

Ergonomics is the strongest feature of the TS 1603 when compared with other 16-bit CP/M-86 or MS-DOS machines on the market. In fact, the system box design and keyboard are those of the TeleVideo 970 terminal. The keyboard sports a palm rest and Selectric-like layout. The monitor is tilt-adjustable, nonglare, green phosphor.

Using the TS 1603 with one of the two TeleVideo network processors provides immediate utility to those requiring a networked environment. TeleVideo claims its MmmOST 2.11 operating system provides such attractive features as print spooling and remote communications capabilities. The network processors are capable of integrating 8- and 16-bit TeleVideo microcomputers. TeleVideo claims that with appropriate communications software each networked node can participate in interactive and batch IBM mainframe communications.

TeleVideo has chosen to use 96-track-per-inch floppy disk drives. This gives CP/M applications an option of greater disk capacity per disk and expands the online floppy storage capacity to over 1M bytes.

### Limitations

The TS 1603 lacks a significant functional feature which would set it apart from the plethora of Intel 8088-based 16-bit microcomputers. It is not portable, for example, and

though it includes bundled software, best-selling titles are not included.

TeleVideo has been tracked as being a market share-oriented company. The longevity of its products are at risk if they do not capture a substantial portion of their targeted market quickly. In demonstration of this point, it is interesting to note that since its first entry into the microcomputer arena TeleVideo has carried no fewer than 20 different models. This corporate strategy has resulted in discouraging potential users interested in a stable product line and third-party hardware vendors interested in developing add-on products.

TeleVideo's solution to networking the TS 1603 is partial. TeleVideo Network is not a full-featured network but, rather, an advanced file sharer running under a proprietary operating system called MmmOST. It is uncertain whether its capabilities are adequate enough to match the powers of up-and-coming networking technologies.

TeleVideo has selected out specific qualified dealers and distributors under their DAVAD (Distributed-Affiliated Value Added Dealer) program to carry its new line of IBM PC compatibles. This has left many previously faithful TeleVideo dealers without TeleVideo's hottest products. The extent to which this will affect marketing efforts and restocking enthusiasm for these potentially insulted dealers is unpredictable. This move by TeleVideo is most assuredly going to have a negative effect on their non-IBM PC-compatible 8- and 16-bit systems sales.

## ■ SOFTWARE

### Terms & Support

**Terms** • available for one-time license fee; several software packages come with update policies on an individual basis; source code for most packages is not available.

**Support** • TeleVideo dealers are responsible for a majority of user technical support; TeleVideo provides individual dealers with appropriate materials and phone technical assistance.

### Software Overview

The TS 1603 is a CP/M-86 and MS-DOS 16-bit microcomputer. This makes available a large library of compatible software and development languages. To assist users in locating compatible software, TeleVideo publishes a software catalog for \$100. Price includes several updates every year.

TeleVideo has selected nonstandard quad-density 5.25-inch disk drives for this microcomputer. This gives users the capability of reading both 48- and 96-track-per-inch diskettes. CP/M software can be copied to and from both formats.

A graphics option and optical mouse can be added for enhanced input and output performance of software. Software must be written specifically for the mouse or graphics option before a user can take advantage of these features. A majority of CP/M-86 and MS-DOS software does not recognize the TS 1603's mouse or graphics. For an example of software using the TS 1603 mouse and graphics option, refer to the TeleDRAW description below.

TeleVideo's solution to providing a "network" for the TS 1603 and other personal computers is original. TeleVideo has developed a central network operating system called MmmOST 2.11 which can download appropriate versions of CP/M 2.2 or CP/M-86 to network members. The 2 network processors, the TS 806/20 and the TS 816/40, are actually just sophisticated file sharers. Data and program files of networked computers are stored on their 15M- or 33M-byte hard disks. Neither network processor has more than 128K bytes of RAM. There is no indication of the



## TeleVideo Systems 16-bit Computer Model TS 1603

MmmOST configuration supporting communications between "networked" processors other than through disk file data interchange.

In actual use, the network processor functions as a private A: drive and public B: drive to CP/M-86 applications. The B: drive is common for all users. Unless implemented for multiuser applications, files in use by one "network" member on the B: drive cannot be opened by other members. This requires duplicate copies of commonly used applications such as word processors or spreadsheets to be stored on the private A: drive of every interested user. This duplication creates unnecessary storage overhead which becomes more critical as users are added.

TeleCOBOL, an OEM version of RM/COBOL, is available for software development. TeleVideo supplies a list of third-party vendor development languages that run under compatible operating systems. These languages include BASIC, PL/1, Pascal, MT, COBOL, and FORTRAN. Also available under the CP/M-86 environment are "C" language and assembler development packages.

### ☐ Packaged Software

**TeleFAST** • OEM version of MBSI MicroBusiness Software financial accounting system; general business application package comes in 6 modules and is written in TeleCOBOL (RM/COBOL) for single- and multiuser 8- and 16-bit TeleVideo microcomputers; utilizes MmmOST facilities when run with the TS 806/20 or 816/40 network computers; some program modules interface automatically with other modules; for example, Order Entry with Inventory Control can optionally interface with Sales Analysis; use of a hard disk with this system is recommended.

**TeleFAST Order Entry with Inventory Control Module** • must work in conjunction with Accounts Receivable system; provides item receivings, order entry, order pricing, and invoice printing; optional online inventory control during order entry; can interface with Sales Analysis system • provides editing and posting of receivings transaction entry; file maintenance and listing; order entry and editing interacts with inventory control; online inquiry of order status; 1- or 2-step order processing; invoicing; credit memos; picking slips; price lists; purchasing advice; stock status and report printing; back order history and report printing; automatic posting to Accounts Receivables package of billing information; password protection; backup/restore and integrity check facilities:

\$750 lens

**TeleFAST General Ledger Module** • can be interfaced with Accounts Receivables or Payables and Payroll modules; can handle up to 13 accounting periods • provides multiple profit center support; accounts maintenance and list chart; standard or general journal transaction entry, posting, and editing; source cross-reference report generation; password protection and file integrity check and backup facilities:

750

**TeleFAST Accounts Receivable Module** • interfaces with General Ledger or can be used alone; generates customer files; handles sales transactions, cash receipts, report aging, finance charges, customer account inquiries, and statements; open item file retains record of each invoice, credit memo, debit memo, finance charge, cash receipt, sales commission control, and balance forward:

750

**TeleFAST Payroll Module** • interfaces with General Ledger; electronic payroll filer, calculator and worksheet, interactive attendance data input; daily, weekly, bi-weekly, semi-monthly, monthly, and quarterly periods; special deductions and earnings handling; check printing; handles union deductions, history, and hours report printing; quarterly reporting; nonemployee compensation; year-end W-2 form report printing; includes password protection and backup facilities:

750

**TeleFAST Accounts Payable Module** • interfaces with General Ledger or can be used alone; can maintain vendor files, perform entry, editing and posting of new payables, cancellations, adjustments, and pre-paid transactions; online inquiry of vendor

accounts; versatile payment selection; password protection and backup facilities:

750

**TeleFAST Sales Analysis Module** • interfaces with Accounts Receivables and Order Entry modules; features sales analysis by customer, customer type, customer sales volume, salesman, state, item, item category, and by item sales volume:

375

### ☐ Operating Systems

The TeleVideo 16-bit microcomputer comes with CP/M-86 by Digital Research. MS-DOS by Microsoft is optional.

**MmmOST 2.11 TeleVideo Network Operating System** • TeleVideo proprietary, multitasking, multiuser, multiprocessor operating system; allows integration of TeleVideo 8- and 16-bit personal computers and CP/M workstations; installed in the TeleVideo TS 806/20 and 816/40 network microcomputers • has print spooling capabilities with selective queuing of documents; this allows multiple copies of one file with a single print command; TeleVideo claims print spooling occurs at full speed regardless of the level of network activity • remote communications capabilities using RWP (remote workstation processor) enable long-distance communications to the TS 800R remote workstation; the RWP connects up to 4 800Rs to MmmOST 2.11 on an 806/20 or 816/40 • MmmOST downloads either CP/M or CP/M-86 by Digital Research onto a connected workstation which then runs with its own CPU and RAM; computers which can connect to the MmmOST network include the TS 802, TS 802H/20, TS 803 and TS 803H (both 803 models require RS-422 serial port option card), and TS 1603 • MmmOST 2.11 provides logical drive tape backup facilities that can save an entire TS 806/20 disk drive in under 20 minutes; MmmOST facilitates restoring lost data by mapping out bad sectors on the network processor's hard disk • MmmOST 2.11 is compatible with all TeleVideo personal computer network application packages • record and file locking features have been optimized for speed, reducing the high networking overhead of previous versions • bundled with network computer systems TS 806/20 and TS 816.

**CP/M-86** • a 16-bit enhanced version of the 8-bit CP/M operating system designed to support the Intel 8086 or 8088 microprocessors; incorporates all the basic elements of the CP/M system but adapts these functions to the larger and faster operating environment • consists of 4 elemental structures: Basic Input/Output System (BIOS), Basic Disk Operating System (BDOS), Command Console Processor (CCP), and a Transient Program Area (TPA) • BIOS is the modifiable portion of the operating system enabling users to tailor CP/M systems to meet specific configurations; allows users to define all hardware-independent elements of the system by defining low-level interface and the peripheral I/O for the system • BDOS provides all the disk management control; supports up to 16 logical drives containing up to 8M bytes each, for a maximum of 128M bytes of online storage; any one file can reach the full drive size • CCP provides the interface between the user's console and the rest of the CP/M system; it reads, interprets, and executes commands entered from the console; commands are both built-in commands and transient commands; transient commands are loaded into the TPA and executed • TPA is the area designated to hold programs that are loaded from disk and then executed • standard utilities provided include DDT-86 interactive debugger; PIP file transfer utility; SUBMIT batch control utility; ED command-oriented text editor; ASM-86 assembler; STAT system status utility; and GENCMD that processes Intel "H86" format files • memory requirements depend on number and types of options implemented • bundled with TS 1603 and MmmOST 2.11.

**MS-DOS 2.00** • single-user, interactive and batch processing operating system with UNIX-like hierarchical directories, piping functions, filters, and hard disk support; equivalent to IBM PC-DOS 2.0 • supports up to 180K bytes in up to 64 different files in single-sided format and up to 360K bytes in up to 112 files

*LCNS: one-time license fee. NA: not available. Prices effective as of February 1984.*



## TeleVideo Systems 16-bit Computer Model TS 1603

double sided, and 5M or 10M bytes with thousands of file names on hard disk; handles records from 1 to 65,535 bytes long in file transfer, executes external (disk-based) commands giving the user ability to expand the DOS vocabulary to limits of disk space • batch processing capabilities with automatic execution on power-up, user commands include DATE, TIME, COPY, ECHO, PATH, MKDIR, RMDIR, CHDIR, TREE, RECOVER, GRAPHICS, BREAK, and CTTY • additions over DOS 1.25 in performance include hierarchical directories to facilitate hard disk use, numerous performance enhancements, redirection of input/output (I/O), piping of functions (sequentially rather than concurrently as in UNIX), higher sector density per track (9 sectors per track versus 8 in DOS 1.25), and installable device drivers • MS-DOS is divided into 4 parts: a device-independent I/O handler, an I/O processor, reference and jump vectors in low memory, and a command processor; the device-independent I/O handler on hidden file MSDOS.SYS is the core of MS-DOS through which I/O must be directed; the I/O processor physically moves data and instructions by means of hidden file IO.SYS as commanded by MSDOS.SYS; the command processor, using the COMMAND.COM program, is responsible for interface between user and MS-DOS, error trapping, batch file processing, interpreting user commands, and executing file names • MS-DOS 2.00 will read earlier MS-DOS diskettes; there are several unique system interrupt calls and file descriptors that make programs utilizing these features nontransportable between MS-DOS 2.00 and earlier versions • an editor, debugger, and other utilities are provided:

NA lens

### Utilities

TeleVideo provides a listing of third-party utilities in the TeleVideo Software Catalog. Individual operating systems also provide their own file handling utilities, debuggers, line editors, and other such facilities.

### Data Management

**TeleDBMS** • customized version of a UVEON Computer Systems OPTIMUM database management system; operates on TeleVideo single-user, multiuser, or network microcomputer systems; was designed and customized to suit users and applications builders; forms and files are variable and user definable; the system provides a reporting and storing facility, cross-referencing features, and dictionaries of record files:

\$600 lens

### Communications/Networks

Networking is supported by the MmmOST software described under the Operating Systems category. There are various emulation packages available for communications described below. TeleVideo has informally endorsed several third-party vendor communications facilities. These include Micro-ez-LNK by Micro Technique which provides communications to Western Union's Easylink for transmission and reception of telegrams, cablegrams, and Telex messages. Also mentioned by TeleVideo are Micro E.COM by the Redding Group for United States Postal ECOM service linkage, and Hermetnet's ComNet-8 electronic mail packages which run on TeleVideo Personal Computer Networks. TeleVideo has indicated it will make available other asynchronous emulators including DEC VT52/100, IBM 3101, Data General, Honeywell, Lear Siegler, Adds, and Hazeltine terminals.

**TeleAsync-86** • OEM version of BLAST by Communications Research Group; menu-driven asynchronous communications program which functions on standard or auto-dial modems using standard dial-up telephone lines; using this package, 2 TeleVideo computers can transfer disk files or parts of disk files between any two 8- or 16-bit TeleVideo microcomputers in full-duplex protocol; this protocol saves connect time by transferring files simultaneously in both directions; TeleAsync-86 supports unattended operation with auto-dial modems and automatic error detection and restart at point of interruption; TeleAsync-86 provides communication facilities to videotex services such as CompuServe, Dow Jones News Retrieval Service, NewsNet, and The Source; several free hours of connect time are included with TeleAsync-86 when you subscribe to CompuServe or NewsNet •

TeleAsync-86 is compatible with BLAST protocol developed by Communications Research Group; this permits communication to any BLAST communicating computer; these include DEC VAX, IBM MVS mainframes, Data General minicomputers, HP 3000, IBM PC, Apple II, and many CP/M machines • TeleAsync-86 can interface with third-party vendor communications hardware including Irmaline (IBM 3270 Coax Interface) by Technical Analysis Corporation and the 10XX series of IBM protocol converters from Protocol Computer • requires modems:

\$195 lens

**TeleAsync-DOS** • TeleAsync for MS-DOS:

195

**Tele3780** • an IBM remote batch emulator for the TS 802, TS 802H, TS 803, TS 803H, the TPC I personal computers, and the 1603; permits transmission of and reception from any host supporting the IBM 2780 and 3780 protocol; features queued files, command file processing, diagnostic utilities, space compression, data rates to 9600 bps in BSC binary synchronous protocol; permits remote users to access host through network processor:

500

**Tele3270** • an interactive IBM mainframe link through 3270 emulation; links 8- and 16-bit TeleVideo computers operating in a TeleVideo network with IBM applications including TSO, CMS, IMS, or CICS, configured for 3276 control units; all networked TeleVideo computers share a single telephone line and can dynamically interact with either 3270 or CP/M applications:

795

### Program Development/Languages

TeleVideo provides TeleCOBOL for its 16-bit personal computers. Other languages are available from third-party vendors. These include BASIC, PL/1, Pascal, COBOL, and FORTRAN.

**TeleCOBOL** • OEM version of RM/COBOL developed by Ryan/McFarland; a high-level implementation of the ANSI-74 COBOL (X3.23-1974) standard • features include Level 2 sequential, relative, and indexed file access methods; full arithmetic capability; standard DISPLAY and COMPUTATIONAL data-type support, extended to include binary as well as packed decimals; extended ACCEPT DISPLAY operations for CRT control; interactive debug at the source statement level; undermarked errors with explanatory messages; cross-reference listing; single-pass compilation; segmentation of the source language level; and built-in security features for source language library control:

\$750 lens

**TeleCOBOL Runtime Monitor:**

275

### Applications Packages

**TeleDRAW-86** • interactive menu-driven drawing program for business graphics; can be keyboard or SuperMouse optical mouse driven; based on Graphics System Extension (GSX) which can produce output for a variety of printers and plotters; screens can be edited, saved, printed, and retrieved; provides a variable size grid for polygons and lines; shapes can be moved, copied, deleted, modified, or filled with text; lines can be solid, dotted, or dashed; zoom features allow detailed editing of specific regions on the screen; requires graphics option card on TS 1603; price does not include \$20 charge for manual:

\$295 lens

**TelePLAN** • OEM version of MicroPlan by Chang Labs; electronic spreadsheet which prompts user through a series of questions; programmable with business and financial functions suited for corporate environment; includes sophisticated report generator; multiuser implementation allows spreadsheet swapping between private and public drives; includes a number of pre-programmed overlays including mortgage amortization, forecasting, budget, and variance analysis and pricing:

995

**TeleWrite** • OEM version of MemoPlan by Chang Labs; word processor designed for ease of use in corporate environment;



## TeleVideo Systems 16-bit Computer Model TS 1603

comes bundled with TeleVideo computers as indicated in Packaged System section.

**TeleCalc** • OEM version of ProfitPlan from Chang Labs; electronic spreadsheet with report generating facilities; interfaces with TeleChart for graphic output of spreadsheet data; comes bundled with TeleVideo computers as indicated in Packaged System section.

**TeleChart** • business graphics extension to TeleCalc; uses GSX extensions to CP/M for bar, point, line, and pie chart output of TeleCalc electronic spreadsheet data; comes bundled with TeleVideo computers as indicated in Packaged System section.

### ■ HARDWARE

#### □ Terms, Support & Documentation

**Terms** • available for purchase with 90-day warranty on parts and labor; units are returned to the factory for repair.

**Support** • support from TRW Service; maintenance contracts available for on-site support from TRW for 90-day and yearly periods.

**Documentation** • TeleVideo provides documentation for operating systems, technical reference, and a user's guide.

#### □ Systems Overview & Configurability

The TS 1603 is based on an Intel 8088 microprocessor running at 4.77 MHz. Memory can be expanded to 256K bytes. System bootstrap and diagnostic ROM is 4K bytes. Integrated with the system unit are 2 quad-density floppy disk drives that have the total capacity of up to 1.47M bytes of formatted storage. A graphics option is available in the form of an add-on card.

The TS 1603 can interface with 2 systems that come without either a monitor or a keyboard. The 806/20 and the 816/40 are what TeleVideo calls "network processors." These sophisticated file sharers, when run under MmmOST 2.11, allow connection of up to 16 "users." The networked TS 1603 user is actually an independent processor that uses the network processor as an A: and B: disk drive. Disk read/write performance varies from the equivalent of hard disk speed with one user to subfloppy speed as you approach a fully populated "network." Storage capacities are 15M bytes of hard disk with 64K bytes of RAM for the 806/20 and 33M bytes with 128K bytes of RAM for the 816/40. Backup is performed using a 5.25-inch 367K-byte floppy drive system on the 806/20 and a 14.5M-byte cartridge tape drive on the 816/40. While backing up an entire 816/40 would take 3 tape cartridges at most, a fully utilized 806/20 could require up to 41 floppy diskettes.

Besides a graphics option, a user can also include an optical mouse device. Currently, it seems that only TeleDRAW supports both the SuperMouse and Graphics Option. To assist users in locating compatible hardware and peripherals TeleVideo publishes a catalog of third-party hardware for all its systems.

Maximum configurability is stated below; minimum configurations are discussed under Packaged Systems.

**TS 1603 System Maximums** • single-user system; 256K bytes of RAM; 32K bytes of display memory; 4K bytes of ROM; detached keyboard and 14-inch, green, tilt-adjustable monitor; 1.47M bytes of floppy disk storage; 2 serial devices such as printers or plotters; satellite connection via RS-422 port to TS 806/20 with 15M-byte hard disk and 367K-byte floppy disk storage or TS 816/40 network processor with 33M bytes of hard disk and 14.5M bytes of cartridge tape storage.

#### □ Physical Specifications (H x W x D); Weight

**System Unit** • 14.5 x 18.5 x 14 inches; 52 pounds.

**Display** • integrated with system unit.

**Keyboard** • 2.5 x 18 x 9 inches; 4 pounds, 14 ounces.

#### □ Packaged Systems

**TS 1603** • single-user system based on 4.77-MHz Intel 8088 microprocessor; 128K bytes of RAM expandable to 256K bytes, 4K bytes of EPROM, optional 32K bytes of alpha and graphic

display memory; CP/M-86 and GSX-86 graphics extensions by Digital Research, TeleWrite, TelePlan, TeleCalc; 2 slim-line 737K-byte 5.25-inch floppy diskette drives; detached Selectric-style keyboard; 2 RS-232C serial ports, one RS-422 port for networking; 14-inch P31 phosphor screen:

**\$2,995 prch**

#### □ CPU

**Intel 8088 Processor** • 8-bit data bus interface, 16-bit internal architecture, direct addressing to 1M bytes of memory, 16-bit register set with symmetrical operations, approximately 70 basic instructions with up to 30 addressing modes, 8-bit and 16-bit signed and unsigned arithmetic with binary and decimal operands, extensive string and block move facilities • powerful segmentation facilities allow memory partitioning for multitasking, concurrent, or multiuser capabilities • a pseudo-superset of the Intel 8080 instruction set where translation to 8088 is straightforward • runs at 4 MHz.

#### □ Memory

The TS 1603 comes with 128K bytes of RAM. It is expandable to a maximum of 256K bytes of RAM. An additional 32K bytes of RAM storage dedicated to display graphics can be added using a display option. Memory upgrades available from third-party vendors and TeleVideo dealers. Price varies from dealer to dealer.

#### □ I/O & Communications

The TS 1603 comes with one standard RS-232C serial port for an asynchronous printer, 1 RS-232C modem port; one RS-422 satellite station port, and one RJ11C connector for SuperMouse. A modem is required to run TeleAsync-86 or TeleAsync-DOS. Connection to the TeleVideo network is accomplished using the TeleVideo RS-422 satellite port.

#### □ Mass Storage

**Floppy Disk Drive** • 5.25-inch soft sectored; 256 bytes per sector; 18 sectors per track; 80 tracks per side; 2 sides per diskette; 250K-bps data transfer rate; 84-millisecond average access time; 120-millisecond maximum access time; 737K-byte capacity under CP/M-86 • 2-drive maximum included in packaged system price.

#### □ Terminals/Workstations

**Display** • 14-inch green phosphor display; 24 lines with 25th status line; characters formed on 8x10 pixel matrix in 7x8 pixels; 640x240 pixel resolution with graphics option; tilt-adjustable integrated with CPU unit.

**Keyboard** • detached Selectric-style keyboards with numeric keypad, cursor edit keys, palm rest, and function keys.

**TeleVideo SuperMouse** • optical cursor device with pad; interfaces with software specifically designed for SuperMouse use; for example, TeleDRAW; rolling SuperMouse on the optical pad results in corresponding movement of on-screen cursor; for TS 802 and TS 803 8-bit, and TS 1603 16-bit systems • price includes interface, but does not include \$10 manual.

**\$248 prch**

#### □ Printer/Graphics Output

TeleVideo provides several letter-quality printers. Dot-matrix printers and plotters must be acquired from third-party vendors and can interface to available serial or parallel ports. Graphics option provides 640x240 pixel monochrome graphics to the TS 1603.

**Graphics Card** • 32K-byte RAM graphics card allows addressable monochrome display of 640x240 pixels:

**NA prch**

**Letter-Quality Printer** • 35-cps thimble printer; 128-character set; 136 columns in 10-cpi mode to 203 columns in 15-cpi mode;

**PRCH:** purchase price. **NA:** not available. **Prices effective as of February 1984.**



## TeleVideo Systems 16-bit Computer Model TS 1603

handles paper to 16 inches; horizontal and vertical tabbing; serial RS-232C interface; 110- to 1200-bps transmission; 256-byte character buffer:

2,195

**TP 720 Parallel Printer** • 18-cps letter-quality print-wheel printer; 110, 132, or 165 columns at 10, 12, or 15 pitch, respectively; English, French, German, Spanish, Italian, Swedish, and Danish character sets; proportional spacing and graphics support; parallel interface with 500-cps transmission speed:

699

**TP 720 Serial Printer** • 18-cps letter-quality print-wheel printer; 110, 132, or 165 columns at 10, 12, or 15 pitch, respectively; English, French, German, Spanish, Italian, Swedish, and Danish character sets; proportional spacing and graphics support; serial interface with 300- to 2400-bps transmission speed preset at

1200 bps:

785

**TP 720 Serial Interface Card** • inserted into parallel TP 720; provides serial interface for RS-232C connection with personal computers:

99

**TP 750 Letter-Quality Printer** • 42-cps, bidirectional, letter-quality, print-wheel printer; 136 columns at 10 pitch; 10, 12, 15 pitch and proportional spacing; handles paper width to 15 inches; cartridge ribbon; optional RS-232C, Diablo, Qume, or IEEE-488 parallel communications; comes standard with Centronics-compatible parallel interface:

1,595

• END



# TeleVideo Systems IBM PC-Compatible Computers

## TS 1605, TS 1605H & TPC II

### ■ PROFILE

**Operating Systems** • TeleDOS 2.11 single user by TeleVideo.

**Data Management** • only TeleDOS file handling capabilities; file and database software available from third-party vendors.

**Communications/Networks** • vendor claims the TeleVideos can be linked using an RS-422 network port to the TeleVideo Personal Computer Network; other communications and local area networking hardware and software are available from third-party vendors catering to the IBM-PC and compatible marketplace.

**Languages** • TeleBASIC BASIC interpreter; other development languages available from third-party vendors include: Pascal, FORTRAN, "C," and COBOL.

**Models** • Tele-PC Model TS 1605, Tele-XT Model TS 1605H, TPC II portable.

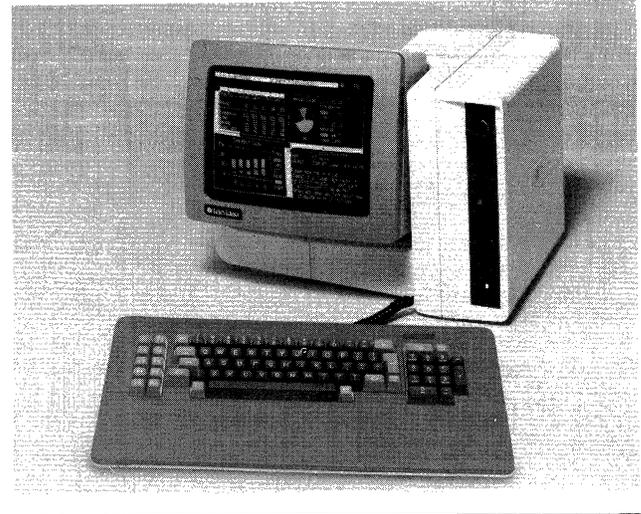
**CPU** • Intel 8088 4.77 MHz, 16-bit with 8-bit data path, socket for adjacent Intel 8087 numeric coprocessor.

**Memory** • 128K bytes of RAM expandable to 256K bytes on the main system board and to 640K bytes using third-party RAM expansion cards; 16K bytes of video graphics RAM; 8K bytes of EPROM; Tele-XT comes with 256K bytes of RAM.

**Chassis Slots** • one IBM PC-compatible chassis slot.

**Ports** • one RS-232C serial port; one parallel printer port.

**Mass Storage** • TeleVideo Tele-PC and TPC II portable come with two 5.25-inch, 360K-byte floppy diskette drives; the Tele-XT comes with one 360K-byte floppy and one 5.25-inch 10M-byte Winchester disk drive.



**Terminals/Workstations** • single-terminal systems with detached keyboard and integral disk drives; green tilt-adjustable monitor on desktop models; yellow integral monitor and composite video output on portable • local area network (LAN) facilities available from third-party vendors.

**Printers** • TeleVideo provides a thimble letter-quality printer, and parallel and serial print-wheel printers.

**First Delivery** • February 1984 for the Tele-PC; second quarter of 1984 for the Tele-XT and TPC II.

**Systems Delivered** • information not available.

**Comparable Systems** • all three computers are competing against the desktop and portable IBM PCs and IBM PC compatibles; these include Compaq, Corona, Columbia, Eagle, Hyperion, and the IBM PC 1, PC/XT, and portable PC.

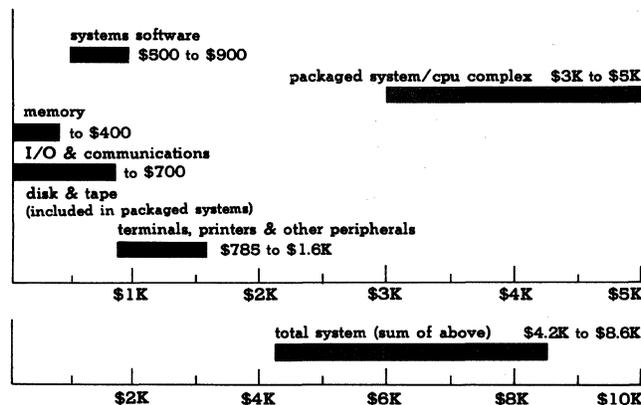
**Vendor** • TeleVideo Systems, Inc; 1170 Morse Avenue, Sunnyvale, CA 94086 • 800-538-1780; 408-745-7760.

**Canada** • TeleVideo Systems, Inc; 1170 Morse Avenue, Sunnyvale, CA 94086 • 800-538-1780; 408-745-7760; 617-369-9370.

**Distribution** • the Tele-PC, Tele-XT, and TPC II are distributed by resellers that qualify for the DAVAD (Distributed-Affiliated Value-Added Dealer) program; seven national regions and two international branches for worldwide distribution.

### PURCHASE PRICE RANGE

hardware & software



**TELEVIDEO TS 1605, 1605H & TPC II PURCHASE PRICING** bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing • **SMALL SYSTEM** is based on TS 1605 packaged system (includes TeleDOS 2.11 operating system, TeleBASIC, 128K-byte RAM, 16K-byte ROM memory, one RS-232C serial port, one Centronics-compatible parallel port, dual, half-height, 5.25-inch, 360K-byte floppy disk drives) and the following options: word processing and spreadsheet software, one TP 720 serial print-wheel printer • **LARGE SYSTEM** is based on the TS 1605H packaged system (includes TeleDOS 2.11, TeleBASIC, 256K-byte RAM, 16K-byte ROM memory, one RS-232C serial port, one Centronics-compatible parallel port, one half-height 5.25-inch 360K-byte floppy disk drive, one 10M-byte Winchester disk drive) and the following options: word processing, spreadsheet, and communications software; additional 256K-byte RAM expansion card, TP 750 Letter-Quality Printer, and a serial modem.

### ■ ANALYSIS

TeleVideo Systems has been manufacturing and marketing low-cost/high-performance computer terminals since 1978. Its president, Dr. K. Philip Hwang, a Korean entrepreneur, has directed his company into the personal computer field and is successfully catering to the CP/M and MS-DOS marketplaces. The announcement of the Tele-PC, Tele-XT, and TPC II IBM PC compatibles was no surprise to those following the TeleVideo success story.

These new Tele-PCs are positioned to compete directly with the IBM PC and other compatibles. The Tele-PC and



## TeleVideo Systems IBM PC-Compatible Computers TS 1605, TS 1605H & TPC II

XT have the ergonomic features of TeleVideo's top-of-the-line terminals and a high degree of IBM PC compatibility. The TPC II offers a high performance/cost ratio and transportability. TeleVideo hopes that these features will help its compatibles to capture a significant portion of the expanding IBM PC marketplace.

The future of TeleVideo IBM PC compatibles is subject to the same technological challenges as those of other IBM PC compatibles. Since delivery of IBM's first portable PC and with rumors of a proprietary operating system in the works, the future of IBM compatibles is questionable. It is true that IBM would find it difficult to abandon the burgeoning MS-DOS marketplace, but nothing is stopping it from creating an upwardly compatible, proprietary DOS. This move by IBM would require the PC-compatible vendors to follow IBM's lead and develop their own work-alike disk operating systems. Current IBM PC-compatible operating systems were written by Microsoft and distributed as MS-DOS 1.25 and 2.0. TeleVideo's TeleDOS is a repackaged version of MS-DOS 2.0. A possible remedy following a move such as this by IBM would arise if Microsoft found it profitable enough to meet the technical challenges and produce a work-alike disk operating system.

The new Tele-PCs have the luxury of being introduced into a mature and prospering MS-DOS-/PC-DOS-compatible software base. Being highly compatible with the IBM, the immediate future of software availability is assured. A potential buyer should inquire as to the availability of their desired software for the TeleVideos prior to purchase.

### Strengths

There are three major strengths that the TeleVideo Tele-PC, Tele-XT, and TPC II have that make them competitors to the IBM PC. These are: low price, availability, and ergonomics.

The systems are manufactured with many cost saving advancements like VLSI (very large-scale integration) technology and modern manufacturing techniques, the result being that each of the TeleVideos is competitive in pricing with its IBM counterpart.

It is expected that the availability of TeleVideo IBM PC compatibles will also provide a significant edge over the IBM PC, which is in short supply. This, coupled with the Selectric-like keyboard IBM should have built, makes the Tele-PC and Tele-XT strong contenders. Though the keyboard of the TPC II is more similar to the IBM PC's, several major keys like the shift and carriage return have been widened for enhanced ease of use.

### Limitations

The TeleVideo IBM PC compatibles do not have integral color monitor capabilities. In order to display color graphics, an external color monitor must be used. This results in a high initial price to purchasers interested in a color monitor only.

The TPC II, which TeleVideo refers to as a portable, weighs 30 pounds. It cannot comfortably be carried for extended periods of time and should, more accurately, be termed a

transportable.

As compatible as the TeleVideos are, they still are not IBM PCs. Any software of interest should be checked for compatibility prior to purchase. Additionally, each TeleVideo comes with only one IBM PC-compatible chassis slot. This could present significant limitations during expansion. TeleVideo has indicated that an expansion box will be available soon. This still presents a high initial cost to someone who just requires two or three expansion cards.

### SOFTWARE

#### Terms & Support

**Terms** • for one-time license only, fee included with purchase price; basic TeleVideo PC compatibles come configured with operating system software and a development language; 90-day warranty.

**Support** • field service nationwide is available through TRW Customer Service Division; Software support and training are available through DAVAD (Distributed-Affiliated Value-Added Dealers).

#### Software Overview

Except for disk storage and RAM capacity differences, the three TeleVideo IBM PC compatibles run applications identically. The Tele-XT has a 10M-byte hard disk capacity, and the TPC II has transportability features. All three systems share a common operating system environment.

The Tele-PC, XT, and TPC II operate under a version of MS-DOS 2.0 called TeleDOS. This permits the TeleVideos to run MS-DOS 2.0-compatible applications. In addition, IBM PC compatibility for programs not adhering completely to the PC-DOS/MS-DOS standard is attained by TeleVideo's use of many IBM PC-compatible components in its design. This allows programs which address some peripheral controllers directly to function compatibly.

TeleVideo publishes a list of popular software that is compatible with the TeleVideo-PC, XT, and TPC II. Notably, these include Lotus 1-2-3, IBM's BASIC, COBOL, Pascal, and FORTRAN compilers, dBASE II, WordStar, and SuperCalc. Software of interest should be tested prior to purchase.

A version of GW BASIC, called TeleBASIC, is bundled with the operating system. This allows IBM PC BASIC programs that require a BASIC interpreter to be run on the TeleVideos. TeleBASIC has been enhanced to support the 2.0 extensions of TeleDOS (MS-DOS 2.0).

With the use of an external color monitor, full IBM PC color graphics can be displayed. Without the monitor, 320x200 pixel color graphics are displayed monochromatically on the integral screens. All three systems include the color/graphics adapter necessary for IBM PC-compatible resolutions.

#### Packaged Software

TeleVideo does not provide packaged software. Integrated packages in many applications are available from third-party vendors catering to the IBM PC and compatibles market.

#### Operating System

The TeleVideo IBM PC compatibles are packaged with TeleDOS 2.11, a version of MS-DOS 2.0 by Microsoft. Concurrent CP/M and CP/M-86 can be purchased in DRI's IBM PC format from any Digital Research distributor.

**TeleDOS 2.11** • an OEM version of Microsoft's MS-DOS 2.0; single-user, interactive, and batch processing operating system with UNIX-like hierarchical directories, piping functions, filters, and hard disk support; equivalent to IBM PC-DOS 2.0 • supports up to 180K bytes in up to 64 different files in single-sided format and up to 360K bytes in up to 112 files double sided, and 5M or 10M bytes with thousands of file names on hard disk; handles



## TeleVideo Systems IBM PC-Compatible Computers

### TS 1605, TS 1605H & TPC II

records from 1 to 65,535 bytes long in file transfer, executes external (disk-based) commands giving the user ability to expand the DOS vocabulary to limits of disk space • batch processing capabilities with automatic execution on power-up, user commands include: DATE, TIME, COPY, ECHO, PATH, MKDIR, RMDIR, CHDIR, TREE, RECOVER, GRAPHICS, BREAK, and CTTY • additions over DOS 1.25 in performance include hierarchical directories to facilitate hard disk use, numerous performance enhancements, redirection of input/output I/O, piping of functions (sequentially rather than concurrently as in UNIX), higher sector density per track (9 sectors per track versus 8 in MS-DOS 1.25), and installable device drivers • TeleDOS is divided into four parts: a device-independent I/O handler, an I/O processor, reference and jump vectors in low memory, and a command processor; the device-independent I/O handler on hidden file MSDOS.SYS is the core of TeleDOS through which I/O must be directed; the I/O processor physically moves data and instructions by means of hidden file IO.SYS as commanded by MSDOS.SYS; the command processor using the COMMAND.COM program is responsible for interface between user and TeleDOS, error trapping, batch file processing, interpreting user commands, and executing file names • TeleDOS 2.11 will read MS-DOS 2.0 and 1.25 diskettes; there are several unique system interrupt calls and file descriptors that make programs utilizing these features non-transportable between TeleDOS 2.00 and MS-DOS 1.25 • an editor, debugger, and other utilities are provided.

#### □ Utilities

Various utilities are available under TeleDOS 2.11. TeleVideo also provides a menu-driven diagnostic program to test major components of their systems. More comprehensive utilities are available from third-party software vendors.

#### □ Data Management

TeleVideo does not provide data or file management facilities. TeleVideo-tested database systems are available from third-party vendors, notably dBase II from Ashton-Tate and Condor 20-3 Database from Condor.

#### □ Communications/Networks

Communication and Local Area Network hardware and software are available from third-party vendors. TeleVideo has indicated that it plans to support networking of its PC-compatible line using the TeleVideo Personal Computer Network.

#### □ Program Development/Languages

The Tele-PCs can run a number of application development languages from third-party vendors. MS-DOS-compatible languages will run under TeleDOS; additional languages will run under optional CP/M-86 and Concurrent CP/M operating system software. TeleVideo bundles TeleBASIC at no additional cost.

**TeleBASIC 2.0** • implementation of Microsoft's GW BASIC and BASIC-86 • enhanced standard BASIC provides dual-mode graphics capabilities in medium and high resolution; also provides drawing statements for creating lines and circles or painting the screen • screen editor implements special function keys and multistatement lines; interpreter allows calling of machine language subroutines, merging of multiple programs, and transferring control to specific program lines during certain events; IF THEN/ELSE constructs are supported as well as trace/notrace for easier debugging • TeleBASIC 2.0 takes advantage of TeleDOS 2.11 enhancements.

#### □ Application Packages

TeleVideo does not provide software other than TeleDOS system software and TeleBASIC. Application software is available for many applications through third-party vendors catering to the IBM PC and compatibles market.

### ■ HARDWARE

#### □ Terms, Support & Documentation

**Terms** • Tele-PC, Tele-XT, and TPC II are available for purchase; 90-day warranty period includes parts and labor.

**Support** • field service nationwide is available through TRW Customer Service Division.

**Documentation** • three-ring binder documentation for TeleDOS 2.11, TeleBASIC, and a general operations manual.

#### □ Physical Specifications (H x W x D); Weight

##### TS 1605 & TS 1605H

**System Unit** • 14.5 x 18.5 x 14.5 inches; 52 pounds.

**Display** • integrated with system unit.

**Keyboard** • 2.5 x 18 x 9 inches; 4 pounds, 14 ounces.

##### TPC II

**System Unit** • 7.9 x 18 x 15 inches; 30 pounds.

**Display** • integrated with system unit.

**Keyboard** • 2.5 x 18 x 9 inches; 4 pounds, 14 ounces.

#### □ Systems Overview & Configurability

The Tele-PC, XT, and TPC II are based on the Intel 8088 microprocessor running at 4.77 MHz. All have the same system board memory capacity of 256K bytes and the ability to expand to a TeleDOS maximum of 640K bytes using an IBM PC-compatible expansion slot. The major differences between systems are in packaging.

The portable TPC II is a dual, half-height diskette drive system. It weighs 30 pounds, which categorizes it as a transportable. The yellow screen is 9 inches diagonally and has the same IBM PC-compatible resolutions as the Tele-PC and XT. The keyboard is smaller than those of the desktop models and is a closer approximation of the IBM PC's layout. TeleVideo has indicated its intentions to include 256K bytes of RAM standard on the TPC II.

The Tele-PC and Tele-XT come in ergonomically designed casings with tilt-adjustable, 14-inch green phosphor displays, and low-profile Selectric-type keyboards with palm rests. The XT comes with a single 5.25-inch 360K-byte floppy disk and one 10M-byte hard disk. The Tele-PC comes with dual floppy disks.

TeleVideo has utilized very large-scale integration (VLSI) technology to reduce component number and overall system cost. It has also chosen to comply with IBM's selections for many peripheral controllers. This allows for a high degree of software compatibility with the IBM PC. Integrated with each system is an IBM-compatible color graphics adapter. Please refer to Software Overview and Analysis sections for further information on IBM PC compatibility.

Maximum configurability is stated below; minimum configurations are discussed under Packaged Systems.

**Tele-PC System Maximums** • 640K bytes of RAM; 720K bytes on dual floppy disks; 640x200 pixel resolution monochrome or 320x200 color/graphics; tilt-adjustable, 14-inch P31 phosphor monitor; external RGB or composite color monitor; one RS-232C serial port and one Centronics-compatible parallel port; a slot for one IBM PC-compatible expansion card.

**Tele-XT System Maximums** • 640K bytes of RAM; 10M-byte hard disk and 360K-byte floppy disk; 640x200 pixel resolution monochrome or 320x200 color/graphics; tilt-adjustable, 14-inch P31 phosphor monitor; external RGB or composite color monitor; one RS-232C serial port and one Centronics-compatible parallel port; a slot for one IBM PC-compatible expansion card.

**TPC II System Maximums** • 640K bytes of RAM; 720K bytes on dual floppy disks; 640x200 pixel resolution monochrome or 320x200 color graphics; integral, 9-inch yellow monitor; external RGB or composite color monitor; one RS-232C serial port and one Centronics-compatible parallel port; a slot for one IBM PC-compatible expansion card.

#### □ Packaged Systems

**TeleVideo Tele-PC TS 1605** • IBM PC compatible with 14-inch, integral, tilt-adjustable monitor and dual, 5.25-inch, 360K-byte disk drives, detached keyboard, TeleDOS 2.11 and TeleBASIC interpreter, 128K-byte RAM expandable to 256K bytes on main system board, serial port, parallel port, sound



## TeleVideo Systems IBM PC-Compatible Computers TS 1605, TS 1605H & TPC II

generator, RGB and composite video output ports, color graphics, one IBM PC-compatible chassis slot, 90-day warranty:

\$2,995 prch

**TeleVideo Tele-XT TS 1605H** • same as Tele-PC but with one floppy disk and the addition of a 10M-byte formatted hard disk; 256K-byte RAM:

4,995

**TeleVideo TPC II** • portable version of Tele-PC with integral 9-inch monitor, twin, slim-line, 360K-byte floppy diskette drives, and detached keyboard:

2,995

### CPU

**Intel 8088 Processor** • 8-bit data bus interface, 16-bit internal architecture, direct addressing to 1M bytes of memory, 16-bit register set with symmetrical operations, approximately 70 basic instructions with up to 30 addressing modes, 8-bit and 16-bit signed and unsigned arithmetic with binary and decimal operands, extensive string and block move facilities • powerful segmentation facilities allow memory partitioning for multitasking, concurrent, or multiuser capabilities • a pseudo-superset of the Intel 8080 instruction set where translation to 8088 is straightforward • runs at 4.77 MHz.

### Memory

The Tele-PC and TPC II TeleVideo IBM PC compatibles come with 128K bytes of dynamic RAM, with sockets for an additional 128K bytes. The Tele-XT main system board comes fully populated with 256K bytes of RAM. Also included with each system are 16K bytes of video RAM and 8K bytes of EPROM. By using an IBM PC-compatible expansion card, memory can be added to a maximum of 640K bytes. Memory increments must be purchased from third-party vendors.

### I/O & Communications

The Tele-PC, Tele-XT, and TPC II each have one RS-232C serial asynchronous modem port, one parallel Centronics-type DB-25S printer port, and one internal IBM PC-compatible chassis slot. There are 15 software-selectable baud rates to choose from: 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, and 9600.

Each TeleVideo has an option for an external color monitor using RGB and composite color monitor ports. TeleVideo plans to support IBM PC networking facilities as they become available.

### Mass Storage

The TeleVideo Tele-PC and TPC II come with two 5.25-inch, 320K-byte floppy diskette drives. The Tele-XT Model TS 1605H comes with one 5.25-inch floppy and one 5.25-inch Winchester disk drive.

**Floppy Disk Drive** • 5.25-inch double-sided, double-density, soft sector, 368.6K-byte formatted capacity, slim-line floppy disk

drive; 512 bytes per sector, 9 sectors per track, 40 tracks per side; average access time of 84 milliseconds, 120-millisecond maximum access time; 250K bps • comes packaged with systems.

**10M-Byte Hard Disk** • 12.75M bytes unformatted, 10M bytes formatted; 3.5-inch Winchester in 5.25-inch casing; 250 series manufactured by Rodine; 306 tracks per side, 32 sectors per track, 256 bytes per sector; average access time of 85 milliseconds, 18-millisecond seek time; 5M-bps data transfer rate, 3600 rotations per minute; not available on TS 1605 or TPC II; included in TS 1605H Tele-XT purchase price.

### Terminals/Workstations

**Display** • the Tele-PC and the Tele-XT have tilt-adjustable, 14-inch P31 phosphor displays; the TPC II has a 9-inch integral yellow display; all systems have IBM PC-compatible graphics with 640 or 320x200 pixels, and RGB and composite output monitor support.

**Keyboard** • the Tele-PC and Tele-XT come with detached ergonomic Selectric-style keyboards with 10-key numeric keypad and palm rest; the TPC II comes with an IBM PC-compatible keyboard with 10 function keys and numeric keypad.

### Printer/Graphics

The TeleVideo IBM PC-compatible personal computers can interface with any IBM PC-compatible parallel or serial printer. TeleVideo provides a number of letter-quality printers.

**TP 720 Parallel Printer** • 18-cps letter-quality print-wheel printer; 110, 132, or 165 columns at 10-, 12-, or 15-pitch, respectively; English, French, German, Spanish, Italian, Swedish, and Danish character sets; proportional spacing and graphics support; parallel interface with 500-cps transmission speed:

\$699 prch

**TP 720 Serial Printer** • 18-cps letter-quality print-wheel printer; 110, 132, or 165 columns at 10-, 12-, or 15-pitch, respectively; English, French, German, Spanish, Italian, Swedish, and Danish character sets; proportional spacing and graphics support; serial interface with 300- to 2400-bps transmission speed preset at 1200 bps:

785

**TP 720 Serial Interface Card** • inserted into parallel TP 720; provides serial interface for RS-232C connection with personal computers:

99

**TP 750 Letter-Quality Printer** • 42-cps, bidirectional, letter-quality, print-wheel printer; 136 columns at 10-pitch; 10-, 12-, 15-pitch and proportional spacing; handles paper width to 15 inches; cartridge ribbon; optional RS-232C Diablo, Qume, or IEEE-488 parallel communications; comes standard with Centronics-compatible parallel interface:

1,595

*PRCH: purchase price. Prices effective as of February 1984.*

• END



# Texas Instruments TI Professional Computers

## ■ PROFILE

**Operating Systems** • Microsoft MS-DOS, Digital Research CP/M-86 and Concurrent CP/M-86, SofTech UCSD p-System Run-Time or Development systems.

**Data Management** • various database software programs available from third-party vendors.

**Communications/Networks** • TTY, 3270 SNA, and 3780 emulators • Ethernet local area network.

**Languages** • MS-BASIC, CBASIC-86, MS-COBOL, MS-Pascal, UCSD Pascal, MS-FORTRAN.

**Models** • TIPC desktop system, TIPPC portable system.

**CPU** • 16-bit Intel 8088.

**Memory** • 64K-byte to 768K-byte main memory; 4K-byte video display memory; 8K-byte to 16K-byte ROM.

**Chassis Slots** • 5 I/O expansion slots; 1 memory expansion slot.

**Ports** • 1 parallel printer port standard.

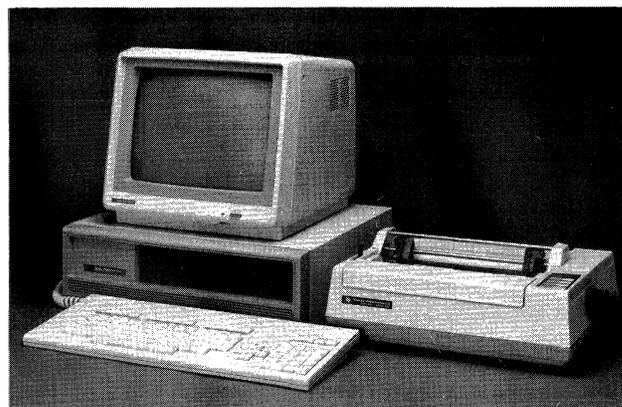
**Mass Storage** • up to 4 320K-byte or 360K-byte diskette drives; 1 5M-byte or 10M-byte Winchester drive.

**Terminals/Workstations** • single-user systems; no add-on terminals available.

**Printers** • dot-matrix printers with speeds from 35 cps to 220 cps.

**First Delivery** • TIPC-January 1983; Portable-December 1983.

**Comparable Systems** • 16-bit, single-user desktop and portable systems supporting MS-DOS and CP/M-86; typically in the



\$2,200 to \$6,000 price range.

**Vendor** • Texas Instruments Inc, Data Systems Group; P.O. Box 402430, H-651, Dallas, TX 75234 • 800-527-3500.

**Canada** • Texas Instruments Research; 9460 Trans Canada Highway, St. Laurent, QUE H4S 1R7 • 514-336-1860.

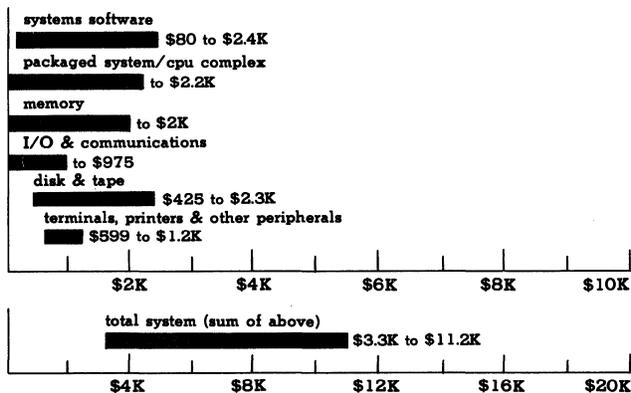
**Distribution** • through authorized dealers, retail stores, value-added resellers, and TI National Accounts program.

## ■ ANALYSIS

When Texas Instruments introduced its Professional Computer (TIPC) in January 1983, it had already stocked and trained several dealers in major cities. Along with the systems themselves, TI also had system enhancements and approximately 100 software packages (mostly from third-party vendors) ready to go. TI wanted to make sure the TIPC was available at the time of introduction to anyone who wanted to see it. So as not to leave any stone unturned, the unit had previously been unveiled to several large corporations under its code name—Pegasus. TI is targeting the TIPC towards professionals, administrators, and anyone else employed in information-intensive business.

While the TIPC is packaged similarly to the IBM PC and its clones (Intel 8088 CPU, MS-DOS operating system, 320K-/360K-byte diskette drives), it seems to offer more system for the money, particularly in the area of graphics and system expansion. The TIPC graphics controller provides for 720x300 pixels as compared to 640x200 pixels for the IBM PC. As for expansion slots, the IBM PC needs to use 1 of its 5 available slots for its floppy disk controller and another for its printer interface, whereas the TIPC has its diskette controller built into the motherboard and provides a parallel printer port as a standard feature, not impacting its 5 I/O slots. Additionally, expansion memory on the TIPC is through a separate memory expansion slot. In short, the TIPC packs more to the

## PURCHASE PRICE RANGE hardware & software



**TI PROFESSIONAL COMPUTER PURCHASE PRICING** bar graphs illustrate price ranges for small to large systems, with solid bars reflecting software/hardware purchase pricing. • **SMALL SYSTEM** is based on TIPC packaged system (includes CPU, 64K-byte RAM, monochrome monitor, keyboard, single diskette drive, parallel printer port) and the following options: MS-DOS and MBASIC software; second diskette drive; 150-cps dot-matrix printer. • **LARGE SYSTEM** is based on TIPC packaged system (includes CPU, 64K-byte RAM, monochrome monitor, keyboard, 1 diskette drive, parallel printer port) and the following options: MS-DOS, CP/M-86, MBASIC, CBASIC, UCSD p-System with Pascal, TTY, 3270, 3780 emulation, word processing and spreadsheet software; additional 704K-byte memory; 10M-byte Winchester drive; async/sync communications card, 300/1200 baud modem; 3-plane graphics controller card; dual mode dot-matrix printer.



# Texas Instruments TI Professional Computers

"board" than the IBM PC and gives users the capability of adding more options.

The TIPC, the portable version of the TIPC, also outshines many of its portable competitors except in the area of price. It offers the same features as the desktop unit except with a smaller screen.

In the area of software compatibility, it has been reported that some IBM-compatible programs will run as-is on the TIPC while others will have to be modified. Using the same operating system and disk format does not necessarily mean total system compatibility—but then TI doesn't tout their systems as being PC-compatible.

Two optional products which TI previewed as its initial TIPC press conference make the TIPC stand out among its competition. The first product, the Speech Command System, not only provides a telephone message store-and-forward service, but also enables the computer to send synthesized voice messages and to recognize and respond to specific voice commands. With this latter feature, the TIPC can recognize up to 50 spoken words and perform the command related to them. Various 50-word groupings can be stored on disk for future use.

TI's second interesting option is a natural language interface which can serve as a "front-end" program with either an online database such as the Dow Jones News and Retrieval Service or with a database management system. Its purpose is to help users construct an English query or command that the computer understands. The bottomline on the TIPC is that it is one of the best systems on the market. It is superior to the IBM PC in many ways—graphics, expandability, price, and state-of-the-art technology (e.g., natural language interface and speech recognition).

### Strengths

When TI introduced its Professional Computer, it broke with company tradition by not employing one of its own processors but went instead with an industry-standard Intel 8088. This was a smart move on TI's part, because by going the Intel route the TIPC was able to utilize "defacto" standard operating systems—MS-DOS and CP/M-86—which open the door to many generic applications programs. Additionally, the availability of Concurrent CP/M-86 provides multitasking capabilities and the availability of the UCSD p-system provides software development capabilities and portability. The capability of accessing all of these operating systems adds up to flexibility.

As mentioned in the Analysis section, the TIPC has high-resolution graphics and plenty of system expansion opportunities—2 more system pluses. Add to that the natural language interface and the speech command option and the TI Professional Computer is more than another "me-too" product.

### Limitations

The TIPC doesn't have any significant system limitations. The new 256K-byte memory expansion kits are expensive and more hard disk storage would be beneficial. One 10M-byte drive for the system could be rather limiting.

## SOFTWARE

### Terms & Support

**Terms** • the suggested list price provides the buyer with 1 copy of the software program • all software is supplied on 5.25-inch diskettes in object format.

**Support** • Software Trouble Reports (STRs) may be filed with TI.

### Software Overview

The TIPC supports 4 industry-standard 16-bit operating systems. These include MS-DOS, CP/M-86, Concurrent CP/M-86, and the UCSD p-system. Various BASIC, COBOL, FORTRAN, and Pascal programming languages are also available from TI as are communications programs, word processing packages, and an electronic spreadsheet. Several third-party applications have been configured to run on the TIPC and are listed in a catalog supplied by TI. For users who wish to run 8-bit software, Xedex is offering Baby Tex, a CP/M softcard.

One of the unique products for the PC is a natural language capability which serves as a "front end" on a database. It assists the user in asking the computer questions using common English words and phrases.

According to TI, the natural language interface is designed to allow the user to easily construct a valid English language query or command that the computer understands. The display screen is split into several windows, with each window providing a set of words or phrases from which the user selects. The chosen words or phrases appear at the bottom of the screen and form an English sentence describing the functions to be performed.

The natural language concept evolved from TI's research in artificial intelligence. Products presently using the interface include the Dow Jones News Retrieval. A tool kit is also available for users who wish to add the natural language to their in-house database.

### Packaged Systems

**CP/M-86** • includes CP/M-86 operating system and CBASIC-86 language compiler:

\$240 lcms

**UCSD p-System Run-Time with Turtlegraphics** • includes runtime version of UCSD p-System portable operating system and Turtlegraphics library routines:

350

**UCSD p-System Development** • includes the development system and Pascal compiler • does not include runtime version:

400

**WordStar Professional** • includes WordStar 3.3, MailMerge, SpellStar, and StarIndex:

895

### Operating Systems

**MS-DOS 1.25** • single-user, interactive, and batch processing disk operating system developed by Microsoft; has its equivalent in IBM PC-DOS 1.2 • supports maximum diskette storage of 160K bytes in up to 64 different files in single-density, double-sided format and 320K bytes in double-density, double-sided format; handles records from 1 to 65,546 bytes long in file transfers; executes external (disk based) commands, giving the user ability to expand the DOS vocabulary to the limits of disk space • includes batch processing capabilities with automatic execution on power up; user commands include DATA, TIME, DISKCOPY, FORMAT, RENAME, ERASE, COMP (compare), CHKDSK (check disk) • innovations include a double File Allocation Table (disk map) with third memory resident copy for efficient disk access, a disk mapping technique, which conceptualizes conventional tracks and sectors as a single-dimensional array of logical sectors, and allocation units, which subdivide data section into 1,

*LCNS: one-time license fee. NA: price not available at this time. Prices effective as of December 1983.*



## Texas Instruments TI Professional Computers

2, 4, 8, 16, 32, 64, or 128 logical sector groups, eliminating disk external fragmentation typical of conventional track-sector mapping • MS-DOS is divided into four parts: a device independent I/O handler, an I/O command processor, reference and jump vectors in low memory, and a command processor; the device independent I/O handler on hidden file MSDOS.SYS is the core of MS-DOS through which I/O must be directed; the I/O processor physically moves data and instructions by means of hidden file IO.SYS as commanded by MSDOS.SYS; the command processor, using the COMMAND.COM program, is responsible for interface between user and MS-DOS, error trapping, batch file processing, interpreting user commands, and executing file names • MS-DOS 1.25 is a predecessor of MS-DOS 2.0 and 2.1:

\$40 lcms

**MS-DOS 2.1** • single-user, interactive, and batch processing operating system with Unix-like hierarchical directories, piping functions, filters, and hard disk support; equivalent to IBM-PC DOS 2.1 • supports up to 180K bytes in up to 64 different files in single-sided format and up to 360K bytes in up to 112 files double-sided, and 5M or 10M bytes with thousands of filenames on hard disk; handles records from 1 to 65,535 bytes long in file transfer, executes external (disk based) commands giving the user ability to expand the DOS vocabulary to limits of disk space • batch processing capabilities with automatic execution on power-up, user commands include: DATE, TIME, COPY, ECHO, PATH, MKDIR, RMDIR, CHDIR, TREE, RECOVER, GRAPHICS, BREAK, and CTTY • additions over DOS 1.25 in performance include: hierarchical directories to facilitate hard disk use, numerous performance enhancements, redirection of input/output (I/O), piping of functions (sequentially rather than concurrently as in Unix), higher sector density per track (9 sectors per track versus 8 in DOS 1.25), and installable device drivers • will read earlier MS-DOS diskettes; there are several unique system interrupt calls and file descriptors that make programs utilizing these features non-transportable between MS-DOS 2.00 and earlier versions • an editor, debugger, and other utilities are provided:

40

**CP/M-86** • a 16-bit enhanced version of the 8-bit CP/M operating system designed to support the Intel 8086 or 8088 microprocessors; incorporates all the basic elements of the CP/M system but adapts these functions to the larger and faster operating environment • consists of 4 elemental structures: Basic Input/Output System (BIOS), Basic Disk Operating System (BDOS), Command Console Processor (CCP), and a Transient Program Area (TPA) • BIOS is the modifiable portion of the operating system enabling users to tailor CP/M systems to meet specific configurations; allows users to define all hardware-independent elements of the system by defining low-level interface and the peripheral I/O for the system • BDOS provides all the disk management control; supports up to 16 logical drives containing up to 8M bytes each, for a maximum of 128M bytes of online storage; any one file can reach the full drive size • CCP provides the interface between the user's console and the rest of the CP/M system; it reads, interprets, and executes commands entered from the console; commands are both built-in commands and transient commands; transient commands are loaded into the TPA and executed • TPA is the area designated to hold programs that are loaded from disk and then executed • standard utilities provided include: DDT-86 interactive debugger; PIP file transfer utility; SUBMIT batch control utility; ED command-oriented text editor; ASM-86 assembler; STAT system status utility; and GENCMD that processes Intel "H86" format files • memory requirements depend on number and types of options implemented • supports up to 1M bytes of memory; requires 56K bytes of memory and an ASCII terminal:

100

**Concurrent CP/M-86** • a single user, multitasking operating system that is compatible with CP/M-86 and MP/M-86 operating systems; provides a virtual console environment where each virtual console can be performing its own task; one virtual console is always mapped to the physical console and is the foreground console, with all other virtual consoles being background consoles; switching a virtual console to the physical console is accomplished through the use of function keys (typical installations use from 4 to 10 function keys for this process) •

supports up to 1M bytes of memory, multiple list devices, and up to 16 logical disk drives, each containing up to 512M bytes of storage for a maximum of 8G bytes of online storage • features include: Real-Time Monitor providing process control and dispatching, as well as queue, flag, and clock management; allows processes to share reentrant code; file management with date and time stamping; and protection of user files and directories through the use of optionally assigned passwords • requires an Intel 8086/8088 microprocessor, 256K bytes of memory (recommended), a console device, disk storage, and real-time clock • developed by Digital Research, Inc:

350

**UCSD p-System** • portable operating system that enables applications written for one microcomputer to run on another without recompilation; p-system programs are compiled into a universal pseudo-code (p-code) which can be executed on any microcomputer with a p-machine emulator • supports single-user interactive and batch processing; provides software framework for UCSD Pascal program development/execution; manages UCSD Pascal compiler; macro assembler, linker, file handler, and text editor • features include: program chaining; input/output redirection; block I/O service routines; dynamic overlays; dynamic memory allocation; runtime support routines; support for asynchronous processes; concurrency primitives in Pascal • requires 64K-byte main memory • marketed by SofTech Microsystems.

### □ Data Management

TI does not market any general-purpose data/database management software for the TI Professional Computer. Various packages are available from third-party vendors.

### □ Communications/Networks

In addition to supporting 3270 and 3780 emulation as well as the Televideo 931, the TI systems also utilize networking products designed by 3 Com Corporation. Called the EtherSeries, these products enable the TI systems to be linked together into an Ethernet local area network.

**PC730 TTY Communications** • for interactive communications providing database and other information services • synchronous/asynchronous transmission • requires 128K-byte RAM:

\$60 lcms

**PC732 3780 Communications** • for 3780 emulation • synchronous/asynchronous transmission • requires 128K-byte RAM:

150

**3270 SNA Communications** • emulates a 3276 Model 12 control unit/display station with a 3287 printer • requires minimum of 128K bytes of memory and a synchronous/asynchronous communication card with an external modem; runs under MS-DOS:

675

**931 Emulator** • emulates a standard 931 video display terminal on a TI Business System 300, 600, or 800 Series minicomputer • enables both ASCII text and binary files to be transferred between stations • TIPC can be attached to the Business System through either a direct-connect, switched, or dedicated link • requires minimum of 128K bytes plus a communication card for direct connect and either an internal modem or a communication card with an external modem for switched or dedicated link; runs under MS-DOS:

150

**EtherSeries** • allows the TIPC to share peripherals, exchange data and programs, and serve as an electronic mail station with other TIPCs and with IBM PCs in the same network • consists of 5 products: EtherLink, which is covered in the hardware section under I/O and Communications; EtherSeries User Software, EtherShare, EtherPrint, and EtherMail; EtherLink, EtherSeries User Software, and EtherShare are required to set up a functioning local area network; runs under MS-DOS 2.1.

**EtherSeries User Software** • enables the computers to function on a LAN:

96



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**EtherShare** • supports sharing the network server's storage device • divides the mass storage into volumes which are allocated to users dynamically as they request storage space; up to 4 volumes can be accessed at a time and they can be designated as private, public, or shared; provides security and access control mechanisms:

500

**EtherPrint** • for sharing printers:

500

**EtherMail** • lets the local area network serve as an electronic mailbox; programs, text, or data files can be attached to any message sent:

750

### □ Program Development/Languages

**PC710B MS-BASIC** • meets ANSI subset requirements • features string handling, structure programming, full-screen editor, keyboard input of keywords, RS-232C asynchronous communications support, joystick and light pen support, event trapping, music capabilities, and graphics capabilities • requires 128K-byte RAM • bundled with MS-DOS operating system:

\$40 lcms

**PC711B CBASIC-86** • compiles source code file created by a text editor or word processor into an intermediate file composed as pseudo-code (p-code) instructions • runtime monitor interprets the p-code directives and performs the operation • features extended precision decimal arithmetic, expanded file processing, comprehensive string processing, assembly code interface, debugging capabilities, and cross-reference lister • requires 64K-byte RAM • included with CP/M-86 operating system or available separately:

180

**PC721 MS-COBOL** • ANSI standard and GSA validated • supports advanced verbs; abbreviated and compound conditions; sequential, relative, and indexed files; ASCII, packed, and binary data formats; runtime assignment of file names; full copy facility; line sequential files, trace-style debugging; COMP-3 data format; program CHAIN, program segmentation; and formatted screen ACCEPT/DISPLAY with a single command • requires 128K-byte RAM • developed by Microsoft:

750

**PC723 MS-FORTRAN** • 16-bit implementation of FORTRAN 77 • includes double-precision arithmetic; long and short integers with selectable default integer length; capability for expressions to appear wherever allowed in the full standard (i.e., a subscript); CLOSE statement; full form of OPEN statement; Hollerith data; formatted direct access files; unformatted sequential access files; ERR = specifier; compiler directives added to provide programmer with source text INCLUDE facility, and back-slash edit control for use in interactive I/O • requires 128K-byte RAM • developed by Microsoft:

500

**PC722 MS-Pascal** • features expanded string support with variable size LSTRING type; UNITS and USES interfaces for clean separate compilation; machine-oriented WORD type and operators; dynamic and conformant arrays using SUPER array types; attributes for variables and procedures, and machine address type and operators • includes low-level escapes such as direct access to memory locations, call to assembly language subroutines, and a retype function • requires 128K-byte RAM • developed by Microsoft:

300

**PC713D UCSD Pascal** • hybrid compiler supports subset implementation of International Standards Organization (ISO) Working Draft #6 for Pascal language; generates pseudo-code which is interpreted at runtime • features include: overlays; optional separate compilation of functions and procedures; EXTERNAL routines; 36-digit integer operands; 32-bit floating-point operands; access to graphics/sound facilities through system library routines; checking for syntax, type, and range errors; compiler directives • requires 48K-byte main memory; and 2 diskette drives • marketed under agreement with

SoffTech Microsystems • bundled with UCSD p-System.

**Natural Language Interface** • combines common English words and phrases into sentences that tell the computer what to do • derived from TI's research in artificial intelligence • used in conjunction with a database management system.

### □ Application Packages

**PC751 EasyWriter 1.2** • word processor used to create and edit letters, reports, documents, and files for other software • features include boldfacing and underlining; insert and delete; movement of characters, words, lines or blocks of text; search and replace; formatting for justification, indented paragraphs, variable margins, and justified right margins • runs under MS-DOS; requires 64K-byte RAM • developed by IUS:

\$175 lcms

**PC752 EasyWriter II** • advanced word processor • edits in modes—character, word, line, paragraph, or page • features formatting, automatic centering, decimal tabs for typing columns, pagination as you go or automatically, simultaneous printing and editing • runs under MS-DOS; requires 64K-byte RAM • developed by IUS:

350

**PC753 EasySpeller 1.2** • spelling checker for EasyWriter 1.1 • dictionary of approximately 89,000 words • requires 64K-byte RAM:

150

**PC755/759 EasySpeller Medical 1.2, Legal 1.2** • spelling checker for EasyWriter 1.1 • dictionary of approximately 89,000 words plus over 20,000 medical/legal terms • requires 64K-byte RAM:

350

**PC754 EasySpeller II** • spelling checker designed to work with EasyWriter II • contains approximately 89,000 words • requires 128K-byte RAM:

200

**PC756/758 EasySpeller Medical II, Legal II** • spelling checker for EasyWriter II • contains approximately 89,000 words plus 20,000 medical/legal terms • requires 128K-byte RAM:

350

**WordStar 3.3** • screen-oriented word processing system • enables the user to enter text, rearrange paragraphs or blocks of text, correct typing errors, insert information from other documents, reformat, proofread, and paginate • creates backup files automatically:

495

**MailMerge** • WordStar option • file merging program:

250

**SpellStar** • WordStar option • spelling checker with a 30,000 word dictionary:

250

**StarIndex** • supports creating customized text reference aids such as an alphabetized index with subentries, a table of contents with up to 4 levels of emphasis, a list of figures and tables, and outlines:

195

**Lotus 1-2-3** • integrated software consisting of a spreadsheet, information management functions, and graphics capabilities • menu-driven; provides online Help functions • requires 192K-byte memory:

495

**NaturalLink to Dow Jones News/Retrieval** • prompts users to construct English questions when accessing the database; allows for the development of offline questions for the database which can then be submitted in a batch for processing • contains built-in tutorial and Help facilities • Dow Jones News/Retrieval consists of 22 databases that contain information such as headlines and articles from the **Wall Street Journal**, **Barron's**, or the Dow Jones News Services • price includes a free subscription to the service and one free non-prime time hour of use of the database •



# Texas Instruments

## TI Professional Computers

NaturalLink requires 256K-byte memory, an internal modem or serial board with an external modem:

180

**PC750 Multiplan** • electronic spreadsheet and planning package • up to 63 columns x 255 rows • runs under MS-DOS; requires 64K-byte RAM • developed by Microsoft:

250

**Turtlegraphics** • machine-independent set of library routines for writing applications utilizing high-resolution monochrome or color graphics • bundled with UCSD p-System Run-Time.

### Other Facilities

**Speech Command Package** • supports speech as an input/output technique for existing applications • allows verbal communication with the computer; offers telephone management capabilities to record incoming phone messages, dial numbers, and deliver outgoing phone messages • user speaks in a conversational manner; system recognizes vocabularies of up to 50 words each; vocabulary switching mechanism allows access to different vocabularies • used in conjunction with Speech Command hardware listed under I/O & Communications section • requires minimum of 256K bytes of memory, MS-DOS • price is for complete system including hardware:

\$2,600 lncs

### HARDWARE

#### Terms, Support & Documentation

**Terms** • available for purchase • 90-day warranty on parts and labor.

**Support** • warranty service is performed during TI prime-shift hours only (8:00 AM to 5:00 PM, Monday through Friday) • maintenance service is available on-site with a maintenance agreement, in TI Depots with a maintenance agreement, or on a time-and-materials basis; TI presently has 38 depot sites in the continental U.S.

**Documentation** • information not available.

#### Physical Specifications (H x W x D); Weight

**CPU** • 5 x 18.9 x 15.5 inches; 32 pounds with diskette.

**Display** • 11.4 x 14.5 x 13.4 inches; 17 pounds (monochrome); 29.8 pounds (color).

**Keyboard** • 1.4 x 20 x 7.9 inches; 2 pounds.

#### Systems Overview & Configurability

The TIPC is an integrated desktop workstation composed of 3 basic components; the system unit, the keyboard, and the display unit. The system unit contains the 16-bit CPU, memory, diskette controller, integral disk/diskette storage, 5 expansion slots, power supply, speaker, keyboard interface, parallel printer port, and CRT controller. A toggle switch located on the back of the unit enables it to be cold started. The low-profile detached keyboard connects to the system unit via a coiled cord, and the display unit, which can be positioned on top of or beside the system unit, is available in either monochrome or color.

The Portable PC is fully compatible with the desktop unit and offers the same standard features and options. The exceptions are the size of the screen and the packaging of the unit. The portable is self-contained with the monitor housed with the system unit and disk drives.

Options available for the systems include memory expansion to 768K bytes, a graphics controller, integral 300- or 300/1200-baud modems, hard disk capability, and companion printers—the OMNI 800 Models 850 and 855. Additionally, TI offers an Ethernet interface and a Speech Command system. The Speech Command system combines speech processing, voice recognition and such telephone management functions as message store and forward, automatic dialing, and telephone answering. One of its key features, the ability to recognize and respond to voice commands, will enable a user to speak a command to an application without modifying it rather than

typing in the command.

Maximum configurability is stated below; minimum configurations are discussed under Packaged Systems.

**TIPC System Maximums** • 768K-byte main memory • 320K-byte diskette storage and 10M-byte Winchester storage • 1 parallel printer port, 3 RS-232C communications ports.

### Packaged Systems

**System Unit** • includes Intel 8088 CPU, diskette controller, keyboard interface, CRT controller, speaker, parallel printer port, 5 card slots, and power supply.

**Base System** • system unit • 64K-byte RAM, 8K-byte ROM • keyboard • monochrome monitor • single floppy drive:

\$2,195 prch

**Monochrome Portable System** • system unit with 64K-byte RAM, 8K-byte ROM, detached keyboard, integral 9-inch monochrome monitor, single diskette drive:

2,395

**Color Portable System** • same as above except with color display:

2,965

### CPUs

The TIPC comes standard with an Intel 8088 microprocessor, 3 timers, and 9 different interrupt levels. Two of the timers are used in general timing applications while the third is used to provide a square wave to drive a small speaker. Of the 9 interrupt levels, 8 are maskable and can be arranged with varying priorities by the system software. An 8087 numeric co-processor is optional.

**Intel 8088 Processor** • 8-bit data bus interface, 16-bit internal architecture; direct addressing to 1M-byte memory • 16-bit register set with symmetrical operations, 24 operand addressing modes; 8-bit and 16-bit signed and unsigned arithmetic with binary and decimal operands.

**Intel 8087 Math Co-Processor** • provides extension of Intel 8086/8088 for approximately 100 times faster hardware execution of number-crunching mathematics • 84-bit wide data paths; 80-bit wide working registers perform with 18-decimal digit accuracy; 8 data formats and close interfacing to mother CPU result in a powerful numeric data processor (NDP) • to utilize the Intel 8087 processor capabilities it must be supported by the language processor or have specific 8087 assembly subroutines:

\$325 prch

### Memory

**Standard Memory** • 64K-byte parity checking RAM, expandable to 768K bytes • 4K-byte video display memory • 8K-byte ROM expandable to 16K; powers up and boots the system; includes self-test diagnostics.

**PC631 64K Add-On Chips** • for upgrading 64K Expansion RAM option board; set of 9 chips:

\$165 prch

**PC632 64K RAM Card** • expands memory to 128K bytes; fits into special RAM expansion slot:

300

**PC634 192K RAM Card** • expands memory to 256K bytes; fits into special RAM expansion slot:

600

**256K Expansion Kit** • expands memory beyond 256K bytes to 512K; occupies single expansion slot:

795

**Second 256K Expansion Kit** • expands memory to maximum of 786K; attaches to 256K-byte RAM card:

695

*PRCH: purchase price. Includes 90-day warranty. Depot and on-site maintenance available for a fee. NA: price not available at this time. Prices effective as of December 1983.*



# Texas Instruments TI Professional Computers

## I/O & Communications

**Parallel Printer Port** • 25-pin female D-type connector • integral to system.

**Speaker** • integral to system.

**Expansion Interface Bus** • permits memory-mapped or I/O mapped devices to be added • contains 5 slots of which 4 are open • integral to system.

**PC640 Async/Sync Communications Card** • provides an RS-232C port; supports synchronous and asynchronous transmission • requires 128K-byte RAM plus TTY or 3780 communications package:  
\_\_\_\_\_ **\$225 prch**

**PC645 300-Baud Internal Modem** • direct connect; provides answer/originate, full-duplex capabilities; includes synchronous/asynchronous interface • requires 128K-byte RAM plus TTY or 3780 communications software • AT&T 103 compatible:  
\_\_\_\_\_ **295**

**PC646 300-/1200-Baud Internal Modem** • direct connect; provides answer/originate full-duplex capabilities; includes synchronous/asynchronous interface • AT&T 103/212 compatible • requires 128-byte RAM, TTY, or 3780 communications software:  
\_\_\_\_\_ **750**

**Speech Command Hardware** • used in conjunction with Speech Command software listed under Other Facilities heading • voice processing is handled by TI's TMS 320 digital signal processor to perform real-time voice analysis and synthesis • telephone interface is handled by TI's TMS 7000 processor chip • hardware consists of 2 boards arranged piggyback; utilizes 1 I/O slot • stores up to 16 minutes of speech on a standard 320K-byte diskette, up to 4 hours on a 5M-byte Winchester, and 8 hours on a 10M-byte Winchester • accepts voice input and provides voice output via a speaker, headset, or telephone • 2 piggyback circuit boards with 32K-byte RAM, 1K-byte ROM, a headset, user's manual, 2 software diskettes, installation/diagnostics guide, diagnostics diskette, and telephone cable included in the price:  
\_\_\_\_\_ **2,600**

**EtherLink** • network server dedicated to providing shared resources for 8 to 10 users • includes user-installable Ethernet interface board containing the Ethernet Data Link Controller and the transceiver • occupies 1 expansion slot • requires EtherSeries User Software and EtherShare which are described under Data Communications in the Software section:  
\_\_\_\_\_ **899**

## Disk

The TIPC is available with 3 varying disk configurations. All include a minimum of 1 integral diskette drive and diskette controller. The 2 other configurations include either an additional integral diskette drive or an integral Winchester drive. The TI Portable is presently only available with the 2 diskette configurations. A hard disk configuration will be forthcoming.

**Integral Diskette Drive Subsystem** • includes controller and 5.25-inch double-sided, dual-density, soft-sectored diskette with capacity of 320K bytes under MS-DOS 1.25 and 360K bytes under MS-DOS 2.1 • controller is on the main processor board; supports up to 4 drives; 34-pin Shugart SA400 compatible.

**PC620 Second Diskette Drive** • integral additional 320K- or 360K-byte floppy drive:  
\_\_\_\_\_ **\$425 prch**

**10M-Byte Winchester Disk/Controller** • integral 5.25-inch

Winchester drive and controller • uses single I/O slot:  
\_\_\_\_\_ **2,295**

## Terminals/Workstations

The TI desktop system and the portable both provide the same high-resolution graphics, color capability, and keyboard. The only differences between the 2 systems' monitors is the size of the screen and its placement. The desktop's monitor is detached from the unit and has a 12-inch diagonal screen; the portable's screen is 9 inches and integrated into the unit. However, an external 12-inch monochrome or 13-inch color monitor can be attached to the portable unit.

**CRT Controller** • drives either a monochrome analog or color RGB TTL display • furnishes 8-level grey scale or 8-color RGB output; 25 lines of 80 characters; character scrolling • contains 4K character generator ROM which provides for 128 ASCII characters, 24 international characters (European), special characters • occupies 1 I/O slot • included with system.

**Monochrome Display** • 9-inch or 12-inch diagonal screen, green characters on a black background • included with base system.

**Color Display** • 13-inch diagonal screen:  
\_\_\_\_\_ **\$695 prch**

**PC650 1-Plane Graphics Controller** • to provide high-resolution raster graphics with the monochrome display; 720x300 pixels • mounts onto the CRT controller board piggyback-style:  
\_\_\_\_\_ **190**

**PC651 3-Plane Graphics Controller** • to provide high-resolution raster graphics; 720x300 pixels • produces 8 shades for monochrome display or 8 colors for color display • attaches to the CRT controller board piggyback-style:  
\_\_\_\_\_ **325**

**Keyboard** • detached, low-profile keyboard connects to unit via telephone-type coiled cord; height adjustable; contains its own microprocessor • 97 keys total; includes separate numeric keypad, 12 programmable function keys, separate cursor control cluster.

## Printers

**PC660 Model 850 Friction-Feed Printer** • dot-matrix printer • bidirectional printing at 150 cps using a 9x9 dot matrix or 90 cps using 15x9 dot matrix • raster graphics print capability; produces original and 2 copies; uses paper 3 to 11 inches wide; prints 80 characters per line up to 134 characters per line • supports both serial and parallel interfaces:  
\_\_\_\_\_ **\$599 prch**

**PC661 Model 850 Tractor Feed Printer** • same specifications as PC660 Friction-Feed:  
\_\_\_\_\_ **659**

**Model 855 Friction-Feed Printer** • dual mode dot-matrix printer; provides letter quality printing at 35 cps using a 32x18 matrix format and draft quality printing at 150 cps using a 9x9 matrix format • raster graphics print capability; produces original and 2 copies; accommodates paper 3 to 11 inches wide • compatible with industry-standard escape codes, featuring Epson, Qume, and Diablo data streams:  
\_\_\_\_\_ **935**

**Model 855 Tractor-Feed Printer** • same specifications as friction-feed model:  
\_\_\_\_\_ **995**

• END