digital
Software Product Description

PRODUCT NAME: TOPS-20, Version 3A, System Software Package   SPD 21.1.5

DESCRIPTION:

The TOPS-20 System Software Package is included with each DECSYSTEM-20. The TOPS-20 System Software Package is a multiuser, multilanguage interactive processing system with multistream batch capabilities. The TOPS-20 System Software Package includes:

- the TOPS-20 operating system
- the RSX-20F operating system*
- EXEC, the TOPS-20 command language executive
- EDIT, the TOPS-20 editor
- GALAXY, the TOPS-20 batch system
- the MACRO assembler
- the LINK overlay loader
- system utilities

* Throughout this SPD, an asterisk will indicate any and all features of the TOPS-20 System Software Package which are not included with DECSYSTEM-2020.

The package optionally supports FORTRAN, COBOL, ALGOL, APL, BASIC, and CPL high-level language processors. The DBMS (Data Base Management System) package is also optionally supported, interfaced to either FORTRAN or COBOL. The SORT program is an additional option which interfaces to COBOL and FORTRAN.

The system features:

- virtual memory system with multiprocess job structure
- advanced file system
- optimized, highly reliable system resource allocation
- a front-end operating system for communications and unit record control*
- easy-to-use system command language
- many system utilities to enhance system use and operation

The TOPS-20 operating system provides a virtual memory user environment of 256K 36-bit words. This virtual address space is demand-paged in 512-word pages. The user environment is structured to provide a multiprocessing job structure that services complex applications as well as simple ones. Several powerful forms of interprocess communication are provided:

- IPCF — interprocess communication facility used to pass messages between processes
- PSI — pseudo-software interrupts are generated by the system for event posting between processes
- ENQ/DEQ — a resource queuing mechanism for the synchronization of two or more processes, commonly used for record-level interlocks
- Page Sharing — system and user level code and data sharing on a per page basis
- Process Control — direct functional control of an inferior process by its superior; used to implement the TOPS-20 EXEC and available for user application subsystems

The TOPS-20 file system is a general purpose named file system providing:

- Mountable disk structures
- Up to 4000 user accounts/directories per structure on a 2020, 2040 or 2050. Up to 12,000 accounts/directories on a 2060.
- Multilevel directory structure
- Interuser security through directory and file access protection mechanisms
- Interuser cooperation specification through the user group definition facility, allowing arbitrary definition of user groups that wish to have common access to files
- Simultaneous update capabilities within a file, allowing two or more cooperating users concurrent update access to a file
- User-level disk space quotas for disk space management
- Automatic space allocation and deallocation during program run time for file creation and deletion
- Automatic optimized file placement and I/O
- Centralized file name parsing and look-up monitor facility, which eliminates the need for file name syntax checking in user programs and provides file naming consistency between programs
- Centralized file operations monitor facilities, which include easy-to-program sequential accessing in byte or string modes

These capabilities are provided to the user through TOPS-20 system calls.

The TOPS-20 operating system performs process scheduling, memory management, and file system management. It also provides the environment for the batch system's queuing, job scheduling, job accounting, and device spooling operations. Specific percentages of the central processor can be allocated to specific jobs.

The TOPS-20 operating system enhances system efficiency by optimizing system resource utilization. Among these optimizations are disk optimization, tape throughput optimization, demand paging, and easy reentrant programming facilities. In addition, the TOPS-20 batch system provides performance and efficiency in the virtual memory environment.

The TOPS-20 operating system supports hardware error detection and recording in a system disk file. A system error reporting program is provided which processes this error file to enable DIGITAL service personnel to monitor system performance.

The RSX-20F operating system*, Version VB12-12, controls the front-end processor and communicates with the DECSYSTEM-2040/2050/2060 processor. RSX-20F controls the unit record equipment and the asynchronous terminal lines. The asynchronous terminal lines can be either local or modem controlled (dial-in). Automatic baud rate detection is supported on modem controlled lines at 110, 150, and 300 baud. RSX-20F also provides the system console facilities.

The TOPS-20 EXEC implements the system command language for interactive and batch processing. It provides command level facilities for controlling creation, compilation, execution, debugging, and deletion of user programs and their data. Commands exist to allow user assignment of resources, and to provide user/operator and user/terminal communications. The TOPS-20 EXEC also provides file handling commands, operator level commands, and a number of system information commands. Additional user level system facilities are provided to further aid system use and operation.

TOPS-20 GALAXY is a high performance multistream batch system providing:

- The same command language used in timesharing
- Multistream operation with operator control of the number of active streams
- Automatic line printer and card reader spooling with job accounting and control, including special forms scheduling
- Job dependency scheduling allowing creation of multijob batch applications
- Job limits parameters to define a batch job's resource bounds
- Job Control Language error recovery facilities that allow command level recovery from expected or unexpected errors
- Support of all language processors, application tools, and system utilities
- Capability to request automatic job restart in the event of a system failure during job execution

All TOPS-20 system facilities are available both interactively and through the batch system.

TOPS-20 EDIT is the DECSYSTEM-20 file editing program. EDIT is a line-oriented editor with many character-oriented editing facilities. The novice user can choose to edit using simple line replacement, while the more experienced user can perform string searches, string replacements, and other advanced editing operations. EDIT runs on any DECSYSTEM-20.

TOPS-20 MACRO is a two-pass symbolic assembler for the DECSYSTEM-20. It features:

- powerful macro facilities with nesting
- extensive pseudo operations
- expressions with constant, absolute, or relocatable symbols
- capability to declare symbols available to FORTRAN or COBOL
- conditional assembly
- support for writing reentrant code
- symbolic debugging facility
- parameter file searching

MACRO runs on any DECSYSTEM-20.

TOPS-20 LINK is a linking loader for the DECSYSTEM-20. In addition to basic loading functions, it provides:

- single region tree-structured overlay facility
- load-time-defined overlay structure, independent of FORTRAN, COBOL, or ALGOL programs
- a diagrammming facility to portray the program overlay structure
- relocatable overlays

LINK runs on any DECSYSTEM-20.

TOPS-20 DUMPER is a highly reliable utility for operational backup and restoration of the file system using tape. The primary facilities are:

- full save or restore
- incremental save by file creation date
- individual user save or restore
- individual file save or restore

DUMPER runs on any DECSYSTEM-20.

The following is a list of the TOPS-20 System Software Components:

TOPS-20	DECSYSTEM-20 Operating System
RSX-20F	Front-end Operating System Version VB12-12*
EXEC	Terminal Command Language Executive
GALAXY	Batch System, including batch controller, queue manager, line printer spooler, and card reader spooler
MACRO	Symbolic Assembler
LINK	Linking Loader
DDT	Symbolic Debugger

MACSYM, MONSYM	Symbol Parameter Files
EDIT	Text Editor
CREF	Cross Reference Utility
PLEASE	User-to-Operator Communication Utility
MAIL/ RDMAIL	User-to-User Mail Utility
FILCOM	File Comparison Utility
BOOT	Disk/Tape Bootstrap
CHECKD	File System Maintenance Utility
DUMPER	File System Backup-to-Tape Utility
PTYCON	Multiple Job Control Utility
SYSJOB	System Utility
INFO	System Utility
CHKPNT	Accounting Utility
MAILER	System Mailing Utility
OPLEAS	Operator Please Utility
DLUSER	User Creation/Deletion
WATCH	Performance Monitoring Utility
SYSERR	System Error Reporting Utility
ULIST	User Listing
MAKRAM	Translation RAM file generator for LP05
MAKVFU	VFU file generator for LP05
CONV20	Usage file to fact file converter
ACTGEN	Account Generation Utility
DX20LD	DX20 Microcode Loader
VERIFY	Installation verifier
UETP	User Environment Test Package

The following are distributed with TOPS-20 as a Category C product:

ACCT20	Accounting Utility for FACT.BIN
USAG20	Accounting Utility for USAGE.OUT

MINIMUM HARDWARE REQUIRED:
Any valid DECSYSTEM-20

OPTIONAL HARDWARE:
Memory:
Additional memory may be added up to a system total of 512K words on a 2020/2040/2050 or 1280K words on a 2060, as follows:

MA20 Core Memory (2040, 2050, 2060)
MB20 Core Memory (2040, 2050, 2060)
MF20 MOS Memory (2060)
MS10 MOS Memory (2020)

Disk Systems:
● RH20 MASSBUS controller with RP04 or RP06 disks (2040/2050/2060)
● RH11 MASSBUS controller with RM03 or RP06 disks (2020)

Magnetic Tape Systems
● RH20 MASSBUS controller with TU45 magnetic tape transports (2040/2050/2060)
● RH20/DX20 MASSBUS controller and channel with TU70, TU71, or TU72 subsystem

● RH11 MASSBUS controller with TU45 magnetic tape transports (2020)

Unit Record Devices:
● LP20 line printer
● CD20 card reader

Asynchronous Communications:
● Additional terminal lines may be added up to 32 on a 2020 or 128 on a 2040/2050/2060
● LA36, LA37, VT50, or VT52 terminals

Synchronous Communications:
● DN20-C Synchronous Front-end (2040/2050/2060)
● DN20-BA/DN20-BB Synchronous Lines (2020)

PREREQUISITE SOFTWARE:
None

OPTIONAL SOFTWARE:
COBOL-20
DECSYSTEM-20 SORT/MERGE
FORTRAN-20
BASIC-20
APL-BASIC
CPL-20
ALGOL-20
DBMS-20
BASIC-PLUS-2
IQL-20
TRAFFIC-20
DECnet-20

TRAINING CREDITS:
TEN (10) — Applies only to options that include support services. Consult the latest Educational Services Catalog at your local office for the available courses, course requirements, and guidelines.

SUPPORT CATEGORY:
A — Software Support will be provided as stated in the Software Support Categories Addendum to this SPD.

UPDATE POLICY:
Software Updates, if any, released by DIGITAL during the one (1) year period following installation, will be provided to the customer without additional charge (includes no installation). After the first year, updates, if any, will be made available according to then prevailing DIGITAL policies.

ORDERING INFORMATION:
All binary licensed software, including any subsequent updates, is furnished under the licensing provisions of DIGITAL's Standard Terms and Conditions of Sale, which provide in part that the software and any part thereof may be used on only the single CPU on which the software is first installed, and may be copied, in whole or in part (with the proper inclusion of the DIGITAL copyright notice and any DIGITAL proprietary notices on the software) only for use on such CPU. All source licensed software is furnished only under the terms and conditions of a separate Software Program Sources Agreement between Purchaser and DIGITAL.

Source and/or listing options are only available after the purchase of at least one binary license and after a source license agreement is in effect.

The following key (K, L, M, Z) represents the distribution media for the product and must be specified at the end of the order number, e.g., QT030-EM = TOPS-20 monitor sources on 9-track magnetic tape.

K = RP04 Disk Pack
L = RP06 Disk Pack
M = 1600 bpi 9-track Magnetic Tape
Z = No hardware dependency

Standard Options

2020	DECSYSTEM-2020, single-use license, binaries on magnetic tapes, documentation, support services
2040	DECSYSTEM-2040, single-use license, binaries on magnetic tapes and floppy disks, documentation, support services
2050	DECSYSTEM-2050, single-use license, binaries on magnetic tapes and floppy disks, documentation, support services
2060	DECSYSTEM-2060, single-use license, binaries on magnetic tapes and floppy disks, documentation, support services

Source/Listing Options

QT029 -E— TOPS-20 front-end sources (media: K, L)

QT030 -E— TOPS-20 monitor sources (media: M)

QT030 -U— Armed services procurement regulation TOPS-20 monitor sources (media: M)

QT038 -E— TOPS-20 Command Decoder sources (media: M)

QT038 -U— Armed services procurement regulation TOPS-20 Command Decoder sources (media: M)

QT040 -E— TOPS-20 combined source package (media: K, L)

QT040 -U— Armed services procurement regulation TOPS-20 combined source package (media: K, L)

Source/Listing Update Options

QT029 -Z— Armed services procurement regulation front-end source update (media: K, L)

QT030 -Z— Armed services procurement regulation monitor sources update (media: M)

QT038 -Z— Armed services procurement regulation command decoder source update (media: M)

ADDITIONAL SERVICES:

QS926 -S— Orientation Services (media: Z)

QTK01 -K— Maintenance Service (media: M)

ADDENDUM
SOFTWARE SUPPORT CATEGORIES

Each software product (hereinafter 'SOFTWARE') with a designated Support Category A or B in the applicable Software Product Description (SPD) existing at the time of order will be the current release at the time of delivery and will conform to the SPD. DIGITAL's sole obligation shall be to correct defects (nonconformance of the SOFTWARE to the SPD) as described below. Any SOFTWARE with a designated Support Category C will be furnished on an 'as is' basis.

For SOFTWARE with a designated Support Category A or B, DIGITAL will provide the services set forth below without additional charge.

CATEGORY A

1. Upon notification by customer to the nearest DIGITAL office that the computer system, including all required prerequisite hardware and software, is ready for the installation of the SOFTWARE, DIGITAL will install such SOFTWARE in any location within the contiguous forty-eight (48) United States, the District of Columbia, or a country in which DIGITAL or a subsidiary of DIGITAL has a software service facility. The notification must be received by DIGITAL and the system must be ready for installation within thirty (30) days after the delivery of the SOFTWARE to customer or DIGITAL will have no obligation to install. Installation will consist of: (1) verification that all components of the SOFTWARE have been received by customer, (2) loading the SOFTWARE, and (3) executing a DIGITAL sample procedure.

2. During the ninety (90) day period after installation, if the customer encounters a problem with the current unaltered release of the SOFTWARE which DIGITAL determines to be a defect in the SOFTWARE, DIGITAL will provide the following remedial service (on site where necessary): (1) if the SOFTWARE is inoperable, apply a temporary correction (TC) or make a reasonable attempt to develop an emergency by-pass, and (2) assist the customer to prepare a Software Performance Report (SPR) and submit it to DIGITAL.

3. During the one (1) year period following installation, if the customer encounters a problem with the SOFTWARE which his diagnosis indicates is caused by a SOFTWARE defect, the customer may submit an SPR to DIGITAL. DIGITAL will respond to problems reported in SPRs which are caused by defects in the current unaltered release of the SOFTWARE via the Maintenance Periodical for the SOFTWARE, which reports SPRs received, code corrections, temporary corrections, generally useful emergency by-passes and/or notice of the availability of corrected code. Software Updates, if any, released by DIGITAL during the one (1) year period, will be provided to the customer on DIGITAL's standard distribution media as specified in the applicable SPD. The customer will be charged only for the media on which such updates are provided, unless otherwise stated in the applicable SPD, at DIGITAL's then current media prices.

CATEGORY B

During the one (1) year period following delivery, the services provided to the customer will be the same as set forth in 3 above.

CATEGORY C

SOFTWARE is provided on an 'as is' basis. Any software services, if available, will be provided at the then current charges.

DIGITAL shall have the right to make additional charges for any additional effort required to provide services resulting from customer use of other than current unaltered release of the SOFTWARE operated in accordance with the SPD.