digital
Software Product Description

PRODUCT NAME: RSTS/E, Version 7.0 **SPD 13.1.13**
Resource Sharing Timesharing System/Extended

DESCRIPTION:

RSTS/E is a multiuser, multitasking, general purpose system. Its use includes: interactive timesharing, batch processing, program development, and special purpose applications. With optionally available hardware and software, a RSTS/E system can also be a node in a network of computer systems using the DIGITAL network architecture or, it can communicate with IBM S/360 and S/370 computers using Binary Synchronous Communications protocols.

Programs may be written in any of several languages. The following languages are standard with all RSTS/E systems:

- BASIC-PLUS
- MACRO-11 assembly language

The following languages are optionally available for use on RSTS/E:

- PDP-11 COBOL
- FORTRAN IV
- FORTRAN IV-PLUS
- RPG II
- APL
- BASIC-PLUS-2

PDP-11 COBOL, RPG II, and BASIC-PLUS-2 require the support of RMS, the Record Management Services software, that is included with all RSTS/E systems. The optionally available DATATRIEVE-11 data management software also uses RMS. The use of RMS is optional for MACRO-11 assembly language programs. BASIC-PLUS, FORTRAN IV, FORTRAN IV-PLUS, and APL do not use RMS.

Some of the features of the RSTS/E system include:

- Interactive timesharing environment
- Batch processing capabilities
- Dynamic allocation of system resources
- Extensive file processing and record management services, including file sharing and protection mechanisms
- Terminal handler designed for interactive environments
- Shared common code
- Software-maintained cache of frequently-accessed disk data
- Intertask communication
- Disk file and device backup and restore utilities
- System operations and access control utilities
- System maintenance tools
- User-definable terminal commands
- Line printer spooling

Timesharing

Each user of a RSTS/E system is associated with some job on the system, and normally interacts with that job using a terminal. Jobs can also run detached (not using a terminal), or they may use pseudo keyboards, as in the case of batch jobs, under the control of other jobs. Using facilities that support multiple terminals per job, some RSTS/E systems may be able to support as many as 127 terminal users concurrently, although the number of jobs per RSTS/E system is limited to 63. These limits are not always achievable. The number of users that a given system can support varies with the system configuration as well as the application or type of use to which it is subjected. The number of user jobs is also diminished by system processes and other detached jobs on the system, such as the Error Logger, Operator Services, Queue Manager, line printer spoolers, batch processors, and batch jobs.

RSTS/E schedules CPU time and memory residency among jobs based on their priority and processing requirements. Jobs are rescheduled based on time-slicing or as a result of waiting for system services. A round-robin algorithm is used to select among eligible jobs with the same priority. Job priorities can be altered by the system manager or any privileged user, or by a privileged program.

RSTS/E uses the memory management hardware capabilities to map a user's job area and any shared code into the user job's virtual address space. Jobs may be swapped out to disk storage when the memory is needed for other jobs to run. A job's size may be expandable dynamically, subject to limits imposed by the system manager or other privileged users. The absolute limit for job size is 62K bytes (31K words), but the usual limit is 56K bytes (28K words). BASIC-PLUS programs cannot be larger than 32K bytes (16K words).

Privilege

As a resource-sharing system, RSTS/E gives every user access to all the system peripherals and resources, as well as a wide range of capabilities, unless otherwise restricted by the system manager or other privileged users. A privileged user has full access to all the capabilities allowed by the RSTS/E system, and may control the operations of the system such as starting up or shutting down the system. A privileged user can add or delete user accounts, including other privileged accounts. A privileged user can also designate certain programs as privileged, in order to grant program-selected privileged capabilities to normally non-privileged users. Privileged users also have access to tools for controlling the use of system features that make the system operate more efficiently.

File System

The RSTS/E data file system provides a range of on-line processing capabilities. Disk files may be created, updated, extended, deleted, and renamed under program control, or they may be created, deleted, and renamed using terminal commands. Files may be created and extended dynamically, with the RSTS/E file system automatically allocating disk space wherever available. Alternatively, to enhance system performance, a file may be pre-allocated to use physically contiguous space. The ability to specify the location of a file on a disk volume also helps to enhance system performance. A disk file's size is limited by the storage capacity of the volume on which it resides. Files may be accessed by multiple users simultaneously. When opened for shared update, multiple users may update the same file while it remains open. The file system's block interlock mechanism prevents different users from updating the same part of the file at the same time.

The RSTS/E disk structure consists of a hierarchy which has an MFD (*M*aster *F*ile *D*irectory), UFD (*U*ser *F*ile *D*irectories), and files. Each MFD may contain up to 1735 UFDs, depending on the size of the MFD. The number of files that a UFD can contain varies, depending on parameters such as the sizes of the files. Each file is distinguished from other files in that UFD by its unique file name and extension.

RSTS/E disk volumes, when used as file-structured devices, are either public or private. A public volume is the system disk or any volume initialized as a public volume. Other file-structured volumes are private. The system disk and any other mounted public volumes together constitute the public structure, which is a logical extension of the system disk. However, files cannot span volumes within the public structure. All users have access to the public structure. Users have access to mounted private volumes only if their UFDs exist on the private volumes, or if the protection codes of the files in other UFDs on those volumes permit access. Access to a disk file is governed by its protection code, that specifies read and write access for the file's owner, for other users within the owner's group, and for all other users. For executable files, the protection code specifies execute and read/write access for owner, group, and all others.

Disk volumes can be used as random-access mass storage rather than file-structured devices. Since RSTS/E uses a unique file structure, volumes with disk structures of other operating systems can be used only as non-file-structured volumes.

A special utility provides file transfer capability to and from volumes using the RT-11 file structure for disks up to 33.5 million bytes capacity. This utility can also be used for flexible diskettes which are supported on RSTS/E only as non-file-structured devices. A separate utility handles interchange of files on flexible diskettes using IBM 3741 single density format (Format 1). With this utility, EBCDIC to ASCII translation is a user-specifiable option.

Magnetic Tape Processing

Nine track, 800 or 1600 BPI magnetic tape may be processed using either of two labelling formats. DOS-11 format is used for interchange between PDP-11 systems: RSTS/E, CTS-500, RT-11, RSX-11M, IAS, TRAX, and VAX/VMS. ANSI format, defined by American National Standard Institute Specification X3.27-1978, is used for interchange between systems that support the standard. When using ANSI labelling format, RSTS/E processes only volume-header, file-header, and end-of-file labels. RSTS/E does not perform access checking. A tape volume is considered private to the job which has access to that volume. RMS uses ANSI labelling format exclusively. Files may be processed using F (fixed-length) or D (variable-length) record formats.

RSTS/E processes single-volume file sets only, except when PIP (*P*eripheral *I*nterchange *P*rogram), is used. PIP can process volume sets consisting of more than one tape reel. Tapes conforming to a subset of ANS X3.27-1978 can be read and written by the RMS utilities and PIP.

RSTS/E supports the TU58 DECtape II cartridge as a non-file-structured device. The file interchange utility which supports the RT-11 file structure must be used for reading and writing files on the TU58.

RMS (Record Management Services)

RMS software comprises a set of run-time service routines and utility programs that provide a data management subsystem. This subsystem allows a user to create and manipulate files, and create, access, and alter records within the files.

RMS supports three file organizations: sequential, relative, and indexed. The indexed file organization allows each indexed file to have one primary key and up to 254 alternate keys. In addition to random access based on key values, programs can access records in an indexed file sequentially in ascending order by key values. Records are stored physically only in primary key order.

RMS supports four record formats; fixed length records, variable length records, variable length records with fixed control field, and stream records. Indexed files are restricted to either of two record formats: fixed or variable. The stream record format is restricted to sequential disk files only. Languages which do not use RMS (for example, BASIC-PLUS) cannot process RMS files unless the record format is stream.

User programs are provided with logical data record access to RMS files through extended language syntax statements. The form of the statement is dependent upon the application language interface. The functional facilities provided are:

- OPEN
- CLOSE
- READ/GET
- WRITE/PUT
- REWRITE/UPDATE
- DELETE

Note that the full capabilities of RMS are available to user programs or subroutines written in MACRO-11 assembly language.

RMS Utility Programs

A set of utility programs is provided for the support of RMS files.

DEFINE — tutorial mode utility to define file attributes for an RMS file.

BACKUP — create a back-up copy of one or more RMS files from a direct access device to another logical device or physical medium (typically, magnetic tape).

RESTORE — recreate from a back-up copy the original RMS file on a direct access device or physical medium.

CONVERT — initially load or add records to an output file from input data recorded on a sequential, relative, or indexed file; creates, supersedes, or extends a sequential output file from an input file.

DISPLAY — lists attributes of RMS files and records.

INDEXED FILE LOAD (IFL) — initial load utility for indexed files, optimized for performance and space.

File Sort Utility

RSTS/E includes a file sort utility, SORT-11, which accepts as input one RMS file, and creates a second, reordered, RMS file. The input file can contain data stored in binary or ASCII format; the file organization can be sequential, relative, or indexed; and the record format can be fixed length, variable length, or stream. The reordering of information can be in ascending or descending order. SORT-11 has four possible sorting methods: Record Sort, Tag Sort, Address Routing Sort, and Index Sort.

SORT-11 also includes a set of subroutines, callable from programs that use one of the languages using RMS. SORT-11 does not provide file merge capability.

BASIC-PLUS

BASIC is a conversational programming language developed at Dartmouth College that uses simple English-like statements and familiar mathematical notations to perform operations. The BASIC-PLUS language is derived from Dartmouth BASIC. In addition to the elementary BASIC statements, BASIC-PLUS also features:

- An incremental compiler
- Immediate mode statements
- Extensive file processing capabilities
- Access to most RSTS/E system features
- Virtual arrays
- Block I/O
- PRINT...USING formatting (optional)
- Extensive string support
- String arithmetic (optional)
- Matrix manipulation operations (optional)
- Long variable names (with EXTEND mode)
- IF...THEN...ELSE construct
- ON ERROR condition handlers
- Statement modifiers: IF, UNLESS, WHILE, UNTIL, FOR
- User-defined functions
- Multistatement lines
- Multiline statements
- Program chaining

The BASIC-PLUS language processor comprises a compiler and a run-time system. THE BASIC-PLUS compiler produces a compact pseudo code which is interpreted by the run-time system. Being an incremental compiler, it checks each program line for syntax errors and returns an appropriate message if an error is found. The user can then correct the line (if necessary) by retyping it. BASIC-PLUS programs may be saved in either source form or in compiled form.

The immediate mode feature of BASIC-PLUS allows single-line statements typed without a line number to be compiled and executed immediately. This is a particularly useful feature in interactive debugging of BASIC-PLUS programs.

BASIC-PLUS can serve as a powerful system programming language. The extensive file processing capabilities of BASIC-PLUS allow users to take full advantage of RSTS/E file processing features. Most system features of RSTS/E are accessible via the flexible SYS system function call mechanism.

Note that, on some systems, it may not be possible to include all the optional features of BASIC-PLUS within 32K bytes (16 words).

MACRO-11

The MACRO-11 assembly language is used for development of programs and/or subroutines using the PDP-11 instruction set. The MACRO-11 assembler is a two-pass assembler with the following features:

- Source and command string control of assembly functions
- Device and file name specifications for input and output files
- Error listing on command terminal and in listing file
- Alphabetized, formatted symbol table listing
- Optional cross-reference listing of symbols
- Relocatable object modules
- Global symbols for linking object modules
- Conditional assembly directives
- Program sectioning directives
- User-defined macros and macro libraries

- Comprehensive system macro library
- Extensive source and command string control of listing functions

Terminal Handling

The RSTS/E terminal handler is designed for interactive environments, and features:

- Full-duplex communications
- Modem control
- Type ahead with immediate echo
- Programmable echo control
- Multiterminal I/O for individual jobs
- Pseudo keyboard capability

The echo control feature allows programs to handle terminal input one field at a time and retain control of the screen display. This feature gives application programs the capability to use non-block mode transfer terminals to simulate block mode input. RSTS/E does not support block mode transfer terminals.

Each RSTS/E system includes at least one terminal, the system console terminal, and potentially as many as 127. The multiterminal service feature allows any job to control multiple terminals, up to the maximum number configured for the system, on one logical channel. This feature allows one program to control a multitude of terminals which are all performing the same function.

Pseudo keyboards are logical devices that have the logical characteristics of real, physical terminals but have no terminals associated with them, Pseudo keyboards have input and output buffers from which a program can extract output and to which it can force input. Using a pseudo keyboard as a communications device, a user can write a program to control other jobs. Each RSTS/E system includes at least one pseudo keyboard. The maximum total number of terminals and pseudo keyboards is 128.

Batch Processing

Users may submit batch jobs to perform tasks which require no terminal interaction, or to run programs at a later time, for example, outside normal working hours. For each batch job, a limit may be set on the amount of CPU and/or elapsed time allowed. Error level checking may be requested. The system manager starts up and controls batch processors. There can be a maximum of eight batch processors per system. Each batch processor requires one pseudo keyboard and two job slots (one for itself and one for the batch job).

Line Printer Spooling

Users may submit text files to be printed on a line printer. Multiple copies may be requested. Different forms may be specified. The system manager starts and controls the line printer spoolers. There can be a maximum of eight line printer spoolers per system. Each spooler requires one job slot. A given spooler may handle requests on a specific line printer queue, or it may be set up to handle requests for the general line printer queue. Only disk files of sequential organization can be printed. Spooled files must not exceed 32767 disk blocks in size. The line printer spooler cannot print files which have variable length records with fixed control fields, such as, VAX/VMS "print format" files.

The line printer spooling capability also supports keyboard spooling to hardcopy terminals, such as receive-only printers like the serial LA180. Note however, that data integrity is not checked on the serial line. The LA180 must remain on-line while keyboard spooling is in operation.

Shared Common Code

RSTS/E allows the sharing of code that is common to multiple jobs. For example, the BASIC-PLUS run-time system is shared by all users of that language. Other examples of shared code are resident libraries of software routines, for example, RMS. Since resident libraries must consist of code written in MACRO-11, the resident library capability is restricted to languages using RMS: COBOL, BASIC-PLUS-2, and RPG II.

Disk Data Cache

RSTS/E can minimize actual accesses to disks for frequently used data by keeping them in a software-maintained cache, a specially designated area of system memory space. The data retained in this cache may be restricted to disk directory blocks only, or it may include data from disk files. In the latter case, a privileged user has the option to place all disk file data in the cache, or to allow only certain files to be put in the cache. As a general rule, disk data files require much more memory dedicated to the cache than disk directory blocks to obtain system performance gains.

Intertask Communication

RSTS/E jobs can communicate with each other by sending and/or receiving intertask messages under program control. For example, submission of batch jobs or requesting files to be printed by the line printer spooler uses the message send/receive mechanism. All jobs can send messages to valid message receivers. A job must have privileges to declare itself as a message receiver. With optional DECnet/E software, the message send/receive mechanism is extended to sending and receiving messages between jobs on different DIGITAL computer systems.

Systems Operation Control

The system manager has the ability at system start up time to:

- Enable and/or disable devices
- Set system default parameters
- Allocate memory usage
- Install a new RSTS/E executive with different system generation parameters
- Initialize disk packs
- Verify and correct the file structure of RSTS/E disks
- Save and restore disk packs

The system manager and other privileged users have access to many utilities for controlling system operations on-line. The functions they can perform include the following:

- Define normal system start-up control files
- Define automatic system restart control files
- Logically mount and dismount disk packs
- Add or remove swap files, run-time systems, and resident libraries
- Add or remove system-dependent commands
- Define terminal characteristics for any terminal
- Change job priorities and other job-related parameters
- Add or delete user accounts, change passwords
- Dump accounting statistics for all or selected accounts
- Control usage of disk data cache feature

System Reliability and Maintenance

The error logging mechanism in RSTS/E records certain classes of hardware errors in a disk file. These include memory parity errors, disk, or magnetic tape errors. Also recorded are system traps occurring in the executive, as well as other events such as system start up and shut down, and power-fail recovery restarts. The error log can be printed and analyzed on-line.

If the hardware detects power failure, RSTS/E automatically ceases system operations. When the hardware detects power restoration, RSTS/E automatically reloads the system from the system disk, and reinitializes system operation by doing a "cold restart". The system resumes operations without operator intervention, but any users previously logged in will have to log in again.

Likewise, if nonrecoverable hardware or system software errors result in a system crash, RSTS/E will dump the read/write portion of the executive's address space to a disk file, then reload the system and do a cold restart, as described above. Note that either or both the crash dump and the automatic restart capability may be disabled by the system manager.

The reliability of most peripherals may be checked on-line by running a Device Test package, which exercises the peripherals in an attempt to force errors and identify fault-prone devices. However, comprehensive error isolation requires DIGITAL Field Service to use standard diagnostic software.

Software integrity is kept at a high level by using software maintenance tools which allow the system manager to correct software components that are found to be in error. The *RSTS/E Software Dispatch* publication contains articles describing known problems, and where applicable, includes instructions for patching the affected software components. The Automated Patching facility (Auto Patch) provides a means of applying patches using machine-readable command files, thus avoiding the effort and potential errors associated with keying in patches manually. The RSTS/E software distribution kit includes one Auto Patch kit, containing already published patches. Subsequent Auto Patch kits are available on a periodic basis as an optional, separate service.

Disk File and Device Backup

RSTS/E provides the ability for total or selective backup of accounts and files to disk or to magnetic tape. Selective backup can be done on-line. Backing up entire disk volumes may be performed off-line for all volumes including the system disk, or it may be performed on-line for any volume which is not logically mounted. Since the system disk is always logically mounted, it can only be backed up off-line, or files on it can be backed up selectively on-line.

Program Development Tools

Program development on a RSTS/E system is facilitated by a wide selection of system utilities. Text editors include the DEC Editor, EDT, which can handle all types of sequential text files, including RMS fixed length record files, variable length record files, and stream files.

Interactive program development is most often done using BASIC-PLUS. Program development using other languages may use either of two environments or run-time systems. The RSX run-time system provides an environment somewhat similar to that found on the RSX-11M operating system, by handling a subset of RSX-11M system directives. The RSX run-time system is required by all software using RMS, and by FORTRAN IV-PLUS. The RT-11 run-time system provides an environment similar to that found on the single-job monitor of the RT-11 operating system, and handles a large subset of the RT-11 directives. The RT-11 run-time system is required by FORTRAN IV, and is also used during System Generation. In addition, the RT-11 run-time system is required for running PIP (*P*eripheral *I*nterchange *P*rogram), and is therefore always present (but not necessarily resident) on each RSTS/E system.

Program development using MACRO-11 assembly language, when it involves subroutines callable by a higher level language program, necessarily uses the run-time system required by that higher level language. When programming in MACRO-11 exclusively, the RSX run-time system is the preferred environment. The RT-11 environment can also be used, but requires RT-11 documentation which must be ordered separately.

Both the RSX and RT-11 environments provide an Assembler, a Linker or Task Builder, and a Librarian utility. The MACRO-11 Assembler provides full macro programming capabilities, including the use of macro libraries, conditional assembly directives, and pseudo operators. The Linker or Task Builder converts relocatable object modules produced by the Assembler or optional compilers into executable images. Overlays do not require any special instructions or function calls in the source program. The user designates an overlay structure, and an executable image with the desired overlays will be produced. The Librarian utility creates and maintains libraries of commonly used object module subroutines and assembly language macro definitions. The Linker or Task Builder uses object libraries to resolve undefined external symbols.

CCL (Concise Command Language)

User commands to the RSTS/E system are handled and interpreted by special run-time systems called Keyboard Monitors. The three standard Keyboard Monitors are BASIC, RSX, and RT-11. These all interpret a common set of system commands, which are English words followed by optional command parameters. These system commands allow users to perform all the fundamental functions required to use the RSTS/E system, such as logging on and off, and running programs. BASIC and RT-11 also have additional commands to perform actions appropriate for those environments. Optional software, such as BASIC-PLUS-2, also provides similar capabilities.

The CCL feature allows each installation's system manager to define additional commands to run system utilities as well as other user programs. Each CCL command definition specifies the full form of the command and its abbreviation, the program to be run to handle the command, and the entry parameter for the program.

MINIMUM HARDWARE REQUIRED:

Minimum hardware configurations permit valid RSTS/E systems to be generated but do not guarantee adequate system performance.

- Processor: Any PDP-11 CPU with Memory Management Unit and Extended Instruction Set. (Microprogramming is not supported on the 11/60). Note that all peripherals are not available for all processors.
- Memory: 128K bytes (64K words) parity or ECC memory, plus additional memory required for optional software (see SPD of each product). 248K bytes (124K words) are required to use RMS. 512K bytes (256K words) are recommended for using the Disk Data Cache feature.
- Clock: KW11-P or KW11-L (or equivalent line-frequency clock with accessible CSR)
- ROM bootstrap
- Console terminal: LA36 or LA120
- Disk: 10 million bytes of disk storage, consisting of:
  1. Two RL01 drives, or
  2. An RL02, RK06, RK07, RPR02, RP03, RM02, RP04, RP05, or RP06 drive, or
  3. An RM03 drive (11/70 systems only), or
  4. Four RK05 drives or one RK05F and two RK05 drives. Only three RK05 drives, or one RK05F and one RK05 drive, for a total of 7.2 million bytes of disk storage, are required for updating from RSTS/E, Version 6C, provided the system is to be used exactly as on Version 6C.

  Optional software requires disk storage in addition to the 10 million byte minimum. See the SPD for each product.
- Software distribution device:

  TU10, TE10, TS03, TS11, TU16, TE16, TU45, or TU77 magnetic tape drive. (7-track magnetic tape distribution is available only as an update option.)

  NOTE: RK05, RK06, RK07, RL01, or RL02 cartridge disk drives are alternative distribution devices for dual or multiple disk systems.
- System backup device:

  Same as software distribution device, or

  Any supported removable disk cartridge or disk pack device.

OPTIONAL HARDWARE:

- Additional parity or ECC memory, up to the limit supported by the CPU
- FP11 (or FP11-compatible) Floating Point Processor, or KE11-F Floating Instruction Set
- KK11-A cache memory option for 1134A
- KE44-A Commercial Instruction Set for 11/44

Disks:

- Up to 4 RX01 dual or single drive systems and/or RX02 dual drive systems
- Up to 8 RS11 drives
- Up to 8 RK05 drives, where each RK05F drive is counted as two RK05 drives
- Up to 4 RL01 and/or RL02 drives
- Up to 8 RK06 and/or RK07 drives
- Up to 8 RPR02 and/or RP03 drives
- Up to 16 RM02, RM03, RP04, RP05, and/or RP06 drives (RM03 supported on 11/70 only)

Note that dual ported disks cannot be used by two systems simultaneously.

Magnetic tapes:

- Up to 8 TU16/TE16, TU45, and/or TU77 drives
- Up to 8 TU10/TE10 and/or TS03 drives, or up to 4 TS11 drives
- Up to 4 TU56 dual DECtape transports
- Up to 8 TU58 DECtape II drives

Terminals:

- Up to 127 terminals, including the system console
- Types of terminals supported are: LA34, LA36, LA37, LA38, LA120, LA180, VT52, VT55, VT100, LT33, and IBM 2741-compatible terminals. VT05B and VT50 terminals are supported only on systems updating from RSTS/E, Version 6C.
- Types of terminal line interfaces supported are: DL11, DJ11, DZ11, and DH11. The DH11 multiplexer can be used with the DM11-BB modem controller
- Types of modems supported are: Bell 103A or equivalent
- The following types of terminal line interfaces are supported only on systems updating from RSTS/E, Version 6C: KL11, LC11, and DC11

Other peripherals:

- Up to 8 LP11 and/or LA11 (LA180) line printers (LS11 or LV11 supported only on systems updating from RSTS/E, Version 6C)

- One CR11, CM11, or CD11 card reader
- PC11 paper tape reader/punch (PR11 paper tape reader supported only on systems updating from RSTS/E, Version 6C)

PREREQUISITE SOFTWARE:

None

OPTIONAL SOFTWARE:

DIGITAL Supported Software Products:

PDP-11 BASIC-PLUS-2, Version 1.6
PDP-11 COBOL, Version 4.0
DATATRIEVE-11, Version 1.1
DECAL, Version 2.0
DECnet/E, Version 1.0 or 1.1
FORTRAN IV/RSTS/E, Version 2.1
RPG II for RMS-11K File Systems, Version 8
RSTS/E-2780, Version 3.0
RSTS/E 3271 Protocol Emulator, Version 2.0
RSTS/E High Performance 2780/3780 Emulator, Version 1.0

Customer Supported Software Products:

APL-11, Version 1.0
DX/RSTS, Version 3.0 or 3.1
RSTS/E FORTRAN IV-PLUS, Version 2.5
NTR/CTS-500, Version 1.0 (DIGITAL Supported in Europe only)

NOTE: See the SPD for each product for hardware required to support each product.

TRAINING CREDITS:

THREE (3) — 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:

DIGITAL SUPPORTED

RSTS/E is a DIGITAL Supported Software Product.

SOFTWARE INSTALLATION:

DIGITAL INSTALLED

DIGITAL installation is required for Software Product Support. There is no charge for installation if performed at the time of system installation. DIGITAL installed software products, except for operating systems, are subject to an add-on installation fee when purchased subsequent to system installation.

SOFTWARE PRODUCT SUPPORT:

RSTS/E includes standard services as defined in the Software Support Categories Addendum of this SPD.

ORDERING INFORMATION:

Options with no support services are only available after the purchase of one supported license.

A single-use license only option is a license to copy the software previously obtained under license.

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

The following key (D, E, F, H, M, Q, R, T, V, Z) represents the distribution media for the product and must be specified at the end of the order number, e.g., QR430-AD = binaries on 9-track 800 BPI Magtape (NRZI).

D = 9-track 800 BPI Magtape (NRZI)
E = RK05 Disk Cartridge
F = 7-track Magtape
H = RL02 Disk Cartridge
M = 9-track 1600 BPI Magtape (PE)
Q = RL01 Disk Cartridge
R = Microfiche
T = RK06 Disk Cartridge
V = RK07 Disk Cartridge
Z = No hardware dependency

QR430 -A— Single-use license, binaries, documentation, support services (media: D, E, H, M, Q, T, V)

QR430 -C— Single-use license, binaries, documentation, no support services (media: D, E, H, M, Q, T, V)

QR430 -D— Single-use license only, no binaries, no documentation, no support services (media: Z)

Source/Listing Options

QR431 -F— Run-time systems and utilities listings (media: R)

QR432 -F— Monitor, INIT, and SYSGEN listings (media: R)

QR433 -F— BASIC-PLUS utilities listing (media: R)

QR438 -E— RSTS/E Monitor, run-time systems and utilities sources (media: M)

QR438 -F— RSTS/E Monitor, run-time systems and utilities listings (media: R)

Update Options

Users of RSTS/E whose specified Support Category warranty has expired may order under license the following software update at the then current charge for such update. The update is distributed in binary form on the appropriate medium and includes no installation or other services unless specifically stated.

QR430 -H— Binaries, documentation (media: D, E, F, H, M, Q, T, V)

QR430 -H— Right to copy for single-use (under existing license), no binaries, no documentation, no support services (media: Z)

Users of RSTS/E whose specified Support Category warranty has not expired may order under license the following software update for the then current media charge. The update is distributed in binary form on the appropriate medium and includes no installation or other services unless specifically stated.

QR430 -W— Binaries, documentation (media: D, E, F, H, M, Q, T, V)

Source/Listing Update Options

The following options are available to licensed users as updates to source/listing options. The update is distributed in source form on the appropriate medium and includes no installation or other services unless specifically stated.

QR438 -N— RSTS/E Monitor, run-time systems and utilities sources (media: M))

QR438 -N— RSTS/E Monitor, run-time systems and utilities listings (media: R)

Miscellaneous Options

QR430 -G— Complete documentation kit (media: Z)

QR431 -G— Advanced Programmer's Documentation kit (media: Z)

QR432 -G— System Manager's Documentation kit (media: Z)

QR433 -G— System User's Documentation kit (media: Z)

ADDITIONAL SERVICES:

The following additional services are available:

- Binary Program Update Service
- Basic Service for Software
- DECsupport

The following options are available to customers who have purchased one of the above services and to in-warranty customers only:

QR430 -1— Additional Dispatch Subscription (media: Z)

QR436 -3— RSTS/E Autopatch option (media: D, E, F, H, M, Q, T, V)