Software Product Description

PRODUCT NAME: ULTRIX-11™ Operating System, Version 2.0 **SPD 16.51.02**
(Formerly V7M-11)

DESCRIPTION

ULTRIX-11 is a native UNIX™ operating system for DIGITAL's PDP-11 family. The ULTRIX-11 Operating System is an improved release of V7M-11, Version 1.0, which was derived from the UNIX Time-Sharing System, Seventh Edition (V7) developed by AT&T Bell Laboratories.**

The ULTRIX-11 Operating System is an integral part of the ULTRIX family of UNIX operating systems currently running on both the 16-bit, PDP-11, and 32-bit, VAX-11, systems. This means a consistent migration path from the PDP-11 family to the VAX line of processors. The ULTRIX-11 Operating System is a general purpose, multiuser, interactive operating system supporting DIGITAL's memory managed PDP-11 processors and has drivers for most of DIGITAL's peripherals and most of the features found in UNIX V7. These include a hierarchical file system with demountable volumes, compatible device and interprocess I/O, asynchronous processes, a system command language selectable on a per-user basis, over 100 subsystems, and a high degree of portability among processors.

Along with the functionality of the UNIX Time-Sharing System, Seventh Edition (V7), DIGITAL has added the following significant features to the ULTRIX-11 Operating System:

- New hardware support including J11-based microprocessors
- Kernel Floating-Point Hardware Simulator
- New software features
  C shell and job control
  VI screen editor
  SCCS - Source Code Control System
- Performance enhancements
- Improved maintainability and reliability
- A wide range of support services for both hardware and software
- UNIX sublicensing for object code directly from DIGITAL
- Repackaged technical documentation
- Installation and configuration without source code

System Facilities

Maintainability

The ULTRIX-11 Operating System kernel provides improved fault tolerance. In addition, ULTRIX-11 Operating System supplies more complete error information when a fault does occur and all operating system and device error messages have been documented.

Error Logging

The ULTRIX-11 Operating System Error Logger collects information on system and device errors as they occur, and records this data in the error log file for later analysis. The ULTRIX-11 Operating System error logging system consists of the following components:

- The Error Log Initialization Program (ELI) performs housekeeping functions which include: saving the error log file, zeroing the error log file, enabling and disabling error logging, and printing the size of the error log files.
- The ULTRIX-11 Operating System kernel and device drivers have been modified to gather error information and save it in the kernel error log buffer.
- The Error Log Copy Process (ELC) is a background process that copies error log records from the kernel buffer to the error log file.
- The Error Log Print Program (ELP) formats the error log data and generates error reports.

Disk Bad Block Replacement

The ULTRIX-11 Operating System implements a bad block replacement strategy for RK06/7, RM02/3/5, and RP04/5/6 disks. The drivers for these disks have been modified to read the bad block file and automatically replace any bad blocks. This bad block replacement is transparent to the operating system and the users. The ULTRIX-11 Operating System and bad blocking includes three standalone programs: Bad Blocks Scan, (BADS), Disk Initialization (DSKINIT), and MSCP Disk Initialization and Bad Block Scan (RABADS). The

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** Refer to the "7th edition UNIX Summary" 9/6/78, Bell Laboratories, Murray Hill, New Jersey, for a more detailed description of the Seventh Edition UNIX system.

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digital software

RABADS program is used, in conjunction with the disk hardware, to replace bad blocks on MSCP type disks (RD51, RD52, RA60, RA80, RA81, RC25). It also includes a Bad Block Status Command (BADSTAT), which monitors and displays the number of replacements performed on each bad blockon RK06/7, RM02/3/5, and RP04/5/6 disks. This command allows the system manager to assess the effect of bad block replacements on system performance.

Automated System Installation and Initial Setup

The ULTRIX-11 Operating System software installation is automated by two interactive programs: system disk load (SDLOAD) and initial setup (SETUP). The user answers a few questions about the system configuration, then the auto-install programs take over and install the ULTRIX-11 Operating system software.

Automated System Generation

An interactive program called SYSGEN automates system generation. By asking a series of questions, SYSGEN allows the user to configure the system, create a configuration file, and install the kernel. SYSGEN includes on-line help to guide the user through the entire system generation process.

System Tuning

In the ULTRIX-11 Operating System, values for parameters that define kernel internal data structures, such as the process and inode tables, can be changed during system generation without recompiling any source code modules.

Processor and Peripheral Device Support

The ULTRIX-11 Operating System supports a wide range of processors and peripheral devices. (Refer to Tables 1 and 2 for a list of supported devices.) It also features the new DIGITAL Storage Architecture (DSA) disks, which use the Mass Storage Control Protocol (MSCP), and which are compatible with any other disk conforming to MSCP specifications.

VI Editor

The ULTRIX-11 Operating System includes Version 3.7 of the University of California at Berkeley full screen editor (VI) for program development and document preparation minus LISP code support.

Terminal Enabling Editor (TED)

The TED command front ends the requirement that the user edit a file to enable/disable terminals and set terminal characteristics, such as speed. This allows the user to control terminals interactively. The introduction of TED will further simplify the ULTRIX-11 Operating System installation procedure, because the user is not required to learn how to use a text editor before enabling terminals.

Overlay Kernel for Processors Without Separate I and D Space

In processors that lack separate Instruction and Data space (I and D space), the kernel is limited to a total of 48K bytes of address space. The ULTRIX-11 Operating System avoids the 48K byte constraint by using a text overlay kernel with mapped buffers.

Overlay User Processes

The ULTRIX-11 Operating System employs a user overlay mechanism similar to the overlay kernel, which allows large user programs such as VI, F77, AWK, YACC, PPC, LINT and LEX to run on processors without separate I and D space. The user overlay scheme can also be applied to user-generated programs, providing that the program is modular in design, and that guidelines set forth in the *ULTRIX-11 Operating System Management Guide* are followed.

System Performance Improvements

The RL02, RD51, and RD52 disks have been partitioned in order to decrease seek time to the swap area. Queue sorting and overlapped seeks have been added to the RL02 disk driver. On systems with a minimum of 512KB of memory, an increase in overall system performance is achieved by the use of an improved disk I/O buffer caching scheme and mapped buffers. These features are based on the Berkeley 2.9 BSD system.

Kernel Floating-Point Hardware Simulator

The ULTRIX-11 Operating System kernel contains a floating point hardware simulator for processors without physical floating point hardware. This eliminates the requirement for floating point hardware. This simulator provides increased floating point instruction execution speed, when compared to the old user level floating point simulator library. For applications involving intensive floating point calculations, the floating point hardware is strongly recommended.

UNIBUS Map Allocation

The ULTRIX-11 Operating System employs a UNIBUS map algorithm which allows four devices to use the map concurrently. This scheme increases both the amount of UNIBUS device I/O overlap system and I/O throughput.

TTY Control Characters

The ULTRIX-11 Operating System STTY command lets the user set the terminal control characters. This facilitates "erase" and "kill" processing for video terminals. The ULTRIX-11 Operating System supports the standard V7 TTY driver and the new Berkeley 2.9 BSD TTY driver used with Job Control.

Special Files

The ULTRIX-11 Operating System provides the Create Special File CSF command. CSF permits all special files needed to access a device to be created with a single command.

File System Table

The ULTRIX-11 Operating System includes a file system table (/etc/fstab), which contains the names of the system and user file systems and the names of the directories where they are to be mounted. All system commands requiring file system names as input have been modified to use the names in the file system table as their default file system names.

ULTRIX-11 System Acceptance Test

ULTRIX-11 System Acceptance Test (USAT) enables the user to verify the installation and that all major sub-systems are functioning properly.

User-Mode System Exerciser Package

The User-Mode System Exerciser Package (USEP) is a collection of user mode programs which use the ULTRIX-11 Operating System, to exercise hardware. There are USEP programs for the processor, memory, floating point, disks, mag tapes, communications interfaces, and the line printer.

Crash Dump Analyzer

The Crash Dump Analysis program (CDA) provides information about system crashes in a dump analysis report. The CDA report includes a memory usage map and information on unlogged errors, hardware traps (panic traps), active processes, I/O buffer cache usage and many of the operating system's internal data structures.

System Management Commands

The ULTRIX-11 Operating System includes several commands designed to aid system monitoring and file system maintenance. The IPATCH command dumps and/or modifies an inode. IOSTAT, which reports disk and CPU usage, is now improved. A new command, BUFSTAT, has been added to display the status of the I/O buffer cache. The MEMSTAT command, also new, prints a map of all the memory usage on the system.

SYSTEM V Commands

The following commands have been ported from the AT&T UNIX SYSTEM V release to the ULTRIX-11 software:

cpio	- copy file archives
cut	- cut selected fields from a file
dcopy	- copy file system for optimal access
ed	- text editor
paste	- merge same lines of several files
labelit	- label file system volumes
volcopy	- copy file system with label checking

SCCS - Source Code Control System

The SYSTEM III Source Code Control System plus the 4.2 BSD SCCS interface program have been implemented on the ULTRIX-11 operating system.

C-Shell With Job Control

The ULTRIX-11 Operating System implements C-Shell with Job Control.

Crypt Command

All forms of encryption and decryption have been removed from ULTRIX-11, with the exception of the one-way password encryption algorithm.

Plot Library

The UNIX V7 plot library has been modified to support the VT240 and VT241 in 4014 emulation mode.

Addition of User-Written Device Drivers

The ULTRIX-11 Operating System contains four prototype device drivers which provide four additional user-written drivers. The prototype device drivers contain all the functions and definitions required to interface to the operating system.

Nonsupported Software

Some features and programs from UNIX V7, though included in the ULTRIX-11 Operating System, are not supported. The following features/programs are provided "AS IS," and are not covered by any warranty, either express or implied:

BAS - BASIC INTERPRETER
C/A/T - PHOTOTYPESETTER INTERFACE
TROFF AND ASSOCIATED MACRO PACKAGE
CU - CALL UNIX COMMAND (ORIGINAL V7 VERSION)
FACTOR - FACTOR A NUMBER
M4 - MACRO PROCESSOR
PRIMES - GENERATE LARGE PRIMES
RATFOR - RATIONAL FORTRAN INTERPRETER
PKOPEN(3) - PACKET DRIVER SIMULATOR
M11, L11, MACXRF - MACRO-11 ASSEMBLER, LINKER, CROSS REFERENCE
DN11 DRIVER
DU11 DRIVER
RS03/4 DRIVER
VERSATEC PRINTER-PLOTTER SOFTWARE
ALL GAMES
ON-LINE MANUALS (/USR/MAN)
MULTI-VOLUME FILE SYSTEMS
UNIX DOCUMENTS (/USR/DOC)

Note: The UNIX on-line documents are not supplied with the RX50 distribution. The on-line documentation is available upon request.

UNIX V7 Features Not Included

PACKET DRIVER
MULTIPLEXED FILES
DC11 DRIVER
TC11 DRIVER
RF11 DRIVER

Intersystem Facilities

UUCP Interfaces

The interfaces function as a series of programs designed to permit communication among ULTRIX family systems (or any other UNIX-based UUCP systems using the "G" protocol). Files can be transferred, and remote commands can be executed via dial-up or hard-wired communication lines. These files are created in a spool directory for processing by the UUCP daemons (background processes) and executed in batch mode.

TIP

The TIP utility establishes a full-duplex connection to another processor. TIP provides virtual terminal access to the remote machine and file transfer between systems. This utility supersedes the "Call UNIX (CU)" command, but retains a user interface similar to CU.

Mail

Mail allows users to transmit text and data files. In addition to electronic transmission, the mail facility permits the defining of aliases, and message forwarding instructions. The system also provides notification of new mail.

Tar

Tar allows for individual files or selected directory subtrees to be saved and restored on tape or RX50 diskette. Tar can also save/restore empty directories and special files.

Compatibility

Compatibility with the ULTRIX-32 Operating System

All ULTRIX-11 source programs written in the C language that contain no architectural dependencies are compatible. Bourne shell scripts are syntax-compatible.

Compatibility with UNIX V7 System

The ULTRIX-11 Operating System includes the features of UNIX V7 such as:

- A shell (Bourne) command language interpreter which combines shell instructions to perform complex operations and may be used in place of C programs.
- Control flow primitives, parameter passing variables and string passing
- Pipes, which are interprocess data channels that redirect the output of one process to the input of another process
- A tree structured directory system
- The V7 C compiler developed at Bell Laboratories
- Standard UNIX mail system
- UUCP
- Assembler
- FORTRAN-77
- Line editor
- More than 100 utility programs.

New Hardware Support

J11 MicroProcessor

The J11 microprocessor contains the functionality of a PDP 11/70 on a chip. It allows the provision of split I and D space on the micro-processor.

RA60 Disk Drive and UDA50 Driver

The RA60 is a 205 megabyte removable media Winchester disk drive. The RA60 is a DSA disk used with the UDA50 controller and MSCP.

RC25 Disk Subsystem

The RC25 is a combination fixed/removable Winchester disk drive. The RC25 disk controller uses the UQPORT implementation of MSCP.

Second RD51 on Micro/PDP-11

An externally mounted second RD51 Winchester disk drive may be installed as an option to the basic Micro/PDP-11 system and is supported by the ULTRIX-11 Operating System.

RD52 Winchester Disk

The RD52 is a 30 megabyte version of the RD51.

TU80 1600 BPI Streaming Magtape

The TU80 is a TS11 compatible 1600 BPI streaming magtape drive. It is supported in start/stop mode only.

TK25 Streaming Cartridge Tape

The TK25 is a TS11 compatible quarter inch streaming cartridge tape subsystem. The TK25 is intended to be used as a standalone backup device for the RD52 disk. It is supported in start/stop mode only.

DHU11/DHV11 Communications Interfaces

These devices are new single module communications interfaces. The DHU11 is a 16 line UNIBUS interface and the DHV11 is an 8 line QBUS interface. The DMA mode is supported.

DZQ11 Communications Interface

The DZQ11 is a direct replacement for the DZV11 four line QBUS communications interface. The advantages of the DZQ11 are reduced cost and the DZQ11 is a dual height module instead of the quad height DZV11.

RUX50 5" Floppy Diskette Interface for UNIBUS

The RUX50 allows reading/writing of 5" floppy diskettes on UNIBUS systems for compatibility with Micro/PDP-11 and Professional 350s. The ULTRIX-11 Operating System supports RUX50 in RQDX1 compatibility mode only, eg., reads/writes diskettes in interleave mode only.

MINIMUM HARDWARE REQUIRED

A ULTRIX-11 Operating System configuration must include:

- Any memory managed PDP-11 CPU listed on Table 1 or 2, with a line clock
- A console terminal
- 256Kb of memory
- A fully supported disk drive from Table 1 or 2 (RL01 requires 2 drives)
- A peripheral device capable of reading one of the distribution media for the product

Load Media & System Disk Configurations

The following chart shows which system disk configurations are supported by each load media:

Load Media	Supported System Disks
RX50	RD51 RD52

RL02	RL02
RC25	RC25 (fixed)
TAPE (9-track)	RL01 RL02 RX25 (fixed) RK06 RK07 RP02 RP03 RP04 RP05 RP06 RM02 RM03 RM05 RA60 RA80 RA81

General Disk Drivers

The ULTRIX-11 Operating System has two general disk drivers. The HP driver supports up to three MASSBUS disk controllers. The RA disk driver supports up to three MSCP (Mass Storage Control Protocol) disk controllers. The general disk drivers allow support of multiple controllers without the overhead of multiple disk drivers in the operating system.

The MASSBUS controllers are:

- RH11 with up to 8 drives (RM02, RP04, RP05, RP06, ML11)
- RH70 with up to 8 drives (RM02, RM03, RM05, RP04, RP05, RP06, ML11)

The MSCP controllers are:

- UDA50 with up to 4 drives (RA60, RA80, RA81)
- KLESI with up to 2 RC25 units (2 drives per RC25 unit)
- RQDX1 with up to 4 drives (RX50, RD51, RD52)
- RUX1 with up to 4 drives (RX50)

NOTE: The general MSCP disk driver supports three controllers, but only one of each type is allowed, that is, only one UDA50, KLESI, RQDX1, RUX1.

OPTIONAL HARDWARE

The following table lists processors and peripherals and the degree to which they are supported by the ULTRIX-11 Operating System. The processors are divided into two groups: those with separate I and D space, and those without separate I and D space. This division reflects the two versions of the ULTRIX-11 kernel: the separate I and D space kernel for the larger processors (Table 1), and the overlay kernel used with the smaller processors (Table 2).

TABLE 1 - Hardware Support on Separate I & D Processors

Processor		**11/44**	**11/45**	**11/55**	**11/70**	**11/73 *11**
Memory	*1	256KB	256KB	256KB	256KB	256KB
Clocks:						
KW11-L	*2	F	F	F	F	F *10
KW11-P		F	F	F	F	N
Floating Point	*15	FP11F	FP11B FP11C	FP11B FP11C	FP11C FP11B	*16
Console Terminal		*3	*3	*3	*3	*3
Disk Drives:						
RK05		S	S	S	S	N
RL01/2	*13	F	F	F	F	F
RX50		S	S	S	S	S
RD51/RD52		N	N	N	N	F
RC25		F	F	F	F	F
RK06/7		F	F	F	F	N
RM02		F	F	F	F*4	N
RM03/5		N	N	N	F	N
RP02/3		F	F	F	F*4	N
RP04/5/6		F	F	F	F	N
RA60		F	F	F	F	N
RA80/RA81		F	F	F	F	N
RX02	*12	S	S	S	S	S
ML11		S	S	S	S	N
RS03/4		O	O	O	O	N

TABLE 1 - Hardware Support on Separate I & D Processors (continued)

Processor		11/44	11/45	11/55	11/70	11/73 *11
Tape Drives:						
TM11-TS03		S	S	S	S*4	N
TM11-TU10/TE10		F	F	F	F*4	N
TS11	*5	F	F	F	F	N
TU80	*5	F	F	F	F	N
TSV05	*5	N	N	N	N	F
TK25	*5	N	N	N	N	S
TM02/3-TU77		F	F	F	F	N
TM02/3-TU16/TE16		F	F	F	F	N
TC11-TU56		N	N	N	N	N
Line Printers:						
LP11	*14	F	F	F	F	N
Printer port	*17	F	F	F	F	F
Comm. Devices						
DL11	*6	F	F	F	F	F
DZ11		F	F	F	F	N
DZV11/DZQ11		N	N	N	N	F
DH11		F	F	F	F	N
DM11-BB	*7	F	F	F	F	N
DHV11		N	N	N	N	F
DHU11		F	F	F	F	N
DN11		O	O	O	O	N
DU11		O	O	O	O	N

TABLE 2 - Hardware Support on Non-separate I & D processors

Processor		M11 *8	11/23+ *9	11/24	11/34	11/40	11/60
Memory	*1	256KB	256KB	256KB	256KB	256KB	256KB
Clocks:							
KW11-L	2	*10	*10	F	F	F	F
KW11-P		N	N	F	F	F	F
Floating Point	*15	KEF11 FPF11	KEF11 FPF11	KEF11 FPF11	FP11A	NONE	FP11E
Console Terminal		*3	*3	*3	*3	*3	*3
Disk Drives:							
RK05		N	N	S	S	S	S
RL01/2	*13	F	F	F	F	F	F
RX50		S	S	S	S	S	S
RD51/RD52		F	F	N	N	N	N
RC25		F	F	F	F	F	F
RK06/7		N	N	F	F	F	F
RM02		N	N	F	F	F	F
RM03/5		N	N	N	N	N	N
RP02/3		N	N	F	F	F	F
RP04/5/6		N	N	F	F	F	F
RA60		N	N	F	F	F	F
RA80/RA81		N	N	F	F	F	F
RX02	*12	S	S	S	S	S	S
ML11		N	N	S	S	S	S
RS03/4		N	N	O	O	O	O

TABLE 2 - Hardware Support on Non-separate I & D processors (continued)

Processor		M11 *8	11/23+ *9	11/24	11/34	11/40	11/60
Tape Drives:							
TM11-TS03		N	N	S	S	S	S
TM11-TU10/TE10		N	N	F	F	F	F
TS11	*5	N	N	F	F	F	F
TU80	*5	N	N	F	F	F	F
TSV05	*5	F	F	N	N	N	N
TK25	*5	S	S	N	N	N	N
TM02/3-TU77		N	N	F	F	F	F
TM02/3-TU16/TE16		N	N	F	F	F	F
TC11-TU56		N	N	N	N	N	N
Line Printers:							
LP11	*14	N	N	F	F	F	F
Printer port	*17	F	F	F	F	F	F
Comm. Devices							
DL11	*6	F	F	F	F	F	F
DZ11		N	N	F	F	F	F
DZV11/DZQ11		F	F	N	N	N	N
DH11		N	N	F	F	F	F
DM11-BB	*7	N	N	F	F	F	F
DHV11		F	F	N	N	N	N
DHU11		N	N	F	F	F	F
DN11		N	N	O	O	O	O
DU11		N	N	O	O	O	O

Key:

F - Fully supported device. When pertaining to disks, indicates that the disk can be the system disk. Regarding magtapes, it can be the distribution load device.

S - Supported as a user device only. When pertaining to disks, it indicates that the disk cannot be the system disk, but can be used for user file storage. Regarding magtapes, it cannot be the distribution load device because this device cannot handle full size reels.

O - Obsolete device. A driver is provided, but the device is not supported. Use of these devices is not recommended. No warranty, no SPR accepted.

N - Not supported.

Notes:

1. The ULTRIX-11 Operating System will operate with a minimum of 192KB of memory; however, 256Kb is the practical minimum memory size. Some large programs, like VI and F77, may notrun on 192KB systems. The ULTRIX-11 Operating System supports up to 3.75MB (4MB - I/O page) of main memory. A minimum of 512Kb of memory is required to take full advantage of themapped buffer feature (system performance improvement).
2. The DL11-W includes a KW11-L clock.
3. Most terminals can be used as the system console, but aterminal that can produce hard copy output is recommended. Upper case only terminals cannot be used as the console terminal. If the LA120 is used as the system console, the auto disconnect feature should be disabled.
4. These devices are not normally configured on the PDP-11/70.
5. Only a single TS11/TU80/TSV05/TK25 tape drive is supported.
6. DL11 includes all versions of the DL11 used as single lineunits. Also includes the DLV11 on Q bus processors. Alsoincludes the second single line unit supplied with the Micro/PDP-11, PDP-11/23, PDP-11/23-PLUS, PDP-11/24, and PDP-11/44.
7. Modem control option for the DH11.
8. M11 is short for the KDF11-B version of the Micro/PDP-11. This is a PDP-11/23-PLUS processor.

9. This column applies to the PDP-11/23 as well as the PDP-11/23-PLUS.
10. The system must have a 60 Hz clock that can be enabled/disabled via bit six of the CLOCK CSR at address 777546. The Micro/PDP-11 and PDP-11/73 processors include the 60 Hz clock.
11. PDP-11/73 refers to the KDJ11-A microprocessor module and Micro/PDP-11/73 system (KDJ11-B), used in Q-bus systmes. If the KDJ11-A is used to replace a PDP-11/23-PLUS, such as Micro/PDP-11, a multifunction module containing a bootstrap must also be added. A single line unit for the system console must also be provided. The MXV11-BF multifunction module may be used, but it is not recommended because its on board memory is non-parity memory.
12. One dual RX02 drive supported, 18 bit addressing only. On Q22bus processors, the RX02 can only be accessed via the ULTRIX-11 buffered I/O mechanism. The physical (RAW) I/O system cannot be used to access the RX02.
13. For RL01, two drives are required; for RL02, two drives are recommended.
14. The LP11 line printer driver supports only a single unit.
15. The ULTRIX-11 Operating System kernel floating point simulatorallows programs that execute floating point instructions torun on processors without floating point hardware. However, floating point hardware is highly recommended for intensivefloating point applications and/or where performance is a factor.
16. The PDP-11/73 (KDJ11-A) includes the floating point instructionset in the microcode, do not use the KEF11 or FPF11.
17. Printer port refers to a printer, such as the LA120, LA100, or LA50 connected to a port on one of the supported communications devices.

PREREQUISITE SOFTWARE

None

OPTIONAL SOFTWARE

None

SOFTWARE WARRANTY

Warranty for this software product is provided by DIGITAL with the purchase of a license for the product. There is no additional charge. This software product is warranted to conform to the Software Product Description (SPD). This means that DIGITAL will remedy any nonconformance when it is reported to DIGITAL by the customer during the warranty period.

The warranty period is ninety (90) days. It begins when the software is installed or thirty (30) days after delivery to the end user, whichever occurs first and expires ninety (90) days later. All warranty related support for this software will end 180 days after release of the subsequent version.

Warranty is provided in the country of purchase. DIGITAL will provide a service location which will accept reporting (in a format prescribed by DIGITAL) of a nonconformance problem caused when using the licensed software under normal conditions as defined by the SPD. DIGITAL will remedy a nonconformance problem in the current unaltered release of the licensed software by issuing correction information such as: correction documentation, corrected code, or notice of availability of corrected code; or a restriction or a bypass. The customer will be responsible for the preparation and submission of the problem report to the service location.

Warranty Exclusion

DIGITAL DOES NOT WARRANT THAT THE SOFTWARE LICENSED TO CUSTOMER SHALL BE ERROR FREE, THAT THE SOFTWARE SHALL OPERATE WITH ANY HARDWARE AND SOFTWARE OTHER THAN AS SPECIFIED IN THIS SPD, THAT THE SOFTWARE SHALL SATISFY CUSTOMER'S OWN SPECIFIC REQUIREMENTS, OR THAT COPIES OF THE SOFTWARE OTHER THAN THOSE PROVIDED OR AUTHORIZED BY DIGITAL SHALL CONFORM TO THE SPD.

DIGITAL MAKES NO WARRANTIES WITH RESPECT TO THE FITNESS AND OPERABILITY OF MODIFICATIONS NOT MADE BY DIGITAL.

IF THE SOFTWARE FAILS TO FUNCTION FOR REASONS STATED ABOVE, THE CUSTOMER'S WARRANTY WILL BE INVALIDATED AND ALL SERVICE CALLS WILL BE BILLABLE AT THE PREVAILING PER CALL RATES.

INSTALLATION

This software product can be installed by the customer using the step-by-step documentation available for this product. Optionally you can purchase DIGITAL Installation Services which provide for the installation of the software product by an experienced DIGITAL Software Specialist.

ORDERING INFORMATION

Single-Use licensed software 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 DIGITAL's copyright notice and any proprietary notices on the software) for use on such CPU.

You will need a separate license for each CPU on which you will be using the software product (except as otherwise specified by DIGITAL). Then you will select the

Materials and Service Options you need to utilize the product effectively. **IF YOU ARE ALREADY FAMILIAR WITH THESE OPTIONS, YOU MAY OBTAIN THE ORDERING INFORMATION DIRECTLY FROM THE SOFTWARE OPTIONS CHART.** In most cases, you will want to review the following descriptions to determine what options you require.

A separate customer agreement must be executed between purchaser and DIGITAL to purchase a license for this software product. By signing the agreement, you agree that the CPU will not be used to support more interactive terminals than the number specified.

LEGAL RECOGNITION

In accordance with the licenses granted to DIGITAL by AT&T and the University of California at Berkeley pertaining to the software described herein, the following should be understood by LICENSEE, and any related documentation provided by LICENSEE to third parties, whether pursuant to an agreement with DIGITAL permitting sublicensing of the software described herein or otherwise, must contain the provisions of this section as set forth below:

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Tip	csh	/etc/termcap
diff	tail	/etc/printcap
hostname	stty	/etc/gettytab
chfn	chsh	/etc/fstab
ctags	finger	Kernel and user overlay schemes
from	macxrel	vi (screen editor, Version 3.7)
l11	mll	buffer mapping scheme
mkstr	renice	job control & signal facilities
script	strings	SCCS Interface Program
which	whoami	/usr/lib/libcurses.a
xstr	Mail	/usr/lib/libtermlib.a
ex	su	/usr/lib/ex3.7preserve
tset	getty	/usr/lib/ex3.7recover
lpr	lpq	/usr/lib/libjobs.a
lpd	lprestart	/usr/lib/Mail.help
ulf	lprm	/usr/lib/Mail.help.2
ul	more	/usr/lib/Mail.rc

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LICENSE OPTIONS

Single-Use License Option

The Single-Use License is your right to use the software product on a single CPU and it includes your 90 day warranty.

For your first installation of this software product you must purchase as a **minimum:**

- Single-Use License Option, and
- Distribution and Documentation Option

The license gives you the right to use the software on a single CPU and the Distribution and Documentation Option provides the machine-readable software and related documentation.

To use this software product on additional CPUs, you must purchase for each CPU as a **minimum:**

- Single-Use License Option

In addition to the right to use, the license gives you the one-time right to copy the software from your original CPU installation to the additional CPU. Therefore, the Distribution and Documentation Option is not required, but optional.

MATERIALS AND SERVICE OPTIONS

Distribution and Documentation Option

The Distribution and Documentation option provides the machine-readable software in binary form and the basic documentation. You must have, or order, a Single-Use License to obtain this option. You will need this option to install the software for the first time. When revised versions of this software product become available, they may also be obtained by purchasing this option again.

If you prefer to receive automatic distribution of revised versions for this product, you must purchase a Software Product Service Agreement.

Software Revision Right-To-Copy Option

The Right-To-Copy Option allows a customer with

multiple CPUs to copy a revised version of a software product from one CPU to another. Each CPU must be licensed for that product. You first install the revised software on one CPU; then you can make copies for additional CPUs by purchasing the Right-To-Copy Option for each additional CPU.

If you prefer to automatically obtain the right-to-copy, you must purchase a Service Right-to-Copy for each additional CPU; this is a service added to a Software Product Service Agreement.

Documentation-Only Option

You can obtain one copy of the basic documentation by purchasing the Documentation-Only Option.

Software Product Service Agreements

DIGITAL offers licensed customers annual Software Product Service Agreements to maintain their software:

DECsupport Service is the most comprehensive level of service offering critical problem on-site assistance and scheduled preventative maintenance. You receive telephone support that gives you timely answers and solves most software problems. In addition, you get revised versions of the software and documentation, and system newsletters or dispatches.

BASIC Service is ideal for customers who have a staff who's experience and expertise enables them to analyze and communicate a software problem to DIGITAL remote support centers. You receive telephone support that gives you timely answers and solves most software problems. In addition, you get revised versions of the software and documentation, and system newsletters or dispatches.

Self-Maintenance Service is designed for customers who require revised versions of the software and documentation from DIGITAL. In addition, you get system newsletters or dispatches and may submit software performance questions.

A variety of service options may be added to an existing Software Product Service Agreement, such as service for multiple-like systems. Contact your DIGITAL representative for additional information and ordering details.

For more information on what is included in these agreements, please obtain the appropriate Service Description from your local DIGITAL office.

Training From Educational Services

To ensure customer success with DIGITAL products, Educational Services sells training for the installation, maintenance and/or management of DIGITAL software. Course formats vary from seminars to packaged training materials that include self-paced instruction and computer-based instruction to traditional lecture/-labs at DIGITAL's worldwide Training Centers.

For a complete listing of course schedules and prices, refer to the *DIGEST*, Educational Services' quarterly publication. For curriculum-specific information, training recommendations and assistance in planning training programs, please contact your Educational Services Representative.

Professional Software Services

DIGITAL Software Specialists are available on a per-call or resident contract basis to help in all phases of software development or implementation. Specialists are available to serve as technical consultants, decision support consultants or business systems analysts. Resources are available to:

- Supplement your programming staff
- Assume project management responsibility
- Develop software
- Augment a system start-up service package with tailored services to meet specific needs

Contact your DIGITAL representative for additional information and ordering details.

SOFTWARE OPTIONS CHART

The distribution Media Codes used in the Software Options Chart are described below. You specify the desired Media Code at the end of the Order Number, e.g., QJ085-H3 = binaries on RX50 Floppy Diskette.

3 = RX50 Floppy Diskette
4 = RC25 Disk Cartridge
D = 9-track 800 BPI Magtape (NRZI)
H = RL02 Disk Cartridge
M = 9-track 1600 BPI Magtape (PE)
Z = No hardware dependency

NOTE: The availability of these software product options and services may vary by country. Customers should contact their local DIGITAL office for information on availability.

OPTIONS **System Capacity***	**UP TO 16-USER Micro/PDP-11**	**UP TO 16-USER PDP-11**	**UP TO 32-USER PDP-11**
LICENSE OPTIONS: A LICENSE IS REQUIRED FOR EACH CPU.			
Single-Use License	QJ085-UZ	QJ087-UZ	QJ088-UZ
MATERIALS AND SERVICE OPTIONS:			
Distribution and Documentation Option	QJ085-H3	QJ087-H4 QJ087-HD QJ087-HH QJ087-HM	QJ088-HD QJ088-HM
Software Revision Right-To-Copy Option	QJ085-HZ	QJ087-HZ	QJ088-HZ
Documentation Only Option	QJ085-GZ	QJ087-GZ	QJ088-GZ
SOFTWARE PRODUCT SERVICE AGREEMENTS:			
DECsupport Service	QJ085-93	QJ087-94 QJ087-9D QJ087-9H QJ087-9M	QJ088-9D QJ088-9M
Basic Service	QJ085-83	QJ087-84 QJ087-8D QJ087-8H QJ087-8M	QJ088-8D QJ088-8M
Self-Maintenance Service	QJ085-33	QJ087-34 QJ087-3D QJ087-3H QJ087-3M	QJ088-3D QJ088-3M

* The Option(s) you select must correspond to the number of interactive terminals specified on the Customer Agreement (Refer to the Ordering Information section).

The software options (Refer to the Software Options Chart) are organized in three columns by system capacity, i.e.; Up to 16-users on the Micro/PDP-11, Up to 16-users on the PDP-11, and Up to 32-users on the PDP-11. This method of software options and ordering by number of users is a requirement of the AT&T UNIX licensing agreement with DIGITAL and AT&T. It is not intended to reflect system capacity.

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