Software Product Description

PRODUCT NAME: The ULTRIX Operating System, Version 4.5 **SPD 26.40.32**

Description

The ULTRIX Operating System, Version 4.5 is Digital Equipment Corporation's native implementation of the UNIX® Operating System for all currently supported VAX, MicroVAX, VAXstation, VAXserver and Digital RISC DECsystem and DECstation systems.

The ULTRIX Operating System is an interactive, demand-paged, virtual memory, multiple processor, time-sharing operating system that has a hierarchical file system with dismountable volumes, compatible device and interprocess I/O, asynchronous processes, system command language selectable on a per-user basis, disk quotas, job quotas, over 200 subsystems, and a high degree of portability among processors running ULTRIX application programs.

In addition to the Berkeley 4BSD functionality, Digital has added the following enhancements to ULTRIX:

File System

The ULTRIX Operating System provides a file system hierarchy of named directories and sub-directories. With the ULTRIX Operating System, the Digital Generic File System Interface (GFSI) provides users with the ability to mount multiple local and remote file systems. The currently supported file system types include the local ULTRIX File System (UFS) and Sun® Microsystems' Network File System (NFS). NFS allows transparent file access over an Ethernet or CI network. POSIX-compatible file and record locking is supported by the NFS lock manager over an Ethernet or CI network. In addition, Sun MicroSystems' Yellow Pages service (YP) provides support for centralized system management of files over an Ethernet or CI network. The automounter service automatically mounts and unmounts NFS file systems.

ULTRIX supports synchronous file system writes on a per-file basis. In addition, an option to the ''mount'' command permits an entire file system to be designated as synchronous, in which case all writes issued to files in that file system are performed synchronously. These synchronous options provide deterministic file system operations and are useful in database applications. The file system buffer cache size is configurable.

ULTRIX provides an option to provide I/O performance enhancement improving both UFS (Local) and NFS.

Virtual Memory

The virtual memory subsystem is derived from 4.2BSD and has been enhanced with 4.3BSD performance enhancements and System V™ memory extensions. It provides full demand paging for both files resident on a local file system and files remotely resident and accessible via NFS. The backing store for paging/swapping can reside on a local disk partition or, in the case of diskless support, in an NFS remote system file. System V features include demand paged shared memory support and page locking.

The ULTRIX virtual memory programmer's interface provides full source level compliance to existing standards. New interfaces of SVID issue 3 are not currently supported.

Multiprocessor Support

The ULTRIX kernel has been enhanced to support multiple processors executing kernel code. Support has been added for both RISC and VAX multiprocessor systems. Semaphores and spin locks synchronize access to kernel data structures. Each processor shares a common kernel image of text and data. The commands startcpu and stopcpu control attached processors. The cpustat utility views various cpu statistics.

OPEN SCSI CAM

ULTRIX RISC includes OPEN SCSI CAM, a new software architecture for the SCSI hardware sub-systems in ULTRIX. This architecture uses Common Access Method (CAM), a standard defined software interface between device drivers and the host bus adapter by which SCSI peripherals are attached to a host processor. With this well architectured interface, system manufacturers, system integrators, controller manufacturers,

and other suppliers of intelligent peripheral are able to more easily write the necessary drivers and support code for other third party devices.

OPEN SCSI CAM is not available on VAX ULTRIX systems. ULTRIX RISC does not support the use of SCSI devices on DECsystem 5800 systems.

System Administration Enhancements

- Graphical User Account Manager
- Integral bad block replacement for DSA/MSCP and SCSI disks
- System diagnostics
- Error logging
- Streaming tape
- Remote backup
- Gateway Screen Facility
- Network installation for MicroVAX, VAXstation, and RISC-based systems
- Magnetic tape facilities including labeled tape facility for single-volume ANSI tape interchange between ULTRIX and non-ULTRIX systems
- Line printer setup automation
- Documented error messages
- Support for up to 256 simultaneous users, available through the use of user capacity upgrades
- Support for more than 64 file descriptors

Security Enhancements

The ULTRIX Operating System offers security features designed to be compliant with the C2 security level as specified by the *Trusted Computing Security Evaluation Criteria* (Orange Book) and the *Password Management Guidelines* (Green Book).

- Protection of the memory interface and terminals via pre-assigned group identifiers.
- Trusted Path facility which allows users, logging into a system via either LAT or a terminal multiplexer, to ensure that no other process is running on that line.
- Administrator option to configure enhanced login and password functionality, which includes a shadow authentication database, configurable minimum password length (up to 16 characters), password aging and expiration.
- Security auditing subsystem and audit trail reduction facility which tracks and records all the security relevant actions occurring on the system along with who performed the action. This includes an audstyle (audit) option to control how much information is included in audit records for execv (2) and execve (2) events.
- Gateway packet screening. An ULTRIX system may be used as a gateway (packet router) to connect several IP networks. The Gateway packet screening facility allows the system manager to control which packets are forwarded, as one part of a comprehensive network security policy. The facility consists of a kernel-resident mechanism and a user-level daemon, /usr/etc/screend. When a packet is ready to be forwarded, the kernel mechanism submits the packet's headers to the daemon. The screend daemon examines the headers and tells the kernel to forward or reject the packet, based on a set of rules defined in the configuration file, /etc/screend.conf. Optionally, some or all decisions can be logged allowing a manager to detect improper configurations or potential security problems.

For reasonable security and performance using screend, Gateway packet screening should be used on a system dedicated only to packet routing and related support activities.

- Kerberos Authentication. Kerberos is a third-party authentication service. The authentication of an application X to another application Y depends upon the trust both X and Y have in Kerberos. The BIND /HESIOD daemon named has been enhanced to optionally use Kerberos. ULTRIX also provides the Kerberos V4 programming interface so that application developers can use this service. ULTRIX does not provide the routines to send encrypted (safe) messages.
- Data Encryption/Decryption Facilities. The object code distribution for the ULTRIX Operating System includes no forms of encryption or decryption other than one-way password encryption and Kerberos encryption algorithm. Data encryption/decryption software is available as an option under a separate order number. Refer to the *SOFTWARE OPTIONS* section for ordering information.

ULTRIX includes a set of intersystem facilities for communication and networking of multiple systems.

- *Asynchronous Lines*

Dynamic reassignment of asynchronous lines allows use of the same modems for dialing in and out of a system without user intervention. Terminal drivers support 7-bit and 8-bit characters.

- *Synchronous Lines*

ULTRIX VAX supports communication over full- and half-duplex point-to-point DDCMP synchronous lines. DMC mode is provided for backwards compatibility. This feature is not available on ULTRIX RISC systems.

- *Ethernet Support*

Ethernet Support allows for Ethernet communication using the TCP/IP network protocols, ThinWire, baseband and, optionally, the Digital DNA network protocol, if either DECnet–ULTRIX or DECnet/OSI for ULTRIX is present (refer to SPDs 26.83.xx and 34.97.xx, respectively). All protocols can operate concurrently on a single physical Ethernet link.

- *CI Network Support*

CI Network Support allows for Computer Interconnect (CI) host to host communication using the network support TCP/IP network protocols. The CI network is well suited for Network File System (NFS®) traffic and can be used to offload the Ethernet of NFS traffic.

- *X.25 Driver Support*

X.25 Driver Support allows for X.25 wide area network device support.

ULTRIX VAX supports uucp and tip operations over an X.25 public packet switching network using a MICOM Micro 800/X.25 Concentrator PAD device attached to one of the supported asynchronous communications multiplexers. This feature is not available on ULTRIX RISC systems.

- *FDDI Support*

FDDI Support provides fiber optic support for the DECsystem and DECstation 5000 systems.

- *Name Services*

ULTRIX supports the BIND V4.8 and HESIOD name services. The BIND service provides a host name and address lookup service for the Internet network. HESIOD is layered on top of BIND and provides a more generic name service. The user can use HESIOD/BIND to replace or supplement the hosts, aliases, auth, group, networks, passwd, protocols, rpc, and services databases.

- *XTI*

XTI is a UNIX® version independent (BSD or System V) network application programming interface. Most networking applications are written to sockets since it is available on most UNIX® systems. Over time, this trend would shift to the System V interface. With XTI, customers can write to a standard interface which will use either streams or sockets.

- *The Packet Filter*

The packet filter is a software-driven network traffic monitor which provides demultiplexing of networking packet headers, as well as reception and transmission of packets containing user defined network protocols on an Ethernet LAN. The packet filter functions as an Ethernet Monitor and can be used to filter specific network protocols. The packet filter can also be used to send and receive packets using protocols not currently supported in the ULTRIX kernel.

- *SNMP*

Simple Network Management (SNMP) protocol manages TCP/IP networks. ULTRIX supports the SNMP Agent on both ULTRIX VAX and ULTRIX RISC systems.

- *IBM® 2780/3780 Terminal Emulator*

The IBM® 2780/3780 Terminal Emulator is an ULTRIX software package that allows the user's system to emulate a 2780 or 3780 IBM terminal. The 2780/3780 Terminal Emulator uses the Binary Synchronous Communications (BSC) protocol to send and receive files across a communication line connected to an IBM system that supports 2780/3780 devices.

The Digital devices that must be used on the VAX and MicroVAX based systems for the ULTRIX 2780/3780 Terminal Emulator are noted in the *OPTIONAL HARDWARE* section of this Software Product Description. This package is not available on ULTRIX RISC systems.

- *Local Area Transport Support*

The Local Area Transport (LAT) protocol supports communication with service nodes on the same Ethernet. Software that runs on local area terminal servers isdownloaded over the Ethernet network from either a Phase IV or Phase V loadhost or any valid ULTRIX load host. A single ULTRIX host may support up to 256 simultaneous LAT sessions.

The host-initiated connection feature of LAT allows the manager of an ULTRIX system to associate a named port on a named terminal server with a specific tty device special file. As a result, users can code applications that connect to the port through LAT.

The LAT/TELNET Gateway feature allows an ULTRIX system to be configured for users on a LAT terminal to connect to remote hosts via Telnet, without first having to log in to the local ULTRIX system.

- *Remote Procedure Call Facility*

The Digital Remote Procedure Call (DECrpc) facility is based on Apollo®'s Network Computing System (NCS®) Remote Procedure Call (RPC) facility. DECrpc allows application developers to partition their applications along subroutine interfaces, and have those subroutines execute on remote hosts. It provides a transport independent interface to applications using the Internet UDP/IP protocols. DECrpc includes the following set of components:

- Remote Procedure Call (RPC) runtime library
- Network Interface Definition Language (NIDL) compiler
- Local and Global Location Brokers

DECrpc does not include other components of Apollo's Network Computing Architecture such as the Concurrent Programming Support or the replicated Global Location Broker.

RPC Applications are written in a high-level language (NIDL) which in turn generates calls to the RPC runtime procedures. The stub files generated by the NIDL compiler are C source files.

DECrpc has been tested and found compatible with the NCS V1.5 product from Apollo.

- *Network Time Protocol*

ULTRIX provides users the ability to synchronize and distribute time for all machines in a network environment. The Network Time Protocol (NTP) is used to synchronize time. The University of Maryland developed the NTP daemon. The University of California at Berkeley time synchronization daemon, timed, is used to distribute time to all machines in a network.

Program Development Enhancements

ULTRIX provides a variety of tools for program development. These tools include R4000 MIPS-ANSI C 3.0, VAX C/ULTRIX, portable C compiler, Pascal compilers and Source Code Control System (SCCS). MIPS-ANSI C 3.0 is only available on VAX RISC systems. VAX C is only available on ULTRIX VAX systems. Pascal for RISC and FORTRAN for RISC are available as a layered product.

- *MIPS-ANSI C 3.0 Compiler*

ULTRIX RISC includes the MIPS-ANSI C 3.0 compiler and related development tools and libraries. This compiler is not available on ULTRIX VAX systems.

The MIPS-ANSI C 3.0 compiler supports a *-std0* K&R[1] mode with ANSI extensions, a *-std1* mode which provides strict ANSI adherence, and a *-std* (default) mode which is ANSI C with popular extensions.

The compiler also supports a *-mips1* mode which generates code executable on any supported MIPS RISC processor (R2000, R3000 or R4000 series), and a *-mips3* mode which generates code specific to and optimized for the MIPS R4000 series processors.

- *VAX C/ULTRIX*

VAX C/ULTRIX is a K&R[1] implementation of the C programming language for all ULTRIX VAX systems. VAX C/ULTRIX is not supported or available on ULTRIX RISC systems.

VAX C
/ULTRIX includes extensions as defined by the proposed ANSI Standard for C. Many compute-bound C applications compiled with VAX C/ULTRIX will run significantly faster than when compiled with the Portable C Compiler (pcc) on ULTRIX. VAX C/ULTRIX cannot be used for system level programs requiring the ASM pseudo function, or where undocumented or nonstandard C features of pcc are used. If necessary, an application can be linked using some object modules compiled with both VAX C/ULTRIX and pcc. VAX C/ULTRIX uses the native runtime and system libraries on ULTRIX. It also uses the native header files. It supports the pcc command line with the exception of the following options: -go,-p,-t,-R,-S,-B. VAX C/ULTRIX is compatible with VAX C, Version 2.3 for VMS systems, except for VMS specific options.

- *DEC C for ULTRIX*

DEC C for ULTRIX Version 1.0 is a Digital ANSI-compliant C compiler currently available for the RISC architecture running the ULTRIX Operating System V4.1 or later.

[1] Kernighan, Brian W., Ritchie, Dennis M., "The C Programming Language," Copyright 1988, Prentice-Hall.

DEC C provides support for the American National Standards (ANSI) definition of the C programming language, ANSI X3J11/88-159. DEC C has passed the Plum Hall test suite.

Using the command line options, DEC C is compatible with older dialects of C, including common (K&R[1]) C and VAX C. The compiler also provides support for function inlining to eliminate call overhead and source code checking features such as those found in the lint(1) utility for assistance in identifying nonportable or unintended coding practices.

In addition to the language, the ANSI C standard also defines the contents of the C library and defining header files.

The documentation for DEC C is provided in hardcopy form and online via the Bookreader. The online man(1) command provides access to the c89 and cpp89 manpages for the compiler and preprocessor, respectively. The documents are provided in hardcopy form with the Media kit and in online form on the ULTRIX Online Documentation (OLD) disc.

ULTRIX and ULTRIX Worksystem Software (UWS) include a license for DEC C. The binaries and documentation are not included in the operating system media, and must be ordered as a separate DEC C Media and Documentation package. Refer to the *SOFTWARE OPTIONS* section for ordering information.

- *CDA Toolkit*

The CDA Toolkit is an object library that provides the data structures and routines used to create, store, and interchange the revisable file formats supported by CDA (Compound Document Architecture). The CDA Toolkit is used to create CDA-compliant applications, or to write converters that will interchange existing file formats using CDA data structures as the intermediate format.

Migration to and from the CDA environment includes portability across the ULTRIX RISC, ULTRIX VAX and VMS Operating Systems. Electronic mailing and copying of revisable CDA documents provide support for hardware- and system-independent display and printing.

CDA data structures are predefined aggregate types that store, in memory, all the items needed to encode DDIF and DTIF documents. DDIF (Digital Data Interchange Format) aggregates are used to create CDA-compliant compound documents, graphics and image documents, or converters. DTIF (Digital Table Interchange Format) aggregates are used to create CDA-compliant table data documents or converters for use by spreadsheet and database applications.

CDA data structures are used by supplying the appropriate information for all the items stored in each aggregate. The way the data structures are linked using the CDA routines determines the structure of the documents created by supporting applications.

CDA routines perform multiple operations including file, stream, and aggregate management; item storage and access; and reading, writing, and conversion of CDA data structures. Calls to the CDA routines are encoded within an application source file.

Converters bundled with the CDA Toolkit are: the DDIF, DTIF, and Text input and output converters; a PostScript® output converter; and an Analysis output converter which is a debugging tool that produces text output of CDA in-memory data structures.

Digital encourages independent software vendors to use the CDA Toolkit and its converter architecture to write new converters. The CDA Converter Architecture provides the advantage of a standard hub of interchange so all CDA-compliant converters, whether developed by Digital or independent software vendors, can participate in data exchange.

The CDA Viewer, also bundled with the CDA Toolkit, displays the contents of all CDA-supported documents on a UWS workstation or character-cell terminal.

Callable DECwindows and character-cell viewer routines are used to write portable viewer widgets.

- *DECthreads*

ULTRIX includes a user-mode multi-threading capability referred to as DECthreads. DECthreads provides an implementation of draft 4 of the proposed POSIX 1003.4a Standard. DECthreads is a library of run-time routines callable from a C program that allows the user to create multiple threads of execution within a single address space. Multi-threading capability allows computation activity to be overlapped with I/O activity. Synchronization elements, such as mutexes and condition variables, are provided to help ensure that shared resources are accessed correctly. DECthreads also provides multiple scheduling policies for scheduling and prioritizing threads.

User Features

User Interfaces

- *Shells*. ULTRIX provides the following shells:
  - C Shell
  - BSD™ Bourne Shell
  - System V Bourne Shell
  - Korn Shell

All shells are programmable and allow for a tailorable user environment.

- *MH Mail System*. MH (from RAND Corporation) is the User Agent supplied with the ULTRIX Operating System. A user agent is the interface with the mail system. It provides the commands that allow the user to send, read and handle mail, as well as determine the form of all drafts and mail messages that are sent.

MH can be used for sending memos and personal messages, sending files to other people, exchanging documents, forwarding messages to other people, and replying to messages that have been received.

Unlike some other systems, the user does not have to go into a separate mail utility or program to send and read messages. With MH, the user can type a mail command at any time. MH commands and other ULTRIX commands may be interspersed and even combined on one line.

- *PrintServer Software*. ULTRIX incorporates client software providing support for the PrintServer range of printers. The software includes ANSI to PostScript®, ReGIS to PostScript and TEK to PostScript filters. The ReGIS to PostScript and TEK to PostScript filters are only available on ULTRIX VAX systems.

Compatibility with Other UNIX® Offerings

The ULTRIX Operating System is compatible with other software system implementations which include:

- *4BSD*

ULTRIX is based on the 4th Berkeley Software Distribution (4BSD), Version 4.2 and Version 4.3, and provides the following compatibility features:

— File system formats are interchangeable provided disk partitions are compatible.

— The Bourne Version 7 script shell and the C Shell script syntax are highly compatible.

— Source code programs written for the Portable C Compiler (pcc) and object file formats are highly compatible.

— 4.2 BSD C Runtime and Math libraries are compatible.

- *SVID*

ULTRIX provides SVID support based on SVID Issue 2, Volume 1. SVID offers the following compatibility features:

— Bourne System V Shell (Issue 1) script syntax is highly compatible.

— Source programs written for the Portable C Compiler (pcc) language that follow programming guidelines contained in Issue 2, Volume 1, Parts II and III of System V Interface Definition are highly compatible.

— System V Interprocess Communication (IPC)-Shared Memory, Semaphores, Message Queues, and Named Pipes.

— System V C Runtime and Math libraries are compatible.

Note: Under ULTRIX, source programs which conform to the SVID, Issue 1, may require recompilation.

- *Sun Network File System (NFS), Version 2.0*

ULTRIX supports the Sun network services NFS, Mount, Yellow Pages, Automount and Lock manager/Status monitor. These services have been tested and found compatible with the corresponding SunOS™ services of the following Sun Operating Releases: V3.0, V3.2, V3.4, V3.5 and V4.0. The Automounter has been tested and found compatible with the automount service provided in SunOS Release V4.0.

Named pipes accessed using NFS are not compatible between ULTRIX-32 V3.2 and ULTRIX V4.0 systems. A patch is available for ULTRIX-32 V3.1 systems.

- *Commands*

The following ULTRIX commands meet specifications for POSIX 1003.2, Draft 8:

diff	id	ln
tr	env	find
getopts	date	mkdir
mkfifo	mktemp	bc
chgrp	chmod	chown
tee	cp	join
ar	nawk	cmp
make	basename	dirname
fold	sort	uniq

- *POSIX nawk(1)*

In anticipation of POSIX 1003.2 final acceptance, a POSIX convergent awk utility, now called *nawk*(1), is available. *nawk* includes a change in the order of operator precedence. This may affect some existing *awk* programs that do not explicitly define precedence with the use of parentheses. Therefore, *nawk* will not replace the current awk, but will be introduced as the current *awk* is retired. ULTRIX 4.0 was the first release for planning the retirement of current awk.

The migration towards full compliancy with POSIX 1003.2 will result in the retirement of the current *awk* utility when the next major release of ULTRIX becomes available. That release will continue to deliver a version of *nawk*(1) modified to reflect a POSIX 1003.2 compatible utility.

nawk introduces a number of new features: \-

- New keywords: delete, do, function, return
- New built-in functions: atan2, cos, sin, rand, srand, gsub, sub, match, close, system
- New predefined variables: FNR, ARGC, ARGV, RSTART, RLENGTH, SUBSEP
- New expression operators: ? : , ^
- The FS variable and the third argument to split are now treated as extended regular expressions.
- The operator precedence has changed to more closely match C
- The escape characters have been added to the extended regular expression

Note that *nawk* does not support internationalized capabilities.

Industry Standards

ULTRIX fully supports a number of UNIX® industry standards:

- *Internet RFC Protocols*

The ULTRIX Operating System implements the following internet RFC (Request for Comment) protocols:

Protocol	Name	RFC
IP	Internet Protocol as amended by:	791
	- IP Subnet Extension	950
	-IP Broadcost Datagrams	919
	- IP Broadcast Datagrams with Subnets	922
ICMP	Internet Control Message Protocol	792
UDP	User Datagram Protocol	768
TCP	Transmission Control Protocol	793
SMI	Structure of Management Information	1155
MIB	Management Information Base	1156
SNMP	Simple Network Management Protocol	1157
DOMAIN	Domain Name System	1034, 1035
TELNET	Telnet Protocol	854
FTP	File Transfer Protocol	959
SUN-NFS	Network File System Protocol	1094
SMTP	Simple Mail Transfer Protocol	821
MAIL	Format of Electronic Mail Messages	822
ARP	Address Resolution Protocol	826
IP-E	Internet Protocol on Ethernet Networks	894
IP-FDDI	Transmission of IP over FDDI	1188
TIME	Time Protocol	868
FINGER	Finger Protocol	1196

- *Internet Non-RFC Standards*

ULTRIX also supports the following Internet non-RFC standards:

4.3BSD Socket Interface
4.2BSD inetd
4.3BSD lpd
4.3BSD netstat
4.3BSD ping
4.3BSD rcp
4.3BSD rexecd
4.3BSD rlogin
4.3BSD rmt
4.3BSD rsh
4.2BSD uucp
ATHENA: Kerberos Version 4
X/Open's Transport Interface (XTI)
Network Computing System (NCS) V1.5
SUN Network Information Service (Yellow Pages)
SUN NFS Lock Manager and Status Monitor

- *ISO 9660*

ISO 9660 is an ISO standard for a volume and file structure for the interchange of information using CDROM. ULTRIX is based on the following levels of ISO 9660:

— Level 2 of Interchange

— Level 1 of Implementation.

This implementation enables the user to:

- Mount single volume ISO 9660 formatted CD-ROMs as a local file system
- List and examine files using standard UNIX® utilities and programs
- Read files and directories using the standard POSIX system interface

— NFS export mounted ISO 9660 file systems

— Execute local and remote non-interleaved files

— Execute interleaved files remotely through NFS

Internationalization

ULTRIX Operating System includes a comprehensive set of library routines, commands and utilities to support the development of internationalized application software.

- *Native Language System (NLS)*

The internationalized environment is based on the definition of the NLS interface in XPG3. This includes language support databases, an announcement mechanism (setlocale), and a message catalog system.

The base system includes language support databases for French, English, and German for each of three codesets: Digital's MCS, ISO 8859/1, and ISO 646. A compiler, ic, is provided for users to define new language support databases.

The default locale is called the C locale and is American English/ASCII.

The message catalog system includes the *gencat* utility and related library functions that are used to access a message catalog from a C language application at run time.

- *I18N Tools*

A set of tools is provided to assist engineers with the process of extracting message text from C programs and generating message catalogs. Message text source files can be translated using the utility *trans* or with any 8-bit transparent text editor. These tools (extract, strextract, strmerge) are designed to work with the XPG3 message catalog system and are Digital enhancements to the NLS environment.

- *Commands and Utilities*

There are 71 8-bit transparent commands as specified in XPG3. Several other commands are also 8-bit transparent including editors (vi, ex, ed, sed) and networking commands (rlogin, ftp, tip, uucp).

All NLS commands are provided and conform to the XPG3 specification. Refer to *I18N Tools*.

The utility iconv provides a mechanism for codeset conversion that may be necessary in a heterogeneous network.

- *Libraries*

A library of internationalization routines that conform to XPG3 is provided (libi) as well as modifications to the standard C library. These changes meet both the XPG3 and POSIX specifications.

ctype library routines have been modified to make use of locale/culture specific information.

Standard C library functions handle 8-bit characters properly in accordance with XPG3.

The routines setlocale, strxfrm, strcoll, and strftime are in libc. The setlocale routine allows users to select a specific instance of localization such as dictionary or telephone ordering instead of character ordering (@modifier syntax).

- *Kernel*

The kernel provides support for the use of Digital's MCS character set as well as ISO 8859/1 (e.g., 8-bit coded character sets).

- *Networking*

Networking commands provide full 8-bit character support. Mail is not 8-bit transparent since the U.S. government RFC 822 specifically states that the high order bit is to be stripped. X/Open has recognized this as a problem and will likely withdraw the requirement for 8-bit transparent Mail.

DECnet is 8-bit transparent.

- *Filesystem*

The ULTRIX filesystem provides full 8-bit transparency.

Data interchange routines, such as tar and cpio, support 8-bit filenames. This can potentially cause an interoperability problem with UNIX® systems that only provide 7-bit ASCII support.

- *System Administration*

Usernames with 8-bit characters are fully supported and tools, such as adduser, have been updated to reflect this.

Architectural Differences

The following differences exist between ULTRIX VAX cc and ULTRIX RISC cc:

- Hardware architectural differences exist.
- ULTRIX RISC pointers are unsigned; VAX pointers are signed.
- Cannot dereference NULL ptrs on ULTRIX RISC; includes arg to strlen.
- asm( ) is not supported with ULTRIX RISC in any form.
- MIPS-ANSI C is not avaliable on ULTRIX VAX systems.
- VAX C is not available on ULTRIX RISC systems.
- The MIPS R2000, R3000 and R4000 series systems uses the COFF format (Common Object File Format) in its object files and load modules.

- The ULTRIX RISC compiler does not allow "old-fashioned" initialization. An example of this, which works on VAX but gives a warning on ULTRIX RISC, is: *int i 0;*.
- *varargs* is different. Any program that tries to walk the argument list by taking the address of an argument and incrementing it will not be successful, especially for double precision arguments. Programs using the macros in varargs.h will work. Compiling with the *-varargs* option on ULTRIX RISC will attempt to detect non-portable code.
- The setjmp/longjmp buffer is larger on ULTRIX RISC. Programs with a hard-coded ten-word buffer will fail; programs that correctly include the header file setjmp.h and declare a *jmp_buf* will work correctly.
- ULTRIX RISC has boundary alignment rules. User programs should only see this as a performance issue (the kernel does fix-ups). It is better, however, to align double-words, words and half-words on natural boundaries. The *setsysinfo* system call or *uac* command can be used to turn off the fixup messages.
- ULTRIX RISC pointers cannot be used as the var on switch statements.
- ULTRIX RISC will not allow the same .c or .o file to be listed twice. ULTRIX RISC will generate doubly defined symbol errors. VAX pcc allows this.
- *-L* flag: On VAX pcc, *-L* flags on the line collectively affect *-l* flags. On ULTRIX RISC, *-L* flags are seen strictly left to right, so that a *-l* must come first.
- ULTRIX RISC global symbols do not have an extra leading underscore added to them. This difference affects assembler programmers and users of *nlist*(3).
- The *-R* (read-only text) option is not yet supported with ULTRIX RISC.
- *-Md*, *-Mg* options: Not needed on ULTRIX RISC; the hardware has only one double precision format.
- ULTRIX RISC defines a macro (LANGUAGE_C, for instance) for the preprocessor that makes it possible to write multilingual include files.
- cpp predefined symbols: Both VAX and ULTRIX RISC define *ultrix*, *unix*, and *bsd4_2*. On ULTRIX RISC, the equivalent predefined symbol of *vax* is *mips*. On ULTRIX RISC, *MIPSEL* and *host_mips* are also defined.
- Some ULTRIX options on the RISC R2000/R3000 /R4000 series hardware are not available on the VAX hardware:

  -I (no dirname).

  -P (preprocess, produce .i file).

  -W (phase, opt).

  -v (print commands).

  -cpp, *-nocpp*: Most useful for languages other than C.

  -G: Relevant only to MIPS architecture.

  -j, *-k*, *-ko*: Relevant only to ULTRIX RISC compiler design.

  -std, *-std0*, *-std1* (warn nonstandard usage): vcc has *-V standard=portable*.

  -volatile, *-varargs*: Modify compiler behavior in certain areas.

  -V (print versions).

- ULTRIX RISC has big/little endian options *-EB* and *-EL*.
- *-unsigned* indicates that variables of type *char* are to be treated as unsigned quantities. The default is to treat chars as signed.
- ULTRIX RISC recognizes the environ variables *ROOTDIR* and *TMPDIR*.
- Profiling: On VAX, there are two levels selected with *-p* and *-pg*. On ULTRIX RISC, there are also two levels, selected with the *-p* option or by running the post-processor program *pixie*(1). The ULTRIX RISC compiler is not affected by either option; all work is done in the assembler or loader (or postprocessor).
- Optimization: On ULTRIX VAX, there is one level of optimization, off by default and enabled with *-O*. On ULTRIX RISC, there are five levels. By default, the second level is used; the *-O0* option disables this, *-O* or *-O2* invokes global optimization. More complex processes can be invoked with *-O3* and *-O4*. ULTRIX RISC also has the *-Olimit* switch that allows optimization to be bypassed with overly complicated code sections.
- Selecting alternate compilers: On both architectures, the *-t* and *-B* options specify passes and paths; however, the pass names for *-t* differ (there are more on ULTRIX RISC), and the semantics of *-B* belong to the *-h* option; *-B* is used to specify a command suffix instead. ULTRIX RISC also has *-H*, *-K*, and *-#* arguments designed for compiler development work.
- Debugging information: ULTRIX RISC offers four levels, where VAX has only two (on and off).

- FORTRAN and Pascal: FORTRAN and Pascal are sold separately as layered products. Certain portions of the unsupported code which are architecture dependent on VAX is not available on ULTRIX RISC.

Hardware Requirements

The ULTRIX Operating System can execute on valid VAX, MicroVAX or Digital RISC based systems and must include the following minimum system configuration. The actual amount of work supported at one time, with good performance, depends on the types of processing performed as well as on the physical memory and secondary storage available. (Refer to ULTRIX Worksystem Software Product Description (SPD 28.22.xx) for minimum hardware and device hardware requirements for all worksystems.)

- Supported ULTRIX processor at appropriate hardware revision level.
- Minimum component of main memory (refer to the *OPTIONAL HARDWARE* section).
- Supported ULTRIX system device capable of holding the supported subsets (refer to the *OPTIONAL HARDWARE* section).
- For local (non-network) distribution, supported ULTRIX software load and backup device.
- A valid load device for diagnostics.
- One console terminal with ASCII capability.
- The minimum memory configuration is 6MB for VAX and 8MB for RISC.
- Amount of memory supported is maximum supported by hardware configurations or 512MB, whichever is less.
- No more than ten terminal multiplexers per ULTRIX driver type may be configured. The actual number of terminal lines supported at one time, with good performance, depends on the types of processing performed as well as on the physical memory and CPU type.
- LAT and DECnet traffic is restricted to one Ethernet interface/controller. Each Ethernet interface /controller must be connected to a separate network or subnetwork in a routing configuration. Diskless activity requires the ability to communicate via mop. Therefore, diskless clients are also restricted to one Ethernet.
- TK50 media can be read but not written on a TK70 drive.
- To support an RL02 disk subsystem along with a UDA50 DSA disk subsystem under ULTRIX, the RL02 controller should be placed on a second UNIBUS. When both controllers are on a single UNIBUS the system will experience Data Lates, Hard disk errors and sometimes file corruption.

ULTRIX/CI Support

ULTRIX supports configurations that utilize the Computer Interconnect (CI) hardware. A configuration can consist of a single node or up to a maximum of 16 nodes, where a node is defined as being either an ULTRIX supported processor or a mass storage server. A maximum of four mass storage servers are permitted in a CI environment. Support is provided for homogeneous CI (ULTRIX) environment only.

The mass storage server is a free-standing, high speed, intelligent service designed to the specifications of the Digital Storage Architecture; it is known as the Hierarchical Storage Controller (HSC).

Network Remote Installation

RIS (Remote Installation Service) performs a remote installation through a local area network. The RIS is structured to install remotely both VAX and RISC workstations from a VAX or RISC server. To manage a large number of workstation installations, the RIS is capable of installing through a database file.

Diskless Workstations

ULTRIX supports a local area network of diskless workstations (clients) managed from a central host equipped with the necessary mass storage (the server). Centralizing the workstation's disk resources reduces the overall system cost and simplifies the administration of the network.

DMS (Diskless Management Service) performs diskless workstations setup. The DMS is structured to set up both VAX and RISC workstations from a VAX or RISC server. To manage a large number of diskless workstations, the DMS is capable of installing through a database file.

The following configuration guidelines apply to diskless workstations and servers:

- All the ULTRIX supported VAXstation and Digital RISC worksystems are supported diskless clients.
- The minimum memory configuration is 6MB for a VAX diskless client or 8MB for a RISC diskless client.
- The minimum memory is 16MB for a VAX diskless server or 16MB for a RISC diskless server.
- The MicroVAX 2000, VAXstation 2000, and any MicroVAX or VAXstation server with an RQDX1, RQDX2, or RQDX3 disk controller is limited to the support of three diskless clients.
- If multiple network segments are present, the DMS clients and server must be on the same segment of the network.

The minimum hardware requirements for any future version of this product may be different from the requirements for the current version.

Optional Hardware

Additional memory and/or secondary storage may be required depending upon the need for ULTRIX software or optional software products and usage of the ULTRIX Operating System.

Note: Combinations of hardware options are subject to limitations such as bandwidth, physical configuration restraints, thermal dissipation, and electrical loads/power.

(System configuration details are described in the *VAX Systems and Options Catalog*.)

The following tables list hardware options that are supported by the ULTRIX Operating System. All device drivers for these hardware units contained in The ULTRIX Operating System are warranted by Digital.

Processor	DECstation 3100 DECstation 3100s	DECsystem 5100	DECsystem 5400	DECsystem 5500
Memory				
-Prestoserve		1		1
Disk Drives	7 Maximum[2]	7 Maximum[2]	32 Maximum	32 Maximum
Controller			DSSI	DSSI
				SCSI[3]
			KDA50	KDA50
			KFQSA	KFQSA
			KRQ50	KRQ50
				KZQSA[4]
Drives			ESE20^{D}	ESE20^{D}
			RA60	RA60
			RA70	RA70
				RA71
				RA72
				RA73
			RA81	RA81
			RA82	RA82
			RA90	RA90
			RA92	RA92
			RF30	RF30
			RD31	RF31
			RF71	RF71
			RF72	RF72
	RRD40^{L}	RRD40^{L}	RRD40^{L}	RRD40^{L}
	RRD42^{L}	RRD42^{L}		RRD42^{L}
	RX23^{D}	RX23^{D}		RX23^{D}
	RX33^{D}	RX33^{D}		RX33^{D}
	RZ23^{D}	RZ23^{D}		RZ23^{D}
	RZ23L^{D}	RZ23L^{D}		RZ23L^{D}
	RZ24	RZ24		RZ24
	RZ24L	RZ24L		RZ24L
	RZ25	RZ25		RZ25
	RZ26	RZ26		RZ26
	RZ55	RZ55		RZ55
	RZ56	RZ56		RZ56
	RZ57	RZ57		RZ57
	RZ58	RZ58		RZ58
Magnetic Tapes	2 Maximum	2 Maximum	4 Maximum	4 Maximum
Controller			DSSI	DSSI/SCSI

Processor	DECstation 3100 DECstation 3100s	DECsystem 5100	DECsystem 5400	DECsystem 5500
			KLESI-SA	KLESI-SA
			TQK70[L,8]	TQK70[L,8]
			TSV05	TSV05
Drives			RV20	RV20
	TK50Z[L,8]	TK50Z[L,8]		TK50Z[L,8]
			TK70[L,8]	TK70[L,8]
	TKZ08[D]	TKZ08		TKZ08
	TKZ09[D]	TKZ09		TKZ09
	TLZ04[D]	TLZ04[D]		TLZ04[D]
	TLZ06	TLZ06		TLZ06
			TS05	TS05
	TSZ05[D]	TSZ05[D]		TSZ05[D]
	TSZ07[D]	TSZ07[D]		TSZ07[D]
			TU81E	TU81E
	TZ30[L,8]	TZ30[L,8]		TZ30[L,8]
	TZK10[D]	TZK10[D]		TZK10[D]
	TZ85[L,8]	TZ85[L,8]		TZ85[L,8]
	TZ857[L,8,9]	TZ857[L,8,9]		TZ857[L,8,9]
Communication Devices	1 Line Asynch[5]	1 Line Asych		
			CXA16	CXA16
			CXB16	CXB16
			CXY08	CXY08
			DELQA/DESQA	DELQA/DESQA
			DESTA	DESTA
Modem/Pad Devices		2 Full Modems Maximum		
			DFA01	DFA01
			DF02	DF02
	DF03[6]	DF03	DF03	DF03
	DF112[6]	DF112	DF112	DF112
	DF212[6]	DF212	DF212	DF212
	DF224[6]	DF224	DF224	DF224
	DF242[6]	DF242	DF242	DF242
			DF296	DF296
			Micom Micro	Micom Micro
			800/X.25	800/x.25
Line Printers	1 Maximum	1 Maximum	1 Maximum	1 Maximum

Processor	DECstation 3100 DECstation 3100s	DECsystem 5100	DECsystem 5400	DECsystem 5500
Controller			LPV11	LPV11
			LPV16	LPV16
Serial Printers	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324
	LCG01	LCG01	LCG01	LCG01
	LG02	LG02	LG02	LG02
	LG31	LG31	LG31	LG31
	LJ250	LJ250	LJ250	LJ250
	LN03 LN03R LN03S	LN03 LN03R LN03S	LN03 LN03R LN03S	LN03 LN03R LN03S
	LQP02 LQP03	LQP02 LQP03	LQP02 LQP03	LQP02 LQP03
	LVP16	LVP16	LVP16	LVP16
	DEClaser 1100 /1150 [7]	DEClaser 1100 /1150 [7]	DEClaser 1100 /1150 [7]	DEClaser 1100/1150 [7]
	DEClaser 2100 /2150 [7]	DEClaser 2100 /2150 [7]	DEClaser 2100 /2150 [7]	DEClaser 2100/2150 [7]
	DEClaser 2200 /2250 [7]	DEClaser 2200 /2250 [7]	DEClaser 2200 /2250 [7]	DEClaser 2200/2250 [7]
	DEClaser 3200 /3250 [7]	DEClaser 3200 /3250 [7]	DEClaser 3200 /3250 [7]	DEClaser 3200/3250 [7]
Asynchronous Terminals	VT100 Series	VT100 Series	VT100 Series	VT100 Series
	VT200 Series	VT200 Series	VT200 Series	VT200 Series
	VT300 Series	VT300 Series	VT300 Series	VT300 Series
	VT420	VT420	VT420	VT420
	DECmate II/III	DECmate II/III	DECmate II/III	DECmate II/III
	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190
	PRO 350/380	PRO 350/380	PRO 350/380	PRO 350/380
	VAXmate	VAXmate	VAXmate	VAXmate

Notes:

1 Letter D = Data device only.
Letter L = Valid ULTRIX load device.

2 Disk and tape devices are connected to the DECsystem and DECstation via SCSI (Small Computer System Interface). There is one integral SCSI controller. The SCSI controller will support up to seven devices in any combination. The controller has an identifier which can be set via the DS5000 Console Interface (the factory default is id6). Each added device must have its own unique identifier which must not conflict with any other device, including the SCSI controller. The SCSI controller should always have the highest id.

3 The DECsystem 5400 and 5500 pprovide by default, a DSSI bus for RF disk support and an Ethernet interface. RF disks are also supported by the KFQSA contoller. The DECsystem 5500 also provides by default a SCSI interface for RZ disk and TZ tape support. RZ disks and TZ tapes are also supported on the 5500 by the KZQSA controller.

4 Two KZQSAs are supported on the DECsystem 5500. All SCSI disks and tapes listed in this SPD under the DECsystem 5500 are supported on the KZQSA. The KZQSA supports data devices only and not boot devices.

5 Although there are 4 ports, ports 1 and 2 are not available. Port 3 is a system console. Port 4 is available for printer or modem.

6 The modems must be configured such that the *Forced DSR* attribute is NOT set on the modem. If the *Forced DSR* attribute is set, the modem will be unable to recognize loss of connection, and may incorrectly assume that a connection has been established. Consult the modem's Owner's Manual for specific information on clearing the *Forced DSR* option.

7 DEClaser support is equivalent to that which is available for the LN03, LN03R, and LN03S printers.

8 Accepts TK50 distribution media.

9 Automatic stack loader tape drives are supported only by the dump, restore and cpio system utilities.

Processor	DECsystem 5000 Models 25/33/50	DECsystem 5000 Models 133/150	DECsystem 5000 Models 200/240/260	DECsystem 5900 DECsystem 5900-260
Memory				
-Prestoserve		1	1	1
I/O Adapters	2 DEFZA	3 DEFZA	3 DEFZA	3 DEFZA
-VME	1	1	1	1
-TURBOchannel Extender	1	1	1	1
-SCSI	2 PMAZ	3 PMAZ	3 PMAZ	3 PMAZ
-Ethernet (Thick)	2 PMAD	3 PMAD	3 PMAD	3 PMAD
-CI			1 CITCA[10]	1 CITCA[10]
Disk Drives[4]	21 Maximum [5]	28 Maximum [5]	28 Maximum [5]	28 Maximum [5]
Controllers				
Drives	RRD40^{L}	RRD40^{L}	RRD40^{L}	RRD40^{L}
	RRD42^{L}	RRD42^{L}	RRD42^{L}	RRD42^{L}
	RX23^{D}	RX23^{D}	RX23^{D}	RX23^{D}
	RX26^{D,6}			RX26^{D,6}
	RX33^{D}	RX33^{D}	RX33^{D}	RX33^{D}
	RZ23^{D}	RZ23^{D}	RZ23^{D,9}	RZ23^{D,9}
	RZ23L^{D,9}	RZ23L^{D,9}	RZ23L^{D,9}	RZ23L^{D,9}
	RZ24	RZ24	RZ24[9]	RZ24[9]
	RZ24L	RZ24L	RZ24L[9]	RZ24L[9]
	RZ25	RZ25	RZ25	RZ25
	RZ26	RZ26	RZ26	RZ26
	RZ55	RZ55	RZ55	RZ55
	RZ56	RZ56	RZ56	RZ56
	RZ57	RZ57	RZ57	RZ57
	RZ58	RZ58	RZ58	RZ58
Magnetic Tape[4]	1 Maximum[5]	2 Maximum[5]	2 Maximum[5]	2 Maximum[5]
Controllers	TK50Z^{L,11}	TK50Z^{L,11}	TK50Z^{L,11}	TK50Z^{L,11}
	TKZ08	TKZ08	TKZ08	TKZ08
	TKZ09	TKZ09	TKZ09	TKZ09
	TLZ04	TLZ04	TLZ04	TLZ04
	TLZ06	TLZ06	TLZ06	TLZ06
	TSZ05	TSZ05	TSZ05	TSZ05
	TSZ07	TSZ07	TSZ07	TSZ07
	TZ30^{L,11}	TZ30^{L,11}	TZ30^{L,11}	TZ30^{L,11}
	TZK10	TZK10	TZK10	TZK10
	TZ85^{L,11}	TZ85^{L,11}	TZ85^{L,11}	TZ85^{L,11}
	TZ857^{L,11,12}	TZ857^{L,11,12}	TZ857^{L,11,12}	TZ857^{L,11,12}

Processor	DECsystem 5000 Models 25/33/50	DECsystem 5000 Models 133/150	DECsystem 5000 Models 200/240/260	DECsystem 5900 DECsystem 5900-260
Communication Devices	0 Line Async [7]	1 Line Async	1 Line Async	1 Line Async
Modem/Pad Devices	DF03	DF03	DF03	DF03
	DF112	DF112	DF112	DF112
	DF212	DF212	DF212	DF212
	DF224	DF224	DF224	DF224
	DF242	DF242	DF242	DF242
	DF296	DF296	DF296	DF296
Line Printers	2 Maximum[7]	2 Maximum	2 Maximum	2 Maximum
Serial Printers	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324
	LCG01	LCG01	LCG01	LCG01
	LG02	LG02	LG02	LG02
	LG31	LG31	LG31	LG31
	LJ250	LJ250	LJ250	LJ250
	LN03 LN03R LN03S	LN03 LN03R LN03S	LN03 LN03R LN03S	LN03 LN03R LN03S
	LQP02 LQP03	LQP02 LQP03	LQP02 LQP03	LQP02 LQP03
	LVP16	LVP16	LVP16	LVP16
	DEClaser 1100/1150 [8]	DEClaser 1100/1150 [8]	DEClaser 1100/1150 [8]	DEClaser 1100/1150 [8]
	DEClaser 2100/2150 [8]	DEClaser 2100/2150 [8]	DEClaser 2100/2150 [8]	DEClaser 2100/2150 [8]
	DEClaser 2200/2250 [8]	DEClaser 2200/2250 [8]	DEClaser 2200/2250 [8]	DEClaser 2200/2250 [8]
	DEClaser 3200/3250 [8]	DEClaser 3200/3250 [8]	DEClaser 3200/3250 [8]	DEClaser 3200/3250 [8]
Asynchronous Terminals	2 Maximum [7]	2 Maximum	2 Maximum	2 Maximum
	VT100 Series	VT100 Series	VT100 Series	VT100 Series
	VT200 Series	VT200 Series	VT200 Series	VT200 Series
	VT300 Series	VT300 Series	VT300 Series	VT300 Series

Processor	DECsystem 5000 Models 25/33/50	DECsystem 5000 Models 133/150	DECsystem 5000 Models 200/240/260	DECsystem 5900 DECsystem 5900-260
	VT420	VT420	VT420	VT420
	DECmate II/III	DECmate II/III	DECmate II/III	DECmate II/III
	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190
	PRO 350/380	PRO 350/380	PRO 350/380	PRO 350/380
	VAXmate	VAXmate	VAXmate	VAXmate

Notes:

1 Letter D = Data device only.
Letter L = Valid ULTRIX load device.

2 Although there are four ports, ports 1 and 2 are not available. Port 3 is system console. Port 4 is available for printer or modem.

3 The modems must be configured such that the *Forced DSR* attribute is NOT set on the modem. If the *Forced DSR* attribute is set, the modem will be unable to recognize loss of connection, and may incorrectly assume that a connection has been established. Consult the modem's Owner's Manual for specific information on clearing the *Forced DSR* option.

4 The SCSI (Small Computer System Interface) cable length is limited to six meters, thereby limiting the number of external devices (tapes and disk) that can actually be attached to the system per bus.

5 Disk and tape devices are connected to the DECsystem and DECstation via SCSI (Small Computer System Interface). There is one integral SCSI controller and, optionally, up to three more SCSI controllers may be added. Each SCSI controller will support up to seven devices in any combination. Each controller has an identifier which can be set via the DS5000 Console Interface (the factory default is id6). Each added device must have its own unique identifier which must not conflict with any other device on its bus including the SCSI controller. The SCSI controller should always have the highest id.

6 On the DECsytem 5000 Model 25/33/50, the RX26 device may either be FDI-based, in which case it is integral in the system; or SCSI-based, in which case it is a separate device. On the DECsystem 5900, the RX26 is SCSI-based.

7 The DECsystem 5000 Model 25/33/50 has one general purpose asynchronous/synchronous serial interface on the system module. A TURBOchannel-based serial connector would be needed if more serial lines are required.

8 DEClaser support is equivalent to that which is available for the LN03, LN03R, and LN03S printers.

9 The RZ23, RZ23L, RZ24 and RZ24L devices are supported via the TURBOchannel Extender (TcE) box.

10 Disks and tapes supported on the CITCA are those CI devices already supported on the DECsystem 5800 series platforms, e.g. ESE20, TAxx tapes, RAxx disks and HSCxx controllers. Devices connected to CITCA are supported as data devices only.

11 Accepts TK50 distribution media.

12 Automatic stack loader tape drives are supported only by the dump, restore and cpio system utilities.

Processor	MicroVAX II VAXserver 100	MicroVAX 2000 VAXserver 2000	MicroVAX 3100 VAXserver 3100	MicroVAX 3300/3400 VAXserver 3300/3400
Disk Drives	7 Maximum	3 Maximum	8 Maximum	3 Maximum
Controller	1 RQDX2			
	1 RQDX3			
	1 KDA50[3]			
				DSSI[14]
	1 KFQSA			KFQSA
	1 KRQ40			
	1 KRQ50			
Drives	RA60			
	RA80			
	RA81			
	RA82			
	RA90			
	RA92			
		RD32[D]		
	RD51[D]			
	RD52[D]			
	RD53[D,5]	RD53[D,15]		
	RD54[6]	RD54[6]		
	RF30			RF30
	RF31			RF31
	RF71			RF71
	RF72			RF72
	RRD40[D,11]		RRD40[D]	
			RRD42[L]	
	RRD50[D,11]			
	RX33[D]	RX33[D]	RX23[D]	
	RX50[D]		RX33[D]	
			RZ23[16]	
			RZ24	
			RZ55	
			RZ56	
			RZ57	
			RZ58	
Magnetic Tapes	4 Maximum	1 Maximum	2 Maximum	4 Maximum
Controller	TQK50[L,18]			KRQ50[L,18]
	TQK70[L,18]			TKQ70[L,18]
	KLESI-Q			KLESI-Q
	TSV05			TSV05
Drives			TZK10	

Processor	MicroVAX II VAXserver 100	MicroVAX 2000 VAXserver 2000	MicroVAX 3100 VAXserver 3100	MicroVAX 3300/3400 VAXserver 3300/3400
			TZ30[L,18]	
	RV20		TSZ05	RV20
		TK50Z[L,18]	TK50Z[L,18]	RRD40
	TK70[L,18]		TLZ04	TK70[L,18]
	TU81E			TS05
	TS05		TKZ08	
			TKZ09	
Communication	DEQNA[7]	DESVA[9]		CXA16
Devices	DMV11[12]	DHT32		CXY08
	DPV11[10]	DSH32	DSH32	DELQA/DESQA[13]
	DHQ11			DMV11[12]
	DHV11			DPV11[10]
	DZQ11[2]			DRV1W
	DZV11[2]			CXF32
	DELQA			CXB16
Modem/Pad	DFA01			DFA01
Devices	DF02	DF02	DF02	DF02
	DF03	DF03	DF03	DF03
	DF112	DF112	DF112	DF112
	DF126[8]			DF126[8]
	DF212	DF212	DF212	DF212
	DF224	DF224	DF224	DF224
	DF242	DF242	DF242	DF242
	DF296	DF296	DF296	DF296
	Micom Micro	Micom Micro	Micom Micro	Micom Micro
	800/X.25	800/X.25	800/X.25	800/X.25
Line Printers	1 Maximum	1 Maximum	1 Maximum	1 Maximum
Controller	LPV11 LVP16			LPV11 LVP16
Printers	LG01			LG01
	LG02			LG02
	LP27			LP27
	LPS20			LPS20
	LPS40			LPS40
Serial Printers[4]	LA36	LA36	LA36	la36
	LA50	LA50	LA50	LA50
	LA75	LA75	LA75	LA75

Processor	MicroVAX II VAXserver 100	MicroVAX 2000 VAXserver 2000	MicroVAX 3100 VAXserver 3100	MicroVAX 3300/3400 VAXserver 3300/3400
	LA100	LA100	LA100	LA100
	LA120	LA120	LA120	LA120
	LA100	LA100	LA100	LA100
	LA210	LA210	LA210	LA210
	LA324	LA324	LA324	LA324
	LCG01	LCG01	LCG01	LCG01
	LG02	LG02	LG02	LG02
	LG31	LG31	LG31	LG31
	LJ250	LJ250	LJ250	LJ250
	LN03	LN03	LN03	LN03
	LN03R	LN03R	LN03R	LN03R
	LN03S	LN03S	LN03S	LN03S
	LQP02	LQP02	LQP02	LQP02
	LQP03	LQP03	LQP03	LQP03
	LVP16	LVP16	LVP16	LVP16
	DEClaser 1100 /1150[17]	DEClaser 1100 /1150 [17]	DEClaser 1100 /1150 [17]	DEClaser 1100/1150 [17]
	DEClaser 2100 /2150 [17]	DEClaser 2100 /2150 [17]	DEClaser 2100 /2150 [17]	DEClaser 2100/2150 [17]
	DEClaser 2200 /2250 [17]	DEClaser 2200 /2250 [17]	DEClaser 2200 /2250 [17]	DEClaser 2200/2250 [17]
	DEClaser 3200 /3250 [17]	DEClaser 3200 /3250 [17]	DEClaser 3200 /3250 [17]	DEClaser 3200/3250 [17]
Asynchronous	VT100 Series	VT100 Series	VT100 Series	VT100 Series
Terminals [4]	VT200 Series	VT200 Series	VT200 Series	VT200 Series
	VT300 Series	VT300 Series	VT300 Series	VT300 Series
	VT420	VT420	VT420	VT420
	DECmate II/III	DECmate II/III	DECmate II/III	DECmate II/III
	Rainbow 100B	Rainbow 100B	Rainbow 100B	Rainbow 100B
	Rainbow 100+	Rainbow 100+	Rainbow 100+	Rainbow 100+
	Rainbow 190	Rainbow 190	Rainbow 190	Rainbow 190
	PRO 350/380	PRO 350/380	PRO 350/380	PRO 350/380
	VAXmate	VAXmate	VAXmate	VAXmate

Notes:

1 Letter D = Data device only.
Letter L = Valid ULTRIX load device.

2 DZV11 and DZQ11 are supported only up to 9600 baud. This also applies to the MicroVAX 2000 serial asynchronous lines.

3 KDA50 for the MicroVAX II must be at least at Rev Level C5.

4 All terminals and serial printers are supported in 7-bit and 8-bit ASCII.

5 The RD53 requires an RQDX2 or RQDX3 controller.

6 The RD54 requires an RQDX3 controller at least at Rev Level 2.8.

[7] The DEQNA must be at least at Revision E1.

[8] The DF126 can only be used with the DPV11 (IBM 2780/3780 Emulator); maximum baud rate is 2400.

[9] The DESVA is the ThinWire Ethernet controller for the MicroVAX 2000.

[10] The DPV11 can only be used in conjunction with the 2780/3780 Emulator.

[11] The RRD50/40 is available with controller and drive, and two drives are supported per controller. The RRD50/40 is supported as a read-only device.

[12] The DMV11 is supported using TCP/IP and DECnet over full and half duplex point-to-point DDCMP sync lines. DMC mode is provided for backwards compatibility.

[13] Two controllers are allowed with an expansion cabinet.

[14] The MicroVAX 3300 and MicroVAX 3400 provide, by default, a DSSI Bus Interface for RF disk support, or by the KFQSA controller and Ethernet interface DELQA/DESQA, by default, which are supported by ULTRIX device drivers.

[15] The RD53 can be used as a system disk only if a second disk of equal or greater size is available on the system.

[16] Two drives (RZ23L) are required for system disks for a standalone system.

[17] DEClaser support is equivalent to that which is available for the LN03, LN03R, and LN03S printers.

[18] Accepts TK50 distribution media.

Processor	MicroVAX 3500 VAXserver 3500	MicroVAX 3600 VAXserver 3600 VAXserver 3602	MicroVAX 3800 VAXserver 3800	MicroVAX 3900 VAXserver 3900
Disk Drives	7 Maximum	7 Maximum	7 Maximum	7 Maximum
Controller	1 RQDX3	1 RQDX3		1 RQDX3
	1 KDA50[8]	1 KDA50[8]	1 KDA50[8]	1 KDA50[8]
	1 KFQSA	1 KFQSA	1 KFQSA	1 KFQSA
		1 KRQ40	1 KRQ40	1 KRQ40
	1 KRQ50	1 KRQ50	1 KRQ50	1 KRQ50[10]
Drives		RA60	RA60	RA60
	RA70	RA70	RA70	RA70
	RA71	RA71	RA71	RA71
	RA72	RA72	RA72	RA72
	RA73	RA73	RA73	RA73
		RA80	RA80	RA80
		RA81	RA81	RA81
		RA82	RA82	RA82
		RA90	RA90	RA90
		RA92	RA92	RA92
	RD51[D] RD52[D] RD53[D,3] RD54[4,9]	RD51[D] RD52[D] RD53[D,3] RD54[4,9]	RD51[D] RD52[D] RD53[D,3] RD54[4,9]	RD51[D] RD52[D] RD53[D,3] RD54[4,9]
	RF30	RF30	RF30	RF30
	RF31	RF31	RF31	RF31
	RF71	RF71	RF71	RF71
	RF72	RF72	RF72	RF72
	RRD40[D,7]	RRD40[D,7]	RRD40[D,7]	RRD40[D,7]
	RRD50[D,7]	RRD50[D,7]	RRD50[D,7]	RRD50[D,7]
Magnetic Tapes	4 Maximum	4 Maximum	4 Maximum	4 Maximum
Controller	TQK50[L,12]	TQK50[L,12]	TQK50[L,12]	TQK50[L,12]
	TQK70[L,12]	TQK70[L,12]	TQK70[L,12]	TQK70[L,12]
	KLESI-Q	KLESI-Q	KLESI-Q	KLESI-Q
	TSV05	TSV05	TSV05	TSV05
Drives	RV20	RV20	RV20	RV20
	TK50[L,12]	TK50[L,12]	TK50[L,12]	TK50[L,12]
	TK70[L,12]	TK70[L,12]	TK70[L,12]	TK70[L,12]
	TS05	TS05	TS05	TS05
	TU81E	TU81E	TU81E	TU81E
Communication	CXA16	CXA16	CXA16	CXA16
Devices	CXB16	CXB16	CXB16	CXB16
	CXF32			

Processor	MicroVAX 3500 VAXserver 3500	MicroVAX 3600 VAXserver 3600 VAXserver 3602	MicroVAX 3800 VAXserver 3800	MicroVAX 3900 VAXserver 3900
	CXY08	CXY08	CXY08	CXY08
	DELQA/DESQA	DELQA/DESQA	DELQA/DESQA	DELQA/DESQA
	DPV11[6]	DPV11[6]	DPV11[6]	DPV11[6]
	DZQ11[2]	DZQ11[2]	DZQ11[2]	DZQ11[2]
Modem/Pad Devices	DFA01	DFA01	DFA01	DFA01
	DF02	DF02	DF02	DF02
	DF03	DF03	DF03	DF03
	DF112	DF112	DF112	DF112
	DF126[5]	DF126[5]	DF126[5]	DF126[5]
	DF212	DF212	DF212	DF212
	DF224	DF224	DF224	DF224
	DF242	DF242	DF242	DF242
	DF296	DF296	DF296	DF296
	Micom Micro	Micom Micro	Micom Micro	Micom Micro
	800/X.25	800/X.25	800/X.25	800/X.25
Line Printers	1 Maximum	1 Maximum	1 Maximum	1 Maximum
Controller	LPV11	LPV11	LPV11	LPV11
	LPV16	LPV16	LPV16	LPV16
Printers	LG01	LG01	LG01	LG01
	LG02	LG02	LG02	LG02
	LP27	LP27	LP27	LP27
	LPS20 LPS40	LPS20 LPS40	LPS20 LPS40	LPS20 LPS40
Serial Printers	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324
	LCG01	LCG01	LCG01	LCG01
	LG02	LG02	LG02	LG02
	LG31	LG31	LG31	LG31
	LJ250	LJ250	LJ250	LJ250
	LN03 LN03R LN03S	LN03 LN03R LN03S	LN03 LN03R LN03S	LN03 LN03R LN03S

Processor	MicroVAX 3500 VAXserver 3500	MicroVAX 3600 VAXserver 3600 VAXserver 3602	MicroVAX 3800 VAXserver 3800	MicroVAX 3900 VAXserver 3900
	LQP02 LQP03	LQP02 LQP03	LQP02 LQP03	LQP02 LQP03
	LVP16	LVP16	LVP16	LVP16
	DEClaser 1100 /1150 [11]	DEClaser 1100 /1150 [11]	DEClaser 1100 /1150 [11]	DEClaser 1100/1150 [11]
	DEClaser 2100 /2150 [11]	DEClaser 2100 /2150 [11]	DEClaser 2100 /2150 [11]	DEClaser 2100/2150 [11]
	DEClaser 2200 /2250 [11]	DEClaser 2200 /2250 [11]	DEClaser 2200 /2250 [11]	DEClaser 2200/2250 [11]
	DEClaser 3200 /3250 [11]	DEClaser 3200 /3250 [11]	DEClaser 3200 /3250 [11]	DEClaser 3200/3250 [11]
Asynchronous Terminals	VT100 Series	VT100 Series	VT100 Series	VT100 Series
	VT200 Series	VT200 Series	VT200 Series	VT200 Series
	VT300 Series	VT300 Series	VT300 Series	VT300 Series
	VT420	VT420	VT420	VT420
	DECmate II/III	DECmate II/III	DECmate II/III	DECmate II/III
	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190
	PRO 350/380	PRO 350/380	PRO 350/380	PRO 350/380
	VAXmate	VAXmate	VAXmate	VAXmate

Notes:

1 Letter D = Data device only.
Letter L = Valid ULTRIX load device.

2 DZV11 and DZQ11 are supported only up to 9600 baud. This also applies to the MicroVAX 2000 serial asynchronous lines.

3 The RD53 requires an RQDX2 or RQDX3 controller.

4 The RD54 requires an RQDX3 controller at least at Rev Level 2.8.

5 The DF126 can only be used with the DPV11 (IBM 2780/3780 Emulator); maximum baud rate is 2400.

6 The DPV11 can only be used in conjunction with the 2780/3780 Emulator.

7 The RRD50/40 is available with controller and drive, and two drives are supported per controller. The RRD50/40 is supported as a read-only device.

8 KDA50 for the MicroVAX 3000 systems must be at Rev Level E1 or greater.

9 The MicroVAX 3500 with RD54s is supported as a timesharing system only.

10 Two controllers are allowed with an expansion cabinet.

11 DEClaser support is equivalent to that which is available for the LN03, LN03R, and LN03S printers.

12 Accepts TK50 distribution media.

Processor	VAX–11/750	VAX–11/780 VAX–11/785
Floating Point	FP750	FP780/785
I/O Adapters		
-SBI		1
-UNIBUS	2 DW750	4 DW780
-MASSBUS	2 RH750	4 RH780
-Memory	1 MS750 Controller	2 MS780 Controllers
CI Adapters	1 CI750	1 CI780
Disk Drives	48 Maximum	64 Maximum
UNIBUS Disks	20 Maximum	28 Maximum
Controller	2 UDA50[5,6] HSC[12] RL11	4 UDA50[5,6] HSC[12] RL11
Drives	RA60[L] RA70 RA71 RA72 RA73 RA80 RA81 RA82 RA90 RA92 RL02[D]	RA60[L] RA70 RA71 RA72 RA73 RA80 RA81 RA82 RA90 RA92 RL02[D]
MASSBUS Disks	32 Maximum RM05 RP07[D]	32 Maximum RM05 RP07[D]
Magnetic Tapes	4 Maximum	4 Maximum
CI Tapes	TA78 TA79 TA81	TA78 TA79 TA81

Processor	VAX–11/750	VAX–11/780 VAX–11/785
Console Tapes	TU58[4,8]	
UNIBUS Tapes[7]		
Controller	KLESI-U	KLESI-U
	TS11	TS11
	TSU05	TSU05
Tapes	RV20	RV20
	TS05	TS05
	TU80[L]	TU80[L]
	TU81[L]	TU81[L]
	TU81E[L]	TU81E[L]
	TUK50[L,14]	TUK50[L,14]
MASSBUS Tapes		
Controller	TM03	TM03
	TM78	TM78
Tapes	TE16[L]	TE16[L]
	TU77[L]	TU77[L]
	TU78[L]	TU78[L]
	TU79[L]	TU79[L]
Communication Devices		
UNIBUS Communication Devices	DELUA[11]	DELUA[11]
	DEUNA[11]	DEUNA[11]
	DHU11	DHU11
	DMF32[2]	DMF32[2]
	DMR11[3]	DMR11[3]
	DMZ32	DMZ32
	DUP11[10]	DUP11[10]
	DZ11	DZ11
	DZ32	DZ32
Modem/Pad Devices	DF02	DF02
	DF03	DF03
	DF112	DF112
	DF126[9]	DF126[9]
	DF212	DF212

Processor	VAX–11/750	VAX–11/780 VAX–11/785
	DF224	DF224
	DF242	DF242
	DF296	DF296
	Micom Micro	Micom Micro
	800/X.25	800/X.25
Line Printers	5 Maximum	5 Maximum
Controller	LP11	LP11
	LP32	LP32
Printer	LG01 LG02	LG01 LG02
	LN01 LN01S	LN01 LN01S
	LP27 LP29	LP27 LP29
	LPS20 LPS40	LPS20 LPS40
Serial Printers	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324
	LCG01	LCG01
	LG02	LG02
	LG31	LG31
	LJ250	LJ250
	LN03 LN03R LN03S	LN03 LN03R LN03S
	LQP02 LQP03	LQP02 LQP03
	LVP16	LVP16
	DEClaser 1100/1150[13]	DEClaser 1100/1150[13]
	DEClaser 2100/2150[13]	DEClaser 2100/2150[13]
	DEClaser 2200/2250[13]	DEClaser 2200/2250[13]
	DEClaser 3200/3250[13]	DEClaser 3200/3250[13]
Asynchronous Terminals[8]	VT100 Series	VT100 Series
	VT200 Series	VT200 Series
	VT300 Series	VT300 Series

Processor	VAX–11/750	VAX–11/780 VAX–11/785
	VT420	VT420
	DECmate II/III	DECmate II/III
	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190
	PRO 350/380	PRO 350/380
	VAXmate	VAXmate

Notes:

1 Letter D = Data device only.
Letter L = Valid ULTRIX load device.

2 The asynchronous and the general purpose parallel interfaces as a printer port in DMA mode of the DMF32 are supported.

3 The DMR11 is supported using TCP/IP and DECnet over full- and half-duplex point-to-point DDCMP sync lines. DMC mode is used for backwards compatibility.

4 The TU58 console tape on the VAX–11/750 is supported in single-user mode only.

5 The UDA50 must be at microcode Revision Level 4 or higher.

6 Each UDA50 must be configured on a separate UNIBUS adapter.

7 A maximum of one UNIBUS tape controller per UBA.

8 The TU58-XB must be at minimum Rev K or F2 for the VAX–11/750.

9 The DF126 can only be used with the DUP11 device (IBM 2780/3780 emulation); maximum baud rate 2400.

10 The DUP11 can only be used in conjunction with 2780/3780 terminal emulation.

11 Either one DELUA or one DEUNA controller can be configured on any UNIBUS adapter. LAT and DECnet traffic is restricted to one Ethernet. Each Ethernet must be connected to a separate network or subnetwork in a routing configuration.

12 The HSC must be running V370 microcode or higher. A maximum of four are supported. HSC40, HSC50, HSC70 and HSC90 only.

13 DEClaser support is equivalent to that which is available for the LN03, LN03R, and LN03S printers.

14 Accepts TK50 distribution media.

Processor	**DECsystem 5810** **DECsystem 5820** **DECsystem 5830** **DECsystem 5840**	**VAX 6000-210** **VAX 6000-220** **VAX 6000-230** **VAX 6000-240** **VAXserver 6000-210** **VAXserver 6000-220**	**VAX 6000-310** **VAX 6000-320** **VAX 6000-330** **VAX 6000-340** **VAX 6000-350** **VAX 6000-360** **VAXserver 6000-310** **VAXserver 6000-320**	**VAX 6000-410** **VAX 6000-420** **VAX 6000-430** **VAX 6000-440** **VAX 6000-450** **VAX 6000-460** **VAXserver 6000-410** **VAXserver 6000-420**
Floating Point Unit	Integral	Integral	Integral	Integral
Vectors				Yes (13)
I/O Adapters				
- MIPS VAXCI	1	1	1	2
- VAXBI	4	6	6	6
- SBI				
- UNIBUS				
- MASSBUS				
CI Adapters[6]	CIBCA-BA	CIBCA-AA, BA	CIBCA-AA, BA	1 CIBCA-AA, BA 1 CIXCD[12]
Disk Drives	96 Maximum	96 Maximum	96 Maximum	96 Maximum
Controller	KDB50	12 KDB50[3]	12 KDB50[3]	12 KDB50[3]
		KDM70	KDM70	KDM70
	HSC[15]	HSC[15]	HSC[15]	HSC[15]
Drives	ESE20[D]	ESE20[D]	ESE20[D]	ESE20[D]
Drives	ESE56[D]	ESE56[D]	ESE56[D]	ESE56[D]
	RA60	RA60	RA60	RA60
	RA70	RA70	RA70	RA70
	RA71	RA71	RA71	RA71
	RA72	RA72	RA72	RA72
	RA73	RA73	RA73	RA73
		RA80	RA80	RA80
	RA81	RA81	RA81	RA81
	RA82	RA82	RA82	RA82
	RA90	RA90	RA90	RA90
	RA92	RA92	RA92	RA92
Magnetic Tapes	6 Maximum	6 Maximum	6 Maximum	6 Maximum
CI Tapes	TA78	TA78	TA78	TA78

Processor	DECsystem 5810 DECsystem 5820 DECsystem 5830 DECsystem 5840	VAX 6000-210 VAX 6000-220 VAX 6000-230 VAX 6000-240 VAXserver 6000-210 VAXserver 6000-220	VAX 6000-310 VAX 6000-320 VAX 6000-330 VAX 6000-340 VAX 6000-350 VAX 6000-360 VAXserver 6000-310 VAXserver 6000-320	VAX 6000-410 VAX 6000-420 VAX 6000-430 VAX 6000-440 VAX 6000-450 VAX 6000-460 VAXserver 6000-410 VAXserver 6000-420
	TA79	TA79	TA79	TA79
	TA81	TA81	TA81	TA81
	TA90[8,17]	TA90[8,17]	TA90[8,17]	TA90[8,17]
	TA90E[9,17]	TA90E[9,17]	TA90E[9,17]	TA90E[9,17]
		TA91[10,11]	TA91[10,11]	TA91[10,11]
VAXBI Tapes	RV20[D]	RV20[D]	RV20[D]	RV20[D]
	TK70[L,16]	TK70[L,16]	TK70[L,16]	TK70[L,16]
	TU81E	TU81E	TU81E	TU81E
Communication Devices	4 Maximum	4 Maximum	4 Maximum	4 Maximum
		DEMNA[5]	DEMNA[5]	DEMNA[5]
	DEBNI[5,7]	DEBNI[5,7]	DEBNI[5,7]	DEBNI[5,7]
VAXBI		DEBNA[5]	DEBNA[5]	DEBNA[5]
Communication Devices	DMB32[2]	DMB32[2]	DMB32[2]	DMB32[2]
	DHB32	DHB32	DHB32	DHB32
UNIBUS				
Communication Devices				
Modem/Pad	DF02	DF02	DF02	DF02
Devices	DF03	DF03	DF03	DF03
	DF112	DF112	DF112	DF112
	DF212	DF212	DF212	DF212
	DF224	DF224	DF224	DF224
	DF242	DF242	DF242	DF242
	DF296	DF296	DF296	DF296
		Micom Micro 800/X.25	Micom Micro 800/X.25	Micom Micro 800/X.25
Line Printers	1 Maximum	5 Maximum	5 Maximum	5 Maximum
Controller	DMB32	DMB32	DMB32	DMB32
				LP11
				LP32

Processor	DECsystem 5810 DECsystem 5820 DECsystem 5830 DECsystem 5840	VAX 6000-210 VAX 6000-220 VAX 6000-230 VAX 6000-240 VAXserver 6000-210 VAXserver 6000-220	VAX 6000-310 VAX 6000-320 VAX 6000-330 VAX 6000-340 VAX 6000-350 VAX 6000-360 VAXserver 6000-310 VAXserver 6000-320	VAX 6000-410 VAX 6000-420 VAX 6000-430 VAX 6000-440 VAX 6000-450 VAX 6000-460 VAXserver 6000-410 VAXserver 6000-420
Printer	LG01 LG02	LG01 LG02	LG01 LG02	LG01 LG02
	LN01 LN01S	LN01 LN01S	LN01 LN01S	LN01 LN01S
	LP27 LP29	LP27 LP29	LP27 LP29	LP27 LP29
	LPS20 LPS40	LPS20 LPS40	LPS20 LPS40	LPS20 LPS40
Serial Printers[8]	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324
	LCG01	LCG01	LCG01	LCG01
	LG02	LG02	LG02	LG02
	LG31	LG31	LG31	LG31
	LJ250	LJ250	LJ250	LJ250
	LN03 LN03R LN03S	LN03 LN03R LN03S	LN03 LN03R LN03S	LN03 LN03R LN03S
	LQP02 LQP03	LQP02 LQP03	LQP02 LQP03	LQP02 LQP03
	LVP16	LVP16	LVP16	LVP16
	DEClaser 1100/1150 [14]	DEClaser 1100/1150 [14]	DEClaser 1100/1150 [14]	DEClaser 1100/1150 [14]
	DEClaser 2100/2150 [14]	DEClaser 2100/2150 [14]	DEClaser 2100/2150 [14]	DEClaser 2100/2150 [14]
	DEClaser 2200/2250 [14]	DEClaser 2200/2250 [14]	DEClaser 2200/2250 [14]	DEClaser 2200/2250 [14]
	DEClaser 3200/3250 [14]	DEClaser 3200/3250 [14]	DEClaser 3200/3250 [14]	DEClaser 3200/3250 [14]
Asynchronous Terminals[8]	VT100 Series	VT100 Series	VT100 Series	VT100 Series
	VT200 Series	VT200 Series	VT200 Series	VT200 Series
	VT300 Series	VT300 Series	VT300 Series	VT300 Series
	VT420	VT420	VT420	VT420
	DECmate II/III	DECmate II/III	DECmate II/III	DECmate II/III

Processor	DECsystem 5810 DECsystem 5820 DECsystem 5830 DECsystem 5840	VAX 6000-210 VAX 6000-220 VAX 6000-230 VAX 6000-240 VAXserver 6000-210 VAXserver 6000-220	VAX 6000-310 VAX 6000-320 VAX 6000-330 VAX 6000-340 VAX 6000-350 VAX 6000-360 VAXserver 6000-310 VAXserver 6000-320	VAX 6000-410 VAX 6000-420 VAX 6000-430 VAX 6000-440 VAX 6000-450 VAX 6000-460 VAXserver 6000-410 VAXserver 6000-420
	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190
	PRO 350/380	PRO 350/380	PRO 350/380	PRO 350/380
	VAXmate	VAXmate	VAXmate	VAXmate

Notes:

1 Letter D = Data device only.
Letter L = Valid ULTRIX load device.

2 The asynchronous and the general purpose parallel interfaces as a printer port in DMA mode of the DMB32 are supported.

3 The KDB50 must be at microcode Revision Level K or greater.

4 A maximum of one UNIBUS tape controller per UBA.

5 Either one DELUA or one DEUNA controller can be configured on any UNIBUS adapter. VAX 8700 and VAX 8800 systems can have two UNIBUS adapters. All other systems are limited to one UNIBUS adapter. The maximum number of Ethernet adapters includes both BI and UNIBUS devices. LAT and DECnet traffic is restricted to one Ethernet. Each Ethernet must be connected to a separate network or subnetwork in a routing configuration.

6 A maximum of one CI interface per system is supported.

7 The DEBNI is a high-speed BI-to-Ethernet adapter intended as a replacement for the existing DEBNA. The DEBNI is available as either a new module or firmware upgrade option to an existing DEBNA.

8 The TA90 must be connected to an HSC running V3.90A or later.

9 The TA90E must be connected to an HSC running V5.0 or later.

10 The TA91 must be connected to an HSC running V4.0 or later.

11 The TA91 is supported in KDM70 Software V3.0.

12 The CIXCD must be at revision 2.2 or higher.

13 Supported configurations are:
- VAX 6000-410 with 1 attached vector processor
- VAX 6000-420 with 1 attached vector processor
- VAX 6000-420 with 2 attached vector processors

14 DEClaser support is equivalent to that which is available for the LN03, LN03R, and LN03S printers.

15 HSC40, HSC50, HSC70, HSC90 only.

16 Accepts TK50 distribution media.

17 Automatic stack loader tape drives are supported only by the dump, restore and cpio system utilities.

Processor	**VAX 6000-510** **VAX 6000-520** **VAX 6000-530** **VAX 6000-540** **VAX 6000-550** **VAX 6000-560** **VAXserver 6000-510** **VAXserver 6000-520**	**VAX 8200** **VAX 8250**	**VAX 8300** **VAX 8350**	**VAX 8500**[18] **VAX 8530**[18]
Floating Point Unit	Integral	Integral	Integral	
Vectors	Yes (19)			
I/O Adapters				
- VAXCI	2	1	1	1
- VAXBI	6	1	1	2
- SBI				
- UNIBUS		1 DWBUA	1 DWBUA	1 DWBUA
- MASSBUS				
CI Adapters	CIBCA-BA[12] CIXCD[12]	CIBCI[12]	CIBCI[12] CIBCA-AA CIBCA-BA[12]	CIBCI[12] CIBCA-AA CIBCA-BA[12]
Disk Drives	96 Maximum	96 Maximum	96 Maximum	96 Maximum
Controller	12 KDB50[5]	4 KDB50[5]	4 KDB50[5]	4 KDB50[5]
	HSC[21]	HSC[21]	HSC[21]	HSC[21]
	KDM70			
Drives				
	ESE20[D]	ESE20[D]	ESE20[D]	ESE20[D]
	RA60	RA60	RA60	RA60
	RA70	RA70	RA70	RA70
	RA71	RA71	RA71	RA71
	RA72	RA72	RA72	RA72
	RA73	RA73	RA73	RA73
	RA80	RA80	RA80	RA80
	RA81	RA81	RA81	RA81
	RA82	RA82	RA82	RA82
	RA90	RA90	RA90	RA90
	RA92	RA92	RA92	RA92
UNIBUS Disks		4 Maximum	4 Maximum	4 Maximum
Controller		1 UDA50[6]	1 UDA50[6]	1 UDA50[D,6]
Drives		RA60	RA60	RA60

Processor	VAX 6000-510 VAX 6000-520 VAX 6000-530 VAX 6000-540 VAX 6000-550 VAX 6000-560 VAXserver 6000-510 VAXserver 6000-520	VAX 8200 VAX 8250	VAX 8300 VAX 8350	VAX 8500[18] VAX 8530[18]
		RA70	RA70	RA70
		RA71	RA71	RA71
		RA72	RA72	RA72
		RA73	RA73	RA73
		RA80	RA80	RA80
		RA81	RA81	RA81
		RA82	RA82	RA82
		RA90	RA90	RA90
		RA92	RA92	RA92
Magnetic Tapes	6 Maximum	6 Maximum	6 Maximum	6 Maximum
CI Tapes	TA78	TA78	TA78	TA78
	TA79	TA79	TA79	TA79
	TA81	TA81	TA81	TA81
	TA90[14,23]			TA90[14,23]
	TA90E[15,23]			TA90E[15,23]
	TA91[16,17]			
VAXBI Tapes	RV20[D]	RV20[D]	RV20[D]	RV20[D]
	TK70[L,22]			
	TU81E	TU81E[L]	TU81E[L]	TU81E[L]
UNIBUS Tapes[7]				
Tapes		TS11[L]	TS11[L]	
		TS05	TS05	
		TU80[L]	TU80[L]	
		TU81[L]	TU81[L]	
		TU81E[L]	TU81E[L]	
		TUK50	TUK50	
Communication Devices	4 Maximum	3 Maximum	4 Maximum	4 Maximum
	DEBNI[11,13]	DEBNI[11,13]	DEBNI[11,13]	DEBNI[11,13]
	DEMNA[11]			
VAXBI	DEBNA[11]	DEBNA[11]	DEBNA[11]	DEBNA[11]

Processor	VAX 6000-510 VAX 6000-520 VAX 6000-530 VAX 6000-540 VAX 6000-550 VAX 6000-560 VAXserver 6000-510 VAXserver 6000-520	VAX 8200 VAX 8250	VAX 8300 VAX 8350	VAX 8500[18] VAX 8530[18]
Communication Devices	DMB32[3]	DMB32[3]	DMB32[3]	DMB32[3]
	DHB32	DHB32	DHB32	DHB32
UNIBUS		DELUA[11]	DELUA[11]	DELUA[11]
Communication Devices		DEUNA[11]	DEUNA[11]	DEUNA[11]
		DMR11[4]	DMR11[4]	DMR11[4]
		DHU11	DHU11	DHU11
		DMF32[2]	DMF32[2]	DMF32[2]
		DMZ32	DMZ32	DMZ32
		DUP11[10]	DUP11[10]	DUP11[10]
		DZ11	DZ11	DZ11
Modem/Pad Devices	DF02	DF02	DF02	DF02
	DF03	DF03	DF03	DF03
	DF112	DF112	DF112	DF112
	DF126[9]	DF126[9]	DF126[9]	DF126[9]
	DF212	DF212	DF212	DF212
	DF224	DF224	DF224	DF224
	DF242	DF242	DF242	DF242
	DF296	DF296	DF296	DF296
	Micom Micro	Micom Micro	Micom Micro	Micom Micro
	800/X.25	800/X.25	800/X.25	800/X.25
Line Printers	5 Maximum	5 Maximum	5 Maximum	5 Maximum
Controller	DMB32	DMB32	DMB32	DMB32
	LP11	LP11	LP11	LP11
	LP32	LP32	LP32	LP32
Printer	LG01 LG02	LG01 LG02	LG01 LG02	LG01 LG02
	LN01 LN01S	LN01 LN01S	LN01 LN01S	LN01 LN01S
	LP27 LP29	LP27 LP29	LP27 LP29	LP27 LP29
	LPS20 LPS40	LPS20 LPS40	LPS20 LPS40	LPS20 LPS40

Processor	VAX 6000-510 VAX 6000-520 VAX 6000-530 VAX 6000-540 VAX 6000-550 VAX 6000-560 VAXserver 6000-510 VAXserver 6000-520	VAX 8200 VAX 8250	VAX 8300 VAX 8350	VAX 8500[18] VAX 8530[18]
Serial Printers[8]	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324
	LCG01	LCG01	LCG01	LCG01
	LG02	LG02	LG02	LG02
	LG31	LG31	LG31	LG31
	LJ250	LJ250	LJ250	LJ250
	LN03 LN03R LN03S	LN03 LN03R LN03S	LN03 LN03R LN03S	LN03 LN03R LN03S
	LQP02 LQP03	LQP02 LQP03	LQP02 LQP03	LQP02 LQP03
	LVP16	LVP16	LVP16	LVP16
	DEClaser 1100/1150 [20]	DEClaser 1100 /1150 [20]	DEClaser 1100 /1150 [20]	DEClaser 1100/1150 [20]
	DEClaser 2100/2150 [20]	DEClaser 2100 /2150 [20]	DEClaser 2100 /2150 [20]	DEClaser 2100/2150 [20]
	DEClaser 2200/2250 [20]	DEClaser 2200 /2250 [20]	DEClaser 2200 /2250 [20]	DEClaser 2200/2250 [20]
	DEClaser 3200/3250 [20]	DEClaser 3200 /3250 [20]	DEClaser 3200 /3250 [20]	DEClaser 3200/3250 [20]
Asynchronous Terminals[8]	VT100 Series	VT100 Series	VT100 Series	VT100 Series
	VT200 Series	VT200 Series	VT200 Series	VT200 Series
	VT300 Series	VT300 Series	VT300 Series	VT300 Series
	VT420	VT420	VT420	VT420
	DECmate II/III	DECmate II/III	DECmate II/III	DECmate II/III
	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190
	PRO 350/380	PRO 350/380	PRO 350/380	PRO 350/380
	VAXmate	VAXmate	VAXmate	VAXmate

Notes:

1 Letter D = Data device only.
Letter L = Valid ULTRIX load device.

2 The asynchronous and the general purpose parallel interfaces as a printer port in DMA mode of the DMF32 are supported.

[3] The asynchronous and the general purpose parallel interfaces as a printer port in DMA mode of the DMB32 are supported.

[4] The DMR11 is supported using TCP/IP and DECnet over full- and half-duplex point-to-point DDCMP sync lines. DMC mode is used for backwards compatibility.

[5] The KDB50 must be at microcode Revision Level K or greater.

[6] UDA50 must be at microcode Revision Level 4 or greater.

[7] A maximum of one UNIBUS tape controller per UBA.

[9] The DF126 can only be used with the DUP11 device (IBM 2780/3780 emulation); maximum baud rate 2400.

[10] The DUP11 can only be used for 2780/3780 emulation.

[11] Either one DELUA or one DEUNA controller can be configured on any UNIBUS adapter. VAX 8700 and VAX 8800 systems can have two UNIBUS adapters. All other systems are limited to one UNIBUS adapter. The maximum number of Ethernet adapters includes both BI and UNIBUS devices. LAT and DECnet traffic is restricted to one Ethernet. Each Ethernet must be connected to a separate network or subnetwork in a routing configuration.

[12] A maximum of two CI interfaces per system is supported. Configurations include two CIXCDs on the XMI or one CIXCD on the XMI and one CIBCA-BA on the VAXBI. The CIXCD must be at revision 2.2.

[13] The DEBNI is a high-speed BI-to-Ethernet adapter intended as a replacement for the existing DEBNA. The DEBNI is available as either a new module or firmware upgrade option to an existing DEBNA.

[14] The TA90 must be connected to an HSC running V3.90A or later.

[15] The TA90E must be connected to an HSC running V5.0 or later.

[16] The TA91 must connect to an HSC running V4.0 or later.

[17] The TA91 is supported in KDM70 Software V3.0.

[18] Console software for the VAX 8530, VAX 8550, VAX 8700 and VAX 8800 must be at Version 4.0 or greater.

[19] Supported configurations are:
VAX 6000-510 with 1 attached vector processor
VAX 6000-520 with 1 attached vector processor
VAX 6000-520 with 2 attached vector processors

[20] DEClaser support is equivalent to that which is available for the LN03, LN03R, and LN03S printers.

[21] HSC40, HSC50, HSC70, HSC90 only.

[22] Accepts TK50 distribution media.

[23] Automatic stack loader tape drives are supported only by the dump, restore and cpio system utilities.

Processor	**VAX 8550**[11]	**VAX 8600**[5,12] **VAX 8650**[6]	**VAX 8700**	**VAX 8800** **VAX 8810**	**VAX 8820** **VAX 8830** **VAX 8840**
Floating Point Unit	Integral	FP86	Integral	Integral	Integral
I/O Adapters					
- VAXCI	1	1	1	1	1
- VAXBI	2		4	4	6
- SBI		1 DB86			
- UNIBUS	1 DWBUA	6 DW780	2 DWBUA[9]	2 DWBUA[9]	
- MASSBUS		4 RH780			
Disk Drives	96 Maximum	96 Maximum	96 Maximum	96 Maximum	96 Maximum
VAXBI Disks					
Controller	4 KDB50[7]	6 UDA50	8 KDB50[7]	9 KDB50[7]	12 KDB50[7]
	RA60	RA60	RA60	RA60	RA60
	RA70	RA70	RA70	RA70	RA70
	RA71	RA71	RA71	RA71	RA71
	RA72	RA72	RA72	RA72	RA72
	RA73	RA73	RA73	RA73	RA73
	RA80	RA80	RA80	RA80	RA80
	RA81	RA81	RA81	RA81	RA81
	RA82	RA82	RA82	RA82	RA82
	RA90	RA90	RA90	RA90	RA90
	RA92	RA92	RA92	RA92	RA92
UNIBUS Disks					
Controller Drives	1 UDA50^{D}[,8]	8 UDA50[8,9,10]	2 UDA50^{D}[,8,9]	2 UDA50^{D}[,8,9]	
	RA60	RA60	RA60	RA60	
	RA70	RA70	RA70	RA70	
	RA71	RA71	RA71	RA71	
	RA72	RA72	RA72	RA72	
	RA73	RA73	RA73	RA73	
	RA80	RA80	RA80	RA80	
	RA81	RA81	RA81	RA81	
	RA82	RA82	RA82	RA82	
	RA90	RA90	RA90	RA90	
	RA92	RA92	RA92	RA92	
MASSBUS Disks		32 Maximum			

Processor	VAX 8550[11]	VAX 8600[5,12] VAX 8650[6]	VAX 8700	VAX 8800 VAX 8810	VAX 8820 VAX 8830 VAX 8840
		RM05			
		RP07[D]			
Magnetic Tapes	6 Maximum	6 Maximum	6 Maximum	6 Maximum	6 Maximum
CI Adapters	CIBCA-AA CIBCA-BA	CI780	CIBCI CIBCA-AA CIBCA-BA	CIBCI CIBCA-AA CIBCA-BA	CIBCI CIBCA-AA CIBCA-BA
CI Tapes	TA78	TA78	TA78	TA78	TA78
	TA79	TA79	TA79	TA79	TA79
	TA81	TA81	TA81	TA81	TA81
	TA90[18,23]	TA90[18,23]	TA90[18,23]	TA90[18,23]	TA90[18,23]
	TA90E[19,23]	TA90E[19,23]	TA90E[19,23]	TA90E[19,23]	TA90E[19,23]
VAXBI Tapes	TU81E[L]		TU81E[L]	TU81E[L]	TU81E[L]
	RV20		RV20	RV20	RV20
UNIBUS Tapes					
Controller		TSU05			
Tapes		TS11[L]			
		TS05			
		TU80[L]			
		TU81[L]			
		TU81E[L]			
		TUK50[L,22]			
MASSBUS Tapes					
Controller		TM03			
		TM78			
Tapes		TE16[L]			
		TU77[L]			
		TU78[L]			
		TU79[L]			
Communication Devices[13]	4 Maximum	4 Maximum	4 Maximum	3 Maximum	
VAXBI Communication Devices	DEBNI[15,17]		DEBNI[15,17]	DEBNI[15,17]	DEBNI[15,17]

Processor	VAX 8550[11]	VAX 8600[5,12] VAX 8650[6]	VAX 8700	VAX 8800 VAX 8810	VAX 8820 VAX 8830 VAX 8840
	DEBNA[15]		DEBNA[15]	DEBNA[15]	DEBNA[15]
	DMB32[13]	DMB32[3]	DMB32[3]	DMB32[3]	DMB32[3]
	DHB32		DHB32	DHB32	DHB32
UNIBUS Communication Devices	DELUA[15]	DELUA[15]	DELUA[15]	DELUA[15]	
	DEUNA[15]	DEUNA[15]	DEUNA[15]	DEUNA[15]	
	DMR11[4]	DMR11[4]	DMR11[4]	DMR11[4]	
	DHU11	DHU11	DHU11	DHU11	
	DMF32[2]	DMF32[2]	DMF32[2]	DMF32[2]	
	DMZ32	DMZ32	DMZ32	DMZ32	
	DUP11[14]	DUP11[14]	DUP11[14]	DUP11[14]	
	DZ11	DZ11	DZ11	DZ11	
Modem/Pad Devices	DF02	DF02	DF02	DF02	DF02
	DF03	DF03	DF03	DF03	DF03
	DF112	DF112	DF112	DF112	DF112
	DF126[13]	DF126[13]	DF126[13]	DF126[13]	DF126[13]
	DF212	DF212	DF212	DF212	DF212
	DF224	DF224	DF224	DF224	DF224
	DF242	DF242	DF242	DF242	DF242
	DF296	DF296	DF296	DF296	DF296
	Micom Micro	Micom Micro	Micom Micro	Micom Micro	Micom Micro
	800/X.25	800/X.25	800/X.25	800/X.25	800/X.25
Line Printers	5 Maximum	5 Maximum	5 Maximum	5 Maximum	5 Maximum
Controller	DMB32		DMB32	DMB32	DMB32
	LP11	LP11	LP11	LP11	
	LP32	LP32	LP32	LP32	
Printer	LG01 LG02	LG01 LG02	LG01 LG02	LG01 LG02	LG01 LG02
	LN01 LN01S	LN01 LN01S	LN01 LN01S	LN01 LN01S	LN01 LN01S
	LP27 LP29	LP27 LP29	LP27 LP29	LP27 LP29	LP27 LP29
	LPS20 LPS40	LPS20 LPS40	LPS20 LPS40	LPS20 LPS40	LPS20 LPS40

Processor	VAX 8550[11]	VAX 8600[5,12] VAX 8650[6]	VAX 8700	VAX 8800 VAX 8810	VAX 8820 VAX 8830 VAX 8840
Serial Printers	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324
	LCG01	LCG01	LCG01	LCG01	LCG01
	LG02	LG02	LG02	LG02	LG02
	LG31	LG31	LG31	LG31	LG31
	LJ250	LJ250	LJ250	LJ250	LJ250
	LN03 LN03R LN03S	LN03 LN03R LN03S	LN03 LN03R LN03S	LN03 LN03R LN03S	LN03 LN03R LN03S
	LQP02 LQP03	LQP02 LQP03	LQP02 LQP03	LQP02 LQP03	LQP02 LQP03
	LVP16	LVP16	LVP16	LVP16	LVP16
	DEClaser 1100 /1150 [20]	DEClaser 1100 /1150 [20]	DEClaser 1100 /1150 [20]	DEClaser 1100 /1150 [20]	DEClaser 1100/1150 [20]
	DEClaser 2100 /2150 [20]	DEClaser 2100 /2150 [20]	DEClaser 2100 /2150 [20]	DEClaser 2100 /2150 [20]	DEClaser 2100/2150 [20]
	DEClaser 2200 /2250 [20]	DEClaser 2200 /2250 [20]	DEClaser 2200 /2250 [20]	DEClaser 2200 /2250 [20]	DEClaser 2200/2250 [20]
	DEClaser 3200 /3250 [20]	DEClaser 3200 /3250 [20]	DEClaser 3200 /3250 [20]	DEClaser 3200 /3250 [20]	DEClaser 3200/3250 [20]
Asynchronous Terminals	VT100 Series	VT100 Series	VT100 Series	VT100 Series	VT100 Series
	VT200 Series	VT200 Series	VT200 Series	VT200 Series	VT200 Series
	VT300 Series	VT300 Series	VT300 Series	VT300 Series	VT300 Series
	VT420	VT420	VT420	VT420	VT420
	DECmate II	DECmate II	DECmate II	DECmate II	DECmate II
	DECmate III	DECmate III	DECmate III	DECmate III	DECmate III
	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190
	PRO 350/380	PRO 350/380	PRO 350/380	PRO 350/380	PRO 350/380
	VAXmate	VAXmate	VAXmate	VAXmate	VAXmate

Notes:

[1] Letter D = Data device only.
Letter L = Valid ULTRIX load device.

[2] The asynchronous and the general purpose parallel interfaces as a printer port in DMA mode of the DMF32 are supported.

[3] The asynchronous and the general purpose parallel interfaces as a printer port in DMA mode of the DMB32 are supported.

[4] The DMR11 is supported using TCP/IP and DECnet over full- and half-duplex point-to-point DDCMP sync lines. DMC mode is used for backwards compatibility.

5 The VAX 8600 CPU must be at hardware Revision Level K or greater.

6 The VAX 8650 CPU must be at hardware Revision Level A1 or greater.

7 The KDB50 must be at microcode Revision Level K or greater.

8 UDA50 must be at microcode Revision Level 4 or greater.

9 Each UDA50 must be configured on a different UNIBUS adapter.

10 On the VAX 8600 and VAX 8650, the eighth UDA50 can only be configured on the last UNIBUS adapter.

11 Console software for the VAX 8530, VAX 8550, VAX 8700 and VAX 8800 must be at Version 4.0 or greater.

12 Console software for the VAX 8600 and VAX 8650 must be at Version 2.0 or greater.

13 The DF126 can only be used with the DUP11 device (IBM 2780/3780 emulation); maximum baud rate 2400.

14 The DUP11 can only be used for 2780/3780 emulation.

15 Either one DELUA or one DEUNA controller can be configured on any UNIBUS adapter. VAX 8700 and VAX 8800 systems can have two UNIBUS adapters. All other systems are limited to one UNIBUS adapter. The maximum number of Ethernet adapters includes both BI and UNIBUS devices. LAT and DECnet traffic is restricted to one Ethernet. Each Ethernet must be connected to a separate network or subnetwork in a routing configuration.

17 The DEBNI is a high-speed BI-to-Ethernet adapter intended as a replacement for the existing DEBNA. The DEBNI is available as either a new module or firmware upgrade option to an existing DEBNA.

18 The TA90 must be connected to an HSC running V3.90A or later.

19 The TA90E must be connected to an HSC running V5.0 or later.

20 DEClaser support is equivalent to that which is available for the LN03, LN03R, and LN03S printers.

21 HSC40, HSC50, HSC70, HSC90 only.

22 Accepts TK50 distribution media.

23 Automatic stack loader tape drives are supported only by the dump, restore and cpio system utilities.

Processor	**VAX 9000-110**[2] **VAX 9000-210 VAX 9000-410 (single XMI)**	**VAX 9000-310**[2] **VAX 9000-410 (2 XMIs)**	**VAX 9000-320** [2] **VAX 9000-420**
Floating Point	Integral	Integral	Integral
Vectors	Yes (16)	Yes (16)	Yes (16)
I/O Adapters			
- VAXCI	4	4	4
- VAXBI	6	6	6
CI Adapters[12]	CIXCD[12]	CIXCD[12]	CIXCD[12]
Disk Drives	96 Maximum	96 Maximum	96 Maximum
Controller	12 KDB50[3]	12 KDB50[3]	12 KDB50[3]
	HSC[11]	HSC[11]	HSC[11]
Drives	KDM70[15]	KDM70[15]	KDM70[15]
	ESE20[D]	ESE20[D]	ESE20 [D]
	RA60	RA60	RA60
	RA70	RA70	RA70
	RA71	RA71	RA71
	RA72	RA72	RA72
	RA73	RA73	RA73
	RA80	RA80	RA80
	RA81	RA81	RA81
	RA82	RA82	RA82
	RA90	RA90	RA90
	RA92	RA92	RA92
Magnetic Tapes	6 Maximum	6 Maximum	6 Maximum
CI Tapes	TA78	TA78	TA78
	TA79	TA79	TA79
	TA81	TA81	TA81
	TA90[6,19]	TA90[6,19]	TA90[6,19]
	TA90E[4,19]	TA90E[4,19]	TA90E[4,19]
	TA91[13,14]	TA91[13,14]	TA91[13,14]
VAXBI Tapes	RV20 [D]	RV20 [D]	RV20 [D]
	TU81E	TU81E	TU81E
	TK70 [L,18]	TK70 [L,18]	TK70 [L,18]

Processor	VAX 9000-110[2] VAX 9000-210 VAX 9000-410 (single XMI)	VAX 9000-310[2] VAX 9000-410 (2 XMIs)	VAX 9000-320 [2] VAX 9000-420
Communication Devices	4 Maximum	4 Maximum	4 Maximum
	DEMNA	DEMNA	DEMNA
	DEBNI[5]	DEBNI[5]	DEBNI[5]
	DEBNA	DEBNA	DEBNA
	DMB32[9]	DMB32[9]	DMB32[9]
	DHB32	DHB32	DHB32
Modem/Pad Devices	DF02	DF02	DF02
	DF03	DF03	DF03
	DF112	DF112	DF112
	DF212	DF212	DF212
	DF224	DF224	DF224
	DF242	DF242	DF242
	DF296	DF296	DF296
	Micom Micro	Micom Micro	Micom Micro
	800/X.25	800/X.25	800/X.25
Line Printers	5 Maximum	5 Maximum	5 Maximum
Controller	DMB32	DMB32	DMB32
	LP11	LP11	LP11
	LP32	LP32	LP32
	LG01 LG02	LG01 LG02	LG01 LG02
	LN01 LN01S	LN01 LN01S	LN01 LN01S
	LP27 LP29	LP27 LP29	LP27 LP29
	LPS20 LPS40	LPS20 LPS40	LPS20 LPS40
Serial Printers	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324	LA36 LA50 LA75 LA100 LA120 LA210 LA324
	LCG01	LCG01	LCG01
	LG02	LG02	LG02

Processor	VAX 9000-110[2] VAX 9000-210 VAX 9000-410 (single XMI)	VAX 9000-310[2] VAX 9000-410 (2 XMIs)	VAX 9000-320 [2] VAX 9000-420
	LG31	LG31	LG31
	LJ250	LJ250	LJ250
	LN03 LN03R LN03S	LN03 LN03R LN03S	LN03 LN03R LN03S
	LQP02 LQP03	LQP02 LQP03	LQP02 LQP03
	LVP16	LVP16	LVP16
	DEClaser 1100 /1150 [17]	DEClaser 1100 /1150 [17]	DEClaser 1100/1150 [17]
	DEClaser 2100 /2150 [17]	DEClaser 2100 /2150 [17]	DEClaser 2100/2150 [17]
	DEClaser 2200 /2250 [17]	DEClaser 2200 /2250 [17]	DEClaser 2200/2250 [17]
	DEClaser 3200 /3250 [17]	DEClaser 3200 /3250 [17]	DEClaser 3200/3250 [17]
Asynchronous	VT100 Series	VT100 Series	VT100 Series
Terminals	VT200 Series	VT200 Series	VT200 Series
	VT300 Series	VT300 Series	VT300 Series
	VT420	VT420	VT420
	DECmate II/III	DECmate II/III	DECmate II/III
	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190	Rainbow 100B Rainbow 100+ Rainbow 190
	PRO 350/380	PRO 350/380	PRO 350/80
	VAXmate	VAXmate	VAXmate

Notes:

1 Letter D = Data device only.
Letter L = Valid ULTRIX load device.

2 The VAX 9000 CPU must be at hardware Revision Level K or greater.

3 The KDB50 must be at microcode Revision Level K or greater.

5 The DEBNI is a high-speed BI-to-Ethernet adapter intended as a replacement for the existing DEBNA.

6 The TA90 must be connected to an HSC running V3.90A or later.

7 The TA90E must be connected to an HSC running V5.0 or later.

9 The asynchronous and general purpose parallel interfaces as a printer port in DMA mode of the DMB32 are supported.

11 Four HSCs per CI star couplers are supported.

12 Supported configurations are four CIXCDs on one XMI or two CIXCDs on each of the two XMIs. The CIXCD must be at revision 2.2

13 The TA91 must be connected to an HSC running V4.0 or later.

14 The TA91 is supported in KDM70 Software V3.0.

15 A maximum of three KDM70s is supported on one XMI system. For a dual XMI system, the supported configuration is two KDM70s on one XMI, and three KDM70s on the second XMI.

[16] Supported configurations are:
- VAX 9000-110 with 1 attached vector processor
- VAX 9000-210 with 1 attached vector processor
- VAX 9000-310 with 1 attached vector processor
- VAX 9000-320 with 1 attached vector processor
- VAX 9000-320 with 2 attached vector processors
- VAX 9000-410 with 1 attached vector processor
- VAX 9000-420 with 1 attached vector processor
- VAX 9000-420 with 2 attached vector processors

[17] DEClaser support is equivalent to that which is available for the LN03, LN03R, and LN03S printers.

[18] Accepts TK50 distribution media.

[19] Automatic stack loader tape drives are supported only by the dump, restore and cpio system utilities.

PACKAGING

- *Supported Subsets*

The definition of mandatory and optional subsets can be found in the *Guide to Installing ULTRIX*. Subsets with names that begin with *UDT* (ULTRIX RISC) and *ULT* (ULTRIX VAX) contain supported components.

- *Unsupported Subsets*

In addition to the supported components of ULTRIX, Digital provides components provided by 4.2BSD on an *as is* basis. This software is not warranted by Digital and no Software Performance Reports will be acknowledged or answered on any component of these subsets. Support service cannot be purchased for this software. The unsupported component software is provided on a separate distribution media, with the exception of the RA60 distribution and CDROM distribution, in which case the unsupported subset is contained in a separate partition on the disk. Subsets with names that begin with *UDX* (ULTRIX RISC) and *ULX* (ULTRIX VAX) are unsupported components.

- *Optional Encryption Software*

The option to include cryptographic software for the ULTRIX product is provided in binary format. This code permits the encryption and decryption of the contents of user files.

> **Note:** This software is not included in the base operating system because of U.S. State Department regulations regarding the shipment of cryptographic code outside the United States and Canada. Refer to the *SOFTWARE OPTIONS* section for ordering information.

PREREQUISITE SOFTWARE

None.

INSTALLATION

ULTRIX is classified as Customer Installed; however, Installation Services are available for those customers who desire installation of the software product by an experienced Digital Software Specialist.

SOFTWARE OPTIONS

- *For VAX Systems:*

QL-VEYA*-**	VAX Software Licenses
QA-VEYA*-H*	VAX Software Media
QL-0BJA9-BA	VAX Software Licenses for Encryption
QA-0BJAA-H*	VAX Software Media for Encryption
QB-0JQAA-E*	VAX Software License/Media for Sources

- *For RISC Systems:*

QL-VYVA*-**	RISC Software Licenses
QA-VYVAA*-H*	RISC Software Media
QA-YSJAA-H*	RISC Software Media for DEC C
QA-YSJAA-GZ	RISC Software Documentation for DEC C
QA-UP2AA-H5	RISC Software Media and Documentation for DEC LMF License Usage Monitor for ULTRIX
QT-VYVA*-**	RISC Software Services
QL-VV3A8-BA	RISC Software Licenses for Encryption
QA-VV3AA-H*	RISC Software Media for Encryption

Note: * denotes variant fields. For additional information on available licenses, services, and media, refer to the appropriate price book.

The above information is valid at time of release. Please contact your local Digital office for the most up-to-date information.

DOCUMENTATION

- *ULTRIX RISC/VAX Full Documentation Kit — QA-VEYAA-GZ*

The ULTRIX Full Documentation Kit contains documents describing the VAX and RISC operating systems. The ULTRIX Full Documentation Kit is divided into three subkits. The three kit division addresses the needs of three different audiences. Each subkit is orderable separately.

QA-VEYAB-GZ — Software Developers
QA-VEYAD-GZ — General Users
QA-VEYAE-GZ — System Administrators

- *Software Development Tools Documentation Kit: — QA-VEYAB-GZ*

This kit, designed for software developers and programmers contains three subkits. Each subkit is orderable separately.

QA-VEYAC-GZ — Supplementary Documents Kit
QA-VEYAG-GZ — Software Development Kit

QA-VEYAH-GZ — CDA Documentation Kit

- *General Information Kit: — QA-VEYAD-GZ*

This kit contains introductory and advanced user information, and one separately orderable subkit:

QA-VEYAF-GZ — ULTRIX Release Notes Kit

- *System and Network Management Documentation Kit — QA-VEYAE-GZ*

This kit contains manuals that describe how to configure systems, maintain disks, and set up and use system administration tools.

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