Software Product Description

PRODUCT NAME: IAS, Version 3.5 **SPD 14.65.19**
Interactive Application System

DESCRIPTION

IAS (Interactive Application System) is a general purpose operating system that runs on the following UNIBUS processors:

PDP–11/24, PDP–11/34, PDP–11/35, PDP–11/40, PDP–11/44, PDP–11/45, PDP–11/50, PDP–11/55, PDP–11/60 (excluding WCS), PDP–11/70, PDP–11/84, PDP–11/94

on the following Q–bus processors:

PDP–11/23 and PDP–11/23–PLUS with memory management unit and EIS

and on the following MicroPDP–11 Q–bus processors:

MicroPDP–11/83, MicroPDP–11/73, MicroPDP–11/53, MicroPDP–11/53+, MicroPDP–11/93

Through the system generation process, one of the following three operating modes of the system is selected:

- Real-time — A multi-tasking system primarily for real-time applications
- Multi-user — A real-time system with a timesharing scheduler for efficient multi-terminal support
- Timesharing — A superset of the other two modes that includes all the capabilities of the IAS system

All system features are not available in each operating mode; some of these exceptions are noted in *Table 1*.

IAS provides:

- Program and data protection
- An easy-to-use interactive and batch program development interface that operates concurrently with real-time processing
- General timesharing services for up to 32 simultaneous users (depending on hardware)
- An interactive interface for the system operator to allocate system resources in timesharing mode

In timesharing mode, IAS provides a real-time processing and timesharing executive that controls the interactive and batch processing facilities. Real-time, interactive, and batch processing can take place concurrently.

IAS requires only a single-user partition, but separate partitions can be used to assure adequate memory for real-time tasks. Real-time tasks are scheduled by priority, regardless of the partition in which they run. The timesharing partition is used for interactive, batch, and noncritical real-time tasks. The heuristic scheduler allocates resources to interactive tasks using a time slicing algorithm and dynamically computed priorities. If necessary, the scheduler swaps tasks in and out of memory from one or more swapping areas on disk.

The executive schedules and swaps batch tasks in the same manner as interactive tasks. Batch tasks usually receive the CPU time available after the execution of real-time and interactive tasks. It is possible, however, to guarantee that a minimum amount of the available CPU time, after real-time requirements, is allocated to batch processing.

IAS is oriented toward the interactive terminal user. In timesharing mode, each terminal is usually associated with a command language interpreter. This is a program that implements a specific user interface, and usually conducts a dialogue with the user and calls system services to carry out the user's requests.

A generic Command Language Interpreter (CLI), called Program Development System (PDS), is included with IAS. PDS includes a privileged superset of CLI, called Systems Control Interface (SCI), which is designed for the system operator's use in system control.

The system manager can define privileges and assign passwords for each PDS user to control the facilities an individual is allowed to invoke. All interactive and batch facilities can be made available to the usual PDS user.

PDS can:

- Provide access to multiple language processors, the file system utilities, and system status information

- Accept indirect command files for automatic command input
- Enable the user to submit batch command files
- Conditionally execute commands in either indirect command files or batch streams based on error tests
- Provide access to real-time program control commands
- Provide a mode for support of Monitor Console Routine (MCR) commands, as used on the RSX–11D system

SCI is the system operator's terminal interface. It enables the operator to control system resource allocation dynamically.

SCI can be:

- Invoked on the system console terminal by any user with appropriate privileges
- Used to control allocation of resources to users and CLI assignment to terminals
- Used to monitor system status and tune the system dynamically

PDS and most other system programs provided with IAS are shareable. Utility programs include:

- A complete set of file control utilities such as file dump, file verification, volume backup and restoration, disk save and compression, and file comparison
- Four editors: an interactive character-oriented editor (EDI), a line-oriented editor (SLP), the DEC Standard Editor (EDT), and a keypad editor (KED/K52)
- Program development utilities including the MACRO assembler, task builder, debugger, and RMS file maintenance utilities
- The system generation program
- The program library management program

Users writing their own CLIs or other application programs can call the Timesharing Control Services (TCS) for controlling and executing tasks and subtasks (timesharing mode only).

User-written interactive programs can:

- Share data through executive directives, including memory management directives and use event flags for intertask synchronization
- Be shared between users
- Execute concurrently with other application tasks, be timeshared and swapped

User-written CLIs can:

- Run other tasks at multiple levels
- Engage in intertask communication using send /receive directives or CLI command lines

User programs have access to the IAS file system, which is compatible with the RSX–11 family of operating systems. Two file access facilities are available: File Control Services (FCS) and Record Management Services (RMS–11).

RMS–11 supports three file organizations — Sequential, Relative and Multi-keyed Index Sequential (ISAM), and provides sequential and direct access models.

FCS supports sequential and direct access to sequentially and randomly organized files.

The use of the File Control Services (FCS) will increase the task size by approximately 2 Kbytes to 8 Kbytes, depending on the number of open files and services desired. The Record Management System (RMS) requires at least 8 Kbytes per task.

Protection is separately controlled for four categories of user (system, owner, group, world) and for four types of access (read, write, extend, delete). Magnetic tape labels are checked and ANSI standard (Level 3) Magtape format is supported.

A multi-stream BATCH facility is provided with IAS indirect command file processing capabilities. The batch commands are in PDS format, making the capability easy to use. Status is returned to the batch processor as each step is completed, allowing for conditionalized branching. The batch processor collects all print files from a batch stream and spools them along with the log file. The queue manager gives the system manager control over the multiple batch streams and print queues.

Other facilities are:

- Spooling of output to printers and noninteractive terminals
- Spooled batch input from record-oriented devices
- Accounting information recorded in timesharing mode for interactive and batch users showing CPU and memory usage and connect time
- Automatic logging (on disk) of peripheral device errors and memory parity errors
- Optional, user mode, diagnostic device exercisers for on-line checkout of selected peripherals
- Block mode terminal support
- Backup and restore utility (BRU)
- On-line, disk format utility (FMT) for drives that support that formatting. MSCP disk devices (RA and RC disks) are not user formatted devices.
- File sort and merge utilities (SORT/MERGE-11)

- Support for the Monitor Console Routines (MCR) including indirect MCR
- Memory Management Directives (PLAS)
- Shadow Recording — A technique used to increase data availability by recording information on two disks. Shadowed disk support, which allows one of two disks of the same type to be designed as a shadowed backup of the other disk mounted as a Files–11 volume. All writes to the primary drive are automatically written to the secondary. In the event of a read failure on the primary drive, the system will automatically read the data from the secondary drive.

Table 1
System Features Supported by Mode of Operation

	RT	MU	TS
Priority Scheduler	X	X	X
Heuristic Scheduler		X	X
General Purpose Timesharing			X
Volume Protection			X
Program and Data Protection	X	X	X
User-written CLIs			X
Concurrent RT, multi-user program development		X	X
PDS, with SCI	A	X	X
MCR	X	X	A
Print Spooling	X	X	X
Shareable Code	X	X	X
Shareable Data Areas	X	X	X
Utilities	X	X	X
Multi-tasking	X	X	X
PLAS	X	X	X
Accounting			X

X = Recommended operation

A = Available, but not recommended or supported

SOURCE CODE INFORMATION

Source code for most Device Handlers is provided with binary, single-use license options. DSA sources (e.g., T/MSCP handlers, HIBBR, UQSSP) are not included.

Any source code provided is on an ‘‘AS IS’’ basis without any warranty of any kind either express or implied.

INSTALLATION

Only experienced customers should attempt installation of this product. Digital recommends that all other customers purchase Digital’s Installation Services. These services provide for installation of the software product by an experienced Digital Software Specialist.

HARDWARE RESTRICTIONS

In some cases, not all hardware features of the options in the following *HARDWARE REQUIREMENTS* and *OPTIONAL HARDWARE* sections are supported. Hardware restrictions can limit the number of devices that a system can support, and there may be some combinations of devices that are mutually exclusive.

If the TK50 is used with utilities other than BRU (the Backup and Restore Utility), degraded performance and /or capacity of the TK50 should be expected.

IAS supports on-line formatting of RX33 diskettes. An RX50 format diskette can be read and written in an RX33 drive, but cannot be reformatted into the higher density RX33 format.

IAS supports the TU81E as a TU81.

For all hardware requirements specified, Digital Equipment Corporation produced or supplied hardware is assumed.

HARDWARE REQUIREMENTS

One of the following processor systems with bootstraps for the supported distribution and target system disk devices, KW11 clock, console terminal, and at least 256 Kbytes of memory:

- PDP–11/24, PDP–11/34, PDP–11/35, PDP–11/40, PDP–11/44, PDP–11/45, PDP–11/50, PDP–11/55, PDP–11/60 (excluding WCS), PDP–11/70, PDP–11/84, PDP–11/94, PDP–11/23 and PDP–11/23-PLUS with memory management unit and EIS, MicroPDP–11/83, MicroPDP–11/93, MicroPDP–11/73, MicroPDP–11/53 or the MicroPDP–11/53+

One of the following Digital IAS software distribution devices:

One of the following disk storage packages:

- RL21 disk system (includes one RL02 drive) and one additional RL02 drive

  or

  One of the following tape storage devices with appropriate UNIBUS or Q–bus controller:

- TU16, TE16, TU77, TS05, TS11, TU81, TK50

One of the following disk systems and one of the following magnetic tape systems:

Disks:

- RL21 disk system (includes one RL02 drive) and one additional RL02 drive
- RK611 disk pack controller (includes one RK06 drive)
- RPR11 disk pack controller (includes one RPR02 disk drive)
- RP11 disk pack controller (includes one RP03 disk drive)
- RJP04/05/06 (or RWP04/05/06/07 for 11/70) disk pack controller (includes RP04/05/06/07 drive)
- RM02/03/05 disk pack drives (with appropriate controller)
- RM50 disk drive (with RH70 controller)
- RK711 disk system (includes one RK07 drive)
- RA60, RA70, RA71, RA72, RA80, RA81, RA82, RA90, RA92 disk drives (with multiple KDA50 controllers per Q–bus system or up to two UDA50 controllers per UNIBUS system.)
- RC25 (with appropriate UNIBUS or Q–bus controller) fixed/removable disk subsystems.
- RD51, RD52, RD53, RD54, RD31, RD32 with RQDX-3 controller and optional RQDX-E expansion adapter (for table-top RD disk configurations)

Magnetic Tape:

One of the following controller/drive combinations:

- TM11/TU10, TMA11/TU10, TME11/TE10, TJU16 /TU16, TJE16/TE16, TJU77/TU77, TJU45/TU45, TS11/TS04, TU80, KLESI/TU81, TKU50/TK50
- TSU05/TS05 Magnetic Tape 1600 BPI (prerequisite for TS05 UNIBUS magnetic tape subsystems is any PDP–11/24, PDP–11/44 or PDP–11/84, or PDP–11 /94 system.)
- TKQ50/TK50, TSV05/TS05 (tape systems for MicroPDP–11 hardware configurations)

Tape systems for PDP–11/70s only:

- TWE16/TE16, TWU45/TU45, TWU77/TU77

Real-Time Systems

A 248 Kbyte PDP–11/34 system configured with a dual RL02 will support a single-user, real-time mode system. This configuration is the minimum supported for a single stream command system, and nonbatch program development is not recommended in this environment.

Multi-User System

A 256 Kbyte memory configuration with at least a dual RL02 is recommended for concurrent program development and application execution. This provides adequate space for FORTRAN 77 libraries, a background compilation of FORTRAN programs, and residency for several handler tasks.

Timesharing Systems

For UNIBUS systems:

A 768 Kbyte PDP–11/44, PDP–11/70, PDP–11/84, or PDP–11/94 system configured with an RP06, RM05, RA60, RA70, RA71, RA72, RA80, RA81, RA82, RA90, or RA92 disk drive is recommended for support of 10 to 12 terminal users executing both batch and interactive tasks.

For Q–bus systems:

A 1024 Kbyte MicroPDP–11/53, MicroPDP–11/53+, MicroPDP–11/73, MicroPDP–11/83, or MicroPDP–11/93 system configured with an RD53, RD54, RA60, RA70, RA71, RA72, RA80, RA81, RA82, RA90, or RA92 disk drive is recommended for support of 10 to 12 terminal users executing both batch and interactive tasks.

The 248 Kbyte PDP–11/34 system is the minimum for supporting a two-terminal system running either interactive or batch tasks. This system provides only a 40 Kbyte to 48 Kbyte user area depending on which device handlers are memory-resident.

OPTIONAL HARDWARE

- Additional memory for a system total of:

18-bit processors	248K bytes
PDP–11/44, PDP–11/70	3840K bytes
PDP–11/84, PDP–11/94	3840K bytes
22-bit Q–bus processors	4088K bytes (includes all supported MicroPDP–11s)

- FP11 Floating Point Processor
- KW11-L or KW11-WA/WB console interface and line frequency clock

I/O Peripherals:

- LA30, LA36, LA100, LA120, LT33, LT35, VT05, VT05B, VT50 terminal family, LA120, VT100 family, VT200 family, VT330/VT340[1]
- PR11 paper tape reader or PC11 paper tape reader /punch

[1] VT100 emulation mode only.

- CR11, CM11, CDA11-A or -E card reader
- CTS11 card reader/punch (available from Computer Special Systems)
- LA35, LS11, LA180, LP11, LP25 or LV11 line printer (plotter not supported by operating system)

Magnetic Tape Devices:

- TU10/TE10 Magnetic Tape Drives
- TU16/TE16 Magnetic Tape Drives
- TS03 Magnetic Tape Drive
- TU45 Magnetic Tape Drive
- TU81 1600/6250 BPI Magnetic Tape Drive
- TSU05/TS05 Magnetic Tape Drive (UNIBUS systems)
- TSV05/TS05 Magnetic Tape Drive (Q–bus systems)
- TU77 Magnetic Tape Drive
- TU56 DECtape Drive
- TU58 DECtape II Cartridge[2]
- TU60 Cassette Tape
- TS11/TS04 Magnetic Tape Drive
- TU80 Magnetic Tape Drive
- TU81-Plus Magnetic Tape Drive
- TKU50/TK50 Magnetic Tape Cartridge (for UNIBUS systems)
- TKQ50/TK50 Magnetic Tape Cartridge (for Q–bus systems)

Note: Different speed tape drives cannot be used on the same controller. IAS does not support tape streaming mode.

Disk Devices:

- RX01/RX02 Floppy Disk Systems
- RL01/RL02 Disk Pack Systems
- RK06/RK07 Disk Pack Systems
- RP02/RP03/RPR02 Disk Pack Systems
- RP04/RP05/RP06 Disk Pack Systems
- RM02/RM03/RM05/RM80 Disk Pack Systems
- RA60/RA70/RA71/RA72/RA80/RA81/RA82/ RA90/RA92 Disk Systems
- RC25 Disk Systems
- RX50 0.8 Mbyte Diskette Drive (with appropriate UNIBUS or Q–bus controller)
- RX33 1.2 Mbyte Diskette Drive (with appropriate UNIBUS or Q–bus controller)
- RD51, RD52, RD53, RD54, RD31, RD32 (with RQDX-3 controller and optional RQDX-E expander module)

Communications:

- DL11 serial single line interface
- DJ11 serial line multiplexer
- DH11 programmable serial line multiplexer
- DM11-BB modem control multiplexer for DH11
- DZ11 serial 8-line multiplexer
- DHU11 16-line asynchronous multiplexer
- DHV11, DHQ11 8-line asynchronous multiplexer
- DZV11, DZQ11 4-line asynchronous multiplexer
- DHF11 32-line asynchronous multiplexer (Q–bus)

Laboratory/Industrial Control:

- AD01 analog/digital converter
- AFC11 analog/digital converter
- UDC11 Universal Digital Controller
- IDA11-AA contact sense module
- IDA11-AB contact sense module
- IDA11-BA contact interrupt module
- IDA11-BB contact interrupt module
- IDA11-CA I/O converter
- IDA11-DA solid state AC/DC driver
- IDA11-EA flip-flop DC driver
- IDA11-FA single shot driver
- IDA11-GA latching output relay
- IDA11-HA flip-flop output relay
- IDA11-JA single shot output relay
- IAA11-AA multi-range A/D converter
- IAA11-BA D/A converter
- IAA11-BB D/A converter
- IAA11-BC D/A converter
- IAA11-BD D/A converter

Data Acquisition:

- LPS11 Laboratory Peripheral System with LPS11-S, SPSAD-12, LPSKW, and LPSDR-A. Options are:
  - — BA408 gain ranging option for LPS11
  - — LPSAM multiplexer expansion to LPSAD-12

[2] The TU58 is to be used in a stand-alone, lightly loaded environment. If used as a file device in a heavily loaded environment, it can degrade system performance.

— LPSAM-SG gain ranging option to LPSAM

— LPSVC digital/analog converters and display control

— LPSAM-E multiplexer expansion (requires LPS11-E in place of LPS11-S)

SOFTWARE REQUIREMENTS

None

OPTIONAL SOFTWARE

- PDP–11 FORTRAN–77/IAS V5.0 (SPD 14.50.xx)
- DATATRIEVE–11 V3.3 (SPD 12.48.xx)

SOFTWARE LICENSING

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SOFTWARE PRODUCT SERVICES

A variety of service options are available. For more information on these or other services, please contact your local Digital office.

SOFTWARE TRAINING

The IAS System Management self-paced training course is a text-based course that describes how to install, configure, and manage an IAS Operating System environment. The first section of the course covers information on the IAS utilities and commands and is prerequisite material for the second section that describes how to manage the IAS Operating System.

The course may be ordered with the part number: EY-C212E-PR-0001

SOURCE MATERIALS OPTIONS

Users can obtain optional source materials for this software product, excluding DSA sources (e.g., T/MSCP handlers, HIBBR, UQSSP), by signing Digital's Software Program Sources License Agreement and then purchasing the source option(s) needed. The agreement entitles users to use the source materials at one customer facility or location specified in the agreement. Most users do not require source materials. They are used primarily to make modifications to the software product. Source kits provided by Digital do not necessarily contain all source files used by Digital to build binary kits.

Source License and Sources Distribution Option

This option provides users with the machine-readable source code for this software product. It gives users the right to use the source code on any CPU at the facility/location specified in the agreement which has a Single-Use License for the object code.

Sources Distribution Option

This option provides users with the revised version of the machine-readable source code for this software product. Users must have purchased the Source License and Source Distribution Option to obtain this option.

Sources Distribution and Listings Option

This option provides users with the revised version of the machine-readable source code and listings for this software product. Users must have purchased the Source License and Source Distribution and Listings Option to obtain this option.

SOFTWARE WARRANTY

Warranty for this software product is provided by Digital with the purchase of a license for the product as defined in the Software Warranty Addendum of this SPD.

SOFTWARE OPTIONS CHART

The distribution Media Codes used in the Software Options Chart are described below. The desired Media Code is specified at the end of the Order Number, e.g., QR330-HD = binaries on 9-track 800 BPI Magtape (NRZI).

When ordering this product for installation on TU81 tape drives, use part number QRV65-*M.

D = 9-track 800 BPI Magtape (NRZI)

H = RL02 Disk Cartridge

M = 9-track 1600 BPI Magtape (PE)

Z = No hardware dependency

5 = TK50 Tape Cartridge

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

LICENSE OPTIONS: A LICENSE IS REQUIRED FOR EACH CPU	ORDER NUMBER
Single-Use License	QR330-UZ (for UNIBUS)
	QRV65-UZ (for UNIBUS)
	QY330-UZ (for Q–bus)

MATERIALS AND SERVICE OPTIONS:	ORDER NUMBER
Distribution and Documentation Option	QR330-HD
	QR330-HH
	QR330-HM
	QR330-H5
	QRV65-HM
Software Revision Right-to-Copy Option	QR330-HZ
Documentation-Only Option	QR330-GZ
Installation Service Option	QR330-ID
	QR330-IH
	QR330-IM
	QR330-I5
	QRV65-IM
DECsupport Service	QR330-9D
	QR330-9H
	QR330-9M
	QR330-95
	QRV65-9M
Basic Service	QR330-8D
	QR330-8H
	QR330-8M
	QR330-85
	QRV65-8M
Self-Maintenance Service	QR330-3D
	QR330-3H
	QR330-3M
	QR330-35
	QRV65-3M

SOURCE MATERIALS OPTIONS:	ORDER NUMBER
Source License and Sources Distribution	QR330-EM
Sources Distribution	QR330-NM
Sources Distribution and Listings	QR330-FR