

Software Product Description

PRODUCT NAME: RT-11, Version 2C, Single-User Operating System

SPD 12.1.4

DESCRIPTION:

RT-11 is a single-user operating system designed for interactive program development and/or on-line applications on the PDP-11. RT-11 supports both single job (S/J) and foreground/background (F/B) modes of processing. In addition to a variety of system and program development utilities, RT-11 offers optional support of a number of high-level language processors, including FORTRAN IV and BASIC (see OPTIONAL SOFTWARE SUPPORTED below).

The RT-11 operating system is delivered with both the single job (S/J) monitor and the foreground/background (F/B) monitor. The F/B monitor allows two programs to operate: a foreground program and a background program. The real-time function is accomplished in the foreground, which has priority on system resources. Functions which do not have critical response time requirements, e.g., program development, are accomplished in the background, which operates whenever the foreground is not busy. Within their priorities, both foreground and background are complete RT-11 systems with access to all system capabilities. Although they operate independently, foreground and background can communicate through disk files and/or message transmission areas in memory. The user not requiring F/B operation can use the S/J monitor, which requires less memory and lower overhead. Should the user's requirements change, a program can be executed under the F/B monitor as a background program with no modification.

RT-11 system features include:

Ease-of-use - RT-11 is designed for the single, interactive user. The keyboard commands are consistent in format and easy to understand. System messages are clear and concise.

Contiguous File Structure - The RT-11 contiguous file structure requires a minimum number of directory accesses, thereby providing fast and efficient file manipulation.

Configuration Independence - The RT-11 system provides device-independent I/O programming. For example, at run-time the user can select to send output directly to a printer or write it to a disk file for later printing. In addition, the system operates without modification on any memory size from 8K to 28K words.

Flexible Real-Time I/O - RT-11 has been designed to satisfy a wide variety of input/output requirements by providing three modes of I/O operation:

- Synchronous I/O, where processing is suspended until the completion of the I/O event.
- Asynchronous I/O, where an I/O event is started, and processing continues until a user-defined point is reached. Processing is then suspended until the I/O event is completed.
- Event-driven I/O, where an I/O event is started, and processing continues until the I/O event completes. Processing is then interrupted to service the completed I/O event.

Low System Overhead - The RT-11 S/J monitor requires less than 2K words of permanent memory to provide system control and I/O for the system device and the operator's terminal. F/B operation adds less than 2K words to this requirement. Its modular structure enables other functions to be swapped in as needed. On the other hand, if the program's memory requirements allow it, the complete monitor stays resident in memory to further increase system responsiveness.

Ease of Expansion - The RT-11 system supports a wide range of PDP-11 peripherals. Beyond that, the modularity of the I/O system allows users with unique devices to easily interface them merely by writing a device handler, adding it to the system as a file, and modifying a small number of locations in the monitor. When a new peripheral handler is added to an RT-11 system, all properly coded programs may immediately use the device without requiring additional coding or reassembly.

Industry Compatible Magnetic Tape - RT-11 supports 7- or 9-track industry compatible magtape with ANSI compatible labels and fixed-length blocks.

BATCH - RT-11 BATCH is a complete job control subsystem which provides batch-mode processing of user jobs. In the F/B environment, BATCH processes job streams in the background partition, allowing real-time or other user jobs to run in the foreground. The BATCH run-time support package (which is resident only when BATCH is running) requires only 1K words of memory. RT-11 BATCH may be used in either S/J monitor configurations of 12K or more words of memory, or in any F/B configuration.

RT-11 system programs include:

EDIT - The RT-11 text editor is used to create and modify ASCII text files. Both character and line oriented commands have been included, along with full provisions for command interaction, powerful editing macros, and run-time file manipulation.

MACRO-11 - With 16K or more words of memory, MACRO-11 provides full macro programming under RT-11. It has the facilities for maintaining and using a macro library on the RT-11 system device as well as CREF (Cross REFerence) listing, conditional assembly directives and pseudo-operators. In 8K word systems, or when it is necessary to conserve background space, a macro expander is used with the assembler to produce a selected subset of the full macro language. This is sufficient to support all library functions required by the operating system. Either configuration offers the convenience of global symbols for linking object modules and extensive error diagnostics.

LINKER - The RT-11 Linker (LINK) converts the relocatable object modules produced by the assembler or optional compilers into a run-time format. Services performed by LINK include converting relative addresses to absolute addresses, linking global references among object modules and initializing all parameters required by the monitor to save and run a program.

Overlays do not require any special instructions or function calls. The user designates an overlay structure at Linker command time, and the Linker automatically produces a runnable memory image with the desired overlays. While ease of use has been paramount, the power of the overlay system has not been compromised. The system allows any number of overlays in any number of memory areas, subject only to memory size.

PIP - The RT-11 Peripheral Interchange Program is a file transfer and maintenance program that uses the same concepts found in PIP utilities on other DIGITAL systems. RT-11 PIP may be used to perform commonly required file operations, such as to transfer files between any supported peripheral devices, perform directory operations such as the initializing of a device directory or renaming a file on a directory device.

LIBRARIAN - The RT-11 Librarian, LIBR, is used to create and maintain libraries of commonly used subroutines. The Linker uses the libraries (as specified by the user) to resolve undefined external symbols.

ODT - The On-line Debugging Technique utility aids in debugging assembled and linked object programs interactively.

UTILITIES - Several other program development utilities are provided. DUMP allows the contents of a file to be printed in various formats. SRCCOM is an ASCII file-comparison program which helps locate the changes made in source files. FILEX allows transfer of RT-11 files to and from other DIGITAL operating system environments. PATCH and PATCHO allow memory images and relocatable binary files to be permanently modified.

New System Capabilities:

In addition to the capabilities present in RT-11 Version 2B, RT-11 Version 2C provides the following enhancements:

- PDP-11/03 Support -- RT-11 Version 2C extends support to PDP-11/03 processor based systems.
- Magtape Distribution -- RT-11 Version 2C is available for distribution on 7-track or 9-track magnetic tape, recorded at 800 bpi.

MINIMUM HARDWARE REQUIRED:

PDP-11V03 with:

- 8K words of memory for S/J operation
- 12K words of memory for S/J operation with BATCH capability
- 16K words of memory for F/B operation with BATCH capability

-OR-

PDP-11 with:

- 8K words of memory for S/J operation
- 12K words of memory for S/J operation with BATCH capability
- 16K words of memory and a Line Frequency Clock for F/B operation with BATCH capability
- one of the following console terminals: LA30, LA36, VT05, VT50, VT52, LT33, LT35
- one of the following mass-storage packages:
 1. TC11 DECtape controller with 1 TU56 dual DEC-tape transport.
 2. RX11 Floppy Disk controller with 2 disk drives.

3. RK11 Disk Cartridge controller with 1 RK05 disk drive and one of the following:
 - An additional RK05 disk drive.
 - RX11 Floppy Disk controller and 1 floppy disk drive.
 - TC11 DECTape controller and dual DECTape transport.
 - TA11 Cassette controller and 1 TU60 cassette drive.
 - TM11 Magnetic Tape controller with one of the following: TS03 magnetic tape drive or TU10 7- or 9-track magnetic tape drive.
 - TJU16 Magnetic Tape controller and 1 TU16 9-track magnetic tape drive.
 - PR11 paper tape reader or PC11 paper tape reader/punch.
4. RP11 Disk Pack controller with 1 RP02 or 1 RP03 disk pack drive and one of the following:
 - TC11 DECTape controller and dual DECTape transport.
 - RX11 Floppy Disk controller and 1 floppy disk drive.
 - RK11 Disk Cartridge controller and 1 RK05 disk drive.
 - TM11 Magnetic Tape controller with one of the following: TS03 magnetic tape drive or TU10 7- or 9-track magnetic tape drive.
 - TJU16 Magnetic Tape controller and 1 TU16 9-track magnetic tape drive.
5. RJS03 or RJS04 Fixed-head Disk system with one of the following:
 - RK11 Disk Cartridge controller and 1 RK05 disk drive.
 - TM11 Magnetic Tape controller with one of the following: TS03 magnetic tape drive or TU10 7- or 9-track magnetic tape drive.
 - TJU16 Magnetic Tape controller and 1 TU16 9-track magnetic tape drive.
6. RF11 Fixed-head Disk system with one of the following:
 - PC11 paper tape reader/punch.
 - TC11 DECTape controller and dual DECTape transport.
 - RX11 Floppy Disk controller and disk drive.
 - RK11 Disk Cartridge controller and RK05 disk drive.
 - TM11 Magnetic Tape controller with one of the following: TS03 magnetic tape drive or TU10 7- or 9-track magnetic tape drive.
 - TJU16 Magnetic Tape controller and 1 TU16 9-track magnetic tape drive.

OPTIONAL HARDWARE SUPPORTED:

Additional memory to 28K words total for any system.

The following options apply to any PDP-11 system with the exception of the PDP-11V03:

LP11, LS11, LV11 Line Printer
 RX11 Floppy Disk
 TC11 DECTape
 TM11, TMA11, TJU16 Magnetic Tape
 (12K required for PIP operations)
 RK11/RK05 DECpack
 RPR11/RP02 Disk Pack
 RJS03, RJS04, RF11 Fixed-head Disk
 CR11, CM11 Card Reader
 TA11 DECCassette
 (12K required for RX11-based PIP operations)
 PC11 Paper Tape Reader/Punch
 LV11 Plotter (FORTRAN and BASIC support only)
 VT11A Graphics Display Processor (graphics with FORTRAN, LA-11 or BASIC)
 LPS11 Laboratory Peripheral System (supported by FORTRAN,
 LA-11 and BASIC only)
 AR11 Analog Real Time System (supported by FORTRAN and LA-11 only)
 DR11-K Digital I/O option (supported by FORTRAN only)

PREREQUISITE SOFTWARE:

None

OPTIONAL SOFTWARE SUPPORTED:

GAMMA-11 F/B
 BASIC/RT-11
 MU BASIC/RT-11
 FOCAL/RT-11
 FORTRAN/RT-11
 BASIC LV11 Plotting Package
 LA-11 Lab Applications Library
 XY11 Incremental Plotter PLOT 11T (Calcomp 563, 565, Houston Complot DP1, 10); CSS software

TRAINING CREDITS:

None

SUPPORT CATEGORY:

B, Software Support will be provided as listed in the Software Support Categories Addendum to this SPD.

UPDATE POLICY:

During the first year, Update Policy shall be in accordance with the Software Support Categories Addendum to this SPD. After the first year, updates, if any, will be made available according to then prevailing DIGITAL policies.

ORDERING INFORMATION:

This software is furnished under a license for use on a single CPU and can be copied and modified (with inclusion of DIGITAL's copyright notice) only for use on such CPU, except as may otherwise be provided in writing by DIGITAL.

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

The following key (B, C, D, E, F, N, R, Y, Z) represents the distribution media for the product and must be specified at the end of the "Q" number, i.e., QJ003-AB = binaries on paper tape.

- B = Paper Tape
- C = DEctape
- D = 9-track Magnetic Tape (TU10)
- E = RK Disk (DECpack)
- F = 7-track Magnetic Tape
- N = Cassette (TU60)
- R = Microfiche
- Y = Floppy Disk
- Z = No hardware dependency

Standard Options

- QJ003 -A- Single-use license for RT-11, binaries, documentation, support services (media: B, C, D, E, F, N, Y)
- QJ926 -A- Single-use license for RT-11 and FORTRAN/RT-11, binaries, documentation, support services (media: C, D, E, F, Y)

Source/Listing Options

- QJ003 -E- All sources (media: C, D, E, F, Y)
- QJ003 -F- Listings (media: R)

Upgrade Options

The following option is available as an upgrade kit from DOS/BATCH.

- QJ260 -A- Single-use license for RT-11 and FORTRAN/RT-11, binaries, documentation, support services (media: B, C, E, N)

Update Options

Users of RT-11 Version 2B whose Standard Binary Program Update Service has expired, may purchase the following. The update distributed in binary form on the appropriate medium includes no installation or other services unless specifically stated otherwise.

- QJ003 -H- RT-11 binaries, documentation, no support services (media: B, C, D, E, F, N, Y)
- QJ926 -H- RT-11 and FORTRAN/RT-11 binaries, documentation, no support services (media: C, D, E, F, Y)
- QJ003 -N- RT-11 source update (media: C, D, E, F, Y)

ADDITIONAL SERVICES:

- QJ003 -SZ Orientation Service
- QJ003 -7- Single-use license, binaries, documentation, support services, including orientation (media: B, C, D, E, F, N, Y)