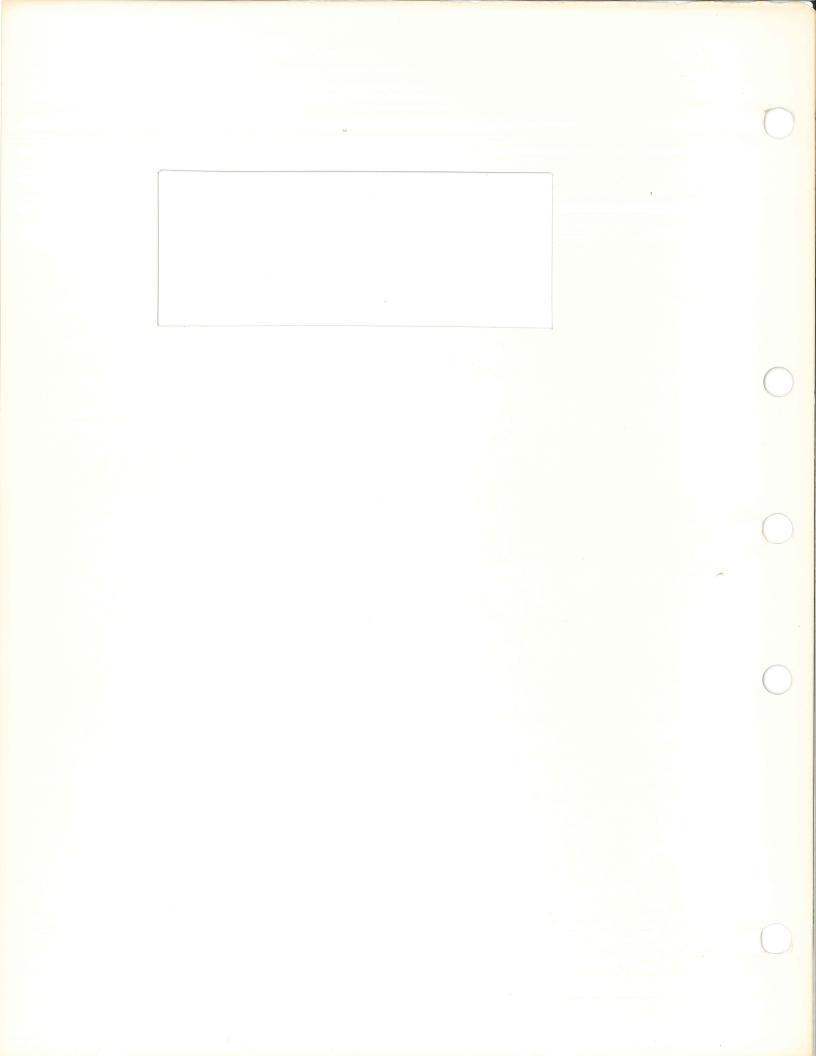
RT-11 FORTRAN IV Installation Guide/ Release Notes

Order Number: AA-JQ69A-TC

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RT-11 FORTRAN IV Installation Guide/ Release Notes

Order Number: AA-JQ69A-TC

The RT-11 FORTRAN IV Installation Guide/Release Notes contains the procedures for installing the FORTRAN IV compiler on the RT-11 operating system. This document describes the minimum system requirements, the files distributed in the kits, the options available for planning and configuring the system to user needs, and system-build verification. The appendixes present a more detailed treatment of material covered in this guide. In addition, Appendix D contains release notes and information relevant to FORTRAN IV programming under the current version of the RT-11 operating system that is not available in any related document.

Operating System and Version: RT-11 V5.4

Software Version:

FORTRAN IV, Version 2.8

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Preface

This manual includes all changes made to RT-11 FORTRAN IV for this release. It contains:

- The procedures used to install the FORTRAN IV compiler and Object-Time System (OTS) library in the RT-11 operating system
- Information about the use of FORTRAN IV on the RT-11 operating system not included in any other document (in the form of release notes)

Read this document completely before beginning the installation.

Associated Documents

When you build your FORTRAN IV system, the following documents might be helpful or of interest:

- RT-11 System User's Guide
- Introduction to RT-11
- RT-11 Installation Guide
- RT-11 System Generation Guide
- PDP-11 FORTRAN IV Language Reference Manual

Conventions Used in This Document

Convention	Meaning
<ret></ret>	The symbol <ret> represents the nonprinting RETURN key. (Note that you press this key to terminate all monitor and system program command lines.)</ret>
CTRL/Z	The notation CTRL/Z (where Z is an alphabetic character) results from pressing the CTRL key and the appropriate character simultaneously.
Uppercase characters	In format descriptions and examples, uppercase characters represent information you must enter exactly as shown.
Lowercase characters	In format descriptions and examples, lowercase characters represent variable information you must supply.

Structure of This Document

This manual is organized as follows:

- Chapter 1 describes the system components and software required for the installation. It further introduces the FORTRAN IV compiler and Object Time System (OTS) library installation procedures.
- Chapter 2 describes use of the prebuilt compiler and the OTS library.
- Chapter 3 contains the FORTRAN IV compiler and the FORTRAN IV OTS library installation procedures.
- Chapter 4 discusses the use of optional modules.
- Chapter 5 discusses installation options.
- Appendix A describes the file provided for all distribution media.
- Appendix B provides a copy of the installation verification procedure.
- Appendix C describes how to report software and documentation problems.
- Appendix D contains pertinent information about the use of FORTRAN IV on the RT-11 operating system not found in any associated document.

Intended Audience

This manual is intended for use by FORTRAN IV programmers.

1 SYSTEM REQUIREMENTS

The software included in this distribution requires the following system components for normal use:

- RT-11 Version 5.4 Single Job (SJ), Foreground/Background (FB), or Extended Memory (XM) monitor
- Any PDP-11 processor
- Minimum memory for installation and compilation:

16K words for SJ monitor 24K words for FB monitor 38K words for XM monitor

- Minimum 135-210 contiguous blocks for the compiler .SAV image
- Minimum 160-180 contiguous blocks for the OTS library

1.1 DISTRIBUTION MEDIA

DIGITAL supplies the FORTRAN IV Version 2.8 software on the media specified in the Software Product Description (SPD).

When you install FORTRAN IV, you must WRITE PROTECT or WRITE LOCK (whichever is applicable) the distribution medium.

CAUTION:: You cannot WRITE LOCK a diskette.

If your distribution medium is magnetic tape, be sure that no write ring is inserted at the back of the tape reel and that the magnetic tape is positioned at the load point. If it is not, rewind it manually.

See Appendix A for a complete listing of the distribution files.

The TK50 cartridge comes under the category of magnetic tape.

1.2 ADAPTING THE SYSTEM DEVICE FOR FORTRAN IV

Before you can build the FORTRAN IV system, the system device must contain at least a minimal RT-11 system and enough free space for the FORTRAN IV files.

If the system device is an RL01, RX01, RX02, or RX50, you might have to delete some files to create a minimal system device and make room for FORTRAN IV. The *RT-11 Installation and System Generation Guide* describes the procedure for system generation on a diskette system.

If the system device is any other disk device, sufficient space is generally available and you should not have to follow any special procedures.

1.3 OVERVIEW OF THE INSTALLATION PROCEDURE

Before you begin installing FORTRAN IV, make a backup copy of the distribution medium. Next, decide whether to use the prebuilt FORTRAN IV compiler and OTS library supplied on the distribution device or to build your own compiler and OTS library. By building FORTRAN IV you can take advantage of arithmetic hardware or other options not included in the prebuilt compiler and OTS library.

The following sequence is an overview of the steps you take during the installation procedure.

- 1 Copy the installation control file from the distribution medium
- 2 Select the compiler defaults or the prebuilt compiler
- 3 Build the compiler
- 4 Select the OTS library options or the prebuilt OTS library
- 5 Build the OTS library
- **6** Verify the installation

1.4 INSTALLATION ERRORS

If you make errors within an installation section, go back to the beginning of that section and repeat the steps. Correct any typing errors by using the standard RT-11 input techniques DELETE and [CTRL/U].

2 USING THE PREBUILT COMPILER AND THE OTS LIBRARY

The prebuilt compiler is an inline/threaded compiler. By default, this compiler produces hardware independent threaded code.

The prebuilt OTS library is hardware independent. By default, this library supports neither virtual arrays nor standalone FORTRAN IV, nor does it perform array bounds-checking at run time.

The FORTRAN IV installation procedure automatically installs the prebuilt compiler and/or OTS library.

3 INSTALLATION PROCEDURES

After you have read Chapters 1 and 2, install the FORTRAN IV compiler and the FORTRAN IV OTS library in your RT-11 system. The names and specifications of devices needed are listed in Table 3-1.

3.1 GENERAL GUIDELINES

The installation process copies files from the distribution medium to the target device. In some cases, the compiler and the OTS library are installed on the same volume. In other cases, the compiler is installed on the first volume and the OTS library is installed on the second volume.

Table 3-1 Device Identification

Device	Device Specification
RL01, RL02 disk cartridge	DLn: ¹
RK06, RK07 disk cartridge	DMn:
RP02, RP03 disk	DPn:
RJS03/4 disk	DSn:
RX01 diskette	DXn:
RX02 diskette	DYn:
TU16, TE16, TU45 magnetic tape	MMn:
TS11 magnetic tape	MSn:
TU10, TE10, TS03 magnetic tape	MTn:
RF11 fixed-head disk drive	RFn:
RX50 diskette	DUn: or DZ:n
RX33 diskette	DUn:
RC25 disk	DUn:
TU58 tape cassette	DDn:
TK50 tape cartridge	MUn:

¹n is the numerical designation of the drive unit

The device on which the compiler will reside must contain at least 226 contiguous free blocks. Therefore, if this device is an RL01 disk, an RX01 or RX02, you might have to delete files to make room for FORTRAN IV. As a minimum, you must retain the following files:

RT11yy.SYS[†]
LP.SYS (if your system has a line printer)
aa.SYS² (device handler for system disk)
bb.SYS² (device handler for distribution medium)

¹ Substitute the monitor appropriate to your application—for example, RTITSJ.SYS for single job monitor

² Substitute the appropriate device code for aa or bb

INSTALLATION PROCEDURES

SWAP.SYS EDIT.SAV LIBR.SAV LINK.SAV PIP.SAV SYSLIB.OBJ IND.SAV

The *RT-11 Installation Guide* describes how to build a system backup after the FORTRAN IV installation. Delete unnecessary files from the backup to make room for FORTRAN IV. The backup device then becomes the system master; treat it with the same care as you do the distribution medium.

After building the system backup, remove both the distribution medium and the system backup and store them in a safe place. When mounting either device, be sure to WRITE LOCK or WRITE PROTECT it if possible; if the device is magnetic tape, ensure that no write ring is inserted. The installation procedure assigns the distribution medium to input (INP) and the target medium to output (OUP) at installation time.

3.2 EXCEPTION TO INSTALLATION PROCEDURE

If the distribution medium is magnetic tape, the target device must have at least 800 to 1000 free blocks to accommodate the magnetic tape files. After the compiler and the OTS library are built, you have the choice of deleting the temporary files copied from the magnetic tape.

3.3 INSTALLING THE COMPILER

Boot the RT-11 Version 5.4 (or later) operating system monitor (SJ, FB or XM) with the required device handlers for the distribution medium and the target devices. Section 3.3.1 describes the installation procedure for diskette and magnetic tape distribution kits. Section 3.3.2 describes the installation procedure for large disk distribution kits.

3.3.1 Installation Procedure for Diskette and Magnetic Tape Distribution Kits

The following is the procedure for diskette and magnetic tape installation:

1 Type the following command to interface with IND, the RT-11 Indirect Control File processor:

SET KMON IND

2 Type the following command to copy the file FORINS.COM from the distribution medium (Diskette 3 of the diskette distribution contains the file FORINS.COM) to the system device:

.COPY XXn:FORINS.COM SY:

3 Type the following command to invoke the FORTRAN IV installation control file:

.@FORINS

4 The installation procedure performs an automatic verification by compiling, linking, and executing the sample program DEMO.FOR. The compiler now resides on the output device and is called FORTRA.SAV. The FORTRAN IV OTS library now resides on your specified output device.

After completing the installation procedure, preserve the FORTRAN IV system by copying the necessary files of the FORTRAN IV system to a file-structured (not magnetic tape) device. This makes it easier to change compiler defaults and apply updates to the FORTRAN IV system. Remember that if the backup medium is RX01, RX02, or RX50, you have four volumes:

- 1 The compiler
- 2 The OTS library
- 3 The prebuilt compiler, the prebuilt OTS library, and the optional modules
- 4 The FORTRAN IV debugger

Make a backup copy of a user-generated FORTRAN IV compiler and OTS library (that is, FORTRA.SAV and FORLIB.OBJ or SYSLIB.OBJ) on a separate volume, if necessary.

Table 3-2 lists the files that constitute the FORTRAN IV system.

3.3.2 Installation Procedure for Single Disk Distribution Kits

The following is the installation procedure for single disk distribution kits:

1 Type the following command to interface with IND, the RT-11 Indirect Control File processor:

.SET KMON IND

2 Type the following command to invoke the FORTRAN IV installation control file from the distribution disk:

.@XXn:FORINS

3 The installation procedure performs an automatic verification by compiling, linking, and executing the sample verification program DEMO.FOR. The compiler now resides on the output device and is called FORTRA.SAV. The FORTRAN IV OTS library now resides on your specified output device.

After completing the installation procedure, preserve the FORTRAN IV system by copying the necessary files of the FORTRAN IV system to a file-structured (not magnetic tape) device. This makes it easier to change compiler defaults and apply updates to the FORTRAN IV system. Remember that if the backup medium is RX01, RX02, or RX50, you have four volumes:

- **1** The compiler
- 2 The OTS library
- 3 The prebuilt compiler, the prebuilt OTS library, and the optional modules

INSTALLATION PROCEDURES

4 The FORTRAN IV debugger

You should make a backup copy of a user-generated FORTRAN IV compiler and OTS library (that is, FORTRA.SAV and FORLIB.OBJ or SYSLIB.OBJ) on a separate volume, if necessary.

Table 3-2 lists the files that constitute the FORTRAN IV system.

Table 3-2 FORTRAN IV System Files

Compiler Files (Diskette 1 of 4)	OTS Library Files (Diskette 2 of 4)	Prebuilt Files and Optional Modules (Diskette 3 of 4)	Debugger Files (Diskette 4 of 4)
FROOT.OBJ	NHD.OBJ	UIOBYT.OBJ	FDT.DOC
F0.OBJ	EAE.OBJ	FORTRA.SAV	FDT.OBJ
F1.OBJ	EIS.OBJ .	FORLIB.OBJ	FDTVER:FOR
F2.OBJ	FIS.OBJ	SIMRT.MAC	•
F3 _. OBJ	FPU.OBJ	FRT MAC	
F4.OBJ	OTSCOM.OBJ	FORTRA.HLP	
F5.OBJ	V2S.OBJ	DEMO.FOR	•
F6.OBJ	V2NS.OBJ	FORINS.COM	
F7.OBJ	NOVIR.OBJ	FORGEN.SAV	
F8.OBJ	VIRP.OBJ	F4V28.TXT	. •
F9.OBJ	VIRNP.OBJ		
F10.OBJ	UNI.OBJ		
LOOP.OBJ .	OTSGEN.SAV		
F11.OBJ	•		
F12.OBJ		•	
CDUMP.OBJ	,		
CONVRT.OBJ		•	
REGALO.OBJ			
F21.OBJ			•
F19.OBJ			•
PEEP.OBJ	•		
OBJGSD.OBJ			•
F18.OBJ			
F13.OBJ			•
F15.OBJ	•	•	
F16.OBJ			
F17.OBJ		•	
F4LINK.COM			
F4LTHR.COM F4LINL.COM			

USING THE OPTIONAL MODULES

Use the following procedure on a booted RT-11 V5.4 system to copy the optional modules from the distribution medium to the target disk.

Note: Before you continue, make sure your system meets the requirements described in Chapter 1.

1 Assign the target physical disk device to OUP by typing:

.ASSIGN XXn: OUP

where XX is the device code for the target disk device.

- 2 Mount the distribution medium and make the physical-to-logical assignment for each medium as follows:
 - **a** For RL01 or RL02 distribution:

Mount the distribution medium in a free drive and assign the drive to input as follows:

.ASSIGN DLn: INP

b For diskette distribution:

Diskette 1 is for the compiler installation; Diskette 2 is for the OTS library; Diskette 3 is for the prebuilt compiler, prebuilt OTS library optional modules, and installation control file; Diskette 4 is for the FORTRAN IV debugger. Mount Diskette 3 in a free drive and assign the drive to input as follows:

.ASSIGN DXn: INP (for RX01 drive) .ASSIGN DYn: INP (for RX02 drive) .ASSIGN DZn: INP (for RX50 drive)

c For magnetic tape distribution:

Mount the distribution tape on a free drive and assign the drive to input as follows:

.ASSIGN MMn: INP (for TU16, TE16, or TU45 drive) .ASSIGN MSn: INP (for TS11, TU80, TSV05, or TSU05 drive) .ASSIGN MUn: INP (for TK50 cartridge tape system)

- **3** Copy the optional module and/or the standalone FORTRAN IV module and its parameter file to the target disk device. For more information on these modules, see the *RT-11 FORTRAN IV User's Guide*.
 - **a** To copy the optional unformatted byte I/O module, type:

.COPY INP:UIOBYT.OBJ OUP:

UIOBYT.OBJ can be used either by explicit reference in the command that links your program, or by integration into an existing OTS library.

USING THE OPTIONAL MODULES

 To link the unformatted byte I/O module explicitly with a FORTRAN IV program, specify UIOBYT.OBJ to the linker in a position that precedes specification of the OTS library.

.LINK program_name, UIOBYT, OTS_library_name

• To integrate the unformatted byte I/O module into an OTS library like FORLIB or SYSLIB, first confirm that sufficient contiguous free space is available on the output device and then invoke the RT-11 librarian as follows.

180 contiguous free blocks are required to place UIOBYT.OBJ into FORLIB. The commands to place UIOBYT.OBJ into FORLIB are:

```
.R LIBR
*OUP:FORLIB[-1]=OUP:FORLIB,OUP:UIOBYT/U/G
Global? $ERRS
Global? $ERRTB
Global? <RET>
*^C
```

230 contiguous free blocks are required to place UIOBYT.OBJ into SYSLIB. The commands to place UIOBYT.OBJ into SYSLIB are:

```
.R LIBR
*OUP:SYSLIB[-1]=OUP:SYSLIB,OUP:UIOBYT/U/G
Global? $ERRS
Global? $ERRTB
Global? $OV#H
Global? <RET>
*^C
```

• To copy the standalone FORTRAN IV module and its parameter file, type:

```
.COPY INP:SIMRT.MAC OUP: .COPY INP:FRT.MAC OUP:
```

5 INSTALLATION OPTIONS

If you decide to build the compiler and OTS library yourself, specify the compiler and OTS library options at installation time. The sections that follow list the available options and parameters. Appendix B gives an example of a compiler installation.

5.1 FORTRAN IV COMPILER INSTALLATION OPTIONS

The FORTRAN IV installation program, FORGEN.SAV, offers the following options when you build the compiler:

- Maximum listing page size
- Maximum record size
- Maximum number of logical channels
- OPEN and CLOSE statement keywords and options
- Type of compiler-generated code

5.1.1 Listing Page Size

The maximum number of lines per page for a compilation listing is set at 56(10) in the compiler, as supplied. You can change this parameter to any value greater than zero for nonstandard line printers.

5.1.2 Record Size

The default maximum formatted record size for runtime I/O is 136(10) characters (bytes). You can change this default to any value from 4 through 4095. At compile time, override the default by using the /RECORDSIZE:n compiler command option.

5.1.3 Number of Logical Channels

This parameter specifies the default maximum number of logical channels that can be open simultaneously under a FORTRAN IV program. The compiler, as supplied, presets this value to 6 for the allocation of file descriptor blocks at run time. At installation time, you can change the default to any number from 1 to 15. You can also change it at compile time by using the /UNITS:n compiler command option.

5.1.4 OPEN and CLOSE Statement Keywords and Options

The FORTRAN IV OPEN and CLOSE statements provide several keywords and options that are valid only for particular operating systems. These keywords apply uniquely to the file services of each system. The *RT-11 FORTRAN IV User's Guide* describes these keywords in detail. Use the RSTS/E switch /X:xxx (cross compile) to specify which of the three systems you are selecting for your FORTRAN IV program. The values are:

RT (for RT-11) RST (for RSTS/E) RSX (for RSX-11)

The default value for this switch is RT. At installation time, it is possible to set this switch to any of the three values. At compile time, it is possible to override the default on a per-program unit basis by invoking FORTRAN IV with the RUN command and using the RSTS/E /X switch.

5.1.5 Compiler-Generated Code

The FORTRAN IV compiler can produce both threaded code and inline code. Select either or both at installation time. Threaded code consists of the addresses of routines that FORTRAN IV invokes to perform specified actions. Inline code consists of PDP-11 machine instructions that interface with the following hardware options:

KE11-A,B	Extended Arithmetic Element	(EAE)
KE11-E	Extended Instruction Set	(EIS)
KE11-F	Floating Instruction Set	(FIS and EIS)
KEV11	Extended Arithmetic Chip	(EIS, FIS, or THR)

Table 5-1 lists valid code generation options for each hardware configuration.

Table 5-1 Code Generation Options

	Arithmetic Hardware Options					
Target System	KE11-A,B	KE11-E	KE11-F, KEV11	Valid Code Options /CD:		
LSI-11, 11/03	-	-	NO YES	THR EIS, FIS, or THR		
11/04, 11/05, 11/10, 11/15, 11/20	NO YES	-	. -	THR EAE or THR		
11/35, 11/40	NO YES NO NO	NO NO YES YES	NO NO NO YES	THR EAE or THR EIS or THR EIS, FIS, or THR		
11/23, 11/23 +, 11/24, 11/34, 11/44, 11/45, 11/50, 11/53, 11/55, 11/60, 11/73, 11/83, 11/84	-			EIS or THR		

Inline code generally produces superior runtime results in terms of faster execution speed and minimal program size. Take advantage of the arithmetic hardware by selecting inline code as the default. At compile time, it is possible to override the default selected at installation by using the /CODE:xxx compiler command option. For more information about compiler-generated code, refer to the *RT-11 FORTRAN IV User's Guide*.

5.1.5.1 Compiler Build Selection

When you select the default code, the system prompts you for your choice of a copy of a threaded-only compiler, an inline-only compiler, or both. Thus, you can build a full compiler (both types of code) or a streamlined compiler (one type of code). Your intended use of the system will determine your choice. If you plan to select the default code all the time, save space on the system device by accepting the streamlined compiler. The approximate size of each compiler is:

Threaded only-130 blocks Inline only-180 blocks Full compiler-210 blocks

5.1.5.2 V2S and V2NS Modules

If you choose inline code only, you can make the FORTRAN IV OTS library smaller by omitting the modules V2S and V2NS. Only the threaded compiler uses these. Conversely, if you select threaded code only, direct that either V2S or V2NS (but not both) be built into the FORTRAN IV OTS library. The V2S module checks to determine whether an array subscript reference is within the bounds of the program. The V2NS module does not check array subscripts. Use the V2NS module only when you do not require bounds-checking.

5.2 OTS LIBRARY INSTALLATION OPTIONS

The FORTRAN IV installation program, OTSGEN.SAV, allows the following options in building the OTS library:

- OTS library built into its own file, FORLIB, or into SYSLIB
- Type of hardware arithmetic support
- Virtual array support
- Array bounds checking support
- Standalone support

Section 5.2.6 discusses an optional form of unformatted byte I/O support.

5.2.1 SYSLIB or FORLIB Decision

Although it is possible to install the FORTRAN IV OTS library in the default system library SYSLIB.OBJ, it is recommended that you install the FORTRAN IV OTS library in its own individual file, FORLIB.OBJ. This separates FORLIB.OBJ from the other routines in the system library.

When the OTS library is installed in SYSLIB, the linker automatically searches SYSLIB to resolve compiler-generated global references. However, if SYSLIB has user-written routines that link with non-FORTRAN IV programs more often than the FORTRAN IV OTS library links with FORTRAN IV programs, choose the separate FORLIB.OBJ. In addition, using a separate FORLIB tends to decrease the SYSLIB search time the linker requires for non-FORTRAN IV programs. You can also combine all the user-written routines into a third, separate, library.

Unless your system is subject to file storage constraints, your operation will benefit when you add the OTS library modules to SYSLIB, forming the file SY:SYSLIB.OBJ. When the linker attempts to locate SYSLIB.OBJ, it normally searches the system device (SY:). To place SYSLIB.OBJ on a different device, use the procedure given in the *RT-11 Installation and System Generation Guide* for modifying LINK to change the default SYSLIB device.

5.2.2 OTS Library Support for Optional Arithmetic Hardware

The arithmetic hardware present on your system configuration interfaces with a specific set of OTS library object modules. The OTSGEN program selects the correct OTS library support for the current hardware configuration. If you are building alternate FORTRAN IV OTS libraries for other systems, specify what type of hardware support they will include. The OTSGEN hardware name corresponding to the available arithmetic hardware options on each CPU is shown in Table 5-2.

The FORTRAN IV compiler does not generate inline code for the FP11 or KEF11-A Floating-Point Processor. However, you can use the FPU library with either inline (EIS) or threaded code. To assure the maximum use of your FP11 or KEF11-A hardware, use threaded code with the FPU library.

Table 5-2 OTS Hardware Options

Target System	Arithmetic Hardware Options	OTS Library Option
PDP-11/23, 11/23+, 11/24, 11/34, 11/44, 11/45, 11/50, 11/53, 11/55, 11/60, 11/73, 11/83, 11/84	FP11-A, FP11-B, FP11-C, FP11-E, FP11-F, KEF11-A floating-point processor	FPU
PDP-11/40, 11/35	KE11-F floating instruction set	FIS
LSI-11	KEV11 extended arithmetic chip	FIS
PDP-11/23, 11/23+, 11/24, 11/34, 11/45, 11/50, 11/55, 11/60	No floating-point hardware (EIS is standard on these processors)	EIS
PDP-11/40, 11/35	KE11-E extended instruction set	·
Any	KE11-E or KE11-E extended arithmetic element	EAE
Any	No optional arithmetic hardware	NHD

5.2.3 Virtual Array Support

FORTRAN IV supports the use of virtual arrays on PDP-11 processors equipped with the KT11 Memory Management Unit. See the *PDP-11 FORTRAN IV Language Reference Manual* for a description of virtual arrays and the *RT-11 FORTRAN IV User's Guide* for some applications of virtual arrays. FORTRAN IV supports virtual arrays under the single job (SJ) and foreground/background (FB) monitors and under the extended memory (XM) monitor. Since the SJ and FB monitor routines differ from those for the XM monitor, you must decide which monitor you want to use with virtual arrays. Programs using virtual arrays linked with a library for the SJ and FB monitors cannot run under the XM monitor. The converse is also true

Therefore, if your FORTRAN IV programs use virtual arrays and run under both the SJ, FB, and XM monitors, you must generate an alternate library. In this case, create two executable versions of your program—one linked with an SJ and FB monitor virtual array library, the other linked with an XM monitor virtual array library.

Depending on your responses to the OTSGEN queries about virtual array support, one of the following three modules will be included in the generated library:

- NOVIR.OBJ-This module provides no virtual array support.
- VIRP.OBJ-This module is for Program Logical Address Space (PLAS) support and requires the XM monitor. The EIS, FIS, or FPU hardware is also required for program execution.

INSTALLATION OPTIONS

 VIRNP.OBJ-This module provides virtual array support for the SJ and FB monitors.

Refer to the RT-11 FORTRAN IV User's Guide for a detailed description of virtual arrays and these three modules.

5.2.4 OTS Library Code Support

You can choose an inline-only library or an inline/threaded library. The inline-only library operates only with inline code; the inline/threaded library operates with either inline or threaded code.

For threaded code, the FORTRAN IV OTS library provides optional runtime array subscript checking in the V2S module (see Section 5.1.5.2). If you select this option, the OTS library checks every array reference that modifies an array element to ensure that the element to be stored is within program bounds. Consider the following effects when you decide whether to include this feature:

- The check ensures only that the referenced element is within program bounds—not array bounds. The user program, including OTS library routines, could still be corrupted if the reference subscript exceeds the bounds of the array.
- Program execution is slower because of the extra overhead involved in checking accesses to arrays.
- Only non-virtual arrays are checked.

5.2.5 Standalone (\$SIMRT) Support

The FORTRAN IV OTS library provides optional SIMRT support, which allows you to run standalone FORTRAN IV jobs. If you do not need standalone FORTRAN IV support, reduce the space required for the FORTRAN IV OTS library by eliminating SIMRT support. For more information on standalone FORTRAN IV jobs, see the *RT-11 FORTRAN IV User's Guide*.

5.2.6 Support for Unformatted Byte I/O

The module UIOBYT.OBJ allows unformatted data to be stored and retrieved by bytes rather than words. For information on using this module, refer to Chapter 4 of this manual.

A

DISTRIBUTION FILES

The distribution media contain the following FORTRAN IV files.

A.1 COMPILER FILES

These files are distributed on Diskette 1 in the diskette distribution kit. The volume ID for this diskette is FOR1 and the owner name is FORV28. For all other distribution media, the volume ID is FOR and the owner name is FORV28.

Table A-1 Compiler Files

Files	Files	Files	
FROOT.OBJ	F11.OBJ	PEEP.OBJ	
F0.OBJ	F12.OBJ	CDUMP.OBJ	
F1.OBJ	F13.OBJ	OBJGSD.OBJ	
F2.OBJ	F14.OBJ	CONVRT.OBJ	
F3.OBJ	F15.OBJ	INLINE.OBJ	
F4.OBJ	F16.OBJ	THREAD.OBJ	
F5.OBJ	F17.OBJ	COPCOM.COM ¹	
F6.OBJ	F18.OBJ	DELCOM.COM ¹	
F7.OBJ	REGALO.OBJ	F4LINK.COM	
F8.OBJ	F19.OBJ	F4LTHR.COM	
F9.OBJ	F20.OBJ	F4LINL.COM	
F10.OBJ	F21.OBJ	FORGEN.SAV ²	
LOOP.OBJ			

¹Appears only on the magnetic tape distribution

A.2 OTS LIBRARY FILES

These files are distributed on Diskette 2 in the RX01 diskette kit. The volume ID for this diskette is FOR2; the volume ID for all other distribution media is FOR. The owner name for all distribution media is FORV28.

²Compiler installation program

Table A-2 OTS Library Files

Files	Files			fareste.
EIS.OBJ	EAE.OBJ			
FIS.OBJ	FPU.OBJ	•		
NHD.OBJ	UNI.OBJ			
VIRNP.OBJ	VIRP.OBJ			
NOVIR.OBJ	V2NS.OBJ			
V2S.OBJ	OTSCOM.OBJ			
UIOBYT.OBJ	OTSGEN.SAV ¹			
COPOTS.COM ²	DELOTS.COM ²			

¹OTS library options selection program

A.3 PREBUILT COMPILER, OTS LIBRARY, AND OPTIONAL MODULES

The prebuilt compiler, prebuilt OTS library, optional unformatted byte I/O module, and the source module and parameter file for standalone FORTRAN IV support are distributed on Diskette 3 in the diskette distribution kit. The volume ID for this diskette is FOR3; the volume ID for all other distribution media is FOR. The owner name for all distribution media is FORV28.

Table A-3 Prebuilt Compiler, OTS Library, and Optional Modules

Descriptions
Online release notes
Prebuilt compiler
Prebuilt OTS library
Optional unformatted byte I/O module
Compiler help file
Installation verification program
Source for the standalone FORTRAN IV
Support and the parameter file needed to assemble it
Compiler options selection program
Installation control file
Verification compilation control file

²Appears only on magnetic tape distribution

A.4 FORTRAN DEBUGGING TECHNIQUE

The FORTRAN Debugging Technique, an unsupported tool for debugging FORTRAN IV programs, is distributed on Diskette 4 in the diskette distribution kit. Its three files, listed and described below, are not part of the FORTRAN IV product and are not used by FORTRAN IV. Copy them from the kit. Print or display the FORTRAN Debugging Technique documentation, FDT.DOC, by using the RT-11 commands PRINT or TYPE. Refer to FDT.DOC for further information.

The volume ID for this diskette is FOR4; the volume ID for all other distribution media is FOR. The owner name for all distribution media is FORV28.

Table A-4 Debugger Files

Files	Descriptions
FDT.DOC	FORTRAN Debugging Technique reference manual
FDT.OBJ	FORTRAN Debugging Technique software in object form
FDTVER.FOR	FORTRAN Debugging Technique verification program, written in FORTRAN IV

Note: FORTRAN Debugging Technique is provided only for the convenience of the FORTRAN IV user. DIGITAL neither supports nor assumes any responsibility for the use and maintenance of FORTRAN Debugging Technique.

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B.1 INSTALLATION VERIFICATION PROGRAM

The following listing is an example of the FORTRAN IV automatic installation procedure.

SET KMON IND @FORIUS FORTRAN IV INSTALLATION ************** PLEASE REFER TO THE FORTRAN IV RT-11 INSTALLATION GUIDE FOR ASSISTANCE IN ANSWERING THE QUESTIONS POSED BY THIS DIALOGUE * WHAT IS THE PHYSICAL NAME OF YOUR DISTRIBUTION DEVICE [S R:1-3 D:"DXO"]: * WHAT IS THE PHYSICAL NAME OF YOUR TARGET DEVICE [S R:1-3 D:"DLO"]: .ASS DXO INP ASS DMO OUP ************* FORTRAN IV COMPILER INSTALLATION ************** DO YOU WISH TO INSTALL THE FORTRAN IV COMPILER ? [Y/N D:N]: Y YOU CAN EITHER INSTALL THE PREBUILT FORTRAIN IV COMPILER, OR SELECT OPTIONS FOR TAILORING YOUR OWN COMPILER. THE PREBUILT COMPILER IS AN INLINE/THREADED COMPILER. BY DEFAULT, THIS COMPILER GENERATES THREADED CODE THAT IS HARDWARE INDEPENDENT * DO YOU WITH TO INSTALL THE PREBUILT COMPILER ? [Y/N D:N]: $\dot{\text{N}}$ ***** FORTRAN IV COMPILER OPTIONS SELECTION ***** **** PLEASE NOTE **** FOR DISKETTE DISTRIBUTION VOLUME IS FOR THE COMPILER. HOWEVER, THE COMPILER OPTIONS SELECTION PROGRAM RESIDES ON VOLUME 3 THIS FILE WILL FIRST BE COPIED TO THE SYSTEM DEVICE, AND DELETED AFTER IT IS EXECUTED. MOUNT VOLUME 3 IN YOUR DISTRIBUTION DEVICE * ARE YOU READY TO CONTINUE ? [Y/N D:N]: Y COPY/HOL INP: FORGEN. SAV SY: MOUNT VOLUME 1 IN YOUR DISTRIBUTION DEVICE * ARE YOU READY TO CONTINUE ? [Y/N D:N]: Y RUII FORGEN Answer questions with: "?" or carriage return (<RET>) for information,

```
YES(Y) for affirmation, anything else for NO.
                        56 lines is allowed per listing page.
A (default) maximum of
Is this acceptable? Y
A (default) maximum of 136 characters is allowed in a formatted
(ASCII) record. Is this acceptable? Y
                         6 channels may be open at a given time
A (default) maximum of
Is this acceptable? Y
The FORTRAN compiler can compile system-specific OPEN and CLOSE
statement keywords for RT-11, RSX-11, and RSTS/E systems These
statements are currently compiled for the following system: RT-11
Is this acceptable? Y
Based on your system's hardware configuration the default
type of code generated by the FORTRAN compiler will be EIS.
Is this acceptable? Y
Do you wish an inline-only compiler? H
Compiler options selection complete.
.DEL FORGEN .SAV
.$@OUP:FORBLD
. QINP: F4LINK
.R LINK
*OUP:FORTRA[-1]=INP:FROOT///S
*INP:FO,OUP:DEFLTS/0:1
*INP:F1/0:1
*INP:F2/0:1
*INP:F3/0:1
*INP:F4/0:1
*INP:F5/0:1
*INP:F6/0:1
*INP:F7/0:1
*INP:F8/0:1
*INP:F9/0:1
*INP:F10/0:1
*INP:LOOP/0:1
*INP:F11/0:1
*INP:F12/0:1
*INP:CONVRT/0:1
*INP:REGALO/0:1
*INP:F14/0:1
*INP:F20/0:1
*INP:F21/0:1
*INP:PEEP/0:1
*INP: OBJGSD/0:1
*INP:F18/0:1
*INP:F13/0:1
*INP:F15/0:1
*INP:F16/0:1
*INP:F17/0:1
*INP: CDUMP/0:1//
*^C
```

```
*******************
                  FORTRAN IV OTS INSTALLATION
                ************
  * DO YOU WISH TO INSTALL THE FORTRAN IV OTS ? [Y/N D:N]: Y
  * DO YOU WISH TO CHANGE THE ASSIGNMENT OF INSTALLATION DEVICES ?
    [Y/N D:N]; N
      YOU CAN EITHER INSTALL THE PREBUILT FORTRAN IV OTS LIBRARY,
      OR SELECT OPTIONS TO TAILOR YOUR OWN LIBRARY. THE PREBUILT
     LIBRARY IS HARDWARE INDEPENDENT, SUPPORTS NEITHER VIRTUAL ARRAYS NOR STAND-ALONE FORTRAN, AND DOES NOT PERFORM ARRAY
     BOUNDS CHECKING.
 * DO YOU WISH TO INSTALL THE PREBUILT LIBRARY ? [Y/N D:N]: N
     DISKETTE INSTALLATION
     VOLUME 2 OF DISKETTE DISTRIBUTION IS FOR THE OTS.
     PLEASE MOUNT YOUR DISTRIBUTION MEDIUM
 * CONTINUE ? [Y/N D:N]: Y
 RUN INP:OTSGEN
 Answer questions with:
 "?" or carriage return (<RET>) for information,
 YES(Y) for affirmation, anything else for NO.
 The following questions refer to the building of the
 default FORTRAN library.
The default FORTRAN library can be stored separately in
the file FORLIB OBJ or integrated into the RT-11 system
library file SYSLIB.OBJ. The recommended choice is
FORLIB.OBJ
Is this acceptable? Y
The default FORTRAN library will be found in the file FORLIB.OBJ.
The default FORTRAN library will be configured for the
FPU hardware found on this machine. Is this acceptable? Y
Is support for VIRTUAL arrays desired? N
Do you wish an inline only library? N
Should runtime checks be made to insure all array
references are contained within program bounds? N
Do you wish SIMRT support in your library?
The default FORTRAN library has been configured.
Are any other FORTRAN libraries required? N
STOP -
. $@OUP: OTSBLD
R. LTBR.
*OUP:FORLIB[-1]=INP:FPU,INP:OTSCOM,INP:NOVIR,INP:V2NS/G
Global? $ERRS
Global? $ERRTB
Global?
```

```
*^C
      ***********
        FORTRAN IV INSTALLATION VERIFICATION *
      *************
* DO YOU WISH TO VERIFY YOUR FORTRAN INSTALLATION ? [Y/N D:N]: Y
   VOLUME 3 OF THE DISKETTE DISTRIBUTION CONTAINS THE VERIFICATION
   PROGRAM
  MOUNT YOUR DISTRIBUTION MEDIUM
* ARE YOU READY TO CONTINUE ? [Y/N D:N]: Y
 COPY INP: DEMO FOR SY:
 Files copied:
INP:DEMO.FOR to SY:DEMO.FOR
 COPY INP:FORTRA.HLP SY:
 Files copied:
INP: FORTRA . HLP to SY: FORTRA . HLP
* IS THE FORTRAN COMPILER INSTALLED ON YOUR SYSTEM DEVICE ? [Y/N D:N]: N
* IS THE FORTRAN OTS LIBRARY BUILT INTO SYSLIB ? [Y/N D:N]: N
 . $@INP:FORCOM.COM
 RUN OUP: FORTRA
*DEMO=SY:DEMO
.MAIN
*^C
* WHAT IS THE NAME OF YOUR FORTRAN LIBRARY [S R:1-6 D:"FORLIB"]:
.LINK DEMO, FORLIB
**** RT11 FORTRAN IV V2.8 DEMONSTRATION TEST *****
INSTALLATION SUCCESSFUL IF NO ERROR MESSAGES
            WERE PRINTED ABOVE.
**** FORTRAN DEMONSTRATION TEST COMPLETE ****
.DEASS INP
.DEASS OUP
       **** FORTRAN IV INSTALLATION COMPLETE ****
       PLEASE REFER TO THE FORTRAIN IV INSTALLATION GUIDE FOR
       INFORMATION ON PRESERVING YOUR FORTRAN SYSTEM
@ <EOF>
```

REPORTING PROBLEMS

Occasionally, you might encounter problems or errors when using the RT-11 FORTRAN IV software and documentation. These problems should be communicated to Digital Equipment Corporation by means of a Software Performance Report (SPR) form, such as the one shown in Figure C-1. You can obtain these forms from your nearest SPR center.

Submit completed reports to an SPR center for handling. The center will forward the SPRs to the appropriate software engineering group for analysis and response.

Follow these procedures to prepare an SPR:

- Give a complete description of the problem encountered. Often, a seemingly irrelevant detail might give a clue to solving the problem.
- If possible, isolate the problem to a small example. Large, unfamiliar programs tend to be cumbersome and might result in a misunderstanding of the problem. This could cause an inability to duplicate the problem.
- If the error example is longer than one page of source code, try to send all information in machine-readable form. Problems in this form are much easier to diagnose. (All media will be returned.)
- Send console samples, command files, listings, link maps; include all relevant files (for example, data files) with the SPR. Annotations showing where the error occurred are extremely helpful.
- If a program reads input data, include sample input listings and, if possible, sample output.
- If an error example cannot be isolated to a single program unit, include listings and other relevant material on all program units involved.

Experience shows that many SPRs do not contain sufficient information to duplicate or identify the problem. Complete and concise information will help DIGITAL give accurate and timely service to software problems. The following examples describe two compiler-related problems and the type of information that might be supplied with an SPR to help resolve them:

1 Problem: Compiler generates a crash dump.

Action: If the program is larger than 30 lines, send a copy of your program on a machine-readable medium. Also, send the console output and indicate which compiler installation options are available for your configuration, and which options you selected for the compilation that aborted.

REPORTING PROBLEMS

2 Problem: Compiler generates incorrect code (program does not work or traps at run time).

Action: If the program is larger than 30 lines, send a copy of your program on a machine-readable medium. Include any required data files on a machine-readable medium. Also, send the console output and indicate:

- a Which compiler options you selected
- **b** Which OTS library installation options you selected
- c Which updates, if any, you have installed

Figure C-1	Software	Performance	Report	(SPR)	Form

digit	al	SOFTWA PERFOR REPORT	MANCE	FIELD NO.1		CORPORATE	BFR NO.:	279086
		PER ALIGNME	NT, START	T AT MARK BE	LOW.		P	AGE OF
PERATING SY	STEM	VERSION	SYSTEM	PROGRAM OR DO	CUMENT TITLE	VERSION OR D	OCUMENT PART	O. DATE
					DEC OFFICE		I DO VOIL HA	VE SOURCES?
NAME:							DO YOU HA	YES NO
FIRM:					DERODT	TYPE/PRIORITY	,	
							1. HEAV	Y SYSTEM IMPACT
ADDRESS:			PROBLEM/ERROR 2. MODERATE SYSTEM IMPAC					
			SUGGESTED ENHANCEMENT 3. MINOR SYSTEM IMPACT OTHER 4. NO SIGNIFICANT IMPACT					
JST. NO.:				. !				MENTATION/SUGGESTI
JBMITTED BY:		PH	IONE:		CANTUE PDC	BI FM BF DFPD	DDUCED AT WILL	YES NO
AG TAPE	ATT	ACHMENTS			COULD THIS	SPR HAVE BEEN	PREVENTED BY	
	rwr r bis	CISTING		CTAPE		IORE DOCUMEN AIN IN PROVIDE	TATION? ED SPACE BELOW.	YES NO
HER: U TYPE	SERIAL	NO. MEMO	RY SIZE	DISTRIBUTION	MEDIUM S	YSTEM DEVICE	DO NO	OT PUBLISH
						*		
DT N 0 1 -	ALLS	UBMISSIONS	BECOME T	HE PROPERT	Y OF DIGITA	L EQUIPMENT	CORPORATION	l
RT NAME	MNT. CAT	. MNT. GI	RP.		XFER GRP.		PL	PRB. TYPE
E RECEIVED (MAIL)	DATE TO	O MAINTAI	NER	XFER DATE		LOGGED O	N
E RECEIVED (ASG1	DATE	CELVED SE	OM MAINT	DATE ASSE			
- HECEIVED (A36)	DATE RE	CEIVED FRO	OM MAINTAINER	DATE ANSWE	RED	LOGGED	FF

C-3 .

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RELEASE NOTES

D.1 RT-11 FORTRAN IV V2.8 USAGE

If you are using the RT-11 V5.4 serial line printer handler, LS.SYS, with the FORTRAN IV programs and have not renamed it to LP.SYS as suggested in the RT-11 Installation and System Generation Guide, state explicitly that FORTRAN IV carriage control is desired in the OPEN or CALL ASSIGN statement for proper interpretation of carriage control characters.

Under the RT-11 XM monitor, if the background job area becomes too small (approximately 8K words), background FORTRAN IV programs might fail with the message "?MON-F-II1 addr." To prevent this failure, increase the background job area.

Use the RT-11 REENTER command to restart background FORTRAN IV programs that have terminated either normally or with a FORTRAN IV error message. You should note, however, that program variables initialized with the DATA statement will not be reinitialized to their DATA statement-specified values when the program is restarted, which might cause some reentered programs to operate incorrectly.

By default, the RT-11 XM monitor translates ("maps") all lowercase characters received as console input to uppercase. Enable lowercase input to FORTRAN IV programs by including the following statement before the first console READ or ACCEPT statement:

CALL IPOKE("44,"40000.OR.IPEEK("44))

Note, however, that if lowercase input is enabled, the letters 'E' and 'D' that appear in floating-point constants and the letters 'T' and 'F' specified as logical variable values must be entered as uppercase letters.

Some peripheral devices require nonprinting characters to perform certain functions, but nonprinting characters are not allowed in FORTRAN IV source programs. Many DIGITAL terminals use escape sequences for various control functions. The following example shows how to send the VT100 terminal escape sequences that move the cursor to the home position and clear the screen.

TYPE 100,27,27 100 FORMAT ('\$'A1'[;H'A1'[2J')

The value 27 in the TYPE statement is the decimal ASCII value of the escape character. The dollar sign carriage control character should be replaced with a plus sign if information to be displayed is appended to the TYPE statement. Certain escape sequences contain numeric parameters. These cannot be output simply with I format unless the number of digits in the parameter value will always match the I format-width specification exactly, since blank characters are treated by DIGITAL terminals as escape sequence terminators.

The RT-11 operating system does not provide form feed emulation for the console terminal. Therefore, the '1' carriage control character will not operate on your console terminal unless the terminal has a hardware form feed capability.

Under RT-11 FORTRAN IV V2.8, the dollar sign format specifier suppresses the carriage return character at the end of the line regardless of the carriage control character. This behavior is different from FORTRAN IV under RSX-11M/M-PLUS, IAS, and FORTRAN IV PLUS, where the dollar sign suppresses the carriage return character at the end of the line if the carriage control character is a blank or a plus sign (refer to the *PDP-11 FORTRAN IV Language Reference Manual*).

D.2 ERROR MESSAGE CLARIFICATIONS

The FORTRAN IV compiler requires that the number of constants in a constant list in a DATA statement be the same as the number of entities in the preceding name list; if this is not the case, FORTRAN issues the message "Syntax error."

The FORTRAN IV compiler requires that the logical unit number specified in an input or output statement be an integer constant or variable; if an integer expression is specified, FORTRAN IV issues the error message "Missing right parenthesis."

D.3 OPEN/CLOSE STATEMENT OPERATION

The FORTRAN IV compiler requires that all literal string values supplied for the OPEN and CLOSE statement keywords, except the value for the NAME keyword, be specified in uppercase letters.

The default value for the OPEN statement TYPE keyword is TYPE='NEW'. This means that if you neglect to specify TYPE='OLD' for a file that already exists, FORTRAN IV will create a temporary file of the same name on the specified volume. If the file is sequential and an input statement is the first I/O statement executed for the file, the message "?Err 25 Attempt to read after write" will be issued. If the file is direct access, since the temporary file was created in a previously unused area of the volume, its contents will be arbitrary. This can cause incorrect program operation if input operations are attempted before the file records are written. In both cases, the temporary file is made permanent when the program terminates, deleting the original data file. If this happens and is detected soon enough, you may be able to recover the original file with the RT-11 DIRECTORY/DELETED and CREATE commands. See the *RT-11 System User's Guide* for additional information.

The following program segment shows how a FORTRAN IV program can request a user file specification, which is then used in a subsequent OPEN statement.

Fourteen characters are allocated for the dev:filnam.typ specification; the fifteenth character is set to a null as required by the OPEN statement. If the NAME = keyword of the OPEN statement is specified, both the file name and file type must be specified, because the OPEN statement does not supply a default file name or file type. In this case, the default device is DK:. If a null file specification or a device name only is supplied, the OPEN statement will perform a non-file-structured open operation regardless of whether or not the device is file-structured. If the volume is intended for use in file-structured mode, (as is usually the case), this can result in destruction of the bootstrap blocks, directory, and files on the volume. Thus, while the above program segment performs a simple check for a null file specification, care should be taken to specify a file name whenever explicitly specifying a file-structured device name.

D.4 HINTS ON CREATING AND DEBUGGING FORTRAN IV PROGRAMS

The FORTRAN IV compiler will not process any characters beyond column 72. This is the default action and can cause confusing compiler error messages. It can also cause the program to compile correctly but execute incorrectly. Therefore, be sure that your FORTRAN IV source program lines do not extend beyond column 72. Some DIGITAL terminals have a margin bell feature to warn you when this happens; consult the appropriate terminal user's guide for additional information. Alternatively, you can use the FORTRAN IV compiler /EXTEND option, which will cause the compiler to process characters up to and including column 80.

If the FORTRAN IV compiler encounters errors in your program, it will print a message on the console terminal of the form:

?FORTRAN-I-[name] Errors: n, Warnings: m

The actual error messages are not listed unless you request a program listing; you can obtain a program listing in three different ways.

- 1 Specify /LIST following the FORTRAN IV command, and the FORTRAN IV program listing will be directed to the line printer.
- 2 Specify /LIST:TT: following the FORTRAN IV command, and the FORTRAN IV program listing will be directed to the console terminal.
- 3 Specify /LIST:DK: following the FORTRAN IV command, and the compiler will send the listing to a file with the same file name as the source program file, and with a file type of J.ST.

Errors detected by the FORTRAN IV compiler are reported in one of two ways. Some error messages are embedded in the FORTRAN IV program listing, for example:

```
***** 1
```

where:

1 = A single letter indicating the error detected

Other error messages appear at the end of the FORTRAN IV program listing, for example:

```
In line nnnn, Error: <text>
```

OI

In line nnnn, Warning: <text>

where:

nnnn = A line number

If you want to determine the meaning of the single-letter error messages, or if the printed text of a message is insufficient for understanding, refer to Appendix C of the *RT-11 FORTRAN IV User's Guide.* Note that warning messages do not appear in the program listing unless you specifically request them by specifying the /WARNING option following the FORTRAN IV command.

If you have directed the FORTRAN IV program listing to a disk file, it is possible to use an editor to examine the file with the EDIT/INSPECT command to locate the errors without the need for a hard-copy listing of the program. First, search for the string '*****' to locate errors of the first form. Next, search for the string 'in line' to locate the error/warning message list at the end of the program listing. When you have read the text corresponding to the error/warning, search backwards for the string 'nnnn' to locate the specific line. Remember, however, that you are examining the listing file, not the FORTRAN IV program source file. Therefore, note the changes that need to be made to the FORTRAN IV source file, and then exit the listing file and reenter the source file with the editor to make the changes.

D.5 COMPILER RESTRICTIONS

The FORTRAN IV V2.8 compiler has the following restrictions. Where feasible, updates will be supplied in the future to lift these restrictions. These restrictions represent highly contextual problems, illustrated by these specific examples. A workaround is suggested for each restriction.

1 Problem statement: the compiler will generate incorrect inline code for the following program:

```
BYTE L
I=L/10
J=L-I*10
END
```

Cause: The register-allocation phase of the compiler assigns the wrong register for the division.

Workaround:

```
BYTE L
J=L-L/10*10
END
```

2 Problem statement: The compiler will generate incorrect inline code for the following program.

```
DIMENSION A(10), K(10), L(10), M(10)

COMMON A, K, L, M

DO 10 I=1, N

J=I+K1

A(I)=A(J)

K(I)=K(J)

L(I)=L(J)

M(I)=M(J)

CONTINUE

END
```

Cause: The code-generation phase of the compiler assigns a compiler-generated temporary storage location to a register already in use, without saving the register's contents.

Workaround:

10

```
DIMENSION A(10), K(10), L(10), M(10)

COMMON A, K, L, M

DO 10 I=1, N

J=I+K1

K(I)=K(J)

L(I)=L(J)

M(I)=M(J)

A(I)=A(J)

10 CONTINUE

END
```

3 Problem statement: The compiler will abort if the inline FIS code option is selected for the following program.

```
SUBROUTINE X(D)
COMMON C(5),S(5)
DIMENSION D(5)
DO 10 I=1,N
C(I)=S(I)
DO 20 J=1,I
20 D(K)=D(J)
10 CONTINUE
K=K/2
D(1)=D(2)
RETURN
END
```

Cause: There is a problem in the register-allocation phase of the compiler.

Workaround: Put array D in COMMON.

4 Problem statement: The compiler will abort if the following program is entered.

```
DO 10 I=1,3000*1000
10 CONTINUE
END
```

Cause: The loop-optimization phase of the compiler tries to evaluate the trip count but fails due to overflow.

Workaround: Avoid using illegal values as DO parameters.

5 Problem statement: The compiler will issue the error "MISSING DELIMITER IN EXPRESSION" for the following program:

```
WRITE(5,100) ((I-N)/N)*2
100 FORMAT(I2)
END
```

Cause: The I/O expression analyzer parses the expression incorrectly.

Workaround:

```
WRITE(5,100) 2*((I-N)/N)
100 FORMAT(I2)
END
```

6 Problem statement: Inconsistency in a logical operation (the value of I will be "177600 and the value of J will be "200 in the following program):

```
BYTE B
DATA B/"200/
I=B.AND."377
J="376.AND.B
END
```

Cause: In FORTRAN IV if the second operand of an operation is an octal constant, the data type of that operand is decided by the data type of the first operand of the operation. Since B is a BYTE variable, "377 is entered into the symbol table as a BYTE constant and the operation is carried out at byte level; when the result of the operation is assigned to I, it is sign-extended. However, "376 is entered into the symbol table as an integer constant; therefore, B is sign-extended when loaded into a register before the operation.

Workaround: Assign "377 to an integer variable.

7 Problem statement: When a computed GOTO statement variable exceeds the count of 16383, the generated inline code for the statement causes an overflow error. This error will cause the program's execution to abort.

Cause: Generated inline code does not check for overflow error.

Workaround: Compile using threaded code option.

8 Problem statement: Lowercase logical input generates runtime conversion errors.

Cause: The FORTRAN IV runtime or OTS library will not accept lowercase input.

Workaround: Use uppercase characters for logical input.

9 Problem statement: The compiler will not accept a nonexpression as a DO loop component. For example:

```
DO 60 I = I1, I2, (2, I)
```

Cause: The compiler expects an expression to be inside the parentheses and does not realize that there is none until it tries to compute the expression.

Workaround: Use valid expressions for DO loop components.

10 Problem statement: The compiler generates a fatal error when an INTEGER variable is used as an array index, and later as a DO loop counter, and the body of the loop contains an ASSIGN statement.

Cause: The compiler does not know how to process the ASSIGN statement in this case.

Workaround: Do not use the same variable as an array index and DO loop counter.

11 If a BLOCK data variable name exceeds six characters, fictional line code is generated beyond the END statement. A TKB error results.

Workaround: Do not use a BLOCK data variable name that exceeds six characters.

12 Problem statement: Incorrect results occur when you compare an INTEGER variable to a floating-point constant.

Workaround: Assign the floating-point constant to a floating-point variable.

13 Problem statement: ! comments at the end of statements are misaligned in the generated listing file.

Workaround: Do not insert tabs on these comment lines.

14 Problem statement: Fatal errors including system crash or hung system will occur if you compile the following one-line program:

READ A

Workaround: Use the STOP statement at the end of your one-line program. This will produce an appropriate error message and avoid fatal errors.

D.6 OTS LIBRARY RESTRICTIONS

- 1 To run FORTRAN IV jobs as vitual jobs, you must have an RT-11 Version 5.4 XM monitor.
- **2** When running FORTRAN IV under the SJ and FB monitors, you cannot use FORTRAN IV virtual arrays and the VM handler concurrently.
- Programs using non-PLAS virtual arrays invoke OTS library routines that manipulate the Memory Management Unit (MMU). They enable the MMU before each reference to a virtual array element and disable it immediately thereafter.

For correct operation of the SJ and FB monitors, following termination of any such program, it is necessary to turn off the MMU. There is a slight possibility, however, that a program aborted via CC from the console will exit with the MMU turned on. For this reason, it might be necessary to reboot the RT-11 operating system after a FORTRAN IV program with non-PLAS virtual arrays is aborted.

4 The "ERR = label" argument to OPEN and CLOSE statements will cause transfer of control under error conditions other than those listed in the *RT-11 FORTRAN IV User's Guide*, Section 3.1.



