TOPS-10
FORTRAN Installation Guide

AA–P345C–TB

February 1987

This manual describes how to install the FORTRAN–10
Version 11 software.

This manual supersedes the *TOPS–10 FORTRAN Installation
Guide*, order number AA–P345B–TB.

Operating System and Version: TOPS–10 V7.03

Software Version: FORTRAN–10 V11

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requests the user's critical evaluation to assist us in preparing future documentation.

CONTENTS

CHAPTER 1

SUMMARY

This document describes the procedures for installing the following software:

1. Version 11 of the FORTRAN compiler

2. Version 11 of FOROTS (the FORTRAN object-time system)

3. Version 11 of FORLIB (the FORTRAN library)

4. Version 11 of FORDDT (the FORTRAN debugger)

FORTRAN, FORLIB, FOROTS, and FORDDT should be installed on SYS:, and .HLP files should be installed on HLP:.

The Version 11 release is on a 1600 BPI FORTRAN distribution tape written in BACKUP interchange mode.

The distribution tape contains of the following savesets:

1. <FORTRAN-DOCUMENTATION>

   This saveset contains FORTRA.DOC, which documents the new features in this version of FORTRAN. This document also lists the bugs and restrictions of this version. Also included if a draft of the FORTRAN Language Manual.

2. <FORTRAN-SYSTEM>

   This saveset includes the .EXE and .REL files that should be installed on SYS:.

3. <FORTRAN-TEST>

   This saveset includes a .CTL file that will run a set of verification tests.

4. <FORTRAN-OTS-DEBUGGER>

   This saveset includes the sources for FOROTS and FORDDT, and all intermediate files generated when building FOROTS and FORDDT.

5. <FORTRAN-COMPILER>

   This saveset includes the sources for the compiler, and all intermediate files generated when building the compiler.

6. <FORTRAN-TOOLS>

    This saveset includes the miscellaneous system utilities
    needed to build the compiler and FOROTS. These files include
    the BLIS1Ø compiler, HELPER, and other tools.

7. <FORTRAN-AUTOPATCH>

    This saveset includes a series of files with the extension
    .KEY. These files are supplied for future use when FORTRAN
    is Autopatched.

CHAPTER 2

INSTALLING AND TESTING STANDARD FORTRAN

The following files comprise the FORTRAN compiler and object-time
system. Merely copying these files from the distribution tape
provides a working FORTRAN system. The FORTRAN software works on a
KL10 or KS10 processor. The files are:

```
FORTRA.HLP
FORTRA.EXE
FORTB.EXE
FORTC.EXE
FORTD.EXE
FORTE.EXE
FORTF.EXE
FORTG.EXE
FORO11.EXE
FORLIB.REL
FORDDT.REL
FORDDT.HLP
```

You also need LINK-10 Version 6.0 on SYS:, and your installation must
be running TOPS-10 Version 7.03.

2.1 INSTALLING STANDARD FORTRAN

Perform the following steps to install the FORTRAN system:

(1) LOGIN as the operator.

(2) Mount the FORTRAN distribution tape. See the TOPS-10 Operator's
     Guide for information on mounting magnetic tapes.

(3) Use the CREDIR program to create directories for the contents of
     the FORTRAN distribution tape. You may use directories of your
     choice. Type the following commands:

```
.R CREDIR
Create directory:dev:[proj,prog,DOC-directory]
Create directory:dev:[proj,prog,RUN-directory]
Create directory:dev:[proj,prog,TESTS-directory]
Create directory:dev:[proj,prog,FOROTS-directory]
Create directory:dev:[proj,prog,COMPILER-directory]
Create directory:dev:[proj,prog,TOOLS-directory]
Create directory:dev:[proj,prog,FORTRAN-AUTOPATCH-directory]
```

(4) Use the BACKUP program to restore the files from the distribution tape to disk. If you wish not to restore a particular saveset, just replace the particular RESTORE command with a SKIP 1 command. Type the following commands:

```
.R BACKUP
/TAPE MTAn:
/REWIND
/INTERCHANGE
/FILES                          !OPTIONAL
/DENSITY 1600
/RESTORE dev:*.*[proj,prog,DOC-directory]=*.*
/RESTORE dev:*.*[proj,prog,RUN-directory]=*.*
/RESTORE dev:*.*[proj,prog,TESTS-directory]=*.*
/RESTORE dev:*.*[proj,prog,FOROTS-directory]=*.*
/RESTORE dev:*.*[proj,prog,COMPILER-directory]=*.*
/RESTORE dev:*.*[proj,prog,TOOLS-directory]=*.*
/RESTORE dev:*.*[proj,prog,FORTRAN-AUTOPATCH-directory]=*.*
/EXIT
```

(5) Follow the "SPECIAL INSTRUCTIONS" (if any) at the end of the cover letter. Also, read the file FORTRA.BWR in the FORTRAN-DOCUMENTATION saveset for any last minute instructions.

(6) It is recommended that you save the old version of FORTRAN in case it is needed again. Type the following commands:

```
.COPY OLD:=SYS:FORO10.EXE
.COPY OLD:=SYS:FORLIB.REL
.COPY OLD:=SYS:FORTRA.EXE
.COPY OLD:=SYS:FORTB.EXE
.COPY OLD:=SYS:FORTC.EXE
.COPY OLD:=SYS:FORTD.EXE
.COPY OLD:=SYS:FORTE.EXE
.COPY OLD:=SYS:FORTF.EXE
.COPY OLD:=SYS:FORTG.EXE
.COPY OLD:=SYS:FORDDT.REL
.COPY OLD:=HLP:FORTRA.HLP
.COPY OLD:=HLP:FORDDT.HLP
.COPY OLD:=UNV:FORPRM.UNV
```

(7) See Section 2.2 for information on how to test the FORTRAN system.

(8) Install the new FORTRAN system software by giving the following commands:

```
.COPY SYS:*.*=dev:*.*[proj,prog,RUN-directory]
.COPY HLP:*.*=dev:*.HLP[proj,prog,DOC-directory]
.COPY UNV:=dev:FORPRM.UNV[proj,prog,FOROTS-directory]
```

(9) See Chapter 4 for DBMS installation instructions.

(10) See Chapter 5 for instructions on using the SORT software.

(11) When the installation is complete, you may want to set up FORTRAN for Autopatching. See the TOPS-10/TOPS-20 Autopatch Procedures References Manual, and any FORTRAN specific information provided with Autopatch documentation files.

2.2 TESTING STANDARD FORTRAN

Perform the following procedures to test the FORTRAN system:

(1) If desired, run the standalone FORTRAN test module provided by giving the following command:

```
.DELETE F10TST.LOG
.SUBMIT [TESTS-directory]F10TST.CTL
```

The test expects to find all the FORTRAN system components and the distributed FORTRAN test programs on logical device DSK:. The test also copies certain required system software components to DSK:, for the duration of the test run.

When the test batch job is completed, the F10TST.LOG file must be examined to make sure that none of the tests branched to the error label UERR::.

(2) Run your own tests if desired. If you run your own tests, be sure that SYS: is defined to include [RUN-directory].

2.3 CLEAN UP

Perform the following step to clean-up your disk area after the installation:

(1) Decide if you want to destroy the directories you created in Step 3 in Section 2.1. For each directory you wish to destroy, give the following commands. (Note: a directory cannot be deleted unless all of its subdirectories have been deleted.)

```
.DELETE dev:*.*[proj,prog,name-of-directory-to-destroy]
.DELETE dev:name.SFD[proj,prog]
```

CHAPTER 3

BUILDING NONSTANDARD FORTRAN

This chapter describes building the FORTRAN compiler from sources if modifications to the standard compiler are desired. It also describes building FOROTS, FORLIB, and FORDDT from sources.

3.1 BUILDING THE FORTRAN COMPILER FROM SOURCES

Required software:

BLIS1Ø	7E(227)
LINK	6.Ø
MACRO	53B
SCAN	7D
WILD	7D
HELPER	7D

NOTE

All files to build the compiler are in the savesets FORTRAN-COMPILER and FORTRAN-TOOLS.

Running the control file B1ØFTN.CTL builds the compiler from its sources and produces the binary files. Edit B1ØFTN.CTL to reflect specifics at your installation.

The control file used to build the compiler in-house uses a private pack called FTN:, and references field-image software from ersatz device DEC: ([1Ø,7]). BLIS1Ø.EXE 7E(227) is included in the FORTRAN-TOOLS saveset on the distribution tape. One source file (COMMAN.MAC) references REL: [5,11] for several files.

Building the FORTRAN compiler from the sources provided is not a trivial computational task. It requires a considerable amount of computer resources. All of the modules will compile within 70K of user core with the exception of LEXICA.BLI which requires 75K. The complete execution of B10FTN.CTL requires at least 1 hour on a 1090 processor. It takes about five times longer on a 2020 processor. It is advised that only installations desiring to modify the compiler consider completely rebuilding it. In addition, it should be noted that the supplied control files are divided into clearly commented sections so that it can easily be determined which phases need to be reloaded if modifications are made. Therefore, installations inserting their own modifications into the compiler usually need only recompile the modules changed and reload the overlays affected without rebuilding the entire compiler. See MODULE.MEM on the FORTRAN-DOCUMENTATION saveset for a list of which modules are in which phases.

The control file called L10FTN.CTL produces a complete set of source listings of the compiler.

To submit the control file to build a compiler on a 1090, use the following command:

    .SUBMIT B10FTN.CTL/RESTART/TIME:1:0:0

                            NOTE

    On a 2020 processor, use /TIME:5:0:0.

3.1.1 Debugging the FORTRAN Compiler with DDT

The saveset FORTRAN-COMPILER on the distribution tape contains a version of the segmented compiler loaded with DDT under the names DORT*.EXE. These files must be renamed to FORT*.EXE before use.

If for some reason it is desired to load the compiler with DDT, there is a series of LINK indirect files included that are similar to the *.CMD files used in B10FTN.CTL. They are D*.CMD files and are used in the same fashion as the *.CMD files (see the FORTRAN-COMPILER saveset).

Since only breakpoints in the low segment are phase independent, the standard technique to set a breakpoint is to set one in FORTRA - module MAIN at GETSG+53 and then SAVE the segment. This will cause a breakpoint to occur at the beginning of each phase of the compiler just after it is loaded. At this point, breakpoints can be set in the particular phase. These phase-dependent breakpoints should be removed prior to bringing the next segment into core.

3.2 BUILDING A SINGLE-SEGMENT VERSION OF FORTRAN

The LINK indirect file ALL.CMD (and the DDT version DALL.CMD) is included on the FORTRAN-COMPILER saveset on the distribution tape. It can be used to load a single-segment version of the compiler. This is particularly attractive for installations where the job mix contains many FORTRAN compilations of several small subroutines, especially if they are handled in batch mode. Note however that the single-segment configuration is not supported.

The single-segment version is comprised of the same modules as the multi-segment version, except the modules DOPT.MAC, DGCMN.MAC, DNPT.MAC, ERROV?.BLI, and OWNDM.MAC are not needed, and ONESEG.REL is used instead of MAIN.REL.

ONESEG is simply a recompilation of MAIN.BLI, recompiled with the compilation control variable FT1SEG in the REQUIREd file FT1SEG.REQ (built as FT1SEG.REQ in B10FTN.CTL) set to 1 rather than 0. This eliminates the GETSEGs. Note that ONESEG.REL, SINGLE.EXE, as well as other modules are included on the distribution tape.

If you wish to use the single-segment compiler type the following command:

        .COPY SYS:FORTRA.EXE=SINGLE.EXE

FORTB.EXE, FORTC.EXE, and so on will no longer be used.

3.3 BUILDING FOROTS AND FORLIB FROM SOURCES

This section describes the procedures for building FORO11.EXE and FORLIB.REL from sources if modifications to the standard FOROTS and FORLIB are desired.

Required software:

        FORTRAN   11
        LINK   6.0
        MACRO   53B
        MAKLIB   2B
        GALAXY   5.1

                        NOTE

        All the files to build FOROTS and FORLIB from sources
        are in the savesets FORTRAN-OTS-DEBUGGER and
        FORTRAN-TOOLS.

The control file B10FRS.CTL can be used to build FOROTS and FORLIB from the sources. The build process uses structure FTN: and field-image software from ersatz device DEC: ([10,7]).

Edit B10FRS.CTL to reflect specifics at your installation.

To run the control file use the following command:

        .SUBMIT B10FRS.CTL/RESTART/TIME:0:30:0

                        NOTE

        On a 2020 processor, use /TIME:3:0:0.

If the FOROTS you are building contains patches or is otherwise different from the standard FOROTS, you may encounter a problem when FOROTS is rebuilt using this updated LINK command file. The likely problems and their recovery procedures are:

1. PSECT overlap - You must move .CODE. down; LINK will provide the information you need in the error message.

2. Not enough room for symbols after .CODE. - You must move down .CODE. origin.

3. ?PAGE. UUO error 4 - You must move up .CODE. origin.

3.3.1 Building FOROTS with symbols

FORO11.EXE does not normally contain symbols. This configuration was assumed to be the most desirable for TOPS-10 sites so that memory can be conserved as much as possible. However, this prevents easy debugging or patching of FORO11.

To build symbols into FORO11.EXE, you must edit the file F10OTS.CCL and comment out the first line containing the /SET and /SYMSEG switches, and remove the ";" comment character from the next line that contains the /SET and /SYMSEG switches. This is the configuration that loads symbols. You will notice that more memory must be allocated (The PSECT origins are lower).

3.4 BUILDING FORDDT FROM SOURCES

This section describes the procedures for building FORDDT from sources if modifications to the standard FORDDT are desired.

Required software:

MACRO 53B

NOTE

All the files to build FORDDT from sources are in the savesets FORTRAN-OTS-DEBUGGER and FORTRAN-TOOLS.

The control file B10FDT.CTL can be used to build FORDDT from sources. The build process uses structure DSKS: and field-image software from ersatz device DEC: ([10,7]).

Edit B10FDT.CTL to reflect specifics at your installation.

To run the control file use the following command:

.SUBMIT B10FDT.CTL/RESTART/TIME:0:5:0

NOTE

On a 2020 processor, use /TIME:0:25:0

3.5 APPLYING SOURCE PATCHES TO THE FORTRAN PRODUCT

Source patches (edits) are published in the DECsystem-10 Software
Dispatch as a problem description, accompanied by one or more FILCOM
files that detail some number of source module changes. The specified
problem is eliminated by insertion of the source changes, and
rebuilding the affected FORTRAN product component using the procedures
described above.

In general, each edit to the product consists of a new entry in the
revision history comments, a change to the edit number of the product
component, and some number of changes to the code. Code changes are
pinpointed by a line of commentary (banner line) that accompanies each
set of source line changes.

The component revision histories and edit number definitions are found
in REVHST.MAC for the compiler, FORHST.MAC for the library and OTS,
and FORDDT.MAC for the debugger. In addition, the compiler source
files all have a local revision history, found at the beginning of
each source module. All new revision history comments will always
precede the line:

"***** End Revision History *****"

Banner lines, which are provided only as a tool for patch insertion,
are NOT to be added to the sources. They are comment lines, taking
the forms:

!**;[nnnn] Where field 1, Where field 2, XXX, Date - for BLIS10 sources
                    or
;**;[nnnn] @ TAG + (or -) mL, Action, XXX, Date - for MACRO sources

Where field 1:	Routine, module, or macro name.	
Where field 2:	@ line mmmm:	where mmmm is the line number taken from a compiler listing of the module. The word "line" may not always appear.
	@ text:	where text is used to describe positioning when line numbers are not available (such as REQUIRE files).
TAG:	Closest unique MACRO tag to the source change; may be qualified with feature test indicators.	
mL: (Decimal)	(Decimal) The change goes at m Lines down (+) or up (-) from the specified TAG. Using an editor to position to the line defining the TAG, and then advancing m lines will assure correct positioning for the actual source change.	
Action:	The usual 3 are: inserted x lines, deleted x lines, or replaced x lines.	

The BLIS10 line numbers referenced are those produced by compiling the
distributed version of the module, using the distributed REQUIRE files
(if any are required). Distributed means exactly as they appear on
the FORTRAN distribution tape, with no edits installed.

In situations where lines of code are deleted, a single line of commentary will be left behind containing the edit number that removed the code. This line MUST remain in the sources (just as banner lines must NOT appear). Failure to adhere to these rules can cause difficulties with later edits that give line counts from MACRO module TAGs used in previous edits.

Each changed line of source code (where feasible) will be flagged with the edit number (nnnn) in commentary associated with the source line. For MACRO changes, this text will usually appear as the first item in the comment field, such as:

        MOVEI   T1,3   ;[1234] Get error count

For BLIS1Ø changes, this text will generally appear down the left margin of the source module, such as:

    %1234% T1 _ 3;   .!Get error count

but may also appear as the first item in the comment field.

CHAPTER 4

BUILDING DBMS VERSION 5A WITH FORTRAN-10

To install the DBMS Version 5A software with FORTRAN-10 perform the following steps:

(1) Make sure you have the files from the FORTRAN-OTS-DEBUGGER saveset on the FORTRAN distribution tape in dev:[proj,prog,FOROTS-directory] (see Section 2.1).

(2) Make sure you have the following files from the DBMS-SOURCES saveset on the DBMS Version 5A distribution tape in your FOROTS-directory:

        DBS10.REL
        DBSANY.REL
        DBSFOR.REL
        SCHIO1.REL

Restore the DBMS-SOURCES saveset using the following commands:

        .R BACKUP
        /TAPE MTAn:
        /REWIND
        /INTERCHANGE
        /FILES
        /DENSITY 1600
        /SKIP 2
        /RESTORE dev:*.*[proj,prog,FOROTS-directory]=*.*
        /REWIND
        /EXIT

(3) LOGIN to dev:[proj,prog,FOROTS-directory]

(4) The file FDBM5.CTL assumes that you have the following files on SYS:

        The files from the FORTRAN-SYSTEM saveset on the FORTRAN
        distribution tape
        LINK-10 V6.0
        MAKLIB

(5) Submit the control file FDBM5.CTL with the following commands:

        .DELETE FDBM5.LOG
        .SUBMIT FDBM5.CTL

NOTE

For a 2020 processor, use /TIME:0:25:0

The following is typed on the operator console if the build is successful:

"PLEASE -- DBMS-10 CREATION SUCCESSFUL!!!"

If the build is not successful, the following is typed on the operator console:

"PLEASE -- DBMS-10 CREATION NOT SUCCESSFUL???"

If the build is not successful, examine FDBM5.LOG for the casue of error.

(7) This control file builds DBMSF.REL and DBMSF.EXE. Put these files on the system area.

.COPY SYS:= dev:DBMSF.*[proj,prog,FOROTS-directroy]

(8) If you wish to build a FORLIB/DBMS with symbols, edit file F1DOTS.CCL in accordance with the instructions in Section 3.3.1.

CHAPTER 5

USING SORT VERSION 4C WITH FORTRAN-1Ø

To use SORT Version 4C with FORTRAN-1Ø, the file FSORT.EXE from the
SORT distribution tape must be on SYS:. The necessary interface
routine is built into FORLIB.REL.

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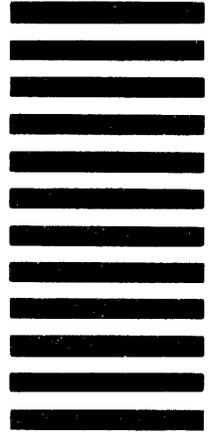City _____ State _____ Zip Code_____
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