# TOPS-20
# FORTRAN Installation Guide

AA–P344B–TM

**May 1985**

This manual describes how to install the FORTRAN–20 Version 10 software.

This manual supersedes the *TOPS–20 FORTRAN Installation Guide*, order number AA–P344A–TM.

**OPERATING SYSTEM:**   TOPS–20 V4.1, V5.1

**SOFTWARE:**   FORTRAN–20 V10

CONTENTS

# CHAPTER 1

## SUMMARY

This document describes the procedures for installing the following software:

1. Version 10 of the FORTRAN compiler

2. Version 10 of FOROTS (the FORTRAN object-time system)

3. Version 10 of FORLIB (the FORTRAN library)

4. Version 10 of FORDDT (the FORTRAN debugger)

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

The Version 10 release is on a 1600 BPI FORTRAN distribution tape written in TOPS-20 DUMPER format.

### NOTE

For the initial release of FORTRAN Version 10, the FORTRAN distribution tape will also contain the LINK Version 6.0 and DDT Version 43 software. This software will eventually be removed from the FORTRAN distribution tape. Thus, some FORTRAN distribution tapes will contain the LINK and DDT software and others will not. The installation procedures for this software have been included in this manual in gray-shading. If your FORTRAN distribution tape contains the LINK and DDT software, you should follow the instructions, including those in gray-shading; otherwise, skip the instructions in gray-shading.

The distribution tape contains the following savesets:

1. <FORTRAN-DOCUMENTATION>

   This saveset includes all FORTRAN documentation files.

2. <FORTRAN-SYSTEM>

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

3.  &lt;FORTRAN-TEST&gt;

    This saveset includes the UETP tests and .VER file. It also
    includes a .CTL file that will run the same tests without
    using UETP.

4.  &lt;FORTRAN-OTS-DEBUGGER&gt;

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

5.  &lt;FORTRAN-COMPILER&gt;

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

6.  &lt;FORTRAN-TOOLS&gt;

    This saveset includes the miscellaneous system utilities
    needed to build the compiler and FOROTS. These files include
    the BLIS10 compiler, HELPER, and other tools.

7.  &lt;FORTRAN-AUTOPATCH&gt;

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

Also included on the distribution tape are four LINK savesets and one
DDT saveset:

1.  &lt;DOCUMENTATION&gt;

    This saveset includes the LINK documentation and beware
    files.

2.  &lt;SUBSYS&gt;

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

3.  &lt;LINK.SOURCES&gt;

    This saveset includes the LINK source files.

4.  &lt;LINK.BUILD&gt;

    This saveset includes miscellaneous system utilities needed
    to build LINK.

5.  &lt;DDT&gt;

    This saveset includes REL, EXE, and documentation files for
    DDT Version 43.

# 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 files are:

```
FORTRA.HLP
FORTRA.EXE
FORO10.EXE
FORLIB.REL
FORDDT.REL
FORDDT.HLP
```

You also need LINK-20 Version 6.0 on SYS:, and your installation must be running TOPS-20 Version 5.1 (KL Model B) or TOPS-20 Version 4.1 (KS and KL Model A).

## 2.1 INSTALLING STANDARD FORTRAN

Perform the following steps to install the FORTRAN system:

(1) LOGIN as the operator or as a user with WHEEL privileges.

(2) Give the ENABLE command.

(3) Mount the FORTRAN distribution tape. (See the <u>TOPS-20 Operator's Guide</u> for instructions on mounting magnetic tapes.)

(4) Use the BUILD command to create directories for the contents of the FORTRAN distribution tape. You may use directory names of your choice. Type the following commands:

```
$BUILD <DOC-directory>      !GIVE DIRECTORY NAME OF YOUR CHOICE
$$WORK 100                  !FOR DOCUMENTATION DIRECTORY
$$PERM 100
$$DIRECTORY group           !ONE OF YOUR USER GROUPS. BUT IF
$$<RET>                     !NONE, ASK SYSTEM MANAGER FOR A
                            !GROUP NUMBER

$BUILD <RUN-directory>      !DIRECTORY NAME FOR FILES REQUIRED
$$WORK 700                  !TO RUN FORTRAN
$$PERM 700
$$DIRECTORY group           !SAME GROUP AS ABOVE
$$<RET>
```

```
$BUILD <TESTS-directory>    !DIRECTORY NAME FOR TEST FILES
$$WORK 500
$$PERM 500
$$DIRECTORY group           !SAME GROUP AS ABOVE
$$<RET>


$BUILD <FOROTS-directory>   !DIRECTORY NAME FOR FOROTS SOURCES
$$WORK 2500
$$PERM 2500
$$DIRECTORY group           !SAME GROUP AS ABOVE
$$<RET>


$BUILD <COMPILER-directory> !DIRECTORY NAME FOR COMPILER
$$WORK 2400                    !SOURCES
$$PERM 2400
$$DIRECTORY group           !SAME GROUP AS ABOVE
$$<RET>


$BUILD <TOOLS-directory>    !DIRECTORY NAME FOR TOOLS REQUIRED
$$WORK 300                    !TO BUILD FORTRAN
$$PERM 300
$$DIRECTORY group           !SAME GROUP AS ABOVE
$$<RET>


$BUILD <FORTRAN-AUTOPATCH-directory> !DIRECTORY NAME FOR
$$WORK 600                    !FORTRAN AUTOPATCH
$$PERM 600
$$DIRECTORY group           !SAME GROUP AS ABOVE
$$<RET>


$BUILD <LINKDOC-directory>  !DIRECTORY NAME FOR LINK
$$WORK 300                    !DOCUMENTATION
$$PERM 300
$$DIRECTORY group           !SAME GROUP AS ABOVE
$$<RET>


$BUILD <LINKSYS-directory>  !DIRECTORY NAME FOR LINK
$$WORK 500                    !SUBSYS
$$PERM 500
$$DIRECTORY group           !SAME GROUP AS ABOVE
$$<RET>


$BUILD <LINKSOURCES-directory> !DIRECTORY NAME FOR LINK
$$WORK 800                    !SOURCES
$$PERM 800
$$DIRECTORY group           !SAME GROUP AS ABOVE
$$<RET>


$BUILD <LINKBUILD-directory> !DIRECTORY NAME FOR LINK
$$WORK 200                    !BUILD TOOLS
$$PERM 200
$$DIRECTORY group           !SAME GROUP AS ABOVE
$$<RET>


$BUILD <DDT-directory>      !DIRECTORY NAME FOR DDT
$$WORK 2000
$$PERM 2000
$$DIRECTORY group           !SAME GROUP AS ABOVE
$$<RET>
```

(5)  Use the DUMPER 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:

```
$DUMPER
DUMPER>TAPE MTAn:
DUMPER>REWIND
DUMPER>FILE                !OPTIONAL
DUMPER>DENSITY 1600
DUMPER>ACCOUNT SYS
DUMPER>RESTORE PS:<*>*.*.*  (TO)  <DOC-directory>*.*.*
DUMPER>RESTORE PS:<*>*.*.*  (TO)  <RUN-directory>*.*.*
DUMPER>RESTORE PS:<*>*.*.*  (TO)  <TESTS-directory>*.*.*
DUMPER>RESTORE PS:<*>*.*.*  (TO)  <FOROTS-directory>*.*.*
DUMPER>RESTORE PS:<*>*.*.*  (TO)  <COMPILER-directory>*.*.*
DUMPER>RESTORE PS:<*>*.*.*  (TO)  <TOOLS-directory>*.*.*
DUMPER>RESTORE PS:<*>*.*.*  (TO)  <FORTRAN-AUTOPATCH-directory>*.*.*
DUMPER>RESTORE PS:<*>*.*.*  (TO)  <LINKDOC-directory>*.*.*
DUMPER>RESTORE PS:<*>*.*.*  (TO)  <LINKSYS-directory>*.*.*
DUMPER>RESTORE PS:<*>*.*.*  (TO)  <LINKSOURCES-directory>*.*.*
DUMPER>RESTORE PS:<*>*.*.*  (TO)  <LINKBUILD-directory>*.*.*
DUMPER>RESTORE PS:<*>*.*.*  (TO)  <DDT-directory>*.*.*
DUMPER>EXIT
```

(6)  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.

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

```
$CONNECT SYS: (or wherever you keep the FORTRAN system)
$COPY SYS:FORTRA.EXE  (TO)  OLD:FORTRA.EXE
$COPY SYS:FOROT7.EXE  (TO)  OLD:FOROT7.EXE
$COPY SYS:FORLIB.REL  (TO)  OLD:FORLIB.REL
$COPY SYS:FORDDT.REL  (TO)  OLD:FORDDT.REL
$COPY SYS:FORTRA.HLP  (TO)  OLD:FORTRA.HLP
$COPY SYS:FORDDT.HLP  (TO)  OLD:FORDDT.HLP
$COPY SYS:FORPRM.UNV  (TO)  OLD:FORPRM.UNV
```

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

```
$DELETE F20TST.LOG
$SUBMIT <TESTS-directory>F20TST.CTL/TIME:0:5:0
```

NOTE

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

Section 2.2 describes how to test the FORTRAN system with UETP.

The test expects to find all the FORTRAN system components and
the files from the FORTRAN test directory on logical device DSK:.

When the test batch job is completed, the F20TST.LOG file must be
examined to make sure that none of the tests branched to the
error label UERR::.

(9)  Install the FORTRAN software on the system area by giving the commands:

```
$COPY <RUN-directory>*.HLP HLP:*.*
$DELETE <RUN-directory>*.HLP
$COPY <RUN-directory>*.* SYS:*.*
$COPY <FOROTS-directory>FORPRM.UNV SYS:FORPRM.UNV
```

LINK Version 6.0 must also be on SYS:.

(10) See Chapter 4 for DBMS installation instructions.

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

(12) When the installation is complete, you may want to set up FORTRAN for Autopatching.  See the TOPS-10/TOPS-20 Autopatch Procedures Reference 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 with UETP:

(1)  Install the FORTRAN UETP test modules by giving the commands:

```
$COPY <TESTS-directory>*.* PS:<UETP.LIB>*.*
```

(2)  To run UETP, you must have OPERATOR privileges, IPCF privileges, and you must be in USER group 100.

(3)  Once the FORTRAN and LINK Version 6.0 system components have been installed in SYS: (see Step 9 in Section 2.1), you may run the UETP test module provided, by giving the following commands:

```
$TAKE PS:<UETP.LIB>SET-UP.CMD
$CONNECT PS:<UETP.RUN>
$DELETE FORTRA.LOG,RUN.LOG,EXCEPT.LOG
$RUN UETP
UETP>ENABLE FORTRA/DEPTH:VERIFICATION
[13:48:01  ENABLE COMPLETED]
UETP>BEGIN
[13:48:08  BEGIN COMPLETED]
UETP>
    START FORTRA 13:49:25
UETP>STATUS                         !PERIODICALLY GIVE STATUS
                                    !COMMAND FOR STATUS OF JOB
    END    FORTRA 13:55:13

[All test complete on processor # 2102]
UETP>EXIT
$DEFINE DSK:
$TAKE PS:<UETP.LIB>CLEAN-UP.CMD
```

### NOTE

For a 2020 processor, add a /TIME:25 to the UETP ENABLE command, such as, UETP>ENABLE FORTRA/DEPTH:VERIFICATION/TIME:25.

If any errors occur, UETP will report them at your terminal and in the file EXCEPT.LOG. For more information on UETP see the UETP Procedures/Reference Manual in the TOPS-20 Notebook set.

(4) 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 4 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.)

```
$BUILD <name-of-directory-to-destroy>
$$KILL
[CONFIRM]<RET>        !TO CONFIRM
$$<RET>               !TO EXIT BUILD
```

# 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:

    BLIS10      7.5(227)
    LINK        6.0
    MACRO       53.1

### NOTE

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

Running the control file B20FTN.CTL builds the compiler from its sources and produces the binary files. Edit B20FTN.CTL and B20FTN.CMD to reflect specifics at your installation.

The file B20FTN.CTL does a TAKE of B20FTN.CMD, which defines SYS: and DSK:. Note that SYS: includes an area <FORTRAN.SSP> that is assumed to contain the files that are in the FORTRAN-TOOLS saveset on the distribution tape.

The control file used to build the compiler at DIGITAL uses field-image software from SYS:. BLIS10.EXE 7.5(227) is included in the FORTRAN-TOOLS saveset on the distribution tape.

Building the FORTRAN compiler from the sources provided is not a trivial computational task. It requires a considerable amount of computer resources. The complete execution of B20FTN.CTL requires at least 1 hour on a 2060 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.

To submit the control file to build a compiler on a 2060 processor, use the following command:

    $SUBMIT B20FTN.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

Symbols are loaded into FORTRA.EXE so that DDT can be used with the FORTRAN compiler without any modifications.


## 3.2  BUILDING FOROTS AND FORLIB FROM SOURCES

This section describes the procedures for building FORO10.EXE and FORLIB.REL from sources if modifications to the standard FOROTS and FORLIB are desired.

Required software:

    FORTRAN    10
    GALAXY     4.2
    LINK       6.0
    MACRO      53.1
    MAKLIB     2.2


                              NOTE

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

The control file B20FRS.CTL can be used to build FOROTS and FORLIB from the sources.  The build process uses field-image software from SYS:.

Edit B20FRS.CTL and B20FRS.CMD to reflect specifics at your installation.  B20FRS.CTL does a TAKE of B20FRS.CMD, which defines SYS: and DSK.

To run the control file use the following command:

    $SUBMIT B20FRS.CTL/RESTART/TIME:0:30:0

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.

## 3.3   PATCHING FOROTS WITH DDT

FORO10.EXE normally contains symbols, but in order to use them the following procedure must be followed (underlined text indicates user input):

```
@GET FORO10
@I MEM            !To find out starting and ending page number
520-574    FORO10.EXE        1-46       R, CW, E

@DDT
DDT
115/   ?   1
75/    0   520   (Starting page number from the I MEM command)

.
.
.
```

At this point, DDT knows about the FOROTS local symbols, so they can be used in applying patches. After you have installed a patch, type Control-Z to DDT, then type:

```
@SAVE FORO10 (PAGES FROM) 400 (TO) 600
```

## 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 53.1

### NOTE

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

The control file B20FDT.CTL can be used to build FORDDT from sources. The build process uses field-image software from SYS:.

Edit B20FDT.CTL to reflect specifics at your installation.

To run the control file use the following command:

$SUBMIT B20FDT.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-20 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.

There are a number of FORTRAN product files that are absent from the
FORTRAN-20 version of the product.  These files are OWNDM.MAC,
DOPT.MAC, DGCMN.MAC, DNPT.MAC, ERROVA.BLI, ERROVB.BLI, ERROVC.BLI,
ERROVD.BLI, ERROVG.BLI, COMMAN.MAC, and ERROVR.BLI for the compiler,
and FORRTF.MAC for the library (FORLIB.REL).  Source changes to these
modules can be safely ignored when installing patches to the
FORTRAN-20 version of the product.

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) The change goes at m Lines down (+)
> (Decimal)        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 BLIS10 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 6.1 WITH FORTRAN-20

To install the DBMS Version 6.1 software with FORTRAN-20 perform the following steps:

(1) Make sure you have the files from the FORTRAN-OTS-DEBUGGER saveset on the FORTRAN distribution tape in your <FOROTS-directory> (see Section 2.1).

(2) Make sure you have the following files from the DBMS-SOURCES saveset on the DBMS Version 6.1 distribution tape in <FOROTS-directory>:

DBS20.REL
DBSANY.REL
DBSFG.REL
SCHIO2.REL

Restore the DBMS-SOURCES saveset using the following commands:

```
$DUMPER
DUMPER>TAPE MTAn:
DUMPER>REWIND
DUMPER>DENSITY 1600
DUMPER>SKIP 2
DUMPER>RESTORE PS:<SOURCES>*.* (TO) <FOROTS-directory>*.*
DUMPER>REWIND
DUMPER>EXIT
```

(3) Connect to <FOROTS-directory>

```
$CONNECT <FOROTS-directroy>
```

(4) The file FDBM6.CTL assumes that you have the following files on SYS:

The files from the FORTRAN-SYSTEM saveset on the FORTRAN distribution tape
LINK-20 V6.0
MAKLIB

(5) Submit the control file FDBM6.CTL with the following commands:

```
$DELETE FDBM6.LOG
$SUBMIT FDBM6.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-20 CREATION SUCCESSFUL!!!"

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

"PLEASE -- DBMS-20 CREATION NOT SUCCESSFUL???"

If the build is not successful, examine FDBM6.LOG for the cause of error.

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

$COPY <FOROTS-directory>DBMSF.* (TO) SYS:DBMSF.*


## 4.1   DEBUGGING FORTRAN-DBMS USING DDT

If you wish to debug a FORTRAN program that uses DBMS, and you want to use  DBMS labels, you must change the contents of .JBHSO to 700.  This points DDT to the symbol table for DBMS.  At this point, however,  DDT no  longer  knows  where  the  symbol  table for FOROTS is.  To regain access to FOROTS symbols, you should change  the  contents  of  .JBHSO back to its original value.

# CHAPTER 5

## USING SORT VERSION 5 WITH FORTRAN-20

To use SORT Version 5 with FORTRAN-20, the file SORT.EXE from the SORT distribution tape must be on SYS:.  The necessary interface routine is built into FORLIB.REL.

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