

KNOWHWDOC

TECHNICALITIES ON WRITING MUSIC IN FORTRAN AT EMS. EDITION 740927

PRELIMINARY VERSION.

THIS INFORMATION IS INTENDED FOR PEOPLE ACQUAINTED WITH FORTRAN WHO WISH TO USE THE PDP 15/40 AT EMS. REFERENCES ARE MADE TO OTHER DOCUMENTS.

0. CONFIGURATION.

A LIST OF THE NOTATION USED IN PIP (SEE 2.) AND IN ASSIGNMENTS (SEE 6.) AND A SHORT DESCRIPTION.

TT CONSOLE TELETYPE
 TT0-TT4 TELETYPES, INCLUDING A TEKTRONIX GRAPHIC TERMINAL.
 TWO OF THESE HAVE PAPER TAPE READER AND PUNCH AND CAN BE USED FOR OFF-LINE PREPARATION.
 TWI THE TEKTRONIX AS ORDINARILY REFERRED TO FROM PIP
 TV " "
 LP LINE PRINTER
 PR PAPER READER
 PP PAPER PUNCH
 DK-DK7 DEC DISKS WITH 128K 18BIT WORDS EACH FOR FILE STORAGE
 DT-DT7 DEC TAPE FOR 144K 18BIT WORDS THERE ARE FOUR DRIVES; EACH CAN BE DIALLED TO A NUMBER 0 - 7 (THE FIGURE 8 ON TWO OF THEM SHOULD BE READ AS 0)
 MT-MTI MAGNETIC TAPE (AMPEX). USED TO STORE STUDIOCODE, READ BY THE PLAY PROGRAM

1. STARTING THE MACHINE.

FOLLOW THE INSTRUCTIONS IN PDP-15 users guide (A SMALL BOOK THAT SHOULD BE SOMEWHERE IN THE COMPUTER ROOM), CONCERNING THE ADVANCED MONITOR, DECDISK SYSTEM, 32K OF MEMORY (PAGES 1 AND 2).

1.1 CHECK THAT THE MACHINE IS ON (LAMPS SHINING). IF NOT, THERE IS A ROTARY SWITCH ON THE COMPUTER CONSOLE. ALSO CHECK THE CONSOLE TELETYPE (TT0). THE MACHINE IS NORMALLY NOT SWITCHED OFF, ONLY THE PERIPHERALS.

1.2 TYPE C (MEANS KEEP THE CONTROL BUTTON DOWN AND STRIKE C) ON THE CONSOLE TELETYPE: THE ANSWER SHOULD BE

KM15 VNN
 \$

1.3 IF NOT, ASSUME THAT THE BOOTSTRAP IS IN CORE AND DO AS IN USERS GUIDE, PAGE TWO (DEPRESS STOP, RESET, START FROM 77646).

1.4 IF THAT DOES NOT WORK, PLACE THE DECDISK BOOTSTRAP IN THE PAPER TAPE READER AND DO AS FOR ALL SYSTEMS ON PAGE ONE IN USERS GUIDE (DEPRESS STOP, RESET, READ IN FROM 77637).

1.5 IF THAT DOES NOT WORK; USE RFSAV TO PLACE A NEW VERSION OF THE MONITOR ON DISK 0. THE EXAMPLE ON THE LAST PAGE BEFORE THE APPENDICES IN USERS GUIDE HOLDS. CHOOSE A SYSTEM TAPE LABELLED KM... IF THE VERSION NOTICE CONTAINS AN X, THE FORTRAN VERSION OF THE SYSTEM UTILIZES HARDWARE FLOATING POINT.

2. PIP (PERIPHERAL INTERCHANGE PROGRAM).

SEE USERS GUIDE FOR A SUMMARY OF PIP. AS A PRACTICAL EXAMPLE; LET US ASSUME THAT YOU HAVE PUNCHED YOUR FORTRAN SOURCE FILE OFF LINE ON A PAPER TAPE, AND WANT IT ON DISK 1 FOR FURTHER PROCESSING. CALL PIP BY TYPING

PIP

AFTER THE MONITOR'S \$, AND WAIT FOR A > .
THEN TYPE

T DK1 PR FNAME SRC

WHERE FNAME IS THE NAME YOU GIVE TO THE FILE NOW RESIDING ON DISK 1.
SRC IS THE STANDARD EXTENSION FOR SOURCE FILES AND IMPLIES DATA MODE A (ASCII).
THERE ARE EIGHT DISK UNITS (0 TO 7). DECTAPE UNITS CAN BE GIVEN NUMBERS 0 TO 7
BY A SWITCH. NOTICE THE REMOTE AND WRITE ENABLE BUTTONS.
A HEART SYMBOL ON THE LINEPRINTER CORRESPONDS TO A BACKARROW ON THE TELETYPE AND
AN UNDERLINE ON THE TEKTRONIX (␣, -)
IN THE EXAMPLE, YOU PROBABLY WANT TO CHECKREAD THE FILE, SO SEND IT TO THE
LINEPRINTER BY

T LR DK1 FNAME SRC

TO SAVE THE FILE ON A DECTAPE, TYPE

T DTN DK1 FNAME SRC

WHERE N IN DTN IS A NUMBER 0 TO 7.
A ^C RETURNS TO THE MONITOR. DO NOT TYPE ^C OR ^P BEFORE TRANSFER TO A
DECTAPE IS FINISHED. IT MAY CRASH THE DECTAPE.

TO LIST THE DIRECTORY OF A DECTAPE, THE COMMAND IS

L LR DTN

AND SIMILARLY FOR DISK, OR A DIFFERENT LIST MEDIUM.
TO PUNCH A FILE ON PAPER TAPE FROM A DECTAPE, THE SERIES OF COMMANDS MAY BE
(STARTING FROM THE MONITOR)

A PP 1

PIP

T PP DT2 FNAME SRC

THE PP IS IN THIS WAY ASSIGNED TO A POSITIVE DAT SLOT, WHICH IT USUALLY IS NOT.
PIP CAN ONLY USE DEVICES ASSIGNED TO POSITIVE DAT SLOTS.

3. EMS DOCUMENTATION.

YOU SHOULD BE ACQUAINTED WITH THE FOLLOWING DOCUMENTATION FILES ON A DECTAPE
MARKED EMS-DOC1:

- 1) EMSDEV DOC (DESCRIBES THE SUBROUTINES BY WHICH THE STUDIO IS CONTROLLED).
- 2) A1/A2 DKU (DESCRIBES HOW TO PLAY THE GENERATED MUSIC FROM THE COMPUTER).
- 3) KNOWHW DKU (THIS INFORMATION).
- 4) EMSDDP PROGRAM PRINTS OUT EMSDEV CALLS FOR TRACING.
- 5) EXTEMS DOC DESCRIBES THE FORMAT IN WHICH ANOTHER COMPUTER SHOULD WRITE AN
ASCII FILE TO BE READ BY THE EXTEMS PROGRAM TO GENERATE THE EMSDEV CALLS.

4. THE EDIT PROGRAM

IF CORRECTIONS AND CHANGES ARE NEEDED IN YOUR SOURCE PROGRAM, HAVE IT ON DISK1
(PUT IT THERE WITH PIP IF NECESSARY) AND TYPE

EDIT

AFTER THE MONITOR'S \$. SEE USERS GUIDE FOR A SUMMARY OF THE EDITING COMMANDS

AFTER EDIT'S >, TYPE

OPEN FNAME

THE LOCATIVE AND MANIPULATIVE REQUESTS ARE PROBABLY SATISFACTORY TO DO YOUR JOB. ONE LINE AT A TIME IS BROUGHT INTO THE WORK AREA BY ONE OF THE LOCATIVE REQUESTS AND THEREAFTER MANIPULATED. THE FIND AND LOCATE COMMANDS ALWAYS START SEARCHING ON THE LINE FOLLOWING THE CURRENT LINE. IF A PREVIOUS LINE IS WANTED, TOP CAN BE USED TO START FROM THE BEGINNING. EMPTY LINES SERVE AS ANCHORS AT THE ENDS. AFTERWARDS THE FILE MUST (I) BE CLOSED. TYPE

CLOSE

AP RESTARTS THE EDITOR AND AC EXITS TO MONITOR. IF EITHER OF THESE COMMANDS ARE PERFORMED WHILE A FILE IS OPEN, THE RECENT CHANGES IN THE FILE WILL BE LOST. THE FILE ITSELF MAY NOT EVEN BE PRESENT ON DK1 AFTERWARDS. IN THAT CASE, HOWEVER, IT IS PRESENT ON EITHER DK1 OR DK2, PERHAPS UNDER THE NAME .TFIL1 EDT, WHICH CAN BE RENAMED TO FNAME BY COMMANDS IN PIP OR EDIT.

NOTICE THAT, IF A FILE IS OPEN A SINGLE CARRIAGE RETURN CHANGES THE EDITOR FROM EDIT MODE (COMMAND REPERTOIRE AVAILABLE) TO INPUT MODE (EVERYTHING THAT IS WRITTEN IS INSERTED AFTER THE PREVIOUS LINE). IF, INITIALLY, THE FILE BEING OPENED IS NOT PRESENT ON THE MEDIUM (USUALLY DISK 1), THE EDITOR ASSUMES YOU WANT TO CREATE A FILE WITH THE NAME GIVEN, AND SETS INPUT MODE IMMEDIATELY.

NOTICE THAT THERE ARE THREE WAYS OF INSERTING NEW LINES IN A FILE:

- 1) USING THE INSERT COMMAND, I.
- 2) SWITCHING TO INPUT MODE, WRITE NEW LINES AND SWITCH BACK TO EDIT MODE (TWO CARRIAGE RETURNS) (NECESSARY FOR CLOSE).
- 3) THE GET COMMAND (G). SEQUENCE:
HAVE THE NEW LINES ON A PAPER TAPE. START FROM MONITOR.

A PR -10

EDIT

OPEN FNAME

L SPOT

(OR OTHER LOCATIVE REQUEST)

G 100

(THE ARGUMENT 100 IS THE NUMBER OF LINES TO BE INSERTED)

CLOSE

IF THE TEKTRONIX IS PLACED NEAR THE CONSOLE TELETYPE, ANOTHER VERSION OF THE EDITOR CAN BE USED. INSTEAD OF EDIT, TYPE

EDITVP

IT IS ALMOST IDENTICAL TO THE NORMAL EDIT, EXCEPT THAT IT HAS A COMMAND

TV ON

AFTER WHICH NEW AND CHANGED LINES ARE PRINTED ON THE TEKTRONIX. IF

TV OFF

IS GIVEN, IT AGAIN WORKS AS THE NORMAL EDITOR.

5. THE FORTRAN COMPILERS.

SOME OTHER COMPILERS ARE MORE GENEROUS TO THE USER. THESE ARE SOME RESTRICTIONS:

AN ARRAY CAN HAVE AT MOST 3 SUBSCRIPTS.

THE ORDER OF SPECIFICATION STATEMENTS IS IMPORTANT:

BLOCK DATA;FUNCTION;SUBROUTINE
 INTEGER;REAL;LOGICAL;DOUBLE PRECISION
 DIMENSION
 COMMON
 EQUIVALENCE;EXTERNAL
 DATA
 STATEMENT FUNCTIONS

OTHER EXECUTABLE PROGRAM STATEMENTS AND FORMAT STATEMENTS

DATA MUST BE SPECIFIED IN DATA STATEMENTS

DOUBLE NESTING IN FORMAT STATEMENTS IS NOT PERMITTED

ARRAY DATA MUST BE SPECIFIED LIKE:

DATA ARR(1),ARR(2),.../1.,2. .../

THIS IS NOT TRUE FOR THE X VERSION; IT CAN TAKE

DATA ARR/1.,2., ...

6. RUNNING THE FORTRAN COMPILER.

THE SOURCE FILE SHOULD BE ON DK1. TYPE

A LP -12

F4

IF THE ASSIGNMENT OF LP TO -12 IS OMITTED LISTING AND ERROR PRINTOUTS WILL BE ON THE CONSOLE TELETYPE, WHICH IS MORE TEDIOUS.

SEE USERS GUIDE FOR A SUMMARY OF COMPILER COMMANDS. THE CASE MAY BE

BLDFNAME

A LISTING OF THE FILE FNAME NOW APPEARS ON LP WITH LINES FLAGGED FOR ERRORS. THE MESSAGE CODES ARE DESCRIBED IN THE FORTRAN MANUAL. THERE ARE SOME BUGS IN THE COMPILER ITSELF. IT MAY NOT ALWAYS FLAG THE CORRECT LINE, BUT THE PRECEDING OR THE FOLLOWING.

COMMON VARIABLES MAY CAUSE TROUBLE:

IF THERE ARE ANY ERRORS, GO TO THE EDITOR AND MAKE CORRECTIONS (OR CIRCUMVENT THE BUGS).

IF THERE ARE NO ERRORS, A BINARY FILE WILL BE CREATED ON DK2, WHICH CAN BE EXECUTED IN A LATER STEP.

7. EMS'S BINARY FILES.

USE PIP TO TRANSFER SOME BINARY FILES FROM A DECTAPE MARKED EMS-BIN1 TO DK2.

T DK2DTN EMSDEV BIN (MODE B FOR BINARY IS ASSUMED IF EXTENSION IS BIN)

SAME WITH WREMA1 AND/OR WREMA2. ONE OF THESE PROGRAMS IS USED BY EMSDEV TO WRITE STUDIO CODE ON MAGNETIC TAPE. WREMA1 WRITES IN AN UNBLOCKED FORMAT THAT CAN BE PLAYED ON LINE AS WELL AS ON THE OFF LINE MAG TAPE UNITS IN THE ROOM WITH STUDIO ELECTRONICS. IN THE LATTER CASE, THE TAPE CAN BE CONTROLLED, COPIED AND EDITED FROM THE BUTTONS ON THE STUDIO CONSOLE. THE SHORTEST POSSIBLE RECORD TIME IS ABOUT 17 MILLISECONDS.

WREMA2 WRITES IN A BLOCKED FORMAT, A2, THAT CAN ONLY BE PLAYED ON LINE WITH THE PROGRAM A1/A2. TIME CAN BE RESOLVED TO 1 MILLISECOND, BUT ONLY A RESTRICTED NUMBER OF EVENTS MAY STILL TAKE PLACE EACH MILLISECOND (SOMETHING LIKE 20).

EMSDDP (EMSDEV DUMP) CAN BE USED INSTEAD OF EMSDEV FOR A MERE TRACING RUN.

8. THE LOADING PROCEDURE.

AFTER THE PROGRAM AND SUBPROGRAMS TO BE RUN ARE PLACED ON DK2 THEY CAN BE LOADED INTO CORE AND EXECUTED.

BUT FIRST, IF STUDIO CODE IS TO BE GENERATED, MOUNT A TAPE ON A MAGTAPE UNIT, SAY MT1, AND REMOTE IT. THEN TYPE ^P OR ^C TWICE ON THE CONSOLE TELETYPE TO GET ON FROM AN IOPS MESSAGE, THEN TYPE

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A MT1 7,10          (AND OTHER NONSTANDARD ASSIGNMENTS YOUR PROGRAM MAY USE)
GLOAD
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TO START THE LINKING LOADER. AFTER THE > RESPONSE, TYPE

```
QFNAME,SUB1,SUB2
E,MSDEV,WREMA1 (ALT MODE)
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IF FNAME IS THE MAIN PROGRAM AND SUB1 AND SUB2 ARE THE USER'S SUBPROGRAMS AND FORMAT A1 IS WANTED.

EACH NAME SHOULD BE TERMINATED WITH A COMMA OR A CARRIAGE RETURN, EXCEPT THE LAST NAME, WHICH SHOULD BE FOLLOWED BY THE ALT MODE CHARACTER (SECOND ROW AT THE VERY LEFT ON THE KEYBOARD).

IF ONE OF THE PROGRAMS IS NOT PRESENT ON DK2, A MESSAGE IS PRINTED:

```
.LOAD3
```

IN THAT CASE, USE PIP TO PUT IT THERE, OR RESTART THE LOADER AND SPELL THE NAME CORRECTLY NEXT TIME. THE REASON MAY ALSO BE THAT A FORTRAN PROGRAM WAS COMPILED UNDER A DIFFERENT SYSTEM, SO THAT A LIBRARY ROUTINE IS MISSING. IN THAT CASE, RECOMPILE OR CHANGE SYSTEM.

IF LOADING IS SUCCESSFUL, EXECUTION WILL START.

AN ALTERNATIVE TO TYPING GLOAD IS "LOAD" IN WHICH CASE EXECUTION WILL NOT TAKE PLACE UNTIL THE USER RESPONDS CTRL S TO THE MESSAGE ^S.

THE LOADING COMMANDS FOR A TRACE RUN COULD BE

```
LP -12
GLOAD
QFNAME,SUB1,SUB2,EMSDDP (ALT MODE)
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LIBROUTINES CAN ALSO BE PACKED IN A LIBRARY FILE CALLED .LIBR5 BIN. SEE USER'S GUIDE FOR THE UPDATE PROGRAM.

IF YOUR .LIBR5 BIN RESIDES ON DK2, PERFORM THE EXTRA ASSIGNMENT

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A DK2 -5
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AND YOU NEED NOT STATE THE NAMES OF THE CONTAINED ROUTINES IN THE LOADING PROCEDURE.

WHEN GLOAD HAS LOADED THE PROGRAMS NAMED EXPLICITLY, IT READS .LIBR5 BIN AND TAKES FROM THERE PROGRAMS THAT ARE CALLED BUT NOT FOUND BEFORE. IF LIBRARY ROUTINES CALL EACH OTHER, IT IS THUS IMPORTANT THAT UP TO THE POINT WHERE A PROGRAM IS, AT LEAST ONE OF THE PREVIOUSLY LOADED PROGRAMS DOES A CALL TO IT.

9. TO PLAY THE RESULTING MAGTAPE,

MAKE SURE THAT THE STUDIO IS ON AND THAT THE SWITCH ON THE STUDIO CONSOLE IS IN THE PDP/EMS POSITION.

THE TAPE CAN NOW BE PLAYED ON LINE (MANUAL BACKING IS NOT NECESSARY). TYPE

A DK -4/MTI 7,10 (WHERE I IS 0 OR 1)
E A1/A2

THE ANSWER WILL BE

A1/A2
?

THE STANDARD THING TO DO NOW IS TO TYPE

B,S

AND IN RESPONSE TO THE PRINTOUT

T,AE?

TYPE A MERE CARRIAGE RETURN.

ALL OF THE TAPE WILL NOW BE PLAYED AT NORMAL SPEED. IF ONLY PARTS
A WANTED, SEE A1/A2 DKU.

SPEEDING UP OR DOWN CAN BE DONE BY ANSWERING DIFFERENTLY TO TIME? .
500 WILL GIVE HALF SPEED, 2000 DOUBLE SPEED ASO. IF THERE ARE TOO MANY
EVENTS, SLOWING DOWN MAY BE NECESSARY.

10. MISCELLANEOUS HINTS.

AC ALWAYS RETURNS TO THE MONITOR.

AP ALWAYS RESTARTS THE CURRENT PROGRAM.

WRITING 0 AS A DEVICE NUMBER IS MANDATORY. DK IS EQUIVALENT TO DK0.

EACH PROGRAM COMMUNICATES WITH THE ENVIRONMENT VIA "DAT SLOTS" NUMBERED
-15 TO 10, OCTAL. THE PRESENT SYSTEM'S USE OF DAT SLOTS IS LISTED WITH
THE R COMMAND IN THE MONITOR.

THE UTILITY PROGRAMS'S USE OF DAT SLOTS IS LISTED IN APPENDIX A,USERS GUIDE.
E.G., IF THE USER WANTS TO EDIT A FILE ON DK4, DK4 CAN BE MADE THE EDITOR'S
INPUT DEVICE BY TYPING

A DK4 -14
IT

ERRORS ARE INDICATED WITH MESSAGE IOPSNM, WHERE NN IS A NUMBER.
A COMPLETE LISTING OF IOPS ERROR CODES IS IN APPENDIX C, USERS GUIDE,
AND LISTED NEAR THE COMPUTER. SOME COMMON ERRORS ARE LISTED BELOW.

IOPS03 ILLEGAL INTERRUPT. USUALLY OCCURS WHEN A MAGTAPE UNIT IS REMOTED
OR DISREMOVED OR THE DISPLAY IS TOUCHED WHEN SWITCHED ON AND NOT ACTIVATED.
THE REASON IS THAT THE APPROPRIATE INTERRUPT CHANNEL IS NOT SETUP.
THE CURRENT PROGRAM EXECUTION IS DESTROYED, WHICH MAY BE VERY ANNOYING
E.G. IF SOMEONE HAS A FILE OPEN IN THE EDITOR.

SENCEMORAL: DO NOT REMOTE THE MAGTAPE UNLESS THE COMPUTER IS IN THE
MONITOR. TYPE AP TWICE TO GET ON.

IOPS4 DEVICE NOT-READY. IN THE DECTAPE CASE, NO UNIT WITH THE NUMBER IN
QUESTION MAY BE REMOTED, SEVERAL UNITS ARE REMOTED WITH THE NUMBER, OR
WRITE IS ATTEMPTED ON A WRITE LOCKED UNIT. MAKE READY AND TYPE AR,
OR DECIDE IT WAS A MISTAKE AND TYPE AP.
NOTICE THAT THE LINE PRINTER WILL NOT GIVE AN IOPS IF IT IS ON BUT NOT ON
LINE; IT HANGS AND WAITS FOR ON LINE.

IOPS06 ILLEGAL HANDLER FUNCTION, TRYING TO WRITE ON A PAPER READER A.O.

IOPS10, IOPS11 REVIEW THE ORDER OF SEEK, ENTER, OPEN, AND CLOSE IN THE FORTRAN PROGRAM.

IOPS15 DECTAPE OR DISK FULL. THE FILE BEING WRITTEN IS LOST.

IOPS14 DIRECTORY FULL. A DECTAPE OR DISK CAN ONLY TAKE 56 (70 OCTAL) FILES. THIS ERROR CAN OCCUR ON EDITING IF THE OUTPUT MEDIUM (DK2 UNLESS REASSIGNED) IS FULL. DELETE UNNECESSARY FILES OR CHOOSE ANOTHER MEDIUM. ALSO NOTICE THAT IF ONE WRITES A FILE ON A MEDIUM THAT ALREADY HAS A FILE WITH THAT NAME, THE OLD VERSION IS DELETED, BUT ONLY AFTER THE NEW VERSION HAS BEEN SUCCESSFULLY WRITTEN. SO, IF THE MEDIUM HAS 56 FILES ONE OF WHICH IS TO BE REPLACED WITH A NEW VERSION, DELETE THE OLD VERSION FIRST.

IOPS61 MAY OCCUR ON A DECTAPE THAT IS EITHER WORN OR MISWRITTEN BY A SYSTEM FAILURE. THE CONTENTS ARE NOT EASILY SAVED.

THE REASON IS ILLEGAL BIT COMBINATIONS IN THE DIRECTORY:

IF, ON A DIRECTORY LISTING, THE MESSAGE ILL CNT IS PRESENT, SOMETHING IS ALSO WRONG WITH THE DIRECTORY. PUT THE FILES ON ANOTHER MEDIUM TEMPORARILY, MAKE NEW DIRECTORY (E.G: N DT3 IN PIP) AND TRANSFER THE FILES BACK.

FILES CAN BE RENAMED IN PIP EITHER WITH THE RENAME COMMAND OR WHILE MAKING A TRANSFER. E.G.: IF THE USER KEEPS HIS FILES ON A DECTAPE, TRANSFERS ONE OF THEM TO A DISK FOR EDITING AND WANTS TO KEEP BOTH VERSIONS, HE COULD RENAME THE FILE EITHER WHEN TRANSFERRING THE FILE TO THE DISK OR WHEN SAVING IT BACK ON TO THE DECTAPE TO AVOID DELETION OF THE OLD VERSION, AS IN

T DT3 VERS18 SRO-DKI VERS17