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TITLE: USE OF THE VAX-11 FARANT MICROWAVE DESIGN PROGRAM FROM GREEN BANK

AUTHOR(S): R. Norrod

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L. D'Addario

USE OF THE VAX-11 FARANT MICROWAVE  
DESIGN PROGRAM FROM GREEN BANK

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R. Norrod

Recently, I have learned to use the FARANT microwave analysis and optimization program which resides on the VAX-11 in CV. As this required tracking down information from general sources, I have had my notes typed in the hope that they can ease the pain of other potential users. To compensate for this largess, and since I am never one to leave well enough alone, I have increased the potential confusion by modifying S. Keller's "SPLOT" subroutine and the APPLE "PLOTTER" program, described in reference [3], to allow the plotting of magnitude and phase of a S-parameter versus frequency. These changes are described in reference [4].

CAUTION: All information contained herein applies completely only to the GBELEC directory on the VAX and two APPLE disks, called "ASCII EXPRESS FOR THE VAX" and "VAX FARANT PLOTTER", available in GB.

The attached information consists of two double-sided crib sheets. The first deals with the use of the APPLE computer as a VAX terminal and the handling of "SPLOT" data files. The second sheet deals with general VAX system operations and some housekeeping specifics of using VAX FARANT. Also attached is an example terminal session accessing FARANT.

This information is not sufficient to teach someone VAX FARANT from the ground up, but hopefully will be a handy reference to less than frequent users.

My thanks to L. D'Addario and G. Fickling in CV for their assistance.

References:

- [1] Blue, Bill, "ASCII Express II Instruction Manual", Southwest Data Systems.
- [2] Fenstermacher, Dan, "A Computer Aided Analysis Routine including Optimization for Microwave Circuits and Their Noise", NRAO EDIR #217.
- [3] Keller, Stowe, "Using the Apple II for Graphics Output from VAX FARANT", NRAO EDTN #113.
- [4] Norrod, Roger, "A Revised VAX FARANT SPLOT Routine and Related Apple II Plotting Program", NRAO EDTN #114.
- [5] Digital Equipment Corporation, "VAX/VMS Primer", AA-D030B-TE.
- [6] Digital Equipment Corporation, "VAX-11 Text Editing Reference Manual", AA-D029B-TE.

APPLE/ASCII EXPRESS II VAX TERMINAL

ASCII EXPRESS II (AE II) is a commercial program which converts the APPLE II into a fairly smart terminal. A flow chart (over) explains the various modes of AE II. For the required hardware configuration, see reference [3].

To begin, boot "ASCII EXPRESS II" disk by turning power on (or if already on type PR#6) with disk in drive and wait for display of MAIN MENU.

To access VAX-11, select D)IAL A SYSTEM. Type F1<C/R> when asked which number to dial. When a solid (non-blinking) cursor appears, press <C/R> to wake the VAX.

To Log on, when asked for user name or password, reply with: ctrl-A1 or GBELEC<C/R>

Note: Certain frequently typed character sequences have been defined as keyboard MACROS. These are automatically loaded by AE II when the VAX number (F1) is dialed. A complete MACRO listing follows (over). For example, when ctrl-A1 is typed, AE II sends the character string GBELEC<C/R> to the VAX.

Note: As with most terminals, control characters are generated by holding down the CTRL key while the character key is pressed, e.g., ctrl-A is generated by holding down the CTRL key and pressing the "A" key.

AEII supports both upper and lower case characters. Lower case appears as inverse on our APPLE display. AEII also has provisions to send certain other characters to the VAX that are not explicitly available on the APPLE keyboard (over).

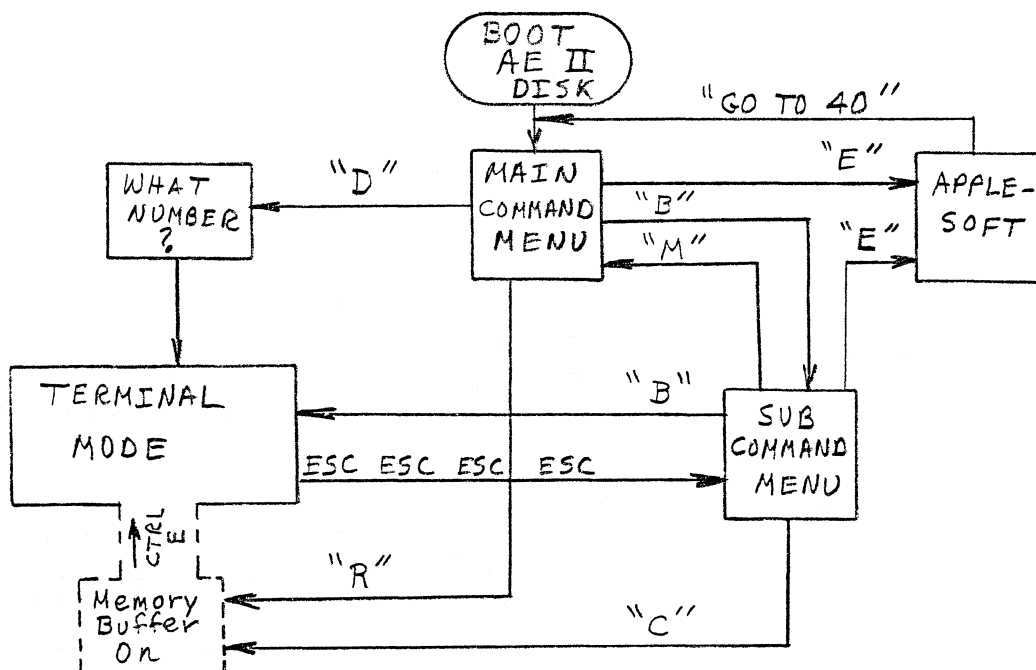
Three or four ESC's will exit the terminal mode (it is not necessary to log-off the VAX to do this) and display AEII's subcommand menu. There are various ways to re-enter terminal mode. Reference [1] pages 9-15 explains the menu options.

To logoff the VAX (from AEII terminal mode), type CTRL-AØ or LOGOUT<C/R>.

Reference [3] explains how to download a FARANT SPLOT file for later plotting. A condensed explanation of the procedure follows:

1. Assume you have a file in the directory called TESTPLOT.DAT;1 generated by the FARANT subroutine SPLOT2 and you wish to plot this data. Assume you are now logged on the VAX and sitting in Terminal Mode,
2. Exit terminal mode with three or four ESC's and get the Main Command menu.
3. Select R)ecieve a file. When asked "WHAT COMMAND TO SEND?", reply TYPE TESTPLOT.DAT<C/R>. Reply to any other questions with just a <C/R>.
4. When the \$ DCL prompt appears, type CTRL-E to close the memory buffer. You may now logoff (or not).
5. Exit terminal mode with ESC's. Hang up the phone if you have logged off. Replace the AEII disk with one called "VAX FARANT PLOTTER". Select P)ut file to disk, using the filename you desire. You may then E)nd AEII and plot the data or you may re-enter terminal mode.
6. To plot an SPLOT2.DAT file, first boot the "VAX FARANT PLOTTER" disk, then type EXEC FARPLOT<C/R>. See reference [4] for details.

## ASCII EXPRESS II MODES FLOWCHART



TERMINAL MODE  
SPECIAL CHARACTERS

In lower case:

ESC	→	Shift to upper case
ESC ESC	→	Shift lock to upper case
CTRL-A,	→	{ (ASCII 123)
CTRL-A.	→	} (ASCII 125)
CTRL-A/	→	(ASCII 124)
CTRL-A CTRL-H	→	Rubout (ASCII 127)
Shift N	→	~ (ASCII 126)

In upper case:

ESC	→	Lowercase (unlocks uppercase shift)
CTRL-A,	→	[ (ASCII 91)
CTRL-A.	→	] (ASCII 93)
CTRL-A/	→	\ (ASCII 92)
CTRL-A CTRL-H	→	^ (ASCII 95)
Shift N	→	~ (ASCII 94)

In either case:

CTRL-U Rt. Arrow	→	_ (ASCII 95)
CTRL-A ESC	→	ESC (ASCII 27)
CTRL-A ?	→	^ \ (ASCII 28)
CTRL-A CTRL-U	→	^ _ (ASCII 31)
CTRL-A CTRL-B	→	BRK

For example, to send a left square bracket to the VAX, type CTRL-A, in uppercase mode. Note that AEII uses the ESC key for an upper/lower case shift; so, to send an ESC character to the VAX, it is necessary to type CTRL-A ESC.

VAX Keyboard MARCOS

<u>Type</u>	<u>String Sent to VAX</u>	<u>Description</u>
CTRL-A1	GBELEC<C/R>	User name and password
CTRL-A0	LOGOUT<C/R>	Log off

### Using VAX-11 from Green Bank

The VAX-11 in CV can be accessed from Green Bank using either the Apple-ASCII EXPRESS II terminal or the Tektronix 4012 terminal in room 233.

To logon, press <C/R> to wake the VAX. When asked for user name and/or password, reply GBELEC<C/R>.

After successfully logging on, the \$ prompt of the DEC Command Language should appear. See references [5] and [6] for an introduction to DCL and the related text editor.

File names have the following format: name.type;version number. The type tells DCL whether the file is BASIC (BAS) code, an object file (OBJ), an executable file (EXC), etc. The version number is often automatically incremented by DCL (ref. [5], p. 4-3). If not specified by the user, DCL looks for the highest version.

#### Some useful DCL commands are:

\$DIRECTORY - Lists files in the current directory.  
 \$TYPE filename - Lists file "filename" on the terminals.  
 \$COPY - Copies files; DCL will prompt for filenames.  
 \$HELP - Provides information on the system and commands.  
 \$DELETE filename - Eliminates the file "filename".  
 \$RENAME - Changes the name of a file; DCL will prompt for old and new names.  
 \$EDIT - Enters file edit (SOS) mode (\*Prompt). See ref. [5], ch. 2 and ref. [6].

#### Some useful SOS commands are:

\*<C/R> - Lists the next line in the file.  
 \*ESC - Lists the previous line in the file. (Note: To send the ESC character from the APPLE terminal, type CTRL-A ESC.)  
 \*PL1:L2 - Lists lines L1 through L2.  
 \*ILn,inc - Input lines following (Ln) with (inc) increment. Exit by sending ESC.  
 \*DL1:L2 - Deletes lines L1 through L2.  
 \*RL1:L2 - Deletes lines L1 through L2 and prompts for retyping. Exit with ESC.  
 \*A - Enters line Alter mode. See ref. [6], p. 5-4.  
 \*W - Saves current (edited) file, increments version number.  
 \*WB - As above but does not increment version.  
 \*E - As W but returns to DCL when through.  
 \*EB - As WB but returns to DCL.  
 \*EQ - Does not save file, returns to DCL.

#### Various control characters sent to the VAX cause wonderful things to happen:

CTRL-Y - Gets DCL's attention from any (?) condition. If sent from SOS, it is usually possible to resume by typing CONTINUE.  
 CTRL-S - Causes any output (e.g., file listings) to pause.  
 CTRL-Q - Resumes output suspended by CTRL-S.  
 CTRL-O - Cancels remainder of output suspended by CTRL-S.  
 CTRL-C - Cancels any command in progress.  
 CTRL-U - Deletes the current input line for a fresh start.  
 CTRL-R - Retypes line currently being typed.

FARANT on the VAX-11

FARANT is a microwave circuit analysis program with optimization (ref. [2]). The user describes his circuit by calling the proper subroutines to define the circuit elements and other subroutines to connect those elements. He may select various output options to print tabular calculated data and/or plot the data.

The specifics of running FARANT from GB are:

- 1) The user generates a copy of "FARAFT.BAS" using the DCL copy command, e.g., \$COPY FARAFT.BAS DEMO1.BAS <C/R>.
- 2) He then EDITS the new file, defining his circuit and calling for the desired output. He should save the edited file using some variation of the SOS E or W command.
- 3) The new file must be compiled, linked, and ran. This may be accomplished with one command using the RUNFAR2 command file (ref. [4]), e.g.: \$ @RUNFAR2 DEMO1 <C/R>. Tabular data from the PRT subroutine will be printed on the terminal during execution. If the user desires a hardcopy, on the APPLE-AEII terminal, he may turn on the copy buffer before execution and then dump the buffer to the printer at his leisure (ref. [1], p. 10, 14). If he has called the SPLOT2 subroutine, e.g., CALL SPLOT2(1,1,"TITLE","DEMO PLOT"), then a file will be created with data properly formatted for use by the "FAR PLOT" APPLE program. (In the above example, the data file will be called "DEMO PLOT.DAT".)
- 4) The @RUNFAR2 filename command creates an executable file called "filename.EXC;version number". Hence, for subsequent runs, the BASIC version need not be recompiled and linked. The user can run a "filename.EXC" file by typing: \$ RUN filename <C/R>.

After several EDIT's, @RUNFAR2's, etc., the directory will become cluttered with multiple versions of .BAS and .EXEC files. These can be DELETED but the PURGE command is a simple and fast way. For example, \$ PURGE filename.\* <C/R> will delete all "filename" files, of any type, except the highest version number. Note: \* is the DCL wildcard character and is useful in other commands as well.

The line numbers of SOS files are not sent to the BASIC compiler so that the user must enter a BASIC line number within the SOS line. For example, the SOS command

```
* P 100 <C/R>
```

might result in the following output:

```
100 22 CALL PRT (4, )
```

The SOS file linenumber is 100 but the BASIC program linenumber is 22.

VAX FARANT  
Sample Terminal Session

Username: <GBELEC>  
Password: <>

<> ⇒ TYPED BY USER

Welcome to VAX/VMS version U3.0 on node CUAX

```
*****
  We seem to have a problem with disk MXA0:
  AIPS will not function until this is fixed.
** WARNING 9350 FREEBLOCKS ON DBA0:
** WARNING 0 FREEBLOCKS ON MXA0: (AIPS DISK 1)
%SYSTEM-W-NOSUCHDEV, no such device available
  \MXA1:\
** WARNING 0 FREEBLOCKS ON MXA1: (AIPS DISK 2)
%SYSTEM-W-NOSUCHDEV, no such device available
  \MXA2:\
** WARNING 0 FREEBLOCKS ON MXA2: (AIPS DISK 3)
*****
```

#<DIR>

Directory SYS\$SYSDEVICE:[GBELEC]

```
FARAFT.BAS;1      FARANT.BAS;2      FARSUB.BAS;2      FARSUB.OBJ;2
RUNFAR.COM;1     RUNFAR2.COM;1     SPLOT2.BAS;1      SPLOT2.OBJ;1
```

Total of 8 files.

#<COPY FARAFT.BAS DEMO.BAS>

#<EDIT DEMO.BAS>

Edit: DBA0:[GBELEC]DEMO.BAS;1

#<06095:6200>

1 Line(s) deleted (06095/1).

#<06100,5>

```
06100 <06100 FOR F=2.7 TO 3.7 STEP .1>
06105 <06105 CALL RLC(A(,),"S",0,22.45,.107,"S",0)>
06110 <06110 CALL RLC(B(,),"P",0,.21485,11.18,"P",0)>
06115 <06115 CALL CAS(A(,),B(,))>
06120 <06120 CALL SAVECKT(A(,),4,0,-1)>
06125 <06125 NEXT F>
06130 <06130 CALL PRT(4,0)>
06135 <06135 CALL SPLOT2(1,1,"S11","DEMOS11")>
06140 <06140 SUBEND>
06145 ↵ <CTRL-A ESC>
```

VAX FARANT  
Sample Terminal Session (continued):

#<FB>

[DBAQ: [GBELEC] DEMO.BAS:1]

#<@RUNFAR2 DEMO>

[S] PARAMETERS IN MAGNITUDE AND PHASE

FREQ	11		12		21		22		K FACT
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	
2.700	0.9905	-34.9	0.1373	148.4	0.1373	148.4	0.9905	151.7	0.00
2.800	0.9775	-44.3	0.2108	139.8	0.2108	139.8	0.9775	144.0	0.00
2.900	0.9376	-59.6	0.3476	125.9	0.3476	125.9	0.9376	131.3	0.00
3.000	0.7985	-86.8	0.6020	100.9	0.6020	100.9	0.7985	108.6	0.00
3.100	0.4200	-132.9	0.9075	60.1	0.9075	60.1	0.4200	73.2	0.00
3.200	0.0559	161.1	0.9984	17.5	0.9984	17.5	0.0559	54.0	0.00
3.300	0.0648	-165.8	0.9979	-19.3	0.9979	-19.3	0.0648	-52.8	0.00
3.400	0.4128	133.7	0.9108	-59.4	0.9108	-59.4	0.4128	-72.5	0.00
3.500	0.7649	91.6	0.6441	-96.5	0.6441	-96.5	0.7649	-104.6	0.00
3.600	0.9132	65.9	0.4075	-120.1	0.4075	-120.1	0.9132	-126.0	0.00
3.700	0.9633	50.9	0.2682	-133.8	0.2682	-133.8	0.9633	-138.5	0.00

#<DIR>

Directory SYS#SYSDEVICE:[GBELEC]

DEMO.BAS:1	DEMO.EXE:1	DEMOS11.DAT:1	FARAFT.BAS:1
FARANT.BAS:2	FARSUB.BAS:2	FARSUB.OBJ:2	RUNFAR.COM:1
RUNFAR2.COM:1	SPLIT2.BAS:1	SPLIT2.OBJ:1	

Total of 11 files.

#<LOGOUT>

GBELEC logged out at 24-SEP-1982 16:30:33.43