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PROGRAM LIBRARY DISK 1.1 FOR APPLE COMPUTER

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I. Introduction

This report is a brief description of software and to a minor degree, hardware as used in two of the four Apple computer systems in the NRAO Central Development Laboratory. The computer systems described are used for automated microwave measurements, interactive engineering design, and as terminals for network analysis and optimization programs operating in a telephone-linked DEC VAX computer. The intention is to document some of the programs and conventions which have been adopted by the author in the hope this will facilitate future exchange of programs with other laboratories. This report assumes that the reader is reasonably familiar with Apple notation, the Applesoft language, and the Disk Operating System (DOS, version 3.3).

II. Hardware

The computer mainframe is an Apple II Plus (floating-point BASIC) with 49,152 bytes of random access memory. Various black and white CRT displays have been used; the Electro-Home V14 9" is slightly preferred because of good focus and good construction. The mainframe has 8 card slots which are assigned to peripherals as follows:

Slot 0 - Usually blank. The INTEGER BASIC ROM card can be plugged in here. However, INTEGER BASIC is available on disk for entry into RAM and has been used very little (although many games are available in INTEGER).

Slot 1 - Printer. The TRENDCOM 200 thermal printer with AIIG graphics interface has been adopted. It is reliable, quiet, and is similar, but superior, to the Apple Silentype printer.

Slot 2 - Vacant.

Slot 3 - Analog-digital input-output system. The ADIOS system, described in Electronics Division Internal Report No. 212, connects here.

Slot 4 - Clock. The California Computer Systems 7424 is recommended. Two systems utilize the Mountain Hardware Apple Clock but it is more expensive and has a shorter back-up battery life.

Slot 5 - Vacant.

Slot 6 - Disk memory. The Apple 5 $\frac{1}{4}$ " disk system, single drive, with DOS 3.0 operating system, is utilized. A second drive can be connected to this same slot.

Slot 7 - Modem. The DC Hayes Micromodem II is utilized. This unit allows direct telephone connection at 300 baud and incorporates automatic dialing and answering.

III. Memory Allocation

If no steps are taken to rearrange memory allocation and High Resolution Graphics page 1 (HRG1) is used, then only memory addresses 2048 thru 8191 are available to a BASIC program including variable storage (except strings). This is not sufficient for some of the longer BASIC programs which have been written. The solution has been to rearrange the location of the BASIC program to addresses 16384 to 36864 using the utility program, LOMEM:. Address space 2048 thru 8191 is used for binary utility programs and the second page of graphics memory, HGR2, occupying 16384 to 24575, is not used. A map of memory, as used for large BASIC programs, is shown in Figure 1.

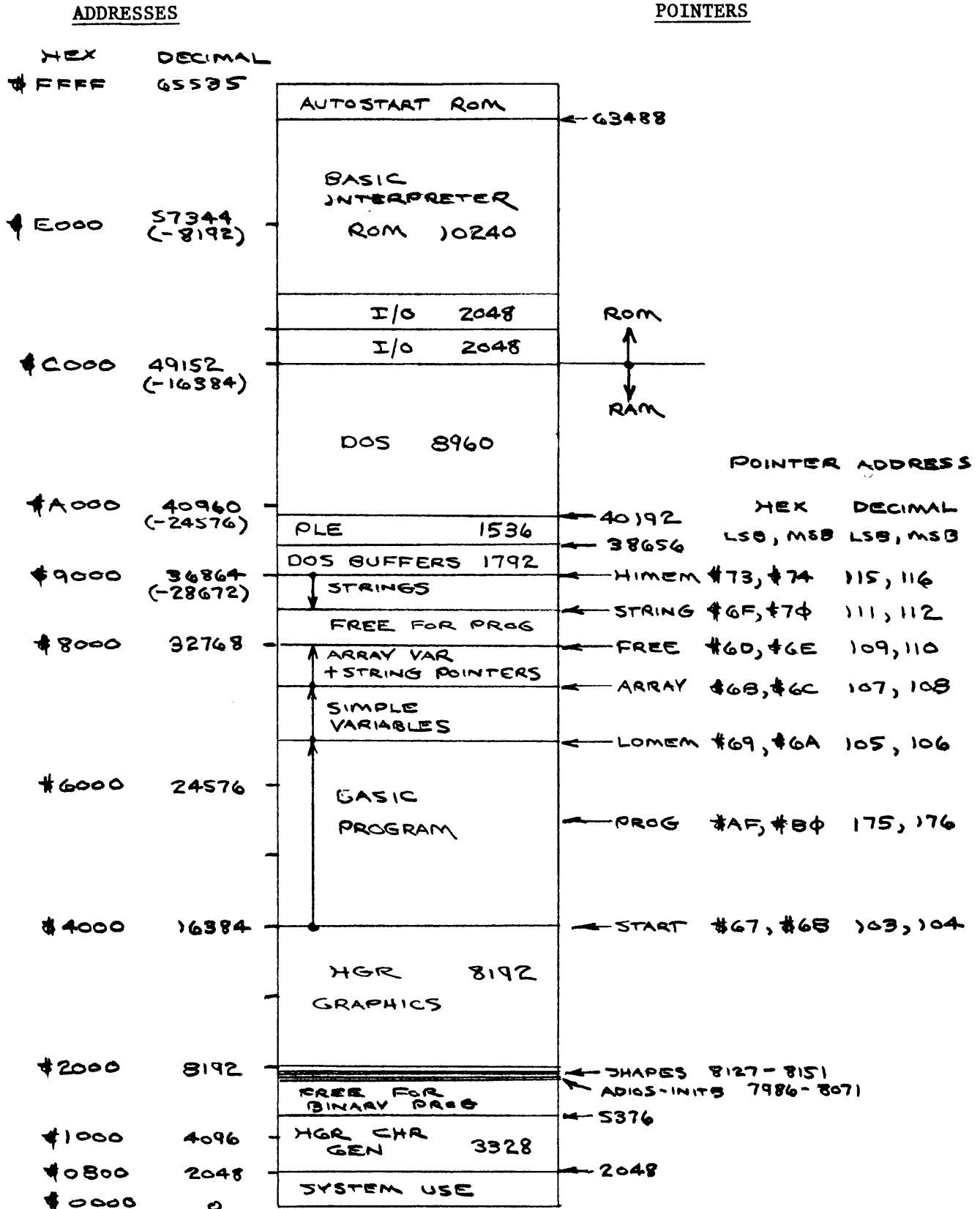


Fig. 1. Apple Memory Map

IV. Program Library 1.1

The programs briefly described here are collected on a diskette labeled "NRAO LIBRARY 1.1." The characters in parenthesis after the program name give the type of file (A = Applesoft BASIC, B= Binary, T = Text) and number of 256 byte sectors on disk. If the program is a binary file, the starting address and length are given in decimal preceded by A and L.

A. Editor Programs

HELLO PLE (A010) - This program performs program line editing (PLE), is usually read into memory as part of the disk greeting program, and can remain in memory while other programs are being run. Most often used commands are CTRL E (line number) to edit a line followed by CTRL I to insert a character and CTRL D to delete a character. To copy HELLO PLE as greeting program on a new disk, first LOAD HELLO PLE, insert the new empty disk, and then INIT HELLO PI. The program also installs user defined ESCape key functions which type in short commands by hitting the ESC key and another key as described next. PLE is described in the A.P.P.L.E.* Program Line Editor manual by Neil Konzen.

ESC EDIT (A019) - This program allows changing the ESC key definitions that are included in HELLO PLE; it is described in the A.P.P.L.E. PLE manual.

Some of the standard ESC commands are:

ESC L = TEXT: HOME: LIST

ESC G = POKE-16304,0 : POKE-16301,0: POKE-16297,0 (CR)

(Puts graphics memory on CRT)

ESC H = CALL 1013: TEXT: HOME (CR)

(Reconnects CRT, text mode, and clears screen)

*Apple Puget-Sound Program Library Exchange, 304 Main Ave. S., Renton, WA 98055
phone (206) 271-4514.

ESC n = GOTO ln00 (CR), for n = 0 to 9

(Allows tasks to be triggered by programming pointers
at line numbers 1000, 1100,...1900. For example,

1100 GOSUB 4200, where 4200 is the start of a program)

ESC P = CALL 34560 (CR)

(Connects Program Global Editor, PGE)

PGE (A004) and PGE BLOAD (B030, A29696, L7168) - This is a Program Global Editor which allows changing line numbers, moving a segment of program, changing a string throughout a program, hex conversion, and several other useful features; RUN PGE gives a summary of commands. PGE is described in a manual available from A.P.P.L.E. and has been renamed from PLE. EDIT. It must be RUN before the BASIC program to be edited is loaded and since it occupies 7168 bytes of memory a BASIC program needing more than 13312 bytes (29696 - 16384) will overwrite PGE.

B. Disk Handling Programs (All programs except CAT are from Apple DOS 3.3 Master Disk)

BOOT 13 (B010, A5888, L2288) - After BRUN BOOT 13, a 13-sector disk, DOS 3.2, may be run.

MUFFIN (B027, A2051, L6397) - Converts 13-sector disk files to 16-sector

FID (B020, A2051, L4686) - File developer. An aid to copying and cataloging DOS 3.3 files.

COPYA (A009) - Copies entire DOS 3.3 disk with a single drive.

COPY. OBJØ (B003, A704, L267) - Binary file used by COPYA.

CAT (B009, A2051, L1919) - Catalogues a disk giving starting address and length of all binary files. Renamed from IMPROVED CTLG.L on A.P.P.L.E. UTILITY DISPAK 6B-16. To use, BLOAD CAT, insert disk you wish to catalog, and then CALL 2051.

C. Utility Programs

LOMEM: (B002, A816, L160) - The following first non-REM line in a BASIC program moves program location to address range 16384 - 36864:

```
10 PRINT CHR$(4); "BRUN LOMEM:" : & LOMEM: 16384
20 HIMEM: 36864
30 POKE 1013,76 : POKE 1014,12
40 POKE 1015,151 : POKE 1016,76
50 POKE 1017,0 : POKE 1018,151
```

(The POKES are necessary to restore some memory changed by LOMEM:)

Reference manual "A.P.P.L.E. High Resolution Text Generator and Character Genera

POINTER (A002) - Lists contents of memory pointers on CRT. Erases program in memory.

POKE CREATOR (A005) - Facilitates writing short binary code into memory from within a BASIC program thru POKE statements. With the binary code in memory, RUN POKE CREATOR writes a text file of POKE statements for a specified range of memory. The text file is then EXEC'ed into the BASIC program.

LIST (T004) - EXEC LIST puts a BASIC program in line numbers 60000 to 60050. GOTO 60000 then produces a printer listing of the program with appropriate margins and line lengths. Program is for Trendcom 200 printer; for Apple Silentyper printer, change line 60026.

INTEGER (A027) - RUN INTEGER installs an Integer BASIC interpreter in memory so Integer BASIC programs can be run. Reference manual is A.P.P.L.E. "Integer Basic + plus Ted II +."

D. Graphics Programs

SHAPES - (B002, A8127, L24) - Installs 3 shapes (+, □, ∙) in memory for use as plotting symbols which can be ROTated and SCALED in size.

HGR CHR GEN - (B015, A2048, L3328) - Allows text characters to be drawn on graphics display screen. Must be activated by CALL 3072 and PRINT CHR\$(1); CHR\$(17) followed by text in normal PRINT statements, and deactivated by CALL 1013 Reference manual is A.P.P.L.E. "High Resolution Text Generator and Character Generator."

SMITH - (A004) - Draws Smith chart on graphics screen.

LITTLE SMITH - (B034, A8192, L8192) - BLOAD LITTLE SMITH brings a Smith chart from disk into graphics memory with 4 lines of text allowed. Faster than SMITH.

E. I/O Programs

ADIOS-INITB (B002, A7986, L85) - Initializes ADIOS when activated by CALL 8018. See NRAO EDIR No. 212 and also DETECTOR1 program for example of usage

ADIOS TEST (A022) - Tests ADIOS; see EDIR No. 212.

CCS CLOCK SET (A008) - Sets time on California Computer Systems 7424 clock.

CCS A/D (A006) - This is a service and demonstration program which converts the reading of a CCS 7470 A/D converter card into a BASIC variable. In order for the program to work, the converter must be modified by connecting pin 2 of U9 to pin 11 of U8 instead of pin 3 of U4.

VAX (A003) and VAX.B (B003, A32768, L256) - Using Micromodem, dials Charlottesville VAX computer and turns Apple into a dumb terminal. VAX.B is binary file used by VAX. Contact L. D'Addario for further information.

F. Automated Measurement Programs

DETECTOR1 - (A048) - Tests square-law error and noise of detectors.

See NRAO EDIR No. 214.

NOISEL3 - (A053) - Measures noise temperature and gain of a microwave amplifier. Version in library is for ADIOS A/D conversion system, TRENDCOM 200 printer (see line 5310) and no clock (see lines 4801 and 4820).

FFT1 (B004, A17152, L668) - Is a machine language 256 point fast (1.3 seconds) Fourier transform program described by Bruce Field in the September 1980 issue of the Washington Apple Pi newsletter.

FFT1 DEMO (A007) - Is a demonstration program for FFT1 which generates a waveform, shows the transform calling procedure, and plots the magnitude of the transform.

G. Design Programs

LADDER - (A022) - Computes input impedance and reflection coefficient of a ladder network of resistors, capacitors, inductors, and transmission lines. Network description is put in lines 100 to 999. Remainder of program is many short subroutines to combine elements and to plot and tabulate results.

INDUCTOR - (A010) - Computes inductance of single layer coil following Reference Data for Radio Engineers, p. 6-1.