NATIONAL RADIO ASTRONOMY OBSERVATORY

CHARLOTTESVILLE, VIRGINIA

ELECTRONICS DIVISION INTERNAL REPORT No. 252

ADIOS CONTROL PROGRAM

DOUGLAS C. HALL

NOVEMBER 1984

# ADIOS CONTROL PROGRAM

## Douglas C. Hall

### I.    Introduction

The analog-digital, input-output system (ADIOS) is a powerful interfacing tool [1] installed with Apple II+/IIe microcomputers in various laboratories of the National Radio Astronomy Observatory.  A general purpose program for controlling the ADIOS module is described herein.  This program should facilitate the use of ADIOS for many experiments, without using precious time to write specialized programs for each application.  Thus, for many applications, it is unnecessary for the user to be familiar with the details of programming either Apples or ADIOS to use the interfacing module.  Familiarity with the features of ADIOS and the method of interfacing it with laboratory apparatus is assumed [1].

### II.    Description of Program

The ADIOS control program is a command-driven program, written in Applesoft-BASIC, which reads all of ADIOS analog and digital inputs, and sets all of the analog and digital outputs.  To communicate with the ADIOS module, the program uses library subroutines ASERV and AINIT from the NRAO binary library [2], [3].  Documentation includes many comments within the code, as well as a list of all the variables and their functions which can be found at the beginning of the program listing.  An explanation of each of the commands is given below in Section III of this report.  Within the program, a help command provides immediate access to information on program operation.

To customize the program for specific applications, the user can change certain DATA and function definition (DEF FN) statements. User selected default values for BLANK and COUNT times, for all initial output values, and for titles for each of the nine analog inputs read can be stored in the DATA statements in lines 580, 600, and 620. The titles are printed with a header which precedes the printing of results when a measurement is made. This header is printed only with the first measurement, and again if the printer has been switched on/off since the previous measurement. In addition to customizing the output header, the user can change any of nine function definitions to display the nine analog input values in meaningful units. These functions are normally defined so that the values are displayed in millivolts, and normalized to be independent of the COUNT time. These functions can be found in lines 420-500.

In writing the program, an effort was made to make it "user-friendly" by simplifying data entry (see Section III) and by controlling the screen output to economize line usage while showing as much information as possible. The available commands are displayed in a window at the bottom of the screen which is present throughout the program. Similar to a format statement in a FORTRAN program, a subroutine formats the output to print two decimal places in a data field seven characters wide. Output can be directed to the screen or to the printer, and is formatted properly for both (in 40 columns for screen, 80 for printer). Note that this data format can be changed in line 640, but a change may cause the output to occupy more than one line on the screen or printer.

A version of this program that can be used from a remote terminal (for Apples with phone modems) has also been created. It is identical to the main version in operation, but the formatted data entry and output features (which make extensive use of cursor control commands, such as HTAB's and VTAB's), the

2

printer capabilities, and most of the documentation has been stripped out. This version of the program has been implemented by L. R. D'Addario in the SIS mixer laboratory in Charlottesville.

III. Program Operation

When the prompt "COMMAND?" appears on the display, the program is in the command mode and ready to accept any of the following single-character commands (explained below): C, D, E, H, L, M, P, R or S. For each of the commands which control ADIOS outputs (C, D and L), the current value stored in the Apple's memory is displayed with the cursor on the first digit (it is also the output value to which ADIOS is set if the command "R" or "M" was selected since a change was made with the C, D, or L commands; *see note below). To leave this displayed value unchanged, simply press <RETURN>. The forward arrow key can be used to move over digits which are not being changed. However, note that because of the data entry format, the backward arrow cannot be used to return to the first character position in the digital output mode (command L). The program checks the validity of each entry and displays the message "INVALID--REENTER" with the unchanged output value when necessary.

Below is a description of each of the program commands:

COMMAND     DESCRIPTION

C           Sets* analog output COUT to any value between -10000 and +9999.7 millivolt
            (*see note below).

D           Sets* analog output DOUT to any value between -10000 and +9999.7
            millivolts.

3

E        Exits program.  This can be used for making changes in the program

code, such as changing the values for the Blank and Count times (MODE%(1)

and MODE%(2), respectively).  Then continue program by typing "CONT".

H        Accesses Help text.  First the valid ranges for COUT, DOUT, and the

digital output are given.  Four (4) pages of further information on

program operation is then available at the user's option.

L        Sets* 13-bit digital output.  This command has several special features.

The user can enter the digital output in one of three forms:  binary,

decimal, or hexadecimal.  Also, any one of the bits can be switched

individually.  When the entry is begun in a form different from the

form currently displayed, the currently displayed form is cleared

to unclutter the entry field.  Otherwise, it remains so that the right

arrow key can be used for minor editing.  Listed below are the different

methods of entry:


For binary entry, type "B" followed by any binary number form

0 to 11111 11111111.  Leading zeroes and spaces are optional (Example:

B111 10101010).

For decimal entry, just type any decimal number from 0 to 8191.

For hexadecimal entry, type "$" followed by any hexadecimal number

from 0 to 1FFF (Example:  $7C0).  No spaces are allowed here.

To toggle a single bit, type "S" followed by the bit number from

0 to 12 (Example:  S8).


The digital output is always displayed in the form last selected by

the user (binary by default).  An additional feature of the "L" command

is the ability to convert the presently displayed value and show it
in another of the three possible forms. This feature of the program
could be used by itself to convert numbers (within the acceptable
ranges) between binary, decimal and hexadecimal forms. To convert
the displayed value to an alternate form, you must first be in the
"L" command mode, and then type:

"D" -- to convert to decimal form;

"B" and <RETURN> -- to convert to binary form;

"$" and <RETURN> -- to convert to hexadecimal form.


The value will be displayed in the new form, and can then be changed
or left the same.

M       Sets all outputs of the ADIOS module to the current values in the
Apple's memory (changes made using commands C, D or L) and then measures
all analog and digital inputs and reads the internal clock in peripheral
slot #4. Values read are converted by the user-defined functions
to meaningful units (millivolts by default) and then the output is
formatted and printed on the screen or the printer (see command P).
A header is printed on the first measurement and after execution of
commands P and R.

P       Switches printer status. When the printer is ON, output from commands
"M" and "S" are sent to the printer only (this command is not available
in the remote version). Causes header to be printed upon execution
of the next M command.

R         Resets[*] the analog outputs COUT and DOUT and the digital output of

          the ADIOS module to the values currently set for them in the Apple's

          memory.  Causes header to be printed upon execution of the next M

          command.

S         Shows the values currently stored in the Apple's memory for COUT,

          DOUT and the digital output.  These might not be the values to which

          the ADIOS module is set[*].

[*]IMPORTANT NOTE:  The changes made with the commands C, D and L change ONLY

the corresponding values in the Apple's memory.  The changes are NOT sent to

the ADIOS module until the command "R" (Reset) or the command "M" (Measure)

is selected.  This feature allows many or all of the values to be changed, if

so desired, before resetting the ADIOS module.

## References


[1]  G. Weinreb and S. Weinreb, "ADIOS – Analog-Digital Input Output System

          for Apple Computer, NRAO Electronics Division Internal Report No. 212,

          May 1981.

[2]  L. D'Addario, "Improved Software for Controlling the ADIOS Module," NRAO

          Electronics Division Internal Report No. 224, January 1982; and Addition,

          March 1982.

[3]  L. D'Addario, "A Library of Binary Subroutines for the Apple II Plus,"

          NRAO Electronics Division Internal Report No. 225, January 1982; and

          Addition, May 1982.