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Analog Sampling Program

V. J. Kovarik

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ANALOG SAMPLING PROGRAM

INTRODUCTION

ASP is a PDP11 assembly language program that will sample up to 25,000 data points. A sixteen channel, 12 bit A/D connecter is triggered at specific intervals. Channel selection, interval time, and data point count are all selected by the user. This program was specifically written for quench studies but by proper modification it can be used for any tests where numerous data points need to be taken.

GENERAL

The data points are sequentially stored in memory during the data acquisition period. The minimum user selectable sampling time between data points is 0.3 milliseconds. The maximum time is 999 milliseconds. Any number of input analog data channels (1 to 16) can be selected during the initial dialogue with the PDP11. The channel number along with its digitized analog value (data point) is stored in memory. After the data acquisition period, the stored words are transferred as 16 bit words to a floppy disc file. The lower 12 bits (0-11) contain the digitized analog value. The upper 4 bits (12-15) contain the channel number. Up to four separate files can be stored on the floppy disc.

When a file is retrieved from the disc for printing (line printer) or plotting, the channel numbers and the digitized analog values are converted to numerical values. Routines have been written for the 4051 Tektronix which allow specific selection of a channel number. The data associated with that channel number can then be plotted using another available routine.

ASP does not rely on any operating system. All of the I/O handlers, algorithms, etc., are contained within the program.

PROGRAM OUTLINE

Run parameters are set up by the user. The setup sequence follows:

SELECT INITIAL DELAY (MILLISEC)

Timing for the system is initiated by an external pulse which starts the clock. This instruction allows the user to delay the start of data taking. The delay time has a range between 0.010 milliseconds and 999 milliseconds.

SELECT FIRST INTERVAL DELAY (MILLISEC)

This instruction allows the user to select the timing between data samples. When the initial delay period is over, the A/D is triggered and the first sample is taken. The clock is reset for timing future data intervals. Each time the clock overflows, the sample for the A/D is taken (hardware interrupt). The program sits in a wait loop and allows the hardware and software interrupts to govern the data acquisition. This first interval delay range is between 0.3 millisec and 999 millisec.

SELECT NUMBER OF FIRST INTERVAL READINGS

This instruction loads a word count register with the total number of samples that the user requires in the first interval. Multiplying the interval delay by the number of readings gives the total time required to sample all the data points.

SELECT SECOND INTERVAL DELAY (MILLISEC)

This instruction allows the user to change the interval time between readings. The interval time will automatically change to the new interval after the total number of first interval readings have been taken. This delay has the same range as the first interval relay.

SELECT NUMBER OF SECOND INTERVAL READINGS.

This serves the same purpose as the first interval reading. The sum of the first and second number of readings should not exceed 25,000. (For 28K core.)

SELECT CHANNEL NUMBERS (A = ALL)

This allows the user to select the channels that are needed (1-16). The channels may be selected at random but the program opens each channel sequentially at the selected interval rate.

DUMP TO TAPE? Y OR N

This allows the user to dump the data point file to the 4051 tape in addition to the floppy disc.

REQUIRED HARDWARE

PDP 11	28 K Core
Dual Floppy Disc	
A/D	ADV11-A
Clock	KWV11-A
Line Printer	
CRT	
4051 Tektronix (for plots)	

COMMENTS

The program has been tested extensively and is free of hardware and software bugs. The lower interval time limit (0.3 millisec) is governed by the memory refresh system in the LSI-11. Modifications can be made to the program so that data points can be event controlled instead of clock controlled. This change will allow the program to be used for magnetic measurements.

A possible problem can crop up if channel one is used exclusively for data taking. When the first interval readings are completed, the file is separated from the second interval by two blank words. If channel one is used and two adjacent words happen to have zeros as data, then these two sequential blank words will be interpreted by the file handler routine as a change from interval one interval two. Therefore, it is advisable to use any channel except the first one for single channel data taking.

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