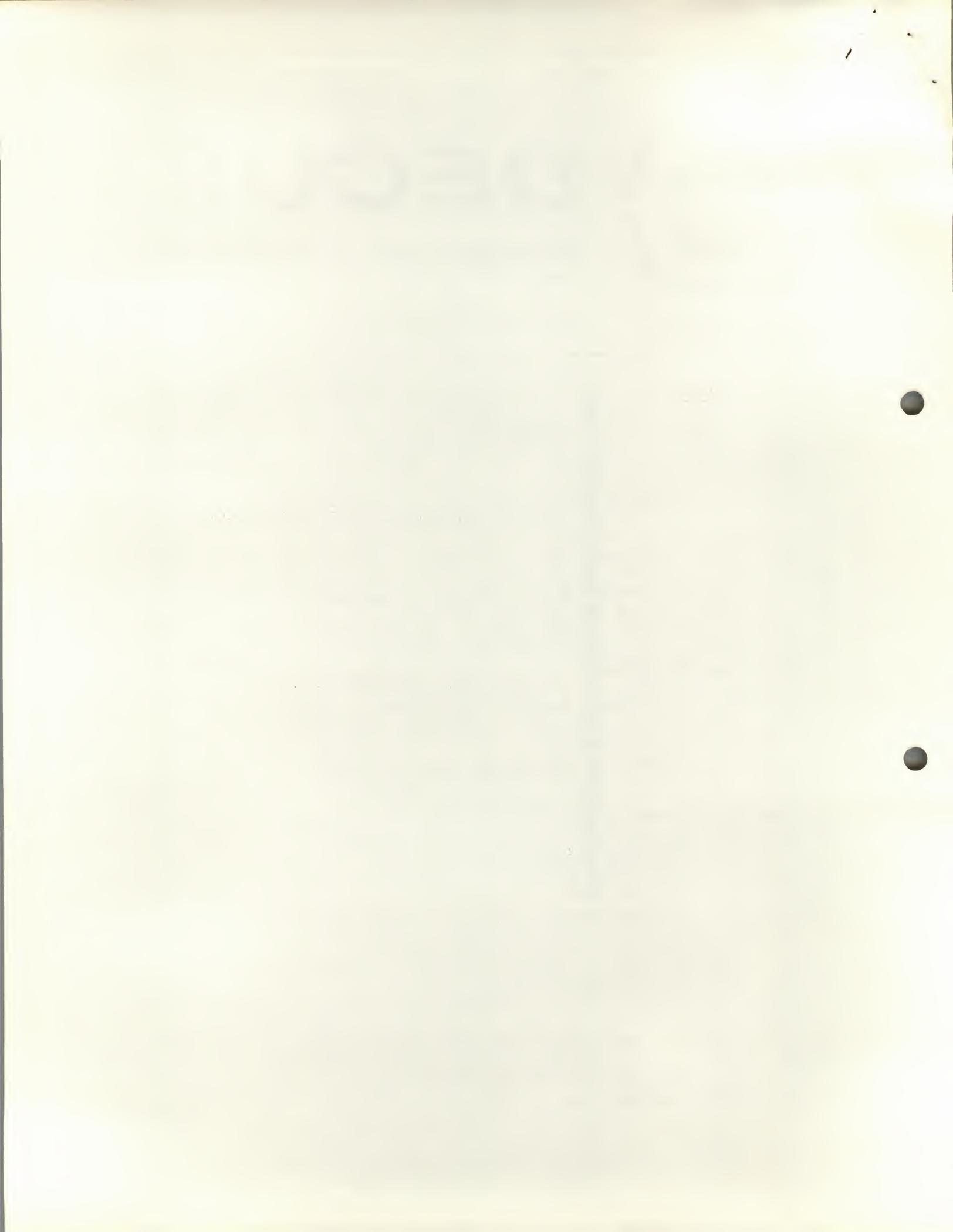




# DECUS

## PROGRAM LIBRARY

DECUS NO.	8-299
TITLE	LATENCY HISTOGRAM AND CALCULATION
AUTHOR	Eugene S. Boyd
COMPANY	University of Rochester Medical Center Rochester, New York
DATE	January 23, 1970
SOURCE LANGUAGE	PAL III



## LATENCY HISTOGRAM AND CALCULATION S.A. 1200 1/23/70

The purpose of this program is to plot a histogram of, and calculate the mean and standard deviation of, the latency of a variable phenomenon, such as an evoked response. Cursors are used to define the area of interest within which the program will find either the maximum or minimum value and form a latency histogram of these values. The latency is measured from another cursor which may be set either at the beginning of the sweep or at some point of interest, such as a shock artifact. Provision is made for breaking the resulting histogram into parts, if desired, as in the case of a bimodal distribution. In addition to calculation of the mean and standard deviation, the histogram may be plotted on a plotter or on the teletype.

The binary tape incorporates the following routines:

- 1) Osense, Bran and Rdelay from AX08 Handlers (these are listed).
- 2) Floating Point Package 2; DEC-08-YQ2A-PB; (not listed) with an overlay of 7327/0240, to suppress + sign output.  
Uses addresses 7; 40-62; 5400-7577
- 3) Oscilloscope Symbol Generator, DECUS 5/8-23 (B) (not listed), with its symbol tables eliminated except for 0-9, and the following modifications:  
0271/6303; 0332/6317; for AX08 display,  
0442/0202; found necessary to make it space,  
0436/0600; to position y axis.  
Uses addresses 200-444; 500; 560-571; 660-671; 760-771.

Procedure:

Starting address: 1200

Program reads the RC clock once and waits:

"Control T", for timing, gives a continuous reading of the RC clock to permit setting it. "Control Q" for quit, terminates this and starts the question list.

"CR", starts the question list.

The following questions are asked:

- #SWPS: How many sweeps are to be looked at?
- #PTS: A 125, 250, or 500 point buffer may be specified. If an unacceptable number is given, the program will type "?" and wait for one of the specified buffer lengths.
- #RC D: How many delays, each equal to the setting of the RC clock, are desired?
- + - PK: Should it look for the largest or smallest value, that is, a peak or a valley in the curve?
- A#: Which analogue input should be looked at?
- S#: Which pulse or sync input should be looked at?

At this point input will be accepted and displayed on the AX08, together with cursors 0-2, set by pots 0-2. (The pots are numbered 0-3, from the top downward). Cursors 1 and 2 are used to bracket the area within which the program will pick the highest or lowest value. Cursor 0 sets the time from which the latency to the peak or valley will be measured. It may be set at the beginning of the sweep or at some other point, such as a shock artifact. The displayed input is in buffer #1; the latency histogram will be built in buffer #2. No points will be deposited in buffer #2 unless cursors 0-2 are in increasing numerical order from left to right. This order should be checked at this point. Although the program may now be building a histogram, the sweeps are not being counted.

Several teletype commands are available from this point on:

- "V"; for view, will change the buffer displayed on the scope.
- "S"; will clear the histogram buffer and start building a histogram and counting the sweeps. Repeating this command will restart both the histogram and the sweep counter.
- "X"; will expand the Y scale of the histogram by a power of 2. This command is effective 6 times. Further commands are ignored.
- "C"; will contract the Y scale of the histogram. It will counteract "X" and will contract the original display to 1/4 of the original scale.
- "W"; will disable the interrupt and can be used to wait through periods of data which are not wanted. "W", repeated, enables the interrupt and allows the program to accept more data.
- "F"; tells the program that data input is finished even though the specified number of sweeps has not been reached.
- "R"; will restart the program from the beginning and allow the parameters to be respecified.

The following commands are operative only after either the specified number of sweeps has been reached or "F" has been typed.

- "T"; will cause the mean latency of the formed histogram, in msec, plus the standard deviation and the number of points involved to be typed.
- "H"; will type the histogram on the teletype. Following "H" the program will wait for 0,1, or 2 to be typed, specifying that the points are to be typed in their true number, or divided by 2 or 4, respectively. This is to keep histograms with high numbers of points within the capacity of the width of the teletype. The output of the histogram may be terminated at any time by "Control Q."
- "P"; will set the program to plot out the histogram in buffer #2. It may be used with a plotter connected to the input of the AX08 scope. P, repeated, will cause the program to sweep the histogram buffer at a rate controlled by the RC clock. P, a third time, at the end of the sweep, will return the program to a display of the histogram buffer.

"Control E"; will exchange the contents of buffers 1 and 2.

"Control C"; will put cursors 2 and 3 into the histogram display. The following two commands are only operative after "Control C." If one or the other is required again it must be preceded by "Control C." They also are only operative if the cursors are arranged in increasing numerical order from left to right.

"M"; will clear buffer #1 and move any points between the cursors from buffer #2 to buffer #1.

"E"; will erase any points in buffer #2 which are between the cursors.

These two commands, together with "Control E" are useful in splitting a histogram (as in a bi- or trimodal distribution) and getting latency measurements on the parts.

The counter displayed with buffer #2 gives the counts present in that buffer at any time. When the specified number of sweeps has been reached the teletype prints "!".

#### Limitations:

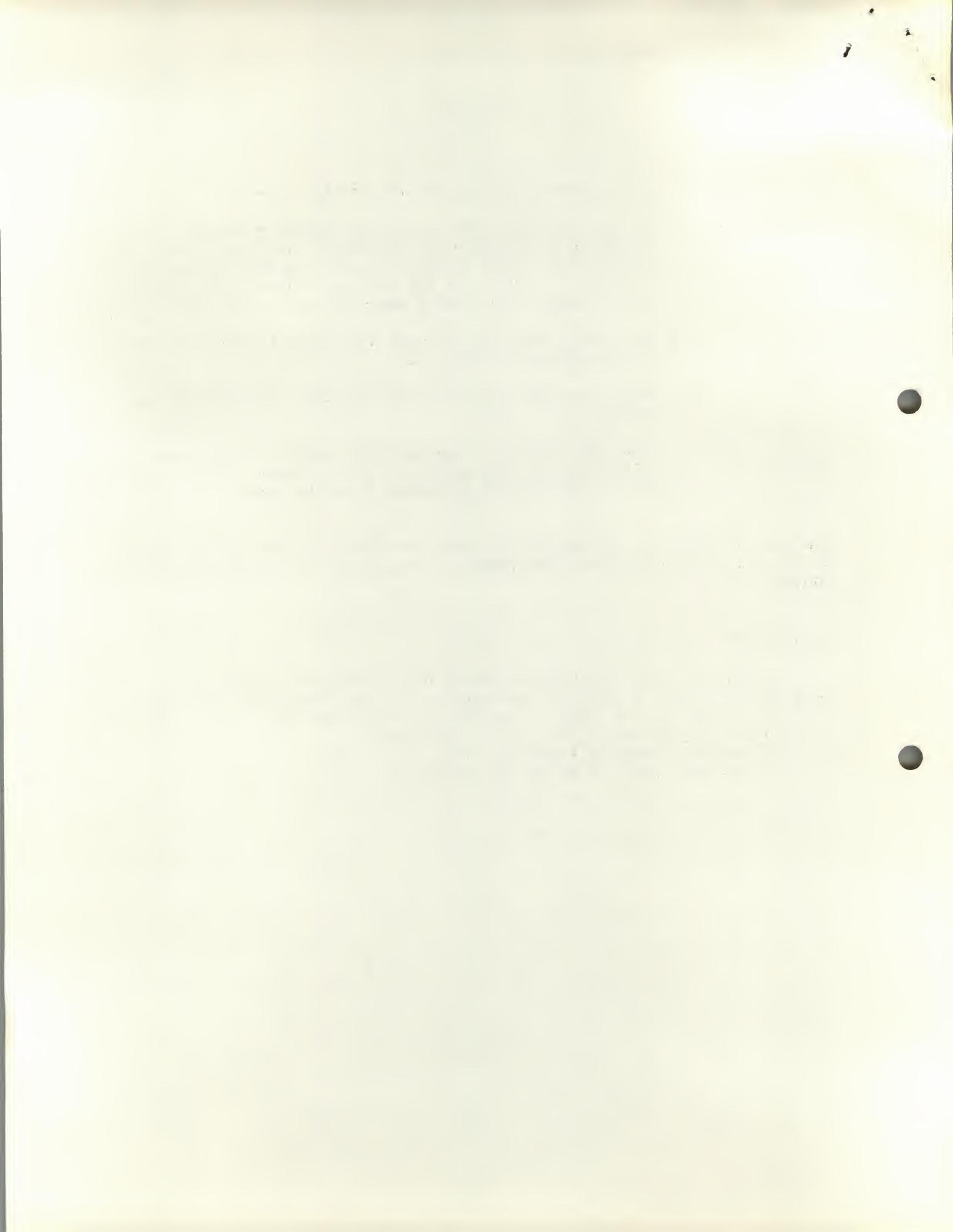
The fastest time resolution is about 30 microseconds. Below 28 the program will output a question mark and wait for the time to be increased.

The maximum timing error in reading the RC clock is 1%.

Buffer lengths may be 125, 250, or 500 points.

The maximum number of sweeps is 4095.

The maximum number of RC delays is 4095.



ERRATA SHEET DECUS NO. 8-299

Another bug has been found in DECUS NO. 8-299, LATENCY HISTOGRAM AND CALCULATION, consisting of a failure to find the proper peak or valley when the size of the input is large. It may be corrected by changing the following addresses to 7000: 1506, 1512, 1531, 1535, and 1602.

Eugene S. Boyd  
University of Rochester  
School of Medicine and Dentistry

THE UNIVERSITY OF CHICAGO

PHYSICS DEPARTMENT  
5712 S. DICKINSON DRIVE  
CHICAGO, ILL. 60637

Dear Sirs:  
Enclosed for you are  
two copies of the report  
of the committee on the  
status of the program.

