SYSTEM RESPONSE ANALYSIS WITH THE ANALOG MEMORY AND LOGIC SYSTEM

INTRODUCTION

The analysis of system response characteristics, utilizing a general purpose analog computer equipped with the Analog Memory and Logic System by EAI, is described in this paper. The response of a servo loop to both fixed and random inputs is considered. Figure 1 shows this system which receives an input signal via a band-pass filter.

THE ANALOG MEMORY AND LOGIC SYSTEM

The Analog Memory and Logic System includes the flexible control and timing of individual integrator modes and time constants which the analog computer requires in order to accomplish a complete system analysis.

Sophisticated programming of integrator and analog memory unit operating modes is possible through the use of logic gates and high-speed voltage comparators.

SYSTEM SIMULATION

Standard analog techniques are used to program the model of the system. The mode control and timing provisions of the Analog Memory and Logic System permit three modes of operation without re-programming:

- real-time simulation -- relatively slow speed solution for recording system response changes on X-Y plotting board

- high-speed repetitive operation -- faster time-scale setting, higher speed solution for observing changes in system response on a cathode ray tube display

- compressed time-scale operation -- very fast time-scale setting for continuous solution for obtaining more significant averages for random inputs over a given time span

HIGH-SPEED PLOTTING TECHNIQUE

The higher-speed operating mode provides solutions that, primarily, are to be observed. Since electro-mechanical recorders operate too slowly to follow such high-speed solutions, it is necessary to employ a special recording technique for those applications in which a permanent record of system response during repetitive operation is necessary.

A Stroboscopic Plotting Technique utilizing Analog Memory units is used to accomplish such plotting. This technique involves sampling of the variable at a specific time during each solution, holding this value, and comparing it to a reference.

PROBABILITY DISTRIBUTION ANALYSIS

In many applications it is necessary to plot the cumulative probability distribution curve for system variables. This curve represents the probability (or fraction of time) during which the variable exceeds a certain value, plotted against that value.

A Probability Distribution Analysis technique utilizing Gaussian noise input is used to accomplish this plot.

For complete details on this application, please write for Hybrid Computing Techniques: 1.3.4.h, Bulletin No. ALHC 6397-1.
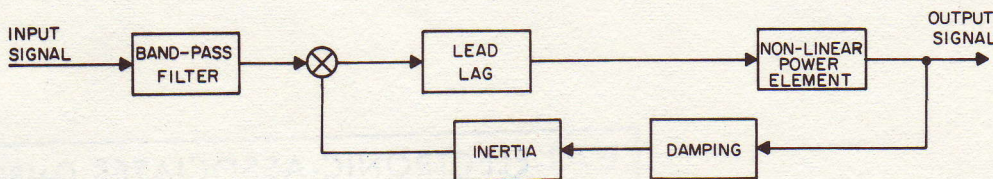

FIGURE 1.