

## XII. SIGNAL PROCESSING

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### A. RAPID 1/3 OCTAVE PINNA RESPONSE MEASUREMENTS

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In order to process audio signals for our auditory localization simulator,<sup>1</sup> data on interaural intensity differences and pinna responses must be obtained for a sound source in many positions in free space.

Instrumentation for taking 1/3 octave resolution pinna frequency responses rapidly is shown in Fig. XII-1. Pink noise was fed to a speaker mounted on a boom and chair apparatus in an anechoic chamber. The speaker could be moved freely to any position on a hemisphere over a subject's head at a radial distance of approximately 1 m. The azimuthal and elevational position of the speaker could be measured readily from protractors on the apparatus.

Thermo-Electron 526-U electret microphones were inserted in the entrance to the

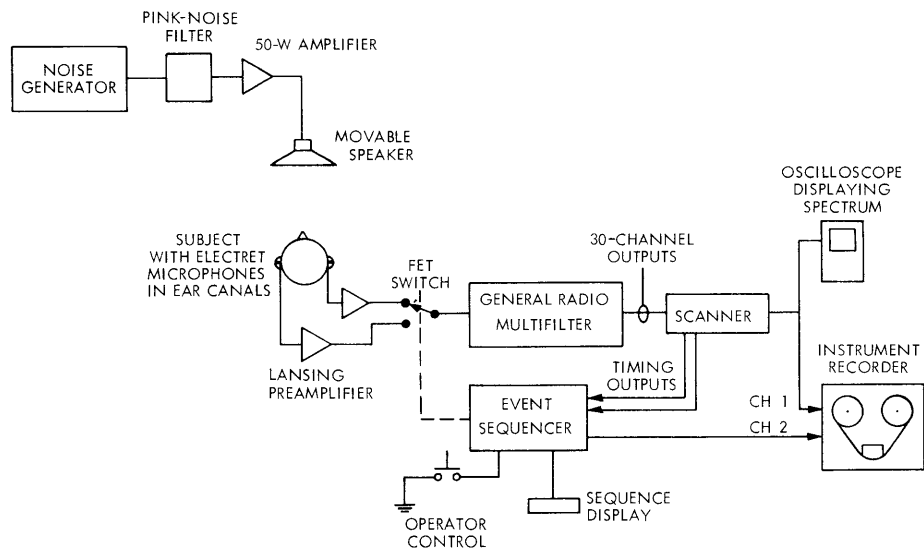


Fig. XII-1. Diagram of instrumentation.

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subject's ear canals. The microphone signals were amplified, and then commutated into the input of the 1/3 octave band multifilter by a switch controlled by the measurement event sequencer. The scanner<sup>2</sup> detected the rms level on each filter channel, and fed a voltage proportional to the level in each channel serially to the instrument recorder. The spectrum could be viewed concurrently by connecting an oscilloscope to the scanner output (triggered on the timing pulses). The sequencer automatically controlled the events of the measurement first by switching the microphones, then gating timing pulses to the recorder, thereby indicating a valid measurement (after a suitable delay to allow the rms detectors to achieve steady state), and finally informing the operator to move the speaker to a new position. Data for 153 source positions representing a uniform density on the surface of the hemisphere were recorded in approximately one hour.

References

1. J. R. Boddie, "Simulation of Auditory Signals for Localization," Quarterly Progress Report No. 108, Research Laboratory of Electronics, M.I.T., January 15, 1973, p. 352.
2. D. R. Cuddy, "Spectrum Scanner," Quarterly Progress Report No. 109, Research Laboratory of Electronics, M.I.T., April 15, 1973, p. 189.