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ELECTRONIC DISTRIBUTION AND SUMMING ELEMENT (EDSE). (U)
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ELECTRONIC DISTRIBUTION
AND SUMMING ELEMENT
(EDSE),
FINAL REPORT

JANUARY 9, 1976

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BACKGROUND

The EDSE module was developed to demonstrate the performance of a basic building block in a programmable acoustic array simulator for NUSC, New London, Connecticut.

This module was constructed during September and October, 1975, and was checked out during November, 1975.

The EDSE module, mounted in its Test Chassis together with the additional necessary test equipment, successfully met all the requirements set forth in the EDSE Acceptance Test Plan. The Acceptance Test was completed in January, 1976.

HARDWARE DESCRIPTION

The EDSE module consists of an 11 by 13.6 inch stitchwire card with voltage and ground planes and with 175 dual-in-line ICs installed. The module has an interface capability of 176 lines, provided by two 88 pin connectors. The ICs used in the EDSE module are 10,000 series ECL circuits with a basic master clock rate of 26 MHz. This was required so that the EDSE could be used in a simulated hydrophone array as large as 2048 hydrophones. The EDSE module contains the digital circuitry to simulate two hydrophone outputs, plus interface with an input data source and other EDSE modules in the acoustic array simulator. A more detailed description of the EDSE module circuits and operation and timing is found in the EDSE Technical Manual.

An EDSE Self-Test Chassis and a Self-Test module were constructed to checkout and self-test the EDSE module. The self-test chassis contains a muffin fan for cooling the EDSE module during test. The cooling fan was considered necessary since the EDSE module draws approximately 15 amps at -5 volt power during operation. During testing, it was found that the EDSE module stabilized at approximately 65°C during operation with the cooling fan turned off. The module exhibited no malfunctions due to operating at this elevated temperature. ✓

The EDSE module was found to be warped slightly after the wiring was completed and all the components were installed. This warpage was due to the large size of the card. To correct this situation, a stiffener, similar to those used on the NOVA computer control card, was installed.

A conformal polycoat coating was applied to the stitchwire side of the EDSE card in order to protect the wire connections, keep the wires in place, and keep them from snagging. A photograph of the module is shown in Figure 1.

CONCLUSIONS -

The EDSE module performed flawlessly during Acceptance Testing. The reliable operation of this ultra-high speed hydrophone simulation circuitry was demonstrated. The module performed precisely as predicted over the temperature and source voltage variations that would be expected in a worst case laboratory environment. The ECL circuits used on the module exhibited no infant mortality, and no component failures were experienced on the EDSE module during the checkout and testing operations.

While the stitchwire construction technique was most practical for the first module, it is recommended that PC techniques be employed for any additional modules.

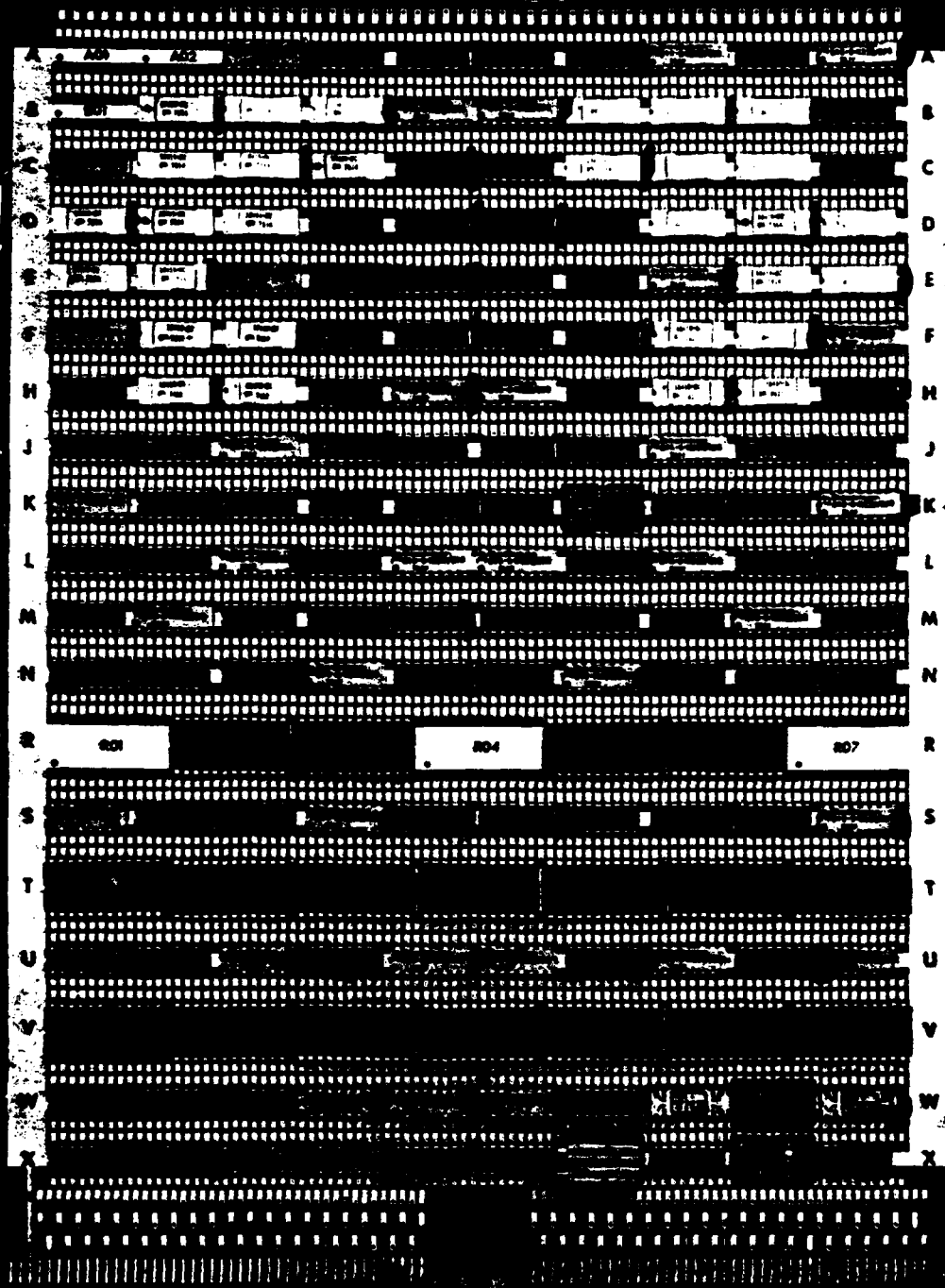
Based on experience with this module, two recommendations are made:

- One - The large size of the module, and the multi-layer construction is conducive to warping or bending of the module. It is recommended that an aluminum frame be used around the periphery of production EDSE modules.
- Two - Noise problems on the module were minimal; however, at the high-speed accumulator interfaces some digital noise was seen. It is recommended that a separate ground return be provided for each two or four interface lines. This would minimize noise by providing a local ground reference connecting the ground pins of the driving and receiving integrated circuits on adjacent EDSE modules.

The reliable performance of this first EDSE module demonstrates the practicality of this method of target generation.

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