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MONTHLY PROGRESS REPORT
COUNTERMEASURES TRANSMITTING SET AN/ALT-22(V)
AND
BARRAGE JAMMER QRC-139A-(T)
MODIFICATIONS TO AN/ALT-6B

Contract AF33(604)38334

LMED Requisition 32634

PERIOD ENDING: 30 JUNE 1962

Prepared for
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SECTION I
INTRODUCTION

This report describes the progress made during June 1962 on the development of an L-band oscillator group for the QRC-139A-(T) and AN/ALT-22(V) jamming system. This work includes the development of two essential microwave components, an L-band barrage magnetron and an L-band ferrite load isolator.

The construction and bench testing of QRC-139A-(T) systems and the construction and qualification testing of three L-band AN/ALT-22(V) systems are also part of the program authorized by letter contract AF33(604)38334.

SECTION II

AN/ALT-22(V) AND QRC-139A-(T) MODIFICATION TO AN/ALT-6B (L-BAND)

A. EQUIPMENT DESCRIPTION.

The equipment being procured under contract AF33(604)38334 consists of sixty government furnished AN/ALT-6B equipments modified to the QRC-139A-(T) and AN/ALT-22(V) configurations. Fifty-seven QRC-139A-(T) equipments complete with L-band QRC-139A-1-(T) oscillator groups are to be supplied with deliveries starting in August 1962. Three first article AN/ALT-22(V) equipments complete with L-band oscillator groups are scheduled to be submitted to first article tests during August and September 1962 and the first article systems delivered to the Air Force by 30 September 1962.

The QRC-139A-(T) equipment supplied on this contract will be identical to the QRC-139A-(T) equipment delivered on contract AF33(604)36722 with the exception that the control dials on the control-indicator and magnetron frequency control units will be designed for L-band and the r-f oscillator will have an L-band barrage magnetron and load isolator.

B. PROGRAM STATUS.

All materials needed for the modification program have been ordered. The orders for the center frequency control dials were placed late in the report period. The linear tuning calibration for these dials was based on L-3519 tuning information received via telephone from Litton Industries on

22 June 1962. Delivery promises have not yet been received from the dial manufacturers but these deliveries will be expedited to the maximum extent.

The order for the BX-1202 noise tube has been sent to the Burroughs Corporation but has not been accepted by them pending results of negotiations between G. E. and Burroughs concerning the purchase specification requirements. Changes have been made to the noise amplifier board circuitry to eliminate some of the objections raised by Burroughs. G. E. has also revised some requirements of the specification to accommodate Burroughs. Burroughs still objects to the shelf life and noise quality requirements, and the performance requirements over the wide filament and anode voltage ranges as required by the specification. G. E. considers these requirements to be realistic and necessary and will continue to try to convince Burroughs that they are necessary. A considerable amount of time and effort, more than was anticipated, has been spent in negotiating an acceptable specification for the noise tube with Burroughs. If this is not resolved soon, G. E. will not have noise tubes to use in the first L-band QRC-139A-(T) systems scheduled to be delivered to the Air Force nor in the first article systems which are scheduled for qualification tests starting in August.

No L-3519 barrage magnetrons have been received to date. Litton Industries is behind schedule due to tube design problems. (See paragraph C. 1 for further information concerning this problem area.) Litton is unwilling to commit themselves to a new delivery schedule until the tube design is frozen. An estimate as to the date when this will be accomplished has been requested but not yet received from Litton Industries. Litton will have engineering and assembly personnel working on the L-3519 barrage magnetron during their vacation period (first three weeks of July).

No coaxial load isolators were received from Sperry Microwave during June. Sperry has had a power handling problem with their isolator. (See paragraph C. 2 for additional information concerning this problem area.) On 29 June 1962, Sperry reported that they had assembled and tested under high power conditions a unit which meets all the specification requirements. They are confident that the design problems have been solved and that several production units will be delivered during the first week of July with regular production deliveries thereafter.

The remainder of the material required for this program is being received on schedule and modification of the government furnished AN/ALT-6B systems has started. The status of this work is summarized in the following table:

QRC-139A Unit	At Assembly	At Inspection	At Test	Remarks
Power Supply	47*		13	*Less Rectifiers
Transmitter	42	12	6	Less Video Boards
Oscillator	60			Less Magnetrons and Load Isolators
Control, Magnetron Frequency	17			Less Center Frequency Dial
Control Indicator	2		5	
Video Board Sub-Unit	0			Engineering change is being incorporated to enhance performance of noise tube.

The change which is being made to the noise board circuitry has been tested on a production board and found to be satisfactory. The change is primarily in the circuits supplying voltages to the noise tube. Figure 1, which shows the new test circuit for the BX1202 noise tube, illustrates the circuit changes. The exact changes which have been made can be determined by comparing this figure with figure 2. The significant change to the circuitry is the segregation of two spades, denoted lagging spades, in the BX-1202 tube and application of an adjustable voltage (20 to 30 volts) to those elements. More consistent performance is obtained from the BX-1202 tube with this arrangement. Segregation of the two spades is accomplished external to the tube.

Other project activities during the month included the definitive contract negotiation on 7 June at the Dayton Air Force Depot, and trips to Litton Industries and the Burroughs Corporation in connection with tube problems and specification negotiations, respectively.

Since the Air Force has advised the General Electric Company that vibration testing to MIL-T-5422E (modified) using Boeing mountings D10-30278-513 and 514 is desired, considerable time was spent planning a vibration study program which would yield information to be used in establishing vibration test limits for the first article tests. The program which will be proposed to the Air Force early in July is a vibration survey designed to establish the highest vibration levels that the equipment will withstand without failure. Since it is estimated that the equipment will not meet the vibration requirements of MIL-T-5422E, the information obtained in the preliminary survey will also be used to make recommendations concerning ways to fix the units so that they will meet the desired vibration requirements.

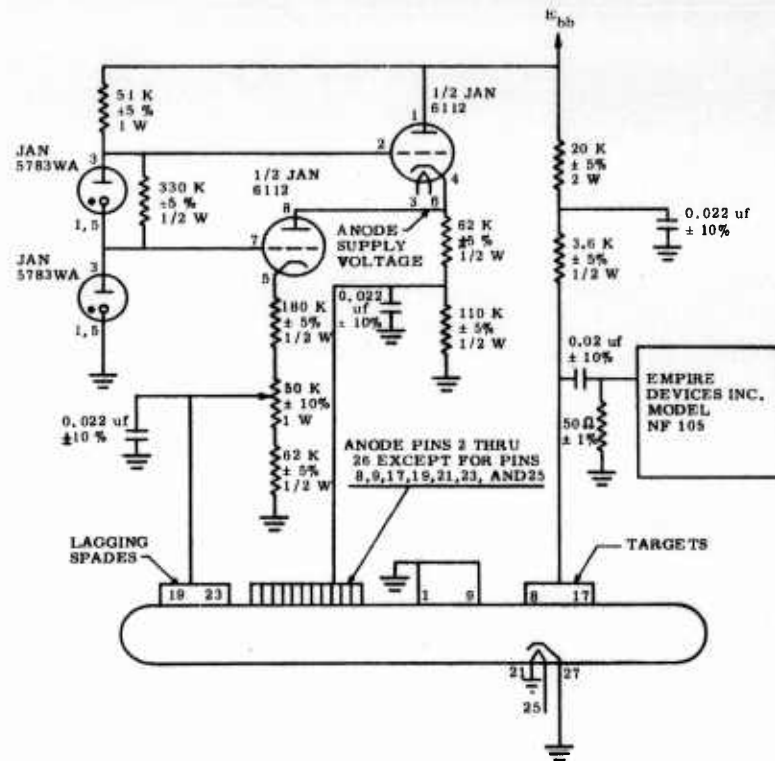
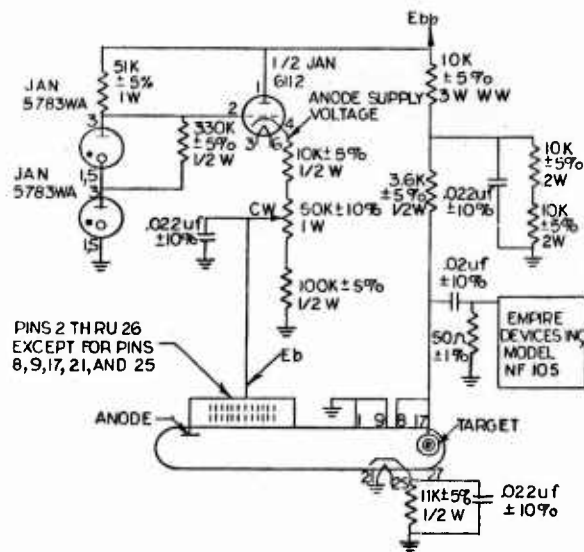


Figure 1. BX-1202 Test Circuit (Revised)



• Figure 2. BX-1202 Test Circuit (Per G-E Drawing A7060620)

Vibration testing to the requirements of MIL-T-5422E (modified) is a change in contract scope.

The status of the development of the noise amplifier printed wiring boards is that sample boards have been received and components have been assembled to them. Evaluation of the performance of these boards will be made during the next period. The latest changes to the noise amplifier circuitry will be incorporated into the boards prior to their evaluation.

C. PROBLEM AREAS.

1. Barrage Magnetron.

All the design problems with the L-3519 barrage magnetron were not solved during the report period. Litton has eliminated the resonance problem by changing the tube's output structure, but a coupling problem still remains to be solved. Litton solved the resonance problem by using an output structure which has a glass window. Since Litton has had some trouble in the past with glass windows, they will include a low loss glass in their window design. They will also prove out the design by running an accelerated life test on several tubes with the new glass window. In parallel with this work, Litton will continue to experiment with the ceramic output structure, until the resonance problem is solved. It is Litton's intention to eventually use an output structure with a ceramic window on the L-3519 tube. This will permit them to couple out of the tube the high power which they claim it is capable of producing.

The coupling problem shows up as reduced power output or narrow bandwidth. Litton advises that this problem can be solved by adjusting the coupling for optimum performance. This involves building a number of models with slightly different coupling until the optimum configuration has

been found. Since the coupling is made to one of the anode vanes, any change in the coupling involves building another complete tube. This takes a minimum of three to four days per change to the anode structure or the method of coupling to that structure. Litton is working overtime to deliver acceptable tubes as soon as possible.

2. Load Isolator.

Sperry Microwave has experienced considerable difficulty in finding a coaxial load isolator structure which will perform as specified and handle the maximum power required. In order to keep the insertion loss down, Sperry has been using a garnet material in their isolator which has a Curie temperature of 275°C. Under the high power conditions specified and with the type of coaxial configuration required for a resonance type isolator, the temperature of the garnet approaches its Curie temperature and the performance of the isolator deteriorates below specification limits.

Two approaches have been tried to solve this problem. One is to replace part of the garnet with a ferrite material with a higher Curie temperature. The other is to find a more effective method of getting the heat out of the garnet material so that its temperature will not approach so closely its Curie temperature.

The isolator design which Sperry has finally evolved utilizes both of the referenced approaches. An intricate set of longitudinal cooling fins has been devised to more effectively remove the heat from the garnet material. Two materials, garnet and iron oxide ferrite, are used in the new design which gives the desired performance. The power handling capability of this new isolator does not provide a great deal of safety factor, but the unit does meet the isolator specification requirement. Increasing the

maximum power into the unit by 12 percent changes the maximum input Voltage Standing Wave Ratio from 1.16:1 to 1.22:1. The insertion loss remains within specification limits under the increased input power conditions.

D. PROGRAM FOR NEXT INTERVAL.

The program for the next interval will consist primarily of working closely with Litton Industries, Sperry Microwave, and Burroughs to the end that acceptable barrage magnetrons, load isolators and noise tubes, respectively, are received for use in assembly of the first L-band QRC-139A-(T) systems. Modification of the AN/ALT-6B systems will continue to the point where they will be ready to accept the new tubes and isolator referenced above. Immediately upon receipt, these components will be installed in QRC-139A-(T) units.

Plans for the first article tests will be made during the next period. It is hoped that the vibration test requirements can be firmed up and factored into the test plans.

E. FINANCIAL STATUS.

The following is an estimate of the monies that have been expended and committed on Contract AF33(604)38334 as of 1 July 1962:

Expenditures for Engineering Material, Design Effort, Direct Labor, and Direct Materials	\$104,500
Total Commitments	\$363,800
Estimated Commitment Liability	\$272,000
Total Expenditures and Commitments	\$468,300

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