(2)

Code 5435A

~~TOP SECRET~~ [redacted]

28 September 1954

MEMORANDUM

From: [redacted] Code 5435A, Countermeasures Branch, Radio Division
To: [redacted] Code EL-4511, Bureau of Aeronautics

Subj: Data on Crystal Checker; Request for information on

Encl: (1) Data on subject, serial 5430-208/54 bws dated 28 Sept 1954

1. Enclosure (1) forwarded herewith for your information and forwarding to [redacted] of Crosley Division of Avco Corporation.

[redacted]
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5430-208/54 bws

28 September 1954

Subj: Data on Crystal Checker

Encl: (1) Circuit Diagram of Crystal Checker

1. A request was made by of Crosley Division, Avco Corporation during his visit to the Naval Research Laboratory on 3 September 1954, for information concerning the matching of crystal diodes incorporated in the square-rooting circuit of the Naval Research Laboratory model, NL/ALD-A direction finder. The following information is forwarded which may provide some answers to the problem.

2. To expedite the selection of matched germanium crystal diodes for use with the square-rooting network, the circuit of enclosure (1) was found to combine both ease and required accuracy in their selection . This arrangement effectively is a means of measuring the d-c resistance of the diode under test at each of five applied potentials within the operating limits of the network.

3. The circuit must first be adjusted in position 1 by varying R_8 until the meter reads 50μa. (Full scale) This must be done each time the circuit is used. The meter current sensitivity is adjusted by means of R_2, R_3, R_4, R_5 and R_6 so that a meter reading of 20 μa is indicated at each test potential when a crystal having the proper resistance characteristic is inserted at the test terminals.

4. The preferred method of calibrating the circuit is, first, to experimentally obtain a crystal diode which, when placed in the square-rooting network and operating at the ambient temperature of the equipment, yields the square-rooting characteristic, and second, to employ this crystal diode as a standard in the final calibration of the crystal checker. The final adjustment or calibration should, however, be made after the standard crystal diode has been allowed to return to the temperature at which the checker will be used.

5. As an approximation, to facilitate the problem of acquiring a standard crystal experimentally, the following resistance valves are applicable to initially calibrate the checker.

R_x = 160 ohms at .92 volts
R_x = 280 ohms at .53 volts
R_x = 600 ohms at .305 volts
R_x = 1800 ohms at .18 volts
R_x = 6000 ohms at .11 volts

A plot of the above data will give the approximate value of R_x required for any applied voltage between these limits. These values correspond to

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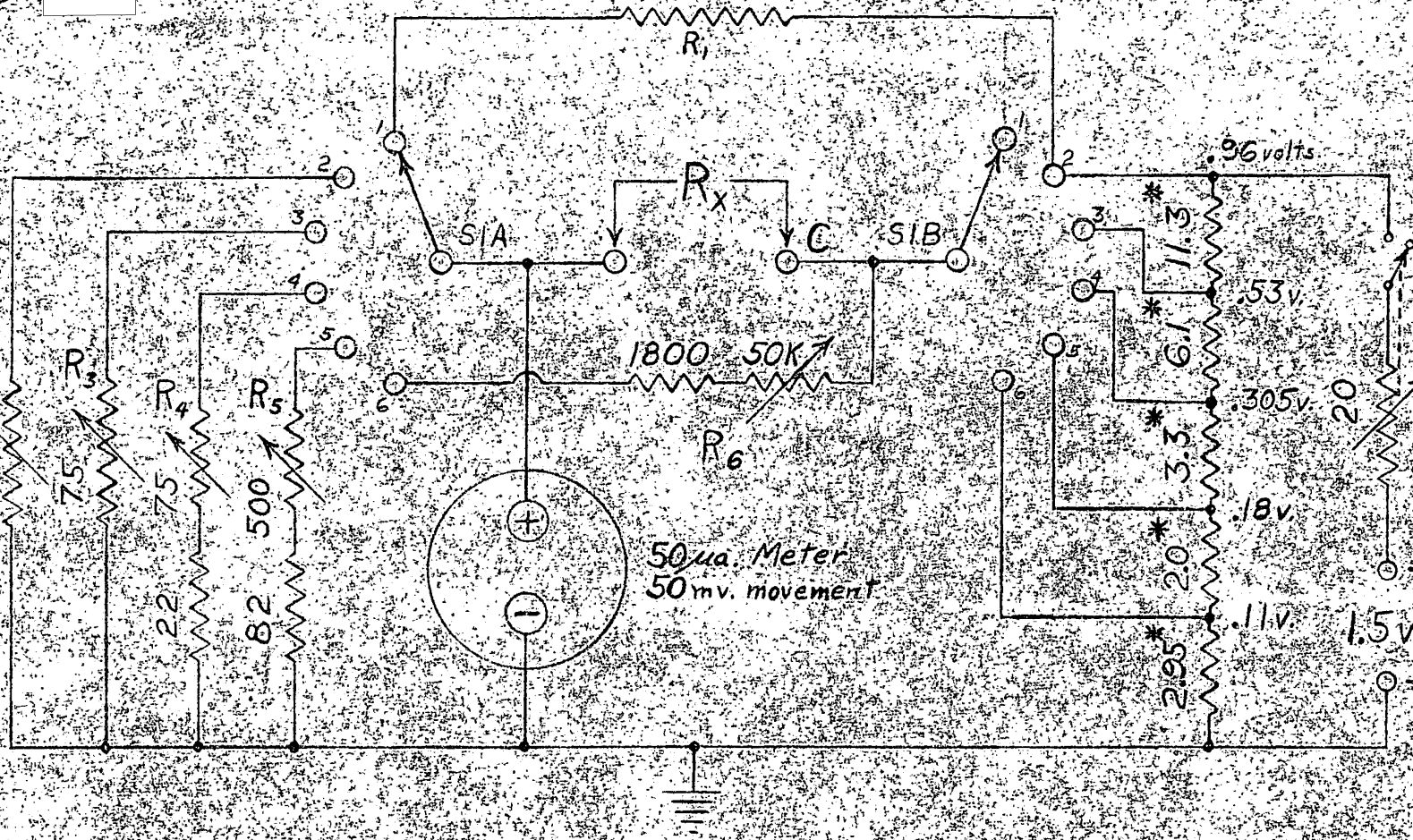
the normal room temperature resistance characteristic of a 1N69 crystal diode which has a square-rooting characteristic at 50°C when operating in the Naval Research Laboratory constructed equipment. The voltage given is that applied at point C and for each setting of resistance the appropriate potentiometer is adjusted to give 20μa. deflection on the meter. The meter voltage drop will then be 20 mv.

6. Corrections for temperature are essential and should not be overlooked when selecting diodes for use in the square-rooting network. The effects of temperature are more readily observed at the lower potentials where the diode resistance is large.

[redacted]
Electronic Scientist
Countermeasures Branch
Radio Division



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Note
Voltages given are for switch S1 in position shown (meter set at 50 ua.) VIA BYEMAN CONTROL SYSTEM ONLY
With crystal diode at Rx terminals and S1 in position 2, the voltage at C (designating cathode) will be approximately .92 volts.
Resistance values in ohms. (* indicates tolerance of 1%.)

U. S. NAVAL RESEARCH LABORATORY WASHINGTON 25, D. C. BLDG. 29 PHONE 467 ROOM 321	SCALE DRWN. A.J.S. CH'K'D. APPR'V'D.	Crystal Checker UNLESS OTHERWISE SPECIFIED, TOLERANCES ARE ±

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Approved for Release: 2024/06/08 C05025287
C05025287