

UNCLASSIFIED

Navy Department - Office of Research and Inventions

DECLASSIFIED

NAVAL RESEARCH LABORATORY
Washington, D. C.

* * *

SHIP-SHORE RADIO DIVISION - RECEIVER SECTION

16 January 1946

DECLASSIFIED by NRL Contract
Declassification Team

Date: 24 Sep 2014

Reviewer's name(s): A. THOMPSON,
P. MANNA

Declassification authority: NAVY DECLASS
MANNA, 11 DEC 2012, OF SERIES

ELECTRICAL CHARACTERISTICS OF
AUDIO OSCILLATOR IN THE
MODEL RDJ-1 PULSE ANALYZER

By: R. G. Hennessey

- Report R-2743 -

RESTRICTED
UNCLASSIFIED
* * *

DECLASSIFIED: By authority of
January 1958
Entered by: E. L. List Code 2027

DISTRIBUTION STATEMENT 4 APPLIES
Further distribution authorized by _____

Approved by: UNLIMITED only.

T. McL. Davis - Head, Receiver Section

L. A. Gebhard, Superintendent,
Ship-Shore Radio Division

Commodore H. A. Schade, USN
Director, Naval Research Laboratory

Preliminary Pages 8-0
Numbered Pages 2
Distribution List d-

NRL Problem 5787T-R

DECLASSIFIED

UNCLASSIFIED

CONFIDENTIAL
Rev. 991 PL 13, dated Feb
28 Mar. 1946.

Navy Department - Office of Research and Inventions

NAVAL RESEARCH LABORATORY
Washington, D. C.

* * *

SHIP-SHORE RADIO DIVISION - RECEIVER SECTION

16 January 1946

ELECTRICAL CHARACTERISTICS OF
AUDIO OSCILLATOR IN THE
MODEL RDJ-1 PULSE ANALYZER

By R. G. Hennessy

- Report R-2743 -

* * *

Approved by:

T. McL. Davis - Head, Receiver Section

L. A. Gebhard, Superintendent,
Ship-Shore Radio Division

Commodore H. A. Schade, USN
Director, Naval Research Laboratory

Preliminary Pagesa-c
Numbered Pages..... 2
Distribution List.....-d-

NRL Problem S787T-R

-2-

DECLASSIFIED

ENC. 2 to
NRL Lit-File 422.2 (1224. RGH)
Ser. R-1220-11/46 of 37-46.

ABSTRACT

The audio calibration oscillator of the Model RDJ-1 Pulse Analyzer was checked for frequency stability under conditions of varying temperature and humidity, for accuracy of oscillator dial calibration and harmonic voltage content. The dial drive vernier ratio has been increased to give a finer control in determining pulse repetition frequencies. This higher ratio is more satisfactory than that used in the X-RDJ and RDJ Pulse Analyzers. The results of the tests were considered satisfactory since the equipment met all of the requirements of the specification on the operation of the oscillator. The equipment may be considered acceptable for Naval use in so far as indicated by the tests reported.

TABLE OF CONTENTS

	<u>Page</u>
ABSTRACT	-b-
INTRODUCTION	1
RESULTS OF TESTS	1
Calibration of Oscillator Dial	1
Harmonic Voltage Content of Oscillator	1
Temperature Test of Audio Oscillator	1
CONCLUSIONS	2
RECOMMENDATIONS	2
REFERENCES	2

INTRODUCTION

1. The Model RDJ-1 Pulse Analyzer is similar to the preceding X-RDJ and RDJ Pulse Analyzers with a few exceptions. The oscillator circuit has had a few changes made in it to increase its stability and reduce the second harmonic voltage content; a new oscillator dial is used so that the calibration can be made more accurately; and the dial drive vernier ratio has been increased to 8-1/2 to 1 to give finer control in determining pulse repetition frequencies. The equipment was submitted for tests to determine the accuracy of the oscillator dial calibration, the amount of harmonic voltages present and the stability of the oscillator frequency over a temperature range of -10°C to +50°C. The tests were conducted at this Laboratory between 16 November 1945 and 13 December 1945.

RESULTS OF TESTS

2. Calibration of Oscillator Dial - A Hewlett-Packard Model 200C Audio Oscillator, calibrated from a 1000-cycle standard line, was used to determine the accuracy of the calibration of the new oscillator dial in the Model RDJ-1 Pulse Analyzer. The calibration was found to be accurate within the required five percent. The high range had the largest deviations. The seven points taken were all in error by more than 3%, the largest error being 4.2% at 3000 cycles, a deviation of 125 cycles. On the mid-range the largest error was 15 cycles at 700 or a deviation of 2.1% while on the low range a 2% error was found at 50 cycles, the dial reading being 51. The dial drive ratio of 8-1/2 to 1 is satisfactory.

3. Harmonic Content of Oscillator - The amount of harmonics present was measured on a General Radio Wave Analyzer Type 736-A. On the low band from 20 to 180, the second harmonic present was 6% of the fundamental at 180 cycles. At 25 it was 5.5% of the fundamental. Third harmonics present were not greater than 3%. On the range covering 180 to 1300 cycles, the second harmonic content was less than 5% of the fundamental over the entire range. Second harmonic voltage present on the high range was 4% of the fundamental voltage at 3000 and 5000 cycles and less than 4% over the remainder of the band which covers 1300 to 10,000 cycles.

4. Temperature Test of Audio Oscillator - The Model RDJ-1 Pulse Analyzer was subjected to temperature variation from -10°C to +50°C with the relative humidity held at 30% at temperatures permitting its observation. During the first cycle the equipment failed to operate properly at 40° and 50°C. When the equipment was operated at room temperature (approx. 26°C) for a few hours, the elliptical sweep again failed to operate normally. The feedback potentiometer RL57 was increased from 860 ohms to approximately 1000 ohms and operation was then normal. The equipment was then tested under temperature variation.

5. The frequency drifted 2.5 cycles at 50 cycles and 6 cycles at 150 cycles on the low band over the above temperature range. At 200 cycles on the mid-range the frequency drifted 7 cycles while at 1000 cycles on the same range the drift was 20 cycles. On the high range the drift at

1500 cycles was 30 cycles and at 10,000 the frequency drifted 350 cycles while the temperature varied from -10°C to +50°C. Except for the drift at 50 cycles which was just 5% of the frequency, the drift over the range was less than 5%. The equipment worked normally under 95% humidity at 40°C. The oscillator frequency was very stable under high humidity.

CONCLUSIONS

6. The new oscillator design, including circuit changes, dial face, and dial drive ratio are considered to be satisfactory. The oscillator frequency is satisfactorily stable under varying temperatures and humidity. The new dial calibration is within the five percent accuracy limit on all the bands and the 8.5 to 1 dial drive ratio gives a finer control in setting the oscillator to the frequency of the pulse being investigated.

RECOMMENDATIONS

7. It is recommended that care be taken when setting the feedback resistor R157 so that the oscillator will operate satisfactorily over the entire range of frequencies from 25 to 10,000 cycles under all conditions.

REFERENCES

1. BuShips ltr. R-S67-5(920-Dw) of 4 July 1944 to NRL: Request for Assignment of Problem S787R-R.
2. NRL ltr. S67-5(354:RGH) R-750-194/45 of 15 June 1945 to BuShips: Preliminary Inspection of X-RDJ Serial 1 Pulse Analyzer.
3. NRL ltr. S67-5(354:RGH) R-750-195/45 of 15 June 1945 to BuShips: Electrical Tests of X-RDJ Pulse Analyzer.
4. NRL ltr. S67-5(354:RGH) R-750-288/45 of 11 September 1945 to BuShips: Type Test of Model X-RDJ Serial 17 Pulse Analyzer.

Original Data in NRL Log Book 2254.

DISTRIBUTION

BuShips, Code 938 and 9250(10)

USNEL (1)

CHORI (1)

Op-413-B2 (3)

Commanding General Army Air Forces (1)

Washington 25, D. C.

Attn: Miss L. Diamond

Office of Air Communications Officer

Office of Chief Signal Officer SPSOL-4 (1)

Army Service Forces

Washington 25, D. C.