

SIGNAL CORPS
REPAIR STANDARD

Amendment 1, 13 November 1956

NO. REP-27
ISSUE NO. 3

REPAIRED EQUIPMENT STANDARD

FOR

RADIO RECEIVER-TRANSMITTER
RC-669-A, B, C, D

PROJECT 4422D

19 May 1953

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SIGNAL CORPS ENGINEERING LABORATORIES

FORT MONMOUTH, N. J.

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REP-27

SCEL-SC FORM NO. 219
REV. AUG. 1946

SIGNAL CORPS
REPAIR STANDARD

NO. REP-27
ISSUE NO.3
AMENDMENT NO.1
13 November 1956

SIGNAL CORPS
REPAIRED EQUIPMENT STANDARD
FOR
RADIO RECEIVER-TRANSMITTER BC-669-A-B-C AND D

Page 8. IV.C.1., line 2. Change "400 KC" to "4000 KC".

IV.C.1., line 4. Change sentence as follows:
"Output current shall be 1.2 amps. min."

FNC/mls

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TABLE OF CONTENTS

Section	Text	Page
	Preface	II
I.	Statement Covering Applicability	1
II.	Applicable References.	1
II. A.	Repair Standards	1
II. B.	Technical Publications	1
III.	Test and Additional Equipment.	2
III. A.	Test Equipment	2
III. B.	Additional Equipment	2
IV.	Requirements	3
IV. A.	General Test Conditions.	3
IV. B.	Receiver Tests	4
IV. C.	Transmitter Tests.	8
V.	Supersedure.	9

**SIGNAL CORPS
REPAIR STANDARD**

PREFACE

Signal Corps Repair Standards (formerly Signal Corps Repaired Equipment Requirements) are prepared by the Maintenance Engineering Branch, Procurement-Maintenance Engineering Division, Signal Corps Engineering Laboratories, and cover various items of signal equipments which are subject to repair, test and inspection. These repair standards are documents which set forth the specific repair requirements and test standards to be applied to the individual equipments being repaired and tested.

Signal Corps Repair Standards are prepared for the specific use of the fifth echelon Signal Repair Shops in repairing and determining the quality and acceptability of repaired signal equipments covered by these standards. The use of Signal Corps Repair Standards is recommended as a guide and reference for any agency having occasion to repair, test or inspect an item of signal equipment for which a repair standard has been prepared.

Signal Corps Repair Standard No. REP-1001 is a general standard and is subsidiary to any individual standard prepared. No individual standard is to be considered complete in itself, but is to be used in conjunction with Signal Corps Repair Standard No. REP-1001, "General Standards for Repaired Signal Equipment."

Reports of any discrepancies or any constructive comments bearing upon this repair standard are invited. A series of Comments and/or Notes pages will be found in the back of this standard which are designed to facilitate reporting any inaccuracies noted. All such reports or comments as well as requests for additional copies, should be addressed to:

COMMANDING GENERAL
Signal Corps Engineering Laboratories, SIGEL-PMM-3
Fort Monmouth, New Jersey.

REPAIRED EQUIPMENT STANDARD
FOR
RADIO RECEIVER-TRANSMITTER
BC-669-A, B, C, D

I. STATEMENT COVERING APPLICABILITY

This repair standard covers inspection requirements to be used in determining the quality and acceptability of repaired Radio Receiver-Transmitter BC-669-A, B, C, D. Its use is mandatory in the Maintenance Divisions of Signal Depots and the Signal Sections of General Depots. The use, insofar as limitations of test and calibration equipment permit, is highly recommended for all Signal Repair organizations.

C A U T I O N 300 VOLTS

II. APPLICABLE REFERENCES

A. Repair Standards. Applicable paragraphs of the following repair standards form a part of this standard:

	Title	Number
1.	General Standards for Repaired Signal Equipment	REP-1001
2.	Class "C" Receiver and Low Power Transmitter Vacuum Tubes	REP-242
3.	Meters	REP-85

B. Technical Publications. The following technical publication forms a part of this standard to the extent referenced herein:

	Title	Number
	Radio Set SCR-543-B	TM 11-625B Section I

SIGNAL CORPS
REPAIR STANDARDNO. REP-27
ISSUE NO. 3**III. TEST AND ADDITIONAL EQUIPMENT**

The following equipments, or suitable equipments of known accuracy, shall be employed in determining compliance with the requirements of this Signal Corps Repair Standard and will be capable of conforming to their respective Repair Standards:

A. Test Equipment

	Equipment	Stock Number	Number Used	REP
1.	Oscilloscope OS-8A/U	3F3665-B	1	-
2.	Spectrum Analyzer TS-723/U	1722-5.4	1	-
3.	Signal Generator TS-588/U	3F3820.2	1	-
4.	Transformer, Var- iable CN-16A/U	3F8100-3	1	-
5.	Multimeter TS-297/U	3F6325-297	1	-
6.	Frequency Meter SCR-211	2C1411	1	-
7.	Audio Oscillator TS-382()/U	3F4325-27	1	-

B. Additional Equipment

	Equipment	Stock Number	Number Used	REP
1.	Headset HS-22()	2B822E	1	-
2.	Ammeter (0-3 Amp RF)	3F10003.18	1	-

SIGNAL CORPS
REPAIR STANDARDNO. REP-27
ISSUE NO. 3

	Equipment	Stock Number	Number Used	REP
3.	Power Supply PE-110-()	3H-4997-100D	1	-
4.	Resistor, fixed, 10 ohm $\pm 5\%$ 40 w, non-inductive	3Z6001-90	2	-
5.	Resistor, 4000 ohms $\pm 5\%$, 5 w, non-inductive	3Z6400-38	1	-
6.	Capacitor, 520 mmf, 500 v	3D9520-2	1	-
7.	Capacitor, 50 mmf, 500 v	3D9055-4	1	-
8.	Resistor, 100 ohms $\pm 5\%$, 1/2 w non-inductive	3Z6010-198	1	-
9.	Key J-45	3Z3445	1	-

IV. REQUIREMENTS

A. General Test Conditions. The following test conditions are, in general, applicable to all required tests:

1. All tests shall be performed in a screened room.
2. Input voltage to Power Supply Unit PE-110-() shall be 115 v, 60 cycles.
3. Tests shall be made after an equipment warm-up period of approximately 15 minutes.
4. Receiver antenna coupling shall consist of a 10 ohm resistor in series with a 50 mmfd capacitor.
5. Transmitter dummy load shall consist of a 0-3 amp RF ammeter in series with a 10 ohm resistor and a 50 mmf capacitor.

SIGNAL CORPS
REPAIR STANDARD

NO. REP-27
ISSUE NO. 3

6. Tests shall apply to all models except certain tests which only apply to the D model and are so designated.

7. All input signals shall be 30% modulated at 400 cycles.

8. Receiver output shall be measured with a vacuum tube voltmeter across the 6 ohm resistor R51 unless otherwise specified.

9. Load resistors for measurement of output across the PHONES terminals for the A, B and C models shall be 100 ohms and for the D model, 4,000 ohms.

10. Standard receiver output shall be 50 mw (550 millivolts across the 6 ohm R51 resistor).

B. Receiver Tests

1. Receiver Sensitivity (VOICE, MANUAL and CW, MANUAL). Establish a signal-plus-noise-to-noise voltage ratio of 2 to 1. This shall be done in the following manner:

a. Tune the signal generator and receiver to 1800 kc.

b. Adjust the output of the signal generator and the receiver volume control to produce a 550 millivolt receiver output across the 6 ohm resistor R51. This shall be done in such a way that with the modulation off, the receiver output shall not exceed 275 millivolts.

c. This signal-plus-noise-to-noise ratio shall be obtained for each frequency listed in Table I and the modulated signal input shall not exceed the values shown:

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4.	Transformer, Var- iable CN-16A/U	3F8100-3	1	-
5.	Multimeter TS-297/U	3F6325-297	1	-
6.	Frequency Meter SCR-211	2C1411	1	-
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SIGNAL CORPS
REPAIR STANDARDNO. REP-27
ISSUE NO. 3

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6.	Capacitor, 520 mmf, 500 v	3D9520-2	1	-
7.	Capacitor, 50 mmf, 500 v	3D9055-4	1	-
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5. Transmitter dummy load shall consist of a 0-3 amp RF ammeter in series with a 10 ohm resistor and a 50 mmf capacitor.

SIGNAL CORPS
REPAIR STANDARD

NO. REP-27
ISSUE NO. 3

6. Tests shall apply to all models except certain tests which only apply to the D model and are so designated.

7. All input signals shall be 30% modulated at 400 cycles.

8. Receiver output shall be measured with a vacuum tube voltmeter across the 6 ohm resistor R51 unless otherwise specified.

9. Load resistors for measurement of output across the PHONES terminals for the A, B and C models shall be 100 ohms and for the D model, 4,000 ohms.

10. Standard receiver output shall be 50 mw (550 millivolts across the 6 ohm R51 resistor).

B. Receiver Tests

1. Receiver Sensitivity (VOICE, MANUAL and CW, MANUAL). Establish a signal-plus-noise-to-noise voltage ratio of 2 to 1. This shall be done in the following manner:

a. Tune the signal generator and receiver to 1800 kc.

b. Adjust the output of the signal generator and the receiver volume control to produce a 550 millivolt receiver output across the 6 ohm resistor R51. This shall be done in such a way that with the modulation off, the receiver output shall not exceed 275 millivolts.

c. This signal-plus-noise-to-noise ratio shall be obtained for each frequency listed in Table I and the modulated signal input shall not exceed the values shown:

TABLE I

Oper	Band	Freq (kc)	Input (microvolts)	
			Voice Operation	CW Operation
Voice	1	1800	5	4
		2200	5	4
		2700	5	4
Voice	2	2900	6	4
		3600	6	4
		4400	6	4

2. Image Frequency Rejection Ratio

a. Set the receiver band switch at MAN 1. Tune the receiver for a 550 mv output at 1800 kc with an input signal of 5 microvolts. Tune the signal generator to the image frequency of 2570 kc and increase the signal strength until receiver output is the same as that obtained with 5 microvolts input. The image rejection ratio = $\frac{\text{Receiver Input at 3470 kc}}{\text{Receiver Input at 1800 kc}}$

b. Repeat paragraph a above for frequencies of 2700 kc and 4400 kc with respective signal inputs of 5 and 6 microvolts and the receiver band switch at MAN 2.

c. The image rejection ratios shall be not less than the values indicated in Table II.

TABLE II

Band	Freq (kc)	Image Freq (kc)	Image Rejection Ratio
1	1800	2570	3500
2	2700	3470	1000
2	4400	5170	400

3. Intermediate Frequency Rejection Ratio. With the signal-plus-noise-to-noise ratio adjusted as specified in B-1 for 1800 kc, change the input from the signal generator to 385 kc and increase the signal until a 550 millivolt output is obtained from the receiver. The IF rejection ratio shall be not less than 30,000.

4. Maximum Undistorted Power Output. Set the signal generator for an output of 1800 kc and tune the receiver to this frequency. Increase output of signal generator and RECEIVER VOLUME control until maximum receiver output with less than 5% distortion is obtained. The receiver output across the R51 resistor, for all models, must be not less than 2.05 volts and at the PHONES output not less than 0.84 volts for all models except the D. For the D model, output at the PHONES terminals shall be not less than 16.75 volts.

5. IF Selectivity

a. Set the receiver to 1800 kc. Connect the signal generator output thru a 520 mmf capacitor to the grid of converter tube V2.

b. Apply a signal of 100 microvolts at 385 kc and adjust the receiver volume control to obtain 550 millivolts output.

c. Increase output of signal generator to 1000 microvolts and adjust signal generator frequency until receiver output is 550 millivolts.

d. Change the frequency of the signal generator in the opposite direction until receiver output is 550 mv at 1000 microvolts input.

e. The difference in the signal generator frequencies in b and c as measured with Frequency Meter FR-67()/U is the bandwidth at 1000 microvolts input and shall not exceed 10 kc.

f. Repeat b, c, this paragraph, with a signal input strength of 0.1 volt. The bandwidth at this value of signal input shall not exceed 45 kc.

6. BFO Zero Beat Adjustment (D Model Only)

a. Set OPERATING CHANNEL switch at 1, RECEIVER BAND switch at XTAL 1, CW OSC switch at ON, SPEAKER switch at ON and tune the receiver to 1740 kc.

b. Connect output of signal generator to the grid of the converter tube V2 thru a 520 mmfd capacitor.

c. Adjust signal generator for an output of 100 microvolts at 385 kc.

d. Vary OSC PITCH control until a zero beat is obtained. Zero beat must occur when panel marker is aligned with control knob marker.

7. Receiver AVC Operation. Adjust the receiver for 550 millivolts output with an input signal of 18 microvolts at 1800 kc. Increase the input signal to 100 millivolts. Receiver output shall not exceed 1.73 volts.

8. Dial Calibration. Dial calibration shall be checked near the high frequency and low frequency ends of each band. The dial error shall not exceed one division on bands 1 and 2. The receiver frequency at each point shall be checked with the Frequency Meter SCR-211.

9. Receiver Squelch Operation (D Model Only)

a. Set RECEIVER BAND SWITCH at MAN 1, receiver CW OSC switch at OFF, VOLUME control at maximum, SQUELCH control at OFF and RECEIVER TUNING dial at 1800 kc.

b. Apply a modulated 3 microvolt signal at 1800 kc. Adjust the signal generator frequency slightly for maximum receiver output.

c. Increase output of signal generator to 25 microvolts.

d. Adjust receiver VOLUME control until the receiver output is 2.24 volts.

e. Adjust the SQUELCH control until receiver output is 175 millivolts.

f. SQUELCH control setting must be between 12 and 4:30 o'clock.

C. Transmitter Tests

1. **Transmitter Power Output.** Transmitter power output shall be measured at 400 kc by connecting an RF ammeter in series with a 10 ohm resistor and a 50 mmf capacitor. Output current shall be at least 2.08 amps. The PA plate current shall not exceed 210 ma.

2. The test in 1, this paragraph, shall be made for all six channels and for the D model on CW operation also. The same requirements as in 1, this paragraph, shall apply.

3. Modulation Capability

a. Apply a 400 cycle signal to the MIC terminals of the transmitter. Adjust ANTENNA TUNING control for maximum indications on RF meter. Adjust signal input to a maximum output that does not cause visible distortion or overmodulation.

b. Calculate the modulation percentage from the formula: $E_1 - E_0$ where $E_1 + E_0$

E_1 = maximum amplitude (peak to peak) of envelope

E_0 = minimum amplitude (peak to peak) of envelope

c. Modulation percentage as calculated in b shall not be less than 85 per cent, and the signal input to the MIC terminals shall be between 0.15 and 0.3 volt.

d. The modulation capability test shall be done for all six channels.

4. Transmitter Sidetone Output

a. (VOICE) With an input signal of 0.3 volt at 400 cycles to the MIC terminals and transmitter ANTENNA TUNING control adjusted for maximum indication on the RF meter, the output at the R51 terminals shall not be less than 220 millivolts for all models and 283 millivolts across the PHONES terminals for all except the D model.

SIGNAL CORPS
REPAIR STANDARD

NO. REP-27
ISSUE NO. 3

For the D model the output at the PHONES terminals shall not be less than 1.8 volts.

b. CW SIDETONE, (for D model only). Disconnect audio oscillator and set CW VOICE switch at CW. Operate transmitter by depressing key J-45. Tune ANTENNA TUNING control for maximum indication on dummy antenna RF meter. Output across the R51 resistor shall be not less than 775 millivolts and 6.4 volts at the PHONES terminals.

4. Operational Test (On Channels 1, 2, 3, 4, 5 and 6)

a. Radio Transmitter and Receiver BC-669 shall be given an operational test to determine that the equipment is functioning properly. The equipment shall be operated with the line voltage reduced to 98 volts and increased to 132 volts. Transmission and reception of signals by the set under test shall be clear and intelligible. Sidetone in handset must be clear and audible. Extraneous noises, intermittent or microphonic conditions shall not be present when the set is tapped several times with a padded mallet to simulate vibration.

b. The transmitter and receiver shall be checked for operation on two manually tunable frequencies within the range of each band.

V. SUPERSEDURE

This issue of this Signal Corps Repair Standard supersedes Signal Corps Specification No. REP-27, Issue No. 2, dated 14 January 1949, "Signal Corps Repaired Equipment Requirements for Radio Receiver and Transmitter BC-669-A, B, C."

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Army - Ft. Monmouth, N. J.

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