SIGNAL CORPS
REPAIR STANDARD

NO. REP-455
ISSUE NO. 1

Amendment 1, 26 September 1955
Amendment 2, 23 August 1956

REPAIRED EQUIPMENT STANDARD

FOR

AMPLIFIER AM-141/MRC

PROJECT 4422D

17 April 1953

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SIGNAL CORPS ENGINEERING LABORATORIES

FORT MONMOUTH, N. J.

REP-455

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SCEL-SC FORM NO. 219
REV. 27 AUG. 1946

REPAIRED EQUIPMENT STANDARD FOR AMPLIFIER AM-141/MRC

I. STATEMENT COVERING APPLICABILITY

This repair standard covers inspection requirements to be used in determining the quality and acceptability of repaired Amplifier AM-141/MRC. Its use is mandatory in the Maintenance Division 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.

A. Safety Precautions

1. Exercise Safety Precautions at all times.

2. Select and apply the proper tools.

3. Avoid makeshift methods.

4. Don't do damage to yourself or to the equipment.

5. BE CAREFUL HIGH VOLTAGE 3300 VOLTS

II. APPLICABLE REFERENCES

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

	Title	Number
1.	General Standards for Repaired Signal Equipment	REP-1001
2.	Repaired Equipment Standard for Radio Transmitter BC-610( )	REP-23

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

	Title	Number
1.	Radio Set SCR-399 and SCR-499	TM 11-281
2.	Radio Sets AN/MRC-2 and AN/MRC-2A	TM 11-624
3.	Instruction Book for Radio Transmitter BC-610-I	

III. TEST AND ASSOCIATED EQUIPMENT

The following equipments, or suitable equivalents of known accuracy, will 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.	Multimeter TS-352/U	3F4325-352	2	420
2.	Multimeter TS-505/U	3F4325-505	1	-
3.	Frequency Meter Set SCR-211	2C1411	1	-
4.	Voltammeter I-50	3F6050	1	-

B. Associated Equipment

	Equipment	Stock Number	Number Used	REP
1.	Radio Transmitter BC-610( )	2C6500E	1	23

	Equipment	Stock Number	Number Used	REF
2.	Ammeter RF	3F1010-23	1	-

3. Dummy Load consisting of 4 resistors connected in parallel. Stock Number 2Z3897-8, 300 ohms, 600 watt non-inductive resistor

IV. REQUIREMENTS

A. General Test Conditions. General test conditions will be as follows and tests performed as indicated.

1. With the line voltage off, visually check primary wiring to transformers making sure that leads are connected to the proper terminals.

2. With all tubes removed from their sockets and the upper door of the front panel closed the following resistance measurements shall be made:

a. The resistance measured from the ungrounded side of plate by pass capacitor C-12 to the amplifier frame shall be between 58000 and 64000 ohms.

b. The resistance measured between the ungrounded side of the bias supply filter capacitor C-14 and the amplifier frame shall be between 1000 and 1300 ohms.

3. Adjustment of controls and set up for test.

a. Replace all tubes in their proper sockets.

b. Install grid coil and plate coil.

c. Connect Radio Transmitter BC-610( ) to Amplifier AM-141/MRC. THE PLATE POWER SHALL NOT BE APPLIED TO THE BC-610 OR AMPLIFIER:

d. Connect RF ammeter and RF load to the amplifier.

e. The amplifier switches and controls shall be in the following positions:

(1) Circuit breaker K5 in the OFF position.

(2) Normal tune-up switch in TUNE UP position.

(3) Plate switch in the OFF position.

(4) Excitation and filament variacs turned to the full counter-clockwise position.

(5) Neutralizing switch S-14 to the OFF position.

(6) Close front panel doors and hinged control panel.

(7) Insert fuses.

(8) Insert plug P1 in socket J1.

f. Connect line voltage to amplifier and check voltage at power input plug. The line voltage shall be 115 ±5 volts.

g. Connect voltmeter across filament meter M2.

h. Operate circuit breaker K5 to ON position.

4. Filament Meter

a. Adjust filament voltage transformer T-5 and T-8 so that external voltmeter reads 10 volts. The panel meter M2 shall read 10 volts ±2%.

b. Check to see that all filaments are lit.

5. Blower and Relay Voltages. Measure voltages to blowers B1, B2, B3 and time delay relay. The voltage readings shall be 115 volts +3.5 volts, -0 volts.

6. Filament Voltages. Measure the filament voltage at all tube sockets. The voltages shall be the following:

V1 and V2 sockets	10 ±0.5 volts
V3 and V4 sockets	2.5 ±0.125 volts
V5 and V6 sockets	5 ±0.25 volts

7. Time Delay Relay

a. Operate circuit breaker K5 to OFF position and determine that all interlock switches are closed.

b. Operate circuit breaker K5 to ON position and observe the time required for relay K1 to operate. (This can be checked by observing the operation of relay K4.) Operate circuit breaker several times to OFF and ON positions and observe that K1 shall operate between 30-50 seconds.

8. Interlock Switches. The following interlock switches shall be checked one at a time to assure interruption of the interlock chain: S4, S5, S6, S7, S8, S9, S10, S11, S12 and S13.

NOTE: Make interlock check with circuit breaker K5 in the ON position and after time delay K1 has operated.

9. Main Blower B3, Interlock. Remove blower plug P1 and reinsert and observe that time delay relay K1 shall operate.

10. Variable Transformer Fusing. Remove fuses F1 and F2 and check that excitation and filament power is removed.

B. Bias Relay K2. The following procedure shall be used to check the bias relay pull-in drop-out current:

1. Tune Radio Transmitter BC-610( ) to 2.5 megacycles, using Frequency Meter Set SCR-211( ). Adjust the grid tuning control of the amplifier to resonance at 2.5 megacycles. Readjust Transmitter BC-610( ) plate tuning to resonance. Readjust amplifier grid circuit to resonance.

2. Operate plate switch of Transmitter BC-610( ) to OFF position. Operate circuit breaker K5 on amplifier to OFF position. Remove both plate cap connectors from 3B28 tubes and make sure that they will not come in contact with any surrounding metal. (INSULATE WELL WITH TAPE)

3. Connect Multimeter TS-352/U, set on 500 ma range in series with coil of bias relay K2.

4. Turn excitation transformer T8 to the full counter-clockwise position.

5. Operate circuit breaker K5 to ON position.

6. Operate plate switch on Transmitter BC-610( ) to ON position.

7. Advance the excitation control while holding plate relay K4 closed with an insulated rod and note the current required to just close the contacts of bias relay K2. This current shall be 200 ±10 ma.

8. Remove the insulated rod from holding plate relay K4 closed. Decrease the excitation control and note the current reading just before the bias relay K2 contacts open. This current shall be 125 ±10 ma.

9. Turn plate switch on Transmitter BC-610( ) to OFF position. Throw circuit breaker K5 to OFF position. Restore amplifier circuits to normal operating conditions, replacing plate cap connectors, restore bias relay coil circuit and panel operation to normal condition.

C. Bandswitch Operation. Visually inspect switch for proper alignment of contacts and operate switch through its three positions. There shall be no binding of the contacts.

D. Plate Switch S1 and Control Relay K4 Operation. With the normal tune up switch in the TUNE UP position and after relay K1 has operated, turn plate switch to ON position. This shall cause relay K4 to operate and apply plate voltage to PA. Repeat this operation several times to assure full operation.

E. Plate Current Meter

1. Neutralize the amplifier. Return the neutralizing switch S14 to the OFF position.

2. Operate plate switch to ON. This shall cause plate current flow as indicated by plate current meter.

3. Tune the plate circuit to resonance and adjust coupling to give approximately 300 ma plate current.

4. Operate tune-up switch to operate. Readjust coupling, while keeping plate circuit at resonance, to give 1 ampere plate current.

F. Plate Overload Relay, K3

1. Slowly detune the plate circuit and observe the plate current reading. (Do not allow the plate current to exceed 1.4 amperes.)

2. The current required to operate overload relay K-3 shall be 1.35 ±0.075 amperes.

G. Overload Reset Switch S15

1. Operate tune-up switch to TUNE UP.

2. Operate reset switch S15.

3. Retune plate circuit to resonance.

4. Operate tune-up switch to OPERATE. This shall restore transmitter to full output.

H. Normal Tune-Up Switch, S2

1. Operate tune-up switch S2 to TUNE UP.

2. The power output shall be 675 watts maximum. (3.0 amperes into 75 ohms)

3. Return plate ON-OFF switch to OFF position.

I. Power Output and Dial Accuracy

1. As PA is tuned to the check frequencies listed on the TEST DATA sheet, observe grid meter for any sudden changes in current as excitation is varied. Observe plate current for any sudden changes in reading as plate circuit is tuned through resonance. There shall be no evidence of any parasitic oscillations as indicated by any sudden changes in meter readings. Removal of excitation shall cause antenna and grid current to return to zero.

2. With the line voltage at 115 volts, filament voltage 10 volts, grid current 150 ma and plate current of 1.0 ampere, the voltage, current and dial readings shall comply with limits listed on the TEST DATA sheet.

a. Connect DC voltmeter, 0.5000 scale, from ungrounded side of plate by-pass capacitor C12 to chassis.

b. Connect DC voltmeter, 0-500 scale, from grid current meter (resistor R4 side) to chassis.

c. Operate plate ON-OFF switch to ON position.

d. Operate tune-up switch to OPERATE.

e. Check and record total grid bias (370 ±25 volts).

f. Check and record plate voltage.

(1) Full load 3300 ±100 volts

(2) No load 3900 ±100 volts

g. Check and record dummy antenna current, plate and grid dial readings for frequencies listed on TEST DATA sheet.

J. Operational Test. With the amplifier tuned to 18000 kilocycles and fully loaded, operate at a dot speed of 40 words per minute. The signal as monitored on a nearby receiver, shall be free from chirps, lilt and lag.

GAB/ns

Army - Ft. Monmouth, N. J.

TEST DATA

for

AMPLIFIER AM-141/MRC

	Limits	Observation
1. Transformer Wiring		
2. Resistance		
a. Hi Voltage	58000-64000 ohms	
b. Bias Supply	1000-1300 ohms	
3. Blower and Relay Voltages		
a. Tube Blower, B1	115 +3.5 -0 volts	
b. Tube Blower, B2	115 +3.5 -0 volts	
c. Main Blower, B3	115 +3.5 -0 volts	
d. Time Delay Relay, K1	115 +3.5 -0 volts	
e. Control Relay, K4	115 +3.5 -0 volts	
4. Filament Voltages		
a. 833A, V1 + V2	10 ±0.5 volts	
b. 3B28, V3 + V4	2.5 ±0.125 volts	
c. 4B32, V5 + V6	5 ±0.25 volts	
5. Time Delay Relay, K1	45-60 seconds	
6. Bias Relay, K2		
a. Pull-in Current	200 ±10 ma	
b. Drop-out Current	125 ±10 ma	

	Limits	Observation
7. Plate Overload Relay, K3	1.35 ±0.075 amps	
8. Tune-up Antenna Current	2.9 amps max	
9. Voltages and Currents		
a. Plate Voltage	Full Load: 3300 ±100 volts No Load: 3900 ±100 volts	
b. Total Bias	370 ±25 volts	

10. Test Frequencies
NOTE: PA grid current is adjusted to read 150 ma at all test frequencies.

Freq. (kc)	Grid Dial Reading		Plate Dial Reading		Power Output
	Limit Chart ±5	Dial	Limit Chart ±5	Dial	Current, Min 5.1 amps (Watts, Min 1950)
†2000	41		14		
3600	53		83		
7000	82		34		
12000	75		89		
15000	57		24		
18000	86		83		

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Signal Corps Repair Standard RRP-455

AUTHOR

TITLE

17 April 1953 Copy 1

SIGNAL CORPS
REPAIR STANDARD

NO. REP-455
ISSUE NO. 1
AMENDMENT NO. 2
23 August 1957

SIGNAL CORPS
REPAIRED EQUIPMENT STANDARD
FOR
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Page 10, Test Data, Test 10, add: Only frequencies of 2000 and 18000 kc are required when the amplifier alone is being tested.

FNC/sah

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SIGNAL CORPS
REPAIRED EQUIPMENT STANDARD
FOR
AMPLIFIER AM-141( )/MRC

1. Page 5

a. Paragraph IV-A-7b.

Change last line of paragraph to read: "between 45 and 60 seconds."

b. Paragraph IV-A-8.

Add: NOTE: "When high vacuum rectifier tubes are used in later units of Amplifier AM-141A/MRC and in all units of AM-141B/MRC, Interlock S4 is not necessary."

2. Page 6

a. Paragraph IV-D.

Delete entire paragraph and substitute the following:

"D. Plate Switch S1 and Control Relay K4 Operation.

With the normal TUNE UP switch in the TUNE UP position and after relay K1 has operated causing K4 to operate, throw plate power switch S1 to the ON position. This will apply plate voltage to the PA. Opening any interlock will remove plate voltage from the PA."

3. Page 7

a. Paragraph IV-F-2, line 2; Change current value from "1.35 ±0.075" to "1.35 ±0.025 amp".

4. Page 8

a. Paragraph IV-I2F(2); Change load value from "3900 ±100 volts" to "4100 ±100 volts".

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b. Paragraph IV-J.

Change to read as follows:

"J. Operational Test. With the amplifier tuned to 18,000 kc and fully loaded, operate at a dot speed of 40 words per minute. The signal as received on the monitor receiver shall be free from all spurious signals and shall be clear and intelligible."

5. Page 10 7.

Change limits as follows: from "1.35 ±0.075" to "1.35 ±0.025 amps"

9. a. Change No Load Voltage from "3900±100" to "4100 ±100 volts"

10. Change both Grid Dial Reading limit chart and Plate Dial Reading limit chart, from "±5 DIAL" to "±10 DIAL".

Change Power Output Watts, Min. from "1950" to "1900"

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