NAVAIR 16-30ARR41-501

Handbook

Operation Instructions

RADIO RECEIVING SET

AN/ARR-41

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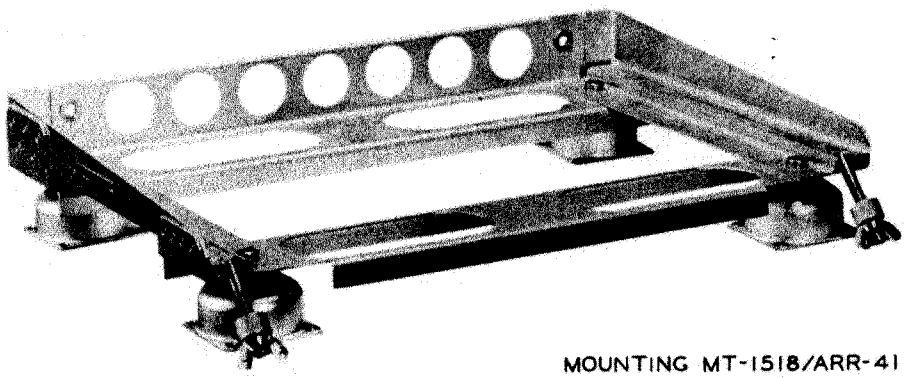
RADIO RECEIVER R-648/ARR-41



MOUNTING MT-1518/ARR-41

Figure 1-1. Radio Receiving Set AN/ARR-41, Equipment Supplied

SECTION I
GENERAL DESCRIPTION

1-1. PURPOSE AND SCOPE OF HANDBOOK.

1-2. This handbook is supplied as an aid in understanding and performing the operating procedures of Radio Receiving Set AN/ARR-41. The handbook provides the operator with a brief description of the equipment, its intended use, its capabilities and limitations, and a general theory of operation. Section II contains a detailed operating procedure and a functional description of the controls of Radio Receiving Set AN/ARR-41.

1-3. PURPOSE AND APPLICATION OF EQUIPMENT.

1-4. Radio Receiving Set AN/ARR-41, consisting of equipment listed in table I, is a general purpose receiving set designed for mounting in larger types of aircraft and capable of receiving amplitude-modulated radiotelephony (A-3), unmodulated cw radiotelegraphy (A-1), and frequency-shift-keyed radioteletype (A-2), when an external converter is employed for operation of the printer. Frequency coverage is within the ranges of 190 to 550 kilocycles and 2 to 25 megacycles, which are covered in five bands.

1-5. EQUIPMENT SUPPLIED.

1-6. Equipment supplied with Radio Receiving Set AN/ARR-41 is listed in table I and illustrated in figure 1-1.

1-7. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

1-8. Equipment required for operation but not supplied as part of Radio Receiving Set AN/ARR-41 is listed in table II.

1-9. GENERAL PRINCIPLES OF OPERATION.

1-10. Radio Receiving Set AN/ARR-41 is a superheterodyne receiver, capable of receiving r-f signals from 190 to 550 kilocycles and from 2 to 25 megacycles. Double conversion is used on all bands except band 2, the 2- to 4-megacycle band, which is single conversion. Two r-f stages, three i-f stages, and two audio stages are employed for amplification, which brings the over-all sensitivity to at least 100 milliwatts output for less than 5 microvolts input. Selectivity is obtained through resonant circuits in all bands and through one of two mechanical filters in the i-f circuit. A built-in circuit consisting of a 500-kilocycle crystal-controlled oscillator and a multivibrator provides for frequency calibration, allowing frequencies to be set up accurately at each 100-kilocycle check point throughout the range of reception. Cooling within the Radio Receiver R-648/ARR-41 is accomplished by a dynamotor fan and by convection through louvers. Modular, unitized construction is employed, greatly simplifying trouble shooting and maintenance operations.

1-11. GENERAL ELECTRICAL CHARACTERISTICS.

1-12. POWER INPUT. Radio Receiving Set AN/ARR-41 is designed to operate on 27.5 volts d-c. A nominal current of 3 amperes will be drawn from the power source at temperatures above 32 degrees Fahrenheit and 5.8 amperes at temperatures below 32 degrees Fahrenheit. The power source should be capable of withstanding a surge current of 20 amperes.

TABLE I. RADIO RECEIVING SET AN/ARR-41, EQUIPMENT SUPPLIED

QUANTITY PER EQUIPMENT	NAME OF UNIT	ARMY-NAVY TYPE DESIGNATION	OVER-ALL DIMENSIONS (Inches) LENGTH - WIDTH - HEIGHT			WEIGHT (lb)	NUMERICAL SERIES OF REFERENCE SYMBOLS
1	Radio Receiver	R-648/ARR-41	13-2/16	17	7-11/16	32.5	200-799 900-999 1300-1399 15000-15999
1	Mounting	MT-1518/ARR-41	13-3/8	17	3-1/4	3.5	100-199

TABLE II. RADIO RECEIVING SET AN/ARR-41, EQUIPMENT REQUIRED BUT NOT SUPPLIED

QUANTITY PER EQUIPMENT	NAME OF UNIT	ARMY-NAVY TYPE DESIGNATION	REQUIRED CHARACTERISTICS
1	Antenna	Fixed Aircraft	Fixed aircraft (with 50-ohm termination if Antenna Coupler CU-351/AR is not used); operating range, 0.19 to 25 megacycles.
1	Headset	H-1/AR or H-4/AR	Nominal impedance: 300 ohms minimum
1	Interphone	AN/AIC-4 or equal	
1	Antenna Tuning Unit	CU-351/AR or equal (Optional)	
1	Power Cable		Two each number 16 wires, length as required. Terminated by connector P301 and connector to be determined by using facility.
1	Radio Frequency Cable	RG-58/U	Coaxial: nominal impedance 53.5 ohms; nominal capacitance 28.5 uuf per foot. Terminated by connector suitable for connection to Antenna Tuning Unit CU-351/AR.
1	Primary Power Source		27.5-volt d-c; 4.5 amperes intermittent; 5.8 amperes continuous; 20 amperes surge.
1	Plug	UG-88/U	P302
1	Connector	AN3108B-16S-1S	P301

1-13. SENSITIVITY. An input of less than 5 microvolts will produce a power output of at least 300 milliwatts into a 300-ohm audio load. Power output will increase to as high as 500 milliwatts with stronger signals. The signal plus noise-to-noise ratio is at least 6 db for radiotelephone and 10 db for cw reception.

1-14. FREQUENCY COVERAGE. Frequencies of 190 to 550 kilocycles and 2 to 25 megacycles are covered in five bands. Stability is plus or minus 2.1 kilocycles for the low band (190 to 550 kilocycles) and plus or minus 1.9 kilocycles plus 0.01% for the remaining bands. Spurious frequencies are attenuated at least 60 db below 5 microvolts.

1-15. TEMPERATURE RANGE. Radio Receiving Set AN/ARR-41 is designed to operate within the temperature ranges of minus 55 degrees centigrade (minus 67 degrees Fahrenheit) to plus 71 degrees centigrade (plus 160 degrees Fahrenheit).

1-16. DESCRIPTION OF COMPONENTS.

1-17. RADIO RECEIVER R-648/ARR-41. (See figures 1-2 and 1-3.) Radio Receiver R-648/ARR-41 consists of a front panel, a chassis, and five removable assemblies which are mounted to the chassis by means of captive screws. Electrical connections from these assemblies are provided by plugs on the assemblies which mate corresponding jacks on the chassis. All operating controls in addition to all external connections are provided on the front panel. The entire component is designed to mount on Mounting MT-1518/ARR-41, which includes a locking mechanism to hold the chassis securely.

1-18. MOUNTING MT-1518/ARR-41. (See figure 1-4.) Mounting MT-1518/ARR-41 is a corrosion-resistant aluminum mounting, with steel spring-type vibration isolators mounted at each corner. The mounting is attached to a metal shelf by means of number 8 screws, lock washers, and nuts. Grounding straps are provided for mounting under the vibration isolator feet to provide good electrical contact.

Figure 1-2. Radio Receiver R-648/ARR-41, Front Panel

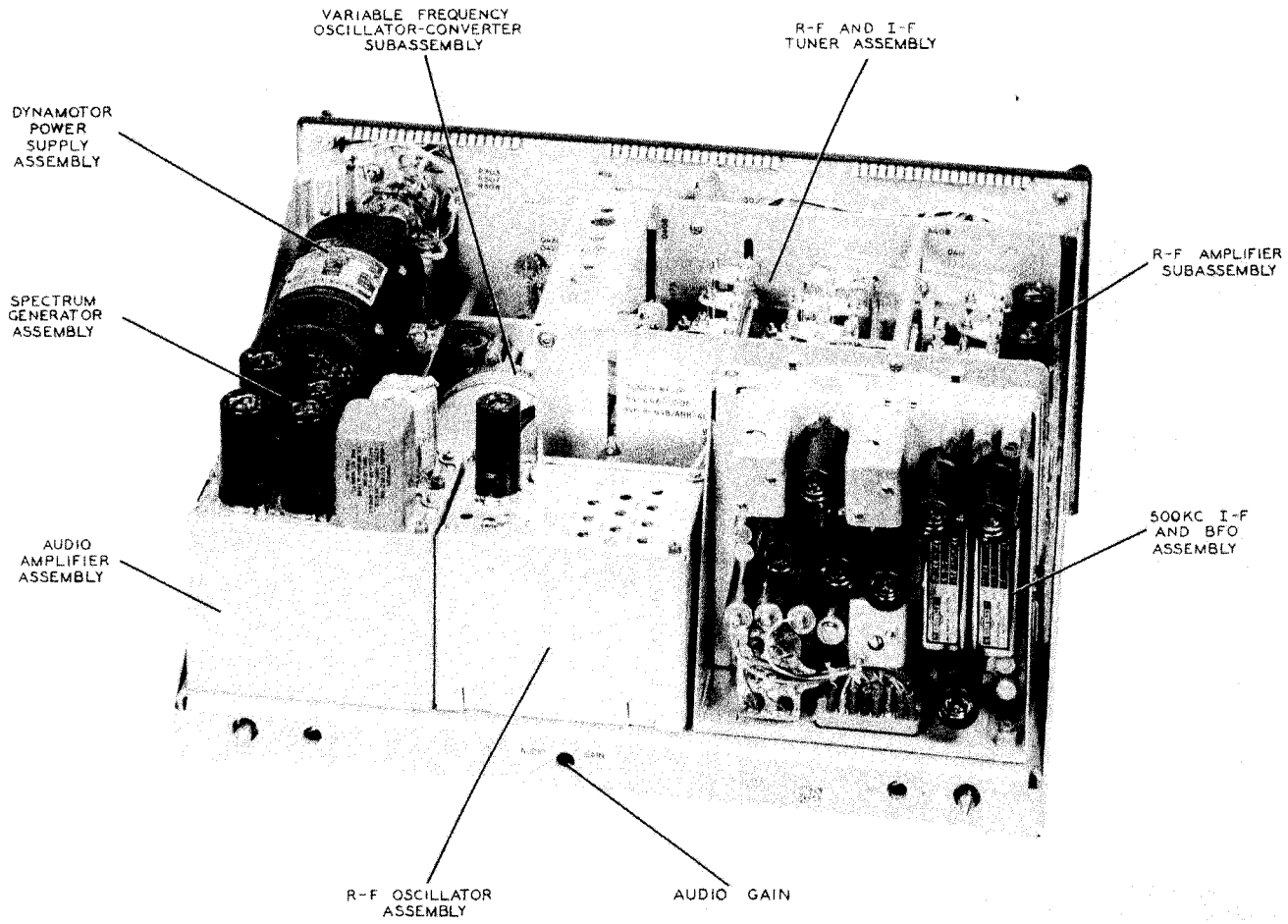


Figure 1-3. Radio Receiver R-648/ARR-41, Top Rear View, Cover Removed

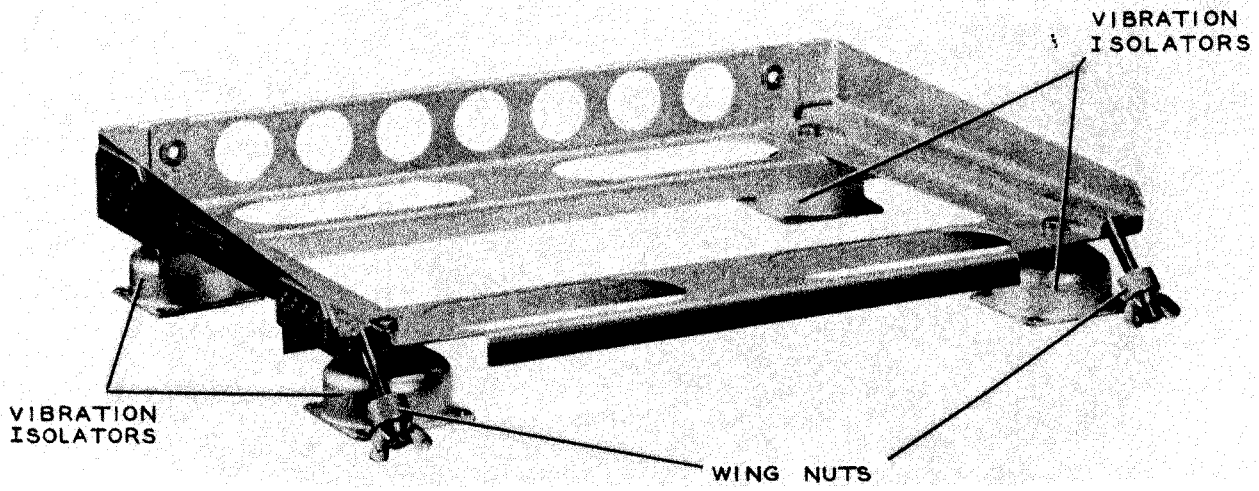


Figure 1-4. Mounting MT-1518/ARR-41, Top Oblique View

SECTION II
OPERATING PROCEDURES

2-1. EQUIPMENT FUNCTIONS.

2-2. Radio Receiving Set AN/ARR-41 provides for continuous reception of r-f signals within the ranges of 190 to 550 kilocycles and 2 to 25 megacycles. A counter-type frequency indicator is employed to read the frequency of reception directly in megacycles. This indicator is designed to allow interpolation to within 0.1 kilocycle of any frequency within the range of reception. Provision is made for reception of both cw and voice signals with a bandwidth of either 1.4 or 6.0 kilocycles. A crystal-controlled oscillator and divider provides for frequency calibration. All operating controls and connections are provided on the front panel, allowing complete local operation of the equipment.

2-3. OPERATING FUNCTION OF CONTROLS.

2-4. Table III lists the operating controls and their functions. The numbers corresponding to the controls illustrated in figure 2-1 should be compared with the numerical listing of table III for a brief description of each control.

2-5. SEQUENCE OF OPERATION, RADIO RECEIVING SET AN/ARR-41.

2-6. PRELIMINARY.

a. Operate the POWER switch (1) to the ON position.
b. Allow about 15 minutes for the equipment to warm completely.
c. Insert the headset plug into the PHONES jack (11).

2-7. OPERATION ON VOICE RECEPTION.

a. Perform the preliminary steps of paragraph 2-6.
b. Operate the EMISSION switch (2) to the VOICE position.
c. Operate the BANDSWITCH (3) for the desired megacycle frequency, as read on the MEGACYCLES frequency indicator (10).
d. Operate the TUNING control (4) for a reading on the MEGACYCLES frequency indicator (10) of the desired frequency. The TUNING control (4) operates the three right-hand counter wheels for frequencies less than one megacycle. Interpolation to within 0.1 kilocycle is possible with the use of the arrow located at the right of the right-hand counter wheel.

NOTE

The TUNING control (4) should be rotated in a counterclockwise direction to increase frequency when tuned below 4 megacycles and clockwise when tuned above 4 megacycles. A certain amount of overlap is obtained when the TUNING control (4) is rotated to either the maximum clockwise of maximum counterclockwise positions. With the range of this overlap, which is approximately 20 kilocycles, the reading on the MEGACYCLES indicator (10) is meaningless. Care should be exercised not to mistake this overlap range with the correct frequency range. If the TUNING control (4) is ever rotated to either maximum position, an error may result in the MEGACYCLES indicator (10), necessitating recalibration as per paragraph 2-9.

e. Upon completion of steps a through d, the audio signal should be heard in the headset and may be controlled in amplitude with the GAIN control (6).
f. If the desired signal is bothered with interference, operate the EMISSION switch (2) to the VOICE SHP position. This increases the selectivity of Radio Receiving Set AN/ARR-41 and allows only a small percentage of the signal to come through to the headset. It may be necessary to touch up the TUNING control (4) slightly when in the VOICE SHP position.

2-8. OPERATION ON CW RECEPTION.

a. Perform the preliminary steps of paragraph 2-6.
b. Operate the EMISSION switch (2) to the CW position.
c. Operate the BANDSWITCH (3) for the desired megacycle frequency indicated by the MEGACYCLES frequency indicator (10) left-hand counter wheel.
d. Operate the TUNING control (4) for a reading on the MEGACYCLES frequency indicator (10) of the desired frequency. The TUNING control (4) operates the three right-hand counter wheels for frequencies less than one megacycle. Interpolation to within 0.1 kilocycle is possible with the use of the arrow located to the right of the right-hand counter wheel.
e. The desired cw signal now should be heard in the headset. Operate the BFO control (8) for the desired signal tone and the GAIN control (6) for the desired amplitude.
f. If the cw signal is bothered with interference, operate the EMISSION switch (2) to the CW SHP position. This increases the selectivity of Radio Receiving Set AN/ARR-41 and allows only a smaller

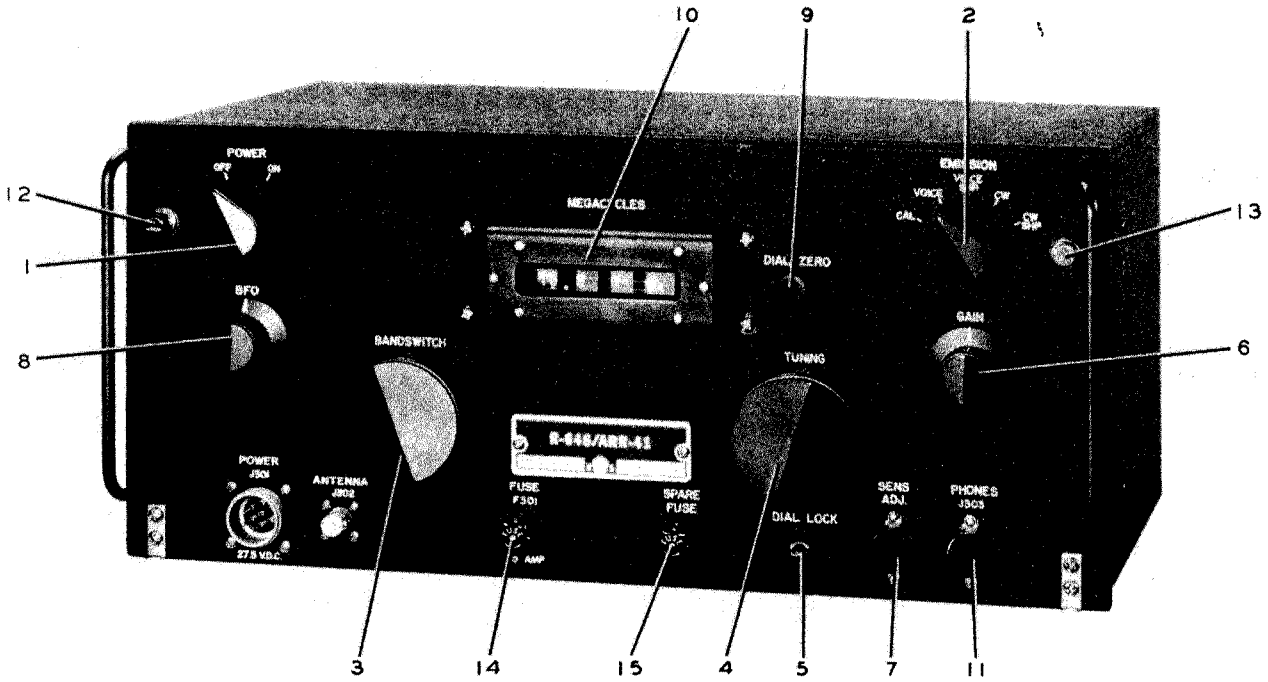


Figure 2-1. Radio Receiver R-648/ARR-41, Front Panel Controls

percentage of the noise to come through to the headset. It may be necessary to touch-up the TUNING control (4) slightly when in the CW SHP position.

2-9. CALIBRATION. (Refer to figure 2-2.)

a. Perform the preliminary steps of paragraph 2-6.

b. Operate the EMISSION switch (2) to the CAL position.

c. Operate the BANDSWITCH to the megacycle frequency on which calibration is desired. The megacycle frequency is indicated by the left-hand counter wheel of the MEGACYCLES frequency indicator (10).

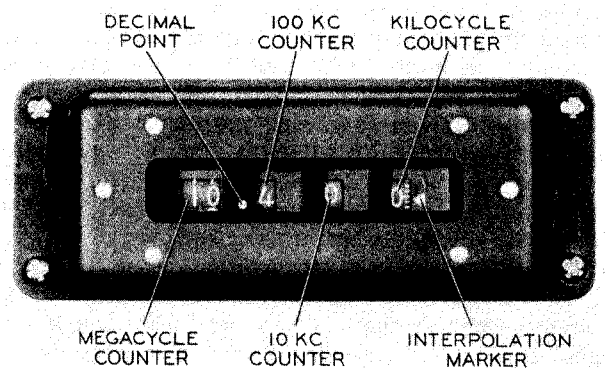


Figure 2-2. MEGACYCLES Frequency Indicator, Front View

d. Operate the TUNING control to the 100-kilocycle check point nearest the desired calibration frequency. For example, assume calibration is desired at the check point nearest the frequency of 10.440 megacycles. The BANDSWITCH (3) and TUNING control (4) should be operated for a reading of 10.400 on the MEGACYCLES frequency indicator (10).

e. Rock the TUNING control (4) slowly around the check point frequency until a zero beat is heard in the headset.

f. Depress the DIAL ZERO knob (9) and rotate until the reading on the MEGACYCLES frequency indicator (10) corresponds to the nearest check point frequency. In the example used in step d, this would be 10.400 megacycles.

2-10. SETTING OF SENS ADJ. Under normal operation the SENS ADJ. (7) is set for maximum sensitivity (full clockwise). For reception of strong signals the SENS ADJ. may be rotated slightly counterclockwise, thereby desensitizing the AN/ARR-41 slightly and allowing less interference to get through to the headset.

2-11. SETTING OF DIAL LOCK. The DIAL LOCK (5) is a setscrew designed to lock the TUNING control (4) at a certain setting. After the desired signal has been tuned in, and it is desired to leave the Radio Receiving Set AN/ARR-41 at the same setting, the DIAL LOCK (5) should be turned in a clockwise direction, thereby preventing the TUNING control (4) from being jarred or accidently moved.

TABLE III. FUNCTION OF CONTROLS

NAME OF CONTROL	FUNCTION
1. POWER	Primary power off-on control.
2. EMISSION (CAL)	Connects frequency calibration circuitry.
(VOICE)	Connects broad-band (9.4 kilocycle) filter for radiotelephone reception.
(VOICE SHP)	Connects narrow-band (1.4 kilocycle) filter for radiotelephone reception.
(CW)	Connects broad-band (6.0 kilocycle) filter for cw reception.
(CW SHP)	Connects narrow-band (1.4 kilocycle) filter for cw reception.
3. BANDSWITCH	Selects frequency of reception in one-megacycle steps.
4. TUNING	Tunes the R-648/ARR-41 throughout a one-megacycle increment.
5. DIAL LOCK	Locks the TUNING control at a desired setting.
6. GAIN	Controls sensitivity.
7. SENS ADJ.	Vernier sensitivity adjustment.
8. BFO	Controls tone of beat signal during cw reception.
9. DIAL ZERO	Sets MEGACYCLES frequency indicator for calibration.
10. MEGACYCLES	Indicates frequency in megacycles.
11. PHONES	Connector for H-1/AR or H-4/AR Headset.
12, 13. LOCK	Locks the front panel to the chassis.
14. FUSE F301	Five ampere overload protection fuse.
15. SPARE FUSE	Spare fuse, replaces item 14.
16. AUDIO GAIN	A preinstallation adjustment used to set the audio output to the desired level.

SECTION III
OPERATING CHECKS AND ADJUSTMENTS

3-1. GENERAL.

3-2. The operating checks and adjustments contained in this section are those which must be made by the operator prior to or during actual operation of Radio Receiving Set AN/ARR-41. Careful observance of these procedures will greatly reduce the chance of equipment failure in service, since any deviation from normal operation may be quickly reported to maintenance personnel if correction of the defect is beyond the scope of the operator. In the checks and adjustments contained in this section, Radio Receiving Set AN/ARR-41 is assumed to be:

a. Properly installed in the aircraft.
b. Connected to a 27.5-volt d-c power source.
c. Connected to the antenna system.
d. The equipment has been turned on and has had sufficient time for warm-up.

3-3. PREFLIGHT TEST. (Refer to figure 2-1.)

a. Connect the headset plug into the PHONES jack (11).

b. Operate the BANDSWITCH (3) to frequencies on all five bands of operation. The bands are as follows; band 1, 190 to 550 kilocycles; band 2, 2 to 3.999 megacycles; band 3, 4 to 7.999 megacycles; band 4, 8 to 15.999 megacycles; band 5, 16 to 24.999 megacycles. Listen for the characteristic hiss on at least one frequency within each band with the EMISSION switch (2) in both the VOICE and VOICE SHP positions.

c. Tune in any signal with the TUNING control (4) and operate the GAIN control (6). Amplitude should be variable.

d. Tune in a cw signal with the TUNING control (4) and operate the EMISSION switch (2) to both the CW and CW SHP positions. The tone of the cw signal should be variable with the BFO control (8) in both the CW and CW SHP positions of the EMISSION switch (2).

e. Operate the EMISSION switch (2) to the CAL position. Tune in several different 100-kilocycle check points with the BANDSWITCH (3) and TUNING control (4), such as 4.1 megacycles, 4.2 megacycles, 4.3 megacycles, etc. Beat note should be heard in the headset. The reading on the MEGACYCLES frequency indicator (10) should correspond with 100-kilocycle check point. If not, recalibrate as per paragraph 2-9.

3-4. DAILY INSPECTION.

a. Check all connectors to the Radio Receiver R-648/ARR-41 jacks to make certain the locking rings are tight.

b. Check the headset cord and connector for possible damage.

c. Make sure Radio Receiver R-648/ARR-41 is properly seated in Mounting MT-1518/ARR-41. Check to be sure the wing nuts, which secure the chassis to the mounting, are tight.

d. Check the LOCK setscrews (12 and 13) on the front panel to make certain the front panel is securely fastened to the Radio Receiver R-648/ARR-41 chassis.

e. Check the primary power source connections to make certain that no short circuits exist in the input power lines.

f. Perform the preflight test, paragraph 3-3.

SECTION IV
EMERGENCY OPERATION AND REPAIR

4-1. EMERGENCY OPERATION.

4-2. If Radio Receiving Set AN/ARR-41 becomes inoperative during flight, the following procedures should be attempted to allow continuation of communication:

a. Attempt operation on another band of frequencies. If the trouble is a defective crystal, this will be possible. The bands of frequencies are as follows: band 1, 190 to 550 kilocycles; band 2, 2 to 3.999 megacycles; band 3, 4 to 7.999 megacycles; band 4, 8 to 15.999 megacycles; band 5, 16 to 24.999 megacycles.

b. Attempt operation on band 2 (2 to 3.999 megacycles). If the trouble is in the R-F and I-F Tuner Assembly, this may be possible.

c. Try operation with a headset from another position.

4-3. EMERGENCY REPAIR.

4-4. In the case of equipment failure during flight, perform the following checks and minor repairs as necessary:

a. Check fuses in the primary power source and replace as necessary.

b. Inspect cabling to the primary power source and the antenna. If a cable has been damaged visibly to the extent that wires have been broken, splice the wires together matching color codes. Be sure to tape the exposed wires to avoid possible shorts.

c. Remove and inspect the front panel fuse (14). If fuse is defective, first check for shorted cables and other possible causes, and then replace the defective fuse with the spare (15).

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