# TM 11-5820-461-12

**DEPARTMENT OF THE ARMY TECHNICAL MANUAL**

## OPERATOR'S AND ORGANIZATIONAL

## MAINTENANCE MANUAL

**RADIO SETS**

**AN/GRC-50(V)1 (NSN 5820-00-892-3851)**
**AN/GRC-50(V)2 (NSN 5820-00-892-3852)**
**AN/GRC-50(V)3 (NSN 5820-00-892-3853)**
**AN/GRC-50(V)4 (NSN 5820-00-892-3854)**
**AN/GRC-50(V)5 (NSN 5820-00-892-3855)**

| | |
|---|---|
| **AN/GRC-50A(V)1 NSN 5820-00-933-6193)** | **AN/GRC-50A(V)6 (NSN 5820-00-936-5480)** |
| **AN/GRC-50A(V)2 (NSN 5820-00-933-6192)** | **AN/GRC-50A(V)7 (NSN 5820-00-936-5481)** |
| **AN/GRC-50A(V)3 (NSN5820-00-933-6191)** | **AN/GRC-50A(V)8 (NSN 5820-00-935-0089)** |
| **AN/GRC-50A(V)4 (NSN 5820-00-933-6190)** | **AN/GRG50A(V)9 (NSN 5820-00-878-8635)** |
| **AN/GRC-50A(V)5 (NSN 5820-00-933-6189)** | **AN/GRC-50A(V)10 (NSN 5820-00-878-8634)** |

**AN/GRC-50A(V)11 (NSN 5820-00-136-4966)**

This copy is a reprint which includes current pages from Changes 1 through 7.

**HEADQUARTERS, DEPARTMENT OF THE ARMY**
**OCTOBER 1966**

## WARNING

Dangerous voltages exist in this equipment.

## DON'T TAKE CHANCES!

## DANGEROUS VOLTAGES EXIST IN THE ANTENNA SYSTEM

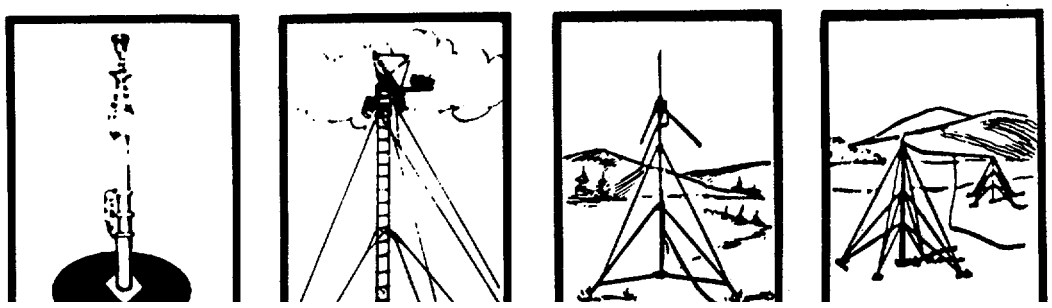
Be careful when working around the antenna or the antenna terminals. Radio frequency high voltages exist at these points.

**FIXED PERATION WITH LONG RANGE ANTENNAS**

# WARNING

## FIXED OPERATION WITH LONG RANGE ANTENNAS

## WARNING



**NEVER ERECT THESE LONG RANGE ANTENNAS DIRECTLY UNDER POWER LINES.**

IF YOU MSUT ERECT THESE LONG RANGE ANTENNAS NEAT POWERLINES, POWER LINE POLES OR TOWERS, OR BUILDINGS WITH OVERHEAD POWERLINE CONNECTIONS, NEVER PUT THE ANTENNA CLOSER THAN TWO TIMES THE ANTENNA HEIGHT FROM THE BASE OF THE POWERLINE, POLE, TOWER OR BUILDINGS.

**NEVER ATEMPT TO ERECT ANY LONG RANGE ANTENNA WITHOUT A FULL TEAM.**

BEFORE ERECTING ANY LONG RANGE ANTENNA, INSPECT ALL THE PARTS MAKING P THE ANTENNA KIT. DO NOT ERECT THE ANTENNA IF ANY PARTS ARE MISSING OR DAMAGED.

DO AS MUCH OF THE ASSEMBLY WORK AS POSSIBLE ON THE GROUND.

WHEN ERECTING THE ANTENNA, ALLOW ONLY TEAM PERSONEL IN THE ERECTION AREA.

MAKE SURE THAT THE AREA FOR THE ANCHORS IS FIRM. IF THE GROUND IS MARSHY OR SANDY, GET SPECIFIC INSTRUCTIONS FROM YOU CREW CHIEF OR SUPERVISOR ON HOW TO REINFORCE THE ANCHORS.

WHEN SELECTING LOCATIONS FOR ANCHORS, AVOID TRAVEILED AREAS AND ROADS. IF YOU CANOT AVOID THESE AREAS, BET SPECIFIC INSTRICTIONS FORM YOUR SUPERVISOR AS TO WHAT CLEARANCE YOUR GUY WIRES AND ROPES MSUT HAVE OVER THE TRAVELED AREAS AND ROAD.

CLEARLY MARK ALL GUY WIRES AND ROPES WITH THE WARNING FLAGS OR SIGNS SUPPLIED BY YOUR UNIT. IN AN EMERGENCY, USE STRIPS OF WHITE CLOTH AS WARNING STREAMERS.

IF YOU SUSPECT THAT POWERLINES HAVE MADE ACCIDENTAL CONTACT WITH YOUR ANTENNA, STOP OPERATING, ROPE OFF THE ANTENNA AREA, AND NOTIFY YOUR SUPERIORS.

IF THE WEATHER IN YOUR AREA CAN CAUSE ICE TO FORM ON YOUR LONG RANGE ANTENNA AND ITS GUY WORES AND ROPES, ADD EXTRA GUY TO SUPPORT THE SYTEM. ROPE OF THE AREA AND POST IT WITH WARNING SUNS LIKE “BEWARE OF FALLING ICE.”

DO NOT TRY TO ERECT ANY ANTENNA DURING AN ELECTRICAL STORM.

KEEP A SHARP EYE ON YOUR ANCHORS AND GUYS. CHECK THEM DAILY AND IMMEDIATELY BEFORE AND AFTER BAD WEATHER.

# 5 SAFETY STEPS TO FOLLOW IF SOMEONE IS THE VICTIM OF ELECTRICAL SHOCK

**1** DO NOT TRY TO PULL OR GRAB THE INDIVIDUAL

**2** IF POSSIBLE, TURN OFF THE ELECTRICAL POWER

**3** IF YOU CANNOT TURN OFF THE ELECTRICAL POWER, PULL, PUSH, OR LIFT THE PERSON TO SAFETY USING A DRY WOODEN POLE OR A DRY ROPE OR SOME OTHER INSULATING MATERIAL

**4** SEND FOR HELP AS SOON AS POSSIBLE

**5** AFTER RTHE INURED PERSON IS FREE OF CONTACT WITH THESOURCE OF ELECTRICAL SHOCK, MOVE THE PERSON A SHOR DISTANCE AWAY AND IMMEDIATELY START ARTIFICIAL RESUSCITATION

**WARNING**

Dangerous voltages exist in this equipment

**DON'T TAKE CHANCES!**
**DANGEROUS VOLTAGES EXIST IN THE ANTENNA SYSTEM**

Be careful when working around the antenna or the antenna terminals and cables. Radiofrequency high voltages exist in these areas.

Personnel working with Mast AB-577/GRC should be familiar with the requirements of TB SIG 291 before attempting installation and disassembly of the AB-577/GRC. Failure to follow the requirements of TB SIG 291 could result in injury or death.

**WARNINGS**

The use of more than one 25 foot mast extension kit (MK-806/GRC) on the Antenna Mast AB-577/GRC is hazardous and not authorized. Injury to personnel and damage to equipment are likely to occur when a second mast extension is used to extend the antenna mast beyond a height of 75 feet.

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

***TM 11-5820-461-12**

TECHNICAL MANUAL
NO. 11-5820-461-12 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *26 October 1966*

Operator's and
**Organizational Maintenance Manual**

# RADIO SETS AN/GRC-50(V) 1, 2, 3, 4, AND AND

# RADIO SETS AN/GRC-50A(V)1, 2, 3, 4, 5, 6, 7, 8, 9, 10, AND 11



This manual supersedes so much of TM 11-5820 461-10, 22 Juno 1962, including C 2, 2 December 1463, C 3, 2 July 1964, and C 4, 14 December 1964; and TM 11-5820-461-20, 22 June. 1962, Including C 1, 28 March 1963, as pertains to AN/GRC-50(V)1, 2, 3, 4, and 5, except Mast AB-577/GRC.

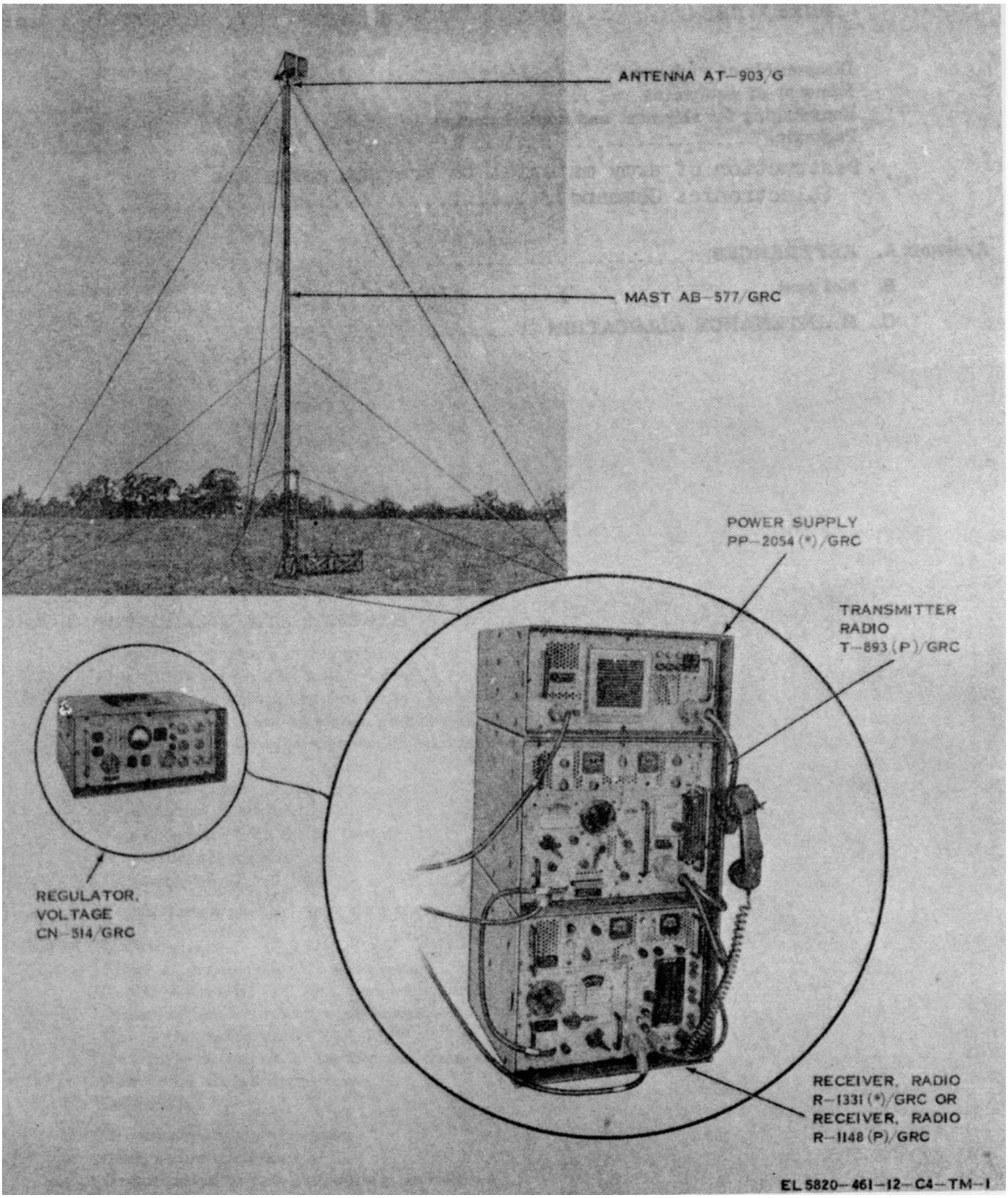



*Figure 1-1. Radio Set AN/GRC-50(*)(v) IN operation.*

# CHAPTER 1
# INTRODUCTION

## Section I. GENERAL

### 1-1. Scope

*a.* This manual describes Radio Sets AN/GRC-50(V) 1, 2, 3, 4, and 5 and AN/GRC-50A(V) 1, 2,3,4, 5, 6, 7, 8, 9, 10, and 11. It covers their installation, operation, and operator's and organizational maintenance. The components of the radio sets are listed in paragraph 1-6.

*b*. and maintenance of Mast AB-577/GRC (figs. 1-1 and 1-8) are provided in TM 11-5820-538-12 which also includes information on the use of Extension Kit MK-806/GRC which is used to extend the height of the antenna to another 25 feet above the 50-foot height of the AB-577/GRC.

*c*. Organizational maintenance of Voltage Regulator CN-514/GRC is provided in TM 11-6110-245-15.

*d* Official nomenclature followed by (*) is used to indicate all models of the equipment item. Thus-

*(1)* Radio Set AN/GRC-50( )(V) applies to all configurations of the radio set: AN/GRC-50(V) 1, 2, 3, 4, and 5 and AN/GRC-50A(V)1, 2, 3, 4, 5, 6, 7, 8,9, 10, and 11.

*(2)* Amplifier-Converter AM-1955( )/GRC applies to Amplifier-Converters AM-1955/GRC, AM-1955A/GRC, and AM-1955B/GRC (pare 1-14d).

*(3)* Amplifier-Converter AM-1956( )/GRC applies to Amplifier-Converters AM-1956/GRC, AM-1956A/GRC, and AM-1956B/GRC (pare 1-14d).

*(4)* Amplifier-Oscillator AM-1958( )/GRC applies to Amplifier-Oscillators AM-1958/GRC and AM-1958A/GRC (para 1-14e).

*e.* Throughout this manual, the term radio set applies to all configurations of the AN/GRC-50(~)(V), unless otherwise specified.

*f.* All references in this manual to Receiver, Radio R-1331 (*)/GRC also apply to Receiver, Radio R-1331 (P)/GRC, Receivers, Radio R-1331A(P)/GRC, and R-1331B(P)/GRC unless otherwise specified (pare 1-14*b* and *c*).

*g.* All references in this manual to Power Supply PP-2054(*)/GRC also apply to Power Supply PP-2054/GRC and to Power Supply PP-2054A/GRC (pare 1-14*g*).

### 1-2. Indexes of Equipment Publications

*a. DA Pam 310-4.* Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes or additional publications pertaining to the equipment.

*b. DA Pam 310-7.* Refer to the latest issue of DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

### 1-3. Maintenance Forms, Records, and Reports

*a. Reports of Maintenance and Unsatisfactory Equipment.* Department of the Army forms and procedures used for equipment maintenance will be those described by TM 38-750, The Army Maintenance Management System.

*b. Report of Packaging and Handling Deficiencies*. Fill out and forward DO Form 6 (Packaging Improvement Report) as prescribed in AR 700-58/-NAVSUPINST 4030.29/AFR 71-13/MCO P4030.29A and DLAR 4145.8.

*c. Discrepancy in Shipment Report (DISREP) (SF 361).* Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33B/AFR 75-18/MCO P4610.19C and DLAR 4500.15.

### 1-3.1. Reporting of Errors

Report of errors, omissions, and recommendations for improving this equipment manual by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended changes to Publications and Blank Forms) and forwarded direct to Commander, US Army Communications and Electronics Materiel Readiness Command, ATTN: DRSEL-MEMQ, Fort Monmouth, NJ 07703.

## Section II. DESCRIPTION AND DATA

### 1-4. Purpose and Use

*a*. All configurations of the radio set provide for multichannel, line-of-sight, two-way communication in the ultrahigh-frequency (uhf) range. The radio sets provide 399 operating channels in-the 601.5- to 999.5-mega-cycle (me) (low band) range and 500 channels in the 1,350.5- to 1,849.5-mc (high band) range. Some radio set configurations include both bands, others include either the high band or the low band. The differences between the model of the radio and the assemblages in which it is used are provided in paragraph 1-14*a.*

*b.* The radio set is intended primarily for use as a radio link in a communication network, which includes carrier telephone and teletypewriter equipment (pare 1-14*a*). The radio sets are used in pairs; one set is used at each end of a line-of-sight transmission path. The radio set may be used with 4-, 12-, or 24-channel frequency-division multiplex (fdm) or 12- or 24-channel pulse-code modulation (pcm) equipment.

*c*. The radio set can also communicate with F-band (789.5 to 964.5 me) and J-band (1,350.5 to 1,849.5 me) configurations of Radio Set AN/TRC-24 (para 1-18). This arrangement applies to communication between fdm systems; there is no provision in the AN/TRC-24 for pcm operation.

### 1-5. Technical Characteristics

*a. Radio Sets AN/GRC-50(*)(V).*

| | |
|---|---|
| Types of operation ..... ..... | Pcm, fdm, and local or remote order wire. |
| Fdm input levels (nominal): | |
| 24-channel operation ..... | 13 dbm. |
| 12-channel operation ..... | 11 dbm. |
| 4-channel operation ..... | 6 dbm. |
| Fdm output levels (nominal): | |
| 24-channel operation ..... | 13 dbm. |
| 12-channel operation ..... | 11 dbm. |
| 4-channel operation ..... | 6 dbm. |
| Fdm impedance: | |
| Input ..... | 136 or 600 ohms, balanced. |
| Output..... | 135 or 600 ohms, balanced. |
| Fdm frequency response: | |
| 135-ohm termination (12/24 channel) | 250 cps to 4 kc, +1 db.<br>4 kc to 68 kc, +0.5 db.<br>68 kc to 124 kc, +1 db. |
| 600-ohm termination (4 channel) | 250 cps to 4 kc, +db.<br>4 kc to 20 kc, +0.5 db. |
| Pcm level (nominal): | |
| Input ..... | 1.5 volt peak to peak. |
| Output..... | 0.75 volt peak to peak. |
| Pcm impedance (nominal): | |
| Input ..... | 50 ohms. |
| Output..... | 50 ohms. |
| Range (approximate; range will vary according to atmospheric conditions and terrain): | |
| Pcm ..... | 30 miles or line-of-sight. |
| Fdm ..... | 30 miles or line-of-sight. |

*b. Transmitter, Radio T -8 93(P)IGRC.*

| | |
|---|---|
| Frequency range..... | 601.5 to 999.5 mc (with low band tuner, Amplifier-Oscillator AM-19571GRC).<br>1,350.5 to 1,849.5 me (with high-band tuner, Amplifier-Oscillator AM-1958(*)/GRC). |
| Channel allocation: | |
| Low band..... | 1-399 (601.5 to 999.5 mc). |
| High band..... | 400~899 (1,350.5 to 1,849.5 mc). |
| Channel separation..... | 1 mc. |
| Frequency stability..... | ±0.005~o +90 kc of carrier frequency. |
| Type of modulation..... | Frequency modulation. |
| Type of transmission..... | Voice and either pulse-code modulation (pcm) or frequency-division multiplexed (fdm) signals. |
| Frequency control..... | Crystal-referenced automatic frequency control system |
| Frequency deviation ..... | 375 kc maximum. |
| RF output: | |
| Impedance ..... | 50 ohms. |
| Power: | |
| 601.5 to 999.5 mc..... | 15 to 30 watts. |

| | |
|---|---|
| 1,350.5 to 1,849.5 mc ..... | 8 to 20 watts. |
| Spurious outputs ..... | Greater than 50 db down. |

*c. Power Supply PP-2054( *)/GRC.*

| | |
|---|---|
| Input ..... | 115 ±4 vac, 47 to 63 cps, 775 watts. |
| Outputs: | |
| Regulated ..... | +250 +1 vdc at 200 mc. |
| | +150 +8, 12 vdc at 80 ma. |
| | +105 +6 vdc at 15 ma. |
| Unregulated ..... | +800 +25 vdc at 100 ma. |
| | +650 +60 vdc at 60 ma. |
| | +645 +60 vdc at 60 ma. |
| | +360 +15 vdc at 80 ma. |
| | 115 +4 vac at 2.2 amperes. |

*d. Receiver, Radio R-1 148(P)/GRC.*

| | |
|---|---|
| Frequency range ..... | 601.5 to 999.5 me (channels 1-399, with low-band tuner, Amplifier- Converter AM-1955(*)/GRC). |
| | 1,350.5 to 1,849 mc (channels 400-899, with high-band tuner, Amplifier Converter AM-1956(*)1 GRC). |
| Receiver type ..... | Double-conversion, superheterodyne. |
| Type of modulation ..... | Frequency modulation. |
| Local oscillator frequency ..... | 60 me below receiver frequency. |
| Intermediate frequencies: | |
| First ..... | 60 me. |
| Second ..... | 17 me. |
| Frequency control ..... | Automatic frequency control systems. |
| | Primary: crystal referenced. |
| | Secondary: signal seeking. |
| Spurious responses (including image) ... | Greater than 50 db down. |
| Rf input impedance ... | 50 ohms. |
| Power requirements: | |
| Power supply ..... | Self-contained. |
| Power input ..... | 115 vac, ±5%, 47 to 63 cps, 315 watts. |

*e. Receiver, Radio R-1881(*)(P)/GRC*. All technical characteristics except frequency control, listed for the R-1148(P)/GRC are applicable. Under Frequency control, the Primary data does not apply to the R-1331(*)(P)/GRC.

*f. Antenna AT-9OS/G.*

| | |
|---|---|
| Type ..... | Modified dipole in a ridge loaded horn. |
| Operating frequency ..... | 600 me to 1,850 me. |
| Polarization ..... | Vertical or horizontal. |
| Weight ..... | 28 pounds. |
| Horizontal Polarization | |
| Horizontal Beam Width | |
| 600 MHZ ..... | 45° |
| 1850 MHZ ..... | 16° |
| Vertical Polarization | |
| Horizontal Beam Width | |
| 600 MHZ ..... | 48° |
| 1859 MHZ ..... | 20° |
| Gain (relative to isotropic radiator) | |
| 600 to 800 mc ..... | 11.0 db. |
| 800 to 1,000 mc ..... | 13.0 db. |
| 1,350 to 1,850 mc... | 17.0 db. |

*g. Mast AB-577/GRC.*

| | |
|---|---|
| Type ..... | Sectionalized tubular. |
| Material ..... | Aluminum. |
| Height: | |
| Maximum expanded ..... | 48 feet. |
| Collapsed ..... | 95 inches. |
| Stability ..... | ±5% of original setting for winds up to 75 mph, under conditions of 1/2-inch ice loading. |
| Rotation ..... | Azimuth; rotation-controlled from ground. |

*h. Regulator, Voltage CN-514/GRC.*

| | |
|---|---|
| Capacity ..... | 5 kva. |
| Efficiency ..... | Better than 98%. |
| Input: | |
| Voltage ..... | 95 to 135 vac. |
| Frequency ..... | 47.5 to 63.5 cps. |
| Output: | |
| Automatic regulation ..... | 115 vac ± 1%. |
| Current ..... | 0 to 43 amperes. |

## 1-6. Components of .AN/GRC-50(*)(V)

*a. Assemblages Using AN/GRC-50(*)(V).* Following is a list of the various configurations of the AN/GR-50(*)(V) and the assemblages in which they are used. The list of components of some assemblages do not identify the particular AN/GRC-50(*)(V) configuration used; instead they list the individual radio components provided in the assemblage. Refer to appendix A for the publications covering the assemblages listed.

| *Radio configuration* | *No.of stacks* | *High or low band* | *Used in assemblage* |
|---|---|---|---|
| AN/GRC-50(V)1 | 1 | High and low | Training |
| AN/GRC-50(V)2 | 2 (1 standby) | High | AN/MRC-73 & AN/MRC-102 |
| AN/GRC-50(V)3 | 2 (1 standby) | Low | AN/MRC-73 & AN/MRC-102 |
| AN/GRC-50(V)4 | 3 (1 standby) | High | AN/MRC-54 & AN/MRC-103 |
| AN/GRC-50(V)5 | 3 (1 standby) | Low | AN/MRC-54 & AN/MRC-103 |
| AN/GRC-50A(V)1 | 1 | High and low | Training |
| AN/GRC-50A(V)2 | 2 (1 standby) | High | AN/MRC-102 |
| AN/GRC-50A(V)3 | 2 (1 standby) | Low | AN/MRC-102 |
| AN/GRC-50A(V)4 | 3 (1 standby) | High | AN/TRC-110 |
| AN/GRC-50A(V)5 | 3 (1 standby) | Low | AN/TRC-110 |
| AN/GRC-50A(V)6 | 2 (1 standby) | High and low a | AN/MRC-102, AN/TRC-109,& AN/TRC-117 |
| AN/GRC-50A(V)7 | 3 (1 standby) | High and low a | AN/TRC110 |
| AN/GRC-50A(V)8 | 1 | High and low a | AN/TRC-108 and AN/TRC 143 |
| AN/GRC-50A(V)9 | 1 | High and low a | AN/TRC108 |
| AN/GRC-50A(V)10 | 3 (1 standby) | High and low a | AN/TRC-110 |
| AN/GRC-50A(V)11 | 1 | High | A basic stack; less CN-514/ GRC, DA-189/GRC, CY-2582 (and spare heads), and CY-2583/GRC (and spare parts). |

☆Either the high or low-band units of the amplifier oscillator and amplifier-converter are issued; the other units may be requisitioned if required.

*b. Remarks.*

*(1) Mast AB-577/GRC.* Refer to TM 11-5820-53~12 for a listing of the components of the mast.

*(2) Regulator, Voltage CN-514/GRC.* Refer to TM 114110-245-15 for a listing of the components of the voltage regulator.

*(3) Antenna AT-908/G*. Refer to TM 11-5820-517-12P for a listing of the components of the antenna. However, the carrying frame for the AT-903/G antenna horn is only issued for the training versions of the radio set: AN/GRC-50(V)1 and AN/GRC-50A(V)1.

*(4) Weights and dimensions.* Refer to paragraph 2-1b for information concerning the weights and dimensions of the major components.

*c. Components*. The numbers given in the Usable on code column in the following chart represent the radio configurations of which the item is a part. For example, 1 each Amplifier-Converter AM-1955/GRC is part of AN/GRC-50(V)1, 2 each are part of AN/GRC-50(V)3, and 3 each are part of AN/GRC-50(V)5. The following list identifies the radio configuration with the number used in the Usable on code column in the chart.

| Usable on code No. | Radio set |
|---|---|
| 1 | AN/GRC-50(V)1 |
| 2 | AN/GRC-50(V)2 |
| 3 | AN/GRC-50(V)3 |
| 4 | AN/GRC-50(V)4 |
| 5 | AN/GRC-50(V)5 |
| 6 | AN/GRC-50A(V)1 |
| 7 | AN/GRC-50A(V)2 |
| 8 | AN/GRC-50A(V)3 |
| 9 | AN/GRC-50A(V)4 |
| 10 | AN/GRC-50A(V)5 |
| 11 | AN/GRC-50A(V)6 |
| 12 | AN/GRC-50A(V)7 |
| 13 | AN/GRC-50A(V)8 |
| 14 | AN/GRC-50A(V)9 |
| 15 | AN/GRC-50A(V)10 |
| 16 | AN/GRC-50A(A)11 |

| *Federal stock No.* | *Description* | *Usable on code* | *Qty (ea)* | *Figure No.* |
|---|---|---|---|---|
| 5820-892-3851 | Radio Set AN/GRC-50(V)1 | 1 | | |
| 5820-892-3852 | Radio Set AN/GRC-50(V)2 | 2 | | |
| 5820-892-3852 | Radio Set AN/G(V)3 | 3 | | |
| 5820-892-3854 | Radio Set AN/GRC-50(V)4 | 4 | | |
| 5820-892-3855 | Radio Set AN/GRC-50(V)5 | 5 | | |
| 5820-933-6193 | Radio Set AN/GRC-50A(V)1 | 6 | | |
| 5820-933-6192 | Radio Set AN/GRC-50(AV)2 | 7 | | |

| *Federal stock No.* | *Description* | *Usable on code* | *Qty (ea)* | *Figure No.* |
|---|---|---|---|---|
| 5820-933-6191 | Radio Set AN/GRC-60A(V)3 | 8 | | |
| 5820-933-6190 | Radio Set AN/GRC-60A(V)4 | 9 | | |
| 5820-933-6189 | Radio Set AN/GRC-60A(V)6 | 10 | | |
| 5820-936-5480 | Radio Set AN/GRC-50A(V)6 | 11 | | |
| 5820-936-5481 | Radio Set AN/GRC-50A(V)7 | 12 | | |
| 5820-935-0089 | Radio Set AN/GRC-50A(V)8 | 13 | | |
| 5820-878-8636 | Radio Set AN/GRC-60A(V)9 | 14 | | |
| 5820-878-8634 | Radio Set AN/GRC-50A(V)10 | 15 | | |
| 5820-136-4966 | Radio Set AN/GRC-50A(V)11 | 16 | | |
| | TM 11-5820-461-12 | 1 through 16 | 1 | |
| 5820-892-3859 | Amplifier-Converter AM-1955/GRC | 1 | 1 | 1-5 |
| | | 3 | 2 | |
| | | 5 | 3 | |
| 5820-082-4293 | Amplifier-Converter AM-1955A/GRC, AM-1955B/GRC. | 6,13,14 | 1 | 1-6 |
| | | 8,11 | 2 | |
| | | 10,12,15 | 3 | |
| 5820-892-3860 | Amplifier-Converter AM-1956/GRC | 1 | 1 | 1-13 |
| | | 2 | 2 | |
| | | 4 | 3 | |
| 5820-082-4294 | Amplifier-Converter AM-1956A/GRC, AM-1956B/GRC | 6,13,14,16 | 1 | 1-6 |
| | | 7,11 | 2 | |
| | | 9,12,15 | 3 | |
| 5820-892-3856 | Amplifier-Oscillator AM-1957/GRC | 1,6,13,14 | 1 | 1-4 |
| | | 3,8,11 | 2 | |
| | | 5,10,12,15 | 3 | |
| 5820-892-3857 | Amplifier-Oscillator AM-1968, AM-1958A/GRC | 1,6,13,14,16 | 1 | 1-4,1-3 |
| | | 2,7,11 | 2 | |
| | | 4,9,12,15 | 3 | |
| 5820-856-9925 | Antenna AT-9031G (TM 11-5820-517-12P) | 1,6,13,14,16 | 1 | 1-7 |
| | | 2,3,7,8,11 | 2 | |
| | | 4,5,9,10,12,15 | 3 | |
| 5820-064-5451 | Case, Standardized Components, Electrical CY-2582/GRC (to store unused amplifier-converter and amplifier-oscillator). | 1,6,13,14 | 1 | 1-31,1-13.1 |
| | | 11 | | |
| | | 12,15 | | |
| 5820-856-9923 | Case, Antenna CY-2595/GR (issued only for AN/GRC-50(V)1, AN/GRC-50A(V)1, AN/TRA-25A, and OA-3668A/TRC-24) (carrying frame for AT-903/G. | 1,6 | 1 | |
| 5820-892-3861 | Dummy Load, Electrical DA-189/GRC | 1,2,3,6,7,8,14,15 | 1 | 1-14 |
| | | 11,13 | 1 | |
| | | 4,5,9,10,12 | | |
| 5820-892-3862 | Mast AB-577/GRC (TM 11-5820-538-12) | 1,6,13,14,16 | 1 | 1-8 |
| | | 2,3,7,8,11 | 2 | |
| | | 4,5,9,10,12,15 | 3 | |
| 5820-889-0857 | Power Supply PP-2054(*)/GRC (incl Case, Electrical Components CY-2428/GRC: FSN 5820-064-5474). | 1,6,13,14,15 | 1 | 1-4 |
| | | 2,37,8,11 | 2 | |
| | | 4,5,9,10,12,15 | 3 | |
| 5820-082-4292 | Receiver, Radio R-1331(*)(P)/GRC (incl Case, Electrical Components CY-2429/GRC; FSN 5820-064-5449). | 6,13,16 | 1 | 1-6 |
| | | 7,8,11 | 2 | |
| | | 9,10,12,15 | 3 | |
| 5820-892-3858 | Receiver, Radio R-1148(P)/GRC (incl Case, Electrical Components CY-2428/GRC; FSN 5820-064-5449). | 1 | 1 | 1-5 |
| | | 2,3 | 2 | |
| | | 4,5 | 3 | |
| 6110-064-5478 | Regulator, Voltage CN-514/GRC (TM 11-6110-245-15) (incl Case, Electrical Components CY-2851/GRC. | 1,2,3,4,5,6,7,8,9,10 | 1 | 1-11 |
| | | 11,12,13,14,15 | | |
| 5930-064-5476 | Switch Box SA-640/GRC | 1,2,3,4,5 | 1 | |
| 5820-892-3863 | Transmitter, Radio T-893(P)/GRC (incl Case, | 1,6,13,14,16 | 1 | 1-4 |

| *Federal stock No.* | *Description* | *Usable on code* | *Qty (ea)* | *Figure No.* |
|---|---|---|---|---|
| | Electrical Components CY-2429/GRC: FSN 5820-064-5449). | 2,3,7,8,11 | 2 | |
| | | 4,5,9,10,12,15 | 3 | |
| | *Cables and accessories* | | | |
| 5935-972-5296 | Adapter, Connector U-211/G | 1,6,13,14,15 | 2 | 6-5 |
| | | 2,3,7,8,11 | 3 | |
| | | 4,5,9,10,12,15 | 5 | |
| 8105-497-9628 | Bag BG-102A | 1,6,8,13,14,16 | 1 | 1-2 |
| | | 2,3,7,11 | 2 | |
| | | 4,5,9,10,12,15 | 3 | |
| 5995-889-0852 | Cable Assembly, Radio frequency CG-718B/u (3 ft.) | 13,14,15 | 1 | 1-2 |
| | | 1,6,11 | 2 | |
| | | 12,15 | 3 | |
| | | 2,3,7,8 | 4 | |
| | | 4,5,9,10 | 8 | |
| 5995-889-0555 | Cable Assembly. Special Purpose, Electrical CX-4557/GRC (3 ft). | 1,6,13,14,16 | 1 | 1-2 |
| | | 2,3,7,8,11 | 2 | |
| | | 4,5,9,10,12,15 | 3 | |
| 5995-889-0999 | Cable Assembly, Power, Electrical CX-10502/U (3 ft, 6 in). | 11 | 1 | |
| 5995-930-9510 | Cable Assembly, Power, Electrical CX-10503/U(4 ft). | 13,16 | 2 | |
| | | 12 | 6 | |
| 5995-889-0848 | Cable Assembly, Power, Electrical CX-4558/U, 458/U, CX-4558A/U (3 ft. 6 in.). | 1,6,13,14,16 | 1 | 1-2 |
| | | 2,3,7,8,11 | 2 | |
| | | 4,5,9,10,12,15 | 3 | |
| 5995-889-0849 | Cable Assembly, Power, Electrical CX-4559/U (4 ft, 6 in.). | 13,14, | 1 | 1-2 |
| | | 1,2,3,4,5,6,7,8,9,10,11 | 2 | |
| | | 12 | 3 | |
| | | 15 | 5 | |
| 5995-889-1079 | Cable Assembly, Power, Electrical CX-4559/U (8 ft, 6 in.). | 13,14 | 1 | 1-2 |
| | | 2,3,4,5,7,8,9,10,11 | 2 | |
| | | 15 | 3 | |
| 5965-892-3850 | Handset H-156/U | 1,6,13,14,16 | 1 | 1-2 |
| | | 2,3,7,8,11 | 2 | |
| | | 4,5,9,10,12,15 | 3 | |
| 5965064-5435 | Holder, handset MT-2161/U | 1,6,13,14,16 | 1 | 1-2 |
| | | 2,3,7,8,11 | 2 | |
| | | 4,5,9,10,12,15 | 3 | |
| 5995-134-5539 | Reel-Cable Assembly includes: | | | |
| 5820-064-5452 | Reel, Cable RC-436/GRC | 1,6,13,14,16 | 1 | 1-10 |
| | | 2,3,7,8,11 | 2 | |
| | | 4,5,9,10,12,15 | 3 | |
| 5935-064-5561 | Adapter, Connector UG-1373/U | 1,6,13,14,16 | 1 | 1-10.1 |
| | | 2,37,8,11 | 2 | |
| | | 4,5,910,12,15 | 3 | |
| 5935-892-8878 | Adapter, Connector UG-1374/U | 1,6,13,16 | 1 | 1-10.1 |
| | | 11,14 | 2 | |
| | | 12 | 3 | |
| | | 2,3,7,8 | 4 | |
| | | 4,5,9,10,15 | 6 | |
| 5935-064-5560 | Adapter, Connector UG-1375/U | 1,6,13,14,16 | 1 | 1-10.1 |
| | | 2,3,11 | 2 | |
| | | 4,5,12,15 | 3 | |
| 5995-926-8030 | Cable Assembly, Radiofrequency CG-3358/U (6 ft) (used in lieu of CG-718/U (4 ft: FSN 5995-935-2606) and CG-718B/U (6 ft; FSN 5995-889-0853). | 1,6,11,13,14,16 | 1 | |
| | | 2,3,7,8,11 | 2 | |
| | | 4,5,9,10,12,15 | 3 | |
| 5995-889-0854 | Cable Assembly, Radiofrequency CG-1859/U (40 ft). | 1,6,13,14,15 | 1 | 1-10 |
| | | 2,3,7,8,11 | 2 | |
| | | 4,5,9,10,12,15 | 3 | |

| *Federal stock No.* | *Description* | *Usable on code* | *Qty (ea)* | *Figure No.* |
|---|---|---|---|---|
| 5995-144-0244 | Cable Assembly, Radiofrequency CG-1859A/U (40 ft). | | | |
| 4559-889-0527 | Cable Assembly, Radiofrequency CG-1859/U (80 ft). | 1,6,12,14,16 | 1 | 1-10 |
| | | 2,3,7,8,11 | 2 | |
| | or | 4,5,9,10,12,15 | 3 | |
| 4559-144-0245 | Cable Assembly, Radiofrequency CG-1859A-U (80 ft). | | | |
| 5820-064-5450 | Case, Standardized Components, Electrical CY-2583/GRC | 1,2,3,6,7,8,11,13,14 | 1 | 1-3,1-3.1 |
| | | 4,5,9,10,12,15 | 2 | |
| | (Following spare items are stowed in CY-2583/GRC) | | | |
| 5820-892-9039 | Arresstor, lighting | 1,6,14 | 5 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 5 | |
| | | 4,5,9,10,12,15 | 10 | |
| 5960-262-3763 | Electron tube: OB2WA | 1,6,14 | 1 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 1 | |
| | | 4,5,9,10,12,15 | 2 | |
| 5960-884-1983 | Electron tube: 4037A | 15 | 24 | 1-3,1-3.1 |
| | | 1,6,14 | 4 | |
| | | 2,3,7,8,11,13 | 4 | |
| | | 4,5,9,10,12 | 8 | |
| 5960-815-0813 | Electron tube: 7289 | 1,6,2,3,7,8,11,13 | 3 | 1-3,1-3.1 |
| | | 14 | 2 | |
| | | 15 | 4 | |
| | | 4,5,9,10,12 | 8 | |
| 5960-262-1357 | Electron tube: 5654/6AK5W | 1,6,14 | 2 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 2 | |
| | | 4,5,9,10,12,15 | 4 | |
| 5960-188-6584 | Electron tube: 5670 | 1,6 | 4 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 4 | |
| | | 4,5,9,10,12 | 8 | |
| | | 15 | 10 | |
| 5960-577-3078 | Electron tube: 5687WA | 1,6,14 | 1 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 1 | |
| | | 4,5,9,10,12,15 | 2 | |
| 5960-237-6917 | Electron tube: 5725/6AS6W | 1,6,14 | 1 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 1 | |
| | | 4,5,9,10,12,15 | 2 | |
| 5960-193-5145 | Electron tube: 5751WA | 1,6,14 | 2 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 2 | |
| | | 4,5,9,10,12,15 | 4 | |
| 5960-247-8748 | Electron tube: 5842 | 1,6,14 | 1 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 1 | |
| | | 4,5,9,10,12,15 | 2 | |
| 5960-217-0361 | Electron tube: 6AH6WA | 1,6,14 | 1 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 1 | |
| | | 4,5,9,10,12,15 | 2 | |
| 5960-543-0219 | Electron tube: 6AN5WA | 1,6,14 | 1 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 1 | |
| | | 4,5,9,10,12,15 | 2 | |
| 5960-542-7182 | Electron tube: 6080WB | 1,6,14 | 2 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 2 | |
| | | 4,5,9,10,12,15 | 4 | |
| 5960-808-4212 | Electron tube: 6146 | 1,6,14 | 1 | 1-3,1-3.1 |
| | | 2,37,8,11,13 | 1 | |
| | | 4,5,9,10,12,15 | 2 | |

| *Federal stock No.* | *Description* | *Usable on code* | *Qty (ea)* | *Figure No.* |
|---|---|---|---|---|
| 5960-820-8717 | Electron tube: 6688 | 1,6,14 | 2 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 2 | |
| | | 4,5,9,10,12,15 | 4 | |
| 5960-262-0167 | Electron tube: 12AT7WA | 1,6,14 | 1 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 1 | |
| | | 4,5,9,10,12,15 | 2 | |
| 5920-131-9821 | Fuse, cartridge F02B125V3A | 1,6,14 | 5 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 5 | |
| | | 4,5,9,10,12,15 | 10 | |
| 5920-518-1743 | Fuse, cartridge F02B125V3A5 | 1,6,14 | 5 | 1-3.1 |
| | | 2,3,7,8,11,13 | 5 | |
| | | 4,5,9,10,12,15 | 10 | |
| 5920-851-9476 | Fuse, cartridge F02B125V5A | 1,6,14 | 5 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 5 | |
| | | 4,5,9,10,12,15 | 10 | |
| 6240-155-7836 | Lamp, incandescent (28v): MS25237-327 | 1,6,14 | 1 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 1 | |
| | | 4,5,9,10,12,15 | 2 | |
| 6240-155-7857 | Lamp, incandescent (6v): MS25237-328 | 1,6,14 | 3 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 3 | |
| | | 4,5,9,10,12,15 | 6 | |
| 5960-224-4868 | Semiconductor device, diode 1N21B | 1,6,14 | 2 | 1-3 |
| | | 2,3,7,8,11,13 | 2 | |
| | | 4,5,9,10,12,15 | 4 | |
| 5960-262-0315 | Semiconductor device, diode 1N21C | 1,6,14 | 2 | 1-3 |
| | | 2,3,7,8,11,13 | 2 | |
| | | 4,5,9,10,12,15 | 4 | |
| 5960-645-4309 | Semiconductor device, diode 1N23WE | 1,6 | 2 | 1-3 |
| | | 2,3,7,8,11,13 | 2 | |
| | | 4,5,9,10,12,15 | 4 | |
| 5960-615-5550 | Semiconductor device, diode 1N21WE | 1,6,14 | 1 | 1-3 |
| | | 2,3,7,8,11,13 | 1 | |
| | | 4,5,9,10,12,15 | 2 | |
| 5120-293-0808 | Tube Puller TL--201 | 1,6 | 1 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 1 | |
| | | 4,5,9,10,12,15 | 2 | |
| 5120-293-2696 | Tube puller, 7-pin | 1,6,14 | 1 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 1 | |
| | | 4,5,9,10,12,15 | 2 | |
| 5120-293-2693 | Tube puller, 9-pin | 1,6,14 | 1 | 1-3,1-3.1 |
| | | 2,3,7,8,11,13 | 1 | |
| | | 4,5,9,10,12,15 | 2 | |
| 5120-788-1623 | Tool, extracting | 1,6,14,15 | 1 | 1-3.1 |
| | | 2,3,7,8,11,13 | 1 | |
| | | 4,5,9,10,12 | 2 | |
| | (Following items are accessories) | | | |
| 6625-889-1583 | Test lead | 1,2,3,4,5,6,7,8,9,10 | 1 | 1-2 |
| 6625-965-0498 | Test lead | 1,2,3,4,5,6,7,8,9,10 | 1 | 1-2 |
| 5120-224-2596 | Wrench, socket: 5/16 in. | 1,11,12,13,14,15 | 1 | 1-2 |
| | | 2,3, | 2 | |
| | | 4,5 | 3 | |
| 5120-222-8858 | Screwdriver, 4 in. blade | 14,15 | 1 | |
| | Screwdriver, 3 in. Blade | 14,15 | 1 | |
| 7510-889-3494 | Log Book Binder | 14,15,16 | 1 | |
| | (Following spare items are stowed in CN-514/GRC) | | | |
| 5960-284-9285 | Electron tube: 5727/2D21W | 1 through 15 | 1 | 5-11 |
| 5920-665-2881 | Fuse, cartridge: F03A250V1A | 1 through 15 | 1 | 5-11 |

| *Federal stock No.* | *Description* | *Usable on code* | *Qty (ea)* | *Figure No.* |
|---|---|---|---|---|
| 5920-557-6057 | Fuse, cartridge: F03A125V20A | 1 through 15 | 1 | 5-11 |
| 6110-064-5369 | Regulator assembly | 1 through 15 | 1 | 5-11 |

[1]This list is the latest authorized revision and takes precedence over quantities shown in the figures.
[2]The excess are stored in the shelter.
[3]Compartments in figure 1-3 and 1-3.1 are shown filled with parts. However, some authorized quantities are less than compartments available.

## 1-7. Description of Radio Set

The major components of the radio set are installed in ruggedized cases that are used for carrying and stack mounting. All operating controls; meters; and power, antenna, and input and output connections are on the front panels of the various units. Paragraphs 1-8 through 1-12 describe the components of the radio set. The combination of Transmitter, Radio T-893(P)/GRC, Power Supply PP-2054(*)/GRC, and Amplifier-Oscillator AM-1957/GRC (or AM-1958(*)/GRC) comprises the transmitting equipment of the radio set. The combination of Receiver, Radio R-1148(P)/GRC with Amplifier-Converter AM-1955/GRC (or AM-1956/GRC) or Receiver, Radio R-1331(*)(P)/GRC with Amplifier-Converter AM-1955A or B/GRC, (or AM-1956A or B/GRC) comprises the receiving equipment of the radio set. Antenna AT-903/G, a directional, horn-type antenna, is for both transmitting and receiving radiofrequency (RF) energy.

## 1-8. Transmitting Equipment

*a.* The transmitter portion of the radio set is illustrated in figure 1-4. Nylon slides on the inside of each equipment case permit the components to slide easily in and out of the cases. Transmitter, Radio T-893(P)/GRC contains a square opening in the lower left side for the installation of Amplifier-Oscillator AM-1957/GRC or Amplifier-Oscillator AM1958(*)/GRC.
The equipment is air-cooled by a blower in the
T-893(P)/GRC. Air is received through an in take filter mounted on the inside of the T-893(P)/GRC front panel and is exhausted through an opening in the AM-1957/GRC (or AM-1958(*)/GRC.

*b.* Both the AM-1957/GRC and AM1958(*)/GRC contain duplexers which permit transmission and reception from one antenna. When not in use, the AM-1957/GRC or AM-1958(*)/GRC is stored in Case, Standardized Components, Electrical CY2582/GRC (fig. 1-13).

*c.* Power Supply PP-2054(*)/GRC is stacked on top of the T-893(P)/GRC and provides operating potentials for the T-893(P)/GRC. A cooling fan and air filter are located at the front center of the chassis. Output voltage test jacks are accessible when the power supply is pulled out of the case.

## 1-9. Receiving Equipment

*a.* The receiving equipment on the radio set consists of the items illustrated in figures 1-5 and 1-6 Nylon slides on the inside of the case permit the components to slide easily in and out of the case. Receiver, Radio R1148(P)/GRC or R-1331(*)(P)/GRC contains a square opening in the lower left side for the installation of the low-band tuning unit (Amplifier-Converter AM-1955(*)/GRC), or the high-band tuning unit (Amplifier Converter AM-1956(*)/GRC). When not in use, the AM-1955(*)/GRC or AM-1956(*)/GRC is stored

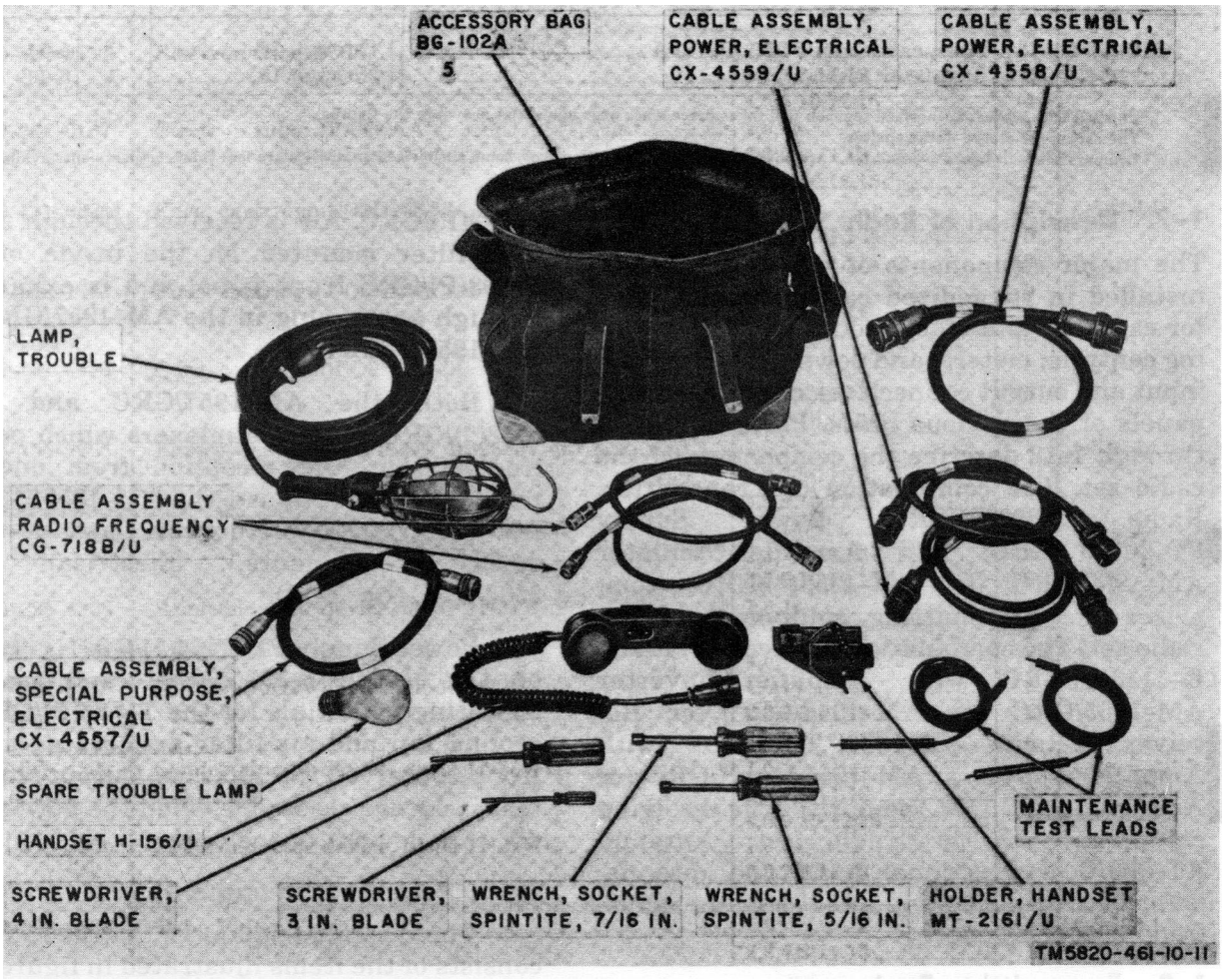



*Figure 1-2. Accessory Bag BG-102A, with contents.*

in Case, Standardized Components, Electrical CY-2582/GRC. The original designed case is shown in figure 1-3; the later designed case is shown in figure 1-3.1. The authorized spare items to be stowed in the case are given in para 1-6.

*b*. Operational controls, power connections, a handset connector for local order wire, a remote order-wire connector for field telephone, and connectors for the multiplex equipment are located on the front panels of the R-1148 (P)/GRC or R-1331(*)(P)/GRC (receiver), AM-1955(*)/GRC, and AM-1956(*)/ GRC. An air intake and filter are on the right side of the front panel of the receiver. The air is pulled in by a blower, circulated, and exhausted through vents around the frame con. trots.

The power for the receiving equipment provided by a self-contained power supply (not shown) located on the lower rear deck of the receiver.

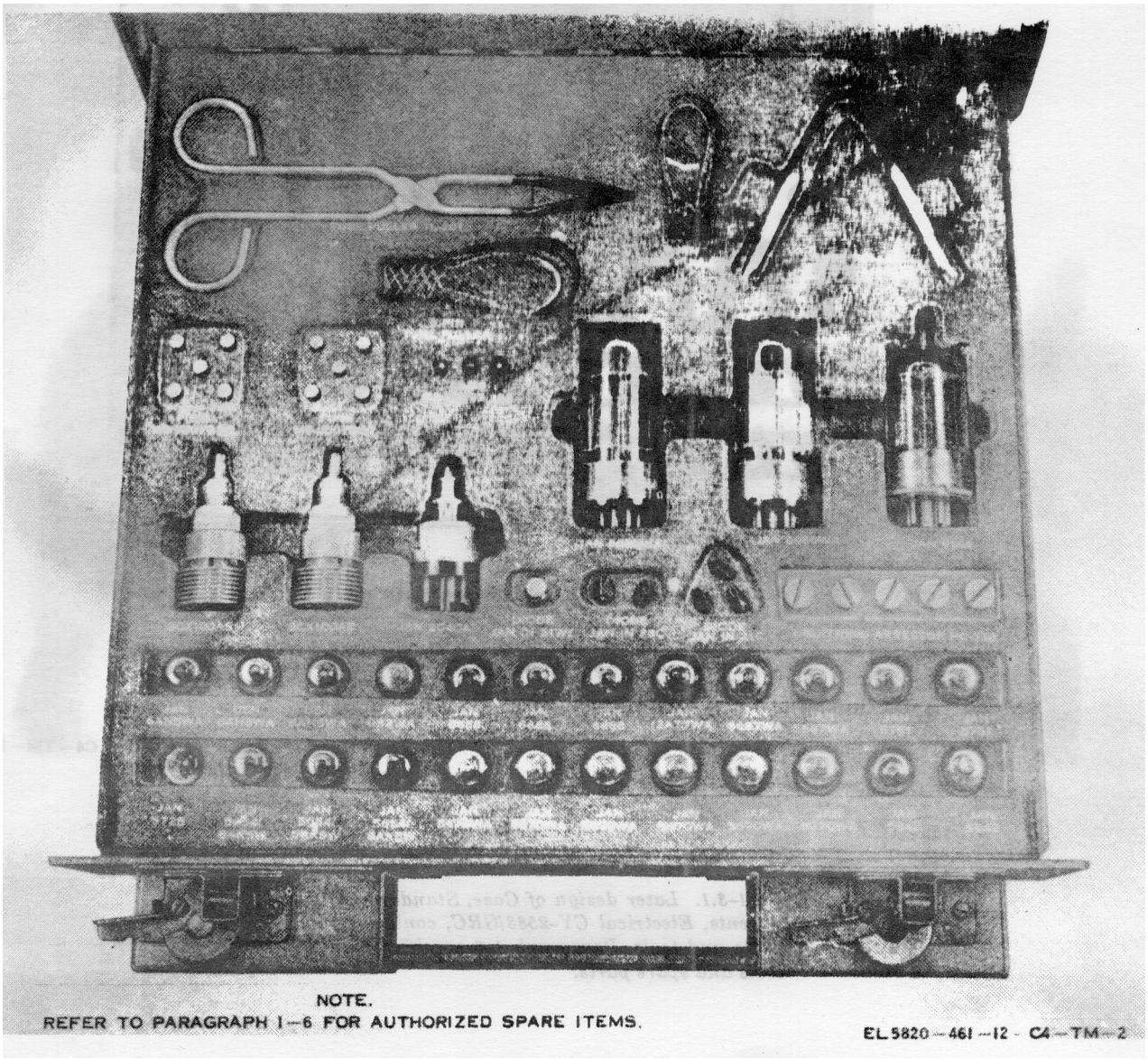



*Figure 1-3. Original design of Case, Standardized Components, Electrical CY-2583/GRC, containing spare parts and tools. Paragraph 1-6 specifies authorized tools and spare parts.*

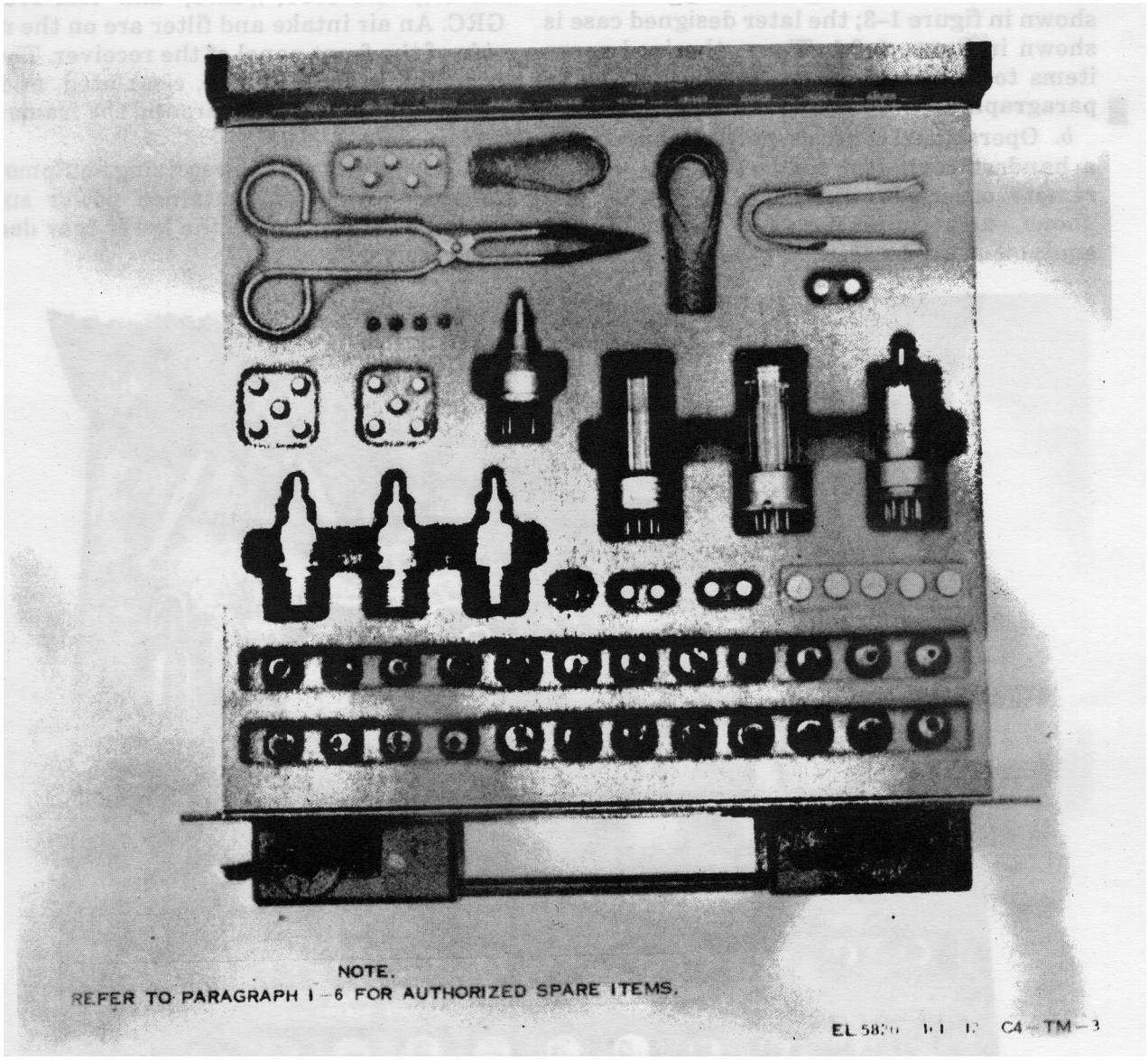



*Figure 1-3.1. Later design of Case, Standardized Components, Electrical CY-2583/GRC, containing spare parts and tolls. Paragraph 1-6 specifies authorized tools and spare parts.*

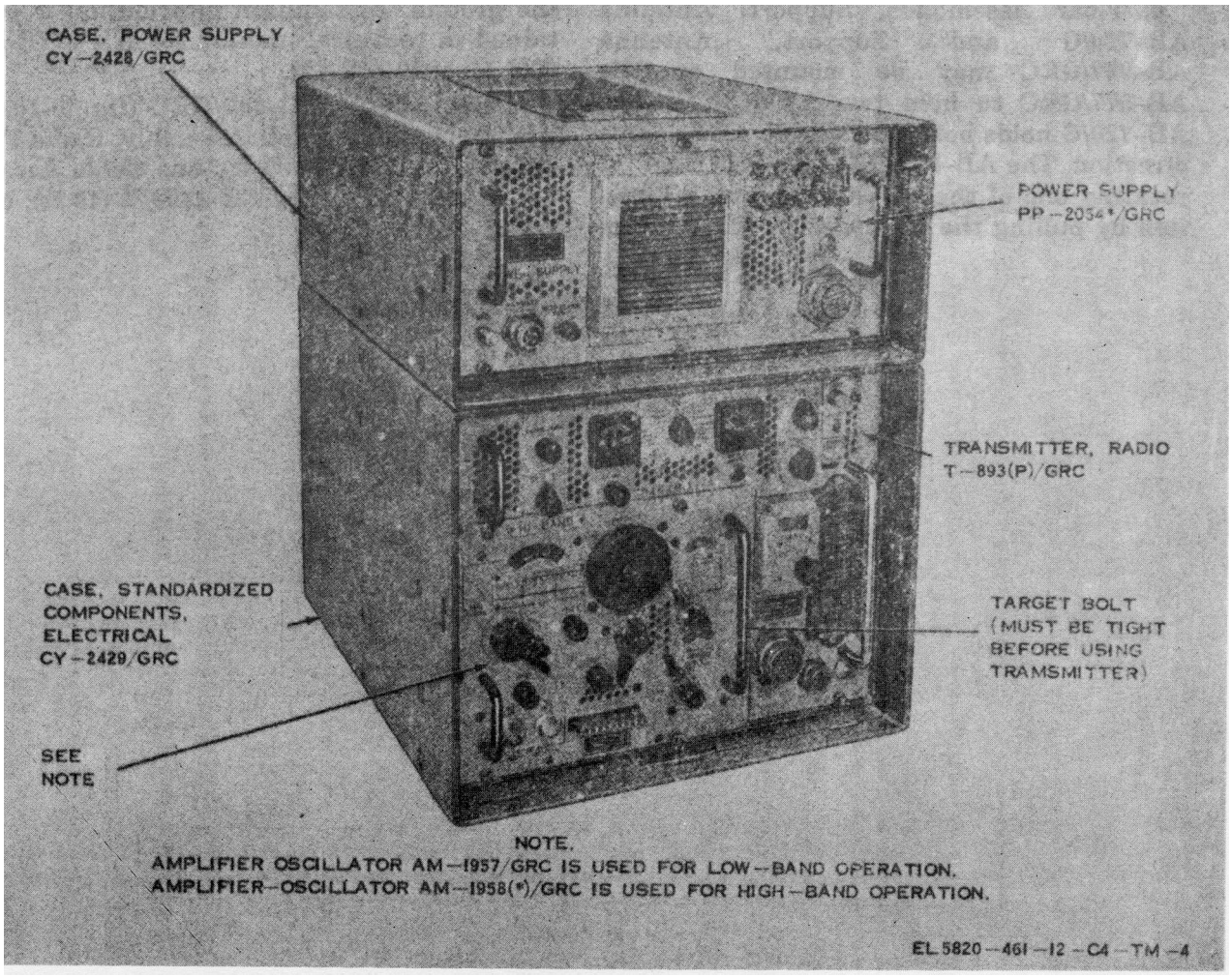



*Figure 1-4. Transmitting equipment, major components.*

## 1-10. Antenna Components

*a.* Antenna AT-903/G (fig. 1-7) is a directional antenna that consists of a modified dipole probe mounted in a ridge-loaded horn that can be positioned for either vertical or horizontal polarization. It has a broad frequency response and is capable of operation throughout the entire frequency range without adjustment. Antenna AT-903/G is installed on top of Mast Extension Kit MK-8061GRC and Mast AB-577/GRC. Connections to the receiver and transmitter are made through a coaxial cable to the front panel connector on the transmitter. Some AT-903/G's are provided with an arrow painted on the narrow end to indicate the antenna polarity with respect to ground.

*b.* Mast AB-577/GRC (fig. 1-8) (TM 11-5820-538-12) consists of eight tubular sections contained in a mast section carrier and a launcher device. When assembled, the mast provides a 48-foot mounting for Antenna AT-903/G.

*c.* Extension Kit, Mast MK-06/GRC (fig. 1-9) (TM 11-5820-538-12) consists of five tubular sections (contained in a mast section carrier case), cable assembly, and accessories (contained in accessory bag). When assembled with the AB-577/GRC, it raises the height of the antenna system to 75 feet. It is used with but is not part of the AN/GRC-50(*)(V).

*d.* T-bar assemblies, Support, Antenna AB-720/G and Support, Antenna AB-957/GRC may be mounted on the AB-577/GRC to hold two AT-9031G's. The AB-7201G holds both AT-903/G's in the same direction. The AB-957/GRC has provision for rotating one of the AT-9031G's in any direction by pulling the horn with lanyards from the ground. Installation information is contained in technical manual for AB-5771GRC (TM 11~820 538-12~.

*e.* Reel, Cable RC - 36/GRC (fig. 1-10) is used to store one Cable Assembly, Radio Frequency CG-1859/U (80 It); one Cable Assembly, Radio Frequency CG-1859/U ~0 It); one Cable As

Radio Frequency CG-718B/U (6 ft); two Adapters, Connector UG-1374/U; and one Adapter, Connector UG-1373/U. The RC-4 36/GRC is 32 inches in diameter and 12 inches in depth.

## 1-11. Regulator, Voltage CN-514/GRC

Regulator, Voltage CN-514/GRC (fig. 1-11) regulates and distributes the primary power source for the radio set. All controls and connections are

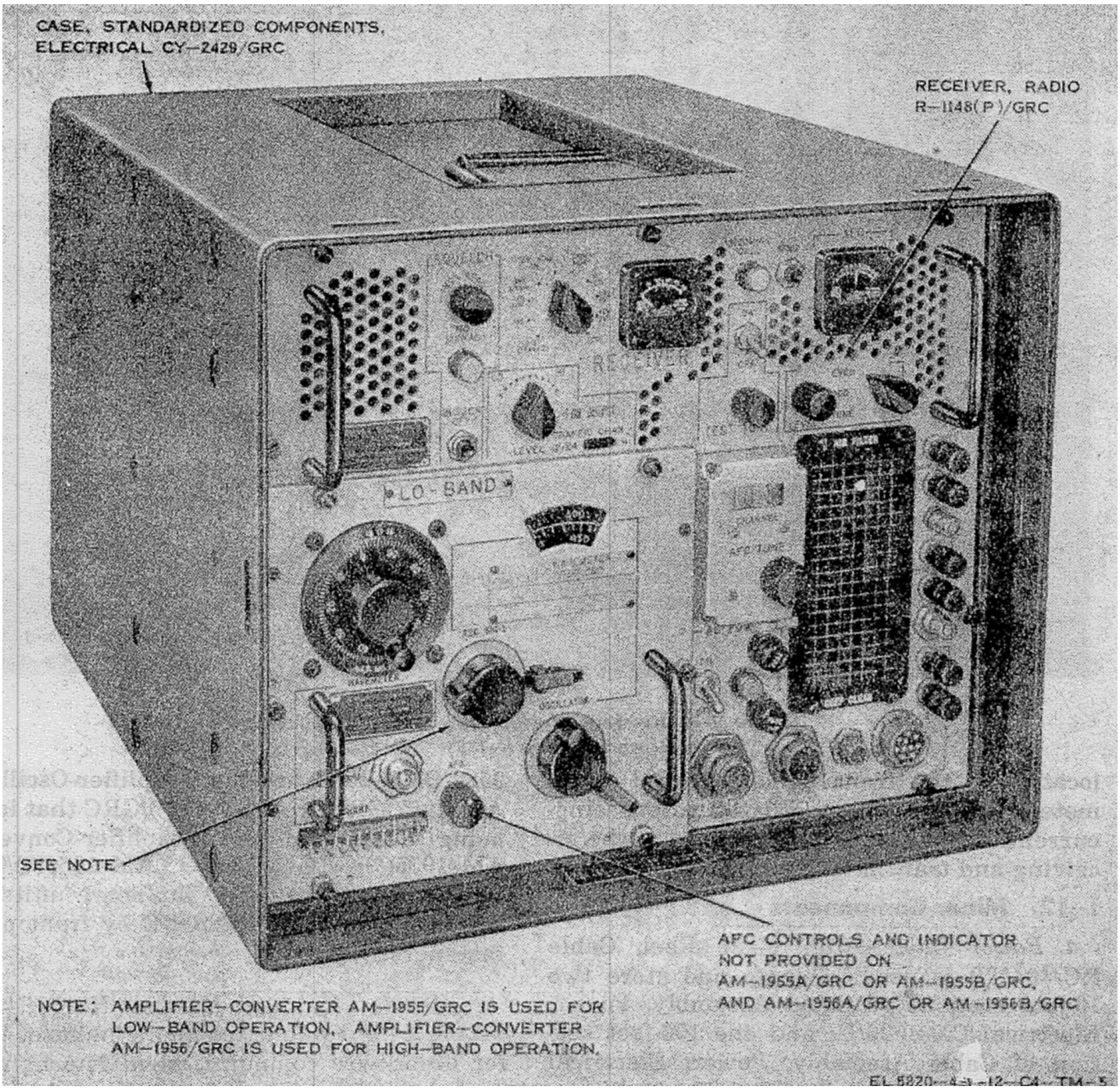



*Figure 1-5. Receiving equipment, major components with Receiver, Radio R-1148(P)/GRC.*

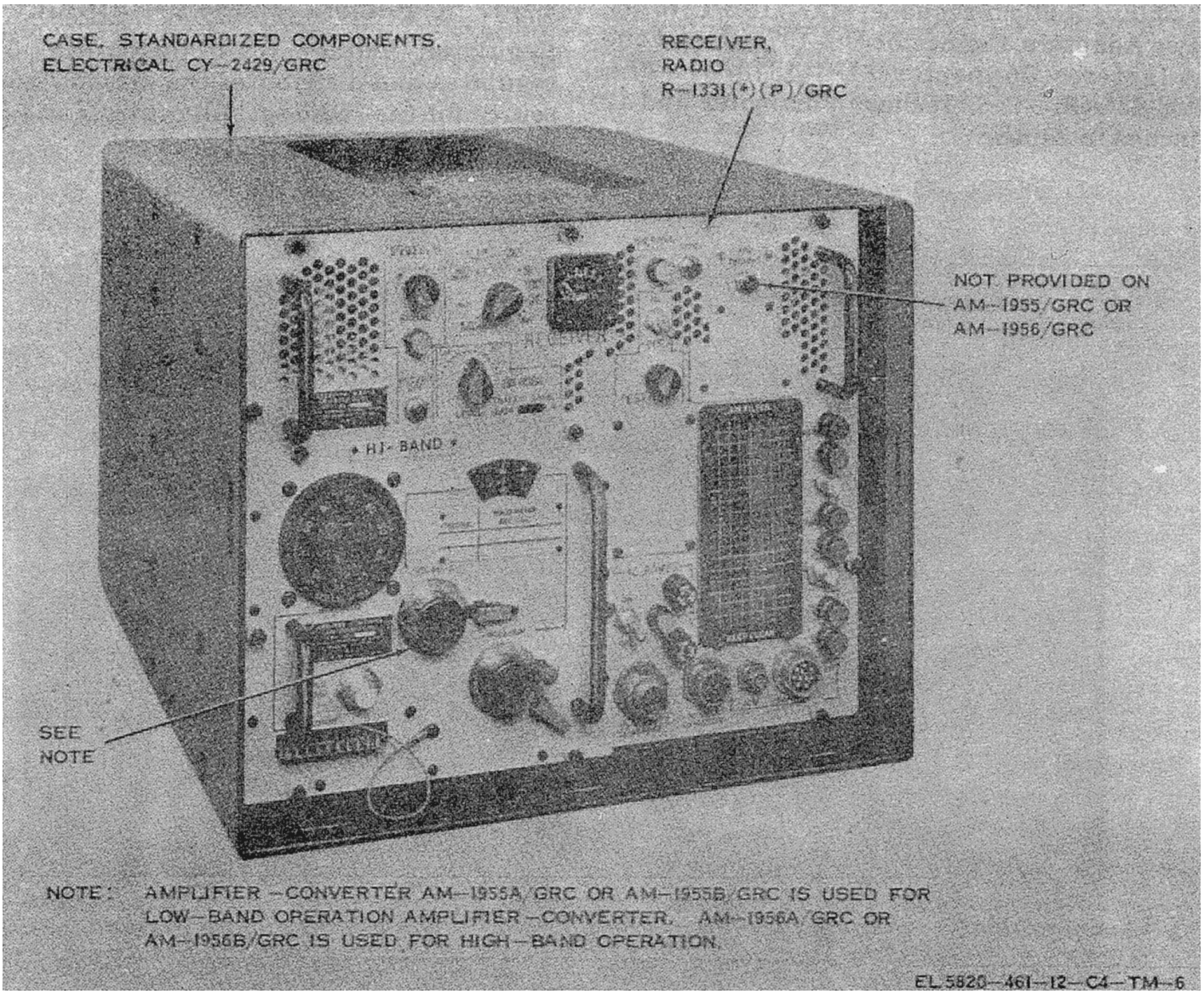



*Figure 1-5. Receiving equipment, major components with Receiver, Radio R-1331(*)(P)/GRC.*

located on the front panel. A front panel meter indicates the regulated alternating current (ac) output voltage applied to the receiving and transmitting equipments.

## 1-12. Minor Components

a. *Power Cables* (fig. 1-12). Reel, Cable RC 404/TR is used to carry and store two 10-foot sections of Cable Assembly, Power, Electrical CX-4686/U; and one 100-foot section of Cable Assembly, Power, Electrical CX-4668/U. The RC-404/TR is 24 inches in diameter and 6 inches in depth.

*b. Case, Standardized Components, Electrical CY-2582/GRC (fig. 1-13).* Case, Standardized Components, Electrical CY2582/GRC contains the Amplifier-Oscillator AM-1957/GRC or AM-1958(*)/GRG that is not being used, and the Amplifier-Converter AM-1955(*)/GRC or AM-1956(*)/GRC that is not being used. The spare units are secured in the CY-2582/GRC by front panel fasteners.

c. *Handset H-156/U*. Handset H-156/U (fig. 1-2) is a lightweight telephone handset used for order-wire communication. The handset cord terminates in a connector which attaches to the HANDSET connector on the front panel of the R-1148(P)/GRC or R-1331(P)/GRC. A press-to-talk switch is provided on the side of the handset.

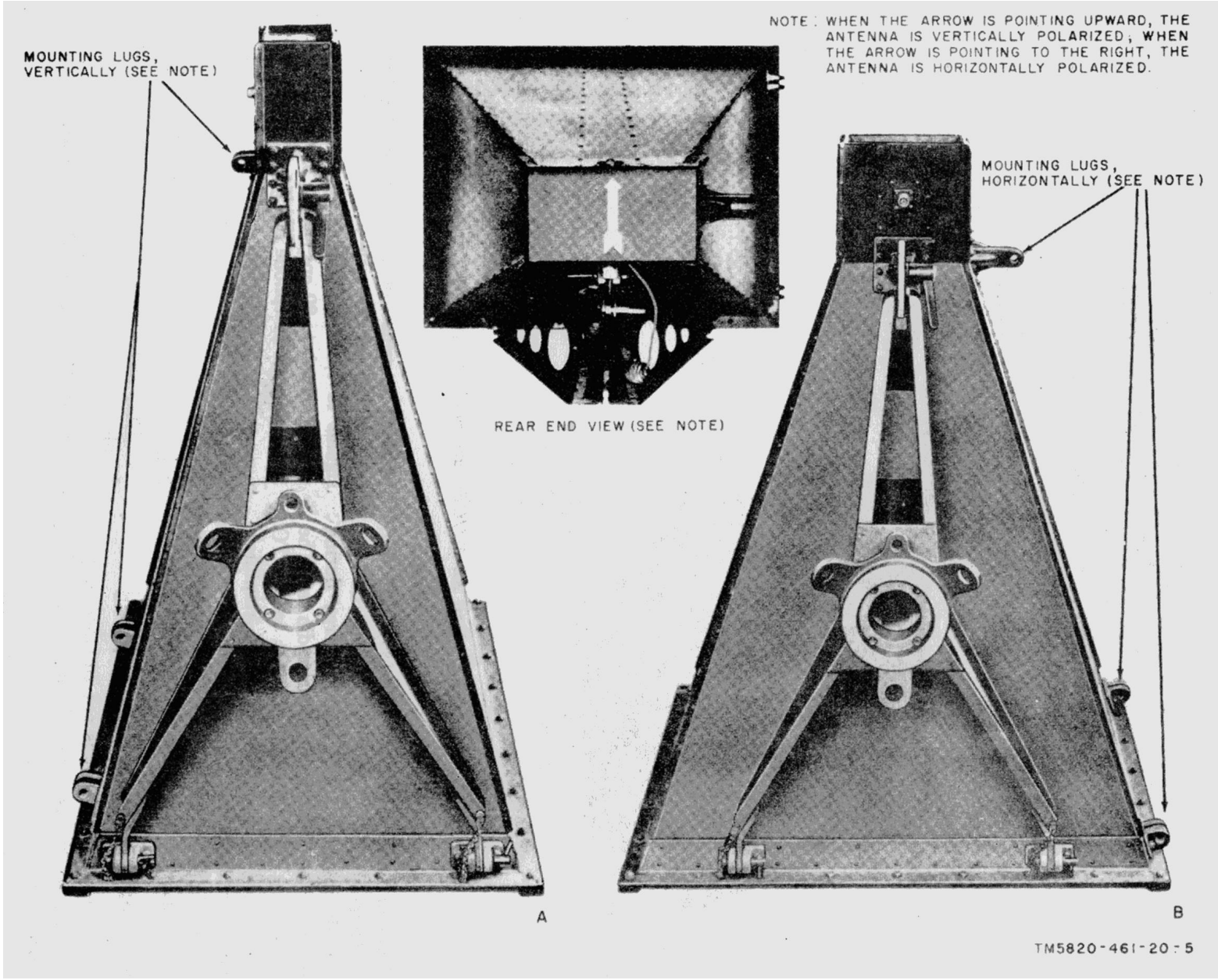



*Figure 1-7. Antenna AT-903/G*

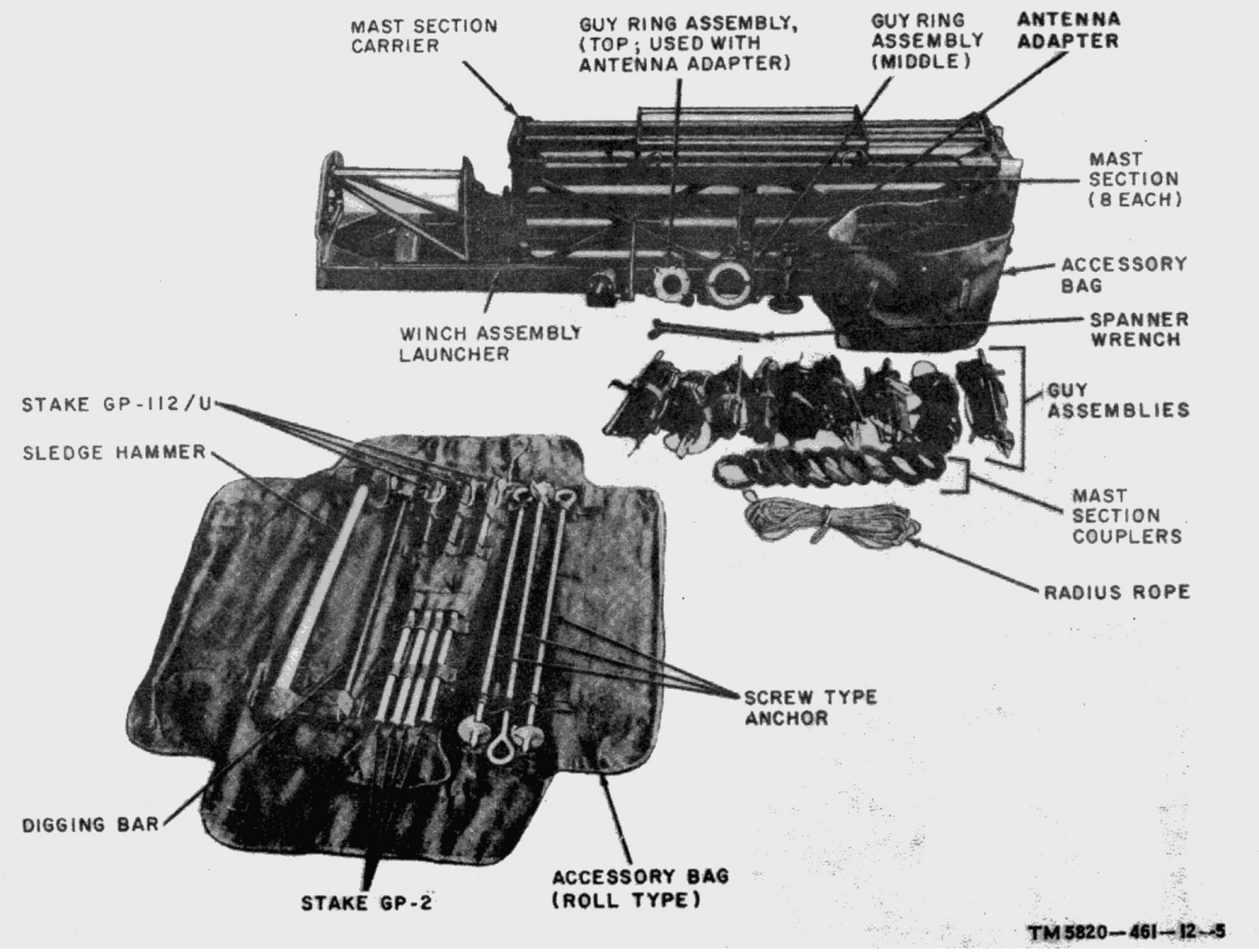



*Figure 1-8. Mast AB 577/GRC and minor components*.

*d*. *Dummy Load, Electrical DA-189/GRC* (fig. 1-14). Dummy Load, Electrical DA-189/GRC is used for dissipation of RF output energy during alignment and troubleshooting of the radio set. The cable from the DA-189/GRC attaches to the TO ANT connector on the front panel of Amplifier Oscillator AM-1957/GRC or AM-1958(*)/GRC A meter included in the DA-189/GRC permits direct observation of the output power level.

## 1-13. Additional Equipment Required

The following equipment is not supplied as part of the radio set but is required for remote order wire operation.

*a. Telegraph-Telephone Signal Converter TA182/U*. The TA-182/U (TM 11-5805-247-12) is required for remote order-wire communication. It is used to convert 20-cycle-per-second (cps) ringing signals to 1,600-cps ringing signals, and 1,600-cps ringing signals to 20-cps ringing signals between the radio set and Telephone Set TA-312/PT.

*b. Telephone Set TA-312/PT*. Telephone Set TA-3312/PT (TM 11-2155) is required for remote order-wire communication. It is used to originate and receive order-wire signals from a remote location from the radio set to distances not exceeding 1 mile.

## 1-14. Differences in Models and Configurations

The major differences of the five different configurations of the radio set are in the operating

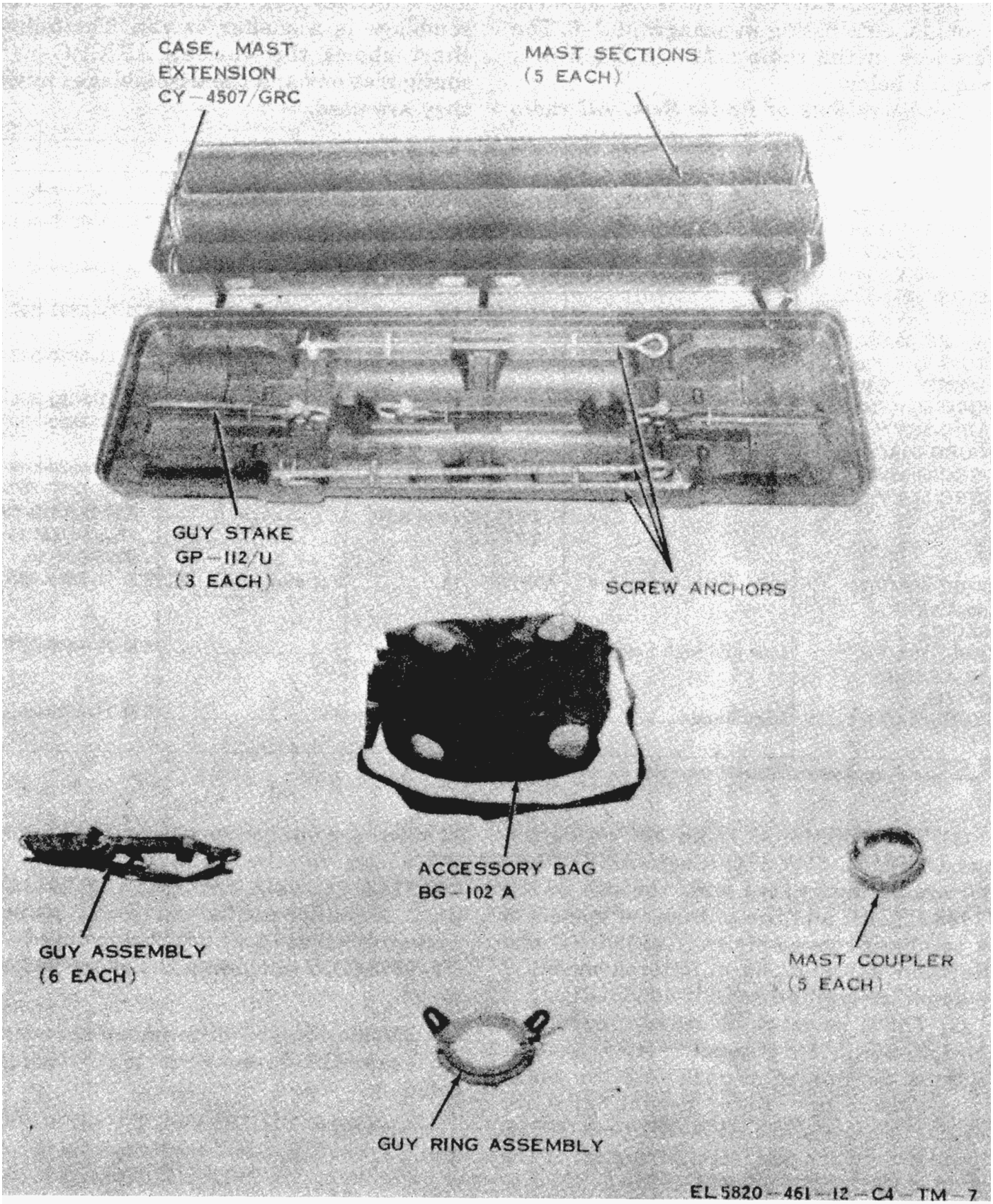



*Figure 1-9. Extension Kit, Mast MK-806/GRC, components*.

frequency. The detailed listing of the different items within each radio set is contained in the components listing in paragraph 1-5 The differences in the radio sets are listed in a through h below.

*a.* Configurations of Radio Sets. All radio set configurations, except AN/GRC-50(V)1 and AN/GRC-50A(V)1, are part of a radio assemblage in a shelter or van. The following chart shows the various AN/GRC-50(*)(V) configurations and the assemblages in which they are used.

| *Radio Set* | *Low or High band* | *Radio System* | | |
|---|---|---|---|---|
| | | *Assembly* | *Quantity of Stacks* | *Publications* |
| AN/GRC-50(V)1 and AN/GRC-50A(V)1 | Low or high band---------- | Training units | 1---------- | TM 11-5820-461-12 |
| AN/GRC-50(V)2 and AN/GRC-50A(V)2. | High band---------- | AN/MRC-102---------- | 2 (1 standby) ---------- | TM 11-5895-357-14 |
| AN/GRC-50(V)3 and AN/GRC-50A(V)3. | Low band ---------- | AN/MRC-102---------- | 2 (1 standby) ---------- | TM 11-5895-357-14 |
| AN/GRC-50(V)4 and AN/GRC-50A(V)4 | High band---------- | AN/MRC-103---------- | 3 (1 standby) ---------- | TM 11-5820-533-14 |
| AN/GRC-50A(V)4 | High band---------- | AN/TRC-110 ---------- | 3 (1 standby) ---------- | TM 11-5820-535-15 |
| AN/GRC-50A(V)5.and AN/GRC-50A(V)5 | Low band ---------- | AN/MRC-103---------- | 3 (1 standby) ---------- | TM 11-5820-533-14 |
| AN/GRC-50A(V)5 ---------- | Low band ---------- | AN/TRC-110 ---------- | 3 (1 standby) ---------- | TM 11-5820-535-15 |
| AN/GRC-50(V)6 ---------- | Low and High band -------- | AN/MRC-102,AN/ TRC-109, and AN/TRC-117 . | 2 (1 standby) ---------- | TM 11-5820-357-14, TM 11-5820-536-15 ,and TM 11 5895-366-15 |
| AN/GRC-50A(V)7 and AN/GRC-50A(V)10. | Low and high bands -------- | AN/TRC-110 ---------- | 3 (1 standby) ---------- | TM 11-5820-535-15 |
| AN/GRC-50A(V)8 and AN/GRC-50A(V)9. | Low and high bands -------- | AN/TRC-108 and AN/TRC-143. | 1---------- | TM 11-5895-367-15 |
| AN/GRC-50A(V)11 -------- | High band---------- | Basic unit (see (3) below) | 1---------- | TM 11-5820-461-12 |

Low band or high band in assemblage. Other band may be requisitioned as required.

*(1)* The unlettered radio set configurations (AN/GRC-50(V)1 through AN/GRC-50 (V)5) are so designated with the use of the R-1148(P)/GRC and the unlettered models of the amplifier-converts (AM-1955/GRG and AM-19561GRC) and the unlettered model of the amplifier-oscillators (AM-1958/GRC).

*(2)* The A-model radio set configurations (AN/GRC-50A(V)1 through AN/GRC-50A (V)11) are designated as such with the use of all models of the R-1331(*)(P)/GRC (R-1331P/GRC, R-1331A(P)/GRC, or R-1331B (P)/GRC) and with the lettered models of the amplifier-converters (AM-1955A/GRC or AM-1955B/GRC, and AM-1956A/GRC or AM1956-B/GRC), and lettered model of the amplifier oscillator (AM-1 958A/GR C).

*(3)* The basic unit configuration AN/GRC-50A(V)11, is one stack, less those items whose quantities vary with the number of stacks in the configuration; namely, CN-514/GRC, DA-1891GRC, CY-2582/GRC (for amplifier-oscillator and amplifier converter that are not being used), and CY-2583/GRC (including the spare parts and tools).

*b. Receivers*. The differences between the various receivers are given in (1) through (4) below.

*(1)* The R-1331(P)/GRC, R-1331A(P)/GRC, and R-1331B(P)/GRC receivers do not have afc circuitry; the R-1148(P)/GRC has this circuitry.

*(a)* Externally, the R-1148(P)/GRC has an AFC TUNE control, an AFC LEVEL control, an-AFC SELECTOR switch, an AFC meter, and the multimeter switch has an AFC

LEV position; the other receivers do not have these items.

*(b)* The R-1148(P)/GRC does not have AFC DISABLE switch; the other receivers have this switch.

*(c)* Internally, the R-1148(P)/GRC has afc assembly 3A4; the other receivers do not have this assembly (fig. 6-6).

(2) Also internally, second intermediate frequency (IF) assembly 3A5, used in the R-1148(P)/GRC, differs electrically from the one used in the other receivers. The 3A5 assembly used with the R-1148(P)/GRC may not be used in the other receivers. The 3A5 assembly issued with the R-1331(*)(P)/GRC receivers can be used in the R-1148(P)/GRC. Each version of the 3A5 assembly has a different Federal stock number.

(3) In afc assembly 3A4 (used only in the R-1148(P)/GRC, and designated 2A4 when it is installed in T-893(P)/GRC (F(2) below), an insulator board is installed between terminal board E8 and the center partition (fig. 5-3.1) on equipment procured under order No. 64027-PP-63 and later procurements. If the insulation board is not provided, refer to paragraph 5-15d(3) for authorization and instructions for organizational maintenance facilities to install the insulator board.

*c. Receivers R-1331(P)/GRC, R-1331A-and R-1331B(P)/GRC.* These receivers differ from each other in the following respects:

(1) In R-1331(P)/GRC, the front panel AFC DISABLE switch has silver contacts; in the other receivers, the switch has gold contacts to give better performance.

(2) In second IF assembly 3A5, originally issued with R-1331A(P)/GRC and R-1331B(P)/GRC, resistor R79 is added in series with diode CR7 to improve a metering circuit. This resistor is not provided in 3A5's originally issued with R-1331(P)/GRC.

**NOTE**

The 3A5 assemblies originally issued with any of these receivers are mechanically and electrically interchangeable and may be used in any of the models of this receiver.

(3) Receiver R-1331B(P)/GRC is so identified because of the features described as follows for the two assemblies originally issued with this receiver:

*(a)* In receiver baseband assembly 3A3, a beaded sleeving is installed on the jumper wires that are connected between connector J3 and test jack J4 and between connector J2 and test jack J6.

*(b)* In second IF assembly 3A5, a resistor is added to provide on-scale receive signal metering indications.

*d. Amplifier-Converters*. The use and differences between the unlettered models (AM-1955/GRC and AM-1956/GRC) and lettered models (AM-1955A/GRC, AM-1955B/ GRC, AM-1956A/GRC, and AM-1956B/ GRC) are given in (1) through (5) below.

(1) The unlettered models of the amplifier-converters are used with the P-1148(P)/GRC; the lettered models are used with the other receivers (R-1331(P)/GRC, R-1331A(P)/GRC, and R-1331B(P)/GRC).

(2) The unlettered models of the amplifier-converters have automatic frequency control (afc) circuitry with the AFC correction control on the front panel (fig.1-5); the lettered models do not have the afc circuitry and the AFC control (fig. 1-6).

(3) Any model amplifier-converter may be used in any model of the receiver; however, for disabling the afc during tuning (para 3-8), the procedures are different when the lettered model amplifier-converter is used in the R-1148(P)/GRC.

(4) The B-model amplifier-converters differ from the A-model units in that filter capacitors C23 and C24 are provided in the filament circuit of tube V2 in first IF assembly 3A1A1/3A2A1 of the B-model unit.

(5) First IF assembly 3A1A1/3A2A1,, whether provided with the filter capacitors ((4) above) or not, are electrically and mechanically interchangeable and may be used in any model of any amplifier-converter.

*e. Amplifier-Oscillators* The uses and differences between the AM-1958/GRC and AM-1958A/GRC are given in (1) through (3) below.

(1) The AM-1958/GRC is used with the AN/GRC-50(V)1 through AN/GRC-50(V)5 configurations. The AM-1958A/GRC is used

with the AN/GRC-50A(V)1 through AN/ GRC-50A(V)11 configurations.

(2) The differences between the AM-1958/GRC (fig. 1-13) and AM-1958A/GRC (fig. 1-13.1) are in the mechanical connections between some front panel controls and the cavities inside the unit. Either model of the amplifier-oscillator can be used in the transmitter.

(3) The latest version of the AM-1958A/GRC includes a notch which is cut into the frame behind the spring cap for tube V3 (fig. 6-10). For those AM-1958A/GRC's that do not have the notch direct support maintenance facilities are authorized and required to cut the notch in the unit (para 15d(4)) and TM 11-5820 461-35).

*f. Transmitter, Radio T-893(P)/GRC.*

(1) In transmitters provided on order No. FR 36-039-N-6 31992(E) and on later procurements, a snap-on cover is provided for the bracket on which current regulator controls R14, R15, and R16 are mounted (fig. 5-12). Refer to paragraph 5-15d(2) for authorization and instructions for organizational maintenance facilities to install the snap-on cover.

(2) In afc assembly 2A4 (designated 3A4 when it is used in the R-1148(P)/GRC(b(3) above), an insulator board is installed between terminal board E8 and the center partition (fig. 5-3.1) on equipment procured
under order No. 64027-PP-6 3 and later procurements. If the insulator board is not provided, refer to paragraph 5-15d(3) for authorization and instructions for organizational maintenance facilities to install the insulator board.

*g. Power Supplies PP-2054/GRC and PP-2054A/GRC*. The two power supplies differ from each other as follows:

(1) Capacitors C3, C4, C5, and C6 with associated bracket assemblies are different in both power supplies. The capacitors are the same value but are different types; the brackets are not interchangeable.

(2) In the PP-2054A/GRC, the HV fuse is 3 amperes, slo-blo, and the front panel is engraved with the marking 3AMP. In the PP-2054/GRC, the HV 6 AMP panel marking is changed by the using personnel and the 3-ampere, time-delay fuse is used. Refer to paragraph 5-15d(1) for authorization and instructions for organizational maintenance facilities to install the 3-ampere fuse.

*h. Regulator, Voltage CN-514/GRC*. On equipment procured on order No. FR 36-039-N-6-31992(E) and later procurements the following words are inscribed on the front panel: CAUTION: OUTPUT VOLTAGE SHALL NOT BE ADJUSTED TO EXCEED 115 VOLTS. This caution is not provided on earlier procurements of the regulator.

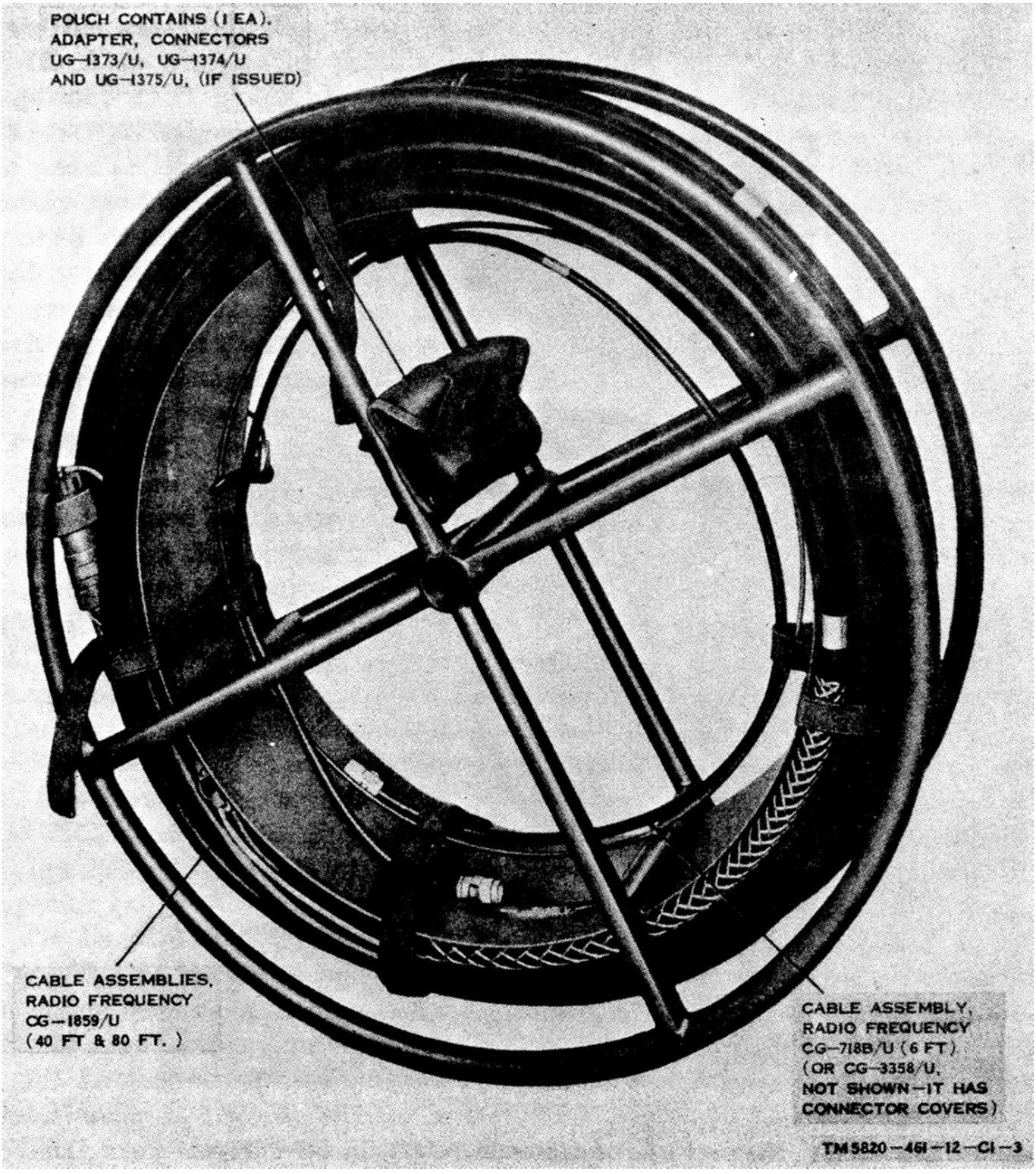



*Figure 1-10. Reel, Cable RC-436/GRC, with components mounted on it.*

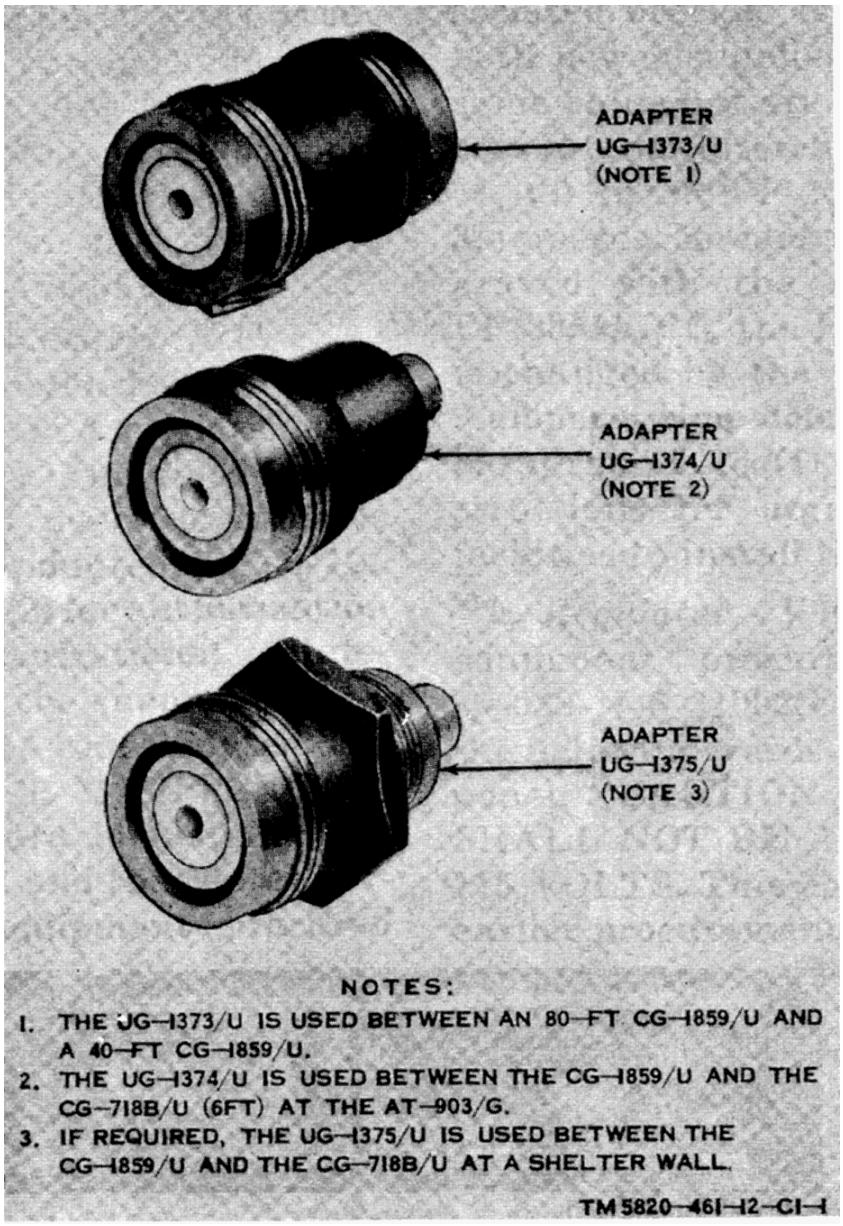



*Figure 1-10.1 Adapters UG-1371/U, UG-1374/U, and UG-1375/U.*

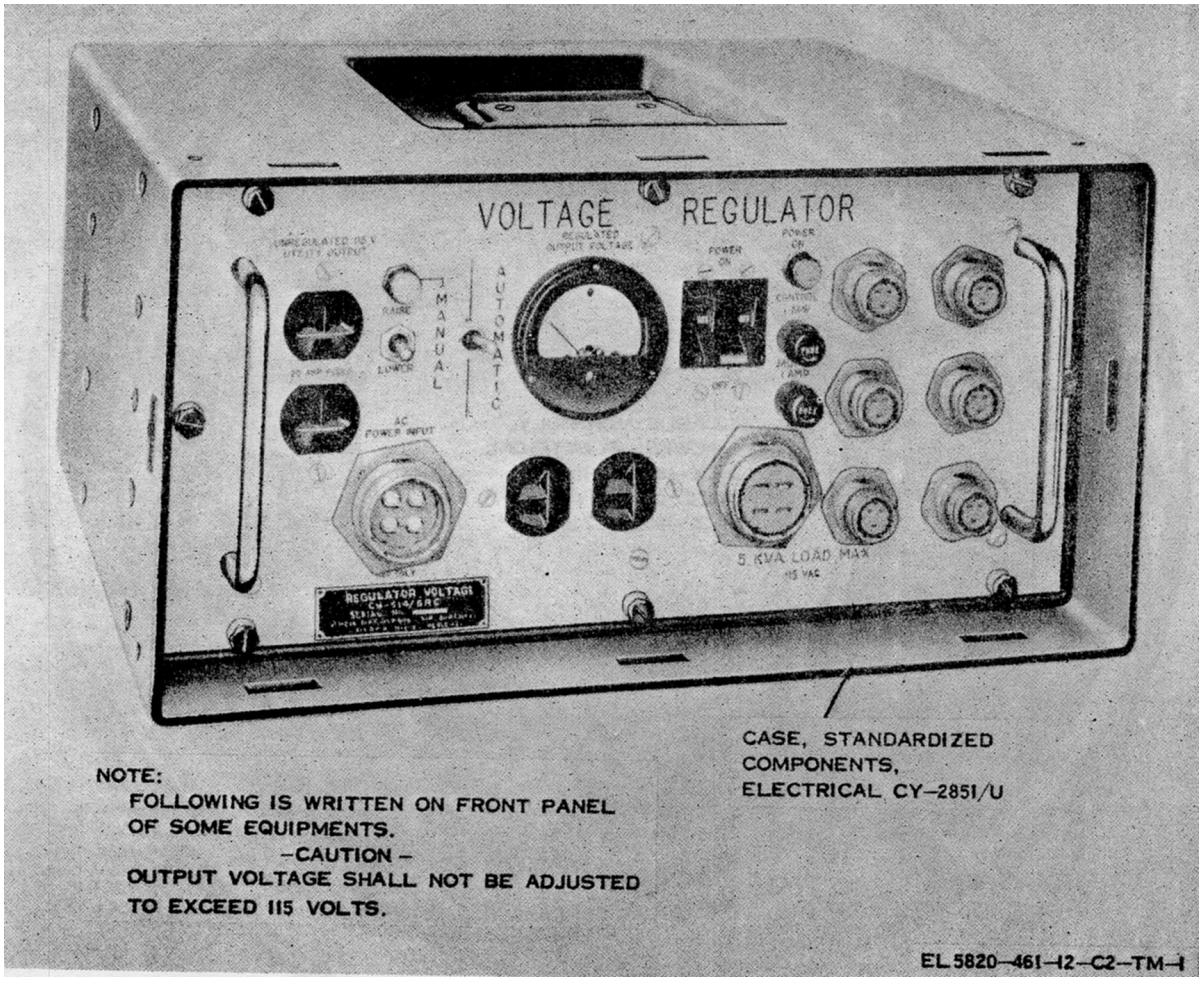



Figure 1-11. Regulator, Voltage CN-514/GRC, less case cover.

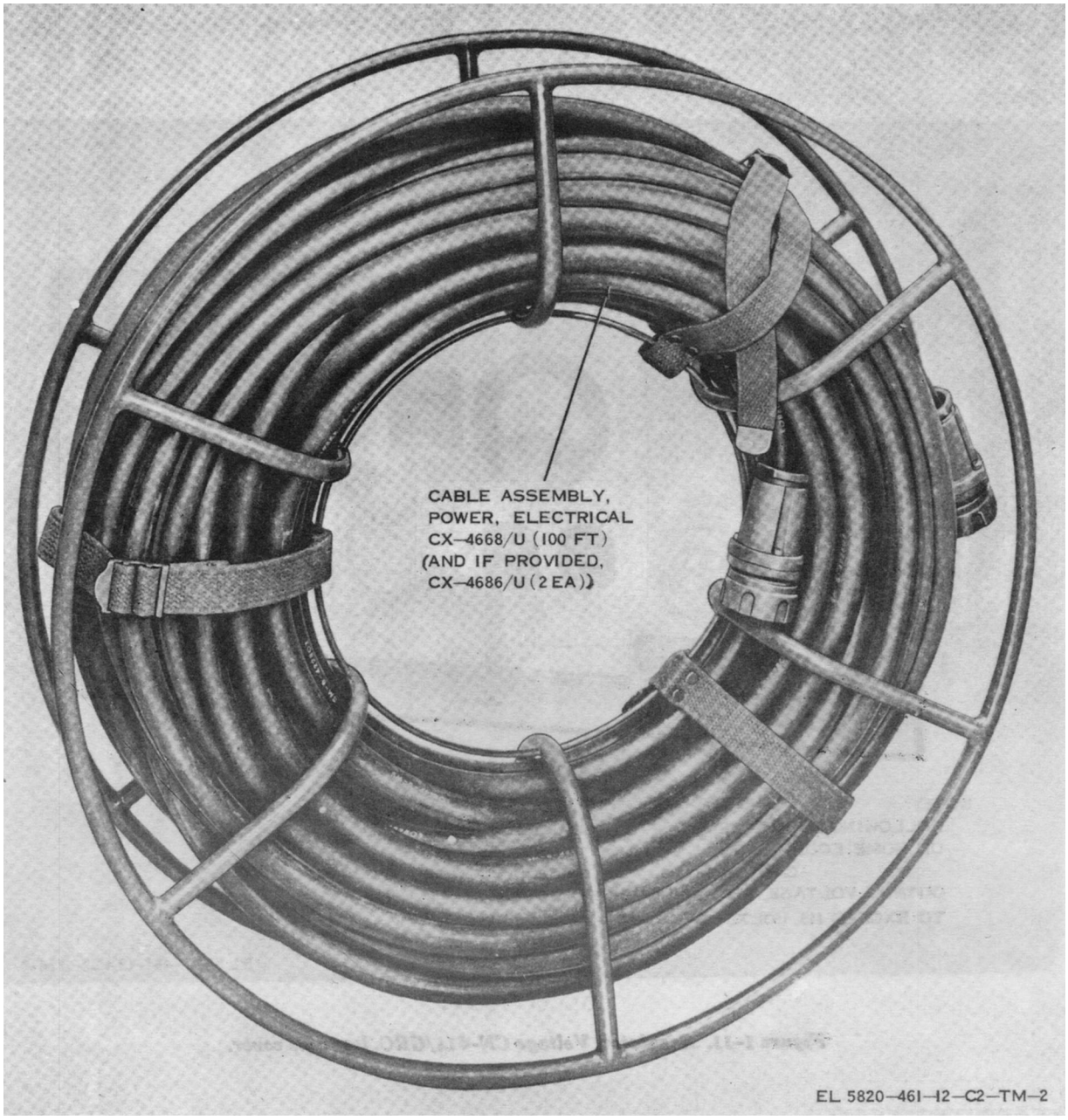



Figure 1-12. Reel, Cable RC-404/TR, with cables mounted on it.

**1-16.2 Change 3**

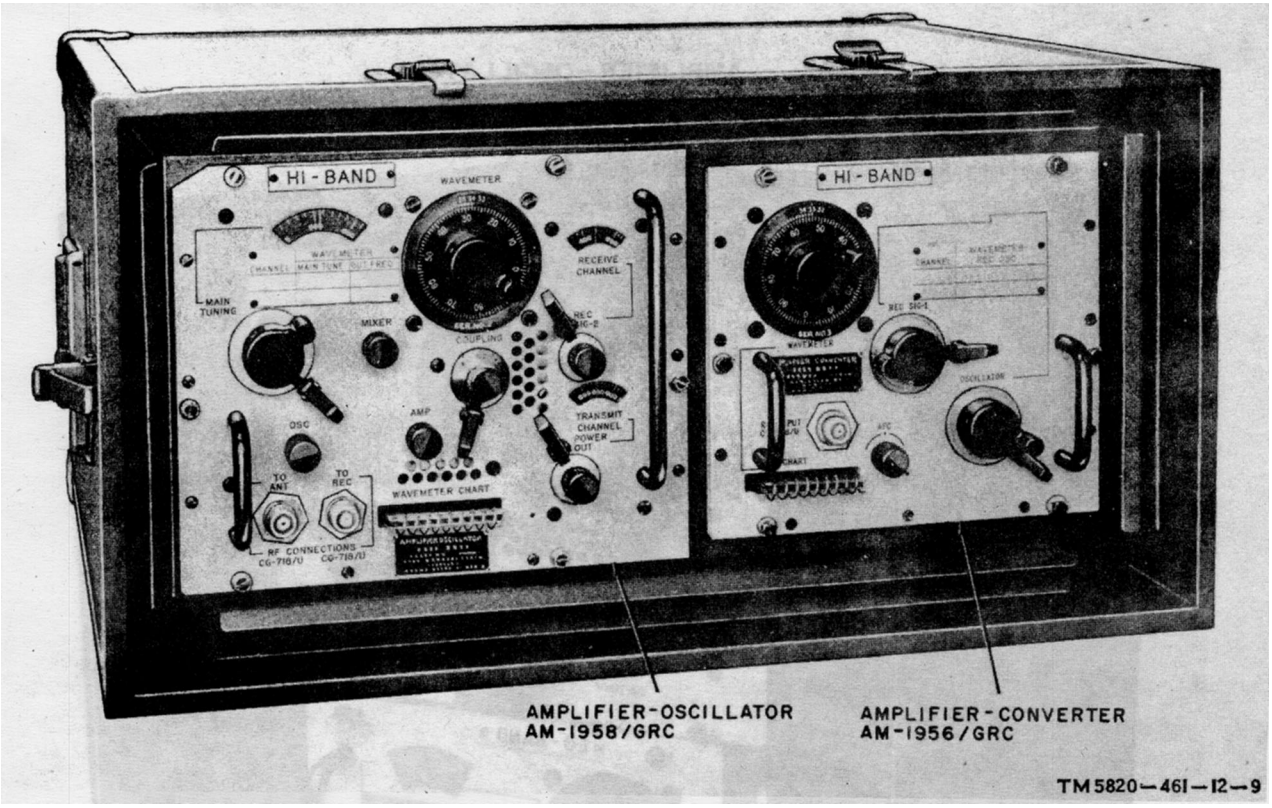



Figure 1-18. Case, Standardized Components, electrical, CY-2582/GRC with alternate turning heads, original design.


Figure 1-13.1. Case, Standardized Components, Electrical CY-2582/GRC with alternate tuning heads; later design

AGO 10032A

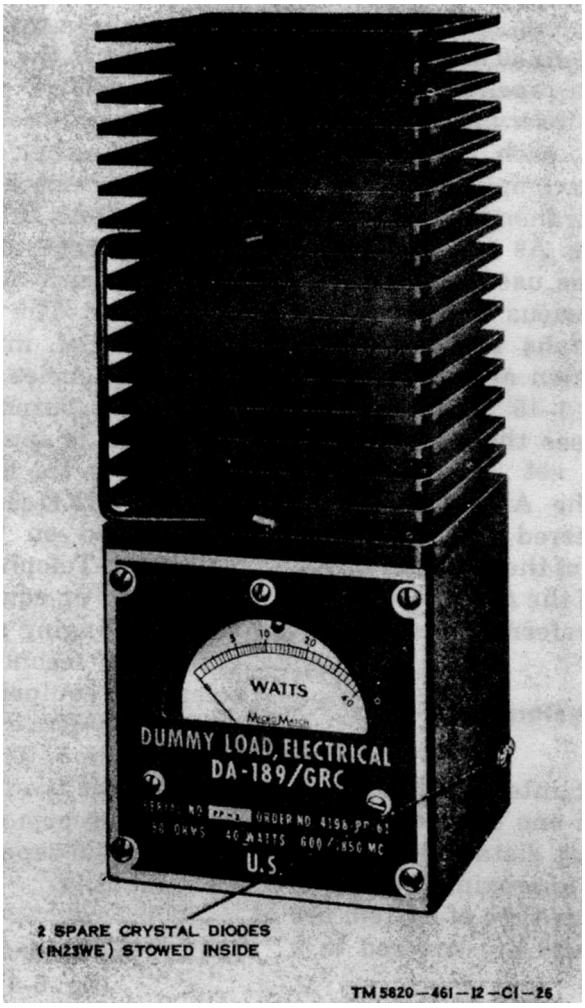



Figure 1-14. Dummy Load, electrical DA-189/GRC.

## Section III. SYSTEM APPLICATION

### 1-15. General

The radio set is designed specifically for system use and generally is not used without supporting multiplex equipment. When the radio set is used in a communications system where the radio link exceeds 30 miles (approximately 50 kilometers), a repeater station is required at each 30-mile interval. In addition to multiplex equipment, each repeater station is equipped with two complete radio sets, to allow simultaneous transmission and reception in two directions. As many as seven repeater stations may be used in a system. The signal paths for various configurations are covered in paragraphs 1-16 and 1-17. Throughout this discussion and accompanying illustrations (figs. 1-15 and 6-1), the equipment that comprises the transmitting portion of the radio set (T-8993(P)/GRC, PP-2054(*)/GRC, and the AM-1957/GRC or AM-1958(*)/GRC) is referred to as the transmitter; the combination of the R-1148(P)/GRC or R-1331(*)(P)/GRC and the AM-1955(*)/GRC or AM-1956(*)/GRC is referred to as the receiver.

### 1-16. Two-Terminal System (fig. 1-15)

*a. General*. Multiplex intelligence can be transmitted direct from one radio set terminal station to another at distances up to 30 miles (50 kilometers, approximately). The signal paths through this type of system are shown in figure 1-15 and are covered in b through d below.

*b. Fdm.*

(1) Multiplex signals (FDM) from fdm equipment are fed through the receiver to the transmitter (FDM OUT).

(2) The RF carrier of the transmitter, frequency-modulated by the multiplex signals, is coupled through the duplexer to the antenna for propagation towards the distant station.

(3) The signals received by the antenna at the distant station are fed through a duplexer in the transmitter to the receiver (RF). From the receiver, the signals (FDM) are routed to the fdm equipment.

*c. Pcm*. Multiplex transmission signals (PCM IN) from the pcm equipment are fed directly into the transmitter of the radio set. From the transmitter, the signals follow the same path as the fdm signals (b above) and are routed to the associated pcm equipment.

*d. Order-Wire and Ring Signal During Fdm Transmission.* Order wire information is generated either at the local radio set handset or at a remote telephone connected to the receiver. Both these circuits are operable at the same time. The order-wire signals are mixed in with the fdm frequencies in the transmitter. The separation of the received pcm channel information and order-wire voice frequencies is done in the receiver. The order-wire output of the fdm multiplex equipment is applied to the receiver for distribution to the local handset and REMOTE ORDER WIRE connections. If ringing signals are desired on the remote order wire, a Telegraph-Telephone Signal Converter TA-182/U, or equivalent, is required to convert the ringing and alarm signals to the 20 cycles per second (cps) used on the remote telephone equipment.

*e*. Order Wire and Ring Signal During Pcm Transmission. These signals are generated the same as the fdm signals (*d* above) except that during pcm reception, the order wire information is separated in the pcm multiplex equipment.

### 1-17. Repeater Station System (fig. 6-1)

*a. General.* When the radio set is used in communications system extending more than approximately 30 miles, a repeater station is required at each 30-mile interval. The signal paths for a system using one repeater station are discussed in b through e below.

*b. Fdm.*

(1) Multiplex signals (FDM) from the fdm equipment at terminal station No. 1 are fed through the receiver to the transmitter (FDM OUT). From the transmitter, the signals are coupled through the duplexer to the antenna for propagation towards the repeater station.

(2) The signals are received by antenna (A) at the repeater station and are fed through a duplexer in transmitter (A) to receiver A (RF). From receiver (A), the signals (FDM) are routed through receiver (B) to transmitter (B). The signals are then coupled through the duplexer to antenna (B) for propagation towards terminal station No. 2.

(3) At terminal station No. 2, the signals are received by the antenna and are fed through a duplexer in the transmitter and then to the receiver (RF). From the receiver, the multiplex signal (FDM) is coupled to fdm equipment. Fdm traffic from terminal station No. 2 to terminal station No. 1 is handled similarly, with the signal path reversed.

*c. Pcm.*

(1) Multiplex signals (PCM IN) from pcm transmitting equipment at terminal station No. 1 are fed through the transmitter and the duplexer to the antenna for propagation towards the repeater station.

(2) The signals received at the repeater station by antenna (A) are coupled through a duplexer in transmitter (A) to receiver (A) (RF). From receiver (A) the signals (PCM OUT) are fed through a pcm multiplexer (A) where they are routed (PCM) with an associated timing signal (TIM) to another pcm multiplexer (B). The resultant signals (PCM IN) are fed through transmitter (B) and propagated towards transmit station No. 2.

(3) At terminal station No. 2, the signals are received by the antenna, fed through a duplexer in the transmitter (RF) to the receiver, and then (PCM OUT) to the pcm multiplex equipment. Pcm traffic from terminal station No. 2 to terminal station No. 1 is handled similarly, with the signal path reversed.

*d. Order-Wire and Ring Signal During FDM Transmission.* The local and remote handsets at a repeater station operate as described in paragraph 1-16d. Both local and remote handsets at a repeater station operate on both system directions.

*e. Order-Wire and Ring Signal during PCM Transmission*. The local and remote handsets at a repeater station operate as described in paragraph 1-16e. The order-wire signals, separated from the pcm signals at the pcm multiplex equipment (A) are returned to the receiver (A) and then routed to the receiver (B) over the FDM lines. One pcm multiplex system, transmitter, and receiver is required at each repeater station for each direction of transmission.

## 1-18. Interoperation With Radio Set AN/TRC-24 Configurations, Fdm Operation Only

The AN/GRC-50(*)(V) may be interoperated with the AN/TRC-24 which is provided with Radio Set Group AN/TRA-25 or AN/TRA-25A to operate in the AN/TRC-24 F-band or with the Radio Set Group OA3668A/TRC-24 to operate in the AN/TR C-24 24 J-band. This arrangement applies to operation with fdm equipment at the AN/GRC-50(*)(V) There is no provision for pcm operation with the AN/TRC-24 configurations.

*a.* The following chart shows the frequency bands and corresponding channels within which the AN/GRC-50(*)(V) and AN/TR C-24 24 can communicate:

| Frequency (mc) | AN/GRC-50(*)(V) | AN/TRC-24 |
|---|---|---|
| | Low-band | F-band |
| 790.5<br><br>964.5 | Channel 189 through channel 364 | Channel 1 through channel 249[a] |
| | High-band | J-band |
| 1,349.5<br><br>1,849.5 | Channel 400 through channel 899 | Channels 1 through 249 on low and medium bands; and channels 1 through 198 on high band [b]. |

[a] Only the odd-numbered channels of the F- band may be used.
[b] see c(2) (*b*) below.

*b*. The chart in a above shows that only channels 189 through 365 of the AN/GRC-50(*)(V) low band and all channels of the high band can be used.

*c*. When the frequency in megacycles to be used for communication between the two radio sets has been determined, the corresponding channels of the respective radio sets are selected,

(1) For the AN/GRC 50(*)(V), refer to paragraph 3-6 to determine the corresponding channel.

(2) For the AN/TRC-24 instructions are given in TM 11-5820-287-12 for channel assignment charts and also for special instructions titled *interoperation untie Radio Set AN/GRC-50.*

*(a)* In the F-band of the AN/TRC-24, only the odd-numbered channels may be used.

*(b)* In the J-band of the AN/TRC-24, the channel settings for the transmitting and receiving frequencies do not exactly correspond to the AN/GRC-50(*)(V) channel frequencies. Thus, before the radio link-lineup, arrangements must be made to decide exactly which AN/TRC-24 frequency will be used and then, during the lineup, which receiver will tune in on the other's transmitter.

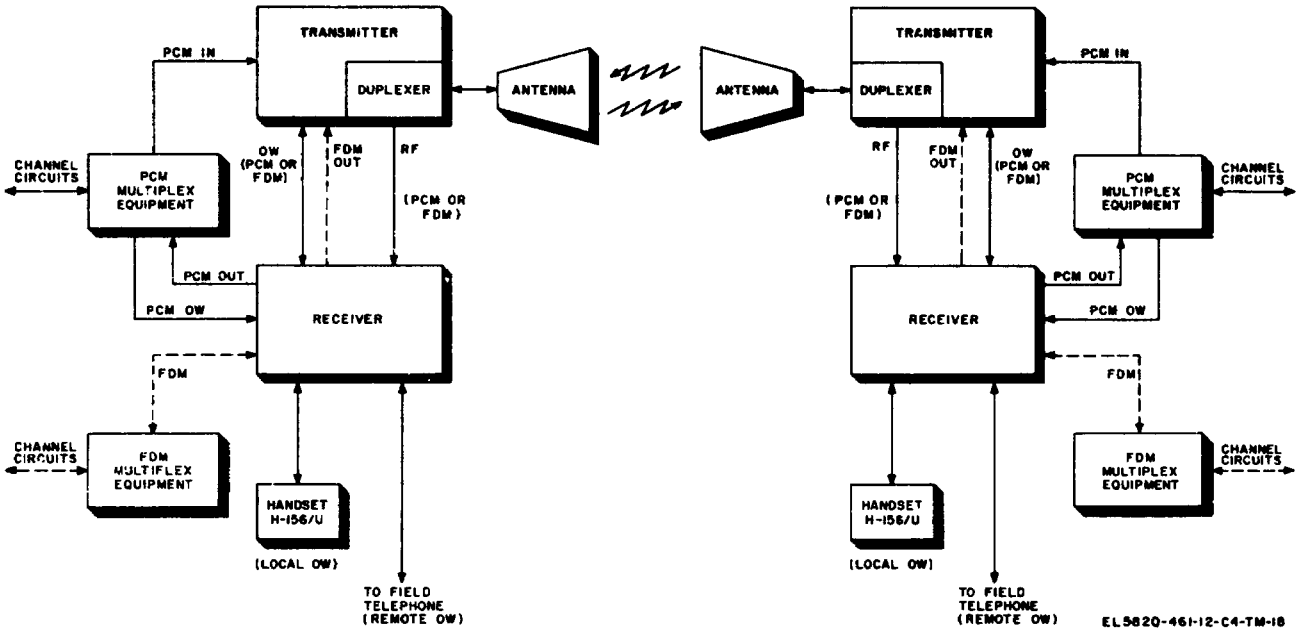



Figure 1-15. System Application using two terminals

# CHAPTER 2
# INSTALLATION

## Section I. SERVICE UPON RECEIPT OF EQUIPMENT

### 2-1. Unpacking

When the radio sets are installed in vans or shelters, refer to unpacking instructions given in the technical manuals applicable to the van or shelter. When the radio set is not installed in a van or shelter, refer to *a* through *b* below.

*a. Packaging Data*. When packed for shipment, the components of the radio set are placed in cartons and packed in wooden boxes. A typical packing case and its contents are shown in figure 2-1. The packaging data for the AN/GRC-50(V)1 is listed below. The other models are packed similarly. Refer to appendix B for list of items contained in other configurations of the radio set.

| Box No. | Dimensions (in.) Height | Width | Depth | Volume (cu ft) | Unit weight (lb.) | Contents of box |
|---|---|---|---|---|---|---|
| 1 | 18 | 22 | 24 | 5.5 | 135 | T-893(P)GRC and AM-1957/GRC |
| 2 | 18 | 22 | 24 | 5.5 | 130 | R-1148(P)/GRC and AM-1955/GRC; or R-1131(*)/(P)/GRC and AM-1955A/GRC or AM-1955B/GRC. |
| 3 | 12 | 22 | 24 | 3.56 | 120 | PP-2054(*)/GRC |
| 4 | 17 | 18 | 22 | 3.89 | 112 | CY-2583/GRC, DA-189/GRC, and BG-102A |
| 5 | 22 | 22 | 26 | 7.25 | 119 | CY-2582/GRC, AM-1956(*)/GRC, and AM-1958(*)/GRC |
| 6 | 10 | 29 | 27 | 4.53 | 100 | RC-404/TR |
| 7 | 22 | 26 | 36 | 11.33 | 70 | AT-903/G |
| 8 | 26 | 17 | 119 | 30.43 | 310 | AB-577/GRC |
| 9 | 9 | 18 | 17 | 1.59 | 109 | CN-514/GRC |
| 10 | 37 | 14 | 35 | 10.49 | 110 | RC-436/GRC |
| | Total weight ..... | | | | 1,315 | |

*b. Component Dimensions.*

| Component | Overall dimensions (in.) Height | Width | Depth | Volume (cu ft) | Weight (lb) |
|---|---|---|---|---|---|
| Case, Standardized Components, Electrical CY-2429/GRC | 13 3/4 | 17 | 20 | 2.5 | 19.5 |
| Transmitter, Radio T-893(P)/GRC (without case) | 12 3/4 | 16 | 17 1/4 | 2 50 | |
| Amplifier-Oscillator AM-1957/GRC | 8 7/8 | 11 | 14 3/4 | 0.8 | 36.5 |
| Amplifier-Oscillator AM-1958(*)1GRC | 8 7/8 | 11 | 14 3/4 | 0.8 | 35.5 |
| Power Supply PP-2064(*)/GRC (less case) | 7 3/4 | 16 | 17 1/4 | 1.25 | 82 |
| Case, Power Supply CY-2428/GRC | 8 1/2 | 17 | 20 | 1.5 | 16.5 |
| Receiver, Radio R-1148(P)/GRC, or R-1331(*)(P)/GRC (less case). | 12 3/4 | 16 | 17 1/4 | 2 | 59.25 |
| Amplifier-Converter AM-1955(*)/GRC | 8 1/4 | 9 1/8 | 13 3/4 | 0.5 | 21.25 |
| Amplifier-Converter AM-1956(*)/GRC | 8 1/4 | 9 1/8 | 13 3/4 | 0.5 | 20.75 |
| Antenna AT-9031G | 20 | 24 | 24 | 6.3 | 30 |

| Component | Overall dimensions (in.) | | | Volume (cu ft) | Weight (lb) |
|---|---|---|---|---|---|
| | Height | Width | Depth | | |
| Reel, Cable RW-436/GRC [a] | 32 | 12 diameter | ..... | 2.1 | 100 |
| Mast AB-577/GRC | 95 | 14 5/16 | 22 1/16 | 17.5 | 240 |
| Regulator, Voltage CN-514/GRC (less case) | 7 3/4 | 16 | 14 | 1 | 89.25 |
| Case Standardized Components, Electrical CY-2851/G | 8 1/2 | 17 | 15 | 1.4 | 15.75 |
| Reel, Cable RC-404/TR | 24 | 6 diameter | ..... | 0.4 | 20 |
| Case, Standardized Components, Electrical CY-2582/GRC | 18 | 24 | 18 | 4.5 | 36 |
| Switch Box SA-640/GRC | 8 1/2 | 9 | 9.25 | 0.5 | 30 |
| Dummy load, Electrical DA-189/GRC | 4 1/8 | 4 | 10.25 | 0.1 | 6.75 |
| Accessory Bag BG-102A[b] | 13 1/2 | 14 | 9 | 0.7 | 25 |
| Case Standardized Components Electrical CY-2583/GRC [c] | 5 | 17 | 20 | 0.98 | 25 |

[a] Includes cables connectors and adapters.
[b] Includes accessories.
[c] Includes running spares and accessories.

*c. Removing Contents*. Perform the following procedures when unpacking the equipment:

(1) Select a location that is convenient to the installation of the equipment and where the equipment may be unpacked without exposure to bad weather.
(2) Cut and fold back the metal straps. Use a pair of tin snips or a large pair of diagonal-cutting pliers.
(3) Remove the nails from the top and one side of the box with a nailpuller. Remove the top and one side.

**Caution: Do not attempt to pry off the top and side of the box without removing the nails because the equipment may become damaged.**

(4) Lift out the moisture-proof barrier containing the outer carton.
(5) Remove the gum seal on the moisture-proof barrier and remove the outer carton.
(6) Open the carton and remove the moisture-vaporproof barrier containing the inner carton. Remove the inner carton. Open the inner carton and remove the contents.

## 2-2. Checking Unpacked Equipment

*a.* Inspect the equipment for possible damage incurred during shipment. If the equipment has been damaged, refer to paragraph 1-3 for the applicable forms and records.

*b*. Check to see that the equipment is complete as listed on the packing slip. If a packing slip is not available, check the equipment against the basic issue items list (app B).

*c*. If the equipment has been used or reconditioned, see whether it has been changed by a modification work order (MWO), in which case the MWO number will appear on the front panel near the nomenclature plate.

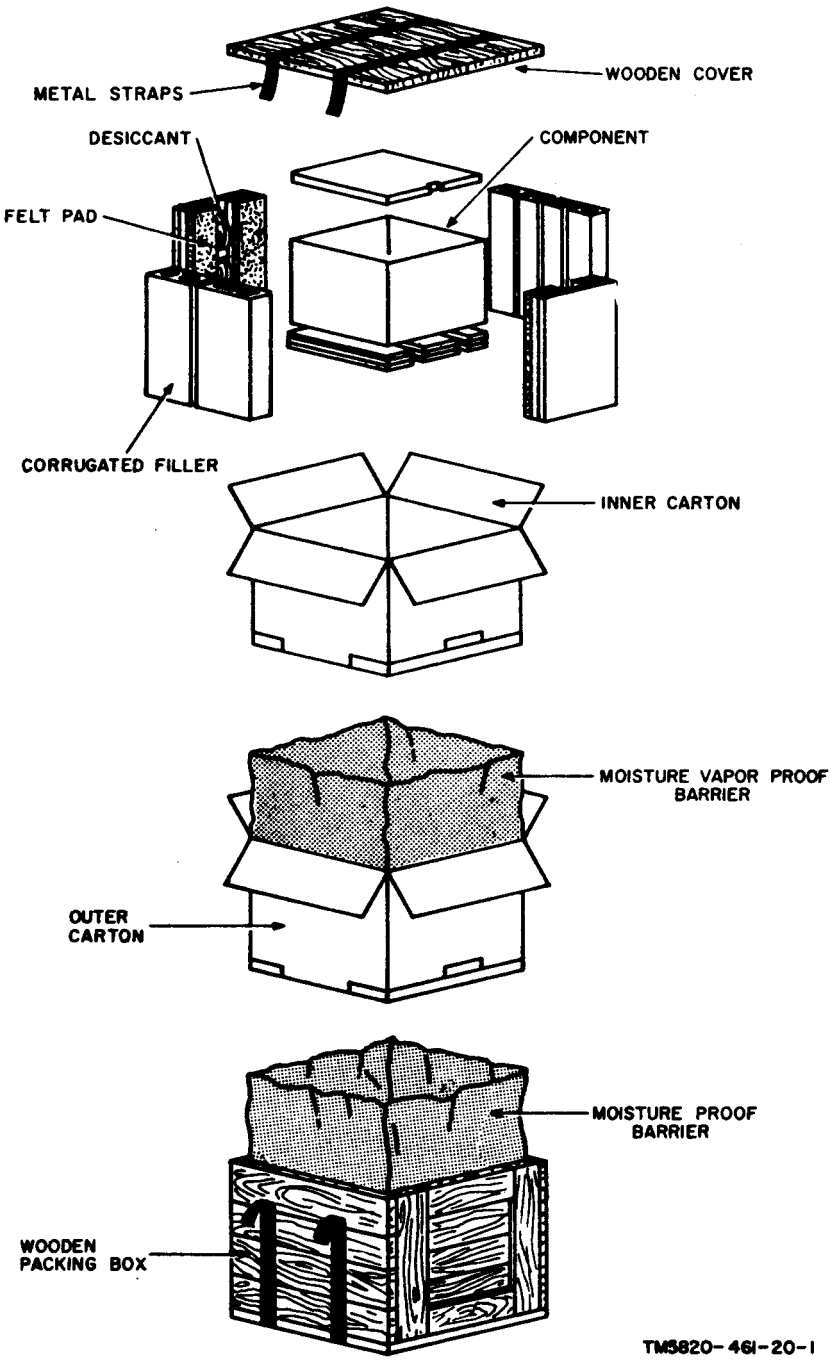



Figure 2-1. Typical packaging diagram.

## Section II. INSTALLATION WARNING

*I.* Safety precautions must be observed when erecting and using the antenna assembly. DEATH can easily occur if the antenna assembly comes in contact with electric powerlines.

Prior to erection of this antenna assembly, survey the area carefully for location of powerlines, their height above ground level, and their proximity to the installation site. The antenna assembly must be installed as far away as possible from electric powerlines, but never closer than twice its height.

The antenna assembly is 49.5, 51, 76.5, or 78 feet tall (depending upon which components are used), so it should never be erected closer than 2 times the height of the structure from the base of the nearest powerlines.

When erection in the vicinity of the powerlines cannot be avoided, the responsible authority will warn all personnel who are to participate in the exercise that contact by the structure with powerlines can cause serious injury or death.

*II*. Guy lines will be kept as far away from powerlines as possible to reduce the possibility of a powerline falling across a guy line.

NEVER touch a structure or any attachment connected to it if the possibility exists that it may be accidentally electrically energized. The area around the structure that is suspected of being energized should be roped off and guards should be posted to prevent anyone from entering the area. Immediately thereafter proper authorities should be notified so that remedial action can be taken.

NEVER engage in work on a structure during an electrical storm or when a storm is imminent.

Personnel engaged in installation of the antenna assembly should be adequately instructed by responsible authority as to the overall method of erection and the specific hazards encountered. Under no circumstances should the erection be attempted with fewer than two persons erecting the mast, and three persons available to hold the ends of the guys, while the mast is being erected. Use of fewer personnel may result in serious injury to the participating personnel or major damage to the equipment. Only personnel required for erection will be in the erection area. All other nonessential personnel must stand clear of the area. During erection of the antenna assembly, conform m to all safety requirements set forth in TB SIG 291.

Plan the installation so that as much of the assembly of the structure as possible i:; accomplished on the ground. Where situations make it necessary to work aloft, thought should be given to the selection of a suitable working location on the structure so that unnecessary climbing or movement can be avoided. Plan each aerial operation so that unnecessary work aloft is avoided.

NEVER walk directly beneath the structure during erection. NEVER stand beneath anything being hoisted. When an assembly, or member, is raised or lowered either by winch or hand, one person should attend the hauling line. This condition will keep the area around the workers feet clear and prevent the person from being entangled. When lowering an assembly or member by the winch, keep the hands as far away from the winch cable reel as possible. NEVER overload the antenna assembly by installing additional sections or assemblies than those authorized.

NEVER attempt to support a structure using fewer guys than prescribed. All guys and the hoisting cable will be inspected for worn spots, frays, rotten portions (ropes only), and any other Imperfections prior for to being placed in use. Do not use any guys and hoisting cable that show any of the imperfections. Do not fasten guys (especially ropes over sharp-edged surfaces which may abraid or cut the guys and cause their failure. If in the course of erection it becomes necessary to suspend operations, sufficient guys must be attached to support the structure safely.

All anchors must be securely entrenched in the ground. In marshy or sandy terrain, special provisions must be made to obtain required anchor holding strength. When selecting anchor locations for guys, avoid locations that will cause the guys to pass over roadways. When these locations cannot be avoided, maximum road clearance must be maintained. Plainly marked guys with orange paint and red flag warning signs, indicating overhead obstructions and their height over the roadway, will be posted.

When making installations in a region known for its heavy icing conditions, thought should be given to providing extra support to the assembly, prior to erection. When an assembly becomes heavily iced, the surrounding area should be roped off and marked "BEWARE OF FALLING ICE."

*III.* Basic Rescue Rules. In the event an individual comes in contact with an electrically energized structure, follow the procedures below in the order as listed:

*a*. NEVER attempt to grasp or pull free the individual--such an action can cause instant death to the rescuer.

*b.* If possible, turn off the electrical power. If not, try to free the individual by using a wooden pole, rope, or some other insulated object.

*c*. After freeing the individual, immediately start artificial resuscitation and send for help.

## 2-3 Preliminary Installation Data

The selection of a site and the design of the installation should be undertaken only by trained personnel. The following instructions are general and will apply to any site.

*a. General.* The siting requirements for the radio sets are determined before any actual installation of equipment. Information required for siting includes profile plotting, selection of operating frequencies, system applications, drop channel facilities, and terminal locations. Information is contained in TM 11-486-6 for preparing the site installation order.

*b. Antenna Siting.* The locations of the antennas in an overall radio relay system are extremely important for consistent communication. The installation order supplied for each of the proposed sites should contain the elevation or depression angle, polarization of the antenna, and relative direction. These data are covered in (1) through (3) below:

(1) *Antenna polarization.* Antenna AT-903/G may provide horizontal or vertical polarization, depending on the way it is mounted (fig. 1-7). The antenna polarization between two stations must be the same. For example, if the transmitting station antenna is horizontally polarized, the receiving station antenna also must be horizontally polarized. When two or more radio sets are placed at the same site, one antenna should be vertically polarized to provide isolation and avoid interference. Approximately 20 to 25 decibel (db) signal attenuation is attained by the cross-polarization.

(2) *Antenna depression-elevation angle.* Antenna AT-903/G may be elevated or depressed in graduated steps to provide correct antenna relationships between relay stations of the radio system. The amount of elevation or depression required for an individual antenna may be determined from the graph in figure 6-2. The angle of depression will be the same as the angle of elevation for the preceding antenna. Refer to figure 6-2 for the two examples listed below.

*(a) Example I.*

*1*. Assume that station A is separated from station B by 28 miles (distance between antenna sites). Also assume that station B is elevated above station A by 2 miles (elevation difference between antenna sites).

*2*. In the horizontal column D, locate the 28-mile point.

*3*. Project a vertical line from the 28-mile point.

*4*. In the vertical column D, locate the 2-mile point.

*5*. Project a horizontal line from the 2-mile point.

*6*. The point of intersection of the two projected lines will indicate the depression elevation angle.

*7*. Station A will set the antenna elevation angle to 4°.

*8*. Station B will set the antenna depression angle to 4°.

*(b) Example II.*

*1*. Assume that station A is separated by 3,100 feet from station B. Also assume that station A is above station B by 500 feet.

*2*. Along the horizontal column B, locate the 3,100-feet point and project a vertical line from this point.
*3*. Along the vertical column B, locate the 500-foot point and project a horizontal line from this point.
*4*. The point of intersection of the two projected lines indicates a depression-elevation angle of 8°.
*5*. Station A will use an antenna depression angle of 8°, and station B will use an antenna elevation of 8°.

(3) *Coarse azimuth alignment.* Exact antenna orientation is performed during the system lineup (20, para 3-6). To obtain a coarse antenna direction when the desired bearing is not known, use the following procedure:

(a) Obtain the desired bearing by reference to a topographical map. When the bearing is determined, install a marker about 150 feet away from the selected antenna site with the aid of a compass.

*(b)* When installing the first guy anchor for the antenna mast, place it in line with the antenna base marker.

*c. Frequency Selection Restrictions.*

(1) *Assigning frequencies.* Operating frequencies should be selected at the 0.5-mc points of the frequency band of the radio sets (601.5 through 999.5 and 1,350.5 through 1,849.5 mc). Refer to paragraph 3-6 for the formula used to convert frequencies to channels and vice versa. For example: select 660.5 or 661.5 mc; do not select 660 or 661 mc. For tuning of the radio set, every frequency selection ending with .5 mc can be converted to a channel. No provision is made for converting a frequency that does not end with .5 mc to a channel number. If a frequency assignment has been made, for example, at 710 mc the operators at both radio terminals must decide before performing tuning procedures whether they will use 709.5 or 710.5 as their operating frequency. Without this arrangement, communication will be delayed until the operators find each other by trial and error; at which time, they will have to realign their radio sets.

(2) *Restricted channels/frequencies.* The chart in (3) below lists the channel and its corresponding frequency (in mc). For each channel/frequency is listed the corresponding channels/frequencies which are detrimental to operation of a receiver, and which are caused by the interference of the signal from a transmitter either in the same stack or in a nearby radio set. The restrictions in *(a)* through *(c)* below must be maintained for a transmitter and receiver in the same stack.

Note. For radio sets that are at the same site (such as a repeater station or a group of terminal station radio sets in one area), the restrictions in *(b*), *(c),* and *(d)* below most likely, would not apply if the radio sets of the conflicting channels/frequencies operate with their antennas polarized differently. That is, if one of the potentially interfering radio sets has its antenna polarized vertically, the other must be polarized horizontally. Such an arrangement provides approximately 20 to 25 db attenuation between the antenna signals.

*(a)* The -15 to +15 column lists the 30-mc channel/frequency band (15 on both sides of each channel/frequency) within which the receiver must not be tuned to the transmitter in the same stack or nearby radio set.

*(b)* The +50 (±3) and +100 (±3) columns are restrictions based on the susceptibility of the receiver to be blocked by its own or nearby transmitter signal and thus preventing the receiver from receiving the signal transmitted from the distant radio station. Refer to the note in (2) above.

*(c)* The +60 (±3) and +120 (±3) columns list the restriction for image frequencies. After the system has been lined up and the transmission from the distant station is interrupted, it is possible for the receiver to lock on to its own or another transmitter in which the transmitting frequency is 60 or 120 mc ±3 below the receiver frequency; that is, the receiver is 60 or 120 mc ±3 above the transmitter frequency. When the distant transmitter operation is restored, the receiver will not respond to its signal because it is locked on to another transmitter. To prevent this lock-on, the receiver must not be assigned an operating frequency that is 60 or 120 ±3 mc above its own or a nearby transmitter frequency. Refer to the note in (2) above.

*(d)* The cross modulation restriction is required when the radio set is situated at a repeater station or at a site where other radio sets are located. The power of the transmitted signal developed by cross modulation may cause damage to a receiver's crystal. The restriction is similar to the requirement to keep the receiver frequency separated from the transmitter frequency by at least 15 mc (*(a)* above). Cross modulation results when the second harmonic of one transmitter at a repeater site is mixed with the fundamental frequency of another transmitter at the same repeater site. If the frequency difference of the mixture of the two transmitter signals is within 15 mc of a receiver frequency, the receiver crystal may be damaged. An example of frequency selection for a repeater station is given below.

| Component | Frequency (mc) |
|---|---|
| Transmitter A ..... | 660.5 |
| Receiver A ..... | 640.5 |
| Transmitter B ..... | 750.5 |
| Receiver B ..... | 550.5 |

*1*. Assume that the second harmonic of transmitter A is mixed with the fundamental (transmitter) frequency of transmitter B. The resultant difference ((2 x 660.5) -750.5) will be 570.5 mc This difference frequency is not within 15 mc of either receiver A or receiver B.

*2*. Assume that the second harmonic of transmitter B is mixed with the fundamental frequency of transmitter A ((2 x 750.5) -660.5). The resultant difference will be 840.5 mc This difference frequency also is not within 15 mc of either receiver A or receiver B; therefore, the frequency selection given in the chart in *(d)* above is acceptable for a repeater station.

*3*. With the same transmitter frequencies, it follows that 570.5 mc (1 above) is outside the radio set band, but 840.5 mc (2 above) could not be used for a receiver at the repeater station.

*4*. Refer to the note in (2) above.

*(3) Restricted channels/frequencies chart*. In addition to the separation restrictions given in (2) above and the following chart, it is also recommended that the receiver channel/frequency separation of +30 (±3) and +40 (±3) be observed. Interference at these points usually occurs. Note that the loop-back tuning procedures in paragraph 3-11 permit the use of the image frequency (+120) for local testing only.

| Low-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 1 | 1-16 | 48-64 | 58-64 | 98-104 | 118-124 |
| 601.5 | | 601.5-616.5 | 648.5-654.5 | 658.5-664.5 | 698.5-704.5 | 718.5-724.5 |
| | 2 | 1-17 | 49-56 | 59-65 | 99-105 | 119-125 |
| 602.5 | | 601.5-617.5 | 649.5-665.5 | 669.5-666.5 | 699.5-705.5 | 719.5-725.5 |
| | 3 | 1-18 | 50-66 | 60-66 | 100-106 | 120-126 |
| 603.5 | | 601.5-618.5 | 660.5-666.5 | 660.5-666.5 | 700.5-706.5 | 720.5-726.5 |
| | 4 | 1-19 | 61-67 | 61-67 | 101-107 | 121-127 |
| 604.5 | | 601.5-619.5 | 661.5-667.5 | 661.5-667.5 | 701.5-707.5 | 721.5-727.5 |

| Low -band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 5 | 1-20 | 52-58 | 62-68 | 102-108 | 122-128 |
| 605.5 | ----- | 601.5-620.5 | 652.5-658.5 | 662.5-668.5 | 702.5-708.5 | 722.5-728.5 |
| | 6 | 1-21 | 53-59 | 63-69 | 103-109 | 123-129 |
| 606.5 | ----- | 601.5-621.5 | 653.5-659.5 | 663.5-669.5 | 703.5-709.5 | 723.5-729.5 |
| | 7 | 1-22 | 54-60 | 64-70 | 104-110 | 124-130 |
| 607.5 | ----- | 601.5-622.5 | 654.5-660.5 | 664.5-670.5 | 704.5-710.5 | 724.5-730.5 |
| | 8 | 1-23 | 55-61 | 65-71 | 105-111 | 126-131 |
| 608.5 | ----- | 601.5-623.5 | 655.5-661.5 | 665.5-671.5 | 705.5-711.5 | 725.5-731.5 |
| | 9 | 1-24 | 56-62 | 66-72 | 106-112 | 126-132 |
| 609.5 | ----- | 601.5-624.5 | 656.5-662.5 | 666.5-672.5 | 706.5-712.5 | 726.5-732.5 |
| | 10 | 1-26 | 57-63 | 67-73 | 107-118 | 127-133 |
| 610.5 | ----- | 601.5-625.5 | 657.5-663.5 | 667.5-673.5 | 707.5-713.5 | 727.5-733.5 |
| | 11 | 1-26 | 58-64 | 68-74 | 108-114 | 128-134 |
| 611.5 | ----- | 601.5-626.5 | 658.5-664.5 | 668.5-674.5 | 708.5-714.5 | 728.5-734.5 |
| | 12 | 1-27 | 59-65 | 69-75 | 109-115 | 129-135 |
| 612.5 | ----- | 601.5-627.5 | 659.5-665.5 | 669.5-675.5 | 709.5-715.5 | 729.5-735.5 |
| | 13 | 1-28 | 60-66 | 70-76 | 110-116 | 130-136 |
| 613.5 | ----- | 601.5-628.5 | 660.5-666.5 | 670.5-676.5 | 710.5-716.5 | 730.5-736.5 |
| | 14 | 1-29 | 61-67 | 71-77 | 111-117 | 131-137 |
| 614.5 | ----- | 601.5-629.5 | 661.5-667.5 | 671.5-677.5 | 711.5-717.5 | 731.5-737.5 |
| | 15 | 1-30 | 62-68 | 72-78 | 112-118 | 132-138 |
| 615.5 | ----- | 601.5-630.5 | 662.5-668.5 | 672.5-678.5 | 712.5-718.5 | 732.5-738.5 |
| | 16 | 1-31 | 63-69 | 73-79 | 113-119 | 135-139 |
| 616.5 | ----- | 601.5-631.5 | 663.5-669.5 | 673.5-679.5 | 713.5-719.5 | 733.5-739.5 |
| | 17 | 2-32 | 64-70 | 74-80 | 114-120 | 134-140 |
| 617.5 | ----- | 602.5-632.5 | 664.5-670.5 | 674.5-680.5 | 714.5-720.5 | 734.5-740.5 |
| | 18 | 3-33 | 65-71 | 75-81 | 115-121 | 135-141 |
| 618.5 | ----- | 603.5-633.5 | 665.5-671.5 | 675.5-681.5 | 715.5-721.5 | 735.5-741.5 |
| | 19 | 4-34 | 66-72 | 76-82 | 116-122 | 136-142 |
| 619.5 | ----- | 604.5-634.5 | 666.5-672.5 | 676.5-682.5 | 716.5-722.5 | 736.5-742.5 |
| | 20 | 5-35 | 67-73 | 77-83 | 117-123 | 137-143 |
| 620.5 | ----- | 605.5-635.5 | 667.5-673.5 | 677.5-683.5 | 717.5-723.5 | 737.5-748.5 |
| | 21 | 6-36 | 68-74 | 78-84 | 118-124 | 138-144 |
| 621.5 | ----- | 606.5-636.5 | 668.5-674.5 | 678.5-684.5 | 718.5-724.5 | 738.5-744.5 |
| | 22 | 7-37 | 69-75 | 79-85 | 119-125 | 139-145 |
| 622.5 | ----- | 607.5-637.5 | 669.5-675.5 | 679.5-685.5 | 719.5-725.5 | 739.5-745.5 |
| | 23 | 8-38 | 70-76 | 80-86 | 120-126 | 140-146 |
| 623.5 | ----- | 608.5-638.5 | 670.5-676.5 | 680.5-686.5 | 720.5-726.5 | 740.5-746.5 |
| | 24 | 9-39 | 71-77 | 81-87 | 121-127 | 141-147 |
| 624.5 | ----- | 609.5-639.5 | 671.5-677.5 | 681.5-687.5 | 721.5-727.5 | 741.5-747.5 |
| | 25 | 10-40 | 72-78 | 82-88 | 122-128 | 142-148 |
| 625.5 | ----- | 610.5-640.5 | 672.5-678.5 | 682.5-688.5 | 722.5-728.5 | 742.5-748.5 |
| | 26 | 11-41 | 73-79 | 83-89 | 123-129 | 143-149 |
| 626.5 | ----- | 611.5-641-5 | 673.5-679.5 | 683.5-689.5 | 723.5-729.5 | 743.5-749.5 |
| | 27 | 12-42 | 74-80 | 84-90 | 124-130 | 144-150 |
| 627.5 | ----- | 612.5-642.5 | 674.5-680.5 | 684.5-690.5 | 724.5-730.5 | 744.5-750.5 |
| | 28 | 13-43 | 75-81 | 85-91 | 125-131 | 145-151 |
| 628.5 | ----- | 613.5-643.5 | 675.5-681.5 | 685.5-691.5 | 725.5-731.5 | 745.5-751.5 |
| | 29 | 14-44 | 76-82 | 86-92 | 126-132 | 146-152 |
| 629.5 | ----- | 614.5-644.5 | 676.5-682.5 | 686.5-692.5 | 726.5-732.5 | 746.5-752.5 |
| | 30 | 15-45 | 77-83 | 87-93 | 127-133 | 147-153 |
| 630.5 | ----- | 615.5-645.5 | 677.5-683.5 | 687.5-693.5 | 727.5-733. | 747.5-753.5 |
| | 31 | 16-46 | 78-84 | 88-94 | 128-134 | 148-154 |
| 631.5 | ----- | 616.5-646.5 | 678.5-684.5 | 688.5-694.5 | 728.5-734.5 | 748.5-754.5 |

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| Low -band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 32 | 17-47 | 79-85 | 89-95 | 129-135 | 149-155 |
| 632.5 | ----- | 617.5-647.5 | 679.5-685.5 | 689.5-695.5 | 729.5-735.5 | 749.5-755.5 |
| | 33 | 18-48 | 80-86 | 90-96 | 130-136 | 150-156 |
| 633.5 | ----- | 618.5-648.5 | 680.5-686.5 | 690.5-696.5 | 730.5-736.5 | 750.5-756.5 |
| | 34 | 19-49 | 81-87 | 91-97 | 131-137 | 151-157 |
| 634.5 | ----- | 619.5-649.5 | 681.5-687.5 | 691.5-697.5 | 731.5-737.5 | 751.5-757.5 |
| | 35 | 20-50 | 82-88 | 92-98 | 132-138 | 152-158 |
| 635.5 | ----- | 620.5-650.5 | 682.5-688.5 | 692.5-698.5 | 782.5-738.5 | 752.5-758.5 |
| | 36 | 21-51 | 83-89 | 93-99 | 133-139 | 153-159 |
| 636.5 | ----- | 621.5-651.5 | 683.5-689.5 | 693.5-699.5 | 733.5-739.5 | 753.5-759.5 |
| | 37 | 22-52 | 84-90 | 94-100 | 134-140 | 154-160 |
| 637.5 | ----- | 622.5-652.5 | 684.5-690.5 | 694.5-700.5 | 734.5-740.5 | 754.5-760.5 |
| | 38 | 23-53 | 85-91 | 95-101 | 135-141 | 155-161 |
| 638.5 | ----- | 623.5-653.5 | 685.5-691.5 | 695.5-701.5 | 735.5-741.5 | 755.5-761.5 |
| | 39 | 24-54 | 86-92 | 96-102 | 136-142 | 156-162 |
| 639.5 | ----- | 624.5-654.5 | 686.5-692.5 | 696.5-702.5 | 736.5-742.5 | 756.5-762.5 |
| | 40 | 25-55 | 87-93 | 97-103 | 137-143 | 157-163 |
| 640.5 | ----- | 625.5-655.5 | 687.5-693.5 | 697.5-703.5 | 737,5-743,5 | 757.5-763.5 |
| | 41 | 26-56 | 88-94 | 98-104 | 138-144 | 158-164 |
| 641.5 | ----- | 626.5-666.5 | 688.5-694.5 | 698.5-704.5 | 738.5-744.5 | 758.5-764.5 |
| | 42 | 27-57 | 89-95 | 99-105 | 139-145 | 159-165 |
| 642.5 | ----- | 627.5-657.5 | 689.5-695.5 | 699.5-705.5 | 739,5-745.5 | 759.5-765.5 |
| | 43 | 28-58 | 90-96 | 100-106 | 140-146 | 160-166 |
| 643.5 | ----- | 628.5-658.5 | 690.5-696.5 | 700.5-706.5 | 740.5-746.5 | 760.5-766.5 |
| | 44 | 29-59 | 91-97 | 101-107 | 141-147 | 161-167 |
| 644.5 | ----- | 629.5-659.5 | 691.5-697.5 | 701.5-707.5 | 741.5-747.5 | 761.5-767.5 |
| | 45 | 30-60 | 92-98 | 102-108 | 142-148 | 162-168 |
| 645.5 | ----- | 630.5-660.5 | 692.5-698.5 | 702.5-708.5 | 742.5-748.5 | 762.5-768.5 |
| | 46 | 31-61 | 93-99 | 103-109 | 143-149 | 163-169 |
| 646.5 | ----- | 631.5-661.5 | 69$.5-699.5 | 703.5-709.5 | 743.5-749.5 | 763.5-769.5 |
| | 47 | 32-62 | 94-100 | 104-110 | 144-150 | 164-170 |
| 647.5 | ----- | 682.5-662.5 | 694.5-700.5 | 704.5-710.5 | 744.5-750.5 | 764.5-770.5 |
| | 48 | 33-63 | 95-101 | 105-111 | 145-151 | 165-171 |
| 648.5 | ----- | 633.5-663.5 | 695.5-701.5 | 705.5-711.5 | 745.5-751.5 | 765.5-771.5 |
| | 49 | 34-64 | 96-102 | 106-112 | 146-152 | 166-172 |
| 649.5 | ----- | 634.5-664.5 | 696.5-702.5 | 706.5-712.5 | 746.5-762.5 | 766.5-772.5 |
| | 60 | 35-65 | 97-103 | 107-113 | 147-153 | 167-173 |
| 660.5 | ----- | 636.5-666.5 | 697.5-703.5 | 707.5-713.5 | 747.5-763.5 | 767.5-773.5 |
| | 61 | 36-66 | 98-104 | 108-114 | 148-164 | 168-174 |
| 661.5 | ----- | 636.5-666.5 | 698.5-704.5 | 708.5-714.5 | 748.5-754.5 | 768.5-774.5 |
| | 52 | 37-67 | 99-105 | 109-115 | 149-155 | 169-175 |
| 652.5 | ----- | 637.5-667.5 | 699.5-705.5 | 709.5-715.5 | 749.5-755.5 | 769.5-775.5 |
| | 53 | 38-68 | 100-106 | 110-116 | 150-156 | 170-176 |
| 653.5 | ----- | 638.5-668.5 | 700.5-706.5 | 710.5-716.5 | 750.5-756.5 | 770.5-776.5 |
| | 54 | 39-69 | 101-107 | 111-117 | 151-157 | 171-177 |
| 654.5 | ----- | 639.5-669.5 | 701.5-707.5 | 711.5-717.5 | 751.5-757.5 | 771.5-777.5 |
| | 55 | 40-70 | 102-108 | 112-118 | 152-158 | 172-178 |
| 655.5 | ----- | 640.5-670.5 | 702.5-708.5 | 712.5-718.5 | 762.5-768.5 | 772.5-778.5 |
| | 56 | 41-71 | 103-109 | 113-119 | 153-159 | 173-179 |
| 656.5 | ----- | 641.5-671.5 | 703.5-709.5 | 713.5-719.5 | 753.5-759.5 | 773.5-779.5 |
| | 57 | 42-72 | 104-110 | 114-120 | 154-160 | 174-180 |
| 657.5 | ----- | 642.5-672.5 | 704.5-710.5 | 714.5-720.5 | 754.5-760.5 | 774.5-780.5 |
| | 58 | 43-73 | 105-111 | 115-121 | 155-161 | 175-181 |
| 658.5 | ----- | 643.5-673.5 | 705.5-711.5 | 715.5-721.5 | 755.5-761.5 | 775.5-781.5 |

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| Low -band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 59 | 44-74 | 106-112 | 116-122 | 156-162 | 176-182 |
| 659.5 | ----- | 644.5474.5 | 706.5-712.5 | 716.5-722.5 | 756.5-762.5 | 776.5-782.5 |
| | 60 | 45-75 | 107-113 | 117-123 | 157-163 | 177-183 |
| 660.5 | ----- | 646.5-675.5 | 707.5-713.5 | 717.5-723.5 | 767.5-763.5 | 777.5-783.5 |
| | 61 | 46-76 | 108-114 | 118-124 | 168-164 | 178-184 |
| 661.5 | ----- | 646.5-676.5 | 708.5-714.5 | 718.5-724.5 | 758.5-764.5 | 778.5-784.5 |
| | 62 | 47-77 | 109-116 | 119-126 | 169-165 | 179-185 |
| 662.5 | ----- | 647.5-677.5 | 709.5-716.5 | 719.5-726.5 | 759.5-765.5 | 779.5-785.5 |
| | 63 | 48-78 | 110-116 | 120-126 | 160-166 | 180-186 |
| 663.5 | ----- | 648.5-678.5 | 710.5-716.5 | 720.5-726.5 | 760.5-766.5 | 780.5-786.5 |
| | 64 | 49-79 | 111-117 | 121-127 | 161-167 | 181-187 |
| 664.5 | ----- | 649.5-679.5 | 711.5-717.5 | 721.5-727.5 | 761.5-767.5 | 781.5-787.5 |
| | 65 | 60-80 | 112-118 | 122-128 | 162-168 | 182-188 |
| 665.5 | ----- | 660.5-680.5 | 712.5-718.5 | 722.5-728.5 | 762.5-768.5 | 782.5-788.5 |
| | 66 | 61-81 | 118-119 | 123-129 | 163-169 | 183-189 |
| 666.5 | ----- | 651.5-681.5 | 713.5-719.5 | 723.5-729.5 | 763.5-769.5 | 783.5-789.5 |
| | 67 | 62-82 | 114-120 | 124-130 | 164-170 | 184-190 |
| 667.5 | ----- | 662.5-682.5 | 714.5-720.5 | 724.5-730.5 | 764.5-770.5 | 784.5-790.5 |
| | 68 | 68-88 | 115-121 | 126-131 | 166-171 | 186-191 |
| 668.5 | ----- | 663.5-683.5 | 715.5-721.5 | 725.5-731.5 | 765.5-771.5 | 785.5-791.5 |
| | 69 | 54-84 | 116-122 | 126-132 | 166-172 | 186-192 |
| 669.5 | ----- | 654.5-684.5 | 716.5-722.5 | 726.5-732.5 | 766.5-772.5 | 786.5-792.5 |
| | 70 | 56-85 | 117-123 | 127-133 | 167-173 | 187-193 |
| 670.5 | ----- | 665.5-685.5 | 717.5-723.5 | 727.5-733.5 | 767.5-773.5 | 787.5-793.5 |
| | 71 | 56-86 | 118-124 | 128-134 | 168-174 | 188-194 |
| 671.5 | ----- | 656.5-686.5 | 718.5-725.5 | 728.5-734.5 | 768.5-774.5 | 788.5-794.5 |
| | 72 | 67-87 | 119-125 | 129-135 | 169-175 | 189-195 |
| 672.5 | ----- | 657.5-687.5 | 719.5-725.5- | 729.5-735.5 | 769.5-776.5 | 789.5-795.5 |
| | 73 | 58-88 | 120-126 | 130-136 | 170-176 | 190-196 |
| 673.5 | ----- | 658.5-688.5 | 720.5-726.5 | 730.5-736.5 | 770.5-776.5 | 790.5-796.5 |
| | 74 | 59-89 | 121-127 | 131-137 | 171-177 | 191-197 |
| 674.5 | ----- | 659.5-689.5 | 721.5-727.5 | 731.5-737.5 | 771.5-777.5 | 791.5-797.5 |
| | 75 | 60-90 | 122-128 | 132-138 | 172-178 | 192-198 |
| 675.5 | ----- | 660.5-690.5 | 722.5-728.5 | 732.5-738.5 | 772.5-778.5 | 792.5-798.5 |
| | 76 | 61-91 | 123-129 | 133-139 | 173-179 | 193-199 |
| 676.5 | ----- | 661.5-691.5 | 723.5-729.5 | 733.5-739.5 | 773.5-779.5 | 793 .5-799.5 |
| | 77 | 62-92 | 124-130 | 134-140 | 174-180 | 194-200 |
| 677.5 | ----- | 662.5-692.5 | 724.5-730.5 | 734.5-740.5 | 774.5-780.5 | 794.5-800.5 |
| | 78 | 63-93 | 126-131 | 135-141 | 175-181 | 195-201 |
| 678.5 | ----- | 663.5-693.5 | 726.5-731.5 | 736.5-741.5 | 775.5-781.5 | 795.5-801.5 |
| | 79 | 64-94 | 126-132 | 136-142 | 176-182 | 196-202 |
| 679.5 | ----- | 664.5-694.5 | 726.5-732.5 | 736.5-742.5 | 776.5-782.5 | 796.5-802.5 |
| | 80 | 66-95 | 127-133 | 137-143 | 177-183 | 197-203 |
| 680.5 | ----- | 665.5-695.5 | 727.5-733.5 | 737.5-743.5 | 777.5-783.5 | 797.5-803.5 |
| | 81 | 66-96 | 128-134 | 138-144 | 178-184 | 198-204 |
| 681.5 | ----- | 666.5-696.5 | 728.5-734.5 | 738.5-744.5 | 778.5-784.5 | 798.5-804.5 |
| | 82 | 67-97 | 129-135 | 139-145 | 179-185 | 199-205 |
| 682.5 | ----- | 667.5-697.5 | 729.5-735.5 | 739.5-746.5 | 779.5-785.5 | 799.5-805.5 |
| | 83 | 68-98 | 130-136 | 140-146 | 180-186 | 200-206 |
| 683.5 | ----- | 668.5-698.5 | 730.5-736.5 | 740.5-746.5 | 780.5-786.5 | 800.5-806.5 |
| | 84 | 69-99 | 131-137 | 141-147 | 181-187 | 201-207 |
| 684.5 | ----- | 669.5-699.5 | 731.5-737.5 | 741.5-747.5 | 781.5-787.5 | 801.5-807.5 |
| | 85 | 70-100 | 132-138 | 142-148 | 182-188 | 202-208 |
| 685.5 | ----- | 670.5-700.5 | 732.5-738.5 | 742.5-748.5 | 782.5-788.5 | 802.5-808.5 |

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| Low -band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 86 | 71-101 | 133-139 | 143-149 | 183-189 | 203-209 |
| 686.5 | ----- | 671.5-701.5 | 733.5-739.5 | 743.5-749.5 | 783.5-789.5 | 803.5-809.5 |
| | 87 | 72-102 | 134-140 | 144-150 | 184-190 | 204-210 |
| 687.5 | ----- | 672.5-702.5 | 734.5-740.5 | 744.5-760.5 | 784.5-790.5 | 804.5-810.5 |
| | 88 | 73-103 | 136-141 | 145-151 | 186-191 | 205-211 |
| 688.5 | ----- | 673.5-703.5 | 735.5-741.5 | 745.5-751.5 | 785.5-791.5 | 805.5-811.5 |
| | 89 | 74-104 | 136-142 | 146-152 | 186-192 | 206-212 |
| 689.5 | ----- | 674.5-704.5 | 736.5-742.5 | 746.5-762.5 | 786.5-792.5 | 806.5-812.5 |
| | 90 | 76-106 | 137-143 | 147-153 | 187-193 | 207-213 |
| 690.5 | ----- | 675.5-706.5 | 737.5-743.5 | 747.5-753.5 | 787.5-793.5 | 807.5-813.5 |
| | 91 | 76-106 | 138-144 | 148-154 | 188-194 | 208-214 |
| 691.5 | ----- | 676.5-706.5 | 738.5-744.5 | 748.5-764.5 | 788.5-794.5 | 808.5-814.5 |
| | 92 | 77-107 | 139-145 | 149-155 | 189-195 | 209-215 |
| 692.5 | ----- | 677.5-707.5 | 739.5-746.5 | 749.5-766.5 | 789.5-796.5 | 809.5-815.5 |
| | 93 | 78-108 | 140-146 | 150-156 | 190-196 | 210-216 |
| 693.5 | ----- | 678.5-708.5 | 740.5-746.5 | 760.5-766.5 | 790.5-796.5 | 810.5-816.5 |
| | 94 | 79-109 | 141-147 | 151-157 | 191-l97 | 211-217 |
| 694.5 | ----- | 679.5-709.5 | 741.5-747.5 | 751.5-757.5 | 791.5-797.5 | 811.5-817.5 |
| | 95 | 80-110 | 142-148 | 152-158 | 192-198 | 212-218 |
| 695.5 | ----- | 680.5-710.5 | 742.5-748.5 | 762.5-768.5 | 792.5-798.5 | 812.5-818.5 |
| | 96 | 81-111 | 143-149 | 153-159 | 193-199 | 213-219 |
| 696.5 | ----- | 681.5-711.5 | 743.5-749.5 | 753.5-769.5 | 793.5-799.5 | 813.5-819.5 |
| | 97 | 82-112 | 144-150 | 154-160 | 194-200 | 214-220 |
| 697.5 | ----- | 682.5-712.5 | 744.5-750.5 | 764.5-760.5 | 794.5-800.5 | 814.5-820.5 |
| | 98 | 83-113 | 145-151 | 155-161 | 195-201 | 215-221 |
| 698.5 | ----- | 683.5-713.5 | 745.5-751.5 | 755.5-761.5 | 795.5-801.5 | 815.5-821.5 |
| | 99 | 84-114 | 146-152 | 156-162 | 196-202 | 216-222 |
| 699.5 | ----- | 684.5-714.5 | 746.5-752.5 | 766.5-762.5 | 796.5-802.5 | 816.5-822.5 |
| | 100 | 85-115 | 147-153 | 157-163 | 197-203 | 217-223 |
| 700.5 | ----- | 685.5-715.5 | 747.5-763.5 | 757.5-763.5 | 797.5-803.5 | 817.5-823.5 |
| | 101 | 86-116 | 148-154 | 158-164 | 198-204 | 218-224 |
| 701.5 | ----- | 686.5-716.5 | 748.5-764.5 | 768.5-764.5 | 798.5-804.5 | 818.5-824.5 |
| | 102 | 87-117 | 149-155 | 159-165 | 199-205 | 219-225 |
| 702.5 | ----- | 687.5-717.5 | 749.5-766.5 | 769.5-766.5 | 799.5-805.5 | 819.5-825.5 |
| | 103 | 88-118 | 150-156 | 160-166 | 200-206 | 220-226 |
| 703.5 | ----- | 688.5-718.5 | 760.5-756.5 | 760.5-766.5 | 800.5-806.5 | 820.5-826.5 |
| | 104 | 89-119 | 151-157 | 161-167 | 201-207 | 221-227 |
| 704.5 | ----- | 689.5-719.5 | 751.5-757.5 | 761.5-767.5 | 801.5-807.5 | 821.5-827.5 |
| | 105 | 90-120 | 152-158 | 162-168 | 202-208 | 222-228 |
| 705.5 | ----- | 690.5-720.5 | 762.5-758.5 | 762.5-768.5 | 802.5-808.5 | 822.5-828.5 |
| | 106 | 91-121 | 153-159 | 163-169 | 203-209 | 223-229 |
| 706.5 | ----- | 691.5-721.5 | 763.5-769.5 | 763.5-769.5 | 803.5-809.5 | 823.5-829.5 |
| | 107 | 92-122 | 154-160 | 164-170 | 204-210 | 224-230 |
| 707.5 | ----- | 692.5-722.5 | 764.5-760.5 | 764.5-770.5 | 804.5-810.5 | 824.5-830.5 |
| | 108 | 93-123 | 155-161 | 165-171 | 205-211 | 225-231 |
| 708.5 | ----- | 693.5-723.5 | 755.5-761.5 | 765.5-771.5 | 805.5-811.5 | 825.5-831.5 |
| | 109 | 94-124 | 156-162 | 166-172 | 206-212 | 226-232 |
| 709.5 | ----- | 694.5-724.5 | 756.5-762.5 | 766.5-772.5 | 806.5-812.5 | 826.5-832.5 |
| | 110 | 95-125 | 157-163 | 167-173 | 207-213 | 227-233 |
| 710.5 | ----- | 696.5-726.5 | 757.5-763.5 | 767.5-773.5 | 807.5-813.5 | 827.5-833.5 |
| | 111 | 96-126 | 158-164 | 168-174 | 208-214 | 228-234 |
| 711.5 | ----- | 696.5-726.5 | 758.5-764.5 | 768.5-774.5 | 808.5-814.5 | 828.5-834.5 |
| | 112 | 97-127 | 159-165 | 169-175 | 209-215 | 229-235 |
| 712.5 | ----- | 697.5-727.5 | 769.5-766.5 | 769.5-775.5 | 809.5-815.5 | 829.5-835.5 |

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| Low -band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 113 | 98-128 | 160-166 | 170-176 | 210-216 | 230-236 |
| 713.5 | ----- | 698.5-728.5 | 760.5-766.5 | 770.5-776.5 | 810.5-816.5 | 830.5-836.5 |
| | 114 | 99-129 | 161-167 | 171-177 | 211-217 | 231-237 |
| 714.5 | ----- | 699.5-729.5 | 761.5-767.5 | 771.5-777.5 | 811.5-817.5 | 831.5-837;5 |
| | 115 | 100-130 | 162-168 | 172-178 | 212-218 | 232-238 |
| 715.5 | ----- | 700.5-730.5 | 762.5-768.5 | 772.5-778.5 | 812.5-818.5 | 832.5-838.5 |
| | 116 | 101-131 | 163-169 | 173-179 | 213-219 | 233-239 |
| 716.5 | ----- | 701.5-731.5 | 763.5-769.5 | 773.5-779.5 | 813.5-819.5 | 833.5-839.5 |
| | 117 | 102-132 | 164-170 | 174-180 | 214-220 | 234-240 |
| 717.5 | -----. | 702.5-732.5 | 764.5-770.5 | 774.5-780.5 | 814.5-820.5 | 834.5-840.5 |
| | 118 | 108-133 | 166-171 | 175-181 | 215-221 | 235-241 |
| 718.5 | ----- | 703.5-733.5 | 765.5-771.5 | 775.5-781.5 | 815.5-821.5 | 835.5-841.5 |
| | 119 | 104-134 | 166-172 | 176-182 | 216-222 | 236-242 |
| 719.5 | ----- | 704.5-734.5 | 766.5-772.5 | 776.5-782.5 | 816.5-822.5 | 836.5-842.5 |
| | 120 | 105-136 | 167-173 | 177-183 | 217-223 | 237-243 |
| 720.5 | -----. | 705.5-735.5 | 767.5-773.5 | 777.5-783.5 | 817.5-823.5 | 837.5-843.5 |
| | 121 | 106-136 | 168-174 | 178-184 | 218-224 | 238-244 |
| 721.5 | ----- | 706.5-736.5 | 768.5-774.5 | 778.5-784.5 | 818.5-824.5 | 838.5-844.5 |
| | 122 | 107-187 | 169-176 | 179-185 | 219-225 | 239-245 |
| 722.5 | ----- | 707.5-737.5 | 769.5-775.5 | 779.5-785.5 | 819.5-826.5 | 839.5-846.5 |
| | 123 | 108-188 | 170-176 | 180-186 | 220-226 | 240-246 |
| 723.5 | ----- | 708.5-738.5 | 770.5-776.5 | 780.5-786.5 | 820.5-826.5 | 840.5-846.5 |
| | 124 | 109-139 | 171-177 | 181-187 | 221-227 | 241-247 |
| 724.5 | ----- | 709.5-739.5 | 771.5-777.5 | 781.5-787.5 | 821.5-827.5 | 841.5-847.5 |
| | 125 | 110-140 | 172-178 | 182-188 | 222-228 | 242-248 |
| 725.5 | ----- | 710.5-740.5 | 772.5-778.5 | 782.5-788.5 | 822.5-828.5 | 842.5-848.5 |
| | 126 | 111-141 | 173-179 | 183-189 | 223-229 | 243-249 |
| 726.5 | ----- | 711.5-741.5 | 773.5-779.5 | 783.5-789.5 | 823.5-829.5 | 843.5-849.5 |
| | 127 | 112-142 | 174-180 | 184-190 | 224-230 | 244-250 |
| 727.5 | ----- | 712.5-742.5 | 774.5-780.5 | 784.5-790.5 | 824.5-830.5 | 844.5-860.5 |
| | 128 | 113-143 | 175-181 | 185-191 | 226-231 | 245-251 |
| 728.5 | ----- | 713.5-743.5 | 776.5-781.5 | 786.5-791.5 | 826.5-831.5 | 845.5-861.5 |
| | 129 | 114-144 | 176-182 | 186-192 | 226-232 | 246-252 |
| 729.5 | ----- | 714.5-744.5 | 776.5-782.5 | 786.5-792.5 | 826.5-832.5 | 846.5-852.5 |
| | 130 | 115-146 | 177-183 | 187-193 | 227-233 | 247-253 |
| 730.5 | ----- | 715.5-745.5 | 777.5-783.5 | 787.5-793.5 | 827.5-833.5 | 847.5-853.5 |
| | 131 | 116-146 | 178-184 | 188-194 | 228-234 | 248-254 |
| 731.5 | ----- | 716.5-746.5 | 778.5-784.5 | 788.5-794.5 | 828.5-834.5 | 848.5-854.5 |
| | 132 | 117-147 | 179-185 | 189-195 | 229-235 | 249-255 |
| 732.5 | ----- | 717.5-747.5 | 779.5-786.5 | 789.5-795.5 | 829.5-835.5 | 849.5-855.5 |
| | 133 | 118-148 | 180-186 | 190-196 | 230-236 | 250-256 |
| 733.5 | ----- | 718.5-748.5 | 780.5-786.5 | 790.5-796.5 | 830.5-836.5 | 850.5-856.5 |
| | 134 | 119-149 | 181-187 | 191-197 | 231-237 | 251-257 |
| 734.5 | ----- | 719.5-749.5 | 781.5-787.5 | 791.5-797.5 | 831.5-837.5 | 851.5-857.5 |
| | 135 | 120-160 | 182-188 | 192-198 | 232-238 | 252-258 |
| 735.5 | ----- | 720.5-760.5 | 782.5-788.5 | 752.5-798.5 | 832.5-838.5 | 852.5-858.5 |
| | 136 | 121-161 | 183-189 | 193-199 | 233-239 | 253-259 |
| 736.5 | ----- | 721.5-751.5 | 783.5-789.5 | 793.5-799.5 | 833.5-839.5 | 853.5-859.5 |
| | 137 | 122-162 | 184-190 | 194-200 | 234-240 | 254-260 |
| 737.5 | ----- | 722.5-752.5 | 784.5-790.5 | 794.5-800.5 | 834.5-840.5 | 854.5 860.5 |
| | 138 | 128-163 | 186-191 | 195-201 | 236-241 | 265-261 |
| 738.5 | ----- | 723.5-763.5 | 786.5-791.5 | 796.5-801.5 | 836.5-841.5 | 865.5-861.5 |
| | 139 | 124-164 | 186-192 | 196-202 | 236-242 | 256-262 |
| 739.5 | ----- | 724.5-754.5 | 786.5-792.5 | 796.5-802.5 | 836.5-842.5 | 856.5-862.5 |

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| Low -band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 140 | 125-155 | 187-193 | 197-203 | 237-243 | 257-263 |
| 740.5 | ----- | 725.5-755.5 | 787.5-793.5 | 797.5-803.5 | 837.5-843.5 | 857.5-863.5 |
| | 141 | 126-156 | 188-194 | 198-204 | 238-244 | 258-264 |
| 741.5 | ----- | 726.5-756.5 | 788.5-794.5 | 798.5-804.5 | 838.5-844.5 | 858.5-864.5 |
| | 142 | 127-157 | 189-195 | 199-205 | 239-245 | 259-265 |
| 742.5 | ----- | 727.5-767.5 | 789.5-795.5 | 799.5-805.5 | 839.5-845.5 | 859.5-865.5 |
| | 143 | 128-158 | 190-196 | 200-206 | 240-246 | 260-266 |
| 743.5 | ----- | 728.5-758.5 | 790.5-796.5 | 800.5-806.5 | 840.5-846.5 | 860.5-866.5 |
| | 144 | 129-159 | 191-197 | 201-207 | 241-247 | 261-267 |
| 744.5 | ----- | 729.5-759.5 | 791.5-797.5 | 801.5-807.5 | 841.5-847.5 | 861.5-867.5 |
| | 145 | 130-160 | 192-198 | 202-208 | 242-248 | 262-268 |
| 745.5 | ----- | 730.5-760.5 | 792.5-798.5 | 802.5-808.5 | 842.5-848.5 | 862.5-868.5 |
| | 146 | 131-161 | 193-199 | 203-209 | 243-249 | 263-269 |
| 746.5 | ----- | 731.5-761.5 | 793.5-799.5 | 803.5-809.5 | 843.5-849.5 | 863.5-869.5 |
| | 147 | 132-162 | 194-200 | 204-210 | 244-250 | 264-27O |
| 747.5 | ----- | 732.5-762.5 | 794.5-800.5 | 804.5-810.5 | 844.5-850.5 | 864.5-870.5 |
| | 148 | 133-163 | 195-201 | 205-211 | 245-251 | 265-271 |
| 748.5 | ----- | 733.5-763.5 | 795.5-801.5 | 805.5-811.5 | 845.5-851.5 | 865.5-871.5 |
| | 149 | 134-164 | 196-202 | 206-212 | 246-252 | 266-272 |
| 749.5 | ----- | 734.5-764.5 | 796.5-802.5 | 806.5-812.5 | 846.5-852.5 | 866.5-872.5 |
| | 150 | 135-165 | 197-203 | 207-213 | 247-253 | 267-273 |
| 750.5 | ----- | 735.5-765.5 | 797.5-803.5 | 807.5-813.5 | 847.5-853.5 | 867.5-873.5 |
| | 151 | 136-166 | 198-204 | 208-214 | 248-254 | 268-274 |
| 751.5 | ----- | 736.5-766.5 | 798.5-804.5 | 808.5-814.5 | 848.5-854.5 | 868.5-874.5 |
| | 152 | 137-167 | 199-205 | 209-215 | 249-255 | 269-275 |
| 752.5 | ----- | 737.5-767.5 | 799.5-805.5 | 809.5-815.5 | 849.5-855.5 | 869.5-875.5 |
| | 153 | 138-168 | 200-206 | 210-216 | 250-256 | 270-276 |
| 753.5 | ----- | 738.5-768.5 | 800.5-806.5 | 810.5-816.5 | 850.5-856.5 | 870.5-876.5 |
| | 154 | 139-169 | 201-207 | 211-217 | 251-257 | 271-277 |
| 754.5 | ----- | 739.5-769.5 | 801.5-807.5 | 811.5-817.5 | 851.5-857.5 | 871.5-877.5 |
| | 155 | 140-170 | 202-208 | 212-218 | 252-258 | 272-278 |
| 755.5 | ----- | 740.5-770.5 | 802.5-808.5 | 812.5-818.5 | 852.5-858.5 | 872.5-878.5 |
| | 156 | 141-171 | 203-209 | 213-219 | 253-259 | 273-279 |
| 756.5 | ----- | 741.5-771.5 | 803.5-809.5 | 813.5-819.5 | 853.5-859.5 | 873.5-879.5 |
| | 157 | 142-172 | 204-210 | 214-220 | 254-260 | 274-280 |
| 757.5 | ----- | 742.5-772.5 | 804.5-810.5 | 814.5-820.5 | 854.5-860.5 | 874.5-880.5 |
| | 158 | 143-173 | 205-211 | 215-221 | 255-261 | 275-281 |
| 758.5 | ----- | 743.5-773.5 | 805.5-811.5 | 815.5-821.5 | 855.5-861.5 | 875.5-881.5 |
| | 159 | 144-174 | 206-212 | 216-222 | 256-262 | 276-282 |
| 759.5 | ----- | 744.5-774.5 | 806.5-812.5 | 816.5-822.5 | 856.5-862.5 | 876.5-882.5 |
| | 160 | 145-175 | 207-213 | 217-232 | 257-263 | 277-283 |
| 760.5 | ----- | 745.5-775.5 | 807.5-813.5 | 817.5-823.5 | 857.5-863.5 | 877.5-883.5 |
| | 161 | 146-176 | 208-214 | 218-224 | 258-264 | 278-284 |
| 761.5 | ----- | 746.5-776.5 | 808.5-814.5 | 818.5-824.5 | 858.5-864.5 | 878.5-884.5 |
| | 162 | 147-177 | 209-215 | 219-225 | 259-265 | 279-285 |
| 762.5 | ----- | 747.5-777.5 | 809.5-815.5 | 819.5-825.5 | 859.5-865.5 | 879.5-885.5 |
| | 163 | 148-178 | 210-216 | 220-226 | 260-266 | 280-286 |
| 763.5 | ----- | 748.5-778.5 | 810.5-816.5 | 820.5-826.5 | 860.5-866.5 | 880.5-886.5 |
| | 164 | 149-179 | 211-217 | 221-227 | 261-267 | 281-287 |
| 764.5 | ----- | 749.5-779.5 | 811.5-817.5 | 821.5-827.5 | 861.5-867.5 | 881.5-887.5 |
| | 165 | 150-180 | 212-218 | 222-228 | 262-268 | 282-288 |
| 765.5 | -----. | 750.5-780.5 | 812.5-818.5 | 822.5-828.5 | 862.5-868.5 | 882.5-888.5 |
| | 166 | 151-181 | 213-219 | 223-229 | 263-269 | 283-289 |
| 766.5 | ----- | 751.5-781.5 | 813.5-819.5 | 823.5-829.5 | 863.5-869.5 | 883.5-889.5 |

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| Low -band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 167 | 152-182 | 214-220 | 224-230 | 264-270 | 284-290 |
| 767.5 | ----- | 752.5-782.5 | 814.5-820.5 | 824.5-830.5 | 864.5-870.5 | 884.5-890.5 |
| | 168 | 153-183 | 215-221 | 225-231 | 265-271 | 285-291 |
| 768.5 | ----- | 753.5-783.5 | 815.5-821.5 | 825.5-831.5 | 865.5-871.5 | 885.5-891.5 |
| | 169 | 154-184 | 216-222 | 226-232 | 266-272 | 286-292 |
| 769.5 | ----- | 764.5-784.5 | 816.5-822.5 | 826.5-832.5 | 866.5-872.5 | 886.5-892.5 |
| | 170 | 155-185 | 217-223 | 227-233 | 267-273 | 287-293 |
| 770.5 | ----- | 755.5-785.5 | 817.5-823.5 | 827.5-833.5 | 867.5-873.5 | 887.5-893.5 |
| | 171 | 156-186 | 218-224 | 228-234 | 268-274 | 288-294 |
| 771.5 | ----- | 766.5-786.5 | 818,5-824.5 | 828.5-834.5 | 868.5-874.5 | 888.5-894.5 |
| | 172 | 157-187 | 219-225 | 229-236 | 269-275 | 289-296 |
| 772.5 | ----- | 757.5-787.5 | 819.5-825.5 | 829.5-835.5 | 869.5-876.5 | 889.5-896.5 |
| | 173 | 158-188 | 220,-226 | 230-236 | 270-276 | 290-296 |
| 773.5 | ----- | 758.5-788.5 | 820.5-826.5 | 830.5-836.5 | 8,70.5-876.5 | 890.5-896.5 |
| | 174 | 159-189 | 221-227 | 231-237 | 271-277 | 291-297 |
| 774.5 | ----- | 769.5-789.5 | 821.5-827.5 | 831.5-837.5 | 871.5-877.5 | 891.5-897.5 |
| | 175 | 160-190 | 222-228 | 232-288 | 272-278 | 292-298 |
| 775.5 | ----- | 760.5-790.5 | 822.5-828.5 | 832.5-888.5 | 872.5-878.5 | 892.5-898.5 |
| | 176 | 161-191 | 223-229 | 283-239 | 273-279 | 293-299 |
| 776.5 | ----- | 761.5-791.5 | 823.5-829.5 | 883.5-839.5 | 873.5-879.5 | 893.5-899.5 |
| | 177 | 162-192 | 224-230 | 284-240 | 274-280 | 294-300 |
| 777.5 | ----- | 762.5-792.5 | 824.5-830.5 | 884.5-840.5 | 874.5-880.5 | 894.5-900.5 |
| | 178 | 163-193 | 225-231 | 235-241 | 275-281 | 295-301 |
| 778.5 | ----- | 763.5-793.5 | 826.5-831.5 | 835.5-841.5 | 875.5-881.5 | 896.5-901.5 |
| | 179 | 164-194 | 226-232 | 236-242 | 276-282 | 296-%02 |
| 779.5 | ----- | 764.5-794.5 | 826.5-832.5 | 836.5-842.5 | 876.5-882.5 | 896.5-902.5 |
| | 180 | 165-195 | 227-233 | 237-243 | 277-283 | 297-303 |
| 780.5 | ----- | 765.5-795.5 | 827.5-833.5 | 837.5-843.5 | 877.5-883.5 | 897.5-903.5 |
| | 181 | 166-196 | 228-234 | 238-244 | 278-284 | 298-304 |
| 781.5 | ----- | 766.5-796.5 | 828.5-834.5 | 838.5-844.5 | 878.5-884.5 | 898.5-904.5 |
| | 182 | 167-197 | 229-236 | 239-245 | 279-285 | 299-305 |
| 782.5 | ----- | 767.5-797.5 | 829.5-836.5 | 839.5-845.5 | 879.5-885.5 | 899.5-905.5 |
| | 183 | 168-198 | 230-236 | 240-246 | 280-286 | 300-306 |
| 783.5 | ----- | 768.5-798.5 | 830.5-836.5 | 840.5-846.5 | 880.5-886.5 | 900.5-906.5 |
| | 184 | 169-199 | 231-237 | 241-247 | 281-287 | 301-307 |
| 784.5 | ----- | 769.5-799.5 | 831.5-837.5 | 841.5-847.5 | 881.5-887.5 | 901.5-907.5 |
| | 185 | 170-200 | 232-238 | 242-248 | 282-288 | 302-308 |
| 785.5 | ----- | 770.5-800.5 | 832.5-838.5 | 842.5-848.5 | 882.5-888.5 | 902.5-908.5 |
| | 186 | 171-201 | 233-239 | 243-249 | 283-289 | 303-309 |
| 786.5 | ----- | 771.5-801.5 | 833.5-839.5 | 843.5-849.5 | 883.5-889.5 | 903.5-909.5 |
| | 187 | 172-202 | 234-240 | 244-250 | 284-290 | 304-310 |
| 787.5 | ----- | 772.5-802.5 | 834.5-840.5 | 844.5-850.5 | 884.5-890.5 | 904.5-910.5 |
| | 188 | 173-203 | 235-241 | 245-251 | 285-291 | 305-311 |
| 788.5 | ----- | 773.5-803.5 | 835.5-841.5 | 845.5-851.5 | 885.5-891.5 | 905.5-911.5 |
| | 189 | 174-204 | 236-242 | 246-252 | 286-292 | 306-312 |
| 789.5 | ----- | 774.5-804.5 | 836.5-842.5 | 846.5-852.5 | X86.5-892.5 | 906.5-912.5 |
| | 190 | 175-205 | 237-243 | 247-253 | 287-293 | 307-313 |
| 790.5 | ----- | 776.5-805.5 | 837.5-843.5 | 847.5-853.5 | 887.5-893.5 | 907.5-913.5 |
| | 191 | 176-206 | 238-244 | 248-264 | 288-294 | 308-314 |
| 791.5 | ----- | 776.5-806.5 | 838.5-844.5 | 848.5-864.5 | 888.5-894.5 | 908.5-914.5 |
| | 192 | 177-207 | 239-245 | 249-265 | 289-295 | 309-316 |
| 792.5 | ----- | 777.5-807.5 | 839.5-845.5 | 849.5-855.5 | 889.5-896.5 | 909.5-915.5 |
| | 193 | 178-208 | 240-246 | 260-266 | 290-296 | 310-316 |
| 793.5 | ----- | 778.5-808.5 | 840.5-846.5 | 860.5-866.5 | 890.5-896.5 | 910.5-916.5 |

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| Low -band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 194 | 179-209 | 241-247 | 251-257 | 291-297 | 311-317 |
| 794.5 | ----- | 779.5-809.5 | 841.5-847.5 | 851.5-857.5 | 891.5-897.5 | 911.5-917.5 |
| | 195 | 180-210 | 242-248 | 262-268 | 292-298 | 312-318 |
| 795.5 | ----- | 780.5-810.5 | 842.5-848.5 | 852.5-858.5 | 892.5-898.5 | 912.5-918.5 |
| | 196 | 181-211 | 243-249 | 253-259 | 293-299 | 313-319 |
| 796.5 | ----- | 781.5-811.5 | 843.5-849.5 | 863.5-859.5 | 893.5-899.5 | 913.5-919.5 |
| | 197 | 182-212 | 244-260 | 264-260 | 294-300 | 314-320 |
| 797.5 | ----- | 782.5-812.5 | 844.5-860.5 | 864.5-860.5 | 894.5-900.5 | 914.5-920.5 |
| | 198 | 183-213 | 245-251 | 255-261 | 295-301 | 315-321 |
| 798.5 | ----- | 783.5-813.5 | 845.5-851.5 | 855.5-861.5 | 895.5-901.5 | 915.5-921.5 |
| | 199 | 184-214 | 246-252 | 256-262 | 296-302 | 316-322 |
| 799.5 | ----- | 784.5-814.5 | 846.5-852.5 | 856.5-862.5 | 896.5-902.5 | 916.5-922,.5 |
| | 200 | 185-215 | 247-253 | 257-263 | 297-303 | 317-323 |
| 800.5 | ----- | 785.5-815.5 | 847.5-853.5 | 857.5-863.5 | 897.5-903.5 | 917.5-923.5 |
| | 201 | 186-216 | 248-254 | 258-264 | 298-304 | 318-324 |
| 801.5 | ----- | 786.5-816.5 | 848.5-854.5 | 858.5-864.5 | 898.5-904.5 | 918.5-924.5 |
| | 202 | 187-217 | 249-255 | 259-265 | 299-305 | 319-326 |
| 802.5 | ----- | 787.5-817.5 | 849.5-855.5 | 859.5-865.5 | 899.5-905.5 | 919.5-925.5 |
| | 203 | 188-218 | 250-256 | 260-266 | 300-306 | 320-326 |
| 803.5 | ----- | 788.5-818.5 | 850.5-856.5 | 860.5-866.5 | 900.5-906.5 | 920.5-926.5 |
| | 204 | 189-219 | 251-257 | 261-267 | 301-307 | 321-327 |
| 804.5 | ----- | 789.5-819.5 | 851.5-857.5 | 861.5-867.5 | 901.5-907.5 | 921.5-927.5 |
| | 205 | 190-220 | 252-258 | 262-268 | 302-308 | 322-328 |
| 805.5 | ----- | 790.5-820.5 | 852.5-858.5 | 862.5-868.5 | 902.5-908.5 | 922.5-928.5 |
| | 206 | 191-221 | 253-259 | 263-269 | 303-309 | 323-329 |
| 806.5 | ----- | 791.5-821.5 | 853.5-859.5 | 863.5-869.5 | 903.5-909.5 | 923.5-929.5 |
| | 207 | 192-222 | 254-260 | 264-270 | 304-310 | 324-330 |
| 807.5 | ----- | 792.5-822.5 | 854.5-860.5 | 864.5-870.5 | 904.5-910.5 | 924.5-930.5 |
| | 208 | 193-223 | 255-261 | 265-271 | 305-311 | 325-331 |
| 808.5 | ----- | 793.5-823.5 | 855.5-861.5 | 865.5-871.5 | 905.5-911.5 | 926.5-931.5 |
| | 209 | 194-224 | 256-262 | 266-272 | 306-312 | 326-332 |
| 809.5 | ----- | 794.5-824.5 | 866.5-862.5 | 866.5-872.5 | 906.5-912.5 | 926.5-932.5 |
| | 210 | 195-225 | 257-263 | 267-273 | 307-313 | 327-333 |
| 810.5 | ----- | 795.5-825.5 | 857.5-863.5 | 867.5-873.5 | 907.5-913.5 | 927.5-933.5 |
| | 211 | 196-226 | 258-264 | 268-274 | 308-314 | 328-334 |
| 811.5 | ----- | 796.5-826.5 | 858.5-864.5 | 868.5-874.5 | 908.5-914.5 | 928.5-934.5 |
| | 212 | 197-227 | 259-265 | 269-275 | 309-315 | 329-335 |
| 812.5 | ----- | 797.5-827.5 | 859.5-865.5 | 869.5-875.5 | 909.5-915.5 | 929.5-935.5 |
| | 213 | 198-228 | 260-266 | 270-276 | 310-316 | 330-336 |
| 813.5 | ----- | 798.5-828.5 | 860.5-866.5 | 870.5-876.5 | 910.5-916.5 | 930.5-936.5 |
| | 214 | 199-229 | 261-267 | 271-277 | 311-317 | 331-337 |
| 814.5 | ----- | 799.5-829.5 | 861.5-867.5 | 871.5-877.5 | 911.5-917.5 | 931.5-937.5 |
| | 215 | 200-230 | 262-268 | 272-278 | 312-318 | 332-338 |
| 815.5 | ----- | 800.5-830.5 | 862.5-868.5 | 872.5-878.5 | 912.5-918.5 | 932.5-938.5 |
| | 216 | 201-231 | 263-269 | 273-279 | 313-319 | 333-339 |
| 816.5 | ----- | 801.5-831.5 | 863.5-869.5 | 873.5-879.5 | 913.5-919.5 | 933.5-939.5 |
| | 217 | 202-232 | 264-270 | 274-280 | 314-320 | 334-340 |
| 817.5 | ----- | 802.5-832.5 | 864.5-870.5 | 874.5-880.5 | 914.5-920.5 | 934.5-940.5 |
| | 218 | 203-233 | 265-271 | 275-281 | 315-321 | 335-341 |
| 818.5 | ----- | 803.5-833.5 | 865.5-871.5 | 875.5-881.5 | 915.5-921.5 | 935.5-941.5 |
| | 219 | 204-234 | 266-272 | 276-282 | 316-322 | 336-342 |
| 819.5 | ----- | 804.5-834.5 | 866.5-872.5 | 876.5-882.5 | 916.5-922.5 | 936.5-942.5 |
| | 220 | 205-235 | 267-273 | 277-283 | 317-323 | 337-343 |
| 820.5 | ----- | 805.5-835.5 | 867.5-873.5 | 877.5-883.5 | 917.5-923.5 | 937.5-943.5 |

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| Low -band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 221 | 206-236 | 268-274 | 278-284 | 318-324 | 338-344 |
| 821.5 | ----- | 806.5-836.5 | 868.5-874.5 | 878.5-884.5 | 918.5-924.5 | 938.5-944.5 |
| | 222 | 207-237 | 269-275 | 279-285 | 319-325 | 339-345 |
| 822.5 | ----- | 807.5-837.5 | 869.5-875.5 | 879.5-885.5 | 919.5-926.5 | 939.5-946.5 |
| | 223 | 208-238 | 270-276 | 280-286 | 320-326 | 340-346 |
| 823.5 | ----- | 808.5-838.5 | 870.5-876.5 | 880.5-886.5 | 920.5-926.5 | 940.5-946.5 |
| | 224 | 209-239 | 271-277 | 281-287 | 321-327 | 341-347 |
| 824.5 | ----- | 809.5-839.5 | 871.5-877.5 | 881.5-887.5 | 921.5-927.5 | 941.5-947.5 |
| | 225 | 210-240 | 272-278 | 282-288 | 322-328 | 342-348 |
| 826.5 | ----- | 810.5-840.5 | 872.5-878.5 | 882.5-888.5 | 922.5-928.5 | 942.5-948.5 |
| | 226 | 211-241 | 273-279 | 283-289 | 323-329 | 343-349 |
| 826.5 | ----- | 811.5-841.5 | 873.5-879.5 | 883.5-889.5 | 923.5-929.5 | 943.5-949.5 |
| | 227 | 212-242 | 274-280 | 284-290 | 324-330 | 344-350 |
| 827.5 | ----- | 812.5-842.5 | 874.5-880.5 | 884.5-890.5 | 924.5-930.5 | 944.5-960.5 |
| | 228 | 213-243 | 275-281 | 285-291 | 325-331 | 345-351 |
| 828.5 | ----- | 813.5-843.5 | 875.5-881.5 | 886.5-891.5 | 925.5-931.5 | 946.5-961.5 |
| | 229 | 214-244 | 276-282 | 286-292 | 326-332 | 346-362 |
| 829.5 | ----- | 814.5-844.5 | 876.5-882.5 | 886.5-892.5 | 926.5-932.5 | 946.5-952.5 |
| | 230 | 216-246 | 277-283 | 287-293 | 327-333 | 347-353 |
| 830.5 | ----- | 816.5-846.5 | 877.5-883.5 | 887.5-893.5 | 927.5-933.5 | 947.5-953.5 |
| | 231 | 216-246 | 278-284 | 288-294 | 328-334 | 348-364 |
| 831.5 | ----- | 816.5-846.5 | 878.5-884.5 | 888.5-894.5 | 928.5-934.5 | 948.5-964.5 |
| | 232 | 217-247 | 279-286 | 289-296 | 329-335 | 349-355 |
| 832.5 | ----- | 817.5-847.5 | 879.5-885.5 | 889.5-896.5 | 929.5-935.5 | 949.5-956.5 |
| | 233 | 218-248 | 280-286 | 290-296 | 330-336 | 360-356 |
| 833.5 | ----- | 818.5-848.5 | 880.5-886.5 | 890.5-896.5 | 930.5-936.5 | 960.5-956.5 |
| | 234 | 219-249 | 281-287 | 291-297 | 331-337 | .351-357 |
| 834.5 | ----- | 819.5-849.5 | 881.5-887.5 | 891.5-897.5 | 931.5-937.5 | 951.5-957.5 |
| | 285 | 220-260 | 282-288 | 292-298 | 332-338 | 352-358 |
| 835.5 | ----- | 820.5-860.5 | 882.5-888.5 | 892.5-898.5 | 932.5-938.5 | 952.5-958.5 |
| | 236 | 221-261 | 288-889 | 293-299 | 333-339 | 363-369 |
| 836.5 | ----- | 821.5-851.5 | 883.5-889.5 | 893.5-899.5 | 933.5-939.5 | 963.5-969.5 |
| | 237 | 222-262 | 284-890 | 294-300 | 334-340 | 354-360 |
| 837.5 | ----- | 822.5-862.5 | 884.5-890.5 | 894.5-900.5 | 934.5-940.5 | 954.5-960.5 |
| | 238 | 223-253 | 286-891 | 295-301 | 335-341 | 355-361 |
| 838.5 | ----- | 823.5-853.5 | 886.5-891.5 | 896.5-901.5 | 935.5-941.5 | 966.5-961.5 |
| | 239 | 224-254 | 286-892 | 296-302 | 336-342 | 366-362 |
| 839.5 | ----- | 824.5-854.5 | 886.5-892.5 | 896.5-902.5 | 936.5-942.5 | 956.5-962.5 |
| | 240 | 225-256 | 287-293 | 297-303 | 337-343 | 357-363 |
| 840.5 | ----- | 826.5-866.5 | 887.5-893.5 | 897.5-903.5 | 937.5-943.5 | 957.5-963.5 |
| | 241 | 226-256 | 288-294 | 298-304 | 338-344 | 368-364 |
| 841.5 | ----- | 826.5-866.5 | 888.5-894.5 | 898.5-904.5 | 938.5-944.5 | 968.5-964.5 |
| | 242 | 227-257 | 289-296 | 299-305 | 339-346 | 359-366 |
| 842.5 | ----- | 827.5-857.5 | 889.5-896.5 | 899.5-906.5 | 939.5-945.5 | 959.5-966.5 |
| | 243 | 228-268 | 290-296 | 300-306 | 340-346 | 360-366 |
| 843.5 | ----- | 828.5-868.5 | 890.5-896.5 | 900.5-906.5 | 940.5-946.5 | 960.5-966.5 |
| | 244 | 229-269 | 291-297 | 301-307 | 341-347 | 361-367 |
| 844.5 | ----- | 829.5-869.5 | 891.5-897.5 | 901.5-907.5 | 941.5-947.5 | 961.5-967.5 |
| | 245 | 230-260 | 292-298 | %02-308 | 342-348 | 362-368 |
| 845.5 | ----- | 830.5-860.5 | 892.5-898.5 | 902.5-908.5 | 942.5-948.5 | 962.5-968.5 |
| | 246 | 231-261 | 293-299 | 303-309 | 343-349 | 363-369 |
| 846.5 | ----- | 831.5-861.5 | 893.5-899.5 | 903.5-909.5 | 943.5-949.5 | 963.5-969.5 |
| | 247 | 232-262 | 294-300 | 304-310 | 344-360 | 364-370 |
| 847.5 | ----- | 832.5-862.5 | 894.5-900.5 | 904.5-910.5 | 944.5-960.5 | 964.5-970.5 |

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| Low -band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 248 | 233-263 | 295-301 | 305-311 | 345-351 | 365-371 |
| 848.5 | ----- | 833.5-863.5 | 896.5-901.5 | 905.5-911.5 | 945.5-951.5 | 965.5-971.5 |
| | 249 | 234-264 | 296-302 | 306-312 | 346-352 | 366-372 |
| 849.5 | ----- | 834.5-864.5 | 896.5-902.5 | 906.5-912.5 | 946.5-952.5 | 966.5-9?2.5 |
| | 250 | 235-265 | 297-303 | 307-313 | 347-363 | 367-%73 |
| 850.5 | ----- | 835.5-865.5 | 897.5-903.5 | 907.5-913.5 | 947.5-953.5 | 967.5-973.5 |
| | 251 | 236-266 | 298-304 | 308-314 | 348-354 | 368-374 |
| 851.5 | ----- | 836.5-866.5 | 898.5-904.5 | 908.5-914.5 | 948.5-954.5 | 968.5-974.5 |
| | 252 | 237-267 | 299-305 | 309-315 | 349-355 | 369-375 |
| 852.5 | ----- | 837.5-867.5 | 899.5-905.5 | 909.5-915.5 | 949.5-955.5 | 969.5-975.5 |
| | 253 | 238-268 | 300-306 | 310-316 | 350-356 | 370-376 |
| 853.5 | ----- | 838.5-868.5 | 900.5-906.5 | 910.5-916.5 | 950.5-966.5 | 970.5-976.5 |
| | 254 | 239-269 | 301-307 | 311-317 | 351-357 | 371-377 |
| 854.5 | ----- | 839.5-869.5 | 901.5-907.5 | 911.5-917.5 | 951.5-957.5 | 971.5-977.5 |
| | 255 | 240-270 | 302-308 | 312-318 | 352-358 | 372-378 |
| 855.5 | ----- | 840.5-870.5 | 902.5-908.5 | 912.5-918.5 | 952.5-958.5 | 972.5-978.5 |
| | 256 | 241-271 | 303-309 | 313-319 | 353-369 | 373-379 |
| 856.5 | ----- | 841.5-871.5 | 903.5-909,5 | 913.5-919.5 | 953.5-959.5 | 973.5-979.5 |
| | 257 | 242-272 | 304-310 | 314-320 | 354-360 | 374-380 |
| 857.5 | ----- | 842.5-872.5 | 904.5-910.5 | 914.5-920.5 | 954.5-960.5 | 974.5-980.5 |
| | 258 | 243-273 | 305-311 | 315-321 | 355-361 | 375-381 |
| 858.5 | ----- | 843.5-873.5 | 905.5-911.5 | 915.5-921.5 | 955.5-961.5 | 975.5-981.5 |
| | 259 | 244-274 | 306-312 | 316-322 | 356-362 | 376-382 |
| 859.5 | ----- | 844.5-874.5 | 906.5-912.5 | 916.5-922.5 | 956.5-962.5 | 976.5-982.5 |
| | 260 | 245-275 | 307-313 | 317-323 | 357-363 | 377-383 |
| 860.5 | ----- | 845.5-875.5 | 907.5-913.5 | 917.5-923.5 | 957.5-963.5 | 977.5-983.5 |
| | 261 | 246-276 | 308-314 | 318-324 | 358-364 | 378-384 |
| 861.5 | ----- | 846.5-876.5 | 908.5-914.5 | 918.5-924.5 | 958.5-964.5 | 978.5-984.5 |
| | 262 | 247-277 | 309-315 | 319-325 | 359-365 | 379-385 |
| 862.5 | ----- | 847.5-877.5 | 909.5-915.5 | 919.5-925.5 | 959.5-965.5 | 979.5-985.5 |
| | 263 | 248-278 | 310-316 | 320-326 | 360-366 | 380-386 |
| 863.5 | ----- | 848.5-878.5 | 910.5-916.5 | 920.5-926.5 | 960.5-966.5 | 980.5-986.5 |
| | 264 | 249-279 | 311-317 | 321-327 | 361-367 | 381-387 |
| 864.5 | ----- | 849.5-879.5 | 911.5-917.5 | 921.5-927.5 | 961.5-967.5 | 981.5-987.5 |
| | 265 | 250-280 | 312-318 | 322-328 | 362-368 | 382-388 |
| 865.5 | ----- | 850.5-880.5 | 912.5-918.5 | 922.5-928.5 | 962.5-968.5 | 982.5-988.5 |
| | 266 | 251-281 | 313-319 | 323-329 | 363-369 | 383-389 |
| 866.5 | ----- | 851.5-881.5 | 913.5-919.5 | 923.5-929.5 | 963.5-969.5 | 983.5-989.5 |
| | 267 | 252-282 | 314-320 | 324-330 | 364-370 | 384-390 |
| 867.5 | ----- | 852.5-882.5 | 914.5-920.5 | 924.5-930.5 | 964.5-970.5 | 984.5-990.5 |
| | 268 | 253-283 | 315-321 | 325-331 | 365-371 | 385-391 |
| 868.5 | ----- | 853.5-883.5 | 915.5-921.5 | 925.5-931.5 | 965.5-971.5 | 985.5-991.5 |
| | 269 | 254-284 | 316-322 | 326-332 | 366-372 | 386--392 |
| 869.5 | ----- | 854.5-884.5 | 916.5-922.5 | 926.5-932.5 | 966.5-972.5 | 986.5-992.5 |
| | 270 | 255-285 | 31 7-323 | 327-333 | 367-373 | 387-393 |
| 870.5 | ----- | 855.5-885.5 | 917.5-923.5 | 927.5-933.5 | 967.5-973.5 | 987.5-993.5 |
| | 271 | 256-286 | 318-324 | 328-334 | 368-374 | 388-394 |
| 871.5 | ----- | 856.5-886.5 | 918.5-924.5 | 928.5-934.5 | 968.5-974.5 | 988.5-994.5 |
| | 272 | 257-287 | 319-325 | 329-336 | 369-375 | 389-395 |
| 872.5 | ----- | 857.5-887.5 | 919.5-925.5 | 929.5-935.5 | 969.5-975.5 | 989.5-995.5 |
| | 273 | 258-288 | 320-326 | 330-336 | 370-376 | 390-396 |
| 873.5 | ----- | 858.5-888.5 | 920.5-926.5 | 930.5-936.5 | 970.5-976.5 | 990.5-996.5 |
| | 274 | 259-289 | 321-327 | 331-337 | 371-377 | 391-397 |
| 874.5 | ----- | 859.5-889.5 | 921.5-927.5 | 931.5-937.5 | 971.5-977.5 | 991.5-997.5 |

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| Low -band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 275 | 260-290 | 322-328 | 332-338 | 372-378 | 392-398 |
| 875.5 | ----- | 860.5-890.5 | 922.5-928.5 | 932.5-938.5 | 972.5-978.5 | 992.5-998.5 |
| | 276 | 261-291 | 323-329 | 333-339 | 373-379 | 393-399 |
| 876.5 | ----- | 861.5-891.5 | 923.5-929.5 | 933.5-939.5 | 973.5-979.5 | 993.5-999.5 |
| | 277 | 262-292 | 324-330 | 334-340 | 374-380 | 394-399 |
| 877.5 | ----- | 862.5-892.5 | 924.5-930.5 | 934.5-940.5 | 974.5-980.5 | 994.5-999.5 |
| | 278 | 263-293 | 325-331 | 335-341 | 375-381 | 395-399 |
| 878.5 | ----- | 863.5-893.5 | 926.5-931.5 | 935.5-941.5 | 975.5-981.5 | 995.5-999.5 |
| | 279 | 264-294 | 326-332 | 336-342 | 376-382 | 396-399 |
| 879.5 | ----- | 864.5-894.5 | 926.5-932.5 | 936.5-942.5 | 976.5-982.5 | 996.5-999.5 |
| | 280 | 265-295 | 327-333 | 337-343 | 377-383 | 397-399 |
| 880.5 | ----- | 865.5-895.5 | 927.5-933.5 | 937.5-943.4 | 977.5-983.5 | 997.5-999.5 |
| | 281 | 266-290 | 328-334 | 338-344 | 378-384 | 398-399 |
| 881.5 | ----- | 866.5-896.5 | 928.5-934.5 | 938.5-944.5 | 978.5-984.5 | 998.5-999.5 |
| | 282 | 267-297 | 329-335 | 339-346 | 379-385 | -399 |
| 882.5 | ----- | 867.5-897.5 | 929.5-936.5 | 939.5-945.5 | 979.5-985.5 | - 999.5 |
| | 283 | 268-298 | 330-336 | 340-346 | 380-386 | |
| 883.5 | ----- | 868.5-898.5 | 930.5-936.5 | 940.5-946.5 | 980.5-986.5 | |
| | 284 | 269-299 | 331-337 | 341-347 | 381-387 | |
| 884.5 | ----- | 869.5-899.5 | 931.5-937.5 | 941.5-947.5 | 981.5-987.5 | |
| | 285 | 270-300 | 332-338 | 342-348 | 382-388 | |
| 885.5 | ----- | 870.5-900.5 | 932.5-938.5 | 942.5-948.4 | 982.5-988.5 | |
| | 286 | 271-301 | 333-339 | 343-349 | 383-389 | |
| 886.5 | ----- | 871.5-901.5 | 933.5-939.5 | 943-5-949-5 | 983.5-989.5 | |
| | 287 | 272-302 | 334-340 | 344-350 | 384-390 | |
| 887.5 | ----- | 872.5-902.5 | 934.5-940.5 | 944.5-950.5 | 984.5-990.5 | |
| | 288 | 273-303 | 335-341 | 345-351 | 385-391 | |
| 888.5 | ----- | 873.5-903.5 | 935.5-941.5 | 945.5-951.5 | 985.5-991.5 | |
| | 289 | 274-304 | 336-342 | 346-352 | 386-392 | |
| 889.5 | ----- | 874.5-904.5 | 936.5-942.5 | 946.5-952.5 | 986.5-992.5 | |
| | 290 | 275-305 | 337-343 | 347-353 | 387-393 | |
| 890.5 | ----- | 875.5-905.5 | 937.5-943.5 | 947.5-953.5 | 987.5-993.5 | |
| | 291 | 276-306 | 338-344 | 348-354 | 388-394 | |
| 891.5 | ----- | 876.5-906.5 | 938.5-944.5 | 948.5-954.5 | 988.5-994.5 | |
| | 292 | 277-307 | 339-345 | 349-355 | 389-395 | |
| 892.5 | ----- | 877.5-907.5 | 939.5-945.5 | 949.5-955.5 | 989.5-995.5 | |
| | 293 | 278-308 | 340-346 | 350-356 | 390-396 | |
| 893.5 | ----- | 878.5-908.5 | 940.5-946.5 | 950.5-956.5 | 990.5-996.5 | |
| | 294 | 279-309 | 341-347 | 351-357 | 391-397 | |
| 894.5 | ----- | 879.5-909.5 | 941.5-947.5 | 951.5-957.5 | 991.5-997.5 | |
| | 295 | 280-310 | 342-348 | 352-358 | 392-398 | |
| 895.5 | ----- | 880.5-910.5 | 942.5-948.5 | 952.5-958.5 | 992.5-998.5 | |
| | 296 | 281-311 | 343-349 | 353-359 | 393-399 | |
| 896.5 | ----- | 881-6-911-5 | 943.5-949.5 | 953.5-959.5 | 993.5-999.5 | |
| | 297 | 282-312 | 344-350 | 354-360 | 394-399 | |
| 897.5 | ----- | 882.5-912.5 | 944.5-950.5 | 954.5-960.5 | 994.5-999.5 | |
| | 298 | 283-313 | 3,45-351 | 355-361 | 395-399 | |
| 898.5 | ----- | 883.5-913.5 | 945.5-951.5 | 955.5-961.5 | 995.5-999.5 | |
| | 299 | 284-314 | 346-352 | 356-362 | 396-399 | |
| 899.5 | ----- | 884.5-914.5 | 946.5-952.5 | 956.5-962.5 | 996.5-999.5 | |
| | 300 | 286-316 | 347-353 | 357-363 | 397-399 | |
| 900.5 | ----- | 885.5-915.5 | 947.5-953.5 | 957.5-963.5 | 997.5-999.5 | |
| | 301 | 286-316 | 348-354 | 358-364 | 398-399 | |
| 901.5 | ----- | 886.5-916.5 | 948.5-954.5 | 958.5-964.5 | 998.5-999.5 | |

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| Low -band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 302 | 287-317 | 349-355 | 359-365 | -399 | |
| 902.5 | ----- | 887.5-917.5 | 949.5-955.5 | 959.5-965.5 | -999.5 | |
| | 303 | 288-318 | 350-356 | 360-366 | | |
| 903.5 | ----- | 888.5-918.5 | 950.5-956.5 | 960.5-966.5 | | |
| | 304 | 289-319 | 351-357 | 361-367 | | |
| 904.5 | ----- | 889.5-919,5 | 951.5-957.5 | 961.5-967.5 | | |
| | 305 | 290-320 | 352-358 | 362-368 | | |
| 905.5 | ----- | 890.5-920.5 | 952.5-958.5 | 962.5-968.5 | | |
| | 306 | 291-321 | 323-359 | 363-369 | | |
| 906.5 | ----- | 891.5-921.5 | 953.5-959.5 | 963.5-969.5 | | |
| | 307 | 292-322 | 354-360 | 364-370 | | |
| 907.5 | ----- | 892.5-922.5 | 954.5-960.5 | 964.5-970.5 | | |
| | 308 | 293-323 | 355-361 | 365-371 | | |
| 908.5 | ----- | 893.5-923.5 | 955.5-961.5 | 965.5-971,5 | | |
| | 309 | 294-324 | 356-362 | 366-372 | | |
| 909.5 | ----- | 894.5-924.5 | 956.5-962.5 | 966.5-972.5 | | |
| | 310 | 295-325 | 357-363 | 367- 373 | | |
| 910.5 | ----- | 895.5-925.5 | 957.5-963.5 | 967.5-973.5 | | |
| | 311 | 296-326 | 358-364 | 368-374 | | |
| 911.5 | ----- | 896.5-926.5 | 958.5--964.5 | 968.5-974.5 | | |
| | 312 | 297-327 | 359-365 | 369-375 | | |
| 912.5 | ----- | 897.5-927.5 | 959.5-965.5 | 969.5-975.5 | | |
| | 313 | 298-328 | 360-366 | 370-376 | | |
| 913.5 | ----- | 898.5-928.5 | 960.5-966.5 | 970.5-976.5 | | |
| | 314 | 299-329 | 361-367 | 371-377 | | |
| 914.5 | ----- | 899.5-929.5 | 961.5-967.5 | 971.5-977.5 | | |
| | 315 | 300-330 | 362-368 | 372-378 | | |
| 915.5 | ----- | 900.5-930.5 | 962.5-968.5 | 972.5-978.5 | | |
| | 316 | 301-331 | 363-369 | 373-379 | | |
| 916.5 | ----- | 901.5-931.5 | 963.5-969.5 | 973.5-979.5 | | |
| | 317 | 302-332 | 364-370 | 374-380 | | |
| 917.5 | ----- | 902.5-932.5 | 964.5-970.5 | 974.5-980.5 | | |
| | 318 | 303-333 | 365-371 | 375-381 | | |
| 918.5 | ----- | 903.5-933.5 | 965.5-971.5 | 975.5-981.5 | | |
| | 319 | 304-334 | 366-372 | 376-382 | | |
| 919.5 | ----- | 904.5-934.5 | 966.5-972.5 | 976.5-982.5 | | |
| | 320 | 305-335 | 367-373 | 377-383 | | |
| 920.5 | ----- | 905.5-935.5 | 967.5-973.5 | 977.5-983.5 | | |
| | 321 | 306-336 | 368-374 | 378-384 | | |
| 921.5 | ----- | 906.5-936.5 | 968.5-974.5 | 978.5-984.5 | | |
| | 322 | 307-337 | 369-375 | 379-385 | | |
| 922.5 | ----- | 907.5-937.5 | 979.5-985.5 | 979.5-985.5 | | |
| | 323 | 308-338 | 370-376 | 380-386 | | |
| 923.5 | ----- | 908.5-938.5 | 970.5-976.5 | 980.5-986.5 | | |
| | 324 | 309-339 | 371-377 | 381-387 | | |
| 924.5 | ----- | 909.5-939.5 | 971.5-977.5 | 981.5-987.5 | | |
| | 325 | 310-340 | 372-378 | 383-388 | | |
| 925.5 | ----- | 910.5-940.5 | 972.5-978.5 | 982.5-988.5 | | |
| | 326 | 311-341 | 373-379 | 383-389 | | |
| 926.5 | ----- | 911.5-941.5 | 913.5-979.5 | 983.5-989.5 | | |
| | 327 | 312-342 | 374-380 | 384-390 | | |
| 927.5 | ----- | 912.5-942.5 | *974.5-980.5* | 984.5-990.5 | | |
| | 328 | 313-343 | 375-381 | 385-391 | | |
| 928.5 | ----- | 913.5-943.5 | 976.5-981.5 | 985.5-991.5 | | |

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| Low -band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 329 | 314-344 | 376-382 | 386-392 | | |
| 929.5 | ----- | 914.5-944.5 | 976.5-982.5 | 986.5-992.5 | | |
| | 330 | 315-345 | 377-383 | 387-393 | | |
| 930.5 | ----- | 915.5-945.5 | 977.5-983.5 | 987.5-993.5 | | |
| | 331 | 316-346 | 378-384 | 388-394 | | |
| 931.5 | ----- | 916.5-946.5 | 978.5-984.5 | 988.5-994.5 | | |
| | 332 | 317-347 | 379-385 | 389-395 | | |
| 932.5 | ----- | 917.5-947.5 | 979.5-985.5 | 989.5-995.5 | | |
| | 333 | 318-348 | 380-386 | 390-396 | | |
| 938.5 | ----- | 918.5-948.5 | 980.5-986.5 | 990.5-996.5 | | |
| | 334 | 319-349 | 381-387 | 391-397 | | |
| 934.5 | ----- | 919-949.5 | 981.5-987.5 | 991.5-997.5 | | |
| | 335 | 320-350 | 382-388 | 392-398 | | |
| 836.5 | ------ | 920.5-950.5 | 982.5-988.5 | 992.5-998.5 | | |
| | 336 | 321-351 | 383-389 | 398-399 | | |
| 936.5 | ------ | 921.5-951.5 | 983.5-989.5 | 993.5-999.5 | | |
| | 337 | 322-352 | 384-390 | 394-399 | | |
| 937.5 | ------ | 922.5-952.5 | 984.5-990.5 | 994.5-999.5 | | |
| | 338 | 323-363 | 385-391 | 395-399 | | |
| 938.5 | ------ | 923.5-953.5 | 985.5-991.5 | 995.5-999.5 | | |
| | 339 | 824-354 | 386-392 | 396-899 | | |
| 939.5 | ----- | 924.5-964.5 | 986.5-992.5 | 996.5-999.5 | | |
| | 340 | 325-366 | 387-393 | 397-399 | | |
| 940.5 | ----- | 926.5-955.5 | 987.5-993.5 | 997.5-999.5 | | |
| | 341 | 826-356 | 388-394 | 398-399 | | |
| 941.5 | ----- | 926.5-956.5 | 988.5-994.5 | 998.5-999.5 | | |
| | 342 | 327-367 | 389-395 | -399 | | |
| 942.5 | ------ | 927.5-957.5 | 989.5-995.5 | -999.5 | | |
| | 343 | 328-358 | 390-896- | | | |
| 943.5 | ------ | 928.5-968.5 | 990.5-996.5 | | | |
| | 344 | 329-359 | 391-397 | | | |
| 944.5 | ------ | 929.5-959.5 | 991.5-997.5 | | | |
| | 345 | 380-360 | 392-398 | | | |
| 945.5 | ------ | 980.5-960.5 | 992.5-998.5 | | | |
| | 346 | 331-361 | 398-399 | | | |
| 946.5 | ------ | 931.5-961.5 | 998.5-999.5 | | | |
| | 347 | 332-362 | 394-899 | | | |
| 947.5 | ------ | 932.5-962.5 | 994.5-999.5 | | | |
| | 348 | 333-363 | 396-399 | | | |
| 948.5 | ------ | 933.5-968.5 | 995.5-999.5 | | | |
| | 349 | 334-364 | 396-399 | | | |
| 949.5 | ------ | 934.5-964.5 | 996.5-999.5 | | | |
| | 350 | 885-866 | 397-899 | | | |
| 950.5 | ------ | 936.5-966.5 | 997.5-999.5 | | | |
| | 351 | 836-366 | 898-899 | | | |
| 951.5 | ----- | 986.5-966.5 | 998.5-999.5 | | | |
| | 352 | 887-367 | -899 | | | |
| 952.5 | ----- | 937.5-967.5 | - 999.5 | | | |
| | 353 | 338-368 | | | | |
| 953.5 | ----- | 938.5-968.5 | | | | |
| | 354 | 339-369 | | | | |
| 954.5 | ----- | 939.5-969.5 | | | | |
| | 355 | 840-370 | | | | |
| 955.5 | ----- | 940.5-970.5 | | | | |

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| Low -band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 356 | 341- 371 | | | | |
| 956.5 | ----- | 941.5-971.5 | | | | |
| | 357 | 342-372 | | | | |
| 957.5 | ----- | 942.5-972.5 | | | | |
| | 358 | 343-373 | | | | |
| 958.5 | ----- | 943.5-973.5 | | | | |
| | 359 | 344-374 | | | | |
| 959.5 | ----- | 944.5-974.5 | | | | |
| | 360 | 345-375 | | | | |
| 960.5 | ----- | 945.5-975.5 | | | | |
| | 361 | 346-376 | | | | |
| 961.5 | ----- | 946.5-976.5 | | | | |
| | 362 | 347-377 | | | | |
| 962.5 | ----- | 947.5-977.5 | | | | |
| | 363 | 948-878 | | | | |
| 963.5 | ----- | 948.5-978.5 | | | | |
| | 364 | 349-379 | | | | |
| 964.5 | ----- | 949.5-979.5 | | | | |
| | 365 | 350-380 | | | | |
| 965.5 | ----- | 960.5-980.5 | | | | |
| | 366 | 351-381 | | | | |
| 966.5 | ----- | 951.5-981.5 | | | | |
| | 367 | 352-382 | | | | |
| 967.5 | ----- | 962.5-982.5 | | | | |
| | 368 | 353-383 | | | | |
| 968.5 | ----- | 953.5-983.5 | | | | |
| | 369 | 364-384 | | | | |
| 969.5 | ----- | 964.5-984.5 | | | | |
| | 370 | 865-886 | | | | |
| 970.5 | ----- | 955.5-985.5 | | | | |
| | 371 | 356-386 | | | | |
| 971.5 | ----- | 966.5-986.5 | | | | |
| | 372 | 357-887 | | | | |
| 972.5 | ----- | 975.5-987.5 | | | | |
| | 373 | 358-388 | | | | |
| 973.5 | ----- | 968.5-988.5 | | | | |
| | 374 | 869-389 | | | | |
| 974.5 | ----- | 969.5-989.5 | | | | |
| | 375 | 360-890 | | | | |
| 975.5 | ----- | 960.5-990.5 | | | | |
| | 376 | 361-391 | | | | |
| 976.5 | ----- | 961.5-991.5 | | | | |
| | 377 | 862-892 | | | | |
| 977.5 | ----- | 962.5-992.5 | | | | |
| | 378 | 363-893 | | | | |
| 978.5 | ----- | 968.5-993.5 | | | | |
| | 379 | 864-394 | | | | |
| 979.5 | ----- | 964.5-994.5 | | | | |
| | 380 | 866-895 | | | | |
| 980.5 | ----- | 965.5-995.5 | | | | |
| | 381 | 366-396 | | | | |
| 981.5 | ----- | 966.5-996.5 | | | | |
| | 382 | 367-397 | | | | |
| 982.5 | ----- | 967.5-997.5 | | | | |

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| Low-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 383 | 368-398 | | | | |
| 983.5 | ----- | 968.5-998.5 | | | | |
| | 384 | 369-399 | | | | |
| 984.5 | ----- | 969.5-999.5 | | | | |
| | 385 | 370-399 | | | | |
| 985.5 | ----- | 970.5-999.5 | | | | |
| | 386 | 371-399 | | | | |
| 986.5 | ----- | 971.5-999.5 | | | | |
| | 387 | 872-399 | | | | |
| 987.5 | ----- | 972.5-999.5 | | | | |
| | 388 | 873-899 | | | | |
| 988.5 | ----- | 973.5-999.5 | | | | |
| | 389 | 374-399 | | | | |
| 989.5 | ----- | 974.5-999.5 | | | | |
| | 390 | 376-399 | | | | |
| 990.5 | ----- | 975.5-999.5 | | | | |
| | 391 | 376-399 | | | | |
| 991.5 | ----- | 976.5-999.5 | | | | |
| | 392 | 377-399 | | | | |
| 992.5 | ----- | 977.5-999.5 | | | | |
| | 393 | 378-399 | | | | |
| 993.5 | ----- | 978.5-999.5 | | | | |
| | 394 | 379-399 | | | | |
| 994.5 | ----- | 979.5-999.5 | | | | |
| | 395 | 380-399 | | | | |
| 995.5 | ----- | 980.5-999.5 | | | | |
| | 396 | 381-399 | | | | |
| 996.5 | ----- | 981.5-999.5 | | | | |
| | 397 | 382-399 | | | | |
| 997.5 | ----- | 982.5-999.5 | | | | |
| | 388 | 388-399 | | | | |
| 998.5 | ----- | 983.5-999.5 | | | | |
| | 399 | 884-399 | | | | |
| 999.5 | ----- | 984.5-999.5 | | | | |

| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 400 | 400-415 | 447-468 | 467-468 | 497-503 | 517-523 |
| 1350.5 | ----- | 1350.5-1365.5 | 1397.5-1403.5 | 1407.5-1413.3 | 1447.5-1453.5 | 1467.5-1473.5 |
| | 401 | 400-416 | 448-464 | 468-464 | 498-604 | 518-524 |
| 1351.5 | ----- | 1350.5-1366.5 | 1398.5-1404.5 | 1408.5-1414.5 | 1448.5-1454.5 | 1468.5-1474.5 |
| | 402 | 400-417 | 449-466 | 469-466 | 499-606 | 519-525 |
| 1352.5 | ----- | 1350.5-1367.5 | 1399.5-1405.5 | 1409.5-1415.5 | 1449.5-1455.5 | 1469.5-1475.5 |
| | 403 | 400-418 | 450-466 | 460-466 | 600-606 | 520-526 |
| 1353.5 | ----- | 1350.5-1868.5 | 1400.5-1406.5 | 1410.5-1416.5 | 1450.5-1456.5 | 1470.5-1476.5 |
| | 404 | 400-419 | 451-457 | 461-467 | 501-507 | 621-527 |
| 1354.5 | ----- | 1850.5-1869.5 | 1401.5-1407.5 | 1411.5-1417.5 | 1451.5-1457.5 | 1471.5-1477.5 |
| | 405 | 400-420 | 462-468 | 462-468 | 602-608 | 522-528 |
| 1355.5 | ----- | 1350.5-1370.5 | 1402.5-1408.5 | 1412.5-1418.5 | 1452.5-1458.5 | 1472.5-1478.5 |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 406 | 400-421 | 453-459 | 463-469 | 503-509 | 523-529 |
| 1356.5 | ----- | 1350.5-1371.5 | 1403.5-1409.5 | 1413.5-1419.5 | 1453.5-1459.5 | 1473.5-1479.5 |
| | 407 | 400-422 | 454-460 | 464-470 | 504-510 | 524-530 |
| 1357.5 | ----- | 1350.5-1372.5 | 1404.5-1410.5 | 1414.5-1420.5 | 1454.5-1460.5 | 1474.5-1480.5 |
| | 408 | 400-423 | 455-461 | 465-471 | 505-511 | 525-531 |
| 1358.5 | ----- | 1350.5-1373,5 | 1405.5-1411.5 | 1415.5-1421.5 | 1455.5-1461.5 | 1475.5-1481.5 |
| | 409 | 400 424 | 456-462 | 466-472 | 506-512 | 526-532 |
| 1359.5 | ----- | 1350.5-1374.5 | 1406.5-1412.5 | 1416.5-1422.5 | 1456.5-1462.5 | 1476.5-1482.5 |
| | 410 | 400-425 | 457-463 | 467-473 | 507-513 | 527-533 |
| 1360.5 | ----- | 1350.5-1375.5 | 1407.5-1413.5 | 1417.5-1423.5 | 1457.5-1463.5 | 1477.5-3483.5 |
| | 411 | 400-426 | 458-464 | 468-474 | 508-514 | 528-584 |
| 1361.5 | ----- | 1350.5-1376.5 | 1408.5-1414.5 | 1418.5-1424.5 | 1458.5-1464.5 | 1478.5-1484.5 |
| | 412 | 400-427 | 459-465 | 469-475 | 509-515 | 529-535 |
| 1362.5 | ----- | 1350.5-1377.5 | 1409.5-1415.5 | 1419.5-1425.5 | 1459.5-1465.5 | 1479.5-1485.5 |
| | 413 | 400-428 | 460-466 | 470-476 | 510-516 | 530-536 |
| 1363.5 | ----- | 1350.5-1378.5 | 1410.5-1416.5 | 1420.5-1426.5 | 1460.5-1466.5 | 1480.5-1486.5 |
| | 414 | 400-429 | 461-467 | 471-477 | 511-517 | 531-537 |
| 1364.5 | ----- | 1350.5-1379.5 | 1411.5-1417.5 | 1421.5-1427.5 | 1461.5-1467.5 | 1481.5-1487.5 |
| | 415 | 400-430 | 462-468 | 472-478 | 512-518 | 532-588 |
| 1365.5 | ----- | 1350.5-1380.5 | 1412.5-1418.5 | 1422.5-1428.5 | 1462.5-1468.5 | 1482.5-1488-5 |
| | 416 | 401-431 | 463-465 | 473-479 | 513-519 | 533-539 |
| 1366.5 | ----- | 1350.5-1381.5 | 1413.5-1419.5 | 1428.5-1429.5 | 1463.5-1469.5 | 1483.5-1489.5 |
| | 417 | 402-432 | 464-470 | 474-480 | 514-520 | 534-540 |
| 1367.5 | ----- | 1352.5-1382.5 | 1414.5-1420.5 | 1424.5-1430.5 | 1464.5-1470.5 | 1484.5-1490.5 |
| | 418 | 403-433 | 465-471 | 475-481 | 515-521 | 535-541 |
| 1368.5 | ----- | 1353:5-1383.5 | 1415.5-1421.5 | 1425.5-1431.5 | 1465.5-1471.5 | 1485.5-1491.5 |
| | 419 | 404-434 | 466-472 | 476-482 | 516-522 | 636-542 |
| 1369.5 | ----- | 1354.5-1384-5 | 1416.5-1422.5 | 1426.5-1432.5 | 1460.5-1466.5 | 1480.5-1486.5 |
| | 420 | 405-435 | 467-473 | 477-483 | 517-523 | 537-543 |
| 1370.5 | ----- | 1355.5-1385.5 | 1417.5-1423.5 | 1427.5-1438.5 | 1467.5-1473.5 | 1487.5-1493.5 |
| | 421 | 406-436 | 468-474 | 478-484 | 518-624 | 538-544 |
| 1371.5 | ----- | 1356.5-1386.5 | 1418.5-1424.5 | 1428.5-1434.5 | 1488.5-1474.5 | 1488.5-1494.5 |
| | 422 | 407-437 | 469-475 | 479-485 | 519-525 | 539-545 |
| 1372.5 | ----- | 1357.5-1387.5 | 1419.5-1425.5 | 1429.5-1485.5 | 1469.5-1475.5 | 1489.5-1495.5 |
| | 423 | 408-438 | 470-476 | 480-486 | 520-526 | 540-546 |
| 1373.5 | ----- | 1358.5-1388.5 | 1420.5-1426.5 | 1430.5-1436.5 | 1470.5-1476.5 | 1490.5-1496.5 |
| | 424 | 409-439 | 471-477 | 481-487 | 521-527 | 541-547 |
| 1374.5 | ----- | 1359.5-1389.5 | 1421.5-1427.5 | 1431.5-1437.5 | 1471.5-1477.5 | 1491.5-1497.5 |
| | 425 | 410-440 | 472-478 | 482-488 | 522-528 | 542-548 |
| 1375.5 | ----- | 1360.5-1390.5 | 1422.5-1428.5 | 1432.5-1438.5 | 1472.5-1478.5 | 1492.5-1498.5 |
| | 426 | 411-441 | 473-479 | 483-489 | 528-529 | 543-549 |
| 1376.5 | ----- | 1361.5-1391.5 | 1423.5-1429.5 | 1483.5-1439.5 | 1473.5-1479.5 | 1493.5-1499.5 |
| | 427 | 412-442 | 474-480 | 484-490 | 524-530 | 544-550 |
| 1377.5 | ----- | 1362.5-1392.5 | 1424.5-143Q.5 | 1434.5-1440.5 | 1474.5-1480.5 | 1494.5-1500.5 |
| | 428 | 413-443 | 475-481 | 485-491 | 525-531 | 545-551 |
| 1378.5 | ----- | 1363.5-1398.5 | 1425.5-1431.5 | 1435.5-1441.5 | 1475.5-1481.5 | 1495.5-1501.5 |
| | 429 | 414-444 | 476-482 | 486-492 | 526-532 | 546-552 |
| 1379.5 | ----- | 1364.5-1394.5 | 1426.5-1432.5 | 1436.5-1442.5 | 1476.5-1482.5 | 1496.5-1502.5 |
| | 430 | 415-445 | 477-483 | 487-493 | 527-533 | 547-553 |
| 1380.5 | ----- | 1365.5-1395.5 | 1427.5-1433.5 | 1437.5-1443.5 | 1477.5-1483.5 | 1497.5-1503.5 |
| | 431 | 416-446 | 478-484 | 488-494 | 528-534 | 548-554 |
| 1381.5 | ----- | 1366.5-1396.5 | 1428.5-1434.5 | 1438.5-1444.5 | 1478.5-1484.5 | 1498.5-1504.5 |
| | 432 | 417-447 | 479-485 | 489-495 | 528-535 | 549-555 |
| 1382.5 | ----- | 1367.5-1397.5 | 1429.5-1435.5 | 1439.5-1445.5 | 1479.5-1485.5 | 1499.5-1505.5 |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 433 | 418-448 | 480-486 | 490-496 | 530-536 | 560-556 |
| 1383.5 | ----- | 1368.5-1398.5 | 1430.5-1436.5 | 1440.5-1446.5 | 1480.5-1486.5 | 1500.5-1506.5 |
| | 434 | 419-449 | 481-487 | 491-497 | 531-537 | 551-557 |
| 1384.5 | ----- | 1369.5-1399.5 | 1431.5-1437.5 | 1441.5-1447.5 | 1481.5-1487.5 | 1501.5-1507.5 |
| | 435 | 420-450 | 482-488 | 492-498 | 532-538 | 552-558 |
| 1385.5 | ----- | 1370.5-1400.5 | 1432.5-1438.5 | 1442.5-1448.5 | 1482.5-1488.5 | 1502.5-1508.5 |
| | 436 | 421-451 | 483-489 | 493-499 | 533-539 | 553-559 |
| 1386.5 | ----- | 1371.5-1401.5 | 1433.5-1439.5 | 1443.5-1449.5 | 1483.5-1489.5 | 1603.5-1509.5 |
| | 437 | 422-452 | 484-490 | 494-500 | 534-540 | 554-560 |
| 1387.5 | ----- | 1372.5-1402.5 | 1434.5-1440.5 | 1444.5-1450.5 | 1484.5-1490.5 | 1504.5-1510.5 |
| | 438 | 423-453 | 485-491 | 495-501 | 535-541 | 555-561 |
| 1388.5 | ----- | 1373.5-1403.5 | 1435.5-1441.5 | 1445.5-1451.5 | 1485.5-1491.5 | 1505.5-1511.5 |
| | 439 | 424-454 | 486-492 | 496-502 | 536-542 | 556-562 |
| 1389.5 | ----- | 1374.5-1404.5 | 1436.5-1442.5 | 1446.5-1452.5 | 1486.5-1492.5 | 1506.5-1512.5 |
| | 440 | 425-455 | 487-493 | 497-503 | 537-543 | 557-563 |
| 1390.5 | ----- | 1375.5-1405.5 | 1437.5-1443.5 | 1447.5-1453.5 | 1487.5-1493.5 | 1507.5-1513.5 |
| | 441 | 426-456 | 488-494 | 498-504 | 538-544 | 558-564 |
| 1391.5 | ----- | 1376.5-1406.5 | 1438.5-1444.5 | 1448.5-1454.5 | 1488.5-1494.5 | 1508.5-1514.5 |
| | 442 | 427-457 | 489-495 | 499-505 | 539-545 | 559-565 |
| 1392.5 | ----- | 1377.5-1407.5 | 1439.5-1445.5 | 1449.5-1455.5 | 1489.5-1495.5 | 1509.5-1515.5 |
| | 443 | 428-458 . | 490-496 | 500-506 | 540-546 | 560-566 |
| 1393.5 | ----- | 1378.5-1408.5 | 1440.5-1446.5 | 1450.5-1456.5 | 1490.5-1496.5 | 1510.5-1516.5 |
| | 444 | 429-459 | 491-497 | 501-507 | 541-547 | 561-567 |
| 1394.5 | ----- | 1379.5-1409.5 | 1441.5-1447.5 | 1451.5-1457.5 | 1491.5-1497.5 | 1511.5-1517.5 |
| | 445 | 430-460 | 492-498 | 502-508 | 542-548 | 562-568 |
| 1395.5 | ----- | 1380.5-1410.5 | 1442.5-1448.5 | 1452.5-1458.5 | 1492.5-1498.5 | 1512.5-1518.5 |
| | 446 | 431-461 | 493-499 | 503-509 | 543-549 | 563-569 |
| 1396.5 | ----- | 1381.5-1411.5 | 1443.5-1449.5 | 1453.5-1459.5 | 1493.5-1499.5 | 1513.5-1519.5 |
| | 447 | 432-462 | 494-500 | 504-510 | 544-550 | 564-570 |
| 1397.5 | ----- | 1382.5-1412.5 | 1444.5-1450.5 | 1454.5-1460.5 | 1494.5-1500.5 | 1514.5-1520.5 |
| | 448 | 433-463 | 495-501 | 505-511 | 545-551 | 565-571 |
| 1398.5 | ----- | 1383.5-1413.5 | 1445.5-1451.5 | 1455.5-1461.5 | 1495.5-1501.5 | 1515.5-1521.5 |
| | 449 | 434-446 | 496-502 | 506-512 | 546-552 | 566-572 |
| 1399.5 | ----- | 1384.5-1414.5 | 1446.5-1452.5 | 1456.5-1462.5 | 1496.5-1502.5 | 1516.5-1522.5 |
| | 450 | 435-465 | 497-503 | 507-513 | 547-553 | 567-573 |
| 1400.5 | ----- | 1385.5-1415.5 | 1447.5-1453.5 | 1457.5-1463.5 | 1497.5-1503.5 | 1517.5-1523.5 |
| | 451 | 436-466 | 498-504 | 508-614 | 548-554 | 568-574 |
| 1401.5 | ----- | 1386.5-1416.5 | 1448.5-1454.5 | 1458.5-1464.5 | 1498.5-1504.5 | 1518.5-1524.5 |
| | 452 | 437-467 | 499-605 | 509-515 | 549-555 | 569-575 |
| 1402.5 | ----- | 1387.5-1417.5 | 1449.5-1455.5 | 1459.5-1465.5 | 1499.5-1505.5 | 1519.5-1525.5 |
| | 453 | 438-468 | 500-506 | 510-516 | 550-556 | 570-576 |
| 1403.5 | ----- | 1388.5-1418.5 | 1450.5-1456.5 | 1460.5-1466.5 | 1500.5-1506.5 | 1520.5-1526.5 |
| | 454 | 439-469 | 501-507 | 511-517 | 551-557 | 671-577 |
| 1404.5 | ----- | 1389.5-1419.5 | 1451.5-1457.5 | 1461.5-1467.5 | 1501.5-1507.5 | 1521.5-1527.5 |
| | 455 | 440-470 | 502-508 | 512-518 | 552-558 | 572-578 |
| 1405.5 | ----- | 1390.5-1420.5 | 1452.5-1458.5 | 1462.5-1468.5 | 1502.5-1508.5 | 1522.5-1528.5 |
| | 456 | 441-471 | 603-509 | 513-519 | 553-559 | 673-579 |
| 1406.5 | ----- | 1391.5-1421.5 | 1453.5-1459.5 | 1463.5-1469.5 | 1503.5-1509.5 | 1523.5-1529.5 |
| | 457 | 442-472 | 504-510 | 514-520 | 554-560 | 574-580 |
| 1407.5 | ----- | 1392.5-1422.5 | 1454.5-1460.5 | 1464.5-1470.5 | 1504.5-1510.5 | 1524.5-1530.5 |
| | 458 | 443-473 | 505-511 | 515-521 | 555-561 | 575-581 |
| 1408.5 | ----- | 1393.5-1423.5 | 1455.5-1461.5 | 1465.5-1471.5 | 1505.5-1511.5 | 1525.5-1531.5 |
| | 459 | 444-474 | 506-512 | 616-522 | 556-562 | 576-582 |
| 1409.5 | ----- | 1394.5-1424.5 | 1456.5-1462.5 | 1466.5-1472.5 | 1506.5-1512.5 | 1526.5-1532.5 |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 460 | 445-475 | 507-513 | 517 -.523 | 557 -.563 | 577 -.583 |
| 1410.5 | ----- | 1395.5-1425.5 | 1457.5-1463.5 | 1467.5-1473.5 | 1507.5-1513.5 | 1527.5-1533.5 |
| | 461 | 446-476 | 508-514 | 518-524 | 558-564 | 578-584 |
| 1411.5 | ----- | 1396.5-1426.5 | 1458.5-1464.5 | 1468.5-1474.5 | 1508.5-1514.5 | 1528.5-1534.5 |
| | 462 | 447-477 | 509-515 | 519-525 | 559-565 | 579-585 |
| 1412.5 | ----- | 1397.5-142?.5 | 1459.5-1465.5 | 1469.5-1475.5 | 1509.5-1515.5 | 1529.5-1535.5 |
| | 463 | 448-478 | 510-516 | 520-526 | 560-566 | 580-586 |
| 1413.5 | ----- | 1398.5-1428.5 | 1460.5-1466.5 | 1470.5-1476.5 | 1510.5-l516.5 | 1530.5-1536.5 |
| | 464 | 449-479 | 511-517 | 521-527 | 561-567 | 581-587 |
| 1414.5 | ----- | 1399.5-1429.5 | 1461.5-1467.5 | 1471.5-1477.5 | 1511.5-1517.5 | 1531.5-1537.5 |
| | 465 | 450-480 | 512-518 | 622-528 | 562-568 | 682-588 |
| 1415.5 | ----- | 1400.5-1430.5 | 1462.5-1468.5 | 1472.5-1478.5 | 1512.5-1518.5 | 1532.5-1538.5 |
| | 466 | 451-481 | 513-519 | 523-529 | 563-569 | $83-589 |
| 1416.5 | ----- | 1401.5-1431.5 | 1463.5-1469.5 | 1473.5-1479.5 | 1513.5-1519.5 | 1533.5-1539.5 |
| | 467 | 452-482 | 514-520 | 524-530 | 564-570 | 584-590 |
| 1417.5 | ----- | 1402.5-1432.5 | 1464.5-1470.5 | 1474.5-1480.5 | 1514.5-1520.5 | 1534.5-1540.5 |
| | 468 | 453-483 | 515-521 | 525-531 | 565-571 | 585-591 |
| 1418.5 | ----- | 1403.5-1433.5 | 1465.5-1471.5 | 1475.5-1481.5 | 1515.5-1521.5 | 1535.5-1541.5 |
| | 469 | 454-484 | 516-522 | 526-532 | 566-572 | 586-592 |
| 1419.5 | ----- | 1404.5-1434.5 | 1466.5-1472.5 | 1476.5-1482.5 | 1516.5-1522.5 | 1536.5-1542.5 |
| | 470 | 455-485 | 517-523 | 527-533 | 567-573 | 587-593 |
| 1420.5 | ----- | 1405.5-1435.5 | 1467.5-1473.5 | 1477.5-1483.5 | 1517.5-1523.5 | 1537.5-1543.5 |
| | 471 | 456-486 | 518-524 | 528-534 | 568-574 | 588-594 |
| 1421.5 | ----- | 1406.5-1436.5 | 1468.5-1474.5 | 1478.5-1484.5 | 1518.5-1524.5 | 1538.5-1544.5 |
| | 472 | 457-487 | 519-525 | 529-535 | 569-575 | 589-595 |
| 1422.5 | ----- | 1407.5-1437.5 | 1469.5-1475.5 | 1479.5-1485.5 | 1519.5-1525.5 | 1539.5-1545.5 |
| | 473 | 458-488 | 520-526 | 530-536 | 570-576 | 590-596 |
| 1423.5 | ----- | 1408.5-1438.5 | 1470.5-1476.5 | 1480.5-1486.5 | 1520.5-1526.5 | 1540.5-1546.5 |
| | 474 | 459-489 | 521-527 | 531-537 | 571-577 | 591-597 |
| 1424.5 | ----- | 1409.5-1439.5 | 1471.5-1477.5 | 1481.5-1487.5 | 521.5-1527.5 | 1541.5-1547.5 |
| | 475 | 460-490 | 522-528 | 532-638 | 572-578 | 592-598 |
| 1425.5 | ----- | 1410.5-1440.5 | 1472.5-1478.5 | 1482.5-1488.5 | 1522.5-1528.5 | 1542.5-1548.5 |
| | 476 | 461-491 | 523-529 | 533-539 | 573-579 | 593-599 |
| 1426.5 | ----- | 1411.5-1441.5 | 1473.5-1479.5 | 1483.5-1489.5 | 1523.5-1529.5 | 1543.5-1549.5 |
| | 477 | 462-492 | 524-530 | 534-540 | 574-580 | 594-600 |
| 1427.5 | ----- | 1412.5-1442.5 | 1474.5-1480.5 | 1484.5-1490.5 | 1524.5-1530.5 | 1544.5-1550.5 |
| | 478 | 463-493 | 525-531 | 535-541 | 575-581 | 595-601 |
| 1428.5 | ----- | 1413.5-1443.5 | 1475.5-1481.5 | 1485.5-1491.5 | 1525.5-1531.5 | 1545.5-1551.5 |
| | 479 | 464-494 | 526-532 | 536-542 | 576-582 | 596-602 |
| 1429.5 | ----- | 1414.5-1444.5 | 1476.5-1482.5 | 1486.5-1492.5 | 1526.5-1532.5 | 1546.5-1552.5 |
| | 480 | 465-495 | 527-533 | 537-543 | 577-583 | 597-603 |
| 1430.5 | ----- | 1415.5-1445.5 | 1477.5-1483.5 | 1487.5-1493.5 | 527.5-1533.5 | 1547.5-1563.5 |
| | 481 | 466-496 | 528-534 | 538-544 | 578-584 | 598-604 |
| 1431.5 | ----- | 1416.5-1446.5 | 1478.5-1484.5 | 1488.5-1494.5 | 1528.5-1534.5 | 1548.5-1554.5 |
| | 482 | 467-497 | 529-535 | 539-545 | 579-585 | 599-605 |
| 1432.5 | ----- | 1417.5-1447.5 | 1479.5-1485.5 | 1489.5-1495.5 | 529.5-1535.5 | 1549.5-1555.5 |
| | 483 | 468-498 | 530-536 | 540-546 | 580-586 | 600-606 |
| 1433.5 | ----- | 1418.5-1448.5 | 1480.5-1486.5 | 1490.5-1496.5 | 1530.5-1536.5 | 1550.5-1556.5 |
| | 484 | 469-499 | 531-537 | 541-547 | 581-587 | 601-607 |
| 1434.5 | ----- | 1419.5-1449.5 | 1481.5-1487.5 | 1491.5-1497.5 | 531.5-1537.5 | 1551.5-1557.5 |
| | 485 | 470-500 | 532-538 | 542-548 | 582-588 | 602-608 |
| 1435.5 | ----- | 1420.5-1450.5 | 1482.5-1488.5 | 1492.5-1498.5 | 1532.5-1538.5 | 1552.5-1558.5 |
| | 486 | 471-501 | 533-639 | 543-549 | 583-589 | 603-609 |
| 1436.5 | ----- | 1421.5-1451.5 | 1483.5-1489.5 | 1493.5-1499.5 | 1533.5-1539.5 | 1553.5-1559.5 |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 487 | 472-602 | 634-540 | 544-560 | 584-590 | 604-610 |
| 1437.5 | ----- | 1422.5-1462.5 | 1484.5-1490.5 | 1494.5-1500.5 | 1534.5-1540.5 | 1554.5-1560.5 |
| | 488 | 473-503 | 535-541 | 545-551 | 585-591 | 605-611 |
| 1438.5 | ----- | 1423.5-1453.5 | 1485.5-1491.5 | 1495.5-1501.5 | 1535.5-1541.5 | 1665.5-1661.5 |
| | 489 | 474-504 | 536-542 | 546-562 | 586-592 | 606-612 |
| 1439.5 | ----- | 1424.5-1454.5 | 1486.5-1492.5 | 1496.5-1502.5 | 1536.5-1542.5 | 1556.5-1562.5 |
| | 490 | 475-505 | 537-543 | 547-553 | 587-593 | 607-613 |
| 1440.5 | ----- | 1425.5-1455.5 | 1487.5-1493.5 | 1497.5-1503.5 | 1537.5-1543.5 | 1551.5-1563.5 |
| | 491 | 476-506 | 538-544 | 548-664 | 588-594 | 608-614 |
| 1441.5 | ----- | 1426.5-1466.5 | 1488.5-1494.5 | 1498.5-1504.5 | 1538.5-1544.5 | 1558.5-1564.5 |
| | 492 | 477-507 | 539-545 | 549-555 | 589-595 | 609-615 |
| 1442.5 | ----- | 1427.5-1457.5 | 1489.5-1495.5 | 1499.5-1505.5 | 1539.5-1545.5 | 1559.5-1565.5 |
| | 493 | 478-508 | 640-646 | 550-556 | 590-596 | 610-616 |
| 1443.5 | ----- | 1428.5-1458.5 | 1490.5-1496.5 | 1500.5-1606.5 | 1540.5-1546.5 | 1560.5-1566.5 |
| | 494 | 479-509 | 541-547 | 651-567 | 591-597 | 611-617 |
| 1444.5 | ----- | 1429.5-1459.5 | 1491.5-1497.5 | 1501.5-1507.5 | 1541.5-1547.5 | 1561.5-1567.5 |
| | 495 | 480-510 | 542-548 | 552-558 | 592-598 | 612-618 |
| 1446.5 | ----- | 1430.5-1460.5 | 1492.5-1498.5 | 1502.5-1508.5 | 1642.5-1548.5 | 1662.5-1568.5 |
| | 496 | 481-511 | 543-549 | 553-559 | 593-599 | 613-619 |
| 1446.5 | ----- | 1431.5-1461.5 | 1493.5-1499.5 | 1503.5-1509.5 | 1543.5-1549.5 | 1563.5-1569.5 |
| | 497 | 482-512 | 644-650 | 554-560 | 594-600 | 614-620 |
| 1447.5 | ----- | 1432.5-1462.5 | 1494.5-1500.5 | 1504.5-1510.5 | 1544.5-1560.5 | 1564.5-1670.5 |
| | 498 | 483-513 | 545-551 | 555-561 | 595-601 | 615-621 |
| 1448.5 | ----- | 1433.5-1463.5 | 1495.5-1501.5 | 1505.5-1511.5 | 1545.5-1551.5 | 1565.5-1571.5 |
| | 499 | 484-514 | 646.552 | 656-662 | 596-602 | 616-622 |
| 1449.5 | ----- | 1434.5-1464.5 | 1496.5-1502.5 | 1506.5-1512.5 | 1546.5-1552.5 | 1566.5-1572.5 |
| | 500 | 486-515 | 547-553 | 557-563 | 597-603 | 617-623 |
| 1450.5 | | 1435.5-1465.5 | 1497.5-1603.5 | 1507.5-1513.5 | 1547.5-1553.5 | 1667.5-1673.5 |
| | 501 | 486-516 | 548-654 | 568-564 | 698-604 | 618-624 |
| 1451.5 | ----- | 1436.5-1466.5 | 1498.5-1504.5 | 1508.5-1514.5 | 1548.5-1554.5 | 1568.5-1574.5 |
| | 502 | 487-517 | 549-555 | 559-565 | 599-605 | 619-625 |
| 1452.5 | ----- | 1437.5-1467.5 | 1499.5-1505.5 | 1509.5-1515.5 | 1549.5-1555.5 | 1569.5-1575.5 |
| | 503 | 488-518 | 550-556 | 560-566 | 600-606 | 620-626 |
| 1453.5 | ----- | 1438.5-1468.5 | 1500.5-1506.5 | 1510.5-1516.5 | 1650.5-1566.5 | 1670.5-1676.5 |
| | 504 | 489-619 | 651-667 | 661-667 | 601-607 | 621-627 |
| 1454.5 | ----- | 1439.5-1469.5 | 1501.5-1507.5 | 1511.5-1517.5 | 1551.5-1557.5 | 1571.5-1577.5 |
| | 506 | 490-520 | 552-558 | 662-568 | 602-608 | 622-628 |
| 1455.5 | ----- | 1440.5-1470.5 | 1502.5-1508.5 | 1512.5-1518.5 | 1552.5-1558.5 | 1572.5-1578.5 |
| | 506 | 491-521 | 553-559 | 563-669 | 603-609 | 623-629 |
| 1456.5 | ----- | 1441.5-1471.5 | 1503.5-1509.5 | 1513.5-1519.5 | 1553.5-1559.5 | 1573.5-1579.5 |
| | 507 | 492-522 | 554-560 | 664-670 | 604-610 | 624-630 |
| 1457.5 | ----- | 1442.5-1472.5 | 1504.5-1510.5 | 1614.5-1620.5 | 1554.5-1560.5 | 1574.5-1580.5 |
| | 508 | 493-523 | 555-561 | 565-571 | 605-611 | 625-631 |
| 1458.5 | ----- | 1443.5-1473.5 | 1505.5-1511.5 | 1515.5-1521.5 | 1555.5-1561.5 | 1575.5-1581.5 |
| | 509 | 494-524 | 556-562 | 566-672 | 606-612 | 626-632 |
| 1459.5 | ----- | 1444.5-1474.5 | 1506.5-1512.5 | 1516.5-1522.5 | 1556.5-1562.5 | 1576.5-1582.5 |
| | 510 | 496-626 | 567-563 | 567-573 | 607-613 | 627-633 |
| 1460.5 | ----- | 1445.5-1475.5 | 1507.5-1513.5 | 1517.5-1523.5 | 1667.5-1563.5 | 1577.5-1583.5 |
| | 511 | 496-626 | 558-664 | 668-574 | 608-614 | 628-634 |
| 1461.5 | ----- | 1446.5-1476-5 | 1508.5-1514.5 | 1518.5-1524.5 | 1558.5-1564.5 | 1578.5-1684.5 |
| | 512 | 497-627 | 559-665 | 569-575 | 609-615 | 629-635 |
| 1462.5 | ----- | 1447.5-1477.5 | 1509.5-1515.5 | 1519.5-1525.5 | 1559.5-1565.5 | 1579.5-1585.5 |
| | 513 | 498-528 | 660-566 | 670-576 | 610-616 | 630-636 |
| 1463.5 | ----- | 1448.5-1478.5 | 1510.5-1516.5 | 1520.5-1526.5 | 1560.5-1566.5 | 1580.5-1586.5 |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 514 | 499-629 | 661-567 | 571-577 | 611-617 | 631-637 |
| 1464.5 | ----- | 1449.5-1479.5 | 1611.5-1617.5 | 1521.5-1527.5 | 1661.5-1567.5 | 1581.5-1587.5 |
| | 515 | 600-530 | 562-568 | 672-678 | 612-618 | 632-638 |
| 1465.5 | ----- | 1460.5-1480.5 | 1512.5-1518.5 | 1522.5-1528.5 | 1662.5-1668.5 | 1682.5-1588.5 |
| | 516 | 501-631 | 663-569 | 573-579 | 613-619 | 633-639 |
| 1466.5 | ----- | 1451.5-1481.5 | 1613.5-1519.5 | 1523.5-1529.5 | 1563.5-1569.5 | 1583.5-1689.5 |
| | 517 | 502-532 | 564-570 | 574-580 | 614-620 | 634-640 |
| 1467.5 | ----- | 1452.5-1482.5 | 1514.5-1520.5 | 1524.5-1550.5 | 1564.5-1570.5 | 1684.5-1690.5 |
| | 518 | 503-533 | 565-571 | 676-581 | 616-621 | 636-641 |
| 1468.5 | ----- | 1453.5-1483.5 | 1515.5-1521.5 | 1525.5-1531.5 | 1565.5-1671.5 | 1586.5-1691.5 |
| | 519 | 604-534 | 566-572 | 576-582 | 616-622 | 636-642 |
| 1469.5 | ----- | 1454.5-1484.5 | 1516.5-1522.5 | 1526.5-1532.5 | 1566.5-1572.5 | 1586.5-1692.5 |
| | 520 | 505-535 | 567-573 | 577-583 | 617-623 | 637-643 |
| 1470.5 | ----- | 1455.5-1485.5 | 1517.5-1523.5 | 1527.5-1533.5 | 1567.5-1573.5 | 1587.5-1693.5 |
| | 521 | 506-536 | 568-574 | 578-584 | 618-624 | 638-644 |
| 1471.5 | ----- | 1456.5-1486.5 | 1518.5-1524.5 | 1528.5-1534.5 | 1568.5-1574.5 | 1588.5-1594.5 |
| | 522 | 507-537 | 669-575 | 579-585 | 619-625 | 639-645 |
| 1472.5 | ----- | 1467.5-1487.5 | 1519.5-1525.5 | 1529.5-1535.5 | 1569.5-1575.5 | 1689.5-1695.5 |
| | 523 | 508-538 | 570-576 | 680-586 | 620-626 | 640-646 |
| 1473.5 | ----- | 1468.5-1488.5 | 1520.5-1526.5 | 1530.5-1636.5 | 1570.5-1576.5 | 1690.5-1596.5 |
| | 524 | 509-539 | 571-577 | 581-587 | 621-627 | 641-647 |
| 1474.5 | ----- | 1459.5-1489.5 | 1521.5-1527.5 | 1531.5-1537.5 | 1571.5-1577.5 | 1591.5-1597.5 |
| | 525 | 510-540 | 572-578 | 682-588 | 622-628 | 642-648 |
| 1475.5 | ----- | 1460.5-1490.5 | 1522.5-1528.5 | 1532.5-1538.5 | 1572.5-1578.5 | 1592.5-1598.5 |
| | 526 | 511-541 | 573-579 | 583-589 | 623-629 | 643-649 |
| 1476.5 | ----- | 1461.5-1491.5 | 1623.5-1529.5 | 1533.5-1539.5 | 1573.5-1579.5 | 1593.5-1599.5 |
| | 527 | 512-542 | 574-580 | 684-590 | 624-630 | 644-650 |
| 1477.5 | ----- | 1462.5-1492.5 | 1524.5-1530.5 | 1534.5-1540.5 | 1574.5-1580.5 | 1594.5-1600.5 |
| | 528 | 513-543 | 575-581 | 585-591 | 625-631 | 645-651 |
| 1478.5 | ----- | 1463.5-1493.5 | 1625.5-1531.5 | 1535.5-1541.5 | 1575.5-1581.5 | 1595.5-1601.5 |
| | 529 | 514-544 | 576-582 | 686-592 | 626-632 | 646-652 |
| 1479.5 | ----- | 1464.5-1494.5 | 1526.5-1532.5 | 1536.5-1542.5 | 1576.5-1582.5 | 1696.5-1602.5 |
| | 530 | 515-545 | 577-583 | 587-593 | 627-633 | 647-653 |
| 1480.5 | ----- | 1465.5-1495-5 | 1527.5-1533-5 | 1637.5-1643.5 | 1577.5-1583.5 | 1697.5-1603.5 |
| | 531 | 516-546 | 578-584 | 588-694 | 628-684 | 648-664 |
| 1481.5 | ----- | 1466.5-1496.5 | 1628.5-1634.5 | 1538.5-1544.5 | 1578.5-1584.5 | 1598.5-1604.5 |
| | 532 | 517-547 | 579-585 | 589-595 | 629-635 | 649-655 |
| 1482.5 | ----- | 1467.5-1497.5 | 1529.5-1535.5 | 1539.5-1545.5 | 1579.5-1686.5 | 1599.5-1605.5 |
| | 533 | 518-548 | 580-586 | 590-596 | 630-636 | 650-656 |
| 1483.5 | ----- | 1468.5-1498.5 | 1530.5-1536.5 | 1540.5-1546.5 | 1580.5-1586.5 | 1600.5-1606.5 |
| | 534 | 519-549 | 581-587 | 591-597 | 631-637 | 661-667 |
| 1484.5 | ----- | 1469.5-1499.5 | 1531.5-1537.5 | 1541.5-1547.5 | 1581.5-1687.5 | 1601.5-1607.5 |
| | 535 | 520-550 | 582-588 | 592-598 | 632-638 | 652-668 |
| 1485.5 | ----- | 1470.5-1500.5 | 1532.5-1538.5 | 1542.5-1548.5 | 1582.5-1588.5 | 1602.5-1608.5 |
| | 536 | 521-551 | 583-589 | 593-599 | 633-639 | 653-659 |
| 1486.5 | ----- | 1471.5-1501.5 | 1533.5-1539.5 | 1543.5-1549.5 | 1583.5-1589.5 | 1603.5-1609.5 |
| | 537 | 522-552 | 584-590 | 694-600 | 634-640 | 664-660 |
| 1487.5 | ----- | 1472.5-1502.5 | 1534.5-1540.5 | 1544.5-1550.5 | 1584.5-1590.5 | 1604.5-1610.5 |
| | 538 | 523-553 | 585-691 | 595-601 | 635-641 | 655-661 |
| 1488.5 | ----- | 1473.5-1503-5 | 1535.5-1541.5 | 1545.5-1551.5 | 1585.5-1591.5 | 1605.5-1611.5 |
| | 539 | 524-554 | 586-592 | 596-602 | 636-642 | 656-662 |
| 1489.5 | ----- | 1474.5-1504.5 | 1536.5-1542.5 | 1546.5-1552.5 | 1586.5-1592.5 | 1606.5-1612.5 |
| | 540 | 525-555 | 587-593 | 597-603 | 637-643 | 667-663 |
| 1490.5 | ----- | 1475.5-1605-5 | 1537.5-1543.5 | 1547.5-1553.5 | 1587.5-1593.5 | 1607.5-1613.5 |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 541 | 526-556 | 588-594 | 598-604 | 638-644 | 658-664 |
| 1491.5 | ----- | 1476.5-1506.5 | 1538.5-1544.5 | 1548.5-1554.5 | 1588.5-1594.5 | 1608.5-1614.5 |
| | 542 | 527-557 | 589-595 | 599-605 | 639-645 | 659-665 |
| 1492.5 | ----- | 1477.5-1507.5 | 1539.5-1545.5 | 1549.5-1555.5 | 1589.5-1595.5 | 1609.5-1615.5 |
| | 543 | 528-668 | 590-596 | 600-606 | 640-646 | 660-666 |
| 1493.5 | ----- | 1478.5-1508.5 | 1540.5-1546.5 | 1660.5-1556.5 | 1590.5-1596.5 | 1610.5-1616.5 |
| | 544 | 529-559 | 591-597 | 601-607 | 641-647 | 661-667 |
| 1494.5 | ----- | 1479.5-1509.5 | 1541.5-1547.5 | 1551.5-1557.5 | 1591.5-1597.5 | 1611.5-1617.5 |
| | 545 | 530-560 | 592-598 | 602-608 | 642-648 | 662-668 |
| 1495.5 | ----- | 1480.5-1510.5 | 1542.5-1548.5 | 1552.5-1558.5 | 1592.5-1598.5 | 1612.5-1618.5 |
| | 546 | 531-561 | 593-599 | 603-609 | 643-649 | 663-669 |
| 1496.5 | ----- | 1481.5-1511.5 | 1543.5-1549.5 | 1553.5-1559.5 | 1593.5-1599.5 | 1613.5-1619.5 |
| | 547 | 532-562 | 594-600 | 604-610 | 644-650 | 664-670 |
| 1497.5 | ----- | 1482.5-1512.5 | 1544.5-1550.5 | 1554.5-1560.5 | 1594.5-1600.5 | 1614.5-1620.5 |
| | 548 | 533-563 | 595-601 | 605-611 | 645-651 | 665-67l |
| 1498.5 | ----- | 1483.5-1513.5 | 1545.5-1551.5 | 1555.5-1561.5 | 1595.5-1601.5 | 1615.5-1621.5 |
| | 549 | 534-564 | 596-602 | 606-612 | 646-652 | 666-672 |
| 1499.5 | ----- | 1484.5-1514.5 | 1546.5-1552.5 | 1556.5-1562.5 | 1596.5-1602.5 | 1616.5-1622.5 |
| | 550 | 535-565 | 597-603 | 607-613 | 647-653 | 667-678 |
| 1500.5 | ----- | 1485.5-1515.5 | 1547.5-1553.5 | 1557.5-1563.5 | 1597.5-1603.5 | 1617.5-1623.5 |
| | 551 | 536-566 | 598-604 | 608-614 | 648-654 | 668-674 |
| 1501.5 | ----- | 1486.5-1516.5 | 1548.5-1554.5 | 1558.5-1564.5 | 1598.5-1604.5 | 1618.5-1624.5 |
| | 552 | 537-567 | 599-605 | 609-615 | 649-666 | 669-676 |
| 1502.5 | ----- | 1487.5-1517.5 | 1549.5-1555.5 | 1559.5-1565.5 | 1599.5-1605.5 | 1619.5-1625.5 |
| | 553 | 538-568 | 600-606 | 610-616 | 650-656 | 670-676 |
| 1503.5 | ----- | 1488.5-1518.5 | 1550.5-1556.5 | 1560.5-1566.5 | 1600.5-1606.5 | 1620.5-1626.5 |
| | 554 | 539-569 | 601-607 | 611-617 | 651-657 | 671-677 |
| 1504.5 | ----- | 1489.5-1519.5 | 1551.5-1557.5 | 1561.5-1567.5 | 1601.5-1607.5 | 1621.5-1627.5 |
| | 555 | 540-570 | 602-608 | 612-618 | 652-658 | 672-678 |
| 1505.5 | ----- | 1490.5-1520.5 | 1552.5-1558.5 | 1562.5-1568.5 | 1602.5-1608.5 | 1622.5-1628.5 |
| | 556 | 541-571 | 603-609 | 613-619 | 653-659 | 673-679 |
| 1506.5 | ----- | 1491.5-1521.5 | 1553.5-1559.5 | 1563.5-1569.5 | 1603.5-1609.5 | 1623.5-1629.5 |
| | 557 | 542-572 | 604-610 | 614-620 | 654-660 | 674-680 |
| 1507.5 | ----- | 1492.5-1522.5 | 1554.5-1560.5 | 1564.5-1570.5 | 1604.5-1610.5 | 1624.5-1630.5 |
| | 558 | 543-513 | 605-611 | 615-621 | 655-661 | 675-681 |
| 1508.5 | ----- | 1493.5-1523.5 | 1555.5-1561.5 | 1565.5-1571.5 | 1605.5-1611.5 | 1625.5-1631.5 |
| | 559 | 544-574 | 606-612 | 616-622 | 656-662 | 676-682 |
| 1509.5 | ----- | 1494.5-1524.5 | 1556.5-1562.5 | 1566.5-1572.5 | 1606.5-1612.5 | 1626.5-1632.5 |
| | 560 | 545-575 | 607-613 | 617-623 | 657-663 | 677-683 |
| 1510.5 | ----- | 1495.5-1525.5 | 1557.5-1563.5 | 1567.5-1573.5 | 1607.5-1613.5 | 1627.5-1633.5 |
| | 561 | 546-576 | 608-614 | 618-624 | 658-664 | 678-684 |
| 1511.5 | ----- | 1496.5-1526.5 | 1558.5-1564.5 | 1568.5-1574.5 | 1608.5-1614.5 | 1628.5-1634.5 |
| | 562 | 547-577 | 609-615 | 619-625 | 659-665 | 679-685 |
| 1512.5 | ----- | 1497.5-1527.5 | 1559.5-1565.5 | 1569.5-1575.5 | 1609.5-1615.5 | 1629.5-1635.5 |
| | 563 | 548-578 | 610-616 | 620-626 | 660-666 | 680-686 |
| 1513.5 | ----- | 1498.5-1528.5 | 1560.5-1566.5 | 1670.5-1676.5 | 1610.5-1616.5 | 1630.5-1636.5 |
| | 564 | 549-579 | 611-617 | 621-627 | 661-667 | 681-687 |
| 1514.5 | ----- | 1499.5-1529.5 | 1561.5-1567.5 | 1571.5-1577.5 | 1611.5-1617.5 | 1631.5-1637.5 |
| | 565 | 550-580 | 612-618 | 622-628 | 662-668 | 682-688 |
| 1515.5 | ----- | 1500.5-1530.5 | 1562.5-1568.5 | 1572.5-1578.5 | 1612.5-1618.5 | 1632.5-1638.5 |
| | 566 | 551-581 | 613-619 | 623-629 | 663-669 | 683-689 |
| 1516.5 | ----- | 1501.5-1531.5 | 1563.5-1569.5 | 1573.5-1579.5 | 1613.5-1619.5 | 1633.5-1639.5 |
| | 567 | 552-582 | 614-620 | 624-630 | 664-670 | 684-690 |
| 1517.5 | ----- | 1502.5-1532.5 | 1564.5-1570.5 | 1574.5-1580.5 | 1614.5-1620.5 | 1634.5-164O.5 |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 568 | 553-583 | 615-621 | 625-631 | 665-671 | 685-691 |
| 1518.5 | ----- | 1503.5-1533.5 | 1565.5-1571.5 | 1575.5-1581.5 | 1615.5-1621.5 | 1635.5-1641.5 |
| | 569 | 554-584 | 616-622 | 626-632 | 666-672 | 686-692 |
| 1519.5 | ----- | 1504.5-1534.5 | 1566.5-1572.5 | 1576.5-1582.5 | 1616.5-1622.5 | 1636.5-1642.5 |
| | 570 | 555-585 | 617-623 | 627-633 | 667-673 | 687-693 |
| 1520.5 | ----- | 1505.5-1535.5 | 1567.5-1573.5 | 1577.5-1583.5 | 1617.5-1623.5 | 1637.5-1643.5 |
| | 571 | 556-586 | 618-624 | 628-634 | 668-674 | 688-694 |
| 1521.5 | ----- | 1506.5-1536.5 | 1568.5-1574.5 | 1578.5-1584.5 | 1618.5-1624.5 | 1638.5-1644.5 |
| | 572 | 567-587 | 619-625 | 629-635 | 669-675 | 689-695 |
| 1522.5 | ----- | 1507.5-1537.5 | 1569.5-1575.5 | 1579.5-1585.5 | 1619.5-1625.5 | 1639.5-1645.5 |
| | 573 | 558-688 | 620-626 | 630-636 | 670-676 | 690-696 |
| 1523.5 | ----- | 1508.5-1538.5 | 1570.5-1576.5 | 1580.5-1586.5 | 1620.5-1626.5 | 1640.5-1646.5 |
| | 574 | 559-589 | 621-627 | 631-637 | 671-677 | 691-697 |
| 1524.5 | ----- | 1509.5-1539.5 | 1571.5-1577.5 | 1581.5-1587.5 | 1621.5-1627.5 | 1641.5-1647.5 |
| | 575 | 560-590 | 622-628 | 632-638 | 672-678 | 692-698 |
| 1525.5 | ----- | 1510.5-1540.5 | 1572.5-1578.5 | 1582.5-1588.5 | 1622.5-1628.5 | 1642.5-1648.5 |
| | 576 | 561-591 | 623-629 | 633-639 | 673-679 | 693- 699 |
| 1526.5 | ----- | 1511.5-1541.5 | 1573.5-1579.5 | 1583.5-1589.5 | 1623.5-1629.5 | 1643.5-1649.5 |
| | 577 | 562-592 | 624-630 | 634-640 | 674-680 | 694-700 |
| 1527.5 | ----- | 1512.5-1542.5 | 1574.5-1580.5 | 1584.5-1590.5 | 1624.5-1630.5 | 1644.5-1650.5 |
| | 578 | 563-593 | 625-631 | 635-641 | 675-681 | 695-702 |
| 1528.5 | ----- | 1513.5-1543.5 | 1575.5-1581.5 | 1585.5-1591.5 | 1625.5-1631.5 | 1645.5-1651.5 |
| | 579 | 664-594 | 626-632 | 636-642 | 676-682 | 696-702 |
| 1529.5 | ----- | 1514.5-1644.5 | 1576.5-1582.5 | 1586.5-1592.5 | 1626.5-1632.5 | 1646.5-1652.5 |
| | 580 | 665-595 | 627-633 | 637-643 | 677-683 | 697-703 |
| 1530.5 | ----- | 1516.5-1546.5 | 1677.5-1583.5 | 1687.5-1693.5 | 1627.5-1633.5 | 1647.5-1653.5 |
| | 581 | 666-596 | 628-634 | 638-644 | 678-684 | 1;08-704 |
| 1531.5 | ----- | 1516.5-1546.5 | 1578.5-1584.5 | 1588.5-1594.5 | 1628.5-1634.5 | 1648.5-1654.5 |
| | 582 | 567-597 | 629-635 | 639-646 | 679-686 | 699-705 |
| 1532.5 | ----- | 1517.5-1547.5 | 1579.5-1585.5 | 1589.5-1595.5 | 1629.5-1635.5 | 1649.5-1655.5 |
| | 583 | 668-698 | 630-636 | 640-646 | 680-686 | 700-706 |
| 1533.5 | ----- | 1518.5-1548.5 | 1580.5-1586.5 | 1590.5-1596.5 | 1630.5-1636.5 | 1650.5-1656.5 |
| | 584 | 569-599 | 631-637 | 641-647 | 681-687 | 701-707 |
| 1534.5 | ----- | 1519.5-1549.5 | 1581.5-1587.5 | 1591.5-1597.5 | 1631.5-1637.5 | 1651.5-1657.5 |
| | 585 | 570-600 | 632-638 | 642-648 | 682-688 | 702-708 |
| 1535.5 | ----- | 1520.5-1550.5 | 1582.5-1588.5 | 1692.5-1698.5 | 1632.5-1638.5 | 1652.5-1658.5 |
| | 586 | 571-601 | 633-639 | 643-649 | 683-689 | 703-709 |
| 1536.5 | ----- | 1521.5-1551.5 | 1583.5-1589.5 | 1593.5-1599.5 | 1633.5-1639.5 | 1653.5-1659.5 |
| 1537.5 | ----- | 1522.5-1552.5 | 1584.5-1590.5 | 1594.5-1600.5 | 1634.5-1640.5 | 1654.5-1660.5 |
| | 588 | 573-603 | 635-641 | 645-651 | 685-691 | 705-711 |
| 1538.5 | ----- | 1523.5-1553.5 | 1585.5-1591.5 | 1595.5-1601.5 | 1635.5-1641.5 | 1655.5-1661.5 |
| | 589 | 574-604 | 636-642 | 646-652 | 686-692 | 706-712 |
| 1539.5 | ----- | 1524.5-1554.5 | 1586.5-1692.5 | 1696.5-1602.5 | 1636.5-1642.5 | 1656.5-1662.5 |
| | 590 | 575-605 | 637-643 | 647-653 | 687-693 | 707-713 |
| 1540.5 | ----- | 1525.5-1555.5 | 1587.5-1593.5 | 1597.5-1603.5 | 1637.5-1643.5 | 1657.5-1663.5 |
| | 591 | 576-606 | 638-644 | 648-654 | 688-694 | 708-714 |
| 1541.5 | ----- | 1526.5-1556.5 | 1588.5-1594.5 | 1698.5-1604.!; | 1638.5-1644.5 | 1668.5-1664.5 |
| | 592 | 577-607 | 639-645 | 649-665 | 689-695 | 709-716 |
| 1542.5 | ----- | 1527.5-1557.5 | 1589.5-1595.5 | 1599.5-1605.5 | 1639.5--1645.5 | 1669.5-1665.5 |
| | 593 | 578-608 | 640-646 | 650-656 | 690-696 | 710-716 |
| 1543.5 | ----- | 1528.5-1558.5 | 1590.5-1596.5 | 1600.5-1606.5 | 1640.5-1646.5 | 1660.5-1666.5 |
| | 594 | 579-609 | 641-647 | 651-657 | 691-697 | 711-717 |
| 1544.5 | ----- | 1529.5-1559.5 | 1591.5-1597.5 | 1601.5-1607.5 | 1641.5-1647.5 | 1661.5-1667.5 |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 595 | 580-610 | 642-648 | 652-658 | 692-698 | 712-718 |
| 1545.5 | ----- | 1530.5-1560.5 | 1592.5-1598.5 | 1602.5-1608.5 | 1642.5-1648.5 | 1662.5-1668.5 |
| | 596 | 581-611 | 643-649 | 653-659 | 693-699 | 713-719 |
| 1546.5 | ----- | 1531.5-1561.5 | 1593.5-1599.5 | 1603.5-1609.5 | 1643.5-1649.5 | 1663.5-1669.5 |
| | 597 | 582-612 | 644-650 | 654-660 | 694-700 | 714-720 |
| 1547.5 | ----- | 1532.5-1562.5 | 1594.5-1600.5 | 1604.5-1610.5 | 1644.5-1650.5 | 1664.5-1670.5 |
| | 598 | 583-613 | 645-651 | 655-661 | 695-701 | 715-721 |
| 1548.5 | ----- | 1533.5-1563.5 | 1595.5-1601.5 | 1605.5-1611.5 | 1645.5-1651.5 | 1665.5-1671.5 |
| | 599 | 584-614 | 646-652 | 656-662 | 696-702 | 716-722 |
| 1549.5 | ----- | 1534.5-1564.5 | 1596.5-1602.5 | 1606.5-1612.5 | 1646.5-1652.5 | 1666.5-1672.5 |
| | 600 | 585-615 | 647-653 | 657-663 | 697-703 | 717-723 |
| 1550.5 | ----- | 1535.5-1565.5 | 1597.5-1603.5 | 1607.5-1613.5 | 1647.5-1653.5 | 1667.5-1673.5 |
| | 601 | 586-616 | 648-654 | 668-664 | 698-704 | 718-724 |
| 1551.5 | ----- | 1536.5-1566.5 | 1698.5-1604.5 | 1608.5-1614.5 | 1648.5-1654.5 | 1668.5-1674.5 |
| | 602 | 587-617 | 649-665 | 659-665 | 699-705 | 719-725 |
| 1552.5 | ----- | 1537.5-1567.5 | 1599.5-1605.5 | 1609.5-1615.5 | 1649.5-1655.5 | 1669.5-1675.5 |
| | 603 | 588-618 | 650-656 | 660-666 | 700-706 | 720-726 |
| 1553.5 | ----- | 1538.5-1568.5 | 1600.5-1606.5 | 1610.5-1616.5 | 1650.5-1656.5 | 1670.5-1676.5 |
| | 604 | 589-619 | 651-657 | 661-667 | 701-707 | 721-727 |
| 1554.5 | ----- | 1539.5-1569 6 | 1601.5-1607.5 | 1611.5-1617.5 | 1651.5-1657.5 | 1671.5-1677.5 |
| | 605 | 590-620 | 652-658 | 662-668 | 702-708 | 722-728 |
| 1555.5 | ----- | 1540.5-1570.5 | 1602.5-1608.5 | 1612.5-1618.5 | 1652.5-1658.5 | 1672.5-1678.5 |
| | 606 | 591-621 | 653-659 | 663-669 | 703-709 | 723-729 |
| 1556.5 | ----- | 1541.5-1571.5 | 1603.5-1609.5 | 1613.5-1619.5 | 1653.5-1659.b | 1673.5-1679.5 |
| | 607 | 592-622 | 654-660 | 664-670 | 704-710 | 724-730 |
| 1557.5 | ----- | 1642.5-1572.5 | 1604.5-1610.5 | 1614 6-1620.5 | 1654.5-1660.5 | 1674.5-1680.5 |
| | 608 | 593-623 | 655-661 | 665-671 | 705-711 | 725-731 |
| 1558.5 | ----- | 1543.5-1573.5 | 1605.5-1611.5 | 1615.5-1621.5 | 1655.5-1661.5 | 1675.5-1681.5 |
| | 609 | 594-624 | 656-662 | 666-672 | 706-712 | 726-732 |
| 1559.5 | ----- | 1544.5-1574.5 | 1606.5-1612.5 | 1616.5-1622.5 | 1656.5-1662.5 | 1676.5-1682.5 |
| | 610 | 595425 | 657-663 | 667-673 | 707-713 | 727-733 |
| 1560.5 | ----- | 1545.5-1575.5 | 1607.5-1613.5 | 1617.5-1623.5 | 1657.5-1663.5 | 1677.5-1683.5 |
| | 611 | 596-626 | 658-664 | 668-674 | 708-714 | 728-734 |
| 1561.5 | ----- | 1546.5-1576.5 | 1608.5-1614.5 | 1618.5-1624.5 | 1658.5-1664.5 | 1678.5-1684.5 |
| | 612 | 597-627 | 659-665 | 669-675 | 709-715 | 729-735 |
| 1562.5 | ----- | 1547.5-1577.5 | 1609.5-1615.5 | 1619.5-1625.5 | 1659.5-1665.5 | 1679.5-1685.5 |
| | 613 | 598-628 | 660-666 | 670-676 | 710-716 | 730-736 |
| 1563.5 | ----- | 1548.5-1578.5 | 1610.5-1616.5 | 1620.5-1626.5 | 1660.5-1666.5 | 1680.5-1686.5 |
| | 614 | 599-629 | 661-667 | 671-677 | 711-717 | 731-737 |
| 1564.5 | ----- | 1549.5-1579.5 | 1611.5-1617.5 | 1621.5-1627.5 | 1661.5-1667.5 | 1681.5-1687.5 |
| | 615 | 600-630 | 662-668 | 672-678 | 712-718 | 732-738 |
| 1665.5 | ----- | 1550.5-1580.5 | 1612.5-1618.5 | 1622.5-1628.5 | 1662.5-1668.5 | 1682.5-1688.5 |
| | 616 | 601-631 | 663-669 | 673-679 | 713-719 | 733-739 |
| 1566.5 | ----- | 1551.5-1581.5 | 1613.5-1619.5 | 1623.5-1629.5 | 1663.5-1669.5 | 1683.5-1689.5 |
| | 617 | 602-632 | 664-670 | 674-680 | 714-720 | 734-740 |
| 1567.5 | ----- | 1552.5-1582.5 | 1614.5-1620.5 | 1624.5-1630.5 | 1664.5-1670.5 | 1684.5-1690.5 |
| | 618 | 603-633 | 665-671 | 675-681 | 715-721 | 735-741 |
| 1568.5 | ----- | 1553.5-1583.5 | 1615.5-1621.5 | 1625.5-1631.5 | 1665.5-1671.5 | 1685.5-1691.5 |
| | 619 | 604-634 | 666-672 | 676-682 | 716-722 | 736-742 |
| 1569.5 | ----- | 1554.5-1584.5 | 1616.5-1622.5 | 1626.5-1632.5 | 1666.5-1672.5 | 1686.5-1692.5 |
| | 620 | 605-635 | 667-673 | 677-683 | 717-723 | 737-743 |
| 1570.5 | ----- | 1555.5-1585.5 | 1617.5-1623.5 | 1627.5-1633.5 | 1667.5-1673.5 | 1687.5-1693.5 |
| | 621 | 606-636 | 668-674 | 678-684 | 718-724 | 738-744 |
| 1571.5 | ----- | 1556.5-1586.5 | 1618.5-1624.5 | 1628.5-1634.5 | 1668.5-1674.5 | 1688.5-1694.5 |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 622 | 607-637 | 669-675 | 679-685 | 719-725 | 739-745 |
| 1572.5 | ----- | 1557.5-1587.5 | 1619.5-1625.5 | 1629.5-1635.5 | 1669.5-1675.5 | 1689.5-1695.5 |
| | 623 | 608-638 | 670-676 | 680-686 | 720-726 | 740-746 |
| 1573.5 | ----- | 1558.5-1588.5 | 1620.5-1626.5 | 1630.5-1636.5 | 1670.5-1676.5 | 1690.5-1696.5 |
| | 624 | 609-639 | 671-677 | 681-687 | 721-727 | 741-747 |
| 1574.5 | ----- | 1559.5-1589.5 | 1621.5-1627.5 | 1631.5-1637.5 | 1671.5-1677.5 | 1691.5-1697.5 |
| | 625 | 610-640 | 672-678 | 682-688 | 722-728 | 742-748 |
| 1575.5 | ----- | 1560.5-1590.5 | 1622.5-1628.5 | 1632.5-16385 | 1672.5-1678.5 | 1692.5-1698.5 |
| | 626 | 611-641 | 673-679 | 683-689 | 723-729 | 743-749 |
| 1576.5 | ----- | 1561.5-1591.5 | 1623.5-1629.5 | 1633.5-1639.5 | 1673.5-1679.5 | 1693.5-1699.5 |
| | 627 | 612-642 | 674-680 | 684-690 | 724-730 | 744-750 |
| 1577.5 | ----- | 1562.5-1692.5 | 1624.5-1630.5 | 1634.5-1640.5 | 1674.5-1680.5 | 1694.5-1700.5 |
| | 628 | 613-643 | 675-681 | 685-691 | 725-731 | 745-751 |
| 1578.5 | ----- | 1563.5-15935 | 1625.5-1631.5 | 1635.5-1641.5 | 1675.5-1681.5 | 1695.5-1701.5 |
| | 629 | 614-644 | 676-682 | 686-692 | 726-782 | 746-752 |
| 1579.5 | ----- | 1564.5-1694.5 | 1626.5-1632.5 | 1636.5-1642.5 | 1676.5-1682.5 | 16965-1702.5 |
| | 630 | 616-645 | 677-683 | 687-693 | 727-733 | 747-753 |
| 1580.5 | ----- | 1565.5-1595.5 | 1627.5-1633.5 | 1637.5-1643.5 | 1677.5-1683.5 | 1697.5-17035 |
| | 631 | 616-646 | 678-684 | 688-694 | 728-734 | 748-754 |
| 1581.5 | ----- | 1566.5-1696.5 | 1628.5-1634.5 | 1638.5-1644.5 | 1678.5-1684.5 | 1698.5-1704.5 |
| | 632 | 617-647 | 679-685 | 689-695 | 729-735 | 749-755 |
| 1582.5 | ----- | 1567.5-1597.5 | 1629.5-1635.5 | 1639.5-1645.5 | 1679.5-1685.5 | 1699.5-1705.5 |
| | 633 | 618-648 | 680-686 | 690-696 | 730-736 | 750-756 |
| 1583.5 | ----- | 1568.5-1598.5 | 1630.5-1636.5 | 1640.5-1646.5 | 1680.5-1686.5 | 1700.5-17065 |
| | 634 | 619-649 | 681-687 | 691-697 | 731-737 | 751-757 |
| 1584.5 | ----- | 1569.5-1599.5 | 1631.5-1637.5 | 1641.5-1647.5 | 1681.5-1687.5 | 1701.5-1707.5 |
| | 635 | 620-650 | 682-688 | 692-698 | 732-738 | 752-758 |
| 1585.5 | ----- | 1570.5-l600.5 | 1632.5-1638.5 | 1642.5-16485 | 1682.5-1688.5 | 1702.5-1708.5 |
| | 636 | 621-661 | 683-689 | 693-699 | 733-739 | 753-759 |
| 1586.5 | ----- | 1571.5-1601.5 | 1633.5-1639.5 | 1643.5-1649.5 | 1683.5-1689.5 | 1703.5-1709.5 |
| | 637 | 622-652 | 684-690 | 694-700 | 734-740 | 754-760 |
| 1587.5 | ----- | 1572.5-1602.5 | 1634.5-1640.5 | 1644.5-16505 | 1684.5-1690.5 | 1704.5-1710.5 |
| | 638 | 623-653 | 685-691 | 695-701 | 735-741 | 755-761 |
| 1588.5 | ----- | 1573.5-1603.5 | 1635.5-1641.5 | 1645.5-1651.5 | 1685.5-1691.5 | 1705.5-1711.5 |
| | 639 | 624-654 | 686-692 | 696-702 | 736-742 | 756-762 |
| 1589.5 | ----- | 1574.5-1604.5 | 16365-1642.5 | 1646.5-1652.5 | 16865-1692.5 | 1706.5-1712.5 |
| | 640 | 625-655 | 687-693 | 697-703 | 737-743 | 757-763 |
| 1590.5 | ----- | 1575.5-1605.5 | 1637.5-1643.5 | 1647.5-1653.5 | 16875-1693.5 | 1707.5-1713.5 |
| | 641 | 626-656 | 688-694 | 698-704 | 738-744 | 758-764 |
| 1591.5 | ----- | 1576.5-16065 | 16385-1644.5 | 1648.5-16545 | 16885-1694.5 | 1708.5-1714 6 |
| | 642 | 627-657 | 689-695 | 699-705 | 739-745 | 759-765 |
| 1592.5 | ----- | 1577.5-1607-.5 | 1639.5-1645.5 | 1649.5-1655.5 | 1689.5-1695.5 | 1709.5-1715.5 |
| | 643 | 628-658 | 690-696 | 700-706 | 740-746 | 760-766 |
| 1593.5 | ----- | 1578.5-1608.5 | 1640.5-1646.5 | 1650.5-16565 | 1690.5-1696.5 | 1710.5-1716.5 |
| | 644 | 629-659 | 691-697 | 701-707 | 741-747 | 761-767 |
| 1594.5 | ----- | 1579.5-1609.5 | 1641.5-1647.5 | 1651.5-16575 | 1691.5-1697.5 | 1711.5-1717.5 |
| | 645 | 630-660 | 692-698 | 702-708 | 742-748 | 762-768 |
| 1595.5 | ----- | 1580.5-1610.5 | 1642.5-1648.5 | 1652.5-1658.5 | 16925-1698.5 | 1712.5-1718.5 |
| | 646 | 631-661 | 693-699 | 703-709 | 743-749 | 763-769 |
| 1596.5 | ----- | 1581.5-1611.5 | 1643.5-1649.5 | 1653.5-1659.5 | 1693.5-1699.5 | 17135-1719.5 |
| | 647 | 632-662 | 694-700 | 704-710 | 744-750 | 764-770 |
| 1597.5 | ----- | 1582.5-1612.5 | 1644.5-1650.5 | 1654.5-1660.5 | 1694.5-1700 6 | 1714.5-17206 |
| | 648 | 633-663 | 695-701 | 705-711 | 745-751 | 765-771 |
| 1598.5 | ----- | 1583.5-1613.5 | 16455-1651.5 | 1655.5-1661.5 | 1695.5-1701.5 | 1715.5-1721.5 |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 649 | 634-664 | 696-702 | 706-712 | 746-752 | 766-772 |
| 1599.5 | ----- | 1584.5-1614.5 | 1646.5-1652 r | 1656.5-1662.5 | 1696.5-1702.5 | 1716.5-1722.5 |
| | 650 | 635-665 | 697-703 | 707-713 | 747-753 | 767-773 |
| 1600.5 | ----- | 1585.5-1615.5 | 1647.5-1653.5 | 1657.5-16635 | 1697.5-1703.5 | 1717.5-1723.5 |
| | 651 | 636-666 | 698-704 | 708-714 | 748-754 | 768-774 |
| 1601.5 | ----- | 1586.5-1616.5 | 1648 6-1654.5 | 1658.5-1664.5 | 1698.5-1704.5 | 1718.5-1724.5 |
| | 652 | 637-667 | 699-705 | 709-715 | 749-755 | 769-775 |
| 1602.5 | ----- | 1587.5-1617.5 | 1649.5-1655.5 | 1659.5-1665.5 | 1699.5-1705.5 | 1719.5-1725.5 |
| | 653 | 638-668 | 700-706 | 710-716 | 750-756 | 770-776 |
| 1603.5 | ----- | 1588.5-1618.5 | 1650.5-1656.5 | 1660.5-16665 | 1700.5-1706.5 | 1720.5-1726.5 |
| | 654 | 639-669 | 701-707 | 711-717 | 751-757 | 771-777 |
| 1604.5 | ----- | 1589.5-1619.5 | 1651.5-1657.5 | 1661.5-1667.5 | 1701.5-1707.5 | 1721.5-1727.5 |
| | 655 | 640-670 | 702-708 | 712-718 | 752-758 | 772-778 |
| 1605.5 | ----- | 1590.5-1620.5 | 1652.5-1658.5 | 1662.5-1668.5 | 1702.5-1708.5 | 1722.5-1728.5 |
| | 656 | 641-671 | 703-709 | 713-719 | 753-759 | 773-779 |
| 1606.5 | ----- | 1591.5-1621.5 | 1653.5-1659.5 | 1663.5-1669.5 | 1703.5-1709.5 | 17235-1729.5 |
| | 657 | 642-672 | 704-710 | 714-720 | 754-760 | 774-780 |
| 1607.5 | ----- | 1592.5-1622.5 | 1654.5-1660.5 | 1664.5-16705 | 1704.5-1710.5 | 1724.5-1730.5 |
| | 658 | 643-673 | 705-711 | 715-721 | 755-761 | 775-781 |
| 1608.5 | ----- | 1593.5-1623.5 | 1655.5-1661.5 | 1665.5-1671.5 | 1705.5-1711.5 | 1725.5-1731.5 |
| | 659 | 644-674 | 706-712 | 716-722 | 756-762 | 776-782 |
| 1609.5 | ----- | 1594.5-1624.5 | 1656.5-1662.5 | 1666.5-1672.5 | 1706.5-1712.5 | 17265-1732.5 |
| | 660 | 645-675 | 707-713 | 717-723 | 757-763 | 777-783 |
| 1610.5 | ----- | 15955-1625.5 | 1657.5-1663.5 | 1667.5-1673.5 | 1707.5-1713.5 | 1727.5-1733.5 |
| | 661 | 646-676 | 708-714 | 718-704 | 758-764 | 778-784 |
| 1611.5 | ----- | 1596.5-1626.5 | 1658.5-1664.5 | 1668.5-1674.5 | 1708.5-1714.5 | 1728.5-1734.5 |
| | 662 | 647-677 | 709-715 | 719-725 | 759-765 | 779-785 |
| 1612.5 | ----- | 1597.5-1627.5 | 1659.5-1665.5 | 1669.5-1675.5 | 1709.5-1715.5 | 1729.5-1735.5 |
| | 663 | 648-678 | 710-716 | 720-726 | 760-766 | 780-786 |
| 1613.5 | ----- | 1598.5-1628.5 | 1660.5-1666.5 | 1670.5-1676.5 | 1710.5-1716.5 | 1730.5-1736.5 |
| | 664 | 649-679 | 711-717 | 721-727 | 761-767 | 781-787 |
| 1614.5 | ----- | 1599.5-1629.5 | 1661.5-1667.5 | 1671.5-1677.5 | 1711.5-1717.5 | 1731.5-1737.5 |
| | 665 | 650-680 | 712-718 | 722-728 | 762-768 | 782-788 |
| 1615.5 | ----- | 1600.5-1630.5 | 1662.5-1668.5 | 1672.5-1678.5 | 1712.5-1718.5 | 1732.5-1738.5 |
| | 666 | 651-681 | 713-719 | 723-729 | 763-769 | 783-789 |
| 1616.5 | ----- | 1601.5-1631.5 | 1663.5-1669.5 | 1673.5-1679.5 | 1713.5-1719.5 | 1733.5-1739.5 |
| | 667 | 652-682 | 714-720 | 724-730 | 764-770 | 784-790 |
| 1617.5 | ----- | 1602.5-1632.5 | 1664.5-1670.5 | 1674.5-1680.5 | 1714.5-1720.5 | 1734.5-1740.5 |
| | 668 | 653-683 | 715-721 | 725-731 | 765-771 | 785-791 |
| 1618.5 | ----- | 1603.5-1633.5 | 1665.5-1671.5 | 1675.5-16815 | 1715.5-1721.5 | 1735.5-1741.5 |
| | 669 | 654-684 | 716-722 | 726-732 | 766-772 | 786-792 |
| 1619.5 | ----- | 1604.5-1634.5 | 1666.5-1672.5 | 1676.5-16825 | 1716.5-1722.5 | 1736.5-1742.5 |
| | 670 | 655-685 | 717-723 | 727-733 | 767-773 | 787-793 |
| 1620.5 | ----- | 1605.5-1635.5 | 1667.5-1673.5 | 1677.5-1683.5 | 1717.5-1723.5 | 1737.5-1743 6 |
| | 671 | 656-686 | 718-724 | 728-734 | 768-774 | 788-794 |
| 1621.5 | ----- | 1606.5-1636.5 | 1668.5-1674.5 | 1678.5-1684.5 | 1718.5-1724.5 | 17385-1744.5 |
| | 672 | 657-687 | 719-725 | 729-735 | 769-775 | 789-795 |
| 1622.5 | ----- | 16075-1637.5 | 1669.5-1675.5 | 1679.5-1685.5 | 1719 6-1725.5 | 1739.5-1745.5 |
| | 673 | 658-688 | 720-726 | 730-736 | 770-776 | 790-796 |
| 1623.5 | ----- | 1608.5-1638.5 | 1670.5-1676.5 | 1680.5-1686.5 | 1720.5-1726.5 | 1741.5-1746.5 |
| | 674 | 659-689 | 721-727 | 731-737 | 771-777 | 791-797 |
| 1624.5 | ----- | 1609.5-1639.5 | 16715-1677.5 | 1681.5-1687.5 | 1721.5-1727.5 | 1741 6-1747.5 |
| | 675 | 660-690 | 722-728 | 732-738 | 772-778 | 792-798 |
| 1625.5 | ----- | 16105-1640.5 | 1672.5-1678.5 | 1682.5-1688.5 | 1722.5-1728.5 | 1742.5-1748.5 |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 676 | 661-691 | 723-729 | 733-739 | 773-779 | 793-799 |
| 1626.5 | ----- | 1611.5-1641.5 | 1673.5-1679.5 | 16835-1689.5 | 1723.5-1729.5 | 1743.5-1749.5 |
| | 677 | 662-692 | 724-730 | 734-740 | 774-780 | 794-800 |
| 1627.5 | ----- | 1612.5-1642.5 | 1674.5-1680.5 | 1684.5-1690.5 | 1724.5-1730.5 | 1744.5-1750.5 |
| | 678 | 663-693 | 725-731 | 735-741 | 775-781 | 795-801 |
| 1628.5 | ----- | 1613.5-1643.5 | 1675.5-l681.5 | 1685.5-1691.5 | 1725.5-1731.5 | 1745.5-1751.5 |
| | 679 | 664-694 | 726-732 | 736-742 | 776-782 | 796-802 |
| 1629.5 | ----- | 1614.5-1644.5 | 16765-1682.5 | 1686.5-1692.5 | 1726.5-1732.5 | 17465-1752.5 |
| | 680 | 665-695 | 727-733 | 737-743 | 777-783 | 797-803 |
| 1630.5 | ----- | 1615.5-1645.5 | 1677.5-1683.5 | 16875-1693.5 | 1727.5-1733.5 | 1747.5-1753.5 |
| | 681 | 666-696 | 728-734 | 738-744 | 778-784 | 798-804 |
| 1631.5 | ----- | 1616.5-1646.5 | 1678.5-1684.5 | 1688.5-1694.5 | 1728.5-1734.5 | 1748.5-1754.5 |
| | 682 | 667-697 | 729-735 | 739-745 | 779-785 | 799-805 |
| 1632.5 | ----- | 1617.5-1647.5 | 1679.5-1685.5 | 1689.5-1695.5 | 1729.5-1735.5 | 1749.5-1755.5 |
| | 683 | 668-698 | 730-736 | 740-746 | 780-786 | 800-806 |
| 1633.5 | ----- | 1618.5-1648.5 | 1680.5-1686.5 | 1690.5-1696.5 | 1730.5-1736.5 | 1750.5-1756.5 |
| | 684 | 669-699 | 731-737 | 741-747 | 781-787 | 801-807 |
| 1634.5 | ----- | 1619.5-1649.5 | 16815-1687.5 | 1691.5-1697.5 | 1731.5-1737.5 | 1751.5-1757.5 |
| | 685 | 670-700 | 732-738 | 742-748 | 782-788 | 802-808 |
| 1635.5 | ----- | 1620.5-1650.5 | 1682.5-1688.5 | 1692.5-1698.5 | 1732.5-1738.5 | 1752.5-1758.5 |
| | 686 | 671-701 | 733-739 | 743-749 | 783-789 | 803-809 |
| 1636.5 | ----- | 1621.5-1651.5 | 1683.5-1689.5 | 1693.5-1699.5 | 1733.5-1739.5 | 1753.5-1759.5 |
| | 687 | 672-702 | 734-740 | 744-750 | 784-790 | 804-810 |
| 1637.5 | ----- | 1622.5-1652.5 | 1684.5-1690.5 | 1694.5-1700.5 | 1734.5-1740.5 | 1754.5-17605 |
| | 688 | 673-703 | 735-741 | 745-751 | 785-791 | 805-811 |
| 1638.5 | ----- | 1623.5-1653.5 | 1685.5-1691.5 | 1695.5-1701.5 | 1735.5-1741.5 | 1755.5-1761.5 |
| | 689 | 674-704 | 736-742 | 746-752 | 786-792 | 806-812 |
| 1639.5 | ----- | 1624.5-1654.5 | 1686.5-1692.5 | 1696.5-1702.5 | 1736.5-1742.5 | 1756.5-1762.5 |
| | 690 | 675-705 | 737-743 | 747-753 | 787-793 | 807-813 |
| 1640.5 | ----- | 1625.5-1655.5 | 1687.5-1693.5 | 1697.5-1703.5 | 1737.5-1743.5 | 17575-1763.5 |
| | 691 | 676-706 | 738-744 | 748-754 | 788-794 | 808-814 |
| 1641.5 | ----- | 1626.5-1656.5 | 1688.5-1694.5 | 1698.5-1704.5 | 1738.5-1744.5 | 1758.5-1764.5 |
| | 692 | 677-707 | 739-745 | 749-755 | 789-795 | 809-815 |
| 1642.5 | ----- | 1627.5-1657.5 | 1689.5-1695.5 | 1699.5-1705.5 | 1739.5-1745.5 | 1759.5-1765.5 |
| | 693 | 678-708 | 740-746 | 750-756 | 790-796 | 810-816 |
| 1643.5 | ----- | 1628.5-1658.5 | 1690.5-1696.5 | 1700.5-1706.5 | 17405-1746.5 | 1760.5-1766.5 |
| | 694 | 679-709 | 741-747 | 751-757 | 791-797 | 811-817 |
| 1644.5 | ----- | 1629.5-1659.5.5 | 1691.5-1697.5 | 1701.5-1707.5 | 1741.5-17475 | 1761.5-1767.5 |
| | 695 | 680-710 | 742-748 | 752-758 | 792-798 | 812-818 |
| 1645.5 | ----- | 1630.5-1860.5 | 1692.5-1698.5 | 1702.5-1708.5 | 1742.5-1748.5 | 1762.5-1768.5 |
| | 696 | 681-711 | 743-749 | 753-759 | 793-799 | 813-819 |
| 1646.5 | ----- | 1631.5-1661.5 | 16935-1699.5 | 1703.5-1709.5 | 1743.5-1749.5 | 1763.5-1769.5 |
| | 697 | 682-712 | 744-750 | 754-760 | 794-800 | 814-820 |
| 1647.5 | ----- | 1632.5-1662.5 | 1694.5-1700.5 | 1704.5-1710.5 | 1744.5-1750.5 | 1764.5-1770.5 |
| | 698 | 683-713 | 745-751 | 755-761 | 795-801 | 815-821 |
| 1648.5 | ----- | 1633.5-1663.5 | 1695.5-1701.5 | 1705.5-1711.5 | 1745.5-1751.5 | 1765.5-1771.5 |
| | 699 | 684-714 | 746-752 | 756-762 | 796-802 | 816-822 |
| 1649.5 | ----- | 1634.5-1664.5 | 1696.5-1702.5 | 17065-1712.5 | 1746.5-1752.5 | 1766.5-1772.5 |
| | 700 | 685-715 | 747-753 | 767-763 | 797-803 | 817-823 |
| 1650.5 | ----- | 1635.5-1665.5 | 1697.5-1703.5 | 1707.5-1713.5 | 1747.5-1753.5 | 1767.5-1773.5 |
| | 701 | 686-716 | 748-754 | 758-764 | 798-804 | 818-824 |
| 1651.5 | ----- | 1636.5-1666.5 | 1698.5-1704.5 | 1708.5-1714.5 | 1748.5-1754.5 | 1768.5-1774.5 |
| | 702 | 687-717 | 749-755 | 759-765 | 799-805 | 819-825 |
| 1652.5 | ----- | 1637.5-1667.5 | 1699.5-1705.5 | 1709.5-1715.5 | 1749.5-1755.5 | 1769.5-1775.5 |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 703 | 688-718 | 750-756 | 760-766 | 800-806 | 820-826 |
| 653.5 | ----- | 1638.5-1668.5 | 1700.5-1706.5 | 1710.5-1716.5 | 1750.5-1756.5 | 1770.5-1776.5 |
| | 704 | 689-719 | 751-757 | 761-767 | 801-807 | 821-827 |
| 654.5 | ----- | 1639.5-1669.5 | 1701.5-1707.5 | 1711.5-1717.5 | 1751.5-1757.5 | 1771.5-1777.5 |
| | 705 | 690-720 | 752-758 | 762-768 | 802-808 | 822-828 |
| 655.5 | ----- | 1640.5-1670.5 | 1702.5-1708.5 | 1712.5-1718.5 | 1752.5-1758.5 | 1772.5-1778.5 |
| | 706 | 691-721 | 753-759 | 763-769 | 803- 809 | 823-829 |
| 656.5 | ----- | 1641.5-1671.5 | 1703.5-1709.5 | 1713.5-1719.5 | 1753.5-1759.5 | 1773.5-1779.5 |
| | 707 | 692-722 | 754-760 | 764-770 | 804-810 | 824-830 |
| 657.5 | ----- | 1642.5-1672.5 | 1704.5-1710.5 | 1714.5-1720.5 | 1754.5-1760.5 | 1774.5-1780.5 |
| | 708 | 693-723 | 755-761 | 765-771 | 805-811 | 825-831 |
| 658.5 | ----- | 1643.5-1673.5 | 1705.5-1711.5 | 1715.5-1721.5 | 1755.5-1761.5 | 1775.5-1781.5 |
| | 709 | 694-724 | 756-762 | 766-772 | 806-812 | 826-832 |
| 655.5 | ----- | 1644.5-1674.5 | 1706.5-1712.5 | 1716.5-1722.5 | 1756.5-1762.5 | 1776.5-1782.5 |
| | 710 | 695-725 | 757-763 | 767-773 | 807,-813 | 827-833 |
| 660.5 | ----- | 1645.5-1675.5 | 1707.5-1713.5 | 1717.5-1723.5 | 1757.5-1763.5 | 1777.5-1783.5 |
| | 711 | 696-726 | 758-764 | 768-774 | 808-814 | 828-834 |
| 661.5 | ----- | 1646.5-1676.5 | 1708.5-1714.5 | 1718.5-1724.5 | 1758.5-1764.5 | 1778.5-1784.5 |
| | 712 | 697-727 | 759-765 | 769-775 | 809-815 | 829-835 |
| 662.5 | ----- | 1647.5-1677.5 | 1709.5-1715.5 | 1719.5-1725.5 | 1759.5-1765.5 | 1779.5-1785.5 |
| | 713 | 698-728 | 760-766 | 770-776 | 810-816 | 830-836 |
| 663.5 | ----- | 1648.5-1678.5 | 1710.5-1716.5 | 1720.5-1726.5 | 1760.5-1766.5 | 1780.5-1786.5 |
| | 714 | 699-729 | 761-767 | 771-777 | 811-817 | 831-837 |
| 664.5 | ----- | 1649.5-1679.5 | 1711.5-1717.5 | 1727.5-1727.5 | 1761.5-1767.5 | 1781.5-1787.5 |
| | 715 | 700-730 | 762-768 | 772-778 | 812-818 | 832-838 |
| 665.5 | ----- | 1650.5-1680.5 | 1712.5-1718.5 | 1722.5-1728.5 | 1762.5-1768.5 | 1782.5-1788.5 |
| | 716 | 701-731 | 763-769 | 773-779 | 813-819 | 833-839 |
| 666.5 | ----- | 1651.5-1681.5 | 1713.5-1719.5 | 1723.5-1729.5 | 1763.5-1769.5 | 1783.5-1789.5 |
| | 717 | 702-732 | 764-770 | 774-780 | 814-820 | 834-840 |
| 667.5 | ----- | 1652.5-1682.5 | 1714.5-1720.5 | 1724.5-1730.5 | 1764.5-1770.5 | 1784.5-1790.5 |
| | 718 | 703-733 | 765-771 | 775-781 | 815-821 | 835-841 |
| 668.5 | ----- | 1653.5-1683.5 | 1715.5-1721.5 | 1725.5-1731.5 | 1765.5-1771.5 | 1785.5-1791.5 |
| | 719 | 704-734 | 766-772 | 776-782 | 816-822 | 836-842 |
| 669.5 | ----- | 1654.5-1684.5 | 1716.5-1722.5 | 1726.5-1732.5 | 1766.5-1772.5 | 1786.5-1792.5 |
| | 720 | 705-735 | 767-773 | 777-783 | 817-823 | 837-843 |
| 670.5 | ----- | 1655.5-1685.5 | 1717.5-1723.5 | 1727.5-1733.5 | 1767.5-1773.5 | 1787.5-1793.5 |
| | 721 | 706-736 | 768-774 | 778-784 | 818-824 | 838-844 |
| 671.5 | ----- | 1656.5-1686.5 | 1718.5-1724.5 | 1728.5-1734.5 | 1768.5-1774.5 | 1788.5-1794.5 |
| | 722 | 707-737 | 769-775 | 779-785 | 819-825 | 839-845 |
| 672.5 | ----- | 1657.5-1687.5 | 1719.5-1725.5 | 1729.5-1735.5 | 1769.5-1775.5 | 1789.5-1795.5 |
| | 723 | 708-738 | 770-776 | 780-786 | 820-826 | 840-846 |
| 673.5 | ----- | 1658.5-1688.5 | 1720.5-1726.5 | 1730.5-1736.5 | 1770.5-1776.5 | 1790.5-1796.5 |
| | 724 | 709-739 | 771-777 | 781-787 | 821-827 | 841-847 |
| 674.5 | ----- | 1659.5-1689.5 | 1721.5-1727.5 | 1731.5-1737.5 | 1771.5-1777.5 | 1791.5-1797.5 |
| | 725 | 710-740 | 772-778 | 782-788 | 822-828 | 842-848 |
| 675.5 | ----- | 1660.5-1690.5 | 1722.5-1728.5 | 1732.5-1738.5 | 1772.5-1778.5 | 1792.5-1798.5 |
| | 726 | 711-741 | 773-779 | 783-789 | 823-829 | 843-849 |
| 676.5 | ----- | 1661.5-1691.5 | 1723.5-1729.5 | 1733.5-1739.5 | 1773.5-1779.5 | 1793.5-1799.5 |
| | 727 | 712-742 | 774-780 | 784-790 | 824-830 | 844-850 |
| 677.5 | ----- | 1662.5-1692.5 | 1724.5-1730.5 | 1734.5-1740.5 | 1774.5-1780.5 | 1794.5-1800.5 |
| | 728 | 713-743 | 775-781 | 785-791 | 825-831 | 845-851 |
| 678.5 | ----- | 1663.5-1693.5 | 1725.5-1731.5 | 1735.5-1741.5 | 1775.5-1781.5 | 1795.5-1801.5 |
| | 729 | 714-744 | 776-782 | 786-792 | 826-832 | 846-852 |
| 679.5 | ----- | 1664.5-1694.5 | 1726.5-1732.5 | 1736.5-1742.5 | 1776.5-1782.5 | 1796.5-18402.5 |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 730 | 715-745 | 777-783 | 787-793 | 827-833 | 847-853 |
| 1680.5 | ----- | 1665.5-1695.5 | 1727.5-1733.5 | 17375-1743.5 | 1777.5-1783.5 | 17975-1803.5 |
| | 731 | 716-746 | 778-784 | 788-794 | 828-834 | 848-854 |
| 1681.5 | ----- | 1666.5-1696.5 | 1728.5-1734.5 | 17385-1744.5 | 1778.5-1784.5 | 1798.5-1804.5 |
| | 732 | 717-747 | 779-785 | 789-795 | 829-835 | 849-855 |
| 1682.5 | ----- | 1667.5-1697.5 | 1729.5-1735.5 | 1739.5-1745.5 | 1779.5-1785.5 | 1799.5-1805.5 |
| | 733 | 718-748 | 780-786 | 790-796 | 830-836 | 850-856 |
| 1683.5 | ----- | 1668 5-1698.5 | 1730.5-1736.5 | 1740.5-1746.5 | 1780.5-1786.5 | 18005-1806.5 |
| | 734 | 719-749 | 781-787 | 791-797 | 831-837 | 851-857 |
| 1684.5 | ----- | 1669.5-1699.5 | 17315-1737.5 | 1741.5-1747.5 | 1781 S-1787.5 | 1801.5-1807.5 |
| | 735 | 720-750 | 782-788 | 792-798 | 832-838 | 852-858 |
| 1685.5 | ----- | 1670.5-1700.5 | 1732.5-1738.5 | 1742.5-1748.5 | 1782.5-1788.5 | 1802.5-1808.5 |
| | 736 | 721-751 | 783-789 | 793-799 | 833-839 | 853-859 |
| 1686.5 | ----- | 1671.5-1701.5 | 1733.5-1739.5 | 17435-1749.5 | 1783.5-1789.5 | 1803.5-1809.5 |
| | 737 | 722-752 | 784-790 | 794-800 | 834-840 | 854-860 |
| 1687.5 | ----- | 1672.5-1702.5 | 1734.5-1740.5 | 17445-1750.5 | 1784.5-1790.5 | 1804.5-1810.5 |
| | 738 | 723-753 | 785-791 | 795-801 | 835-841 | 855-861 |
| 1688.5 | ----- | 1673.5-1703.5 | 1735.5-1741.5 | 1745.5-1751.5 | 1785.5-1791.5 | 1805.5-1811.5 |
| | 739 | 724-754 | 786-792 | 796-802 | 836-842 | 856-862 |
| 1689.5 | ----- | 1674.5-1704.5 | 1736.5-1742.5 | 1746.5-1752.5 | 1786.5-1792.5 | 18065-1812.5 |
| | 740 | 725-755 | 787-793 | 797-803 | 837-843 | 857-863 |
| 16905 | ----- | 1675.5-1705.5 | 1737.5-1743.5 | 17475-1753.5 | 1787.5-1793.5 | 1807.5-1813.5 |
| | 741 | 726-756 | 788-794 | 798-804 | 838-844 | 858-864 |
| 1691.5 | ----- | 16765-1706.5 | 1738.5-1744.5 | 17485-1754.5 | 1788.5-1794.5 | 1808.5-1814.5 |
| | 742 | 727-757 | 789-795 | 799-805 | 839-845 | 859-865 |
| 1692.5 | ----- | 1677.5-1707.5 | 1739.5-1745.5 | 1749.5-1755.5 | 1789.5-1795.5 | 1809.5-1815.5 |
| | 743 | 728-758 | 790-796 | 800-806 | 840-846 | 860-866 |
| 1693.5 | ----- | 1678.5-1708.5 | 1740.5-1746.5 | 1750.5-1756.5 | 1790.5-1796.5 | 1810.5-1816.5 |
| | 744 | 729-759 | 791-797 | 801-807 | 841-847 | 861-867 |
| 1694.5 | ----- | 1679.5-1709.5 | 1741.5-1747.5 | 1751.5-1757.5 | 1791.5-1797.5 | 18115-1817.5 |
| | 745 | 730-760 | 792-798 | 802-808 | 842-848 | 862-868 |
| 1695.5 | ----- | 1680.5-1710.5 | 1742.5-1748.5 | 1752.5-1758.5 | 1792.5-1798.5 | 1812.5-1818.5 |
| | 746 | 731-761 | 793-799 | 803-809 | 843-849 | 863-869 |
| 1696.5 | ----- | 1681.5-1711.5 | 1743.5-1749.5 | 1753.5-1759.5 | 17935-1799.5 | 1813.5-1819.5 |
| | 747 | 732-762 | 794-800 | 804-810 | 844-850 | 864-870 |
| 1697.5 | ----- | 1682.5-1712.5 | 1744.5-1750.5 | 1754.5-1760.5 | 1794.5-1800.5 | 1814.5-1820.5 |
| | 748 | 733-763 | 795-801 | 805-811 | 845-851 | 865-871 |
| 1698.5 | ----- | 16835-1713.5 | 1745.5-1751.5 | 1755.5-1761.5 | 1795.5-1901.5 | 1815.5-1821.5 |
| | 749 | 734-764 | 796-802 | 806-812 | 846-852 | 866-872 |
| 1699.5 | ----- | 1684.5-1714.5 | 1746.5-1762.5 | 1756.5-1762.5 | 1796.5-1802.5 | 1816.5-1822.5 |
| | 750 | 735-765 | 797-803 | 807-813 | 847-853 | 867-873 |
| 1700.5 | ----- | 1685.5-1715.5 | 1747.5-1753.5 | 1757.5-1763.5 | 17975-1803.5 | 1817.5-1823.5 |
| | 751 | 736-766 | 798-804 | 808-814 | 848-854 | 868-874 |
| 1701.5 | ----- | 1686.5-1716.5 | 1748.5-1754.5 | 1758.5-1764.5 | 1798.5-1804.5 | 1818.5-1824.5 |
| . | 752 | 737-767 | 799-805 | 809-815 | 849-855 | 869-875 |
| 1702.5 | ----- | 1687.5-1717.5 | 1749.5-1755.5 | 1759.5-1765.5 | 1799.5-1805.5 | 1819.5-1825.5 |
| | 753 | 738-768 | 800-806 | 810-816 | 850-856 | 870-876 |
| 1703.5 | ----- | 1688.5-1718.5 | 1750.5-1756.5 | 1760.5-1766.5 | 18005-1806.5 | 1820.5-1826.5 |
| | 754 | 739-769 | 801-807 | 811-817 | 851-857 | 871-877 |
| 1704.5 | ----- | 1689.5-1719.5 | 1751.5-1757.5 | 1761.5-1767.5 | 1801.5-1807.5 | 1821.5-1827.5 |
| | 755 | 740-770 | 802-808 | 812-818 | 852-858 | 872-878 |
| 1705.5 | ----- | 1690.5-1720.5 | 1752.5-1758.5 | 1762.5-1768.5 | 1802.5-1808.5 | 1822.5-1828.5 |
| | 756 | 741-771 | 803-809 | 813-819 | 853-859 | 873-879 |
| 1706.5 | ----- | 1691.5-1721.5 | 1753.5-1759.5 | 1763.5-1769.5 | 1803.5-1809.5 | 1823.5-1829.5 |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 757 | 742-772 | 804-810 | 814-820 | 854-860 | 874-880 |
| 1707.5 | ----- | 1692.5-1722.5 | 1754.5-1760.5 | 1764.5-1770.5 | 1804.5-1810.5 | 18245-1830.5 |
| | 758 | 743-773 | 805-811 | 815-821 | 855-861 | 875-881 |
| 1708.5 | ----- | 1693.5-1723.5 | 1755.5-1761.5 | 1765.5-1771.5 | 1805.5-1811.5 | 1825.5-1831.5 |
| | 759 | 744-774 | 806-812 | 816-822 | 856-862 | 876-882 |
| 1709.5 | ----- | 1694.5-1724.5 | 1756.5-1762.5 | 1766.5-1772.5 | 1806.5-1812.5 | 1826.5-1832.5 |
| | 760 | 745-775 | 807-813 | 817-823 | 857-863 | 877-883 |
| 1710.5 | ----- | 1695 6-1725.5 | 1757.5-1763.5 | 1767.5-1773.5 | 1807.5-1813.5 | 1827.5-1833.5 |
| | 761 | 746-776 | 808-814 | 818-824 | 858-864 | 878-884 |
| 1711.5 | ----- | 1696.5-1726.5 | 1758.5-1764.5 | 1768.5-1774.5 | 1808.5-1814.5 | 1828.5-1834.5 |
| | 762 | 747-777 | 809-815 | 819-825 | 859-865 | 879-885 |
| 1712.5 | ----- | 1697.5-1727.5 | 1759.5-1765.5 | 1769.5-1775.5 | 1809.5-1815.5 | 1829.5-1835.5 |
| | 763 | 748-778 | 810-816 | 820-826 | 860-866 | 880-886 |
| 1713.5 | ----- | 1698.5-1728.5 | 1760.5-1766.5 | 1770.5-1776.5 | 1810.5-1816.5 | 1830.5-1836.5 |
| | 764 | 749-779 | 811-817 | 821-827 | 861-867 | 881-887 |
| 1714.5 | ----- | 1699.5-1729.5 | 1761.5-17675 | 1771.5-1777.5 | 1811.5-1817.5 | 1831.5-1837.5 |
| | 765 | 760-780 | 812-818 | 822-828 | 862-868 | 882-888 |
| 1715.5 | ----- | 1700.5-1730.5 | 1762.5-1768.5 | 1772.5-1778.5 | 1812.5-1818.5 | 1832.5-1838.5 |
| | 766 | 751-781 | 813-819 | 823-829 | 863-869 | 883-889 |
| 1716.5 | ----- | 1701.5-1731.5 | 1763.5-1769.5 | 1773.5-1779.5 | 1813.5-1819.5 | 1833.5-1839.5 |
| | 767 | 752-782 | 814-820 | 824-830 | 864-870 | 884-890 |
| 1717.5 | ----- | 1702 6-1732.5 | 1764.5-1770.5 | 1774.5-1780.5 | 1814.5-1820.5 | 1834.5-1840.5 |
| | 768 | 753-783 | 815-821 | 825-831 | 865-871 | 885-891 |
| 1718.5 | ----- | 1703.5-1733.5 | 17655-1771.5 | 1775.5-1781.5 | 1815.5-1821.5 | 1835.5-1841.5 |
| | 769 | 754-784 | 816-822 | 826-832 | 866-872 | 886-892 |
| 1719.5 | ----- | 1704.5-1734.5 | 1766.5-1772.5 | 1776.5-1782.5 | 1816.5-1822.5 | 1836.5-1842.5 |
| | 770 | 755-785 | 817-823 | 827-833 | 867-873 | 887-893 |
| 1720.5 | ----- | 1705.5-1735.5 | 1767.5-1773.5 | 1777.5-1783.5 | 1817.5-1823.5 | 1837.5-1843.5 |
| | 771 | 756-786 | 818-834 | 828-834 | 868-874 | 888-894 |
| 1721.5 | ----- | 1706.5-1736.5 | 1768.5-1774.5 | 1778.5-1784.5 | 1818.5-1824.5 | 1838.5-1844.5 |
| | 772 | 757-787 | 819-825 | 829-83.5 | 869-875 | 889-895 |
| 1722.5 | ----- | 1707.5-1737.5 | 1769.5-1775.5 | 1779.5-1785.5 | 1819.5-1825.5 | 1839.5-1845.5 |
| | 773 | 758-788 | 820-826 | 830-836 | 870-876 | 890-896 |
| 1723.5 | ----- | 1708.5-1738.5 | 1770.5-1776.5 | 1780.5-1786.5 | 1820.5-1826.5 | 1840.5-1846.5 |
| | 774 | 759-789 | 821-827 | 831-837 | 871-877 | 891-897 |
| 1724.5 | ----- | 1709.5-1739.5 | 1771.5-1777.5 | 1781.5-1787.5 | 1821.5-1827.5 | 1841.5-1847.5 |
| | 775 | 760-790 | 822-828 | 832-838 | 872-878 | 892-898 |
| 1725.5 | ----- | 1710.5-1740.5 | 1772.5-1778.5 | 1782.5-1788.5 | 1822.5-1828.5 | 1842.5-1848.5 |
| | 776 | 761-791 | 823-829 | 833-839 | 873-879 | 893-899 |
| 1726.5 | ----- | 1711.5-1741.5 | 1773.5-1779.5 | 1783.5-1789.5 | 1823.5-1829.5 | 1843.5-1849.5 |
| | 777 | 762-792 | 824-830 | 834-840 | 874-880 | 894-899 |
| 1727.5 | ----- | 1712.5-1742.5 | 1774.5-1780.5 | 1784.5-1790.5 | 1824.5-1830.5 | 1844.5-1849.5 |
| | 778 | 763-793 | 825-831 | 835-841 | 875-881 | 895-899 |
| 1728.5 | ----- | 1713.5-1743.5 | 1775.5-1781.5 | 1785.5-1791.5 | 1825.5-1831.5 | 1845.5-1849.5 |
| | 779 | 764-794 | 826-832 | 836-842 | 876-882 | 896-899 |
| 1729.5 | ----- | 1714.5-1744.5 | 1776.5-1782.5 | 1786.5-1792.5 | 1826.5-1832.5 | 1846.5-1849.5 |
| | 780 | 765-795 | 827-833 | 837-843 | 877-883 | 897-899 |
| 1730.5 | ----- | 1715.5-1745.5 | 1777.5-1783.5 | 1787.5-1793.5 | 1827.5-1833.5 | 1847.5-1849.5 |
| | 781 | 766-796 | 828-834 | 838-844 | 878-884 | 898-899 |
| 1731.5 | ----- | 1716.5-1746.5 | 1778.5-1784.5 | 1788.5-1794.5 | 1828.5-1834.5 | 1848.5-1849.5 |
| | 782 | 767-797 | 829-835 | 839-845 | 879-885 | -899 |
| 1732.5 | ----- | 1717.5-1747.5 | 1779.5-1785.5 | 1789.5-1795.5 | 1829.5-1835.5 | -1849.5 |
| | 783 | 768-798 | 830-836 | 840-846 | 880-886 | |
| 1733.5 | ----- | 1718.5-1748.5 | 1780.5-1786.5 | 1790.5-1796.5 | 1830.5-1836.5 | |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 784 | 769-799 | 831-837 | 841-847 | 881-887 | |
| 1734.5 | ----- | 1719.5-1749.5 | 1781.5-1787.5 | 1791.5-1797.5 | 1831.5-1837.5 | |
| | 785 | 770-800 | 832-838 | 842-848 | 882-888 | |
| 1735.5 | ----- | 1720.5-1750.5 | 1782 6-1788.5 | 1792.5-1798.5 | 1832.5-1838.5 | |
| | 786 | 771-801 | 833-839 | 843-849 | 883-889 | |
| 1736.5 | ----- | 1721.5-1751.5 | 1783.5-1789.5 | 1793.5-1799.5 | 1833.5-1839.5 | |
| | 787 | 772-802 | 834-840 | 844-850 | 884-890 | |
| 1737.5 | ----- | 1722.5-1752.5 | 1784.5-1790.5 | 1794.5-1800.5 | 1834.5-1840.5 | |
| | 788 | 773-803 | 835-841 | 845-851 | 885-891 | |
| 1738.5 | ----- | 1723.5-1753.5 | 1785.5-1791.5 | 1795.5-1801.5 | 1835.5-1841.5 | |
| | 789 | 774-804 | 836-842 | 846-852 | 886-892 | |
| 1739.5 | ----- | 1724.5-1754.5 | 1786.5-1792.5 | 1796.5-1802.5 | 1836.5-1842.5 | |
| | 790 | 775-805 | 837-843 | 847-853 | 887-893 | |
| 1740.5 | ----- | 1725.5-1756.5 | 1787.5-1793.5 | 1797.5-1803.5 | 1837.5-1843.5 | |
| | 791 | 776-806 | 838-844 | 848-854 | 888-894 | |
| 1741.5 | ----- | 1726.5-1756.5 | 1788.5-1794.5 | 1798.5-1804.5 | 1838.5-1844.5 | |
| | 792 | 777-807 | 839-845 | 849-855 | 889-895 | |
| 1742.5 | ----- | 1727.5-1757.5 | 1789.5-1795.5 | 1799.5-1805.5 | 1839.5-1845.5 | |
| | 793 | 778-808 | 840-846 | 850-856 | 890-896 | |
| 1743.5 | ----- | 1728.5-1758.5 | 1790.5-1796.5 | 1800.5-1806.5 | 1840.5-1846.5 | |
| | 794 | 779-809 | 841-847 | 851-857 | 891-897 | |
| 1744.5 | ----- | 1729.5-1759.5 | 1791.5-1797.5 | 1801.5-1807.5 | 1841.5-1847.5 | |
| | 796 | 780-810 | 842-848 | 862-868 | 892-898 | |
| 1745.5 | ----- | 17305-1760.5 | 1792.5-1798.5 | 1802.5-1808.5 | 1842.5-1848.5 | |
| | 796 | 781-811 | 843-849 | 853-859 | 893-899 | |
| 1746.5 | ----- | 1731.5-1761.5 | 1793.5-1799.5 | 1803.5-1809.5 | 1843.5-1849.5 | |
| | 797 | 782-812 | 844-850 | 854-860 | 894-899 | |
| 1747.5 | ----- | 1732.5-1762.5 | 1794.5-1800.5 | 1804.5-1810.5 | 1844.5-1849.5 | |
| | 798 | 783-813 | 845-851 | 855-861 | 895-899 | |
| 1748.5 | ----- | 1733.5-1763.5 | 17965-1801.5 | 1805.5-1811.5 | 1845.5-1849.5 | |
| | 799 | 784-814 | 846-862 | 856-862 | 896-899 | |
| 1749.5 | ----- | 1734.5-1764.5 | 17966-1802.5 | 1806.5-1812.5 | 1846.5-1849.5 | |
| | 800 | 785-815 | 847-853 | 857-863 | 897-899 | |
| 1750.5 | ----- | 1735.5-1765.5 | 1797.5-1803.5 | 1807.5-1813.5 | 1847.5-1849.5 | |
| | 801 | 786-816 | 848-854 | 858-864 | 898-899 | |
| 1751.5 | ----- | 1736.5-1766.5 | 1798.5-1804.5 | 1808 6-1814.5 | 1848.5-1849.5 | |
| | 802 | 787-817 | 849-855 | 859-865 | -899 | |
| 1762.5 | ----- | 1737.5-1767.5 | 1799.5-1805.5 | 1809 6-1815.5 | -1849.5 | |
| | 803 | 788-818 | 860-866 | 860-866 | | |
| 1763.5 | ----- | 1738.5-1768.5 | 1800.5-1806.5 | 1810.5-1816.5 | | |
| | 804 | 789-819 | 851-857 | 861-867 | | |
| 1754.5 | ----- | 1739.5-1769.5 | 1801.5-1807.5 | 1811.5-1817.5 | | |
| | 805 | 790-820 | 862-858 | 862-868 | | |
| 1755.5 | ----- | 1740.5-1770.5 | 1802.5-1808.5 | 1812.5-1818.5 | | |
| | 806 | 791-821 | 853-859 | 863-869 | | |
| 1766.5 | ----- | 1741.5-1771.5 | 1803.5-1809.5 | 1813.5-1819.5 | | |
| | 807 | 792-822 | 854-860 | 864-870 | | |
| 1757.5 | ----- | 1742.5-1772.5 | 1804.5-1810.5 | 1814.5-1820.5 | | |
| | 808 | 793-823 | 855-861 | 865-871 | | |
| 1758.5 | ----- | 1743.5-1773.5 | 1805.5-1811.5 | 1816.5-1821.5 | | |
| | 809 | 794-824 | 856-862 | 866-872 | | |
| 1759.5 | ----- | 1744.5-1774.5 | 1806.5-1812.5 | 1816.5-1822.5 | | |
| | 810 | 795-825 | 857-863 | 867-873 | | |
| 1760.5 | ----- | 1746.5-1775.5 | 1807.5-1813.5 | 1817.5-1823.5 | | |

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| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 811 | 796-826 | 858-864 | 868-874 | | |
| 1761.5 | ----- | 1746.5-1776.5 | 1808.5-1814.5 | 1818.5-1824.5 | | |
| | 812 | 797-827 | 869-865 | 869-876 | | |
| 1762.5 | ----- | 1747.5-1777.5 | 1809.5-1815.5 | 1819.5-1825.5 | | |
| | 813 | 798-828 | 860-866 | 870-876 | | |
| 1763.5 | ----- | 1748.5-1778.5 | 1810.5-1816.5 | 1820.5-1826.5 | | |
| | 814 | 799-829 | 861-867 | 871-877 | | |
| 1764.5 | ----- | 1749.5-1779.5 | 1811.5-1817.5 | 1821.5-1827.5 | | |
| | 815 | 800-830 | 862-868 | 872-878 | | |
| 1765.5 | ----- | 1750.5-1780.5 | 1812.5-1818.5 | 1822.5-1828.5 | | |
| | 816 | 801-831 | 863-869 | 873-879 | | |
| 1766.5 | ----- | 1751.5-1781.5 | 1813.5-1819.5 | 1823.5-1829.5 | | |
| | 817 | 802-832 | 864-870 | 874-880 | | |
| 1767.5 | ----- | 1752.5-1782.5 | 1814.5-1820.5 | 1824.5-1830.5 | | |
| | 818 | 803-833 | 865-871 | 875-881 | | |
| 1768.5 | ----- | 1753.5-1783.5 | 1815.5-1821.5 | 1825.5-1831.5 | | |
| | 819 | 804-834 | 866-872 | 876-882 | | |
| 1769.5 | ----- | 1754.5-1784.5 | 1816.5-1822.5 | 1826.5-1832.5 | | |
| | 820 | 805-836 | 867-873 | 877-883 | | |
| 1770.5 | ----- | 1755.5-1785.5 | 1817.5-1823 6 | 1827.5-1833.5 | | |
| | 821 | 806-836 | 868-874 | 878-884 | | |
| 1771.5 | ----- | 1756.5-1786.5 | 1818.5-1824.5 | 1828.5-1834.5 | | |
| | 822 | 807-837 | 869-875 | 879-885 | | |
| 1772.5 | ----- | 1757.5-1787.5 | 1819.5-1825.5 | 1829.5-1835.5 | | |
| | 823 | 808-838 | 870-876 | 880-886 | | |
| 1773.5 | ----- | 1758.5-1788.5 | 1820.5-1826.5 | 1830.5-1836.5 | | |
| | 824 | 809-839 | 871-877 | 881-887 | | |
| 1774.5 | ----- | 1759.5-1789.5 | 1821.5-1827.5 | 1831.5-1837.5 | | |
| | 825 | 810-840 | 872-878 | 882-888 | | |
| 1775.5 | ----- | 1760.5-1790.5 | 1822.5-1828.5 | 1832.5-1838.5 | | |
| | 826 | 811-841 | 873-879 | 883-889 | | |
| 1776.5 | ----- | 1761.5-1791.5 | 1823.5-1829.5 | 1833.5-1839.5 | | |
| | 827 | 812-842 | 874-880 | 884-890 | | |
| 1777.5 | ----- | 1762.5-1792.5 | 1824.5-1830.5 | 1834.5-1840.5 | | |
| | 828 | 813-843 | 875-881 | 885-891 | | |
| 1778.5 | ----- | 1763.5-1793.5 | 1825.5-1831.5 | 1835.5-1841.5 | | |
| | 829 | 814-844 | 876-882 | 886-892 | | |
| 1779.5 | ----- | 1764.5-1794.5 | 1826.-1832.5 | 1836.5-1842.5 | | |
| | 830 | 815-845 | 877-883 | 887-893 | | |
| 1780.5 | ----- | 17655-1795.5 | 1827.5-1833.5 | 1837.5-1843.5 | | |
| | 831 | 816-846 | 878-884 | 888-894 | | |
| 1781.5 | ----- | 1766.5-1796.5 | 1828.5-1834.5 | 1838.5-1844.5 | | |
| | 832 | 817-847 | 879-885 | 889-895 | | |
| 1782.5 | ----- | 1767.5-1797.5 | 1829.5-1835.5 | 1839.5-1845.5 | | |
| | 833 | 818-848 | 880-886 | 890-896 | | |
| 1783.5 | ----- | 1768.5-1798.5 | 1830.5-1836.5 | 1840.5-1846.5 | | |
| | 834 | 819-849 | 881-887 | 891-897 | | |
| 1784.5 | ----- | 1769.5-1799.5 | 1831.5-1837.5 | 1841.5-1847.5 | | |
| | 835 | 820-850 | 882-888 | 892-898 | | |
| 1785.5 | ----- | 1770.5-1800.5 | 1832.5-1838.5 | 1842.5-1848.5 | | |
| | 836 | 821-851 | 883-889 | 893-899 | | |
| 1786.5 | ----- | 1771.5-1801.5 | 1833.5-1839.5 | 1843.5-1849.5 | | |
| | 837 | 822-852 | 884-890 | 894-899 | | |
| 1787.5 | ----- | 1772.5-1802.5 | 1834.5-1840.5 | 1844.5-1849.5 | | |

AGO 10032A

| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 838 | 823--853 | 885-891 | 895-899 | | |
| 1788.5 | ----- | 1773.5-1803.5 | 1835.5-1841.5 | 1845 6-1849.5 | | |
| | 839 | 824-854 | 886-892 | 896-899 | | |
| 1789.5 | ----- | 1774.5-1804.5 | 1836.5-1842.5 | 1846.5-1849.5 | | |
| | 840 | 825-855 | 887-893 | 897-899 | | |
| 1790.5 | ----- | 1775.5-1805.5 | 1837.5-1843.5 | 1847.5-1849.5 | | |
| | 841 | 826-856 | 888-894 | 898-899 | | |
| 1791.5 | ----- | 1776.5-1806.5 | 1838.5-1844.5 | 1848.5-1849.5 | | |
| | 842 | 827-857 | 889-895 | -899 | | |
| 1792.5 | ----- | 1777.5-1807.5 | 1839.5-1845.5 | -1849.5 | | |
| | 843 | 828-858 | 890-896 | | | |
| 1793.5 | ----- | 1778.5-1808.5 | 1840.5-1846.5 | | | |
| | 844 | 829-859 | 891-897 | | | |
| 1794.5 | ----- | 1779.5-1809.5 | 1841.5-1847.5 | | | |
| | 845 | 830-860 | 892-898 | | | |
| 1795.5 | ----- | 1780.5-1810.5 | 1842.5-1848.5 | | | |
| | 846 | 831-861 | 893-899 | | | |
| 1796.5 | ----- | 1781.5-1811.5 | 1843.5-1849.5 | | | |
| | 847 | 832-862 | 894-899 | | | |
| 1797.5 | ----- | 1782.5-1812.5 | 1844.5-1849.5 | | | |
| | 848 | 833-863 | 895-899 | | | |
| 1798.5 | ----- | 1783.5-1813.5 | 1845.5-1849.5 | | | |
| | 849 | 834-864 | 896-899 | | | |
| 1799.5 | ----- | 1784.5-1814.5 | 1846.5-1849.5 | | | |
| | 850 | 835-865 | 897-899 | | | |
| 1800.5 | ----- | 1785.5-1815.5 | 1847.5-1849.5 | | | |
| | 851 | 836-866 | 898-899 | | | |
| 1801.5 | ----- | 1786.5-1816.5 | 1848.5-1849.5 | | | |
| | 852 | 837-867 | -899 | | | |
| 1802.5 | ----- | 1787.5-1817.5 | -1849.5 | | | |
| | 853 | 838-868 | | | | |
| 1803.5 | ----- | 1788.5-1818.5 | | | | |
| | 864 | 839-869 | | | | |
| 1804.5 | ----- | 1789.5-1819.5 | | | | |
| | 855 | 840-870 | | | | |
| 1805.5 | ----- | 1790.5-1820.5 | | | | |
| | 856 | 841-871 | | | | |
| 1806.5 | ----- | 1791.5-1821.5 | | | | |
| | 867 | 842-872 | | | | |
| 1807.5 | ----- | 1792.5-1822.5 | | | | |
| | 858 | 843-873 | | | | |
| 1808.5 | ----- | 1793.5-1823.5 | | | | |
| | 859 | 844-874 | | | | |
| 1809.5 | ----- | 1794.5-1824.5 | | | | |
| | 860 | 846-875 | | | | |
| 1810.5 | ----- | 1795.5-1825.5 | | | | |
| | 861 | 846-876 | | | | |
| 1811.5 | ----- | 1796.5-1826.5 | | | | |
| | 862 | 847-877 | | | | |
| 1812.5 | ----- | 1797.5-1827.5 | | | | |
| | 863 | 848-878 | | | | |
| 1813.5 | ----- | 1798.5-1828.5 | | | | |
| | 864 | 849-879 | | | | |
| 1814.5 | ----- | 1799.5-1829.5 | | | | |

AGO 10032A

| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 865 | 850-880 | | | | |
| 1815.5 | | 1800.5-1830.5 | | | | |
| | 866 | 851-881 | | | | |
| 1816.5 | | 1801.5-1831.5 | | | | |
| | 867 | 852-882 | | | | |
| 1817.5 | | 1802.5-1832.5 | | | | |
| | 868 | 853-883 | | | | |
| 1818.5 | | 1803.5-1833.5 | | | | |
| | 869 | 854-884 | | | | |
| 1819.5 | | 1804.5-1834.5 | | | | |
| | 870 | 855-885 | | | | |
| 1820.5 | | 1805.5-1835.5 | | | | |
| | 871 | 856-886 | | | | |
| 1821.5 | | 1806.5-1836.5 | | | | |
| | 872 | 857-887 | | | | |
| 1822.5 | | 1807.5-1837.5 | | | | |
| | 873 | 858-888 | | | | |
| 1823.5 | | 1808.5-1838.5 | | | | |
| | 874 | 859-889 | | | | |
| 1824.5 | | 1809.5-1839.5 | | | | |
| | 875 | 860-890 | | | | |
| 1825.5 | | 1810.5-1840.5 | | | | |
| | 876 | 861-891 | | | | |
| 1826.5 | | 1811.5-1841.5 | | | | |
| | 877 | 862-892 | | | | |
| 1827.5 | | 1812.5-1842.5 | | | | |
| | 878 | 863-893 | | | | |
| 1828.5 | | 1813.5-1843.5 | | | | |
| | 879 | 864-894 | | | | |
| 1829.5 | | 1814.5-1844.5 | | | | |
| | 880 | 865-895 | | | | |
| 1830.5 | | 1815.5-1845.5 | | | | |
| | 881 | 866-896 | | | | |
| 1831.5 | | 1816.5-1846.5 | | | | |
| | 882 | 867-897 | | | | |
| 1832.5 | | 1817.5-1847.5 | | | | |
| | 883 | 868-898 | | | | |
| 1833.5 | | 1818.5-1848.5 | | | | |
| | 884 | 869-899 | | | | |
| 1834.5 | | 1819.5-1849.5 | | | | |
| | 885 | 870-899 | | | | |
| 1835.5 | | 1820.5-1849.5 | | | | |
| | 886 | 871-899 | | | | |
| 1836.5 | | 1821.5-1849.5 | | | | |
| | 887 | 872-899 | | | | |
| 1837.5 | | 1822.5-1849.5 | | | | |
| | 888 | 873-899 | | | | |
| 1838.5 | | 1823.5-1849.5 | | | | |
| | 889 | 874-899 | | | | |
| 1839.5 | | 1824.5-1849 | | | | |
| | 890 | 875-899 | | | | |
| 1840.5 | | 1825.5-1849.5 | | | | |
| | 891 | 876-899 | | | | |
| 1841.5 | | 1826.5-1849.5 | | | | |

| High-band transmitter | | Receiver channel/frequency | | | | |
|---|---|---|---|---|---|---|
| | | Required separation | | | | |
| Frequency | Channel | -15 to +15 | +50 (±3) | +60 (±3) | +100 (±3) | +120 (±3) |
| | 892 | 877-899 | | | | |
| 1842.5 | | 1827.5-1849.5 | | | | |
| | 896 | 878-899 | | | | |
| 1843.5 | | 1828.5-1849.5 | | | | |
| | 894 | 879-899 | | | | |
| 1844.5 | | 1829.5-1849.5 | | | | |
| | 895 | 880-899 | | | | |
| 1845.5 | | 1830.5-1849.5 | | | | |
| | 896 | 881-899 | | | | |
| 1846.5 | | 1831.5-1849.5 | | | | |
| | 897 | 882-899 | | | | |
| 1847.5 | | 1832.5-1849.5 | | | | |
| | 898 | 883-899 | | | | |
| 1848.5 | | 1833.5-1849.5 | | | | |
| | 899 | 884-899 | | | | |
| 1849.5 | | 1834.5-1849.5 | | | | |

**2-4. Shelter Requirements**

The shelter used to house the radio set when it is to be installed without the use of a supplied shelter should provide the following:

*a*. Protection from bad weather.

*b*. A dry, secure mounting, free from vibration, that furnishes support for the equipment in a level position.

*c*. Sufficient space for satisfactory maintenance and operation of the equipment.

*d.* Adequate lighting for day and night operations with the front panel markings easily recognizable.

*e*. A floorspace approximately 2 feet by 2 feet and a minimum ceiling height of 3 feet to allow for stack mounting the equipment.

*f.* A power source of 115 volts ±17 percent, 47 to 63 cps, 12 amperes, for each radio set stack.

**2-5. Tools Required for Installation**

The installation of the radio set does not require the use of any special tools or test equipment. All necessary tools are supplied in the accessory case.

*a.* The following tools are required for the installation of transmitter, and receiver. Some are included with the radio sets (app B).

(1) 5/16-inch socket wrench.
(2) 7/16-inch socket wrench.
(3) 4-inch screwdriver.
(4) 2-1/2-inch screwdriver.

*b*. The tools with Mast AB-577/GRC for installation of the AT-903/G include the following:

(1) Spanner wrench.
(2) Mast-section clamp tool.
(3) Sledge hammer.
(4) Chisel-joint digging bar. 2-6. Antenna Site

The antenna site should be large enough for adequate installation and be reasonably flat and clear of obstructions. The maximum separation between Mast AB-577/GRC and the shelter should not be more than 60 feet. The antenna components are shown in figures 1-7 and 1-8. The MK-806/GRC is not supplied with the radio sets. It may be obtained and installed with the AB-577/GRC to raise AT-903/G to 76 feet.

**2-7. Antenna AT-903/G Adjustment**

*a*. Antenna AT-903/G (fig. 1-7) is provided with a removable three-legged mounting frame which is used to position the horn for either horizontal or vertical polarization. This mounting frame may be detached from the AT-903/G by pulling the rings of the three ball-lock pins that secure the mounting frame legs to the horizontal or vertical polarization mounting lugs on the horn. The mounting frame is attached to the horn for either type of polarization by aligning the holes in the legs of the mounting frame with the holes in the horn

mounting lugs. Set the ball-lock pins until the ball locks have passed through the holes and are visible. The ball-lock pins should then be pulled back without the use of the release rings to make sure that the lock mechanism works. B. figure 1-7 illustrates the horn position for vertical polarization, and A illustrates the horn position for horizontal polarization. An arrow is painted on some antennas to indicate the horn polarity with respect to the horizon.

*b.* To install Antenna AT-903/G and Mast AB-577/GRC, refer to TM 11-5820-538-12.

**2-8. Cable Connections and Grounding**

*a. Cable Connections*. Refer to figure 6- for typical cable connections between the components of the radio set. The illustration also shows the cable connections for associated telephone carrier terminal or repeater station equipment.

*b. Grounding*. Use heavy gage, Insulated wire or ground straps to connect the GRD binding post on Power Supply PP-2054(*)/GRC to an earth grounding facility.

*c. PCM Operation*. After all the radio lends have been satisfactorily lined up (pare 3-16), the video transmission signal cable of the pcm equipment is connected to the PCM IN receptacle on the T-893(P)/GRC and the order-wire cable Is connected to the PCM ORDER WIRE connector. Connect the receiver signal cable of the pcm equipment to the PCM OUT receptacle on the receiver.

*d. Fdm Operation*.

(1) Connect the spiral-four cable from the pcm equipment to the FDM CABLE CONNECTIONS binding posts.

(2) Set the FDM OUTPUT TRAFFIC CHAN switch according to the type of carrier terminal equipment (4- or 12/24-channel equipment).

**2-9. Wavemeter Vernier Scale Interpretation**

(fig. 2-2)

To set the wavemeter, special procedures must be followed because of the intricate interpretation of the wavemeter vernier scale. Remove the wavemeter chart from its slot in either the amplifier-converter or the amplifier-oscillator. Determine the wavemeter setting by looking up the channel number to be used In the CHN column of the chart. When the transmitter is being tuned, use either the dial setting in the MAIN TUNE or OUT FREQ. columns as stated in the procedures; when the receiver is being tuned, use the dial setting in the REC. OSC. column. For example: when a setting of 961.7 is required according to the wavemeter chart, the wavemeter adjustment procedures are given in a through *e* below:

*a.* Assume that a setting corresponding to 961.7 is desired.

**CAUTION**

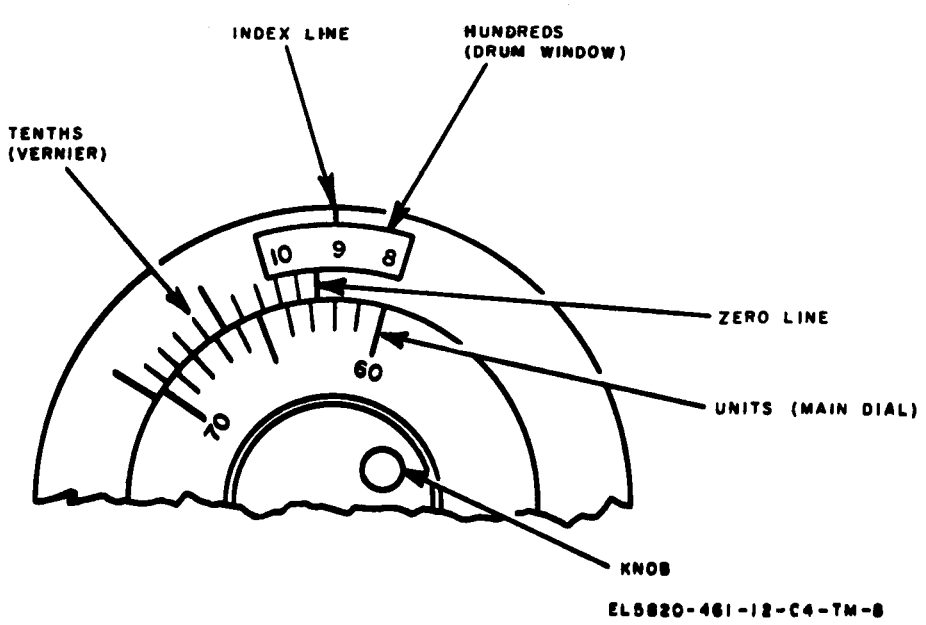
To prevent damage to the wavemeter main dial assembly, tune slowly and avoid forcing main dial against end stop.

*b.* Rotate the main dial knob until the number 9 on the hundreds (drum window) is directly under the index line.

*c*. Again rotate the main dial knob clockwise until the 61 gradation (line) on the units scale IS directly under the zero hne on the vernier scale.

*d.* Continue turning the main dial slowly clockwise until the seven-tenths gradation on the vernier scale exactly coincides with a gradation on the units scale.

*e*. Reading the dial is the reverse of inserting a setting. A gradation on the vernier scale, counterclockwise from the zero line, which coincides with a gradation on the units scale Is the dial setting In tenths; the units gradation under, or to the right of, the zero line is the dial setting In units; and the number on the hundreds (drum window) under the index line is the dial setting in hundreds.


INDEX LINE
HUNDREDS
(DRUM WINDOW)
TENTHS
(VERNIER)
10
9
8
ZERO LINE
60
70
UNITS (MAIN DIAL)
KNOB
EL5820-461-12-C4-TM-8

# CHAPTER 3
# OPERATING INSTRUCTIONS

## Section I. OPERATOR'S CONTROLS AND INDICATORS

*Note.* This section covers only Items used by the operator, Items used by higher category maintenance personnel are covered In instructions for the appropriate maintenance category

***Caution:*** **To avoid receiver crystal damage, the REC SIG-1 and OSCILLATOR controls (in the receiver) and the REC SIG-2 control (in the transmitter) should not be tuned closer than 15 channels to the MAIN TUNING, POWER CUT, and COUPLING controls settings (in the transmitter).**

### 3-1. Transmitter Controls and Indicators

*a. General.* The complete transmitter consists of Transmitter, Radio T-893(P)/GRC, Amplifier-Oscillator AM-1 957/GRC, Amplifier-Oscillator AM-1958(*)/GRC, and Power Supply PP-2054(*)/GRC. The controls and indicators are listed In b and c below.

*b. Transmitter, Radio T -98(P)/GRC, and Amplifier-Oscillators AM-1957/GRC and AM-1858(*)/GRC: (figs. 3-1, 3-2, and 3-3).* The operating controls and indicators in the following chart are common to the AM-1957/GRC and AM-1958(*)/GRC, unless otherwise noted. The AM-1957/GRC is plugged into the T-893(P)/GRC when the low-band transmitting frequencies are used, and the AM-1958(*)/GRC is plugged in when the high-band transmitting frequencies are used.

| Control or indicator | Function |
|---|---|
| ARC selector switch (fig. 3-1)..... | *sw pos* — *Function*<br>TUNE----------Disables arc for tuning.<br>ODD----------Sets arc motor for use on odd-numbered channels (l, 3, 5, etc).<br>EVEN----------Set afc motor for use on even-numbered channels (2, 4, 6, etc) |
| AFC CORRECTION control ..... | Checks arc system Physical position of control (with respect to center position) indicates relative amount and polarity of afc correction voltage. |
| AFC LEVEL control..... | Adjusts arc signal level. |
| AFC meter..... | Indicates arc tuning error. |
| INPUT LEVELS PCM control ..... | Sets the Input signal level of the pcm amplifier for proper amplitude at modulator. The inputs are lowered as the control is turned toward the LO position and raised as the control is turned toward the HI position. |
| INPUT LEVELS FDM control..... | Sets the input signal level of the fdm amplifier for proper amplitude at modulator. The inputs are lowered as the control is turned toward the LO position and raised as the control is turned toward the HI position. |
| INPUT LEVELS TRAFFIC CHAN switch (for FDM only). | Switches input impedance from 600 ohms (for four-channel operation) to 135 ohms (for 12/24-channel operation). |

| Control or indicator | Function |
|---|---|
| BUZ OFF button | Silences alarm buzzer. |
| ALARM ADJ control (screwdriver adjustment) | Sets power level at which alarm buzzer will ring. |
| LOW POWER indicator | When lighted, indicates that the transmitter is operating below the predetermined power output level |
| Multimeter selector switch | *Sw pos* — *Causes meter to read* |
| | OFF (TRANSIT) — Protects multimeter during transit |
| | OSC Oscillator — cathode current. |
| | MAIN TUNE — Oscillator signal level |
| | MIXER — Mixer cathode voltage. |
| | AMP — Amplifier output voltage. |
| | OUT FREQ — Transmitter output voltage. |
| | PWR OUT — Output power to the antenna. |
| | REF PWR — Reflected power from the antenna. |
| | AFC LEV — Afc if signal level. |
| | 1 KC IN — Fdm multiplex signal input. |
| | 68 KC IN — Fdm multiplex tone signal. |
| | I KC MOD — Local signal output of modulator (test tone). |
| | 68 KC MOD — Local signal output of modulator, generated by multiplex equipment. |
| | PCM IN — Amplitude of pcm pulses at input to modulator. |
| | TEST — External signal applied to test jacks. |
| Multimeter | Indicates the output of the circuit selected by the multimeter selector switch. |
| METER SHUNT button | Decreases meter sensitivity when multimeter reading goes off scale. |
| AFC TUNE control | Tunes T 893(P)IGRC cavity to desired channel frequency. |
| AFC TUNE CHANNEL indicator | Indicates selected channel |
| MAIN TUNING (figs 3-2 and 3 3): | |
| Control | Roughly tunes oscillator mixer, and power amplifier to selected channel. |
| Indicator | Indicates selected channel |
| MIXER control | Tunes mixer plate circuit to frequency of selected chancel. |
| AMP control | Tunes power amplifier plate circuit to frequency of selected channel |
| WAVEMETER control | Adjusts wavemeter cavity. |
| WAVEMETER CHART | Table of calibrated wavemeter settings. |
| COUPLING control | Adjusts output coupling from power amplifier to antenna circuit |
| POWER OUT control | Tunes transmitter section of duplexer |
| TRANSMIT CHANNEL indicator | Indicates selected channel when transmitter section of duplexer is tuned by the POWER OUT control |
| REC SIG-2 control | Tunes receiver section of duplexer. |
| RECEIVE CHANNEL indicator | Indicates selected channel when receiver section of duplexes is tuned by the REC SIG-2 control. |
| OSC control (AM-l958(*)/GRC only) | Tunes oscillator to selected channel frequency |

*c. Power Supply PP-2054* (*)/GRC (fig. 3-4).

| Control or indicator | Function |
|---|---|
| AC POWER circuit breaker | Turns transmitter ac power on and off. Also serves as circuit breaker to automatically turn transmitter off if overload occurs. |
| OPERATE-STAND BY switch | Applies high voltage to transmitter in OPERATE position. |
| FIL indicator | When lighted, indicates that 116 volts ac is applied to primary of filament transformer. |
| LV indicator | When lighted, indicates that 115 volts ac is applied to primary of low voltage transformer |
| HV indicator | When lighted, indicates that 115 volts ac is applied to primary of high voltage transformer. |

### 3-2. Receiver Controls and Indicators

*a. General*. The receiver consists of Receiver, Radio R-1148(P)/GRC or Receiver, Radio R-1331(*)(P)/GRC7 and Amplifier Converter AM-1955(*)/GRC or AmpllfIer Converter AM-1956(*)/GRC.

*Note.* In an emergency, the AM-1955A/GRC and AM-195fiA/GRC may be used In the R-1148(P)/GRC

*b. Receivers, Radio R- 1148(P)/GRC and R-1881(*)(P)/GRC* (figs. 3-5 and 3-6).

| Control or indicator | Function |
|---|---|
| SQUELCH INCR SENS control | Sets level of squelch alarm. |
| SQUELCH NO SIGNAL indicator | When lighted, indicates receiver signal Input IS below predetermined level. |
| SQUELCH BUZZER OFF button | Silences alarm buzzer. |
| FDM OUTPUT LEVEL control | Adjusts fdm output level. |
| FDM OUTPUT TRAFFIC CHAN switch | Switches input impedance from 600 ohms (for four-channel operation) to 135 ohms (for 12/24-channel operation). |
| Multimeter selector switch: | *Sw pos* — *Causes meter to read*. |
| | OFF (TRANSIT) — Protects multimeter during transit. |
| | OSC — Oscillator output voltage. |
| | AFC LEV [a] — Afc signal output level. |
| | REC SIGNAL — Signal output level of receiver. |
| | TEST TONE CAL — Test tone level (when TEST TONE ON-OFF switch is on the ON position). |
| | ORDER WIRE — Order-wire signal level output. |
| | 1 KC OUT — Fdm output pulses (1-kc test tone) |
| | 68 KC OUT — Fdm output pulses (68 kc). |
| | PCM OUT — Pcm output pulses. |
| | TEST — External signal applied to test jacks. |
| Multimeter | Indicates the output of the circuit selected by the multimeter selector switch. |
| INCOMING CALL indicator | When lighted, indicates reception of 1,600-cps ring signal |
| RING button | Activates 1,600 cps oscillator for signaling on order wire. |
| TEST TONE ON-OFF switch | Turns test tone signal on or off. |
| TEST TONE adjust control | Adjusts test tone signal level. |
| AFC meter [a] | Indicates afc tuning error. |
| AFC selector switch [a] | *Sw* — *Function* |
| | TUNE — disables afc for tuning. |
| | ODD — Sets afc motor for use on odd-numbered channels. |
| | EVEN — Sets arc motor for use on even-numbered channels |
| AFC LEVEL control [a] | Sets afc level. |
| AFC TUNE control [a] | Tunes the R-1148(P)/GRC arc cavity to desired frequency |
| AFC TUNE CHANNEL indicator [a] | Indicates selected channel number |
| AC POWER ON-OFF switch | Turns receiver on and off. |
| AC POWER indicator | When lighted, indicates 115 volts ac is applied to power transformer primary. |
| AFC DISABLE (R-1331(*)(P)/GRC only) | Disables afc during tuneup. |

[a] These controls are not Dart of Receiver. Radio R-13311P)/GRC

*c. Amplifier-Converter AM-1955(*)/GRC and Amplifier-Converter AM-1956(*)/GRC* (fig. 3-7). The operating controls and indicators listed in the following chart are common to the AM-1955(*)/GRC and AM-1956(*)/GRC, except where indicated. The AM-1955/GRC is plugged into R-1148(P)/GRC and the AM-1955A/GRC into the R-1331(*)(P)/GRC when the low-band frequencies are to be received, and the AM-1956/GRC is plugged into the R-1148(P)/GRC and the AM-1955A/GRC into the R-1331(*)(P)/GRC when the high-band frequencies are to be received. With the exception of the nameplate and AFC control on the front panel, the AM-1956/GRC is functionally

identical with the AM-1955/GRC, and the AM-1956A/GRC is functionally identical with the AM-1955A/GRC.

*Note.* In an emergency, the AM-1955A/GRC and AM-1956A/GRC may be used in the R-1148(P)/GRC. In this situation use of afc operations are changed as indicated in the tuning procedures

| Control or indicator | Function |
|---|---|
| WAVEMETER control | Sets wavemeter to desired frequency. |
| WAVEMETER CHART | Table of calibrated frequency settings for wavemeter. |
| AFC correction control [a] | Checks afc system. Physical position of control (in respect to center position) indicates relative amount and polarity of afc correction voltage. |
| REC SIG-1 | Tunes the amplifier-converter to desired channel |
| OSCILLATOR | Tunes local oscillator to desired frequency. |

[a] This control is not part of Amplifier-Converter AM-1955A/GRC or Amplifier-Converter AM-1956A/GRC.

### 3-3. Regulator, Voltage C-514/GRC, Controls and Indicators

(fig. 3-8)

| Control or indicator | Function |
|---|---|
| MANUAL indicator ..... | When lighted, indicates MANUAL-AUTOMATIC switch is in MANUAL position. |
| MANUAL RAISE-LOWER switch ..... | Controls the regulator circuits from manually raise or lower the 115-volt power source input |
| MANUAL-AUTOMATIC switch ..... | Switches the regulator circuits from manual to automatic control. |
| REGULATED OUTPUT VOTAGE meter. ..... | Indicates the regulated output voltage |
| POWER switch..... | Turns voltage regulator ac power on and off. Also serves as circuit breaker to automatically turn ac power off if overload occurs. |
| POWER ON indicator..... | When lighted, indicates POWER switch is in ON position. |

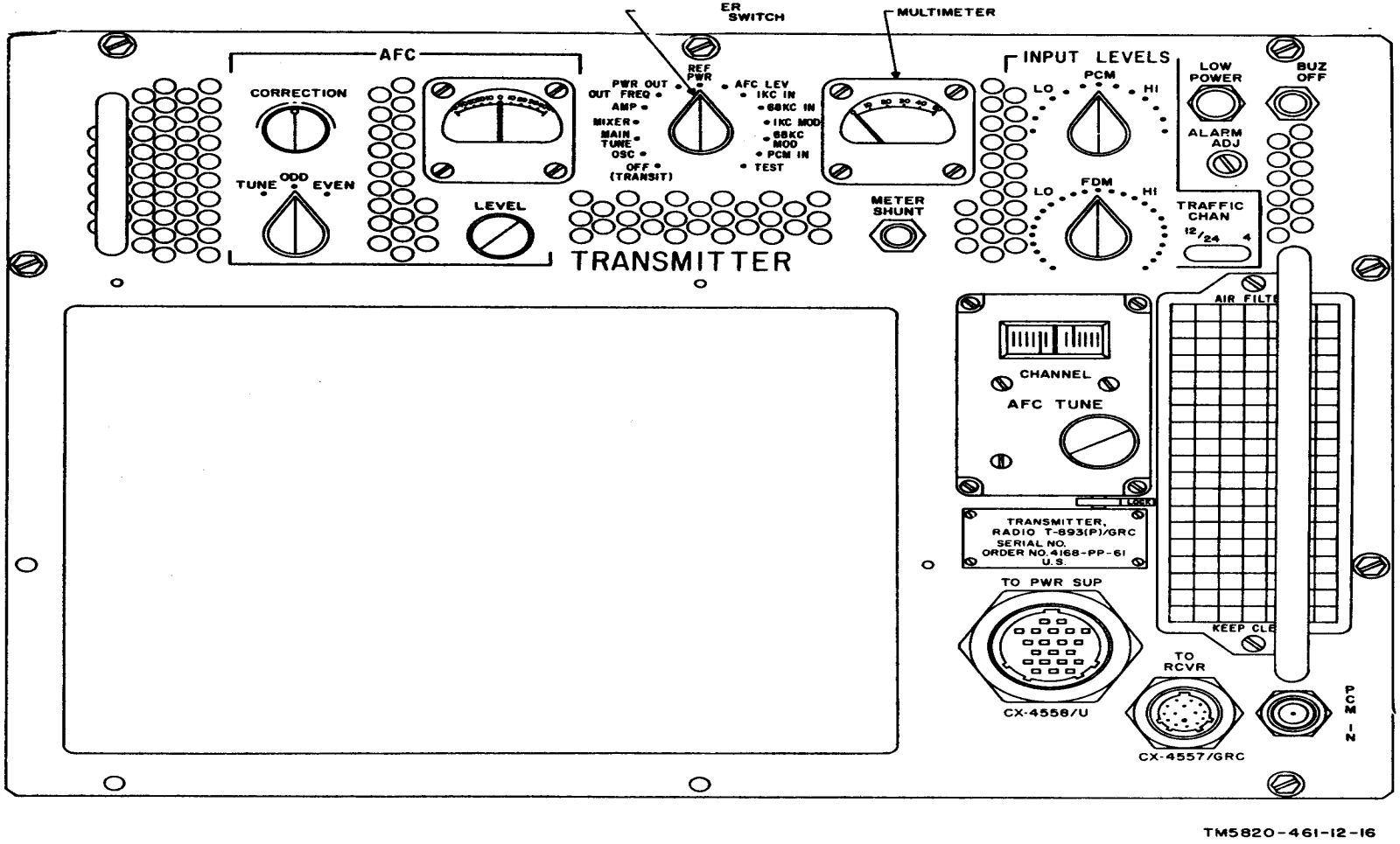



*Figure 3-1. Transmitter, Radio T-893(P)/GRc, front panel view*

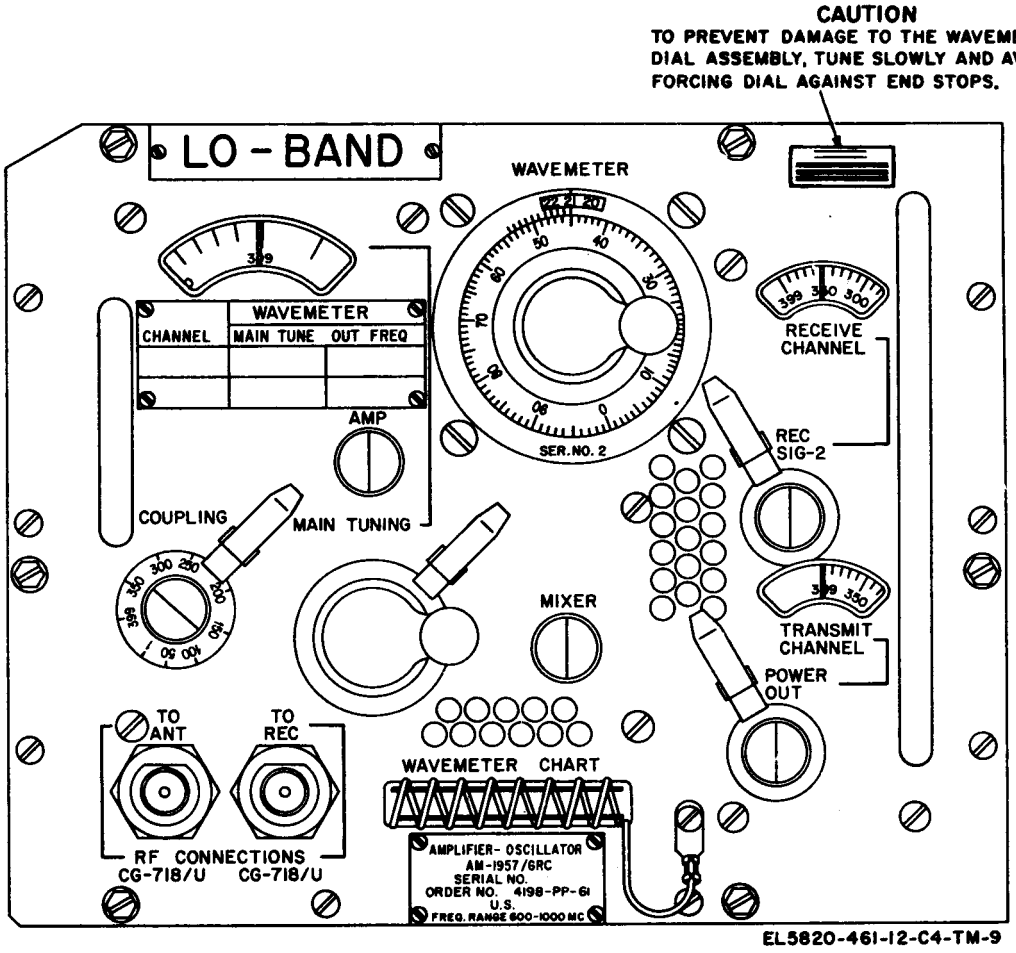



*Figure 3-2. Amplifier-Oscillator AM-1957/GRC, front panel view.*

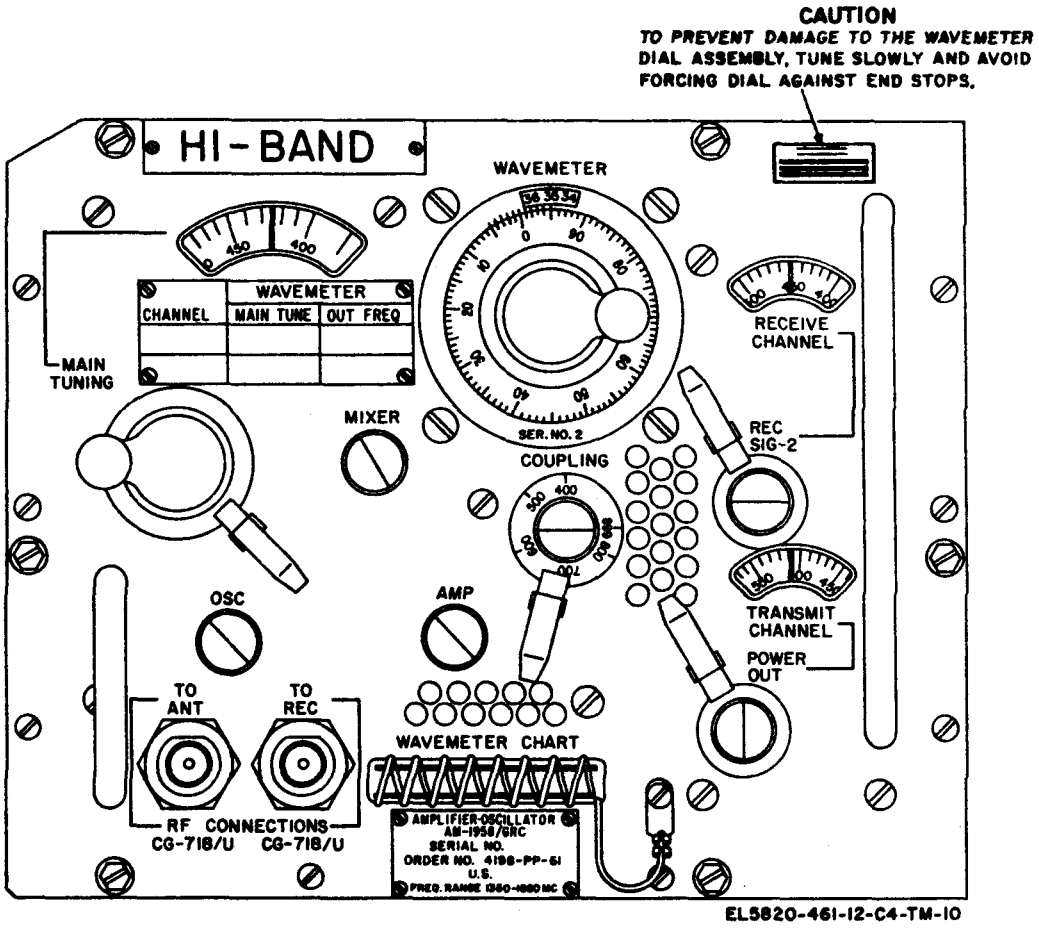



*Figure 3-3. Amplifier-oscillator AM-1958/GRC, front panel view.*

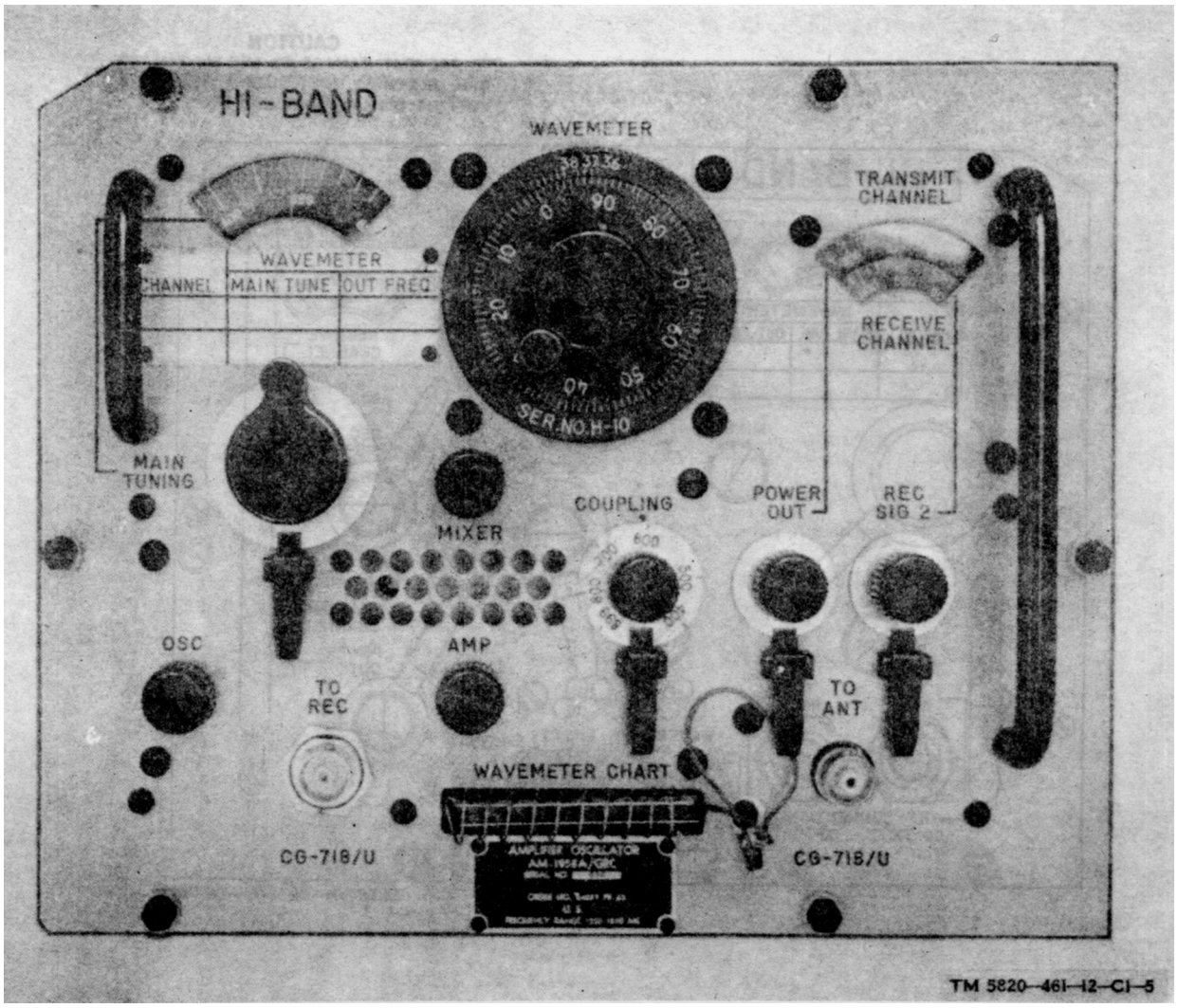



*Figure 3-3.1. Amplifier-Ocillator AM-1958A/GRC, front panel view.*

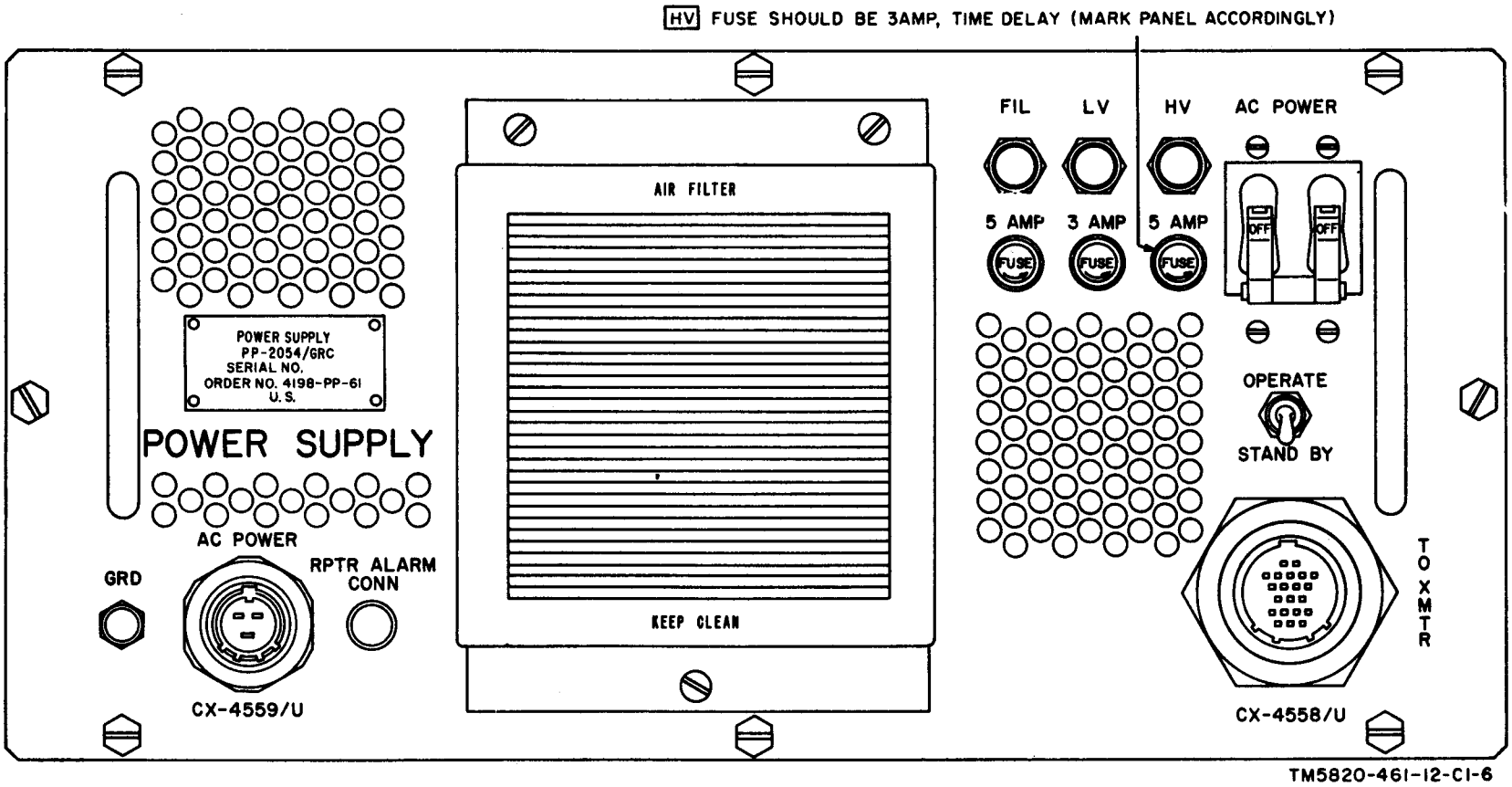
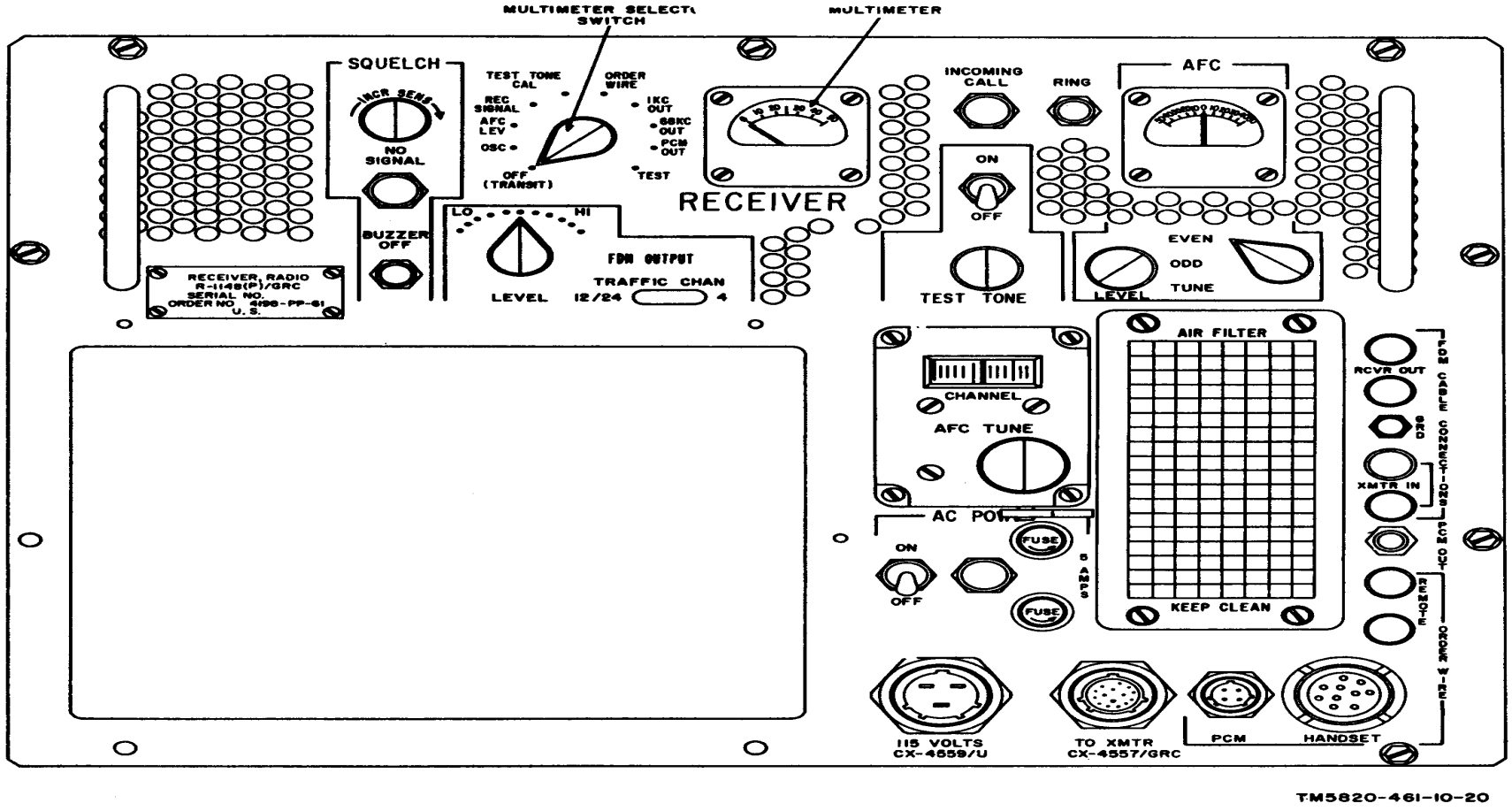



*Figure 3-4. Power Supply PP-2054(*)/GRC, front panel view*




TM5820-461-10-20

*Figure 3-5. Receiver Radio R-1148(P)/GRC, front panel view.*

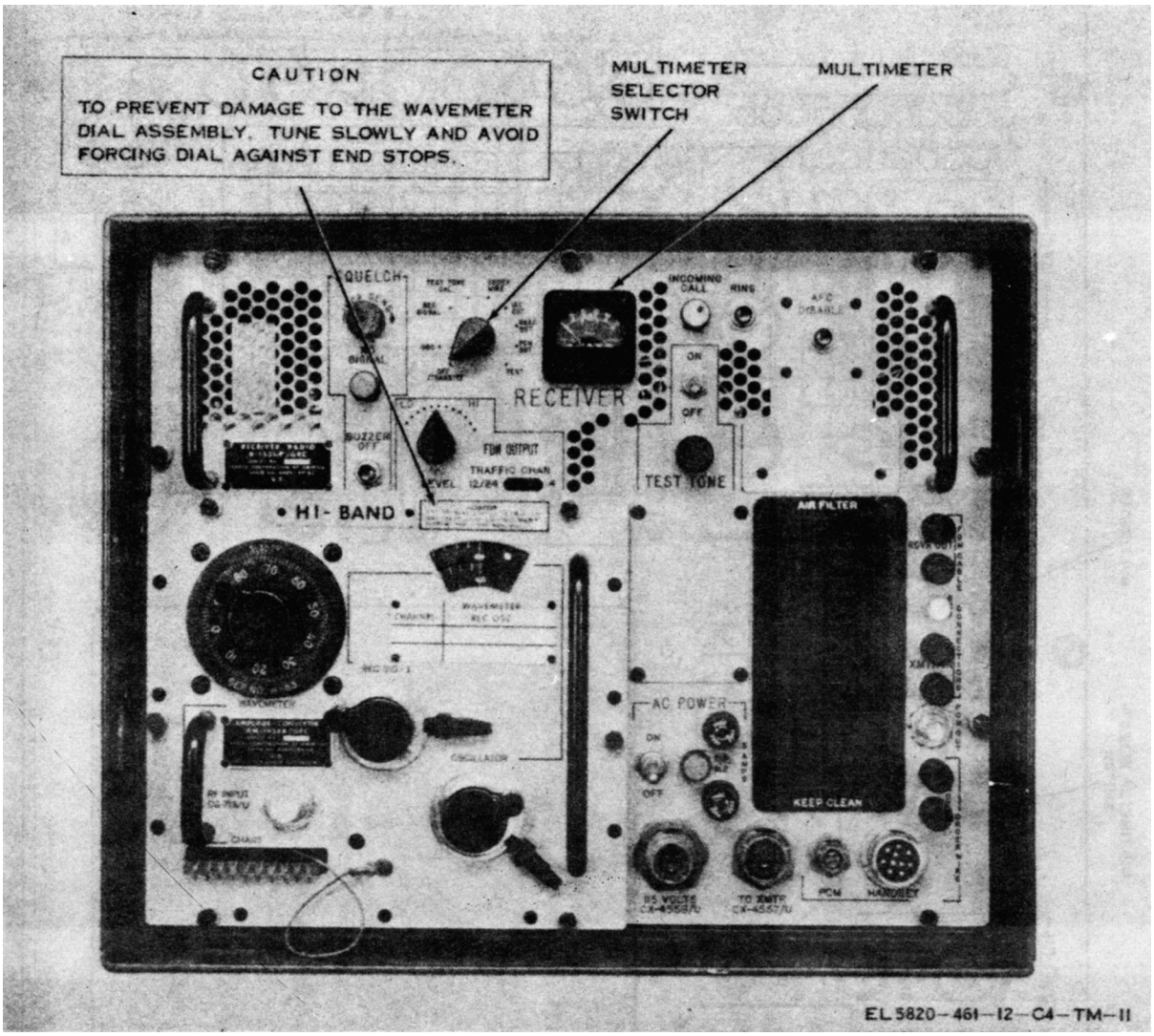



*Figure 3-6. Receiver, radio R-1331(*)(P)/GRC, and Amplifier-Converter AM-1956A/GRC fron panel viewl*

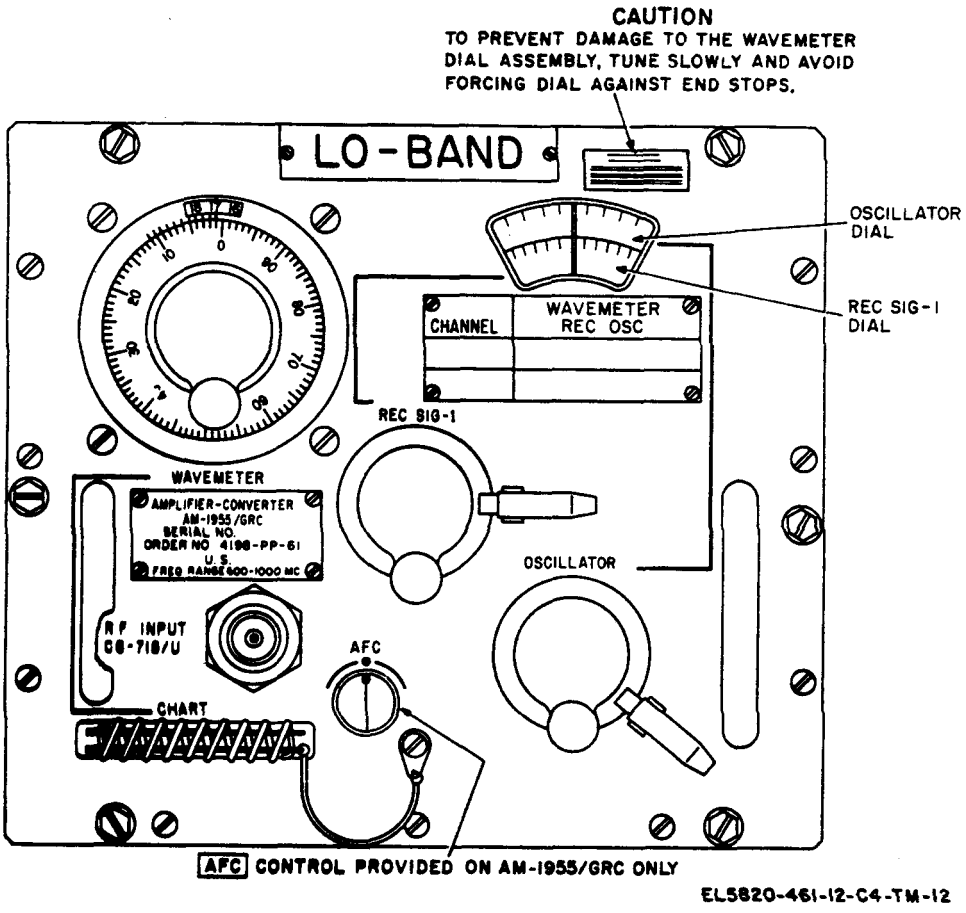



*Figure 3-7. Amplifier-Converter AM-1955(*)/GRC, front panel view.*

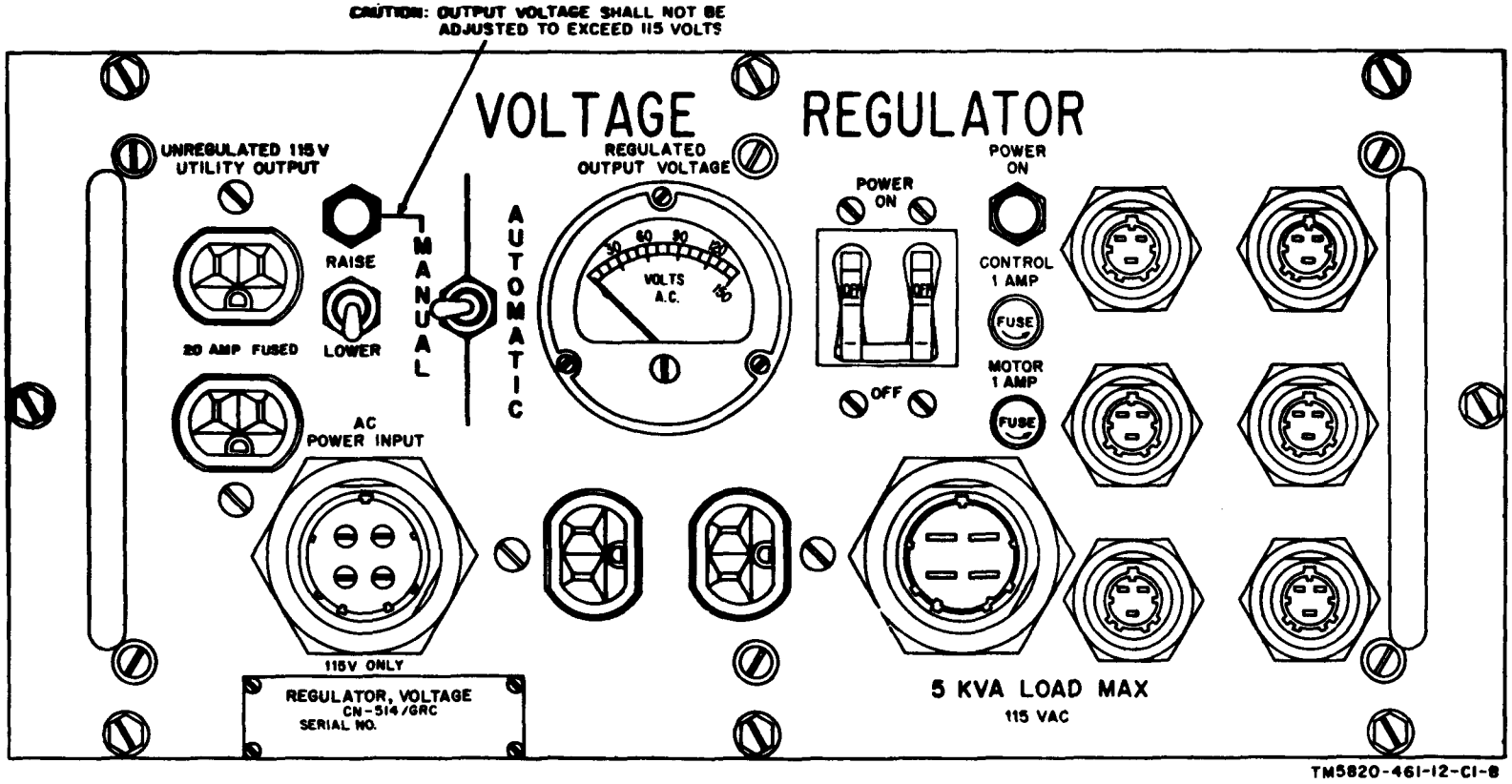



***Figure 3–8. Regulator, Voltage CN–514/GRC, front panel view.***

*Figure 3-8. Regulator, Voltage CN-514/GRC, front panel view.*

## Section II. TUNING PROCEDURES

### CAUTIONS

1 To prevent damage to the crystal diode in the receiver mixer assembly, the transmit and receive channel frequencies must be separated by at least 15 channels(15 megacycles). To observe this precaution never turn the REC SIG1 and OSCILLATOR controls in the receiver, or the REC SIG-2 controls of the transmitter, closer than 15 channels to the transmitter MAIN TUNING control setting. Conversely; never turn the transmitter MAIN TUNING control closer than 15 channels to the REC SIG-2 setting in the transmitter, and RCV SIG-1 and OSCILLATOR setting in the receiver. See caution 2 below for the procedure to be used when changing channels in the transmitter and receiver.

2. Before the radio transmitter or radio receiver is tuned, or retuned to another channel, check the channel frequencies that are set up on the transmitter and receiver to determine whether the channel to be set up will require passing through the channel set up on the other radio. For example, if the transmitter (or receiver) is set up on channel 550 and the receiver (or transmitter) is to be retuned to some channel below 550, the transmitter must be turned off first as explained in a below.

a. When the transmitter or receiver is to be retuned, set the PP-2054(*)/GRC OPERATE-STANDBY switch to STANDBY set the transmitter AFC TUNE-ODD-EVEN switch to TUNE, and the MAIN TUNING POWER OUT, and COUPLING controls to the new channel; then reset the PP-2054(*)/GRC OPERATE-STANDBY switch to OPERATE. Wait approximately 75 seconds for the LV and HV indicators to light before tuning the transmitter.

b. Do not reset PP-2054-(*)./GRC OPERATE-STANDBY switch to operate without ensuring the transmitter and receiver are preset 15 channels apart.

3. Do not turn on the transmitter (by setting the PP-2054(*)/GRC OPERATING-STANDBY switch to OPERATE) unless the DA-189/GRC or the complete antenna system is connected to the transmitter. Failure to observe this precaution may result In damage to the transmitter duplexer assembly which, in turn, may provide incorrect meter readings for PWR OUT and REF PWR.

4. To prevent damage to the WAVEMETER dial assembly, turn the dial slowly and avoid forcing the dial against the end stops.

5. Operate the CN-514/GRC on automatic control (para 3-7b(3)). Do not operate it on manual control unless the automatic function is defective. In which case, the output voltage must be adjusted to 115 volts and monitored to insure it does not exceed 115 volts.

### 3-4. General

Before the radio set is used in a communication system, it is tuned to the assigned operating channels (paras 3-7 through 3-11). When the equipment has been satisfactorily tuned, the telephone carrier equipment is connected to the radio system, and the radio is adjusted to the type of multiplex equipment used (para 3-13 or 3-14). Finally, the radio sites are operated on a routine basis, using the order wire circuit for communication between the radio sites and between the radio sites and multiplex equipment.

### 3-5. Installation of Tuning Units

Use the procedures given below to change the AM-1957/GRC and AM-1958(*)/GRC in the transmitter; the AM-1955/GRC and AM-1956/GRC in the R1148(P)/GRC; and the AM-1955A/GRC or AM-1955B/GRC and AM-1956A/GRC or AM-1956B/GRC in the R-1331(*)(P)/GRC.

**CAUTION**

To prevent serious damage to the radio set, remove the primary power from the equipment while performing the following procedures.

**NOTE**

In an emergency, the AM-1955A/GRC and AM-1956A/GRC may be used in the R-1148(P)/GRC.

*a.* Remove the short interconnecting cable, CG-718B/U (fig. 6-3), between the AM-1957/GRC and the AM-1955(*)/GRC; or between the AM-1958(*)/GRC and the AM-1956(*)/GRC. Disconnect the antenna cable from the AM-1957/GRC or the AM-1958(*)/GRC.

b. Loosen the captive screws that hold the unit to the unit frame, and slide the unit out.

*c*. Slide the appropriate unit into the unit frame and tighten the captive screws. Make sure that all the screws are tight.

**CAUTION**

Make sure that the target bolt screw on the right side of the AM-1957/GRC or AM-1958(*)/GRC (fig. 1-4) is screwed in fully. Failure to make this bolt tight results in no power being applied to the transmitter equipment.

*d*. Replace the interconnecting antenna cables.

**NOTE**

When the AM-1957/GRC or AM-1958(*)/GRC is changed in the transmitter, the current regulator circuits *must be checked and adjusted, if necessary* (para 5-13*b*).

### 3-6. Determining Channel Frequency

Operating frequencies are generally assigned in megacycles (mc). To convert megacycles to channel numbers of the AN/GRC-50/(*)(V), and channel numbers to megacycles, use the methods given in *a* and *b* below. Refer to paragraph 2-3*c* for information on frequency assignment restrictions.

*a. Low Band.* To convert a channel number to its corresponding frequency, add 600.5 to the channel number.

*Example*: Determine the frequency of channel 399:

399 channel
+600.5
999.5=999.5 (mc).

To determine the channel number from a given frequency, subtract 600.5 from the frequency.

*Example:* Determine the channel number corresponding to a frequency of 601.5 (mc).

601.5 (mc).
+600.5
1 =channel 1

*b. High Band.* To convert a channel number to its corresponding frequency, add 950.5 to the channel number.

*Example:* Determine the frequency of channel 899:

899 channel
+950.5
1,849.5=1,849.5 (mc).

To determine the channel number from a given frequency, subtract 950.5 from the frequency.

*Example:* Determine the channel number corresponding to a frequency of: 1,350.5 (mc).

1,350.5 (mc).
-950.5
400.0=channel 400.

### 3-7. Preliminary Starting Procedures

*a. Checks.*

(1) Set all power switches and circuit breakers to OFF.
(2) Check for proper 3-ampere, time-delay fuse in the HV fuse receptacle of PP-2054(*)/GRC (para 1-14*g*).
(3) Check to see that all cables are properly installed. Refer to figure 6 3 or the technical manual applicable to the assembly in which the radio set is installed (para 1-14*a*).
(4) When pcm multiplex equipment is used, remove the video cable from PCM IN connector on the transmitter (fig. 6 3) and the pcm order wire cable from PCM connector on the receiver until after the transmitter has been tuned and satisfactory reception has been established throughout the system. When fdm multiplex equipment is used, no cables need be removed.

*b. CN-514/GRC Adjustments.* Always use the CN-514/GRC in automatic operation by setting the MANUAL-AUTOMATIC switch in AUTOMATIC position unless the voltage indication on the REGULATED OUTPUT VOLTAGE meter will not remain at 115 volts. In which case, set the MANUAL-AUTOMATIC switch

to MANUAL and adjust the RAISE-LOWER switch until the meter indicates 115 volts. Under this condition, periodically monitor the meter indication and adjust the output voltage to maintain it at 115 volts. Adjust the CN-514/GRC as follows:

**CAUTION**

Do not exceed the 115-volt output on the CN-514/GRC (fig. 3-8) except for testing. The small increase in output power of the transmitter is offset by reduced life of the tubes in the equipment.

(1) Set POWER switch to ON.
(2) Set MANUAL-AUTOMATIC switch to MANUAL, and observe that the MANUAL indicator lamp lights.
(3) Set RAISE-LOWER switch to LOWER. Hold the switch until approximately 105 volts is indicated on the REGULATED OUTPUT VOLTAGE meter.
(4) Set MANUAL-AUTOMATIC switch to AUTOMATIC. Observe that the MANUAL indicator lamp goes out and the voltage is automatically raised to 115 volts on the meter.
(5) Set MANUAL-AUTOMATIC switch to MANUAL, and observe that the MANUAL indicator lamp lights.
(6) Set RAISE-LOWER switch to RAISE. Hold the switch until approximately 120 volts is indicated on the meter.
(7) Set MANUAL-AUTOMATIC switch to AUTOMATIC. Observe that the MANUAL indicator lamp goes out and the voltage is automatically lowered to 115 volts on the meter.

### 3-8. Receiver Tuning Procedures

**NOTE**

Radio receiver used in the following procedures applies to R-1148(P)/GRC and R-1331(*)(P)/GRC.

**CAUTIONS**

*1.* If the AC power fails and the R-1148(P)/GRC is being used, immediately set the AFC TUNE-ODD-EVEN switch to TUNE. After the power is restored, wait about 2 minutes before setting the AFC TUNE-ODD-EVEN switch to the original setting of ODD or EVEN as applicable.
*2.* Do not turn on the receiver again immediately after it has been turned off. Walt about 5 minutes before turning it on again. This procedure allows power control circuits to be reestablished.

| Step | Unit | Switch or control | Position or action |
|---|---|---|---|
| 1 | Radio receiver..... | AC POWER..... | OFF. |
| | | TEST TONE switch ..... | OFF. |
| | | TEST TONE control..... | Maximum counterclockwise. |
| | | FDM OUTPUT LEVEL ..... | Midrange. |
| | | SQUELCH INCR SENS..... | Maximum clockwise. |
| | | TRAFFIC CHAN..... | Set to 12/24 for fdm multiplex 12- or 24-channel system. Set to 4 fdm multiplex 4-channel system. |
| 2 | R-1148(P)/GRC only [a]..... | AFC LEVEL ..... | Midrange. |
| | | AFC TUNE-ODD-EVEN ..... | TUNE. |
| 3 | AM-1955/GRC or AM-1956/GRC only. | AFC correction..... | Set to midrange (white dot in up position). |
| 4 | AM-1955(*)/GRC or AM-1956(*)/GRC. | REC SIG-1 ..... | Set to desired receive channel as indicated on respective dial. |
| 5 | AM-1957/GRC or AM-1958(*)/GRC (In the transmitter). | REC SIG-2 ..... | Set to desired receive channel as Indicated on respective dial. |
| 6 | AM-1965(*)/GRC or AM-1956(*)/GRC. | OSCILLATOR..... | Set to desired receive channel as indicated on respective dial. |

| Step | Unit | Switch or control | Position or action |
|---|---|---|---|
| 7 | R-1148(P)/GRC [a] ..... | AFC TUNE..... | Set to desired receive channel as indicated on AFC TUNE CHANNEL indicator. (ODD numbered channels are on top scale; EVEN numbered channels are on bottom scale). |
| 8 | CN-514/GRC ..... | | Check to see that the CN-514/ GRC is properly adjusted (para 3-7*b*). |
| 9 | Radio receiver..... | AC POWER..... | ON. The AC POWER indlcator should light and the blower motor should run. The INCOMING CALL indlcator may light and the buzzer may sound. Walt a few seconds; the INCOMING CALL indicator should go out and the buzzer should stop sounding. Walt approximately 5 minutes before proceeding to the tuning procedures. |
| | | *Tuning procedure* | |
| 10 | AM-1955(*)/GRC or AM-1956(*)/GRC. | WAVEMETER..... | Set the wavemeter dial to the position indicated in the WAVE-METER chart under REC OSC column which corresponds to the desired channel. Caution: Before tuning the receiver OSCILLATOR control, check the channel settings of the OSCILLATOR control and the transmitter MAIN TUNING control. If the receiver channel to be set up is on the other side of the transmitter channel, turn off the receiver (AC POWER switch to OFF) until the OSCILLATOR control is set to the new channel. See cautions No. 1 and 2 at the beginning of this section. |
| 11 | Radio receiver..... | Multimeter selector..... | OSC. |
| 12 | AM-1955(*)/GRC or AM-1956(*)/GRC | OSCILLATOR..... | Adjust for peak indication on multimeter. Lock the control |
| 13 | R-1148(P)/GRC only [a] | Multimeter. Selector..... | AFC LEVEL. |
| | | AFC LEVEL ..... | Adjust for peak indication on multimeter. |
| | | AFC TUNE ..... | Adjust for peak indication on multimeter. |
| | | AFC TUNE-ODD-EVEN ..... | Set the switch to ODD when the receiver channel Is odd numbered (e g., 401, 403, 405, etc.) or to EVEN when the receiver channel is even numbered (e.g. 402, 404, 406, etc.). |
| | | AFC correction..... | Rotate control until AFC meter indicates approximately 40 on either side of center scale. The AFC meter needle and the AFC correction control should simultaneously move back to near center position. |

| Step | Unit | Switch or control | Position or action |
|---|---|---|---|
| 14 | AM-1955/GRC or AM-1956/GRC in R-1148(P)/GRC only. | WAVEMETER ..... | Adjust for maximum indication on the multimeter. The WAVE-METER dial setting should indicate within two divisions of the setting required according to the REC OSC column for the desired channel. If the dial setting is beyond this requlre-ment, repeat the tuning procedures to this point (steps 10 through 14 above). |
| | | *Tuning receiver to distant terminal* | |
| 15 | Radio receiver..... | Multimeter. selector switch..... | REC SIGNAL. |
| 16 | AM-1955(*)/GRC or AM-1956(*)/GRC. | REC SIG-1 | The multimeter. should show 0 (no signal) indication until the signal from the distant station trans-mitter causes the meter needle to deflect. At this indication, adjust REC SIG-1 control for peak meter indication.<br>Use the order wire to communicate with the distant terminal (para 3-18). Do not use the clarity of the order wire to tune in the receiver.<br>Check with the distant station transmitter to insure that the pcm video cables are not connected at that station (para 3-14c, caution and note). |
| 17 | R-1331(*)(P)/GRC only [b]..... | AFC DISABLE ..... | Hold this switch depressed while performing the next adjustment in step 18. |
| 18 | AM-1955(*)/GRC or AM-1956(*)/GRC | OSCILLATOR ..... | Adjust for peak indication on multi-meter. Lock the control. Release the AFC DISABLE switch. |
| 19 | In the transmitter: AM-1957/GRC or AM-1958(*)/GRC. | REC SIG-2 ..... | Adjust for peak indication on multi-meter. It is not necessary to turn on the transmitter for this adjustment. |
| 20 | Antenna (AT-903/GRC or equivalent). | ..... | Elevation-depression adjustments of the AT-903/GRC cannot be made after It has been erected (TM 11-5820-538-12). The procedures in steps 21 through 23 below refer to azimuth adjustment only.<br><br>*Note 1* The following antenna adjustments assume a two terminal radio link. Repeat these procedures for each radio link. One terminal is referred to as terminal A, the other as terminal B (fig 3-10)<br>*Note 2* To with the person stationed at the base of the antenna mast (fig 3-9), locate a field telephone at the antenna mast base Connect a pair of telephone field wires between the telephone and REMOTE connectors on the receiver (fig 6-3)<br>Use the order wire to communicate with the person at the telephone (para 3-18a) |

| Step | Unit | Switch or control | Position or action |
|---|---|---|---|
| | | | **Caution**: Unless a telephone signal converter is used with the telephone, do not use the telephone ringer. The 20 cps ringing voltage can damage the radio receiver. |
| 21 | Radio Receivers, terminals A and B. | Multimeter selector switches ..... | REC SIGNAL. |
| 22 | Terminal B radio receiver ..... | ..... | Observe receiver multimeter indication and advise the person located at the antenna base to rotate the base of the AB-577/GRC (fig. 3-9) back and forth approximately 15° until peak meter indication is obtained. Continue to observe receiver multimeter indication and advise terminal A to rotate his AB-577/GRC to attempt to raise received signal indication. |
| 23 | Terminal A radio receiver ..... | ..... | Observe receiver multimeter indication and advise the person located at the antenna base to rotate the AB-577/GRC back and forth approximately 15° until peak meter Indication is obtained. Check with terminal B radio receiver and arrange a compromise of antenna adjustment to provide highest indication of receded signal levels at both terminals. |
| 24 | AM-1955/GRC or AM-1956/GRC in R-1148(P)/GRC only. | AFC correction control ..... | If AFC correction control is more than than 10° from center position after about 20 minutes of operation, repeat tuning procedures (step 2 and steps 10 through 14 above) |
| | | *Radio receiver squelch adjustment* | |
| 25 | Radio receiver ..... | Multimeter selector switch..... | REC SIGNAL |
| 26 | AM-1955(*)/GRC or AM-1956(*)/GRC, | REC SIG-1 ..... | Adjust until signal is just audible in H-156/U. |
| 27 | Radio receiver..... | SQUELCH INCR SENS..... | Starting at maximum clockwise position, rotate until SQUELCH NO SIGNAL indicator lights and buzzer sounds. Silence buzzer by depressing SQUELCH BUZZER OFF pushbutton. |
| 28 | AM-1955(*)/GRC or AM-1956(*)GRC. | REC SIG-1 ..... | Readjust to obtain maximum indication on multimeter SQUELCH NO SIGNAL indicator should extinguish and buzzer should sound. Silence buzzer by depressing SQUELCH BUZZER OFF PUSHBUTTON. |
| | | *System lineup procedures* | |
| 29 | Radio receiver..... | | The proceeding tuning procedures apply whether fdm or pcm equipment is used with the radio set. After the transmitter has been tuned (para 3-11) perform system lineup procedures For fdm equlp- |

| Step | Unit | Switch or control | Position or action |
|---|---|---|---|
| | | | ment, refer to paragraph 3-13; for pcm refer to paragraph 3-14<br>To retune the radio receiver to another channel, perform the operations given in steps 10 through 28 above. When R-1148(P)/GRC is used, set AFC TUNE ODD-EVEN switch to TUNE before performing the operations. |

[a] Omit this step If the AM-1955A/GRC or AM-1966A/GRC is being used In the R-1148(P)/GRC

[b] If the AM-1955A/GRC or AM-1956A/GRC is being used In the R-1148(P)/GRC, this operation by connecting a jumper between test Jacks J5 and J7 on second IF assembly 3A5 (fig 5-8). Remove the Jumper after the adjustment is made

**3-9. Transmitter Tuning Requirements**

Some precautions that must be observed during the operation of the transmitter are given in a through *i* below.

**CAUTION**

*Never turn on the transmitter (by setting the PP-2054(*)/GRC OPERATE-STANDBY switch to OPERATE) unless the DA-189/GRC or the complete antenna system is connected to the transmitter (fig. 6-3).* Failure to observe this caution will result in damage to the duplexes assembly which, in turn, will indicate incorrect meter readings for PWR OUT and REF PWR.

*a*. Observe the required frequency (channel) separation between the transmitter and receiver (para 2-3*c*).

*b.* Check to see that the target bolt on the amplifier-oscillator (fig. 1-4) is fully screwed in. If the bolt is not fully screwed in, no power will be applied to the transmitter.

*c*. When the amplifier-oscillator is changed in the transmitter, or a tube in the amplifier-oscillator is changed, a check of, and adjustment if necessary, must be performed on current regulator control R14, R15, or R16 (fig. 6-4). Procedures for the check and adjustment are given in paragraph 5-13*b*.

*d.* When the transmitter is operating with pcm multiplex equipment, the cable connection to the PCM IN connector must be removed until all receivers throughout the system have been satisfactorily lined up to the transmitter frequency.

(1) When the pcm multiplex frequency band is applied to the transmitter, the REC SIG indication at the distant receiver will usually be lowered, this is normal. If the receiver operator readjusts REC SIG-1 control to obtain a higher indication (which sometimes can be done), he will be tuning to a transmitter carrier signal which is no longer peaked at the point of the original transmitter carrier signal (before pcm modulation). The receiver circuits can still accept this dislocation without distorting the pcm intelligence.

(2) If the receiver were tuned to the peak of the dislocated carrier signal, it could result in a loss or distortion of some speech or intelligence on one end of the pcm band. This problem does not exist when fdm multiplex signal band is applied to the transmitter carrier signal.

*e*. For cold and damp areas or after an overnight turnoff, the following starting procedures are required:

(1) Raise the shelter or room temperature before turning on the equipment.

(2) On the receiver, set the AFC selector switch to TUNE and the AC POWER switch to ON.

(3) On the transmitter, set the AFC TUNE-ODD-EVEN switch to TUNE and the PP-2054(*)/GRC OPERATE-STANDBY switch to STANDBY.

(4) Leave the equipment in this warmup condition until the room and the equipment have warmed up.

*f.* Before time-delay relays were installed in the transmitter by the application of MWO

11-5820-461-35/3 (for equipment procedure on orders No. 4198-PP-61, 15104-PP 62, and 64027-PP-63), it was necessary to set the transmitter AFC TUNE-ODD-EVEN switch to TUNE and the PP-2054(*)/GRC OPERATE-STANDBY switch to STANDBY as soon as an ac power interruption occurred. This procedure was required to deactivate the transmitter arc motor correction until the afc and oscillator tube circuits had warmed up after the power restoration. Failure to set the switch to TUNE usually resulted in the transmitter locking in on the wrong transmitting frequency after the power was restored. In transmitters modified by the MWO and in the later-procured transmitters, this requirement is no longer necessary.

*g.* Observe the following precaution:

(1) *After the transmitter has been tuned, do not increase the CN-514/GRC output voltage* beyond *115 volts*. The small increase in transmitter power obtained as a result of increasing the CN-514/GRC voltage is countered by greatly reducing the life of the tubes in the amplifier-oscillator.

(2) Keep the transmitter AFC TUNE-ODD-EVEN switch at ODD or EVEN, as applicable, to prevent frequency drift after the transmitter has been tuned. This requirement is even more important in those systems in which the R-1331(*)(P)/GRC IS used, since the primary afc circuit of this receiver has been removed.

*h.* On the WAVEMETER CHART are condensed tuning procedures. However, always tune the transmitter first with the DA-189/GRC and after it has been determined that the transmitter is functioning satisfactorily for the assigned channel, connect the transmitter to the antenna system.

### 3-10. Transmitter Tuning Procedures

*a. General.*

(1) Observe the cautions given at the beginning of this section and the instructions given in paragraph 3-9.

(2) Depress the BUZ OFF pushbutton each time the buzzer sounds. The LOW POWER indicator is a true indication and on crates only when the output power is below the preset level (steps 17 and 18 in *b* below).

(3) To check the performance of transmitter, receiver, and associated multiplex equipment at a terminal or repeater station before going on a mission, use the loop-back tuning procedures given in paragraph 3-11.

*b. Procedure.*

| Step | Unit | Switch or control | Position or action |
|---|---|---|---|
| | | *Preliminary operations* | |
| 1 | DA-1891/GRC | | Use CG-718B/U and connect DA-189/GRC to TO ANT receptacle on the amplifier-oscillator. |
| 2 | CN-514/GRC | POWER | ON POWER. ON indicator lights |
| | | MANUAL AUTOMATIC. | AUTOMATIC. The meter should indicate 115 volts (para 3-7*b*) |
| 3 | PP-2054(*)/GRC | OPERATE-STANDBY | STANDBY |
| | | AC POWER | ON. The FIL indicator lights. The blower motors in the PP-2054(*)/GRC and transmitter should be heard running |
| | | | Allow the PP-2054(*)/GRC to warm up for approximately 15 minutes. |
| 4 | Transmitter | AFC CORRECTION | Midrange |
| | | PCM INPUT LEVELS | Midrange. |
| | | FDM INPUT LEVELS | Midrange |
| | | AFC TUNE-ODD-EVEN | TUNE. |
| | | AFC TUNE | Set to assigned transmitting channel. Odd-numbered channels are on top scale; even ones on bottom scale. |
| | | TRAFFIC CHAN | Set to 12/24 for fdm multiplex system |

| Step | Unit | Switch or control | Position or action |
|---|---|---|---|
| | | | Set to 4 for 4-channel fdm multiplex system |
| 5 | Amplifier-oscillator..... | | Unlock all controls. |
| | | POWER OUT..... | Set to assigned transmitting channel. |
| | | COUPLING ..... | Set to assigned transmitting channel. |
| | | | **Caution**: Observe cautions 1 and 2 given at beginning of this section. |
| | | MAIN TUNING ..... | Set to assigned transmitting channel. |
| | | REC SIGN ..... | This is receiver tuning control. It should be set to assigned receiving channel. |
| 6 | PP-2054*/GRC ..... | OPERATE-STANDBY ..... | OPERATE. LV and HV indicators should light. |
| | | | *Note 1. When multimeter indications are off scale. depress METER SHUNT push button and continue control adjustment for peak meter needle defection* |
| | | | *Note 2. The MAIN TUNING control must be locked after adjustment Adjustment of OSC, AMP, and MIXER may change setting of MAIN TUNING control* |
| | | *MAIN TUNING operations* | |
| 7 | Amplifier-oscillator..... | WAVEMETER..... | Set control to setting listed under MAIN TUNE column of the WAVE METER chart corresponding to the assigned transmitting channel. |
| 8*a* | AM-1957/GRC only..... | MAIN TUNING ..... | Set multimeter switch to MAIN TUNE and adjust control for peak multimeter indication. Lock the control. |
| 8*b* | AM-1958(*)/GRC only..... | OSC..... | Set multimeter switch to OSC and adjust control for peak multimeter indication |
| | | MAIN TUNING ..... | Set multimeter switch to MAIN TUNE and adjust control for peak multimeter indication. |
| 8*c* | AM-1958(*)/GRC only..... | ..... | Repeat tuning procedures in step 8*b*. Lock the MAIN TUNING control. |
| 9 | Amplifier-oscillator..... | WAVEMETER..... | Set control to setting: listed In OUT FREQ column of WAVEMETER chart corresponding to assigned transmitting channel. |
| 10 | Amplifier-oscillator..... | MIXER ..... | Set multimeter switch to MIXER and adjust control for peak multimeter indications. |
| 11 | Amplifier-oscillator..... | AMP..... | Set multimeter switch to AMP and adjust control for peak multimeter and DA-189/GRC meter indications |
| 12 | Transmitter..... | AFC CORRECTION ..... | Adjust control through its range to obtain peak multimeter indication; the control should be within 40 degrees of center position |
| | | | Note If either of these conditions is not met, reset AFC CORRECTION to midposition and repeat tuning in steps through 11. |

The procedures from this point prepare the transmitter for maximum output The procedures In steps 12 through 19 check the performance of the transmitter with Dummy Load DA-189/GRC. When the transmitter performance is satisfactory, the antenna system is connected and the transmitter is tuned for maximum output (steps 20 through 25).

| Step | Unit | Switch or control | Position or action |
|---|---|---|---|
| | | *Output power operation* | |
| 13 | Amplifier-oscillator..... | WAVEMETER..... | Check that action of step 9 has been performed. |
| 14 | Amplifier-oscillator..... | POWER OUT..... | Set multimeter selector switch to PWR OUT.<br>Adjust POWER OUT control for peak DA-189/GRC and multimeter indications. |
| | | AMP and COUPLING..... | Adjust controls for peak DA-189/ GRC meter and multimeter indi- cations<br>Readjust the three controls until no further increase in meter indi- cations can be obtained.<br>While carefully adjusting AMP control, rotate COUPLING control for peak meter indications. |
| | | POWER OUT and COUPLING..... | Lock the controls. |
| 15 | DA-189/GRC ..... | ..... | With AM-1957/GRC, the meter should indicate more than 12 watts for channels 1 through 99 and more than 15 watts for channels 100 through 399.<br>With AM-1958(*)/GRC, the meter should indicate more than 8 watts |
| 16 | Transmitter..... | Multimeter selector switch ..... | REF PWR. The multimeter indica tion should be near zero.<br>PWR OUT. The multimeter indica- tion should be no less than 20; excep- tion; for channels 1 through 20 using AM-1957/GRC), the indication should be no less than 16.<br>MAIN TUNE. The multimeter in- dication should be no less than 10<br>AMP. The multimeter indication should be no less than 10. |
| 17 | Amplifier-oscillator..... | POWER OUT..... | Set multimeter switch to PWR OUT<br>Adjust control to lower DA-189/ GRC Indication to 5 watts when AM- 1958(*)/GRC 19 being used or to 11 watts when AM-1957/GRC is being used. |
| 18 | Transmitter..... | ALARM ADJ..... | Adjust control until LOW POWER indicator lights. The buzzer should sound. Silence buzzer with BUZ OFF pushbutton |
| 19 | Amplifier-oscillator..... | POWER OUT..... | Adjust control for peak DA-189/GRC meter and multimeter indications<br>The buzzer should sound, silence it with BUZ OFF pushbutton.<br>If LOW POWER Indicator is not extin guished at this point, higher main- tenance services are required to correct the fault. |

When the transmitter is satisfactory to this point, connect the antenna to the transmitter (step 20) and tune the power circuits again (steps 21 through 25)

| Step | Unit | Switch or control | Position or action |
|---|---|---|---|
| 20 | Transmitter..... | ..... | Disconnect the pcm equipment cable from PCM IN receptacle on the transmitter (fig. 6-3) The fdm equipment cables need not be removed.<br>Check that the transmitter AFC TUNE-ODD-EVEN switch is set to TUNE<br>*The following three operations must be performed within 6 seconds* (After 6 seconds, the time-delay circuits remove power from the oscillator and amplifier circuits of the amplifier-oscillator )<br>1. Operate PP-2054(*)/GRC OPERATE-STANDBY switch to STANDBY.<br>2. Remove DA-189/GRC connection and connect antenna cable to transmitter.<br>3. Reset PP-2054(*)/GRC OPERATE-STANDBY switch to OPERATE.<br>If the above three operations take more than 6 seconds, the tuning procedures in steps 7 and 8 must be performed before proceeding to step 21.<br>Make sure all antenna cable connections are tight and that the antenna is properly oriented toward the next receiver in the radio system. |
| 21 | Amplifier-oscillator..... | MIXER ..... | Set multimeter switch to MIXER and adjust control for peak meter indication |
| 22 | Amplifier-oscillator..... | | Check that the WAVEMETER control is still set for OUT FREQ setting of channel being used. |
| | | POWER OUT..... | Set multimeter switch to PWR OUT. Adjust control for peak multimeter indication |
| | | AMP..... | Adjust control for peak multimeter indication |
| | | AMP and COUPLING ..... | Adjust AMP control while rotating COUPLING control for peak multimeter indication. |
| | | POWER OUT..... | Set multimeter selector switch to REF PWR. Carefully readjust control to obtain maximum dip indication on multimeter. When the AM-1957/GRC is used, if two dips occur, adjust the control to the peak indication *between* dips. When the AM-1958(*)/GRC is used, do not adjust for a dip. |

| Step | Unit | Switch or control | Position or action |
|---|---|---|---|
| | | AMP and COUPLING ..... | Set the multimeter switch to PWR OUT. Carefully readjust the AMP control while rotating COUPLING control for peak multimeter indication |
| | | POWER OUT and COUPLING..... | Lock these controls |
| 23 | Transmitter..... | Multimeter switch ..... | Set the switch to REF PWR and PWR OUT; note the meter indications. PWR OUT indication should be not less than four times the REF PWR indication. With the AM-1957/GRC, the REF PWR indication may be higher than the PWR OUT indication when the transmitter is being tuned on the upper end of the band. When the correct indication is not obtained, check the antenna system, particularly cable connections Note The REF PWR indication should only be used as a reference so that if it should increase, trouble may have occurred in the antenna system. The more nearly the antenna system is matched to the frequency being used, the lower will be the REF PWR reading, and the farther will be the separation between REF PWR and PWR OUT readings |
| 24 | Transmitter..... | Multimeter selector switch ..... | AFC LEV. |
| | | AFC LEVEL..... | Adjust for peak multimeter indication. Rotate a number of turns to locate the peak position at which the AFC meter indicates near center scale |
| | | AFC TUNE..... | Adjust for peak multimeter indication |
| | | AFC LEVEL and AFC TUNE..... | Readjust for peak multimeter indication and center AFC meter indication. |
| | | AFC TUNE-ODD-EVEN..... | Set to ODD for odd-numbered channels (501, 503,.505, etc.), set to EVEN for even-numbered channels (502, 504, 506, etc.) |
| | | AFC CORRECTION ..... | Check afc circuit for proper lock-on by rotating the control slightly in either direction until AFC meter indicates 40 (right or left). The meter indication should slowly move back to mldposition. The control should also move back to midposition Check the transmitter frequency by moving the WAVE METER control (in the area in which it is preset) for peak multimeter indication. If the WAVEMETER dial is not within two divisions of the required setting for the channel, repeat the tuning procedures using steps 7, 8, and 21 through 24 above, after setting AFC TUNE-ODD-EVEN so switch to TUNE |

| Step | Unit | Switch or control | Position or action |
|---|---|---|---|
| 25 | Transmitter..... | ..... | Reconnect the cable from the pcm multiplex equipment to PCM IN receptacle (fig 6-3) *after* all receivers in the system have been lined up. |
| 26 | Transmitter..... | Multimeter selector switch..... | Set the switch to each position between OSC and AFC LEV and record the meter indication for each position.<br>When the system is lined up, record the meter indications for each position between IKC IN to PCM IN.<br>The indications will be used as reference during periodic checks of the system (para 3-19*b*). |
| | | *System lineup operations* | |
| 27 | Transmitter..... | ..... | For remaining system lineup procedures with fdm equipment, refer to paragraph 3-13.<br>For remaining system lineup procedures with pcm equipment, refer to paragraph 3-14 |
| | | *Returning operations* | |
| 28 | Transmitter..... | ..... | To change operation to another channel, proceed as follows:<br>Notify multiplex terminals that system operation will be interrupted until the radio system is satisfactorily lined up.<br>Before changing channels, review the requirements specified in cautions 1 and 2 at the beginning of this section.<br>When pcm multiplex equipment is used, disconnect the pcm cable from PCM IN receptacle (fig. 6-3). |
| 29 | Transmitter..... | AFC TUNE ODD-EVEN .....<br>AFC CORRECTION .....<br>AFC TUNE ..... | TUNE.<br>Midrange.<br>Set to assigned transmitting channel. |
| 30 | Amplifier-oscillator..... | POWER OUT, COUPLING, and MAIN TUNING. | Set to assigned transmitting channel |
| 31 | Amplifier-oscillator..... | ..... | Perform tuning operations in steps 7 and 8.<br>Perform operations in steps 21 through 26. |
| 32 | Transmitter..... | ..... | Check the operation of the multiplex system (para 3-13 or 3-14). |

### 3-11. Single Stack Look-Back Operational Tests

*a. General*. The loop-back operational tests given in *b* below allow the attendant to make a complete operational check of the terminal prior to undertaking a mission. The procedure makes use of the "image" frequency response of the receiver which is always 120 channels above the transmitter frequency. The test channels used in the following procedure are channel 500 for the transmitter and channel 620 for the receiver. Whenever possible, tune the transmitter to the assigned channel frequency and the receiver to a test channel 120 channels above the transmitter

channel frequency (para 2-3c(3)). This procedure would then require a minimum retuning after the terminal checkout has been completed. Refer to caution at the beginning of this section before tuning the transmitter and receiver to the assigned operating frequencies.

*b. Tuning and Testing Procedures.*

**NOTE**
**This image loopback check cannot be made when PCM is in secure.**

| Step | Unit | Switch or control | Position or action |
|---|---|---|---|
| | | *Preliminary operations* | |
| 1 | DA-1891GRC ..... | ..... | Use CG-718B/U and connect DA-189/GRC to the TO ANT receptacle on the amplifier-oscillator. |
| 2 | CN-514/GRC ..... | POWER..... | ON. |
| | | MANUAL-AUTOMATIC ..... | AUTOMATIC. The REGULATED OUTPUT VOLTAGE meter should indicate 115 volts (para 3-7b). |
| 3 | PP-2054(*)/GRC..... | OPERATE-STANDBY ..... | STANDBY. |
| | | AC POWER..... | ON. |
| 4 | Receiver ..... | AC POWER..... | OFF. |
| | | OSC ..... | Set to test channel 620 (or 120 channels above assigned transmitter channel). |
| | | REC SIGN ..... | Set to test channel 620 (or 120 channels above assigned transmitter channel). |
| | | TEST TONE switch..... | OFF. |
| | | AFC TUNE-ODD-EVEN..... | TUNE. (This applies only to R-1148(P)/GRC.). |
| | | WAVEMETER..... | Set control to setting listed under REC OSC column of WAVEMETER chart for test channel 620 (or 120 channels above assigned transmitter channel). |
| 6 | Transmitter..... | AFC CORRECTION..... | Midrange. |
| | | PCM INPUT LEVELS ..... | Midrange. |
| | | FDM INPUT LEVELS ..... | Midrange. |
| | | AFC TUNE-ODD-EVEN..... | TUNE. |
| | | AFC TUNE..... | Set to test channel 500 (or assigned transmitting channel), as indicated on AFC TUNE indicator. |
| | | TRAFFIC CHAN..... | Set to 12/24 for FDM or PCM multiplex system; set to 4 for 4-channel FDM multiplex system. |
| 6 | Amplifier-oscillator..... | ..... | Unlock all controls |
| | | POWER OUT ..... | Set to test channel 500 (or assigned transmitting channel). |
| | | MAIN TUNING ..... | Set to test channel 500 (or assigned transmitting channel) |
| | | COUPLING..... | Set to test channel 500 (or assigned transmitting channel) |
| | | REC SIG-2..... | Set to test channel 620 (or 120 channels above assigned transmitter channel). |
| 7 | Receiver ..... | AC POWER..... | ON. |
| 8 | PP-2054(*)/GRC..... | OPERATE-STANDBY ..... | OPERATE. |
| 9 | Amplifier-oscillator..... | WAVEMETER..... | Set control to setting listed under MAIN TUNE column of WAVE-METER chart for test channel 500 (or assigned transmitting channel). |

| Step | Unit | Switch or control | Position or action |
|---|---|---|---|
| | | *Tuning procedures* | |
| 10 | Transmitter and amplifier oscillator. | ..... | Perform transmitter tuning procedures given in paragraph 3-10*b* steps 7 through 19, 24, and 25. |
| 11 | Receiver and amplifier converter | ..... | Perform receiver tuning procedures given in paragraph 3-8, steps 10 through 19 and 25 through 28.<br>With the loop-back procedures, the REC SIG indication may be too high to be able to determine the peak settings for REC SIG-1 and REC SIG-2. If off-scale indications are obtained, leave these controls on the channel number previously preset m steps 4 and 6 above. These controls will be properly adjusted during system lineup with the distant radio terminal. |
| | | *Local tests* | |
| 12 | Receiver ..... | Multimeter selector switch ..... | TEST TONE CAL. |
| | | TEST TONE switch ..... | ON. |
| | | TEST TONE control ..... | Adjust for center scale (green area) of multimeter |
| 13 | Transmitter ..... | Multimeter selector switch ..... | 1 KC MOD. The multimeter should indicate in green area.<br>*Note.* If the FDM CABLE REC OUT terminals are not connected to FMD multiplex |

| Step | Unit | Switch or control | Position or action |
|---|---|---|---|
| | | | equipment, the multimeter indication will be to the right of midscale |
| 14 | Receiver..... | Multimeter selector switch..... | 1 KC OUT and ORDER WIRE. In both positions, multimeter should indicate in green area |
| 15 | Handset..... | | Listen on the handset, the 1-kc test tone should be heard. |
| 16 | Receiver..... | TEST TONE switch ..... | OFF. |
| | | TEST TONE control..... | Counterclockwise |
| 17 | Receiver..... | RING pushbutton..... | Depress the pushbutton. The IN-COMING CALL indicator should light and buzzer should sound The 1,600 cps ringing tone should be heard in the handset. |
| 18 | Handset..... | | Speak into the microphone; sidetone should be heard. |
| | | | Tests with multiplex equipment |
| 19 | PCM or FDM multiplex equipment. | ..... | *a*. Turn on and tune the trans-mitting and receiving equip-ment. |
| | | | *b*. Connect the cables from the transmitting and receiving multi-plex equipment to the radio (para 2-8 and fig. 6 3). |
| 20 | PCM or FDM multiplex equipment. | ..... | *a.* Refer to paragraph 3-13; for fdm equipment or to paragraph 8-14 for pcm equipment and perform the indicated transmis-sion and receiving operations. The required indications should be obtained on the radio equip-ment and the multiplex equip-ment. |
| | | | *b.* Check some of the local chan-nels of the multiplex equipment to determine that satisfactory communication occurs from the transmitting channel back to the associated receiving channel. |
| | | | *c*. When the equipment performs satisfactorily, proceed to the retuning procedures in *c* below. |

c. Retuning Transmitter and Receiver. After the radio and multiplex equipment have been successfully tested using the procedures In b above, retune the transmitter and/or receiver as given in (1), (2), and (3) below. In retuning the transmitter and receiver, observe the precautions given in caution 2 above at the beginning of this section

(1) If the transmitter has been tuned tothe assigned channel, the DA-189/GRC may be removed and the antenna system connected In less than 6 seconds without retuning the transmitter (step 20, para 3-10b)

(2) If the transmitter must be retuned to the assigned channel, leave the DA-189/GRC connected and retune the transmitter using the procedures given in steps 7 through 27 of paragraph 3-10b)

(3) If the receiver must be retuned to the assigned receiving channel, retune the receiver using the procedures given in steps 10 through 29 of paragraph 3-8.

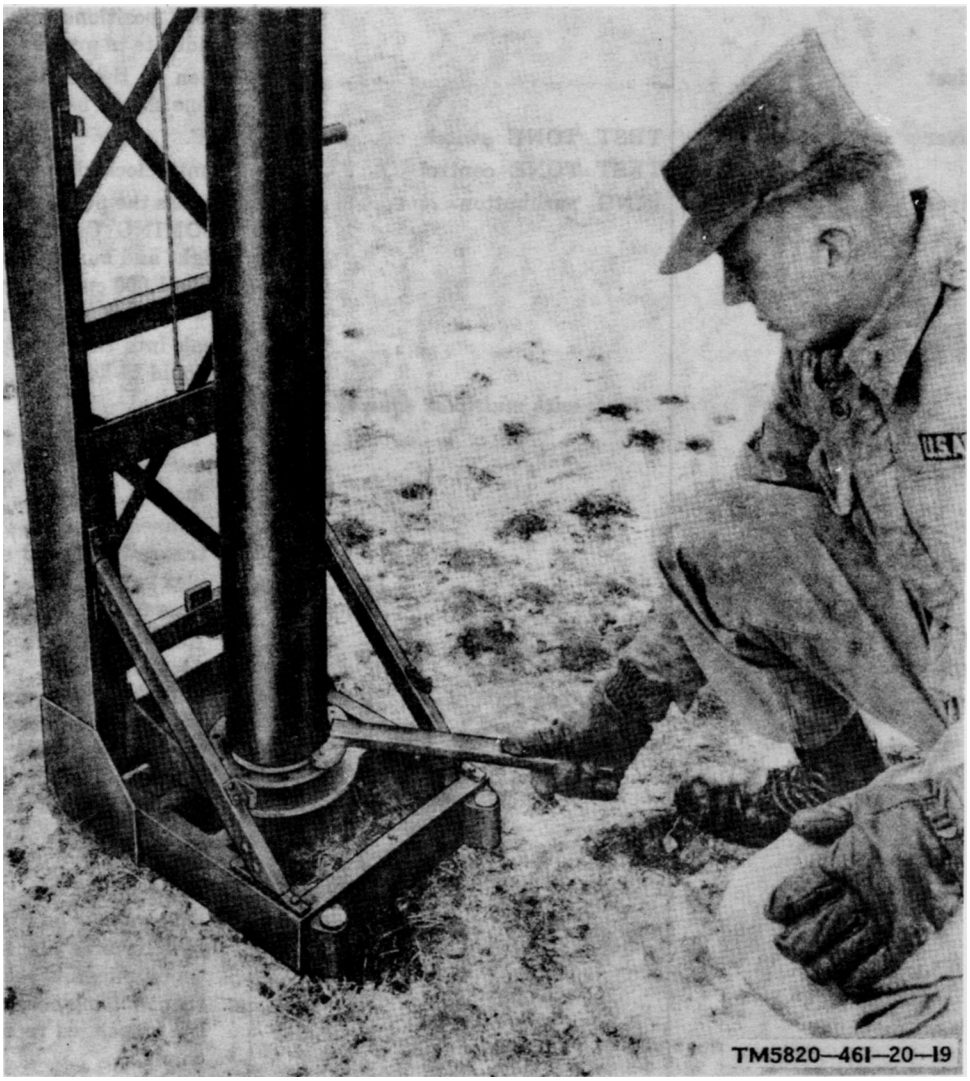



*Figure 3-9. Rotating base of Mast AB-577/GRC to change azimuth of antenna on top of mast*

## Section III. SYSTEM LINEUP PROCEDURES

### 3-12. General

System lineup consist of checking the system signal levels from station to station in the system. The lineup is required to insure the system provides the optimum communication from terminal to terminal The lineup procedures provide means for setting and checking the receiving levels at all stations in the system. The procedures described use front panel controls only, and the levels are indicated on the front panel meters.

**NOTE**

When the system lineup is completed, record the meter readings for positions

of the multimeter selector switches and the positions of the other controls. These will be used for routine operations (para 3-19).

*a. Control of Lineup.* All system procedures should be supervised by a designated control station in the system. During lineup procedures, intermediate stations will report completion of lineup procedures to the control station. The control station will then order the next station to begin the procedures.

*b. General Lineup Procedures.* One terminal in the system is designated as the control station; this station will be designated terminal A, and the other terminal as terminal B (fig. 3-10). The lineup procedures will be performed between terminal A and the next station in the line. When the procedures are completed between these two stations, the operator at terminal A will inform the operator at the next station to begin lineup procedures with the station next to It in the A-to-B direction. The lineup procedures are continued until all stations in A-to-B direction of the system have performed system lineup procedures. Terminal B then assumes temporary control of the system, and the lineup procedures are performed in the B-to-A direction. The system is ready for normal operation after completion of the following: lineup procedures in B-to-A direction.

## 3-13. Fdm System Lineup

The following procedures are used after the transmitting and receiving equipment (radio and fdm) are prepared for system lineup:

*a.* Connect the spiral-four cable from the fdm equipment to the receiver (fig. 6-3). The fdm equipment must have been lined up for transmission and reception.

*b.* Tune the transmitter (para 3-10) and receiver (para 3 8).

*c.* Set the TRAFFIC CHAN switch to 12124 for 135-ohm impedance fdm equipment (such as Terminal, Telephone AN/TCC-7 or AN/TCC-50); set the TRAFFIC CHAN switch to 4 for 600-ohm impedance fdm equipment (such as Terminal, Telephone AN/TCC- 3).

*d.* Use the order wire circuit for calling and communication between the radio terminals and the fdm terminals (para 3-18).

*e.* Prepara the equipment for 1-kc and 68-kc adjustments as follows:

(1) Request the fdm multiplex terminal to transmit 1 kc- test signal adjusted to 0-dbm level.

(2) At the radio transmitter, perform the

*(a)* Set the multimeter selector switch

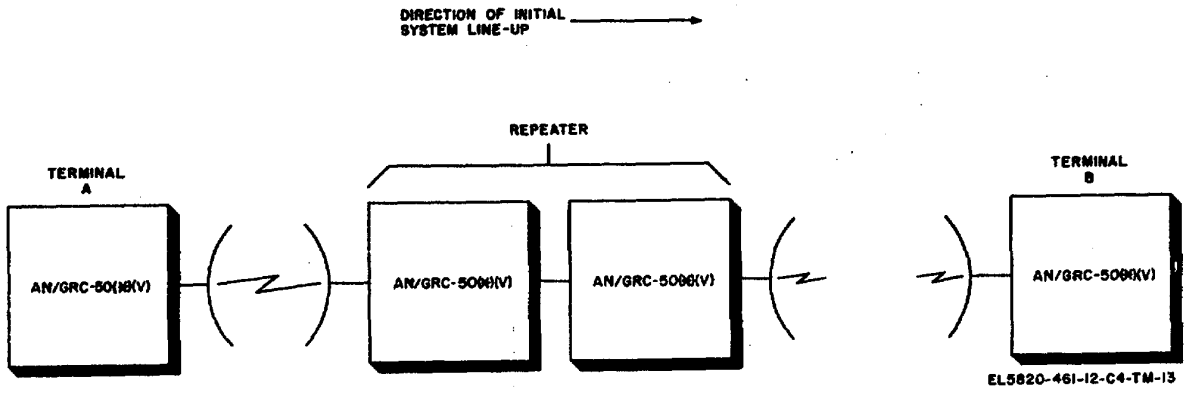



*Figure 3-10. System lineup.*

to 1 KC IN and 68 KC IN. The transmitter multimeter should indicate within the green area for both positions of the switch. If not, adjust the FDM INPUT LEVELS control until both meter indications are within the green area.

*(b)* To check the passage of the 1-kc and 68-kc signals through the transmitter, set the transmitter multimeter selector switch to 1 KC MOD and 68 KC MOD. The multimeter should indicate within the green area for both positions of the switch.

*(c)* If the test signal is not required by the distant receiver terminal ((3) below)? request the fdm terminal to stop sending the test signal

(3) At the radio receiver, perform the following adjustments after the transmitter adjustments ( (2) above) have been successfully performed.

*(a)* Request the preceding transmitter terminal to send 1-kc test signal. Use either the 1-kc, 0-dbm test signal from the fdm terminal; or use the 1-kc test signal from the transmitter (adjusted to 0 dbm (para 3-15a).

*(b)* Set the receiver multimeter selector switch to 1 KC OUT and 68 KC OUT. The receiver multimeter should indicate within the green area. If the meter does not indicate within the green area, adjust the FDM OUT PUT LEVELS control until the receiver multimeter indicates in the green area for both positions of the meter switch.

*(c)* Notify the fdm receiving terminal to perform required receive signal adjustments.

*(d)* At the conclusion of the receiver adjustments, notify the transmitter terminal to stop sending the l-kc test signal.

(4) Fdm operation should proceed without further radio adjustments, except normal system monitoring (para 3-19).

## 3-14. Pcm System Lineup

The following procedures are used after the transmitter and receiver (radio and pcm) are prepared for system lineup

*a.* Tune the transmitter (para 3-10) and the receiver (para 3-8) without the pcm video and order wire cables connected to the radio sets (fig. 6-3).

*b.* When satisfactory radio reception is obtained, connect the pcm video and order wire cables to the radio sets (fig. 6-3).

*c.* As soon as the pcm video cable is connected to the transmitter, the REC SIGNAL indication at the radio receiver usually is lowered and will become lower as more channels of the pcm equipment are in operation. For satisfactory pcm operation, the REC SIGNAL indication should be about 20.

**CAUTION**

When the pcm video cable is connected at distant transmitter, do not readjust the REC SIG-1 and REC SIG-2 controls at the receiving station to attempt to raise the REC SIGNAL level indication

**NOTE**

When pcm signals are applied to the transmitter, the peak of the radio carrier signal is moved slightly to one side of the assigned carrier frequency; this is normal. Readjustment of the REC SIG-1 and REC SIG-2 controls at the receiver will increase the REC SIGNAL indication. However, to do so usually will result in loss of intelligence of some pcm channels at one end of the pcm band. This problem does not exist with fdm signals, thus the fdm cables can be connected to the radio before radio system lineup.

*d*. Adjust the order wire circuit in both directions as follows:

(1) At the transmitting radio terminal, turn on and adjust the output of the 1-kc test signal (para 3-15*a*). To check the level of the test signal, set the transmitter multimeter selector switch to 1 KC MOD. The multimeter should indicate in the green area. Do not attempt to increase the indication obtained

(2) At the receiving terminal, request the pcm terminal operator to adjust the level of the 1-kc test signal to the proper indication on the pcm indicator.

(3) From the pcm terminal, the test signal (and order wire channel) is applied through the radio receiver to the metering circuit (and the handset). To check the level of the 1-kc test signal, set the receiver multimeter switch to ORDER WIRE. The multimeter shows some indication; record the indication obtained for future use. Do not attempt to increase the indication obtained.

(4) At the conclusion of the 1-kc test signal test, request the transmitting terminal to stop sending the test signal. ((1) above).

*e.* After the order wire circuits have been adjusted (*d* above), adjust the video circuits in both directions as follows:

(1) At the radio receiving terminal, set the receiver multimeter selector switch to PCM OUT.

(2) At the radio transmitting terminal, check to see that the pcm transmitting terminal is properly adjusted for transmission. Then, adjust the PCM INPUT LEVELS control at the radio *transmitter* until the radio *receiving* terminal states that the receiver multimeter indicates in the green area.

(3) At the radio transmitting terminal, set the transmitter multimeter selector switch to PCM IN and record the meter indication for future reference.

(4) At the pcm receiving terminal, adjust the received pcm signal level for proper indications on metering circuits.

(5) At the radio receiving terminal, set the receiver multimeter to PCM OUT and record the meter indication for future reference.

## 3-15. System Checks and Adjustments

The following procedures are used to check and adjust, if necessary, the passage of signals through the radio set. The procedures are performed on a routine basis after fdm or pcm multiplex equipment is connected to the radio.

*a. Test Tone Calibration.* The following procedure provides adjustment of the 1-kc test signal used for checking the performance of the order wire circuit in the system. Perform the following operations at the receiver:

(1) Set the multimeter selector switch to TEST TONE CAL.

(2) Set the TEST TONE switch to ON.

(3) Adjust the TEST TONE control for an indication of 25 (approx 0 dbm) on the receiver multimeter.

(4) Set the TEST TONE switch to OFF and TEST TONE control fully ccw if test tone is no longer required.

*b. Fdm Signal Checks in Transmitter*. These procedures check the passage of the 1-kc and 68-kc signals through the transmitter. The fdm cable is connected to the radio (fig. 6-3) and the fdm equipment is adjusted for proper transmission.

(1) Request the associated fdm multiplex terminal to send a 1-kc test signal adjusted to 0 dbm.

(2) Set the transmitter multimeter selector switch to 1 KC IN and 68 KC IN. The multimeter should indicate in the green area.

(3) If necessary, adjust the FDM INPUT LEVELS control until the meter indicates in the green area for both positions of the switch.

(4) Set the transmitter multimeter selector switch to 1 KC MOD and 68 KC MOD. The multimeter should indicate m the green area. There is no adjustment provided.

*b. Pcm Signal Checks in Transmitter*. These procedures check the passage of the 1-kc and pcm signals through the transmitter. An pcm cables are connected to the radio set and the pcm terminal equipment is properly adjusted for transmission.

(1) On the receiver, set the TEST TONE switch to ON (adjusted for 0-dbm output (*a* above)).

(2) Set the transmitter multimeter selector switch to 1 KC MOD. The multimeter should indicate within the green area.

(3) Set the transmitter multimeter selector switch to PCM IN. The multimeter usually indicates within the green area. The actual indication obtained depends on the setting of the PCM INPUT LEVELS control when it was adjusted during pcm system lineup (para 3-14*e*).

*d. Fdm Signal Checks in Receiver.* The following procedures check the passage of 1-kc and 68-kc signals through the receiver.

(1) Request the distant transmitter station to send a 1-kc test signal adjusted to 0

dbm. Send it from the radio transmitter (a above) or from the fdm transmitter terminal.

(2) Set the receiver multimeter selector switch to 1 KC OUT and 68 KC OUT. The multimeter should indicate within the green area for both switch positions.

(3) If necessary, adjust the FDM OUTPUT LEVELS control until the meter indicates in the green area for both switch positions.

(4) With the 1-kc test signal still being sent from the distant transmitter station, set the receiver multimeter selector switch to ORDER WIRE. The meter should indicate within the green area. No adjustment is provided.

*e. Pcm Signal Cheeks at Receiver*. The following procedures check the passage of 1-kc and pcm signals through the receiver:

(1) Request the distant transmitter station to send a 1-kc test signal adjusted to 0 dbm. Send it from the radio transmitter (*a* above).

(2) Set the receiver multimeter selector switch to ORDER WIRE. The multimeter usually indicates in the green area. The actual indication obtained depends on the setting of the order wire control in the pcm receiver terminal during pcm system lineup (para 3-14*d*(3)).

(3) Set the receiver multimeter selector switch to PCM OUT. The meter usually indicates in the green area. The actual indication obtained depends on the setting of the PCM INPUT LEVELS control of the *distant* radio transmitter during pcm system lineup (para 3-14*e*(2)).

### 3-16. Multiplex Terminal Adjustments

When the radio system has been satisfactorily lined up, using procedures in paragraphs 3-13 or 3-14, and 3-15, the multiplex terminals in the communication system are advised that the radio system is ready for traffic. The multiplex terminals proceed to perform their system lineup. Routine radio operation is discussed in paragraphs 3-17 through 3-20.

## Section IV. ROUTINE OPERATING PROCEDURES

### 3-17. General

*a.* After the system lineup of the radio and multiplex equipment, the radio operator will periodically monitor the quality of the circuits and check the output power of the transmitter and the level of the signal received on the receiver. Communication among the radio operators and multiplex attendants is accomplished on the order wire circuits.

*b.* Refer to paragraph 3-19 for routine tests and adjustments used to observe operation of the radio and multiplex equipment circuits.

### 3-18. Order-Wire Operation

*a. Originating Order Wire Communications*. Use the procedures given below to originate an order wire communication.

(1) Lift Handset H-156/U from its bracket.

(2) Press the RING push-button on the R-1148(P)/GRC or R-1131(*)(P)/GRC front panel to inform the other station (or field telephone) that order wire communication is desired.

(3) Wait for the station called to answer.

(4) Press the Handset H-156/U PRESS-TO-TALK switch and speak into the handset.

**NOTE**

To originate an order-wire communication from a remote location, follow the operational instructions supplied with the field telephone being used.

(5) For remote operation on the order wire circuit, connect field wire from the REMOTE terminals of the receiver (fig. 6-3) to the remote telephone. To enable 1,600 cps ringing signals from the radio and 20 cps ringing signals from the telephone to function in the order wire circuit, connect a telephone signal converter to the telephone. If the converter is not used, do not ring on the telephone; the 20 cps is not detected in the radio system and the receiver may be damaged by the ringing voltage (6-90 volts ac).

*b. Receiving Order Wire Communications.* If the INCOMING CALL buzzer sounds and the INCOMING CALL lamp lights at the equipment location, an order wire communication ;B being originated at a distant station (or a field telephone). Proceed as follows:

(1) Lift Handset H-156/U from its mounting brackets.
(2) Depress the Handset H-156/U PRESS-TO-TALK switch and identify your station.
(3) Wait for the order wire message.

*c. Pcm or Fdm Operation.* Once the type of operation (pcm or fdm) is determined and the radio set is correctly tuned (paras 3-13 through 3-16), no additional adjustments are required for transmission or reception of multiplexed signals. Use the order wire la and b above) to notify the distant terminal that the equipment is ready for use.

## 3-19. Monitoring Equipment

*a. General.* The following checklist provides a list of items with nominal or required indications observed by the radio set operator. Each item should be monitored periodically.

*b. Checklist.*

| Component | Item | Indication |
|---|---|---|
| CN-514/GRC | OUTPUT VOLTAGE | 115 volts. |
| PP-2054(*)/GRC | FIL indicator | Lighted. |
| | LV indicator | Lighted. |
| | HV indicator | Lighted. |
| | Blower | Operating, |
| | Blower motor | Operating. |
| Transmitter with AM-1957/GRC or AM-1958(*)/GRC | WAVEMETER | Set within two divisions of required setting according to WAVEMETER CHART. |
| | MAIN TUNING control | Locked. |
| | COUPLING control | Locked. |
| | REC SIG-2 control | Locked. |
| | POWER OUT control | Locked. |
| | LOW POWER lamp | Not lighted. |
| | AFC TUNE-ODD-EVEN switch | Set at ODD or EVEN to correspond to transmitting channel. |
| | PCM INPUT LEVELS control | Position same as recorded during system lineup. |
| | FDM INPUT LEVELS control | Position same as recorded during lineup. |
| | AFC TUNE CHANNEL Indicator | Same as transmitting channel. |
| | *Multimeter selector switch position:* | Compare meter reading with reading recorded while performing system lineup. |
| | OSC position | Reading recorded durning system lineup. |
| | MAIN TUNE position | Reading recorded durning system lineup. |
| | MIXER position | Reading recorded durning system lineup. |
| | AMP position | Reading recorded durning system lineup. |
| | OUT FREQ position | Reading recorded durning system lineup. |
| | PWR OUT position | Reading recorded durning system lineup. |
| | REF PWR | Reading recorded durning system lineup. |
| | AFC LEV position | Reading recorded durning system lineup. |

| | |
|---|---|
| 1KC IN | Green area when l-kc test signal is sent from multiplex terminal |
| 1KC MOD | Green area when 1-kc test signal IS sent from multiplex terminal or when receiver TEST TONE switch IS operated to ON |
| 68KC IN | Green area when fdm equipment is connected to radio set |
| 68KC MOD | Green area when fdm equipment is connected to radio set |
| PCM IN | Reading recorded when PCM was connected to transmitter |
| TEST | Paragraph 5-13*b* |
| TEST TONE switch | OFF |
| TEST TONE control | Counterclockwise position |
| Multimeter selector switch position: | Compare meter reading with reading recorded while performing system lineup |
| OSC | Reading recorded during system lineup |
| AFC LEV (R-1148(P)/GRC only) | Reading recorded during system lineup |
| REC SIGNAL | Reading recorded during system lineup |
| TEST TONE CAL | Green area when TEST TONE switch is set to ON and control Is adjusted. |
| ORDER WIRE | Green area when distant radio station or multiplex terminal sends l-kc test signal |
| 1KC OUT | Green area when distant radio station or multiplex terminal sends l-kc test signal |
| 68KC OUT | Green area when fdm equipment connected to distant radio set |
| PCM OUT | Green area when pcm equipment connected to distant radio set |
| TEST | See para 5-13 |

**3-20. Stopping Procedure**

The radio set may be placed in standby or completely turned off. Normally, the stopping procedure takes from 2 to 3 minutes. In an emergency, the radio set may be stopped immediately.

a. Standby. To place the radio set in standby, place the PP-2054(*)/GRC OPERATE-STANDBY switch al STANDBY. This action will remove the direct current (dc) potentials (filaments are left on) from the transmitter The receiver will remain on.

b. Normal Stopping. The normal stopping procedure for the radio set is listed below. Use this procedure only when the equipment is to be off for 2 hours or longer. For periods of less than 2 hours, place the equipment in standby.

| | | |
|---|---|---|
| Component Control Position | R-1148(P)/GRC or R-1331(*)(P)/GRC | AC POWER ON-OFF |
| OFF | R-1 148(P)/GRC. | AFC selector switch |
| TUNE | PP-2054(*)/GRC | OPERATE-STANDBY |
| STANDBY (for 2 or 3 minutes) | PP-2054(*)/GRC | AC POWER . |
| OFF | T-893(P)/GRC | AFC selector switch |
| TUNE | CN-514/GRC | POWER ON-OFF |
| OFF | | |

e. Emergency Stopping. To turn off the radio set m R- 1331 (*) (P)/GRC, PP-2054 (* )/GRC, and an emergency, place the R-1148(P)/GRC, or CN-514/GRC AC POWER switches at OFF

| | | |
|---|---|---|
| Component Item Indication | Blower motor | Operating |
| Receiver with AM-1955(*)/GRC or AM-1956(*)/GRC | WAVEMETER | Set within two divisions of required setting according to WAVEMETER CHART |
| | OSCILLATOR contra | Locked |
| | REC SIG-I control | Locked |

| Component | Item | Indication |
|---|---|---|
| | SQUELCH control..... | Position same as recorded during system lineup |
| | NO SIGNAL lamp ..... | Not lighted |
| | AFC TUNE CHANNEL indicator (R-1148(P)/GRC only) | Same as receiving channel |
| | AFC TUNE-ODD-EVEN switch (R-1148(P)/GRC only) | Set at ODD or EVEN to correspond to receiving channel |
| | FDM OUTPUT LEVEL control ..... | Position same as recorded during system lineup |
| | RING push-button..... | When depressed 1600 cps tone heard in H-156/U. |

# CHAPTER 4

# OPERATOR'S MAINTENANCE

## 4-1. Scope of Operator's Maintenance

*a*. The following is a list of maintenance duties normally performed by the operator of the radio set. These procedures do not require special tools or test equipment.

*b.* Operator's maintenance for the radio set consists of the following:

(1) Preventive maintenance (paras 4-2- 4-6).
(2) Visual inspection (para 4-7).
(3) Operational check (para 4-8).
(4) Replacement of indicator lamps (para 4-9).
(5) Replacement of fuses (para 4-10).

## 4-2. Operator's Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

*a*. Systematic Care. The procedures given in paragraphs 4-3 through 4-6 cover routine systems and care and cleaning essential to proper upkeep and operation of the equipment.

*b*. Preventive Maintenance Checks and Services. The preventive maintenance! checks and services charts (paras 4-3 and 4-5) outline functions to be performed at specific intervals. These checks and services are to maintain Army electronic equipment in a combat serviceable condition; that is in good general (physical) condition and in good operating condition. To assist operator in maintaining combat serviceability, the charts indicate what to check, how to check, and the normal conditions; the references column lists the illustrations, paragraphs, or manuals that contain supplementary information. If the defect cannot be remedied by the operator, higher category maintenance or repair is required. Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

## 4-3. Preventive Maintenance Checks and Services Periods

Preventive maintenance checks and services are required daily and weekly Paragraphs 4 and 4-5 specify the items to be inspected and serviced.

*a*. Paragraph 4-4 specifies the items to be checked and serviced daily. In addition to daily checks, the equipment should be re-inspected and serviced immediately before going on a mission and as soon after the completion of the mission as possible.

*b*. Paragraph 4-5 specifies the items to be checked and serviced once each week. If the equipment is maintained in a standby condition, the daily and weekly services and inspections should be accomplished at the same time.

### 4-4. Daily Preventive Maintenance Checks and Services Chart

| Sequence No. | Item to be inspected | Procedures | References |
|---|---|---|---|
| 1 | Radio set | Cleans cases, cables, and frost panels | Para 4 -6 |
| 2 | Cables | Check all cables for cables for tight connection to receptacles. | None. |
| 3 | Controls | a. During tuning operations, note any switch or control that does not operate smoothly and lock into position. | a. Higher category of maintenance required. |
| | | b. Check that control knobs are tight on their shafts. | b. Tighten the knob screws. |
| 4 | Operation | Check the condition of indicator lights and meter indications. | See para 3-19. |
| 5 | Filters | Check the condition of the filters in the transmitter and in the receiver. | Para 4-11. |

### 4-5. Weekly Preventive Maintenance Cheeks and Services Chart

| Sequence No. | Item to be inspected | Procedures | References |
|---|---|---|---|
| 1 | Antenna system | *a*. Tighten any guys that are not properly tensioned.<br>*b*. Reset any stakes that are not firmly in the earth<br>*c*. Check to see that the antenna cables is not endangered by, or is a danger to vehicles and pedestrians. | TM 11-5820-538-12 |
| 2 | Mounting screws | *a*. Tighten all screws holding chassis in cases.<br>*b*. Tighten all screws holding cases and cables in the shelter. | *a*. None<br>*b*. None |
| 3 | Metal surfaces | *a*. Check all metal surfaces for rust and corrosion. a. Para 4-6. Higher maintenance services required if painting is necessary<br>*b*. Check AB-577/GRC launcher for rust and corrosion. b. Same as a above. | *b*. TM 38-750. |
| 4 | Cables | *a*. Check all cables for cuts and kinks and for broken insulation.<br>*b*. Temporarily tape open cable insulation and report defect to higher maintenance category. | a. None |
| 5 | Wavemeters | a. Check to see that the charts are attached to each wavemeter with the nylon cord. a. Higher maintenance<br>b. Check to see that serial numbers on the charts are the same as the numbers on the wavemeter dial. | b. Higher maintenance services services. |
| 6 | Transmitter | Check the voltages of the current regulator circuits and adjust if necessary. | Para 5-13*b*(2). |
| 7 | Filters | Check the condition of the filters in the transmitter and receiver. | Para 4-11. |

## 4-6. Cleaning

Inspect the exteriors of the radio set. The exteriors should be free of dust, dirt grease, and fungus.

a. Remove dust and loose dirt with a clean, soft cloth.

**WARNING**

Cleaning compound trichloroethane (Federal stock No. 6810-292-9625; 1 qt) is toxic. Provide thorough ventilation when it is used. DO NOT USE NEAR AN OPEN FLAME. It is not flammable, but exposure of the fumes to a flame converts the fumes to highly toxic and dangerous gases.

*b*. Remove grease, fungus, and ground-in dirt from surfaces; use a cloth dampened (not wet) with cleaning compound.

*c*. Remove dirt from plugs and jacks with a brush.

*d*. A cloth dampened with water and soap is effective in cleaning surfaces and cables.

## 4-7. Visual Inspection

*a*. When the equipment fails to perform properly, check the items listed below.

(1) Check for improper settings of switches and controls.

(2) Check antenna lead-in cable for breaks and loose connections. Check the looseness of the cable CG-718B/U between the transmitter and receiver (fig. 6-3).

(3) Improper channel selection (para 2 3).

*b*. If the above checks do not identify the trouble, proceed to the operational checklist (para 4 8).

## 4-8. Operational Checklist

*a. General*. The operational checklist consists of preliminary starting and operating procedures and is supplemental to the operator's repair procedures (paras 4-9, 4-10, and 4-11). The corrective measures listed are those the operator can perform. When no corrective measures are listed or if the measures recommended do not restore normal equipment performance, troubleshooting is required by higher maintenance category. Note on the repair tag what corrective measures were performed at the time of the failure.

*b. Procedure*. To check the operation of the equipment, perform the operations given in *c* and *d* below. Do not proceed to later steps until the abnormal condition is corrected. Before proceeding with the checks, turn off all of the equipment and notify the other stations in the system of the situation.

*c. Conditions*. The following operational conditions are based on the following conditions:

(1) Set the PP-2054(*)/GRC OPERATE-STANDBY switch to STANDBY and connect the DA-189/GRC to the transmitter.

(2) The loop-back testing procedures will be used to make the operational check of the transmitter, receiver, and multiplex equipment (para 3-11). If possible, use the assigned transmitting channel and tune the receiver 120 channels above the transmitting channel. If this is not possible, select channels that are 120 channels apart.

d. Checklist. The receiver in the following checklist refers to R-1148(P)/GRC or R1331(*)(P)/GRC; the amplifier-oscillator refers to the AM-1957/GRC or AM-1958(*)/GRC in the transmitter; and the amplifier-converter refers to the AM-1955(*)/ GRC or AM-1956(*)/GRC in the receiver.

| Step | Component | Action | Normal Indication | Corrective Measures |
|---|---|---|---|---|
| 1 | Radio receiver ..... | Perform receiver opera-tions given in steps 1 through 7, paragraph 3-8. | None..... | None. |
| 2 | CN-514/GRC..... | Set POWER switch to ON | POWER ON indicator lights. | Check power cable connections. Replace POWER ON indicator lamp. |
| 3 | CN-5 14/GRC..... | Set MANUAL-AUTO- | Meter indicates voltage. | Replace MANUAL indica- |

| Step | Component | Action | Normal Indication | Corrective Measures |
|---|---|---|---|---|
| 4 | CN-514/GRC | Set RAISE-LOWER switch to RAISE then to LOWER | Meter indicates increase In voltage then decrease in voltage. | Check MOTOR 1 AMP fuse; replace If defective (para 4-10). |
| 5 | CN-514/GRC | Set MANUAL-AUTOMATIC switch to AUTOMATIC. | | |
| 6 | Radio receiver | | MANUAL indicators lamp goes out. Meter indicates a voltage change and settles at 115 volts. | If abnormal indications are obtained, higher maintenance services are required. |
| 7 | Transmitter | Check CONTROL 1 AMP fuse, replace If defective (para 4-10) | PP-2054(*)/GRC | Set OPERATE-STANDBY switch to STANDBY. Set AC POWER switch ON |
| 8 | Replace LOW POWER indicator lamp (para 4-9). | If abnormal indications are obtained, higher maintenance services are required. | AC POWER indicator lights. The INCOMING CALL indicator lamp may light and buzzer sound; after a few seconds, the lamp goes out and the buzzer should stop sounding. | Refer to paragraph 3-11b and perform operations in steps 5, 6, 9, and 10. |
| 9 | Check two 5 AMPS fuses; replace If defective (para 4-10). Replace AC POWER indicator lamp (para 4-9). | FIL indicator lights and blower motors In PP-2054(*)/GRC and transmitter run. | Replace FIL lamp (para 4-9). If blower motors do not run, check cable connections to CN-514/GRC and transmitter. Check 5 AMP FIL fuse (para 4-10). | None. |
| 10 | Transmitter | At least 15 minutes after step 6, set OPERATE-STANDBY switch to OPERATE. | PP-2054(*)/GRC | Normal indications are given In turning procedures. |
| 11 | Receiver | The LV and HV indicator lamps light. | Note position of LOW POWER ALARM ADJUST control, and rotate it until LOW POWER indicator lights; then reset to original position. Silence buzzer by operating BUZ OFF push-button. | Set AC POWER switch to ON. Note: Before turning on the receiver, make sure it has been turned off for at least 5 minutes. |
| | Refer to paragraph 3-11b, step 11 and tune receiver. | Check tightness of target bolt (fig 1-4). If LV indicator does not light, check 3 AMP LV fuse (para 4-10). Replace LV indicator lamp. If HV Indicator does not light, check 3 AMP HV fuse. (This fuse, even when equipment is marked with 5 AMP, should be 3-amp, time-delay fuse in all equipments (para 1-14f). Replace if defective (para 4-10). Replace HV indicator lamp (para 4-9). | LOW POWER indicator lights and buzzer sounds. Buzzer is silenced when BUZ OFF push-button is operated. | Normal indications are given in tuning procedure. |

| Step | Component | Action | Normal Indication | Corrective Measures |
|---|---|---|---|---|
| 12 | Transmitter receiver and multiplex equipment. | Refer to paragraph 3-11b and perform operations given in steps 12 through 20. | Normal indications are given in the local test procedures. | When the required indications are not obtained on the radio transmitter and receiver multimeters during checks of the pcm (or fdm) multiplex circuits (para 3-14 or 3-13), check the multiplex equipment cable connections at the radio and at the multiplex equipment.<br>Perform local troubleshooting checks at the multiplex equipment. |

## 4-9. Replacement of Indicator lamps

a. The following indicator lamps may be replaced by the operator.

**NOTE**

Type 327 lamp is used in the CN-514/GRC. All other components use type 328 lamps. Do not interchange lamp types.

| Unit | Indicator |
|---|---|
| CN-5 14/GRC | POWER ON MANUAL |
| Receiver | AC POWER |
| | INCOMING CALL |
| | NO SIGNAL |
| PP-2054(*)/GRC | FIL |
| | LV |
| | HV |
| Transmitter | LOW POWER |

b. Replace the indicator lamps as follows:

(1) Turn the lampholder counterclockwise and remove it from the receptacle.

(2) Remove the defective lamp from the lampholder.

(3) Insert the replacement lamp in the lampholder.

Replace the lampholder in its receptacle and tighten the holder by turning it clockwise.

## 4-10. Replacement of Fuses

a. The following fuses may be replaced by the operator:

| Unit | Indicator |
|---|---|
| CN-514/GRC | MOTOR 1 AMP |
| | CONTROL 1 AMP |
| | Fuses F1 and F2 (fig. 5-11); 20 amperes |
| Receiver | AC POWER 5 AMPS |
| PP-2064(*)/GRC | FIL 5 AMP |
| | LV 3 AMP |
| | HV 3 AMP (This fuse will be 3 amp time-delay fuse even on those units that have HV 5 AMP marked on the front panel; see para 1-14*g* ) |

*Fuses F1 and F2 (fig. 5-11) (20 amps) protect the CN-514/GRC from overload from equipment connected to the utility outlets on the left of CN-514/GRC front panel (fig. 3-8).

b. Replace the fuse as follows:

(1) Remove the fuse holder from its socket; remove the fuse from the fuse holder.

(2) To replace the fuse, insert the replacement fuse in the fuse holder, and replace the fuse holder in its socket.

## 4-11. Replacement of Air Filter

**CAUTIONS**

*1*. Observe the precaution marked on the filter screens: KEEP CLEAN.

*2*. Do not operate the equipment without a filter. The filters in the transmitter (fig. 3-1), receiver (figs. 3-5 and 3-6), and PP-2054(*)/GRC (fig. 3-4) should be free of clogging dust and dirt. To make sure that they are in this

condition, they should be removed and cleaned by tapping and shaking to remove the accumulated dust and dirt (para 5-6c(3)).

a. In dusty and damp areas, the cleaning procedures should be performed daily. In other areas, the cleaning operation should be performed at least weekly.

b. When the filter appears clogged and cleaning operations are ineffective in removing dust and dirt, replace the filter.

# CHAPTER 5
# ORGANIZATIONAL MAINTENANCE

## Section I. MAINTENANCE

### 5-1. Scope of Organizational Maintenance

Organizational maintenance includes preventive maintenance (paras 5-2 through 5-7), troubleshooting (paras 5-8 through 5-14), and repairs (para 5-15).

### 5-2. Tools, Materials, and Test Equipment Required

Refer to TM 11-5820-461-25P for those items of the radio set that are authorized for replacement at organizational maintenance. The materials, tools, and test equipment are listed in a, b, and c below.

a. Materials.

**WARNING**

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

(1) Cleaning Compound, trichlorotrifluoroethane
(2) Cleaning cloth
(3) Sandpaper, No. 000.
(4) Grease, Aircraft and Instrument (GL) (NSN 9150-00-985-7245).

b. Tools.

(1) 5/16-inch socket wrench.
(2) 7/6-inch socket wrench.
(3) 4 inch screwdriver.
(4) 3-inch screwdriver.
(5) Tube puller TL-201.
(6) Tube puller (7-pin miniature).
(7) Tube puller (9-pin miniature).
(8) Tube puller for 3CX100A5, 7289, 7211.
(9) Tool Kit TK-101/G.
(10) Maintenance test leads.
(11) Small brush.
(12) Trouble lamp.

**NOTE**

**With the exception of Tool Kit TK-101/G and the small brush, all these tools are located in Accessory flay BG-102A and in Case, Standardized Components, Electrical CY-2583/GRC.**

c. Test Equipment.

(1) Multimeter AN/URM-105.
(2) Test Set, Electron Tube TV-7(*)/U.
(3) Dummy Load, Electrical DA-189/GRC (part of radio set).

### 5-3. Organizational Preventive Maintenance

*a*. Preventive maintenance is the systematic care, inspection, and servicing of the equipment to maintain it in serviceable condition, prevent breakdowns, and insure maximum operational capability. Preventive maintenance is the responsibility of al} maintenance categories concerned with the equipment, and includes the inspection, testing and repair or replacement of parts, subassemblies, or units that inspection and tests indicate would probably fail before the next scheduled periodic service. Preventive maintenance service and inspection of the radio set at organizational category are made quarterly unless otherwise directed by the commanding officer.

*b*. Maintenance forms and records to be used and maintained on this equipment are specified in TM 38-750.

### 5-4. Quarterly Maintenance

Quarterly maintenance on the radio set will be scheduled in accordance with the requirements of TM 38-750. All deficiencies or shortcomings will be recorded, and those not corrected during the inspection and service will be immediately reported to higher maintenance category by use of forms and procedures specified in TM 38-750. Equipment that has a deficiency that cannot be corrected by organizational personnel should be deadlined in accordance with TM 38-750. Perform all the services listed in the quarterly maintenance and inspection chart (para 5-5)

in the sequence listed. Whenever a *normal condition* or *result* is not observed, take a corrective action in accordance with the paragraph or figure listed under *references*, or refer to higher maintenance category.

## 5-5. Quarterly Maintenance Service and Inspection Chart

| Sequence No. | Procedure | | References |
|---|---|---|---|
| | Item to be inspected | Normal Indication or result | |
| 1 | Set: Inspect the equipment for:<br>*a.* Completeness<br>*b*. Proper installation<br>*c.* Cleanliness<br><br><br><br><br>*d*. Preservation<br><br><br>*a*. Equipment must be complete<br>*b.* Equipment is properly installed<br><br>*c*. Radio set must be clean inside and out, and free of dust, dirt, grease, and fungus.<br>*d*. Painted surfaces must be free of bare spots, rust, and corrosion, equipment markings must be legible. Touchup where necessary. | c. DA Pam 310-4 | a. None.<br>b. Para 5-6.<br>9<br>The fuses and the spares should be of the indicated value and located as follows:<br>a. Regulator, Voltage CN-514/GRC<br>front panel:<br>MOTOR: 1 ea. 1 amp.<br>CONTROL: 1 ea. 1 amp.<br>inside: F1, F2: 20 amp. |
| 2 | PUBLICATIONS. See that pertinent publications are available.<br>a. Organizational maintenance manual must be complete and serviceable.<br>b. Repair parts and special tools list. must be complete and serviceable.<br><br>c. All changes pertinent to the equipment must be on hand.<br>a. DA Pam 310-4, TM 11-5820-461-12 | | b. Radio receiver:<br>AC POWER: 2 ea. 5 amp.<br>c. Power Supply PP-2054(*)/GRC<br>front panel:<br>FIL: 1 ea. 5 amp.<br>LV: 1 ea. 3 amp.<br>HV: 1 ea 3 amp<br>(para 1-14g). |
| 3 | MODIFICATION WORK ORDERS: Check DA Pam 310-7 to determine If new applicable MWO's have been published. | All URGENT MWO's have been applied to the equipment. All NORMAL MWO's. have been scheduled. | c. Para 4-6. |
| 4 | LUBRICATION: Perform a complete lubrication of the equipment. | Mechanisms do not show signs of overlubrication or underlubrication. | d. Para 5 6d and TB 746-10. |
| 5 | CONNECTIONS: Inspect interior wiring for abrasions and broken or loose connections. | Binding posts have sufficient tension to hold wire. Wiring has no abrasions. | |
| 6 | KNOBS, DIALS, AND SWITCHES: Check for proper mechanical action by setting each control to each of its positions. | Action is positive without backlash, looseness, binding, or scraping. | |
| 7 | PLUCHOUT ITEMS: Inspect vacuum tubes, lamps, and crystals for proper seating and visible damage | Vacuum tubes, lamps and crystals are securely mounted There is no visible damage. | |
| 8 | CIRCUIT BREAKERS: (Power Supply PP-2054(*)/GRC and Regulator age CN-514/GRC.) Inspect circuit breakers for loose mounting hardware, corroded contacts, and loose electrical connections. | | b. TM 11-5820-461-25P |
| 9 | FUSES: Check for proper fuses | | Para 4-10. |

| Sequence No. | Procedure | | References |
|---|---|---|---|
| | Item to be inspected | Normal Indication or result | |
| 10 | ANTENNA: Inspect the antenna assembly for damage, proper installation, and proper guy wire tension | *a*. The antenna assembly is complete and properly installed.<br>*b*. There must be no damage to the launcher frame, mast sections, Antenna AT-903/G, the winch assembly, cable reels, and cables. | *a*. TM 11-5820-538-12.<br>*b*. None. |
| 11 | NORMAL OPERATION: Check the operation of the equipment by the use of the checklist | There is no evidence of malfunction when the procedures in the checklist are performed. | Para 5-11 |
| 12 | PP-2054(*)/GRC VOLTAGES | Check the output voltages of the power supply; perform the required adjustments. | Para 5-13*a* |
| 13 | TRANSMITTER TESTS:<br>*a*. Current regulator circuits of amplifier-oscillator tubes.<br>*b*. Voltages of modulator assembly 2A5 and afc assembly 2A4. | *a*. Check the current regulator circuits; perform required adjustments.<br>*b*. Check the voltages of the two assemblies; perform required adjustments | *a*. Para 5-13*b*.<br>*b*. Para 5-13*c* |
| 14 | RECEIVER TESTS:<br>*a*. Power supplies<br>*b*. Amplifier converter and crystal mixer CRT.<br>*c*. R-1148(P)/GRC only: afc assembly | *a*. Check the power supply voltages, perform required adjustments<br>*b*. Check the unit for required indications.<br>*c*. Check the unit for required indications. | *a*. Para 5-13*d*.<br>*b*. Para 5-13*e*<br>*c*. Para 5-13*f* |

## 5-6. Additional Maintenance Items

*a. Chain Linkage*. Inspect the chain linkage in Regulator, Voltage CN-514/GRC for dirt, rust, corrosion, or loose and worn links. Remove dirt with a cleaning cloth dipped in cleaning compound. Remove rust or corrosion with fine sandpaper. If any sanding is performed, wipe abraded area thoroughly with a cleaning cloth dipped in cleaning compound; then coat the area lightly with grease (GL). If links are loose or worn excessively, higher category of maintenance is required.

*b. Gears /and Shafts*. Check the gears, shafts, and couplings of afc assemblies 2A4/3A4 (figs. 6-4 and 6-6), modulator assembly 2A5 (fig. IN Amplifier-Converters AM-1955(*)/GRC and AM-1956(*)/GRC, and Amplifier-Oscillators AM-1957JGRC and AM-1958(*)/GRC for dirt, rust, or corrosion, and evidence of wear. If the gears, shafts, or couplings are excessively worn, higher category of maintenance is required.

c. Cleaning. Clean the radio set as follows:

**WARNING**

The fumes of cleaning compound trichloroethane (FSN 6810-292-9625; 1 at) are toxic. Provide enough ventilation whenever used. DO NOT use near an open flame. Trichloroethane is not flammable but exposure to the open flame converts the fumes to a highly toxic, and dangerous gas.

(1) Remove dirt from terminal blocks and lightning arrestors with a cleaning cloth and cleaning compound.

(2) Use a cleaning cloth dipped in cleaning compound to remove the dirt and dust from the exterior surfaces and fan blades of blower motors In the PP-2054(*)/GRC, T-893(P)/GRC, R-1148(P)/GRC, R-1331(*) (P)/GRC, and the synchromotors in modulator assembly 2A5.

(3) Remove dust and dirt from the air filters by tapping the filter on a solid surface. If compressed air IS available, blow the dust and dirt out by directing the airflow over the surface of the filter. Clean the surface with a cleaning cloth dipped in cleaning compound.

**NOTE**

To remove the air filters from their housing loosen the fasteners of the air filters from the component. After cleaning, replace the air filter in the housing and tighten the fasteners.

d. Painting. Remove rust and corrosion from metal surfaces by lightly brushing them with sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to applicable cleaning and refinishing practices in TB 746-10.

## 5-7. Lubrication

The symbol Q appearing in the illustrations showing the lubrication points of the radio set stands for a period of 3 months. A 8-month interval consists of 90 days of normal 8-hour operation. If the equipment is operated more than 8 hours a DA>, the lubrication inspection intervals will have to be adjusted to prevent active wear. *For example* if the radio set is operated 16 hours a day instead of 8, inspection for lubrication will be necessary, and new lubrication applied as required every 45 days instead of every 90 days.

**CAUTION**

Do not apply grease to any part that enters any cavity during tuning or operation of the radio set.

a. Amplifier-Oscillator AM-1957/GRC and AM-1958(*)/GRC. Loosen the front panel mounting screws on the AM-19571GRC or the AM-1958(*)1GRC and remove it from the T -8 93(P)/GRC. Locate all the points to be lubricated (fig. 5-1) and clean them with a brush dipped in cleaning compound. Use a clean brush to apply a light film of grease ((GL) to the points indicated. Replace the components and tighten the mounting screws.

b. Amplifier-Converters AM-1953(*)/GRC and AM-1956(*)/GRC. Loosen the front panel mounting screws on the AM-1955(*)/GRC or the AM-1956(*)/GRC and remove it from the R-1148(P3/GRC or the R-1381(*)(P)/GRC. Locate all points to be lubricated and clean them with a brush dipped in cleaning compound (fig. 5-2). Apply a light film of grease (GL) with a clean brush to the points indicated. Replace the AM-1955(*)/GRC or the AM-1956(*)/GRC and tighten the front panel mounting screws.

c. Regulator, Voltage CN-514/GRC Loosen the mounting screws that attach the CN-514/GRC to the component case and remove the CN-514/GRC from the component case. Clean the sprockets and the chain with a brush dipped in cleaning compound (fig. 5-3). Apply a light film of grease (GL) to the sprockets and chain with a clean brush.

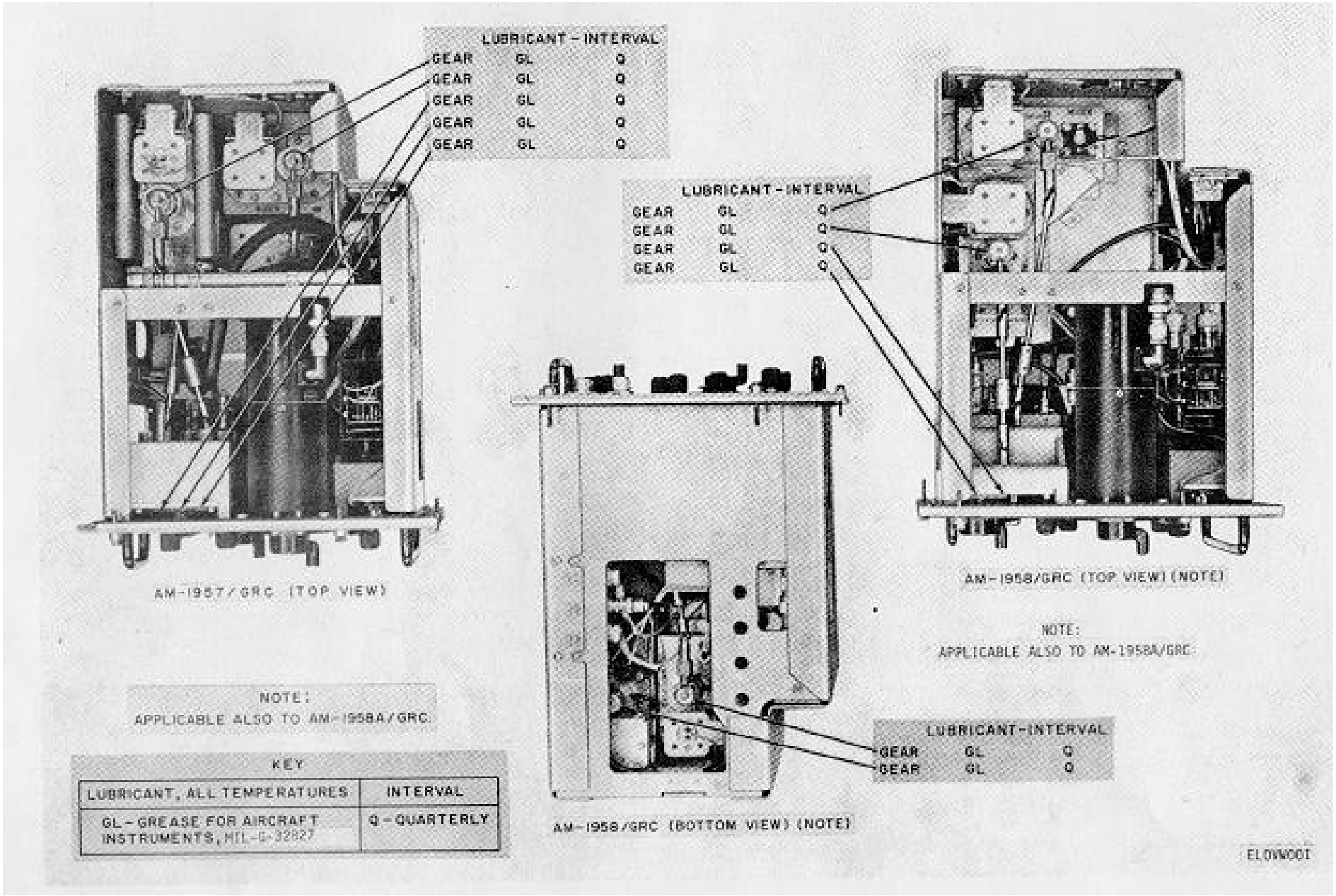



*Figure 5-1. Amplifier-Oscillators AM-1957/GRC and AM-1958(*)/GRC, lubrication points.*

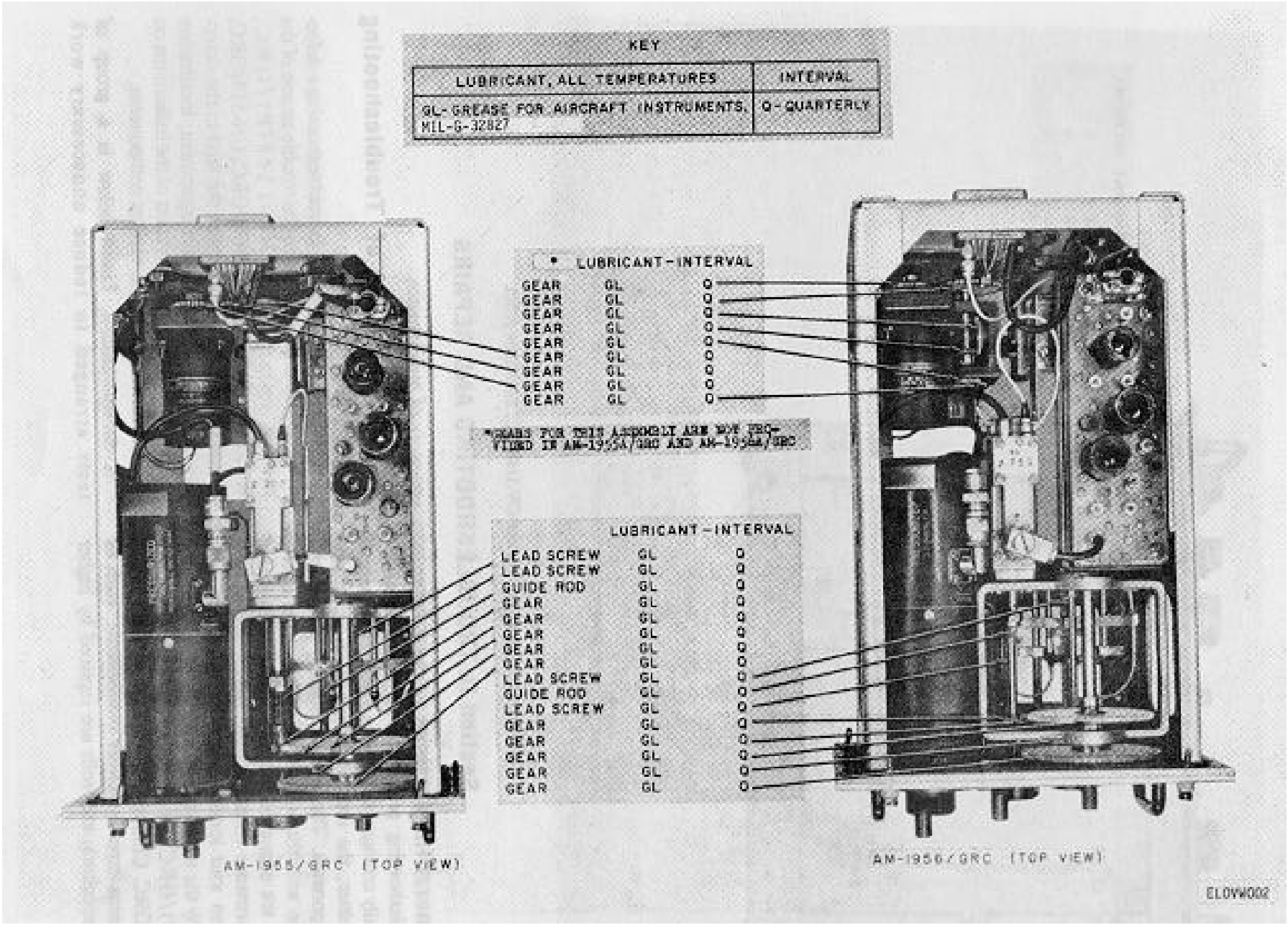



*Figure 5-2. Amplifier-Oscillators AM-1955(*)/GRC and AM-1956(*)/GRC, lubrication points.*

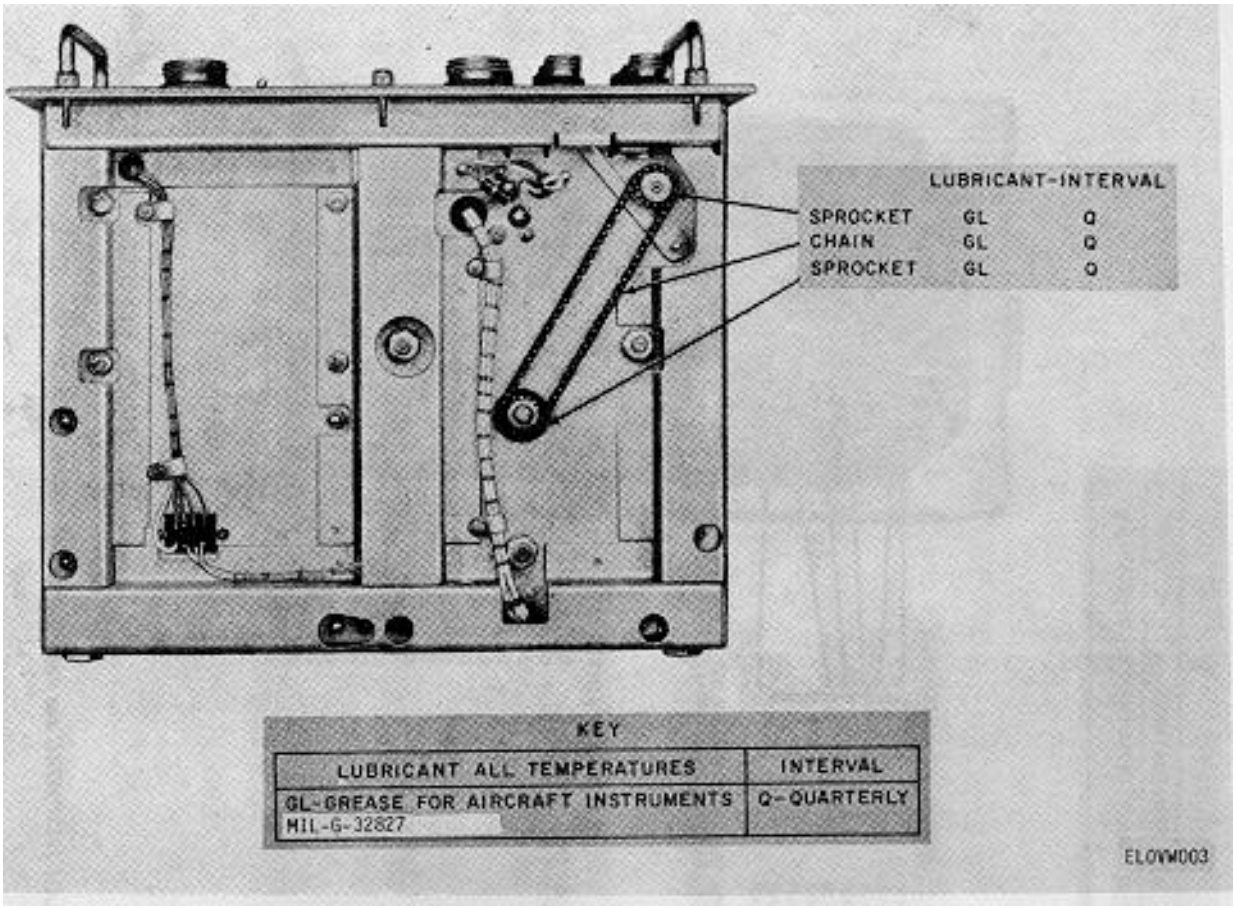



*Figure 5-3. Regulator, Voltage CN-514/GRC, lubrication points.*

## Section II. TROUBLESHOOTING AND REPAIRS

### 5-8. General Instructions

The troubleshooting procedures in this manual are systematically arranged to provide detailed coverage of the transmitter, the receiver, the plug-in units, and other components The troubleshooting procedures, which begin with the operational check at the operator's level are expanded through the use of an equipment performance checklist (para 5-11), and by sectionalization and localization. Troubleshooting is simplified by the use of the built-in multimeters on the R- 1148 (P) /GRC or R- 13 31 (* ) (P) /GRC and T-893(P)/GRC. Component replacement is limited to pluckout items (app B). Other components, such is resistors, capacitors, and coils are replaced by higher category of maintenance.

### 5-9. Organization of Troubleshooting Procedures

a. General. The first step in troubleshooting a defective radio set is to sectionalize the trouble to one of the major components (R-1148(P)/GRC, R-1331 (*)(P)/GRC, T-893(P)/GRC, CN-514/GRC, etc) The next step is to localize the fault in the defective major component. In this equipment, localization may be performed by observation of the indications on the built-in meters in the various components.

b. Sectionalization. Listed below is a group of tests arranged to reduce unnecessary work and to aid in tracing troubles to a defective major component within the radio set. To locate the unit at fault, proceed as follows:

and to aid in tracing troubles to a defective major component within the radio set. To locate the unit at fault, proceed as follows:

(1) *Visual inspection*. The purpose of visual inspection is to locate faults without testing or measuring circuits. Observe all meter readings or other visual signs and attempt to sectionalize the fault to one of the major units. Refer to paragraph 5-8 for trouble sectionalizing by use of the front panel indications.

(2) *Operational tests.* Operational tests frequently indicate the general location of trouble. In many instances, the tests will help to determine the exact nature of the fault. The equipment performance checklist (para 5-11) is a good operational check.

*c. Localization.*

(1) *Voltage and current measurements*. A set of tests and adjustments, by the use of panel-mounted meters, is provided in paragraph 5-13. These tests recommend specific adjustment or repair procedures.

(2) *Intermittent troubles*. In all these tests, do not overlook the possibility of intermittent troubles. If present, this type of trouble often may be made to appear by tapping or jarring the equipment. Check the interconnecting cables for firm seating.

## 5-10. Visual Inspection

**NOTE**

Turn off all power before proceeding with the inspection.

*When equipment failure occurs, inspect the equipment carefully before performing detailed troubleshooting procedures. This will save time and may also avoid further damage. Loosen the captive screws that hold the component to the component case. Remove the component partially from the component case and inspect it for the defects listed below.*

*a*. Improperly seated assemblies.
*b*. Worn, broken, or disconnected cords or connectors.
*c*. Improperly connected cords or connectors.
*d*. Broken wires or parts because of strain or excessive vibration.
*e*. Broken or cracked tubes.
*f.* Defective operation of switches and controls.
*g*. Improper setting of operating frequency.
*h*. Discolored or blistered resistors, capacitors, and silicone rectifiers.
*i.* Cracked glass seals on hermetically sealed components.

## 5-11. Equipment Performance Checklist

*a. General.* The equipment performance checklist is a procedure to systematically check equipment performance. All corrective measures that the organizational repairmen can perform are given in the Corrective measures column. When using the checklist, follow each step in the order given. If the corrective measures indicated do not restore normal performance, or if no corrective measures are given, troubleshooting is required by higher category of maintenance. Note on the repair tag how the equipment performed and what corrective measures were taken.

**NOTE**

Refer to paragraph 5-14 for the tube replacement procedures.

(1) Select test channels so that receiving channel is 120 channels above transmitting channel *(*para 3-11*a*).

(2) Connect DA-189/GRC to transmitter.

*b. Checklist*

PREPARATORY

| Step | Unit | Action | Normal indication | Corrective measures |
|---|---|---|---|---|
| 1 | CN-514/GRC | Set POWER ON-OFF circuit beaker to OFF. | | |
| 2 | CN-514/GRC | Set MANUAL-AUTOMATIC switch to MANUAL. | | |
| 3 | PP-2054/GRC | Set AC POWER circuit breaker to OFF. | | |
| 4 | PP-2054/GRC | Set OPERATE-STANDBY switch to STANDBY. | | |
| 5 | T-893(P)/GRC | Set multimeter selector switch to TEST. | | |
| 6 | T-893(P)/GRC | Rotate AFC CORRECTION control to midrange. | | |
| 7 | T-893(P)/GRC | Set AFC TUNE-ODD-EVEN switch to TUNE. | | |
| 8 | T-893(P)/GRC | Rotate PCM INPUT Levels control to midrange. | | |
| 9 | T-893(P)/GRC | ROTATE FDM INPUT LEVELS control to midrange. | | |
| 10 | T-893(P)/GRC (fdm only) | Set TRAFFIC CHAN switch to 12/24 or 4, depending on channel operation desired. | | |
| 11 | T-893(P)/GRC | Set AFC TUNE control to desired channel. | | |
| 12 | AM-1957/GRC or AM-1958(*) /GRC | Set MAIN TUNING control to desired channel. | | |
| 13 | AM-1957/GRC or AM-1958(*) /GRC | Rotate WAVEMETER control to indication listed under MAIN TUNE column of WAVEMETER CHART corresponding to desired channel. | | |
| 14 | AM-1957/GRC or AM-1958(*) /GRC | Rotate COUPLING control to desired channel. | | |

***Caution*:** To avoid burning out receiver crystal, do not tune the POWER OUT control through, or closer than 15 channels to, receiver channels. Refer to paragraph 2-3*a* for other frequency restrictions. Observe cautions given on page 3-13.

| | | | | |
|---|---|---|---|---|
| *15* | AM-1957/GRC or AM-1958(*) /GRC. | Rotate REC SIG-2 control to desired channel indicated on RECEIVE CHANNEL dial. | | |
| *16* | AM-1957/GRC or AM-1958(*) /GRC | Rotate POWER OUT control to desired channel indicated on TRANSMIT CHANNEL dial. | | |

PREPARATORY

| Step | Unit | Action | Normal indication | Corrective measures |
|---|---|---|---|---|
| 17 | R-1148(P)/GRC or R-1331(*)(P) /GRC. | Set AC POWER switch to OFF. | | |
| 18 | R-1148(P)/GRC or R-1331(*)(P) /GRC. | Set meter selector switch to OFF (TRANSMIT) | | |
| 19 | R-1148(P)/GRC or R-1331(*)(P) /GRC. | Rotate FDM OUTPUT LEVEL control to midrange. | | |
| 20 | R-1148(P)/GRC or R-1331(*)(P) /GRC. | Set FDM OUTPUT TRAFFIC CHANS switch to 12/24 or 4, depending on number of channels to be received. | | |
| 21 | R-1148(P)/GRC or R-1331(*)(P) /GRC. | Set TEST TONE ON-OFF switch to OFF | | |
| 22 | R-1148(P)/GRC or R-1331(*)(P) /GRC. | Set TEST TONE control to counterclockwise position. | | |
| 23 | R-1148(P)/GRC only. Omit this step if using Amplifier-Converter AM-1955A/GRC or AM-1956A/GRC in R-1148-(P)/GRC. | Set AFC TUNE-ODD-EVEN switch to TUNE. | | |
| 24 | R-1148(P)/GRC only. Omit this step if using Amplifier-Converter AM-1955A/GRC or AM-1956A/GRC in R-1148 (P)/GRC. | Set AFC TUNE control to desired channel. | | |
| 25 | R-1148(P)/GRC or R-1331(*)(P) /GRC. | Set SQUELCH INCR SENS control fully clockwise. | | |
| 26 | AM-/655(*)/GRC or AM-1956(*)/ GRC. | Rotate WAVEMETER control to indication in WAVEMETER CHART that corresponds to desired channel. | | |

***Caution***: To avoid burning out receiver crystal, do not tune REC SIG-1, REC SIG-2, and the OSCILLATOR controls through, or closer than 16 channels to, transmitter channels. Refer to paragraph 2-3c for other frequency restrictions. Observe the cautions given on page 3-13.

| | | | | |
|---|---|---|---|---|
| 27 | AM-1955(*)/GRC or AM-1956(*)/ GRC. | Rotate REC SIG-1 control to desired channel. | | |
| 28 | AM-1955(*)/GRC or AM-1956(*)/ GRC | Rotate OSCILLATOR control to desired channel. | | |

| | Step | Unit | Action | Normal indication | Corrective measures |
|---|---|---|---|---|---|
| | *29* | AM-1955/GRC or AM-1956/GRC only. | Set AFC correction control to midrange. | | |
| | *30* | AM-1957/GRC or AM-1958 (*)/GRC | Connect the DA-189/GRC to ANT connector. | | |

EQUIPMENT PERFORMANCE

| Step | Unit | Action | Normal indication | Corrective measures |
|---|---|---|---|---|
| *31* | CN-514/GRC | Set POWER circuit breaker to ON. | *POWER ON indicator light.*<br><br>MANUAL indicator lights. | Check power source output and power cable connections.<br>Check POWER ON indicator lamp. Check MANUAL indicator lamp |
| *32* | CN-514/GRC | Set MANUAL RAISE-LOWER switch to RAISE then to LOWER. | Meter indicates raise in voltage then decrease in voltage. | *Check MOTOR 1 AMP fuse* |
| *33* | CN-514/GRC | Set MANUAL-AUTOMATIC switch to AUTOMATIC. | Meter indicates 115 volts. MANUAL indicator goes out. | |
| *34* | CN-514/GRC | Set MANUAL-AUTOMATIC switch to MANUAL and MANUAL RAISE-LOWER switch to LOWER until meter indicates approximately 105 volts. Then set MANUAL AUTOMATIC switch to AUTOMATIC.<br>Repeat above except operate switch to RAISE until meter indicates approximately 120 volts. | Voltage indication on meter changes back to 115 volts in both operations. | Check CONTROL 1 AMP fuse.<br>Check V1 and V2. Replace plug-in assembly. |
| *35* | PP-2054(*) /GRC | Set AC POWER circuit breaker to ON. Allow equipment to warm up for 5 minutes. | Blower motor operates. FIL indicator lights.<br><br>Blower motor in T-893(P)/ GRC operates. | Check 5 AMP FIL fuse.<br>Check FIL indicator lamp.<br>Check silicon rectifiers in PP-2054 (*)/GRC. If they are blistered or discolored, higher maintenance services are required.<br>Check cable connection between TO XMTR on PP-2054 (*)/GRC and TO PWR SUP on T898(P)/ GRC. |
| *36* | PP-2054 (*)/GRC | Set OPERATE-STANDBY switch to OPERATE. | The LV and HV indicators light. Target bolt (interlock switch (fig. 1-4)) is tight; also all bolts holding amplifier-oscillator are tight.<br><br>If buzzer sounds in T-893(P)/ GRC, silence it by operating BUZ OFF push-button. | If LV indicator does not light, check 3 AMP LV fuse. Check LV lamp.<br>If HV indicator does not light, check HV fuse. (This fuse, whether equipment is marked with 6 AMP or 3 AMP should be replaced with 8 amp, time-delay fuse in all equipments (para 1-14*g*). Check HV lamp. Check V1. |

EQUIPMENT PERFORMANCE

| Step | Unit | Action | Normal indication | Corrective measures |
|---|---|---|---|---|
| 37 | AM-1958(*)/ GRC only. | Set multimeter selector switch to OSC and adjust OSC control for peak multimeter indication. | Peak indication is obtained. *Note* When meter needle goes off scale for any reading, depress METER SHUNT push-button and continue to adjust control for Peak indication. | Check V1. If V1 replace. Readjust R14 (para 5-13*b*). |
| 38 | AM-1957/GRC or AM-1958(*)/ GRC | Set multimeter selector switch on T-893(P)/ GRC to MAIN TUNE and adjust MAIN tuning control for peak indication on multimeter. | Peak indication is obtained on multimeter. | Check V1. If V1 is replaced, readjust R14 (para 5-13*b*). Replace rectifier CR3 on wavemeter. Para 5-13*c*. |
| 39 | AM-1957/GRC or AM-1958(*)/ GRC. | Repeat steps 37 and 38. Lock MAIN TUNING control. | | |
| 40 | AM-1957/GRC or AM-1958(*)/ GRC. | Set multimeter selector switch on T-893(P)/ GRC to MIXER and adjust MIXER control for peak indication on multimeter. | Peak indication is obtained on multimeter. (If meter needle deflects off scale, press METER SHUNT push-button.) | Check V2. If V2 is replaced, readjust R15 (para 5-13*b*). If V2 does not help, do step 41 action and correction. |
| 41 | AM-1957/GRC or AM-1958(*)/GRC. | Rotate WAVEMETER control to indication listed under OUT FREQ column of WAVEMETER CHART that corresponds to desired transmitter channel. Set multimeter selector switch to T-893(P)/ GRC to AMP, and adjust AMP control for peak indication on multimeter. | Peak indication is obtained on multimeter. | Check V3. If V3 is replaced, readjust R16 (para 5-13*b*). |
| 42 | T-893(P)/GRC | Set multimeter switch to AMP. Adjust AFC CORRECTION through its range for peak indication. | Peak indication is obtained on multimeter. AFC CORRECTION control is not over 10° from midrange. | If there is no meter indication, check V1 through V4 by substitution in assembly 2A4. If indication is now obtained, but AFC CORRECTION control is set more than 10° from midrange, check V1 and V2 by substitution in assembly 2A5 until one tube provides indication within 10° of midrange. If control is still more than 10°, check V6 and V7 by |

| Step | Unit | Action | Normal indication | Corrective measures |
|---|---|---|---|---|
| | | | | substitution in assembly 2A4 until the control is within 10°<br>Note: Do not discard until unsatisfactory tubes; they may be used in other circuits satisfactorily. |
| 43 | AM-1957 /GRC or AM-1958 (*) /GRC. | Set multimeter selector switch on T-893(P)/ GRC to PWR OUT, and adjust POWER OUT control for peak Indication on DA-189/GRC meter.<br>Adjust AMP, POWER OUT, and COUPLING controls until no further increase can be obtained on DA-189/GRC. | Peak indication is obtained on DA-189/GRC meter. Multimeter indicates peak deflection. | When multimeter indication is obtained, but DA-189/GRC meter shows no indication, open back of DA-189/GRC and replace diode with one of spares stowed in DA-189/GRC (fig 1-14). |
| 44 | AM-1957 /GRC or AM-1958 (*) /GRC. | Set multimeter selector switch to MIXER and adjust MIXER control to in-crease DA-189/GRC indication.<br>Repeat adjustments in step 43 above. | | |
| 45 | AM-1957 /GRC. | Set multimeter selector switch to REF PWR. Carefully re-adjust POWER OUT control for maximum dip on multimeter within reducing DA-189/GRC Indication.<br>On AM-1957/GRC only, if two dips occur on the multimeter, adjust the control to peak indi-cation between dips. | | |
| 46 | AM-1957 /GRC or AM-1958 (*) /GRC. | Set multimeter selector switch on T-893 (P)/GRC to PWR OUT and readjust AMP control while rotating COUPLING control to obtain higher DA-1891 GRC meter indication.<br>Lock POWER OUT and COUPLING controls. | With AM-1957/GRC, DA-189/GRC meter should Indicate more than 12 watts.<br>With AM-1968(*)/GRC, DA-189/GRC meter should Indicate more than 8 watts. | If minimum wattage is not obtained, check tubes V3, V2, and V1, in turn, and adjust associated resistor If necessary (para 5-13*b*).<br>If tubes are replaced, repeat tuning procedures from step 38 through 46.<br>Replace the amplifier-oscillator. |
| 47 | T-893 (P)/ GRC | Set multimeter selector switch to REF PWR and PWR OUT and note multimeter indications.<br>Set multimeter selector switch to PWR OUT. | PWR OUT indication should be no less than 4 times greater than REF PWR indication<br>Multimeter indication should be no less than 20, in the HI and LO-band, except for channels 1 thru 20 in the LO-band where the indication should be no less than 16. LOW POWER indicator should be extinguished. | Substitute cable between T-8 93(P)/GRC and DA-189/GRC.<br>Check amplifier-Oscillator tubes V1, V2, and V3 and adjust associated resistor if necessary |

EQUIPMENT PERFORMANCE

| Step | Unit | Action | Normal indication | Corrective measures |
|---|---|---|---|---|
| | | | indication should be no less than 16.<br>LOW POWER indicator should be extinguished. | para 5-13b).<br>If tubes are replaced, repeat tuning procedure from step 38 through step 47. Higher maintenance category repair required. |
| 48 | T-893(P)/GRC | Set multimeter selector switch to AFC LEV and adjust AFC LEVEL control for peak indication on multimeter. | Peak indication of more than 10 is obtained on multimeter and AFC meter indicates in center. | Check voltage supplied to afc assembly 2A4 (para 5-13*e*).<br>Check tubes V6, V7, and V1 through V4 in afc assembly 2A4. |
| 49 | T-893(P)/GRC | Adjust AFC TUNE control slightly for peak indication on multimeter. | Peak indication is obtained on multimeter. | |
| 50 | T-893(P)/GRC | Set AFC TUNE-ODD-EVEN switch to ODD if selected channel is odd-numbered, or to EVEN if selected channel is even numbered.<br>Rotate AFC CORRECTION control 30° to the right from its original setting.<br>*Note*. Due to the time delay in afc circuit, wait until AFC meter indication has returned to Its original Indication before proceeding. | AFC meter indication moves off center then slowly returns to center; simultaneously, AFC CORRECTION control returns to original setting. | Check tubes V8 and V9 of assembly 2A4 |
| 51 | T-893(P)/GRC | Rotate AFC CORRECTION control 30° to the left from its original setting. | Same as step 50. .... | Same as step 50. Adjust R42 on afc assembly to center AFC meter indication. |
| 52 | T-893(P)/GRC | Set multimeter selector switch to PWR OUT. Adjust POWER OUT control to reduce DA-189/GRC indication as follows: With AM-1957/GRC, reduce power to 11 watts; with AM-1958 (*)/GRC, reduce power to 5 watts.<br>Adjust ALARM ADJ control until LOW POWER indicator lights and buzzer sounds.<br>Depress BUZZ OFF push-button to silence buzzer.<br>Readjust POWER OUT control to obtain original maximum indication on DA-189/GRC. | LOW POWER indicator lights and buzzer sounds.<br>LOW POWER indicator extinguishes and buzzer sounds. | Replace indicator lamp. Check V1 on T-893(P)/GRC main frame. |

EQUIPMENT PERFORMANCE

| Step | Unit | Action | Normal indication | Corrective measures |
|---|---|---|---|---|
| 53 | R-1148(P)/GRC or R-133/(*) (P)/GRC | Set AC POWER switch to ON. Allow 5-minute warm-up. | AC POWER indicator lights. INCOMING CALL lamp lights momentarily. RING buzzer sounds momentarily. Blower motor operates. | Check silicon rectifiers on bottom of receiver for blistering or discoloration. If rectifiers are blistered or discolored, or show any signs of malfunction, higher category of maintenance is required. |
| 54 | R-1148(P)/GRC or R-1331(*) (P)/GRC | Set multimeter selector to TEST TONE CAL. Set TEST TONE switch to ON and adjust TEST TONE control for indication in green area of receiver multimeter. | Multimeter indicates in green area of meter scale. | Check V2 in signaling unit 3A6. |
| 55 | T-893(P)/GRC | Set multimeter selector switch to 1 KC MOD. | Multimeter indicates in green area of meter scale. | Check V1, V2, and V4 on 2A3. Check V5 on afc assembly 2A4. Check all tubes in modulator 2A5. |
| 56 | AM-1955(*)/GRC or AM-1956 (*)/GRC | Set multimeter selector switch on R-1148(P)/GRC or R-1331(*)(P)/GRC to OSC and adjust OSCILLATOR control for peak indication on multimeter. | Peak indication is obtained on multimeter. | Check WAVEMETER control for correct setting. Check diode CR2 in wave-meter. |
| 57 | R-1148(P)/GRC. (Omit this step when using AM-1955A/ GRC or AM-1956A/GRC.) | Set multimeter selector switch to AFC LEV. or more. Tune AFC LEVEL control for peak indication on multimeter. | Multimeter indicates 10 or more. | Check V1 through V7 on afc assembly 3A4. |
| 58 | R-1148(P)/GRC. (Omit this step when using AM-1955A/ GRC or AM-1956A/GRC ) | Adjust AFC TUNE control for peak indication on multimeter. | Peak is indicated on multimeter. | |
| 59 | R-1148(P)/GRC (Omit this step when using AM-1955A/ GRC or AM-1956A/GRC.) | Set AFC TUNE-ODD-EVEN switch to ODD if receiver channel is odd-numbered, or to EVEN if receiver channel is even-numbered. Rotate AFC correction control on AM-1955/GRC or AM-1956/GRC until AFC meter indicates ±40. After normal indication, repeat in the other direction. | AFC meter needle moves back toward center and stops near center. AFC correction control on AM-1955/GRC or AM-1956/GRC moves away from center position and then returns to original setting. | Adjust R42 on afc assembly 3A4 to center AFC meter needle. Check V8 and V9 on AFC assembly 3A4. If V8 is replaced, adjust R42 as required |

EQUIPMENT PERFORMANCE

| Step | Unit | Action | Normal indication | Corrective measures |
|---|---|---|---|---|
| 60 | AM-1955(*)/ GRC or AM-1956(*)/GRC. | Set multimeter selector switch on R-1148-(P)/GRC or R-1331(P)/GRC to OSC. Adjust WAVEMETER control for peak indication on multimeter. | Peak is indicated on multimeter WAVEMETER dial indicates within 2 dial divisions of indication listed on WAVEMETER CHART for desired receiver channel. | Repeat steps 56 through 60. If Indications are still abnormal, higher category of maintenance is required. |
| 61 | R-1148(P)/GRC or R-1331(*)(P)/ GRC | Press push-to-talk button on Handset H-156/U and speak into microphone. | Side tone is heard in H-156/U receiver. | Check Handset H-156/U and replace if required. |
| 62 | R-1148(P)/GRC or R-1331(*)/(P)/GRC. | Press RING push-button and listen for side tone on Handset H-156/U. | 1,600-cycle side tone is heard In Handset H-156/U. | *Check V1 on signaling unit 3A6.* |
| 63 | R-1148(P)/GRC or R-1331(*)(P)/GRC | Set multimeter selector switch to REC SIGNAL. | | |
| 64 | AM-1955(*)/GRC or AM-1956(*)/GRC | Adjust REC SlG-1 for maximum indication on receiver multimeter. | Multimeter indicates peak or off scale. | |
| 65 | AM-1957/GRC or AM-1958(*)/GRC | Adjust REC SIG-2 control for maximum indication on receiver multimeter. | Multimeter indicates peak or off scale. | Substitute CG-718B/U between transmitter amplifier-oscillator and receiver amplifier-converter (fig. 6-3). Check crystal mixer CR1 and tube V1(para 5-13e). Note. *If V1 is defective and replaced, substitute more than one V1 type tube. Do not discard tubes that are unsatisfactory; they are useful as replacements in another amplifier-converter.* Check V1, V2, and V3 in first IF assembly 3A1/3A2A1. Check V1 through V6, V10, and V11 in second IF assembly 3A5. If V10 is defective, realignment of circuits in 3A5 is required at higher maintenance category. |
| 66 | R-1148(P)/GRC with AM-1955A/GRC or AM-1955B/GRC or AM-1956A/GRC or AM-1956 B/GRC. | Connect a jumper between test jacks J5 J7 of second if assembly 3A5 (fig. 5-9). Adjust OSCILLATOR control on AM-1955/ GRC or AM-1956A/ GRC for peak indication on multimeter. Remove Jumper. | Multimeter indicates peak. | |
| 67 | R-1331(*)(P)/GRC with AM-1955A/GRC or AM-1955B/ GRC, AM-1966A/GRC or AM-1956B/GRC. | | Multimeter indicates peak. | |

EQUIPMENT PERFORMANCE

| Step | Unit | Action | Normal indication | Corrective measures |
|---|---|---|---|---|
| 68 | AM-1955(*)/GRC or AM-1956 (*)/ GRC. | Detune REC SIG-1 control for minimum indication on multimeter. | Multimeter indicates minimum level. | |
| 69 | R-1148(P)/GRC or R-1331(*)(P) / GRC. | Rotate SQUELCH INCR SENS control counter clockwise until squelch alarms operate. | NO SIGNAL Indicator lights and buzzer sounds. Depress SQUELCH BUZZER OFF push-button. | Check V12 on second IF assembly 3A5. If buzzer sounds but Indicator does not light, change indicator lamp. |
| 70 | AM-1955(*)/GRC or AM-1956(*)/ GRC. | Readjust REC SIG-1 control for maximum indication on multimeter | NO SIGNAL Indicator extinguishes and buzzer sounds. Depress SQUELCH BUZZER OFF push-button. | |
| | | *For* 4-channel fdm operation *only* | | |
| 71 | Fdm multiplex equipment. | Connect spiral -4 cable from multiplex equipment to RCVR OUT terminals (fig. 6-3.) Have multiplex terminal transmit 1-kc test tone at O dbm. | | |
| 72 | T-893(P)/GRC | Set multimeter selector switch to 1 KC IN and adjust FDM INPUT LEVELS control for indication within green area of multimeter scale. | Multimeter indicates in green area of meter scale. | Check V4 in baseband assembly 2A3. |
| 73 | T-893(P)/GRC | Set multimeter selector switch 1 KC MOD. | Multimeter indicates in green area of meter scale. | Check V1 and V2 on baseband assembly 2A3. Check V5 on afc assembly 2A4. Check all tubes on modulator assembly 2A5. |
| 74 | R-1148(P)/GRC or P-1331(*)(P)/GRC. | Set multimeter selector switch to 1 KC OUT and adjust FDM OUTPUT LEVEL control for Indication within green area of multimeter scale. | Multimeter indicates green area of meter scale. | Check V7, V8, and V9 In second IF assembly 3A5. Check tubes V5, V6, and V9 in baseband assembly 3A3. If meter indication obtained is not In green area, replace V9 until requirement is met. Do not discard unsatisfactory tubes; they are useful in other circuits. |

EQUIPMENT PERFORMANCE

| Step | Unit | Action | Normal indication | Corrective measures |
|---|---|---|---|---|
| 75 | R-1148(P)/GRC or R-1331 (*)(P)/GRC | Set multimeter selector switch to ORDERWIRE. | Multimeter indicates in green area of meter scale. | Check V7 and V8 in baseband assembly 3A3. |
| | | *For* 12/24 fdm channel operation *only* | | |
| 76 | Fdm multiplex equipment | Connect spiral-4 cable from multiplex equipment to RCVR OUT terminals (fig. 6-3). Have multiplex terminal transmit 1-kc test tone at 0 dbm. | | |
| 77 | T-893(P)/GRC | Set multimeter selector switch to 1 KC IN and adjust FDM INPUT LEVELS control for indication within green area of multimeter scale. | Multimeter indicates in green area of meter scale. | Check V4 in baseband assembly 2A3. |
| 78 | T-893 (P) /GRC | Set multimeter selector switch to 1 KC MOD and 68 KC MOD. | Multimeter indicates in green area of meter scale. | Check V1 and V2 on baseband assembly 2A3. Check V5 on afc assembly 2A4. Check all tubes on modulator assembly 2A5 |
| 79 | R-1148 (P) /GRC or R-1331(*)(P)/GRC . | Set multimeter switch to 1 KC OUT and 68 KC OUT and adjust FDM OUTPUT LEVEL control for indication within green area of multimeter scale. | Multimeter indicates in green area of meter scale. | Check V7, V8, and V9 in second IF assembly 3A5. Check tubes V5, V6, and V9 in baseband assembly 3A3. If meter indication obtained is not in green area, replace V9 until requirement is met. Do not discard unsatisfactory tubes; they are useful in other circuits. |
| 80 | R-1148(P)/GRC or R-1331 (*)(P)/GRC | Set multimeter selector switch to ORDERWIRE. | Multimeter indicates in green area of meter scale. | Check V7 and V8 in baseband assembly 3A3. If necessary, replace V8 until meter indicates in green area. Do not discard unsatisfactory tubes; they are useful in other circuits. |
| | | *For* Pcm channel operation *only* | | |
| 81 | Transmit and receive pcm equipment | Connect three cables to PCM IN, PCM OUT and PCM (order wire) (fig. 6-3). The pcm terminal should make required adjustments of its equipment. | Required indications are obtained. | Perform applicable corrective measures at pcm terminal. |
| 82 | T-893(P)/GRC | Set multimeter selector switch to PCM IN and adjust PCM INPUT LEVELS for multimeter indication in green area. | *Multimeter indicates in green area.* | Check connections of pcm transmit cable at PCM IN on transmitter and at pcm terminal. Check V1, V2, and V3 in baseband assembly 2A3. |

EQUIPMENT PERFORMANCE

| Step | Unit | Action | Normal indication | Corrective measures |
|---|---|---|---|---|
| 83 | R-1148(P)/GRC or R-1331(*)(P) /GRC | Set multimeter selector switch to PCM OUT. Adjust PCM INPUT LEVELS control on the transmitter for indication in green area on receiver multimeter. | Receiver multimeter indicates In green area. | Check V6, V7, V8, V9, and V12 in second IF assembly 3A5. Check V1, V2, and V3 in baseband assembly 3A3. *Proceed to step 84.* |
| 84 | Pcm receive terminal | The pcm terminal should make required adjustments of the received signal. | Required indications are obtained. | Check connections of pcm receive cable at PCM OUT on receiver and at pcm terminal. Perform required corrective measures at pcm terminal. |
| 85 | R-1148(P)/GRC or R-1331(*)(P) /GRC . | ---------- | ---------- | If required indications are not obtained at pcm terminal check V4 in baseband assembly 3A3. Do not discard unsatisfactory tubes If tube replacement results in meter indications consistently in the same meter area, refer receiver to higher maintenance services for adjustment of R23 in assembly 3A3. |
| 86 | R-1148(P)/GRC or R-1331(*)(P)/ GRC. | Set multimeter selector switch to TEST TONE CAL and TEST TONE switch to ON. Adjust TEST TONE control for indication in green area of multimeter scale (approximately 0 dbm). | Multimeter indicates in green area. | Check V2 in signaling unit 3A6. |
| 87 | T-893 (P)/GRC | Set multimeter selector switch to 1 KC MOD. | Multimeter indicates in green area. | Check V5 (metering tube) in afc assembly 2A4. |
| 88 | Pcm receive terminal. | Adjust level of test tone | Required indications are obtained. | Perform required corrective measures. |
| 89 | R-1148 (P) /GRC or R-1331 (*)(P)/GRC | Set multimeter selector switch to ORDERWIRE. | Multimeter indicates in green area. | Check connection of, pcm order wire cable at PCM on receiver and at pcm terminal. Check V7 and V8 in baseband assembly 3A3. Is. necessary, replace V8 until meter indicates in green area. Do not discard unsatisfactory tubes; they are useful in other circuits |
| 90 | R-1148(P)/GRC or R-1331 (*)(P)/ | *Operate RING switch and listen on handset.* | a. 1,600-cps ringing tone should be heard. b. CALL indicator should light and buzzer should sound | a. Check V2 in signaling unit 3A6. b. Check V1 in signaling unit 3A6. Check CALL Indicator lamp If buzzer sounds but lamp does not light |
| 91 | R-1148(P)/GRC or R-1331(*) (P)/GRC | Talk into handset microphone. | Sidetone should be heard. | *Replace handset.* |

## 5-12. Trouble Sectionalizing Chart

When any of the major components contain the symptoms listed in the chart below, the major component is defective. Refer to paragraph 5-13 for repair and adjustment procedures.

| Component at fault | Symptom |
|---|---|
| CN-514/GRC | POWER ON-OFF circuit breaker trips to OFF.<br>Front panel indicators remain off.<br>REGULATED OUTPUT VOLTAGE meter does not indicate 115 volts. |
| PP 2054(*)/GRC | AC POWER circuit breaker trips to OFF or front panel indicators remain off. |
| T-893(P)/GRC | LOW POWER Indicator lights and alarm buzzer sounds.<br>AFC CORRECTION control does not return to midrange when control is turned<br>Multimeter Indication not within limits listed below:<br>*Multimeter selector switch setting* — Multimeter indication<br>OSC (high band only) — At least 10.<br>MAIN TUNE — Same as above.<br>MIXER — Same as above.<br>AMP — Same as above.<br>OUT FREQ — HI-BAND 20, Lo-BAND 20 ( except<br>PWR OUT — channels 1 through 20 at least 16).<br>AFC LEV — Same as above.<br>1 KC IN — Within green area of meter scale (fdm).<br>68 KC IN — Same as above.<br>1 KC MOD — Same as above.[a]<br>68 KC MOD — Same as above.<br>PCM IN — Actual indication obtained is recorded when distant receiver states he has indication in green area for PCM OUT (para 3-14e). |
| R-1148(P)/GRC or R-1331 (*)(P)/GRC | NO SIGNAL lamp lights and alarm buzzer sounds.<br>AFC CORRECTION control (on AM-1956/GRC or AM-1956/GRC) does not return to midrange when control is turned (R-1148(P)/GRC ONLY).<br>Multimeter indication not within limits listed below<br>*Multimeter selector switch setting* — *Multimeter indication*<br>OSC — At least 10.<br>REC SIGNAL (Acceptable signal is required at receiver input for this test.) — Same as above for fdm operation; and at least 18 when pcm is connected at distant transmitter.<br>AFC LEVEL (Applicable when checking R-1148(P)GRC with AM-1955/GRC or AM-1956/GRC.) — Same as above.<br>ORDER WIRE — Green area.[a]<br>1 KC OUT — Same as above.<br>68 KC OUT — Same as above.<br>PCM OUT — Same as above.[a] |

[a] *For pcm operation, indication obtained depends on adjustments made during pcm system lineup (para 3 14*d *and* e*).*

## 5-13. Repairs and Adjustments

These procedures are designed to aid the organizational repairman in determining when adjustments or repairs are required. If the suggested adjustments or repairs do not restore normal operation, or normal indication is not obtained after test, repair, or adjustment, higher category of maintenance is required.

*a.* Power Supply PP-2054(*)/GRC. Set the multimeter selector switch on the T-893(P)/GRC to TEST and perform the tests below; use the maintenance test leads provided with the radio set to make the test jack connections.

**NOTES**

1. T-893(P)/G R C teat jacks are shown in figure 6-4; PP-2054(*) GRC test jacks are shown in figure 6-5.

2. On multimeters that do not have green and orange areas, indications between 22 and 28 correspond to the green area; indications between 17 and 33 correspond to the orange area.

| Test jacks connections | | Normal indication on T-893(P)/GRC multimeter | PP-2054(*)/GRC procedure |
|---|---|---|---|
| From T-893(p)/GRC | To PP-2054(*)/GRC | | |
| J7---------- (chassis)<br>J6---------- | J10---------- (chassis)<br>J3 (800 vdc.) | Between orange marks------ | Check V1 through V4. If silicon rectifiers are discolored, higher category of maintenance is required. If V4 is replaced, readjust R45 (below). |
| J7----------<br>J6---------- | J10----------<br>J4 (645 vdc). | Between orange marks. | |
| J7----------<br>J6---------- | J10----------<br>J5 (645 vdc). | Between orange marks. | |
| J7----------<br>J6---------- | J10----------<br>J6 (360 vdc). | Between orange marks. | |
| J7----------<br>J5---------- | J10----------<br>J7 (250 vdc). | In green area---------- | Adjust R45 to obtain indication within green area. |
| J7----------<br>J6---------- | J10----------<br>J94 (105 vdc). | Between orange marks------ | Check v5. |
| J7----------<br>J6---------- | J10----------<br>J8 (150 vdc). | Between orange marks. | |

*b*. Transmitter, Radio T -893(P)/GRC, Current Regulator Assembly 2A6 Adjustments for Amplifier-Oscillator Tubes. Assembly 2A6 circuits are adjusted by current regulator potentiometers R14, R15, and R16 (fig. 6-4), which control the voltage applied to the 2A6. cathodes of V1, V2, and V3, respectively, in the amplifier-oscillator.

(1) The adjustment of the respective potentiometers must be performed for each of the following conditions:

(*a*) When a tube in the amplifier oscillator is changed, the associated potentiometer is adjusted.

(*b*) All potentiometers are tested and adjusted, if necessary, when the following items are changed:

1. The amplifier-oscillator.
2. The current regulator assembly
3. Tube V4 in PP-2054(*)/GRC.

**NOTE**

The current regulator circuit test jacks J16, J17, and J18 on the transmitter main frame (fig. 6-4) are used to connect the respective current regulator circuit to multimeter circuit test jacks J5 and J7.

(2) To make the tests and adjustments, maintenance test leads supplied with the set the transmitter multimeter selector radio set. Replace the snap-on cover over con-switch to TEST and make the following test controls R14, R15, and R16 after performing the jack connections and adjustments. Use the required adjustments (pare 1-14f; fig. 6-4).

| Stage being checked | Test lead connections (main frame) | Normal meter indication | Procedure |
|---|---|---|---|
| 250-volt circuit. Perform this test and adjustment before performing following tests. | J7 on T-893(P)GRC to J10 on PP-2054(*)/GRC.; and J5 on T-893(P)/GRC to J7 on PP-2054/GRC. | Green area<br>Green area b,c | Adjust R45 on PP-2054(*)/GRC. |
| Oscillator V1 | J7 to J15 and J5 to J16 | Green area b | Adjust R14. Check V1.a |
| Mixer V2 | J7 to J15 and J5 to J17 | Green area b | Adjust R15. Check V2. a |
| Amplifier V3 | J7 to J15 and J5 to J18 | | Adjust R16. Check V3. a |

a Tighten locknuts on control after adjustment. If replace tube, readjust the control.
b Do not adjust control for indication higher than green area. To do so, greatly reduces tube life.
c If unable to reach green area, adjust the control to obtain an indication at least at the left orange area

c. Modulator Assembly 2A5 and Afc Assembly 2A4. The following checks are used to check the voltages at various points on transmitter assemblies 2A4 and 2A5. To make the tests, proceed as follows:

(1) Turn off power to the transmitter by setting PP-2054(*)/GRC OPERATE-STANDBY switch to STANDBY, and the AC POWER circuit breaker to OFF.

(2) Set a chair or box (equivalent in height to transmitter case) in front of the T -8 93(P)/GRC. Loosen the bolts holding the transmitter in its carrying case. Remove all cable connections from the transmitter front panel. Pull out the transmitter chassis from its carrying case and set the chassis on the chair or box In front of the stack of the radio. (This procedure is required in order to gain access to the test jacks while power is applied to the transmitter.)

(3) Reconnect the CX -4 558/GRC to the transmitter TO PWR SUP receptacle (fig. 6 3). Connect DA-189/GRC through CG-718B/U to the transmitter TO ANT receptacle.

**NOTE**

The connections of CX 4557/GRC and CG-718B/U from the receiver are not required.

(4) On PP-2054(*)/GRC, set AC POWER switch to ON and OPERATE-STANDBY switch to STANDBY. After about 2 minutes, set OPERATE-STANDBY switch to OPERATE.

(5) If the last step of the following chart (for crystal diodes CR11 and CR12 on 2A4) is to be performed, tune the transmitter to an assigned frequency.

(6) Set the transmitter multimeter selector switch to TEST, and make the indicated test jack connections; use the maintenance test leads supplied with the radio set.

**NOTE**

Multimeter circuit test jacks J6 and J7 and the test jacks on the assemblies are shown in figure 6-4.

| Stage being checked | Test lead connections: Transmitter mainframe | Assembly | Normal indication | Procedure |
|---|---|---|---|---|
| Modulator assembly 2A5 | J7 (chassis)----------<br>J6---------- | J9 on 2A5----------<br>J7 on 2A5 | Between orange marks (360 volts dc.) | Check PP-2054(*)/GRC (a above) for 360 volts dc.<br>Check tube V5 on 2A5. |
| | J7----------<br>J6---------- | J9 on 2A5----------<br>J6 on 2A5 | In green area (250 volts dc.) | Check PP-2054(*)/GRC (a above) for 250. |

| Stage being checked | Test lead connections: Transmitter main frame | Test lead connections: Assembly | Normal indication | Procedure |
|---|---|---|---|---|
| | | | | volts dc. Check tubes V3 and V4 on 2A5. |
| | J7---------- J6---------- | J9 on 2A5---------- J4 on 2A5. | In green area (150 volts dc.) | Check tubes V1 and V2 on 2A5. |
| Afc assembly 2A4----- | J7 (chassis)---------- J6---------- | J10 on 2A4---------- J12 on 2A4 | Between orange marks (150 volts dc.) | Check PP-2054(*)/GRC (a above) for 150 volts dc. |
| | J7---------- J6---------- | J10 on 2A4---------- J5 on 2A4 | Between orange marks (250 volts dc.) | Check PP-2054(*)/GRC (a above) for 250 volts dc. |
| | J7---------- J6---------- | J4 on 2A4---------- J10 on 2A4 | From slight deflection to off scale. The higher DA-189/GRC indication, the higher TEST indication ((5) above). | Check crystal diodes CR11 and CR12 on Z1 (para 5-15c). Check V7 on 2A4. (Tune transmitter before making test.) |

*d*. Receiver, Radio R-1148(P)/CRC or R-1331(*)(P)/GRC Power Supplies. Set the receiver multimeter switch to TEST and make the following connections; use the maintenance test leads supplied with the radio set. Set the receiver AC POWER switch to ON.

| Stage being checked | Test lead connections | Normal multimeter indication | Procedure |
|---|---|---|---|
| Receiver power supply. | J10 (chassis; fig. 5-10) to J12 (fig. 6-6); and J11 (150 vdc; fig. 5-10) to J14 (fig. 6-6). | Green area---------- | Adjust R36. Check V1, V3, V4, and V5. |
| Receiver power supply. | J10 to J12; and J9 (250 vdc) to J14. | Green area---------- | Adjust R18. Check V2. |

*e*. Amplifier-Converter AM-1955(*)/GRC or AM-1956(*)/GRC. Set the receiver multimeter selector switch to TEST and make the following connections; use the maintenance test leads supplied with the radio set.

(1) To reach test jacks J3 and J4 on first IF assembly 3A1A1/3A2A1 (fig. 6-7 or 6 8), remove the amplifier-converter from the receiver. Use Extender, Module MX-6988/GRC-50(V) from Test Facilities Kit MK-715/GRC-50(V) to make the connection between the connectors of the amplifier-converter and the receiver.

(2) Set switches as follows for the tests in chart below:

(*a*) Set OSCILLATOR control to channel 200 for the AM-1955(*)/GRC and to channel 650 for the AM-1966(*)/GRC.

(*b*) Set the REC SIG-1 control to the highest channel on the dial.

(*c*) On R-1148(P)/GRC, only, set AFC TUNE-ODD-EVEN switch to TUNE and on the AM-1955,1GRC or AM-1956/ RC, set the AFC correction control to midrange.

| Stage being checked | Test lead connections | | Normal indication on multimeter | Procedure |
|---|---|---|---|---|
| | On receiver (fig. 6-6) | On assembly | | |
| Crystal mixer CR1 and oscillator V1. | J12----------<br><br>J13---------- | J4 on 3A1A1/3A2A1 (fig. 6-7 Or 6-8<br>J3 on 3A1A1/3A2A1. | Between 5 and 50. | Check CR1 (fig 6-7 Or 6-8) (para 5-15c). Check tube V1 by substitution; turn power off before making substitution. Refer to paragraph 5-14e for tube V1 replacement procedure If indication IS obtained on AM-1955(*)/GRC, no further action is required. If Indication is obtained on AM-1956(*)/GRC, mechanical realignment of oscillator cavity is required at higher maintenance category |

*f. Afc Assembly 3A4 (Used in R-1148(P)/ GRC Only).*

(1) Set switches as follows:

(*a*) Set OSCILLATOR control to channel 200 when AM-1955/GRC is used or to channel 650 when AM-1956/GRC is used.

*(b*) Set REC SIG-1 control to highest channel on the dial.

*(c*) Set AFC TUNE-ODD-EVEN to TUNE.

*(d)* Set AFC correction control to midrange.

*(e*) Set multimeter selector switch to

(2) Set maintenance test leads to make the following connections and test:

*(a)* Connect one test lead between J12 on the receiver and J10 on 3A4. Connect another test lead between J13 on the receiver and J12 (+150 volts dc) on 3A4.

(*b)* The multimeter should indicate between the orange marks.

(3) If the required meter indication is not obtained, check power supply tubes V4 and V5 in the receiver chassis (fig. 5-10).

## 5-14. Tube Replacement Procedures

When trouble occurs, check all cables, connections, and fuses before removing and testing any tubes. Attempt to isolate the trouble to a component or assembly. When tube failure is suspected, use the procedures contained in a through f below to gain access to the tubes.

*a.* T-898(P)/GRC. Loosen the screws that attach the T-893 ( P ) /GRC to the component case, and slide the component out of the case The plug-in assembly locations in the T-893 (P)/GRC are shown in figure 5-4. The locations of tubes in the plug-in assemblies of the T-893(P)/GRC are shown in figures 5-4 through 5-6 When the defective tube is replaced, slide the component back into the case and tighten the screws.

*b*. AM-1957/GRC or AM-1958(*)/GRC. Loosen the screws that attach the AM-1957/ GRC or AM-1958(*)/GRC to the T-893(P)/ GRC, and remove the AM-1957/GRC or AM-1958(* )/GRC from the T-893(P)/GRC. The locations of tubes in the AM-1957/GRC and the AM-1958(*)/GRC are shown in figures 6-9 and 6-10, respectively. Remove and replace the tubes as follows:

(1) Lift the spring-loaded cover up and back from the top of the tube. The cover will remain upright when placed back.

(2) Carefully remove the tube with the tube extractor by turning it slowly and exerting an upward pull.

(3) Carefully insert a new tube in the socket by gently pushing it downward.

(4) Place the spring-loaded cover gently on the top of the tube. Do not snap the cover back into position.

*c*. PP-2054(*)/GRC. Loosen the screws that attach the PP-2054(*)/GRC to the component case, and slide the component out of the case. The tube locations are shown in figure 6-5.

*d*. R-1148(P)/GRC or R-1881(*)(P)/GRC. Loosen the screws that attach the R-1148(P)/GRC or R-1331(*)(P)/GRC to the component case, and remove the component from the case. Loosen the screws that attach the access cover to the rear of the R-1148(P)/GRC or R-1331(*)(P)/GRC, and remove the cover. The plug-in assembly locations in R-1148(P)/GRC or R-1331(*)(P)/GRC are shown in figure 6-6. The location of tubes on the main frame of the R-1148(P)/GRC or R-1331(*)(P)/GRC is shown in figure 5-10. The locations of tubes in plug-in assemblies are shown in figures 5-5, 5-7, and 5-9.

**CAUTION**

Do not replace tube V8, V10, or V11 in second IF assembly 3A5. Tube replacement requires realignment of the associated circuit at higher maintenance category.

*e.* AM-1955(*)/GRC or AM-1956(*)/GRC. Loosen the screws that attach the amplifier-converter to the receiver and remove the assembly from the receiver. The location of the AM-1955(*)/GRC tubes IS shown in figure 6-7; those in the AM-1956(*)/GRC are shown in figure 6 8.

**NOTE**

Tube type 4037A is used in the amplifier-converters for V1. It replaces tube type 2C40A. The 4037A should not be used in the AM-1956/GRC unless MWO 11-5820-461-35/2 has been applied.

(1) Remove the amplifier-converter from the receiver.

(2) Remove the four screws that hold the cap-socket assembly in the rear of the VI cavity. The screws are located on the corners of the cap.

**NOTE**

Do not remove the two screws on the raised cylindrical portion of the capsocket assembly.

(3) Lift the cap-socket assembly slowly and evenly; the tube is attached to it. If the tube remains in the cavity, carefully pull it straight out. Do not use sideward force on the tube.

**CAUTION**

Replace the cylindrical plastic bushing at the bottom of the cavity (if it has come out with the tube). If the bushing is left out, improper action results and the tube can damage the grid socket fingers.

(4) If the tube is broken, turn the equipment upside down and shake the broken glass out.

(5) Carefully insert the new tube into the cavity. Orient the base so that the locking pin or key on the base mates with the keyway in the ceramic socket.

(6) Check to see that the tube is fully and firmly seated m the tube socket.

(7) Carefully place the cap-socket assembly over the tube, press it down carefully, and tighten the four screws.

(8) To check the output of the tube, use the procedures in paragraph 5-13e. Then check for REC SIG operation of the receiver. Check several tubes to obtain proper REC SIG Indication. Do not discard tubes that fail to provide satisfactory REC SIG Indication; the unsatisfactory tubes can be used in other amplifier-converters.

*f.* CN-514/GRC. Loosen the screws that attach the CN-514/GRC to the component case, and slide the component out of the case. The tube locations are shown in figure 5-11.

## 5-15. Repairs

Replacement of tube V1, V2, or V3 in the amplifier-oscillator, replacement of the amplifier-oscillator, tube current regulator assembly 2A6, or tube V4 in PP-2054(*)/GRC will require adjustment of regulator resistors R14, R15, and R16. Refer to paragraph 5-13b for the procedures. Replacement procedure for plug-in assemblies is given in a below. Receiver lightning arresters protecting the fdm cable circuits are located at the input to baseband assembly 3A3 in the receiver (fig. 5-13). Procedures for their replacement are given in b below.

*a. Replacement of Plug-In Assemblies*. Remove and replace plug-in assemblies in the radio set as follows

(1) Remove any interconnecting cables.

(2) Loosen the mounting hardware.

(3) Grasp the assembly handles and pull the assembly straight up from the chassis.

(4) Insert the new assembly. Check to see that the assembly is seated evenly on the chassis.

(5) Tighten the mounting hardware.

(6) Replace all interconnecting cables. Be sure that the cables have been connected to the proper receptacle.

*b. Replacement of Lightning Arresters* (fig. 5-13).

(1) Loosen the attaching screws on the front of the receiver and slide the chassis about 6 inches out of the component case.

(2) Remove the front access plate on the light side of the receiver chassis and inspect the interior wiring for charred insulation, broken connections, etc. If damage is extensive, higher category of maintenance is required.

(3) Unscrew the lightning arresters and remove them.

(4) Insert the new lightning arresters (fig. 1-3 or 1-1.1). Check to see that they are seated correctly.

(5) Replace the access plate and push the receiver chassis into the component case. Tighten the attaching screws on the front panel of the receiver.

*c. Replacement of Diodes*. To remove and replace a diode, unscrew the connector, pry out the diode from the receptacle, and insert the proper diode. Replace the connector and screw it tightly to the receptacle. The type and location of replaceable diodes are given in the following chart. The diodes listed are the preferred types.

| Location | | Designation | Type |
|---|---|---|---|
| Unit | Figure | | |
| AM-1957/GRC and AM-1958(*)/GRC. | 6-9 and 6-10. | CR1 and CR2.<br>CR3 (wavemeter). | 1N23WEa<br>1N21WEb |
| AM-1955/GRC and AM-1956(*)/GRC. | 6-7 and 6-8. | CR1----------<br>CR2 (wavemeter). | 1N21WE<br>1N21WEb |
| T-893(P)/GRC (afc cavity Z1). | 5-12---------- | CR12---------- | 1N21WEc |
| R-1148(P)/ GRC (afc cavity Z1). | 5-12---------- | CR-111---------- | 1N21WEc |
| DA-189/GRC---------- | 1-14---------- | CR1---------- | 1N23WE |

a. Type 1N23C is provided In some equipment and may be used.
b. Type 1N21B is provided in some equipment and may be used.
c. Type 1N21C is provided In some equipment and may be used.

*d. Equipment Modifications and Changes*. In addition to the equipment modifications specified by modification work orders (MWO's) (listed in DA Pam 310-7), the changes listed in (1) through (4) below are authorized and required to be performed on equipment in the hands of using organizations. These changes are designed to facilitate maintenance or improve the operation of the equipment. These changes are mandatory. The changes to the equipment given in (l), (2), and (3) below are authorized to be performed by organizational level maintenance facilities; the change given in (4) below is authorized to be performed by direct support (DS) maintenance facilities. The equipment changes are not reportable and require no documentation; however, local records should be maintained (at organizational and DS level) listing the equipment serial numbers against the equipment that has been changed. In this way, equipment that has been changed can be identified.

(1) PP-2054(*)/GRC. The following change of fuse and its panel marking applies to the PP-2064/GRC, not to the PP-2054A/GRC; the latter is provided with the proper 3-ampere fuse. The original 5-ampere fuse did not provide enough protection when there was an overload in the oscillator circuit of the amplifier-oscillator (AM-1957/GRC or AM-1958(*)JGRC), resulting in a burn-out of resistor R13 in the PP-2054/GRC.

(*a*) Remove the 5-ampere HV fuse (fig. 3-4) and insert the 3-ampere, 125-volt, time-delay fuse (FSN 5920-131-9821).

(*b*) Mark the panel with 3 AMP SLO-BLO in place of "5 AMP."

**NOTE**

This fuse is the same as the one used in LV 3 AMP holder.

(2) T-893 (P)/GRC. In the transmitter main frame, a snap-on cover is installed over the adjustment screws for current regulator controls R14, R15, and R16 (fig.6 4). To install the snap-on cover (FSN 5820-055-5973), pull out the transmitter main frame and press the cover over the bracket holding the controls. Refer to paragraph 5-13b for procedures to adjust these controls, and for conditions under which the controls must be adjusted.

(3) Assembly 2A4 in T-893(P)/GRC and Assembly 3A4 in R-1148 (P)/GRC. In afc assembly 2A4/3A4, an insulator board must be inserted between terminal board E8 and the metal partition on which E8 is mounted (fig. 5-14) on those assemblies in which the boss (small hump in the metal) is not provided in the metal partition midway between the bosses for the E8 mounting screws. The purpose of the insulator board, or the boss in the metal partition, is to prevent resistors R28 and R33 from touching the metal partition when E8 warps, which would cause them to burn out. In afc assemblies issued with T-893(P)/GRC and R-1148 (P)/GRC on order No. 64027-PP -6 3 (RCA), and on later orders, the boss is provided in the partition behind E8. The assembly must be removed from the equipment and the terminal board and the metal partition investigated to determine if the insulator board must be requisitioned and installed.

(*a*) To install the insulator board (FSN 5970-935-4977), loosen mounting screws holding E8 to the center partition, and slide the insulator board behind E8 (fig. 5-3.1)

(*b*) Tighten the E8 mounting screws.

(4) AM-1958A/GRC. When the cover assembly for tube V3 in AM-1958A/GRC is lifted up, it snaps down again because there is not enough clearance between the cover and the frame (fig. 6-10). Instruction to cut the notch to provide the necessary clearance for the cover of V3 are provided in TM 11-5820-461-35 for direct support maintenance facilities.

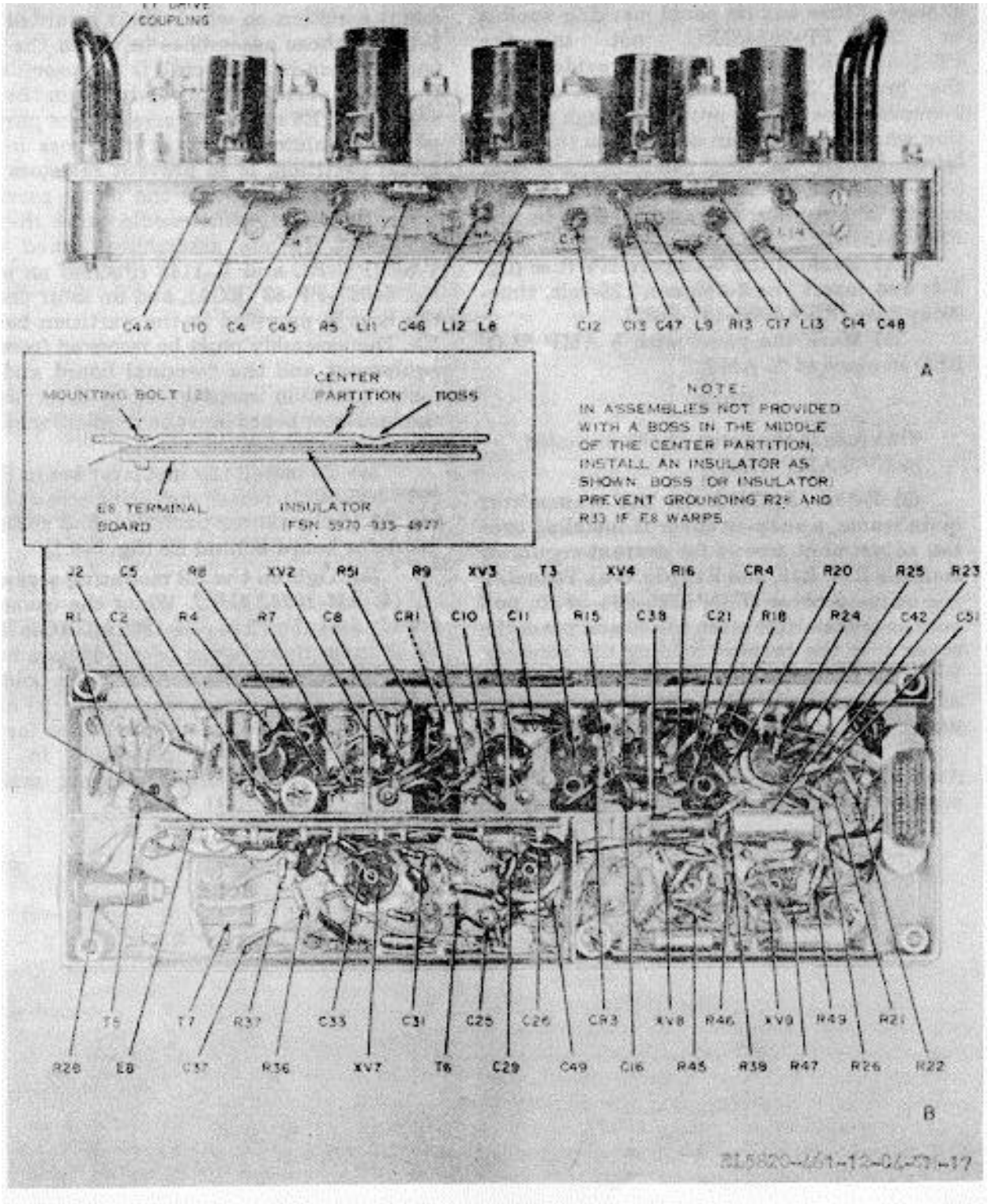



Figure 5-3.1. Afc assembly 2A4/3A4, side and bottom views, and details for installing insulator board behind terminal board E8.

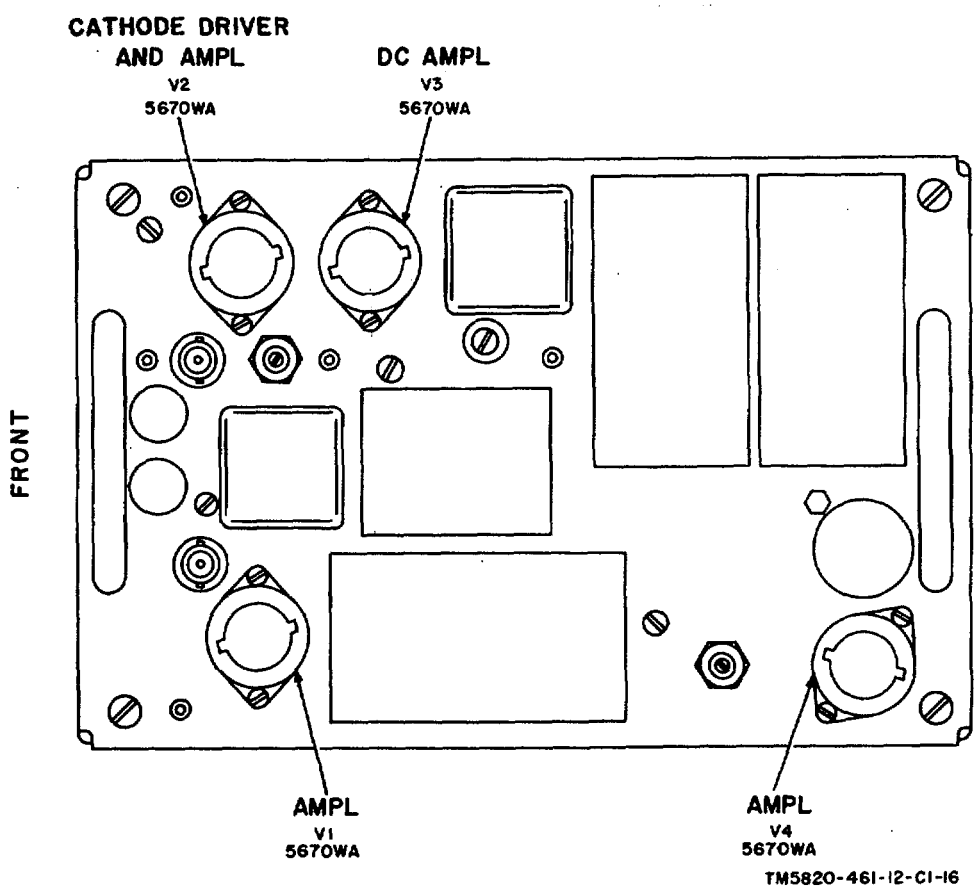



Figure 5-4. Baseband assembly 2A3 (part of T-893(P)/GRC), tube locations.

AGO 10032A

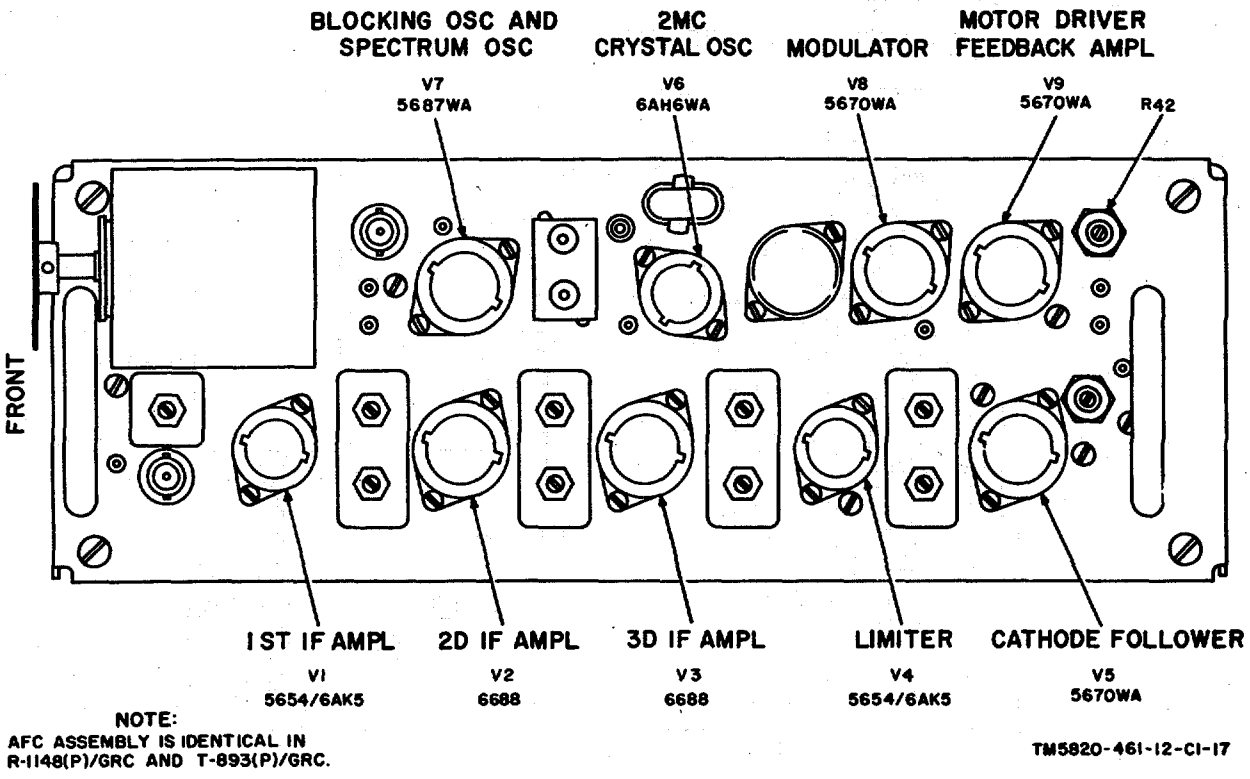



Figure 5-5. Afc assembly 2A4/3A4 (part of T-893(P)/GRC and R-1148(P)/GRC), tube locations.

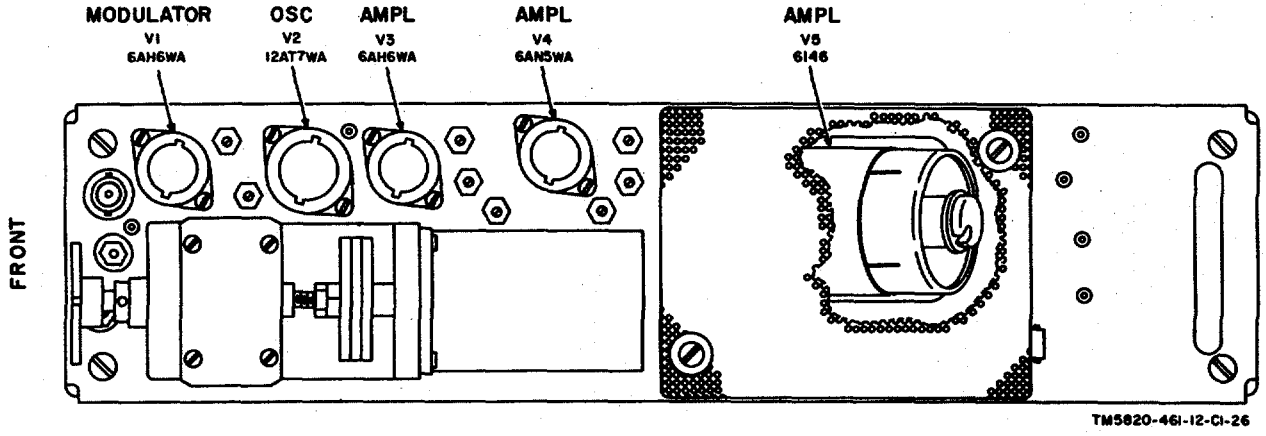



Figure 5-6. Modulator assembly 2A5 (part of T-893(P)/GRC),, tube locations.

AGO 10032A

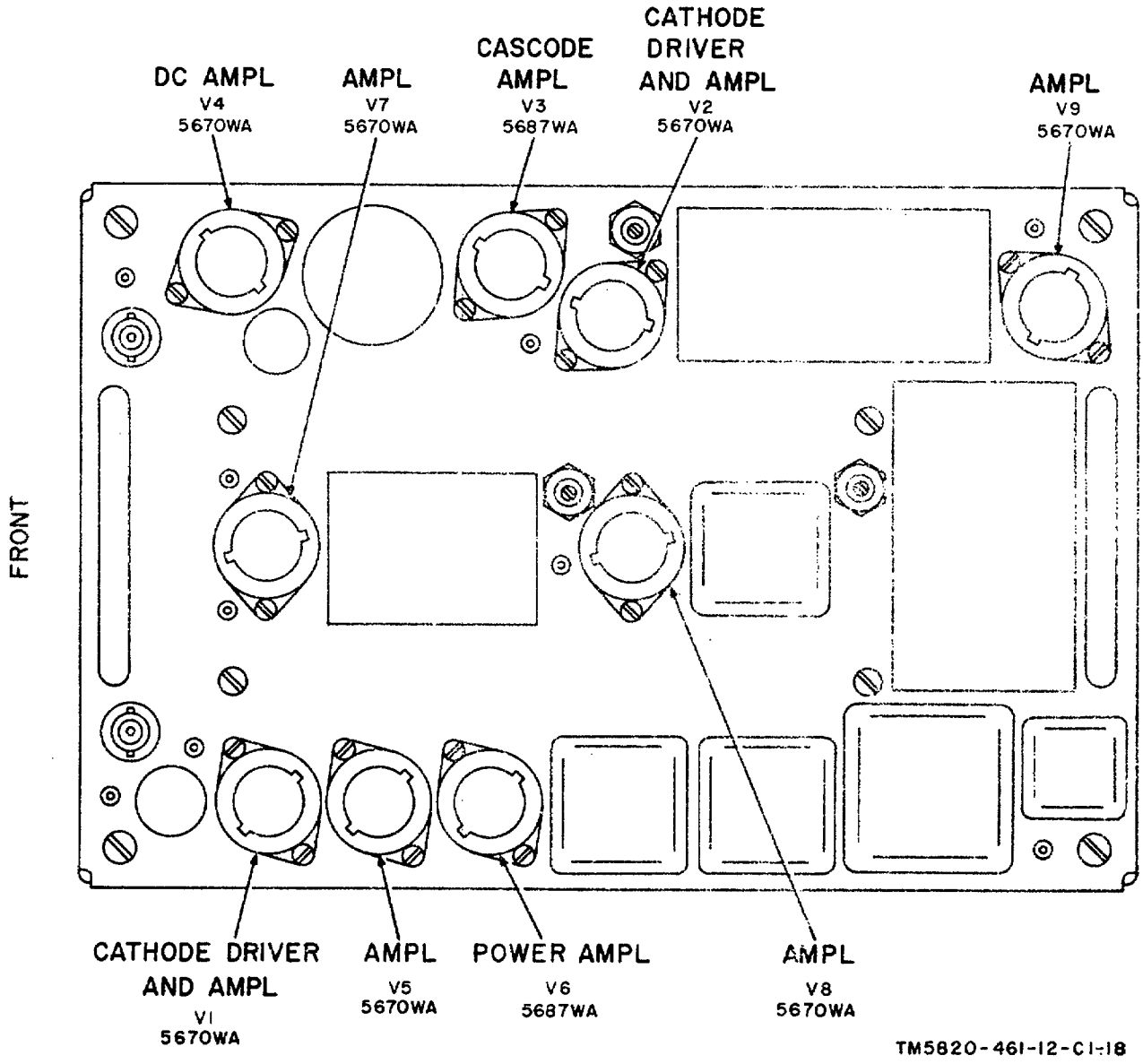



Figure 5-7. Baseband assembly 3A3 (part of R-1331(*)(P)/GRC or R-1148(P)/GRC), tube locations.

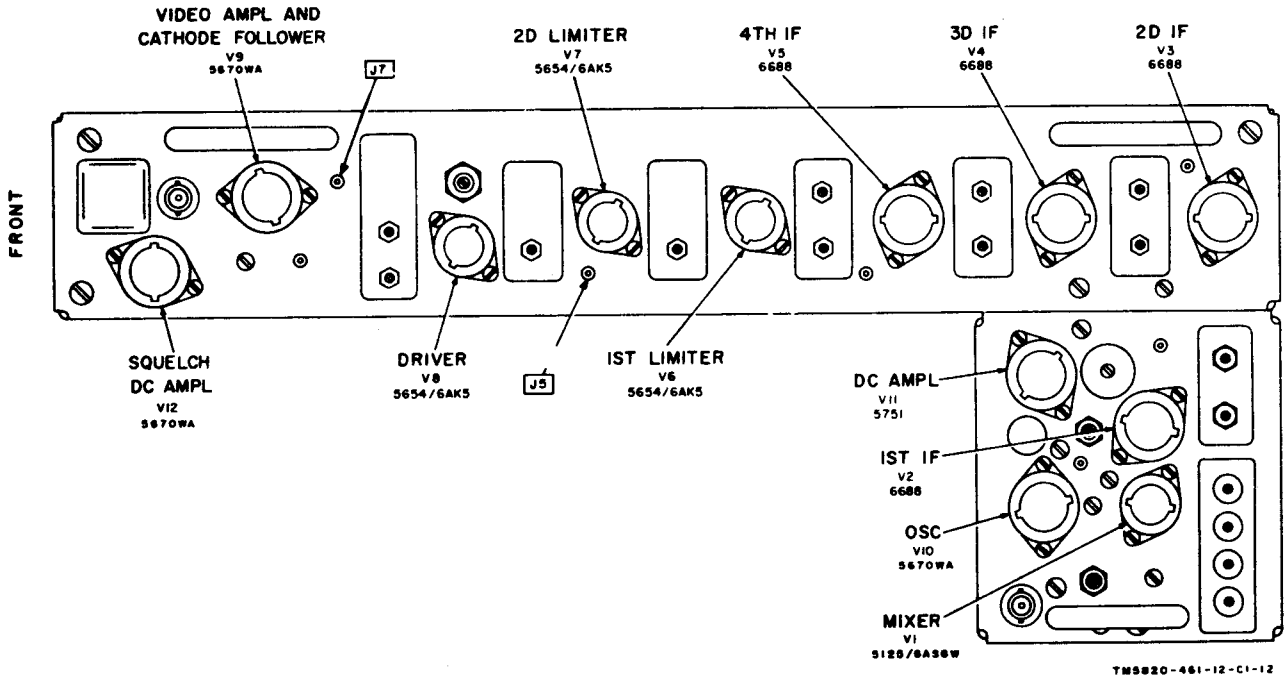



Figure 5-8. Second IF assembly 3A5 (part of R-1148(P)/GRC or R-1331(*)(P)/GRC), tube locations.

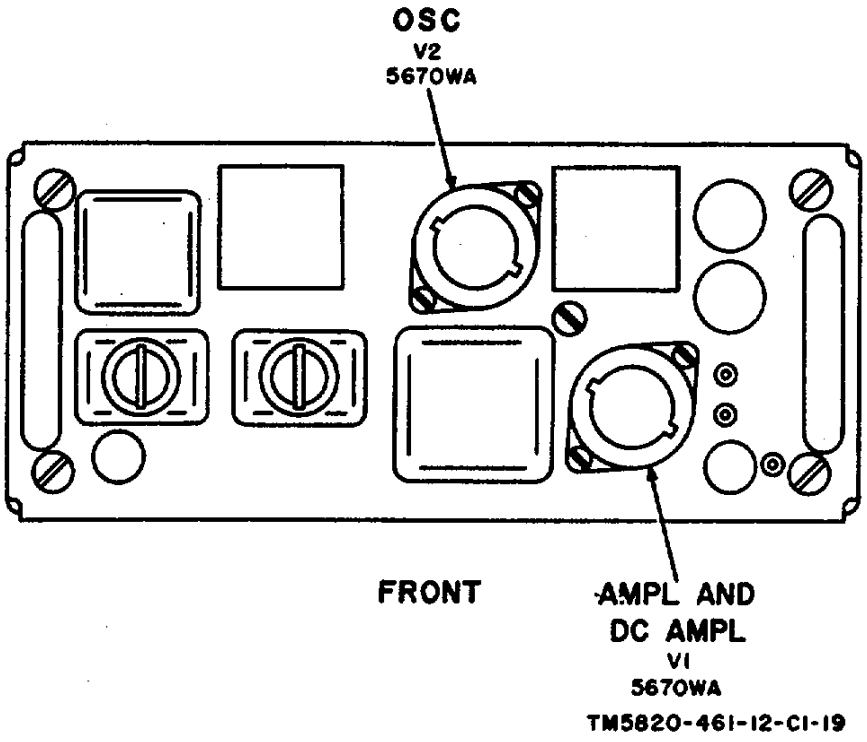



*Figure 5-9. Signaling Unit 3A6 (part of R-1148(p)/GRC or R-1331 (*) (P)/grc), tube locations.*

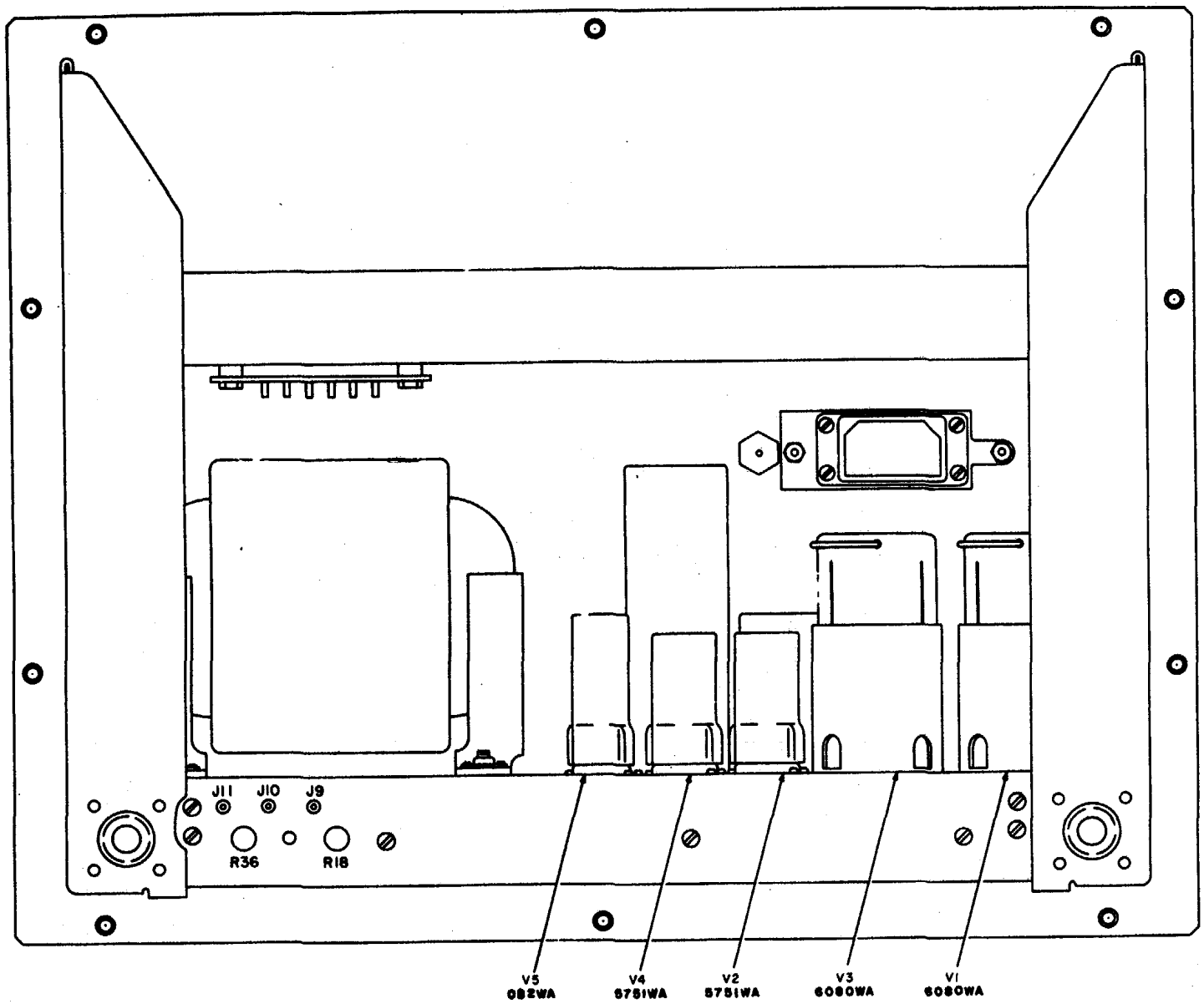



*Figure 5-10. R-1331(*)(P)/GRC,Main frame, rear view tube and test point locations .*

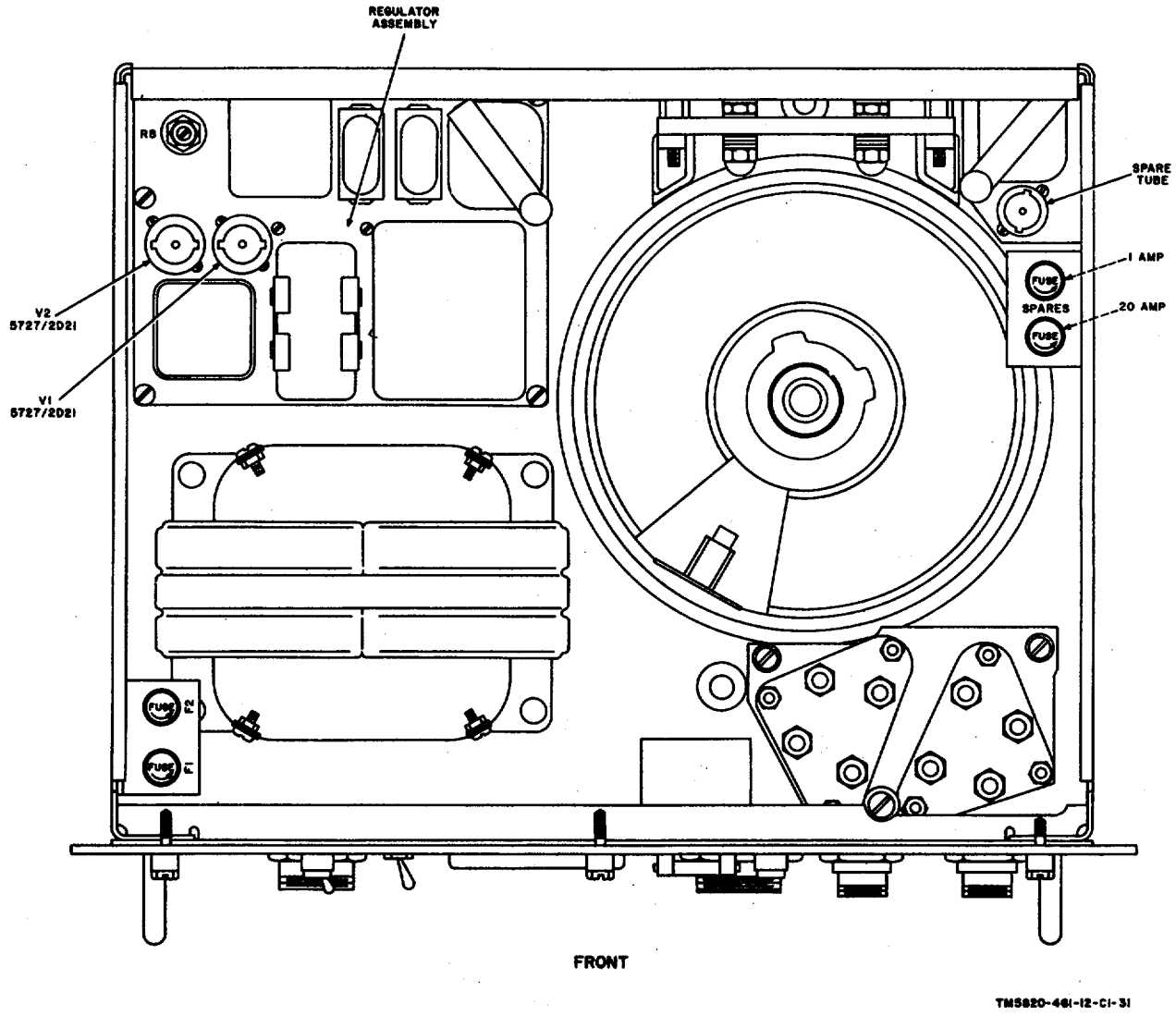



*Figure 5-11. CN-514/GRC, top view, tube, fuses, and regulator assembly locations.*

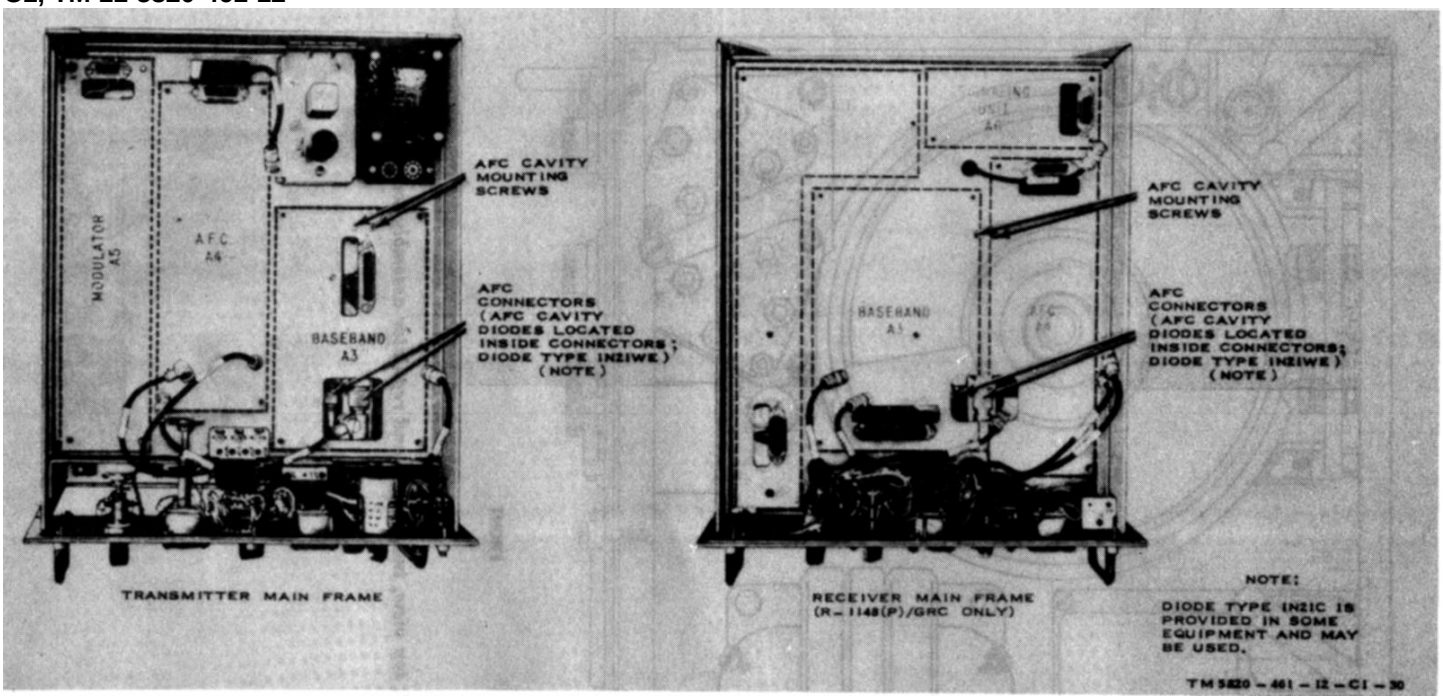



*Figure 5-12. T-893(P)/GRC and R-1148(P)/GRC, top views, plug-in assemblies removed, diode locations.*

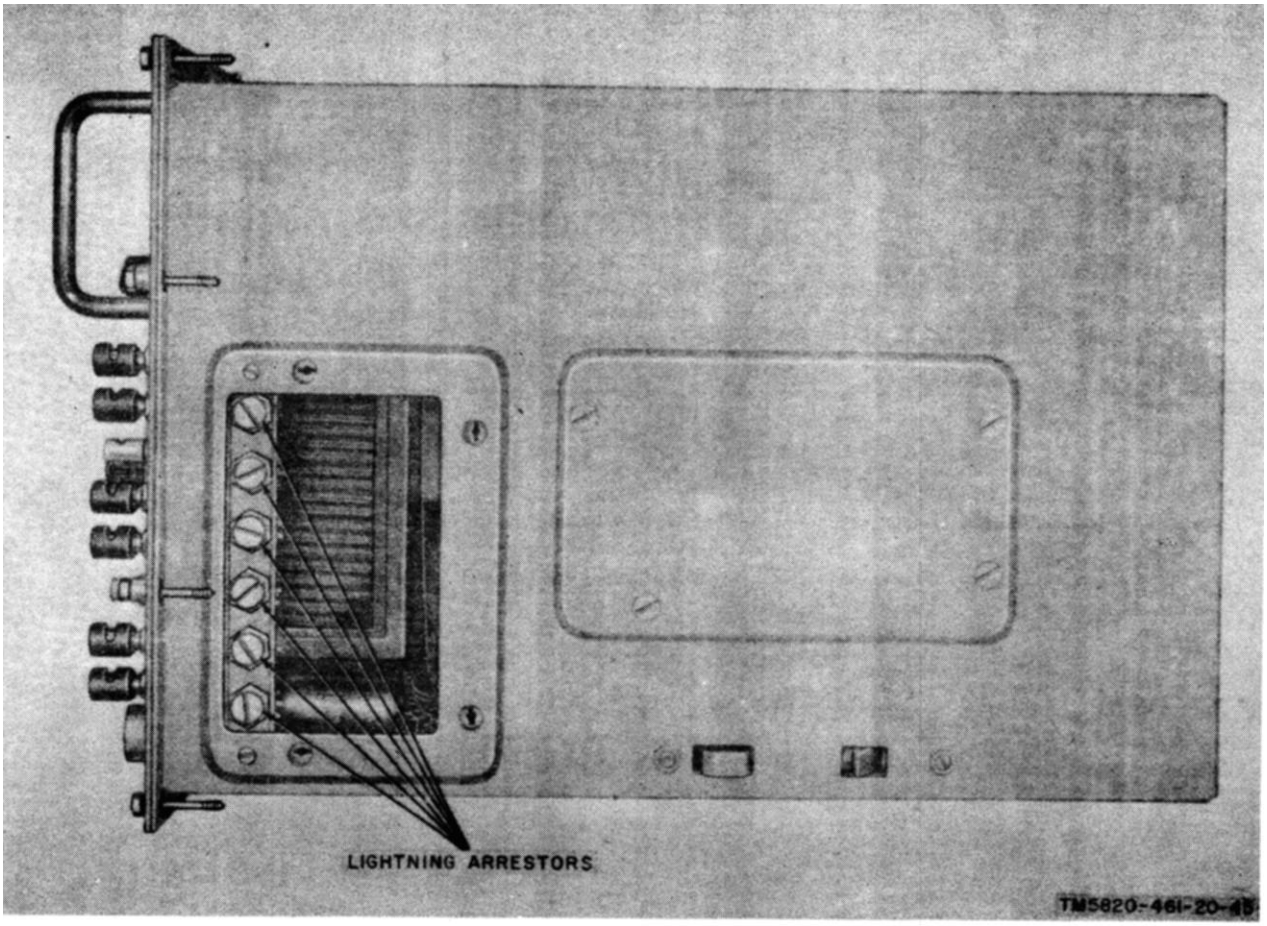



*Figure 5-13. R-1148(P)/GRC or R-1331(*)(P)/GRC, lightning arrester location.*

# CHAPTER 6
# SHIPMENT, LIMITED STORAGE, AND DESTRUCTION TO PREVENT ENEMY USE

## 6-1. Disassembly of Equipment

*a. General* The following instructions are recommended as a guide for preparing the radio set for shipment and limited storage. The instructions include the disconnection of equipment (*b* through *e* below), removal of the equipment (para 6-2), and disconnection and disassembly of the AB-5 77/GRC and AT-903/G.

*b. Switch Box SA-640/GRC (If Provided).*

(1) Disconnect Cable Assembly, Power, Electrical CX-4686/U from the power source.

(2) Disconnect Cable Assembly, Power, Electrical CX-4686/U from the ac power sources and the AC POWER INPUT connector on Regulator, Voltage CN-514/GRC.

(3) Place the cables on Reel, Cable RC-404/TR.

(4) Remove the ground wire connections.

*c. Regulator Voltage CN-514/GRC.*

(1) Disconnect the CX-4559/U from the ac power output connector on the CN-514/GRC and the AC POWER connector on Power Supply PP-2054(*)/GRC.

(2) Disconnect the CX-4559/U from the ac power output connector on the CN-514/GRC and the AC POWER connector on the 115 VOLTS connector on the R-1148(P)IGRC or R-1331(*)(P)/GRC.

*d. Power Supply PP-2054 (*)/GRC and Transmitter, Radio T -8 93(P)/GRC.*

(1) *PP-2054*(*)/GRC.

*(a)* Remove the common ground connection from the GRD connector on the PP-2054(*)/GRC.

*(b)* Disconnect the cable from the RPTR ALARM CONN connector between the two PP-2054(*)/GRC power supplies in a repeater installation.

*(c)* Disconnect the CX 4558/U from the TO XMTR connector on the PP-2054(*)/GRC and the TO PWR SUP connector on the T-893(P)/GRC.

(2) *T-8 93(P)/GRC and AM-19571GRC or AM-1958(*)/GRC.*

*(a)* Remove the antenna cable from the TO ANT connector on the AM-19571GRC or AM-1958(*)/GRC.

*(b)* Disconnect the CG-718B/U from the TO REC connector on the AM-19571GRC or AM-1958(*)/GRC and the RF INPUT connector on the AM-1955(*)/GRC or AM-1956(*)/GRC.

*(c)* Disconnect Cable Assembly, Special Purpose, Electrical CX-4557/U from the TO RCVR connector on the T-893(P)/GRC and the TO XMTR connector on the R-1148(P)/GRC or R- 1331(*)(P)/GRC.

*(d)* Remove the cable connected to the PCM IN connector on the T-893(P)/GRC. This cable is a part of the associated pcm multiplex installation.

*e. Receiver, Radio R-1148(P)/GRC or R-1331(*)(P)/GRC.*

(1) Remove the cables connected to the PCM ORDER WIRE and the PCM OUT connector on the R-1148(P)/GRC or R-1331(*) (P)/GRC. These cables are a part of the associated pcm multiplex installation.

(2) Remove the handset cable connected to the HANDSET connector on the R-1148(P)/GRC or R-1331(*)(P)/GRC.

(3) Remove the order wire cables attached to the REMOTE ORDER WIRE connectors on the R-1148(1) GRC or R-1331(*)(P)/GRC.

(4) Remove the spiral-four cable from the RCVR OUT, the GRD, and the XMTR IN connections on the R-1148(P)/GRC or

R-1331(*)(P)/GRC. This cable is a part of the associated fdm multiplex installation.

### 6-2. Removal of Equipment

After the radio set has been electrically disconnected, perform the following procedures.

(*a)* Operate the multimeter selector switch on the T-1148(P)/GRC or R-1331(*)(P)/GRC and the T893(P)/GRC to the OFF (TRANSIT) position. This action protects the meter movement during transit of the equipment.

*b*. If the wavemeter charts have been removed from the AM-1955(*)/GRC, or AM-1956(*)/GRC, and the AM-19571GRC or AM-1958(*)/GRC, replace the charts in the WAVEMETER CHART slots. Check each chart to make sure that it is connected to the same serial numbered assembly for which it was designated.

*c*. Place all spare parts and accessories in the spare parts case and accessory bag. Remove the bag and case from the shelter.

*d*. Replace the covers on the component cases and remove the components from the shelter. Place the components in a convenient location for final packaging.

*e*. Disassemble. the AB-577/GRC (and MK-806/GRC, if provided).

*f*. Remove the AT-903/G from the AB-577/GRC. Store the AB-577/GRC components in the AM-577/GRC launcher and canvas bags provided with the AB-577/GRC (fig. 1-8).

### 6-3. Repackaging for Shipment and Limited Storage

*a. General*. The exact procedure for repackaging depends on the material available and the conditions under which the radio set is to be shipped or stored. Adapt the procedures outlined in paragraph 6-1 whenever possible. Pack each component in a separate wooden box. Place three dehydrating agents in each box. Figure 2-1 illustrates a typical box. Refer to paragraph 2-1*a* for the dimensions of the boxes originally supplied with the radio set.

*b. Material Requirements*. The following materials are required for packaging the radio set. For stock number of materials, consult SB 38-100.

| Material | Quantity |
|---|---|
| Waterproof paper..... | 2,528 sq ft |
| Waterproof tape..... | 100 ft |
| Corrugated cardboard..... | 2,528 sq ft |
| Adhesive tape..... | 100 ft |
| Filler material..... | 20 lb |
| Dehydrating agent..... | 3 per carton |
| Cotton twine..... | 150 ft |

### 6 4. Packaging

The components of the radio set should be packaged as outlined in *a* and *b* below. The procedures described in a below apply to the CN-514/GRC, the PP-2054(*)/GRC, the T-8 93(P)/GRC (with the AM-1957/GRC or AMC-1958(*)/GRC installed) the R-1148(P)/GRC or R-1331(*)(P)/GRC (with the AM-1955(*)/GRC or AM-1956(*)/GRC installed, the alternate tuner ease, and the spare parts accessory case.

*a. Components Contained in Standard Cases.*

(1) Cushion the component on all surfaces of the case with filler material. To hold. the filler material in place, wrap strips of adhesive tape over the filler material and around the case.

(2) Place the cushioned component in a wrap of corrugated cardboard. Secure the wrap with adhesive tape.

(3) Wrap the cardboard-wrapped component with waterproof paper. Seal all openings and secure the wrap with waterproof tape.

*b. Antenna AT-903/G and Mast AB-577/GRC.*

(1) Antenna AT-903/G. Perform the following procedures to package the AT-903/G:

*(a)* Check to see that the elevation depression bracket is in the 0° position. Lock the locking handle.

*(b)* Cushion the AT-9031G on all surfaces with filler material. To hold the filler material in place, wrap strips of adhesive tape over the filler material and around the component.

*(c)* After the AT-903/G has been cushioned, place it in a wrap of corrugated cardboard. Secure the wrap with adhesive tape.

(*d*) Wrap the cardboard-wrapped AT-903/G with waterproof paper. Seal all

openings and secure the wrap with waterproof tape.

(2) *Mast AB-577/GRC*. No further packaging of the AB-577/GRC is required after the mast sections have been replaced in the mast-section carrier. Place the mast-section carrier in a convenient location for final packing.

(3) *Accessory bag and roll*. Place all the antenna accessories in the canvas roll and accessory bag (fig.. 1-8). No further packaging is required after the accessories have been secured in place.

**6-5. Destruction of Army Material to Prevent Enemy Use (Electronics Command)**

Refer to TM 750-244 2 for information concerning destruction of Army materiel.

## APPENDIX A

## REFERENCES

| | |
|---|---|
| DA Pam 310-4 | Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, and Lubrication Orders |
| DA Pam 310-7 | Index of Modification Work Orders |
| FM 5-25 | Explosives and Demolitions |
| FM 21-26 | Map Reading |
| SB 38-100 | Preservation, Packaging, Packing and Marking Materials, Supplies, and Equipment Used by the Army |
| TB SIG 291 | Safety Measures to be Observed When Installing and Using Whip Antennas, Field Type Masts, Towers, Antennas, and Metal Poles that are Used With Communication, Radar, and Direction Finder Equipment |
| TB 746-10 | Field Instructions for Painting and Preserving Electronics Command Equipment |
| TM 11-486-6 | Electrical Communications Systems Engineering: Radio |
| TM 11-5805-201-12 | Organizational Maintenance Manual: Telephone Set TA-312/PT |
| TM 11-5805-247-12 | Organizational Maintenance Manual: Converter, Telegraph Telephone Signal TA-182/U |
| TM 11-5820-461-25P | Organizational, DS, GS, and Depot Maintenance Repair Parts and Special Tool Lists: Radio Sets AN/GRC-50(V)1, 2, 3, 4, and 5 and AN/GRC-50A(V)1, 2, 3, 4, and 5 |
| TM 11-5820-517-12P | Operator and Organizational Maintenance Repair Parts and Special Tool Lists and Maintenance Allocation Chart: Antenna AT-903/G |
| TM 11-5820-533-14 | Organizational, DS, GS, and Depot Maintenance Manual, Including Repair Parts and Special Tool Lists: Repeater Set, Radio AN/ MR C 103(V). |
| TM 11-5820-535-15 | Operator, Organizational, DS, GS, and Depot Maintenance Manual, Including Repair Parts and Special Tool Lists: Repeater Set, Radio AN/TRC-110(V). |
| TM 11-5820-536-15 | Organizational, DS, GS, and Depot Maintenance Manual, Including Repair Parts and Special Tool Lists: Repeater Set, Radio AN/ TRC-109(V). |
| TM 11-5820-538-12 | Operator's and Organizational Maintenance Manual Including Repair Parts and Special Tools Lists: Mast AB-577/GRC and Extension Kit, Mast MK-806/GRC. |
| TM 11-5896 357-14 | Operator, Organizational, Direct Support and General Support Maintenance Manual, Including Repair Parts and Special Tool Lists: Radio Terminal Set AN/MRC-102(V) |
| TM 11-5895-366-15 | Operator, Organizational, DS, GS, and Depot Maintenance Manual: Radio Terminal Set AN/TRC-117(V) |
| TM 11-5895-367-15 | Organizational, DS, GS, and Depot Maintenance Manual: Radio Terminal Set AN/TRC- 108(V) |
| TM 11-6110-245-15 | Operator, Organizational, DS, GS, and Depot Maintenance Manual: Voltage Regulator CN-514/ARC. |

| | | |
|---|---|---|
| TM 11-6625-203-12 Multimeter ME-77/U | Operator and Organizational Maintenance: Multimeter AN/URM- | 105, Including |
| TM 11-6625-274-12 TV-7A/U, TV- | Operator's and Organizational Maintenance Manual: Test Sets, | Electron Tube TV-7/U, |
| TM 38-750 | The Army Maintenance Management Systems (TAMMS) | |
| TM 750-244-2 | Procedures for Destruction of Army Materiel to Prevent Enemy | Use (Electronics |
| | 7B/U, and TV-7D/U | |
| | Command) | |

# APPENDIX C
# MAINTENANCE ALLOCATION

## Section I. INTRODUCTION

### C-1. General

This appendix provide summary of the maintenance operations for AN/GRC-50(V)1 thru 5 and AN/GRC-50A(V)1 thru 11. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

### C-2. Maintenance Function

Maintenance functions will be limited to and defined as follows:

*a.* Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

*b*. Test. To verify serviceability and to detect incipient failure by measuring the mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

*c*. Service. Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint, or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

*d*. Adjust. To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

*e*. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

*f.* Calibrate. To determine and cause corrections to be made or to be adjusted. on instruments or test measuring and diagnostic equipments used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

*g*. Install The act of emplacing, seating, or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment or system.

*h*. Replace. The act of substituting a serviceable like type part, subassembly, or module (component or assembly) for an unserviceable counterpart.

*i*. Repair. The application of maintenance services (inspect, test, service, adjust, align calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

*j*. Overhaul. That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (I.e., DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul haul does not normally return an item to like new condition.

*k.* Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipments/components

### C-3. Column Entries

*a. Column 1, Group Number*. Column I lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

*b. Column 2, Component/Assembly*. Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

*c. Column 3, Maintenance Functions*. Column 3 lists the functions to be performed on the item listed in column 2. When items are listed without maintenance functions, it is solely for purpose of having the group numbers in the MAC and RPSTL coincide.

*d. Column 4, Maintenance Category.* Column 4 specifies, by the listing of a "work time" figure in the appropriate subcolumn(s), the lowest level of maintenance authorized to perform the function listed in column 3. This figure represents the active time required to perform that maintenance function at the indicated category of maintenance. If the number or complexity of the tasks within the listed maintenance function vary

at different maintenance categories, appropriate "work time" figures will be shown for each category. The number of task-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time, and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the maintenance allocation chart. Subcolumns of column 4 are as follows:

C — Operator/Crew
O — Organizational
F — Direct Support
H — General Support
D — Depot

*e. Column 5, Tools and Equipment*. Column 5 specifies by code those common tool sets (not individual tools) and special tools, test, and support equipment required to perform the designated function

*f. Column 6, Remarks*. Column 6 contains an alphabetic code which leads to the remark in section IV, Remarks, which is pertinent to the item opposite the particular code.

**C-4 Tool and Test Equipment Requirements (See III)**

*a. Tool or Test Equipment Reference Code.* The numbers in this column coincide with the numbers used in the tools and equipment column of the MAC. The numbers indicate the applicable tool or test equipment for the maintenance functions.

*b. Maintenance Category*. The codes in this column indicate the maintenance category allocated the tool or test equipment.

*c. Nomenclature.* This column lists the noun name and nomenclature of the tools and test equipment required to perform the maintenance functions.

*d. National/NATO Stock Number*. This column lists the National/NATO stock number of the specific tool or test equipment.

*e. Tool Number.* This column lists the manufacturers part number of the tool followed by the National Supply Code for Manufacturers (5-digit) in parentheses.

**C-5. Remarks (Sec IV)**

*a. Reference Code*. This code refers to the appropriate item in section II, column 6.

*b. Remarks*. This column provides the required explanatory information necessary to clarify items appearing in section II.

**(Next printed page is C-3)**

SECTION II MAINTENANCE ALLOCATION CHART
FOR
RADIO SETS AN/GRC -50(V)1 THRU 5
AND AN/GRC-50(V)1 THRU 11

| (1) GROUP NUMBER | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE CATEGORY | | | | | (5) TOOLS AND EQUIPMENT | (6) REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | C | O | F | H | D | | |
| 00 | RADIO SETS AN/GRC-50(V)1 thru 5 and AN/GR50A(V)1 thru 11 | Inspect | 0.1 | | | | | 3 | C |
| | | Inspect | | 0.4 | | | | 3 | B |
| | | Inspect | | | 1.1 | | | 14,15 | C |
| | | Test | 0.2 | | | | | | D |
| | | Test | | 0.6 | | | | 1,2,3,37, 40,48 | F |
| | | Test | | | 1.0 | | | 4 thru 13, 16 | E |
| | | Test | | | | 2.4 | | 4 thru 35, 37,39,40, 48 | G |
| | | Test | | | | | 8.0 | 4 thru 48 | H |
| | | Service | 0.1 | | | | | | A |
| | | Service | | 0.5 | | | | 3 | B |
| | | Service | | | 1.2 | | | 14,15 | J |
| | | Adjust | 0.1 | | | | | | K |
| | | Adjust | | 0.5 | | | | 1,2,3,37, 40,48 | M |
| | | Adjust | | | 0.9 | | | 4 thru 16, 34,37,40, 48 | O |
| | | Adjust | | | | 1.8 | | 4 thru 35, 37,39,40, 48 | O |
| | | Adjust | | | | | 4.5 | 4 thru 48 | L |
| | | Align | | | | 2.0 | | 4 thru 35 37,39,40, 48 | N |
| | | Align | | | | | 3.1 | 4 thru 48 | I |
| | | Install | | 0.5 | | | | | 3 |
| | | Repair | 0.2 | | | | | 1 thru 3 | Q |
| | | Repair | | 0.2 | | | | 1 thru3 37,40,48 | Q |
| | | Repair | | | 0.8 | | | 14,15 | Q |
| | | Repair | | | | 1.6 | | 4 thru 35, 37,39,40, 48 | R |
| | | Repair | | | | | 5.0 | 4 thru 48 | S |
| | | Overhaul | | | | 4.0 | | 4 thru 35, 37,39,48 | U |
| | | Overhaul | | | | | 5.0 | 4 thru 48 | |
| 01 | RECEIVER, RADIO R-1148 (P)/GRC and R-1331(*) (P)/GRC(3) | Inspect | 0.1 | | | | | 3 | A |
| | | Inspect | | 0.1 | | | | 3 | B |
| | | Test | 0.1 | | | | | 3 | D |
| | | Test | | 0.6 | | | | 1,2,37, 48 | D |
| | | Test | | | | 2.8 | | 4 thru 35, 37,39,48 | E |
| | | Test | | | | | 4.1 | 4 thru 48 | H |
| | | Service | 0.1 | | | | | | A |
| | | Service | | 0.6 | | | | 14,15, | B |
| | | Adjust | 0.3 | | | | | 1 thru 3 37,48 | K |
| | | Adjust | | 0.7 | | | | 1 thru 3 37,48 | M |
| | | Align | | | | 2.1 | | 4 thru 35 37,39,48 | W |
| | | Align | | | | 4.3 | | 4 thru 35, 37,39,48 | V |
| | | Replace | | 0.6 | | | | | |
| | | Repair | | | 1.1 | | | 4 thru 16, 34,37,48 | Y |
| | | Repair | | | | 4.3 | | 4 thru 35, 37,39,40, 48 | U |
| | | Overhaul | | | | 4.7 | | 4 thru 35 37,39,48 | U |
| | | Rebuild | | | | | 5.8 | 4 thru 48, | |
| | | Repair | | | | | 5.8 | 4 thru 48 | P |
| | | Repair | | 0.6 | | | | 1 thru 3, 37,48 | X |

SECTION II MAINTENANCE ALLOCATION CHART
FOR
RADIO SETS AN/GRC-50(V)1 THRU 5 AND
AN/GRC-50(V) 1 THRU 11

| (1) GROUP NUMBER | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE CATEGORY | | | | | (5) TOOLS AND EQUIPMENT | (6) REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | C | O | F | H | D | | |
| 0101 | AMPLIFIER-CONVERTER AM-1955(*)/GRC (3A1) | Inspect | • 1 | | | | | 3 | B |
| | | Test | | • 9 | | | | 1 thru 3, 2 37 40,48 | Z |
| | | Test | | | 1 2 | | 3.4 | 4 thru 16, | E |
| | | Service | 0.2 | | | | | 4,37,48 | H |
| | | Adjust | 0.4 | | | | | 3 | B |
| | | Align | | | | | | 1 thru 3 | K |
| | | Replace | | 0.2 | | | 4.6 | 4 thru 48 | I |
| | | Repair | | 0.6 | | | | 3 | |
| | | | | | | | | 1 thru 3 | X |
| | | Repair | | | | 3.0 | | 4 thru35, 37,39,48 | U |
| | | Repair | | | 1.1 | | | 14,15 | AC |
| | | Overhaul | | | | 4.0 | | 4 thru 35, 37,39,48 | U |
| | | Rebuild | | | | | 5.0 | 4 thru 48 | |
| | | Repair | | | | | 3.0 | 4 thru 48 | S |
| 010101 | 1ST IF SUBASSEMBLY (3A1A1) | Inspect | 0.9 | | | | | 3 | |
| | | Test | | | 1.2 | | | 4 thru 16 34,39,48 | AI |
| | | Service | | | 0.8 | | | 14,15 | J |
| | | Adjust | | | | 1.8 | | 4 thru 35, 37,39,48 | AE |
| | | Replace | | | 0.33 | | | 14,15 | |
| | | Repair | | | | 2.0 | | 4 thru 35, 37,39,48 | P |
| | | Overhaul | | | | 2.1 | | 4 thru 35, 37,39,48 | P |
| | | Rebuild | | | | | 4.0 | 4 thru 48 | |

**SECTION II MAINTENANCE ALLOCATION CHART**
**FOR**
**RADIO SETS AN/GRC-50(V)1 THRU 5 AND**
**AN/GRC-50A(V)1 THRU 11**

| (1) GROUP NUMBER | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE CATEGORY | | | | | (5) TOOLS AND EQUIPMENT | (6) REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | C | O | F | H | D | | |
| 0102 | AMPLIFIER-CONVERTER A~1956(~)/GRC (3A2) | Inspect | | | | | | 3 | B |
| | | Test | | 0.9 | | | | 1 thru 3 37,48 | Z |
| | | Test | | | 1 2 | | | 4 thru 16, 35, 32 39,48 | AA |
| | | Test | 0 2 | | | | 3 4 | 4 thru 48 | H |
| | | Service | | | | | | 3 | B |
| | | Adjust | 0 4 | | | | | 3 | K |
| | | Align | | | | | 4 6 | 4 thru 48 | I |
| | | Replace | | 0 2 | | | | 3 | |
| | | Repair | | 0 6 | | | | 1 thru 3 37 48 | X |
| | | Repair | | | 1 1 | | | 14 15 | AC |
| | | Repair | | | | 3 0 | | 4 thru 35,37,39 48 | U |
| | | Repa1r | | | | | 3 0 | 4 thru 48 | S |
| | | Overhaul | | | | 4 0 | | 4 thru 35,37, 38,48 | U |
| | | Rebuild | | | | | 5.0 | 4 thru 48 | |
| 010201 | IST IF SU8ASSEIIILY (3A2A1) | Inspect | | | 0-9 | | | 14,15 | C |
| | | Test | | | 1 2 | | | 4 thru 16 | Z |
| | | Service | | | 0 8 | | | 4 thru 16,34, 37,39 | AB |
| | | Adjust | | | | 1-1 | | 4 thru 35,37, 39,48 | AE |
| | | Align | | | | 1 8 | | 4 thru 35,37, 39,48 | I |
| | | Replace | | | 0 33 | | | 14,15 | |
| | | Repair | | | | 2 0 | | 4 thru 35,37, 39,48 | P |
| | | Overhaul | | | | 2 1 | | 4 thru 35,37, 39,48 | P |
| | | Rebuild | | | | | 4.0 | 4 thru 48 | |
| 0103 | RECEIVER BASE BAND ASSEMBLY (3A3) | Inspect | | 0.1 | | | | | A |
| | | Test | | | 1.1 | | | 4 thru 16,34, 37,39, 48 | E |
| | | Test | | | | 1 8 | | 4 thru 35,37, 39,48 | H |
| | | Test | | | | | 2 9 | 4 thru 48 | H |
| | | Align | | | | 1.5 | | 4 thru 35,37, 39,48 | W |
| | | Align | | | | | 2 3 | 4 thru 48 | I |
| | | Replace | | | 0 25 | | | 14,15 | |
| | | Repair | | | | | 1 6 | 4 thru 48 | P |
| | | Overhaul | | | | | 3 0 | 4 thru | P,T |
| | | Rebuild | | | | | 5.0 | | |

SECTION II MAINTENANCE ALLOCATION CHART
FOR
RADIO SETS AN/GRC-50(V)1 THRU 5 AND
AN/GRC-50A(V)1 THRU 11

| (1) GROUP NUMBER | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE CATEGORY | | | | | (5) TOOLS AND EQUIPMENT | (6) REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | C | O | F | H | D | | |
| 0104 | RECEIYER AFC ASSEMBLY (3A4) | Inspect | 0.1 | | | | | | A |
| | | Test | | | 1.1 | | | 4 thru 16 34,37,39, 48 | G |
| | | Test | | | | 1 8 | | 4 thru 35, 37,39,48 | G |
| | | Test | | | | | 2.9 | 4 thru48 | H |
| | | Align | | | | 1.5 | | 4 thru 35, 37,39,48 | W |
| | | Align | | | | | 2.3 | 4 thru48 | I |
| | | Replace | | | 0 25 | | | 14,15 | |
| | | Repair | | | | 2 6 | | 4 thru 35 37,39,48 | P |
| | | Overhaul | | | | 3 0 | | 4 thru 35, 37, 39,48 | P,T |
| | | Rebuild | | | | | 5.0 | 4 thru 48 | |
| 0105 | RECEIVER 2ND IF ASSEMBLY (3A5) | Inspect | | 0.1 | | | | 1 thru 3 | A |
| | | Test | | | 1.1 | | | 4 thru 16, 34,37,39, 48 | G |
| | | Test | | | | 1.8 | | 4 thru 35, 37,39,48 | G |
| | | Test | | | | | 2.9 | 4 thru 48 | H |
| | | Align | | | | 1.5 | | 4 thru 35, 37,39,48 | W |
| | | Align | | | | | 2.3 | 4 thru 48 | I |
| | | Replace | | | 0.25 | | | 14,15 | |
| | | Repair | | | | 2.6 | | 4 thru 35, 37,39,48 | P |
| | | Overhaul | | | | 3.0 | | 4 thru 35, 37,39 | |
| | | Rebuild | | | | | 5.0 | 4 thru 48 | |
| 0106 | RECEIVER-SIGNAL UNIT (3A6) | Inspect | | | | | | | |
| | | Test | | 0.1 | | | | | A |
| | | | | | 1.1 | | | 4 thru 16, 34,37,39, 48 | G |
| | | Test | | | | 1.8 | | 4 thru 35, 37,39,48 | G |
| | | Test | | | | | 2.9 | 4 thru 48 | H |
| | | Align | | | | 1.5 | | 4 thru 48 | V |
| | | Replace | | | | | 1.6 | 4 thru 48 | P |
| | | Repair | | | 0.25 | | | 14,15 | |
| | | Overhaul | | | | | 3.0 | 4 thru 48 | P,T |
| | | Rebuild | | | | | 5.0 | 4 thru 48 | |
| 02 | TRANSMITTER, READIO T-893(P)/GRC (2) | Inspect | 0.1 | | | | | | A |
| | | Inspect | | 0.5 | | | | 1 thru 35, 37,39,40, 48 | B |
| | | Test | 0.2 | | | | | | D |
| | | Test | | 0.6 | | | | 1 thru 35, 39,40,48 | F |
| | | Test | | | 1.0 | | | 4 thru 16, 35,37,39, 40,48 | AF |
| | | Test | | | | 1.9 | | 4 thru 35, 37,39,40, 48 | G |
| | | Test | | | | | 2.4 | 4 thru 48 | H |
| | | Service | 0.1 | | | | | | A |
| | | Service | | | | | | 3 | B |
| | | Align | | 0.6 | | 2.0 | | 4 thru 37, 39,40,48 | W |
| | | Align | | | | | 2.8 | 4 thru 48 | I |
| | | Replace | | | | | | 14,15 | |
| | | Repair | | 0.5 | | | | 3 | X |
| | | Repair | | 0.6 | 1.2 | | | 4 thru 16, 34,37,39, 39,40,.48 | AH |
| | | Repair | | | | 2.1 | | 4 thru 35, 37,39,40, 48 | R |
| | | Overhaul | | | | | 2.6 | 4 thru 48 | P,T |
| | | Rebuild | | | | | 5.0 | 4 thru 48 | |

SECTION II MAINTENANCE ALLOCATION CHART
FOR
RADIO SET AN/GRC-50(V)1 THRU 5 AND
AN/GRC-50/(V)1 THRU 11

| (1) GROUP NUMBER | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE CATEGORY | | | | | (5) TOOLS AND EQUIPMENT | (6) REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | C | O | F | H | D | | |
| 0201 | TRANSMITTER BASE BAND ASSEMBLY (2A3 | Inspect | | 0 4 | | | | 3 | B |
| | | Test | | | 1.0 | | | 4 thru 16, 34 37,39, 40,48 | AF |
| | | Test | | | | | 1.9 | 4 thru 48 | AG |
| | | Adjust | | | | | 1.9 | 4 thru 48 | L |
| | | Align | | | | | 1.8 | 4 thru 48 | I |
| | | Replace | | | 2.5 | | | 14,15 | |
| | | Repair | | | | 2.3 | | 4 thru 35, 4 thru 35, 48 | R |
| | | Overhaul | | | | | 3.2 | 4 thru 48 | P,T |
| | | Rebuild | | | | | 5.2 | 4 thru 48 | |
| 0202 | TRANSMITTER MODULATOR ASSEMBLY (2A4) | Inspect | | 0.4 | | | | 1 thru 3 | A |
| | | Test | | | 1.0 | | | 4 thru 16, 34,37,39, 40,48 | AF |
| | | Test | | | | 1.9 | | 4 thru 35, 37,39,40, 48 | AG |
| | | Adjust | | | | 1.1 | | 4 thru 35, 4 thru 35, 48 | O |
| | | Align | | | | 1.8 | | 4 thru 35, 37,39,40, 48 | M |
| | | Replace | | | 0.25 | | | 14,15 | |
| | | Repair | | | | 2.3 | | 4 thru 35, 37,39,40, 48 | R |
| | | Overhaul | | | | | 3.2 | 4 thru 48 | 4 thru 35, |
| | | Rebuild | | | | | 5.2 | 4 thru 48 | |
| 0203 | TRANSMITTER AFC ASSEMBLY (2A5) | Inspect | | 0.4 | | | | 1 thru 3 | A |
| | | Test | | | 1.0 | | | 4 thru 16, 37,38,39, 40,48 | AG |
| | | Test | | | | 1.9 | | 4 thru 35, 37,39,40, 48 | AG |
| | | Adjust | | | | 1.1 | | 4 thru 35, 37,39,40, 48 | O |
| | | Align | | | | 1.8 | | 4 thru 35, 37,39,40, 48 | M |
| | | Replace | | | 0.25 | | | 4 thru 16, 34,37,39, 40,48 | |
| | | Repair | | | | 2.3 | | 4 thru 35, 37,39,40, 48 | R |
| | | Repair | | | | | 2.1 | 4 thru 35, 40 | P |
| | | Overhaul | | | | | 2.2 | 4 thru 35, 40 | P,T |
| | | Rebuild | | | | | 4.6 | 4 thru 48 | |
| 0204 | TRANSMITTER REGULATOR ASSEMBLY (2A6) | Inspect | | 0.4 | | | | | A |
| | | Test | | | 1.0 | | | 4 thru 16, 35,37,39, 40,48 | AG |
| | | Test | | | | | 1.9 | 4 thru 48 | AG |
| | | Adjust | | | | | 1.9 | 4 thru 48 | L |
| | | Align | | | | | 1.8 | 4 thru 48 | I |
| | | Replace | | | 0.25 | | | 14,15 | |
| | | Repair | | | | 2.1 | | 4 thru 35, 38,40 | AJ |
| | | Repair | | | | | 2.3 | 4 thru 48 | R |
| | | Overhaul | | | | | 3.2 | 4 thru 48 | P,T |
| | | Rebuild | | | | | 5.2 | 4 thru 48 | |

SECTION II MAINTENANCE ALLOCATION CHART
FOR
RADIO SETS AN/GRC-50(V)1 THRU 5 AND
AN/GRC-50A(V)1 THRU 11

| (1) GROUP NUMBER | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE CATEGORY | | | | | (5) TOOLS AND EQUIPMENT | (6) REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | C | O | F | H | D | | |
| 0205 | AMPLIFIER-OSCILLATORS AM-1957/GRC (2A1) | Inspect | 0.1 | | | | | | A |
| | | Test | | | | | | 1,2,40,48 | F |
| | | Test | | 0.6 | | | 3.6 | 4 thru 35, 40 | H |
| | | Service | 0.1 | | | | | 1 thru 3 | A |
| | | Adjust | 0.6 | | | | | 1 thru 3 | K |
| | | Adjust | | | | | 4.8 | 4 thru 48 | L |
| | | Replace | | 0.25 | | | | 3 | |
| | | Repair | | 0.7 | | | | 1 thru 3 | X |
| | | Repair | | | | | 4.7 | 4 thru 48 | S |
| | | Overhaul | | | | | 5.7 | 4 thru 48 | P,T |
| | | Rebuild | | | | | 6.5 | 4 thru 48 | |
| 03 | DUMMY LOAD, ELECTRICAL DA-189/G | Inspect | 0.1 | | | | | 3 | A |
| | | Test | | | | | 1.2 | 4 thru 48 | H |
| | | Service | | 0.4 | | | | 1 thru 3 | A |
| | | Adjust | | | | | 0.9 | 4 thru 48 | L |
| | | Align | | | | | 0.8 | 4 thru 48 | I |
| | | Repair | | | | | 2.1 | 4 thru 35, 40 | P |
| | | Overhaul | | | | | 2.2 | 4 thru 35, 40 | 4 thru 48 |
| | | Rebuild | | | | | 4.6 | 4 thru 48 | |
| 04 | POWER SUPPLY PP-2054(*)/GRC | Inspect | 0.1 | | | | | 3 | A |
| | | Test | 0.1 | | | | | 1 thru 3 | D |
| | | Test | | 0.6 | | | | 1 thru 3, 37 | F |
| | | Test | | | 1.2 | | | 4 thru 16, 37,48 | AI |
| | | Test | | | | | 4.1 | 4 thru 48 | V |
| | | Service | 0.1 | | | | | 3 | A |
| | | Adjust | 0.1 | | | | | 1 thru 3, 37,48 | K |
| | | Adjust | | 0.5 | | | | 1 thru 3, 37,48 | O |
| | | Repair | | | | 1.8 | | 4 thru 16, 34,37,39, 40,48 | AJ |
| | | Overhaul | | | | | 2.1 | 4 thru 48 | P,T |
| | | Rebuild | | | | | 3 | 4 thru 48 | |
| 05 | REGULATOR VOLTAGE CN-514/GRC (10) (11) | Inspect | 0.1 | | | | | 3 | A |
| | | Test | | 0.3 | | | | 1 thru 3, 37,48 | D |
| | | Test | | | 0.5 | | | 4 thru 16, 34,37,48 | Z |
| | | Service | 0.1 | | | | | 3 | A |
| | | Adjust | | | 0.9 | | | 4 thru 16, 35,37,48 | O |
| | | Repair | | | | 0.9 | | 4 thru 35, 37,39,48 | AJ |
| | | Overhaul | | | | | 3.1 | 4 thru 48 | P,T |
| | | Rebuld | | | | | 4.6 | 4 thru 48 | |
| 06 | SWITCH BOX SA-640/U | Inspect | 0.1 | | | | | 3 | A |
| | | Inspect | | 0.4 | | | | 1 thru 3 | B |
| | | Test | 0.2 | | | | | 1 thru 3 | D |
| | | Test | | 0.5 | | | | 1 thru 3 37 | AI |
| | | Test | | | 0.8 | | | 14,15 | AI |
| | | Repair | | | 0.9 | | | 14,15 | AJ |
| | | Overhaul | | | | 1.9 | | 7,14,15 | AJ |
| | | Rebuild | | | | | 3.0 | 4 thru 48 | |

SECTION II MAINTENANCE ALLOCATION CHART
FOR
GENERATOR, SIGNAL AN/URM-149

| (1) GROUP NUMBER | (2) COMPONENT/ASSEMBLY | (3) MAINTENANCE FUNCTION | (4) MAINTENANCE CATEGORY | | | | | (5) TOOLS AND EQUIPMENT | (6) REMARKS |
|---|---|---|---|---|---|---|---|---|---|
| | | | C | O | F | H | D | | |
| 07 | HOLDER, HAND SET MT-2161/U | Inspect | 0.1 | | | | | 3 | A |
| | | Test | | 0.4 | | | | 3 | D |
| | | Service | 0.1 | | | | | 3 | A |
| | | Repair | | 0.5 | | | | 3 | AJ |
| 08 | ACCESSORY BAG BG-102A (5MP2) | Inspect | 0.1 | | | | | 3 | C |
| | | Repair | | 0.5 | | | | 3 | AK |
| 09 | ANTENNA AT-903/G (1) | Inspect | 02 | | | | | 1 thru 3 | A |
| | (SEE TM 11-5820-517-14P FOR PARTS) | Test | | 0.6 | | | | 1 thru 3 | AI |
| | | Test | | | 0.2 | | | 7 | AI |
| | | Service | 0.2 | | | | | 1 thru 3 | A |
| | | Repair | | 0.1 | | | | 1 thru 3 | AK |
| | | Overhaul | | | | 1.5 | | 7,14,15 | |
| | | Rebuild | | | | | 2.0 | 7,14,15 | |
| 10 | MAST AB-577/GRC (9) | | | | | | | | |
| | (SEE TM 11-5810-538-14) | | | | | | | | |
| 11 | HAND SET H-156/U (5HS1) | Inspect | 0.1 | | | | | 3 | A |
| | | Test | 0.2 | | | | | 1 thru 3, 48 | D |
| | | Test | | | 0.5 | | | 7,11,48 | AI |
| | | Replace | | 0.1 | | | | 3 | |
| | | Repair | | | 0.9 | | | 14,15 | AJ |
| | | Overhaul | | | | 1.5 | | 7,11,13 14 | AJ |
| | | Rebuild | | | | | 2.0 | 7,11,13, 14 | |
| 12 | CASE, STANDARDIZED COMPONENT CY-2582 (7) | Inspect | 0.1 | | | | | 3 | C |
| | | Overhaul | | 0.5 | | | | 3 | D |
| 13 | CASE, STANDARDIZED COMPONENT CY-2583 (8) | Inspect | 0.1 | | | | | 3 | C |
| | | Overhaul | | 0.5 | | | | 3 | AK |
| 14 | CABLE ASSEMBLIES | Inspect | 0.1 | | | | | 3 | C |
| | | Test | | 0.1 | | | | 1 thru 3 | D |
| | | Service | 0.1 | | | | | 1 thru 3 | A |
| | | Repair | | | 0.9 | | | 14,15 | AK |
| | | Overhaul | | | | 1.5 | | 14,15 | AJ |
| | | Rebuild | | | | | 2.3 | 4 thru 48 | |

SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
RADIO SETS AN/GRC-50(V)1 THRU 5
AND AN/GRC-50A (V)1 THRU 11

| TOOL OR TEST EQUIPMENT REF CODE | MAINTENANCE CATEGORY | NOMENCLATURE | NATIONAL/NATO STOCK NUMBER | TOOL NUMBER |
|---|---|---|---|---|
| 1 | 0 | MULTIMETER AN/URM-105 | 6625-00-581-2036 | |
| 2 | 0 | TEST SET, ELECTRON TUBE TV-7D/U | 6625-00-820-0064 | |
| 3 | 0 | TOOL KIT TK-101/G | 5180-00-064-5178 | |
| 4 | F,H,D | METER, FREQUENCY AN/USM-159 | 6625-00-892-5360 | |
| 5 | F,H,D | GENERATOR, SIGNAL SG-71/FCC | 6625-00-669-0255 | |
| 6 | F,H,D | MULTIMETER ME-26B, C/U | 6625-00-646-9409 | |
| 7 | F,H,D | MULTIMETER TS-352B/U | 6625-00-242-5023 | |
| 8 | F,H,D | DIGITAL READOUT ELECTRONIC COUNTER AN/USM-267 | 6625-00-911-6368 | |
| 9 | F,H,D | GENERATOR, SIGNAL AN/URM-149 (SEE NOTE) | 6625-00-903-3501 | |
| 10 | F,H,D | TEST SET, ELECTRON TUBE TV-2(*)/U | 6625-00-669-0263 | |
| 11 | F,H,D | VOLTMETER, METER ME-30A/U | 6625-00-669-0742 | |
| 12 | F,H,D | TRANSFORMER TF-171/USM | 5950-00-503-0632 | |
| 13 | F.H.D | TEST SET, FACILITIES KIT MK-715/GRC-50 | 6625-00-868-8335 | |
| 14 | F,H,D | TOOL KIT TK-100/G | 5180-00-605-0079 | |
| 15 | F.H,D | TOOL KIT TK-105/G | 5180-00-610-8177 | |
| 16 | F,H.D | TUBE SOCKET, ADAPTER KIT MX-1258/U | 5835-00-378-5009 | |
| 17 | H,D | TRANSMISSION MEASURING SET TS-559(*)/FT | 6625-00-649-4286 | |
| 18 | H,D | INDICATOR.PANORAMIC JP-173/U | 5820-00-224-5500 | |
| 19 | H,D | ANALYZER, SPECTRUM TS-723A/U | 6625-00-668-9418 | |
| 20 | H,D | OSCILLOSCOPE AN/USM-281A | 6625-00-053-3112 | |
| 21 | H,D | GENERATOR. SIGNAL TS-452D/U | 6625-00-828-6410 | |
| 22 | H,D | GENERATOR, 516NAL AN/USM-U | 6625-00-669-4031 | |
| 23 | H,D | TEST SET, TELEPHONE AN/USM-181 | 6625-00-740-0344 | |
| 24 | H.D | TEST SET, RADIOFREQUENCY POWER AN/URM-120 | 6625-00-813-8430 | |
| 25 | H,D | MODULATION, METER ME-57/U | 6625-00-647-3737 | |
| 26 | H,D | TEST SET. IF AN/GRM-63 | 6625-00-089-4653 | |
| 27 | H.D | TEST SET, MODULATION IF AN/GRM-64 | 6625-00-089-4327 | |
| 28 | H,D | TEST SET, NOISE LOADING AN/GRM-66 | 6625-00-089-4326 | |
| 29 | H,D | TEST SET, RECEIVING FILTER AN/GRM-68 | 6625-00-089-4654 | |
| 30 | H,D | DETECTOR, RADIO FREQUENCY DT-149/U (P/O TOOL CODE | 6625-00-245-9619 | |
| 31 | H,D | 20) | 5986-00-831-5991 | |
| 32 | H,D | ATTENUATOR, VARIABLE CN-796/U | 6625-00-868-8352 | |
| 33 | H,D | GENERATOR, SIGNAL AN/URM-103 | 6625-00-720-2495 | |
| 34 | F,H,D | ANALYZER. SPECTRUM AN/URM-110 | 6625-00-788-9672 | |
| 35 | H,D | GENERATOR, SIGNAL AN/USM-205 | 6625-00-649-5193 | |
| 36 | D | GENERATOR. SIGNAL AN/URM-25D | 6625-00-566-4990 | |
| 37 | O.F,H, | WATTMETER AN/URM-98/U | 6625-00-519-2414 | |
| 38 | D, | REGULATOR, VOLTAGE CN-514/GRC(P/O AN/GRC-50) | 6625-00-973-3986 | |
| 39 | D | VOLTMETER, R F AN/URM-145 | 5820-00-889-0857 | |
| | F,H,D | POWER SUPPLY PP-2054(*)/GRC (P/O AN/GRC-50) | | |

SECTION III TOOL AND TEST EQUIPMENT REQUIREMENTS
FOR
RADIO SETS AN/GRC-50(V)1 THRU 5
AND AN/GRC-50a (V)1 THRU 11

| TOOL OR TEST EQUIPMENT REF CODE | MAINTENANCE CATEGORY | NOMENCLATURE | NATIONAL/NATO STOCK NUMBER | TOOL NUMBER |
|---|---|---|---|---|
| 40 | O,F,H,D | DUMMY LOAD, ELECTRICAL DA-189/GRC (P/D AN/GRC-50) | 5820-00-892-3861 | |
| 41 | D | TEST SET, RF AN/GRM-62 | 6625-00-935-4201 | |
| 42 | D | TEST SET, AUDIO AN/GRM-65 | 6625-00-935-1500 | |
| 43 | D | TEST SET, POWER SUPPLY AN/GRM-67 | 6625-00-935-4200 | |
| 44 | D | SLOTTED LINE, COAXIAL IM-92/U | 6625-00-692-6558 | |
| 45 | D | COMPARATOR, FREQUENCY CM-77/USM | 6625-00-788-3780 | |
| 46 | D | GENERATOR, SIGNAL SG-321B/U | 6625-00-674-7097 | |
| 47 | D | INDICATOR, STANDING WAVE RATIO AN/UPM-103 (*) | 6625-00-682-4494 | |
| 48 | O,F,H,D | HANDSET H-156/U (P/O AN/GRC-50) | 5965-00-892-3850 | |

NOTE
IF NOT AVAILABLE, USE FOLLOWING

| | |
|---|---|
| AN/URM-49 | NSN 6625-00-669-5131 |
| | OR |
| AN/URM-49A | NSN 6625-00-553-7386 |
| AN/URM-64 | NSN 6625-DO-283-9621 |
| | OR |
| AN/URM- 64A | NSN 6625-00-553-D433 |

## SECTION IV. REMARKS

| REFERENCE CODE | REMARKS |
|---|---|
| A | EXTERIOR ONLY |
| B | INTERIOR OF EQUIPMENT BUT EXTERIOR OF SUBASSEMBLIES |
| C | ALL INSPECTION |
| D | OPERATIONAL TEST ONLY |
| E | THOSE TESTS REQUIRED TO LOCATE FAULTY SUB-ASSEMBLIES, 3A1A1 OR 3A1A2, OR 3A1A3, OR 3A1A4, OR 3A1A5, OR 3A1A6, OR COMPONENTS MOUNTED ON MAIN CHASSIS |
| F | THOSE TESTS REQUIRED TO LOCATE FAULTY TUBES, FUSES, CABLES AND AMPLIFIER CONVERTERS AND OSCILLATORS |
| G | THOSE TESTS REQUIRED TO LOCATE FAULTY COMPONENTS IN SUBASSEMBLIES, 3A1A1/3A2A1, 3A5, 2A5 2A4/3A4 ONLY |
| H | ALL TESTS |
| I | ALL ALIGNMENTS |
| J | ALL SERVICING |
| K | OPERATOR ADJUSTMENT ONLY |
| L | ALL ADJUSTMENTS |
| M | THOSE ADJUSTMENTS AS OUTLINED IN TM 5820-461-12, PAR 5-13 |
| N | THE FOLLOWING SUBASSEMBLIES ONLY: 3A1A1/3A2A1, 3A5 2A5, 2A4/3A4 |
| 0 | THOSE ADJUSTMENTS AS OUTLINED IN TM-11-5820-461-35 |
| P | ALL REPAIRS |
| Q | BY REPLACEMENT OF SUBASSEMBLIES AND COMPONENTS MOUNTED ON MAIN CHASSIS |
| R | BY REPLACEMENT OF COMPONENTS IN THE FOLLOWING SUBASSEMBLIES ONLY 3A1A1/3A2A1, OR 3A5, OR2A5 OR 2A4/3A4, 2A3, 2A5, 2A6 |
| S | ALL REPAIRS, INCLUDING REPLACEMENT OF TUBES 3A1V1 OR 3A2V1 IF NECESSARY |
| T | PLUS SHOP SUPPORT |
| U | ALL REPAIRS EXCEPT REPLACEMENT OF TUBES 3A1V1 OR 3A2V1 |
| V | THOSE SPECIAL ASSIGNED SHOPS AUTHORIZED |
| W | THOSE SHOPS AUTHORIZED TEST SETS AN/GRM-62,63,64,65,66,67,68 |
| X | BY REPLACEMENT OF LIGHTING ARRESTERS, CABLES 2A4, CAPACITOR 3A5C2 TUBES, FILTERS, KNOBS, LAMPS, AND FUSES, CRYSTALS |
| Y | BY REPLACEMENT OF SUBASSEMBLIES 3A1A1/3A1A2, 3A3, 3A4, 3A5, AND 3A6 AND COMPONENTS LOCATED ON MAIN CHASSIS |
| Z | THOSE TESTS REQUIRED TO LOCATE FAULTY TUBES AND CABLES |

SECTION IV. REMARKS

| REFERENCE CODE | REMARKS |
|---|---|
| AA | THOSE TESTS REQUIRED TO LOCATE FAULTY SUBASSEMBLIES 3A1A1 OR 3A1A2 |
| AB | BY REPLACEMENT OF TUBES EXCEPT(3A1V1 and 3A2V1), CABLES AND KNOBS |
| AC | BY REP LACEMENT OF SUBASSEMBLIES 3A1A1 OR 3A2A1 |
| AD | BY REPLACEMENT OF 3A1A2 AND COMPONENTS MOUNTED ON MAIN CHASSIS |
| AE | THOSE ADJUSTMENTS USING TEST SET AN/GRM-63 |
| AF | THOSE TESTS REQUIRED TO LOCATE FAULTY SUBASSEMBLIES 2A3, 2A4 2A5 2A6 AND COMPONENTS MOUNTED ON MAIN CHASSIS |
| AG | THOSE TESTS REQUIRED TO LOCATE FAULTY COMPONENTS IN 2A3, 2A4, 2A5, 2A6 |
| AH | BY REPLACEMENT OF SUBASSEMBLIES 2A3, 2A4, 2A5, 2A6 AND COMPONENTS LOCATED ON MAIN CHASSIS |
| Al | THOSE TESTS REQUIRED TO LOCATE FAULTY COMPONENTS |
| AJ | BY REPLACEMENT OF COMPONENTS |
| AK | BY REPLACEMENT OF ITEM |

By Order of the Secretary of the Army:

HAROLD K. JOHNSON
*General, United States Army ~*
*Chief of Staff.*

Official:
KENNETH G. WICKHAM,
*Major General, United States Army*
*The Adjutant General.*

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| USAESC (85) | USARERDAW (13) |
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| USAAMS (2) | 11-95 | 17 | |
| USAARMS (2) | 11-97 | 27 | |

*NG.* State AG (3)
USAR: None
For explanation of abbreviations used see AR 320 50

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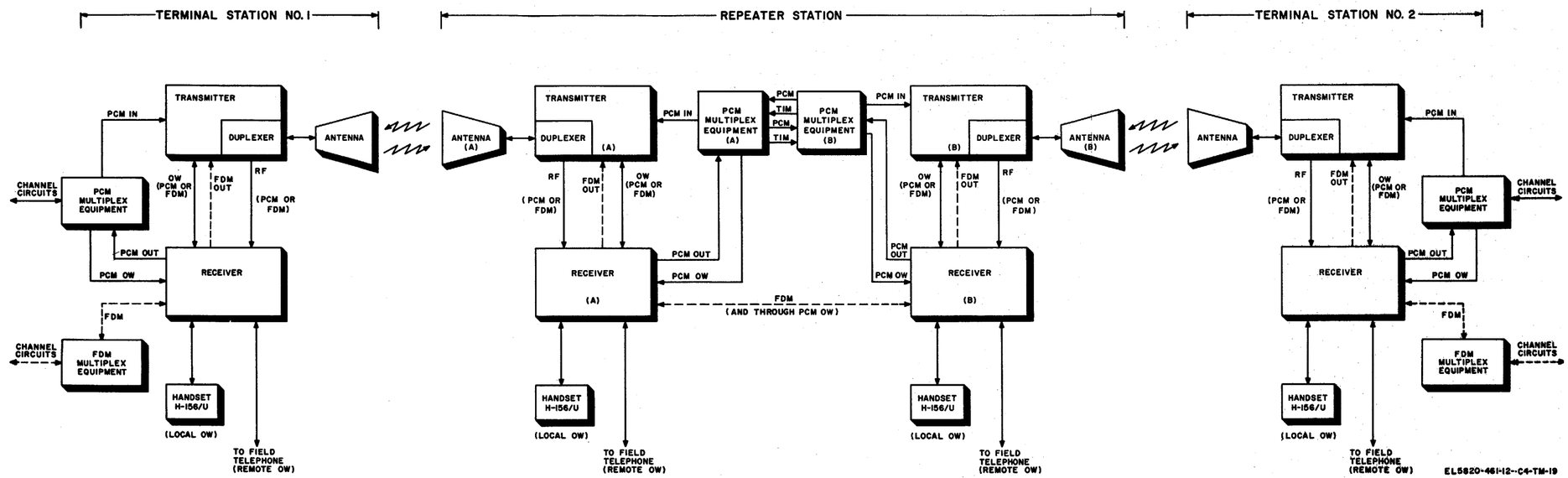



Figure 6-1. Radio Set AN/GRC-50 (*) V, repeater system application

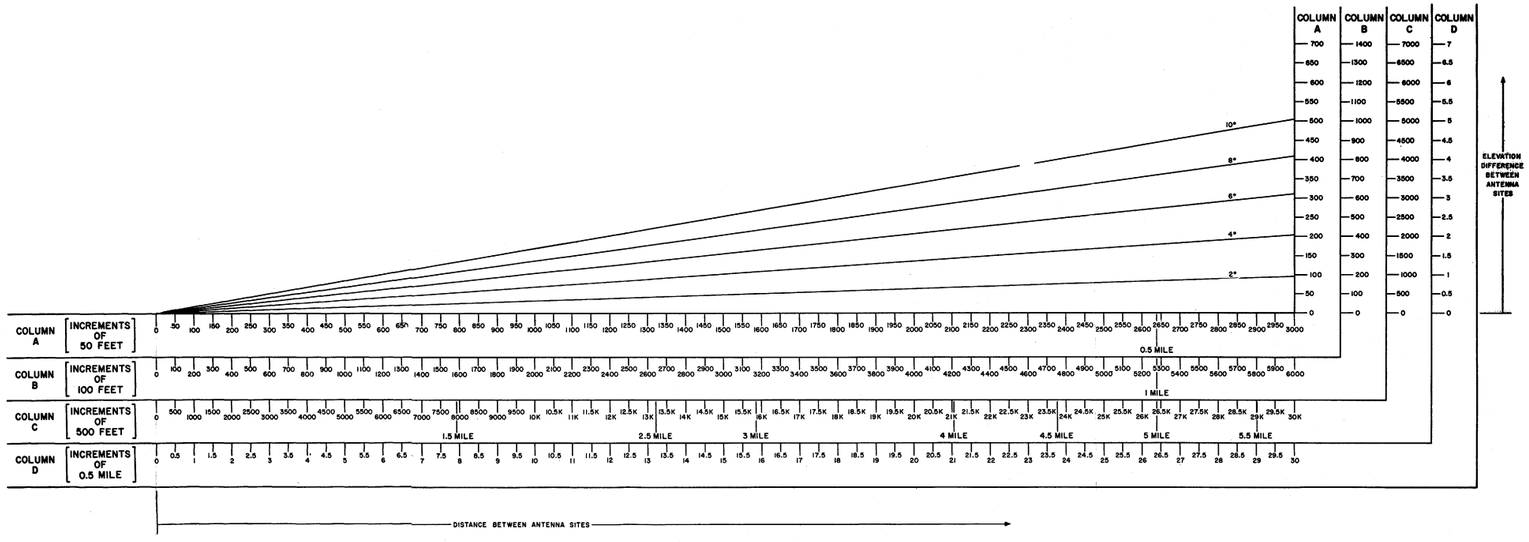
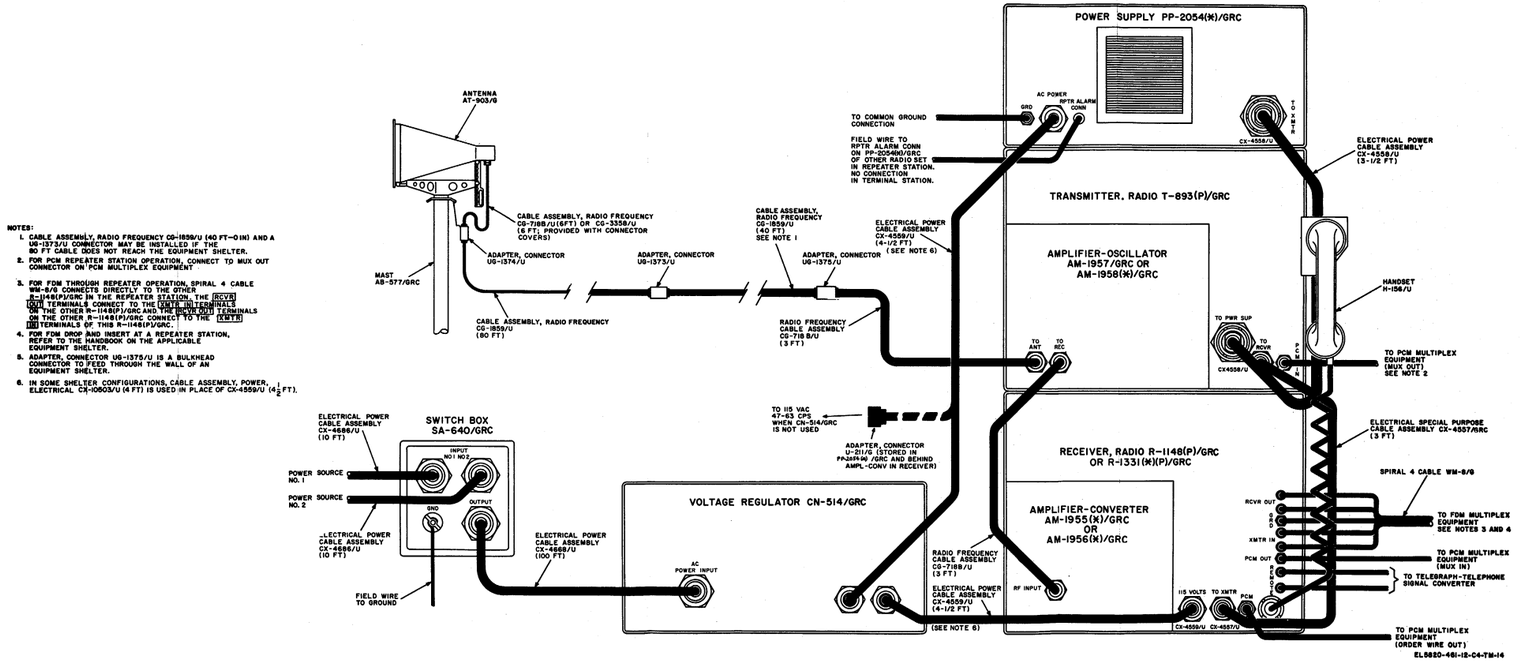



Figure 6-2. Antenna depression-elevation angles




NOTES:

1. CABLE ASSEMBLY, RADIO FREQUENCY CG-1859/U (80 FT-0 IN) AND A UG-1373/U CONNECTOR MAY BE INSTALLED IF THE 80 FT CABLE DOES NOT REACH THE EQUIPMENT SHELTER.
2. FOR PCM REPEATER STATION OPERATION, CONNECT TO MUX OUT CONNECTOR ON PCM MULTIPLEX EQUIPMENT.
3. FOR FDM THROUGH REPEATER OPERATION, SPIRAL 4 CABLE WM-8/G CONNECTS DIRECTLY TO THE OTHER R-1148(P)/GRC IN THE REPEATER STATION. THE RCVR OUT TERMINALS CONNECT TO THE XMTR IN TERMINALS ON THE OTHER R-1148(P)/GRC AND THE RCVR OUT TERMINALS ON THE OTHER R-1148(P)/GRC CONNECT TO THE XMTR IN TERMINALS OF THIS R-1148(P)/GRC.
4. FOR FDM DROP AND INSERT AT A REPEATER STATION, REFER TO THE HANDBOOK ON THE APPLICABLE EQUIPMENT SHELTER.
5. ADAPTER, CONNECTOR UG-1375/U IS A BULKHEAD CONNECTOR TO FEED THROUGH THE WALL OF AN EQUIPMENT SHELTER.
6. IN SOME SHELTER CONFIGURATIONS, CABLE ASSEMBLY, POWER, ELECTRICAL CX-10603/U (4 FT) IS USED IN PLACE OF CX-4559/U (4 1/2 FT).

Figure 6-3. Typical interunit cable connections

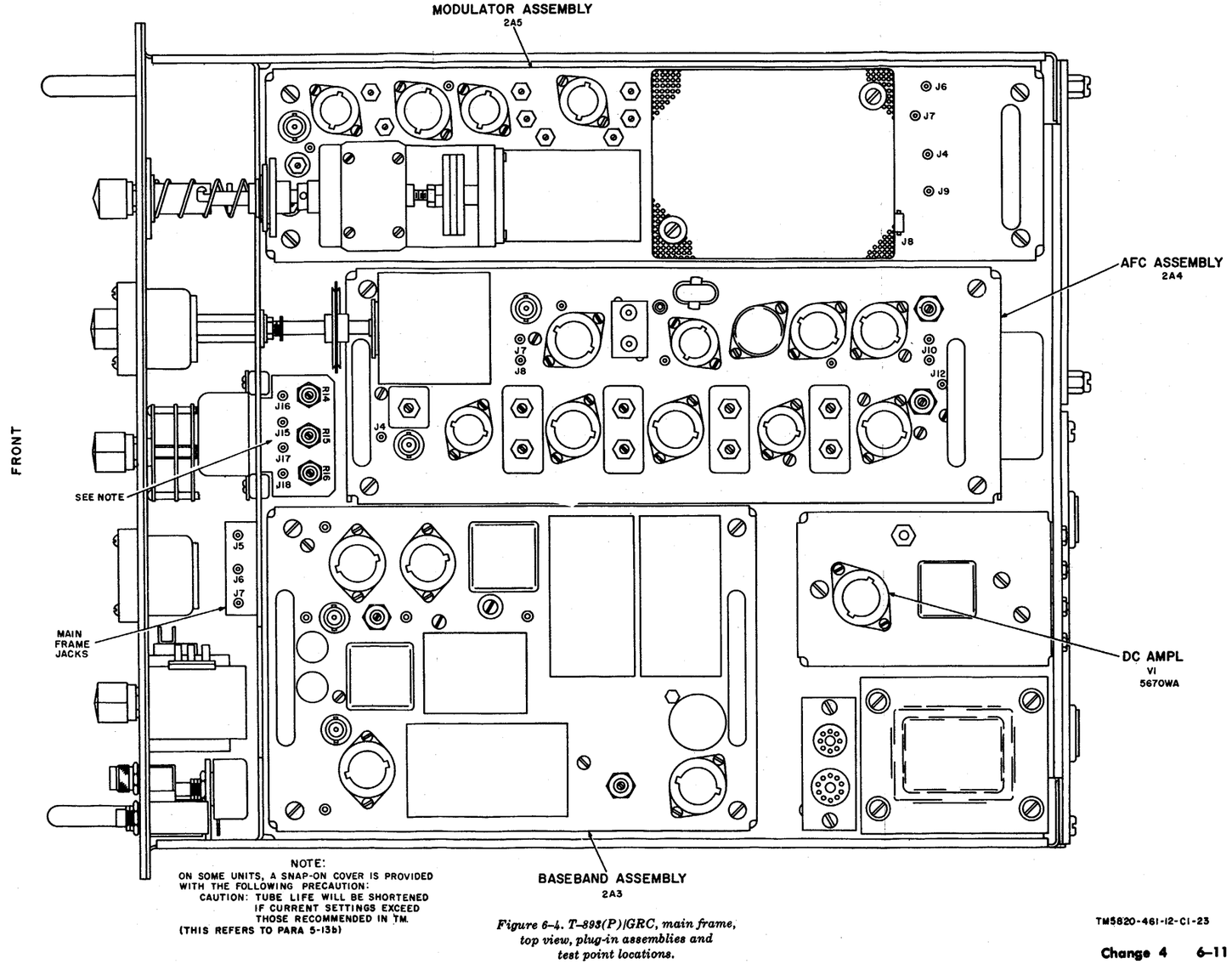



*Figure 6-4. T-893(P)/GRC, main frame, top view, plug-in assemblies and test point locations.*

TM5820-461-12-CI-25



Figure 6-4. T-893 (P)/GRC, main frame, top view, plug-in assemblies and test points

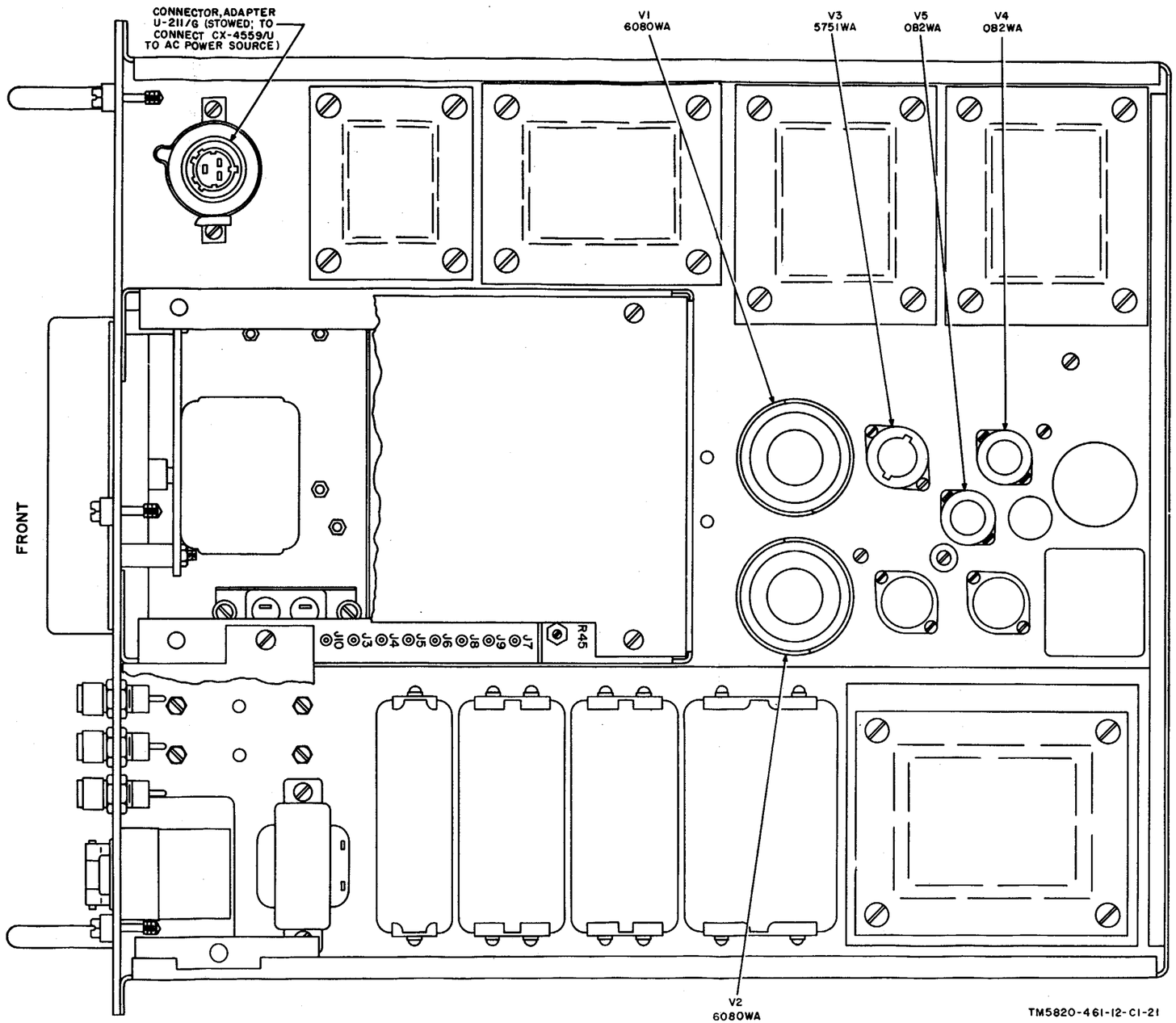



Figure 6-5. PP-2054(*)/GRC, top view, tube and test point locations

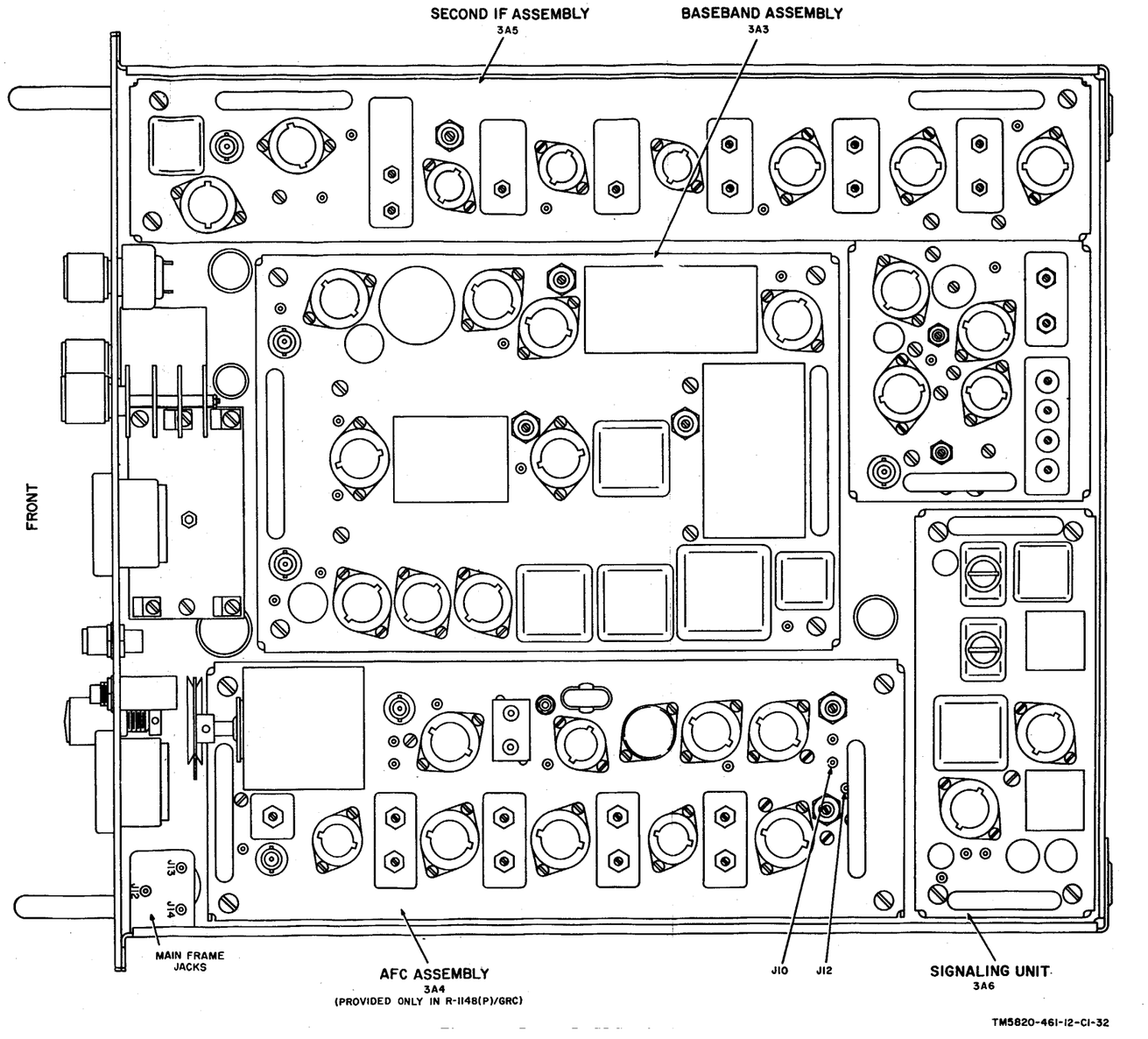



Figure 6-6. R-1148(P)/GRC or R-1331(*)(P)/GRC, top view, plug-in assemblies and test point locations

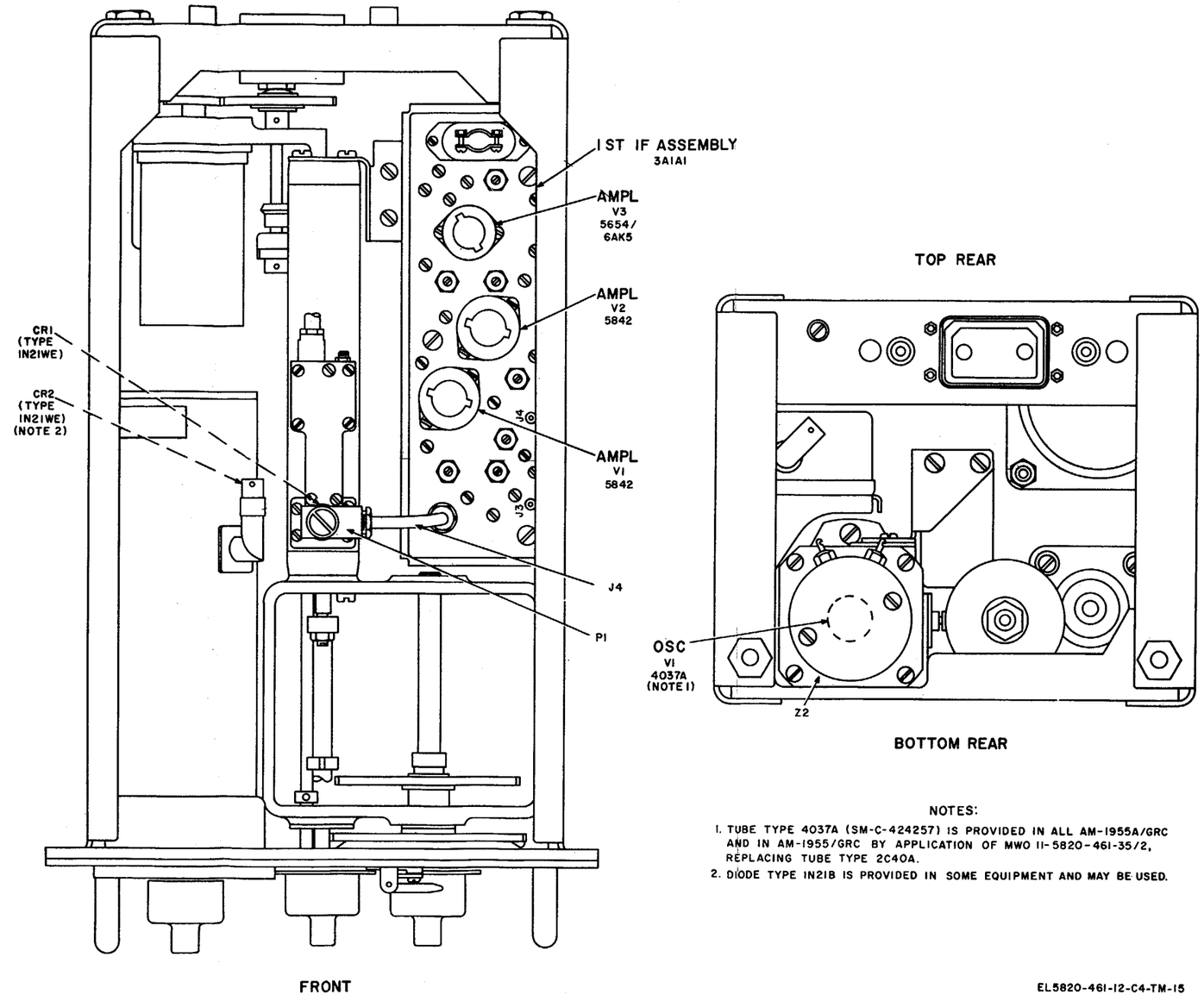



Figure 6-7. AM-1955(*)/GRC, tube and test point locations

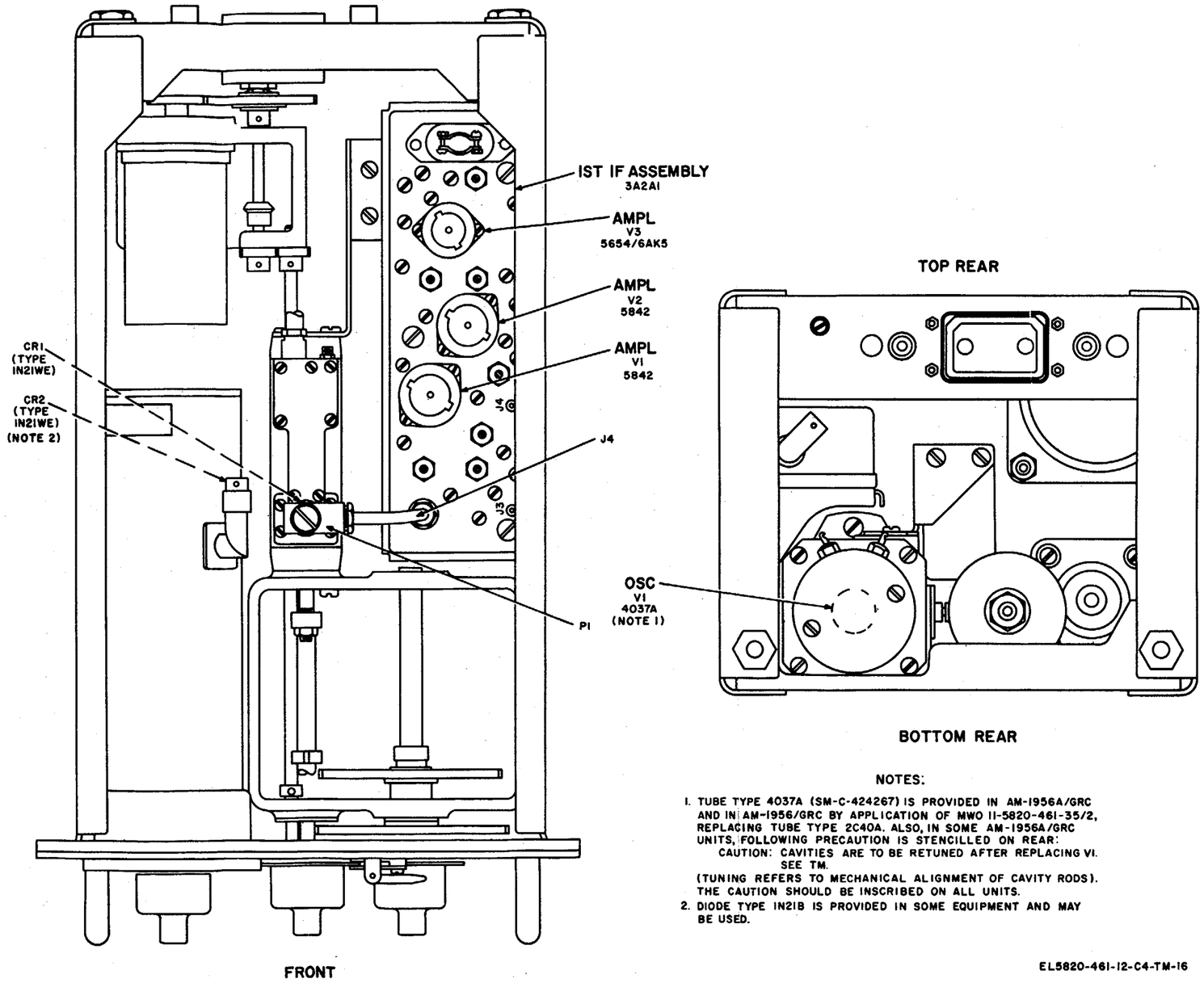
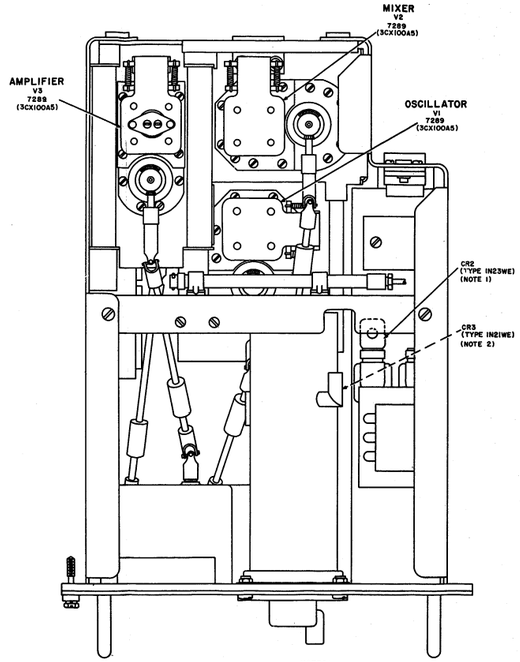



Figure 6-8. AM-1956(*)/GRC, tube and test point locations



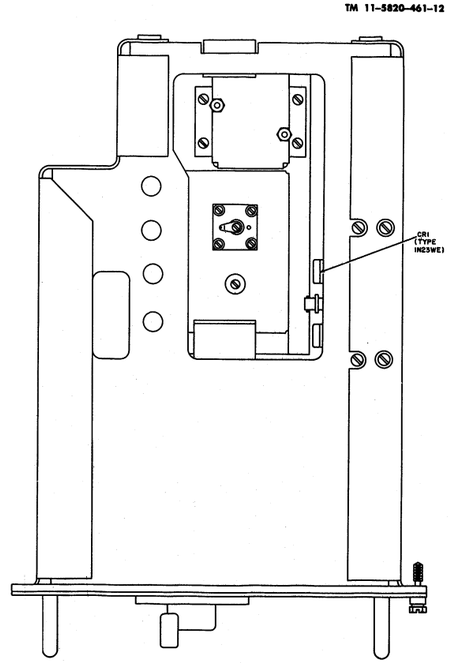




Figure 6-9. AM-1956(*)/GRC, tube and crystal diode locations.

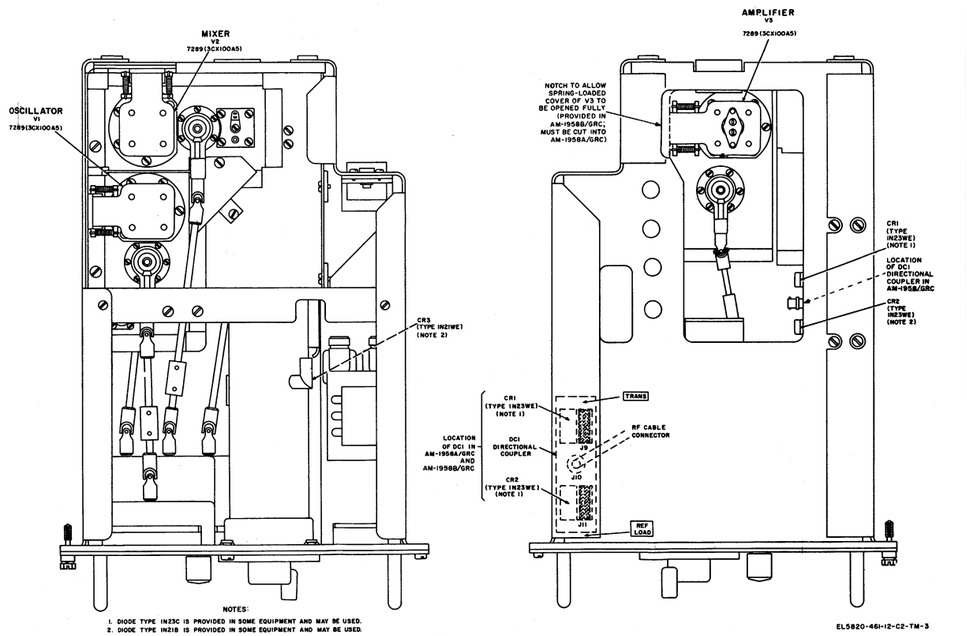



Figure 6-10. AM-1956(*)/GRC, tube and crystal diode locations.

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