

**RESTRICTED**

**Section 11**  
**'AN' AND ARMY EQUIPMENT**

**COMMUNICATION EQUIPMENT MAINTENANCE BULLETIN**

**RESTRICTED**

## SECTION II. 'AN' AND ARMY EQUIPMENT

## TYPE AM-215A/U A-F AMPLIFIER

The type AM-215A/U audio-frequency amplifier shown below is a 10-watt unit designed for communication work in conjunction with Naval electronic receiving equipment and associated loudspeakers, such as the type 49546 speaker. The amplifier should be installed in a protected location in such a manner that the power "on-off" switch, volume-control, and channel-selector are convenient to operating personnel. Mounting of the AM-215A/U amplifier may be accomplished by means of bolts through the top, back, or bottom of the case in the area shown cross-hatched in the illustration below. Input, output, and power circuits may be brought into the case by means of terminal tubes ("B", "C", and "E" sizes as applicable) in any of the cross-hatched areas providing, of course, for the method of mounting, clearance, etc.

The type AM-215A/U amplifier is very similar to the type AM-215/U amplifier previously procured. A type 12AU7 voltage amplifier and phase-inverter tube is utilized in lieu of the 6J6 installed in the older model. The over-all dimension of the type AM-215A/U amplifier are 7" deep, 12" wide, and 8 $\frac{3}{8}$ " high. The unit weighs 23 $\frac{1}{2}$  pounds and a power source of

110 to 120 volts a. c., 50/60 cps, approximately 55 watts, is required.

A quantity of 7500 type AM-215A/U amplifiers is being delivered under contract NObsr-39405.

See page AM-215/U: 2 for Figure 1. 10/1/48.

→RACK MOUNTING FOR TYPES AM-215/U  
AND AM-215A/U AUDIO-FREQUENCY  
AMPLIFIER

The Long Beach Naval Shipyard has designed a rack mounting for the Type AM-215/U Audio-Frequency Amplifier. Figure 1 illustrates the AM-215/U amplifier in the rack mounting. Construction data and fabrication information are also included in figure 1 for use by all Naval shore establishments.

This type of mounting with slight modification can also be used for the AM-215A/U amplifier. The front panel of the AM-215A/U amplifier will have to extend about  $\frac{3}{4}$  inch in front of the mounting rack to allow the front panel to be lowered and the hinge pin to be removed. For illustrations and diagrams see figure 1 on page AM-215/U: 3. 1/1/49.

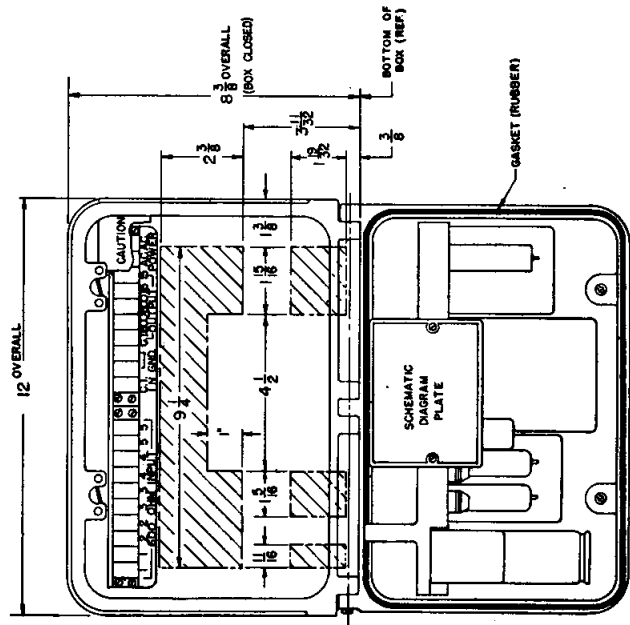
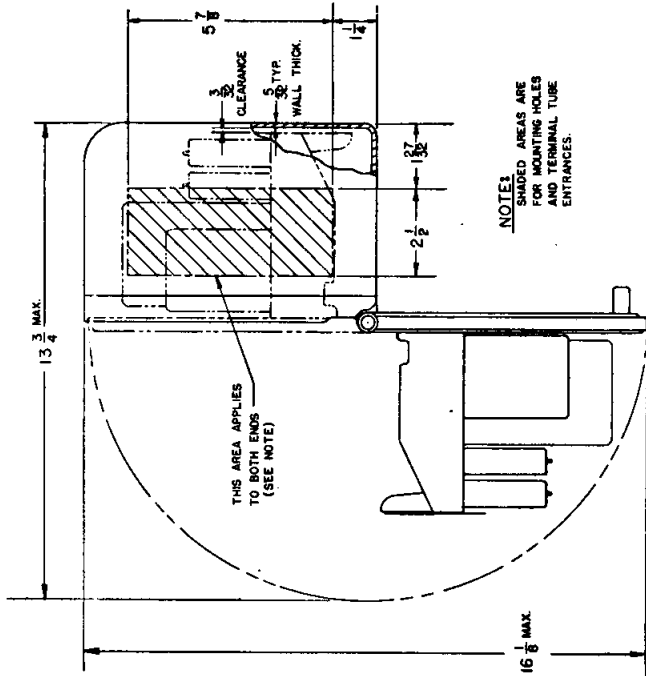
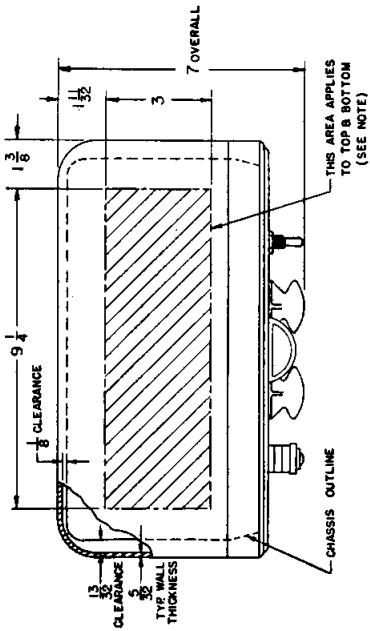
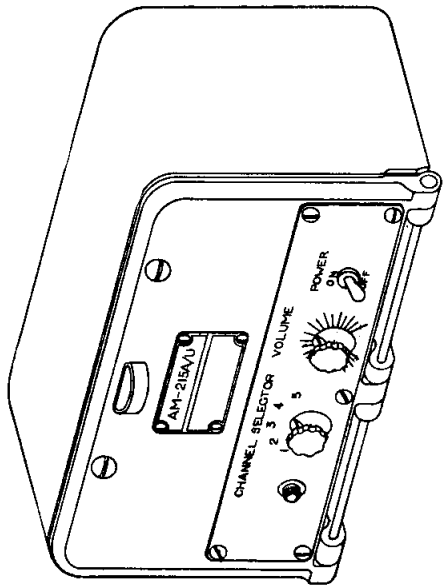


FIGURE 1.—AM-215A/U drawings for first item on page AM-215/U: 1 entitled "Type AM/215A/U A-F Amplifier".

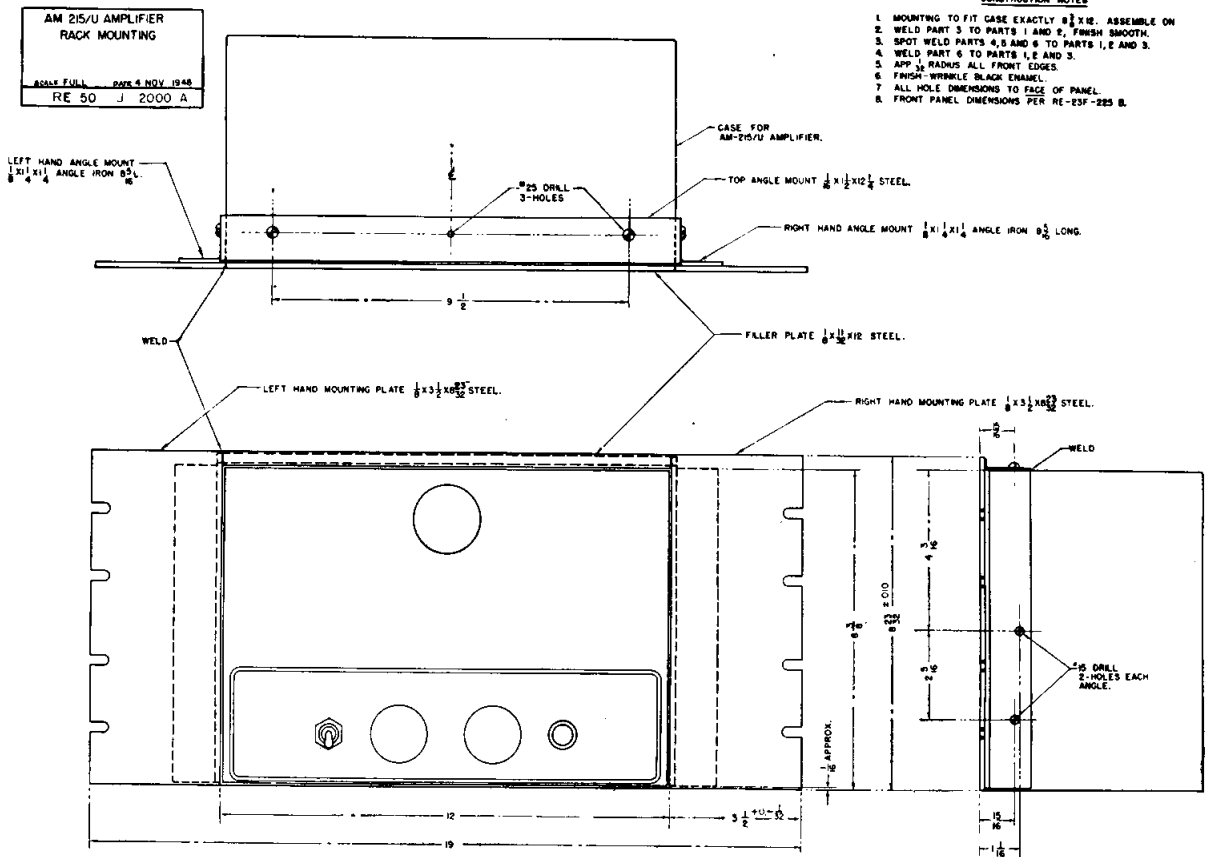
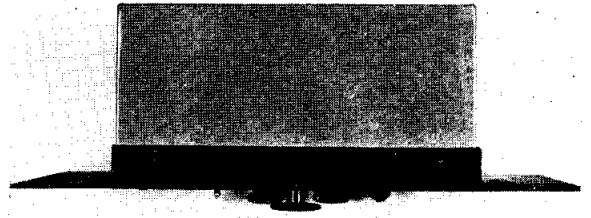


FIGURE 1.—Rack mounting for AM-215/U and AM-215A/U amplifiers. For text see Page AM-215/U : 1. ←

AN/APN-9 LORAN EQUIPMENT  
FIELD CHANGE NO. 1

IMPROVED CRYSTAL CLAMP (NO KIT)

*Equipments affected.*—All model AN/APN-9 loran equipments installed aboard ships.

*Purpose.*—To provide a more secure crystal clamp.

*Material required.*—Approximately  $5\frac{1}{2}$ " of .055" nickel-plated steel spring wire or equivalent.

*Time required.*—One man-hour.

*Procedure.*—Fabricate a reinforcing spring as shown in Figure 1. Fasten the spring under the two screws holding the crystal socket supporting bracket and hook it back of the present crystal holder spring to give added stiffness.

*General.*—Shock and vibration tests at NRL indicate that difficulty may be experienced from the crystal holder coming out of the socket. This change provides added stiffness to the crystal holder spring. Figure 1 shows

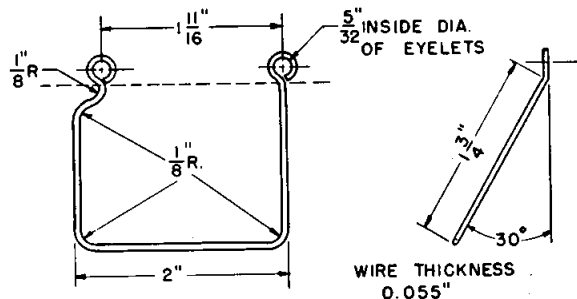


FIGURE 1.—New crystal clamp for model AN/APN-9.

how a reinforcing spring may be fabricated, if required.

This change, using available material, is within the scope of the ship's force and should be accomplished, where required, at the earliest opportunity.

A record of the completion of this change should be made on the ship's "Radio Equipment Log" NAVSHIPS 900,039. Completion of this change should be reported on the NBS-383 failure report form. 5/1/46

**ERROR IN THE INSTRUCTION BOOK FOR  
THE AN/APR-5AX EQUIPMENT**

The instruction book for the AN/APR-5AX equipment on page 8-2 lists the meter reading on the XTAL 10 MA position of the meter switch as being "at least 0.2 ma. or  $\frac{1}{60}$ th of full scale." This should read "at least 0.2 on meter scale (2.0 ma.) or  $\frac{1}{5}$ th of full scale."—11/1/45

→ **AN/APR-9A RADAR EQUIPMENTS  
FIELD CHANGE NO. 1  
INVERSION OF VIDEO OUTPUT PULSE**

Field Change No. 1, applicable to all ship-board Radar Sets AN/APR-9A operating in conjunction with the Pulse Analyzer, Model RDJ, and the Radar Direction Finder, Model DBM-1, inverts the existing positive video output pulse of the Mixer-Amplifier CV-43/APR-9A so as to provide the negative video output pulse required by the associated Pulse Analyzer and Radar Direction Finder.

Field Change Kits (SNSN F16-M-384501-960) consisting of the Field Change Bulletin, NAVSHIPS 98427, Complementary Instruc-

tions for the Instruction Book, NAVSHIPS 91510, and the Field Change Report Card, NAVSHIPS 2369, are being shipped directly to each ship having an installation of the AN/APR-9A. Additional kits are available from the Bureau of Ships.

In Radar Sets AN/APR-9A that have already been installed, changes have been made to the equipment by the installing activity to provide for the inversion of the video output pulse. These changes, in most cases, do not conform to requirements and therefore should be removed and replaced by Field Change No. 1.

When the field change has been completed, or if inspection shows that the modifications made comply with the requirements of this field change, the responsible technician should follow the routine below:

1. NAVSHIPS 2369 should be filled out to give installation data and mailed to the Bureau of Ships.

2. The field change should be recorded on the "Electronic Equipment History Card", NAVSHIPS 536, and on the "Field Record Change Card", NAVSHIPS 537. 1/1/52 ←

## AN/ARC-1 CAPACITOR FAILURE

Investigation of several failures of capacitor C-179 in AN/ARC-1 equipments has led to the conclusion that the mounting arrangement should be changed as shown in figures 1 and 2 and a capacitor with higher voltage rating substituted.

Electrical test on a quantity of these capacitors taken from the production line at Western Electric has shown that they are not adequate for this circuit application. In addition, the capacitor is mounted in the set as shown in figure

3 (plate terminal). It is believed, therefore, that the difficulty might be due either to random defective condensers or misplacement in the assembly or both.

Future equipments commencing with Western Electric serial No. 5700 and Westinghouse serial No. 11663 will be modified to avoid trouble due to misplacement of this capacitor by rearranging the terminal board on which it is mounted, as shown by figure 2, and by substituting a 200-mmfd. 500-volt capacitor.

Perhaps a warning to service men that C-179

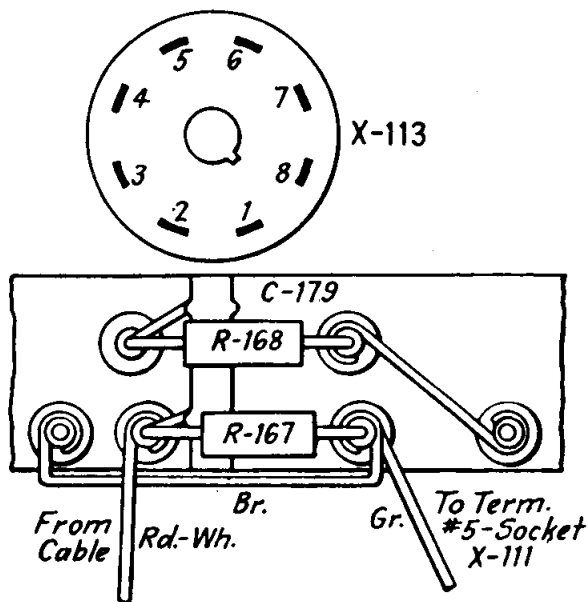


FIGURE 1.—Original arrangement.

1 and may possibly have become misplaced to such an extent that the end nearest to tube socket X-113 was actually in contact with the terminals projecting from the socket. In this case the bakelite insulation on the condenser would soon wear through and result in a contact between the grounded end of C-179 and socket terminal No. 2 (heater terminal 18 volts) or No.

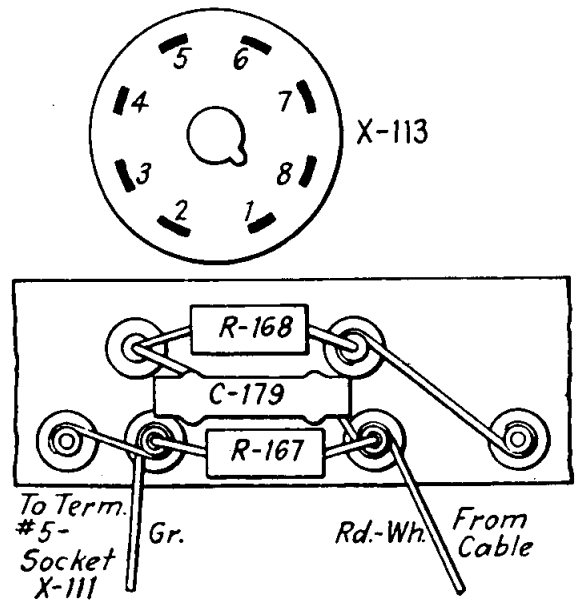


FIGURE 2.—Revised arrangement.

should have at least  $\frac{1}{8}$ " clearance from the terminal of socket X-113 is all that is warranted although the change is one that could be readily made at any repair shop. This change will also, be shown on the wiring diagram, figure 43, of the maintenance handbook when it is reissued.

### REPLACEMENT OF 6AK5 TUBES IN THE AN/ARC-1

The filaments of 6AK5 tubes have the unusual characteristic of decreasing in resistance with usage. Consequently, if a tube is being replaced in an AN/ARC-1 equipment which has been in use for some time it will also be necessary to replace the tube whose filament is in series with the filament of the bad tube. The second tube can be determined by referring to the schematic diagram in the handbook of maintenance instructions or merely by removing the bad tube from its socket with the equipment turned on and noticing what other 6AK5 tube darkens. The latter method is assuming, of course, that the filament of the bad tube is not burned out. If it is burned out, another 6AK5 will already be dark.

If the 6AK5 tubes are not replaced in pairs the tube with the most operating time will have lower filament resistance and cause excessive filament voltage to appear across the new tube with consequent failure.

### AN/ARC-1 CIRCUIT CHANGES

The Bureau has recently approved the following modifications to be incorporated in the production of transmitter RT-18/ARC-1:

(1) Addition of a 120-ohm resistor R-110 in parallel with the mixer roller coil coupling link, to prevent excessive transmitter excitation and to minimize the variation in excitation resulting from changes in frequency.

(2) Reduction of R-114 from 1500 ohms to 430 ohms, to reduce the driver grid current meter reading approximately 13 percent and prevent off-scale readings.

These resistors may be found in the AN/ARC-1 spare parts or possibly the spare parts of other equipments. If not, the nearest RMO will most likely have them.

### AN/ARC-1 TEST HINT

The Signal Corps type I-106-A indicator, part of the Signal Corps type IE-35-A supplied for servicing AN/ARC-5 VHF components, can be used rather successfully for tracing signals in the harmonic generator and harmonic amplifier sections of the AN/ARC-1 main channel.

When, as has occasionally happened, some fault exists in this section resulting in no output into the receiver or transmitter mixers it is desirable to know in which stage the trouble lies. Operation of the oscillator can be checked by reading grid drive on the harmonic generator but no such check can be made of the other stages due to the two amplifiers V-108 and V-109 operating class A.

Looping a short length of wire around the I-106-A antenna and looping the other end into the plate circuit of the stage being tested will result in an indication of RF on the I-106-A meter when the latter is tuned to frequency. The indication taken from the harmonic generator (V-107) plate may be quite small but that on each of the amplifier plates will be easily detected if those stages are operating.

### LOADING AN/ARC-1 TRANSMITTERS

A recent ACG field report suggested the following method of loading the AN/ARC-1 transmitter where input voltages are low:

The directions in the instruction book (sec. II, par. 2b, 1, i) state that the transmitter should be loaded up to the highest peak of "PA Ik" within the limits of 0.7 to 0.8 ma. That is correct if the input is 28 volts. However, with auxiliary power units sometimes encountered in the field the input voltage is considerably less and with low voltage the proper load point is at a somewhat lower meter reading. With 28 volts input the "MOD Ik" is 0.75 ma. on the meter. Therefore, no matter what the input voltage is (22-30 volts), adjusting the ANT knob for the peak of "PA Ik" nearest the "MOD Ik" reading, whatever it is at that voltage, will load the transmitter satisfactorily.



### SERVICE NOTES AND CHECKS FOR THE AN/ARC-1 EQUIPMENTS

A revision of the AN/ARC-1 Maintenance Manual, ANO8-30ARC1-3, is under preparation at the present time. The following information concerning the AN/ARC-1 transceiver is being included in the new revision. Western Electric advises that equipments in the field should be checked at the earliest opportunity and corrected, if necessary. Realignment of the equipment should not be undertaken unless it is shown to be required by means of the "Check" provided in each case. Realignment, when necessary, after repair or tube replacement, can usually be satisfactorily accomplished by a slight readjustment of the circuits immediately concerned.

#### Frequency Selector

Troubles which have been reported include the following:

- (1) Failure of relay K-102 to operate.
- (2) Motor brake sticking.
- (3) Binding of control unit bearing.
- (4) Grounding of relay K-102 flexible leads.
- (5) Loose sprocket on motor shaft.

**CAUTION:** If frequency selector fails to operate, immediately remove power from the set.

Items (1) and (2): These have been experienced occasionally in sets which have been in storage and not operated for a prolonged period of time. When such a set is placed in operation, determine immediately whether or not the frequency selector is functioning properly. If the selector fails to operate, proceed as follows:

- (a) Remove power immediately.
- (b) With power off, rotate the motor armature by hand. There will be a drag due to the brake but it should be possible to rotate the shaft. This will release any adhesion of the brake and once released, it will continue to operate satisfactorily.
- (c) Reapply power and if selector still does not operate, manipulate the relay armature with an insulated prod or stick. The selector will operate immediately if the relay was at fault.
- (d) Once operated, the relay will probably continue to function satisfactorily. However, as a precaution, add a drop of AN-O-4 oil at the hinge point.

(e) If the selector does not operate after the above procedure, a complete check must be made for other causes of failure.

Item (3): Instances of motor burnouts have been attributed to binding of the shaft in the control head bearing of the selector. This bearing is being redesigned to eliminate this difficulty. As a precautionary measure, after approximately every 20 hours use, this shaft should be lubricated at the following points in the following manner:

(a) Add three drops of AN-O-4 oil, or other low temperature instrument oil, to steel washer with eye dropped or match stick. Add four drops of AN-O-4 oil, or other low temperature instrument oil, to shaft at top of gear. Do not allow any oil to come in contact with bakelite clutch.

Item (4): In some sets, the flexible leads connecting the movable contacts on the relay K-102 to the fixed terminal strip were dressed in such manner as to abrade and ground against adjacent metallic parts. The relays having wire insulated with green silk covering are particularly subject to such abrasion. Sets beyond serial numbers Western Electric 5000 and Westinghouse 11000 have all been dressed properly at the factory, but if this unit is removed for repair, care should be taken in replacing it to see that adequate clearance is observed at this point. If a motor burns out, the equipment should be examined for possibility of grounding of these leads as the cause.

#### Failure of Oscillator Drive

Loss of oscillator drive has been reported due to moisture absorption in the insulating liner of the shield of the crystal switch S-101A. If difficulty from this source is suspected, the insulating liner should be thoroughly dried and painted with Bureau of Ordnance #OS-1433, type B quick drying varnish or glyptol. Two coats should be applied, allowing one hour drying time between coats, making certain that the edges as well as the exposed surfaces of the insulator are completely covered with varnish. The edge flaps, if loosened from the shield, should be readhered with the varnish, applying some to the back side of the flap.

Sets beyond Western Electric serial Nos. 30100 and Westinghouse 19100 will be insulated with three separate phenol fibre sheets which do not require this protective treatment.

#### Protection for Resistor Mounting Strip

There have been sets shipped to the field, serial numbers unknown, in which the rivets affixing an insulating separator to the chassis are located so as to come dangerously close to live terminals on the resistor strip feeding the modulator audio amplifier tubes V110, V111, V112 and V113. (See Figure 1.) This condi-

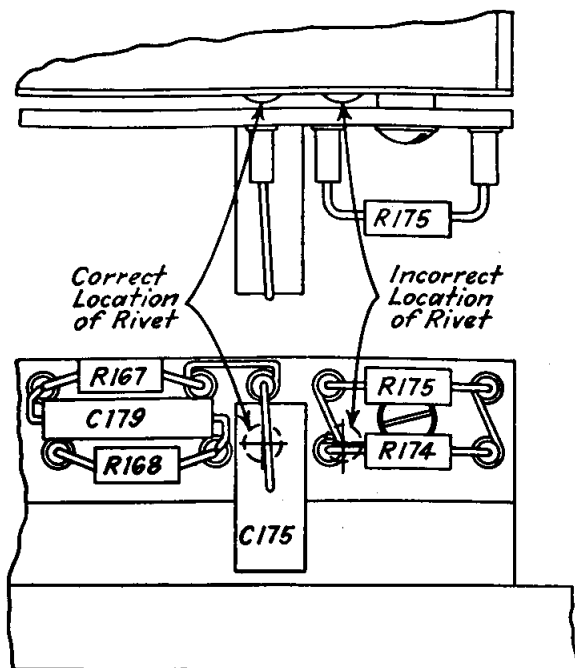


FIGURE 1.—Protection for resistor mounting strip in AN/ARC-1 equipments.

tion is present in occasional sets up to current production but will not be found in sets beyond Western Electric 28000 or Westinghouse 7850. To eliminate difficulties which might arise from this source, part BA-40,789 consisting of a  $\frac{1}{32}$  inch thick phenol fiber insulator strip with properly located holes will be furnished to all service activities for general distribution. This strip should be inserted between the existing riveted-on insulator and the resistor strip which is done by removing the three screws mounting the resistor strip, slipping the new

insulator under the resistor strip until the edges conform, and restoring the three screws. Many sets are already provided with this insulator or a spacing washer and will not require any change. Examine sets not equipped with the extra insulator or spacing washer and if a rivet appears in the incorrect location as shown in Figure 1, it is an indication that an insulator strip should be inserted to avoid contact. In the correct location, no modification is necessary.

#### Grounding of Oscillator Plate Lead

The flat strap connection between the oscillator plate and the main channel harmonic amplifier has been found grounded on the shield in some sets. Where this condition is suspected, inspect by removing the oscillator cover and make certain this lead is cleared of ground as it passes through the oscillator shield. If resistor R-146 is burned out, grounding of this connection is usually the cause. In sets beyond Western Electric 29471 and Westinghouse 18300 the hole in the oscillator shield has been enlarged so as to minimize the possibility of this difficulty.

#### Transmitter Alignment

This check assumes that the selector heads have been adjusted for all channels in accordance with operating instructions prior to the start of this test. Results as indicated should be obtained on all channels; however, it should normally be satisfactory to check only channels 1, 4, 9, and GC. When the primary voltage differs from 28 volts, the test meter readings will differ somewhat from those in the table at the end of this article. However, satisfactory operation can be obtained if the antenna autotune head is adjusted so as to get a PA  $I_k$  peak reading equal to or slightly less than MOD  $I_k$  test meter reading.

(1) With the antenna circuit detuned, adjust the TRANS selector head for maximum PA  $I_g$  current and note the meter reading. Readjust the TRANS selector head slightly for minimum PA  $I_k$  current and again note the PA  $I_g$  current; it should not be less than 50 percent of the reading obtained when the selector head was adjusted for maximum PA  $I_g$  current.

(2) The minimum PA  $I_k$  current obtained in the preceding test should not exceed 0.58 as indicated on the meter.

(3) With the TRANS selector head adjusted as described above and with the ANT selector head adjusted in accordance with the operating instructions and with the dummy antenna or the plane's antenna coupled to the set, the PA  $I_g$  current should be at least 0.3 as indicated on the meter.

TABLE

Circuit	Meter Indication (milliamperes)
Osc $I_G$ .....	0.1-0.2
Mix $I_G$ (trans. off).....	0.2 min.
Mix $I_G$ (trans. on).....	0.35-0.65
Driver $I_G$ .....	0.0-1.0
PA $I_G$ .....	0.3-1.0
PA $I_k$ .....	0.6-0.8
Mod $I_k$ .....	0.6-0.8

—Digest Airborne Radio and Radar News.

### SUGGESTIONS FOR ISOLATING TROUBLE IN AN/ARC-1 EQUIPMENTS

When routine tests have failed, the following suggestions may aid in isolating the trouble:

(1) If the set fails to track properly after alignment, check REC and TRANS selector heads to see that they are both set for the frequency giving greatest MIX  $I_g$ ; then check harmonic amplifier, or transmitter output, with wave meter or Signal Corps type I-106 field strength meter to ascertain that they are delivering the eighteenth harmonic. If the frequency is found to correspond to the seventeenth or nineteenth harmonic, the oscillator, harmonic generator and harmonic amplifiers should be realigned and the alignment of the transmitter should be checked.

(2) If the MIX  $I_g$  current is low, check the voltage on the grid of V-107 using an electronic voltmeter with a 100,000 ohm resistor in series with one lead. If the reading is less than 20 volts, the trouble may be due to tracking choke L-131 in the 2F oscillator. There may be no apparent damage to the coil beyond scratched enamel, etc., and it may check OK but still func-

tion improperly. Try replacing the coil. Condenser C-143 may also be faulty and replacement should be tried.

(3) If harmonic generator output is weak or dead, check the coupling condenser in the affected stage. C-146, C-154, C-161 and C-166 are the chief offenders.

(4) After removing shortened 6AK5's or replacing bypass condensers, be certain to inspect or replace the 1/2-watt resistors in the screen and plate circuits. They usually have become overloaded and have changed in value. This is also true of the guard channel.

(5) If tubes V-108 or V-109 go flat or burn out, check the 500-mmfd. condensers C-331 and C-328. A defective condenser raises the filament voltage. (This is possible in any of the filament circuits.)

(6) The field strength indicator Signal Corps type I-106 can serve as a very efficient combination signal chaser and aligning device for the harmonic generator provided the indicator is supplied with a good crystal. One activity has built a separate power unit and tuning head jig. The harmonic generator can be removed from the set, repaired, calibrated, and tuned up on the bench and replaced in the set in much less time than would otherwise be required.

(7) If transmitter fails to align on or below channel four, check r-f plate chokes for open windings.

(8) If the driver tube fails to respond, check cathode resistors R-115 and R-116. Damaged resistors may increase to about twice their original value. If they are high in value, the tube has probably experienced very high cathode current which is likely to recur. Replace the resistors and the tube.

(9) If the driver or power-amplifier grid-current is low, check the 10-mmfd. coupling condensers C-116, C-117, C-124, and C-125; watch for the one that heats up and "sweats." Check the voltage from pins 6 and 2 on the 832A tube to ground. If there is a large difference between the two voltages, replace the condenser on the side that reads lowest.

(10) If transmitter checks OK except for erratic or zero output, the fault may be in the

antenna relay K-101. Erratic output may be due to poor adjustment. If output is zero, rotate antenna selector head slowly noting peak PA  $I_k$  values which will all be substantially alike if the relay fails to close on the transmitter side. Check for open coil, frozen bearing, misadjustment, or loose contact. Also check for light roller contact on T-105 and open or short circuit in transmission lines and plugs.

(11) If receiver loses sensitivity at times up to 75 to 100 microvolts (after the usual adjustment), again check antenna relay contact points on receive position, etc. If relay checks OK, test the voltage from ground to the junction between R-274 and R-278 with SENS control in maximum position. This should be between 2.1 and 2.7 volts. If it is outside these limits, check the values of R-273 and R-278 which should be 10,000 ohms plus or minus 5 percent and 430,000 ohms plus or minus 5 percent, respectively.

(12) If the autotune cycles in one direction only and fails to reverse, it is an indication of continuous ground on the reversing relay coil. This may be due to one of the following causes:

(a) There may be accidental grounding of one of the control leads either in the set, in the control unit or in the external wiring.

(b) The pin terminating the tension springs on the motor control clutch band may have slipped exposing a knurled portion of the pin. This may prevent actuation of the limit switch, S-103B, thereby holding the relay operated.

(c) On early sets there was close clearance between the ground side of the K-102 relay coil and apparatus on the front jack panel. Contact at this point may be the cause of failure.

(13) If the autotune is erratic in operation on certain channels only, check the corresponding slots in the cam drum for burrs, improper fit, etc. Also check for freedom of movement of the pawl spring in the slot at the end of the pawl.

(14) If the autotune motor continues to operate, it may be that the main drive sprocket has become loose requiring a tightening of the set screws.

(15) If mixer tubes are short-lived or continually go flat, check for high filament voltage. Condenser C-330 has been an offender.

#### PLUG AND RECEPTACLE FOR USE IN SERVICING AN/ARC-1 EQUIPMENTS

In cases where it is necessary to remove an AN/ARC-1 equipment from its mounting base for servicing, facilities for connection to the power source and control unit are not usually available. The Bureau has, therefore, procured a quantity of plugs and receptacles, identical to the termination plug of the transmitter-receiver (symbol P-101, Cannon DP-D32-34) and the receptacle in the mounting base (symbol J-104, Cannon DP-D32-33) so that a connecting cable with the plug on one end and the receptacle on the other end may be made up. When the transmitter-receiver is removed from the mounting rack the receptacle end of the cable may be plugged into the plug of the transmitter-receiver and the plug end may be plugged into the receptacle of the mounting base. In making up the connecting cable, it is suggested that individual wiring be used and placed in a flexible conduit, or laced, as it would then be more flexible than solid cable. The length of the connecting cable would depend upon the distance from the mounting base to the transmitter-receiver after it has been removed for servicing and it is suggested that the connecting cable be made about 6 feet long.

Plugs and receptacles may be requisitioned from supply activities at NYNYK, NYMI, and NYPEARL.

#### GENERAL INFORMATION ON THE ADJUSTMENT OF THE RECEIVER OF MODEL AN/ARC-1 EQUIPMENT

**Guard Channel:** The guard channel is adjusted by the manufacturer for operation on the carrier frequency specified in the contract.

**Main Channel:** The heterodyne frequency generator was properly set for the ten channels in the process of tuning the radio transmitter. Since the capacitor which tunes the radio receiver main channel is mechanically ganged to the capacitor which tunes the heterodyne frequency generator, the radio receiver main channel will be completely tuned when the radio transmitter has been tuned as prescribed above.

—ARMN

### ADJUSTMENT OF THE AN/ARC-1 RECEIVER'S SENSITIVITY CONTROL

The sensitivity control, R-274, is a 10,000-ohm potentiometer which varies the grid bias of the r-f and l-f amplifiers of the main channel receiver and r-f amplifier of the guard channel. Sensitivity is maximum with minimum resistance, that is, when the control is fully clockwise. It would be fine to have a sensitivity of one or two microvolts all the time except that the listener's ears would suffer until a signal came in to override the ignition and generator hash. Thus it is necessary to back off the sensitivity control just enough to activate the squelch and cut out the noise but not so much as to eliminate weak signals. If the following procedure is used the maximum reception distance will be realized with the minimum discomfort due to noise.

With the radio transmitter-receiver turned on, unlock the SENS control. Turn to the highest assigned frequency or the channel with the highest noise and, with the GUARD-MAIN switch in the BOTH position, reproduce as far as possible the normal conditions which produce electrical noise. For instance, energize any other rotating or vibrating equipment. Adjust the SENS control for maximum sensitivity by rotating the control shaft completely in a clockwise direction, and then rotate the shaft slowly in a counterclockwise direction until the squelch circuit operates to silence the audio output. Observe the position of the screw-driver slot in the control shaft, and then turn the shaft approximately five degrees farther in a counter-clockwise direction. Now lock the control shaft without disturbing the setting.

—ARMN

### I-F AMPLIFIER CHANGE IN AN/ARC-1 VHF RECEIVING EQUIPMENT

The performance of certain models of the AN/ARC-1 VHF radio receiving equipment has been adversely affected by instability in the i-f amplifier as far as regeneration and bandwidth are concerned. Some activities have attempted to overcome this difficulty by detuning one or more i-f stages. This expedient stabilizes

the amplifier but results in undesirable broadening of the response band of the receiver.

To solve the problem, the manufacturers are incorporating a parallel R-C filter in series with the control grid leads of the second and third i-f amplifier tubes in all models subsequent to serial numbers CW 26550 and CAY 16580. The filter acts as a voltage divider to reduce the gain to the point where the amplifier may be lined up "on the nose" and the band pass characteristics preserved.

Activities serving equipment containing these filters are cautioned not to remove them. The i-f alignment of these sets is normal and is covered in the AN/ARC-1 Maintenance Handbook, AN-08-30ARC1-3 dated 26 April 1944. A revised maintenance handbook to be released shortly will show the addition of the filters.

Models of the AN/ARC-1 equipment which have not been so modified and which exhibit instability or regeneration in the i-f amplifier may be modified by service activities having the necessary facilities. The materials required for modifying each AN/ARC-1 equipment are two 330,000-ohm  $\frac{1}{4}$ - or  $\frac{1}{2}$ -watt resistors and two condensers (midget mica), each having a capacity of from 16 to 18 mmfd. The modification procedure follows:

(1) A parallel R-C filter is made from one condenser and one resistor. One filter is inserted in series with the control grid lead to V-117 (the second i-f amplifier tube), and the other filter is inserted in series with the control grid lead to V-118 (the third i-f amplifier tube). The filters are wired into the circuit as near the tube sockets as practical. Care must be taken to make good connections and all excess solder or flux must be removed. The amplifier should then be realigned following the procedure given on page 5-20 of the AN/ARC-1 Maintenance Handbook, AN-08-30ARC1-3.

—ACG Digest

### PARASITICS IN THE AN/ARC-1 EQUIPMENTS

If the output of an early model AN/ARC-1, when properly tuned, drops off when positioning the meter switch to read "Driver I<sub>g</sub>" with the meter in the circuit, and if no circuit defi-

ciencies are observed, the chances are that the parasitic oscillations are present. The final check for determining if a parasitic oscillation does exist is to remove the crystal and tune the final amplifier for any indication of plate current. If any parasitics are found, it is recommended that a 100-mmfd. condenser be placed across R-114. On equipments built by Western Electric starting with serial number 1000 and Westinghouse serial number 8750 these condensers are already installed and are designated C-134.

—ARMN

#### ELIMINATION OF R-F "HASH" PRODUCED BY AN/ARC-1 DYNAMOTOR IN ASSOCIATED EQUIPMENTS

Recent tests have indicated that radio-frequency noise emanating from the dynamotor of AN/ARC-1 equipment may produce interference in associated equipment. The dynamotor noise is apparently radiated (rather than conducted) by the power input leads where no shielded cable is used, because the interference disappears when the antenna is disconnected from the receiver.

The Naval Research Laboratory has been able to reduce this interference to a negligible level by the insertion of a 4-mfd., 50-volt condenser in the back of rack, MT-100/ARC-1, connected between terminal 1 of J-403 and ground.

#### IMPROVED CRYSTAL SOCKETS FOR AN/ARC-1 EQUIPMENTS

Numerous failure reports from the field indicate that the yellow moulded bakelite crystal sockets X-201 used in the AN/ARC-1 transmitter-receiver are structurally weak and unsuitable for use aboard ship.

To solve the problem, late model sets are being equipped with new black high impact strength bakelite sockets.

—ARMN-13

#### AN/ARC-1 TUNING DIFFICULTIES DUE TO OLD STYLE NATIONAL UNION 832A TUBES

Reports reaching BuShips indicate that some difficulty has been experienced in tuning the AN/ARC-1 transmitter when certain old National Union 832A type tubes are used in the final stage. One manifestation of this trouble is that when the p-a tank circuit is tuned, the dial reading of the tuning head does not agree with that given in tune-up procedures. Another is that sometimes the circuit will not track at all with the circuits ahead of it, without retracking the whole transmitter.

This trouble is caused by the inter-electrode capacity in some of the older National Union tubes which may be sufficiently low to throw the circuit out of the range of the associated trimmer capacitors and inductances.

At present there are not enough 832A tubes available to permit wholesale withdrawal for AN/ARC-1. Hence, it is necessary, and not in all cases undesirable, to use the old National Union tubes. In situations where the final amplifier will track at all, the actual reading of the tuning head dial is not of great importance and it is recommended that the circuit be tuned even though the dial reading is off. However, if it will not track, without retracking the rest of the transmitter, it is recommended that other tubes be tried until one is found which will permit tracking of the final.

—ACG Digest

#### AN/ARC-1 MISTRACKING

Recent experience with the AN/ARC-1 equipment has indicated that mistracking of the transmitter can occur, if, during the alignment process, the antenna circuit is not properly detuned. This difficulty is evident when the PA IG test meter current is reduced to less than 0.3 ma. with the antenna detuned and the transmitter tuned for minimum PA IK meter current, as called for in Section 2, Paragraphs 2b, 4, f and 2b, 4, g of the maintenance and operating handbook. It is believed that some

equipments have been delivered to the field in this condition.

In realigning such equipments in the field, the antenna circuit should be detuned to a point giving a minimum of current in the phantom antenna, as called for in Section 5, Paragraph 15, c, (8) of the maintenance handbook. The exact setting of the antenna dial can be found by observing both the antenna and the PA IK test meter currents, noting that between peaks of output there are regions in which the output in a minimum and in which the test meter current remains constant. The dial should be set in the center of one of these regions as an alternate for detuning the antenna circuit. This circuit may be disabled by short circuiting antenna roller coil T-105B. For this purpose a piece of thin flat spring stock bent into a U, with one side curved to ride on the slip ring on the lefthand end of the coil while the other side rests against ground, will be found useful. If, after realignment, it is found that transmitter dial settings for maximum PA IG and minimum PA IK are not in close agreement on all channels, it will be necessary to repeat the alignment with a new initial set of trimmer inductances L-112 and L-114. When the dial settings agree closely on all channels except one or more in the group 1 to 4, the separation between turns in L-112 and L-114 should be increased to about  $\frac{3}{16}$ ". If satisfactory performance is obtained on all lower number channels such as 9, the separation between turns in L-112 and L-114 should be decreased to about  $\frac{1}{2}$  its former value.

—ARMN

#### DEFECTIVE AUTOTUNE LOCKING BARS IN AN/ARC-1 EQUIPMENTS

During the assembly of AN/ARC-1 transmitter-receivers, defective locking bars for the frequency selector heads were inadvertently included in 30 of the finished units.

The defect will not become evident until numerous frequency-changing operations have occurred. Then locking the selector at the desired setting will become impossible because certain of the locking bars are too short.

The AN/ARC-1 units in which the difficulty will probably occur are in the serial number ranges from 1479 to 2278 and from 8360 to 9671. If it does occur, ascertain the serial number of the autotune mechanism. To do so, remove the set from its case, turn it over and look directly to the left of the drive motor for a red metal nameplate riveted to the frequency selector casting. On the nameplate are stamped the type and serial numbers and the legend, "Manufactured by the Collins Radio Company".

The following autotune assemblies contain one or more locking bars that are not long enough:

A11870	A12632	A13475
A11887	A12783	A13626
A12035	A12879	A13710
A12062	A12934	A13713
A12093	A13037	A13734
A12242	A13038	A13770
A12279	A13236	A13857
A12293	A13333	A13903
A12442	A13370	A14021
A12560	A13421	A14104

—ARMN

#### BURNING OUT OF MODEL AN/ARC-1 TUNING MOTORS

One of the most persistent causes of burning out of the tuning motor in model AN/ARC-1 equipments has been the shorting of the leads to the motor-reversing relay K-102 against adjacent metal parts. This supplies a ground return causing the motor to run continuously and eventually burn out.

Western Electric (CW) sets with serial numbers above 5000 and Westinghouse (CAY) sets with serial numbers above 11,000 have been inspected for proper dressing and length of these leads before shipment. However, sets in the field with lower serial numbers should be inspected by field maintenance activities as soon as possible to prevent needless failures of the tuning motors.

Whereas, proper dressing may prevent trouble for a limited length of time, there is a tendency for the leads to drift back to the dangerous posi-

tion if they are left long enough to do so. The real solution to the problem is shortening the leads so that they are not long enough to ground to the chassis or nearby metal parts.

—*Digest of Airborne Radio & Radar News*, 3-25-45.

#### REMOVAL AND REPLACEMENT OF MODEL AN/ARC-1 AUTOTUNE MOTORS

The autotune motors in the model AN/ARC-1 transceiver unit may be removed and replaced without the removal of the assembly, and more quickly and efficiently than formerly, by the following procedure:

- (1) Loosen front sub-panel that retains the metering switch. Let it hang on the leads.
- (2) Remove the type 832A tube in the final stage.
- (3) Obtain a "Phillips 90° right-angle wrench" or equivalent and remove all the motor retaining screws—behind transformer T-104, etc.
- (4) Unsolder the motor leads and draw the motor through the front panel.
- (5) Replace the motor using the above steps in reverse order. The method of permanently removing that portion of the framework adjacent to the motor, with a hacksaw, is not approved since it weakens the framework of the radio equipment.

#### SLO-BLO FUSING OF AN/ARC-4 EQUIPMENTS

The primary current requirements for this series gear differ greatly with regard to the starting and running input. A 24-volt unit has a starting peak current in excess of 20 amps., while steady state operation draws around 10.5 amperes. It is, therefore, obvious that the ordinary style fuse will have a tendency to blow, if the unit is fused for the running condition, or, if fused for the starting current, it will not give very good protection on prolonged overload conditions. The answer to this is a thermal fuse which has a definite time lag. A fifteen-ampere "Fusetron" will stand up under the starting current, which lasts only a fraction of a second, and yet on a prolonged overload that might seriously damage the gear, the fuse will open the circuit.

It is therefore recommended that a type 3AG or 4AG "Fusetron" or "Slo-Blo" or equivalent fuse with a fifteen-ampere rating be installed in the 24-volt AN/ARC-4 series gear.

For the 12-volt installations the 25-ampere fuse is recommended.

—ARMN

#### HEX WRENCHES FOR AN/ARC-5 EQUIPMENTS

Spare hex tuning wrenches for AN/ARC-5 equipments may be fabricated from a half-inch length of aluminum tubing of  $\frac{3}{16}$ " inside diameter, a  $\frac{3}{16}$ " Allen wrench tapered back about  $\frac{1}{8}$ " from the end by filing, and a dowel or handle of fibre, wood, or other dielectric material. The ends of the aluminum tubing should have the burrs removed and should be filed smooth.

The Allen wrench is clamped in a vise and the tubing driven over the end down past the tapered portion. The wrench with the tubing still on it is rolled on an anvil and lightly hammered until a perfect fit is obtained. Next the aluminum tubing is slipped off the wrench and driven over the end of the wood or fibre dowel by drilling a hole through both and using a piece of copper wire as a rivet to hold the tubing tight.

#### AN/ARC-5 FAILURE DUE TO POSITIONING OF SHELF SUPPORTING H-F GENERATOR TUBES

Reports have been received describing a condition in AN/ARC-5 receivers with serial numbers between 3000 and 10,000 which may produce a strain on the condenser rotor shafts and which, in serious cases, may cause failure of the cycling mechanism.

The trouble is brought about by the small shelf supporting the oscillator and harmonic-generator tubes. This shelf was made a trifle too long and, if not properly centered within the cabinet, it presses against the i-f. compartment putting a strain on the condenser bearings.

A visual inspection should be made of sets with serial numbers falling between 3000 and 10,000 by removing the side plates. If the shelf is pressing against the i-f. compartment, it should be loosened and moved slightly away.

—ARMN



### POOR SENSITIVITY IN M-F AND H-F RECEIVERS OF AN/ARC-5 DUE TO 12K8 MIXER TUBES

Low sensitivity in R-25/ARC-5, R-26/ARC-5, and R-27/ARC-5 receivers may be due to the 12K8 tube used as mixer. Contractors for this equipment have complained of a lack of uniformity in these tubes, and even those tubes inspected in accordance with joint Army-Navy specifications are known to cause trouble.

If low-sensitivity receivers cause difficulty in the field, satisfactory performance may be achieved by the following means:

(1) Select the 12K8 tubes giving the best performance for use in the mixer sockets of receivers R-25/ARC-5, R-26/ARC-5 and R-27/ARC-5. The tubes thus discarded may be utilized in R-23/ARC-5 receivers, or

(2) Shunt R-1, the 620-ohm 12K8 cathode resistor with a similar 620-ohm resistor, thus lowering the effective cathode resistance to 310 ohms.

—ARMN

### TUNING PRECAUTIONS WHEN USING TEST EQUIPMENT WITH THE AN/ARC-5

The use of the battery-operated buzzer in Signal Corps test set IE-35A has apparently been misunderstood in some quarters in connection with the servicing of the subject equipment.

The buzzer is used as an r-f noise generator in locations where electrical disturbances are at a very low level. It must never be used in the over-all alignment of a receiver. Its only two purposes are:

(1) The tuning of a properly aligned receiver to a new frequency. Normally, it is held near the antenna or antenna input terminal of the R-28 receiver while rocking the manual tuning dial at the approximate frequency as indicated on the dial. The set is tuned to the maximum noise.

(2) The antenna and/or r-f circuits are then brought into alignment with the set in place and connected to its antenna.

The entire tuning procedure is covered on page 15, section II of the Handbook of Maintenance Instructions for Model AN/ARC-5 Radio Equipment, VHF Components.

—ARMN

### REPLACEMENT SCREWS IN SELECTOR UNIT OF AN/ARC-5 VHF RECEIVER

One difficulty with the AN/ARC-5 VHF receiver, involving the tuning mechanism, can be easily cleared up in a few moments with four screws.

In the selector unit, part number 101 or 102, the channel locking screws originally furnished were of the Allen head type. After a few adjustments, these screws tend to lose their shape. By the substitution of four  $\frac{3}{32}$  by  $\frac{7}{16}$ -inch fillister head screws for the Allen head variety, it is hoped that one of the numerous difficulties with this set will be eliminated.

—ARMN

### BAND SWITCHING MOTORS FOR AN/ARC-5 EQUIPMENTS

A report has been received from the field that band switching motors have been shipped minus lubrication. In the particular case, the lack of lubrication was observed by the activity involved. However, it would not be difficult to overlook this discrepancy which would result in bearings searing and freezing. Hence, it is recommended that replacement motors be carefully inspected before installation, and lubricated, if necessary, with a grease which meets the standard specification, AN-G3 for low-temperature operation.

—ARMN

### ERROR IN VOL. I OF THE INSTRUCTION BOOK FOR AN/ARC-5 EQUIPMENTS

An error has been found in the printing of the cabling hookup in the "Handbook of Maintenance Instructions" (AN-08-10-195 Vol. I), Figure 30 (Sheet 5 of 8). According to this diagram, on plug ARC 9821 to front of the transmitter, number 3 contact is connected to wire 50K3, ground, and number 4 contact is connected to 50K4, channel C. This is found to be reversed, and 50K3 should be connected to contact no. 4, and 50K4 should be connected to contact no. 3.

—ARMN

### RESONANCE INDICATOR FOR AN/ARC-1 RECEIVER TUNING

It is customary in receiver tune-up procedures to utilize an a-c output meter as an indication of resonance when tuning the various i-f and r-f circuits. Whereas, an a-c meter is perfectly acceptable as a resonance indicator in the AN/ARC-1 receiver tune-up process, there is available in this set a d-c voltage which is steadier and, therefore, easier to use for peaking the tuned circuits. This voltage is found between the cathode (pin 7) of the AVC detector-amplifier tube, V-129, and ground; and the same voltage appears at pin 7 of plug P-101 at the rear of the transceiver unit.

When no signal is applied to the circuit, the potential at these points is in the magnitude of plus 50 volts with respect to ground. As a signal is applied, this voltage becomes less positive and, in the presence of a strong signal, will be driven negative. Hence, if a vacuum tube voltmeter or high-resistance d-c voltmeter (20,000 ohms-per-volt) is connected between pin 7 of P-101 and ground, the i-f circuits and r-f circuits of the receiver may be peaked by tuning for a *minimum* reading on the meter. In order to avoid overloading, the level of the signal into the i-f or antenna circuits should be kept sufficiently low so that the observed voltage does not go negative.

—ARMN

### SLIPPAGE OF AN/ARC-1 TUNING CONTROLS DUE TO BACKLASH

Recent reports indicate that the alarm regarding the slippage of AN/ARC-1 tuning controls due to backlash when the set is first tuned up and recycled may be, to some extent, unjustified.

There is an allowable tolerance of 5% for the AN/ARC-1 between the meter reading when the set is originally tuned and the reading after recycling the tuning mechanism.

In the event that excessive slippage is encountered, it should be reported to the Bureau

(Code 982) in order that further investigation may be undertaken.

—ARMN

### FORCE-DRAFT VENTILATION FOR AN/ARC-1

The type aircraft generator that is made up of both an a-c generator and a d-c generator may be made to supply its own ventilation. To accomplish this, remove the forward end bell and take out the armature. Remove all mounting screws for the field windings and pry them loose from the case. Mounted on the armature is a laminated core for the a-c generator section. The core is made up of laminated poles whose blade-like surfaces are diagonal with respect to the axis of rotation of the armature and, when driven at high speed, will drive air through the casing. Using this forced ventilation, the motor-generator has been run continuously for 30 days without any trouble.—12/1/45

U. S. S. Lind (DD-703)

### DESIGN OF DUMMY ANTENNA FOR AN/ARC-1

If a dummy antenna is desired to aid in tuning the AN/ARC-1 it can be made by connecting three pilot bulbs in parallel. These bulbs can be fitted into a suitable container fitted with a plug which screws into the antenna connector. A 50-ohm load is presented when GE313, 0.17-amp., 28-volt bulbs are used.—12/1/45

U. S. S. Lind (DD-703)

### → ROTARY TEST RACK FOR MODEL AN/ARC-1 EQUIPMENT

The rotating rack for AN/ARC-1 servicing is shown in the accompanying photographs (Figures 1 and 2). This type of rack has seen wide use and is a great help whenever any sizable number of equipments are being repaired. Many activities have manufactured these units but have varied slightly from the original design. The details shown in Figure 3 are those used by NAS Pearl Harbor except for a few slight changes which reduce the amount of machine work and simplify construction.

The only external connections required are

the 28 volt d-c leads from the power source to the rack because a standard C-45/ARC-1 control box is mounted on the rack and wired directly to the 28 conductor plug (Cannon DP-D32-33) which plugs into the back of the set under test. The base plate is mounted on the bench so that the rack may be rotated through 360 degrees in a horizontal plane while the

rings and rollers permit a 360 degree rotation in the vertical plane. These features allow a set to be easily turned in any position for servicing without any interruption in power.

This method may also be made applicable to other types of shipboard electronic equipment. 6/1/46. ←

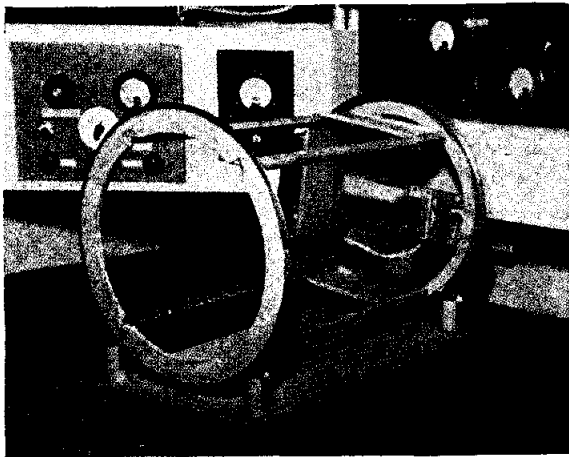


Figure 1.—AN/ARC-1 rotary test rack.

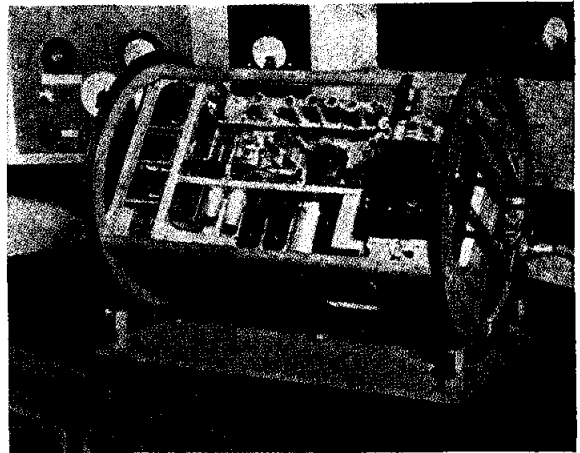
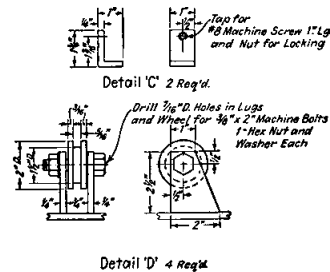
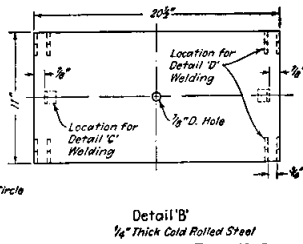
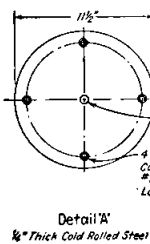
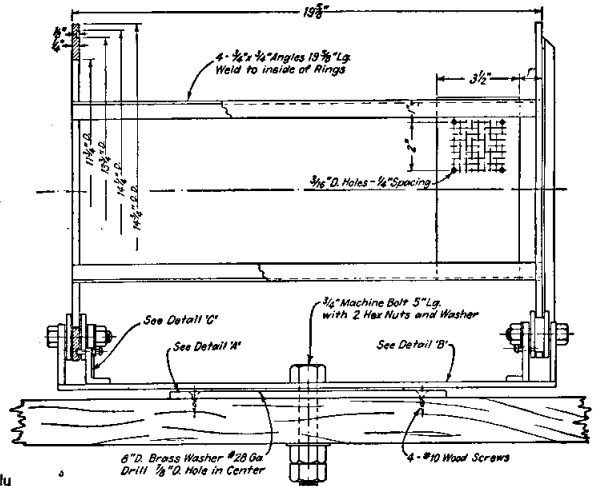
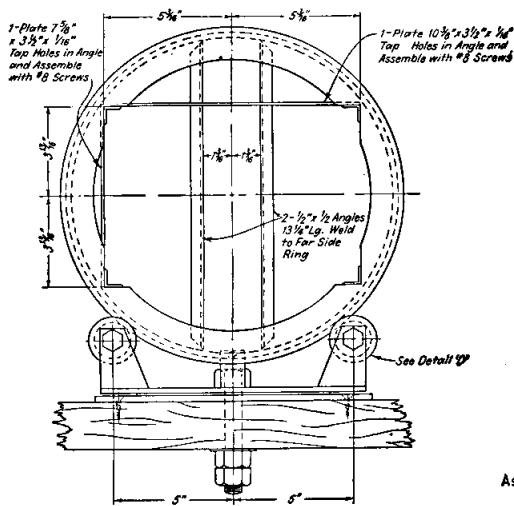


Figure 2.—An AN/ARC-1 mounted in the rotary test rack.



Note: All Materials Steel Except as noted.

Figure 3.—Detail drawing for the rotary test rack.

→ LUBRICATION DATA FOR AIRCRAFT RADIO EQUIPMENT AN/ARC-1 AND FOR RADIO SET AN/ARC-1A

AN/ARC-1 Maintenance Handbook. These lubricants should also be used with Radio Set AN/ARC-1A. The corresponding lubricants as listed in AN 16-30ARC1-7 are:

The latest Government Specification lubricants to be used and their stock numbers are given in Table 1 below for corresponding lubricants as given in the Aircraft Radio Equipment

For No.	Use
AN-O-4	AN-O-6a
AN-G-3a	AN-G-25
AN-O-6	AN-O-6a
14L3 Hard	14-L-3

TABLE 1

Handbook of maintenance instructions for AN/ARC-1, AN 08-30 ARC1-3, Section V, Page 5-8, Paragraph 8a.				Use		
Type designation	Government specification	Supplier	Name	Government specification	Stock No.	For
A		Cities Service Co.	HO-38G Oil	{AN Aero Spec. AN-O-6a	Aviation Supply Office Stock Cat. No. R14-O-2405	}1 qt. can.
B		Cities Service Co.	North Star 000 Oil	{AN Aero Spec. AN-O-6a	See above	
C	AN-6-3a	{Socony Vacuum Colonial Beacon	Mobilgrease PD-535-A M-285 Grease	{AN Aero Spec. AN-G-25	Aviation Supply Office Stock Cat. No. R14-G-982-20	}1 lb. can.
D		Fiske Brothers Co.	Lubriplate 105	{AN Aero Spec. AN-O-6a	See above	
E	AN-O-4	Esso	Aviation Instrument Oil per WS-429.	{AN Aero Spec. AN-O-6a	See above	}1 lb. can. 5 lb. can.
F	14L3 Hard	Standard Oil Co. of N. J.	Andok C	{Navy Spec. 14-L-3	Fed. Standard Stock Nos.: 14-L-84-900. 14-L-84-910.	
G	AN-O-6	Pioneer Instrument Co.	Pioneer Instrument Oil No. 1.	{AN Aero Spec. AN-O-6a	See above	

### AN/ARC-1 LUBRICATION PREVENTIVE MAINTENANCE

The following article is reprinted from the *Airborne Digest* of August 1947. Inasmuch as proper lubrication is of prime importance in the maintenance of electronic equipment, the information contained herein should be of interest to all concerned.

"Recent field reports indicate that the channel-selector drive motors on the AN/ARC-1 equipments are beginning to fail as a result of mechanical overload caused by lack of lubrication in the autotune assembly.

"The loss, through aging and use, of lubrication in the worm drive of the autotune has been the point most frequently mentioned as a source of increased friction and drag on the motor. With the aging of AN/ARC-1 equipments in service, this type of failure can be expected to increase unless immediate steps are taken by all activities servicing AN/ARC-1 equipments

to check, and lubricate where necessary, all moving parts in these equipments at regular intervals.

"The Handbook of Maintenance Instructions for the AN/ARC-1 carries detailed lubrication instructions on page 5-8 in Section 5. Since operating time logs or autotune cycling logs are not kept on these equipments, it is difficult to comply with the time intervals specified for lubrication, but this does not make the remaining instructions on lubrication impractical. The decision on when to lubricate can be made after a visual inspection of bearings and moving parts when the equipment is being serviced in the shop.

"It must be borne in mind that excessive lubrication can be as bad as no lubrication at all. Lubricant in the wrong places can act as an excellent collector of dirt and dust and help jam parts that were designed to operate without lubricant. All moving parts that are normally lubricated should be inspected at

regular intervals and, if there is sufficient oil or grease which has not become hard, caked, or dirty, and the parts are free-running, then lubrication may be omitted until the next inspection. If lubrication is required, clean off the old lubricant and dirt and apply the minimum amount of fresh lubricant to the working surfaces.

"The oil or grease must be kept from adjacent parts which are not intended to be lubricated; for example, when adding grease to the dynamotor bearings, it must be kept off the commutators. Accidental oiling of the autotune clutch would be especially harmful and would probably make the replacement of the clutch necessary." 10/1/47

### AN/ARC-1 RADIO EQUIPMENT FIELD CHANGE NO. 1

#### REDUCING RADIO INTERFERENCE CAUSED BY DYNAMOTORS

*Equipment affected.*—All model DY-9/ARC-1, DY-9A/ARC-1, and DY-9B/ARC-1 dynamotors with serial numbers prior to 89.111 (a unit of the model AN/ARC-1 radio equipment).

*Purpose.*—To reduce the radio interference caused by the dynamotors by incorporating additional filters. This field change should be accomplished at the earliest opportunity by maintenance personnel of the activity or vessel to which the affected equipment is assigned.

*Time required.*—Approximately two man-hours.

*Material required.*—The following material for this change should be requisitioned from the nearest Electronics Supply Officer:

Item	Quantity	Part and description	JAN type number
→1	1	Capacitor, fixed, mica, 10,000 mmf ±20%, 600 VDC test.	CM45A103M.
	2	Capacitor, fixed, mica, 8200 mmf ±10%, 500 VDCW.	CM40A822K.
	3	No. 16 bare (solid) copper wire.	
	4	Solder-type terminals	

*Tools and instruments required.*—All of the tools necessary to complete this change are available in the Electronics Tool Kit, type 10223.

*Procedure.*—Servicing personnel must at all times observe all safety regulations. *Do not make this field change to the equipment with high-voltage supply on.* Under certain conditions, dangerous potentials may exist in circuits with power controls in the OFF position due to charges retained by capacitors. To avoid casualties, always remove power and ground the circuits prior to touching them.

(1) Replace capacitor C-801, 3000 or 6000 mmf, with the 10,000-mmf capacitor, item 1. This capacitor is located at the low-voltage end of the dynamotor, and is connected between the low-voltage brush terminals.

(2) Install a ground lead from the negative low-voltage brush terminal to a terminal on the dynamotor "through" bolt. The lead required is an approximately 1¼-inch length of the bare copper wire, item 3. The existing terminal on the negative low-voltage brush is used to connect one end of this lead; solder-type terminals are used in making electrical connection to the dynamotor housing "through" bolt. Insure good electrical metal-to-metal contact between solder terminal and dynamotor housing by removing any dirt, paint, or other foreign material in the contact area.

(3) Install the 8200 mmf capacitors, item 2, between the high-voltage brush terminals and the dynamotor housing "through" bolt. Use existing solder terminals on the brush holders to connect one end of the capacitors, and use solder-type terminals or the equivalent to make electrical connection to the dynamotor housing "through" bolt. Insure good electrical metal-to-metal contact between solder terminal and dynamotor housing by removing any dirt, paint or other foreign material in the contact area, and by tightening nuts on both ends of the "through" bolt.

*Routine instructions.*—(1) Personnel making this field change shall record the completion of the change on the Electronic Equipment History Card, NavShips 536, and the completion

date and data on the Field Change Record Card, NavShips 537.

(2) Completion of this field change should be reported to the Bureau on the Electronic Failure Report Card (NBS) 383.

(3) The capacitor C-801 (JAN type CM-30A302M, stock No. R16-C-10326-60) removed from the dynamotor shall be properly tagged and placed in the spare-parts box for emergency use.

(4) Holders of maintenance handbook instructions AN 16-30ARC1-3 and AN 08-30ARC1-3 shall enter information relative to the above modification in respective sections of these publications as follows:

(a) Section VII, Table of Replaceable Parts, page 7-68, of AN 08-30ARC1-3 and page 7-82 of AN16-30ARC1-3.

1. In the columns pertaining to reference symbol C-801:

a. Cross out stock number "R16-C-10326-60" and insert "R16-C-33628-1231".

b. Under "description" cross out "3000" and insert "10,000".

c. Under "manufacturer" cross out "CM-30A302M" and insert "CM-45A-103M".

d. Cross out all information relative to alternate 6000 mmf capacitor.

2. Between reference symbols C-804 and D-801 insert reference symbols "C-805 and C-806". Enter the following information in the respective columns:

a. Stock number, "R16-C-10479-500".

b. Description, "Capacitor; fixed, mica dielectric, 8200 mmf  $\pm$  10%, 500 VDCW.

c. Function, "dynamotor high-voltage a-f by-pass."

d. Manufacturer, "CM-40A822K".

e. Specification "JAN-C-5".

(b) Section VIII, Drawings, Figure 42 of AN-8-30 ARC1-3 and Figure 8-6 of AN-16-30 ARC1-3, entitled "Model AN/ARC-1 Aircraft Radio Equipment, Schematic Diagram".

1. Change capacity designation under C-801 from "3000" to "10,000".

2. Insert lead from low-voltage negative brush terminal to ground.

3. Insert capacitor from positive high-voltage terminal to ground and from negative high-voltage terminal to ground. Label these capacitors C-805 and C-806, respectively. Insert capacity designation numerals "8200" under each symbol. 1/1/48

#### OUTPUT TRANSFORMERS FOR MODELS AN/ARC-1 AND SCR SERIES RADIO SETS

In order to utilize Navy type loudspeakers and amplifiers with AN/ARC-1 and certain SCR series radio equipments, it is recommended that the following transformers be installed adjacent to and connected with the respective equipments to provide proper impedance matching and balanced output to ground:

EQUIPMENT	TRANSFORMER	
	Manufacturer	Type
AN/ARC-1 and SCR-274, SCR-508, SCR-510, SCR-522, SCR-608, SCR-609, SCR- 610 and SCR-624.	Halldorson Stancor or Thordarson	E1041 A-4770 T61S25

4/1/49

#### TURN SWITCH OFF WHEN REPLACING MODEL AN/ARC-1 RADIO SETS

Heavy current flowing in power plugs will melt down and destroy connector pins when poor or intermittent contacts are permitted. This fact, true for any equipment, has been reported as occurring on the receptacle J-401 located at the rear of the mounting rack of the Model AN/ARC-1 Radio Set. The failures are considered to be due to improper installation practice, with the following factors contributing heavily:

(1) In several instances, the transmitter-receiver has been removed and installed in the

mounting base with the switch inside the front panel cover in the on position while power is still applied to the mounting base.

(2) Investigation of bent male terminals on the transmitter-receiver reveals that the terminals were engaged by the receptacle J-401 before the untapered sides of the alignment dowels fully engaged the transmitter-receiver. If the transmitter-receiver is not in proper alignment with the mounting base when installation is made, the male terminal will not be engaged properly by the receptacle J-401 and a bent terminal will result.

(3) During the installation of the transmitter-receiver, the wing nuts on the mounting base had been tightened manually in accordance with the instruction book, but had not been safety-wired. Normal vibration had loosened these nuts, and had allowed the transmitter-receiver to slide back in the mounting base far enough to lose positive contact with the receptacle J-401.

All maintenance personnel are cautioned to remove the power before replacing the transmitter-receiver, to carefully align the transmitter-receiver with the base before installation, and to secure the wing nuts on the mounting base properly. 4/1/49

#### AN/ARC-1 LOCKING WRENCH

During the alignment and tune-up of the AN/ARC-1 transmitter it is sometimes necessary to lock and unlock the auto tune heads several times.

To facilitate this operation and insure the proper tightening of the heads, a technician at NAESU has designed the locking tool shown below.

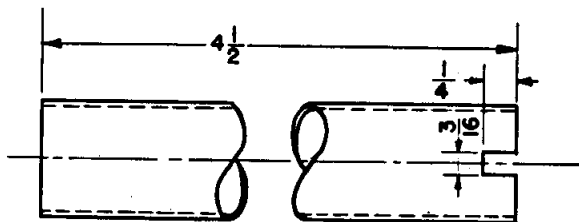


FIGURE 1.—AN/ARC-1 locking wrench.

It may be constructed in a few minutes out of a piece of seven-eighths inch O. D. brass or fiber tubing. 4/1/50.

#### REPAIR OF ROLLER-COIL TIE RODS IN MODEL AN/ARC-1 RADIO EQUIPMENT

It is no longer necessary to remove and disassemble the entire roller-coil assembly in model AN/ARC-1 radio equipment in order to replace a broken roller-coil tie rod. The following method of repair may be accomplished with the roller-coil in place:

1. Note the position of the roller-coil trolley wheels so they may be reset if accidentally displaced.

2. Remove the nuts securing the broken tie rod, saving the flat washers and lock washers for reuse. If necessary, snip out a section of the broken rod with diagonal cutters, and remove all parts of the broken rod.

3. Cut a piece of 1/4-inch diameter laminated phenolic rod, 2 inches in length. Finish the ends flat and square. Drill each end axially to a depth of 1/2 inch and tap with 4-40 N.F.-3 thread.

4. Place the new rod in position between the phenolic end plates of the roller-coil assembly and secure with machine screws using the original washers. Note: Before tightening the screws make sure that the new rod places no strain on the end plates.

5. Check the position of the roller-coil trolley wheels. If necessary, realign the transmitter in accordance with the procedures of the equipment instruction book. 4/1/50

#### AID TO AUTOTUNE ADJUSTMENT OF AN/ARC-1

A damaged Excelite nut-driver or screw-driver with slight alteration can be put to good use in maintaining the autotune units of the Model AN/ARC-1 radio equipments. Figure

1 illustrates how such a damaged article can be utilized together with the autotune adjusting wrench provided with the Model AN/ARC-1 equipment, to make a useful tool.

After sawing off the shank at A-A, a  $\frac{1}{8}$ -inch hole is drilled in the end of the shank to a depth of  $\frac{5}{8}$  of an inch. The tip of the AN/ARC-1 tuning wrench (with the knob removed) is then pressed into the shaft for a press fit. Finally, a  $\frac{7}{16}$ -inch hole is drilled in the handle to a depth of  $\frac{1}{2}$  inch and a slot cut across the end  $\frac{3}{16}$  of an inch wide and  $\frac{1}{4}$  inch deep. 4/1/50

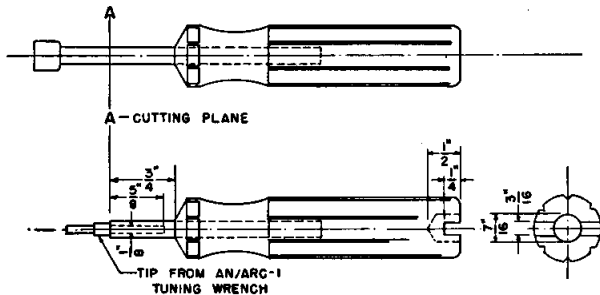


FIGURE 1.—Combination tuning and locking wrench.

#### →USE OF MULTIMETER TS-297/U IN PLACE OF TEST METER TS-80/U WITH RADIO SET AN/ARC-1

There have been many requests from Naval activities concerning Test Meter TS-80/U. For proper loading and aligning of the AN/ARC-1 Transmitter-receiver, a TS-80/U or its equivalent is necessary.

Multimeter TS-297/U is a suitable meter for use in lieu of TS-80/U. Although its smallest milliamper scale is 0 to 4 milliamperes, the TS-297/U, if used as described below, will give equal or greater sensitivity for AN/ARC-1 adjustments than the TS-80/U.

#### TS-297/U CIRCUITY

When making transmitter performance checks on the AN/ARC-1, equal or greater sensitivity may be obtained by substituting Multimeter TS-297/U for the TS-80/U. No circuit changes are necessary in the TS-297/U to ob-

tain the desired meter readings, shown in Table I, for the AN/ARC-1 transceiver.

On the first inspection of the meter, it will be observed that the smallest milliamper scale is from 0 to 4 ma. Since the maximum current to be measured on the AN/ARC-1 performance check is only 1 milliamper, the TS-297/U would appear to be useless. However, by examining the internal circuits of the TS-297/U, some very important facts are brought out.

Figure 1 shows the TS-297/U with the protective cover removed. Directly under the meter is an OHMS-ZERO ADJUST knob, and below this knob is a selector switch for selecting OHMS, AC or DC. The meter does not have a Range Selector Switch so the test leads must be

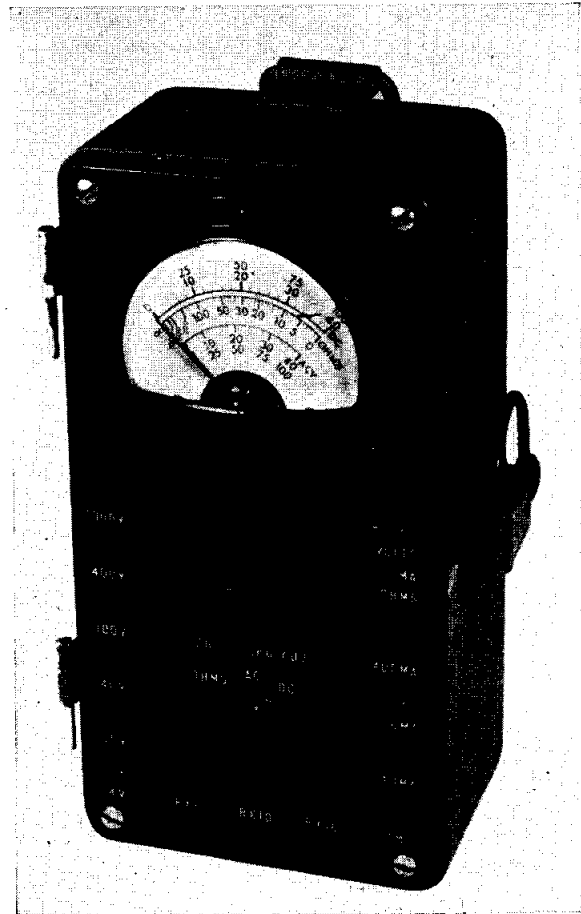


FIGURE 1.—Multimeter TS-297/U.



plugged into the jacks of the desired scale to be used. On the right hand side of the meter, a common jack is used for  $\pm$  VOLTS, - MA, and OHMS.

In taking readings with the TS-297/U, the zero to one hundred scale will be used. These readings are not actual values of voltage or current but only relative meter indications. Table I shows the order of magnitude obtained on the TS-297/U for the various metered stages of the AN/ARC-1.

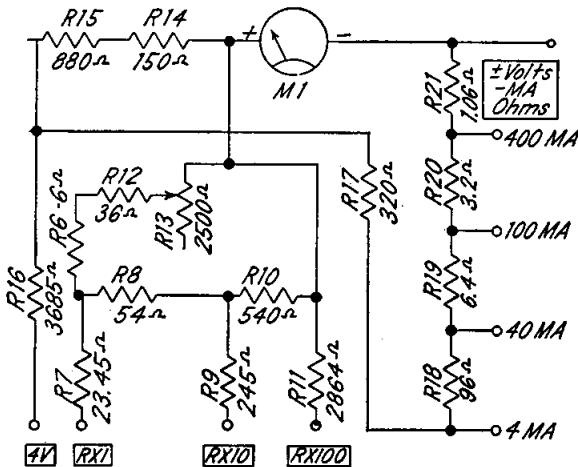


FIGURE 2.—Internal circuitry of Multimeter TS-297/U with selector switch on DC.

A composite circuit diagram, Figure 2, shows all of the circuits when the selector switch is in the DC position. A series of shunt resistors are connected across the meter so that the meter will not exceed the current rating of its movement, 250 microamperes with 62.5 millivolt drop.

With the selector switch in the DC position, the red lead of the test cable inserted into the 4V jack and the black lead inserted into the  $\pm$  VOLTS jack, the meter will have a full scale deflection when 4 volts is impressed across it and the circuit will draw 1 milliampere of current. Figure 3 shows the connections to be made on the front panel of the meter and the internal circuit when the above cable connections have been made. Since the circuit will

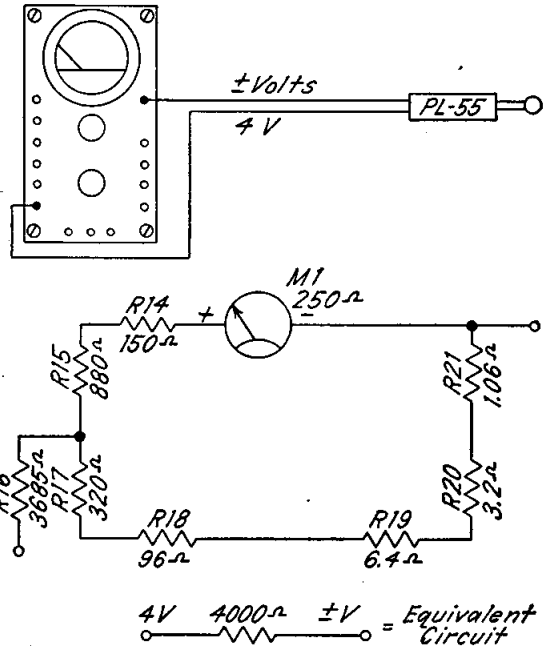


FIGURE 3.—Internal circuitry of Multimeter TS-297/U using 4-volt jack.

draw 1 ma, it alone may be used in place of the TS-80/U. With less than 0.6 ma flowing in the circuit, the sensitivity of the TS-297/U drops so that the readings are below 25 on the 0-100 scale. Therefore the 4V jack connection should be limited to readings above 0.6 ma.

To obtain more sensitive readings on the 0-100 scale, the Rx100, Rx10 and the Rx1 jacks are used as indicated in Figures 4, 5, and 6. The Selector Switch is placed in the DC position and the OHMS-ZERO ADJUST control is turned full counter-clockwise. Examination of Figures 4, 5, and 6 will show that Rx100, Rx10, and Rx1 place resistances in series with the meter and in this way form a sensitive voltmeter circuit. Under normal operating conditions, the meter appears to be damped sufficiently to withstand a small overload without damage to the needle.

For increased protection to the meter, however, all readings should be taken on the least sensitive (4V to GND) position first, as this

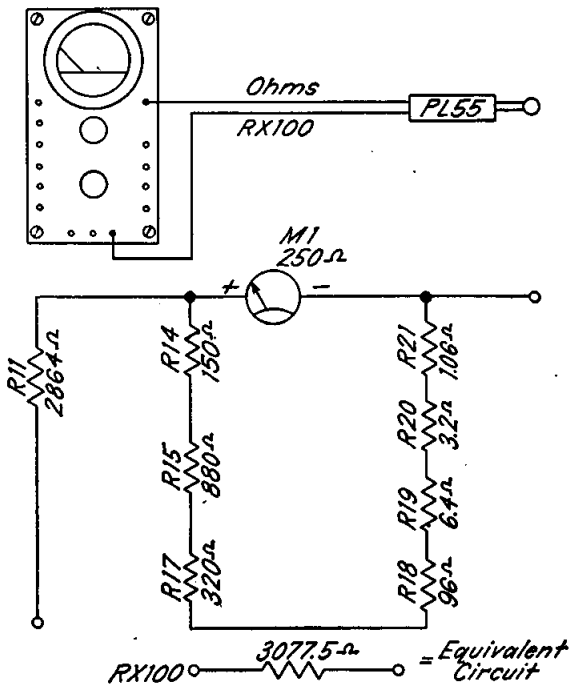


FIGURE 4.—Internal circuitry of Multimeter TS-297/U using Rx100 jack.

more sensitive positions may be used, as shown in Figures 4, 5, and 6.

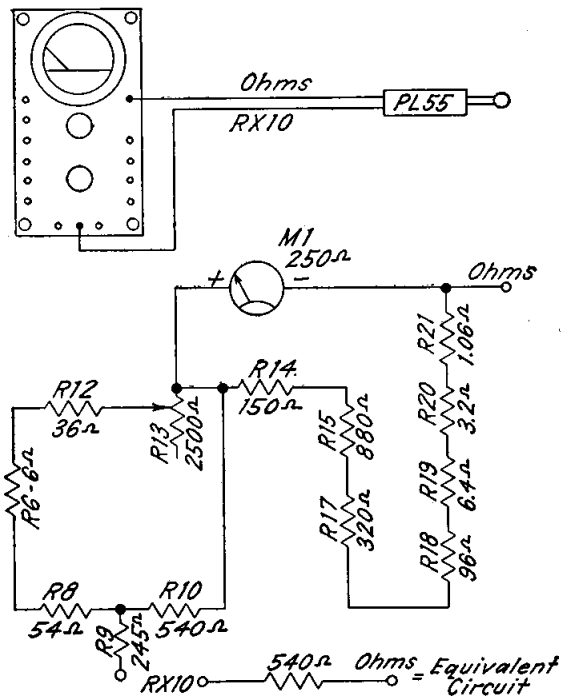


FIGURE 5.—Internal circuitry of Multimeter TS-297/U using Rx10 jack.

represents 1 ma deflection or the sensitivity of the TS-80/U. If this first reading indicates that more sensitivity is desirable, one of the

Table I.—AN/ARC—1 transmitter performance check

Meter switch	Dial head	Cycle key test switch	Dial heads	TS-80/U	TS-297/U			
					Figure 3 4-volt jack to GND	Figure 4 Rx100 to GND	Figure 5 Rx10 to GND	Figure 6 Rx1 to GND
OSC I <sub>g</sub> ---	None ..	Keyed .---	No adjust.....	0.1 to 0.2	5	20.....	43.....	45.
MIX I <sub>g</sub> ---	Rec....	Not keyed.	Maximum current..	0.3 to 0.6	7.5	25.5.....	73.....	85.
DRI I <sub>g</sub> ---	Trans..	Keyed....	Maximum current..	0.0 to 1.0	5	15.....	48.....	60.
PA I <sub>g</sub> ---	Trans..	Keyed....	Maximum current..	0.6 to 1.0	8	35.....	98.....	Off scale.
PA I <sub>k</sub> ---	Ant....	Keyed....	Tune for resonance.	0.6 to 0.8	75	Off scale..	Off scale..	Off scale.
MOD I <sub>k</sub> ---	None ..	Keyed....	No adjust.....	0.6 to 0.9	50	Off scale..	Off scale..	Off scale.

NOTE.—On TS-297/U, the 0 to 100 scale is divided by 100 to obtain the above readings. Jack positions which give OFF SCALE readings are not used.

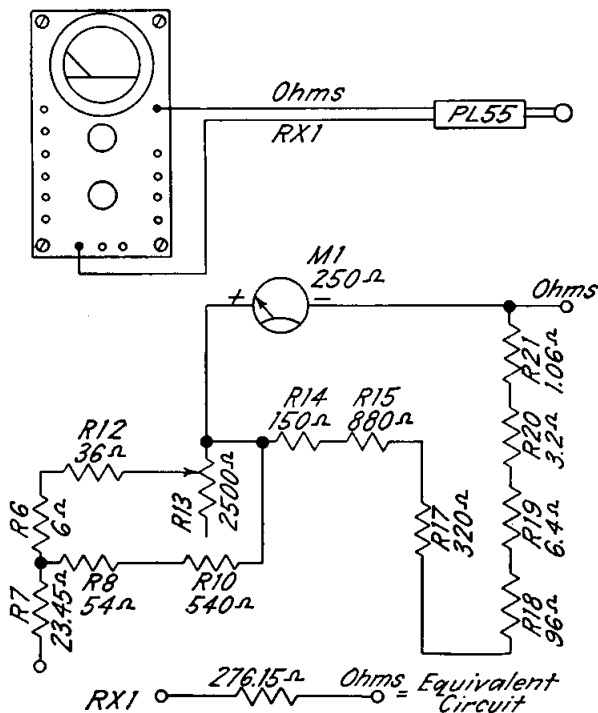


FIGURE 6.—Internal circuitry of Multimeter TS-297/U using Rx1 jack.

**ADDITIONAL TEST LEADS**

Supplied with the meter is a test cable, CX-468/U, which contains a red and black test probe on one end and a standard phone plug, PL-55, on the other. In case this cable has been mis-

placed or lost, a set of test leads may be constructed as shown in Figure 7.

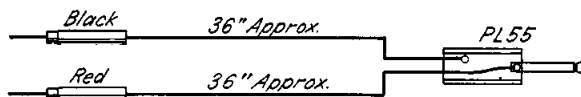


FIGURE 7.—Details of construction for additional test leads.

To fabricate a set of test leads, two pieces of number 16 stranded rubber-covered wire approximately 36 inches long will be required. Two short test probes, color coded black and red, and a standard PL-55 phone plug will also be needed. The wire leading from the red probe will be connected to the screw toward the front of PL-55, and that leading from the black probe will be connected to the screw located on the brass body of PL-55.

**COMPARATIVE AN/ARC-1 METER READINGS**

Readings for the various metered stages in the transmitter and receiver of the AN/ARC-1 as obtained both by the TS-80/U and the TS-297/U are presented in Table I. These readings are not to be taken as a standard, but are to be used as a guide by which correct calibration of the AN/ARC-1 can be made, using the TS-297/U in place of the TS-80/U. 4/1/52 ←

## MODEL AN/ARC SERIES TROUBLE SHOOTING NOTES

DIFFICULTY ENCOUNTERED	CAUSE AND REMEDY
AN/ARC-5.—Capacitor C-185 frequently cracked.	Close check on the ceramic capacitor's clearance to prevent cracking should be made.
AN/ARC-5.—Switch assembly S-1101 inoperative and frozen.	Front shaft support frozen to shaft. Twentieth similar failure experienced by this one activity. Recommend use of felt pad between switch knob and panel. Oil applied to shaft should prevent tendency to corrode.
AN/ARC-5.—Resistor R-152 frequently fails.	Caused by shorted capacitor C-168. Recommend use of capacitor with higher voltage rating. Believe this occurs only in Western Electric manufactured equipments.
AN/ARC-1.—Transmitter and receiver readings low. Transmitter and receiver intermittently becoming inoperative a short time after switching to a new channel.	Replaced V-102, 103, 114, 124, (all 6AK5's). Old tubes found to be very low. U. S. S. Lind (DD-703)
→ AN/ARC-1.—The channel selector drive motor, B-101, ran continuously for about five hours. This motor is not designed for such continuous operation and heated excessively, causing the insulation of the armature and field windings to melt.	The panel spring on the home stop panel came off. The tip of the panel came up and caught the clutch band, causing the limit relay to stay in one position, thus providing a complete electrical circuit for the motor so that it ran continuously. The panel spring is hooked to one of the screws holding the limit relay in place. The motor was replaced and a drop of solder was put over the screw end to keep the spring in place.
AN/ARC-1.—On checking it was found that the filament voltage of V-107 had increased to 13.5 volts and the filament voltage of V-108 was zero.	Capacitor C-327 in the receiver section was shorted. Replaced and resumed normal operation. ←

### REPLACEMENT COAXIAL CABLES AND CONNECTORS FOR THE AN/FGC-1A KEYS

In order to improve the reliability and availability of coaxial cable and connectors used on and with the AN/FGC-1A frequency shift keyer, a change has been made to a more standard Army-Navy type. Whenever the cables and connectors of the older type become defective, they should be replaced with the following:

(1) Wherever the H. B. Jones S-101 receptacle is used, the Navy type 49194 receptacle and Navy type 49193 receptacle hood should be substituted therefor.

(2) Wherever the H. B. Jones P-101 1/4 plug is used, the Navy type 49195 plug should be substituted therefor.

(3) Wherever the Western Electric Company, code KS-8086 coaxial cable (Army-Navy type RG-39/U) is used, the Army-Navy type RG-8/U coaxial cable should be substituted therefor.

These new cables and cable connectors are described with assembling instructions in Bureau of Ships Radio and Sound Bulletin Number 13, dated 1 January 1944.

### MODIFICATIONS TO AN/FGC-1A AND AN/FGC-1B EQUIPMENTS

Reports have been received concerning the overheating and melting of compound from the 34A varistors (part No. CR-901 and CR-902) on the detector panel CW-50133 of the frequency monitoring assembly bay of the AN/FGC-1A and AN/FGC-1B radio equipments. This condition is caused by the fact that the two varistors are located too close to the 6V6G detector tubes and to the flat resistors R-915 to R-919.

This situation should be corrected by mounting the varistors in the same relative location on the rear of the mounting panel. Each varistor is mounted by using two 1-inch brass spacers

1/4" in diameter and drilled with a #29 drill and tapped with an 8-32 tap. The two spacers are fastened to the mounting panel by 8/32 1/2-inch round head machine screws through a 1 1/4" x 3/4" metal mounting plate in which there are two holes drilled 1 1/16" apart with a #19 drill. Reconnection can be made without disturbing the leads.

There is a discrepancy in the instruction book NAVSHIPS 900623 for the AN/FGC-1B equipment. In figure 4-9, the two 34A varistors should be marked CR-901 and CR-902 instead of R-903 and R-902. These are located between C-904 and T-904 and C-903 and T-903. In figure 5-3, CR-903 should be CR-901.—10/1/45 U. S. Naval Radio Station, Cheltenham.

### REPLACEMENT OF ELECTRONIC TIMERS IN NAVY MODELS AN/FGC-1, AN/FGC-1A, AN/FGC-1B, AND UF TELETYPE AND TONE EQUIPMENTS

The Bureau of Ships has available a quantity of electronic timers, Western Electric type KS-15206 (List 1), procured under contract NOBsr-30097, which will be issued on request to the Bureau. These timers are to replace similar mechanical timers, utilized at present in Navy models UF, AN/FGC-1, AN/FGC-1A, and AN/FGC-1B terminal equipments, wherever difficulties and failures warrant the substitution. In these equipments, damage to the rectifier tube results from failure of the old-style timers. Four timers are used in each model UF, and one in each of the AN/FGC-1, AN/FGC-1A, and AN/FGC-1B units. The Bureau will supply additional station spares, upon request, in amounts based on the total number of timers in use at any one location. It is requested that recommendations for spare timers include a statement of the total number of timers in use at each location. Adequate amounts of stock spares will be maintained by the Bureau at Naval Supply Depots. 4/1/48

→ AN/FGC-5 MODIFICATION FOR POLAR OUTPUT FROM RECEIVING CODE CONVERTER

Bureau of Ships drawing RE 10 C 2113 A outlines the procedure necessary to obtain polar output from the CV-94/FGC-5 receiving code converters. This modification is recommended where the teletype signal from the AN/FGC-5 receiving terminal must be transmitted over a land line not suitable for neutral keying.

Where this modification is made, it is directed

that a copy of the modification be kept with the modified equipment. Also any AN/FGC-5 so modified must be returned to its original condition if for any reason it is returned to stock.

Copies of the above drawing may be obtained from the Bureau of Ships, code 991.  
1/1/51 ←

→ REPORTING OF FAILURES OF MODEL  
AN/FMQ-1A RADIOSONDE  
EQUIPMENTS

See the article entitled "Reporting of Fail-  
ures of Model RAU Series and AN/FMQ-1A  
Radiosonde Equipments" on page RAU:3 of  
this Bulletin. 5/1/46 ←

→ **MOISTURE CONDENSATION IN CEILOMETER  
(AN/GMQ-2)**

A method for preventing moisture condensation in AN/GMQ-2 ceilometers is given in a recent beneficial suggestion. It was submitted by Floyd L. Rinehart, Radio Mechanic (civilian), NATB, Pensacola, Fla.

During periods of high humidity, considerable moisture was found to condense within the air lines and the compressor cylinders. When the equipment was operated, the condensed moisture was forced through the nozzles, vaporized, and re-collected on the quartz mercury lamps. There was enough moisture on the lamp to set up a low resistance across the lamp transformer. Excessive current flowed, and the lamp fuse blew so that the ceilometer was rendered inoperative. As a result, the average life of the mercury lamps was shortened materially. This was found to occur repeatedly unless the apparatus was thoroughly dry.

The beneficial suggestion contains a remedy

which was found to work satisfactorily at the Station. A type HR101 heater unit, furnished as a spare for that used in the detector, was employed to dry out the equipment and prevent the unwanted moisture condensation. The heater was mounted on two 1 $\frac{1}{4}$ -inch stand-off insulators, and was located on the sidewall near the top of the control-assembly box. (This location provided a slight forced draft in the region of the lower cabinet.) The 115-volt outlet in the control-assembly box was used to provide power for the heater. It was found that this heater was necessary only when excessive humidity was encountered. It materially improved the average life span of the mercury lamps, and prevented interruption of service from the equipment thus protected.

The Bureau approves the suggested method, but its use is optional. It is to be restricted to those activities experiencing humidity conditions where this method would be beneficial.  
1/1/49. ←



**→ AN/SGC-1A RADIO TELETYPE TERMINAL SET**

Due to an internal wiring difference, chassis and cabinets of the AN/SGC-1 and the AN/SGC-1A radio teletype terminal set are not

interchangeable. Subsequent to a field change, all installation and maintenance activities should not interchange chassis and cabinet of this equipment. 4/1/52 ←

**EXCESSIVE POWER SUPPLY FAILURES IN  
MODELS AN/SPA-6A AND AN/APA-1 PULSE  
ANALYZERS**

Repeated failures of the high-voltage power supply in the above equipments have been attributed to failure of the high-voltage rectifier tube type 2X2. Excessive failures of the type 2X2 tube have led to the following information:

National Union type 2X2 tubes, manufactured for the 3-month period ending 30 June 1944 and shipped up to January 1945, are identified by the letters HU, HR, HC or IN on the tube base. It is recommended that all National Union 2X2 tubes bearing the above coding should be considered unreliable after 200 hours when operating as the high-voltage

rectifier for the cathode-ray-tube supply in the above mentioned equipments.

An improved type 2X2 will be available in a short time which will also be coded IN. The improved tube can be recognized, however, by a glass sleeve around the anode lead, extending downward from the seal to the anode.

All vacuum tubes marked 2X2 are satisfactory replacements for the National Union type 2X2. All tubes marked 2X2, manufactured by manufacturers other than National Union, are also acceptable replacements for the above indicated use.

For further information on type 2X2 tubes, see the article "Faulty Type 2X2 Rectifier Tubes" on page GEN:53 of this bulletin.



## MODEL AN/SPA SERIES TROUBLE SHOOTING NOTES

DIFFICULTY ENCOUNTERED	CAUSE AND REMEDY
AN/SPA-1.—Intermittent operation of indicator scope.	R-201 decreased in value from 100,000 ohms to 4,000 ohms.— U. S. S. <i>Guest</i> (DD-472).
AN/SPA-1.—Power transformer T-201 burned out. Also tube V-108 was removed.	Found to be due to unexplained presence of a 2,500-ohm resistor in place of R-201, the required value of which is 100,000 ohms.— U. S. S. <i>YMS-243</i> .



### COAXIAL COUPLER FOR AS-45A/SPR-2 ANTENNA

Delivery has just been completed under a contract (NObsr 30117) with the Barlow Engineering Company, New York, N. Y., for a quantity of 200 Navy type UG-340/U coupling units. These are coaxial units for connecting Navy type RG-48/U waveguide to Navy type RG-8/U solid-dielectric coaxial cable, and are employed in the model AS-45A/SPR-2 "Y" waveguide antenna with which the model AN/SPR-2 receiver is used. A total of 87 of these couplers has been shipped to the Navy Supply Depot at Clearfield, Utah, and 100 have been sent to the Depot at Mechanicsburg, Pennsylvania.

It is recommended that those ships on which the AS-45A/SPR-2 is installed, and on board which the couplers are needed, should apply to the nearest Electronics Officer. The coaxial coupler can be installed by the ship's crew in a matter of a few hours. Consequently, Navy yard availability is not necessary. The length of the type RG-8/U solid-dielectric cable from the receiver to the coupler should be kept as short as is practicable, because of the attendant losses inherent in this type of cable.

A previous article on this coupler explained briefly its function in the radar countermeasures system, and presented a drawing of it, BuShips Plan No. RE50F131A, entitled "Coupler, Coax RG-8/U to 1½" x 3" Wave Guide Assembly and Detail". Attention is directed to the fact that this coupler was previously referred to as type 49890 but is now referred to as Navy type UG-340/U, and the approved BuShips drawing is RE49F449A, entitled "Adapter, UG-340/U Coaxial Line to Wave Guide (RG-8/U to RG-48/U)".

It is recommended that Electronics Officers request these coupling units from either of the two Naval supply depots previously referred to, and have them available for installation, distribution, or stock. 1/1/48

### TUNING UNITS FOR AN/SPR-2 RECEIVER

Maintenance reports on AN/SPR-2 indicate an increasing number of oscillator cavity failures. These cavities are in short supply and should, therefore, be handled with the greatest of care and repaired if at all possible. The TN-56/SPR-2 tuning units have sliding finger shorting rings for tuning which cause wear on the cavity and noise during tuning if excessive wear has occurred. The majority of units have a plate cap soldered to the plate rod. Failure reports indicate that the plate cap becomes loose due to the melting of solder by the heat of the oscillator tube. Upon cooling a cold solder joint is formed. Under such conditions the cavity becomes noisy. This point should be thoroughly inspected when the cavity is being repaired. A few of the latest AN/SPR-2 equipments have a collar around the plate cap over the plate rod. No failures have been reported for this type of unit.

The TN-56B/SPR-2 tuning units have reactance plunger cavities with no sliding fingers. The TN-57/SPR-2 tuning units, shown in the preliminary instruction books for the AN/SPR-2 equipment were not procured.

The present applicable instruction book for the AN/SPR-2 is NavShips 900,654.

1/1/50

### RADAR SET CRYSTAL INFORMATION ON AN/SPR-2

Construction details, electrical details, and instructions on changing the 1N21B crystal of the Mixer Assembly CV-13/APR-5 used as part of the Model AN/SPR-2 receiver are given on the next page in figure 1.

#### INSTRUCTIONS FOR REPLACING CRYSTAL

1. Remove the mixer assembly from the coaxial cavity by taking out the four mounting screws.
2. Remove the two connector housings, the antenna and IF connectors.
3. Remove end plug.

4. To remove spring, washer, choke coil, and capacitor assembly, tip mixer assembly upside down.

5. The polystyrene sleeve E-522 and crystal may be removed by loosening sleeve E-521 by means of a pencil or small screw driver.

6. Place new crystal in polystyrene sleeve E-521.

7. Place sleeve E-522 on capacitor C-501. Align holes.

8. With polystyrene sleeve E-521 held in a vertical position, slide E-522 and C-501 into sleeve, and align with bottom hole.

9. Slide choke coil into sleeve and align end of coil with small detent in capacitor assembly. Place washer on top of choke coil. The threaded hole in choke coil should be aligned with hole in sleeve.

10. Slide above assembly into mixer housing, and screw in antenna and IF connectors.

11. Place spring in hole in end plug, tip mixer assembly upside down, and then screw end plug with spring into housing.

12. Slightly loosen and retighten antenna and IF connectors to permit spring tension to be uniformly applied.

13. Replace connector housing and mount mixer assembly on coaxial cavity.

*Instructions for Checking Crystal:* The crystal should be checked using a TS-268/U crystal rectifier test set. If no test set is available, replace with new crystal and check crystal current using AN/SPR-2 receiver. 7/1/50

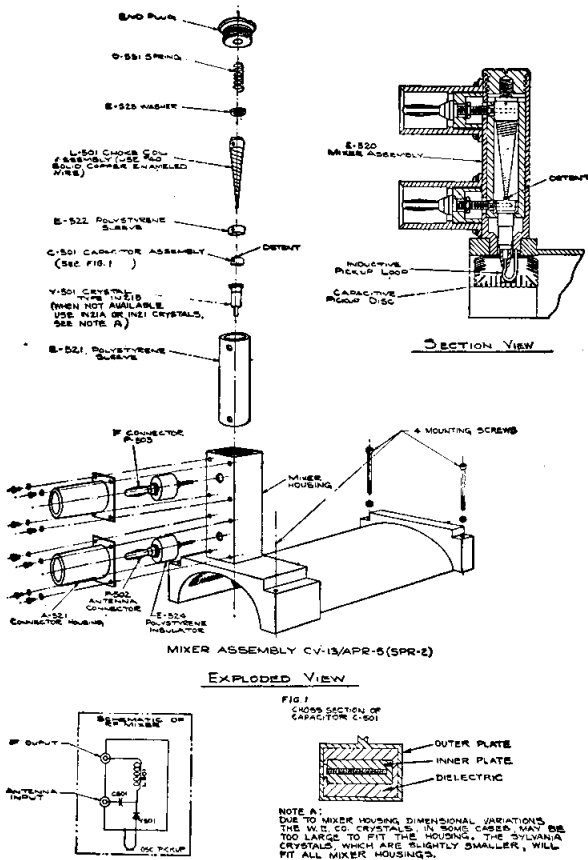


FIGURE 1.—BuShips drawing RE 100F 2006 (rearranged). Details and instructions on changing the IN21B crystal of the Mixer Assembly CV-13/APR-5.

### AN/TRC-1A NOW AVAILABLE FOR NAVY MODEL UF RADIO CARRIER EQUIPMENT

The first twelve Navy model UF multi-channel link equipments were shipped with 50-UFS radio equipments. The 50-UFS radio equipments were issued only as a "stop-gap". Orders have now been issued to replace all these sets with AN/TRC-1A equipments.

The AN/TRC-1A is arranged with a separate 50-watt transmitter and receiver housed in a portable cabinet. This frequency-modulated radio equipment covers a frequency range of

70-90 megacycles and is furnished complete in every detail with crystals, antennas, antenna masts, running spares, tools, etc. No other special accessories are required. The antenna, which weighs only 11.5 lbs., is a horizontally polarized directional array consisting of one driven half-wave dipole, one director and one reflector spaced approximately one-quarter wave.

In other words the AN/TRC-1A is the "right hand" for the Navy model UF carrier system and will be issued for all future installations.



## → WAVEMETER TEST SET AN/UPM-2

## FIELD CHANGE NO. 1

## REPLACEMENT OF CRYSTALS

*Equipment affected.*—All serial numbers.

*Purpose.*—(1) This change is necessary to prevent the burning-out of the crystal and does so by replacement of the crystal already in the wavemeter test set with a high-burn-out 1N25 crystal.

(2) This field change should be accomplished at the earliest possible date by maintenance personnel of the activity or vessel to which the equipment affected is assigned.

*Time required.*—Approximately one-quarter of a man-hour.

*Material required.*—Seven 1N25 crystals, rectifiers.

*Tools required.*—One screw-driver.

*Procedure.*—(1) The two 1N21 crystals in the wavemeters TS-211/UPM-2 and TS-212/UPM-2 should be removed and replaced with two 1N25 crystals as outlined in Section V of NAVSHIPS 900,452 IB (instruction book for Wavemeter Test Set AN/UPM-2).

(2) The five spare 1N21 crystals carried in the screw-topped receptacle mounted in the lid

of the carrying case CY-194/UPM-2 should be replaced with five 1N25 crystals.

*General.*—(1) The 1N25 crystals for this purpose shall be requisitioned in the usual manner.

(2) The completion of this field change shall be entered on the Electronic Equipment History Card, NAVSHIPS 536, and on the Record of Field Changes, NAVSHIPS 537. This field change shall be reported to the Bureau of Ships, Code 980, by filling out the top portion of a Failure Report, Electronic Equipment, NAVSHIPS 383, and noting under "Remarks" that Navy Field Change No. 1 has been carried out. This card should then be mailed to the Bureau.

(3) References to 1N21 crystals in NAVSHIPS 900,452 IB should be changed to 1N25 with pen and ink. This applies to the following pages: 1-3 (twice), 1-4 (twice), 3-1 (once), 5-0 (twice), and once in the Table of Replaceable Parts on the last page of the book. Changes to the instruction book shall not be made until the field change is completed.

(4) The 1N21 crystals removed from the equipment shall be turned in to the supply activity from which the 1N25 crystals were received. If this is not possible, they should be turned in to the nearest Electronics supply activity. 4/1/48 ←

**→ FUSES IN AN/URA-8A FREQUENCY SHIFT  
CONVERTER COMPARATOR EQUIPMENTS**

The AN/URA-8A equipment consists of two frequency shift converters and one comparator. Each converter is separately fused with two  $\frac{3}{4}$  ampere fuses. The comparator is fused with two  $\frac{1}{2}$  ampere fuses.

Under certain conditions due to heat generated in the completely enclosed spaces of the equipment, it has been found that the present fuses are not of sufficient capacity to prevent an occasional failure.

Where this condition exists, the following fuses (Symbol Nos. F-501, F-502, F-901,

F-902 and their replacements F-503, F-504, F-903, and F-904) should be replaced with 1 ampere cartridge fuses which have the following description:

(a) Fuse, cartridge, 1 amp., opens in 1 hour at 135% rated load at 25° C., continuous at 110% rated load; 250 volts, 1 time, glass body; 2 ferrule terminals;  $1\frac{1}{4}$ " lg. x  $\frac{9}{32}$ " dia. o/a. NEC Std 4AG. Mfgr. Bussman. (Navy Stock No. N-17-F-14309-330.)

This information will be included in the future as a field change to the equipment.

7/1/52 ←



→ AN/URD-2 VHF/ADF INSTALLATION SUGGESTION

The U. S. Naval Air Station, Grosse Ile, Michigan, has forwarded a helpful suggestion in connection with shore installations of the AN/URD-2 VHF/ADF. In making an installation of this equipment at that station, it was found that orientation of the antenna assembly could be greatly facilitated if the guy wire fitting flange could be constructed in two parts. This type of construction will permit the rotation of the antenna assembly, together with the pole upon which it is mounted, independent of the guy wire placement.

In order for this method of installation to be practical, a base plate must be constructed which has welded to it an 18-inch piece of pipe having an inside diameter slightly larger than the outside diameter of the antenna mast.

It is absolutely necessary, in using this method of installation, that a hole be drilled and tapped in the base mounting sleeve which shall be fitted with a large set screw. This will permit locking the antenna in its final position, thus preventing its involuntary rotation due to action of the wind or other vibration. Figure 1 shows a sketch of construction details. 1/1/51 ←

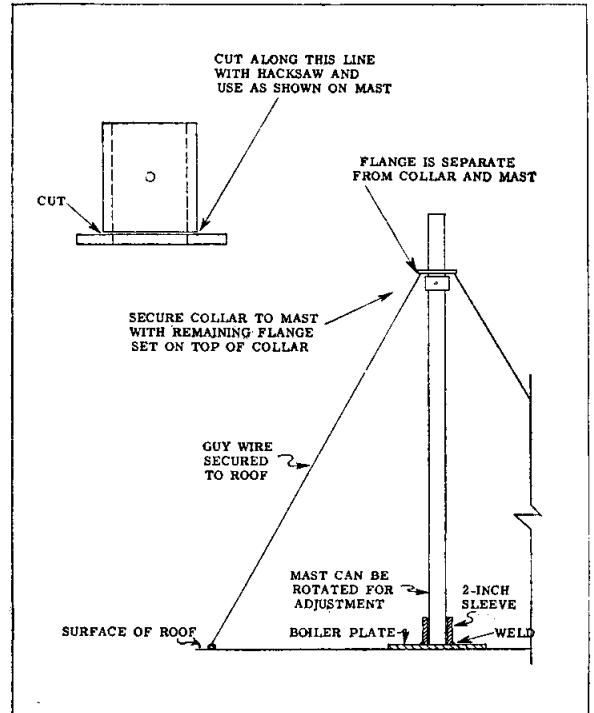


FIGURE 1.—Sketch showing construction details for allowing adjustment of the orientation of the AN/URD-2 antenna.

**DEFECTIVE WIRING IN AN/URM-25**

A recent Failure Report from the USS *Mountrail* (APA 13) to the Bureau of Ships reported a case of improper operation of a newly received R. F. Signal Generator AN/URM-25. A routine check showed that all tubes were good, and no apparent cause for failure existed. After a short time, however, the set started to blow the line fuses.

Upon investigation, the source of trouble was traced to defective wiring. It was found that the lead supplying filament voltage to the audio compartment (this lead is encased in braid and is covered with transparent plastic insulation) had shorted out where the braid terminated in the audio compartment and had melted back the plastic insulation for five inches. This action also caused the insulation on the filament supply leads in the power supply to melt and short all the wires served together leading to the four prong connection plug. It was also found that the serving twine was so tightly bound around the wires that the soft plastic insulation was severed in many places.

The Bureau of Ships suggests an inspection of all braided leads covered with plastic insulation be made upon receipt of the signal generator and approximately quarterly thereafter.

Particular attention should be given to braid terminations, melted plastic insulation and tightly bound serving twine.

This situation has been brought to the attention of the manufacturer and modifications are being made to prevent recurrence of the aforementioned unsatisfactory conditions. An insulating heat resistive sleeving is being substituted for the plastic insulation. A new type of plastic lacing cord is also being used which will not cut the insulation. 1/1/52

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**→AN/URM-17 INSTRUCTION BOOK CORRECTION**

An error has been noted in the Instruction Book for Radio Test Set AN/URM-17, Nav-Ships 91388. Paragraph 10b (2) Step 5 on pages 7-17 should be corrected to read as follows:

Divide the signal generator output (in microvolts) by the RI-FI Meter indicated output (100 microvolts times the attenuator factor "X10" equals 1000 microvolts). This product is the correction factor at 370 megacycles for attenuator positions X10 and X10<sup>2</sup>. This factor applies to both attenuator positions since the RF termination is the same. 4/1/52 ←

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**WARNING—USE OF PROPER ALIGNMENT  
TOOL**

Attention is invited to the fact that the RF plate inductance trimmer screws in the AN/URR-13 receiver are approximately 180 volts above ground. These screws are of the Bristol type and a special insulated alignment tool to fit these screws is provided with each receiver.

Inexperienced or careless personnel may attempt to use a regular metal Bristol wrench to make the plate trimmer adjustments which would result in either a severe shock or grounding of plate voltage.

All Electronics Technicians are warned of this potential hazard, and are requested to insert the following warning under Paragraph 4d, section 7 of the instruction book:

**WARNING.**—Unless the Bristol-type alignment tool furnished with the equipment is used,

danger to personnel and damage to equipment may result since these trimmer screws are 180 volts above ground." 4/1/51

**→ AVAILABILITY OF TEST CABLES FOR  
MODEL AN/URR-13 RECEIVERS**

Test Cables for Model AN/URR-13 Receivers procured under Contract NOBSr-43176 are available in stock at SSD, ESB, NSC, Norfolk, Virginia, and SSD, NSC, Oakland, California. All activities and ships that received Model AN/URR-13 less Test Cables are advised to requisition this item through the nearest supply activity. As required, one cable for each receiver will be furnished. Receiver Serial Numbers 1-1281, incl., under NOBSr-43176 are applicable. 1/1/52 ←

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→PERFORMANCE OF RM AND CONVEN-  
TIONAL DRY BATTERIES

See similarly titled article on page MISC: 20.  
4/1/48 ←

### DESCRIPTION OF BC-638-A FREQUENCY METER AND SIGNAL GENERATOR

The following information is offered on the use of the BC-638-A frequency meter and signal generator being furnished by the Bureau for use at various Naval air activities in connection with the installation and maintenance of VHF receivers:

The BC-638-A equipment consists of a crystal-controlled signal generator with a frequency range of 100-156 mc. It is tone-modulated approximately thirty percent at 1000 cycles. The frequency meter is used to pre-set, test and align radio receivers whose frequency range is within the frequency limits of the frequency meter.

The crystals used in the BC-638-A equipment are identical to those used in the BC-640-A transmitter and the transmitter section of the SCR-522-A and SCR-624-A equipments. Six crystals may be mounted under a dust cover on the front panel—five connected into the frequency meter circuit and one spare. Selection of the crystals is made with a five-position switch located on the front panel.

### MODIFICATION TO ADD NOISE LIMITER IN BC-639-A

The noise limiter to be described is suggested by the U. S. S. *Yorktown* for the purpose of reducing interference to communications. The limiter will be especially effective on interference of a pulsy nature as it operates by cutting off the audio signal for the duration of any large noise peak.

The parts required are: One 6H6 vacuum tube; two resistors of 1 megohm and  $\frac{1}{4}$  or  $\frac{1}{2}$  watt; one paper capacitor of 0.1 mfd.; one switch, SPDT; one octal tube socket; and, optionally, one potentiometer of 100,000 ohms.

The tube socket may be mounted on small metal brackets above the chassis to the rear of the audio output jacks, or may be flush-mounted in a hole punched in the chassis itself. The toggle switch may be mounted anywhere desired on the front panel. If the switch is physically

distant from the limiter circuit proper, it is advisable to sheath the leads running to it with Belden braid and ground the braid to the chassis by means of soldering.

Referring to the schematic diagram shown in Figure 1, operation is as follows: Rectified signal current flows through resistors 236-4 and 236-5 causing a voltage drop in the proportion to the incoming signal amplitude. The potential across 236-5 is the audio signal voltage delivered to the grid of the 6SQ7 through the limiter tube 6H6. The potential across 236-4 operates the limiter tube. Both of these voltages can vary with instantaneous changes in signal amplitude such as occurs with noise or modulation, but the cathode of the 6H6 is not allowed to follow instantaneous voltage variations across 236-4 due to the filtering action of R-1 and C-1.

These two potentials are negative with respect to the 6SQ7 cathode, point "A" being normally more negative than point "B", thereby permitting conduction in the 6H6. In the presence of a noise pulse, points "A" and "B" become more negative, and the 6H6 plate becomes more negative, but the filtering action of R-1 and C-1 holds the 6H6 cathode nearly constant; cut-off occurs because the plate is more negative than the cathode and no signal is delivered through the 6H6 to potentiometer 251 and the 6SQ7 grid.

The resistor R-2 prevents the audio output from being shorted to ground via C-1. The degree of noise-limiting action is roughly proportional to the ratio of resistance 236-5 to that between "A" and "B" and is limited by the cutting-off of the peaks of voice modulation when this ratio is made too large.

Resistor 236-4 is shown as a variable potentiometer to permit control of the degree of noise limiting. It may be utilized without replacement with wire "A" connected to point "C".

Addition of this device to the receiver does not effect the i-f alignment provided the i-f circuit wiring is not tampered with. All parts except the 6H6, switch, R-1, R-2 and C-1 are in the original circuit.

Placing the switch in the OFF position eliminates the limiter action. When used the limiter will cause considerable loss in signal strength and may, therefore, have to be turned off when used with a very weak signal.

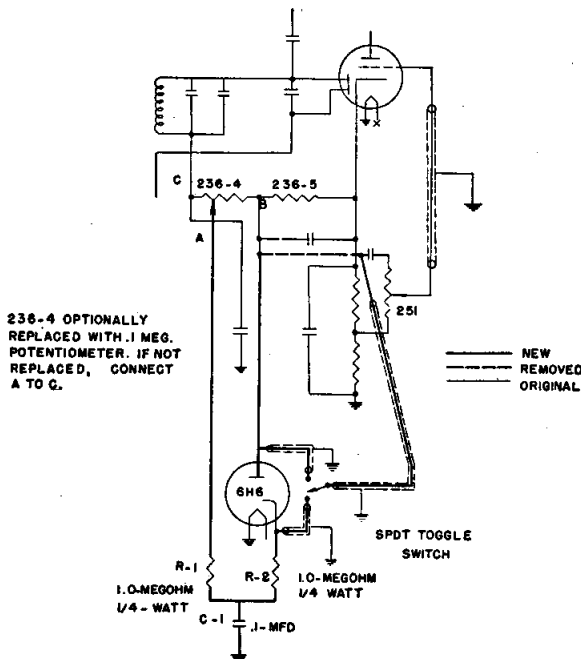


FIGURE 1.—Schematic diagram of noise limiter.

### WIRING MODIFICATION OF THE BC-640-A VHF TRANSMITTER TO PERMIT REMOTE CONTROL OPERATION

In order to provide remote control operation of the BC-640-A VHF transmitters now being installed at various Naval air activities, the following notes from a letter received by the Bureau from the Radio Material Officer, Navy Yard, Washington, are given (see Figure 1):

(1) It was decided to use two pairs for the remote control station, one pair for the audio line and one pair for the control or push-to-talk line. The remote signal line operated from relay no. 7 on PN-11-A and terminals 34 and 35 on the cabinet terminal board were not used in this installation. Therefore it was decided to make terminals 34 and 35 the remote push-to-talk circuit.

(2) On the original circuit on both REMOTE and LOCAL positions of switch 55 on PN-10-B, the plate control relay was in series with the mike, push-to-talk switch and the primary of transformer 34. Therefore for the modification, when switch 55 was placed in the LOCAL position, the same conditions as to keying were required; namely, the transmitter would key when the local mike was out of jack 40 or would key when the push-to-talk switch was pressed on a mike plugged into jack 40.

(3) The leads from relay 7 were disconnected on the inside of PN-11-A and taped. Jumpers were placed between terminals 21 to 23 and 22 to 24 so that the laced inter-unit wiring need not be disturbed and spliced.

(4) The d-c keying voltage from rectifier 12 was used in both REMOTE and LOCAL conditions. For the modification all the blank blades on switch 55 were wired in so that plate control relay 8 was switched to the local push-to-talk circuit on the local mike when 55 was in the LOCAL position, and to terminals 34 and 35 on REMOTE position. By short-circuiting terminals 34 and 35, plate control relay 8 is energized.

(5) A single stage line amplifier may be required to offset the losses in a long control line in order to provide an audio level at the transmitter sufficient for 100% modulation.

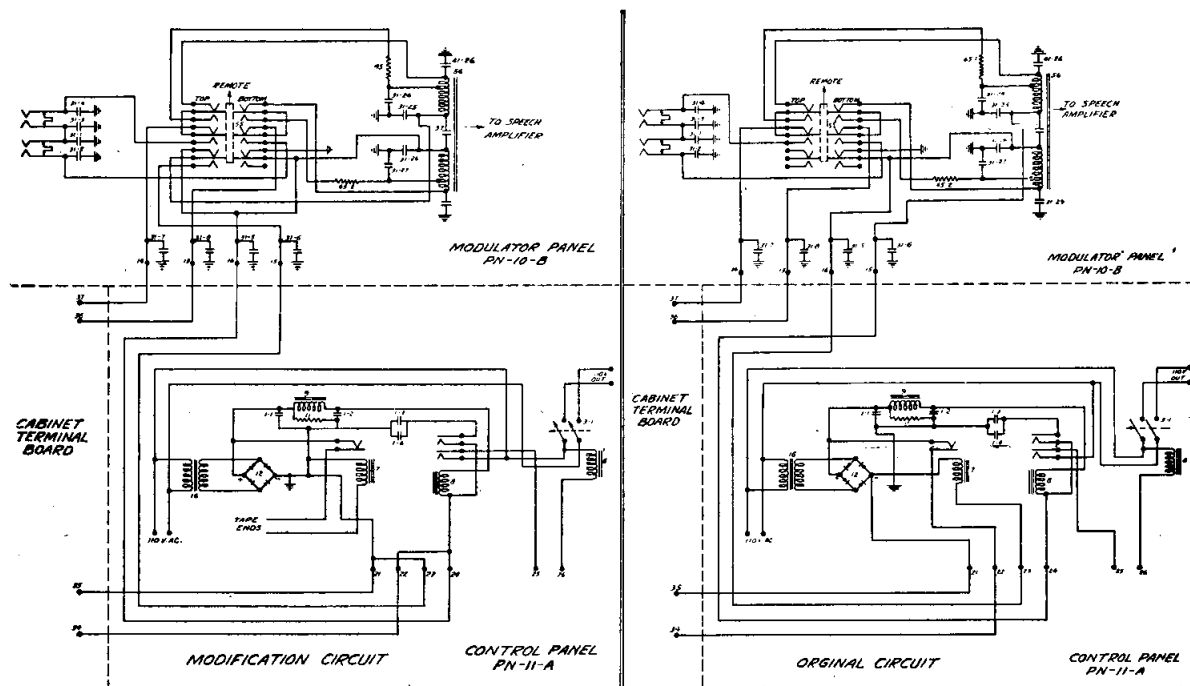


FIGURE 1.—Modification to allow remote control operation.

## BC SERIES TROUBLE SHOOTING NOTES

DIFFICULTY ENCOUNTERED	CAUSE AND REMEDY
BC-610 (E) Overheating of transmitter during continuous operation.	No means of ventilating interior of transmitter. Facilities for forced draft ventilation should be used or Signal Corps modification kit type MC-610 should be procured through channels. This kit includes facilities for forced draft ventilation.
BC-610.—Capacitor C-29 in transmitter fails.	Need for a higher voltage rating capacitor. A 5,000-volt capacitor was used on transmitter BC-610 beginning with BC-610 (E) serial #5066.
BC-640.—Equipment inoperative.	Rectifier tubes V-99-1 and V-99-2 burned out. Replaced and started gear—main line fuse blew. Found C-125 shorted. Replaced and started gear. C-125 shorted again. Replaced C-125 three times before finding a capacitor which would stand the surge. It is suggested that all capacitors in high-voltage work (over 100 volts) be checked for leakage with megger before installation in equipment.
BC-640A.—Grid excitation to i-p-a dropped intermittently to subnormal values.	The lugs of second tripler tank inductor, reference #181, of oscillator panel PN-9-A, were merely pressed on at the factory and the silver plating had tarnished. The lugs had never been soldered on the coil. The connections were bridged with solder and equipment now operates satisfactorily.—U. S. S. <i>Yorktown</i>
BC-640A.—Reports were received of weak signals from the transmitter, also that frequency of emission was 1.5 megacycles below nominal frequency.	Checked final-amplifier tubes—all OK with balanced operation. Cleaned and removed tarnish from screw connections of linear tank, symbol 136, tightened connections, resulting in elimination of trouble.—U. S. S. <i>Yorktown</i>



**→MODEL ME-11/U R-F WATTMETER**

One or more model ME-11/U wattmeters are on the allowance lists of all ships which have a Navy Model TDZ Radio Transmitting Equipment on their allowance list, and on the lists of all tenders and repair ships. This wattmeter is now being distributed to various supply points and naval shipyards, and should be requisitioned to fill authorized allowances as soon as possible.

The meter is especially useful in tuning the Model TDZ Radio Transmitting Equipment.

It is rated at up to 60 watts at from 30 to 500 megacycles, and works into a coaxial 51.0-ohm nominal load. The application of this wattmeter is explained in detail in the instruction book, Navships 91118, which should be referred to very carefully in order that the wattmeter be utilized to best advantage. 1/1/49. ←

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**OUTPUT TRANSFORMERS FOR CERTAIN MODEL SCR SERIES RADIO SETS**

See item on page AN/ARC:16 of Supplement 26 entitled "Output Transformers for Models AN/ARC-1 and SCR Series Radio Sets." 4/1/49

**MODELS SCR-508 AND SCR-608 RADIO TRANSMITTING-RECEIVING EQUIPMENTS**

Models SCR-508 and SCR-608 radio transmitting-receiving equipments have been widely distributed for shipboard installation. This article is published for general information and guidance in connection with the installation of these equipments.

<i>Components</i>	<i>SCR-508</i>	<i>SCR-608</i>
Transmitter	BC-604	BC-684A
Receivers	2-BC-603	BC-683A
Mounting	FT-237	FT-237
Antenna	Whip	Whip

Mast base MP-48A

Mast sections MS-51, MS-52, MS-53.

The basic unit of the models SCR-508 and SCR-608 is packed with the above components and other miscellaneous accessories, except mast section MS-51.

*Navy Installation Unit*—(U. S. Army Signal Corps, Stock No. 2S508-NA/50) :

In addition to the basic unit the equipments procured for shipboard use are now being shipped with an additional package designated the Navy Installation Unit, U. S. Army Signal Corps, Stock No. 2S508-NA/50, which contains additional accessories such as headsets, microphones, and mast section MS-51.

*Power Supply:*

The SCR-508 and SCR-608 sets for shipboard installations are to operate from 12 volts dc. The plate voltage is obtained from self-contained 12-volt d-c input dynamotors.

Storage batteries will have to be supplied to operate these equipments on ships where the required voltage is not available, until such time as auxiliary power units become available.

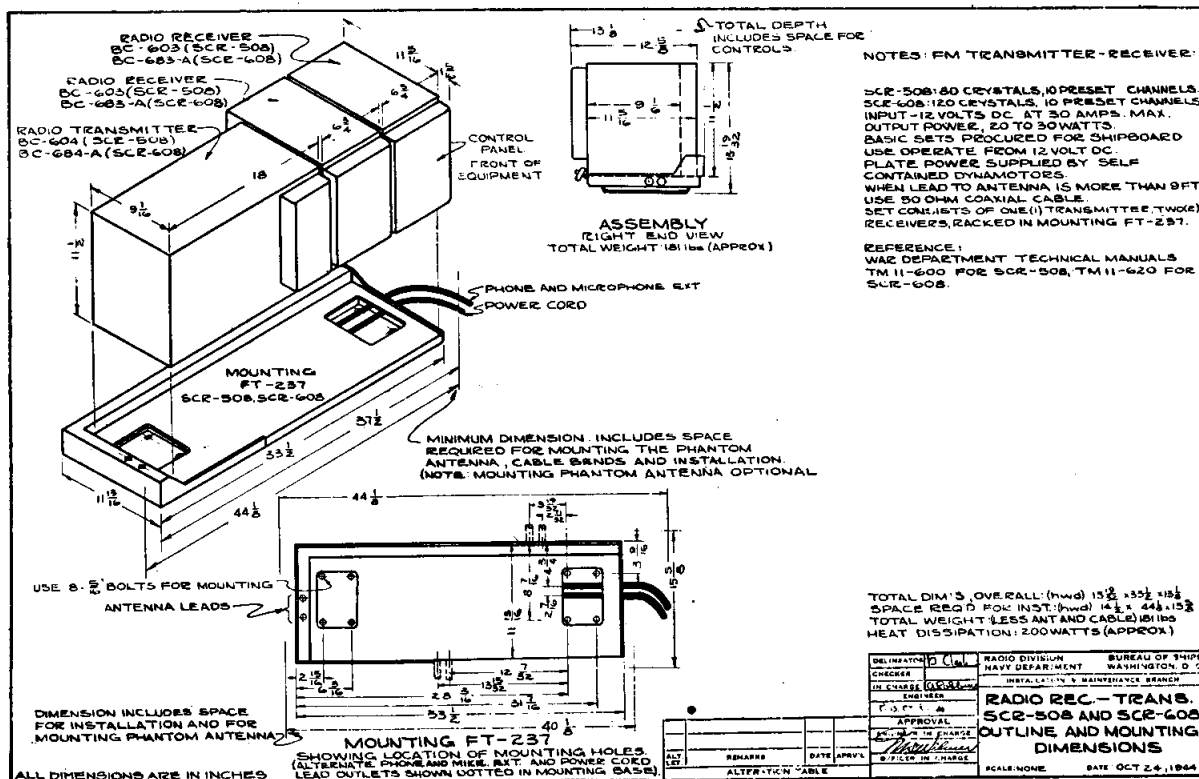


FIGURE 1.—Installation data.

Auxiliary power units under procurement to operate the SCR-508 and the SCR-608 are as follows:

Dynamotors: 115/230-volt d-c input and 12-volt d-c input, 500 watts output.

Motor-Generators: 115-volt d-c input and 12-volt d-c input, 500 watts output.

*References:*

War Dept. Technical Manual for SCR-508, TM-11-600

War Dept. Technical Manual for SCR-608, TM-11-608

Type Installation Plan for Model SCR-508 and SCR-608, BuShips Dwg. RE 43F 334B.

BuShips Dwg. RE 43AA 426A reproduced as Figure 1 for additional detailed installation data.

#### INTERFERENCE BETWEEN ARMY MODELS SCR-508, SCR-608, SCR-610, AND SCR-808 EQUIPMENTS

The Navy Radio and Sound Laboratory, San Diego, California, has made an investigation of interference between Army models SCR-508, SCR-608, SCR-610, and SCR-808 equipments and has found that the main source of interference is radiation at transmitter harmonic frequencies resulting in interfering signals on several channels of receivers connected to adjacent antennas. Other interferences are due to image response.

Field modification of these equipments to eliminate this interference is not practicable and therefore should not be tried by field activities.

It is recommended that frequency plans be laid out and tested with actual equipments in order that interference between channels may be detected and corrected. Maximum separation of antennas is also of value in reduction of interference.

#### MODIFICATION OF SIGNAL CORPS MODELS SCR-508, SCR-608, AND SCR-808 RADIO EQUIPMENTS TO ADAPT THE SETS TO SHIPBOARD MOUNTING FOR AMPHIBIOUS OPERATION

This article and the accompanying modification drawing are based on information forwarded to the Bureau of Ships by the New York Navy Yard. To increase the usefulness of the models SCR-508, SCR-608, and SCR-808 radio equipments in amphibious operations, it has been found desirable to operate the two receivers independently, in order that only one would need be disabled when the transmitter is working.

This modification, Figure 1, allows one receiver to operate on the transmitter frequency and the other receiver to operate as a standby receiver. Two antennas, therefore, are needed. The standby receiver, with its own antenna, must necessarily be set on frequencies different from those used by the transmitter and will guard one of these additional frequencies. The operating receiver is disabled and the antenna is automatically transferred to the transmitter when the latter is keyed. The standby receiver is not disabled. The single-pole double-throw toggle switch permits the transfer of the audio from either operating or standby receiver to the various remote stations.

The following recommendations are forwarded:

(1) One additional antenna should be installed for each SCR-508, SCR-608, and SCR-808.

(2) One antenna should be connected to the transmitter and one receiver; the second antenna should be connected to the other receiver, which will serve as a standby receiver.

(3) The mounting base Signal Corps type FT-137, common to each type equipment mentioned, should be modified so that each receiver can be operated on headphones independently.

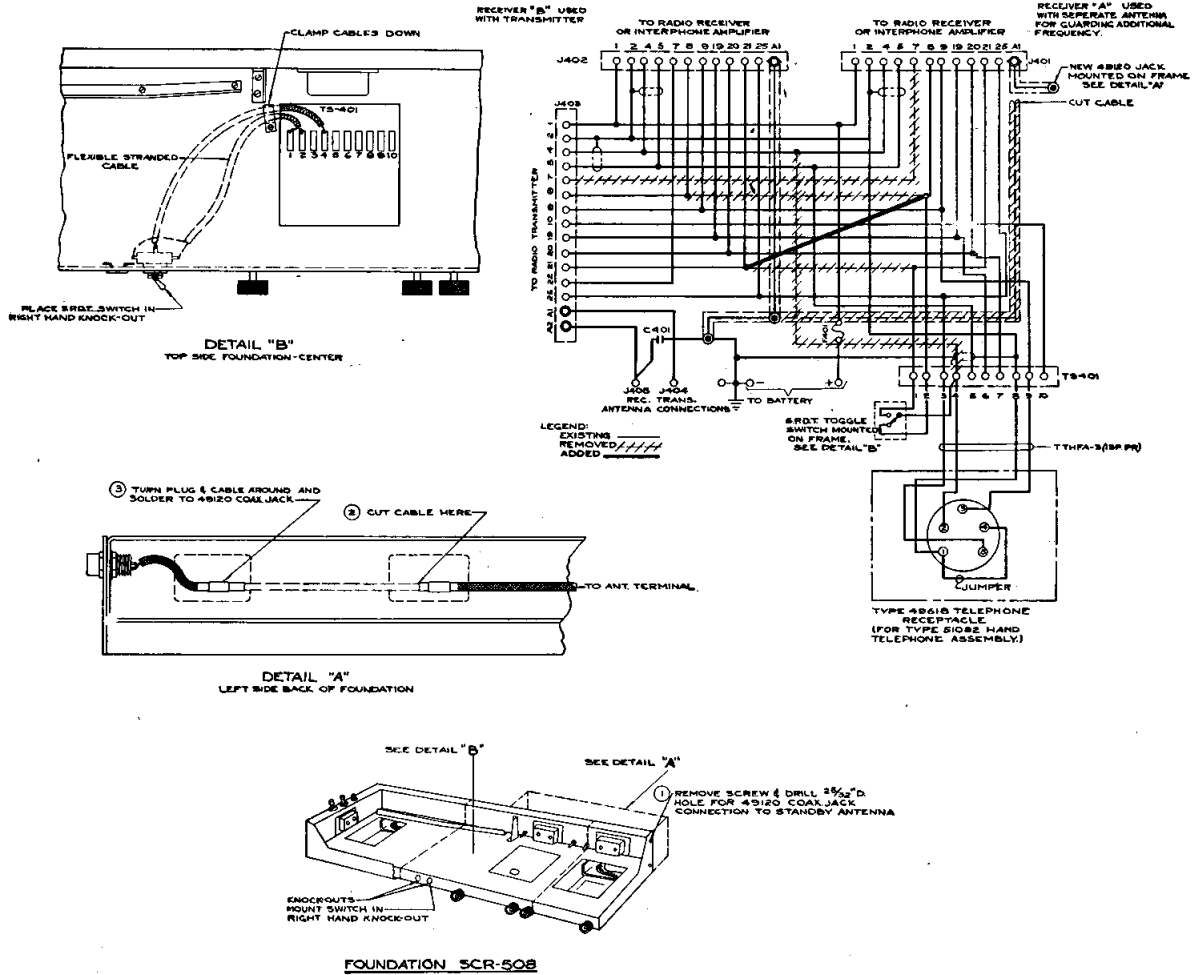


FIGURE 1.—Modification to permit independent operation of the receivers of radio sets SCR-508, -608, and -808.

The accompanying circuit diagram shows the changes required. The Bureau desires that these modifications be made in equipments installed in new construction vessels by the cognizant Radio Material Officer either prior to the delivery of the vessel or during the outfitting period. Ships having qualified technicians are authorized to make similar modifications on equipments already installed in vessels of the amphibious force.

The necessary procedure of modifying Signal Corps mounting type FT-237 for receiver audio selection is outlined below.

- (1) Remove lead (white with red-brown tracer) between receiver A connection receptacle J-401, pin 7 and transmitter connection J-403, pin 7.
- (2) Remove lead (white with red-green tracer) between J-403, pin 21 and J-401, pin 21. Retain lead (white with red-green tracer) between J-401, pin 21 and mounting plate terminal strip TS-401 terminal 1.
- (3) Clip lead (white with brown tracer) between receiver B connection receptacle J-402, pin 8 and terminal strip TS-401, terminal 2. Splice this lead to the lead remaining on J-402,

pin 21 (white with red-green tracer) so there is continuity between J-402, pin 21 and TS-401, terminal 2.

(4) Mount the single-pole double-throw toggle switch in right-hand "cable knock out" on front of mounting FT-237.

(5) Connect TS-401, terminal 1, to one side of the switch and TS-401, terminal 2, to the other side of the switch. Clip and tape lead on TS-401, terminal 4, and run a lead between this terminal and the pole of the toggle switch.

(6) Signal Corps Technical Manual (instruction book) TM 11-600 for radio sets SCR-508, SCR-528, and SCR-538 will be very helpful in making these modifications.

These modifications are necessary so that each receiver can be used independently of one another, with one permanently acting as a standby receiver to continuously guard the frequency to which it is assigned. These three models, SCR-508, SCR-608, and SCR-808 were originally designed for vehicular mounting and only required one antenna. The sets were so designed that *both* receivers were disabled when the microphone push-to-talk button was depressed (to transmit). Without the above modification, incoming traffic on *both* receivers is lost whenever the transmitter is being used.

All antennas should be placed as clear of nearby metal screens or masses as practicable in order to avoid shadow and directional effects. Mount receiving whips in the clear as far forward as practical. Mount transmitting whips in the clear as far aft as practicable. A minimum of twenty feet between receiving and transmitting antennas is necessary for minimum interference. Tests should be conducted on each vessel prior to permanent installation of antennas to determine the most suitable locations. Temporary coaxial cable may be run from the permanent location of the radio equipment to the various antenna locations for test purposes. The antennas used on these installations should be separated both horizontally and vertically as far as practical. The receiver antenna should be the higher of the two. Ship's

personnel should conduct tests to determine whether two or three section whips should be used for transmitting and receiving antennas.

Antenna mountings Signal Corps type MP-48-A have been forwarded to Radio Material Officer activities to meet requirements of the additional whip antenna installations.

Beginning March 1945, this extra MP-48-A mounting base will be included in the Navy Installation Unit Signal Corps stock number 2S508-NA/50.

The antenna used with these equipments is a nine-foot fishpole sectional mast type and is composed of mast sections Signal Corps types MS-51, MS-52, and MS-53. Mast section MS-51 is the top and smallest section. One of each type mast section is provided with the basic equipment, when first procured.

The Commander Amphibious Force, U. S. Pacific Fleet has provided information to Bureau of Ships on a somewhat similar modification. This modification, described in an article entitled "Modification to Permit Independent Operation of the Receivers of Models SCR-508, SCR-608 and SCR-808 Radio Equipments" and previously published in this bulletin and deleted with this supplement, also required two antennas. One antenna is connected to the transmitter. The second antenna is connected to the receivers only. This modification is a less satisfactory modification than the one described in this article, for the following reasons: As originally designed, the receivers and transmitters used a common antenna. The receiver disabling relay was energized when the microphone button was pressed, which short-circuited the output of both receivers. Simultaneously, the antenna transfer relay was energized and its contacts transferred the antenna from the input of both receivers to the transmitter output. When the modification, as recommended by COMPHIBPAC, is affected, the antenna transfer relay no longer performs a transfer function. This means that the receiver or receivers which are operating on the same frequency as the transmitter will have the transmitted energy loaded into the

receiving antenna and endanger the first r-f stage as the disabling relay shorts the audio output only. The COMPHIBPAC modification is excellent, but requires alert operators, if the burning out of the first r-f transformer, etc., and the continual shutting down of the operating receiver is to be avoided. The New York modification, once installed, is automatic and the "master" frequency is always open to incoming signals when the transmitter is not being used.

### INSTALLATION OF RESISTORS IN MODEL SCR-508

The New York Navy Yard has reported that several model SCR-508 receivers have come through without resistors R-22, R-32, and R-33 in the headphone audio output circuit.

Investigation discloses that the Army has removed the three parallel resistors in this circuit in order to increase the audio headphone output. Since in Naval installations, the loudspeaker is used as well as phones, activities concerned are authorized to install a resistor or resistors equivalent to 10,000 ohms at 1½ watts in place of resistors R-22, R-32, and R-33 if they have been removed. 10/1/45

### MODELS SCR-509, SCR-510, SCR-609 AND SCR-610 RADIO TRANSMITTING-RECEIVING EQUIPMENTS

Models SCR-609 and SCR-610 radio transmitting-receiving equipments are now being widely installed on shipboard. This article is published for general information and guidance:

Component	SCR-509	SCR-510	SCR-609	SCR-610
Trans-Rec.....	BC-620	BC-620	BC-659	BC-659
Battery case.....	CS-79	CS-79	CS-79	CS-79
Antenna (whip)....	AN-29-C	AN-29-C	AN-29-C	AN-29-C
Plate power supply.		PE-97 or PE-120		PE-117 or PE-120
Mounting base....		FT-250		FT-250
Antenna.....		Whip		Whip
Base MP-48A				
Sections MS-51, 52, 53.				

The basic unit of these sets comes packed with

the above components and other miscellaneous accessories.

*Navy Installation Unit*—(U. S. Army Signal Corps, No. 2S510-NA/50):

In addition to the basic unit the sets procured for shipboard use are now being shipped with a second package designated the Navy Installation Unit, U. S. Army Signal Corps, Stock No. 2S510-NA/50, which contains additional miscellaneous accessories such as headsets, microphones and vibrators.

*Power Supply Units:*

PE-97 and PE-117, input 6 or 12 volts DC. Linkages are provided on the sets to connect for desired input voltage.

PE-120, input 6, 12 or 24 volts DC. The proper vibrator has to be inserted in the set to operate at the desired input voltage.

All basic sets now being shipped are to operate from 12 volts. The Navy Installation Unit contains the additional 6- and 24-volt vibrators.

*Power Supply:*

Storage batteries will have to be supplied, to operate these sets on ships where the required voltage is not available, until other auxiliary power units become available.

Rotary equipment to operate these sets from a 115-volt d-c source is expected to be available. This unit is a dynamotor with an input of 115 volts DC, and with 150 watts output at 12 volts DC.

Dry batteries to operate the SCR-509 and SCR-609 are stocked by Supply Officer for Radio at Navy Yards Mare Island, New York, and Norfolk, and may be requisitioned through the regular channels.

*References:*

War Dept. Technical Manual for SCR-510, TM-11-605.

War Dept. Technical Manual for SCR-610, TM-11-615.

Type Installation Plan for SCR-610—BuShips Dwg. RE 43F 333B.

BuShips Dwg. RE 43AA 424A reproduced as Figure 1 for additional detailed installation data.

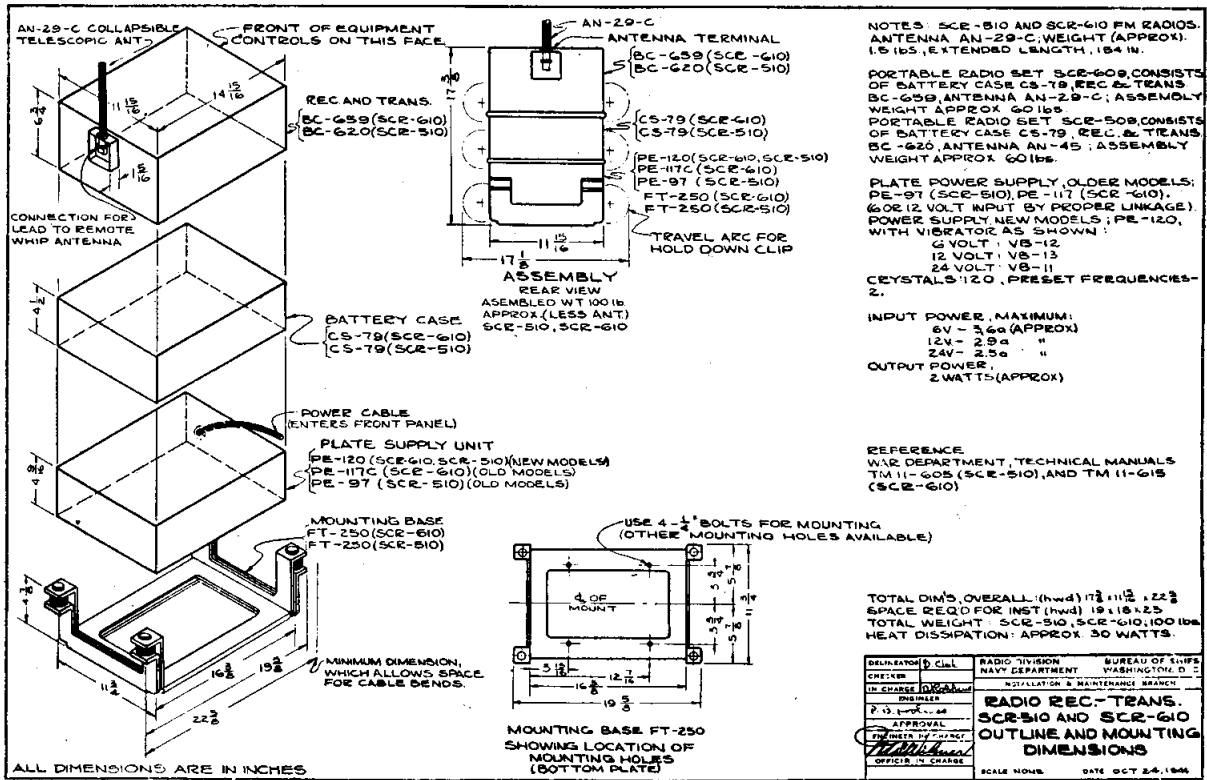


FIGURE 1.—Installation data for models SCR-509, SCR-510, SCR-609 and SCR-610.

**ELIMINATION OF NOISE AND POOR OPERATION IN SCR-522 EQUIPMENTS**

The following expedients have successfully eliminated noise and improved reception in SCR-522 transceivers:

- (1) The coaxial shield of the antenna transmission line was soldered at both ends to the connectors.
- (2) Paint was removed from around the mounting holes under the junction box to assure a good ground connection.
- (3) Paint was removed from around antenna insulating base.
- (4) A few antennas had been covered with paint containing zinc oxide. This nearly eliminated transmission and reception. Antennas were cleaned and replaced.
- (5) Grounds on all four corners of the dynamo and transmitter-receiver rack were made secure.

motor and transmitter-receiver rack were made secure.

(6) Bonding of antenna transmission line at intervals of 20 to 21 inches was found desirable when above precautions failed.

**RECEIVER TUBE PROTECTION IN MODEL SCR-610 RADIO EQUIPMENTS**

When removing receiving tubes from the SCR-610 be sure that the power is off. The filaments of the receiving tubes are all hooked in parallel, in series with an Amperite tube 10T1, as shown in Figure 1. If more than three tubes are out of the circuit when the power is applied, the rest of the tubes will almost certainly be damaged. Without the proper number of tubes, there is not enough current to give the

correct voltage drop across the Amperite tube, leaving too much voltage across the receiving tube filaments. 5/1/46

FAILURE OF CAPACITORS IN MODEL SCR-624 RADIO EQUIPMENT

A relatively large number of failures of capacitors used in model SCR-624 radio equipment have been reported. Investigation discloses that many of the defective capacitors are paper. These capacitors gather moisture and, after an idling period, fail more rapidly. In some cases the capacitor failure will result in other components becoming defective, and conditions will arise which makes shipboard repair very difficult.

When failures of these capacitors occur, they should be replaced with either mica or ceramic type capacitors. All vessels and activities should be on the alert for failures of this type. 4/1/46

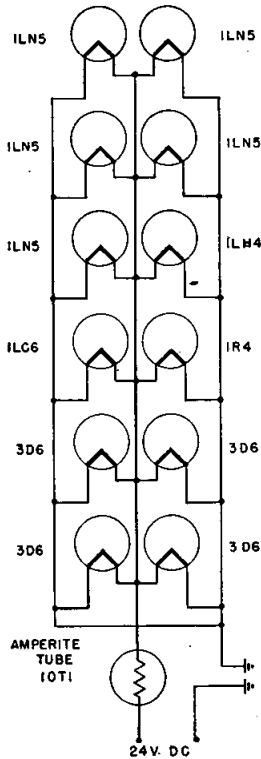


FIGURE 1.—Receiver filament circuit.



## SCR TROUBLE SHOOTING NOTES

DIFFICULTY ENCOUNTERED	CAUSE AND REMEDY
SCR-299.—Antenna tuning unit Signal Corps type BC-720 of radio set SCR-299 is not satisfactory for use with long wire antennas.	An auxiliary long wire antenna has been furnished beginning with SCR-299-(C), and Signal Corps instruction books TM11-280 and TM11-281 give instructions for its use.
SCR-299.—Frequent failures of transformers and reactors, due to moisture absorption.	Replace with hermetically sealed replacement components.
SCR-299.—Failure of electrolytic capacitors C-20 and C-21 in radio transmitter BC-610.	Use an 8-mfd. 600-volt paper capacitor for this circuit.
SCR-299.—Radio interference, which may result from ventilating fan circuit.	Investigation determined that the addition of a 0.5-mfd. automotive suppression type capacitor, connected between the fan "hot" terminal and ground, would effectively suppress the reported radio interference.
SCR-299.—Leakage between B+ and a-v-c circuits on common terminal board, under humid conditions.	This leakage can be corrected by relocating connections to the terminal board. Data for field modifications is being assembled.
SCR-300.—Mechanical failure of flexible gooseneck of antenna AN-130-A.	Tests show that the failure of the gooseneck is not due to a weakness in the material used for its construction, but rather to the method of fastening the gooseneck to the base bushings. It has been determined that an external spring covering the joint of the gooseneck and the base shell bushing will considerably improve the gooseneck's resistance to breakage. Signal Corps nomenclature AN-130-B has been assigned to the antenna incorporating the reinforced spring. Current procurement of antennas for replacement purposes will require antenna AN-130-B.
SCR-300.—Inadequate carrying method for radio set SCR-300 which tires personnel.	The standard Army quartermaster pack board can be utilized. A light-weight model of SCR-300 has also been developed. The pack board is obtainable, through channels, from the Marine Corps.
SCR-300.—Failure of antenna AN-130-A due to breakage of the base shell.	A stronger base shell is now being manufactured. Procure through regular channels.
SCR-300.—Insecure fastening of tube shields of radio receiver and transmitter BC-1000.	During initial production, the tube shields were too tight and contributed to the excessive tube breakage experienced with early sets. The loose tube shield is a compromise solution of the problem. It is believed that the tube shields in current production are adequately secured.

DIFFICULTY ENCOUNTERED	CAUSE AND REMEDY
SCR-300.—Breakage of trunk catches holding chassis and battery cases together.	Signal Corps modification work order MWO SIG 11-242-2, dated 20 November 1944 details instructions for replacing original catches with catches of a stronger mechanical construction. Procure these modification work orders through channels. Production changes are now being made.
SCR-300.—Insufficient clearance between B-plus lug on coil L-3 and chassis, resulting in water grounding B-plus lug to chassis, causing resistor R-6 to burn out.	Manufacturers are providing, on all future models, additional clearance by proper dressing of lug.
SCR-509.—Destruction of loudspeaker cones by concussion of nearby gunfire.	A manually operated loudspeaker shutter will be incorporated in future production of BC-659-H. This shutter may be requisitioned and installed in the field.
SCR-522.—Power-amplifier plate choke (r-f reactor, circuit reference #128-3, Signal Corps stock #2C6525A/R3) in the transmitter (Signal Corps nomenclature BC-625A) burned out.	The cylindrical-shaped phenolic insulator, that insulates the antenna coupling inductor (circuit reference #122, Signal Corps stock #2C6525A/J10), worked loose from the coupling inductor. When the thumbscrew was turned counter-clockwise, the phenolic insulator was also turned from two to four turns off the inductor, thereby causing a short from the antenna coupling to the power-amplifier plate inductor when the thumbscrew was tightened. This failure was remedied by removing the antenna coupling control thumbscrew completely. The phenolic insulator was then screwed from six to eight turns counter-clockwise and Glyptol cement was applied to the threads of the antenna coupling inductor. The phenolic insulator was next screwed down tight and the cement was allowed to harden for one hour. Finally, the thumbscrew was replaced. The equipment has given no further trouble in tuning.
SCR-608.—Very low percentage of modulation when operating from local position.	Due to remote microphone being in parallel with local microphone. Rearranged switch contacts in remote control to disconnect remote microphone when not in use.—U. S. S. <i>J. E. Campbell</i> (APD-49).
SCR-608A.—Relays S-101, S-102 and S-103 were lagging when microphone button was released.	Found remote control cable to be grounded in box on bridge. Cleared ground, cleaned relay contacts and all O. K. again.—U. S. S. <i>SC-1312</i> .
SCR-610.—Continually blew line fuses.	Faulty voltage regulator tube VT-195, and a shorted filter condenser, C-403, were discovered. These were replaced and the set operated normally.—U. S. S. <i>Curtiss</i> .
SCR-624.—The by-pass capacitor, symbol No. 102-1, 6800 mmf. 300 V DCW has been reported as failing.	Replace 102-1 with a mica capacitor, 6800 mmf. 600 V. DCW Navy type CM 45 B682K.