4-1 INTRODUCTION

The information contained in these service notes is based on data obtained from Navy publications such as the Electronics InformationBulletin (EIB), Naval Ship Systems Command Technical News (Formerly Bureau of Ships Journal), and from other approved publications.

4-2 PURPOSE

The purpose of these service notes is to provide technical personnel a convenient source of installation, operation, and maintenance notes peculiar to specific types of radio, radio communications, and associated equipments. These service notes are provided to assist personnel associated with electronics equipment. They do not supersede information contained in the equipment technical manuals; rather, they are intended as supplementary information which will lighten the ever-increasing burden of perssonnel responsible for the installation and maintenance of electronics equipment.

4-3 DOCUMENTATION

The following service notes pages are numbered in alphanumeric order by communications equipment nomenclature. However, the service notes for specific equipment are arranged in functional order. For example the first page for Audio-Frequency Amplifier AM-215/U service notes is designated AM-215/U:1. The second page of notes for this equipment is designated AM-215/U:2, and the third page would be designated AM-215/U:3. The method of page numbering provides for future addition of service notes without renumbering all the pages of this section.

Signal Distortion Resulting from Improper use of Audio Distribution Amplifier Model AD-2 (Cooke Engineering Company)

The Model AD-2 Audio Distribution Amplifier is a solid-state general purpose amplifier designed to accept up to five input signals and to provide up to eight output signals per input. These amplifiers are normally installed in the terminal equipment room associated with a radio transmitter facility. Their main purpose in the system is to provide mutliple signal outputs from a single signal source. The multiple outputs serve to modulate a series of radio transmitters dedicated to a particular broadcast circuit.

Serious distortion of the input signal can result unless particular attention is paid to the input signal level or to the manner in which the input signal line is connected to the amplifier. For example, the signal level applied to the LOW LEVEL 600 OHM input should never exceed–10 dbm. The reason being that the input attenuator adjustment potentiometer R5 becomes extremely critical to adjust if the input signal level exceeds approximately–10 dbm, see figure 1. Mis-adjustment of the input attenuator adjustment potentiometer R5 can cause the input transistors Q1 and Q2 to be over driven resulting in a seriously distorted output signal. Adjustment of the output level potentiometer will not correct for distortion developed in the input stage of the amplifier.

There are two relatively simple solutions to the problem: (1) install signal line level adjustment pads ahead of the AD-2 Distribution Amplifier and set the level of the input signal not to exceed approximately–15 dbm., or (2) connect the signal lines to the HIGH LEVEL 10K OHM input terminals of the AD-2 Distribution Amplifier, as shown in figure 2.

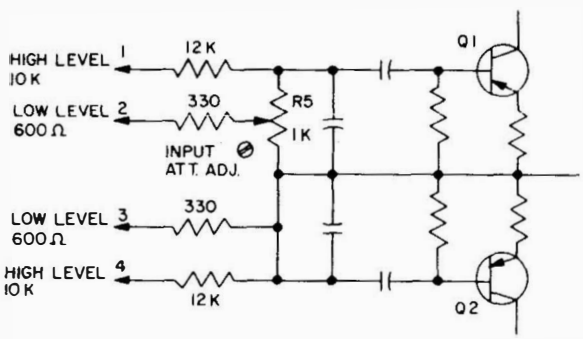


Figure 1. Input Circuit of AD-2 Distribution Amplifier (1-Channel)

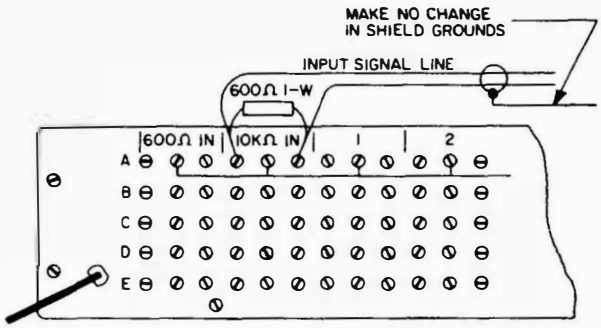


Figure 2. Signal Line Connections for High Level Signals. Note Terminating Resistor

Since this input is a high impedance input, normally used for bridging applications, the signal line should be terminated with an impedance approximating 600 ohms. The value is not critical and a 620 ohm ±5%, 1 watt resistor, FSN 9N-5905-279-2629, is satisfactory. This manner of connection will accomodate signal lines on which the signal level nominally averages between –10 dbm and +1 dbm.

All activities using Cooke Engineering Company Model AD-2 Distribution Amplifiers are requested to monitor the input levels of signals applied to AD-2 and take corrective action as outlined above to assure that the input circuits are not overloaded. If the signal line connections are changed to agree with figure 2, make a notation on the Electronic Equipment History Card, NAVSHIPS 536, which reads "TERMINATING RESISTOR ADDED AND SIGNAL LINES CONNECTED TO HIGH LEVEL 10K OHM INPUT IN ACCORDANCE WITH EIB ARTICLE_____ OF_____ DATE_____." (17S)

Adjustment Procedures for Amplifier Group AN/GSA-33 and Audio Amplifier AM-413A/G

See article in AN/GSA-33 Section under the same title. (EIB 5S)

AM-420/U, AM-421/U ELECTRONIC CONTROL AMPLIFIERS

It has been determined that 170 to 180 milliamperes flow through power transformer T-102 and filter choke L-101. These components are each rated at only 150 milliamperes maximum and operate very hot to touch. However, replacement is not contemplated due to insufficient failures reported to the Bureau. For protection of the equipment, it is requested that field changes 1-AM-420/U and setting 1AM-421/U (fusing) be accomplished.

AM-2123/U, AM-2123(V)/U, and AM-2123A(V)/U
RF Amplifiers, Output Signal Levels

The original AM-2123/U amplifier was designed with a variable input attenuator for each of the frequencies of 0.1, 1.0 and 5.0 MHz. It was found that in some installations, coaxial lines from the amplifier to the user equipments were picking up noise. Signal to noise ratio was such that the signal was unuseable at the user equipment. The later equipments do not have an input attenuator but will supply between 4 and 5 volts RMS into a 50 ohm load. By using attenuators, as listed in NAVSEC drawing RE-F 2687915, at the user equipment the signal and noise are reduced in the same proportion and a useable signal is delivered.

In order to determine the proper attenuator value the voltage on the line is measured, at the user end, with the line terminated into a resistive 50 ohm load. Measuring the voltage with an oscilloscope or other suitable high impedance device and knowing the voltage required by the user equipment, reference to RE-F 268715 will provide a proper value attenuator. (Note: Oscilloscope voltage will be peak to peak and must be reduced to an RMS value for use.)

The voltage measurement must be made with the line (coaxial cable) properly terminated with a 50 ohm load. A feed thru termination such as the Hewlett-Packard 10100A, or equivalent, is satisfactory for the measurements. The measurements should not be made at the amplifier output, nor can they be meaningfully made with an unterminated line. *(800)*

Electron Tube 6AH6WA in CHG (AM-2505/URA-31) Unit of AN/FRT-39/40/62 Series Transmitters

Responses to EIB 17S, page 3, indicate the CHG unit AM-2505/URA-31 of the AN/FRT-39/40/62 operates properly when RCA or Sylvania Electron Tubes 6AH6WA are used as a replacement for V-2501. The use of 6AH6WA tubes from other manufactures have resulted in insufficient outputs from CHG.

Activities having similar difficulties are advised that ESO has stocked Sylvania 6AH6WA tubes as a source control item for support of the AN/FRT-39/40/62. The tubes may be obtained through normal supply channels. The FSN assigned to the Sylvania 6AH6WA is 1N5960-935-4946. (741)

AM-3637/FRA-54—Fan Motor B-8101 Replacement

Fan motor B-8101, FSN 4140-054-6467 has a direct replacement unit, less mounting ring, in the Federal Stock System. The FSN for the replacement unit is 4140-595-3026.

It is suggested that all using organizations requiring replacement of B-8101 fan motor retain the existing mounting ring and replace the motor only with the replacement unit 4140-595-3026. (845)

RF AMPLIFIER AM-3924(XN-2)/URT-INFORMATION CONCERNING

The AM-3924(XN-2)/URT is a 1000-watt P.E.P., 2.0 to 30 MHz, 115V, 3 phase, 400 Hz RF Amplifier for use with Transmitter-Exciter T-827 ( )/ URT. This equipment is only intended for use on specific new submarines. Although this unit carries a similar nomenclature as the RF Amplifier of Radio Transmitter AN/URT-23(V) (AM-3924(P)/URT), the two units are not interchangeable. The equipments were provided by two different contractors. The AM-3924(XN-2)/ URT was procured by the General Dynamics/Electric Boat Co., as required under a submarine construction contract.

The applicable technical manual for the AM-3924(XN-2)/ URT version is NAVSHIPS 0967-127-9010. The technical manual for Radio Transmitter AN/URT-23(V), including its RF Amplifier AM-3924(P)/URT, is NAVSHIPS 0967-191-7010. (EIB 720)

AM-6047/FRT-84(V) Capacitor 9A1C10 in the Power Amplifier—Information on

The purpose of this article is to provide a temporary fix to the arcing problem of capacitor 9A1C10 due to adverse environmental conditions (condensation of supersaturated air within the transmitter).

Insulation may be provided for the capacitor by the use of heat shrinkable tubing around each end of the capacitor, the type recommended is the thick wall type made by American Pamcor Inc., which has a 2" ID and a shrink ratio of 2 to 1. The recommended length for best protection should be 1-1/2". The tubing may be ordered in different lengths according to amount needed. The following is a list of Pamcor part numbers for tubing of varying lengths:

Part Number	Length
603103	3"
603107	6"
603110	9"
603120	12"
603133-1	18"
603124-1	24"
603128-1	30"

It is reiterated that this is a temporary fix to the problem, and applies only to those activities having transmitters exposed to adverse environmental conditions. NAVELEX is at present working on a proposal to change the capacitor, and to provide a blower orifice to reduce air pressure, or to install a different size blower impeller. (825)

AM-6154/GRT-21, AM-6155/GRT-22 Air Filters—Recommended Cleaning Procedure of

Operation of AM-6154/GRT-21 and AM-6155/GRT 22 radio sets in moderate or high dust contamination areas may show the wire mesh air filter on the unit to be inadequate. Dust passing through the wire mesh filter tends to accumulate in the power amplifier tube cavity area causing premature failure of the power amplifier tube or transmitter shut-down due to an over-temperature condition.

In order to prevent this passage and accumulation of dust and dirt, it is suggested that the filter be cleaned and sprayed lightly with filter adhesive (Federal Stock Number 8040 103 3754) to enhance the dust trapping ability of the filter. Upon initial application of the filter adhesive, filters should be checked weekly to determine an adequate interval of filter cleaning as the monthly interval required by maintenance requirement card 922 M-1 may not be adequate in all circumstances.

This procedure is intended to supplement normal Planned Maintenance Subsystem in locations where the requirement exists.

(EIB 891)

AM-6154/GRT-21, AM-6155/GRT-22 Air Filters—Recommended Cleaning Procedure of

See article in AM-6154/GRT-21 section under the same title.

(EIB 891)

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. (EMB)

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	TS-297/U Figure 4 Rx100 to GND	TS-297/U Figure 5 Rx10 to GND	TS-297/U Figure 6 Rx1 to GND
OSC Ig	None—	Keyed—	No adjust—	0.1 to 0.2	5	20—	43—	45.
MIX Ig	Rec—	Not keyed	Maximum current	0.3 to 0.6	7.5	25.5—	73—	85.
DRI Ig	Trans-	Keyed—	Maximum current	0.0 to 1.0	5	15—	48—	60.
PA Ig	Trans-	Keyed—	Maximum current	0.6 to 1.0	8	35—	98—	Off scale
PA Ik	Ant—	Keyed—	Tune for resonance	0.6 to 0.8	75	Off scale	Off scale	Off scale
MOD Ik	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.

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

In order to utilize Navy type loudspeakers and amplifiers will 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	Transformer Type
AN/ARC-1 and SCR-274	Halldorson	E1041
SCR-508, SCR-510, SCR-522, SCR-608, SCR-609, SCR-610 and SCR-624.	Stancor or Thordarson	A-4770 T61S25

IMPROVED CRYSTAL SOCKETS FOR AN/ARC-1 EQUIPMENTS

Failure reports 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 have been equipped with new black high impact strength bakelite sockets.

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.

ROTARY TEST RACK FOR AN/ARC-1 EQUIPMENT

A detail drawing for rotating rack for AN/ARC-1 servicing is shown in figure 1. This type of rack has seen wide use and is a great help whenever any sizeable 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 1 are those used by NAS Pearl Harbor except for a few slight changes which reduce the amount of machine work and simplify construction.

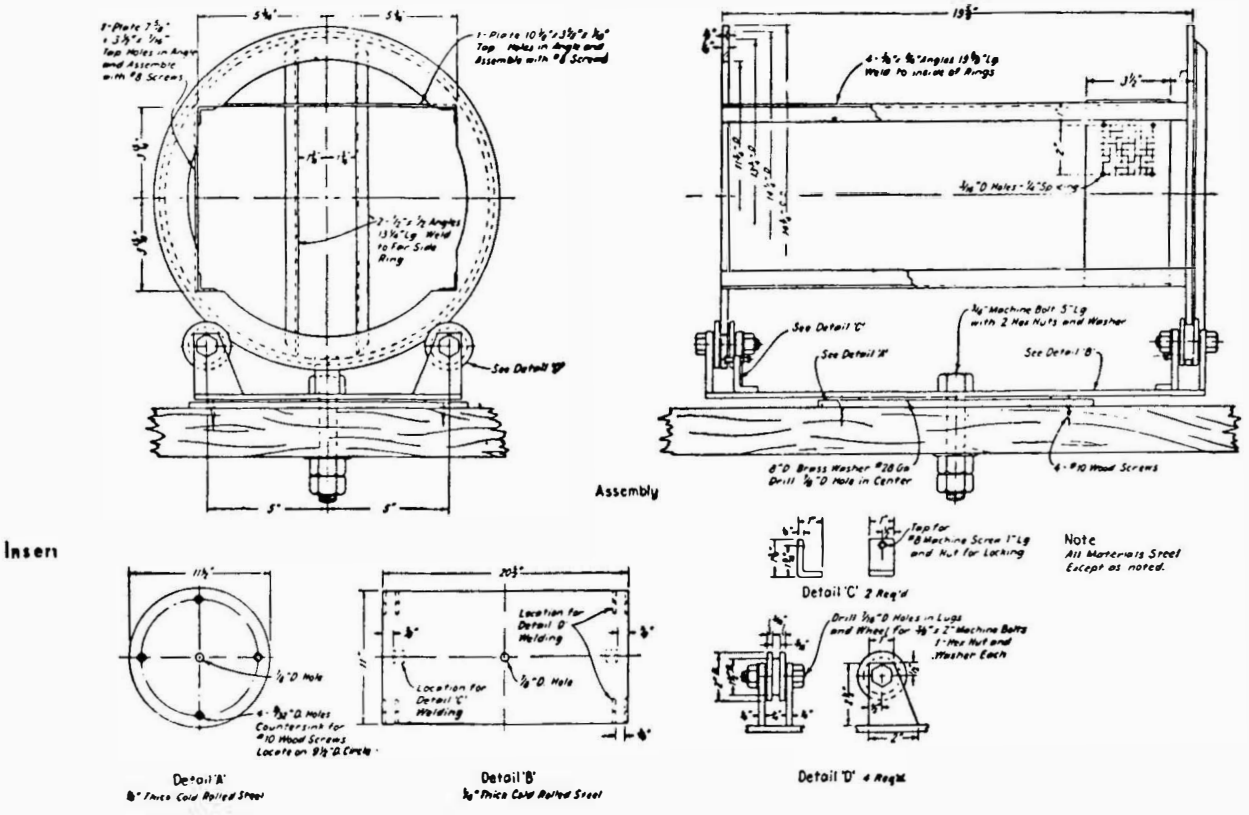


FIGURE 1 - Detail drawing for the rotary test rack.

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. (EMB)

AID TO AUTOTUNE ADJUSTMENT OF AN/ARC-1

A damaged Excelite nut-driver or screwdriver with slight alteration can be put to good use in maintaining the autotune units of the 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 AN/ARC-1 equipment, to make a useful tool.

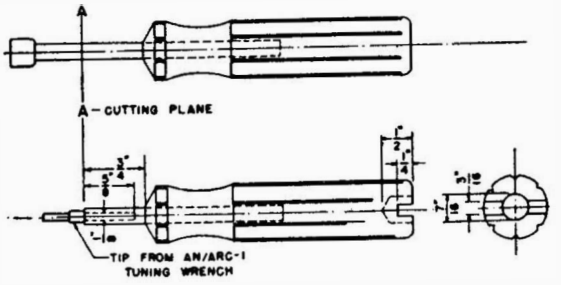


FIGURE 1.--Combination tuning and locking wrench

After sawing off the shank at A-A, a 1/8-inch hole is drilled in the end of the shank to a depth of 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 7/16-inch hole is drilled in the handle to a depth of 1/2 inch and a slot cut across the end 3/16 of an inch wide and 1/4 inch deep.

LOCKING WRENCH FOR AN/ARC-1

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 in figure 2.

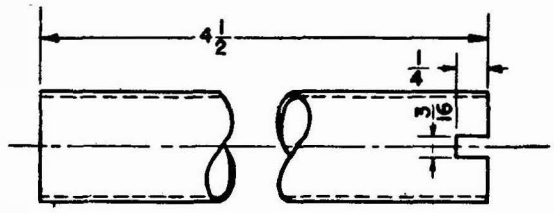


FIGURE 1. --AN/ARC-1 locking wrench

It may be constructed in a few minutes out of a piece of seven-eights inch O. D. brass or fiber tubing.

PLUNG 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. It is suggested that the connecting cable be made about 6 feet long.

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 Ig; 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 Ig 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 function 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 shorted 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 IK 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 and 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.

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 meter when the latter is tuned to frequency. The indition 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.

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.

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.

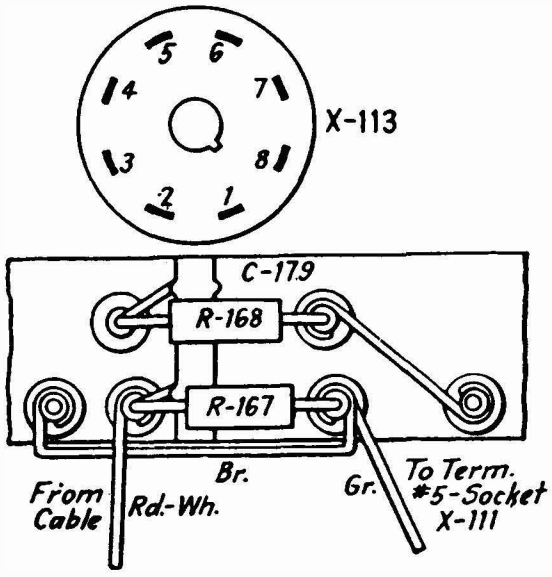


FIGURE 1.—Original arrangement

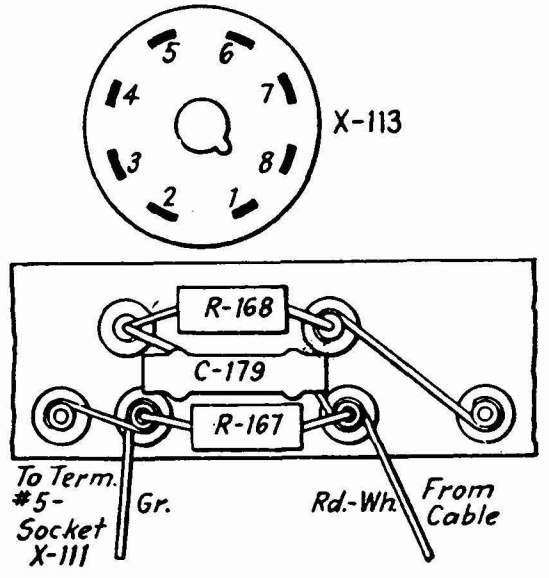


FIGURE 2.—Revised arrangement

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 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. 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.

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 should have at least 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.

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 is 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 3/16". If satisfactory performance is obtained on all lower number channels such should be decreased to about 1/2 its former value.

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 Ig'' with the meter in the circuit, and if no circuit deficiencies 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.

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

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.

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
A12293	A13333	A13903
A12442	A13370	A14021
A12560	A13421	A14104

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.

While proper dressing may prevent trouble for a limited length of time, there is a tendency for the leads to drift back to the dangerous position 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 chasis or nearby metal parts.

*** Digest of Airborne Radio & Radar News.**

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, with drive air through the casing. Using this forced ventilation, the motor-generator has been run continuously for 30 days without any trouble.

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

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

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, Use AN 08-30 ARC1-3, Section V, Page 5-8, Paragraph 8a.

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	Mobilgrease PD-535-A.	AN Aero Spec	Aviation Supply Office.	1 lb. can.
		Colonial Beacon	M-285 Grease	AN-G-25	Stock Cat. No. R14-G-982-20.	
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	
F	14L3	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-	1 lb. can. 5 lb. can.
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."

LOADING AN/ARC-1 TRANSMITTERS

An 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.

AN/ARC-1 CIRCUIT CHANGES

The Bureau has 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 paralled 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 obtained from spare parts, or will be supplied upon request through the normal supply channels.

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 undersirable broadening of the response band of the receiver.

To solve the problem, the manufacturers have incorporated 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 shows 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 1/4- or 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.

AN/ARC-1 TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
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-106 was zero.	Capacitor C-327 in the receiver section was shorted. Replaced and resumed normal operation.

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 re-use. If necessary, snip out a section of the broken rod with diagonal cutters, and remove all parts of the broken rod.

3. Cut a 2-inch length of 1/4-inch diameter, laminated-phenolic rod. 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, re-aline the transmitter in accordance with the procedures of the equipment instruction book. 4/1/50

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 rf and if amplifiers of the main channel receiver and rf 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 on the highest assigned frequency or the channel with the highest noise and, with the GUARD-MAIN switch on 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 screwdriver slot in the control shaft, and then turn the shaft approximately five degrees farther in a counterclockwise direction. Now lock the control shaft without disturbing the setting.

GENERAL INFORMATION ON THE ADJUSTMENT OF THE RECEIVER OF 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.

TURN SWITCH OFF WHEN REPLACING 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 alinment dowels fully engaged the transmitter-receiver. If the transmitter-receiver is not in proper alinment 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 aline the transmitter-receiver with the base before installation, and to secure the wing nuts on the mounting base properly. 4/1/49

REPLACEMENT OF 6AK4 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.

REMOVAL AND REPLACEMENT OF AN/ARC-1 AUTOTUNE MOTORS

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

(1) Loosen front subpanel, that retains the metering switch, and let it hang on the leads.

(2) Remove the type-832A tube in the final stage.

(3) Obtain a Phillips right-angle wrench, or equivalent, and remove all the motor retaining screws from behind transformer T-104, ect.

(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.

AN/ARC-1 ( ) RADIO INTERFERENCE

The Philadelphia Naval Shipyard has conducted a radio survey on Radio Sets AN/ARC-1 ( ) as authorized by Bureau of Ships. The following statements are extracts from the report: Spurious AN/ARC-1 ( ) radiation is of sufficient magnitude to cause intolerable interference to receivers installed on the same ship. All interference of this type was found to be antenna coupled. The most serious problem is second-harmonic energy interfering with UHF receivers. Use of Navy type-53232 antenna filter (used with TDQ) reduced second-harmonic interference to acceptable levels. This filter caused no measurable reduction in signal strength. Conducted, spurious, energy, up to 6000 microvolts, was measured at the power input. This noise was traceable to the dynamotor which caused interference to its own AN/ARC-1 ( ). The installation of Field Change 3-AN/ARC-1 and Field Change 1-AN/ARC-1A will eliminate all dynamotor interference. Improperly tuned AN/ARC-1 ( ) equipments generate spurious radiation at frequencies in the vicinity of the carrier frequency. Tuning instructions in the Technical Manual (AN 16-30-ARC-3) should be followed closely.

MODEL AN/ARC-1 TROUBLE SHOOTING NOTES

Difficulty Encountered

AN/ARC-1-Transmitter and receiver readings low. Transmitter and receiver intermittently becoming inoperative a short time after switching to a new channel.

Cause and Remedy

Replaced V-102, 103, 114, 124 (all 6AK5's. Old tubes found to by very low. U.S.S. Lind (DD-703)

Difficulty Encountered

AN/ARC-1- The channel selector drive motor, B-101, ran continuously for about five hours. This motor was not designed for such continuous operation and heated excessively, causing the insulation of the armature and field windings to melt

Cause and Remedy

The panel spring on the home-stop panel came off. The tip of the panel come up and caugh 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 to keep the spring in place.

Difficulty Encountered

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-106 was zero.

Cause and Remedy

Capacitor C-327 in the receiver section was shorted. Replaced and resumed normal operation.

A.C. POWER SUPPLY FOR AN/ARC-1 AVAILABLE WITHOUT REIMBURSEMENT

The Bureau of Ships has in stock a quantity of PP-903/U Rectifier Power Units which provide high and low-voltage power requirements for AN/ARC-1 when operated from 117 volts a.c. These units are furnished in a cabinet 27-inches long, 19-inches wide, and 12-inches high (including shock mounts), but they may be rack-mounted in a CY-597/G cabinet. The weight of the unit is 144 pounds. NAVSHIPS 91761 is the Technical Manual for PP-903/U Rectifier Power Unit. These units are available, without reimbursement, to activities forwarding shipment requests to the Bureau of Ships.

AN/ARC-1, AN/ARC-1A

Failures in Power Supply

An analysis of recent failure reports submitted to the Bureau of Ships has indicated repeated failures of capacitors C3 (16 mfd, 660wv) and C4 (8mfd, 600wv) in Power Supply PP-1092/U.

It has been determined that these failures are caused by the slow heating of the cathodes in the 6AU5 voltage-regulator tubes V5, V6, V7 and V8, as compared to the faster heating of the filaments in the 5U4G rectifier tubes V2 and V3. The estimated time differential is about three seconds. During these three seconds, the filtered, unregulated portion of the power supply operates with practically open terminals, except for a very small load imposed by resistor R3 and tube V9(OA2) which is not sufficient to hold the voltage within limits of the capacitor ratings. The cathode of the 6AG5 (V10) heats somewhat faster than the cathodes of the 6AU5's, however, this tube by its characteristics and function as a control tube, does not provide any appreciable load for the unregulated supply.

The Bureau of Ships is investigating a time delay (thermal type) relay for application in the primary of transformer 2 to permit all tube heaters and cathodes to arrive at proper operating temperature before application of high voltage.

AN/ARC-27 SHOCK HAZARD

When operating Radio Set AN/ARC-27 on the bench, electronic technicians have been shocked by contact with the dynamotor. Investigation has shown that the shock-mounted dynamotor was not grounded to the set chassis and leakage current from the high-voltage side causing the entire dynamotor assembly to be about 250 volts above ground. The offending dynamotor was disassembled, revealing an accumulation of dirt, carbon dust, and copper dust in the high-voltage side. An ohmmeter check revealed a resistance of only 0.1 megohm from the brush holder to the frame. After thoroughly cleaning the dynamotor, the resistance from brush holder to frame increased beyond the range of the ohmmeter.

In other cases where this condition existed, arcing had been occuring from the high-voltage brush holder to the dynamotor frame, charring the surface of the insulation.

To prevent damage to the equipment and to safequard technicians, the dynamotor in Radio Set AN/ARC-27 should be cleaned whenever the equipment is on the test bench, or at least every 60 hours of operation as required by the equipment Preventive Maintenance Instructions.

UNIT FAILURES IN AN/ARC-27

A study of failures in AN/ARC-27 equipment reveals two common related failures: failure of the equipment to tune to o selected frequency, and noisy dynamotors. Further investigation also reveals that whenever tuning failure occurred, it become necessary to overhaul the associated dynamotor. The units generally affected were the receiver RF amplifier, the spectrum oscillator, the spectrum amplifier, and the RF power amplifier. A thorough inspection of affected units showed them to be completely contaminated with carbon dust originating in the dynamotor. Such units con be returned to normal operation by cleaning them with moisture-free compressed air, and applying a thin coating of CRC2-26.

It is recommended that inspection of these items be conducted at regular monthly intervals in order to prevent excessive carbon dust from accumulating.

AN/WRR-7 Digital Data Receiving Set and AN/ART-50 Digital Data Transmitting Set--Calibration Unit

See article in AN/SRR-7 Section under the same title. (EIB 924)

AN/BRA-15, AN/BRA-21 Antenna Resistance Readings – Corrections to

The AN/BRA-15 and AN/BRA-21 antennas are essentially identical electrically and should have identical resistance readings. Following is a listing of correct resistance readings for the subject equipment control cables:

PINS	READING
A-B	100
B-C	100
A-C	100
D-S	90
E-S	22 or 60
F-S	22 or 60
G-N	6000
K-N	150 (AN/BRA-15); 2280 (AN/BRA-21)
M-N	Infinity
P-N	9000
V-S	300
V-R	300
R-S	300
T-N	1K to 9K
U-N	0 to 1250

NOTE

Reading from K to N is the only one which is different for AN/BRA-15 and AN/BRA-21 and is due to different grounding relays being used in these antennas. Readings from E to S and F to S will differ depending on manufacturer of motor B101. All readings have tolerance of plus or minus 10%. *(EIB 856)*

AN/BRA-16 Power Supply—Maintenance Hint

The high voltage transistors and regulator diodes for the AN/BRA-16 power supply are covered with a soft rubber cap. These rubber caps will split with age and leave the transistors and diodes, which may have as high as 200 volts on them exposed. This is very hazardous to anyone working on or around the subject power supply.

The technical manual does not list a manufacturers part number for the rubber caps, therefore, replacements are not readily obtainable.

It is suggested that a plexiglas cover be fabricated, 7 1/2" x 16 1/4" x 1/4", to cover the entire heat sink portion of the power supply. This cover can easily be mounted by using the existing screws on the heat sink. The cover is attached using eight electrical posts, FSN 5340-207-8319, and eight 8-32 x 3/8" screws. All of this material is readily available from any Repair Facility or tender site. A "DANGER HIGH VOLTAGE" sign can also be easily attached to the cover. This sign is available from Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120. Part number I0177-225-2800 applies.

This plexiglas cover is currently in use on the SSBN 609.

(EIB 891)

AN/BRA-18 "O"-RINGS

The O-rings supplied with the AN/BRA-18 equipments and replacement O-rings carried under FSN 1H5330-064-6585, are made of unsatisfactory material and should not be used. Satisfactory O-rings for the AN/BRA-18 can be obtained under FSN 1H5330-731-4223. (EIB 717)

MX-6403/BRA-18 and MX-8176/BRA-18C—Adjustment and Maintenance of Antenna Cable Length Counters

Antenna Cable Length Counters MX-6403/BRA-18 and MX-8176/BRA-18C have often been reported to be inaccurate or even inoperative. An investigation by the Navy Underwater Sound Laboratory has revealed the causes and cures for such conditions, and has also found that the technical manuals for the AN/BRA-18A and AN/BRA-18C do not adequately cover required adjustment and maintenance for the counters.

Insufficient or improper maintenance, misalignment, conversion, and indiscriminately applied paint appear to be the major causes of this trouble. In addition to the cleaning and oiling instructions contained in NAVSHIPS 95803 and NAVSHIPS 0967-325-8010, the following information should be added:

a. Be certain that no paint is or has been applied in the vicinity of any of the moving parts of the assembly, particularly near the counter reset knob and the back-up sheave assembly. When cable is being payed out the reset knob is stationary; however, when it is paying in the reset knob must be free to turn or the counter will not register. A small amount of carelessly applied paint, dirt, or other foreign matter between the knob and the counter case, or between the case and the collar on the opposite end of the reset shaft, is sufficient to cause the reset knob to hang-up and result in incorrect readings.

b. The two spring-loaded carriage blocks of the back-up sheave assembly should move freely in the ways machined in the cast body. If these blocks are sticky or jammed as a result of corrosion, the careless application of paint, or insufficient maintenance, the result will probably be either a damaged cable or incorrect counter readings.

c. A measuring wheel which still has a tight spot when turned by hand after performance of the repair procedures of section 8.4.1 of the Technical Manual may frequently be freed up by a simple adjustment of the alignment between the measuring wheel shaft and the counter shaft. If the four mounting screws holding the counter to the bracket are loosened, motion of the counter when the measuring wheel is turned by hand indicates misalignment. The two 5/16-18 screws holding the counter bracket to the body should be loosened and the position of the bracket adjusted to eliminate the motion and then retightened. The holes in the bracket provide 1/32 inch clearance around the mounting screws which makes this adjustment possible. (767)

AN/BRA-18, AN/BRA-18A, and AN/BRA-18C - Adjustment of Drive Block Chain Tension

When adjusting the tension of the drive block chain on the AN/BRA-18, AN/BRA-18A, or AN/BRA-18C care must be exercised to turn the adjusting knob in the direction which will cam the idler roller away from the pressure plate and against the chain. When facing the adjusting knobs the one on the left should be turned clockwise and the one on the right counterclockwise. If these knobs are turned in the opposite direction the idler roller is jammed against the pressure plate, causing it to cock, resulting in rapid wear of the idler roller, pressure plate, and chain.

When requisitioning a replacement pressure plate be sure to note the part number, 26061, as well as the FSN 2040-064-8152 on the requisition. Some items carried under this FSN are marked with the part number 22658 and will not fit in these equipments.(791)

AN/BRA-18( ) Antenna Transfer Assembly—Antenna Seal Valve Operation

In accordance with the technical manuals for the AN/BRA-18, 18A, and 18C antenna transfer assemblies, the antenna seal valve is used on many submarines as the primary seal to prevent water from entering the submarine while paying-out or retrieving the buoyant cable antenna. In actuality, the Fat O-ring is the primary seal and it should be replaced periodically or when excessive leakage occurs.

If excessive leakage occurs while paying out or retrieving cable, the seal valve should be pressurized to reduce the flow of water to approximately 5 gallons per hour (not zero leakage as many believe). The flow of water lubricates the seal valve rubber. Do not attempt to pay-out or retrieve the cable without some leakage of water through the seal.

The antenna cable is compressible and will pass through the seal valve when the valve is properly pressurized. But buoyant cable antennas such as the AS-2520( )/BRA-32 and the AS-2629( )/BRR have incompressible metal in-line connectors, in-line grounding ferrules and termination tips. The pressurized seal valve may cause some damage to the metal fittings when retrieving the cable.

The squeeze of the seal may either loosen or completely pull the fitting off of the cable. When retrieving the cable, the hydraulic pressure in the seal valve should be reduced to zero as the fittings approach the seal valve.

A cable mark in accordance with Section 4.5.8 of the SAIP Handbook, NUSC Report 551, should be placed on the cable approximately 25 feet inboard of the first fitting. This should allow sufficient time to release the pressure in the seal valve before the fitting actually enters the seal valve. *(813)*

AN/BRA-18, 18A, 18C and GD/EB Antenna Transfer Mechanism Ball Check Valves-- Inspection of

The primary function of the Ball Check Valve, incorporated in the AN/BRA-18, 18A, 18C, and GD/EB Antenna Transfer Mechanism, is to prevent sea water from entering a submerged submarine when the buoyant cable is pulled completely through the transfer mechanism or when the shear/shutoff valve fails to close properly.

A recent report from a submarine indicated that the entire length of buoyant cable had been pulled off the storage reel and through the antenna transfer mechanism. The ball check valve operated properly and prevented water from entering the submarine.

Inspections by NUSC/NL representatives indicate a definite lack of periodic inspection and maintenance of the antenna transfer mechanisms. This is especially true of the ball check valve because it is inaccessible for periodic inspection and maintenance.

Ball check valves that have been disassembled and inspected by NUSC were found to contain dirt, muck, harden scale, etc., within the ball check valve cavity which could inhibit the operation of the valve. On several of the older submarines nylon balls instead of the required "K" monel, were found in the ball check valve.

To insure that the ball check valve is operating properly in the AN/BRA-18, 18A, 18C, and GD/EB antenna transfer mechanisms the following procedure is recommended prior to paying out cable.

1. Obtain a 1/2 in. diameter nylon rod approximately 48 in. long (FSN 9G9330-618-5517).
2. Round off the tip of the nylon rod to remove any sharp edges.
3. Place the nylon rod along the length of the antenna transfer mechanism with one end of the rod at the lower end of the ball check valve.
4. Mark the nylon rod to indicate the length from the cable opening at the bottom of the antenna transfer mechanism to the lower end of the ball check valve.
5. Remove any blanking plugs or buoyant cable inside of the antenna transfer mechanism.
6. Place the shear valve in the closed position.
7. Insert the nylon rod with the rounded tip in the cable opening at the bottom of the antenna transfer mechanism until the mark on the nylon rod reaches the cable opening. At this point, rapidly tap the ball off its seat 3 or 4 times to be certain that it is free. A small amount of water which may be trapped in the ball check cavity may come out the bottom of the antenna transfer mechanism.
8. If no bill is felt thru the nylon rod, or if there is no metallic sound when tapping the ball off its seat, it is an indication of the presence of a nylon ball or a dirty ball cavity. The valve should then be disassembled, cleaned and the nylon ball replaced with the "K" monel ball FSN 2040-990-6479. *(796)*

SSN637 CLASS ANTENNA MAST CYCLE COUNTER PANEL

SSN637 class vessels are fitted with a cycle counter panel, GD/EB, drawing H96169-4567E0006, mounted in the attack center on the starboard side of the periscope area, off frame 36. This panel contains counters to record the number of raise and lower cycles of the UHF/IFF, VLF Loop, AN/BRA-21, ECM/DF, RDF, and snorkel masts. These counters provide factual data on the number of raise and lower cycles experiences by submarine antenna masts in actual service.

It is requested that personnel preparing Submarine Antenna Failure Reports include the counter reading. It is also requested that the counter readings be included in the Submarine Antenna Inspection Reports prepared by the Submarine Antenna Representatives.

The counters should not be reset except in the event that a complete antenna system is replaced. (EIB 713)

AN/BRA-15, AN/BRA-21 Antenna Resistance Readings—Corrections to

Refer to article in AN/BRA-15 section under same title. (EIB 850)

AN/BRD-7 Direction Finder Set—Connector Maintenance

The AN/BRD-7 extensively utilizes Subminiature Coaxion Contacts (AMP trade name) which are subject to failure if not properly mated. In most instances the failure occurs as a bent center conductor pin shorts to the shield. This failure occurs when the receptacle does not align properly and forces the pin aside. Some of the pins within each connector will be more articulated than others due to the different bend radii of their respective cables within the harness and their location on the connector block.

1. Use extreme caution when mating these style connectors. The guides do not function until several turns of the screws have been affected. It is also important to recognize when a greater than normal mechanical resistance is encountered during refastening and immediately disconnect and inspect the connector.
2. Prior to turning the pull-down screws insure that the guides are properly aligned and the face of each mating connector is exactly parallel.
3. When turning screws start with the screw on the end which tends to be misaligned the furtherest from the mating connector. Take up each screw alternately, turning 1/2 turn each time. Tighten only finger-tight; the screw slots are there for loosening.
4. Each time a connector is disconnected make a detailed visual search for bent pins or distorted shield pieces. Straighten as necessary using a suitable straightener so as not to damage pins or connector block.
5. In the event a new discrepancy is noted subsequent to connector mating, consider the possibility of its cause being a bent pin; however, do not indiscriminately demate and mate the connectors.

(EIB 904)

AN/BRN-7, AN/SRN-17 OMEGA Receiving Set — Maintenance Notes

This article which is in three parts provides the means to increase the reliability and improve the maintainability of the AN/BRN-7 and AN/SRN-17 OMEGA Receiving Sets.

Part I - Reports are being received that the PUSH-TO-READ OSC HTR current button located on the front of the Interconnecting Group, ON-128/WRN, is being depressed (inadvertently or otherwise) when no current meter is connected across test points TP 8 - TP 9. This causes the computer program to "DUMP", with the result that the set must be reinitialized, i.e., Enter Time, Enter Position, etc., must be reinserted into the computer program. Pending the issuance of a field change to prevent this from occurring, the following temporary fix can be made: using a 2.5 inch length of #14 solid conductor, plastic shielded copper wire, bare each end for a distance of 1/2" from each end; insert the two bare ends of the wire into test points TP 8 and TP 9; this effectively short circuits the button. To read the OSC HTR current, remove the short-circuit and proceed as outlined in Table 4-3, NAVELEX 0967-LP-467-6010; otherwise, leave the short circuit wire inserted into TP 8 and TP 9.

Part II - A significant amount of inoperative (MALF indications) Receiver-Computers, OR-133(V)1/URN have been reported after new modules were inserted. An investigation showed that a large percentage of these failures were due to improper insertion of the replacement (spare) module into the Interconnecting Box, J-3213/URN (base of the receiver-computer). This improper insertion results in some of the high density male pins in the base being bent to one side, broken or pushed down into the plastic body of the connector. Pending the issuance of a field change to prevent the improper insertion of modules in the receiver-computer, the following instructions should be followed:

a. When removing a module (after the 5 front-access body screws have been removed), unscrew the module's tie-down screws evenly, i.e., unscrew the right tie-down screw 2 turns, then unscrew the left tie-down screw 2 turns; return to the right tie-down screw and repeat the action, alternating the action between the two screws until the module is free of the pins and mounting base.

b. More importantly, when reinserting a module, manually push the replacement module down into the base until the tie-down screws and guide/key pins rest evenly on the base. Now, perform the same action as outlined in paragraph a., except tighten the tie-down screw, i.e., tighten the right tie-down screw 1 turn, then go the left screw and tighten 1 turn; return to the right screw and tighten 1 turn, then to the left screw 1 turn, etc. Repeat this action until the module is firmly in place. This will effect a smooth, even lowering of the module into the base with the result that the high-density male pins in the base will smoothly engage with the female receptacles located on the modules.

Part III - This part of the maintenance note is just a reminder that the only method of cooling the Receiver-Computer, OR-133(V) 1/URN is by radiation and convection. Therefore, it is very important that the area around the top, sides, and bottom of the unit be kept clear of any objects which would restrict the natural flow of air around the unit. The more open space provided around the unit, the more efficient will be the radiation and convection of heat into the surrounding air and away from the unit.

(EIB 925)

AN/BRN-7 OMEGA Receiving Set—Safety Precautions

The purpose of this article is to inform the users of the AN/BRN-7 OMEGA Receiving Set of a possible safety hazard during the use of the Programmer-Controller, TS-3389/URN.

The Programmer-Controller, TS-3389/URN power cable, 1W3, part no. 61719030-301 connectors are not securely clamped. During normal use they will rotate causing the cable ground shield to break. This breakage can be the cause of electrical shock when connecting the power cable to Interconnecting Group, ON-128/WRN.

Prior to connecting the power cable to the Interconnecting Group switch off the AC power to the AN/BRN-7 system.

A field change to the Programmer-Controller is being prepared to correct this problem.

(EIB 987)

AN/BRR-3, AN/BRR-3A—Equipment and Personnel Shock Hazard; Elimination of

The Naval Electronic Systems Command has been advised by the Puget Sound Naval Shipyard that a potential equipment damage and personnel shock hazard exists in all Radio Receivers AN/BRR-3 and AN/BRR-3A in that the shield on the shielded lead connected to the CRT Switch (S-605) in many cases shorts out the switch contacts. This condition exists due to the congestion area in whcih the switch is mounted and the fact that this shielded lead lays across the rear wafer of this switch.

In order to eliminate this potential personnel shock hazard and to prevent damage to the equipment it is recommended that the shielded lead be insulated by using a suitable insulating sleeving or wrapped with an insulated tape.

This procedure shall be followed on all Radio Receiving Sets AN/BRR-3 and AN/BRR-3A. (EIB 733)

AN/BRR-3 Radio Receiving Set — Electrical Shock Hazard

During a recent submarine safety review, the Naval Safety Center discovered a case of mild electrical shock due to frayed interconnecting cables on the AN/BRR-3.

Investigation by the Naval Electronic Engineering Office, Norfolk revealed that this is not a major problem or an inherent safety hazard. However, continued rough handling can cause excessive wear or damage to the cable, resulting in a potential shock hazard and/or damage to the equipment.

This problem can be averted by ensuring that the cable ties are secured as shown in figure 2-3 (item 4) of NAVELEX 0967-LP-063-6010 (formerly NAVSHIPS 93716) and careful insertion/withdrawal of the receiver chassis.

These cables should be inspected routinely as directed by MRC C-64 O-1 and repairs made as necessary.

(EIB 914)

AN/BRR-3, -3A Prototype Field Change (No Field Change Number Assigned). Referred to as "Field Change 5, Type 1" or "Field Change 5, Type I"—Cancellation and Turn-in of

The purpose of this article is to announce the cancellation of the subject field change and to provide instructions for turning in the field change material.

The subject field change was manufactured by the Naval Research Laboratory (NRL) and may be identified by noting that a Coherent FSK Demodulator unit is used with the AN/BRR-3, -3A receiver. The unit measures (not including panel dimensions) 4-1/2 inches wide by 7-3/4 inches high by 14 inches deep and is mounted beside or near the AN/BRR-3, -3A. The subject field change Coherent FSK Demodulator unit has "COHERENT FSK DEMODULATOR" imprinted in the upper part of its front panel above the thumbwheel frequency selection switches.

The subject field change has been superseded by FC 5-AN/BRR-3 and FC 3-AN/BRR-3A (both of these field changes were formerly referred to as "FC 5-AN/BRR-3, Type 2" or "FC 5-AN/BRR-3, Type II")--see announcement of availability which follows this article.

The subject field change should be removed from equipments and returned to NRL in accordance with the instructions which follow, because parts and maintenance support for the field change will not be provided.

All holders of the subject field change should, with the concurrence of their respective Type Commanders, ship the associated Coherent FSK Demodulator units manufactured by NRL (only) to:

Director
Naval Research Laboratory
Washington, DC 20375
ATTN: Code 5424 (R. Stone)

(EIB 950)

Field Changes 5, 6 to the AN/BRR-3 and Field Changes 3, 4 to the AN/BRR-3A—Availability of and Other Information Concerning

The purpose of this article is to announce the availability and applicability of the subject field changes and to provide other information relevant thereto.

FC 5-AN/BRR-3 and FC 3-AN/BRR-3A (each formerly referred to as "FC 5, Type 2" or "FC 5, Type II" to the AN/BRR-3) are identical Type 1, Class A field changes which are applicable only to submarine broadcast subscribers operating in fringe areas where marginal very low frequency reception has been predicted. Each field change is provided automatically to those subscribers designated by their respective Type Commanders to receive the field change. The purpose of FC 5-AN/BRR-3 and FC 3-AN/BRR-3A is to improve the reception capability of the AN/BRR-3, -3A receivers.

Each of these field changes may be identified by noting the use of a 19-inch rack-mounted Coherent FSK Demodulator unit manufactured by the Naval Weapons Support Center (NAVWPNSUPPCEN) with the AN/BRR-3, -3A. The nominal dimensions of the field change Coherent FSK Demodulator units (not including panel dimensions) are 16-3/4 inches wide by 5 inches high by 8 inches deep. Each of the Coherent FSK Demodulator units has an identification plate mounted to the left on its front panel imprinted with "COHERENT FSK DEMODULATOR" and "Naval Weapons Support Center," "Crane, Indiana 47522."

FC 6-AN/BRR-3 and FC 4-AN/BRR-3A (each formerly referred to as "FC 5 Type 2" (modified) are identical Type 1, Class C field changes which are applicable to all AN/BRR-3, 3A equipments having FC 5-AN/BRR-3 or FC 3-AN/BRR-3A installed. The purpose of FC 6-AN/BRR-3 and FC 4-AN/BRR-3A is to permit ±25 hertz frequency shift coherent FSK (frequency shift keyed) reception in addition to ±50 hertz frequency shift coherent FSK reception. FC 6-AN/BRR-3 and FC 4-AN/BRR-3A may be identified by the presence of a CARRIER CENTER/OFFSET switch on the front panel of the associated Coherent FSK Demodulator unit.

All holders of FC 5-AN/BRR-3 and FC 3-AN/BRR-3A who have not previously shipped the associated Coherent FSK Demodulator unit to NAVWPNSUPPCEN for modification should, with the concurrence of their Type Commanders, ship the Coherent FSK Demodulator unit (only) of the field change manufactured by NAVWPNSUPPCEN to:

Commanding Officer
Naval Weapons Support Center
Crane, Indiana 47522
ATTN: Code 30714 (Nyle Riegle)

for installation of FC 6-AN/BRR-3 or FC 4-AN/BRR-3A as applicable. Holders should also provide return shipment instructions. Upon completion of FC 6-AN/BRR-3 or FC 4-AN/BRR-3A by NAVWPNSUPPCEN, the modified Coherent FSK Demodulator unit will be returned to the sender, together with all instructions required for its reinstallation with the AN/BRR-3, -3A.

Holders of the subject field changes should note that the following actions are in process or are planned for the near future to ensure support for the field changes:

1. One set of spare modules (each set consisting of one each of the eight different modules contained in the Coherent FSK Demodulator unit) to be provided to each holder of FC 5, 6-AN/BRR-3 and each holder of FC 3, 4-AN/BRR-3A for storage in the spare/module storage spaces of the Coherent FSK Demodulator unit.

2. JAN nomenclature to be assigned to the Coherent FSK Demodulator unit with appropriate equipment nameplates to be forwarded to all holders of the subject field changes.

3. Revisions and update of the field change publications package (including a supplemental technical manual for the field change; field change bulletin; change sheets for the AN/BRR-3, -3A technical manual; and PMS MIP and MRC's) to be developed and forwarded to all holders of the subject field change.

Field Change Spares Support

The AN/BRR-3, -3A is being replaced by the AN/WRR-7 receiving system, with complete phase-out of the AN/BRR-3, -3A expected to take several years. As indicated previously, a certain number of FSK Demodulator spare modules are being procured for direct distribution to holders of the subject field changes. Additional spare modules will be retained by NAVWPNSUPPCEN for issue to equipment holders as required. Since the subject field changes have not been provided with standard U.S. Navy supply system support, it is planned that additional spares support be obtained by cannibalization of turned in Coherent FSK Demodulator units manufactured by NAVWPNSUPPCEN.

Therefore, when AN/BRR-3's and AN/BRR-3A's with the installed subject field changes are to be removed from the ship (by SHIPALT, etc.), the Coherent FSK Demodulator unit from the field change (and not the AN/BRR-3 or AN/BRR-3A receiver itself) should be shipped to:

Commanding Officer
Naval Weapons Support Center
Crane, Indiana 47522
ATTN: Code 30714 (Nyle Riegle)

These units will be retained and/or refurbished as required to satisfy spares requirements pending phaseout of the AN/BRR-3, -3A. Note that the Coherent FSK Demodulator units should not be turned in to the supply system for disposition as they have not been assigned National Stock Numbers and the system cannot process them.

Questions or problems relating to this subject may be referred to the Naval Electronic Systems Command, ELEX 51012, at AUTOVON 222-8420.

(EIB 950)

AN/CRT-3, -3A Radio Set Balloons—Shortage of

The purpose of this article is to inform EIB readers of the importance, shortage and current issue control of the subject balloons.

The AN/CRT-3, -3A is a hand powered (i.e., cranked) radio transmitter used to send an SOS message in the event emergency assistance is required and normal communications capability is not available. It is, at present, the surface Navy's standard emergency transmitter and is located aboard virtually every ship in the Fleet(s).

Due to its low output frequency/power, the AN/CRT-3, -3A must be operated with a long wire antenna raised to considerable height. The subject balloons (NSN 9N 5820-00-212-7172) are used to raise the antenna aloft for indefinite periods and are indispensable to the transmitters use at sea.

These balloons were manufactured of pure neoprene to stringent specifications giving them high durability and a very low leakage rate. Recent attempts by DESC (Defense Electronic Supply Center) to obtain spare balloons have been unsuccessful due to lack of a source. Widespread misuse of these balloons has resulted in a recent requisition demand rate of 240 per year which would exhaust stock in a few months.

NOTE:

ALL READERS SHOULD NOTE THAT THESE BALLOONS SHOULD NEVER BE USED (OR HERMETICALLY SEALED CANS OPENED) EXCEPT IN A BONA FIDE EMERGENCY REQUIRING SOS TRANSMISSION.

COMNAVELEXSYSCOM RO321512 Aug 76 to Fleet Commanders summarized this problem and announced an issue restriction to conserve remaining balloon stocks. Although current demand rate has dropped to 50 per year, it is still excessive in view of intended usage.

All activities are advised that requisitions for balloons will be rejected unless issue has been authorized by NAVELEX (ELEX 5048). Issue authorization requires explanation of disposition of balloons originally packed with AN/CRT-3, -3A.

EIB 94?

AN/FCC-3 CARRIER-TELEGRAPH TERMINAL EQUIPMENT

The Bureau of Ships has received numerous requests from field activities for information on the AN/FCC-3 Carrier Telegraph-Terminal equipment to facilitate planning on new construction projects. Design characteristics are believed sufficiently firm for the following information to be used pending general distribution of installation drawings and operational information.

Basically, the AN/FCC-3, is a combined narrow and wide-band telegraph- terminal equipment, and may be operated over any good quality voice channel radio link or wire line having a loss not exceeding 30dbm. The equipment is housed in two relay rack cabinets of the same construction and dimensions as the standard Navy type CY 597A/G but with minor internal modifications. One cabinet contains the transmitting group or send equipment, and the second cabinet, the receive group or receiving equipment.

The transmitting group consists of eight narrow-band 85-cycle frequency-shift-channel oscillators with mid-band frequencies between 425 and 1615 cycles per second with 170 cycle frequency-shift channel oscillators with frequencies of 1955,2380, 2805 and 3230 cycles. The narrow-band channels are capable of handling a keying rate of 40-dot cycles per second; and the wide-band channels, a rate of 100-dot cycles per second. The channel oscillator or transmitter is keyed from a 20 to 60-ma neutral-telegraph loop with battery supplied from either the loop, the transmitter, or a 30-ma polar-telegraph loop with battery supplied from the loop. The outputs from the transmitters are combined for transmission over a single-voice channel having a nominal input impedance of 600 ohm.

The receive group consists of eight narrow-band and four wide-band receivers or demodulators for converting the tones to direct current for operating telegraph or teletype equipment. The dc output is capable of keying a 20 to 60-ma neutral loop with battery supplied either from the loop, the receiver, or a 30-ma polar loop with battery supplied from the receiver.

An additional modulator or converter is provided in the transmitter for translating the eight narrow-band channels to a frequency spectrum of from 1700 to 3060 cycles. Information on the use of this facility will be forwarded to the field by the Bureau at a later date.

External wiring to the transmitting group normally requires a single-phase 115 or 230-volt, 1125-watt circuit for power, 12 signal circuits for dc telegraph loops, and one audio-signal circuit for the combined output of the transmitters. A similar number of circuits is required for the receiver group, except for a power requirement of 1770 watts. Type plans for installation, when completed by the Bureau, will require individual signal circuits from the audio output of each transmitter to a jackfield or patch board in the supervisory area to facilitate testing and provide flexibility in the use of the equipment. Combining of the outputs will be accomplished by strapping on the main distributing frame instead of within the terminal equipment cabinet. The total number of audio-signal circuits required then becomes 15, including the input and output of the group modulator. Similarly the input to the receiver will be terminated in the jack field in order that receivers may be removed from a circuit by patching.

Each unit of the equipment except the power distribution unit is mounted on a drawer-type slide permitting the chassis to be pulled out and tilted, bottom side out, for servicing. The chassis may be removed from the cabinet by disconnecting the power and signal-cable connectors and lifting it out.

AN/FCC-3 TELEGRAPH-TERMINAL EQUIPMENT

A report of recent studies by Aeronautical Radio, Incorporated, indicates that a substantial increase in the life of rectifier tubes in the AN/FCC-3 Telegraph-Terminal Equipment can be obtained by using ruggedized tubes. Accordingly, use of type 5Y3WGT or 5Y3GTB is authorized as replacement for 5Y3GT tubes in this equipment.

AN/FCC-3, -7, -8 HEAT PROBLEM

To alleviate maintenance problems in the AN/FCC-3, -7, -8, caused by excessive heating, the installation of a commercial blower unit, such as Model 2E408 manufactured by the McLean Engineering Laboratories, of Princeton, New Jersey, is authorized. For maximum cooling, the method of installation is important: (A) mount the 2E408 unit in place of the existing seven-inch blank panel at the bottom of the AN/FCC-3, -7, -8 cabinets (B) close the air outlet in the top of the cabinet and disconnect the existing exhaust fan. The new blower pressurizes the cabinet with filtered air which escapes through existing openings in each equipment drawer. Cost is on the order of $75. No field change covering air circulation in the AN/FCC-3, -7, -8 is planned.

AN/FCC-3, -7, -8 AND UQ REPAIR PARTS ALLOWANCES

The Telegraph-Carrier Terminals AN/FCC-3, AN/FCC-7 and AN/FCC-8 and the Radio-Relay Link Equipment, model UQ, when placed on the allowance of a communication station by the Chief of Naval Operations, are normally assigned to the parent activity for accountability. Since these equipments are utilized on a system basis and consist of a number of transmitter and receiver units or groups, it may be necessary to install several units or groups in different locations.

In those cases where incomplete equipments are installed each new activity, when requesting repair parts allowances from the Electronic Supply Officer, Great Lakes, should list only the type designations of the units or groups actually installed at the activity in lieu of listing the model designation of the complete equipment. An example is as follows:

Quantity	Description
1	T-371/FCC-3
1	R-525/FCC-3
1	OA-504/FRC

Stock number identification tables are being prepared by the Electronic Supply Office, Great Lakes for the AN/FCC-3 as a complete equipment as well as for the major units of the AN/FCC-3, AN/FCC-7 and AN/FCC-8. Such tables are also being prepared for the major groups of the UQ equipment.

Telegraph Carrier Terminal, AN/FCC-3A and AN/FCC-7A

These equipments have been designed to permit ready access for testing and repairs, without removal of the individual units from their cabinets. The circuits are grounded to the chassis for adequate protection against accidental electric shock.

However, if the units are removed to a test bench or otherwise detached for testing, the chassis of the detached unit should be provided with a good ground connection to minimize shock hazard.

AN/FCC-66, Back-to-Back Testing of Individual Channels

Section 5, (Maintenance), paragraphs 5-1 through 5-4 of Technical Manual (NAVSHIPS 0967-279-4010) for Telegraph Terminal AN/FCC-66 indicates that, should a fault occur on a channel the units concerned should be removed and plugged into a special test bed connected in a back-to-back configuration, or clear all the traffic from the entire system and patch the system back-to-back to effect maintenance on the channel concerned.

The purpose of this article is to describe a simple but effective method of testing a faulty channel in the system. This test method will also allow traffic flow to continue on the channels which are considered to be satisfactory. A special test cord must be fabricated to accomplish the test. (see figure 1).

The test procedure is as follows:

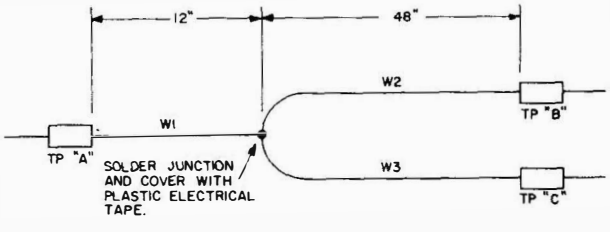
1. CLEAR THE SEND AND RECEIVE TRAFFIC FROM THE CHANNEL TO BE TESTED. BE SURE THAT THE TONE KEYER AT THE DISTANT SENDING END IS TURNED OFF.
2. Be sure that the SEND Vu switch on the channel selector panel CS 604 is in the 5-8/1-16 position.
3. Rotate the SEND channel selector switch on the channel selector panel CS 604 to the channel that is to be tested.
4. Set the SEND Vu switch on the channel selector panel CS 604 to the INDIVIDUAL position.
5. Set the mode switch of the TONE KEYER of the channel concerned to TEST.
6. Set the SEND/REC A switch on the channel selector panel CS 604 to the SEND position.
7. Insert the "A" end (see figure 1) of the test lead into TP2, the green test point directly under the SEND/RECEIVE A Vu meter, located on the TEST PANEL TP 604.
8. Insert the "B" end (see figure 1) of the test lead into TP6 of the A channel TONE CONVERTER under test. If diversity operation is applicable, insert the "C" end (see figure 1) of the test lead into TP6 of the B channel TONE CONVERTER under test.
9. Adjust the send level of the TONE KEYER under test to a -10 Vu as indicated on the SEND/RECEIVE A Vu meter of the TEST PANEL TP 604.
10. Conduct tests to determine the status of the faulty channel.

NOTE

After the testing of the faulty channel has been completed and the return to normal operation is desired, the following steps apply:

1. Remove the special test lead from the system.
2. Set the output level of the TONE KEYER which was under test to the normal operate level.
3. Place the SEND Vu switch on the channel selector panel CS 604 to the 5-8/1-16 position.
4. Set the mode selector switch of the TONE KEYER which was under test to the LINE position. ADVISE OPERATIONS AS TO THE STATUS OF THE CHANNEL CONCERNED.

(EIB 887)



MATERIAL REQUIRED TO FABRICATE THE SPECIAL TEST LEAD

TP"A" -SOLDERLESS INSULATED TIP PLUG, NICKEL PLATED. (H. H. SMITH TYPE 2001, COLOR OPTIONAL).

TP"B" - SAME AS TP "A".

TP"C" - SAME AS TP "A".

W1 - TEST PROD WIRE, AWG. 18-65x36, 12" LONG, COLOR OPTIONAL.
W2 - SAME AS W1 EXCEPT IT IS 48" LONG.
W3 - SAME AS W2.

Figure 1. Special Test Lead

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

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 ¼ 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.

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 ¼" 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 ½-inch round head machine screws through a 1¼" x ¾" 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.

REPLACEMENT OF ELECTRONIC TIMERS IN 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 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.

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 equipment so modified must be returned to its original condition if, for any reason, it is returned to stock.

AN/FGC-5 SERVICING NOTES

The Bureau of Ships forwarded Electronic-Equipment Failure Reports to the Teletype Corporation, manufacturer of the AN/FGC-5 Electronic Multiplex equipment, for analysis and comment. As a result, the following recommendations support the need for conscientious reporting of failures by field activities. The Teletype Corporation indicated that it could not comment on the failure of components manufactured by other concerns, but these recommendations have been found to improve the overall operation of the AN/FGC-5.

1. The instruction book for the Telegraph-Terminal Set AN/PGM-1 (NAVSHIPS 91945) details a procedure for checking the plate-voltage range of tubes in the AN/FGC-5 equipment. The contractor recommends that generally the tubes not be replaced, except in the Oscilloscope, if their associated circuit is functioning properly. Tubes, whose emission has fallen as low as forty percent of maximum, have been found to operate satisfactorily in properly alined circuits.

2. Pages 3-3 to 3-5 of the instruction book, noted above, describe a simple way of checking the operation of the tuned circuit associated with the first frequency divider in the Signal-Distributor Drive Units (0-101 and 0-100/FGC-5).

The coils in these tuned circuits tend to change value and eventually it becomes difficult to find a type 6SN7 tube that will operate properly in this circuit. Replacing the associated capacitor, instead of the coil, will clear up the trouble. Proper replacement of these capacitors often makes replacement of the associated oscillator tube unnecessary.

3. A capacitor decade box is recommended for precise checking of all the frequency dividers. Proceed as follows:

a. Remove the tuning capacitor, or capacitors, from the divider tank circuit.

b. Connect the decade box to the tank circuit using leads as short as possible.

c. Determine the capacitance that drives the circuit out of operation (both the minimum and maximum values).

d. Replace the tuning capacitor, or capacitors, with a capacitor equal to the average value found in step (c) above.

4. If the external battery-voltage-regualtor circuit (Receiving-Control Monitor Unit C-625/FGC-5) is not used, removing tubes V317, V318, and V319 will reduce heat dissipation, and increase the life of the remaining tube.

5. The failure reports (other than tube failures) were largely concerned with resistors located in the oscilloscope unit. New rear doors will reduce these types of failures and generally improve the operation of this unit. (EIB No. 395 provides ordering information on the doors).

6. Page 7-70 of the instruction book for the AN/FGC-5 equipment (NAVSHIPS 91265A) indicates the adjustments that should be made following the replacement of certain critical tubes. Particular attention should be given this section to insure both proper operation and longer tube life.

The Bureau is appreciative of the cooperation on the part of the Teletype Corporation and urges each technician to assume a personal responsibility in filling out and forwarding failure reports promptly.

ALIGNMENT OF AN/FGC-5 RELAY CIRCUIT

This alignment procedure is applicable to all AN/FGC-5 equipments modified for polar operation and utilizing Western Union Type 202 relays. This procedure for the 202 relay circuit will permit observation of the AC reversals under actual operating conditions.

Procedure

1. Place the send and receive Mux in the back-to-back position.

2. Place the transmit Muxsignal distributor drive unit (0.101) channel switch in the two-channel position.

3. Place the transmit control monitor C-620 input switch in the AC position and then place the receive control monitor (C-621) switch in position 6 (+ output).

4. Remove tube V-840 from CV-94 under test and then patch from the "V" input of the receive scope to position 6 (mixer) of the CV-94 monitor jack.

5. Terminate the receive channels in Tech control.

6. Place the transmit control monitor (C-620) switch in position 1 (external).

7. Using a shorted tip-to-sleeve patch cord, patch from the monitor printer jack of CV-94 under test to the "V" input of the transmit scope.

8. Adjust the bias current resistor on the 202 relay adapter panel to the fully clockwise position.

9. Observe the double trace on the transmit scope and adjust R-1058 (relay bias) for crossover. It should be noted that if crossover cannot be obtained, a slight adjustment of the bias current resistor may be necessary.

AN/FGC-59 UNIVERSAL TORN TAPE SYSTEM

Some activities are inadvertently referring to the AN/FGC-59 torn tape system in requests for equipment or dimensions. This article will provide comments and clarifications in the use of the proper nomenclature and configuration.

Universal Torn Tape System AN/FGC-59 is nomenclature assigned to identify the overall torn tape system used by the U.S. Army. The Navy has approved the use of this system; however, the Navy has assigned nomenclature to identify the various components to be used within the system.

The Navy nomenclature for the Model 28 Universal Torn Tape System: AN/FGR-5 Reveiving Group, AN/FGR-6 Monitoring Group, and AN/FGT-4 Transmitting Group, as stated in NAVSHIPS 94158, Volume I, Page "B," Change 1.

The Teletype Corporation now is making minor modifications to the receiving and monitoring group. The primary modification will include the use of selector magnet drivers in lieu of line relays. Nomenclature for the modified receiving group and monitoring group will be AN/FGR-5A and AN/FGR-6A, respectively.

The Model 28 Torn Tape System comes equipped with 75 baud 7.00 unit code and steppable transmitter distributors. When the 74.2 baud 7.42 unit code is required, field activities should request the necessary conversion kits from Naval Communication System Headquarters. The modification kits may be identified by the Teletype Corporation kit number 194273 for the transmitting group and kit number 194274 for the receiving and monitoring group. The quantity of kits required for conversion is:

AN/FGT-4	One kit (Teletype Corp. No. 194273) will convert one complete transmitting group or a total of six transmitter distributors.
AN/FGR-5 AN/FGR-5A AN/FGR-6 and AN/FGR-6A	One kit (Teletype Corp. No. 194274) will convert one complete receiving group and one complete monitoring group, or a total of six reperforators.

In some cases, the torn tape equipment was furnished with nameplates indicating "AN/FGC-59" rather than the individual group nomenclatures indicated above. All acitvities with torn tape equipment should obtain and install correct nameplates with the assistance of their local industrial facility. Each cabinet should have a nameplate similar to those presently installed indicating "AN/FGR-5," "AN/FGT-4," and so on, as applicable, rather than "AN/FGC-59." NAVSHIPS 94158 (Volume 1, Sept. 1962 issue) defines the components comprising each unit.

AN/FGC-60(V), NAVSHIPS 93841 - REPLACEMENT OF PILOT LAMPS

The pilot lamps supplied in KY-346(P)/UG and CU-972 (P)/UG equipments burn out at an excessive rate. The lamps originally supplied were GE-338, rated 2.7 volts, 0.15 ampere.

On current production, the manufacturer is installing GE-345 lamps, rated at 3.6 volts, 0.15 ampere. Replacement of the short-lived lamps (in the field) with GE-345 type is authorized recommended. The Federal Stock Number is 6240-683-0560.

Current issues of the applicable technical manual, NAVSHIPS 93841(A), list the new type lamps. However, holders of equipments accompanied by technical manual NAVSHIPS 93841 should requisition NAVSHIPS 93841(A).

AN/FGC-73 Series Equipment with Tape Flow Monitor Capability—Information Concerning

Several Communications Stations have reported the failure of axle (part #120579) in the wheel assembly of the tape flow monitor remote units. A solution to this problem has been devised with good results. The failed axles are removed from the wheel assembly as described in the tape flow monotor repair kit provided by the equipment contractor. The failed axle is then replaced with a section of wire from a standard paper clip cut to the proper length. These fabricated axles have been demonstrated at several communications stations with satisfactory results.

For those stations not holding copies of the Tape Flow Monotor Repair Procedures contact Naval Electronic Systems Command, Code 05612, Washington, DC 20360. (843)

AN/FRA-501 AND /FRA-19(V), AN/FRR-502 AND AN/FRR-49(V), CV-591/URR, CV-591A/URR, CV-1758/URR, AND TECHNICAL MATERIAL CORPORATION COMMERCIAL MODEL MSR-5-USA OF AUTO-TRANSFORMER TO REDUCE EXCESSIVE LINE VOLTAGE

Early procurement of the remote control receiver systems bearing the designations listed above, and all procurements of the CV-591/URR, CV-591A/URR, TMC commercial model MSR-5, and CV-1758/URR were equipped with power transformers designed for input voltages of 110/220 volts A.C. Operation of these equipments on line voltages in excess of 110 volts A.C. will materially reduce equipment reliability in addition to increasing the maintenance costs.

Later procurements of the AN/FRA-501 and AN/FRA-19 (V) and AN/FRR-502 and AN/FRR-49(V) equipments were provided with power transformers having tapped primaries to enable adjustment for input voltages from 105 volts to 230 volts A.C. Information is not available as to which serial numbers apply to the later equipments. The instruction books released with the equipments do not necessarily reflect the correct information regarding the type of power transformer used; therefore, it will be necessary to visually inspect each power transformer in the system to determine which type transformer is installed in the equipment.

The type of transformer in use can be determined by comparing the notation on the transformer primary connections with the notations for three different transformers shown in figure 1.

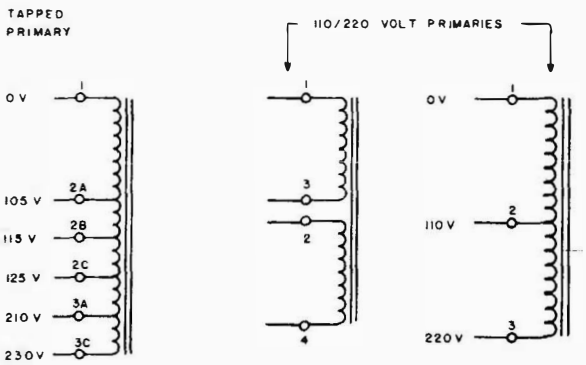
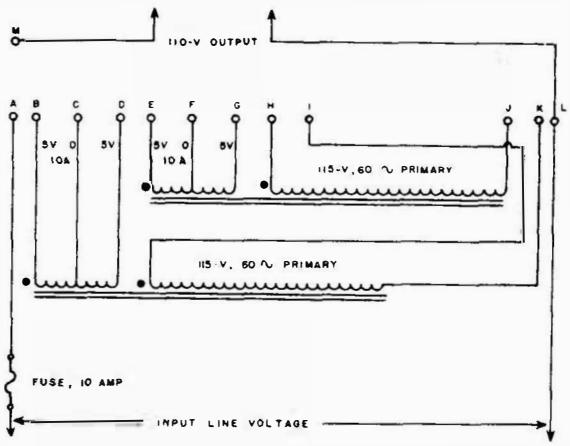


figure 1.

Activities using any of the equipments (or components thereof) listed in the subject for this article are directed to inspect their respective equipments to ascertain if the power transformers have 110/220 volt primaries or if tapped primary power transformers are used. Those activities finding 110/220 volt transformers in their equipment are further directed to take remedial action as necessary to correct the deficiencey at the earliest opportunity.

The simple auto-transformer arrangement shown in figure 2 is recommended because it provides the most economical method of voltage reduction using readily obtainable parts. The arrangement is designed to supply a 5 to



INPUT VOLTAGE	MAKE THE FOLLOWING CONNECTIONS FOR 110-VOLTS OUTPUT:
115-V	A-F, J-L, G-H-M
120-V	A-E, J-L, G-H-M
125-V	A-C, D-E, J-K-L, G-H-I-M
130-V	A-B, D-E, J-K-L, G-H-I-M

20-volt line voltage reduction to electronic equipment requiring a maximum of approximately 8 amperes rms.

A study of figure 2 and the connection chart, figure 3, will show that the 115-volt primaries of the transformers are connected to the 110-volt output circuit. Although this has the effect of lowering the total current available by an amount equal to the transformer primary currents, the transformer primaries are subjected to a slight under-voltage which will prevent overheating.

Two transformers are shown, although a single transformer with its 5-or 10-volt reduction capability may be sufficient for certain installations.

In most applications, the arrangement shown in figure 2 will supply all equipments installed in one CY-597( )/G equipment cabinet. The reduced voltage should be connected to a separate plug strip permanently installed in the

CY-597( )/G. This plug strip should be painted some contrasting color and equipment plugs should be color-coded using the same color.

Material Required
(To be supplied by installing activity):

Quantity	Description
1	Fuse Holder
1	Fuse, 10 amp
2	Transformer filament type, 115 volt primary, 10-volt, 10-amp centertapped secondary
1	Terminal Board, (14) terminal
1	Mounting Box, dimensions as required
	Miscellaneous hardware as required.

CAUTION

BE SURE TO OBSERVE THE PROPER PHASE POLARITY OF THE TRANSFORMERS AS SHOWN IN FIGURE 2. FAILURE TO OBSERVE THIS PRECAUTION WILL RESULT IN A VOLTAGE INCREASE INSTEAD OF THE DESIRED VOLTAGE REDUCTION. BE SURE TO MEASURE THE OUTPUT VOLTAGE OF THE AUTO-TRANSFORMER BEFORE CONNECTING TO THE EQUIPMENT LINE FEED BUS.

Auto-transformer tap connections are indicated in figure 3. Determine the required tap connections by measuring the line voltage. If possible, connect a recording voltmeter to the equipment supply line for a 24-hour period, and adjust the auto-transformer connections to compensate for the highest line voltage recorded for any 24-hour period.

After the equipment is connected to the output of the auto-transformer, measure the AC voltage applied to the filament circuits of the equipment using an accurate AC voltmeter. Do not measure the filament voltage at the panel lamp socket since the panel lamp voltage may be different than the filament voltage. A filament voltage between 6.0 and 6.3 volts rms is considered normal. Under no conditions should the filament voltage exceed 6.3 volts rms.

Test all units of the equipment affected as a result of this reduction in the supply line voltage. This is necessary because electron tubes operated with excessively high filament voltages for extended periods of time may have deteriorated to the extent that they will fail to function properly when the filament voltage is reduced to normal.

AN/FRA-501 Maintenance Notes

It has been reported that a decrease in resistance of R-45, a part of C-5027/FRA-501 through C-5031/FRA-501, caused a failure of the output transformer (T-5 of these units) and of the power transformer T-1 of PP-5030/FRA-501). To prevent such failures, the resistance of R-45 should be measured at each preventive maintenance inspection. Replacement should be made when the resistance decreases to 600 ohms.

AN/FRA-501, AN/FRA-19(V), AN/FRR-502, AN/FRR-49 (V), CV-591/URR, CV-591A/URR, AND TECHNICAL MATERIAL CORPORATION COMMERCIAL MODEL MSR-5 - USE OF AUTO-TRANSFORMER TO REDUCE EXCESSIVE LINE VOLTAGE

See article in AN/FRA-19 section under the same title.