AN/UCC-1(V)–Telegraph Terminal Diversity Pairs

The AN/UCC-1(V) terminal equipment is configured to operate with any selected combination of audio-frequency diversity pairs as long as send and receive terminals correspond. The tone combinations shown in the technical manuals do not correspond with those selected for the forthcoming multichannel broadcast. The following listed tone frequency diversity pairs should be noted by pen-and-ink changes to the following technical manual pages.

AN/UCC-1(V)–NAVSHIPS 0967-046-9010 (formerly NAVSHIPS 94767) pages 1-8, 1-10, 1-11, 1-12, and 1-14.

AN/UCC-1A(V)–NAVSHIPS 0967-106-1010 (formerly NAVSHIPS 96028, pages 1-6, 1-7, 1-8, and 1-10.

AN/UCC-1C(V)–NAVSHIPS 0967-046-9010, pages 1-8, 1-10, 1-11, 1-12, and 1-14.

AN/UCC-1D(V)–NAVSHIPS 0967-239-4010, pages 1-10, 1-11, 1-12, and 1-13.

Tone Frequency diversity pairs:

425–1785	1105–2465
595–1955	1275–2635
765–2125	1445–2805
935–2295	1615–2975

(745)

AN/UCC-1(V) Series Telegraph Terminal Utilization–Information Concerning

The following information clarifies requirements for proper utilization of Telegraph Terminals AN/UCC-1(V) and updates information that was originally published in EIB 704.

OPNAV INSTRUCTION 02303.21D of 1 Feb 68, OPNAV INSTRUCTION 02303.36A of 3 Sep 68, and ALCOM 79 of Nov 68, contain information concerning channelization.

For receive operation, the converters should be set up and adjusted as outlined in applicable technical manuals, with specific attention to discriminator balance and bias adjustments.

NOTE

Loop current should never exceed 60MA. This level should not be exceeded to avoid damage to the output switch transistor of the converters. This check should be made periodically on all loops whether in operation or not. Adjustment should only be made with a steady MARK condition on the loop.

Output Switch 1A2A1Q14 in AN/UCC-1(V), AN/UCC-1A(V), and Output Switch 1A2A1Q6 in AN/UCC-1C(V), AN/UCC-1D(V) equipment converter modules will not withstand excessive loop current.

For proper operation of keyers and transmitters, the keyers should be set up as outlined in applicable technical manuals with specific attention to bias and adjustment.

NOTE

Only tones being utilized should be fed to the transmitter being used. Keyers and the control attenuator must be readjusted when increasing or decreasing the number of tones. Do not overload transmitters.(745)

R-1051( )/URR RADIO RECEIVER–OPERATION IN AFTS RATT MODE

See article under R-1051( )/URR with the same title. (EIB 721)

AN/UCC-1 SERIES TELEGRAPH TERMINAL-OPERATIONAL HINTS

OPNAV INST 02303.21C and OPNAV INST 02303.36 are the channelization plans for Fleet mult-channel radio teletypewriter broadcast and Fleet multi-channel radio teletypewriter ship-to-shore and shore-to-ship communications, with a clarification promulgated as ALCOM 80 of 1966. Specific attention should be noted of the proper methods of utilization as outlined in the ALCOM.

The frequency stability of the transmitting and receiving equipment is important for proper operation. Frequencies being off more than a few Hertz tend to degrade capability of various channels. It is necessary to utilize a synthesized transmitter and receiver.

It is necessary to check the loop current available to the various keyers and converters. Loop current should never exceed 60 MA. Adjustment should only be made with a steady mark condition on the loop. It is necessary to open the loop by inserting a dummy plug in the loop of the various patch panels or run the adjustable pot counterclockwise (inserting all of the resistance of the adjustable pot) to avoid having excessive loop current available on the loops not actually being used. Checks should be made on all loops periodically to assure proper loop current on loops actually being used and that no loop current exists or that the loop current is 60 MA or below on the unused loops.

"The output switch (TRANSISTOR) in the AN/UCC-1 series of equipments will not withstand excessive loop current."

For proper receive operation, the converters should be set up and adjusted as outlined in the applicable technical manuals with specific attention to the discriminator balance, bias, delay, and diversity balance adjustments.

For proper operation of keyers and transmitters, the keyers should be set up as outlined in the applicable technical manuals with specific attention to the bias adjustment.

NOTE

Only tones being utilized should be fed to transmitter or transmitters being used. Keyers and control attenuator must be re-adjusted when increasing or decreasing the number of tones being utilized. DO NOT OVER DRIVE THE TRANSMITTERS. (EIB 730)

AN/UCC-1C(V) AND AN/UCC-1D(V)—DIVERSITY BALANCE ADJUSTMENT FOR

This article defines a method to adjust the DIV BAL control on AN/UCC-1C and AN/UCC-1D Converters. This procedure provides a clearer, more precise alignment in preparation for Diversity operation than can be obtained with the procedure presently given in the technical manual. For this reason all future adjustments for DIV BAL will be made in accordance with the following procedure:

The use of this procedure requires that Field Change 4-AN/UCC-1C(V) and 2-AN/UCC-1D(V) be accomplished. (See previous articles in this issue.)

Diversity Balance.—This procedure identifies the converter in a diversity combination which has the least gain and uses that particular converter as a reference to which the other converters in the diversity group are adjusted, thus providing equal gain for all the converters in the diversity group.

1. Reference:
   AN/UCC-1C(V) NAVSHIPS 0967-046-9010
   AN/UCC-1D(V) NAVSHIPS 0967-239-4010
   FC 4-AN/UCC-1C(V) and 2-AN/UCC-1D(V)
2. Test Equipment (or equivalent) to be used:
   Audio Oscillator AN/URM-127
   Electronic Frequency Counter AN/USM-207
   Electronic True RMS/dbm Voltmeter ME-6D/U
   Multimeter AN/PSM-4 series or Simpson 260
3. Turn the DELAY adjust control fully counterclockwise.
4. Turn the DIV BAL control on all converters in the diversity group fully clockwise.
5. Set the DIVERSITY switch on all converters in the diversity group to the ONE position.
6. Place the TONE INPUT switch, 1A2S1, on all converters of the diversity group to be adjusted to the REC-A position. Place the TONE INPUT switch of all other converters to the REC B position.
7. Connect Audio Oscillator AN/USM-127 to the REC A test point and common of the test connector on the control attenuator. Insure that no signals are patched to the RECE-A input at the audio patch panel.
8. Connect Electronic Frequency Counter AN/USM-207 across the output of the audio oscillator. Adjust the audio oscillator to the highest center frequency ±3 Hz of the diversity group. Connect RMS Voltmeter M-6D/U across the oscillator output. Adjust the oscillator output level for a reading of -20 dbm.
9. Set Multimeter AN/PSM-460 to +10 Vdc scale. Connect the negative (-) lead to common and the positive (+) lead to test point R of the test connector on the converter under test. Measure the dc voltage (AGC-Detector) on the converters having the higher center frequency of the diversity group. Record these measurements for future reference.
10. Adjust the audio oscillator to the lower center frequency of the diversity group at level of -20 dbm.
11. Measure the dc voltage (AGC Detector) between pin R and common of the test connector on the converters having the lower center frequency of the diversity group. Record these measurements for future reference.
12. The converter with the highest AGC detector voltage recorded in Steps 9 and 11 will now be used as a standard to which the remaining converters of the diversity group will be adjusted.

Connect the multimeter between common and pin R of a converter with a lower AGC detector voltage; tune the audio oscillator to the center frequency for this converter at an output level of -20 dbm. Adjust the DIV BAL control (R-26) until the AGC detector voltage is equal to the highest voltage recorded in Steps 9 and 11 (standard converter). Repeat this procedure for the remaining converters in the diversity group which have low AGC detector voltage.

13. Repeat Steps 3 through 12 for all diversity groups in the system.
14. Place all TONE INPUT switches and DIVERSITY switches to the proper position for the desired system operation. (733)

AN/UCC-1 MOD A, B, OR C (V)—REPORTING OF ERRORS ON NAVSHIPS 4110's

In the past numerous errors have been noted in reporting of AN/UCC-1 (Mod A, B, or C) (V) equipments on the NAVSHIPS 4110. The errors are most prevalent in reporting correctly the "R" or "TR" designation. The following list reflects the proper listing:

"N System"—Multichannel Broadcast

Correct Designation	Consists of modules for Broadcast Channels
AN/UCC-1(:)(V)R1	3, 4
AN/UCC-1(:)(V)R4	1, 2, 3, 4
AN/UCC-1( )(V)R7	1, 2, 3, 4, 5
AN/UCC-1( )(V)R10	1, 2, 3, 4, 6
AN/UCC-1( )(V)R13	1, 2, 3, 4, 7
AN/UCC-1( )(V)R16	1, 2, 3, 4, 8
AN/UCC-1( )(V)R17	1, 2, 3, 4, 7, 8
AN/UCC-1( )(V)R19	1, 2, 3, 4, 5, 7
AN/UCC-1( )(V)R22	1, 2, 3, 4, 5, 7, 8
AN/UCC-1( )(V)R25	1, 2, 3, 4, 5, 6, 7, 8

"P System"–Ship-Shore-Ship Multichannel

Correct Designation	Consists of modules for transmitting and receiving on channels
AN/UCC-1( )(V)TR1	A, B, C, D
AN/UCC-1( )(V)TR4	A, B, C, D, E
AN/UCC-1( )(V)TR6	A, B, C, D, G
AN/UCC-1( )(V)TR8	A, B, C, D, E, G
AN/UCC-1( )(V) TR14	A, B, C, D, E, F, G, H,
AN/UCC-1( )(V)TR15	MX/DEMX A, B, C, D, E, F, G, H (735)

AN/UCC-1C(V) AND AN/UCC-1D(V) EQUIPMENT–MAINTENANCE HINT

AN AC power cord for use with the Test Adapter, 1A3A2, is not provided with the equipment.

Do not use clip leads to apply AC power to the Test Adaptor. Avoid a shock hazard by fabrication an appropriate power cord. Federal Stock Numbers for an approved plug and connector are:

Electrical Attachment Plug, male, 3-wire, grounding-type, 9N5935-577-0284, $.19 each.

Connector Plug, 3- wire grounding-type, 9N5935-577-0287, $.34 each. (737)

AN/UCC-1C(V) AND AN/UCC-1D(V)–MAINTENANCE HINT

This article defines a method of adjusting the Discriminator Balance Control on Converters AN/UCC-1C(V) and AN/UCC-1D(V). This method eliminates the need for reversals to be transmitted from a distant station when a receive -only system is to be adjusted.

Discriminator Balance–This procedure describes a method for adjusting the discriminator to provide equal energy levels for both MARK and SPACE input tones.

1. Reference:
   AN/UCC-1C(V) NAVSHIPS 0967-046-9010
   AN/UCC-1D(V) NAVSHIPS 0967-239-4010
2. Test Equipment (or equivalent) to be used:
   Telegraph Test Set TS-2232/UCC-1C(V) or TS-2232A/UCC-1C(V)
   Oscilloscope AN/USM-140

Procedure:

1. Set the converter to the following condition:
   Diversity Switch to Div. One Position
   Tone Input Switch to Individual Position
2. Connect the test set-test cable to the converter test Jack (J1) and place the test set switches to the following positions:
   Power Switch to OFF
   Function Select Switch to TONE OUT
   Tone Select Switch to Frequency of Converter under test
   Mode Select Switch to MARK
3. Oscilloscope Setup:

Vertical Polarity	+ up
Vertical Sensitivity	.2 Volts/CM
Input	DC
Sweeptime	1 MS/CM
Trigger Source	Internal
Sweep Mode	Free Run

4. Using a 10:1 probe connect the vertical input of the oscilloscope to the Disc A Jack and the probe ground lead to the Disc B Jack of the Test Set.
5. Adjust the Vertical Position control of the oscilloscope to position the sweep in the center of the graticule. This must be done with the power switch on the Test Set in the OFF position. When a "no tone" condition is present at the input to the converter, a small voltage is still present at the discriminator output. This voltage will be the reference level of the balanced output.
6. Energize the Test Set and place the Mode Select Switch to MARK. Note the amount of deflection of the scope sweep.
7. Place the Mode Select Switch to SPACE. Note the direction and amount of deflection of the scope sweep.
8. Withdraw the converter chassis and adjust the Disc Bal control until the deflection for MARK and SPACE tones are equal and opposite. Where space permits, the Test Adaptor may be used to apply AC power to the Converter. This allows access to the Disc. Bal. Control while monitoring the discrominator output with the oscilloscope. Steps must be taken to insure that each converter is returned to the proper slot in the cabinet.
9. Repeat this procedure for all converters to be adjusted.
10. Return equipment to normal operating condition. (738)

AN/UCC-1 Series Equipment–Maintenance Hint

This article provides the necessary information and adjustment procedures to reduce the bias distortion present in the output loop circuit of the AN/UCC-1 series of converters.

The bias adjustment functions to control the switching level of a detector driving the output switch. The amount of control by this adjustment allows compensation for a wide range of bias distortion. This distortion may be introduced into the communications link at the transmit station, or it may be caused by the content of the converter output loop.

The technical manuals for AN/UCC-1C(V) and AN/UCC-1D(V) equipments define a bias adjustment procedure that requires the DC loop current to be removed from the converter output. Under this condition, the content of the external loop circuit and the bias distortion it creates are not considered when performing the bias adjustment. This procedure also requires special signals (reversals) to be transmitted from the distant station.

The technical manual utilizes +Loop (J1-A) and Common (J1-P) test points when making the bias adjustment. The use of common as a test point is not desirable as this point in the converter circuit has no electrical relationship with the external loop current source.

The signal appearing across these test points, therefore, is not representative of the Current/No-Current signal at the output of the converter.

To properly adjust the Bias Control of the converter, it is necessary to observe on an oscilloscope a current waveform of the loop circuit, while receiving normal traffic with the external loop current applied to the converter output. The following paragraphs describe this procedure for bias adjustment.

Bias adjustment procedure for Converters CV-1920/UCC-1C(V) and CV-1920A/UCC-1C(V) during NORMAL TRAFFIC CONDITIONS.

Test Equipment (or equivalent) required:

Oscilloscope	AN/USM-140

Using a 10:1 probe, connect the vertical input of the oscilloscope to the converter test connector +Loop (J1-A).

Present installation guidelines place the negative side of the converter loop circuit at ground potential by grounding the negative side of the loop current power supply. With the presence of this ground and with to oscilloscope properly grounded by the AC power cord, the scope probe ground lead must not be connected to the Converter Test Connector (J1). This procedure assumes the aforementioned conditions are met.

Scope Setup:

Input	DC
Sensitivity	5 Volt/cm
Polarity	+ UP
Trigger Source	Internal
Trigger Slope	- (Negative)
Sweep Mode	Preset
Sweep Time	5 MS/cm
Sweep Magnified	X2

While receiving traffic signals (keyed tones) from the distant station, adjust the scope Trigger Level Control until a stable sweep is present. Adjust the scope Horizontal Position Control so that the beginning of the sweep is at the left edge of the graticule. Refine the Trigger Level Control to display a MARK to SPACE (negative going) transition at the beginning of the sweep.

Under this condition the first portion of the sweep will display a SPACE signal. The total duration of this SPACE is dependent on the number of SPACE bauds occurring after the scope is triggered.

Measure in centimeters, the minimum duration of the SPACE signal (such as 5.2 cm) which represents one SPACE baud.*

Set the scope Trigger Slope to +(Positive). Adjust the Trigger Level Control until a SPACE to MARK (positive going) transition occurs at the beginning of the sweep. A MARK signal will now be displayed at the beginning of the sweep. Measure in centimeters the minimum duration of MARK time (such as 5.1 cm) which represents one MARK baud.* Add these minimum durations for SPACE and MARK times and divide by 2.

$$\text{Example: } \frac{Ts + Tm}{2} = \frac{5.2 + 5.1}{2} = \frac{10.3}{2} = 5.15 \text{ cm}$$

Adjust the Converter Bias Adjust Control for the minimum MARK and SPACE duration equal to the computed time (5.15 cm) or equal MARK and SPACE duration.

This procedure also is applicable for the bias adjustment of Converters CV-1522(P)/UCC-1(V) and CV-1522A(P) UCC-1(V). The vertical input to the scope, however, is connected to the sleeve of the Converter Loop Monitor Jack.

*NOTE

For the purpose of this adjustment procedure, a SPACE baud time is measured from the beginning of the MARK to SPACE transition to the beginning of the SPACE to MARK transition! The time of a MARK baud is measured from the beginning of the SPACE to MARK transition to the beginning of the MARK to SPACE transition. (742)

TS-2232/UCC-1C(V) and TS-2232A/UCC-1C(V) Test Sets, Telegraph Terminal Incompatibilities of

Incompatibilities exist between Telegraph Terminal Test Sets TS-2232/UCC-1C(V) and TS-2232A/UCC-1C(V). The incompatibility is due to circuit parameter differences of the parent equipments, the AN/UCC-1C(V) and AN/UCC-1D(V).

As a result of the incompatibility, testing and adjustments must be made using the assigned test set. Proper assignment of the subject test sets is as follows:

TS-2232/UCC-1C(V)	AN/UCC-1C(V)
TS-2232A/UCC-1C(V)	AN/UCC-1D(V)

AN/UCC-1(V) Telegraph Terminal Units and Assemblies—Interchangeability of

In order to expand communications facilities, it has been necessary on occasion to provide a cabinet of AN/UCC-1D(V) equipment to supplement previously installed AN/UCC-1C(V) equipment. Although this arrangement is compatible, component and sub-assemblies of these equipments are not to be interchanged. For example, the converters of the AN/UCC-1C(V), designated CV-1920(P)/UCC-1C(V), and the converters of the AN/UCC-1D(V), designated CV-1920A(P)/UCC-1C(V), are not to be interchanged and should not be used in other than their parent cabinet. Likewise, printed circuit board assemblies of the AN/UCC-1C are not to be interchanged with boards from the AN/UCC-1D.

Units of one series of the AN/UCC-1 equipment are not to be mixed or interchanged with units of another series. The appropriate test set must also be used. Article on page AN/UCC-1:4 explains incompatibilities between Test Sets TS-2232/UCC-1C(V) and TS-2232A/UCC-1C(V).

The name plate (nomenclature) of the equipment is located on the rear of the cabinet above connectors J2 and J3.

The complete list of units for an equipment is contained in Section 6 of the applicable technical manual.

Action is being initiated to prevent future installations of this nature and to correct existing installations.

AN/UCC-1(V), AN/UCC-1A(V)—Converter Adjustment Procedures

Reports from the Fleet, the findings of Baseline II and other research programs, describe AN/UCC-1( ) performance as poor due to high distortion of the converter output signal and improper diversity combining. Investigation revealed that the problem is primarily created because the adjustment procedures given in the technical manuals do not condition the equipment for proper system operation.

The following alignment procedures provide a clearer, more precise adjustment of Converters AN/UCC-1(V) and AN/UCC-1A(V) in preparation for diversity operation than can be obtained with the procedures presently given in the technical manual. This is achieved through the use of locally generated test tones of known quality and values. Minor modifications to the converters have also been made which improve the operation of the discriminator and permit easier recognition of an equal gain condition for converters of a diversity group.

For these reasons the adjustment procedures given in this article are to be used in lieu of the procedure given in the technical manual. It is also recommended that the adjustments be made in the order in which they are presented. (755)

Diversity Balance Adjustment for AN/UCC-1(V), AN/UCC-1A(V) Converters

Diversity Balance—This procedure identifies the converter in a diversity combination which has the least gain and uses that particular converter as a reference to which the other converters in the diversity group are adjusted, thus providing equal gain for all converters in the diversity group.

The use of this procedure requires that Field Change 2-AN/UCC-1(V) and 1-AN/UCC-1A(V) published elsewhere in this EIB be accomplished.

Reference:

AN/UCC-1(V) NAVSHIPS 0967-172-2010 (formerly NAVSHIPS 94787)

AN/UCC-1A NAVSHIPS 0967-106-1010 (formerly NAVSHIPS 96028)

EIB

Test Equipment (or equivalent) to be used:

Audio Oscillator AN/URM-127
Oscilloscope AN/USM-140
Frequency Counter AN/USM-207
RMS Voltmeter ME-6D/U

Procedure:

1. Disconnect the DC loop connector from J8 on the rear of the converter cabinet.
2. Turn the delay adjust control fully counterclockwise.
3. Turn the diversity balance control on all converters in the diversity group fully counterclockwise.
4. Set the diversity switch on all converters in the diversity group to the ONE position.
5. Place the TONE INPUT switch of all converters of the diversity group to the RCVR A position. Insure that no signals are patched to the RCVR A input at the audio patch panel.

6. Connect the Electronic Frequency Counter, AN/USM-207, across the output of the Audio Oscillator, AN/URM-127. Tune the audio oscillator to the lowest center frequency, ±3Hz, of the diversity group. Disconnect the frequency counter.

7. Connect the audio oscillator output to the RCVR A test points on the control attenuator.

8. Connect the RMS Voltmeter, ME-6D/U, across the audio oscillator output. Adjust the audio oscillator output level for a reading of -20dbm on the RMS voltmeter.

NOTE

The ground terminal of the audio oscillator output must be connected to the bottom RCVR-A test point.

9. Connect the vertical input probe of the oscilloscope to the AGC test point of a converter having the lowest center frequency of the diversity group (audio oscillator frequency). Connect the oscilloscope ground probe to the OV test point of the converter.

Oscilloscope Setup

Input	AC
Polarity	+UP
Vertical Sensitivity	.5 volts
Sweep Time	1 ms/cm
Trigger Source	Internal
Sweep Mode	Preset
Trigger Slope	+(positive)
Trigger Level	for stable sweep

10. Measure the peak-to-peak voltage of the signal on the oscilloscope. Record this voltage for future reference.

11. Measure and record the peak-to-peak voltage at the AGC test point of the remaining converter having lower frequency of the diversity group.

12. Disconnect the audio oscillator from the control attenuator. Connect the output of the audio oscillator to the frequency counter. Tune the audio oscillator to the higher center frequency, ±3Hz, of the diversity group. Disconnect the frequency counter.

13. Connect the audio oscillator output to the RCVR A test points on the control attenuator.

14. Connect the RMS voltmeter across the audio oscillator output and adjust the oscillator output level for a reading of -20 dbm on the RMS voltmeter.

15. Measure and record the peak-to-peak voltage at the AGC test point in each converter with the highest center frequency of the diversity group as described by steps 9 and 10.

16. The converter with the lowest peak-to-peak voltage at the AGC test point recorded in steps 9 through 15 will be used as a standard to which each of the remaining converters of the diversity group will be adjusted.

17. Connect the vertical input of the oscilloscope to the AGC and OV test points of a converter with a high peak-to-peak voltage recorded in steps 9 through 15; tune the audio oscillator to the center frequency, ±3Hz, for this converter at an output level of -20dbm. Adjust the converter diversity balance control clockwise until the peak-to-peak voltage at the AGC test point is equal to the peak-to-peak voltage of the standard converter as described in step 16. Repeat this step for each of the remaining converters in the diversity group which have peak-to-peak AGC voltage higher than the standard converter.

18. All converters of this diversity group are now adjusted to provide equal gain.

19. Connect the DC loop connector to J8 on the rear of the converter cabinet. (755)

Delay Adjustment for AN/UCC-1(V), AN/UCC-1A(V) Converters

Delay Equalization—Turn the delay adjust control fully counterclockwise on all converters in the diversity group. Unless specifically directed by other procedures, the delay adjust control will be left in this position.

Discriminator Balance Adjustment for AN/UCC-1(V) Converters

Discriminator Balance—This procedure describes a method for adjusting the discriminator to provide equal energy levels for both MARK and SPACE input tones.

Reference:

AN/UCC-1(V) Technical Manual NAVSHIPS 0967-172-2010 (formerly NAVSHIPS 94787)

Test Equipment (or equivalent) to be used:

Audio Oscillator	AN/URM-127
Electronic Frequency Counter	AN/USM-207
Oscilloscope	AN/USM-140
RMS Voltmeter	ME-6D/U

Procedure:

1. Set the converter to the following condition:

   Diversity Switch to ONE position
   Tone Input Switch to RCVR A position

2. Oscilloscope Setup

Vertical Polarity	+UP
Vertical Sensitivity	.1 Volt/cm
Input	DC
Sweeptime	1ms/cm
Trigger Source	Internal
Sweep Mode	Free Run

3. Using a 10:1 probe, connect the vertical input of the oscilloscope to the DISC A test point and the probe ground lead to the DISC B test point of the converter under test.

4. Adjust the vertical position control of the oscilloscope to position the sweep in the center of the graticule. This must be done with no signals applied to the converter. When a "no tone" condition is present at the input to the converter, a small voltage is still present at the discriminator output. This voltage will be the reference level of the balanced output.

5. Connect the output of the audio oscillator to the electronic frequency counter. Tune the oscillator to the MARK frequency ±3Hz of the converter under test. (Reference Table 1-1, page 1-13 of NAVSHIPS 0967-172-2010).

6. Connect the audio oscillator output to the RCVR A test points on the control attenuator. The ground terminal of the oscillator output must be connected to the bottom RCVR A test point.

7. Connect the RMS voltmeter across the audio oscillator output. Adjust the oscillator output level for a reading of 0 dbm on the RMS voltmeter.

8. Note the direction and amount of deflection of the scope sweep.

9. Connect the output of the audio oscillator to the electronic frequency counter. Tune the oscillator to the SPACE frequency ±3Hz of the converter under test. (Reference Table 1-1, page 1-13 of NAVSHIPS 0967-172-2010.)

10. Connect the oscillator output to the RCVR A test points of the control attenuator. Adjust the oscillator output level for a reading of 0dbm on the RMS voltmeter.

11. Note the direction and amount of deflection of the scope sweep.

12. Withdraw the converter chassis and adjust the DISC BAL control until the deflection for MARK and SPACE tones are equal and opposite. Where space permits the test adaptor may be used to apply AC power and tone input to the converter. This allows access to the DISC BAL control while monitoring the discriminator output with the oscilloscope. Steps must be taken to insure that each converter is returned to the proper slot in the cabinet.

13. Repeat this procedure for all converters to be adjusted.

14. Return the equipment to normal operating condition.

Discriminator Balance Adjustment for AN/UCC-1A(V) Converters

Discriminator Balance—This procedure describes a method for adjusting the discriminator to provide equal energy levels for both MARK and SPACE input tones.

Reference:

AN/UCC-1A(V)	NAVSHIPS 0967-106-1010 (formerly NAVSHIPS 96028)

Test Equipment (or equivalent) to be used:

Telegraph Test Set	TS-1920A/UCC-1(V)
Oscilloscope	AN/USM-140

Procedure:

1. Set the converter to the following condition:
   Diversity Switch to Div. One position
   Tone Input Switch to RCVR A position
2. Place the test set switches to the following positions:
   Power Switch to OFF
   Tone Gen. Level Switch to -20
   Tone Selector Switch and Range Switches to the frequency of the converter under test.
   Mark/Space Switch to MARK

   Connect the test set tone out jack to the control attenuator RCVR A jacks.
3. Oscilloscope Setup:

Vertical Polarity	+UP
Vertical Sensitivity	.1 Volts/cm
Input	DC
Sweeptime	1 MS/cm
Trigger Source	Internal
Sweep Mode	Free Run

4. Using a 10:1 probe connect the vertical input of the oscilloscope to the Disc A jack and the probe ground lead to the Disc B jack of the converter under test.

5. Adjust the vertical position control of the oscilloscope to position the sweep in the center of the graticule. This must be done with the power switch on the test set in the OFF position. When a "no tone" condition is present at the input to the converter, a small voltage is still present at the discriminator output. This voltage will be the reference level of the balanced output.

6. Energize the test set and place the Mark/Space Switch to MARK. Note the amount of deflection of the scope sweep.

7. Place the Mark/Space Switch to SPACE. Note the direction and amount of deflection of the scope sweep.

8. Withdraw the converter chassis and adjust the DISC BAL control until the deflection for MARK and SPACE tones are equal and opposite. Where space permits the test adaptor may be used to apply AC power and tone input to the converter. This allows access to the DISC BAL control while monitoring the discriminator output with the oscilloscope. Steps must be taken to insure that each converter is returned to the proper slot in the cabinet.

9. Repeat this procedure for all converters to be adjusted.

10. Return equipment to normal operation condition. (755)

Distortion Bias Adjustment for AN/UCC-1(V) and AN/UCC-1A(V) Converters

The bias adjustment functions to control the switching level of a detector driving the output switch. The amount of control by this adjustment allows compensation for a wide range of bias distortion. This distortion may be introduced into the communications link at the transmit station, or it may be caused by the content of the converter output loop.

1. Bias adjustment procedure for Converters CV-1522/UCC-1(V) and CV-1522A/UCC-1(V) during NORMAL TRAFFIC CONDITIONS.

Test Equipment (or equivalent) required:

Oscilloscope AN/USM-140

Using a 10:1 probe, connect the vertical input of the oscilloscope to the sleeve of the converter loop monitor jack.

2. Present installation guidelines place the negative side of the converter loop circuit at ground potential by grounding the negative side of the loop current power supply. With the presence of this ground and with the oscilloscope properly grounded by the AC power cord, the scope probe ground lead must be connected to the converter-18V test point. This procedure assumes the above conditions are met.

Scope Setup:

Input	DC
Sensitivity	5 Volt/cm
Polarity	+UP
Trigger Source	Internal
Trigger Slope	- (Negative)
Sweep Mode	Preset
Sweep Time	5 MS/cm
Sweep Magnified	X2

3. While receiving traffic signals (keyed tones) from the distant station adjust the scope trigger level control until a stable sweep is present. Adjust the scope horizontal position control so that the beginning of the sweep is at the left edge of the graticule. Refine the trigger level control to display a MARK to SPACE (negative going) transition at the beginning of the sweep.

4. Under this condition the first portion of the sweep will display a SPACE signal. The total duration of this SPACE is dependent on the number of SPACE bauds occurring after the scope is triggered.

5. Measure in centimeters, the minimum duration of the SPACE signal (such as 5.2 cm) which represents one SPACE baud.*

6. Set the scope trigger slope to +(Positive). Adjust the trigger level control until a SPACE to MARK (positive going) transition occurs at the beginning of the sweep. A MARK signal will now be displayed at the beginning of the sweep. Measure in centimeters the minimum duration of MARK time (such as 5.1 cm) which represents one MARK baud.* Add these minimum durations for SPACE and MARK times and divide by 2.

Example: $\frac{Ts + Tm}{2} = \frac{5.2 + 5.1}{2} = \frac{10.3}{2} = 5.15$ cm

7. Adjust the converter bias adjust control for the minimum MARK and SPACE duration equal to the computed time (5.15 cm) or equal MARK and SPACE duration.

***NOTE**

For the purpose of this adjustment procedure, a SPACE baud time is measured from the beginning of the MARK to SPACE transition to the beginning of the SPACE to MARK transition. The time of MARK baud is measured from the beginning of the SPACE to MARK transition to the beginning of the MARK to SPACE transition.

(755)

AN/UCC-1 ( )—Maintenance Hint

Recent field changes to the AN/UCC-1( ) series of equipments have modified the output switch circuit of the converters. These modifications insure that the output transistor is in saturation under high loop current conditions which would have previously damaged the transistor. After installation of the appropriate field changes, make the following test to insure that the transistor has not been damaged as a result of high loop current prior to the field change. This test should be made immediately after installing the field change.

1. Remove the converter to be tested from the cabinet. With the use of the test adaptor, connect a 60ma DC loop and AC power to the converter.
2. Using the telegraph terminal test set apply a Mark Tone to the converter. For Converters AN/UCC-1(V) a Mark Tone can be applied by connecting an audio oscillator to the tone input terminals on the test adaptor.
3. Adjust the resistance of the DC loop for 60ma.
4. Measure the Collector to Emitter voltage (Vce) of the output switch transistor.

a. Using Multimeter AN/PSM-4 set to +2.5 Vdc range, connect the positive (+) lead to the collector and the negative lead to the emitter of the transistor.

b. Should the voltage exceed +0.5 Vdc the transistor is defective and must be replaced. (760)

AN/UCC-1( )—Modification for Fleet Broadcast Improvement.

See Article under SB-1203( )/UG with same title. (EIB 776, 789)

AN/UCC-1C(V) Telegraph Terminal and AN/UCC-1D(V) Keyer and Converter Chassis Assembly, Front—Information Concerning

This article provides the Federal Stock Numbers (FSN) for ordering the keyer and converter chassis assemblies front and clarifies the proper use.

AN/UCC-1C(V)

Ref. Desig.	Description	FSN
1A1A1	Keyer Chassis Assembly, Front	4G5805-925-7257
1A2A1	Converter Chassis Assembly, Front	4G5805-925-7259

AN/UCC-1D(V)

1A1A1	Keyer Chassis Assembly, Front	4G5805-129-6602
1A2A1	Converter Chassis Assembly, Front	4G5805-129-6601

The front assemblies (Printed Circuit Boards) of the keyers and converters of one series equipment are not to be interchanged with those of another series. The CV-1920(P)/UCC-1C(V) and KY-558(P)/UCC-1C(V) are to be used only in the AN/UCC-1C(V). The CV-1920A(P)/UCC-1C(V) and KY-558A(P)/UCC-1C(V) are to be used only in the AN/UCC-1D(V). (804)

*Tone Multiplexing Shipboard Transmitters

Whenever a single sideband transmitter is modulated by tone multiplex equipment, care must be exercised to insure that the transmitter Peak Envelope Power (PEP) rating is not exceeded. If the PEP is exceeded for a large percentage of the modulation cycle without adequate Peak and Average Power Control (APC/PPC), as found in the AN/URT-23 and AN/URT-24, the level of Intermodulation (IM) Distortion will become excessive and result in a deterioration of radiated signal.

The operator and technician may better understand the principles and practices of single sideband communications by reviewing NAVSHIPS Publication "Fundamentals of Single Sideband" 0967-222-2010.

The primary shipboard tone multiplex equipment is the AN/UCC-1 Family. The major shipboard Navy transmitters used in conjunction with the multiplexer are the AN/URT-23, AN/WRT-2 and the AN/URC-32( ). When either the multiplexer or the transmitter is adjusted to operate in the multiplex system, the control settings of the other equipment comprising the system must be considered. Personnel

adjusting the transmitter must communicate with the personnel adjusting the multiplexer and both must insure that all ancillary equipments (Transmitter Switchboard SB-863/SRT and the Patch Panel SB-1203/UG are examples) are correctly "patched" to complete the system.

To further insure adequate system performance, each circuit of the individual equipment must be adjusted as prescribed in the applicable technical manual.

The operating instructions for the individual transmitters are adequate for single sideband (USB, LSB) voice communications and are applicable to multiplex operation, however additional information concerning the position of some operating controls, output levels and meter indications is required for satisfactory tone multiplex system performance.

Tables I, II, III and IV are a summary of the transmitter audio input levels required from the multiplexer and the power per tone and approximate meter indications at the transmitter.

Table I AN/URT-23(V)

TONES	AN/UCC-1( ) Input Level	Power Meter Level (PEP)	Power/Tone
2	-10 dbm	1000 w	≈ 250 w
4	-10 dbm	1000 w	≈ 75 w
6	-10 dbm	1000 w	≈ 60 w
8 (TR1)	-10 dbm	1000 w	≈ 36 w
10 (TR4)	-10 dbm	1000 w	≈ 36 w
10 (TR6)	-10 dbm	1000 w	≈ 36 w
12 (TR8)	-10 dbm	1000 w	≈ 32 w
16 (TR14)	-10 dbm	1000 w	≈ 19 w

Table II AN/URC-32( )

TONES	AN/UCC-1( ) Input Level	VU Meter Level	Power Meter Level (AP)	Power/Tone
2	-10 dbm	-3 vu	200-250 w	≈ 125 w
4	-10 dbm	-6 vu	100-150 w	≈ 25 w
6	-10 dbm	-8 vu	75-125 w	≈ 20 w
8 (TR1)	-10 dbm	-9 vu	64-100 w	≈ 10 w
10 (TR4)	-10 dbm	-9 vu	64-100 w	≈ 10 w
10 (TR6)	-10 dbm	-9 vu	64-100 w	≈ 10 w
12 (TR8)	-10 dbm	-9 vu	64-100 w	≈ 6 w
16 (TR14)	-10 dbm	-10vu	30-90 w	≈ 3 w

Table III AN/WRT-2

TONES	AN/UCC-1( ) Input Level	VU Meter Level	Power Meter Level (AP)	Power/Tone
2	-5 dbm	-3 vu(2 Tone)	400 to 500 w	≈ 250 w
4	-5 dbm	-6 vu(4 Tone)	200 to 250 w	≈ 36 w
6	-5 dbm	-8 vu(NA)	150 to 225 w	≈ 30 w
8 (TR1)	-5 dbm	-9 vu(8 Tone)	125 to 175 w	≈ 15 w
10 (TR4)	-5 dbm	-9 vu(8 Tone)	125 to 150 w	≈ 15 w
10 (TR6)	-5 dbm	-9 vu(8 Tone)	125 to 150 w	≈ 15 w
12 (TR8)	-5 dbm	-9 vu(8 Tone)	125 to 150 w	≈ 10 w
16 (TR14)	-5 dbm	-10vu(16 Tone)	64 to 125 w	≈ 6 w

Table IV AN/URT-24

TONES	AN/UCC-1( ) Input Level	Power Meter Level (AP)	Power/Tone
2	-10 dbm	40 to 60 w	≈ 25 w
4	-10 dbm	25 to 40 w	≈ 10 w
6	-10 dbm	25 to 40 w	≈ 8 w
8 (TR1)	-10 dbm	20 to 40 w	≈ 4 w
10 (TR4)	-10 dbm	15 to 40 w	≈ 4 w
10 (TR6)	-10 dbm	15 to 40 w	≈ 4 w
12 (TR8)	-10 dbm	10 to 40 w	≈ 3 w
16 (TR10)	-10 dbm	10 to 40 w	≈ 1 w

Tables V, VI, VII, VIII and IX contain a description of the operating procedures that are in addition to those described in the equipment technical manuals.

Table V Radio Transmitter AN/URT-23(V)

UNIT	CONTROL/INDICATOR	FUNCTION SWITCH POSITION/INDICATION		COMMENT
AM-3924(P)/URT				
	Test Key	Local Key		Transmitter may be keyed locally unless terminals 8 and 11 associated with AN/UCC-1 position on SB-863/SRT have been jumpered to provide a keyline closure. This will key the transmitter when it is patched to the AN/UCC-1.
	Multipurpose Meter	PA Plate 1	300 to 500 ma	PA and driver plate current will vary between the limits shown depending on the number of input audio tones, frequency selected and bias adj.
		PA Plate 2	300 to 500 ma	
		Driver 1	300 to 400 ma	
		Driver 2	300 to 400 ma	

Table V Radio Transmitter AN/URT-23(V) (cont'd)

UNIT	CONTROL/INDICATOR	FUNCTION		
		SWITCH POSITION/INDICATION		COMMENT
	Power Meter	Fwd. Pwr 0-1500	1000 w PEP	The meter indicates approximate PEP. At some frequencies, the power meter pointer may vary between 500 and 1000w; this indicates that the transmitter is not developing maximum tone power at this frequency. This is normal for the low gain frequencies of the transmitter. (About 2% of selectable frequencies.) However, if this occurs at the majority of the frequencies selected, it indicates that tone levels are incorrect, misalignment of APC/PPC circuit or output level of T-827( )/URT, or a module failure. With some combinations of 3 or 4 tones, a variation of ·750 to 1000w will occur on most frequencies. This is a characteristic of the metering circuit and is normal. If the transmitter is adjusted to levels below 1000w PEP the meter will indicate the instantaneous peak tone level.
T-827( )/URT				
	Local-Remote Switch	Remote		The transmitter provides a 600 ohm impedance to the AN/UCC-1 control attenuator and tone levels should not be adjusted until this switch is positioned correctly.
	Line Level Meter Switch	-10db		
	Line Level Meter		0±2db	When adjusting composite tone level at AN/UCC-1( ), do not use this meter to set level, use test equipment specified under AN/UCC-1 procedures (Table IX).

Table VI Radio Set AN/URC-32( )

UNIT	CONTROL/INDICATOR	FUNCTION		
		SWITCH POSITION/INDICATION		COMMENT
C-2698/SRA-22				
	Meter Switch	1000 Forward		
	Power Meter		Average Power	Refer to Table II for levels.
AM-2061/URT				
	Plate Current Meter	Total Plate current	200 to 500 ma	Plate current will vary between limits shown, depending on the number of tones transmitted and the frequency selected.
AM-2064/URC				
	Exciter RF Gain			Adjust as required to achieve power meter levels shown in Table II.

Table VI Radio Set AN/URC-32( ) (cont'd)

UNIT	CONTROL/INDICATOR	FUNCTION	
		SWITCH POSITION/INDICATION	COMMENT
CV-730/URC	Meter Multr Switch	0 DBM	
	MONITOR SWITCH	USB XMIT	
	CW Test Switch	Keyed	Transmitter may be keyed locally unless terminals 8 and 11 associated with AN/UCC-1 position on SB-863/SRT have been jumpered to provide a keyline closure. This will key the transmitter when it is patched to the AN/UCC-1
	Audio Level (vu) Meter		Refer to Table II for VU level.
AM-2062( )/URC	MIC GAIN		Adjust for VU level indicated in Table II. When three or more tones are applied to the transmitter the output power will vary. Adjust exciter RF gain control to insure the power output does not exceed the power meter levels shown in Table II.
	Handset Control	Remote	Prior to adjusting output level of multiplexer, this control must be in the remote position. For equal power distribution between tone, the mike line amplifier 356C-1 should be used in lieu of the AM-3198/URC.

Table VII Radio Transmitter AN/WRT-2

UNIT	CONTROL/INDICATOR	FUNCTION		
		SWITCH POSITION/INDICATION		COMMENT
AM-2121/WRT-2				
	Test Ammeter Switch	PA Screen current		
	Test Ammeter		0 to -10 MA	When PA screen current is positive, excessive distortion occurs to the output signal. Positive screen current indicates incorrect tuning or alignment of PA or component failure.
	PA Cathode Current switch	Total 1.5 amp		
	Current Meter		550 to 750 MA	Will vary with number of input tones and selected frequency.
	Output Meter Selector Switch	RF Output		
	Output Meter		Average Power	Refer to Table III.
	Drive Adjust			Adjust for power level indicated in Table III.
	Carrier Test Key	ON		Transmitter may be keyed locally unless terminals 8 and 11 associated with AN/UCC-1 position on SB-863/SRT have been jumpered to

Table VII Radio Transmitter AN/WRT-2 (cont'd)

UNIT	CONTROL/INDICATOR	FUNCTION	
		SWITCH POSITION/INDICATION	COMMENT
			provide a keyline closure. This will key the transmitter when it is patched to the AN/UCC-1.
AM-2122/WRT-2			
	Emission Selector Switch	ISB	
	Remote-Local Switch	Remote	Prior to adjusting output level of AN/UCC-1 this switch must be in the remote position.
	Power Selector Switch	500 W	
	USB Mod Level AMP control	Adjust to 8	This setting may be adjusted slightly to achieve levels established in Table III.
	USB Input Level AMP Control		With three or more tones applied to the transmitter, the level will vary. Adjust this control to insure level observed on VU meter does not exceed those indicated in Table III.
	Audio Level Meter		Refer to Table III.

Table VIII Radio Transmitter AN/URT-24

UNIT	CONTROL/INDICATOR	FUNCTION		
		SWITCH POSITION/INDICATION		COMMENT
AM-3007/URT				
	RF Output Meter Switch	100 w Forward		
	RF Output Meter		Average Power 0 to 50 w	Refer to Table IV.
	RF Output Tune/ Operate Switch	Operate		Local keyline is not provided. In order to key transmitter for multiplex operation, terminals 8 and 11 associated with the AN/ UCC-1 position on the SB-863/SRT terminal board must be jumpered to provide a keyline closure. The transmitter will be keyed when it is patched to the AN/ UCC-1.
T-827( )/URT				
	Local - Remote Switch	Remote		The transmitter provides a 600 ohm impedance to the AN/UCC-1 control attenuator and tone levels should not be adjusted until this switch is positioned correctly.
	Line Level Meter Switch	-10 db		
	Line Level Meter		0±2db	When adjusting composite tone level at AN/UCC-1, do not use this meter to set level, use test equipment specified under AN/ UCC-1 procedures (Table IX).

Table IX AN/UCC-1( )

To provide the desired composite level from the AN/UCC-1( ) with the minimum number of adjustments when the number of tones are changed requires that the composite signal into the control attenuator must be 0 dbm when all tones are transmitted.

The individual keyer tone levels must be equal and adjusted to a value determined by the maximum number of keyers in the system regardless of the number of tones to be transmitted. Table IXA gives the proper individual tone (Keyer) level for each system. All keyer level adjustments must be made with the loop in a mark condition (60 ma.).

Keyer Tone Level Adjustment

1. Connect the ME-6( )/U to the tone out test point of the keyer to be adjusted.
2. Turn off all tone switches or withdraw the keyer modules to disable the tone of all keyers except the keyer to be adjusted.
3. Adjust the keyer tone level control for the desired level reading on the ME-6( )/U. (See Table IXA)
4. Repeat Steps 1-3 for all keyers in the system.
5. Restore all keyer tones.

Table IXA

System	No. Channels	Maximum No. Tones	Level/Tone
AN/UCC-1( )-TR1	4	8	-9 dbm
AN/UCC-1( )-TR4	5	10	-10 dbm
AN/UCC-1( )-TR6	5	10	-10 dbm
AN/UCC-1( )-TR8	6	12	-11 dbm
AN/UCC-1( )-TR14	8	16	-12 dbm

The test set provided with the equipment does not have the range to measure these levels. A ME-6( )/U or HP-400H must be used when making adjustments.

Control Attenuator Output Level Adjustment

The AN/UCC-1( ) must be patched at the SB-863/SRT to the desired transmitter to provide the proper loading when making this adjustment. Transmitter Remote/Local Switch must be in the remote condition. Refer to Tables V, VI, VII, VIII.

The meter, ME-6( )/U or HP-400H used to measure the control attenuator output when patched to an AN/URC-32 transmitter must have the chassis ground (hazard ground) disabled at the power plug and the meter insulated from ground.

CAUTION:

UNDER THIS CONDITION A SHOCK HAZARD EXISTS. PERSONNEL MUST NOT COME IN CONTACT WITH THE METER TERMINALS OR CHASSIS AND GROUND.

Connect the ME-6/U or HP-400H to the Tone OUT Test points on the control attenuator.

With all the keyer tones on, adjust the control attenuator output level to the desired level for the transmitter. See the appropriate transmitter table in this article. The output of the control attenuator has a slowly varying or swinging level. The output level must be adjusted so that the peak of the swing does not exceed the desired transmitter input level.

When the number of channels or tones are changed, only the control attenuator output must be adjusted to insure the correct level to the transmitter.

Do Not use more tones than necessary to handle the message traffic. Unused tones that are transmitted take away RF power from the traffic channels.

This article was prepared for NAVELEX by NAVSECNORDIV. *(822)*

AN/UCC-1(V) Telegraph Terminal—Diversity Balance Adjustment

This article is to clarify the status and useage of the diversity balance lamp indicator units which have recently been made available to some ships equipped with AN/UCC-1(V) equipment.

The lamp indicator units are intended primarily as an aid in system operation and are not to preclude use of the standard diversity balance adjustment procedure provided in the applicable PMS. However, the lamp indicator units may be used as an interim procedure to adjust diversity balance in an emergency situation when time will not permit use of the standard procedure.

Users of the lamp indicator units are cautioned to obey the warning provided in the Instruction Book, repeated as follows:

WARNING

DO NOT USE THE DIVERSITY BALANCE INDICATOR IF THE LINE VOLTAGE TO THE TELEGRAPH TERMINAL IS BELOW 115 VAC.

(EIB 856)

AN/UCC-1( ) and AN/SSR-1 Output Loop Circuits—Improved Performance for

This article provides information relating to communications equipment of primary interest to the Electronic Maintenance Officer, Electronics Maintenance and Operating Personnel. The purpose is to provide technical guidance in modifying the shipboard satellite "N" system. This modification improves communications by reducing signal distortion, improving isolation and reducing ground loops between channels of the Black DC Patch Panel.

Recent shipboard visits by Communications Evaluation and Assist Teams have verified continuing high distortion of the Secure (Black) side of the Satellite Fleet Broadcast System. This high distortion is only present, as shown by quality monitoring, with a TSEC/KG-14 in the loop.

The purpose of this article is to ensure negative side ground of high level (60 mA) Black DC Loop Current Power Supplies. The procedure is as follows:

a. Secure all power to the Black Teletype Subsystem and observe all Navy safety precautions for forces afloat as set forth in OPNAVINST 5100.19.

b. Ensure that the positive side of the loop current power is not grounded, either directly or through any peripheral equipment.

c. If positive grounds are found, remove them citing this article as authority.

CAUTION

Because of positive grounding of the plate load in the AN/URA-8( ) converters, they must be replaced in the loop by an AN/URA-17 prior to implementing this modification.

d. Ground the negative side of the DC loop current power supply. Ships with standard DC Loop Power Supplies (PP-3494/UG or PP-3495A/UG) should effect this ground at Terminal Board 2: connect a jumper from terminal 3 (DC negative side) to terminal 5 (ships ground) using 20 AWG wire with a terminal lug at each end. Caution should be taken to ensure that terminal 5 is, electrically, ships ground. Ships with non-standard DC Power Supplies should consult the applicable technical manual for guidance in grounding the negative side. In order to provide uniform installations and allow loop current selectability where available, ground the negative side of all Black Loop Current Power Supplies.

The AN/SSR-1 Installation Control Drawings have been modified to include the foregoing information. (EIB 959/968)

AN/UCC-1( ) and AN/SRR-1 Output Signal Distortion—Discussion of

This article discusses distortion measurement of quality and performance monitoring AN/UCC-1( ) and AN/SRR-1 multichannel broadcast systems. Distortion measurement of loops comprising TSEC/KG-14 are of principal concern.

Two types of distortion measurements and their application are of interest in this discussion.

1. Average (AVG) Bias distortion is the average displacement of the SPACE-TO-MARK transitions of the input signal with respect to ideal transition times. On shaped signals, the time of a transition is taken as the half-current point for neutral signals (30 mA for 60 mA neutral signal).
2. TOTAL PEAK distortion is the highest distortion occurring on a signal. It may occur on a MARK-TO-SPACE or SPACE-TO-MARK transition. In short a TOTAL PEAK measurement provides a reading of the highest amount of distortion in a signal from any cause.

The content of the loop circuit is of primary importance when measuring distortion in Multicast AN/UCC-1( ) or AN/SRR-1 loop. When the loop contains a TSEC/KG-14, the input filter shapes the signal transition. This shaping causes a displacement of the 30 mA point of the signal transition. As stated above, the distortion analyzer toggles at the 30 mA point on the signal transition, thus the displacement is recognized as distortion by the analyzer. The KG-14 SPACE-TO-MARK and MARK-TO-SPACE toggling does not recognize the displacement of the 30 mA point of the signal and therefore is not influenced by the distortion indicated on the analyzer.

The waveforms given in Figure 1 provide a graphic example of the effect of the 30 mA point on the Distortion Analyzer and the TSEC/KG-14. The following discussion assumes the KG-14 P/N INPUT adjustment has been made in accordance with CONFIDENTIAL EIB (CEIB) 22 of January 1972.

Figure 1A typifies an undistorted input signal to an AN/UCC-1( ) or AN/SRR-1 channel.

Figure 1B shows the AN/UCC-1( ) or AN/SRR-1 output signal shaping and displacement of the 30 mA point of the SPACE-TO-MARK transition when a KG-14 is in the loop.

Figure 1C is a graphic display of how the shaped signal is recognized by the Distortion Analyzer. Assuming the channel input to be an undistorted 75 baud reversals signal, the displacement of the 30 mA point is recognized by the Distortion Analyzer as approximately 22% SPACING bias distortion.

Figure 1D is a graphic display of how the shaped signal is recognized by the KG-14. Monitoring the output of the logic level conversion circuit reveals that the KG-14 recognizes the signal as having approximately 2% SPACING bias.

Removal (dummy out) of the KG-14 from the loop eliminates the signal shaping and the resulting displacement of the 30 mA point. The Distortion Analyzer would now read approximately 2% distortion.

In the case of an AN/UCC-1( ) and a KG-14 loop, if the BIAS ADJUST of the AN/UCC-1( ) is used to compensate for the distortion indicated on the analyzer, the 30 mA point will be moved. Figure 1E shows the new displacement of the 30 mA point of the SPACE-TO-MARK transition. The response to the new displacement, shown in Figure 1F, is recognized by the analyzer as approximately 2% distortion. The new displacement of the SPACE-TO-MARK transition shown by Figure 1E is recognized by the KG-14, shown in Figure 1G as approximately 22% MARKING BIAS distortion. Since the purpose of the Multicast system is to provide the best possible signal to the KG-14, it is obvious that the AN/UCC-1( ) bias adjustment described above is improperly applied. A meaningful distortion measurement and bias adjustment can be made only when the KG-14 is dummied out of the loop.

To allow meaningful decisions and corrective actions to be made, both AVG BIAS and TOTAL PEAK distortion measurements should be taken. The rationale given below allows the determination of a signal quality that provides optimum performance.

1. AVG BIAS—5% maximum
2. TOTAL PEAK—not greater than 4% more than AVG BIAS

AN/UCC-1( ) output signal having excessive AVG BIAS distortion and TOTAL PEAK distortion not greater than 4% higher than the AVG distortion the AN/UCC-1( ) BIAS adjustment can be adjusted to reduce the amount of distortion. Should the TOTAL PEAK distortion exceed 4% greater than the AVG BIAS distortion the BIAS adjustment will be ineffective in improving signal quality. When AVG BIAS and TOTAL PEAK distortion indicates BIAS adjustment is not possible the following areas and conditions should be examined.

1. Content of the loop circuit
2. Loop Current value
3. Audio Line Level (AN/UCC-1 Input)
4. Transmitter/Receiver Frequency Difference
5. AN/UCC-1( ) Converter Discriminator Balance
6. AN/UCC-1( ) Diversity Mode of operation.

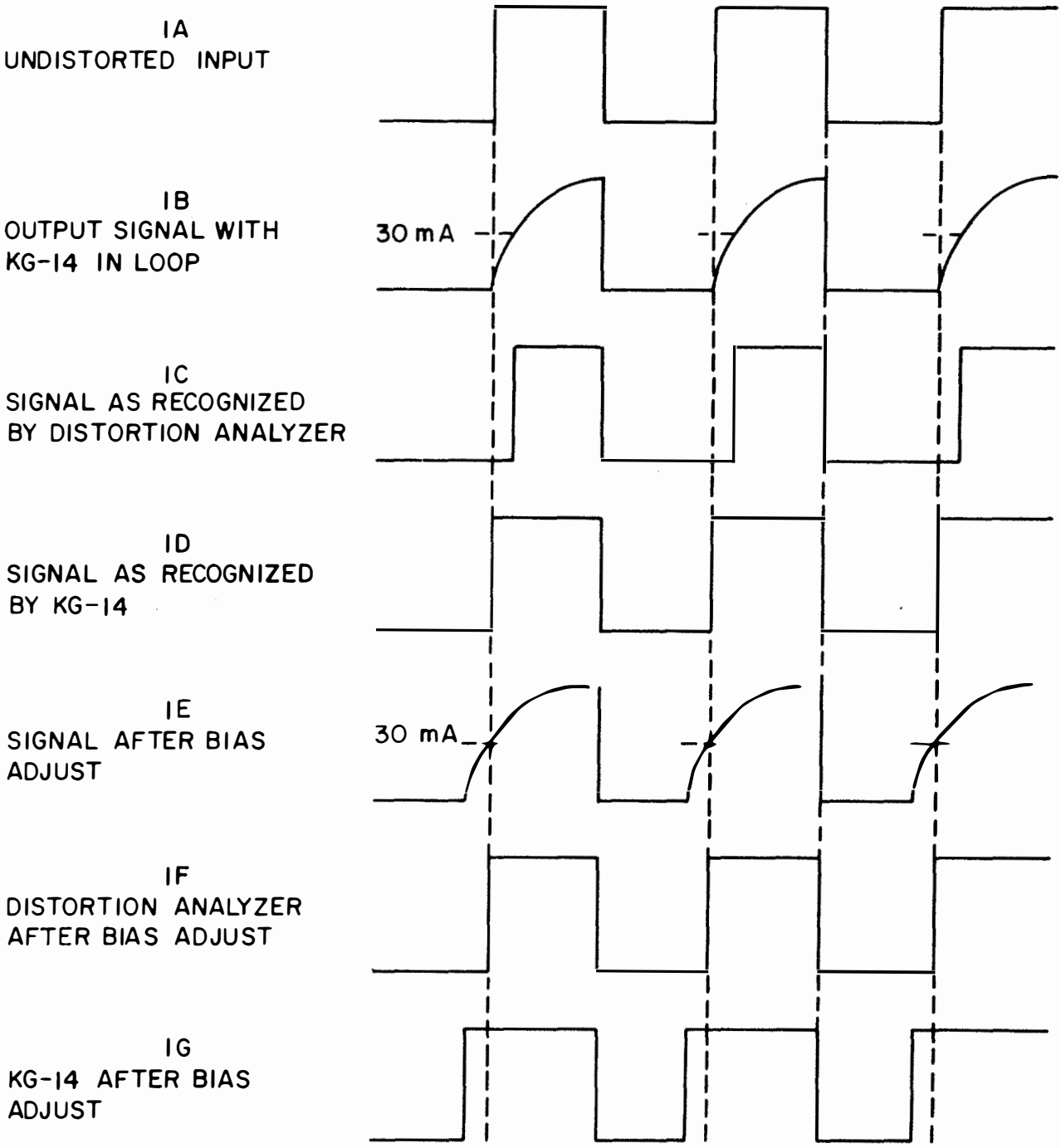


Figure 1. Waveforms.

(EIB 959)

AN/UGC-13—Criticom Equipment; Page Printer Sets, Model 28

A 1-1/2-inch hole drilled in the base (LRB-32) of the Auxiliary Typing Reperforator unit (TT-316/UG) will expedite the inspection of one of the brushes of the PD-18/U series governed motor by eliminating the need to remove the motor from the base. (See Page 1-11 of NAVSHIPS 93788, Volume 1, and figure 1 of this article, showing location of hole to be drilled.)

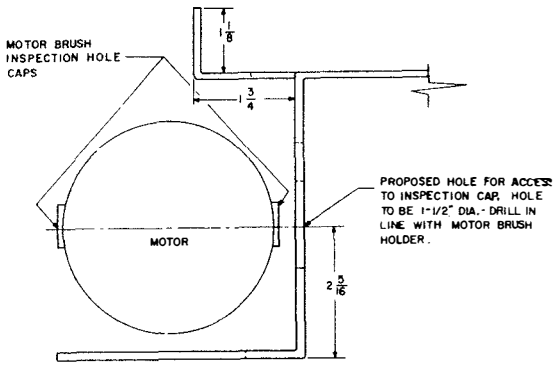


Figure 1.

TELETYPE MODEL 28 CONSOLE, AN/UGC-15, -16, -16A, AND -18--INSTALLATION PROBLEMS

The new Teletype Model 28 ASR sets are similar to older Model 28 units, but differences exist which may cause installation problems. AN/UGC-15, -16, -16A, and -18 correspond to AN/UGC-5, -6, -6A, and -8, respectively, but have three significant changes.

1. AN/UGC-15, -16, -16A, and -18, as delivered, are are equipped for 7.00 unit code because of a planned conversion of Naval equipment to this code. Because of delay of the planned conversion, this equipment must be operated at 7.42 unit code in many cases. The 7.42 unit code transmission is necessary when operating non-stepping into a crypto device. However, if a distribution system for stepping pulses can be arranged, the sets may be operated at 7.00 unit code/75 baud without incompatibility. Where crypto devices are not involved, 7.00 and 7.42 unit codes will interoperate if the baud rates are nearly equal. For instance, 7.00 code/75 baud and 7.42 code/74.2 baud are compatible with only slight loss of range at the receiving selector.

Where conversion from 7.00 unit code to 7.42 unit code is necessary, installing activities should order mod kits direct from Teletype Corp., since they will not be available in Navy stock for 6 to 9 months. Teletype mod kit 194266 ($61.80 each) converts AN/UGC-15 to 7.42 unit code; mod kit 194265 ($76.56 each) converts AN/UGC-16, -16A and -18 to 7.42 unit code. All 7.00 code parts removed during modification should be retained for eventual reconversion from 7.42 to 7.00 unit code when directed by the Chief of Naval Operations.

2. The AN/UGC-15, -16, -16A, and -18 include the necessary magnet, armature, contact, and linkage in the keyboard for synchronous pulsed transmission. Nonpulsing operation requires disabling of this feature. As shown in the equipment technical manual (T-2 and T-3 changes to NAVSHIPS 93534), a mechanical clamp is provided to hold the armature against the magnet. Clamping the armature holds the linkage in the activated position and allows free-running transmission from the keyboard. This method of disabling allows on-line keyboard signal generation in all operating modes, including the normal off-line tape preparation "T" mode. Since this condition is not desirable in most installations, an alternate method of disabling the synchronous pulse transmission system is available. Energize the pulsing magnet (50 milliamps d.c. maximum) in the "K" and "KT" modes to allow free-running signal generation. Open the pulsing circuit in the "T" mode to allow tape preparation without keyboard signal generation. This switching may be done by adding a separate switch or by using the mode selector switch. It should be noted that the transmitter-distributor is also equipped for stepping operation. For non-pulsing operation, the clutch magnets must be wired parallel as shown in the equipment technical manual.

3. The AN/UGC-15, -16, -16A, and -18 include a keyboard typing reperforator rather than the typing perforator used on the older sets. The reperforator, since it has a receiving selector, can produce tape either electrically on-line or mechanically off-line. However, regardless of the mode of operation used, the selector must be terminated to avoid continuously running open. If only keyboard mechanical perforation "T" mode is needed, the selector can be terminated with a holding d.c. (60 milliamp maximum) or with a mechnical strap to hold the armature stationary. If signal line tape preparation is required on the keyboard reperforator, as well as on the auxiliary reperforator, connect the selector to the signal line, using appropriate line battery and relay (not provided with the set). If both of these methods are used together, an external patching arrangement is required for connection to holding d.c. for keyboard perforation, to a signal line for receive reperforation, or to the keyboard signal line for monitor use.

Detailed installation instructions and wiring diagrams, in the form of an improved supplement to the equipment technical manual, are now available. This supplement is identified as temporary change T-4 to NAVSHIPS 93534, data January 1964. It has been distributed to equipment holders where end destinations were available and to NSD Philadelphia for stock. Copies should be requisitioned by the usual procedures. If present installations of equipment are satisfactory, no changes are required by the issuance of this technical manual supplement.

TELETYPE MODEL 28 CONSOLE, AN/UGC-15, 16, -16A AND 18- INSTALLATION PROBLEMS

See article in AN/UGC-15 section under the same title.

TELETYPE MODEL 28 CONSOLE, AN/UGC-15, -16, -16A, AND -18 INSTALLATION PROBLEMS

See article in AN/UGC-15 section under the same title.

AN/UGC-20, AN/UGC-25 TELETYPEWRITERS–MAINTENANCE HINT

Caution should be exercised when handling the LP-111 Automatic Typers of the AN/UGC-20, AN/UGC-25 Teletypewriters. Due to the shortened side frames, the LP-111 Automatic Typer cannot be rotated to the number three maintenance position. It is stressed once again that no Automatic Typer should ever be rested on the front plate mechanism. (689)

AN/UGC-20 TELETYPEWRITER MAINTENANCE HINT-IMPROVED REPEAT KEY OPERATION

Reports have been received that the repeat key on Teletypewriter AN/UGC-20 is sticking. Refer to NAVSHIPS 0967-059-9010, technical manual for Teletypewriter AN/UGC-20, Section 573-116-703, Paragraph 2.06, Keyboard Transmitter Positioning. Ensure that the left and right brackets are positioned all of the way forward against the rear mounting screws.

When the requirement of the above paragraph is met and the 195307 keylever has not been distorted, the keylever with line up with the center of the actuator on the 195322 switch. This prevents the keylever from slipping by the actuator and sticking in the operated position. (704)

AN/UGC-20, AN/UGC-20A TELETYPEWRITER SETS–MAINTENANCE HINT

Many activities have reported breaking the plastic projections of the keytop guide plate on AN/UGC-20 Series equipments. The keyboard must be removed from the keyboard base pan by means of the four shoulder mounting screws before the keytop guide plate can be removed. With the two keytop guide plate retaining rings and the left keyboard bracket mounting screws removed, disengage the left keyboard bracket. With the right keyboard mounting screws loosened, lift the keytop guide plate at the end and disengage from the keylevers and right keyboard bracket. Avoid complete disengagement of the right keyboard bracket frame. The keytop guide plate may now be rotated to the rear of the keyboard to permit maintenance. For complete keytop guide plate removal, the fuse holder and "ON/OFF" switch must be removed from the keytop guide plate by means of their mounting nuts. (EIB 722)

AN/UGC-20, AN/UGC-25 Teletypewriters–Installation Information

Several reports have been received of activities improperly installing the AN/UGC-20, AN/UGC-25 series teletypewriters. NAVSHIPS 0967-059-9010, Section 573-100-202, provides installation information. The 305051 shipping stud, which secures the equipment to the plywood pallet for shipping, disables the internal shock mounts of the equipment, figure 1.

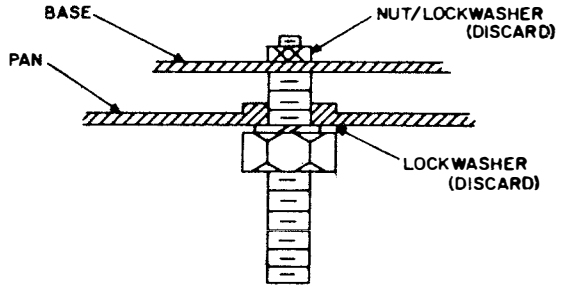


Figure 1. 305051 Shipping Stud

If the 305051 studs are to be used for mounting the equipment without external shock mounts, the 305051 stud should be modified as shown in figure 2. This may be accomplished

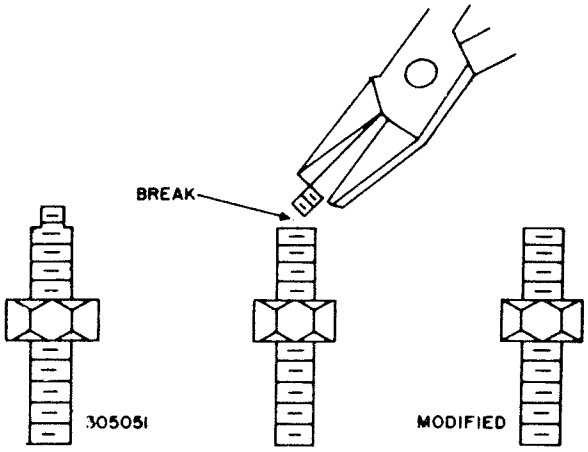


Figure 2. Method of Modifying Stud for Use with Equipments without External Shock Mounts

by holding the stud in a vise and snapping off the top portion with pliers. A flat washer, approximately 1/8" thick must be inserted between the stud nut and the bottom of the equipment pan as shown in figure 3. This

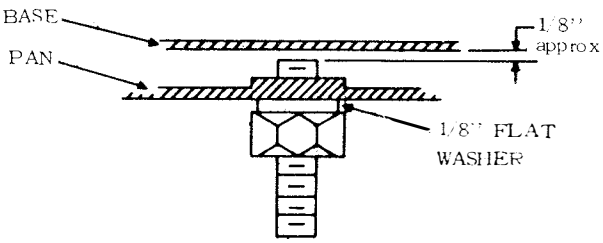


Figure 3. Modified Stud Installed

method of mounting permits the equipment internal shock mounts to function, reducing noise and harmful vibration. This action should be taken immediately by activities with noise and vibration problems. (836)

AN/UGC-20 and AN/UGC-20A — Overhaul and Update to Baseline AN/UGC-20B Configuration

Under the authority of the NAVELEX Teletype Modernization Program the standard configuration for all the AN/UGC-20 family teletype equipment will be the AN/UGC-20B.

All AN/UGC-20, AN/UGC-20A equipment will be modified to AN/UGC-20B, NSN 4G5815-00-470-7740 as they are inducted into NAVELEXSYSENGCEN San Diego, the assigned Designated Overhaul Point (DOP).

No external configuration changes are required when AN/UGC-20 or AN/UGC-20A is replaced by an AN/UGC-20B. Hookup instructions will be packed with all modified AN/UGC-20B equipments issued by the Navy Supply System.

The advantages of the AN/UGC-20B are:

(1) Ability to operate in varied modes, i.e., half duplex 20-60mA at 120 VDC and full duplex 70uA, 1.5 VDC Transmit or 60mA at 40 VDC Receive.

(2) Durable photo electric keyboard.

(3) Availability of required piece parts.

(4) AN/UGC-20B contains an automatic line feed and carriage return mechanical function.

(5) Less complex preventive maintenance services (PMS) for AN/UGC-20B user activities.

(EIB 916)

AN/UGC-20( ) Teletypewriter — Configuration Clarification

Conversions will be done on a scheduled basis only at the time of overhaul and repair at the DOP (Designated Overhaul Point).

It has been brought to this Headquarters attention that users have been turning in units in good operating condition and requesting a new configuration. Turn-ins should be effected only upon the need for complete overhaul of the equipment. Because of presently limited resources available to make conversions at the depot, issuance of RFI (Ready for Issue) units from the supply system may be identical to the AN/UGC-20/20A equipments turned in until the conversion program is fully implemented.

(EIB 937)

AN/UGC-20, AN/UGC-25 Teletypewriter–Maintenance Hint
See article in AN/UGC-20 section under the same title. (689)

AN/UGC-20, AN/UGC-25 Teletypewriters --Installation Information

See article under AN/UGC-20 with same title. (836)

AN/UGC-41, TT-299/UG, TT-299A/UG, TT-298B/UG AND TT-299B/UG – Maintenance Fixture Availability

The maintenance fixture provides motive power to the keyboard of the teletypewriter while allowing the technician to gain access to the bottom or top of the printer. This enables the technician to utilize the keyboard during all adjustment procedures. The fixture is supplied with two sets of gears. One is for operation with 7.0 unit code equipment, and one is for operation with 7.42 unit code equipment. Instructions for installation and use are packed with the maintenance fixture.

The Mite Corporation part number is 37200. The FSN is 2F5815-985-7517. The fixture may be ordered through regular channels. Quantities are limited to one each per ship or repair facility. Where there is more than one repair station a fixture may be ordered for each station. (704)

AN/UGH-1 CODE PRACTICE TRAINING KEYERS

The Bureau is currently procuring a quantity of code-practice training keyers for use aboard ship to increase cw operator proficiency. These training keyers will provide a cw signal for receiving practice at various speeds. In addition, provisions are included for cw sending practice and signalman "flashing light" practice.

These training devices are similar to the U.S. Naval Special Devices Center Model 8M-3, however, the standard AN nomenclature is AN/UGH-1.

WIRING ERROR IN AN/UNQ-7

Because of an error in the installation instructions for connecting the AN/UNQ-7 recorder-reproducer manufactured by Ampex Corporation and the auxiliary tape transport OA 3457/UNQ-7 manufactured by Midwestern Instruments, a short circuit develops between the equipments. This short circuit can be eliminated by the following wiring correction to the AN/UNQ-7 recorder:

1. See Technical Manual, NAVSHIPS 365-2734, Fig. 4-5, Cabinet wiring.
2. Remove wire between pin 13 of TB102 and pin K of J103.
3. Reconnect pin 13 of TB102 to pin 21 of J405.
4. Remove wire between pin 28 of TB103 and pin of J405.
5. Reconnect pin 28 of TB103 to pin K of J103.
6. Connect pin 14 of TB102 to pin J of J103.
7. Remove wire between pin 21 of J405 and pin K of J103.

When a Versitron Preamplifier Kit is used with the AN/UNQ-7 and OA-3457/UNQ tape transport installation, the following additional procedures must be accomplished:

1. Move the 130K ohm resistor (supplied with the preamp kit) from pin 21 on J405 to pin 22 on J405.
2. On the lead which ran between pin J on J103 and pin 22 on J405, disconnect the lead from pin J on J103 and reconnect it to pin 31 of TB104.
3. Connect the orange lead of the preamp kit to pin 31 on TB104.
4. Disconnect the shield ground wire from pin 31 on TB104 and connect it to pin 38 on TB104.

AN/UNQ-7 ELIMINATION OF SHOCK HAZARD

An electric shock hazard may be present during operation of the Magnetic Tape Recorder-Reproducer, AN/UNQ-7.

The AN/UNQ-7 was designed for permanent installation aboard ship and as such includes the facilities for grounding of the case through the base mountings. When installed in accordance with General Specifications, 9600-0-j, the grounding provided will eliminate the shock hazard.

However, it is possible for either inadvertent painting or corrosion to destroy the effectiveness of this case ground strap. To correct this problem, proceed as follows:

1. Remove power from the machine.
2. Remove the ground strap which bridges across the left front (facing the equipment) shock mount.
3. Burnish the ends of the strap and the case to assure good metal to metal contact.
4. Replace the ground strap and make sure that the applied torsion on the nuts establishes a good ground from case to base.

If the machine is used so that it cannot be installed as required by the standard installation instructions, a ground must be provided by (1) a ground cable between an unpainted chassis ground and a ships ground or an electrical outlet box ground, or (2) a third wire ground between the terminal board ground and the electrical outlet box ground.

ELECTRIC SHOCK HAZARD DURING USE OF AN AN/UNQ-7 RECORDER-REPRODUCER

An electric shock hazard may be present during operation of the AN/UNQ-7 magnetic tape recorder-reproducer.

The AN/UNQ-7 was designed for permanent installation aboard ship and as such includes the facilities for grounding of the case through the base mountings. When installed in accordance with General Specifications for Ships of the U.S. Navy, section 9600-0-j, the grounding provided will eliminate the shock hazard.

It is possible that either inadvertent painting or corrosion may destroy the effectiveness of this case ground strap. To correct this type of problem, proceed as follows:

1. Remove power from the machine.
2. Remove the ground strap which bridges across the left front (facing the machine) shock mount.
3. Burnish the ends of the strap and the case to assure good metal to metal contact.
4. Replace the ground strap and make sure that the applied torsion on the nuts establishes a good ground from case to base.

If the machine is used so that it cannot be installed as required by the standard installation instructions, a ground must be provided by (1) a ground cable between an unpainted chassis ground a ship's ground or an electrical outlet box ground, or (2) a third wire ground between the terminal board ground and the electrical outlet box ground.

AN/UNQ-7A

The Recorder-Reproducer AN/UNQ-7A manufactured by Midwestern Instruments of the Tulsa, Oklahoma, has been found to have excessive "crosstalk" between channels. There are two methods of correction for this problem, depending upon the installation of the equipment. These corrections apply to all equipments prior to Serial Number 394 and are as follows:

1. AN/UNQ-7A **installed without remote control box connected.** If the remote control box is not connected to the equipment, the terminals 11, 12, and 13 on terminal board TB102 should be jumpered together.
2. AN/UNQ-7A **installed with remote control box.** If the remote control box is connected, the following instrutions apply:

a. Replace the V802 tube with a 6201 (12AT7WA) tube.

b. Bridge terminals 11 and 12 on terminal board TB102 with a 2000-ohm resistor.

c. Recalibrate M402 (channel A) by adjusting R521 in accordance with instructions in the final **Technical Manual,** NAVSHIPS 365-2620, paragraph 5-44, on page 5-8.

Submarine Antenna System for Loran

Submarine installation of the Loran system using AN/UPN-12 normally include antenna coupler CV-532/UPN-12 inserted in the coaxial r.f. transmission line from the receiver to antenna patch panels. The coupler is not designed for the application, and efficiency of the system may be seriously reduced.

Omission of the coupler from future plans and removal of installed couplers is recommended for better operation.

Until further notice, yards and other field activities may omit or remove CV-532/UPN-12 antenna coupler where improved efficiency will result. Current Bureau projects, aimed toward overall improvement of submarine antenna systems, are expected to provide definite data on this subject for inclusion on future Bureau plans.

TRACE INSTABILITY AND IMPROPER FUNCTIONING OF THE LEFT-RIGHT SWITCH IN AN/UPN-12A

In the past few months, several reports of (1) trace instability and (2) improper functioning of the Left-Right switch (S202 in the AN/UPN-12A Loran receiving sets have been received from the fleet. Investigation of this equipment by MOTU-8 and the Bureau of Ships reveals the following:

1. When the components are without fault, overheating of the receiver-indicator equipment can cause trace instability. This overheating is caused by the blower motor fan blade being installed backwards in some equipments. The technical manual NAVSHIPS 92988, figure 3-26) shows the blower motor as it is installed. In this figure, the back (convex) side of the fan blade appears to be pushing, rather than pulling, the air. Turning the fan blade so that the concave side is towards the motor increases the air flow appreciably. The units then do not overheat, and normal trace stability is regained.

2. The operation of the Left-Right switch during sweep functions one and two at times causes the upper and lower sections of the trace to be superimposed. This malfunction often is diagnosed incorrectly as being caused by a faulty Left-Right switch. In the most cases, it is because of the incorrect setting of the Counter and PRR bias voltages. Referring to NAVSHIPS 92988, paragraphs 6-2b10 (T-1, dated 15 Oct. 9157) and 6-2b10, the correct settings are +40 and +90 for the counter and PRR bias voltages, respectively. In some instances it will be necessary to set the counter bias as high as +42 to +43 volts because of variations in the characteristics of V-232 (the reset thyratron tube). Exercise caution, however, when it becomes necessary to set the counter bias above ±40 volts, since too high a voltage causes improper Left-Right functioning.

AN/UPN-12 LORAN RECEIVING SETS—POTENTIAL SHOCK HAZARDS

Potential shock hazards exist in the AN/UPN-12( ) Loran Receiving Sets. Exposed high voltage terminals and an ungrounded input power connector have been located on the Polarad-manufactured AN/UPN-12; possibly the same hazards are present in some pieces of equipment in the AN/UPN-12A, UPN-12B, and UPN-12C series.

Connector J802, located on line filter FL801 at the rear of the equipment cabinet, is not grounded on the noted equipments. It is recommended that ship personnel check the connector for a proper ground connection and, if necessary, provide a suitable external ground to the connector.

1600-volt dc terminals are located on terminal boards TB202 and TB205 in the Loran Indicator chassis and TB703 in the Power Supply chassis. The high voltage ends of capacitors C701, C702, and C703 are, in some instances, exposed. These capacitors are located in the Power Supply chassis. "DANGER - HIGH VOLTAGE" signs should be placed in red paint on the chassis framework near the voltage points described above. Though special attention is given to the 1600-volt terminals, each electrical circuit should be considered a potential source of danger and handled with caution.

AN/UPN-12( ), AN/UPN-15( ) SERIES LORAN—MAINTENANCE HINT

When the AN/UPN-12( ), AN/UPN-15( ) Loran receivers are installed in confined spaces, instability due to overheating is frequently a problem.

A number of ships have made cutouts in the mounting shelf directly below the blower intake. This method has been moderately successful in reducing overheating by minimizing the tendency to recirculate the heated air expelled from the rear of the cabinet.

Ships that have these equipments installed should inspect to determine if structural braces need repositioning and whether this modification is required for their particular installation. If required, an eight inch diameter lightening hole, in the mounting shelf directly below the cabinet air intake filter, is authorized.

Installation activities are requested to flect this information on plans for future installations. (669)

AN/UPN-12( ) and AN/UPN-15( ) Loran Receivers—Delay Switch S-206 Alignment; Maintenance Hint

When misalingment of Delay Switch, S-206 is caused by slippage of the gear on the shaft of S-206 and/or slippage of the Switch Drive Gear, MOTU-13 has devised a simple alignment procedure as follows:

1. Turn the Delay Control until counter reads 98375 ± 4 (lower limit stop). Place Indicator Chassis in its vertical service position. Referring to Figure 1 make the following observations:

a. The flat sides of the switchshaft are parallel to the chassis sides.

b. The key-way on each switch wafer is on the left flat side of shaft.

2. If the above conditions do not exist, refer to Figure 2 and proceed as follows:

a. Loosen set screws on switch shaft gear.

b. Rotate shaft until positioned properly as in step 1a and 1b above.

c. Verify that counter still reads 98375 ± 4 and tighten set screw on switch shaft gear.

NOTE: A detailed alignment procedure for the Delay Switch has been published as Temporary Correction T-4 to NAVSHIPS 94247 and Temporary Correction T-5 to NAVSHIPS 92988. (684)

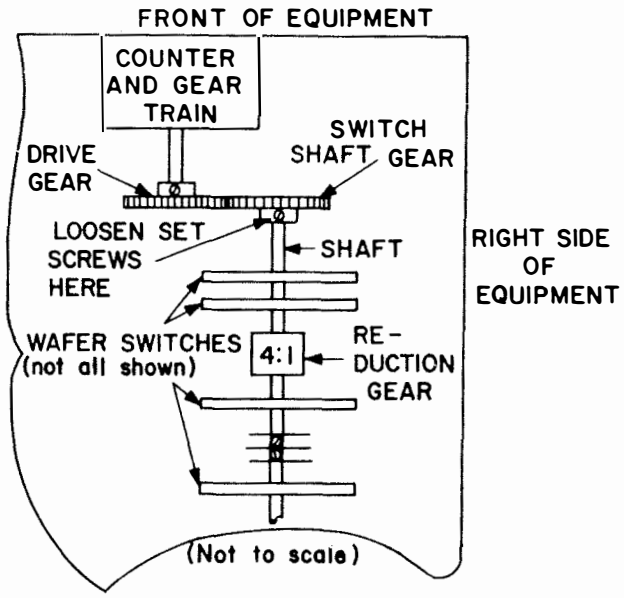


Figure 2. Delay Switch Assembly, S-206

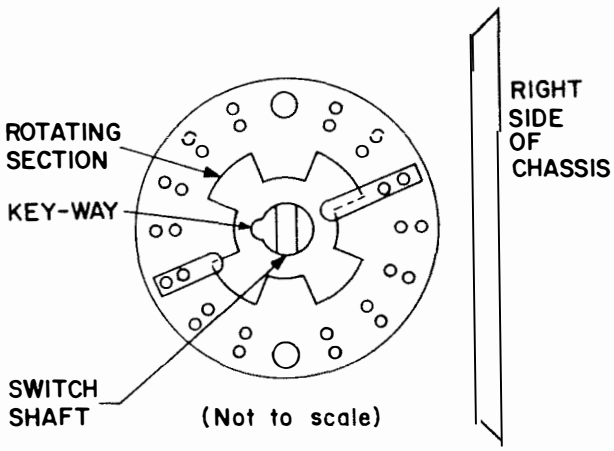


Figure 1. Top View of a S-206 Switch Wafer and Shaft

Field Change 1-AN/UPN-12( ) Series, NAVSHIPS 981452(A)—Discontinuance of Installation

Installation of Field Change Kit for Field Change 1-AN/UPN-12( ) series, FSN F5825-560-7213, should be discontinued, in accordance with CNO letter Serial 0209P35 dated 19 June 1964.

Where the field change has already been accomplished, those installations should be retained until adequate Loran A/C (or equivalent) receivers are available.

The operator is cautioned to the probability of extensive navigation errors when using the Loran C capabilities of the AN/UPN-15 ( ).

Accuracy of the Loran A system is not degraded by Field Change 1-AN/UPN-12( ), providing Field Change 4-AN/UPN-12 (see EIB 687) is installed. (697)

AN/UPN-15, Maintenance Notes Concerning the LORAN C Converter

Gear Reduction Assembly MP901 and the associated microswitches S953 and S954 enable LORAN C time delay measurements to continue up to 100,000 microseconds. The microswitches prevent extraneous triggering of the slave pedestal and loss of coincidence as the time-delay counting circuits crossover between 23,500 and 25,500 microseconds. Refer to NS94378 paragraph 4.4e for the principles of operation.

Various activities have noted that the slave pedestal is blanked and coincidence is lost at delay readings between approximately 2000 to 0μsec. This condition is due to the premature actuation of switch S954 and is caused by the cam that operates the switch. Removal of approximately 1/8 inch from the cam actuating roller corrects the condition.

Relay K900 is used to switch a common antenna input from the LORAN A receiver to the LORAN C receiver. Standard installation procedure provides separate antennas for the LORAN A and LORAN C modes of operation, thus eliminating the need for relay K900.

When separate antennas are provided with the AN/UPN-15 equipment and relay K900 fails, the relay should not be replaced. In lieu of replacement, the relay should be by-passed and the applicable antenna connected directly to the LORAN A and LORAN C radio-frequency input terminals. (637)

AN/UPN-15( ) SERIES–SURFACE VESSEL ANTENNA INSTALLATION NOTES

Inspection of numerous AN/UPN-15 installations indicate that many ships are not aware of the antenna requirements for Loran "C" signal reception. Prior to installation of Field Change 1-AN/UPN-12( ), most ships used a long wire antenna and CU-532 antenna coupler or the AN/GRA-40 antenna group. The field change publications or technical manuals do not specify a separate Loran "C" antenna; however, experience has shown that performance is substantially improved when an efficient antenna, such as the AN/SRA-17( ), is provided and installed.

Bureau of Ships drawing number RE46C2165A applies to AN/UPN-15( ) antenna installations, and indicates use of separate antennas for Loran "A" and Loran "C". EMEC concurs in this practice and recommends that an AN/GRA-40 antenna group be connected directly to the Loran "A" receiver input, and an AN/SRA-17 antenna group connected to the Loran "C" receiver input. A long wire with CU-532 antenna coupler is satisfactory for Loran "A". This hook-up provides an effective antenna system and also eliminates all antenna switching. (651)

AN/UPN-15 Series LORAN A/C Receiving Set—Signal Matching Limitations of LORAN-C

Field Change 1-AN/UPN-12 Series LORAN-A receiving sets added a visual LORAN-C video pulse and cycle matching technique and changed the nomenclature to AN/UPN-15 Series LORAN A/C receiving sets.

In LORAN-A the method of obtaining time difference readings involves matching video envelopes of two received signals. In LORAN-C besides video envelope matching, RF cycle matching is added to provide a vernier measurement within the pulse envelopes. This matching is done visually in the AN/UPN-15 Series.

Visual envelope and cycle matching has definite accuracy limitations when used in LORAN-C. Limitations are caused by (1) the difficulty in visually discriminating between the groundwave and skywave components of the LORAN-C signal and (2) the susceptibility of visual matching to atmospheric and man-made interference. Skywaves begin to appear at 400 miles from a particular station and contaminate the LORAN-C pulse. To avoid skywave contamination, the envelope and cycle match must be made at the beginning of the signals preferably 30 microseconds from the beginning. Frequently this portion of one of the signals is below the interference level. The operator's ability to make a correct match rapidly deteriorates as the signal/interference ratio decreases. An incorrect match can result in unpredictable time difference errors in multiples of 10 microseconds.

In view of the nature and unpredictability of errors the AN/UPN-15 (FC1-AN/UPN-12) has been discontinued as a reliable navigational aid. However, if the AN/UPN-15 Series LORAN-C limitation is recognized, it can be used for general navigation. *(805)*

HINGE PIN SPRING MODIFICATION FOR AN/URA-8A AND -8B

Norfolk Naval Shipyard has pointed out that open control-knob covers on the AN/URA-8A, -8B equipments are held in an upright position by the hinge-pin spring. These upright covers may cause damage by hanging in the wiring and resistor networks of the drawer above if the drawers are carelessly opened and closed during alinement and repair periods. This damage may be eliminated by clipping the hinge-pin spring in accordance with the accompanying figure. The covers will then drop into a closed position after control adjustments have been made. (See fig. 2.)

The adoption of this suggestion is left to the discretion of the individual activity. No field change will be issued.

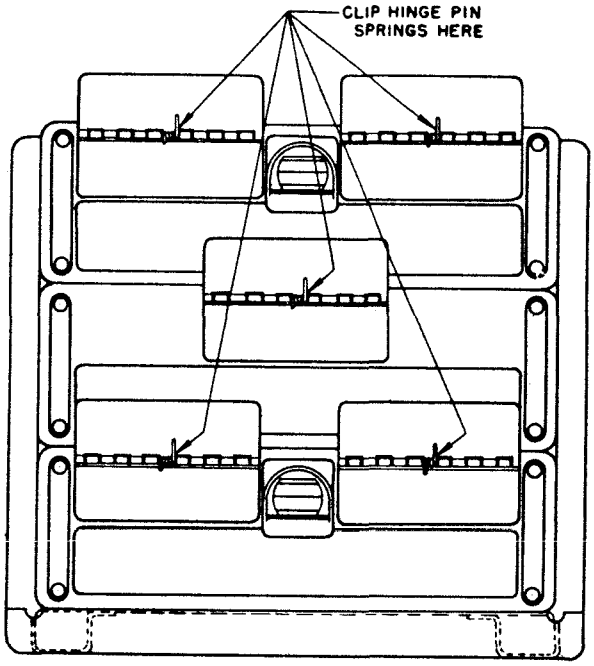


FIGURE 2. Modification of control knob covers.

AN/URA-8A, -8B DISCRIMINATOR TESTS

When the discriminator output voltages of the AN/URA-8A or the AN/URA-8B differ from the values given in Figure 2-3 of the instruction book, correct operation may be obtained by selecting, through trial and error, optimum vacuum tubes for V-102 and V-103. Any new tubes which are tried and found to be unsatisfactory should not be discarded, unless they are also found to be unsatisfactory in other equipments.

If proper performance cannot be obtained when the optimum tubes are selected for V-102 and V-103, the circuit components should be checked and any defective parts replaced. The resistors and capacitors may be checked with an ohmmeter and an impedance bridge.

Since transformers cannot be checked easily with an ohmmeter and impedance bridge, the following procedure is given for the test of T-102 and T-103:

1. Withdraw the converter-drawer assembly and connect the jumper cable.
2. Remove V-101 and V-103.
3. Set R-111 to its midposition.
4. Set the Mark-Space switch in the Normal position and the Shift switch in its Narrow position.
5. Connect a jumper from terminal 1 to terminal 4 of Z-103.
6. Connect an audio oscillator from terminal 1 to terminal 3 of Z-103. (Terminal 3 of Z-103 is grounded.) Adjust the audio oscillator for 1-volt output at 1000 c.p.s.
7. Connect a vacuum-tube voltmeter across terminals 3 and 4 of T-102; record the voltage at this point and disconnect the voltmeter.
8. Connect the vacuum-tube voltmeter across terminals 3 and 4 of T-103; record the voltage at this point and disconnect the voltmeter.
9. If the voltage readings differ more than 20%, substitute other tubes and repeat the tests. If the output voltage of one transformer is consistently low, replace the transformer with the lowest voltage.
10. Remove the jumper from the terminal 1 and 4 of Z-103; replace tubes V-101 and V-103.
11. Repeat the complete discriminator test; select the optimum tube for V-102 and V-103.
12. Replace the chassis in its cabinet and check the converter's performance on an incoming teletype signal.

MODEL AN/URA-8A/B FREQUENCY SHIFT CONVERTER ELIMINATION OF POSSIBLE DAMAGE

Commander, Destroyer Force U.S. Atlantic Fleet, provides the following information as pertaining to elimination of possible damage to AN/URA-8A/B: A possible cause of damage to teletype converters and source of cross talk in shipboard communications systems is the use of the 10-watt output of the RBS receiver. Use of the 10-watt output is not necessary because remote stations intended for voice reception are equipped with individual amplifiers. Damage to the input circuit of AN/URA-8A/B teletype converters (R101 & T102) may result from excessive input power.

Connection to the receiver transfer switchboard should be made to J-904 or J-905, which are located on the rectifier power supply unit of the RBS receiver, rather than to J-902, the 10-watt audio output.

Several ships of the Destroyer Force U.S. Atlantic Fleet have been wired to use the 10-watt output with resultant damage to teletype converters.

RELIABLE TELETYPE RECEPTION*

The Frequency Shift Converter/Comparator Group AN/URA-8A is employed with both high frequency (wide shift) and low frequency (narrow shift) transmission. Numerous cases of erratic teletype operation have been traced to improper tuning and adjusting of the AN/URA-8A. For such cases, it is believed that a better understanding of the present system of teletype transmission utilized by the Navy, together with the use of simplified tuning and adjustment procedures for the equipment, will greatly assist the technician in obtaining reliable teletype operation.

With the exception of UHF, practically all teletype transmissions made above 500 kc use the wide-space frequency-shift method, and all those below 500 kc use the narrow-space frequency-shift method. In the former method, the carrier is shifted 425 cycles above and below the mean carrier frequency for a total shift of 850 cycles, whereas, in the latter method, the carrier is shifted 90 cycles in the same manner for a total shift of 180 cycles. These frequency-shift limits are only approximate and will vary with different station transmissions. Moreover, a radio station may transmit teletype signals on 3 mc and 6 mc using the wide-spacing frequency-shift method and simultaneously transmit teletype signals on 100 kc using the narrow-space frequency-shift method.

On the Frequency Shift Converter CV-89A/URA-8A, two input receptacles are mounted on the rear of the cabinet. One is marked 600 OHM INPUT, WIDE SPACE, and the other, 6000 OHM INPUT, NARROW SPACE. For reception of a wide-space frequency-shift signal, the receiver output must be connected to the WIDE SPACE receptacle, and for reception of a narrow-space frequency-shift signal, it must be connected to the NARROW SPACE receptacle. On shipboard installations, only one connection is used from the audio patch panel to Converter AN/URA-8A. To eliminate the necessity of moving the plug from the WIDE SPACE to the NARROW SPACE receptacle when changing from one type to shift to the other, the manufacturer has installed a small jumper block so that, by placing the connections in the PARALLEL position, either wide-space or narrow-space frequency-shift may be used from either input plug. The jumper block (E102) is located on the left side of the discriminator submit near the front panel. It is recommended that this jumper block be placed permanently in the PARALLEL position for normal shipboard use.

For setting up Converter AN/URA-8A for wide-space frequency-shift reception, the following steps are recommended:

1. Connect receiver audio output to input of AN/URA-8A through audio patch panel.
2. Set KEYER control to TUNE position.
3. Set SHIFT control to WIDE position.
4. Set SPEED control to SLOW position.
5. Set CYCLE SHIFT control to 850 using the number on the outside line.
6. Adjust receiver tuning until pattern on CRT is as wide as possible (this tuning is rather critical).
7. Set KEYER control to OPERATE position.
8. Set MARK-SPACE control to either NORMAL or REVERSE position to produce intelligible copy. The setting of this control will depend upon which side of zero beat the receiver is tuned.

For setting up Converter AN/URA-8A for narrow-space frequency-shift reception, the following steps are recommended:

1. Connect receiver audio output to input of AN/URA-8A through audio patch panel.
2. Set KEYER control to TUNE position.
3. Set SHIFT control to NARROW position.
4. Set SPEED control to SLOW position.
5. Set CYCLE SHIFT control to 180, using the number on the inside line.
6. Adjust receiver tuning until pattern on CRT is as wide as possible (this tuning is rather critical).
7. Set KEYER control to OPERATE position.
8. Set MARK-SPACE control to either NORMAL or REVERSE position, to produce intelligible copy. The setting of this control will depend upon which side of zero beat the receiver is tuned.

The THRESHOLD control is to be adjusted to provide intelligible copy. Its setting is not very critical. The setting of the CYCLE SHIFT control does not materially affect the operation of Converter AN/URA-8A. It merely adjusts the width of the teletype pattern on the CRT by increasing or decreasing the signal level to the monitor scope. This pattern should be between the etched lines on the CRT; however, because of the manufacturer's tolerance of component parts, this setting may vary with equipments. The FREQ CPS and VOLUME LEVEL controls are used only in conjunction with teletype terminal equipment, such as the CF-1, and may be disregarded in a normal shipboard installation.

The complete AN/URA-8A usually consists of two Frequency-Shift Converters CV89A/URA-8A and one Comparator CM22A. For diversity reception, the output of each converter is connected to the input of the comparator. The teletype output of the comparator is connected to the teletype patch panel (TT-23-SG). On some shipboard installations, the teletype outputs of the converters are also wired to the patch panel. Either converter or comparator keying may then be selected by the use of patch cords.

A few of the more common troubles that may develop in the AN/URA-8A are listed below:

Symptom	Trouble
Low or no line current	Defective keyer tubes V207, V208; defective trigger tube V205; defective rectifier tube V401.
Teletype garbled	Defective tubes; MARK-SPACE control in wrong position; improper tuning of receiver.

*Adapted from the March– April 1957 Issue of Philco's Tech Rep Division Bulletin.

Inability to obtain a teletype pattern or full width on CRT	CYCLE SHIFT control improperly set; receiver improperly tuned; defective tubes.
Unit does not turn on	Defective fuses F502 and F501 (located on bakelite panel inside unit).

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

The AN/URA-8A equipment consists of two frequency shift converters and one comparator. Each converter is separately fused with two ¾-ampere fuses. The comparator is fused with two ½-ampere fuses.

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

Where this condition exists, the following fuses (Symbol Nos. F-501, F-502, F-901, F-902 and their replacements F-503, F-504, F-903, and F-904) should be replaced with 1 ampere cartridge fuses which have the following description:

(a) Fuse, cartridge, 1 amp., opens in one hour at 135% rated load at 25° C., continuous at 110% rated load; 250 volts, 1 time, glass body; 2 ferrule terminals; 1¼" lg. x 9/32" dia. O/a. NEC Std 4AG, Mfgr. Bussman.

REPAIR OF SUB-UNITS IN FREQUENCY SHIFT CONVERTER/COMPARATOR AN/URA-8A AND AN/URA-8B

Reports of failure of sub-units in the above equipments have been brought to the attention of the Bureau of Ships. When a failure occurs, an Electronic Failure Report shall be completed and forwarded to the Bureau of Ships. The defective sub-unit should be replaced by a sub-unit from the equipment spares. The defective sub-unit should be returned to an electronic shop (a tender or shop 67 in shipyard) for repair and return to stock only if repair to defective unit cannot be effected on ship.

Equipment spares supplied with each Frequency Shift Converter-Comparator Group AN/URA-8A and AN/URA-8B consist of one each of the following sub-units:

Converter Discriminator
Converter Oscillator-Keyer
Converter Monitor
Converter Power Supply
Converter Cable Filter Assembly[1]
Comparator Selector Unit
Comparator Power Supply
Comparator Cable Filter Assembly[1]

A requisition for a new sub-unit should include the following: Sub-unit is to replace a defective sub-unit not repairable aboard ship. Defective sub-unit sent to ..... for repair and return to stock.

REFLECTORS FOR VIEWING OSCILLOSCOPE TUBE OF AN/URA-8A

The use of special reflectors on the frequency shift converter units installed in the Communications Central AN/MSC-3 has been suggested. Their purpose is to permit the operator of the associated communications receiver to observe the monitor scopes during the tuning procedure. The principle is applicable wherever space limitations necessitate locating the Frequency Shift-Convertor - Comparator Group AN/URA-8 away from direct view.

Figure 1 shows the manufacturing details and the use of the device as covered by this suggestion. The versatile design, simple construction and low cost may well justify its use in other applications where similar installation conditions exist. Since requirements will depend upon the extent of application at each

[1]Cable filter assemblies for AN/URA-8B are not interchangeable with those of the AN/URA 8A. 12/1/52

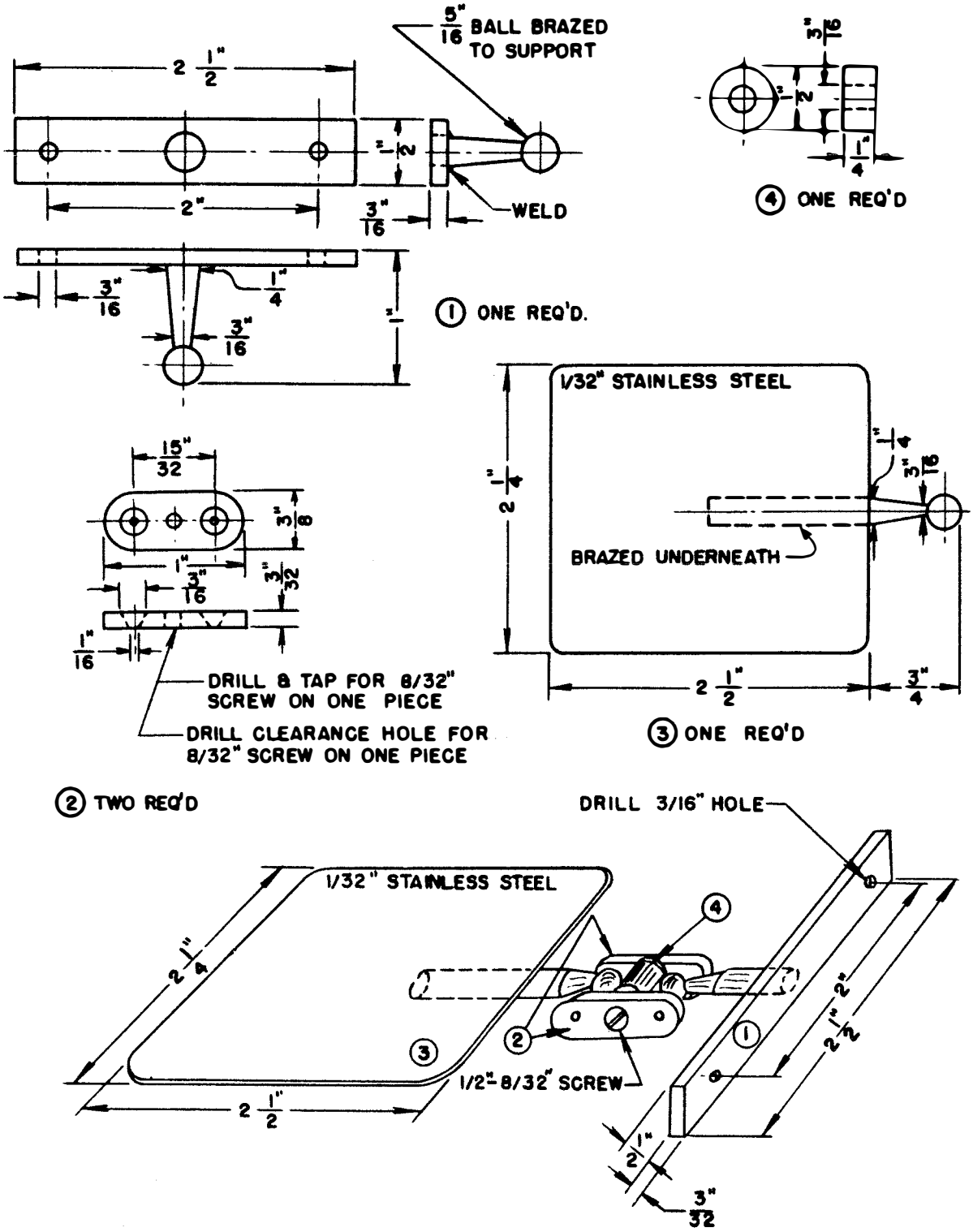


FIGURE 1. Reflectors for viewing oscilloscope tube.

AN/URA-8( ), AN/URA-17 Terminal Equipment, Reverse Keying — Operation of

The purpose of this article is to inform users of subject equipment of the proper setting of the normal/reverse keying switch.

It appears that there is some confusion by operators of subject equipment in the proper setting of the normal/reverse keying switch.

ALCOM 86-112014Z of December 1972, informed the fleet of the impending change to reverse keying of transmitters and the changes required thereto.

No changes were specified or are required in receiving terminal equipments other than changing the position of the keying switch from "NORMAL" to "REVERSE." Thus the "REVERSE" position now becomes the standard or normal mode of operation.

(EIB 914)

AN/URA-17( ) Comparator-Converter Group--Personnel Safety Warning

It has been brought to Naval Ship Engineering Center, Norfolk Division's attention that dangerous voltage exists on the case of Q17 and Q18 both during operation and after the equipment has been deenergized.

Caution should be exercised to prevent coming in contact with the case or the spring clip on top of Q17 and Q18.

Early dissemination of the solution to this problem is anticipated by NAVSECNORDIV.

(796)

AN/URA-17C, AN/URA-17D Comparator-Converter, 48 Volt Power Supplies, Adjustment—Maintenance Hint

The purpose of this article is to point out the correct methods of balancing the outputs of the 48 volt power supplies in AN/URA-17C and AN/URA-17D equipments.

A recent influx of PMS feedback reports, tend to indicate some confusion in the proper procedure to meet requirements for the -48 and +48 volt tests.

The AN/URA-17C and AN/URA-17D do not have adjust controls to permit balancing of the -48 and +48 volt power supplies at test points TP-7 and TP-8.

Referral to technical manual for AN/URA-17C, infers that adjust controls R-72 and R-89 are installed in the equipment. This is not true, hence the confusion.

Replacement of either or both zener diodes, CR-27, CR-34 generally balances the voltages to the limits specified in PMS requirements. If this does not correct balance, then other corrective maintenance is required. Refer to technical manual for action required.

(EIB 911)

AN/URA-8( ), AN/URA-17 Terminal Equipment, Reverse Keying--Operation of

See article in AN/URA-8 Section under the same title. (EIB 914)

AN/URA-27, ANTENNA TUNING UNIT-- Tuning Instructions

The Navy Electronic Supply Office, Great Lakes, has received numerous requests for rotary switch assemblies associated with the AN/URA-27. This volume of requests indicates that the specified tuning procedures are not being followed.

The problem of burnt rotary switch contacts can be eliminated by a modification to the tuning procedure, as follows:

The transmitter high voltage should be turned off while a new resistance position is being selected on the AN/URA-27 tuner.

In most cases, the rotary switches are repairable. After repairs are accomplished, strict adherence to the recommended procedure specified in the technical manual, and as modified in this article, should prevent future burnouts of this type. (703)

AN/URA-38 Antenna Coupler

The AN/URA-38 is the associated antenna tuning device for use with Radio Transmitter AN/URT-23(V) in surface ship installations. This antenna coupler may also be used with any other transmitter, up to average power levels of 1000 watts.

The AN/URA-38 coupler unit will be shipped from the contract and without pressurization. Pressurization is not mandatory for electrical operation of the equipment. But the unit should be pressurized, upon receipt or during preparation for installation, using the MK-260/U, or similar equipment, as specified in the AN/URA-38 Technical Manual.

This antenna coupler unit should be opened only when absolutely essential. Access for initial calibration or POMSEE is not required. Exercise care, if you must open the unit for repair, to avoid water or moisture leakage. (681)

AN/URA-38 Antenna Coupler—Sealing of Pressure Switch Vent in CU-938/URA-38

NAVSECNORDIV has been advised concerning a buildup of corrosion and debris in the vent hole for pressure switch 1A1S1 as shown in Technical Manual, NAVSHIPS 0967-204-0010, figure 5-3 (Top). Since installation of the coupler with the vent hole pointing down does not solve the problem, the hole should be plugged. The hole is not required for proper switch operation and it may be blocked in several ways as follows: Choose the most available materials method. The coupler MUST be pressurized to its normal 10 psig of dry nitrogen for method #1.

Method 1. Using RTV silicone rubber, place the mouth of the tube over the hole and squeeze about 1/4 inch into the hole.

Method 2. Use a patch of pressure sensitive tape over the hole and then apply several coats of paint for preservation. The area around the hole should first be cleaned with a solvent dampened cloth to remove grease or salt. (785)

AN/URA-38, Antenna Coupler Group--Operational Change

The purpose of this change in operational procedure is to avoid automatic detuning caused by adjacent transmitting antennas.

In the automatic mode the AN/URA-38 continuously tunes with any change in antenna impedance. This high sensitivity makes the AN/URA-38 susceptible to detuning due to energy coupled in from an adjacent transmitting antenna.

Correction Procedure

1. Automatically tune the AN/URA-38 in accordance with procedures outlined in the NAVSHIPS Technical Manual 0967-204-0010 to the desired operating frequency.

2. After the AN/URA-38 is tuned to the chosen frequency, turn the mode selector switch from auto to manual.

This operational procedure change applies only to the AN/URA-38 antenna coupler group and does not apply to the AN/URA-38A. (795)

AN/URA-38, AN/URA-38A Antenna Coupler Group—Maintenance Hint

The purpose of this article is to inform SHIPBOARD technicians that two Test Sets, TS-3229/URA-38 and TS-3230/URA-38, are available for use as a troubleshooting aid at all Tenders and MOTU Facilities.

1. Test Set TS-3229/URA-38 provides a rapid, convenient and efficient method of isolating faults to a unit and/or circuit of the AN/URA-38, 38A antenna coupler group. Technical Manual NAVELEX 0969-133-6010 gives operational details for testing motors, motor brakes, limit switches, alarms, etc.

2. Test Set TS-3230/URA-38 provides a convenient means of testing and troubleshooting the PLUG-IN printed circuit board assemblies contained in the Antenna Coupler Control C-3698/URA-38, pinpointing the individual malfunctioning areas of the card.

Problems are usually a transistor or diode associated with a stage; most semiconductors used on the cards have improved replacements as listed in the 1 February 1971 edition of the technical manual.

(EIB 885)

AN/URA-38,-38A Antenna Coupler Group—Maintenance Hint

The purpose of this article is to provide helpful information and details pertaining to potential problems within the discriminator assembly (1A2A2) which is located in the CU-938( )/URA-38 antenna coupler. The following hints will assist in isolating and preventing problems.

1. Tap the "Discriminator Null" meter (2A1M2) with the tip of your finger; if the meter appears erratic when tapped, it should not be used as an indicator for aligning the discriminator but should be replaced before alignment is attempted.

2. Frequently, excessive heat is applied when the discriminator output lead is unsoldered from TP-1 during alignment or repair. This action results in the 5pf capacitor (1A2A2C1) being either damaged or its lead becoming unsoldered.

3. Before the final alignment of the discriminator; adjust capacitor (C6) and resistor (R6) for a full scale meter reading on each side of center of the Null meter when power is applied. If there are no readings check the associated pins in connector 1A1J1 for open or short as well as leads on the discriminator, TP1-TP5. If either side fails to indicate full scale, replace matched pair of diodes as necessary. CR5 and CR6 if "C" is out, or, CR1 and CR2 if "L" is out. Matched pairs of diodes are available from RF Communications, 1680 University Avenue, Rochester, NY 14610, P/N 0902-1957. Recommend order 6 pairs @ $1.82 per pair to offset minimum billing of $10.00 and discount.

(EIB 904)

AN/SRC-20, AN/SRC-21, and AN/URC-9( )–Maintenance Hint

See article in AN/SRC-20 section under the same title (EIB 685).

MX-1743B/SRC and AN/URC-9 – Required Connections Between

Control Adapter MX-1743B/SRC is used to adapt recently procured UHF Radio Set AN/URC-9 to the standard 12-wire radio remote-control system.

It has been noted by the Engineering Interface Management Office (EIMO), NAVSHIPS Code 06C, that different methods are being used to interconnect the MX-1743B/SRC and the AN/URC-9. The method shown in figure 1 provides the required connections and eliminates the need for modifying the internal wiring of the MX-1743B/SRC. (710)

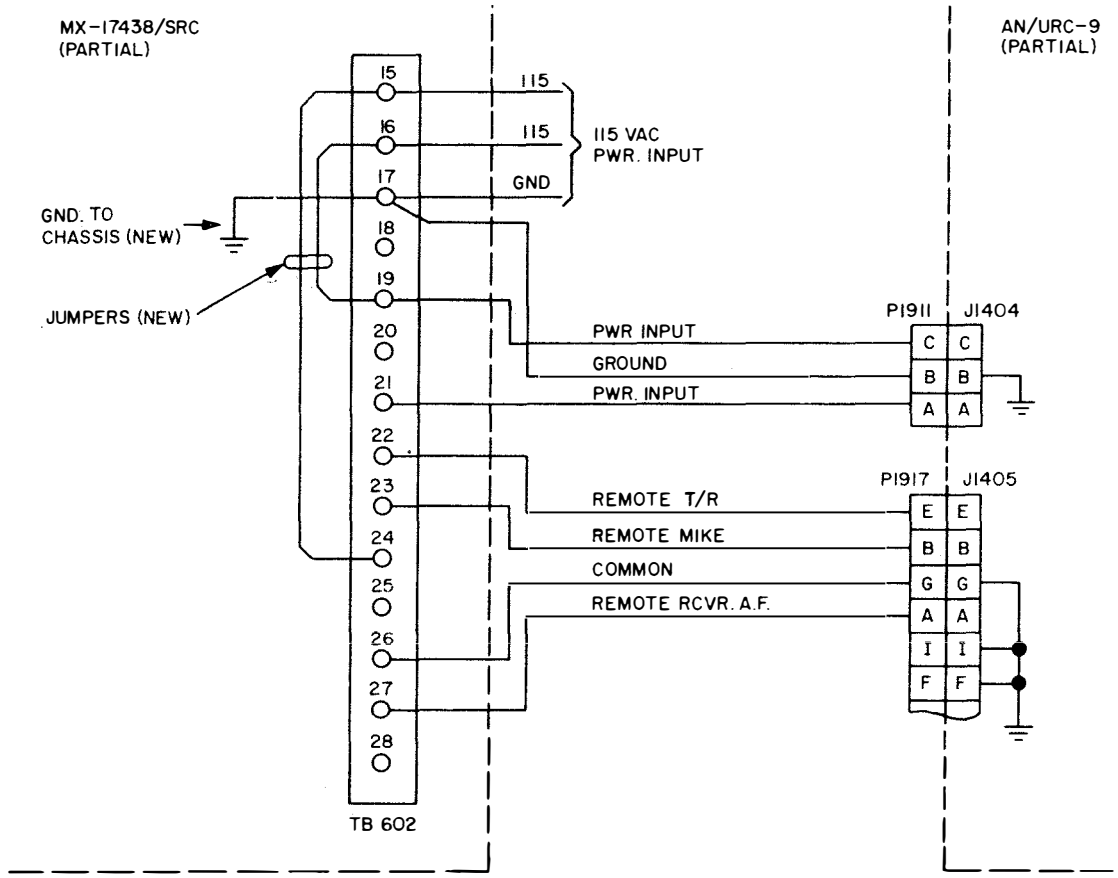


Figure 1. Connections Between MX-1743B/SRC and AN/URC-9

AN/SRC-20, AN/SRC-21 AND AN/URC-9 UHF MAINTENANCE HINT–CORRECT FREQUENCY ALIGNMENT OF RF AND PA AMPLIFIER IN THE RT-581/URC-9

See article under AN/SRC-20 with the same title. (EIB 722)

FIELD CHANGE 5-AN/SRC-20, 5-AN/SRC-21 AND 1-AN/URC-9( ) – AVAILABILITY OF REPLACEMENT PARTS

See article under AN/SRC-20 with the same title. (EIB 724)

AN/SRC-20, AN/SRC-21 AND AN/URC-9( ) RADIO SETS – BLOWER ASSEMBLY B-1051, SUPPORT INFORMATION

See article under AN/SRC-20 with the same title. (EIB 714)

AN/SRC-20, AN/SRC-21–REDUCTION OF ELECTRONIC ASSEMBLY ATTRITION RATE

See article under AN/SRC-20 with the same title. (763)

AN/SRC-20, AN/SRC-21, AN/URC-9( ) REPLACEABLE RF CABLE ASSEMBLIES INFORMATION

See article under AN/SRC-20 with the same title. (771)

AN/SRC-20, AN/SRC-21 and AN/URC-9( ) Blower Assembly B-1051 – Maintenance and Ordering Information.

See Article under AN/SRC-20 with the same title. (EIB 774)

AN/SRC-20, AN/SRC-21, and AN/URC-9( ) – Electronic Assembly Maintenance Philosophy.

See Article under AN/SRC-20 with same title. (EIB 774)

AN/SRC-20, AN/SRC-21, AN/URC-9 Radio Sets – Maintenance Hint.

See Article under AN/SRC-20 with same title. (EIB 793)

AN/SRC-20, AN/SRC-21, and AN/URC-9; Alignment of Capacitor C132 After Installation of Field Changes 10-AN/SRC-20, 9-AN/SRC-21 and 4-AN/URC-9–Maintenance Hint

See Article under AN/SRC-20 with same title. (806)

AN/SRC-20, AN/SRC-21 and AN/URC-9–Maintenance Hint

See Article under AN/SRC-20 with same title. (806)

AN/SRC-20( ), AN/SRC-21( ), and AN/URC-9--Maintenance Hint

See article under AN/SRC-20( ) with same title. (835)

AN/SRC-20,AN/SRC-21, and AN/URC-9--Personnel Safety Hazard

See article under AN/SRC-20 with same title. (836)

AN/SRC-20(), AN/SRC-21(), AN/URC-9 Radio Set--Maintenance Hint

Refer to article in AN/SRC-20 section under same title. *(EIB 875)*

AN/SRC-20(), AN/SRC-21(), and AN/URC-9()--Maintenance Hint

Refer to article in AN/SRC-20 section under same title. *(EIB 878)*

AN/URC-9, AN/SRC-20, -21, RF/PA Module, NSN 4G5820-00-981-1598–Repair of

See article under AN/SRC-20 with same title. (EIB 900)

AN/SRC-20( ), AN/SRC-21( ) and AN/URC-9( ) Radio Set--Maintenance Hint

See article in AN/SRC-20 Section under the same title. (EIB 932)

AN/URC-9( ), AN/SRC-20( ) and AN/SRC-21( ) Radio Sets—Maintenance Hint

The purpose of this article is to give technicians a fast procedure for determining the overall condition of RT-581/URC-9( ) before being returned to service after corrective maintenance. In many instances after a repair to the RT-581, it is returned to service without checking the overall operating conditions of each subassembly while the equipment is on the bench.

This procedure as outlined is brief and takes approximately six minutes to accomplish after the initial checkout if no new problems are uncovered. The use of this procedure will assure superior performance and longer operating time between repair. The following test equipment is required:

1. AC VTVM, CAQI-400E (SCAT 4206)
2. RF Sig.Gen, CAOI-608E (SCAT 4367)
3. DC & RF VTVM, AN/USM-116( ) (SCAT 4237)
4. AC Sig.Gen (IKHZ), AN/URM-127( ) (SCAT 4358)
5. ADAPTER, MX-9407/URC-9

RT-581( )/URC-9( ) CHECK OUT PROCEDURE

STEP	CONDITION	TEST POINT	INDICATION
1	XMIT/REC	J404	-6 to -12VDC
	Check 10 to 20 positions of the Tenths-Hundredths switch (.95 to .00).		
2	XMIT	V304 Pin 1	0.5 to 1.5VAC
	Remove V304 and measure the RF voltage at pin 1. Check 10 to 20 positions of the Tenths-Hundredths switch (.95 to .00). Replace V304.		
3	XMIT	J305	-1 to -2.6VDC
	Check 10 positions of the Units Switch (9 to 0).		
4	XMIT	J302	5VRF MIN
	Measure the RF Voltage at J302. Check 10 positions of the Units Switch (9 to 0).		
5	XMIT	J103	5VRF MIN
	Measure the RF Voltage at J103. This is the combined output of the first and second IF Amplifiers. Check 10 positions of the Units Switch (9 to 0).		
6	XMIT	J106	-1 to -3VDC
	This is the combined output of the FMO and first IF amplified by the front end of the RF-PA Amplifier. Check 18 positions of the Tens Switch (39-22).		

STEP	CONDITION	TEST POINT	INDICATION
7	XMIT	J701(ANT)	12 WATTS MIN
	Check all positions of Tens, Units, and Tenths-Hundredths Switches. If unable to obtain 12 WATTS, repair to obtain 16 WATTS MIN.		
8	XMIT	J805	.08VAC
	Remove V802 (Compression tube). Apply a 1000Hz audio signal through Adapter MX-9407/URC-9. Adjust audio signal level to produce .08VAC at J805. Do not change/ disconnect audio signal until step 11 is completed.		
9	XMIT	J803	210VAC
	Adjust R831 to obtain 210VAC at J803.		
10	XMIT	J803	200VAC
	Reinstall V802 (Compression Tube). Adjust R839 to obtain 200VAC at J803.		
11	XMIT	SIDETONE OUTPUT of MX-9407/URC-9 (600 OHM Audio Output)	+8VAC
	Set Volume Control to maximum (CW). Adjust R609 for sidetone level of 8VAC on AC VTVM.		
12	(SQUELCH)	SIDETONE OUTPUT of MX-9407/URC-9 (600 OHM Audio Output)	SQUELCH BROKEN
	Apply a 399.9 MHz, 30% Modulated with 1000 Hz, 100 micro-volt through a 6dB pad at J701 (ANT). Volume control and Squelch Control set to maximum (CW). Adjust R716 so squelch will break (indicated by up scale deflection on AC VTVM).		
13	(SENSITIVITY)	SIDETONE OUTPUT of MX-9407/URC-9 (600 OHM Audio Output)	10dB MIN DROP
	Change input of Step 12 to 6 microvolts. Set squelch control to OFF. Adjust R819 for AC VTVM pointer indication of 0dB with scale switch to +30dB range. Remove the modulation and note that pointer moves downscale to -10dB or further.		

(EIB 938)

AS-390/SRC and AT-150/SRC Antennas--Maintenance Hint

See article in AN/SRC-20 Section under the same title. (EIB 967)

AN/SRC-20( ), AN/SRC-21( ) and AN/URC-9( ) Radio Sets--Potential Safety Hazard

See article in AN/SRC-20 Section under the same title. (EIB 969)

AN/URC-16, -17, -18 RADIO SETS AVAILABILITY OF BAG COVER CW-330/GR

A protective bag cover, CW-330/GR, FSN N5820-330-9654, is now available for portable Radio Sets AN/URC-16, -17, -18 through normal supply channels. This cover is designed to prevent water damage to these equipments when exposed to inclement weather.

AN/SRC-10 THROUGH -15 AND AN/URC-16 THROUGH -18 SERIES RADIO SETS – POSSIBLE WIRING DISCREPANCY

See article in AN/SRC-10 section under the same title.

AN/SRC-10 THROUGH -15 AND AN/URC-16 THROUGH - 18 SERIES RADIO SETS – POSSIBLE WIRING DISCREPANCY

See article in AN/SRC-10 section under the same title.

AN/SRC-10 THROUGH -15 AND AN/URC-16 THROUGH -18 SERIES RADIO SETS – POSSIBLE WIRING DISCREPANCY

See article in AN/SRC-10 section under the same title.

AN/URC-32 – USE OF COUPLER-MONITOR CU-737/URC ACCESSORY

The Coupler-Monitor CU-737/URC (Collins model 180U-2), as accessory for Radio Set AN/URC-32 was initially procured for submarine use. This unit primarily provides circuitry for transmission line impedance matching, a monitor speaker, an RF wattmeter and is provided for use with submarine antenna tuning systems such as the AN/BRA-3 and AN/BRA-5.

There have been requirements for the AN/URC-32 to operate with transmitting antenna multicouplers and the Antenna Coupler AN/SRA-22 on surface ships.

Figure 1 provides the typical system interconnection for this purpose. The control unit for the AN/SRA-22 shall be installed in the AN/URC-32 rack in the space provided and the CU-737/URC shall be located close to the AN/URC-32 for convenience in tuning. Figure 2 indicates the preferred method of mounting, if space permits.

Since the CU-737/URC was not originally intended to perform this system function, the equipment modifications as noted on Figure 1 notes must be accomplished. When the AN/SRA-22, CU-737/URC system is used, it is preferable to provide a separate receiving antenna to the AN/URC-32 receiver antenna input. (518)

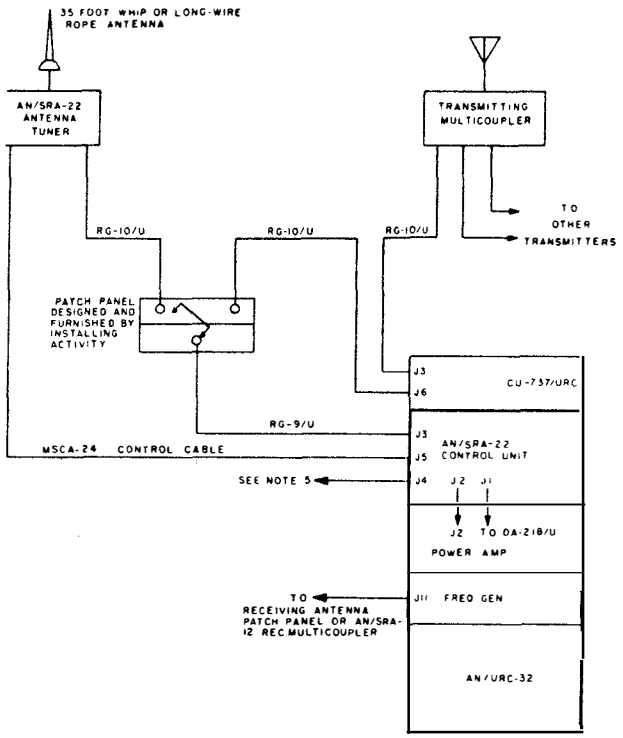


Figure 1. Typical System Interconnection Diagram

Figure 1 Notes:

1. CU-737/URC

a. Disconnect interval connections to J4 and J5. Assemble cable and connectors to connect J4 and J5 direct. Remove switch S3, associated wiring and blank-off front panel hole and switch position indicators.

b. Remove antenna relay K1, connector P1 and connect transmission line from patch panel to J6 of the CU-737/URC.

c. From terminal board J8, connect speaker leads 3 and 4 to terminals 3 and 4 of terminal board TBH in the AN/URC-32 junction box. This will provide a local speaker-monitor.

2. AN/URC-32

a. Remove 680 ohm resistor from junction box terminals G5-G6.

3. Since there are two wattmeters, one in the CU-737/URC and one in the AN/SRA-22 control unit, there will be two meter indications when the AN/URC-32 is used with the CU-737/URC-multicoupler system--only one metering system need be used for tuning.

4. The AN/SRA-32 control unit controls are only used with the associated tuner when the AN/URC-32 is patched through to the tuner.

5. The AN/SRA-22 control unit receiver output receptacle J4 may be cabled to (or through a patch system) J11 on the AN/URC-32 for receiving on the same antenna as used for transmitting.

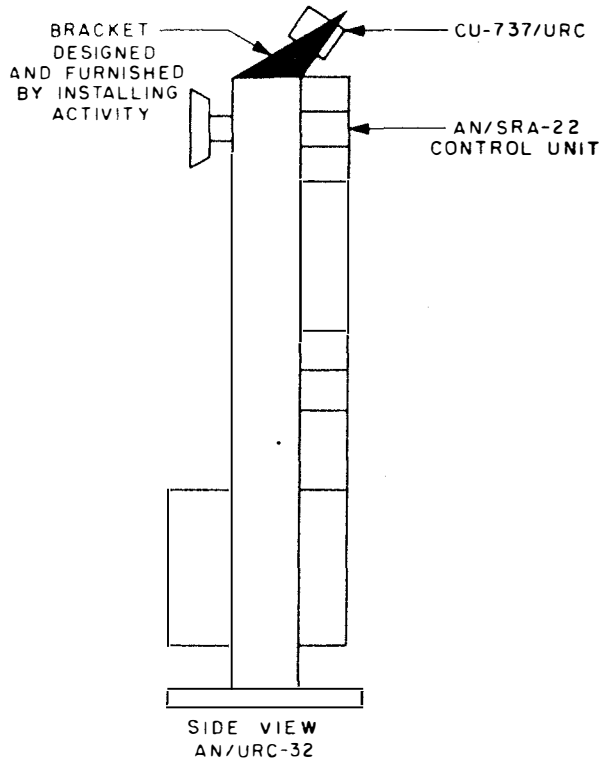


Figure 2. Preferred Method of Mounting

AN/URC-32: SHOCK AND VIBRATION MOUNT INSTALLATION

Photographs received in the Naval Ship Systems Command indicate several installations of the shock and vibration

mounting supplied with radio set AN/URC-32 have been improperly installed. These photographs show off-the-deck mounting on inverted ''L'' steel angles with no bed-plate.

The shock and vibration mounting unit supplied with the AN/URC-32 should be mounted on a flush surface for proper operation. If it is necessary to mount the equipment off-the-deck by means of angle supports, a steel bed-plate must be provided that will permit complete support of the entier shock and vibration mount base.

AN/URC-32 & AN/URT-18 ALINEMENT OF REFERENCE OSCILLATOR

Many of the reference oscillator plug-in (module) units of the Radio Set AN/URC-32 and Transmitter AN/URT-18 have been reported inoperable and turned in for repair. After investigation, it has been disclosed that many of these units could have been restored to service locally through an alinement process.

The equipment contractor, in conjunction with the field service engineer, has evolved an alinement procedure for application by fleet personnel. It is recommended that this alinement process be employed, if possible, prior to sending the units into a module repair activity, in order to reduce unnecessary costs and attendant problems.

TEST EQUIPMENT REQUIRED:

Oscilloscope OS-8/U, or equivalent.

AN/USM-34 vacuum tube voltmeter, or equivalent.

MK-447/URC-32 tool kit (supplied with AN/URC-32 and AN/URT-18).

PROCEDURE:

1. Measure the 100-kc. signal at J1 of the Frequency Divider Module. This level should be 1.0 to 1.5 VAC (RMS). Measure the 2400-kc. signal at J1 of the Sidestep Oscillator module. This level should be 0.5 VAC (RMS). If these values or signals are not as stated, or missing, proceed with the following alinement procedures.

NOTE: Loss of the 2400.kc. signal will cause the stabilized master oscillator to operate as a free-running oscillator, so that the equipment will be operating off frequency.

Loss of the 100-kc. signal will render the equipment inoperative except in the AM receive mode. Either of these conditions will exist if the Reference Oscillator is inoperative. A "noisy" 100-kc. signal may be noted in the AN/URC-32 receiver as excessive hash and lack of any desired receiver audio signal. Loss of the Reference Oscillator signal will cause the AC meter to remain at zero.

2. Plug in a spare operative Reference Oscillator from the MK-464/MRC kit, if available, and double check scope and ac signal levels from the operative unit.

3. Synchronize the scope for good ac display of the signal that was found improper on the inoperative Reference Oscillator module in step 1.

4. Remove the working module and reinsert the unit determined as being inoperative.

5. Using the oscillator alinement cover found in the MK-447/URC-32 tool kit, and the extension pendant cable marked for use on the Oscillator 100 kc. (Collins part number 544-9031), remove the inoperative Reference Oscillator module and place the test cable in J1 with side marked "A" to terminal "A" of J1.

CAUTION: "A" on the opposite end of the test cable must also go to terminal "A" of P1 on the Reference Oscillator module.

6. Remove the cover closest to P1 of the Reference Oscillator and place the test alinement cover on the module before attempting the variable capacitor adjustments.

7. Connect the oscilloscope to the 100-kc. and 600-kc. test points as shown in figure 1. Adjust C17 and C30 for a well-balanced 6-to-1 Lissajous figure with maximum amplitude. Tuning of C17 and C30 will readily show the position at which the best figure display will be seen. Adjust C11 for maximum amplitude of the 6-to-1 figure. Tuning of C26 will cause the figure to run off the scope to the left or right. After doing this, the proper setting of C26 will be apparent. At this setting there will also be a very slight increase in the amplitude of the 6-to-1 figure. If the 6-to-1 figute is obtained, it is known that the 2.4 mc. signal and the 100-kc. signals are present and the above adjustment will have peaked the 2.4-mc. signal.

NOTE: Only minor adjustments of these capacitors will be necessary and, if step 6 does not render the module operative, component troubles may exist and the module **should then be turned in to a supply center (see BUSHIPS Instruction 9671.22, serial 623A5-2377 of 14 September 1960), for forwarding to a module repair activity. (AN/URQ-9 only).**

8. Field alinement of L1 on the Reference Oscillator module should be attempted only when a known high stability reference signal is available (100 or 1000 kc.). If not available, the procedures listed in the equipment technical manual should not be attempted. (Refer to

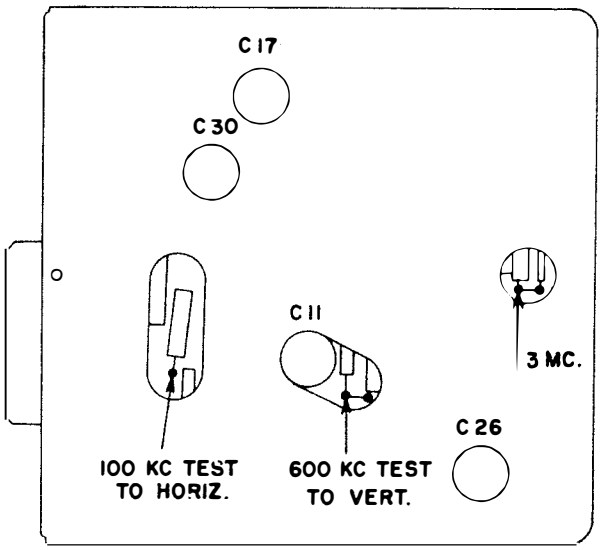


Figure 1. Test Points as Viewed Through Alignment Cover

the L1 alinement procedure as listed in the frequency comparator unit section of the manual). (548)

AN/URC-32 High Voltage Power Supply Fuse Failure

Recurring failures of fuse F3 in the high voltage power supply of AN/URC-32 has resulted in additional research by the manufacturer. It has been found that the front panel interlock shorting switch (S7) is at fault. This switch is located on the same bracket as the front panel interlock microswitch (S8). Shorting switch (S7) is directly above microswitch (S8).

At the point where the wire carrying high voltage from C49 is connected to the porcelain insulator the high voltage will occasionally arc to the bracket supporting the insulator causing fuse F3 to blow. A new bracket has been devised which provides more spacing between the insulator and the bracket. These will appear on AN/URC-32, commencing with serial 360, with at least 1/8-inch spacing to prevent this arcing. To accomplish this on models prior to serial 360, the following procedure is suggested:

1. Remove from the panel the ventilating cover of power amplifier.
2. Remove two small Phillips-head screws that hold bracket to chassis. This will permit access to the screw that holds the porcelain insulator to the bracket.
3. Loosen screw holding porcelain insulator to the bracket; move insulator over as far as possible from side of bracket and tighten screw.
4. Replace bracket and switches. If clearance does not appear to be sufficient, further spacing may be gained by appling pressure between bracket and insulator, thereby slightly bending the bracket and forcing the far end of the insulator away from the bracket. (545)

AN/URC-32--General Notes

Periodically, requests for information, comments from the fleet, notes from field-engineer reports, etc., include information of general interest to all users of Radio Set AN/URC-32. The following such notes are provided for information and use.

Installation information— A list of stock numbers which may be useful in requisitioning of necessary installation material:

Equipment	Stock number
MSCA-24 Cable	G6145-184-5862 or G6145-542-6894
MSCA-10 Cable	N6145-184-5863
DSGA-9 Cable	G6145-184-5893
TTHFWA 1-1/2 Cable	G6145-184-1253
RG-10/U Cable	N6145-161-0883
RG-10A/U Cable	N6145-161-0884
RG-18/U Cable	N6145-195-8724
RG-18A/U Cable	N6145-635-9915
Type 66047 Whip Antenna	2N5985-369-5532
Type IL-18/U Insulator	N5970-681-8018
Type 61335 Insulator	N5970-284-8084

NOTE: RG-18( )/U cable is normally used on antenna runs.

Equipment warranty— The AN/URC-32, AN/SRA-22, and accessories have a manufacturer's warranty for a period of one year after delivery to the Navy. Any electrical or mechanical failure on new equipment attributed to a manufacturing defect should be reported to the Service Force Commander.

MK-446A/URC-32— This unit is used only in installations where access to the high-voltage power supply on the rear of the AN/URC-32 is not possible. This unit permits mounting the power supply remotely from the equipments mounting rack. Existing stock of the unit has been depleted. Ships and activities requiring the use of the unit may manufacture locally using BUSHIPS Plan RE 43D2024B, when the fabricated unit is not available.

Sideband selection— For proper sideband selection, operate switch on the Audio and Control Unit (AM-2002/URC) to either the Upper sideband (USB) or lower sideband (LSB) position, for operation as required by the operational communications plan. Communicating with stations on the opposite sideband is not possible.

Tool allowance— Several ships have recommended that the AN/URC-32 be supplied with a small tool such as a surgical hemostat for use in repair work and as a "heat sink." These items (hemostats) are on every Electronics Tool Allowance List. Ships not having these tools for electronics work should requisition them from the supply system.

Printed wiring boards—Use only a low-wattage soldering iron such as that supplied in the MK-447/URC-32 accessory toolkit. Soldering irons or guns generate more heat than is required to melt the solder on printed wiring connections and, if used carelessly, could cause damage to the printed circuit board and components. Use 60/40-type solder. Module repair techniques are provided in the AN/URC-32 technical manual (page 49, para 5.7, NAVSHIPS 0967-066-7010 (Vol. 1), 0967-066-7020 (Vol. 2), and 0967-066-7030 (Vol. 3).

Power amplifier tubes—Ships have reported the replacement of the 4CX250B final amplifier tubes with type 4X150 in emergencies where the 4CX250( ) version was not available. This operation is possible and results in a lower power-out-put from the equipment. Temporary tubes should be replaced with the proper types, upon availability. Whenever final amplifier tubes are replaced, neutralization, bias, and balance checks should be made in accordance with the technical manual (page 4, power amplifier section of Technical manual instructions to assure proper operation.

Radio Sets AN/URC-32 being supplied under contract NObse (delivery commencing August 1960) will include type 7580 final amplifier tubes. The 7580 is a later version of the 4CX250( ) series and is interchangeable. Backfitting of the existing 4CX250( ) series is not necessary. Replacement with type 7580 is recommended, upon failure. The 7580 is a more reliable military design.

P & O reports—When submitting P & O reports on the AN/URC-32, include the associated AN/SRA-22, CU-737/URC (if used) report serial numbers. These reports may be submitted for a period of six months, then terminated, unless the equipment has unusual failures that should be brought to the attention of the Bureau. On one report, it is requested that information be included, whether the equipment was installed by ship's force or shipyard.

Equipment repair parts provisioning procedures—For information concerning procedures in obtaining equipment-onboard repair parts, reference should be made to the Electronics Supply Office publication Electronic Repair Parts Allowance List, Processing Guide, ESO Instruction 4441.17C.

Latest Allowance Parts List dates:

AN/URC-32	June 1965
AN/SRA-22	Jan. 1966
Cu-737/URC	Feb. 1962

Antenna tuners—Although the Antenna Coupler AN/SRA-22 was designed specifically for use with the AN/URC-32, it is possible to use the AN/SRA-18( ) unit. Detailed tests conducted by NEL have shown that the AN/SRA-22 is a more efficient and preferred unit. For emergency situations or when the AN/SRA-22 is not available, temporary use of the AN/SRA-18 should be considered.

Sidetone for CW operation—To adjust the audio sidetone in the CW mode, adjust the potentiometer R205 on the speaker-amplifier module contained within the AM-2062/URC (159-1 Audio and Control) chassis to the desired level (see pages 6 and 11 of the audio and control unit section, NAVSHIPS 0967-066-7010, AN/URC-32 Technical Manual.) Note also that this module contains a fuse (F201) for the 24 vdc transistor supply and should be checked when there is an indication of no audio output from this unit. Sidetone operation may be disabled, when desired, by operating the sidetone ON-OFF switch located behind the dust cover on the sideband generator (AM-2064/URC) chassis.

Issue of accessories—The current authorized allowance issue of equipment accessories is one set of spare modules (MK-464/URC, Maintenance Kit) for each three equipments installed on board and one tool kit (MK-447/URC, Maintenance Kit) per ship. Ships currently having an excess of this allowance are being directed to forward the excess to a naval supply center. The modules contained within the MK-464/URC forwarded to the supply center will be individually stocked for issue, on requisition, to ships requiring a unit to replace a defective one. Ships receiving a replacement unit will be directed to forward the defective unit to a repair facility (San Francisco, or Norfolk Naval Shipyard, Restoration Coordinator), via a supply activity for repair and return to the stock supply system.

Equipment training—Bureau of Naval Personnel Instruction 1500.25 and catalog NAVPERS 91769D contain information concerning available training courses. Quota information should be obtained from the Commanding Officer, Enlisted Personnel Distribution Office, U.S. Atlantic Fleet or U.S. Pacific Fleet, via the Type Commander. (541)

Remote operation—When remote control of the AN/URC-32 is desired in the ships-standard-radio-remote-control system it is only necessary to operate the switch marked "REMOTE-LOCAL" on the Handset Adapter Chassis C-2691/URC, to the "REMOTE" position. The switch marked "TUNE-LOCAL-EXTERNAL" on the sideband generator chassis should not be operated. Operating this switch will not permit keying of the equipment from a remote position. This switch performs the following functions:

TUNE position—Disconnects external audio input signals and reinserts a carrier signal for tuning the power amplifier.

LOCAL position—Normal operating position after equipment is tuned and ready for operation.

EXTERNAL position—Not used. This switch permits the remote operation of the receiver RF gain control and the TGC-AGC meter indicator. This capability is not available in the existing ships-standard-radio-remote-control system. DO NOT OPERATE THIS SWITCH TO "EXTERNAL" POSITION.

High replacement item stock numbers--Stock numbers for items with a high-replacement rate follow:

High-voltage fuse F3	N5920-232-3691
20-amp line fuse	N5920-296-4885
4CX250B tube	N5960-615-4376
20L diodes	N5960-542-7040

Attention is invited to the revised Parts List (APL), dated June 1965. The APL for the AN/URC-32 has been revised by ESO to include items inadvertently left out of the original issue.

Caution-antenna tuning—Reports being received indicate that some ships inadvertently are burning out receiver front-end coils by tuning up a "back-up" transmitter, in high power, and on the same frequency to which the AN/URC-32 is tuned. With the close proximity of shipboard antennas, this amounts to "pumping" a large amount of RF directly into the receiver, causing the resultant receiver-coil failures. When tuning other equipments to the same frequency, it is recommended that this be done with low or tune power, and that the receiver-antenna-input-transmission line of the AN/URC-32 be temporarily disconnected to eliminate this equipment failure. Future AN/URC-32 equipments will be provided with an antenna protective device that will disable the receiver when excessive power is encountered on the transmission line. Field change kits to back-fit equipments procured under contract NObsr 75279 have been initiated, and information on their availability will appear in the EIB.

Ships force and activities installing the AN/URC-32 equipment (and the Antenna Coupler AN/SRA-22) should investigate thoroughly the proposed antenna location to provide as wide a separation as possible between adjacent antennas. Alternately, though least desirable, due to attenuation, etc., the equipments-receiver-antenna input (on frequency-generator chassis) could be cabled to the ships-receiving-antenna-distribution system (patch panel, multicoupler, or direct).

Stock number—The stock number for the CU-737/URC Coupler-Monitor has been changed to FSN F5985-678-4053.

"Off-frequency Reports – A number of off-frequency reports received by ships have been attributed to improper switching in the CW and FSK modes. When operating in these modes, assure that the frequency-indicator dial on the frequency-generator unit is set **2kc. below the assigned frequency** for **FSK** operation, and **1 kc. below the assigned frequency** for **CW** operation, and that the appropriate position of the OSC CONTROL switch on the **CW/FSK** unit is used. Switch to the **CW 1 kc.** position when the assigned frequency is an even-numbered frequency (i.e., 3000.00 kc.) and to the **CW 1.5 kc** position for a 500 cycle-increment assignment (i.e., 3000.5 kc.)."

The instructions as provided in the Technical Manual, Operators Chart, and stenciled on the front cover of the equipments frequency-generator unit are correct.

The AN/URC-32 is capable of operation in all modes on 1 kc. increment-frequency assignments and 500-cycle increments in the **CW** mode. (541, 561)

AN/URC-32–Use of Isolation Amplifier Module

The Bureau has been receiving requisitions for the Isolation Amplifier Module as described on page 10 of the Frequency Generator section of AN/URC-32 Technical Manual. Currently, the use of this module is not required.

The Isolation Amplifier Module is to be installed only in specific equipments requiring the use of the AN/URC-32 in future, highly sophisticated, communications systems (i.e., for data handling etc.) This module is installed in the equipment in place of the existing Reference Oscillator Module and is connected to a highly stable ships-frequency source such as Standard AN/URQ-9 Frequency.

Upon avalability and installation of the AN/URQ-9, ships requiring the use of the AN/URC-32 for conventional communications (SSB, AM, CW, FSK) shall connect the AN/URQ-9 output to the AN/URC-32 frequency comparator chassis jack J2. The signal from the AN/URQ-9 shall be used as a frequency standard for calibrating the AN/URC-32 internal frequency standard, within the reference oscillator module.

The Isolation Amplifier Module has recently been assigned the nomenclature AM-1785/GRC and the Federal stock number F5820-715-6393.

AN/URC-32–INSTALLATION INFORMATION

Ships and activities planning the installation of Radio Set AN/URC-32 and making use of the MK-446A/URC-32 Installation Kit should ensure that the high-voltage power supply will not be located in spaces where the ambient temperature will exceed 160° F. When the MK-446A/URC-32 is used, the high-voltage power supply is removed from the equipment rack, and away from the equipment's blower system. The manufacturer has advised that this power supply will operate satisfactorily without air supply to temperatures of 160° F.

The AN/URC-32, as shipped, has the CW break-in delay control set for MAXIMUM lag. Ships and activities installing the AN/URC-32 should refer to the equipment technical manual (CW/FSK unit) and make adjustments for the desired CW break-in relay hold-in time.

To eliminate AN/SRA-22 equipment damage, a detailed verification of cable connections and continuity should be made prior to applying power.

AN/URC-32; L-32 OF RF TUNER (MODEL B) UNGROUNDED

A very small quantity of Model B RF Tuners, FSN 5820-799-7433, may have been released as spares without having L-32 grounded. These carried the manufacturer's serial numbers 101 to 130. This trouble can be identified by lower-than-normal exciter RF gain when the tuners are installed in an AN/URC-32. Also a visual inspection of L-32 can be made to determine whether or not L-32 is grounded. Ships having spare RF tuners (Model B) withing the above manufacturer's serial numbers should inspect and if necessary replace the missing ground wire. (559)

AN/URC-32–ELIMINATION OF RECEIVER INPUT INTERFERENCE

Ships have reported elimination of receiver interference (due to radar, etc.), through the use of a filter network that is in the supply system. This filter (stock No. N5915-615-5827) was originally supplied in the AN/SRA-20 antenna tuning equipment. The filter has a pass-band of 0 to 32 mc., 52 ohm impedance, insertion loss of .5 db (maximum) in the pass-band range and 100 db (normal) in the stop-band range. This filter contains BNC type connectors and may be installed in the AN/URC-32 receiver antenna input line for the attenuation of input signals above 32 mc. (560)

AN/URC–32–FACSIMILE USE

Facsimile Receive System–For reception of facsimile transmissions, the AN/URC-32 receiver output from junction-box terminals F-11, F-12, C-13, C-14 (LSB only), or C-15, C-16 (USB only) is connected through the receiver switchboard or direct to CV-172/UX (Frequency Shift Converter) and RD-92/UX or AN/UXH-2 (Facsimile Recorder).

Facsimile Transmit System–For transmission of facsimile information a scanner (TT-41B/TXC-1B), or its equivalent, is connected to a MC-168/UX modulator through the transmitter switchboard (or direct) into either the upper sideband (terminals C-1 and C-2) or lower sideband (terminals C-11 and C-12) transmitter audio input lines. In addition, a transmitter control (C-1004()/SG), or its equivalent, is connected to the transmitter for keying control and control indication. The output of the MD-168/UX unit provides a frequency shift audio of constant amplitude between 1500 and 2300 c.p.s. (560)

AN/URC-32–TEST DEVICE

Component parts for fabricating the test device as shown in NAVSHIPS 0967-066-7010, Vol. 1. page 5-83, 5-84

Figure 5-100, figure 4, page 4, of the Power Amplifier unit AM-2061/URT KEYUA-3) may be obtained from the supply system under the following stock numbers:

.01 Capacitor–N5910-678-5306 (same as part 34C1 in RF Tuner Module)

220UH Inductance–N5950-686-6425 (same as part 3A4621 in RF Tuner Module)

Diode–N5960-284-6516 (same as part 5CR2 in CS/FSK unit) (560)

AN/URC–32–MICROPHONE AMPLIFIER MODULE

The microphone amplifier module, located within the audio and control unit (AM-2062/URC), is not normally used in the AN/URC-32. An equipment field change is currently being prepared to remove this unit including the associated front panel microphone (MIC) receptacle, wiring, and transformer T6. Later production models of the AN/URC–32 will have this module removed and the modifications applied.

The microphone amplifier module is the same as the upper-sideband and lower-sideband line-amplifier modules contained within the same chassis and, pending further instructions, may be retained on board as a spare. (561)

AN/URC–32–RECURRING FAILURES

Power Amplifier Nylon Gears–Caused by misalinement of dial gears. Later production units have had this problem corrected. Field Change 1 AN/URC–32 provides new dials for the equipments earlier produced. Periodically apply lubrication to the dial plates by using the "Lubriplate" material supplied in the AN/URC–32 tool kit.

Z14, Z15, Z16 RF Tuner Coils–Caused by burnout due to Z14, Z15 and up high-level RF feed-in from antenna. This failure will be eliminated by the use of the protective device supplied in Field Change 1 AN/URC-32 for equipments (serial no. 1 through 359). Equipments with serial numbers 360 and above have this protective device installed.

R–13 in RF Tuner–Caused by excessive drive during the tuning process or the feed-back of high level RF in the receiver-antenna transmission line. This failure should be reduced when the receiver protective device is installed. Ships experiencing this failure should attempt repair on board, if possible, rather than shipping the entire assembly to a repair activity.

Fuse F3–This failure has been attributed to several causes such as shorted power-amplifier tubes, switch arcing as reported in EIB 545, and failure of C49 in power amplifier or circuit transients. The major cause of failure is believed due to the internal structure of the power amplifier tubes which is being corrected by the design of a more rugged tube.

Rattle and Binding of Frequency-Generator Frequency-Change Mechanism–Apply lubrication periodically as specified in the Technical Manual and the Maintenance Standard Book.

RF Tuner Band-Switch Shaft Binding–Apply lubrication periodically as specified in the Technical Manual and Maintenance Standard Book. Later production units have been provided with a bearing at the end of the shaft, away from the drive motor. The lubricant is provided in the AN/URC–32 tool box.

No Shift in FSK Mode–Check diodes CR2 and CR3 (1N67A or 1N198). Failures of these diodes have been caused by installation miswiring, application of too high current, failure to install 800 ohm resistor at TT–23/SG board (or in equipments junction box), and incorrect polarity of the complete teletype system.

AN/URC–32–USE ON 50–CYCLE POWER SOURCES

Occasionally information is requested on the use of the AN/URC–32 ashore where only 50-cycle power is available. The only effect of using 50-cycle power is that the equipment's blower motor will run slower causing a reduction in the amount of air supplied to each chassis. To offset any damage to the equipment's final amplifier tubes from heat, the air ports on each of the chassis should be **closed one notch** and the final amplifier air port should be **fully** opened. (See Field Change 24 AN/URC-32). (561)

ISSUE OF SUBSTITUTE EQUIPMENT KWT-6, Type 8, FOR RADIO SET AN/URC-32

Urgent requirements for procurement of commercial equipment substitutes for Radio Set AN/URC-32 and components have necessitated the installation of Collins Model KWT-6, Type 8, equipment.

Collins Model KWT-6, Type 8, equipment is exactly the same equipment as the latest models of Radio Set AN/URC-32 currently being delivered (Ser. No. 900 range). The commercial version of Antenna Tuning Group AN/SRA-22 is Collins Model 180T-2.

ESO has been continuously advised of the equipment procurements and issue so that similar material support will be provided for both the military and commercial versions of these equipments. (575)

DEFECTIVE MODULAR ASSEMBLIES IN RADIO SET AN/URC-32

During gunnery exercises at sea, the automatic frequency control (AFC) meter in Radio Set AN/URC-32 commenced to fluctuate erratically. The cause of failure and the action taken to correct this condition, are described as follows:

The difficulty was at first believed to be caused by loose modules or tubes in the frequency and carrier generator, but inspection showed that these components were intact and secure. Then, a test, using a vacuum tube voltmeter AN/USM-34, indicated that the 455-kc signal from A2J1 on the stabilized master oscillator (SMO) measured only 1.2 volts RMS instead of the required 3.5 volts RMS. As a corrective measure, a spare stabilized master oscillator module was installed and aligned in accordance with

the instruction manual. The results of this substitution were negative.

Next, a spare reference oscillator (RO) module was installed. However, a check made with a vacuum tube voltmeter AN/USM-34 indicated that there was no 100-kc output from the reference oscillator. An additional test was then conducted using the original stabilized master oscillator and the spare reference oscillator. The results were again negative.

Finally, it was determined that both the stabilized master oscillator and reference oscillator spare-module assemblies were defective and inoperative. A close visual inspection of the stabilized master oscillator inner modules revealed that a section of the insulating sleeving on the collector lead of transistor Q2 had been displaced, thereby causing a short circuit to the lead on C6. After completion of repairs to the defective insulation, the transmitter operation was normal.

In view of the foregoing, it can be seen that spare modular assemblies, regardless of outward appearance, may be defective. Despite the fact that these assemblies are painstakingly assembled and tested, the possibility to inadvertent damage or the existence of other defects must not be overlooked. Damage to modular assemblies as a result of poor handling, either prior to, or during installation, can render associated equipments useless. From the standpoint of reliability and cost, therefore, the importance of correct and careful handling of modular assemblies cannot be overemphasized. To eliminate wasted installation effort, every modular assembly should be subjected to a thorough inspection and/or test prior to installation.

Attention is directed to the excellent series of articles entitled, "Repair and Maintenance Techniques of Modular Assemblies, "in the General Maintenance Handbook, NAVSHIPS 0967-000-0160.

DAMAGE OF PRINTED CIRCUIT IN RADIO SET AN/URC-32

The accompanying illustrations show severe damage to printed circuit boards which never should have occured. An analysis of recent failures has proved conclusively that, had field changes to the AN/URC-32 equipments been accomplished, this damage would not have taken place.

Figures 1, 2, 3, and 4 show the destruction of the printed circuit boards (Signal IF Board in the Stabilized Master Oscillator Module), caused by the thermostatic switch (A1S1) sticking. If Field Change 1 had been accomplished, the damage probably would not have occurred. (See note below)

Field changes to these equipments have been published and announced repeatedly in successive issues of the EIB. It is strongly recommended that holders of equipments accomplish equipment field changes as soon as they are available.

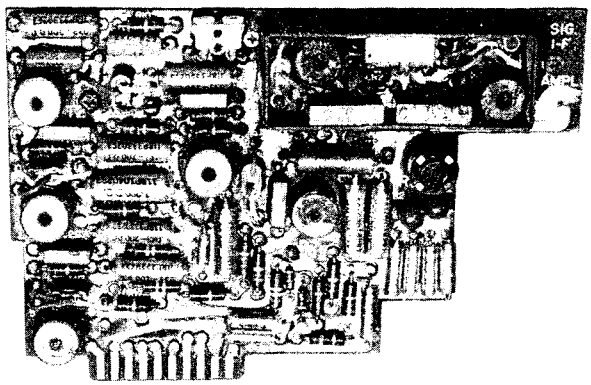


Figure 1

NOTE: Holders of Models A or B SMOS should turn same in and draw C SMOS.
All models A or B are being converted to model C by S. Fran and NORVA Module Repair Facilities as fast as they are received. No A or B are being issued by Supply.

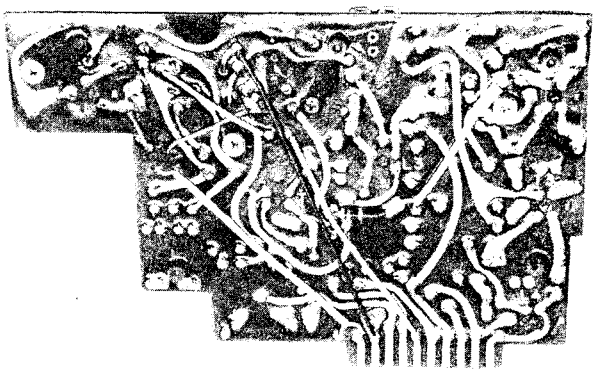


Figure 2

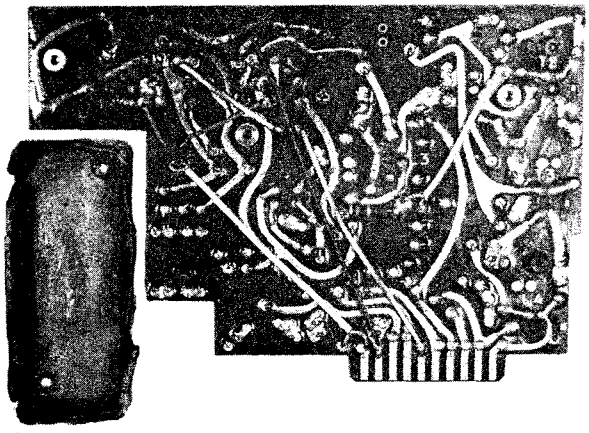


Figure 3

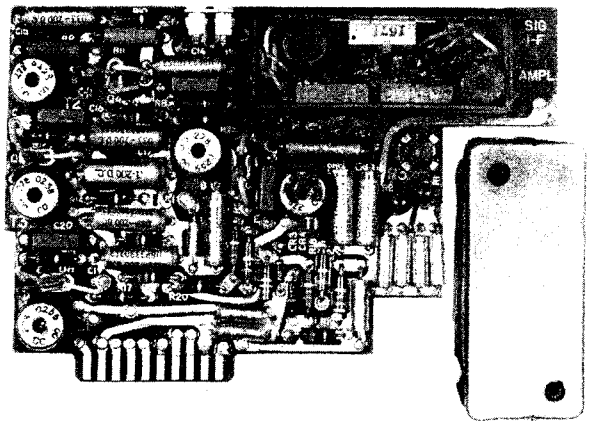


Figure 4

INSPECTION OF POWER AMPLIFIER IN AN/URC-32

Power Amplifier

Periodically inspect L-10 tune coil and coil roller adjustment for optimum performance. Dirt or arcing deposits will cause erratic power amplifier tuning.

No AM Output

Check TUNE-LOCAL-EXT. Control switch on the sideband generator unit, AM operation is not possible in the EXT. Control position.

PA Tubes

A more ruggedized tube for the AN/URC-32 power amplifier has been developed and is currently being stocked. When requisitioning new power amplifier tubes, request the new version 4CX250R(FSN N5960-738-2217), if the new version is unavailable, use the 7580 or 4CX250B type. The new RCX250R was specifically developed to reduce PA tube failure caused by mechanical shock and vibration from operational use and shipping damages.

Tool kits and Spare Modules

Reports have shown that a number of ships have more than their authorized allowance of AN/URC-32 tool kits (MK-447/URC-32) and sets of spare modules (MK-363/URC). Because of the short supply of the AN/URC-32 and accessory items, this practice will jeopardize other ship installations that may be in critical deployment situations and do not have these items available in stock. Because of funding limitations, the Bureau has been able to procure only a minimum amount of these items to meet only planned installations. There are no spare units available in stock. Authorized allowance is one tool kit per ship and one set of spare equipment modules for each five AN/URC-32 equipments installed per ship.

Modules

Reports have been received of ships disposing of modules (**destruction** or **thrown overboard**). All of the AN/URC-32 modules are repairable, at a repair facility. These units are in very critical supply for the reasons cited above.

Blower Unit

Reported failures, inspections, and photographs received from shipyards indicate negligence in the cleaning of the equipment air filters. Newer equipments have the words, "Clean Filter Every Two Weeks-SEE INSTRUCTION BOOK," on front of the blower unit dust cover, It is recommended that this notice be affixed, if not already provided, to serve as a cleaning reminder.

Reference Oscillator Calibration

Refer to POMSEE book and AN/URC-32 Technical Manual and periodically calibrate the units L1 adjustment with frequency standard AN/URC-9. This unit may be used by connection to the equipment frequency comparator unit. Failure to calibrate L1 will result in off-frequency operation and distorted transmission and reception of signals.

Junction Box

Equipments with serial number 660 and above will have a 800-ohm resistor installed at the teletype input terminals TBD-1 and -16. Refer to the AN/URC-32 Technical Manual, figure 2-10. When installing the AN/URC-32 and connecting for teletype operation, assure that an 800-ohm resistor is either in the equipment junction box or in the TT-230/56 patch panel. Only one 800-ohm resistor across this line is required.

Operational

The AN/URC-32 is primarily a single-sideband transmitter, with the added capabilities of AM(compatible), CW, and FSK. It is preferable to use the AN/URC-32 for SSB, and other equipments, if availabe, for the other modes. The

equipments design is for high-quality SSB voice transmission and reception, exceptional frequency stability, and for future sophisticated multi-channel FSK and data handling capability.

Dummy Load

It has been reported that shipyards have been removing the DA-291/U dummy load from the AN/URC-32 air duct and installing it at an antenna patch panel for use with other equipments. This dummy load is a part of the AN/URC-32 and requires the air supply from the equipment blower to handle its rated 500 watts. Additionally, if the dummy load connection on the C-2698/SRA-22 or CU-737/URC unit, used with AN/URC-32 is not properly terminated with this dummy load as a result of this practice, then severe power amplifier unit damage may result as this unit will not operate into an open load. (565)

CHECK-OUT PROCEDURE FOR AN/URC-32 and AN/SRA-22 ANTENNA COUPLER

This procedure is written for the technician who is familiar with the AN/URC-32, at least to the point of being able to properly tune the equipment for its various modes of operation in SSB, ISB, AM, CW, and FSK. If the following step-by-step procedure is adhered to, the technician can determine whether his equipment is functioning properly.

Failure of the AN/URC-32 to give correct indications, as set forth in the following steps, may indicate a failure and should be investigated further by the technician.

If any of the following checks fail to give satisfactory results, the nature of the check being made should indicate to the technician which unit or units of the transceiver are at fault. Refer to the appropriate section of the Technical Manual for further aid in localizing troubles.

Initial Setting of Front Panel Controls

1. Low Voltage Power Supply ON/OFF Switch	OFF
2. Handset Adapter	LOCAL
3. Frequency Comparator	OFF
4. Audio Control	
a. Sideband Selector	USB Xmit
b. Microphone Gain	Fully CCW
5. CW/FSK Unit	
a. Oscillator Control Switch	OFF
b. Output Control	Fully CCW
c. Meter Multiplier	+ 8 dbm
d. Xmit/Rec/CW Test	REC
e. Meter Selector	LSB
6. Sideband Generator	
a. AM/SSB Switch	SSB
b. Tune/Local Ext. Control	LOCAL
e. Exciter RF Gain	Fully CCW
d. Receiver Gain	Fully CW
e. Multimeter Switch	TGC/AGC position
7. Frequency Generator Unit	
a. Band Change Switch	Band 1
b. Frequency Counter	5.001 MC
8. Power Amplifier Unit	
a. Fil/Tune/Operate	Operate
b. Plate on/off/key	OFF
c. Band Switch	Band 2
d. Driver Tune	Fully CCW
e. PA Tune	Fully CCW
9. Antenna Control Unit	
a. Load/Ant. Switch	Load
b. Meter Power Selector	"Forward 1000"
c. Cap Switch	Shunt 1
d. Coil Switch	Center
e. Tap Switch	Center
f. Coil Dial	100
g. Tap Dial	100

Blower Interlock Switch

Turn low Voltage Power Supply ON/OFF Switch to ON position. The blower motor should start and, after a slight delay, the RED power indicator lamp should glow, indication closure of the Air Interlock Switch which energizes the low voltage power supply. (If lamp fails to glow after blower is energized, check the air filter as it must be kept clean.) If indications above are normal, block the air intake to the transceiver by placing a sheet of paper or cardboard over air intake filter which is located directly below the low voltage power unit at the bottom of the rack amount. When the air passage through the filter is thus blocked, the RED power ON indicator lamp on the low voltage power supply should extinguish, although the blower motor will continue to run. When the air blockage is removed, the power ON indicator should light. If these indications cannot be obtained, the air interlock switch is probablu defective and further investigation will be necessary.

Low Voltage Measurements

On the sideband generator, use the meter selector switch to monitor the minus 90 volts, plus 250 volts, and the plus 130 volts setting. The meter should indicate approximately 40 db in each position of the switch.

Frequency Accuracy, Reference Oscillator, and SMO

Allow a warmup period of approximately 15 minutes before making the frequency accuracy check described below.

1. Depress the Tune-Operate switch on the frequency generator unit to Tune position and note the AFC meter on the frequency generator unit. The meter should indicate zero or center position. Release the Tune-Operate switch to Operate position and the AFC meter should indicate either to the right or left of center position. This deviation from center reading may be from a fraction of a dial division, to a maximum of 90-micro-amps. (See Technical Manual NAVSHIPS 0967-066-7010 Vol. 1, 90 μa only up to 2 MC). The meter needle should be steady and free of jitters. If the reading obtained on the AFC meter exceeds the 90 micro-amps or is unstable, one of the following modules is usually defective: SMO, frequency divider, sidestep oscillator, or reference oscillator. Refer to the Frequency Generator Section of the Technical Manual for further troubleshooting assistance. REMEMBER! When setting up a frequency control group, after locking the dial on the desired frequency,

ALWAYS momentarily depress the Tune-Operate switch to insure proper lock-in of the stabilized master oscillator. The frequency counter dial should now be set for 5.001 mc as set forth in the preliminary settings of this instruction.

2. If WWV can be received in your present location, a 1-kc audio tone should be audible at the handset. This is caused by heterodyning of WWV carrier frequency against the reinserted carrier frequency of the AN/URC-32. Any frequency deviation of the 1-kc tone will be indicative of the frequency error of the AN/URC-32, plus a slight error caused by doppler shift of the received carrier. Turn the switch on the frequency comparator to 1-kc position and adjust meter zero and gain controls to provide a visual sweep on the meter. If the AN/URC-32 is "on frequency," a slow steady sweep should be obtained on the meter. This sweep indicates the AN/URC-32 frequency error in cycles per second at the received frequency, in this case, WWV at 5.000 mc. EXAMPLE: If a sweep of 1 cps is obtained, an error of 1 cycle at 5 mc indicated. However, if you compare against WWV at 10.000 (dial reading at 10.001 mc), the sweep on the comparator should increase to 2 cps because at 10.000 mc, there would be an error of 2 cycles.

NOTE: A formula for computing the frequency difference between the AN/URC-32 and the transmitted frequency standard is given in the Instruction Manual, Section TD-112, page 4. If this check does not result in a satisfactory indication, refer to Section 111, TD-113, of the Instruction Manual and perform appropriate checks to localize the trouble.

CW and FSK Unit

1. Turn the frequency comparator off.
2. Operate sideband selector switch USB.
3. CW/FSK unit to FSK.
4. With frequency change knob, tune in an FSK signal and vary the BFO control on the CW/FSK unit. (This should change the frequency of audible signals at the handset.)
5. Turn Xmit/Rec/CW/ test switch to Xmit on the CW/FSK unit.
6. Advance the output control on the CW/FSK unit and insure that FSK oscillator will provide over 0-db output indication on monitor meter of CW/FSK unit.
7. Turn oscillator control switch to CW 1 kc and XMIT/REC/CW TEST switch to CW TEST. Advance the output control to insure meter indication of greater than 0-db output from the CW oscillator. Intermittently key at CW rate. The transmitter should remain keyed (green light remains on) between key rate. If not, adjust CW key release time potentiometer under dust cover for approximately .5-second fallout time. Repeat this step for CW 1.5 KC and turn CW/FSK unit to OFF position with oscillator control switch. Return XMIT/REC/CW TEST switch to REC..

Power Amplifier

With TUNE/LOCAL switch on sideband generator in LOCAL and exciter gain control fully CCW, apply high voltage to the power amplifier. Turn XMIT/REC/CW TEST switch to XMIT. An indication of 150-ma static plate current should be observed on the plate meter of the power amplifier. If this value of plate current is not available, adjust bias potentiometer R-19, located behind button just above driver tune control, to obtain the 150-ma static plate current. Operate plate No. 1 and plate No. 2 switches alternately. Readings should be between 60 ma and 90 ma in each instance. If this result is not obtained, change the PA tubes to obtain a closer balance. Unkey transmitter and turn plate voltage to the OFF position.

NOTE: If tube types 4X-250, 4CX-250, 4CX-250B, 4CX-250R, or 7580 are not available, then 4X-150B may be used for power amplifiers in an emergency. If 4X-150B is used, set bias control to obtain 100 ma of static plate current with NO drive into the power amplifier.

RF Tuner Module Gain

Set the band change control on the frequency generator unit to Band 1 and set the frequency dial to 1.7 mc. On the sideband generator unit, turn the TUNE LOCAL switch to TUNE and meter switch to RF OUT. On CW/FSK unit, throw test key to XMIT. Advance the exciter gain control to a minimum of 40-db output as indicated on meter on sideband generator. Unkey the transmitter and switch to Band 2. Key the transmitter and turn up exciter gain control so that a minimum of 40-db output is again obtained. Repeat for Bands 3 and 4. After checking Band 4 output on the low end, leave exciter keyed and rotate frequency change knob across the entire band to insure a minimum of 40-db output. Check Bands 1, 2, and 3 at the high end also. Unkey the transmitter.

Sidestep Oscillator

On the frequency generator unit, turn the frequency band change control to Band 4, add 3 kc. As each 1-kc step is added, the AFC meter should deflect by approximately one small increment on the scale. This will indicate proper operation of the sidestep oscillator. An alternate method of checking the sidestep oscillator is to tune in some received signal on Band 4 that will result in a tone at the headphones or speaker and then change the ADD KC control to check that the received tones change in frequency by 1 kc each time the ADD KC control is changed.

Over-All Transmit Operation

1. Tune the transmitter to a frequency near the middle of Band 1, into the built-in dummy load for USB operation. With carrier inserted (TUNE/LOCAL switch on sideband generator in **TUNE** position), insure that 500 watts output can be obtained with 450-to 500-ma PA plate current. Reduce power output to 125 watts with the exciter gain control and switch TUNE/LOCAL switch to LOCAL. The AM/SSB switch must be in SSB position. Power output should now drop to zero watts. Return the XMIT/REC/CW/TEST switch on CW/FSK unit to REC. Turn multimeter select switch on sideband generator to AGC/TGC. Key transmitter with handset. Speak into handset in normal voice tones and advance the microphone gain control until the multimeter, located on the sideband generator, indicates in the upper portion of the red scale on average voice peaks. At this time, the power output meter should swing to approximately 300 watts on the voice peaks.

2. Switch the sideband selector on the audio and control unit to LSB and repeat step 1.

3. Turn microphone gain fully CCW and power selector switch on antenna control unit to forward 100 watts. The The TUNE/LOCAL switch on the sideband generator should still be in LOCAL. Advance exciter gain control fully CW. Cover the mouthpiece of the handset with your hand and key the transmitter; observe output power meter. No output will indicate that the LSB modulator is properly balanced.

Repeat step 3 with sideband selector in USB to check USB modulator balance. Step 3 completes the checkout of the line amplifiers, modulators, TGC, RF tuner module, and PA on Band 1. It is now only necessary to tune the transmitter on carrier frequency to check Bands 2, 3, and 4. On one of these frequencies, check the transmitter for proper operation in AM, FSK, and CW modes of operation.

NOTE: In AM operation, for rated power output, the carrier power should indicate about 125 watts without modulation. While checking the FSK mode of operation, patch a teletype signal into the transmitter, and, with the sidetone switch in the ON position, you should hear the FSK oscillator tones change from 1575 cps to 2425 cps in the headphones when inserted in the phone jack on the audio control unit.

Receiver Sensitivity

If all the previous checks give normal indications, the transceiver is probably in good condition. If the sensitivity of the receiver is in doubt, a quick check may be made by feeding a signal from the AN/URM-25 signal generator into J11 (receiver input jack), of the frequency generator unit. One or two microvolts input should result in a clear audible tone at the handset or phone jack.

Antenna Tuner Checkout AN/SRA-22

Depress the TUNE/Operate switch of the tuner control unit to TUNE. Run the coil and tap to the low end stops by operating coil and tap switches to minimum. Adjust coil and tap dials for a null on respective meters. If calibration is correct, both dials should read approximately 70. Next, run coil and tap to maximum stops and adjust dials for null on meter. Coil dial should read approximately 540 and tap dial approximately 470. Return both coil and tap dials to 100. Starting from "Shunt 1" on the capacitor switch, increase one step at a time through position 12. At each switch position, the capacitor run light should come on momentarily and go out as the capacitor motor cuts off. At position 12, switch to Series and step down, one step at a time, watching indicator light for an indication of capacitor tuning. Return to Shunt 1 home position. If all coupler motors tune properly, tune the transmitter on a frequency and load the antenna as per tuning charts. If antenna and coupler are satisfactory, the reflected power should tune out below 10 watts with 500 watts of forward power. (586)

SHOCK AND VIBRATION MOUNT INSTALLATION; AN/URC-32, AN/WRT-1, and AN/WRT-2

The Naval Ship Systems Command has received reports and photographs which indicate that the vibration mountings supplied with AN/URC-32, AN/WRT-1, and AN/WRT-2 equipments are being installed improperly. These photographs show equipment mounted off-the-deck on inverted "L" steel angles without a bed-plate.

The shock vibration mounting unit supplied with the subject equipments should be mounted on a flush surface for proper operation. If it is necessary to mount the equipment off-the-deck by means of angle supports, a steel bedplate must be provided that will permit complete support of the entire shock and vibration mount base. (607)

UPDATING OF RADIO SETS AN/URC-32 AND AN/URC-32A

As a result of a 3-year detailed survey made of performance and operational reports, failure reports (DD-787's), and the equipment modular repair reports from the East and West Coast Navy Modular Repair Activities, changes are incorporated in the AN/URC-32A that will give a significant increase in reliability to the AN/URC-32A over that of the AN/URC-32. These changes will improve significantly the general reliability and use of the AN/URC-32A by the Fleet. The following are the major changes incorporated in the AN/URC-32A:

1. Diode 1N547 is used instead of 1N1084 in the (C-2691/URC). (Except 10CR6 and 10CR7 which are 1N3190; see FC 22-AN/URC-32). The same diode (1N547) is also used in high voltage power supply (PP-2153/U.) Such common use of the same diode will not only increase the reliability of these power supplies, but will also reduce the number of types of diodes required in stock aboard ship.

2. The limiter amplifier module (AM-3198/URC) is used instead of the former line-mike amplifier module (356C-1).

The AM-3198/URC (FSN 5820-973-2480) is a direct electrical and mechanical plug-in-replacement for the older line-mike amplifier. Its performance and characteristics were so designed that the power of each sideband is equalized automatically when both sidebands are used, such as in the simultaneous use of voice on the upper sideband with teletype (TTY) being transmitted over the lower sideband.

In addition, the limiter amplifier is capable of raising, as well as limiting, the voice excitation of the AN/URC-32A so that either a forceful talker or a weak talker speaking into the microphone will excite and drive the power amplifier at the same level. Thus all talkers transmit equal power regardless of the strength of their voices. This especially important when various talkers, using the remote control units (C-1138 ( )/UR) throughout a ship use the same AN/URC-32A for communication. For example, talkers on the bridge, CIC, or main radio will

now automatically drive the AN/URC-32A at the same levels, thus maintaining the communication power of AN/URC-32A at a constant and maximum level.

Many talkers do not understand that the output from single sideband transmitters is a function of the excitation level, and that the excitation level, when on voice, is a function of the talker's voice power. Thus, even though an SSB transmitter is capable of 500 watts output, the transmitter will not transmit its full 500 watts power if the talker does not hold the microphone properly or if he talks with a weak voice, thereby not providing sufficient drive to the power amplifier. If a man is inclined to whisper into the microphone, the power of a 500-watt power amplifier could drop to a few watts. Likewise, a forceful speaker can overdrive a transmitter to excessive power output which cause his voice to be distorted. When many different types of talkers use voice single sideband circuits, the need for a limiter amplifier, such as the AM-3198/URC, becomes very essential to ensure that each talker produces equal transmitter power. It is equally important that talkers know how to use a microphone properly.

An additional advantage of the AM-3198/URC is that its characteristics are such that the frequencies generated by the human voice are amplified and limited to ensure that the transmitter is loaded to its maximum efficiency and power output. The limiter thus raises the weak voice frequencies and yet limits the strong voice frequencies so that the overall voice power average is consistently and constantly higher than the normal voice power without the the limiter. This increases the talk power of the communications net by about 3 db or twice the power. This is readily noticeable if one compares the received signal strength from a transmitter using the old line amplifier with a transmitter using the new AM-3198/URC.

All AN/URC-32's have two limiter amplifiers, one for each sideband.

3. A most significant change was made to the power amplifier (AM-2061/URT) when circuits were added. While this change was not extensive with respect to the parts change, it nevertheless added functions to the power amplifier that will result in future savings on power amplifier tube replacement. Circuits added to the power amplifier (AM-2061/URT) are as follows:

a. An automatic load control (ALC) circuit was added (F.C. 17-AN/URC-32) to allow the power amplifier to operate as closely as possible to its rated output without danger of its being overdriven (excess power output) on output) on input signal peaks. As a result of three years of detailed review of power amplifier usage, it was found that power amplifier tube manufacturers had so improved their tube characteristics during this period of production that it was possible to obtain up to 800 watts from the power amplifier. The design of the AN/URC-32 was such that it could handle this increased power but at a sacrifice of reliability in tube life, power transformers, and filter chokes. Since the gain in power of 500 to 800 watts is actually small in communicating capability, it was decided to favor the change in the interest of higher reliability of the equipment and the actual economies that could result therefrom.

The power amplifier (AM-2061/URT) now incorporates a transmit gain control (TGC) circuit, the purpose of which is to indicate when grid current occurs and to limit the exciter drive to the power amplifier when that point is reached. The setting of TGC threshold is directly dependent upon the bias setting for the final tubes, and, since this is the area where the tube characteristics have changed, TGC threshold no longer corresponds to 500 watts, but rather is normally 700 to 800 watts for new tubes.

The automatic load control (ALC) addition will sample the plate RF output voltage, and generate an exciter clamping bias when rated output is reached. This limiting action is not dependent upon the final tube characteristics. ALC will limit the RF output to no more than 1.2 db increase when audio inputs increase to any level above rated input. A front subpanel screwdriver adjustment will set the ALC to control the RF output level at any level between 50 watts and maximum capable power. Normally , the ALC threshold will set to allow maximum RF output at 500 watts ±10 percent.

b. Added screen voltage tap switches (FC 17-AN/URC-32) will allow any 4CX250R (or equivalent tube) with widely varing characteristics to be used as a pair in the AM-2061/URT. In the AN/URC-32, the only variable control for setting the operating point of each tube is a single bias control which affects both tubes simulataneously. To assure a sufficient balance of operation two tubes must be selected so that the difference in static plate current is liss than 30.

The amount of signal distortion is directly affected by the amount of unbalance between tubes. With adjustable screen voltage for each tube, two tubes, formerly impossible to use as a pair because of unbalance, can now be closely balanced and used as a pair. This will assure longer tube life. Presently, the tube with lower emission works the least, allowing the better tube to deteriorate faster than it should. With adjustable screen voltage, the balanced tubes would share the load equally and distortion would be reduced.

The screen voltage tapping switches are mounted at the rear of the power amplifier with the screwdriver-adjusted switch shafts extending through the back cover. Five voltage selections are available for each tube to vary the screen voltages from 320 to 400 volts.

In checking Fleet experience with the use as well as with the failure rates of the 4CX250B, 7580, and 4CX25PR tubes, it was found that many power amplifier tube replacements had to be made in pairs because tubes, in order to load equally, had to be within 30 milliamperes of each other in their static plate current measurements. This requirement made it almost impossible to match a used tube with a new tube. Also, it was found that even the tube characteristics of new tubes varied to such an extent that at times it was possible to get only two tubes out of a group of six that would reasonably match in static plate

current. Thus, in many instances, tubes were discarded even before their useful life period ended. Power amplifier tubes are expensive and a discarded tube represents $30.00 to $40.00. However, now that the screen voltage of each tube can be controlled independently, it is possible to mix old tubes with new tubes or to use new tubes with greatly different static plate currents.

The saving to the Fleet resulting from a much improved utilization of the power amplifief tubes can be very significant when one considers that there are now in excess of 1200 AN/URC-32's operating in the Navy, each having two power amplifier tubes with a yearly replacement cost near $425,000. By thd end of 1963, there will be about 2000 AN/URC-32's and AN/URC-32A's in the Fleet, making it most important that steps be taken to get full effective power amplifier tube utilization.

The tube manufacturer actually guarantees the power amplifier tubes for only 1000 hours. Experience to date with the changes incorporated in the power amplifier of the AN/URC-32A, that is, the ALC circuit and the screen voltage tap switches, indicates that it now is possible for ships to obtain at least 3000 to 3500 hours of operating life from existing production power amplifier tube as well as to reduce the tube changes to only those of complete failure.

The Bureau of Ships is currently preparing a field Change for the earlier mode 1 AN/URC-32 power amplifiers to modify them to the equivalent of the AN/URC-32A described above.

At the request of CNO, the Bureau of Ships is procuring later models of AN/URC-32 that will have a capability of 1 KC incremental tuning in lieu of the 1 KC tuning of the AN/URC-32 and AN/URC-32A. It is expected that these equipments will be assigned the nomenclature Radio Set AN/URC-32B. Planning includes the procurement of necessary Field Change Kits (FC 23-AN/URC-32) to back fit all earlier delivered equipments. Therefore, when the AN/URC-32 has had all existing Field Changes applied and is furnished with a 0.1 KC modification kit, these equipments will then be equivalent to the later model AN/URC-32B and may be renomenclatured. (612)

AN/URC-32 POWER AMPLIFIER

Frequent reports of erratic power output and tuning difficulties in Radio Frequency Amplifier AM-2061/URT have been traced to dirt deposits or defective front and rear wipers which make contact with the front and rear shafts of coil assemblies L4 and L10. The wipers should be inspected in addition to the cleaning of the coils and rollers. (605)

AN/URC-32; No Drive to Power Amplifier

When there is no drive to the equipment power amplifier (AM-2061/URT) when operating in the TUNE position, check the carrier reinsert adjustment and consult the AN/URC-32 technical manual for proper adjustment. (605)

AN/URC-32 - High Voltage Power Supply Capacitors

The Collins Radio Company has advised that capacitors C3 and C4 in the AN/URC-32A and AN/URC-32B High Voltage Power Supply (PP-2153/U) have been eliminated in recent production of this equipment. It has been determined that these capacitors are unnecessary.

A field change will not be issued for the earilier versions of the AN/URC-32 series of equipments for the elimination of these capacitors. Ships and activities encountering a failure in these components may remove them from the circuit without replacement. Correct Technical Manual, NAVSHIPS 0967-066-7010, Vol. 1, 0967-066-7020, Vol. 2, and0967-066-7030, Vol. 3, by deleting these capacitors from schematics and parts lists when C3 and C4 are removed from the power supply. (615-619)

AN/URC-32( ), Dummy Load DA-218/U Resistance Change

A significant change in value of the AN/URC-32 Dummy Load DA-218/U has been reported. An analysis indicates that the particular equipment had been tuned at full power in excess of 500 watts into this dummy load for a lengthy period. This caused a decrease in its resistance value in excess of the rated 50 ohms ±10 percent.

This is the first reported failure of this type. Ships and stations should periodically confirm the DA-218/U resistance value during AN/URC-32 POMSEE checks. This checkpoint will be made a part of any subsequent revision to the AN/URC-32 POMSEE publications.

AN/URC-32--POWER AMPLIFIER TUBE LIFE

Recent tests of final amplifier tubes 4CX250( ) in Radio Frequency Amplifier AM-2061/URT indicate that when the filiment voltage is not allowed to exceed 6 volts, extended tube life results. Periodic measurements of the filament voltage should be made. If the filament supply is consistently high (above 6 volts) because of ship power voltage, transformer T1 (Collins part No. 622-0261-00) of the amplifier should be changed as follows:

Change the connection from pin 7 to pin 8 and the connection from pin 3 to pin 4.

This will reduce the filament voltage. Recheck periodically to verify filament voltage condition. The filament voltage can be measured at the test points on left front panel of the amplifier unit near the PLATE ON-OFF KEY switch.

Evaluation of a device for automatically regulating the filament voltage supply under conditions of varying input

supply is being conducted by the Navy Electronics Laboratory. If these tests prove acceptable, information will be promulgated concerning availability for equipment field change installation. (See FC 24-AN/URC-32)

The Naval Ship Systems Command continues to receive reports indicating that equipment having the new 4CX250R tube installed are capable of 700 to 900 watts output. Although the new tubes have improved power handling capability, the bility, the equipment should **not** be tuned to **exceed** the **500-watt output level** Specified in the technical manuals and operator charts. Continued operation at the higher output levels will reduce tube life and may result in damage to Antenna Coupler Group AN/SRA-22.

Additional field changes to increase the amplifier reliability, and Radio Set AN/URC-32 in general, are being investigated. These changes include an electronic load control circuit that automatically limits the amplifier plate current to a value which provides a maximum output of 500 watts ± 10 percent. Provisions will be included to bypass the automatic control circuit when special circumstances require maximum output capability.

Another change to improve operation of the AN/URC-32 is being studied and will be incorporated in the AN/URC-32A. This change includes provisions for adjustment of the screen grid circuit of the amplifier, and will enable operating personnel to make adjustments to compensate for variations in the screen grid voltage requirements of tubes with different characteristics. This adjustment will permit equalizing the power output of each amplifier tube and give added tube life. Also to be included is a bias control which provides an increase in the range of biasing voltage supplied the amplifier tubes. The bias control will permit immediate and adequate compensation for variations in tube characteristics. These controls in the screen grid and bias circuits will extend the range of tube types and tube characteristics that may be used in the amplifier. (602)

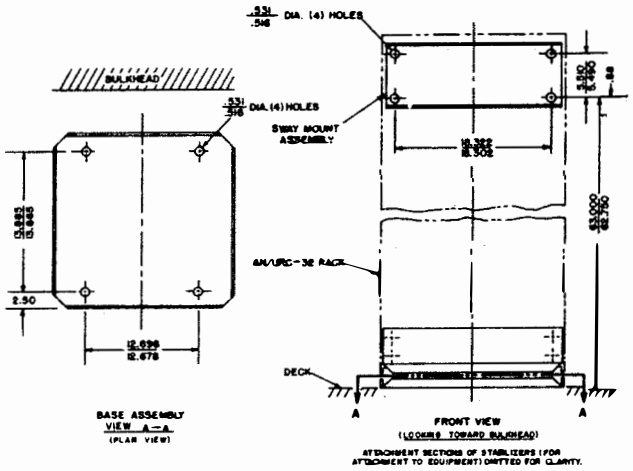


Figure 1. Mounting Hole Loaction for Newer Assembly

AN/URC-32A, AN/URC-32B – SHOCK AND VIBRATION MOUNTING ASSEMBLY

In the AN/URC-32A and AN/URC-32B equipments, the shock and vibration mounting assembly is slightly different than that in the earlier AN/URC-32 version of the equipment. The newer shock and vibration mount assembly is of simpler construction and lesser cost, and it still meets the technical characteristics of the earlier unit.

The major difference in the assemblies is the location of the bolt holes used in installing the equipment. The newer unit requires only 4 bolts in the base assembly and 4 bolts in the sway brace assembly. The earlier units required 8 bolts in each assembly. Figure 1 provides mounting hole locations for the newer assembly. Figure 2 provides mounting hole locations for the earlier AN/URC-32 version.

When a new AN/URC-32( ) equipment is received, detailed step-by-step instructions are provided and packed with the supplied shock and vibration mount assembly. (614)

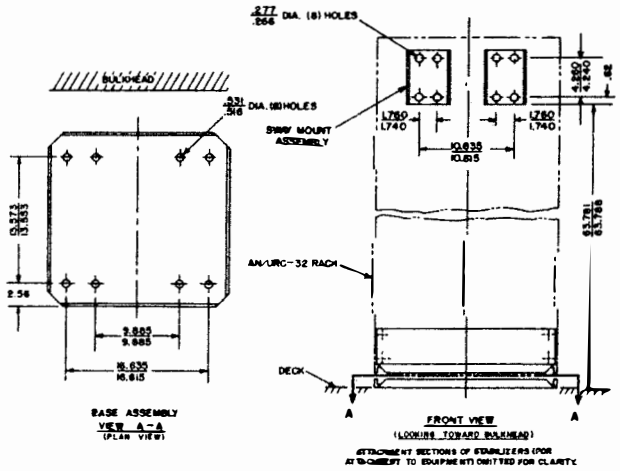


Figure 2. Mounting Hole Location for Earlier AN/URC-32 Version

AN/URC-32 Radio Set, Maintenance Article (High Voltage Interlock Switch Adjustment)

Boston Naval Shipyard reported that, because of vibration, the interlock switch (S-1) in the high voltage power supply, AN/URC-32, operates intermittently.

When this occurs, secure the primary input voltage at the power distribution panel and then remove the cover from the high voltage power supply. Remove the two screws that hold the interlock switch (S-1) bracket. Elongate the mounting holes in the bracket to allow it to be moved forward. Move the bracket only to the extent that assures a snug fit of the cover on the switch. (629-633)

AN/URC-32, -32A, -32B, AND KWT-6(8) RADIO SETS - ARCING IN THE POWER AMPLIFIER

This article is to advise maintenance technicians that, because of improper maintenance procedures, arcing can result in the power amplifier (AM-2061/URT). This malfunction can be caused by the following sequence of events.

1. During removal of V3 and V4 (4CX250R PA Tubes), it is necessary to move Z3 and Z4 to come into contact with C10.
2. When V3 and V4 are replaced, technicians have neglected to restore Z3 and Z4 to the original position, resulting in arcing from the plate circuit to ground of the PA tubes, possible destroying tube sockets.

To preclude this malfunction, personnel must ensure that the clearance between Z3 and Z4 and capacitor C10 is of the same amount as it was prior to the removal of V3 andV4. (653)

RADIO SET AN/URC-32( ) - MAINTENANCE HINT

The purpose of this article is to provide installation and maintenance personnel with the necessary information to determine if Coil 2L8, located in the Radio Frequency Amplifier AM/2061/URT, has been properly installed.

Coil 2L8 has two terminal posts mounted on the coil form. One terminal is located 3/16 inch from the end of the coil form and the other terminal is located 3/8 inch from the opposite end of the coil form (refer to figure 1). The coil form flush mounts to the top of the chassis of the AM/2061/URT and is identified by the circuit symbol number printed on the chassis adjacent to the coil form. High level d-c and rf voltages are present on these two terminals. If the terminal that is 3/16 inch from the end of the coil form is mounted adjacent to the chassis, there is the probability that the voltages present will arc to chassis ground.

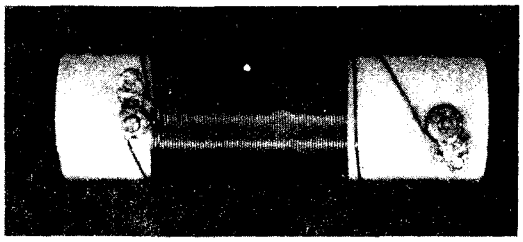


Figure 1. Coil 2L8.

Personnel are directed to inspect Coil 2L8 to ensure that the coil is mounted in such a manner that the terminal that is 3/8 inch from the end of the coil form is mounted adjacent to the chassis. The manufacturer did not attempt to position the coil form in the prescribed manner; therefore, it is mandatory that all equipments are inspected and corrected if required. (668)

AN/URC-32 and AN/URT-18—Alinement of Stabilized Master Oscillator

NOTE: The terminology as applied to the AN/URC-32 and AN/URT-18 plug-in (Module) units has been redefined. These units (Reference Oscillator, Stabilized Master Oscillator, etc.) are to be identified in correspondence, EIB articles, etc., as **Electronic Assembly**. Although the equipments, technical manuals, and "POMSEE" publications currently make reference to the term "Modules" for these units, it is desired that the terminology "Electronic Assembly" be applied.

Many of the Stabilized Master Oscillator electronic assemblies of the Radio Set AN/URC-32 and Transmitter AN/URT-18 have been reported inoperable and turned in for repair. After investigation, it has been disclosed that many of these units could have been restored to service locally through an alinement process.

The equipment contractor, in conjunction with the field service engineers, has evolved an alinement procedure for application by fleet personnel. It is recommended that this alinement process be employed, if possible, prior to sending the units into a module repair activity, in order to reduce unnecessary costs and attendant problems.

Test Equipment Required

R-390/URR Receiver or Equivalent
AN/USM-34 VTVM or Equivalent
MK-447/URC-32 tool kit (supplied with AN/URC-32 and AN/URT-18)

Procedure

Set the Frequency Generator, CV-731/URC, to Band 1. Monitor the Stabilized Master Oscillator (SMO) frequency (300 kc. above the Frequency Generator dial setting) on a communication receiver such as the R-390/URR. Distinct 500 cps. steps should be heard as the SMO frequency is changed. This check should be made at 1.7 mc., 2.7 mc. and 3.699 mc. In all cases the frequency change of the SMO should be very **sharp** 500 cps. steps.

If the frequency change of the SMC is garbled or is sharp only when tuned in one direction, in all probability the Master Oscillator (MO) is not phaselocked. This can be caused by any or a combination of the following:

A. Loss of signal.
B. Excessive interpolation oscillator error.
C. Excessive master oscillator error.
D. Discriminator center off.

1. Using a DC VTVM, measure the AGC voltages at test points A2J2 and A7J2. These readings should be not more than +0.55 VDC. A reading of more than +0.55 VDC at A2J2 would indicate a weak signal and the MO may need alinement. A reading of more than +0.55 VDC at A7J2 could indicate a weak signal or excessive interpolation oscillator error.

2. **Interpolation Oscillator.** To check the Interpolation Oscillator (IO) frequency it will be necessary to have a communications receiver that can be calibrated, or a frequency counter. An R-390/URR receiver is recommended. If a receiver is used, loosely couple the antenna input to the Reference IF board near the front and near the Interpolation Oscillator. A short piece of coax with 2 inches of braid removed may be used and laid alongside the mechanical filter above A7J2. **Be careful not to make a metallic connection to the printed circuit.**

Calibrate the receiver at 600 kc. and set to read 637.4 kc. Set the AN/URC-32 Frequency Generator dial to 4.102 mc. (SMO Freq. = 2.201 mc). The IO frequency at this point should be 637.0 kc. to 637.5 kc. If the IO frequency is less than 637.0 kc. or more than 637.5 kc., remove the SMO module and connect to an extension cable supplied in the AN/URC-32 tool kit. Adjust A5L2 through hole "A" on IO cover for 637.4 kc. If the IO frequency is within the above limits, set the Frequency Generator dial to 4.107 mc. (SMO freq. = 2.2035). The IO frequency at this point should be 617.0 kc. to 617.5 kc. If the frequency is less than 617.0 kc. or more than 617.5 kc., remove the SMO and adjust A5L7 through hole "B" in the IO cover for 617.4 kc. Repeat the above procedure for the following frequencies:

Frequency Generator Dial	SMO Freq.	Receiver	IO Freq.	Adjust
4.112 mc.	2.206 mc.	597.4	NLT 597.0 kc. NMT 597.5 kc.	"C"
4.117 mc.	2.2085 mc.	577.4	NLT 577.0 kc. NMT 577.5 kc.	"D"
4.122 mc.	2.211 mc.	557.4	NLT 557.0 kc. NMT 557.5 kc.	"E"

NLT–Not less than
NMT–Not more than

If a frequency counter is used, the SMO must be attached with an extension cable and the counter connected to J8, Pin F, with as short a length of coax cable as possible. The above frequencies may then be read directly on the counter.

3. Turn SMO through its frequency range (2-4 mc.), observing AFC meter on front panel of the Frequency Generator (CV-731/URC). Note the amount of deflection of the meter from zero (center scale). If the IO is sitting in the

proper position with respect to the MO, the average deflection either side of zero should be equal across the band. If the average deflection is concentrated to one side or the other, remove the SMO and connect an extension cable and remove front cover. The MO should be disengaged by loosening the MO shaft gear. Turn shaft of MO slightly (as in ±) in the direction that causes the AFC meter to move in the direction for shaft gear clamp and turn MO in a direction to decrease reading of AFC meter a few microamperes. Tighten clamp and listen to SMO output around this point again. Repeat until distict 500 cps. steps are heard in the SMO output. Recheck the AFC meter excursions across the rest of the band.

4. Since the discriminator center adjustment on the earlier delivered units (with a d.c. amplifier-type discriminator) is a critical adjustment, field adjustment is limited. However, after it has been ascertained that the oscillator errors are within limits and all correct signals are present in the SMO, some adjustment of the discriminator center is possible. The signal IF and Discriminator must be removed with an extension cord and the SMO frequency set to a particular place where it does not phase-lock. The balance pot A2R3 of the Signal IF board may be adjusted not more than ±20° to obtain a complete lock. After adjustment the SMO should be tuned through its range 2-4 mcs. or at least checked at 2 mc., 3 mc., 3.995 mc. to assure proper operation using a receiver and noting the distinct 500 cps. steps when tuned in both directions.

AN/URC-32( ) RADIO SETS, MAINTENANCE ARTICLE (HIGH R.F. ARC-OVER IN THE S-6A SECTION OF THE AM-2061/URT, S-6 AND S-5 SWITCH ASSEMBLY).

Richard J. Dobrowolski, ETN3, aboard the USS TANNER, has reported that several failures of the TANNER's AN/URC-32( ) Radio Sets have occurred as a result of arcing between the metal strip wafer switch terminal connector and the wafer spacer depicted in figure 1.

The arc-over was due to the flat metal strip being routed too close to the metal wafer spacer. Investigations by the Naval Ship Engineering Center, Norfolk Division, have revealed that some of these switch sections have the metal strip connector routed as close as 1/16th of an inch to the spacer.

It is recommended that switch section S-6A be examined at the earliest opportunity by maintenance personnel to ensure that the foregoing condition does not exist. If it is found that the flat metal strip is routed too close to the spacer (less than 1/4") due to the strip being too long, which in turn necessitated a large bend in the strip in order to make the connection to the soldered terminal, the strip should then be un-soldered from the solder terminal and shortened so as to obtain 1/4" to 5/16" clearance between the strip and spacer, then resolder the strip to the solder terminal. In some instances the strip can be pushed away from the spacer to obtain the desired clearance. This is permissable as long as a smooth, even bend or curve can be maintained over the length of the connector strip; otherwise, unsolder and shorten, as above.

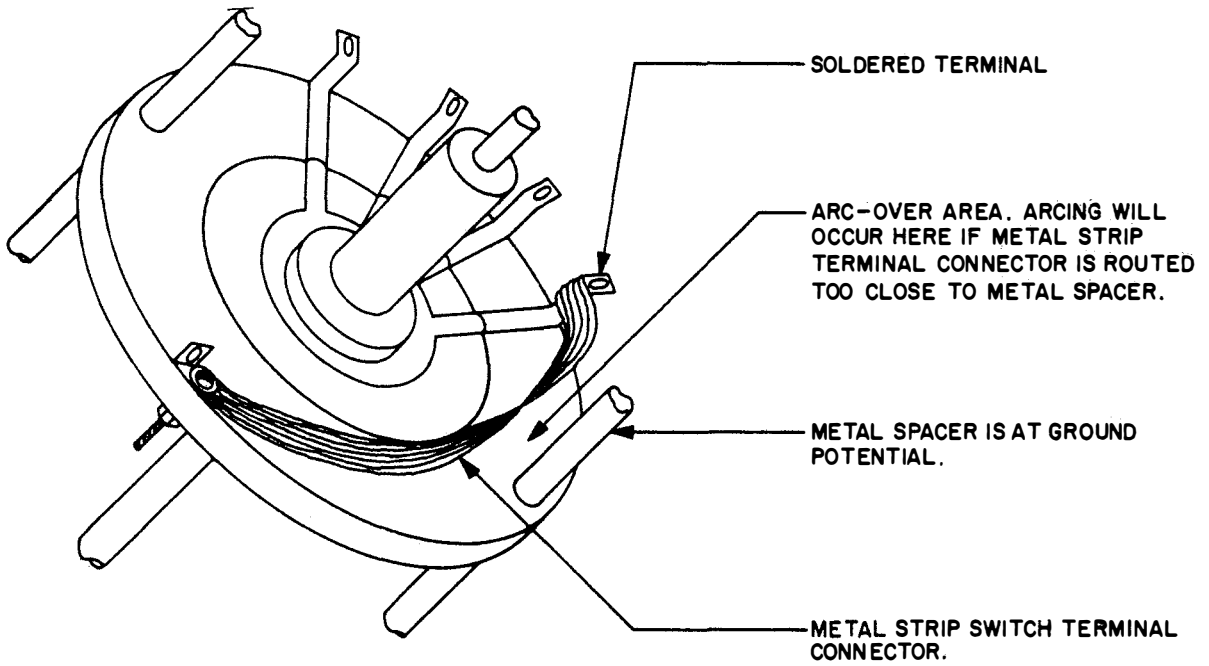


Figure 1. S-6A Section of AM-2061/URT, S-6 and S-5 Switch Assembly

AN/URC-32, AN/URC-32A, AN/URC-32B AND KWT-6(8)–BLOWER UNIT MAINTENANCE PROCEDURE

This article advises maintenance personnel of a procedure that is recommended for accomplishment before a suspected bad Air Pressure Switch S1 is replaced in the AN/URC-32( ) blower unit compartment.

Secure and tag main power to the AN/URC-32( ).

OBSERVE ALL APPLICABLE SAFETY PRECAUTIONS.

1. Remove the front cover and filter from the blower compartment. Determine that the filter is clean.

2. Remove the clamps and rubber hose which connect the air pressure switch input port to the blower unit output port.

3. Obtain a piece of No. 22 gauge wire, or equivalent, and determine that both the input port to the air pressure switch and the output port from the blower unit are both open and free of lint or dirt.

4. Remove the clamps and hose which connect the output port of the pressure switch to the output port of the blower compartment. Determine that both output ports are open and free of lint or dirt.

5. Clean interior of both hoses and check for air leaks. If any leaks are detected replace the faulty hose.

6. Reinstall both hoses and their respective clamps.

7. Return power to the AN/URC-32( ) and check for proper operation.

The foregoing procedure will, in most instances, save replacing Air Pressure Switch S1. (EIB 724)

AN/URC-32( ) Series Radio Set–Maintenance Hint

The 0.1KC Tuning Unit, CV-1749( )/UR, is keyed by the "Transmit 130VDC". Numerous naval activities have reported a main chassis wiring error in the Converter-Oscillator CV-731/URC. The wiring error applies the "Key-line" ground to the CV-1749( )/UR instead of the "Transmit 130VDC".

Correct wiring may be verified by determining if continuity exists between 3J8-1 and 3C17. Further action is not required if this condition exists.

Absence of continuity between 3J8-1 and 3C17 indicates that the wiring terminates between 3J8-1 and 3C5. This should be verified by measuring for continuity. Remove the lead from 3C5 that connects to 3J8-1 and connect to 3C17. This action corrects the wiring error.

Activities desiring documentation that will reflect the wiring error correction may order a copy of field change bulletin NAVSHIPS 0967-066-7300, and retain the bulletin with the AN/URC-32 technical manual. (733).

AN/WRT-2, AN/URC-32, AN/URC-35, AN/WRC-1, AN/URT-23–CARE AND FEEDING OF SSB TRANSMITTERS

See article in AN/WRT-2 under same title. (733)

AN/URC-32( ) Series Radio Sets: Possibility of Radiation from Some 11T1 Power Transformers Degrading Output Transmissions--Information Concerning

This article provides maintenance and operating personnel of AN/URC-32( ) radio sets with information relative to the possibility of transmissions being degraded due to excessive radiation from some 11T1 transformers appearing in the equipment's transmitted output. This article resulted from a beneficial suggestion submitted by Messrs. Terrence C. Kennedy and Luis Beria of Long Beach Naval Shipyard.

Due to the adjacent locations of the Control-Power Supply, C-2691/U (Unit 9) and the Low Voltage Power Supply, PP-2154/U (Unit 11) within AN/URC-32( ) radio sets, electromagnetic radiation from power transformer 11T1 will be present in various degrees in the equipment's transmitted output. 11T1 is basically an OPEN-FRAME type of transformer which is located above the PP-2154/U chassis. The shielding between the C-2691/U and PP-2154/U chassis is not sufficient in all cases to prevent radiation from <u>some</u> 11T1 transformers from FINDING its way to the PA at a sufficient level so as to result in degradation of normal transmissions. The radiation from 11T1 is induced into the components of the C-2691/U chassis which feeds the radiation to the PA via the line amplifiers, balanced modulators and RF tuner. When some AN/URC-32( ) radio sets are subjected to <u>MAXIMUM DRIVE</u> conditions, 11T1 radiation from the output of the RF tuner may be at such a level as to result in an SSB output from the PA of 100 watts or greater. This can occur without any audio tones or intelligence being applied to the equipment from normal sources.

In order to determine if this specific radiation is excessive for a particular 11T1 power transformer, the following generalized procedure should be performed.

1. Select any of the low frequencies which produces the greatest drive. Drive in excess of 100db (meter will peg) is preferred from the RF tuner in "TUNE" when the "EXCITER RF GAIN" control is rotated

to its maximum clockwise position. (PA "PLATE" switch is in its "OFF" position for this check.)

2. Use 50 ohm dummy load (the equipment's internal load is preferred) and tune the equipment for 500 watts output in the "TUNE" mode ("TUNE-LOCAL-EXTERNAL CONTROL" switch in "TUNE" position). Reduce the output to zero watts and unkey the equipment.

3. Set-up the equipment for SSB transmit operation. The "SSB-AM" switch should be in the "SSB" position, and the "TUNE-LOCAL-EXTERNAL CONTROL" switch should be in the "LOCAL" position.

4. Check that the FSK/CW switch is in its "OFF" position. Also, check that no audio tones or intelligence are being applied from any source. Disconnect any handset that may be connected to the equipment.

5. Check that the "LOCAL-REMOTE" switch is in the "LOCAL" position.

6. Key the equipment and rotate the "EXCITER RF GAIN" and "MIC GAIN" controls to their maximum clockwise positions.

7. Check the wattmeter indication with the "SIDEBAND SELECTOR" switch in both the "LSB" and "USB" positions. Vary the "MIC GAIN" control and check if the wattmeter indication is variable with rotation of the "MIC GAIN" control. If an output wattage was indicated and it was variable with the "MIC GAIN" control, radiated interference from 11T1 was indicated.

Zero wattage outputs are desirable, however, outputs obtained which do not exceed 10 watts under the maximum gain conditions of "STEP 6" should not be cause for undue alarm. The transmitted spectrum will be within normal limits when the equipment is operated with normal drive settings and inputs. Outputs in excess of 10 watts obtained under the maximum gain conditions of "STEP 6" will degrade transmissions when the equipment is returned to normal operation. The degree of severity will depend upon the amount of output produced in excess of 10 watts.

There are several conditions, other than the 11T1 transformer, which can aggravate the situation and result in excessive 11T1 radiation finding its way to the PA. These conditions are as follows and should be checked and corrected as necessary:

a. Carrier reinsert misadjusted.

b. Misadjusted balanced modulators, or faulty balanced modulator mechanical filters.

c. R10 misadjusted in AM-3198/URC line amplifiers -- or R109 misadjusted in 356C-1 line amplifiers. (The R10 adjustment in AM-3198/URC modules is critical relative to this problem.)

d. Line levels set improperly.

e. Covers not in place in the equipment.

If accomplishment of the foregoing does not result in decreasing the maximum gain output to a zero watt indication, the positions of the C-2691/U control-power supply and the CM-126/UR comparator may be switched in the AN/URC-32( ) rack. The swapping of positions between these two units usually will bring the output down to zero watts and in most all cases excessive outputs will be decreased to an acceptable level of less than 10 watts, negating the purchase of a new 11T1 for replacement. *(801)*

AM-2061/URT, Radio Frequency Amplifiers (PA), Unit 2 of AN/URC-32( ) Series Radio Sets, Overheating of P.A.—Suggestions and Comments Concerning

Recent reports received by NAVSECNORDIV from forces afloat indicate that various ships are experiencing AM-2061/URT overheating difficulties resulting in damage to their power amplifiers. Additionally requests have been received for the development of design changes, improvements, etc. relative to the overheating difficulties.

Due to the basic equipment's age (12 years) the AN/URC-32( ) equipments are approaching obsolescence, and are to be replaced by AN/URT-23(V)'s. No further expenditures of funds for any changes or improvements to the AN/URC-32( ) equipments are planned.

The AN/URC-32( ) equipments were designed for extensive constant key use at an output of 500 watts. These equipments have and will operate at their 500 watt rated output without PA damage. The following checks and suggestions should be helpful in reducing power amplifier damage as a result of overheating:

1. Check the airport settings on the rear of the following units: adjust if necessary to prevent starving air flow to the PA.

PA (2 air vents)	position 8
Frequency Generator	position 3
Amplifier, Converter Modulator	position 2
Amplifier Control	position 2
Converter Monitor	position 2
Power Supply (low voltage)	position 3.5
Power Supply (high voltage)	position 4

2. Check that the air supply duct and blower compartment are clean and that no air leaks exist.

3. Check that the air filter is clean and maintained in a clean condition. Additional cleaning periods may be necessary other than MRC requirements. The air pressure actuated switch in the blower compartment should be adjusted to drop out when two-thirds to three-quarters of the air filter intake is blocked.

4. Load the equipment into a dummy load and determine that the equipment's wattmeter is indicating correctly. When 157 to 160 V RMS is measured across the dummy load, the wattmeter should indicate approximately 500 watts. Load equipment into its associated antenna system and determine VSWR. Ideal reflected power is zero. A ratio of less than 1.5 to 1 is desirable.

5. Check that the operators are tuning the PA properly and that the antenna system is being tuned for the absolute minimum reflected power obtainable.

6. Check that the ALC adjustment has been properly set so as to prevent the equipment from exceeding 500 watts output on the frequencies in use. (F.C. No. 17-AN/URC-32 or F.C. No. 3-AN/URC-32A, Serials 1 thru 90, with corrections appearing in EIB's 727 and 734.)

7. Check that the PA tubes dynamic balance adjustments have been properly made to maintain plate currents within 10 ma of each other. (Screen adjust pots - F.C. No. 17-AN/URC-32 or F.C. No. 3-AN/URC-32A, Serials 1 thru 90, with corrections appearing in EIB's 727 and 734.)

8. Check that the 2V3 PA Tube Socket has been rotated to reduce arc-over possibilities. (F.C. No. 26-AN/URC-32, F.C. No. 12-AN/URC-32A or F.C. No. 9-AN/URC-32B in EIB 713.)

9. Check PA 2S6-2S5 for an arc-over possibility in accordance with EIB 731.

10. Check PA 2C50 replacement information in reference to EIB 755. 2C50 originally was a dual 20MFD capacitor which was parallel to form a 40 MFD capacitor at 450 WVDC. When a 2C50 failure occurs it should be replaced with the EIB 755 replacement, which is a single section 40 MFD capacitor rated at 500 WVDC.

11. The preferred tube type for 2V3 and 2V4 application is the 7580W. No other tube type numbers such as 4CX250B/7580W or 4CX250R/7580W should appear on these tubes. See EIB 713.

12. Check that the filament voltage to 2V3 and 2V4 is maintained between 5.8 and 6.1V AC. F.C. No. 24-AN/URC-32, F.C. No. 10-AN/URC-32A, F.C. No. 7-AN/URC-32B. See correction appearing in EIB 746 or 748.

13. Maintain the internal compartments of the AM-2061/URT in a clean and dust free condition. Dirt and soot accumulations prevent proper heat dissipation and result in unnecessary arc-overs. Additional cleaning periods may be warranted other than the MRC requirements.

14. Check that the line voltage to the equipment is maintained at 115V AC ±10%.

15. It may be that due to the long service of some of these equipments, a complete PA overhaul is required before satisfactory performance will be obtained. If overhauls are required, arrangements should be made with the Hunters Point Naval Shipyard, Norfolk Naval Shipyard or U.S. Naval Ship Repair Facility, GUAM for accomplishment of any required overhaul by their AN/URC-32( ) Module Repair Facilities.(787)

AN/URC-35 RADIO SET–INSTALLATION REFERENCE INFORMATION

The following installation reference information applies to Radio Set AN/URC-35:

Technical Manual	NAVSHIPS 0967-287-5010
Performance Standard	NAVSHIPS 0967-287-5020
Maintenance Standard	NAVSHIPS 0967-287-5030
Installation Data List	NAVSEC DWG. RE B2696065
Cable Running Sheet	NAVSEC DWG. RE B2696363
Interconnection & Cabling	NAVSEC DWG. RE B2696364
System Pictorial Diagram	NAVSEC DWG. RE B2696365
Primary Power Distribution	NAVSEC DWG. RE B2696365
Summary List of Inst. Material	NAVSEC DWG. RE B2696367
Outline and Mounting:	
AN/URC-35	NAVSEC DWG. RE B2696368
C-3697/URC	NAVSEC DWG. RE B2696369
PP-4679/URC-35	NAVSEC DWG. RE B2696370
CU-937/UR	NAVSEC DWG. RE 50 D 2099

(EIB 728)

R-1051/URR, T-827/URT, AN/WRC-1 SERIES, AN/URT-23 AND AN/URC-35 FAMILY EQUIPMENTS. INTERCHANGEABILITY DATA ON TRANSLATOR SYNTHESIZERS.

See article under AN/WRC-1 with same title. (761)

AN/WRT-2, AN/URC-32, AN/URC-35, AN/WRC-1, AN/URT-23–THE CARE AND FEEDING OF SSB TRANSMITTERS

See article under AN/WRT-2 with same title. (734)

AN/WRC-1( ), AN/URT-24, and AN/URC 35( ) PA Tube High Voltage Protection Shield--Ordering of

See article under AN/WRC-1( ) with same title. (827)

Field Change 5-R-1051/URR, 1-R-1051B/URR, 9-AN/WRC-1, 1-AN/WRC-1B, and/or 2-AN/URC-35 entitled: Improved Antenna Overload Circuitry--Installation Information Concerning

See article in R-1051/URR Section under the same title. (EIB 945)

AN/URC-35, -35A; AN/URT-24, -24A; AN/WRC-1, -1B—Alteration Equivalent to Repair (AER) on DC-DC Converter Part Number 0026-2200—Information on

The purpose of this article is to inform all ships and shore activities having DC-DC Converter Part Number 0026-2200 installed in the AM-3007/URT or AM-3007A/URT unit of the AN/WRC-1 Family Radio Sets, of an AER to the converter which prevents catastrophic failure of the A1 and A2 Printed Circuit Boards.

This DC-DC converter was manufactured with a design deficiency in the pulse generator circuitry which causes severe overheating of its components and usually results in a charred A1 and/or A2 Printed Circuit Board. This AER will prevent this failure mode and the resulting damage to the A1 and the A2 boards.

It must be stressed that the AER is of a PREVENTIVE nature and must be performed prior to failure to preclude damage to the A1 and/or the A2 boards. If destructive damage has already occurred to the module, it must be turned in for repair and subsequent installation of the AER. For undamaged modules, it is imperative that the AER be made as soon as possible to prevent catastrophic failure and to prolong the operational life of the module.

Note that the DC-DC converter is coded as a depot repairable item and repairs are not to be performed at the Organizational (Ship or Station) level.

The 0026-2200 converter was manufactured for use in the AN/URC-35B and the AN/URT-24A Radio Sets. For a time this module was also issued as a replacement DC-DC converter for use for other types of DC-DC converters used in the AN/WRC-1, AN/WRC-1B, AN/URC-35, AN/URC-35B and AN/URT-24. Accordingly, all ships and stations are requested to make a determination as to whether the subject module is installed in any of their equipments as listed above.

The subject converter can be identified by disconnecting the cable attached to J2 on the front of the module and noting the information stenciled on the top front of the module

main frame just in front of the Connector J2, as shown in Figure 1.

It is important that all ships and stations with AN/WRC-1( ) equipments installed take the following actions:

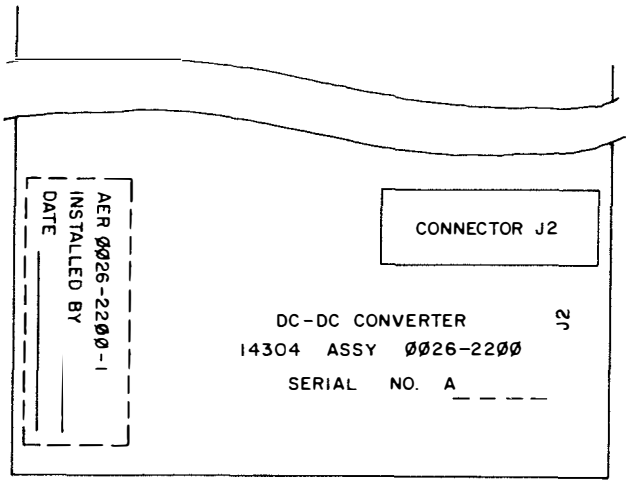


Figure 1. DC-DC Converter 0026-2200, Top Front View.

1. Determine whether any of the 0026-2200 DC-DC converters are aboard. (Most AN/URC-35B and AN/URT-24A Radio Sets will have the module installed in the AM-3007A/URT unit.)

NOTE

Modified DC-DC Converters will have a decal indicating "AER 0026-2200-1" has been accomplished. The decal will be located as shown in Figure 1. Modules not having the decal mounted will require modification.

2. Contact Naval Electronic Systems Engineering Center, Portsmouth by either speed-letter or telephone and report that you have DC-DC converters which require the modification. Provide the serial number of the module(s) and state whether they are operational or non-operational.

MAIL ADDRESS: Commanding Officer
Naval Electronic Systems
Engineering Center
P.O. Box 55 (Code 610)
Portsmouth, VA 23705

TELEPHONE: AUTOVON 690-9120, 9128, 9129
Commercial 804-444-9120,
9128, 9129
Points of Contact:
Joe Popp or Don Peek

NAVELEX Portsmouth will furnish shipping instructions for the modules and will provide a RFI (Ready For Issue) DC-DC converter to replace each one turned in for modification. (EIB 968)

AN/URC-58(V) Radio Set—General Information

Radio Set AN/URC-58(V) has been procured to meet immediate operational needs pending stock availability of the military-designed AN/URC-35 equipment. The intended operational use of the equipment is similar to that of Radio Set TCS. A descriptive article and photograph of the equipment appeared in the BUSHIPS Journal publication of August 1965. The equipment covers the 2.0 to the 15 MC frequency range, with a power output of 100 watts PEP/AVG and 25 watts carrier power in AM mode. The frequency selection is in 1KC synthesized digital increments, with additional capability for unsynthesized operation in less than 1KC increments for continuous tuning.

The frequency stability is one part in 10^6 per month. Primary power input is 115 volts, 50/60CPS at 4 amperes; or 230 volts, 50/60CPS at 2 amperes. With the addition of an accessory power supply within the equipment, it can operate on either 12 volts DC at 28 amperes or 24 volts DC at 15 amperes. The equipment is splash-proof and can operate in an environment of -28 degrees C to +65 degrees C, with relative humidity conditions to 95 per cent. A shock and vibration mount isolates the equipment for ship, boat, and vehicular installations. The equipment weighs 65 pounds and is 22 inches wide by 9 5/8 inches high by 15 9/16 inches deep. The Antenna Coupler unit is mounted on the equipment mounting base and is intended for direct connection to an associated antenna. The transceiver and coupler are designed to be located within 3 feet of the antenna. The Antenna Coupler may be used with whip-type antennas of 9 to 35 feet in length or wire antennas of 75 to 150 feet. A good grounding system should be used; in non-metal small boats, a ground plate should be provided in the hull.

In installations where it is not convenient to locate the equipment within 3 feet of the antenna, an operating installation can be accomplished by the use of a remote tuned antenna coupler such as the AN/SRA-22 equipment. The publication number NAVSHIPS 0967-034-8000, has been assigned to the Commercial Technical Manual procured with this equipment. Spare parts for the AN/URC-58(V) equipment, listed in the applicable APL, must be requistioned through normal supply channels using COSAL processing guide ESO Instruction 4441.17C.

AN/URC-58(V) Installations

1. Reports indicate several apparent AN/URC-58(V) equipment failures are attributed to poor and/or improper installations. An installation instruction sheet is now being issued with each equipment and should be read carefully by the installing activity. Some provisions of this instruction sheet are listed below for general information.

a. **Antenna and Ground System:** Both the Antenna Coupler and the transceiver shockmount must have good electrical ground connections to the frame of the vehicle, a closed metal bulkhead in a ship, or to grounded pipe in a fixed installation. Connections should be made with separate heavy braids (such as the braid from a length of R6-8/U cable) to the ground post at the rear of the shockmount. Remove paint on shockmount and vehicle frame, bulkhead, or ground pipe around areas of connection. NOTE: THE GROUND LEADS MUST BE LESS THAN 12 INCHES LONG. The connections from the antenna base to the antenna insulator on the coupler should be made with a heavy, flexible insulated conductor, such as the *inner conductor and insulation only* from a length of RG-8/U cable. NOTE: THIS LEAD MUST BE LESS THAN 3 FEET IN LENGTH. All connections must be secure. If the antenna lead will be subject to movement, it should be supported in a few places by high voltage standoff insulators of the material and size used on the rear of the coupler. The type of insulator used on the coupler is recommended for installations in which the antenna lead must go through a bulkhead to reach the antenna. Coaxial connection from the transceiver to the antenna coupler should be made with 50-ohm coaxial line, such as type RG-8/U and UHF type connectors.

b. Power Requirements: The AC line cord is normally supplied wired for 115VAC operation. To connect the line cord for 230 top VAC use, remove the black wire from pin 1 on the 7 pin plug and reconnect it to pin 3. The transceiver can be used for either 12 or 24 volt DC operation only if the appropriate DC Power module has been installed in the the transceiver. The DC power cable should be of at least as large a wire as given below for the maximum length given. NOTE: DO NOT EXCEED THESE LENGTHS.

Voltage	Wire Size (AWG)	Maximum L
12 VDC	#12	10 FT.
12 VDC	#10	20 FT.
24 VDC	#12	15 FT.
24 VDC	#10	30 FT.

c. Clearance: A 2-inch minimum clearance on all sides of the Radio Set must be allowed for movement due to shock and vibration.

d. Shipboard Installations: In installations where the Radio Set must be located more than 3 feet from the antenna, remove the antenna coupler from the shockmount and locate it not more than **3 feet** from the antenna base. The removal of the coupler creates an unbalanced load for the transceiver shockmount and therefore a 7-pound uniform weight should be bolted at the geometric center of that portion of the shockmount exposed by removal of the antenna coupler. With balance restored, extended lengths up to 100 feet, if necessary, of RG-8/U cable may be used between coupler and transceiver. However, any length of lead between the **coupler** and **antenna** acts as a part of the antenna itself and radiates. The importance of having the antenna coupler within 3 feet of the antenna cannot be over-emphasized. Likewise, any extended length of lead between the **coupler** and a **good electrical ground** acts as a part of the antenna. In addition to resulting in poor operation of the antenna system, a long ground lead may result in having an RF voltage on the coupler chassis, causing improper operation and presenting a shock hazard.

2. Tuning Procedures

a. The tuning procedures in the Technical Manual, NAVSHIPS 0967-034-8000, under Transmitter Adjustments, page 3-3/3-4, should include a note after paragraph 3.5.2j as follows:

"DO NOT retune the "PA Tune" control until coupler tuning is completed."

b. The last sentence in the paragraph after the note on page 3-3 of the coupler Technical Manual which states "Retune Transceiver to obtain power to tune by." should be deleted and the following added:

"The forward power should occasionally be checked by placing the toggle switch on the front panel of the coupler to its "Forward Power" position, then back to the "Reflected Power" position to continue the tuning process. This switching must frequently be done if the condition exist where the coupler is mistuned to the point where there is little or no forward power. The transmitter should not be retuned as the power should again rise if the coupler tuning procedure is continued. The transmitter should be retuned only if coupler tuning cannot be achieved, but just sufficient to get a 10 watt forward power indication. After the coupler is completely tuned and the "PA Tune" control repeaked, the "Transmit Audio" control should be advanced until the power output level as stated in the Technical Manual is achieved." (689)

OA-8364/URC-58(V) (RF-302R) REMOTE CONTROLLED ANTENNA COUPLER–REVISED TUNING PROCEDURE

The following procedure is for tuning the coupler when no previous Meter A and B settings have been logged for the type of antenna in use.

NOTE

These procedures should be carefully performed or a false tune may result.

CAUTION

When operating Control A and Control B, do not allow control to abruptly snap back to off position. Damage to switch may result.

1. Set Power switch at ON.
2. Set Mode switch at TRANSMITTER TUNE. Meter lamps should flash.
3. Tune transmitter to the selected frequency, and adjust the RF output for approximately 25 to 50 watts.
4. Unkey the transmitter.

The tuning procedure described in the following paragraphs for the coupler is divided into three sequences:

1. With the transmitter unkeyed, Coupler controls A and B are preset to zero. (Step a.)
2. With the transmitter keyed, the Coupler is coarse-tuned to a position of greater tuning sensitivity. (Step b.)
3. The Couplet is fine-tuned to its correct tuning point. (Step c.)

a. Coupler Preset

1. Set Mode switch at A and B SET. Meter lamps should stop flashing and remain on.
2. Rotate Control A counterclockwise and hold until meter A indicates near zero (minimum at left).
3. Rotate Control B clockwise and hold until meter B indicates near zero (minimum at right).

Control A and Control B may be operated simultaneously.

b. Coarse-Tuning

CAUTION

Before proceeding, first read and understand the following:

The Coupler is correctly tuned when both meters are reading center scale. Control A tunes Meter A, and Control B tunes Meter B.

During tuning, the direction to turn either control knob can be determined by the position of the respective meter. If the meter needle is to the left of center, the control knob should be rotated clockwise. If the needle is to the right of center, the control knob should be rotated counterclockwise.

The speed of tuning is determined by how far the control knob is rotated. The further it is rotated, the faster the tuning. This speed control is especially helpful near the end of the tuning cycle when sensitivity is usually quite high.

The Coupler will be coarse-tuned when Meter B, which at first has shown little or no movement, suddenly becomes sensitive to tuning and indicates to the right of center.

1. Set Mode switch at COUPLER TUNE/OPERATE. Meters A and B should provide a center scale indication.
2. Key the transmitter and observe the indication of Meters A & B. The deflection from the center position may be small because the antenna coupler is far from its proper tuning position.

NOTE

Read all of step 3 below before any further coarse-tuning.

3. First, rotate Control B couterclockwise, and hold at least 30 seconds in the maximum counterclockwise position OR until Meter B swings to the right of center, and then adjust for a maximum meter deflection to the right. When meter deflection is observed and adjusted for maximum, the coupler is coarse-tuned and it is not necessary to perform steps 4 and 5 below. However, if no appreciable change or swing occurs on Meter B after Control B is held in a maximum counterclockwise position for 30 seconds, proceed with the alternate coarse-tuning procedure in steps 4 and 5 below.

4. Set Mode switch at A & B SET. Rotate Control A counterclockwise and hold until Meter A indicates near zero (minimum at left.) Then rotate Control B counterclockwise and hold until Meter B indicates near zero minimum at right. Set Mode switch at COUPLER TUNE/OPERATE and proceed with step 5.

5. Key the transmitter and rotate Control A clockwise until Meter B indicates to the right of center. Adjust for maximum meter indication. The Coupler is now coarse-tuned.

c. *Coupler Fine-Tuning*

CAUTION

When tuning Control A, Meter B normally will move off center. When this occurs, stop tuning Control A and recenter Meter B with Control B. Try to keep Meter B centered at all times. Alternately perform this until both meters are centered in the black area in the middle of the meter. Meter A should not be allowed to swing to the right during tuning. When it comes to center, area on Meter B is intended as an aid in tuning. It does not indicate an overload or other undesirable electrical condition.

1. First adjust Control B to center Meter B. Keeping Meter B centered with Control B, adjust Control A to center Meter A.

2. The coupler is now fine-tuned and ready for operation when both meters are centered.

d. Adjust transmitter to rated RF power. Due to the increased sensitivity with the higher power it may be desirable to obtain a finer tune by repeating step c.

e. If this frequency will be used again in the future, set Mode switch at A & B SET and record meter positions on the logging chart. Reset Mode switch to TUNE/OPERATE position.

AN/URC-72 RADIO SET–INFORMATION CONCERNING

NAVELEX has procured Radio Set AN/URC-72 primarily as a helicopter transportable communications system. Radio Set AN/URC-72 is equivalent to a combination of the AN/URC-58 transceiver with RF Amplifier AM-3924/URT-23 and Power Supply PP-3916/UR components of standard Radio Transmitter AN/URT-23(V).

This information is furnished for reference in equipment similarity to that used in other Navy configurations, and is provided for possible emergency support assistance purposes. (EIB 727)

AN/URC-85 Radio Set—Maintenance Hint

This article provides ordering information on spiral wrap tubing to protect internal cabling of electrical equipment cabinet CY-7404. It has been found that the internal coaxial/control cable interconnecting the TD-1117/UR multiplexer (2A2) unit and the electrical equipment cabinet tends to fray due to normal wear and tear. Fraying of these cables may be prevented by spiral wrap tubing which is easily installed by shipboard technicians.

The tubing and installation directions may be obtained from the AN/URC-85 NAVELEX Field Maintenance Agent (FMA):

Officer in Charge
Naval Electronic Systems Test and
Evaluation Detachment
Patuxent River, Maryland 20670
Attn: M. L. Leopold, Code 027

(EIB 960)

AN/URC-85 UHF Radio Set—Maintenance Hint

The purpose of this article is to inform users of precautions to take to insure that Amplifier-Power Supply Group OG-120A/URC-85 (kilowatt amplifier) is not keyed before its warmup time delay cycle is complete.

PROCEDURES

1. Prior to initiating turn-on procedure, place the MODE SELECT switch on both channels in Handset position (this permits the radio to be keyed from local control only) and POWER SELECT switches on Radio Set Control C-9059/URC-85 in the Low Power position (for the channel selected to kilowatt amplifier).

2. Approximately five minutes after applying power to the AN/URC-85, the warmup time delay cycle should be complete. This can be confirmed by measuring +33V dc at 1A9A1A2A1J4 Pin 2H (test jack on kilowatt amplifier shelf).

3. The MODE SELECT switches and C-9059/URC-85 POWER SELECT switches may then be selected for the desired modes of operation.

NOTE

If +33V dc is not measured at the test point after five minutes, verify that the interlocked cover on Amplifier-Power Supply Group OG-120A/URC-85 shelf is secured. If the problem still exists, refer to NAVELEX 0967-LP-468-8020.

(EIB 974)

AN/URD-4 DIRECTION FINDER CABLE DISCREPANCY

Equipment, Serial Numbers 462, 463, 465, 467, 469, 470, 473, 475, and 476 may have been shipped without the required 23-inch lengths between cables W802 and W803 and their respective AN-3057-10 Cable Clamps.

If this discrepancy actually exists in the equipments, it will not immediately affect the operation of an AN/URD-4. However, when either of the two drawers, R-353/URD-4 Receiver or PP-556/URD-4 Power Supply, is opened for servicing, a chafing action may take place upon closing. To correct the discrepancy, it is necessary to loosen the screws in the AN-3057-10 and the rubber sheathed cable clamps located between TB8-1 and the fixed end of the individual cables. The cables may then be extended until the required length is obtained and then secured by tightening the loosened screws.

AN/URD-4 Antenna Simulator

An antenna simulator for use with the AN/URD-4 direction finder has been constructed. When an AN/URD-4 is removed from a ship for repair, the simulator makes unnecessary the time-comsuming and expensive process of removing the antenna, provided the antenna too does not need repair.

The simulator consists of a drive motor and two-phase generator, a sense relay and a calibration tone wheel and pickup. A nominal 900-rpm motor connected directly to a two-phase generator with a 9-volt output (15 cps) will suffice to produce a circular trace on the AN/URD-4 indicator. A 72-tooth tone wheel on the motor shaft and a pickup magnet and coil, similar to those of the AN/URD-4, with its output controlled by a relay, serve to produce a calibration pattern when the SENSE-CALIBRATE switch is in the CALIBRATE position. The entire assembly can be mounted on a 14-inch x 4-inch aluminum base.

By means of the antenna simulator the procedure of Section 3, paragraph 3b, "Pattern Calibration", of NAVSHIPS-91912(A) may be followed to check indicator operation and provide initial alignment. Very little alignment is then necessary when the equipment is re-installed.

The antenna simulator therefore may be used to advantage by a shipyard, tender, or any other activity which is concerned with extensive AN/URD-4 repair and maintenance.

Tacan Performance and Operational Reports

Recent reports indicate that difficulties are being encountered in the areas of installation, maintenance, and operation of TACAN equipments and systems.

In order to assist in correcting these difficulties as rapidly as possible, it is requested that Performance and Operational Reports, NAVSHIPS 3878, be submitted on all TACAN installations. The reports should specify the model beacon and the type of antenna group being used.

For example: indicate whether an OA-552/URN-3 or an OA-1545/SRN-6 is being used with and AN/URN-3. Serial numbers of all units and equipments should be reported as well as the data and information required on the report form.

AN/URD-4 ANTENNA SIMULATOR

Mr. Leonard F. Heggstrom, Shop 67, Long Beach Naval Shipyard, has constructed an antenna similar for use with the AN/URD-4 direction finder. When an AN/URD-4 is removed from a ship for repair, the simulator makes unnecessary the time-consuming and expensive process of removing the antenna, provided the antenna too does not need repair.

The simulator consists of a drive motor and two-phase generator, a sense relay and a calibration tone wheel and pickup. A nominal 900-r.p.m. motor connected directly to a two-phase generator with a 9-volt output (15 c.p.s.) will suffice to produce a circular trace on the AN/URD-4 indicator. A 72-tooth tone wheel on the motor shaft and a pickup magnet and coil, similar to those of the AN/URD-4, with its output controlled by a relay, serve to produce a calibration pattern when the "Sense-Calibrate" switch is in the "Calibrate" position. Mr. Heggstrom was able to mount the entire assembly on a 14-inch x 4-inch aluminum base.

By means of the antenna simulator the procedure of Section 3, paragraph 3b, "Pattern Calibration," of NAVSHIPS-91912(A) may be followed to check indicator operation and provide initial alignment. Very little alignment is then necessary when the equipment is re-installed.

The antenna simulator therefore may be used to advantage by a shipyard, tender, or any other activity which is concerned with extensive AN/URD-4 repair and maintenance.

R-353/URD-4, Alignment of Monitor Unit

The Bureau of Ships has received reports of difficulty experienced in aligning the monitor unit of Receiver R-353/URD-4 when using alignment procedures contained in the basic manual, NAVSHIPS 91912(A). All concerned activities are advised that Change 5 to NAVSHIPS 91912(A) incorporates revised alignment procedures for the monitor unit. Paragraph 6-2b(2) of the Technical Manual for Direction Finder Sets AN/URD-4A and 4C, NAVSHIPS 93610(A), also contains alignment precedures for this unit in tabulated form.

AN/URD-4 REPLACEMENT OF ANTENNA MOTOR POWER LEADS

Reports that four ships have experienced an intermittent shorting condition, resulting in repeatedly blown fuses in the antenna motor circuit for the AN/URD-4 direction finder set.

Investigation revealed that in some cases metallic shielding, on leads W-2 and W-3 shown on page 7-53 of Technical Manual AN/URD-4 NAVSHIPS 91912(a), was

contacting terminals E and F of plus P-102. In earlier models, shielding was found to be intermittently contacting terminals E and F of jack J-103. In one instance, the clamp securing this shielded lead had cut through the insulation, shorting the conductor to ground.

Since these shorting conditions may develop in other AN/URD-4 antennas, the original leads should be replaced with insulation-covered, shielded wire whenever the antennas become available for servicing.

AN/URD-4 Flexible-Coupling Shaft

A new flexible-coupling shaft, 0-439, FSN N3010-315-2578; is available for Direction Finder Set AN/URD-4, serial numbers 1 through 159.

The 0-439 will not be installed unless trouble occurs, However, if neither the selector switch (S-403) nor the rotary clutch (K-403) are defective but difficulty is experienced with this channel set-up mechanism, the old style coupling assembly may be replaced with the new coupling shaft. This change makes it necessary to remove the 0-429 and 0-435 assemblies from the shaft of the switch (S-403) and the clutch (S-403). During the installation of 0-439, reference should be made to NAVSHIPS 91912(A), section 7, paragraph 3b (2) (a) 2C.

The new coupling shaft may be obtained through normal supply channels.

AN/URD-4 Equipment Supplied

Radio Direction Finder Set AN/URD-4 is supplied with six, special-purpose cables (one CX-2356/U, one CX-2357/U, two CX-2358/U and two CG-1068/U) to permit testing of sub-units when withdrawn from the major unit. Reports received in the Bureau of Ships from forces afloat indicate that special-purpose cables have not been supplied to many ships which have AN/URD-4 equipments installed.

Shipyards and repair facilities are requested to exercise particular caution when installing AN/URD-4 equipments to insure that all accessories supplied with the equipment are placed on board.

AN/URD-4; Pilot Lights on Azimuth Indicator IP-93/URD-4

The Green (I-904), Amber (I-905), and Red (I-906) indicator lights on Azimuth Indicator IP-93/URD-4 use 28 volt lamps. In case of burnout they must be replaced with the proper 28 volt lamp, FSN 9G 6240-155-7836. Replacement of these lamps with 6 volt lamps will result in damage to the dimming controls and wiring in the unit. The remainder of the light (I-901 thru I-903 and I-907 thru I-910) in the IP-93/URD-4 use 6 volt lamps, FSN 9G 6240-155-7857.

All maintenance personnel with the AN/URD-4( ) on board should note the above in the equipment technical manual.

AN/URD-4 and AN/URD-4B Direction Finder Set—Monitor Unit Alignment Procedure

The Maintenance Data Collection Sub-system (MDCS) of the Navy Maintenance and Material Management (3M) System reveals that an excessive number of manhours are being expended on corrective maintenance for the monitor unit in Direction Finder Set AN/URD-4 and AN/URD-4B.

The Naval Ship Engineering Center, Norfolk Division with the cooperation of MOTU 2, MOTU 8, MOTU 12, and the Norfolk Naval Shipyard has devised the following alignment procedure for improving the corrective maintenance manhour expenditure posture of the monitor unit.

Test Equipment Required:

TS-777/URD-4 Radio Test Set
AN/URM-25J Signal Generator or Equivalent
AN/USM-207 Frequency Counter or equivalent

Preliminary Steps: It is assumed that the monitor unit is misaligned and will not lock on any frequency. Always verify the AN/URM-25J output frequency with the frequency counter.

1. Turn on the direction finder set and allow it to lock out. Remove thermal relay, K605.
2. Plug 11-pin test probe of TS-777/URD-4 into power supply test jack, J703. Verify the following meter indications:
   Position 3—"67" (200V regulated, adjust R709)
   Position 9—"58-62" (+30V filtered)
3. Plug 11-pin test probe of TS-777/URD-4 into monitor test jack, J402. Verify the following meter indications:
   Position 3—"35" (+105V regulated)
   Position 4—"50 minimum" (1st crystal osc)
   Position 5—"40 minimum" (2nd crystal osc)
   Position 6—"40 minimum" (3rd crystal osc)
   Position 7—"40 minimum" (4th crystal osc)

General Alignment: When the above meter indications have been verified and the AN/URD-4 and test equipment have had a 30 minute warm up, continue with the following procedures. (A frequency change and/or signal input are not required at this time.)

1. Connect 11-pin test probe of TS-777/URD-4 to monitor test jack, J402. Set meter selector switch to position 11 (discriminator test).
2. Adjust Z407, primary and secondary for a maximum meter indication (minimum of 25).
3. Set meter selector switch to position 4 (first oscillator test). Adjust L402 for a maximum meter indication (minimum of 50).

Alignment with Digits Set to 315.0:

1. Set digit selector switches to 315.0.
2. Insert relay K605 momentarily to allow digit control relays to set. (Tuning motor will start when these relays are set.) Remove K605 when tuning motor starts.
3. Tune signal generator, AN/URM-25J, to 24.973 MHz. Connect RF output to VFO input, J401.
4. Remove 11-pin test probe from J402.
5. Remove V404; plug 7-pin test probe of TS-777/URD-4 into XV404.
6. Adjust L401 for maximum meter indication on test set.
7. Adjust Z402, primary and secondary, for maximum meter indication on test set.
8. Remove probe from XV404 and return V404 to XV404.
9. Remove V405. Plug 7-pin test probe of TS-777/URD-4 into XV405.
10. Adjust Z401, primary and secondary, for maximum meter indication on test set.
11. Adjust Z403H for maximum meter indication on test set.
12. Remove probe from XV405 and return V405 to XV405.
13. Plug 11-pin test probe of TS-777/URD-4 into J402. Set meter selection switch to position 8.
14. Adjust Z404, primary and secondary, for maximum meter indication on test set.
15. Adjust Z-405, primary and secondary, for maximum meter indication on test set.
16. Adjust Z406, primary and secondary, for maximum meter indication on test set.

Alignment with Digits Set to 295.0:

1. Set digit selector switches to 295.0.
2. Insert relay K605 momentarily to allow digit control relays to set. Remove K605 when tuning motor starts.
3. Tune the AN/URM-25J signal generator to 23.306 MHz. Leave RF output connected to J401.
4. Remove probe of TS-777/URD-4 from J402.
5. Remove V405 and plug 7-pin probe of TS-777/URD-4 into XV405.
6. Adjust C420 for maximum meter indication on test set.
7. Adjust C427 for maximum meter indication on test set.
8. Adjust Z403L for maximum meter indication on test set.
9. Remove test probe from XV405 and return V405 to XV405.
10. Plug 11-pin test probe of TS-777/URD-4 into J402. Set meter selector switch to position 8.
11. Adjust Z405, primary and secondary, for maximum meter indication on test set.
12. Adjust Z406, primary and secondary, for maximum meter indication on test set.
13. Adjust C420 for maximum meter indication on test set.
14. Adjust C427 for maximum meter indication on test set.
15. Adjust Z403L for maximum meter indication on test set.
16. Disconnect signal generator from J401 and return cable from VFO to J401.
17. Return K605 to its socket and the equipment should lock in on 295.0 MHz.

Continue Alignment with Digits Set to 290.0 And 299.9:

1. Set digit selector switches to 290.0 and check if equipment locks in.
2. Set digit selector switches to 299.9 and check if equipment locks in.

NOTE:

If equipment locks in on both of these digit settings, proceed to step 14 of this paragraph. If equipment fails to lock in on either one or both of these digit settings, continue with following step 3.

3. Set digit selector switches to 290.0.
4. Push reset switch and allow equipment to lock out.
5. Tune AN/URM-25J signal generator to 22.973 MHz and connect RF output to J401.
6. Plug 11-pin test probe of TS-777/URD-4 into J402 and set meter selection switch to position 8.
7. Adjust Z404 primary for maximum meter indication on test set.
8. Disconnect signal generator from J401 and return cable from VFO to J401.
9. Set digit selector switches to 299.9.
10. Push reset switch and allow equipment to lock out.
11. Tune AN/URM-25J signal generator to 23.714 MHz and connect RF output to J401.
12. Adjust Z404 secondary for maximum meter indication on test set.
13. Disconnect signal generator from J401 and return cable from VFO to J401.
14. Set digit selector switches to 290.0 and allow equipment to lock in.
15. Adjust Z404 primary for maximum meter indication on test set.

16. Set digit selector switches to 299.9 and allow equipment to lock in.

17. Adjust Z404 secondary for maximum meter indication on test set.

18. Repeat steps 14 through 18 for balanced maximum meter indications.

Alignment Verification:

1. Restore equipment to normal operation.

2. Verify the following meter indications with the TS-777/URD-4 still connected to J402.

Position 1 "0" (bridge balance)
Position 2 "0" (bridge balance)

3. Check that equipment locks in on the following digit settings:

315.0	299.9
295.0	344.5*
290.0	

*If equipment fails to lock in on digit setting 344.5, adjust L412 to obtain lock in. (770)

AN/URD-4 Direction Finder Set—Reported Miswiring in

It has been reported by Shop 67 Long Beach Naval Shipyard that miswiring exists in the AN/URD-4.

Refer to NAVSHIPS 0967-108-4010 (formerly NAVSHIPS 91912 (A) figures 7-38 and 7-39). The miswiring consists of connections from TB-601-9 directly to C-660 and also to XK-605-7.

C-660 should be connected to XK605-7. TB-601-9 should be connected to XK605-2, as shown in figures 7-38 and 7-39 of the technical manual. The wire from C-660 should be disconnected from TB-601-9, pulled back through the harness to the break-out to the relay assembly, then routed to XK605 and laced in place.

Users of the AN/URD-4 are requested to check for this miswiring which by-passes contacts on drive protection relay K-604. *(804)*

AN/URD-4 Direction Finder Set—Use of AN/USM-34 Multimeter for Making Measurements Called for in Maintenance Standards Book

The Maintenance Standards Book for the AN/URD-4 ( ) equipment calls for use of the AN/USM-34 for making video and audio measurements. The voltage measured should not constitute a shock hazard as the highest voltage measured is 5 to 10 volts. The case of the meter is directly connected to one of the test leads, therefore, measurements made across balanced (ungrounded) lines may be incorrect unless the case of the meter is insulated from ground for these measurements. The AN/USM-34 must not be used in this manner for measurements of higher voltages. See article in EIMB Test Equipment Handbook AN/USM-34:1—Potential Shock Hazard. *(805)*

RADIO-FREQUENCY MONITOR MX-1627/URN-3 INSTALLATION INFORMATION

Care should be taken in installing the rf Monitor, MX-1627/URN-3 for use with the AN/URN-3 TACAN Equipment.

For best results, the Monitor should be located in the same compartment as the AN/URN-3 below decks equipment. It has been found that with proper shielding, the MX-1627/URN-3 Monitor can be located a minimum of five feet away from the AN/URN-3 receiver-transmitter group.

The Monitor Antenna AT-592/URN-3 should be located 48 to 72 inches from the vertical center line and 43.5 inches above the antenna radome base. Reference may be made to BUSHIPS drawing, RE 36D 2085, for guidance in locating his monitor antenna.

AN/URN-3, Coil L2107, Part Numbers MA675041AY and MA675042AY

The purpose of this article is to clarify the apparent use of two different part numbers for Coil L2107, used in the speed control power amplifier of Antenna Control C-1349/URN or C-1700/URN-3.

The questionable part numbers MA675042AY and MA675041AY are Magnetic Amplifier Corporation numbers and denote the same item. Originally, Magnetic Amplifier Corporation assigned part number MA675041AY to this item, but stamped it, by mistake, MA675042AY.

ITT-Federal Division has a newly designed direct replacement for this coil, which overcomes the overheating problem the original design presented.

Holders of equipment requiring replacement coils should request these parts through the normal supply system under part number A 1054450.

AN/URN-3-EMERGENCY PARTS SUBSTITUTION

The following information is adapted from an article which appeared in the Technical Information Letter (AACS) of January 1961, and is offered for consideration by technicians concerned with the maintenance of TACAN equipments.

Transformer T-1406 in the MD-129A/GR—which is a component of the AN/GRC-27 system—can be used as an emergency replacement for transformer T-1801. This substitution requires no modifications and fulfills all requirements of paragraph 4b(3) (c), NAVSHIPS 92348(A), AN/URN-3.

NOTE: This should be considered an emergency repair in order to reduce time of the TACAN until a new T-1801 can be installed. It should be noted that T-1801 cannot be substituted for a T-1406 because of the transformer mounting differences.

UNDESIRABLE OSCILLATIONS IN AN/URN-3A, AN/SRN-6 (SERIES), AND AN/GRN-9 (SERIES) TACAN

Undesirable oscillations have been noted in the tripler stage, V-1504, of AN/URN-3A, AN/SRN-6 (series), and AN/GRN-9 (series) TACAN. Symptoms which indicate that the tripler stage is in a self-oscillating condition are:

1. Tripler grid current will be higher than normal.
2. Tripler operation, as monitored with the receiver meter in positions 1 and 2, will remain unchanged when any of the doubler tubes are removed.
3. Oscilloscope display, as monitored at the Klystron Incident mack, will consist of distorted negative pulses.
4. Slight movements of the FMO chassis will cause fluctuation in the meter readings and scope display.

To correct the self-oscillating condition, it is recommended that the following procedure be utilized:

1. Make sure that a 2C 39 or 2C 39A tube is used. (The use of tube type 7289 (2C 29WA) is the major cause of the spurious oscillations which result from certain differences in the physical and electrical characteristics of the tubes.)
2. Tune the tripler for maximum reading on the crystal current meter. If more than one peak or extremely sharp tuning is noticed, the circuit should be suspected of self-oscillation. Confirm this condition by removing one of the doubler tubes. If the tripler is functioning normally, the meter will read zero and the pulse output at the klystron input jack will disappear.

CAUTION

Extreme care must be exercised to avoid shorting the filament or damaging the filter.

3. If oscillations continue, separate the filament filters in the tripler shell as much as possible.
4. Repeat the tripler tuning to ensure that the undesirable oscillations have been eliminated.
5. Do not attempt to tune the klystron until the tripler cavity self-oscillations have been corrected. Do not exchange high-band unit parts with low-band unit parts.

7289 – 2C39A SERIES TUBE INFORMATION

Extensive efforts to standardize on a single tube type in the 2C39 series of tubes resulted in establishment of MIL-E-1/1120(NAVY), dated 4 October 1960, for type 7289 (FSN-5960-815/0813). It was later established that, because of the irregular design criteria for the tube cavity of the AN/URN-3, the type 7289 would not fit mechanically in the AN/URN-3 equipment. Accordingly, the requirement for tube types 2C39 or 2C39A (FSN 5960-188-8567) are stressed.

U.S. Navy Electronics Supply Office will procure on a one-time basis tube type 2C39A for use in AN/URN-3 equipment pending results of the U.S. Naval Applied Science Laboratory investigation of the incompatibility of type 7289 in AN/URN-3 equipments.

TUBE TYPE USN-SAL-89 – DETERMINATION OF RESTORATION FEASIBILITY

See article in AN/GRN-9 section under same title.

RELIABLE TUBES FOR THE AN/URN-3

A recent study of 196 reported tube failures in this equipment indicates that 85 failures of lower-quality tubes have occured. These types can now be replaced by reliable tubes.

The first 52 equipments manufactured did not contain reliable type tubes. Equipment serials 53 and up contain 10 types of reliable tubes used in 56 sockets. Since it is essential that the AN/URN-3 operate with a maximum degree of reliability, it is highly important to use reliable tubes as replacements when tubes of lower quality fail.

For requisitioning purposes, the following reliable tubes are available for issue:

Lower Quality Tube	Reliable Type	Reliable Type Standard Navy Stock Numbers
OA2	OA2WA	N16-T-52001-3
OB2	OB2WA	N16-T-52001-8
5R4WGY	5R4WGB	N16-T-55446-5
6AS7G	6080WA	N16-T-76080-85
6AU6	6AU6WA	N16-T-56203-53
6C4W	6C4WA	N16-T-56214-55
6J4	6J4WA	N16-T-56349-85
6X4	6X4WA	N16-T-56840-60
12AT7	12AT7WA	N16-T-58240-14
5651	5651WA	N16-T-75651-85
5687	5687WA	N16-T-75687-85
5751	5751WA	N16-T-75651-85

When ordering replacement tubes for this equipment, specify the reliable type, its stock number, and state that this reliable tube is necessary for use in the AN/URN-3 equipment. As additional reliable tubes become available the information will be published.

AN/URN-3
Preferred Transformer for Symbol T-1001

ESO has shipped a preferred transformer, FSN N5950-568-2362, to fill requests for FSN N5950-645-1710, Symbol T-1001 in the AN/URN-3. Since the cabinet must be modified in order to install the preferred transformer, activities requesting FSN N5950-645-1710 are advised to contact the cognizant Industrial Manager for assistance. Field Change 1-AN/URN-3 has been developed to replace the non-preferred transformer.

AN/URN-3 PARTS SUBSTITUTION T-1801

Transformer T-1406 in MD-129 A/GR, which is a section of the AN/GRC-27 system, may be used as an emergency replacement for T-1801. This replacement requires no modifications and fulfills all requirements of paragraph 4b (3) (c), NAVSHIPS 92348 (a) AN/URN-3.

This should be an emergency repair to prevent outage of the TACAN while awaiting supply action to obtain a new T-1801. It should be noted that reverse substitution cannot be made, due to mounting differences.

AN/URN-3 EMERGENCY REPAIR OF TACAN ANTENNA

Emergency repairs to an antenna AS-777/URN-3 (part of an AN/URN-3 Tacan) were successively made recently. The damage was the result of a casualty which occured on a carrier deployed in WesPac.

Damage to Antenna

The casualty resulted from arcing, between the fixed array and the rotating element, which apparently had been caused by excessive vibration or shock. The fixed array (low band array assembly) was of a type that is being replaced by a field change, and the change had not been made in this instance.

The path of the discharge was from the fixed array through its fiber cover to the parasitic element of the inner fiberglass cylinder of the rotating element. From this conductor the discharge passed across the aluminum dish, which is used to stabilize the two cylinders, ending in one of the nine parasitic elements of the outer cylinder.

The damage to certain parts of the assembly can be seen in figures 1 and 2. The fixed array was severely damaged and was replaced. The second conical element from the top was badly burned and physically deformed, and the support tube for the elements was bent in that region. The surface of the cover for the array was burned and broken also. The inner of the two cylinders of the rotating element was subjected to the discharge immediately above the mid supporting flange and circumferentially in the area in which the parasitic element is placed. The surface was punctured, the flange was burned, and area extending out from the hole for about 2 inches was discolored owing to the heat of the discharge, and the parasitic element was shorted. The damage to the outer cylinder of the rotating element consisted of the shorting of one of the nine parasitic elements.

Replacing Parasitic Elements

To repair the cylinders of the rotating element it was necessary to obtain a suitable replacement for the wire contained in the shorted parasitic elements. An examination of a sample removed from the inner cylinder indicated a resistance factor of approximately 2,000 ohms per meter. No standard stock replacement being available, a search of the Japanese market was made. A high-quality Nichrome type of wire with a resistance factor of 1,000 ohms per meter was procured as the nearest substitute obtainable. This wire was used in the repair process now to be described.

Repair Technique

The two damaged cylinders of the rotating element were repaired in the following manner:

Inner cylinder (6-inch diameter)

The problem here was twofold. First, the damaged area at the point of discharge had to be replaced. Second,

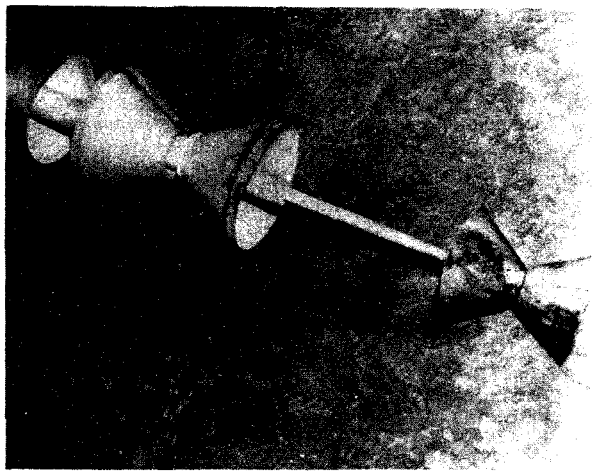
the wire used in the parasitic element had to be renewed and replaced.

To remove the damaged wire, the outer surface for the length of the cylinder was scraped in the area of the wire to a width of about 2 inches. After the wire was removed, the area actually damaged by the discharge was cut-out (total area approximately 4 square inches).

Inner and outer dies were formed of 1/8-inch steel. When the inner die was in place and an appropriate separating film had been inserted, seven layers of resin-impregnated glass were applied over the cut-out area. (Material used: FSN 2040-372-6046 Plastic Repair Kit.) The outer die was then clamped in place, and the patch was allowed to cure for 6 hours.

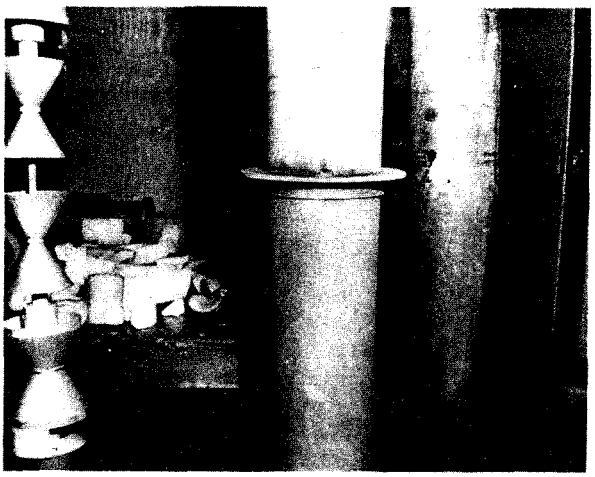
After the outer die was removed, the surface in the area of the patch was ground to match the depth of the 2-inch strip referred to above. Grooves were then scribed in the scraped area to allow the wire to be properly embedded. This work was done and tacks of resin were used to hold the wire in place. At this point the wire was tested for continuity, and 3 hours later four layers of resin-impregnated glass cloth (3 inches wide) were applied over the scraped area. The outer die was again affixed, pressure was applied, and the curing process was repeated.

A section of the mid flange that had been damaged in the discharge was cast and fitted into place on the cylinder. The final operation was one of finishing the surface and balancing the cylinder.



Outer cylinder (40-inch diameter)

The repair of the outer cylinder of the rotating element followed nearly the same steps described above. Although only one of the nine parasitic elements had been affected, to insure uniformity all nine were replaced. Note: Elements in the outer cylinder consist of two parallel rows of wire, one row embedded in the middle of the cylinder wall and the other near the inner surface. Only the latter row was damaged and replaced. Because of this fact, all work was done on the inner wall of this cylinder.



Bench-Testing of Unit

Before reassembly of the antenna, a shop test was given to all motors, synchros, and generators. The antenna was then reassembled and bench-tested before installation.

A routine check of the system of operation was made upon completion of the installation, and the power output was normal. The standing wave ratio was noted to be Incident 12, Reflected 2. This gave a ratio well above the acceptable minimum stand in the Technical Manual NAVSHIPS 92348 (A).

Later air checks bore out these observations, indicating that the Tacan was functioning normally.

Although this repair procedure is not recommended as a routine method, it is an example of what can be done to maintain Fleet operational capabilities.

FAULTY CHASSIS TO TUBE SOCKET GROUND CONNECTIONS

This article describes the possibility of unusual problems that can be encountered and caused by faulty ground connections. The types of equipment in which ground problems are most likely to be encountered are those whose chassis have been anodized and which employ the half-ring ground tube socket mountings (see figure 1).

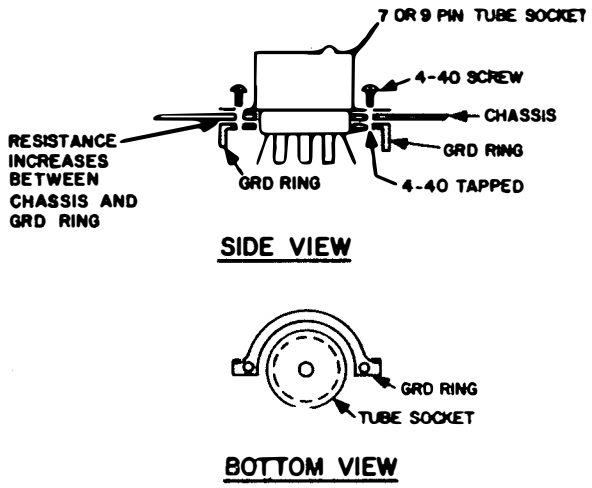


Figure 1.

The d-c resistance between the half-ring ground and the chassis increase after the equipments, aboard ships, have been operational for several years. The problems are unusual in that the symptoms caused by this condition are never the same, although the units are in the same series.

The types of equipment in which this condition has been found are the AN/URN-3 TACAN, AN/UPN-12, and AN/SRD-7. An indicator of an AN/SRD-7 had a 60-cycle ripple on its sweep; the cause was found to be a faulty ground connection on one of the sweep amplifier tube socket grounding rings. Although the d-c resistance was only 1/4 of an ohm, the heater current through this resistance was sufficient to couple the a-c voltage into the sweep amplifier tube. Because of the same condition, the TACAN and LORAN equipments also were inoperative except that the d-c resistance was between 1-1/2 to 2 ohms.

To locate and correct these faults, use a high gain oscilloscope and proceed as follows:

1. Connect the ground lead of the oscilloscope to the faulty unit chassis.
2. Apply power to the equipment.
3. Set the vertical gain control of the oscilloscope on high and place the oscilloscope probe to each tube socket ring.

NOTE: Any vertical indication of the oscilloscope means a faulty ground connection.

4. Remove the ground rings causing this faulty condition, and clean the area under ring and chassis. Reinstall the ring and check to see if the condition has been corrected. Use the same method used in step 1 through 3. (668)

AN/URN-3A TACAN Spectrum Filters; Information Concerning

The high failure rate that has been experienced with the Spectrum Filters Z4001 and Z4002 supplied with Field Change 10 to the AN/URN-3 has reduced with present stock to a low level.

Repair of these units is not recommended in the field because (a) difficulty in removing heater blanket prior to opening; (b) need for resurfacing and replating of some units; (c) difficulty in installing "O" rings; and (d) special equipment and techniques for checking pressure leaks, band pass characteristics, and attenuation.

These units will be repaired at Philadelphia and San Francisco Naval Shipyards where several improvement features will be incorporated during overhaul.

Each holder of the AN/URN-3A TACAN equipment is authorized to have only those filters that are actually in operation. Excess filters and filters that were supplied with Field Change 10-AN/URN-3 for the band that is not currently is use should be reported to BUWEPS in accordance with Item 11 of BUWEPS Ground Maintenance Notes No. 4. The most pressing need is for AN/URN-3A type filters but other types not in use or in need for repair shall also be reported. It is essential that all nonoperational TACAN Spectrum filters be reported to BUWEPS as soon as possible so that arrangements can be made for repair and return to stock. (9S)

AN/URN-3, 3A, and AN/SRN-6, 6A, Uprated Special Test Equipment Package and Monitor for TACAN Equipments—Availability of

Special test equipment is to provide field technicians with simple, expedient, efficient, and an accurate means of testing, calibrating, and maintaint TACAN beacons, antennas, and monitors. The monitor is used to automatically check the performance of the beacon and antenna, and to provide an alarm signal when the system deviates from its normal performance.

Presently used TACAN special test equipment and monitor is comprised of Oscilloscope OS-54/URN-3; Pulse Analyzer-Signal Generator TS-890A, B, C/URN-3; Pulse Sweep Generator SG-121A, B/URN-3; Power Meter–Pulse Counter TS-891/URN-3; Switch-Test Adapter SA-420/URN-3; and RF Monitor MX-1627/URN-3.

Reports from the field have repeatedly indicated deficiencies that limit the effective use of these equipments for troubleshooting and monitoring the transponder. Investigations have delineated the areas of deficiencies and modifications have been designed and developed to correct these areas. These modifications are in the form of field change kits and replacement units, integrated into a test package.

Field change kits are available for four equipments. Upon incorporation of these field changes, the nomenclature of the equipments is changed as follows:

Old Nomenclature	New Nomenclature
TS-890A, B C/URN-3	TS-890D/URN-3
SG-121A, B/URN-3	SG-121C/URN-3
SA-420/URN-3	SA-420A/URN-3
MX-1627/URN-3	MX-1627A/URN-3

Power Meter-Pulse Counter TS-891/URN-3 has been replaced by a new type Pulse Counter-Power Meter-Marker Generator TS-2102/URN, which fits in the space provided for the TS-891/URN-3. The new Pulse Counter-Power Meter-Marker Generator is a solid-state, modularized device, employing a digital type counter, a decimal numerical display, and a precision power meter. The unit provides direct reading VSWR.

Oscilloscope OS-54/URN-3 has been replaced by Oscilloscope OS-169/URN, which fits in the space provided for OS-54/URN-3. The new oscilloscope consists of high reliability solid-state circuitry, employing a dual channel, 20 mc vertical amplifier and expanded delayed sweep. Its amplifiers, sweeps, and triggering are highly stable. The trace can be seen in a fully lighted room when any TACAN system pulse is displayed. Time markers generated by TS-2102/URN are displayed on the X axis.

The uprated TACAN Special Test Equipment Package and Monitor will consist of the following:

Oscilloscope–OS-169/URN
Pulse Analyzer-Signal Generator–TS-890D/URN-3
Generator, Pulse Sweep–SG-121C/URN-3
Pulse Counter-Power Meter-Marker Generator–TS-2102/URN
Switch Test Adapter–SA-420A/URN-3
Monitor–MX-1627A/URN-3

All cables, adapters, probes and micsellaneous items required to install and use the test equipment package and monitor are included in the package. The modification kits use the latest solid-state circuitry, and are completely modularized for maintainabilty. The modified test units and the new replacement units have heen integrated as a test package.

Federal Stock Number FSN 2F5825-946-7746 has been assigned to the overall package containing the kits and replacement units. This is a Type 1, Class B, field modification that should be installed by or under the supervision of shipyard or tender personnel. It is estimated that the installation will require the services of two men for a period of twenty (20) hours. Full details of this field change may be obtained from Field Change Bulletin NAVSHIPS 0967-052-6250 and NAVSHIPS 0967-156-8010 (the Technical Manual for the Uprated Test Equipment). The field change kits and replacement units, together with the bulletin and technical manual, may be obtained by requisition from Naval Ship Engineering Center, SEC 6627DK8, 18th & Constitution Avenue, N.W., Washington, D.C. (700)

OS-54/URN-3–Rerouting of High-Voltage Leads

The following is adapted from an article which appeared in the Technical Information Letter (AACS) of January 1961, and is offered for the consideration and benefit of personnel engaged in the maintenance of AN/URN-3 equipments.

The high-voltage leads in the OS-54/URN-3 power supply are routed quite close to rectifier tubes V-6576 and V-6577. The heat generated by the rectifier tubes can cause deterioration and melting of the power-lead insulation and can result in a short circuit. It is recommended that the power leads be redressed as follows:

a. Unsolder the opposite ends of the harness leaving power transformer T-6576.

b. Right-angle each wire toward the rear of the OS-54/URN-3 chassis halfway down the transformer; then right-angle it toward capacitors C-6576 and C-6577.

c. Route each wire between the capacitors, then toward and between the base of the 5R4 tubes (V-6576 and V-6577).

d. Redress each wire to its tie point.

NOTE: Relacing is necessary only from the transformer to the base of the 5R4 tubes. (561)

Tacan Crystal Requisition Difficulties

Some difficulties in obtaining TACAN crystals have been reported to NAVELEX from field activities. Normally all low band crystals are identified with a Federal Stock Number. The FSN may be obtained from the Master Cross Reference List (NAVSUP 4300). High band crystals, due to limited usage, are not covered by FS numbers. It is requested that the following procedure be used in requesting crystals.

(a) Order by FSN through normal supply channels upon verification that the number identifies the proper crystal.

(b) If no stock number is available, follow this procedure and order through ESO, Great Lakes:

1. Specify crystal type, such as CR-65/U.
2. Specify exact crystal frequency as noted in equipment technical manuals, using all digits.
3. Specify channel number and beacon frequency.
4. Specify crystal usage, i.e., beacon, monitor or signal generator.

Observe applicable security regulations covering channel assignments. (788)

Tacan Antenna Requisition Difficulties

Field activities have reported difficulties in requisitioning portions of an antenna group noting that supply activities only recognize the overall group FS number. In many cases the requirement is only for a replacement base and antenna and not for a control unit. The group consists of antenna, base and control unit. Shipboard groups also include an outer radome. When requesting a specific assembly or assemblies of an antenna group, the request should be made to NAVELEX specifying the exact portion required and identifying it as a part of a specific antenna group. Example: Antenna base AB-361/URN-3 and Antenna AS-685/URN-3 (P/O Antenna Group OA-592/URN-3). NAVELEX will in turn assess the availability and furnish the requested assembly or assemblies. (788)

AN/URN-3 TACAN--Accomplishment of Field Change 6

Part 1 of Field Change 6-AN/URN-3, NAVSHIPS 98950 is required to be accomplished to assure proper cooling of integrated special test equipment in AN/URN-3A TACAN beacon equipments. Forces afloat should inspect air ducts in rear of Electrical Cabinet CY-2755/URN-3A for compliance with Field Change 6-AN/URN-3. (785)

AN/URN-3A, AN/GRN-9, and AN/SRN-6 Series - Requisitioning of 2C39WA Tubes

Information in EIB 776 relative to 2C39WA tubes in the subject equipments is hereby cancelled.

When requisitioning for 2C39 tubes for use in the subject TACAN equipments, specify type 2C39WA stocked under FSN 5960-490-6238 and procured in accordance with ESO Drawing 000029. (791)

AN/URN-20(V)1, AN/URN-20(V)2, AN/GRN-9B, AN/SRN-6A, and AN/URN-3A – Gases for Tacan Spectrum Filters Applicable to Pressurized Filters.

See Article under AN/URN-20(V)1 with same title. (EIB 788)

AN/GRN-9 and AN/URN-3 TACANS--Increased Aging Times for Klystron SAL-39A

See article under AN/GRN-9 with same title. (840)

TACAN Maintenance Hint for Klystron Tube, ITT Type 8493 for AN/SRN-6( ), AN/GRN-9( ), and AN/URN-3A TACANS

See article in AN/SRN-6 Section under the same title. (EIB 958)

New Planar Triodes for AN/URN-3A, AN/SRN-6 (Series), and AN/GRN-9 (Series) TACANS—Availability of

New planar triodes are now available for use in the AN/URN-3A, AN/SRN-6 (series) and AN/GRN-9 (series) equipments. These new triodes will directly replace the 2C39WA triodes currently used in the Frequency Multiplier-Oscillator (FMO).

Tube type and reference designations for the location of the new triodes are shown in Table 1 below.

The planar triodes were developed to eliminate the problem of undesired oscillations in the FMO (see "Undesirable Oscillations" article in the EIMB (0967-LP-000-0010) Communications Handbook, Service Notes, page AN/URN-3:1) and to increase the MTBF. Elimination of this problem necessitated the use of two new tube types in the FMO.

The new planar triodes are in the process of being assigned National Stock Numbers. Until these numbers have been assigned, these triodes may be requisitioned from Ships Parts Control Center, Mechanicsburg under the Activity Control Numbers (ACN) as shown in Table 1.

Table 1. Locations and ACNs for the New Planar Triodes

		Reference Designations in AN/URN-3A, AN/GRN-9, 9A, 9B, AN/SRN-6, 6A TACANS		Reference Designations in AN/GRN-9C TACAN	
ACN	Tube Type	High Band	Low Band	High Band	Low Band
1N9999-LL-HHA-2063	8964	V1504	V1510	V1604	V1610
1N9999-LL-HHA-2064	8965	V1505 V1506	V1511 V1512	V1605 V1606	V1611 V1612

(EIB 922)

OA-7203/URN-20(V) and OA-7203A/URN-20(V) TACAN Antennas—Information on

Information received from forces afloat indicates that excessive corrosion has resulted in Antennas OA-7203/URN-20(V) and OA-7203A/URN-20(V) from trapped stack gas which enters the radome at the access doors.

As shown on Installation Drawing RE-D2695710, Rev. D, neoprene seals are to be installed on antenna access holes/covers.

It is recommended that all holders of these antennas assure that seals have been installed; in the event that seals are not in place, accomplish installations during next yard availability. (751)

Field Change 2-AN/URN-20 TACAN Equipment—Information Concerning

Since Part "L" of Field Change 2 to AN/URN-20 Radio Set is not applicable to all serial number systems, and due to certain omissions in the associated bulletin, it is necessary that the following tests be conducted to assure that this portion of the field change is performing the desired functions:

a. Open 1A3 drawer and bypass the interlock switch.

b. Place system main power switch 2A1S1 to ON position.

c. Place status switch 1A3S1 to ON position.

d. Turn the 25.2 V power supply switch 1A2S1 to ON, and the 250 V and 1000 V power supply switches 1A3S2 and 1A3S3 respectively to OFF.

e. Check Overvoltage Protect Circuit 1A3A1 for proper setting by assuring that when 1A3A1R5 is jumpered, the overload indicator on 1A3 front panel is energized. If it lights, proceed to the next step. If not, align 1A3A1 as specified in NAVSHIPS 0967-303-9210, page 1-5. When proper operation is achieved proceed to step f.

f. Present system condition should now be status switch in the ON condition with only the 25.2 V power supply energized.

g. Jumper 1A3A1R5, simulating an overload condition. At this time the overload indicator light on the 1A3 drawer front panel should be energized and the 25.2 V power supply green indicator light on the 1A2 front panel should be de-energized. If the overload light is energized and the 25.2 V power supply remains ON, a wiring error exists in Field Change 2 Part L. Proceed to step h for correction. If the overload light is energized and the 25.2 V power supply green indicator light is de-energized, Field Change 2 Part L is wired correctly. Remove the jumper across R5, close drawer 1A3 and restore the system to normal operation.

h. The problem areas requiring correction are 1A3S1 and 1A3K2. Terminal X1 of relay 1A3K2 (Transponder On Control Relay) has two WH/VIOLET wires connected to it. One connects to 1A3A1 terminal 4 and the other connects to 1A3S1-2B.

i. De-energize the system by placing status switch 1A3S1 OFF and main power switch 2A1S1 OFF.

j. Disconnect, tape, and fold back into the harness, both ends of the WH/VIOLET wire which provides connection between 1A3S1-2B and 1A3K2-X1.

NOTE

Since there are two WH/VIOLET wires connected to 1A3K2-X1, use an ohmmeter to verify removal of the correct wire. After completion of this correction the only wire on 1A3K2-X1 should be connected to 1A3A1 terminal 4.

k. Repeat steps 2 f and 2 g above to assure proper operation. (757)

AN/URN-20 Defective Spectrum Filter, HG5825-816-4154—Turn in of

The purpose of this article is to request holders of the AN/URN-20 equipment to return tuning charts with the failed spectrum filters to the repair depot.

Tuning charts are an integral part of the spectrum filter and its use without its own tuning chart jeopardizes other components in the AN/URN-20.

NSY SFRAN BAY (Hunters Point Div.) will maintain a library of spectrum filter tuning charts. (769)

AN/URN-20(V)1, AN/URN-20(V)2, AN/GRN-9B, AN/SRN-6A and AN/URN-3A—Gases for Tacan Spectrum Filters Applicable to Pressurized Filters

Pressurized spectrum filters in the subject TACAN equipments use dry Nitrogen or Freon 12. At present, some types of filters require dry Nitrogen while other types require Freon 12. In each case, the gas to be used is specified in the applicable equipment technical manual.

Information from the Fleet indicates that the specified gas is not always available aboard ship.

Either dry Nitrogen or Freon 12, at the pressures specified in the technical manuals, may be used in the subject equipments without any undesirable effects. No appreciable change will result in the performance characteristics of these filters by using either gas. (788)

AN/URN-20 Radio Navigation Beacon—Bent Connector Problem

Reports have indicated that the connectors are bent on the W1 cable in normal usage, although the cable is long enough to allow for full extension of the RF drawer without stress on the connectors. Upon study of the problem the following information is assumed to be the solution to the problem:

a. With the RF drawer closed (normal operation) it is tempting to take up the cable slack by draping the cable over the tops of the cabinets and behind the eye-bolts on the front corners of the cabinets.

b. The next time someone attempts to pull out the RF drawer for equipment maintenance, they forget that the cable is hooked behind an eye-bolt until it is too late. This is a very heavy drawer and it takes considerable force to break it loose from the cabinet. Once it starts moving on the slides it is not easily stopped. Worse yet, the operator may not realize why the drawer failed to open all the way and will deliberately try again with ever greater force until the "light finally dawns" by which time the connectors are bent or the connection is broken.

The problem has been eliminated on the AN/URN-20's for the current contracts in that the installation instructions call for removal of the front eye-bolts and replacement with cap screws* which are supplied with the installation material. *(818)*

*Hex head cap screw (3/8-16 x 1-1/4 - MS-35307-362.

AN/URN-20(V) Klystron Filament Leads—Maintenance Hint

This article contains guidelines for proper lead dress of the AN/URN-20(V) klystron filament leads. The purpose of this article is to reduce failures caused by arcing in the filament leads.

1. Remove all power to the equipment.
2. Open the transponder drawer and short across all high voltage components to electrical ground with shorting probe.
3. Position filament lead connectors on klystron such that the leads are 180° away from each other.
4. Spot tie the filament leads to the high voltage cable and to the cable harness from the klystron grid modulator to 1A1PS1T1 and 1A1PS1T2. The leads should be maintained at a maximum distance away from the chassis and the klystron shell.
5. Close drawer and return power to equipment.
6. Replace filament leads each time a new klystron is installed. *(EIB 867)*

OA-7203A/URN-20 Antenna Group—Electrical Shock Hazard In

An electrical shock hazard exists in the TACAN Antenna Group OA-7203/URN-20 to maintenance personnel servicing the antenna. The safety switch, mounted on the antenna pedestal inside the randome, removes only the 400 VAC spin motor power from the terminal boards located on the pedestal. With the safety switch in the OFF position, 117 VAC power can still be present at several terminal boards associated with roll, bearing, and convenience circuits.

Maintenance personnel working aloft on the antenna should ensure that power to the antenna has been previously turned off at the antenna control assembly. Some means, such as a sign, should be placed on the control assembly to inform others of the "down" status of the antenna.

When work to be done on the antenna necessitates any of the circuits to be "live", personnel going aloft should turn off all power to the antenna prior to going aloft. Personnel should then go aloft and establish sound powered phone communications with another person located at the antenna control unit. After communication is established, personnel at the antenna may then have voltages to the various circuits switched as desired, thereby minimizing any electrical shock hazard.

AN/URN-20 and AN/URN-20B TACAN Radio Set BITE Equipment—Information on

The purpose of this article is to familiarize all EIB readers with NAVELEXINST 4700.11A of 11 January 1972, which designates NAVELEXSYSENGCEN San Diego as the Technical Repair Agent for all 4G cognizance repairable material.

The AN/URN-20 and the AN/URN-20B BITE test equipment is 4G material. Therefore, when this material requires repair and calibration it should be forwarded to:

Calibration Facility
Code 34
NAVELEXSYSENGCEN San Diego
Building 92
Naval Station
San Diego, CA 92136

To prevent delay in receiving this service, it is recommended that the calibration facility in San Diego be given advance notification of requirements prior to forwarding the test equipment for repair and calibration.

Further information on this matter can be obtained from NAVELEXSYSENGCEN San Diego Calibration Facility or NAVELEXSYSENGCEN Vallejo FMA, Code 042, Autovon 253-4546. (EIB 895)

AN/URN-20( ) TACAN Radio Set, Frequency Multiplier Oscillator (FMO)—Maintenance Hints

This article discusses proper tuning of the FMO and describes a test for FMO output power.

1. In many cases when tuning FMO 1A1A9/2A4A25 for a channel change, the FMO can be tuned with the first three capacitors C8, C11, and C18, but no "good" response can be obtained for following stages. The problem may be that C18 gives two significant tuning peaks. The smaller peak is often the correct one. If the FMO was previously tuned to a channel, then when retuning all capacitors will change in the same direction and approximately by the same amount (turn CW for decreasing frequency). As an alternate method, tune C8 and C11, then tune C18 throughout its range and note all peaks. Return C18 to a peak and attempt to tune C23 and C28. If very low or no response is obtained, tune C18 to another peak and repeat. To verify proper operation, check power as noted in the following steps.

2. In the event of low transmitter power the problem may be in the klystron, RF driver (1A1A2) or FMO. The following procedure checks FMO power directly.

a. On analyzer generator 2A3A3 place function to RF AVG PWR. Place attenuator to 30dB. Disconnect jumper from J3 and connect a coaxial test cable approximately four feet long.

b. De-energize the Low Voltage Power Supply (LVPS) on receiver coder. At 1A1A2 disconnect FMO output cable from J1 at the bottom of RF assembly. Patch the removed FMO output cable to the test cable.

c. On 1A1A11 ensure R6 is fully CCW for maximum FMO power.

d. Re-energize the LVPS on the receiver-coder.

e. Adjust the attenuator on the analyzer-generator to obtain mid-scale reading on the average power meter. Peak the FMO tuning capacitors for maximum meter indication, adjusting the attenuator as needed to maintain on-scale meter readings.

f. Adjust the attenuator to redline (Power Set) the average power meter. Attenuator reading is the FMO power output in dbm. If less than 20, the power is too low and indicates weak or a mis-tuned FMO. Nominal reading is 23dB and reading may be up to 32dB.

g. De-energize the LVPS, return connections to normal, and re-energize the LVPS. FMO capacitors C34 and C37 must be re-tuned to match the RF driver in accordance with normal channel change procedures. (EIB 897)

AN/URN-20 TACAN Radio Set—Functional Check Maintenance Hint

This article provides an alternate method by which the AN/URN-20 may be peak tuned without the use of the built-in test equipment. This procedure is to be used when the test equipment is removed for calibration or in the case of a malfunction to the test equipment. This article does not pertain to planned or preventative maintenance.

All material required should be available locally with the exception of the crystal holder NSN 9N5961-00-642-2509 and 1N25 crystal diode NSN 9N5961-00-262-0316 which should be ordered in accordance with existing procedures.

Connect the RF detector assembly as shown in figure 1. For signals of very low amplitude the 10dB attenuator may be removed.

A USM-281, USM-140, USM-105 or equivalent may be used for the oscilloscope in the event of a malfunction of, or during the calibration of, the built-in test oscilloscope.

The procedures followed for peak tuning are then the same as those listed in NAVELEX 0967-LP-041-0020 Section 3, except where the manual states to connect an RF patch cable between a test jack and jack J3 on the ANALYZER GEN 2A3A3, connect the detector assembly between this test jack and oscilloscope.

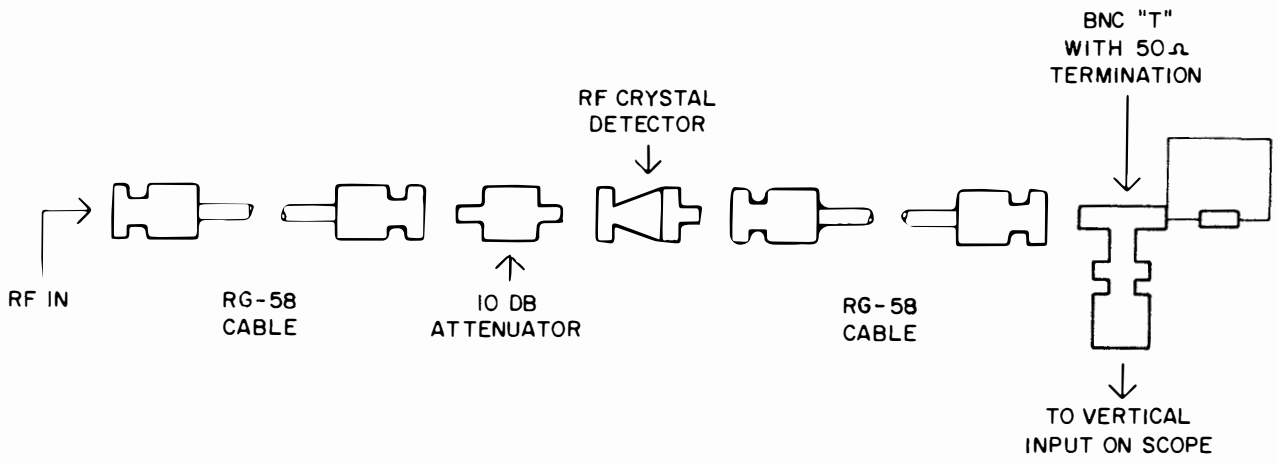


Figure 1. RF Detector Assembly Connection

(EIB 899/906)

AN/URN-20(V) TACAN Maintenance Hint for Klystron Blower Motor (1A1B1)

Most of the failed blower motors (1A1B1) are the direct result of worn-out bearings. To maintain the AN/URN-20(V) operational, the klystron requires constant cooling and keeping the blower motor operable is a must. Replacement of worn-out bearings can alleviate the problem. It is recommended that all users of the AN/URN-20(V) TACAN set, order replacement bearings; NSN 9Z 3110-00-156-4086 applies.

(EIB 921)

AN/URN-20(V) Crystal Frequency—Information Concerning

The initial stocking of crystal sets for the AN/URN-20(V) supplied the wrong crystal for the channel 19 transponder frequency. The correct transponder crystal frequency for channel 19 is 36.29630 MHz. All equipment holders are requested to check their crystal sets for the proper channel 19 crystal. Correct crystals are available in the supply system under NSN 9N 5955-00-725-0307.

(EIB 966)

AN/URN-20 TACAN Radio Set — Functional Check — Maintenance Hint

This article applies to all AN/URN-20 TACAN's. The purpose of this article is to provide a maintenance step to be taken if low transponder output power is observed after transponder is placed in a fully operational mode.

Place transponder in STANDBY mode. Measure filament voltage at center of posts on top of klystron tube. If voltage reads less than 4.2 ± 0.2 volts AC, then try the corrective steps below:

Shut down the transponder.

Disconnect filament voltage leads between 1A1V1 klystron tube and 1A1T2 klystron filament voltage transformer.

Clean off contacts of filament leads, klystron tube posts, and transformer contacts with emory paper.

Reconnect filament leads and place transponder in STANDBY mode, then measure voltage at klystron tube posts. Reading should be 4.2 ± 0.2 volts AC.

(EIB 932)

AN/URN-20(V) Klystron Filament Leads—Maintenance Hint Reminder

To alleviate klystron filament arcing problems, all AN/URN-20(V) users encountering arcing in the filament leads are reminded to refer to the following article which appeared in EIB 867 of 19 November 1973 for corrective action.

This article contains guidelines for proper lead dress of the AN/URN-20(V) klystron filament leads. The purpose of this article is to reduce failures caused by arcing in the filament leads.

1. Remove all power to the equipment.
2. Open the transponder drawer and short across all high voltage components to electrical ground with shorting probe.
3. Position filament lead connectors on klystron such that the leads are 180° away from each other.
4. Spot tie the filament leads to the high voltage cable and to the cable harness from the klystron grid modulator to 1A1PS1T1 and 1A1PS1T2. The leads should be maintained at a maximum distance away from the chassis and the klystron shell.
5. Close drawer and return power to equipment.
6. Replace filament leads each time a new klystron is installed.

(EIB 946)

AN/URN-20 Receiver Sensitivity Calibration Factor — Maintenance Hint

The AN/URN-20 TACAN receiver sensitivity is checked periodically by injecting a calibrated signal from generator 2A3A3 via attenuator 2A3A3A21. A "Receiver Sensitivity Calibration Factor" is added to the attenuator reading to get receiver sensitivity in dBm. The calibration factor is a number between 14 and 20dB and was supplied with the new AN/URN-20 system. As several complaints of "low receiver sensitivity" have been traced to this factor, the following procedure is given for redetermining the calibration factor.

Equipment required:

1. 7/8" male flange - to - N adaptor, Andrews Antenna Equipment type 2260A or equal.
2. TNC - to - N jumper cable, 3 feet, with known loss at TACAN frequency (±0.5db).
3. HP431C, AN/USM-177B rf power meter or similar.
4. Female N - to - N coupling adapter.
5. 50 - ohm TNC dummy load.

Procedures:

1. Measure and record 2A3DC1 coupling attenuation.

a. Secure transmitter, remove beam power fuses.

b. Remove flange of coupling from top front of TMC.

c. Install flange - to - N adapter on TMC.

d. Disconnect 2A3A3J3 (front panel jumper on ANALYZER GEN). Connect a TNC - to - N jumper cable to J3. Select CW mode, RF Sig Gen, set for maximum CW power. Set attenuator 2A3A3A21 (front panel of ANALYZER GEN) to about 20dB.

e. Connect the rf power meter to the jumper cable, using an N - to - N adapter if needed. Adjust 2A3A3A21 attenuator and/or the CW power adjust for maximum readable power on the rf meter. This is nominally +10 dBm.

f. Remove jumper from rf power meter and connect jumper to flange adapter at top of TMC. Remove cable W7, plug P15 from J2 (INC jack) on 2A3DC1, on top of TMC behind Magnetic Variation unit. Connect rf power meter to 2A3DC1J2 and read power. Difference between power inserted (nominal +10dBm) and power measured here is coupling loss of 2A3DC1, nominally 30dB. Record in step 4 below, to nearest 0.5 dB.

NOTE:

The directional coupler attenuation is stable with time. This number should be recorded separately for Ships Force future use, preferably in the Maintenance Standards Book for the AN/URN-20.

g. The transmitter may be restored to normal.

2. Measure and record RF Sig Gen output power

a. With J4 connected to J7 and J3 connected to J6 on front panel of ANALYZER GEN, set to RF Sig Gen, CW mode and adjust for red-line indication on Average Power Meter.

b. Reconnect J3 to J7, terminate J4 with 50 ohms. Adjust attenuator A21 for red-line on Average Power Meter. Record attenuator reading in 4 below. Nominally 14 or 18 dB but may differ.

3. Measure and record TMC cable losses

a. With connections as in 2.b. above, note attenuator setting.

b. Reconnect J3 to J6. Using N-N female adapter, TNC - to - N jumper with known insertion loss from J7 to the cable W7 which normally connects to 2A3DC1J2 behind the Magnetic Variation unit.

c. Adjust attenuator again to redline the Average Power Meter. The difference between this reading and the reading in 2.b is the total of TNC - to - N jumper loss and internal cabinet cable loss. Subtract known jumper loss and record result in step 4.

4. Receiver sensitivity calibration factor.

a. Enter 2A3DC1 coupling factor from 1 (about 30dB) _____dB

b. Enter TMC cable loss from 3 (about 2-5 dB) _____dB

c. Add a and b. This is total loss _____dB

d. Enter RF Sig Gen output power from 2 (about 14dB) _____dB

e. Subtract. This is Receiver Calibration Factor. _____dB

Procedure step 1 should be performed yearly and steps 2, 3, and 4 should be performed either yearly or after every channel change, whichever is more frequent.

(EIB 940)

AN/URN-20( ) TACAN Radio Sets—Maintenance Hint for Klystron Tube ITT Type 2919

The following procedures should accompany new ITT 2919 klystrons and be closely adhered to:

Initial Turn On and Aging Procedures
for ITT 2919 Klystron for Use in
AN/URN-20( ) TACANS

1. Cold tune the klystron for the desired operating channel using the serialized cold curve supplied.

2. Install the klystron in the equipment.

3. Apply heater (filament) voltage. After 5 minutes, measure the heater voltage at H and HK terminals. If voltage measured is not 4.2±0.3 VAC, corrective action must be taken.

4. After 10 minutes of heater warmup, set BEAM SUPPLY switch to KLYSTRON AGING, BEAM CURRENT ADJUST to minimum (fully counterclockwise) and turn on all power supplies. Beam voltage should be approximately 7 kV and beam current should be less than 5 mA. Operate for 5 minutes.

5. After 5 minutes, turn BEAM SUPPLY power off, set BEAM SUPPLY switch to NORMAL and turn BEAM SUPPLY power back ON. Some arcing may occur and if an overload occurs, turn the BEAM SUPPLY power OFF, press the OVERLOAD RESET button and wait for time delays to recover. Turn BEAM SUPPLY power ON again. When arcing ceases, beam voltage should be approximately 20 kV and beam current should be less than 15 mA. Set BEAM CURRENT ADJUST for 30 mA.

6. Adjust the klystron cavity flanges, driver final amplifier and double slug tuner for maximum klystron power output. Ensure that the center cavity is tuned for the higher of two detected power output pulses (flanges farthest apart). The cold tuning curve is sometimes inaccurate. This can result in what appears to be a maximum output of only several hundred watts peak power. If this condition is encountered, slowly tune the output cavity in the higher frequency direction. The center cavity must then be retuned due to interaction. If this fails to result in higher power output, tune the output cavity in the lower frequency direction. The center cavity should be tuned for maximum output at its test jack and finally for maximum klystron output.

7. After 10 minutes of operation, increase BEAM CURRENT ADJUST gradually, fine tuning the klystron cavity flanges and double slug tuner as necessary to maintain proper output pulse shape until the desired output power level is obtained. A 10 kW peak power output should be obtainable with 70 mA of beam current or less. If not, equipment problems may be indicated (e.g., low driver output power).

WARNING

Do not turn any flange tuning nut more than 1-1/2 turns from level. Maintain level cavity operation. Do not operate in standby (heater voltage only) for longer than 30 minutes until klystron has 160 hours of operating time. After 160 hours of operation, the klystron may be left in standby for longer periods, but never more than two weeks. Prolonged operation in standby results in gas buildup which causes degradation of performance and arcing when beam voltage is applied.

(EIB 975)

AN/URQ-9 FREQUENCY STANDARD–STRESSING IMPORTANCE OF STEADY AC POWER

Frequency Standard AN/URQ-9 depends on continuous operation for maintaining its accuracy. The built-in re-chargeable battery will maintain operation during a power interruption of up to approximately two hours.

To prevent accidental prolonged power interruption, it is recommended that two signs be made, as follows:

1. Display the following sign on the front of the equipment or immediately adjacent to it:

   "RESTORE AC POWER AS SOON AS POSSIBLE IF BATTERY POWER INDICATOR LIGHT GOES ON."

2. Display the following sign on the AC power panel serving the power line for the equipment:

   "IMPORTANT - DO NOT TURN OFF AN/URQ-9 SWITCH."

AN/URQ-9–BATTERY MAINTENANCE

All ships and stations having one or more Frequency Standard AN/URQ-9 installed are reminded that this equipment has an internal re-chargeable battery which requires periodic maintenance. Information received by the Bureau indicates that repair and calibration facilities often receive this equipment for repair with batteries in extremely neglected condition. Since the presence of an internal battery is not immediately apparent by viewing the outer case of the equipment, personnel in charge of maintenance should set up a schedule for checking the battery condition in all units every 90 days.

These batteries are refillable nickel-cadmium type. In normal service, a noncorrosive white residue forms around individual cell terminals and case-tops; this should be wiped away with a clean cloth, Electrolyte level should be checked and distilled water added, if necessary, through a small diameter tube to be inserted through the opening in the top of each cell (with plug removed). A 3-cc hypodermic obtainable from medical supply is suitable for this purpose. Since this battery uses a basic (non-acid) electrolyte, and even a minute concentration of acid would affect performance, care must be exercised not to use water which is slightly acid from use in filling lead-acid type batteries.

Additional information on battery care can be found in the maintenance section of Technical Manual NAVSHIPS 93806(A).

AN/URQ-9, EXTERNAL ALARM FOR POWER FAILURE

Frequency Standard AN/URQ-9 requires costly and time consuming re-calibration if its a.c. power input is lost for more than two hours. The equipment has internal circuit-closing contacts provided through connector J709, to which an external alarm device may be connected.

A satisfactory external alarm device developed by the Assistant Industrial Manager, San Diego, is in use at the Fleet Anti-Air Warfare Training Center (FAAWTC), San Diego. Figures 1 through 3 of this article show the wiring and packaging details of the alarm. Batteries are used, since an a.c. alarm supply might also go dead when the AN/URQ-9 power is lost.

The sound alarm should be installed in a location which will assure detection at all times.

This information is provided for possible use by other AN/URQ-9 installing activities either aboard ship or at shore stations.

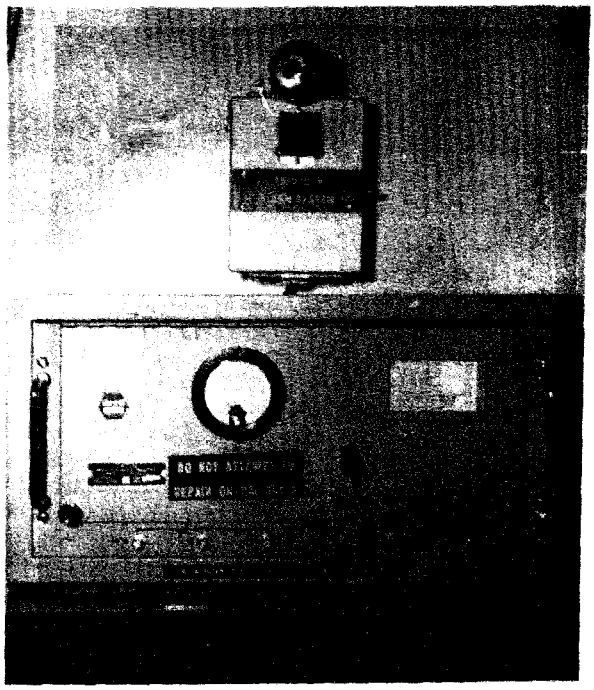


Figure 1. AN/URQ-9 Alarm System, Installed View.

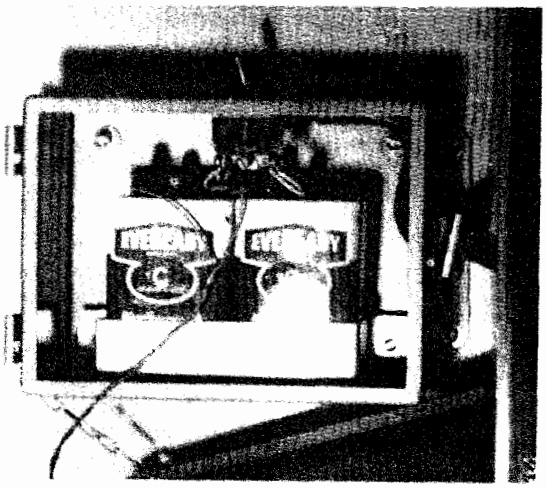
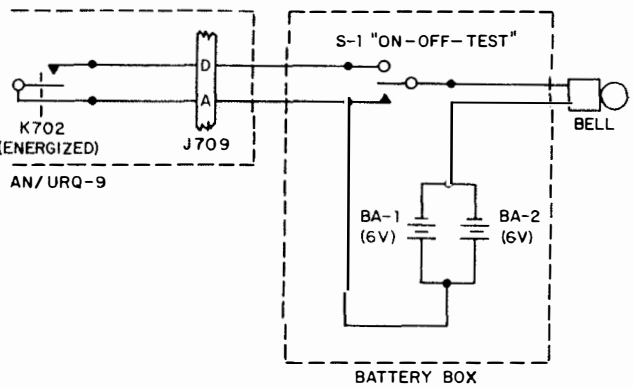


Figure 2. Battery Box, Cover Removed.



BILL OF MATERIAL		
NO.	QUAN.	DESCRIPTION
S-1	1	3 POSITION- 1 POLE- ON, OFF & MOMENTARY
BA-1	1	6 V DRY BATTERY (EVEREADY NO. 510S)
BA-2	1	6 V DRY BATTERY (EVEREADY NO. 510S)
—	1	BELL - 6 V (LUNGEN NO. 13-3)
—	1	BOX (HOFFMAN) 6 X 8 X 3 1/2 JIC #608LP
—	A/R	DSGA-3 CABLE

Figure 3. AN/URQ-9 Alarm System, Schematic Diagram.

FREQUENCY STANDARD AN/URQ-9 – CONNECTION TO A. C. POWER

The preferred method of connecting this equipment to the 115v a.c. power line is through the power cable supplied with and attached to the equipment. A single outlet serving only this equipment should be conveniently located. A clamp anchoring the plug in the outlet can be fabricated and should be installed to prevent inadvertently disconnecting the unit.

An alternate method of connecting to power, used in some installations, is to hard-wire the equipment to the power line. In order to facilitate removal of the equipment for maintenance, calibration, or for use as a portable standard, a hard-wired installation should be provided with a power connector on the rear of the unit. Receptacle type MS 3102E-14S-7P should be mounted on the rear panel and permanently wired into the unit's AC input circuit. Mating cable-plug type 3106E-14S-7S should then be installed on the a. c. feed cable. The same type cable plug may be installed on a separate line cord for use during maintenance or emergency. In the interest of interchangeability, pins A and C should be connected to the power line; pin B should be grounded.

Further safeguards against prolonged power interruption, such as signs and decals, should be incorporated. All hands are reminded about the need for periodic battery inspection and maintenance. (666)

AN/URQ-9 FREQUENCY STANDARD-SERVICING INFORMATION CONCERNING THE BATTERY PACK

Electronics personnel involved in the servicing and repair of Frequency Standard AN/URQ-9 may find it necessary to instal, maintain or replace the nickel cadmium batteries used in the stand-by power sypply. To facilitate that task the following information should be noted.

(a) Specific instructions for installation and maintenance of the batteries is presented in the 6 June 1966 addendum to Navy Technical Manual NAVSHIPS 93806(A). Order from NSD Philadelphia.

(b) Replacement cells are still procured in accordance with Amphenol-Borg Drawing 501578, but due to a minor dimensional change in batteries now being procured by ESO, Great Lakes, a new stock number has been assigned. The old stock number was 1N6140-829-3694. The new stock number was 1N6140-893-1477. Since requisitions bearing the old number may not be automatically processed under the now correct number, it is imperative that the new stock number be used. (702)

AN/USM-26 OSCILLATOR INSTABILITY

Background. –Successful communications using single sideband techniques are largely dependent on the accuracy with which the transmitter/receiver combination can be maintained precisely on a discrete operating frequency.

Recent developments in the art of frequency synthesis have produced frequency synthesizers for use with trans-

mitters and receivers which meet the stability requirements necessary for successful single sideband communications.

The fact that the stability of the frequency standards used with frequency synthesizers is continually being improved makes improved frequency measuring techniques mandatory.

The design specifications for the AN/USM-26 Frequency counter calls for the internal frequency standard to be stable within ±2 parts in 10^6 per week. Applying simple arithmetic shows that this design tolerance can account for an error of 30 cycles per week at 15 mc. Recent tests by a U.S. Naval Aviation Engineering Service Unit indicates that the internal frequency standard in the AN/USM-26 does not exceed its design specification.

In other words, the AN/USM-26 will not provide reliable frequency measurement on an equipment whose internal frequency standard is inherently more stable than the internal frequency standard use in the AN/USM-26 Frequency Counter.

The Problem. –Transmitters designed for single sideband operation, such as the AN/URT-18 and the AN/FRT-39B-D, are equipped with extremely stable internal reference standards which discipline the synthesizers used to produce the final transmitter output frequency.

Frequency synthesizers for new radio transmitters, and synthesizers for use with radio receivers which are currently under development and/or procurement, will possess internal frequency standards with stabilities better than 1 part in 10^8 per day.

Activities attempting to use the AN/USM-26 Frequency Counter to measure the output frequencies of ultra-stable radio transmitters and receiver frequency synthesizers should be aware of the limitations stated above.

The Fix. –The fix is simple. Connect the 100-Kc output frequency from the station frequency standard AN/URQ-9 to the "EXT. STD. IN" connector of the AN/USM-26 Frequency Counter. The stability of the internal reference standard in the AN/URQ-9 is better than 1 part in 10^8 per 60-day period. This degree of stability is more than adequate to provide accurate frequency measurements when the gating circuits in the AN/USM-26 are disciplined by the 100-Kc standard frequency output from the AN/URQ-9.

Activities provided with AN/URQ-9 Frequency Standard are urged to install the coaxial cabling required to facilitate use of the 100-Kc standard frequency output from the AN/URQ-9 in lieu of the internal standard normally used with the AN/USM-26 Frequency Counter. Figure 4 illustrates of typical hook-up.

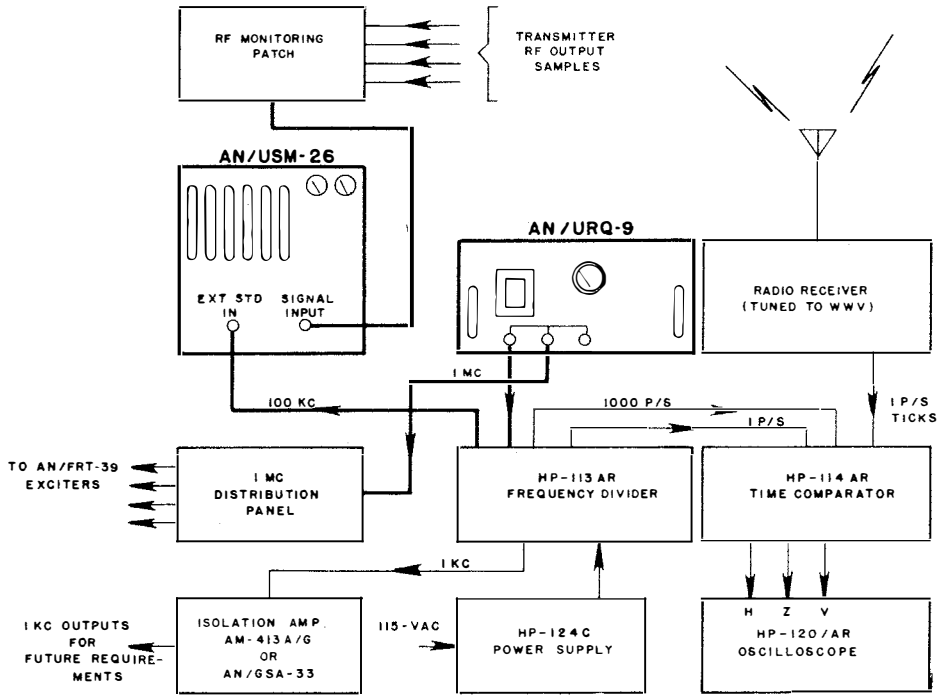


Figure 4.

AN/URQ-9 and AN/URQ-10 Frequency Standards--
Information on

1. When the AN/URQ-9 and AN/URQ-10 frequency standards are submitted to Navy Calibration Laboratories for calibration, precautionary measures should be applied to minimize prime system down-time. Calibration turn around time is considerably reduced when these items are delivered to the calibration laboratory in an energized (POWER ON) condition. If not, at least 11 days warm-up time will be required before it can be calibrated. The energized condition is maintained during transit by the internal battery power supply which is automatically connected upon removal of the AC power. It is equally important to have the newly calibrated frequency standard to the installation site in an energized condition.

2. Another "MUST" requirement is that the AC power supplies must accompany the AN/URQ-9's and AN/URQ-10's when being delivered for calibration, because it is unlikely that the calibration laboratory has spare power supplies. The handling of the AN/URQ-10 in this respect is simple because the AC power supply (PP-4354/URQ) is mounted on the same frame as the oscillator (O-1283/URQ-10) whether it is rack mounted or not. With the AN/URQ-9, however, the handling is more difficult with rack-mounted installations because the oscillator (O-471/U) is disconnected from the AC power supply (PP-2223/U) when it is removed from the rack. The PP-2223/U must also be removed from the (rear) rack so that both units may be delivered at the same time. If the O-471/U and the PP-2223/U are installed in an equipment case, the entire assembly should be delivered as a whole AN/URQ-9. The frequency standards must be returned to AC power operation immediately upon delivery to either the calibration laboratory or the installation site, assuming that the internal batteries are still operating. Calibration is voided if the battery power fails during transit to the installation site. If this happens, the frequency standard must be returned to the calibration laboratory to repeat the entire process of warm-up (stabilization) and calibration.

3. To help keep the precautionary measures in mind, the user is requested to affix a temporary tag to each frequency standard containing the following information:

a. For the AN/URQ-9 the tag should read - "1. The AN/URQ-9 internal battery will operate for about 2 hours after AC power interruption if it is fully charged. (A 24-hour AC operation must precede each 2-hour battery operation.) 2. Deliver the AC power supply (PP-2223/U) with the RF oscillator (O-471/U) when submitting for calibration. 3. Reconnect to AC power immediately upon delivery to the calibration laboratory or upon return to the installation site. 4. Calibration is VOIDED when de-energized (no AC or battery power)."

b. For the AN/URQ-10 the tag should read - "1. The AN/URQ-10 internal battery will operate about 8 hours maximum after AC power interruption if it is fully charged. (A 72-hour AC operation must precede each 8-hour battery operation.) 2. Reconnect to AC power immediately upon delivery to the calibration laboratory or upon return to the installation site. 3. Calibration is voided when de-energized (no AC or battery power)." When the frequency standards are scheduled into a calibration laboratory, the calibrating technician will remove the temporary tag and replace it with a CAUTION label containing the same information. The Metrology Engineering Center, NAVPRO Pomona, will provide these CAUTION labels under separate communication to the calibration activities concerned with instructions as to their location on the front panel of each frequency standard.

4. The handling procedures described in foregoing paragraph, as well as the cautionary label captions, may be justified by a better understanding of the performance and characteristics of standard frequency oscillators. The technical explanation, which follows, describes the battery power supply and the crystal oscillator performance and calibration.

a. The Battery Power Supply. Specifications for the AN/URQ-10 (MIL-F-21584C(SHIPS)) state that "The battery shall be capable of operating the equipment with no deterioration in performance for a minimum of 8 hours continuously during each 72-hour period and in a 20°C. ambient, maximum." Specifications for the AN/URQ-9 (MIL-F-22078A(SHIPS)) state that "The battery shall be capable of operating the equipment with no deterioration in performance for a minimum of 2 hours continuously during each 24-hour period and in a 20°C. ambient, maximum." The 8-hour and 2-hour operation of the AN/URQ-10 and AN/URQ-9, respectively, may not always occur because of chemical

deterioration and polarization of the battery plates when subjected to very long charge periods. Batteries are usually more responsive to charge when they are frequently subjected to several partial cycles of charge and discharge. It has been suggested by the manufacturer that this exercise be performed about once a week allowing about 10 minutes of battery operation. (This can be done by disconnecting the AC power plug for 10 minutes each week.) To assure a 2-hour battery operation for the AN/URQ-9 it is necessary to perform periodic maintenance in accordance with the bi-weekly and monthly reference tests outlined in the technical manual. To assure an 8-hour battery operation for the AN/URQ-10 the panel meter readings should be checked frequently. If these readings appear abnormal or show signs of degradation, the trouble shooting and maintenance checks should be performed as outlined in the technical manual. Batteries which fail these tests, or do not operate within specification after proper maintenance, should be submitted to the appropriate maintenance shop for repair.
NOTE: Panel meter switches should not be left on the battery test positions. The batteries have Nickel (Ni) and Cadmium (Cd) plates with Potassium Hydroxide (KOH) as the electrolyte. Distilled water may be added to the electrolyte only after the battery is fully charged.

b. The Crystal Oscillator Performance and Calibration. In the process of calibrating, the output frequencies are compared with a laboratory reference frequency standard which is simultaneously compared with very low frequency (VLF) phase stable radio transmissions. The frequency standards are basically precision quartz crystal oscillators with amplifiers and frequency dividers to provide frequencies at 5.0 MHz, 1.0 MHz, and 0.1 MHz. It is the nature of quartz crystals to slowly change their frequency in time. Although this change may seem small in terms of cycles per second of the fundamental frequency, it is very significant when frequency precision must be in the order of a part in 10^8. When a frequency standard has drifted in frequency to a point where its frequency is more than 1 part in 10^8 from the standard (absolute) frequency, an adjustment of the oscillator tuning is necessary to bring it back to the original frequency. This is done by the calibrating technician. The drift rate of a crystal is greatly affected by temperature. For this reason, the crystals are isolated from the ambient temperature environment by placing them in a Dewar flask which in turn is enclosed by an inner oven and an outer oven. (These are called "double proportional ovens.") The AN/URQ-9 and AN/URQ-10 have this arrangement. If the AC power is disconnected or turned off, the internal battery is automatically switched ON to supply crystal oscillator voltage and oven current. When the battery reaches a certain point of discharge (not completely discharged) it is automatically switched OFF, all operation ceases, and the crystal cools. This is the DE-ENERGIZED CONDITION (no AC or battery power). When the AC is re-applied, the voltages operate the crystal circuit while the current warms the oven. The crystal frequency changes to another frequency, usually quite different than it was before power failure. The drift rate is also different (usually greater) than it was because the crystal naturally repeats some of its own history. These differences in frequency and drift rate are great enough to VOID CALIBRATION. The warm-up period to achieve stability (drift rate) equivalent to the previous rate may take from 11 days to as much as 2 months depending on the age of the crystal (older crystals stabilize faster if they have remained in the same physical position). The calibrating technician can do nothing with the frequency standard during the warm-up period. He must wait until the oscillator achieves a drift rate as specified (1 part in 10^8 in 60 days after 11 days of continuous operation) before valid measurements can be made. To the user this means additional "down-time." At this point it is obvious why the frequency standards must be delivered energized to both the calibration laboratory and the installation site and immediately reconnected to AC power.

5. Perhaps the most important consideration the user must have regarding these frequency standards is how often to submit them for calibration. Because no two frequency standards have exactly the same crystal frequency drift rate, assignment of an "across the board" calibration cycle just won't work. Recently, the Metrology Engineering Center issued NAVAIR 17-20AF-41 for calibration of AN/URQ-9 and AN/URQ-10 frequency standards. This procedure instructs the calibrating technician to assign a calibration recall date that is based on the measured drift rate of the crystal. After the drift rate has been determined, the frequency is intentionally offset (opposite from the drift direction) by a measured amount to lengthen the time

between calibrations. The frequency will always be within ± 1 part in 10^8 from the standard (absolute) frequency. The intent of this technique is to provide the user with the least possible downtime for calibration recall reasons. The calibration label will tell the user when the next calibration recall date is. *(800)*

AN/URQ-9 Frequency Standard—Battery Maintenance

Overhaul and repair records at Naval Electronic Systems Engineering Center, San Diego for the AN/URQ-9 indicate that approximately 75% of the problems encountered are caused by inadequate battery maintenance. A misconception exists that, since emergency battery power is seldom used, the battery pack dielectric level need not be checked.

The battery pack is under a constant trickle charge cycle when the AN/URQ-9 is connected to the AC line. Therefore, when battery dielectric decreases, an increased demand is made on the power supply through control thermistor RT-801. As this condition continues, increased current flow is felt through thermistor RT-801 as the power supply attempts to charge the defective cell, until the wattage rating of RT-801 is exceeded and the thermistor opens. At this point, the power supply load is decreased and output voltage increases to approximately 32V. This high source voltage then contributes to oscillator instability and possible component damage. Average repair cost per unit, directly attributable to inadequate battery maintenance, is approximately $200.00.

It is suggested that all activities using the AN/URQ-9 pay particular attention to dielectric levels as specified in NAVSHIPS 0967-077-8010 (formerly 93806(A)), paragraph 5-2b(3)(a), (b), (c) and (d).

(EIB 885)

AN/URQ-9 and AN/URQ-10 Frequency Standards—Information on

See Article under AN/URQ-9 with same title. (800)

AVAILABILITY OF TEST CABLES FOR AN/URR-13 RECEIVERS

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

WARNING--USE OF PROPER ALINEMENT TOOL

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

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

All electronics technicians are warned of this potential hazard, and are requested to insert the following warning under paragraph 4d, section 7 of the instruction book:

WARNING-Unless the Bristol-type alinement tool furnished with the equipment is used, danger to personnel and damage to equipment may result since these trimmer screws are 180 volts above ground.

AN/URR-13 RECEIVERS REMOVAL OF PHONE-JACK DUST COVERS

The Phone-Jack Covers, Federal Stock Number N5935-387-6548, installed on the AN/URR-13 receivers have become damaged when Phone-Jack Plug Navy-Type CN-49034A, is used with the AN/URR-13. It is noted that cause of damage is due to the phone-jack exceeding the clearance allowed in the open position of the dust cover.

The phone-jack dust covers shall be removed from the AN/URR-13 when damaged since their function does not warrant the cost of repair or replacement.

AN/URR-13 SERIES, AN/URR-27, -28 AN/URR-35 SERIES REPLACING BLOWER MOTOR BEARINGS

Replacement of bearing in the motor of Blower BL301 in the AN/URR-13 Series, AN/URR-27, -28 and AN/URR-35 Series is facilitated by a few simple tools which can be fabricated from scrap stock in any repair shop.

A puller, as illustrated in Figure 1, can be fabricated from scrap stock and will provide direct pressure on the bearing, simplifying the work and eliminating possible damage to the motor shaft.

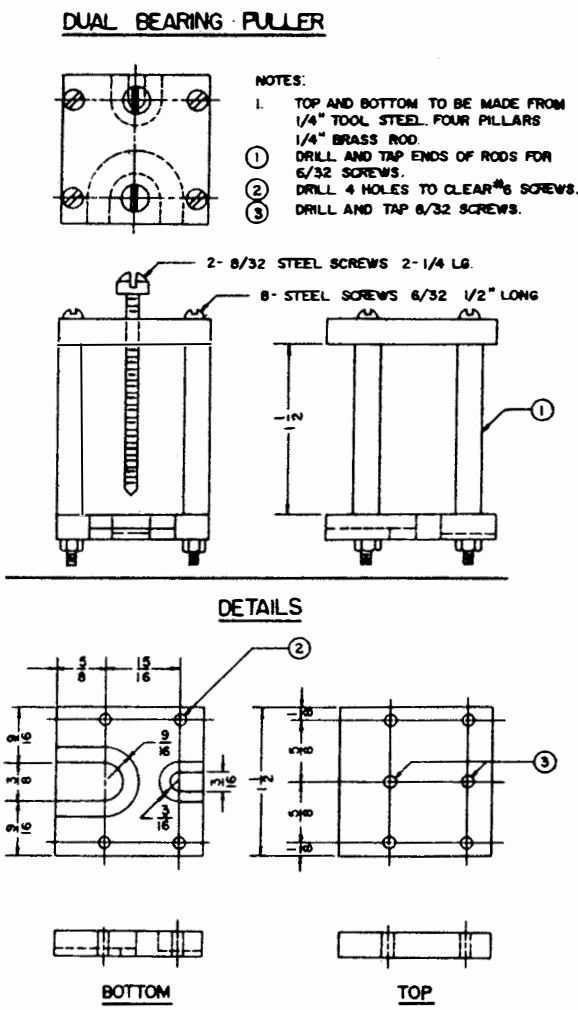


Figure 1

Figure 1. Bearing Puller, Fabrication Details

AN/URR-13 SERIES, AN/URR-35 SERIES INPUT-METER READING

Failure of the input meter in AN/URR-13 Series and AN/URR-35 Series equipments to zero properly has been reported by several field activities. The input-meter

(M501) circuit of these radio receivers includes one variable and several fixed resistors, one of which is connected between 180 volts dc and ground. This 68,000-ohm, 1/2-watt resistor has changed value in a number of cases, resulting in inability to obtain the zero indication by adjusting the variable-input balancing resistor.

It has been suggested that a 1-watt, 68,000-ohm resistor be substituted for the 1/2-watt resistor now provided. The Naval Ship Systems Command approves this suggestion and recommends installation of the higher-wattage resistor when replacement of resistor R305 in the AN/URR-13 Series, or resistor R224 in the AN/URR-35 Series is necessary.

NOTE

Similar difficulty in zero adjustment can be caused by a defective tube in the i-f amplifier section of the receiver. Therefore, the applicable tube (meter is connected to screen grid or plate circuit) should be checked first. No field change will be issued.

CORRECTION OF BLOWER INSTALLATION IN AN/URR-13, AN/URR-27, AN/URR-25 SERIES

Investigation of power transformer and filter choke failures in the subject equipments revel that the blowers have been improperly installed in many of the receivers. If the motor is connected so that it rotates in the wrong direction, of if the impeller is installed so that the blades curve backwards, the air flow willbe greatly reduced resulting in overheating and failures of parts.

All users of receivers in the AN/URR-13, AN/URR-27 and AN/URR-35 series should inspect these receivers to insure that rotation is in the proper direction and that the impeller is installed with the blades curved in the forward direction, as shown in figure 1.

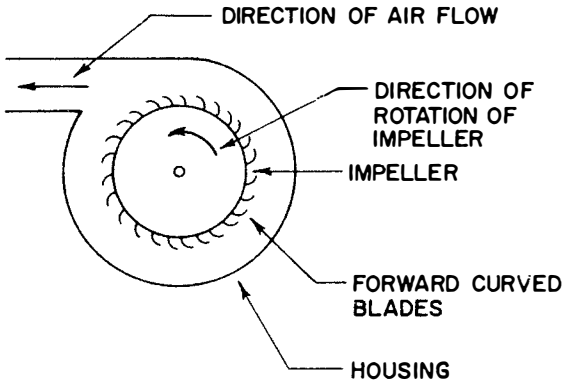


Figure 1. Correctly Mounted Impeller

AN/URR-13A RECEIVERS – NOISE REDUCTION

There have been reports encountering noise originating Milton, Florida, has reported encountering noise originating in the AN/URR-13A receivers. The noise appears as a "buzz" in the audio output with the silencer switch S-501 at the "IN" position. When this receiver is used with the AN/FRA-11 system, this buzz is amplified by an AM-413/G constant level amplifier to the same amplitude as signals, thus defeating the squelch circuit.

Any receivers in the AN/URR-13 series, producing excessive noise in the silencer stage, should be corrected as follows:

1. Disconnect both ends of wire connecting resistor R-236 to pin 7 of V-207. Wrap both ends with tape to prevent accidental shorts.
2. Substitute appropriate length of shielded wire wire between resistor R-236 and pin 7 of V-207. Ground shield braid at one end only. Carefully trim shield braid and wrap with tape on ungrounded end to prevent accidental shorts and grounds.

AN/URR-13 SERIES, AN/URR-27 SERIES, AN/URR-35 SERIES – CORRECTION OF BLOWER INSTALLATION

See article in AN/URR-13 section under the same title.

AN/URR-13( ) AND AN/URR-35( ) – REPLACEMENT OF AUDIO HEADPHONE

Jack, J-501, consists of a short frame, tip and sleeves, hex nut, metal washer, and a phenolic washer. When it is necessary to replace or repair this jack, care should be exercised not to replace the phenolic washer with a metal washer. Since the audio output at jack, J-501, is a balanced output, substitution of a metal washer in place of the phenolic washers results in shorting one side of the output to ground, causing a loss of audio output signal.

AN/URR-21 RCK REPLACEMENT OF ANTENNA CONNECTOR

It has been suggested that the Antenna-Input Jack J-101, Type 49120, in the AN/URR-22A and RCK (receivers) be replaced with the current standard type, UG-160C/U (SNSN N17C-73115-8494). This change conforms with the general policy of standardizing antenna-input connectors on all shipboard-communication receivers. It also permits proper termination of the outer conductor and armor on coaxial cables, thereby reducing antenna-line losses for the receivers.

Figure 1 provides details for installing a UG-160C/U and applies to the AN/URR-21A and RCK.

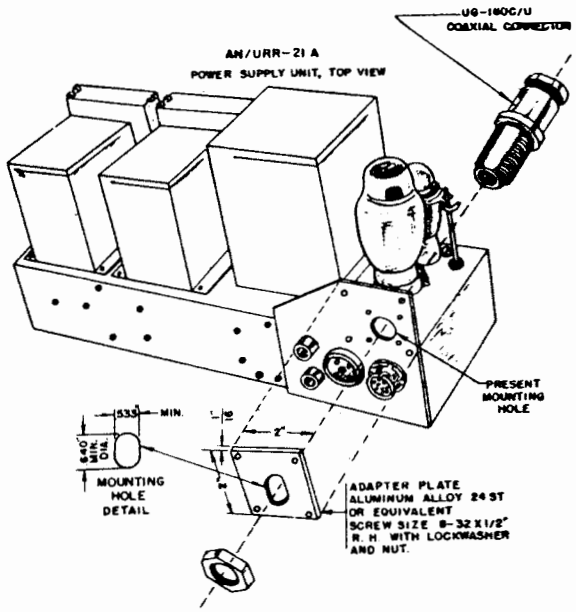


FIG. 1

AN/URR-13( ) AND AN/URR-35( ) – REPLACEMENT OF AUDIO HEADPHONE JACK, J-501

Refer to article in AN/URR-13 section under the same title.

AN/URR-35 RECEIVERS–UHF COMMUNICATIONS IN EXCESS OF 50 MILES LINE OF SIGHT–UHF MAINTENANCE HINT

The Naval Ship Engineering Center, Norfolk Division (NAVSECNORDIV), has been informed that problems exist in the area of shipboard UHF communications with respect to distance, even through the sensitivity of Receiver AN/URR-35 is 1 or 2 microvolts for 10 db S+N/N ratio.

Normal UHF communications distance can be defined as 40 to 50 miles at an altitude of 10,000 feet (line of sight) or 13 miles surface to surface. Ranges in excess of these, however, can be expected. If these conditions cannot be met, the complete installation should be checked. The following suggestions relate to problem areas found on various ships surveyed.

The main problem results from misalignment of the IF strip. The frequency tolerance given on a UHF transmitter is ±10 KC of center frequency. In some cases, the AN/URR-35 IF strip was found to be peaked as much as +37 KC off center frequency. NAVSHIPS 92022, Section 7, para. 4b to 4e, calls for an alignment frequency of 18.602 MC. To get this frequency within a tolerance of ±1 KC, it is mandatory to monitor the signal generator output with an accurate frequency meter (±300 cps) or a digital readout counter. This method of assuring frequency accuracy is seldom used.

After assuring the correct frequency is being provided by the signal generator, it is necessary that probe H-502 or H-203 be used to load the primary and secondary of the IF transformers. The procedure outlined in NAVSHIPS 92022, Section 7, para. 4a(4), must be followed to obtain a band pass of 80 KC at 2db.

NOTE: It is mandatory that probe H-502 or H-203 be used. If these probes are not available, it will not be possible to properly align the IF strip. **Substitute probes definitely are not to be used.**

The next problem becomes evident when better communications can be established on manual rather than crystal mode of operation. This indicates that the tracking of the RF oscillator with the RF amplifier is out of tolerance. Tracking can be corrected by following Section 7, para. 4f(1) through 4f(23). After the low and high ends have been tracked with crystals, the manual adjustment of L114 and C148 is critical. Hand capacity has to be compensated for and probe H501 or H201 may have to be inserted many times to adjust C148 for the final high end adjustment. This is well within the ET's technical ability.

After the oscillator and RF amplifier have been aligned, the following bench check is suggested: With the receiver set on MANUAL, squelch out, and volume at MAX, tune the AN/URR-35 from 218 MC to 400 MC. The output noise across the band should be at least +11 db, ±5 db, as indicated by meter M502.

NOTE: A crystal should be left in crystal holder XY201, during MANUAL mode of operation, because of its capacitive influence.

When tuning the receiver for crystal operation, place the ALIGN-REC switch in the ALIGN position and tune for a peak indication on meter M501 while observing M502 for a simultaneously, the receiver front end is properly centered in the IF bandwidth.

Following these suggestions and NAVSHIPS 92022 instructions, normal communications can be restored to the receiver.

If problems still exist, a critical review of the installation should be performed, checking the transmission line (via relay K104 in TED transmitter) to multicoupler CU-691 or CU-692 and then to the UHF antenna. Power and SW into the antenna should be checked if the transmission line or antenna is suspected.

If normal reception cannot be established or corrected, information concerning existing problems are requested by NAVSECNORDIV. (701)

AN/URR-35 SERIES – METHOD OF TESTING IF AMPLIFIER BANDWIDTH

NAVSHIPS 92022 does not have a method of testing the IF amplifier bandwidth, and it has been increasingly evident that all AN/URR-35 IF amplifiers require alignment. In the past, ships surveyed showed that the IF amplifier has been rocked off center frequency by not using an accurate frequency meter and/or swamping probe H502. EIB 701 explains the correct alignment procedures.

The following procedure can be used to check IF amplifier bandwidth after the alignment of the IF amplifier has been accomplished.

1. Adjust Signal Generator AN/URM-25 output to 100 microvolts unmodulated. Connect to Jack J101 of AN/URR-35. Tune signal generator for maximum on input meter M501.
2. Using a VTVM, read and record the voltage at AGC test point J204.
3. Increase signal generator to 200 microvolts and tune signal generator to each side of resonance until the same voltage exists as recorded. Connect a digital counter to the 1-volt output jack of the AN/URM-25 and read direct. An 80-KC bandwidth is acceptable (at the 6 db points). Read from each side of resonance. (EIB 713)

PROPER RESPECT FOR TED/-AN/URR-35 UHF EQUIPMENT

The TED-AN/URR-35 UHF equipment is obsolete communication equipment that will become more obsolete before it is finally replaced. Whenever this equipment is used, the operator and technician should treat it with the same respect and care as he would give to an old couple who have led a long and useful life. For instance:

1. Never separate the combo. They were meant to work as matched pairs and, if you separate them, don't be surprised if they let out a loud protest (squeal due to feed back).

2. Both these old folks (TED-AN/URR-35) use a crystal for deriving their frequency. These crystals will operate within their designed limits (measured on BASE LINE circuits to be ±20 Khz). Because of the limitations in accuracy of their crystals, the old gal (URR-35) must use an IF passband of at least 80 kilohertz. To get this passband, the interstage circuits of the second IF use four separate tuned circuits. Each circuits is tuned to the same center frequency, but they use over coupling to broaden the IF bandwidth. The instruction book procedure for alignment REQUIRES that an alignment probe (Part #H-203) be used to reduce the Q of the coupled circuits to insure that the circuit is tuned for the center of the response curve and not for one of the humps. If the probe is not used, the IF passband can be reduced to 20 Khz and the receiver will not receive more than one-half of the stations on a net. Do not attempt to align by using the second IF frequency of 1.775 Mhz. The first IF frequency must be used as specified in the instruction book, otherwise you will not account for the frequency of the 2nd local oscillator.

3. The old gent TED is a bit shakey in his knees. If you tune his crystal for the peak output, the old boy is teetering on edge of a steep slope from which he is liable to fall. Procedures call for backing off to a place on the gently sloping approach to the peak.

4. From the instruction book procedures for alignment of old TED, you may get the impression that TED will track across the frequency band at top performance throughout. The truth is that you will undoubtedly have to compromise some performance at one end of the band to get comparable preformance at the other end of the band. The tedious procedures in the instruction book of going back and forth from one end of the band to the other is designed to half the errors and, in that way, arrive at the correct compromise.

5. The old girl (URR-35) can operate in a continuous tune mode. If you force her into this position you take away the crutch (crystal) that she uses to maintain stability. If you use her in the continuous tune mode, do not be surprised if she drifts off frequency.

6. The power output meter on dear old TED is an average voltage reading device. This meter WILL NOT INDICATE PRESENCE OF MODULATION. The average voltage of a steady carrier and a modulated carrier are one and the same unless the carrier is OVERMODULATED.

7. The correct alignment of the URR-35 in widening bandwidth will result in a lower sensitivity for the receiver than if the receiver were incorrectly aligned to a narrow bandwidth. This mature URR-35 won't complain about this because she realizes that you don't get something for nothing. (Technically, this is called the principal of Gain/ Bandwidth product).

8. TED's modulation circuits were built for VOICE signals. If TED is going to be used for transmitting multiplex teletype signals, it is required that his voice clippling circuit be disabled with the internal switch placed for this purpose. Disabling this same clipping circuit could save occasional grief when TED is used with the SGC-1 for teletype transmission.

OLD TIMERS SHOULD BE TREATED WITH CARE AND RESPECT AND NEVER TAKEN FOR GRANTED. (736)