AN/SPS-39, 42 RADAR-IMPROVED TWT OPERATION

The following checks should be carefully followed if there are troubles in the driver-amplifier area. The procedure applies to all AN/SPS-39, -42 radar systems.

1. **Action**

a. Open 10 KV circuit breaker--BE SURE 10 KV SUPPLY IS DISCHARGED--then calibrate the filament voltmeters against **actual filament transformer secondary voltage with the TWT's in the circuit.** A test meter with 5 percent accuracy in the range 10 VAC should be used to measure the secondary voltage at the filament transformers.

Suggestion: A calibration curve may be prepared or, an appropriately rated high-resistance potentiometer may be placed in parallel with the 701 filament meter multiplier resistor to effect calibration. Adjust potentiometer until the 701 meter indicates the same voltage as the test meter across the secondary. The potentiometer may then be permanently replaced with a fixed precision resistor of the same resistance.

b. Check TWT blowers for proper operation.

c. Check peak pulse voltage at the TWT's to ensure proper pulse amplitude. Use the decade voltage taps in the 701 unit to set the voltage properly (see alinement procedure in technical manual). If proper instrumentation is available (e.g., high-voltage-precision capacitor divider), check the accuracy of the power-supply meter versus pulse amplitude, taking the 701 decade divider into consideration. Check and note the amplitude and division ratio accuracy of the pulse available at 078 TP-5 and TP-6.

d. NEVER OPERATE THE TWT's WITH REDUCED PULSE VOLTAGE. Reduced voltage operation results in defocussing, localized heating, and gas evolution in the TWT.

e. If the monitor pulses at 078 TP-5 of TP-6 evidence jitter, pulse splitting, or unusual waveform, the unit **may** be tending to oscillate. Operation with this condition may exceed the duty cycle of the TWT's. This condition is related to malfunction of the 078 unit, and may result if the high-voltage wiring and/or grounding in the 078, 132, 701 subgroup is improper.

f. The 078-pulse capacitors should be checked for d.c. leakage current. This leakage will result in a steady d.c. voltage on the TWT's, which may contribute to failure from defocussed helix current, or excessive duty cycle.

g. Rotation of operational and spare TWT's through the system may be programmed every 200 hours. Although this increases the paperwork necessary in logging lifetime, it will significantly reduce the possibility of spare TWT's "going to gas" during extended periods of extended shelf life.

2. **Performance Records**

a. Presently, an effort is being made to evaluate the reliability of the TWT. It is recommended that accurate records of operating time and filament time be kept on all TWT's.

b. When a TWT is replaced, the time data and other pertinent information should be forwarded to ESO with this notation:

"Please forward time data to:
Hughes Aircraft Company
ATTN: Microwave Tube Division
11105 Anza, Los Angeles,
California"

c. The failed TWT should be returned to ESO for evaluation by the contractor. Mark tube (for GFE Stores (HAC)."

SUBSTITUTE VARIABLE RESISTOR FOR AN/SPS-39/42 (XN-1)

Resistor, Variable, Motor, FSN 5840-575-0373, Part No. 719299-67, used in AN/SPS-39(XN-1), AN/SPS-42, and AN/SPS-42(XN-1) radars, circuit symbol 311Z1, is no longer carried in the Supply System.

Instead, Part No. 719140-2, FSN 5905-777-3494 will be carried. The latter part is presently installed in AN/SPS-39, 39A equipments, and is supplied with mounting bracket for installation.

AN/SPS-39, 42 RADARS TWT OPERATION--SUPPLEMENTARY INFORMATION (132 POWER SUPPLY ADJUSTMENT PROCEDURE)

The bias current and zero adjustment procedures Technical Manual, NAVSHIPS 93390, Section 3, for the 132 power supply are being revised. The correct procedure is as follows:

1. TWT 7 KV Power Supply Adjustment (272 Cabinet):

NOTE: For this adjustment, use d.c. voltmeter of plus or minus 5 percent accuracy.

a. Adjust 32R5 for 5 VDC between 132TP2 and 132TP1.

b. Connect a jumper between 132TP2 and 132TP3.

c. Adjust 132R12 for highest TWT voltage call-out (see Part 2).

d. Remove jumper.

e. Adjust 132R12 for the voltage obtained in step c.

2. TWT beam voltage adjustment:

The correct beam voltage for each TWT is called out on the tube nameplate assembly. The small signal call-out is to be used in TWT No. 1 (701V1) position and the large signal callout in the TWT No. 2 (701V2) position.

After the beam voltage has been set up for TWT No. 2 (701V2), the beam voltage is adjusted (lowered) for the first TWT by shorting, at terminal board 701TB3, one or more of the series TWT cathode resistors. The remaining resistors than drop the applied pulse voltage to the correct value. The step-by-step procedure is as follows:

a. Subtract the value of the small signal voltage on the 701V1 nameplate from the large signal voltage on the 701V2 nameplate.

b. **With the system turned off and the 132 power supply discharged,** connect the 701V2 jumper on TB4 for zero series resistance (Zero Voltage difference), and the 701V1 jumper of 701TB3 to the terminal labeled with the voltage most nearly equal to the difference voltage obtained in step 2.

c. Thereafter, operate the system with the 132(7KV) power-supply high-voltage set at the large signal voltage on the 701V2 nameplate.

Reference: Hughes Aircraft Company Field Bulletin, file 2:S-39/42.2.106, Revision 1, dated 23 February 1961.

KY-59/SRR-4 "CROSS-TALK"

Field reports indicate that the cosine blocking oscillator is occasionally fired by the sine blocking oscillator due to "cross talk" in the cable wiring. In cases where this trouble is noted, relocate wire numbers 443 from T-501-5 to E-902-12 and wire number 258 from E-902-15 to XV-709-6. This may be accomplished by running a wire along the route of the cable. The original wire should then be clipped on the four points where it leaves the cable.

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, S60-0-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.

AN/UPA-24 DISPOSITION OF DEFECTIVE RELAYS

Numerous reports have been received indicating failures of the nine switching relays, K-401 through K-406 and K-501 through K-503 (FSN N5945-510-0550).

Until further notice, using activities are requested to ship the defective relays, made by Brubaker, direct to: Brubaker Electronics, Inc. 9151 Exposition Drive, Los Angeles 34, California.

Relays of the above types when made by other manufacturers should still be disposed of in accordance with Chapter 67, Bureau of Ships Manual.

Continue forwarding failure reports to the Bureau.

AN/UPA-24 TERMINATING RESISTORS

Equipment serials 1034 and above are being shipped to the field with terminating resistor R-105 grounded and R-115 ungrounded. Since these equipments should be terminated for private line operation, the R-115 must be grounded and the R-105, ungrounded.

AN/UPA-24 RELOCATION OF MODE 2 JACK

AN/UPA-24 equipments above serial number 1033 have a recessed coax connection panel with jacks spaced too close to allow the use of T connectors.

The jack marked, "Mode 2", should be moved to a position about 1½ inch (centered) below the radar "in" jack, thus allowing sufficient space to utilize "T" connectors. The hole remaining should be covered with a snaphole plug. This modification does not involve any change in the operational characteristics of the equipment.

TESTING OF AN/UPA-24 VIDEO DECODER

Before testing the AN/UPA-24 Video Decoder refer to Bureau of Ships Instruction 09672.20, serial 961-06 of 1 April 1954.

KY-80/UPA-24 CABLE MARKING CORRECTIONS

Some cables in KY-80/UPA-24, serials 1034 and above, may be reversed while others may have reversed marking tags. Where cables W604 (RDR IN) and W605 (Output) are reversed, interchange the cable tags and connect the cables to the proper jacks. The cables should also be interchanged under the strap so they will be in the same order as the jacks.

Cable tags, where necessary, should be interchanged between cables W601 and W602. A pencil notation of the above information should be made to figures 3-6 and 7-11 in the Technical Manual for Decoder Group AN/UPA-24, NAVSHIPS 92119 (A).

AN/UPN-7 ELECTRON TUBE REPLACEMENT

Use **only** General Electric Type GL-2C39-B or GL6897 tubes when replacements are needed in the cavity of the AN/UPN-7 equipment, since design does not permit use of other manufacturer's tubes.

AN/UPN-7 RADAR TRANSMITTER GEAR REMOVING STAND

A description of a Gear Removing Stand for replacing the small gears on the AN/UPN-7 transmitter cavity has been submitted. Prior to this innovation, if the gears on the cavity became damaged or unserviceable, it was usually necessary to replace the entire cavity assembly. The tedious and ticklish task of removing the gears is simplified with the introduction of this gear pulling stand, which makes it possible to repair and return to service transmitter cavities usually discarded. The stand provides a safe method of removing the gear pins and gears without damaging the shaft or other small cavity parts. This repair aid can be locally fabricated from scrap sheet-metal plate, and without the use of special tools or machinery. Figure 1 illustrates the measurements for the fabrication of the gear removing stand.

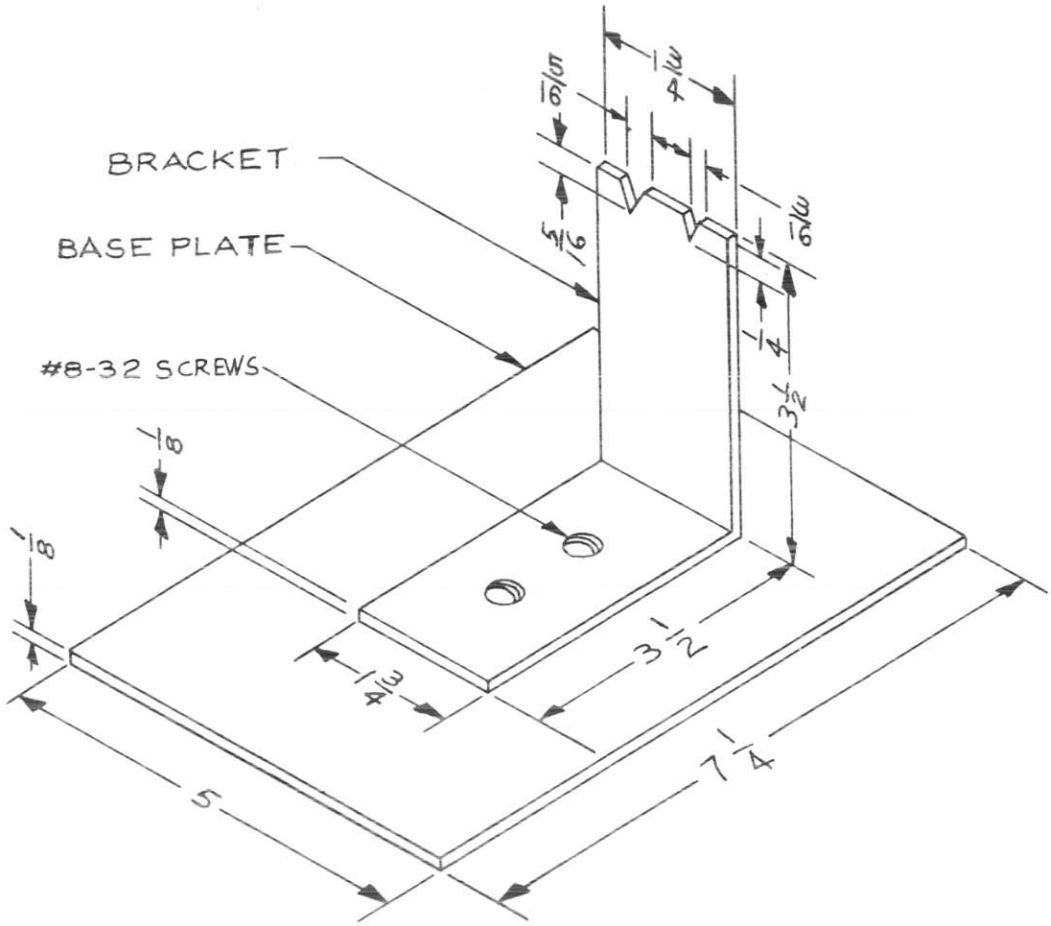


FIGURE 1

Submarine Antenna System for Loran

Submarine installations 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.

AN/UPX-1 BLOWER MOTOR ASSEMBLY REPLACEMENT

The following suggestion will substantially reduce the time required to change the blower motor in AN/UPX-1 equipments.

In the existing installation the blower motor bracket is secured to the back of the cabinet, requiring the removal of the cabinet and associated wiring in order to replace the blower.

The suggested change replaces the two machine screws holding the blower bracket with longer screws. Shake proof washers and hex nuts are run down and tightened, after which the bracket and motor blower is set in place and secured with shakeproof washers and hex nuts. (See figure 1).

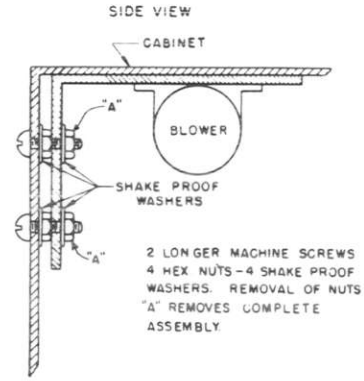


Figure 1

AN/UPX-1 RADAR RECONGNITION SET

The following suggestion is recommended for adoption by all installing and fleet activities.

Place a prick punch lock on the panel bushing and locking nuts of Radar Recognition Set AN/UPX-1 to prevent loss of the panel captive screws.

AN/UPX-5 HIGH VOLTAGE TEST POINT

A plus 300-volt test point should be located topside of KY-88/UPX-5 near C-654 for the purpose of measuring this voltage without removing KY-88/UPX-5 from its cabinet.

The Bureau concurs in the need for this test point and recommends the following installation procedure: Locate a test point 1/2-inch to the left of R-561 and R-574. Run a red lead from the high side (nearest chassis) of R-570, which is located on Terminal Board E-510, to the test point. The new test point should be marked "J-511 (plus 300 volts)".

A pencil notation should be made in the appropriate part of NAVSHIPS 91836 (A).

AN/UPX-5 LOCATION OF ANTENNA ASSEMBLY AS-177/UPX

From a study of photographs of antenna installations, it has been found that Antenna Assembly AS-177/UPX used with the AN/UPX-5 equipment is in a more obstructed location than the position occupied by the AS-177/UPX used with the AN/UPM-4, -6 equipments (radar test set).

Suppose these photographers are mislabeled. The antenna used with AN/UPX-5 should be in the most unobstructed location obtainable for any Antenna Assembly AS-177/UPX. The less favorable location should be used for the test equipment antenna.

DETAILS OF AN/UPX-5 CABLE OBSTRUCTION TO BLOWER FAN

Five coaxial cables and two multiconductor cables going from terminals E-501, E-502, E-503, and E-504 of the KY-88/UPX-5 drawer to terminals E-511, E-512, E-513 and E-514 inside the KY-88/UPX-5 case may come in contact with the blower motor fan blades or the drawer guides after the drawer is opened and closed during routine maintenance.

These cables should be checked for signs of damage and to see that they roll straight back when the drawer is closed. If they are twisted or slope to the left or right, corrective action must be taken to prevent such damage.

If the fan blades strike the cables, it may also impair the fan operation and result in inadequate ventilation of the AN/UPX-5.

AN/UPX-5 BENEFICIAL SUGGESTIONS

A method has been proposed for testing the enabler circuit of the KY-88/UPX equipment, using a locally built gate chassis. However, since this circuit is not used now or expected to be used, a testing method is not applicable. If the enabling circuit is used in the future, the AN/UPM-4 Series equipment will be modified to provide the necessary gate for checking the circuit.

AN/UPX-12

It has come to the attention of the Bureau of Ships that certain AN/UPX-12 equipments are inoperative, but the cause is not apparent. In some cases, the cause has been found to be switch S-401, located in the center of the decoder chassis, in the "NOR" position. For SIF operation, it must be set in the counterclockwise, "SIF" position.

AN/URD-2, DBF-1 MEASURE TO INSURE SAFE ANTENNA FOUNDATION

A nearly fatal accident occurred on board a ship, when the antenna foundation of Direction Finder Set AN/URD-2 broke loose from the mast while the antenna was being cleaned.

This type of antenna is attached by means of setscrews to a stud welded to the top of the mast. In this case, the weld broke - causing the antenna and the man working on it to fall. A BUSHIPS Instruction is being prepared which directs an immediate inspection of the foundation studs of antennas of AN/URD-2 Series and DBF-1 equipments to insure safe conditions of the weld and alteration of the foundation in future installations to provide greater safety.

A recommended interim safety measure is the removal of the antenna from the mast whenever rountine cleaning and maintenance is required. The light weight (33 pounds) and ease of connection renders this a practical procedure. Care must be taken to reinstall the antenna with the same for-and-aft alinement by scribing marks on the antenna and foundation before removal.

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.

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.

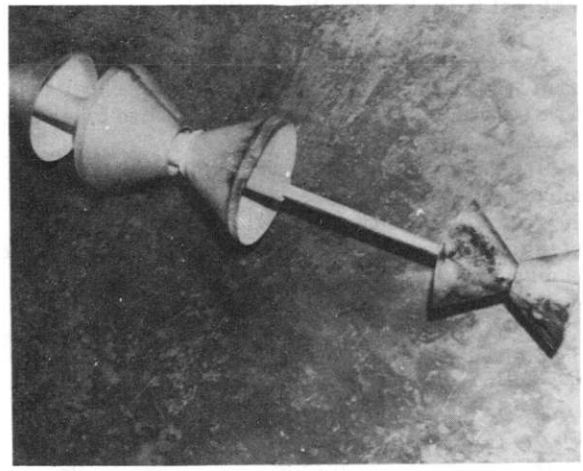
Bench-Testing of Unit

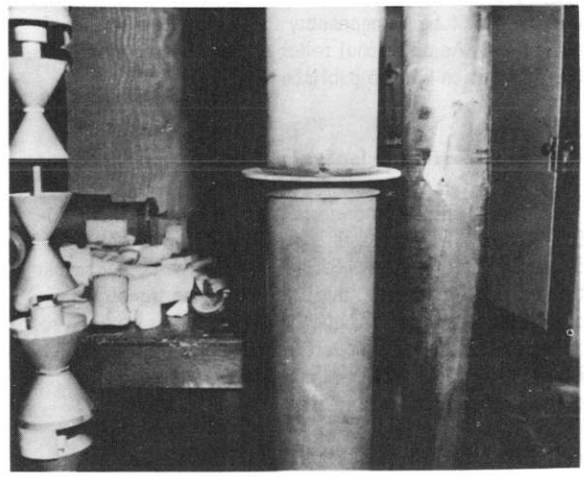
Before reassembly of the antenna, a shop test was given to all motors, synchros, and generators. The antenna was then reassembled and bench-tested before installation.

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.





AN/URN-5 LUBRICATION OF IDENTIFICATION KEYER GEAR BOX

To prevent failures in the keyer gear box of the AN/URN-5, activities concerned should disassemble and clean the box, at least every three months. Reassemble and fill the gear box with new oil (approximately one teaspoonful of low volatility aircraft instrument lubricating oil, Stock Number R-14-0-1400). During reassembly, it may be necessary to paint the gear box flange with glyptol to prevent oil leakage.

Several reports of keyer gear-box failures, which resulted in damage to the shaft on the first large reduction gear, indicate that the grease packing probably became hard with age. Lubrication of the bearing depends upon this grease packing.

The equipment contractor is now preparing an addition to Section 6-2 (Lubrication) of the Instruction Book for AN/URN-5, NAVSHIPS 91766. Pending this action, the above measures should be taken to forestall keyer gear-box failures.

USE OF AN/USM-25 A OR B FOR CALIBRATION OF RADAR INDICATORS

BACKGROUND:

The Bureau is aware of the problem of the lack of adequate test equipment at some facilities to perform range calibration of the radar indicators. The AN/USM-25 series oscilloscopes may be used to perform this calibration operations in the event that other equipments, allowed for the task, are not readily available. The following method may be used to calibrate the range markers on any of the various Navy radar indicators whose operating repetition rate and other critical parameters fall within the operation values of the AN/USM-25 series oscilloscope.

METHOD:

1. The prime requisites in alignment of radar indicators are:

a. A trigger source of proper characteristics compatible with the indicator.

b. An indication, in time, from initiating trigger. This is accomplished in practice by use of an oscillator that is crystal controlled.

2. The Handbook of Service Instruction AN/16-30 USM-25-2 will be referred to as T.M. (technical manual). The AN/USM-25, A or B will be referred to as OS-4A/AP.

3. Because of the dual output of the OS-4A/AP, this procedure is divided into two parts. Part I is the more accurate and desirable method. This procedure will apply to OS-4A/AP or B.

4. Enclosed graphs are furnished for converting microseconds to yards or miles. The mile used is based on 2000 yards or 12.2 microseconds.

5. Part I - Marker Method

a. The OS-4A/AP must be inspected to determine the marker generator crystal installed.

(1) The 100-kc. crystal will generate markers at 10-microsecond intervals or counted down (5-1) at 50-microsecond intervals.

(2) The 81.94-kc. crystal will generate markers in 2000-yard (1-mile) intervals; or counted down, at 10,000-yard (5-mile) intervals.

(3) As issued the OS-4A/AP will have the 100-kc. crystal installed. It may be used in this condition or converted to the 81.94 kc. crystal. The 81.94-kc. crystal is carred in the ACCESSORIES CASE, CY = 1404-OS4, or CY-1456-OS4A or B. The procedure for conversion is contained in T.M. page 56, paragraphs 6-40 and 6-41.

b. The accuracy of the markers should be checked following T.M. page 27 paragraph 5-11, prior to use or at routine intervals. Adjustments if required, will be found in T.M. page 48, paragraph 6-21, and page 55, paragraph 6-22 and 6-23.

c. Connect OS-4A/AP to 115V 60 cycle single phase a.c. power outlet. Ground equipment case for your protection. Turn on. Allow a 15-minute warmup to ensure stability.

d. Disconnect the video input from the indicator to be calibrated. Connect a coaxial cable (RG 59/U) to the video input connection. The opposite end connection must be made with a BNC fitting (UG 260/U). The cable must be of sufficient length to reach the OS-4A/AP.

e. Disconnect the trigger input from the indicator. Connect a coaxial cable (RG 62/U) to the trigger input connection. The opposite end connection must be made with a BNC fitting (UG 260/U). The cable must be of sufficient length to reach the OS-4A/AP.

f. Set controls on OS-4A/AP as follows:

(1) SYNC SELECTOR to A-R, INT.

(2) SWEEP SELECTOR to "A" sweep.

(3) A-R TRIGGER POLARITY to + or -dependent on trigger requirements of the indicator..

(4) INT TRIGGER RATE to approximate rate required by indicator.

NOTE:

This control is variable from 40 to 3300 p.p.s.; from about 20 percent to 90 percent of rotation it is linear. The frequency between these points is approximately 50 to 3000 p.p.s.

(5) MARKER SWITCH to + or - 2Kyds/10 microseconds dependent upon polarity of video requirements of the indicator.

g. Energize the indicator. Set sweep length (RANGE) to a value of less than 10 miles, but not below 2 miles. Turn marker control off or at minimum setting. Set all other controls for normal operation.

h. Connect the cable connected in step d (indicator trigger input) to OS-4A/AP "A" trigger output jack. A sweep line will now be obtained on the indicator. An increase in intensity may be required. After sweep is observed, turn intensity down until sweep line is faintly visible.

i. Connect the cable connected in step c (INDICATOR VIDEO INPUT) to the OS-4A/AP marker output jack. Increase video gain and/or intensity markers from OS-4A/AP are visible along the sweep line.

j. OS-4A/AP markers, in yards, appear as bright pips at each mile along the sweep. Turn the indicator markers at lowest intervals. Using the instruction book for the indicator being calibrated, adjust indicator markers to coincide with proper markers from OS-4A/AP. It microseconds markers from OS-4A/AP are used, select proper point from attached graphs or compute proper markers.

k. Beyond about 5 miles or when markers become difficult to distinguish, shift markers switch on OS-4A/AP to 10Kyds of proper polarity. Align indicator markers with markers from OS-4A/AP. The OS-4A/AP markers will now appear at 5-mile intervals.

l. Beyond 100 miles (twenty 5-mile markers from OS-4A/AP) is not recommended due to the difficulty in observation. The strobe method (part II) is recommended at these ranges.

m. The indicator range strobe may now be adjusted to correspond to the indicator range marks.

6. Part II - Strobe Method

a. This method may have errors introduced by non-precise observation and therefore is not recommended for inexperienced personnel.

b. Accomplish steps a and b of Part I.

c. The accuracy of the strobe output must be checked as described in T.M. page 27, paragraph 5-11. Adjustment of this circuit will be found in T.M. page 32, paragraphs 5-17 through 5-29. The strobe should also be checked against the OS-4A markers. The markers have crystal accuracy; the strobe does not. This check should be on range selector settings of MS x 1/yds x 10K, MSx 10/yds x 1K, and MS x 100/yds x 10K; there is no strobe in fast sweep.

d. Complete steps c through h of part I.

e. Connect cable connected to indicator video input (Step d, part I) to "R" trigger output jack.

f. Set RANGE SELECTOR to MS x 1/yds x 100 or as desired from the following calculations: By adjusting "R" delay microseconds (RANGE) there will appear a traveling strobe on the indicator. The range of this strobe will be: Range from "R" delay dial times RANGE SELECTOR SWEEP RANGE plus or minus error found in step c above. By computation or from graphs, accurate points may be selected to correlate microseconds to range in yards.

AS-494/FRN-12A MAINTENANCE NOTE ON ANTENNA ASSEMBLY

The AS-494/FRN-12A, a complex electromechanical antenna assembly, is the "heart" of the AN/FRN-12A system. Apparent, minor defects which are commonly overlooked, such as loose cage rods, corroded connectors, or water-logged cable dielectric will adversely effect equipment pattern stability. These conditions will cause radical inaccuracies and possibly result in a hazard, rather than an aid to air navigation. Frequent inspections and preventive maintenance measures are necessary to prevent such conditions and assure correct performance.

LUBRICATION OF THE ABI UNIT OF MODEL DAK SERIES EQUIPMENTS

It has come to the attention of the Bureau that many ships are either failing to lubricate or overlubricating the rotating assembly in the ABI unit. Neither condition is desirable and may cause defects in the operation of the equipment.

There are two lubrication points in the ABI unit and these are clearly indicated in figure 85 on page 94 of the model DAK-2 instruction book. Both the front and the rear bearings should be lubricated once a week. The Navy type OS-1113-D oil is preferred over the Standard Oil Company Univis #40, oil which is generally specified in the instruction books. No other type of oil is suitable for lubricating the ABI unit in the Navy models DAK, DAQ, DAU, DAJ, and DAH direction-finding equipments. If Navy type OS-1113-D is not available aboard ship, the Univis #40 oil should be requisitioned through regular supply channels.

Attention is invited to the fact that the front bearing is made of Oilite which is a porous material containing in its structure approximately 25 percent oil by volume. In addition, it has a felt-packed oil well at the bottom of the bearing structure to act as an additional reservoir. Due to the porosity of the bearing it is not necessary that oil, when added, be applied to bearing surfaces. A channel is provided from the oil hole at the top of the bearing around the inside of the bearing cap to the oil reservoir at the bottom. It is not intended that oil be applied directly to bearing surfaces. Under no circumstances should the bearing be drilled to provide an oil hole. The rear bearing is of the ballbearing type and is lubricated through the snap cap on the lower bearing.

Attention is invited to the fact that the ABI unit must be kept scrupulously clean and free from excessive oil, copper dust, and carbon dust.

MODELS DAK/DAQ SERIES TROUBLE SHOOTING NOTES

The following paragraphs list a number of quick checks which will assist in tracing the trouble to a perculiar circuit. Following performance of these checks, the circuits suspected should be investigated, using the appropriate schematic diagram as a reference.

TROUBLE - All Pilot and Dial Lamps Out.
REMEDY - Failure of a-c power supply
Blown fuse.
Faulty OFF-ON switch.
Break in continuity of power cables, probably at plugs or in the vicinity of a sharp bend. Plugs must be seated firmly in their sockets and coupling rings on plugs must be tight.
Failure of filament circuit due to open or short.

TROUBLE - No Signal, Weak Signal, or Incorrect Indication
REMEDY - Failure of plate supply due to burned out or weak rectifier, poor contact at tube socket, break in continuity of power cable, shorted filter or bypass condenser in plate or screen circuit.
Faulty antenna connection. Check contact at plugs in connecting cables.
Ground or open circuit in junction box, goniometer, or interconnecting cables.
Weak or burnt out vacuum tubes, expecially type 6SH7 in DAQ.
Dirty contact in band switch. Contacts may be temporarily cleaned by rotating switch back and forth several times. Grease and dust may be removed with carbon tetrachloride.
Incorrect cable connection. Shorted trimming or tuning condenser.

TROUBLE - Noisy or Intermittent Reception.
REMEDY - Noise pickup by antenna system. Check by removing antenna (both sense and loop) and noting if noise is eliminated.
Poor joint in cable.
Worn gain control.
Defective contact in wave switch.
Poor contact at vacuum-tube socket. Noisy tube, due to loose weld.
Leaky bypass or coupling condenser.
Poor ground on shields.

TROUBLE - Fading
REMEDY - Reception of sky-wave signals.
Defective bypass or coupling condenser.
Thermostatic heater in vacuum tube, i.e. heater warms up then breaks and remakes connection after cooling.

TROUBLE - All Sense Indication Reversed in One Pair of Quadrants.
REMEDY - Transmission lines incorrectly connected at loop or junction box.

TROUBLE - Indicator Pattern Satisfactory with "Search - Instant Bearing - Sense" Switch on Instant Bearing but No Pattern on Sense or vice versa.
REMEDY - Open directional or sense deflection coils in ABI units. Remove power and check continuity between slip rings and replace defective coil.
Brush not making proper contact or pigtail broken. Check by visual inspection and/or ohmmeter check. Replace defective brush.

TROUBLE - All Sense Indications Reversed.
REMEDY - Deflection-coil assembly rotated 180° with respect to goniometer. Loosen locking screw and turn coupling adjustment until graduated ring has turned 180°.

TROUBLE - Receiver Tunes Signal Satisfactorily and Circle on ABI is Satisfactory, but No Bearings Can Be Obtained.
REMEDY - Cable number 12 open.
No receiver-indicator-channel output. Check receiver-indicator-channel output with deflection amplifier connected and indicator goniometer rotating. Required voltage is approximately 4 volts, DC. If no voltage, check circuits for defect.

TROUBLE - Saw Tooth or Jiggly Pattern on ABI.

REMEDY - Intermittent or poor contact at slip rings due to pitting of slip rings or low brush spring tension. Check adjustment of spring tension and clean slip rings.
Loose slip rings. Tighten slip-ring retainer.

TROUBLE - Pattern Oscillates on ABI.

REMEDY - Defective goniometer coupling.
Loose rivets holding spindle on rotating unit.
Leather coupling stretched out of shape.
High-voltage transformer leads 3 and 4 reversed.
Excessive beat-frequency-oscillator injection. In DAK-2 dress leads to S-201 and C-224 as far from each other as possible. In DAQ dress leads to V-105. Also coupling condenser C-221 in DAK not properly set. Adjust C-221 so that CW overload at 1000 cycles occurs at 25 miliwats.
Defective bearings in rotating unit or motor. Check for freedom of movement and replace defective bearings as required.
The a-c leads not properly located near the cathode-ray tube. Twist a-c leads and locate them away from tube.

TROUBLE - ABI Reciprocal Bearings Off.

REMEDY - Rotating shaft axes out of alinement.
Parts of indicator assembly magnetized. Demagnetize in accordance with instructions in instruction book.

TROUBLE - ABI Pattern Blanks Out at 90° and 270°.

REMEDY - Type 5 BPI cathode-ray tube used instead of 5NPI tube. Use only type 5NPI.

TROUBLE - ABI Pattern in Error by 45°.

REMEDY - Brush holders shorted across bakelite. Clean or replace.

TROUBLE - ABI Pattern Shifts With Time

REMEDY - Coupling in ABI unit loose. Readjust and tighten, inserting spacer if necessary.

TROUBLE - No Pattern on ABI.

REMEDY - Defective high-voltage transformer.
Blown fuse.
Defective 2X2 rectifier tube.
Defective cathode-ray tube or tube improperly placed in socket.

TROUBLE - Rounded Nulls on ABI Pattern

REMEDY - Deflection-sense control set too close to maximum. Set control as close to maximum as will give sharp points on pattern.
Excessive quadrature-voltage pickup on antenna system.
Low transconductance in 6AC7 deflection-amplifier tube.
Defective 6H6 indicator-detector tube.

TROUBLE - ABI Pattern Gives Circle at Center With No Signal Input.

REMEDY - Parts of indicator magnetized. Demagnetize as per instructions in instruction book.
Deflection-sensitivity control set back too far from maximum.

TROUBLE - Poor Sense Indication in Wet Weather on DAQ.

REMEDY - Leakage of moisture into antenna. Dry out thoroughly and coat all cable connections, leads to dummy loop, and dummy loop insulators with glyptol.

TROUBLE - Low-Leakage Resistance in DAQ Antenna on Megger Check.

REMEDY - Condensation of moisture in antenna and on terminal blocks. Dry out thoroughly and coat with glyptol.

TROUBLE - Poor Sense Pattern.

REMEDY - Unmatched transmission line.
Coils in sense-input stage of DAQ improperly adjusted. Sense coils should resonate above operating frequency of band.
Sense-balancing condenser C-305 improperly adjusted. Readjust.
Improper alinement of input stages in DAK. Realine in accordance with procedure outlined in instruction book.
Improper setting of goniometer gain control in DAK.

TROUBLE - Indicator Tracks Backwards.

REMEDY - Transmission lines or interconnecting cable interchanged or lead reversed.

TROUBLE - Sense Input Stage Will Not Aline in DAK.

REMEDY - One side of sense input cable grounded

TROUBLE - Directional Input Stage Will Not Aline in DAK.

REMEDY - One side of cable to directional input stage through junction box shorted to ground. Check lead to J-109.

TROUBLE - Reciprocal Bearing in Error on DAK Manual Indicator.

REMEDY - Balanced-modulator tubes unbalanced. Readjust R-127 as described on page 77 of DAK-2 instruction book.
Leakage of signal between sense and directional-input channels.
Axes of goniometer and dial shaft out of alinement.

TROUBLE - One Line on Manual Indicator in DAK Disappears.

REMEDY - Balanced-modulator tubes unbalanced.
One tube of balanced modulator defective. Replace both tubes and rebalance.

TROUBLE - Blanking Circuit of DAK Manual Indicator

REMEDY - Blanking Switch open.
Bias-supply voltage to cathode-ray tube low.
Defective cable 18.
Defective type 6SN7 tube (V-212).
Defective type 6AC7 tube (V-108 or V-109).

TROUBLE - Fuse Good, But Holder Caused Open Circuit.

REMEDY - Repaired by securing the locknuts holding fuse holder in place.

TROUBLE - Lower Bearing of ABI Unit Damaged Due to Copper Dust From Slip Rings.

REMEDY - Emergency repair maybe made by using SKF bearing 1202, item 195 in equipment spares for model SL radar.

TROUBLE - Excessive Oil, Copper Shavings, and Dust in the ABI Unit.

REMEDY - Follow lubrication and preventive-maintenance schedule.

TROUBLE – DAK. – Receiver Lost Sensitivity.
REMEDY – Found plate–filter capacitor C–106 to be shorted and R–104 to have burned out. Replace these two components and set operated normally.

TROUBLE – DAK–1.– Loss of Sense Determination.
REMEDY – Found loose connection in base of sense antenna between the sense antenna and sense cable.

TROUBLE – DAK–2.– Intermittent Operation of Automatic Bearing Indicator. Signals would appear and Disappear Leaving Only a Dot on the Oscilloscope.
REMEDY – Pin E on plug J–502 and pin D on plug J–403 were not electrically or mechanically connected to the cable. The leads were just touching the pins and no permanent connection had been made. This failure had apparently been caused by the operator's knee hitting the cable which caused intermittent contact of pin and leads. Pin E is the high–voltage return through the deflection coils and pin D is the common–ground connection between the two units.

TROUBLE – DAK–2. – Intermittent Operation of ABI Unit with Signals Appearing and Disappearing, Leaving No Trace on Cathode–ray Tube.
REMEDY – Found poor solder joint at pin E on J–502 and pin D on J–403 with leads from cable just touching connectors.

TROUBLE – DAK–2. – Failure of R–133.
REMEDY – The Short–wire lead between R–132 and R–133 shorted to ground, causing an excessive current to be drawn through R–133 and burning out this resistor. The wire was shorted to ground by being squeezed between the terminal board, which holds R–132, and the metal support for the terminal board.

TROUBLE – DAQ–Tracing on ABI Unit Became Very Broad and Could not be Focused.
REMEDY – Found to be due to R–255 becoming partially opened.

TROUBLE – DAK–3. During Calibration, the Matched Lines Would Not Go Up And Down but Were Excessively Long and Ragged.
REMEDY – It was noted that the trouble was present only when the nearby SU radar was in operation. The radar–pulse cable was grounded and conditions were much improved.

CUTTING ANTENNA CABLE FOR MODEL DAK, DAQ, AND DAU SERIES EQUIPMENT

The following information on the cutting of antenna cables for the Model DAK and DAQ series of Radio Direction–Finder Equipments and DAU series of High–Frequency–Radio Direction–Finder Equipments should be placed in all appropriate instruction books and all associated installation manuals now in force.

The three lengths of RG–24/U twin–coaxial cable to be used between the base of the loop and the junction box should be of the same electrical length to assure the same electrical–phase conditions for each cable. Past experience has indicated that adequate match in electrical length can be achieved by accurately cutting these cables to the same physical length, if the RG–24/U cable is in good condition. Whenever possible, this cable should be drawn from stock rather than taken from any cable originally supplied with the equipments.

After being cut, the cables should be installed in accordance with the appropriate instruction book. 4/1/49

ALINEMENT PROCEDURE FOR RECEIVING "S" RATE LORAN SIGNALS ON DAS–3 AND DAS–4

In order to receive "S" PRR signals on the DAS-3 or DAS-4 Loran sets the following is required:

Ascertain that the counter circuits are alined properly. Set the PRR switch to the "L" position and adjust the "D" control potentiometer to give ten sets of 2500-microsecond markers. Set the PRR switch to "H" position; if interaction is observed, adjust the "S" control potentiometer for six sets of 2500-microsecond markers and recheck the counter circuits. When a condition of ten and six sets of 2500-microsecond markers exists on the "L" and "H" positions respectively it is possible to receive "S" type signals on the "L" position. Foldover at the beginning of the sweeps may be observed, but this in no way affects the accuracy of the Loran reading. To return to normal operation, adjust the "S" and "D" controls to give six sets on the "H" position and eight sets on the "L" position respectively.

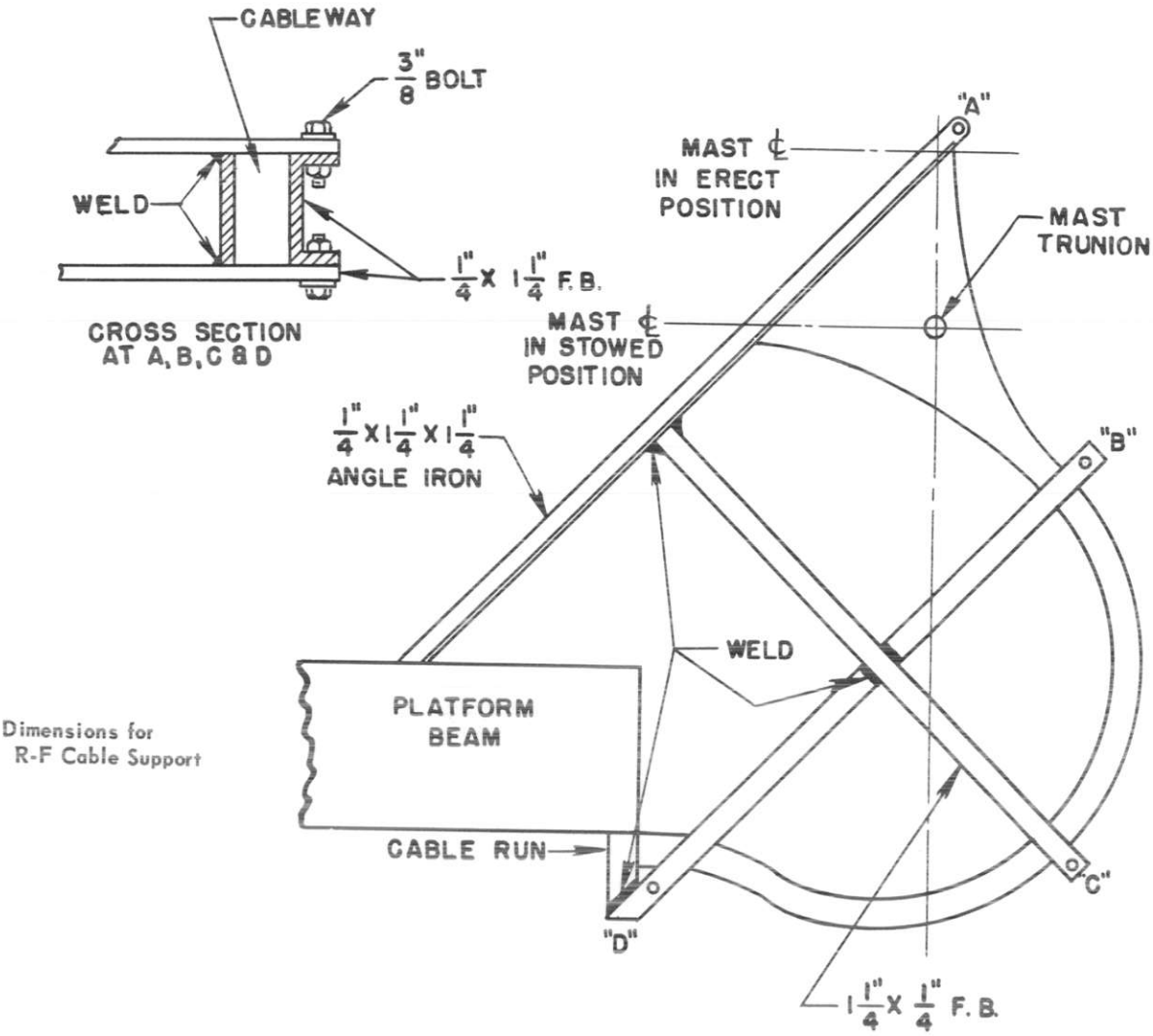
DAU IMPROVED DEVICE FOR RG/24U

An improved method for supporting Radio-Frequency Cable, RG/24U, at the fulcrum of the tilting mast of DAU equipment by means of a cable support. This method was used successfully for installing the DAU on the USS Essex (CVA9). The cable support is described herein is shown in figure 1. It requires only a 45-degree flexure of the cables on a long (20 in.) radius on each side of the straight position during the entire process of erecting and stowing the mast.

The present method of support involves a 90° bending of the cables. In addition, as no "working" slack-loop is required, the suggested device provides additional protection against mechanical damage. The present practice allows the lower end of the slack-loop to dangle unprotected from maximum-axis bending when the mast is erected.

The proposed cable support requires less cable since there is no slack-loop, and a minimum radius is used in bringing the cable-run from underneath the operating platform up to the mast. The cable support is stationary, and only the cable moves with the mast. A demountable outer guard on the cable support permits inspection or replacement of the cables.

The Bureau recommends the use of this suggestion for any future installations of DAU equipment on tilting masts in CV34 Class Carriers. The suggestion will be included in the next revision of the **Electronics Installation Practices Manual,** NAVSHIPS 900,171, as a guiding principle for future installations. As tilting masts are used on a relatively few aircraft carriers, installation plans will not be changed and modification of existing installations is not recommended.



Dimensions for R-F Cable Support

Figure 1

DEL DAU SERIES TROUBLE SHOOTING NOTES

The following paragraphs list a number of quick checks which will assist in tracing the trouble to a particular circuit. Following performance of these checks, the circuits suspected should be investigated, using the appropriate schematic diagram as a reference.

TROUBLE - Scan signal were unstable and impossible to read

REMEDY - Tests showed contactor ring in type CFT-55146 automatic-bearing indicator "bouncing" excessively in mount. Installed new ring and operation again became normal.

TROUBLE - Arcing and Sparkle at Brushes in ABI Unit, Making Bearings Impossible.

REMEDY - Traced to small piece of copper wire which fell behind slip ring and caused a ground. Cleared trouble by blowing out ABI unit with dry compressed air.

RADOME SECURED WITH CLAMP WHEN REMOVED ABOARD SHIP

A device to secure protective domes of DBM radar antennas when they are removed aboard ship has been suggested.

A chain and a modified C clamp hold the dome when it is removed from the antenna. The clamp is attached to the rim of the antenna dome, and the end of the chain opposite the clamp, which is equipped with a safety hook, is attached to a structural part of the ship.

This suggestion provides a safer means of retaining domes when they are removed for zeroing or repairing radars. It prevents hazards not only to the employees doing the work, but also the personnel below who are exposed if the dome is dropped or pulled loose by the wind.

SUBSTITUTION OF TUBE 6SA7 FOR TUBE 6SA7GT/G IN RANGE INDICATOR IP-99/SP

The following information concerning a source of difficulty with the Range Indicator IP-99/SP has been received.

A phantastron circuit is used to generate the range step in the IP-99/SP. The indicator was installed aboard the USS ALGOL with a type 6SA7 tube as V102, instead of the 6SA7GT/G specified by the Technical Manual (NAVSHIPS 91443). The substitution of the metal tube was not considered important, although the range step never operated satisfactorily. After much searching for the trouble, it was noticed that in the 6SA7GT/G, grid number 5 is connected internally to the cathode, while in the 6SA7, grid number 5 is brought out to pin number one. The tube socket (XV-102) has no connections to terminal No. 1. Thus, when the 6SA7 is used as V102, grid number 5 floats and accumulates a charge which causes erratic operation of the tube. The visible result is a jumpy, disappearing range step and inaccurate ranges.

Operating characteristics of the 6SA7 and 6SA7GT/G are similar, so if terminals one and six of tube socket XV-102 are connected together and the equipment is calibrated in the normal fashion, either a 6SA7 or a 6SA7GT/G may be used as V102.

KY-136/UPA-38, PREVENTIVE MAINTENANCE

A suggestion concerning corrective action to be taken on faulty eyelets on printed circuit board "A" has been approved.

It is recommended that a jumper of small-diameter wire be inserted in the eyelets, and the ends of the jumper be soldered to the inlaid conductors on each side of the board. This is to be done on all eyelets.

REDUCING INTERFERENCE FROM RADAR EQUIPMENT MK 25 MOD 3

A number of shipboard radio-interference reports have indicated the Radar Equipment Mark 25 Mod 3 as a source of radio interference to LF, MF, and HF radio receivers. The radar interference appears in the output of radio receivers as noise at the frequency of the radar pulse repetition rate. The major portion of the Mark 25 Mod 3 pulse-repetition-rate interference is carried topside by cables 232 through 236 and radiated in the vicinity of radio-receiving antennas.

Bureau of Ordnance letter RE4f-CJF:br S67 of 22 March 1954 revised the Mark 25 Mod 3 interconnection wiring diagrams to include the following changes:

This revision to the Mark 25 Mod 3 installation will reduce radiated interference from the Mark 25 Mod 3 radar if the replacement cables and copper braid are properly installed. The internal shield for the twisted pair in TTRSA-8 (cable 232) and TTRS-8 (cable 235) should be grounded at both ends as shown on Mark 25 Mod 3 Interconnection-Wiring Diagram. To insure maximum cable shielding, it is necessary to bond the cable armor on cables 232, 233, and 234 and the copper braid on cables 235 and 236 to the equipment at both ends. The dc resistance of the bond connection between the cable armor or copper braid and equipment should be less than .05 ohms.

This cable revision for Mark 25 Mod 3 can be accomplished on existing shipboard installations under the Radio Interference ShipAlt, provided this ShipAlt has not been completed.

OA-133/FRN-12A VHE OMNI-RANGE TYPICAL METER READINGS AND DIAL SETTINGS

In the following table are manufacturer's recommended, typical meter and dial readings for the OA-133/FRN-12A Omni-Range Transmitter:

Xtal Freq 12.7 MC Output Freq 114.3 MC

METER READINGS

Osc Grid	Buf Plate	Tripler Grid	Tripler Plate
2.4 MA	30 MA	7 MA	63 MA

IPA Grid	IPA Cath 1	IPA Cath 2	P.A. Grid	P.A. Screen	P.A. Cath 1	P.A. Cath 2
7.5	110	110	12	14	150	150

Line Voltage	Trans H.V.	Mod H.V.	Mod Cath	Mod Output
230 V	1850 V	1850 V	60 MA	0%

DIAL SETTING

Osc Grid	Buf Plate	Tripler Grid	Tripler Plate	Osc Amp Output
45	53	13	49	1/2 CCW

IPA Grid	IPA Plate	P.A. Grid	P.A. Plate	P.A. Neut Setting
29	60	30	44	74

Power output Hi - 220 Watts Power output Lo - 30 Watts
Rear of Transmitter Output Coupling adjust 1/4 turn CCW.
Output coupling loop from final tank (resonators) adjusted for maximum power output.

Xtal Freq 12.444 MC Output Freq 112.0 MC

METER READINGS

Osc Grid	Buf Plate	Tripler Grid	Tripler Plate
2.2 MA	29 MA	7.8 MA	65 MA

IPA Grid	IPA Cath 1	IPA Cath 2	P.A. Grid	P.A. Screen	P.A. Cath 1	Tripler Plate
6.9 MA	100 MA	100 MA	18 MA	15 MA	150 MA	150 MA

Line Voltage	Trans H.V.	Mod H.V.	Mod Cath	Mod Output
230 V	1850 V	1850 V	60 MA	0%

DIAL SETTING

Osc Grid	Buf Plate	Tripler Grid	Tripler Plate	Osc Amp. Output
2	25	7	25	1/2 Turn CCW

IPA Grid	IPA Plate	P.A. Grid	P.A. Plate	P.A. Neut Dials
15	55	2	23	77

Power output Hi - 220 Watts Power output Lo - 35 Watts
Rear of Transmitter Output Coupling adjust 3/4 turn CCW.
Output coupling loop from final tank (resonators) adjusted for maximum power output.

Xtal Freq 13.1 MC Output Freq 117.9 MC

METER READINGS

Osc Grid	Buf Plate	Tripler Grid	Tripler Plate
2.4 MA	28 MA	7 MA	58 MA

IPA Grid	IPA Cath 1	IPA Cath 2	PA Grid	PA Screen	PA Cath 1	PA Cath 2
5.3	75	75	15	25	170	170

Line Voltage	Trans H.V.	Mod H.V.	Mod Cath	Mod Output
230 V	1850 V	1850 V	60 V	0%

DIAL SETTING

Osc Grid	Buf Plate	Tripler Grid	Tripler Plate	Osc Amp Output
87	96	65	97	1/2 CCW

IPA Grid	IPA Plate	P.A. Grid	P.A. Plate	P.A. Neut Dials
49	80	47	75	70

Power output Hi - 230 Watts Power output Lo - 30 Watts
Rear of Transmitter Output Coupling adjust 1/2 turn CCW.
Output coupling loop from final tank (resonators) adjusted for maximum power output.

OS-54/URN-3

The high-voltage leads in the power supply OS-54/URN-3 are routed very close to the two rectifier tubes V-6576 and V-6577 which tends to melt the insulation causing the leads to short together.

It is recommended that the leads be re-dressed as follows:

Unsolder the opposite ends of the present harness leaving the power transformer, T-6576.

Right-angle each wire toward the rear of the chassis of the power supply OS-54 half-way down the transformer, than right-angle toward capacitors C-6577 and C-6576.

Route each wire between the capacitors toward and between the base of the 5R4 tubes (V-6576 and V-6577).

Re-dress each wire to its tie point.

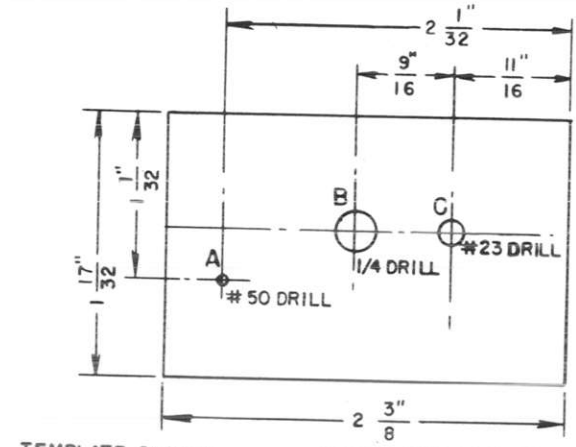
Replacing is only necessary from the transformer to the base of the 5R4 tubes.

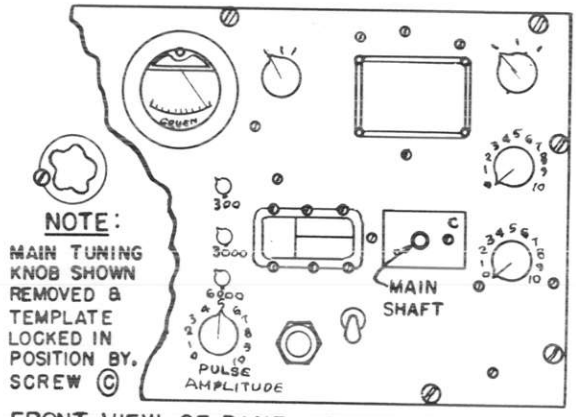
FACILITATING REPAIRS TO RDJ AND RDJ-1

It has been necessary to remove the front panel of Radar Pulse Analyzing Equipment RDJ to replace the limit stop of the eliptical sweep tuning capacitor when the stop becomes broken.

A method by which these pins may be removed and replaced without removing the front panel has been suggested. This can be done by modifying the present limit stop system as shown in the figure and by following the accompanying instructions.

This modification may be made when it will facilitate maintenance of the RDJ-1. In view of the obsolescence of the equipment, no field change will be issued.





FRONT VIEW OF PANEL (RDJ) SHOWING TEMPLATE IN PLACE

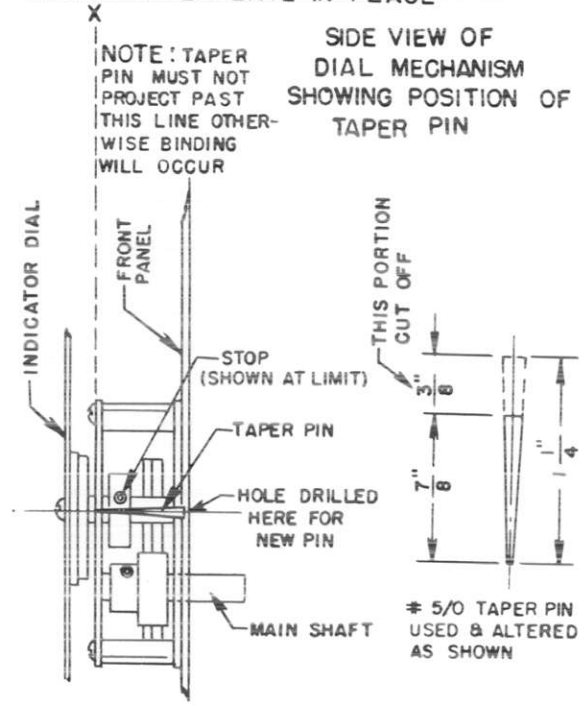


Figure 1

NRL REPORT ON OPERATION OF EXTERNAL TYPE DUPLEXER

The SA external type duplexer is shown schematically in figure 1. It consists of two tuned "tanks," these being connected by two line sections which are somewhat less than a quarter-wave length long to the ends of a quarter-wave section of line which is inserted in the main transmission line from transmitter to antenna. The designations of the tanks are descriptive of their functions. The protective tank isolates and protects the receiver from the high voltage transmitted pulse and prevents absorption of transmitted power by the receiver; the decoupler decouples the transmitter from the antenna line during reception, so the receiver signal energy cannot be lost into the transmitter circuits to a great extent.

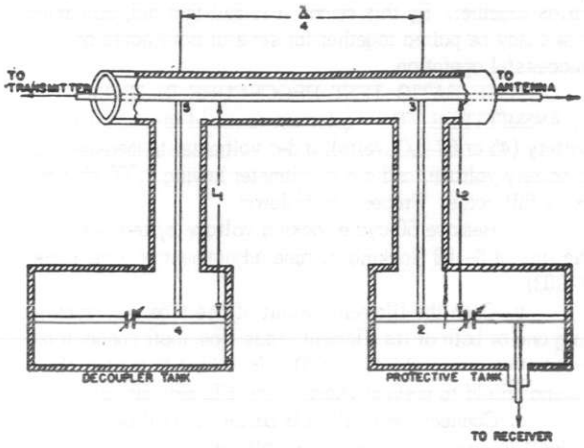


FIGURE 1.—External type duplexing system for SA equipment.

The tanks are identical except for the fact that the protective tank has an output connection for the receiver, while the decoupler has only the input connection. Each tank consists of a section of concentric line (larger in diameter than the connecting lines) short circuited at both ends, and with a variable spacing condenser connected in series with the inner conductor at the center. A tungsten-point spark gap is arranged coaxially with the condenser plates, so that the spark occurs across the condenser; i.e., between the two inner conductor sections. Spacing of the condenser plates and spark gap points are independently controlled.

During reception, operation of the system is as follows: The protective tank is tuned by its condenser to anti-resonance, and is equivalent to a one-to-one transformer between input and output circuits. When the receiver is connected, since its input impedance is 50 ohms, the impedance seen at point 2 is also 50 ohms; if the receiver were not connected a much higher impedance would be seen at this point, which means the losses in the tank itself are small. (This is exactly in accordance with ordinary transformer theory—the tank during reception is just such a thing.) Looking into the connecting line from point 3, the impedance seen is also 50 ohms, and the system is correctly matched to the antenna line. The length L_2 of the connecting line is immaterial for reception; it is determined by transmission conditions, as shown below. At the same time, in the decoupler tank, a high impedance is seen at point 4. (No output load is connected to this tank.) Since the length L_1 of the connecting line, adjusted for transmitting conditions, is less than a quarter-wave length its input will be reactive if the decoupler tank is tuned to exact antiresonance, and therefore this tank is actually tuned slightly off antiresonance, so that the system as a whole is brought into tune, and at point 5 a very low impedance is thrown across the line. Then at point 3, a quarter-wave away, a high impedance will be seen looking into the branch to the transmitter, and little of the received signal energy will be lost into this branch.

During transmission, the spark gaps in both tanks, fire, and their shunt resistances detune the circuits. The impedances seen at points 2 and 4 are then equivalently very small resistances in series with moderately small inductances. The lengths L_1 and L_2 of the connecting lines are adjusted to resonate with these impedances, and we see at points 3 and 5 high impedances looking into the branch lines, because of the transforming property of these line sections. The length of each of these lines is actually somewhat shorter than a quarter-wave length because of the inductive termination. Very little power is absorbed by the branch lines because of the high impedances at points 3 and 5. The decoupler tank and associated line now perform no useful function; they simply amount to a low loss shunt on the main line. In the case of the protective tank and line, the main line voltage at point 3 is transformed by the connecting line to a much lower value at point 2, and this is further stepped down along the tank itself to a value at point 1 which may be safely applied across the receiver input.

Tuning of the duplexing system is very simple. The spark gaps are set to spacings of around 0.010 inch to 0.015 inch, and the radar equipment is put into operation. An isolated echo is selected and adjusted to small amplitude by the receiver gain control. The tuning condensers on each tank are then adjusted for maximum amplitude of this echo. This assumes that the system is sufficiently in tune to start so that echoes can be seen. If not, the protective tank condenser should be tuned through its range until echoes can be seen. It may be necessary also to run through the range of the decoupler, but stronger echoes probably can be seen even if this tank is off tune. The spark gap should be observed, and should be firing steadily, without missing.

The spark gas spacing is not critical. If it is set at about 0.010 inch to 0.015 inch as specified above, receiver protection will not be greatly increased by setting the points still closer together, and if they are to close, corrosion may be increased. When the points become corroded, they can be cleaned by a small file or emery cloth. Persistent missing of the spark after prolonged operation, at normal spacing and tuning, and with normal transmitter power, is

an indication that the gap requires cleaning. One form of corrosion is the growth of shorting "hairs."

The external duplexing system can be installed anywhere in the main transmission line, since it does not depend on the length of line between it and the transmitter to supply high impedance at point 3 in the figure during reception, to prevent loss of signal into the transmitter. If it happens to be installed at a place where this condition would be fulfilled without its presence, this simply means that the decoupler tank will show little if any tuning, since its function is already being performed by the transmitter line. If, however, any change, such as a modification of loading conditions at the transmitter, displaces the standing wave pattern seen looking toward the transmitter during reception, then the decoupler will show tuning. If there were no decoupler, but only the protective tank, an adjustment of transmitter line length would be required to prevent loss of received energy.

TESTING 8014-A TUBES

As 8014-A tubes age in use, it is generally necessary to increase the value of grid leak to maintain stable pulsing. This type of instability is a resultant of all the changes that take place within the tube; that is, changing emission, changing grid resistance, changing element spacing (due generally to filament distortion).

The type of instability due to bad cases of element distortion in 8014-A tubes shows up as high transmitter plate current, or as unstable plate current associated with improper pulsing. In the latter case, when proper pulsing and steady plate current are obtained by grid leak adjustment, abnormally high plate current results. This trouble is a direct result of a low plate voltage to grid voltage cut-off ratio in one or both 8014-A tubes. Means for testing tubes for this fault are outlined under "Cutoff Ratio Test Procedure." In general, tubes of equal cutoff ratios work best together.

IN SA equipments, 8014-A tubes with low cutoff ratios have been known to have stable plate current as much as twice the normal value, and still give satisfactory presentation on the receiver-indicator screen. However, ragged pulsing and unstable trace on the screen may result in some cases. In extreme cases, the presence of this trouble can be detected on the receiver-indicator screen by turning the CAL.SYNC switch to position 1 and the gain control to maximum. The transmitter pulse should then appear on one of the sweep ranges. Figure 1A shows the ragged pulse resulting from one or both 8014-A tubes having a low cutoff ratio. Figure 1B shows the sharp front pulse, which should appear with good transmitter tubes. (It is possible that some installations will not show a transmitter pulse on any of the three ranges with the CAL-SYNC switch on position 1. If this condition is found, reverse terminals 1 and 2 on transformer T-201 in the receiver.)

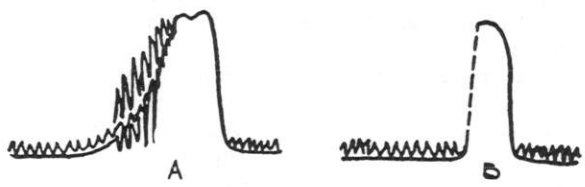


FIGURE 1.—(A) Bad cutoff, old tubes, ragged pulse; (B) Good cutoff, new tubes, sharp pulse.

METHOD OF TESTING OLD TUBES FOR BALANCE

CUTOFF RATIO E_p/E_g. One important figure of merit in an 8014-A tube is the plate voltage to grid voltage cutoff ratio. In the SD/SA type of oscillating circuit, tubes with a ratio E_p/E_g equal to 20 to 24 will operate satisfactorily, other characteristics being correct. Tubes having ratios less than 20 may be considered of doubtful value. For the most stable transmitter operation match two tubes of equal ratios together. By this means it is felt that old, discarded tubes may be paired together for several more hours of successful operation.

CUTOFF RATIO TEST PROCECURE IN SD/SA TRANSMITTERS. The equipment required is a small B battery (45 or 67-1/2 volts), a d-c voltmeter to measure this B battery voltage, and a d-c voltmeter having 1,000 or 1,500 volts full scale. Proceed as follows:

a. Remove 60-cycle locking voltage by removing the link of S-108 (locking voltage adjustment or transformer T-103).

b. Open the filament circuit of one tube by disconnecting one or both of its filament leads from their connectors inside the corona shield. NOTE: It is best to remove the corona shield to prevent shorting the filament circuit.

c. Connect "minus" of B battery to grid bars, "plus" to ground. Connect low voltmeter across battery.

d. Connect 1,000 .o 1,500 v. d-c voltmeter from tube plate to ground.

e. With all power off, set plate current meter (M-101) accurately to zero by means of its zero adjustment. Set plate Variac to zero. Turn on power and carefully bring up plate Variac to give 1-milliampere plate current indication.

f. Carefully read the plate voltage to give 1 milliampere (see (e) above) and read the voltage of the grid battery.

g. Calculate E_p/E_g from information in (f). This is the cutoff ratio of the tube which remained connected after operation (b) above. (A minimum satisfactory value is about 20, new tubes may measure a maximum of about 25.)

h. Repeat the procedure, after disconnecting the filament of tube just tested and reconnecting the other tube's filament.

Technician's Checkoff List (SA, SA-2)

The maintenance procedures outlined in this checkoff list were collected from data submitted by vessels, navy yards and manufacturers' radar field service engineers. This checkoff list is to be used by the ship's radar technician or other radar personnel equally qualified. The checkoff list should be made effective immediately upon receipt of this information. A copy of this checkoff list (preferably typewritten) should be made for future use.

NOTE: After completion of each item check (√) in appropriate blank space.

Year													
Month													
Week	1	2	3	4	1	2	3	4	1	2	3	4	
ANTENNA AND PEDESTAL													
1. Inspect for rust on antenna. Touch up with paint if necessary.		X	X	X		X	X	X		X	X	X	
2. Inspect bolts on flange holding antenna and pedestal together. Tighten if necessary.		X X	X X	X X		X X	X X	X X		X X	X X	X X	
3. Inspect end seal insulators for cracks, leaks, dirt, paint.		X	X	X		X	X	X		X	X	X	
4. Check for leaks and tighten coax coupling between top of pedestal and antenna if system does not hold pressure.													
5. Check lubrication. Ref: Instruction book and lubrication chart.													
6. Inspect and clean slip rings and brushes.		X	X	X		X	X	X		X	X	X	
7. Check all antenna access plates for gas leaks.		X	X	X		X	X	X		X	X	X	
8. Check small external junction box on antenna pedestal for leaks, moisture, loose or corroded connections.		X X	X X	X X		X X	X X	X X		X X	X X	X X	
9. Check operation of pedestal heater.		X	X	X		X	X	X		X	X	X	
10. Check and tighten all terminal board connections.		X	X	X		X	X	X		X	X	X	
11. Check action of safety switch S-901.		X	X	X		X	X	X		X	X	X	
12. Check pedestal cover plates for weatherproof fit.		X	X	X		X	X	X		X	X	X	
COAX AND DEHYDRATOR													
A. Gas dielectric type: S													
1. Check for leaks. (If leak apparent, check connections to dehydrator and nitrogen tanks. Also check all coax couplings, end-seal insulators, antenna access plates, and rotating (chiksan) joint. Soapsuds method may be helpful in locating leaks. M													
T													
Important: Be sure to remove all soap from end-seal insulators after testing. W													
T													
F													
S													

Technician's Checkoff List (SA, SA–2)—Continued

		Year											
		Month											
		Week	1	2	3	4	1	2	3	4	1	2	3	4
COAX AND DEHYDRATOR—continued														
A. Gas dielectric type—Continued														
2. Using megohmmeter, measure resistance from center to outside conductor.				X	X	X	X	X	X	X	X	X	X	X
				X	X	X	X	X	X	X	X	X	X	X
3. Check and tighten if necessary all coax couplings, coax mounting brackets to mast, bulkheads, etc., and supporting flanges for solderless couplings.				X	X	X		X	X	X		X	X	X
				X	X	X		X	X	X		X	X	X
4. Check for proper operation of dehydrator. Ref: Instruction book. Check condition of indicating crystals. Blue is good; pink is bad.	S													
	M													
	T													
	W													
	T													
	F													
	S													
B. Solid dielectric type:	S													
1. Check for leaks. (If gas leak is apparent, check all connections to dehydrator and small tubing running to antenna pedestal.) Check end-seal insulators, rotating (chiksan) joint, antenna access plates, coax couplings in antenna and pedestal. Soap suds method may be helpful in locating leaks. *Important:* Be sure to remove all soap from end-seal insulators after testing.	M													
	T													
	W													
	T													
	F													
	S													
2. Check for good electrical connection at connectors at each end of coax.				X	X	X		X	X	X		X	X	X
TRANSMITTER														
1. Check control transformer T–104 setting for proper 8014–A filament voltage. Check control transformer lubrication. Ref: Instruction book. Check action locking screw.				X	X	X		X	X	X		X	X	X
				X	X	X		X	X	X		X	X	X
				X	X	X		X	X	X		X	X	X
2. Check for tight connections at 8014–A filaments and grids. Also antenna coupling straps, grid and filament tuning bars. Clean grid connectors with fine emery cloth if there are signs of oxidation.				X	X	X		X	X	X		X	X	X
				X	X	X		X	X	X		X	X	X
				X	X	X		X	X	X		X	X	X
3. Check for proper seating of 8014–A tubes and tighten anode clamp plates.				X	X	X		X	X	X		X	X	X
4. Check and tighten all terminal board connections.				X	X	X		X	X	X		X	X	X

Technician's Checkoff List (SA, SA–2)—Continued

	Year											
	Month											
	Week	1	2	3	4	1	2	3	4	1	2	3	4
TRANSMITTER—continued													
5. Check blower motor operation and lubrication. Ref: Instruction book and lubrication chart.		X X		X X		X X		X X		X X		X X
6. Check for proper operation door interlocks and high voltage shorting bar.		X X	X X	X X		X X	X X	X X		X X	X X	X X
7. Check plate current (M–101) for normal reading and stable operation.		X		X		X		X		X		X
8. If internal duplexer is used, check for glow in 1960 tube, V–104.		X		X		X		X		X		X
9. If ship is located where stable targets are available, check for peak duplexer tuning.		X X	X X	X X		X X	X X	X X		X X	X X	X X
10. Using stable land target, check for peak 8014–A filament tuning bar setting.		X	X	X		X	X	X		X	X	X
11. Check operation, clean contacts of time delay relay, K–101.		X	X	X		X	X	X		X	X	X
12. Thoroughly clean all dust and foreign material from interior of transmitter, especially blower and T–102, C–102.		X X	X X	X X		X X	X X	X X		X X	X X	X X
RECEIVER-INDICATOR													
1. Check and tighten all control knob set screws.		X	X	X		X	X	X		X	X	X
2. Check and tighten all cable connectors. After tightening, check for good connection by moving cables and observing trace on screen.		X X	X X	X X		X X	X X	X X		X X	X X	X X
3. Check for good connection on all "A" scope (V–411) connector caps.		X	X	X		X	X	X		X	X	X
4. Check pilot lamps on range scales. Replace if necessary.		X	X	X		X	X	X		X	X	X
5. Check controls for proper operation: "A" scope focus, intensity, horizontal and vertical centering, astigmatism; calibration controls; lobing action on A, B, and C scales, L–R switch positions 1 and 2; calsync switch, positions 1, 2, and 3; receiver tuning controls.													
6. Check operation of all r-f, i-f, and video tubes by replacing one at a time with tubes known to be good, and observing comparative results on fixed land target.		X X X	X X X	X X X		X X X	X X X	X X X		X X X	X X X	X X X
7. Check for characteristic glow in voltage regulator tubes.		X	X	X		X	X	X		X	X	X
8. Check operation of heater.		X	X	X		X	X	X		X	X	X
9. Thoroughly clean all dust and foreign matter from interior.		X	X	X		X	X	X		X	X	X

Technician's Checkoff List (SA, SA-2)—Continued

	Year___											
	Month_											
	Week__	1	2	3	4	1	2	3	4	1	2	3	4
TRAIN-INDICATOR CONTROL UNIT													
1. Check and tighten all terminal board connections.			X	X	X		X	X	X		X	X	X
2. Check P–1004 for firm connections. Make sure locking springs are in proper position.			X X	X X	X X		X X	X X	X X		X X	X X	X X
3. Check pilot lamps. Replace if necessary. Check instruction book parts list for proper type.			X X	X X	X X		X X	X X	X X		X X	X X	X X
4. Check and tighten all control knob set screws.			X	X	X		X	X	X		X	X	X
5. Check lubrication slewing motor, slewing motor switch, voltage control transformers. Ref: Instruction book and lubrication chart.			X X	X X	X X		X X	X X	X X		X X	X X	X X
6. Check operation of all controls and switches.													
7. Check true bearing repeater for correct reading.													
8. Check for correct reading of antenna "bug" repeater by comparison with pelorus reading on known target.													
9. Thoroughly clean all dust and foreign material from interior.			X	X	X		X	X	X		X	X	X
10. Check plate control transformer (T–1002) knob and slider for proper zero setting. Adjust zero and maximum settings if necessary.			X X	X X	X X		X X	X X	X X		X X	X X	X X
TRAINING CONTROL AMPLIFIER													
1. Check action and clean contacts time delay relay (K–501)			X	X	X		X	X	X		X	X	X
2. Check and tighten all control knob set screws.			X	X	X		X	X	X		X	X	X
3. Check overall operation: training on both "true" and "relative." Readjust if necessary. Ref: Instruction sheet inside TCA door.													
4. Thoroughly clean all dust and foreign material from interior.			X	X	X		X	X	X		X	X	X
EXTERNAL DUPLEXER													
1. Check for proper electrode spacing. Ref: Instruction book.			X	X	X		X	X	X		X	X	X
2. Using stable land target, check for peak tuning of duplexer.													
3. Check for proper action of spark gaps.			X	X	X		X	X	X		X	X	X

Technician's Checkoff List (SA, SA-2)—Continued

	Year___											
	Month_											
	Week__	1	2	3	4	1	2	3	4	1	2	3	4
PLAN POSITION INDICATOR													
1. Inspect all cable connectors for good connection. Tighten if necessary.			X	X	X		X	X	X		X	X	X
2. Check and tighten all control knob set screws.			X	X	X		X	X	X		X	X	X
3. Check operation of all front panel controls.													
4. Check trace for proper alignment with orange antenna "bug" in TCI.													
5. Check centering, size, circularity on PPI scope. *Important:* Be sure to allow at least *30 minutes* warm-up before making any adjustments.													
6. Check lubrication blower motor. Ref: Instruction book, lubrication chart.			X X		X X		X X		X X		X X		X X
7. Thoroughly clean all dust and foreign material from interior.			X	X	X		X	X	X		X	X	X
BEARING AMPLIFIER CONVERTER													
1. Check and tighten all terminal board connections.			X	X	X		X	X	X		X	X	X
2. Check operation and clean contacts K–1301, K–1302, K–1303.			X	X	X		X	X	X		X	X	X
3. Check lubrication servo-motor (B–1301) worm gear. Ref: Instruction book, lubrication chart.			X X	X X	X X		X X	X X	X X		X X	X X	X X
4. Thoroughly clean all dust and foreign material from interior.			X	X	X		X	X	X		X	X	X
GENERAL													
1. Check all ground straps, mounting brackets, shock mounts. 2. Check Field Change Record. 3. Check receiver tuning daily when targets are available. 4. Check range calibration each watch. 5. Keep constant check on line voltage at M–1001. Set to red line. 6. Person checking equipment should initial and date.	Initial												
	Date												

NOTE 1: To measure leakage resistance of coax, proceed as follows:

a. Disconnect coax at topmost coax coupling before coax enters antenna pedestal. Disconnect antenna coupling straps inside transmitter at coax end (opposite ends of straps connect to 8014–A filament bars).

b. Remove U section of internal duplexer.

c. Connect megohmmeter leads across coax inside transmitter

d. Where external duplexer is used, it is necessary to disconnect coax at both ends of duplexer and measure the two sections separately.

e. When checked with a 500-volt megohmmeter, the leakage resistance of a clean, dry line in good condition will be at least 200 megohms.

Technician's Checkoff List (SA–1)

The maintenance procedures outlined in this checkoff list were collected from data submitted by vessels, navy yards and manufacturers' radar field service engineers. This checkoff list is to be used by the ship's radar technician or other radar personnel equally qualified. The checkoff list should be made effective immediately upon receipt of this information. A copy of this checkoff list (preferably typewritten) should be made for future use.

NOTE: After completion of each item check (✓) in appropriate blank space.

		Year___											
		Month_											
		Week__	1	2	3	4	1	2	3	4	1	2	3	4
1. Inspect antenna for rust. Touch up with paint if necessary.				X	X	X		X	X	X		X	X	X
2. Inspect all mounting bolts. Tighten if necessary.				X	X	X		X	X	X		X	X	X
3. Inspect end-seal insulators for cracks, leaks, dirt, paint.				X	X	X		X	X	X		X	X	X
4. Check for gas leaks in antenna coax and gastight rotating joint.				X	X	X		X	X	X		X	X	X
5. Check lubrication. Ref: Instruction book and lubrication chart.				X	X	X		X	X	X		X	X	X
COAX AND DEHYDRATOR														
1. Check for leaks. If leak apparent, check connections to dehydrator and nitrogen tanks. Also check all coax couplings, end-seal insulators, rotating joint. Soap suds may be helpful in locating leaks. *Important:* Be sure to remove all soap from end-seal insulators after testing.	S													
	M													
	T													
	W													
	T													
	F													
	S													
2. Using megohmmeter, measure resistance from center to outside conductor of coax.				X X	X X	X X	X X	X X	X X	X X	X X	X X	X X	X X
3. Check and tighten if necessary all coax couplings, coax mounting brackets to mast, bulkheads, etc., and supporting flanges for solderless couplings.				X X	X X	X X		X X	X X	X X		X X	X X	X X
4. Check for proper operation of dehydrator. Check condition of indicating crystals. Blue is good; pink is bad.	S													
	M													
	T													
	W													
	T													
	F													
	S													

Technician's Checkoff List (SA–1)—Continued

	Year											
	Month											
	Week	1	2	3	4	1	2	3	4	1	2	3	4
TRANSMITTER													
1. Check control transformer (T–104) setting for proper 8014–A filament voltage. Check control transformer lubrication. Ref: Lubrication chart and instruction book. Check action locking screw.		X X X	X X X	X X X		X X X	X X X	X X X		X X X	X X X	X X X	
2. Check for tight connections at 8014–A filaments and grids. Also antenna coupling straps, grid and filament tuning bars. Clean grid connectors with fine emery cloth if there are signs of oxidation.		X X X	X X X	X X X		X X X	X X X	X X X		X X X	X X X	X X X	
3. Check for proper seating of 8014–A tubes in sockets and tighten anode clamp plates.		X X	X X	X X		X X	X X	X X		X X	X X	X X	
4. Check and tighten all terminal board connections.		X	X	X		X	X	X		X	X	X	
5. Check blower motor operation and lubrication. Ref: Instruction book lubrication chart.		X X		X X		X X		X X		X X		X X	
6. Check for proper operation door interlocks and high-voltage shorting bar.		X	X	X		X	X	X		X	X	X	
7. Check plate current (M–101) for normal reading and stable operation.		X		X		X		X		X		X	
8. If interval duplexer is used, check for glow in 1960 tube, V–104.		X		X		X		X		X		X	
9. If ship is located where stable targets are available, check for peak duplexer tuning.		X	X	X		X	X	X		X	X	X	
10. Using stable land target, check for peak 8014–A filament tuning bar setting.		X	X	X		X	X	X		X	X	X	
11. Check operation, clean contacts of time delay relay, K–101.		X	X	X		X	X	X		X	X	X	
12. Thoroughly clean all dust and foreign material from interior of transmitter, especially blower and T–102, C–102.		X X	X X	X X		X X	X X	X X		X X	X X	X X	
RECEIVER-INDICATOR													
1. Check and tighten all control knob set screws.		X	X	X		X	X	X		X	X	X	
2. Check and tighten all cable connectors. After tightening, check for good connection by moving cables and observing trace on screen.		X X	X X	X X		X X	X X	X X		X X	X X	X X	
3. Check for good connection all "A" scope (V–411) connector caps.		X	X	X		X	X	X		X	X	X	
4. Check pilot lamps on all range scales. Replace if necessary.		X	X	X		X	X	X		X	X	X	
5. Check controls for proper operation: "A" scope focus, intensity, horizontal and vertical centering, astigmatism, calibration controls; lobing action on A, B, and C scales; L–R switch positions 1 and 2; Cal-Sync switch, positions 1, 2, and 3; receiver tuning controls.													

Technician's Checkoff List (SA–1)—Continued

	Year											
	Month											
	Week	1	2	3	4	1	2	3	4	1	2	3	4
RECEIVER-INDICATOR—continued													
6. Check operation of all r-f, i-f, and video tubes by replacing one at a time with tubes known to be good and observing comparative results on fixed land target.		X	X	X		X	X	X		X	X	X
		X	X	X		X	X	X		X	X	X
7. Check for characteristic glow in voltage regulator tubes.		X	X	X		X	X	X		X	X	X
8. Check operation of heater.		X	X	X		X	X	X		X	X	X
9. Thoroughly clean all dust and foreign matter from interior.		X	X	X		X	X	X		X	X	X
TRAIN-INDICATOR CONTROL UNIT													
1. Check and tighten all terminal board connections.		X	X	X		X	X	X		X	X	X
2. Check P–502 for firm connection. Make sure locking springs are in proper position.		X	X	X		X	X	X		X	X	X
		X	X	X		X	X	X		X	X	X
3. Check pilot lamps. Replace if necessary. Check instruction book for proper type.		X	X	X		X	X	X		X	X	X
		X	X	X		X	X	X		X	X	X
4. Check and tighten all control knob set screws.		X	X	X		X	X	X		X	X	X
5. Check operation all controls and switches.		X	X	X		X	X	X		X	X	X
6. Check plate control transformer (T–1002) knob and slider for proper zero setting. Adjust zero and maximum settings if necessary.		X	X	X		X	X	X		X	X	X
		X	X	X		X	X	X		X	X	X
7. Check lubrication. voltage control transformers, training motor ratio gears, clutch surfaces and associated linkages, indicator drive chain and sprocket gear, spur gears. Ref: Instruction book and lubrication chart.		X	X	X		X	X	X		X	X	X
		X	X	X		X	X	X		X	X	X
		X	X	X		X	X	X		X	X	X
		X	X	X		X	X	X		X	X	X
8. Check alignment of linkages.		X	X	X		X	X	X		X	X	X
9. Thoroughly clean all dust and foreign material from interior.		X	X	X		X	X	X		X	X	X
GENERAL													
1. Check all ground straps, mounting brackets, shock mounts.	Initial												
2. Check Field Change Record.													
3. Check range calibration each watch.													
4. Keep constant check on line voltage at M–501. Set to red line.													
5. Check receiver tuning daily when targets are available.	Date												
6. Person checking equipment initial and date.													

LUBRICATION CHART (SA)

Proper maintenance requires periodic lubrication of the various components. This chart is intended to reference the units involved, time serviced, and to give the Navy type number if available. Reference must also be made to the instruction book for location of lubrication points and the quantity of lubricant required.

Equipment			Service					Lubrication data						
Unit involved	Name of component	Circuit symbol	Hours	Daily	Weekly	Monthly	Annual	Oil	Grease	Instruction book type	Commercial type	Navy type	Nearest Navy equivalent	Comments
Transmitter	Blower motor	B-101				S		X		SAE #20	SAE #20	3050 or 9170		
	Contacts—time delay relay	K-101				X			X	Petrolatum	Petrolatum		14P1	
	Miter gears—Veeder counter	N-102					S		X	Petrolatum	Petrolatum		14P1	See Note 1.
Receiver-indicator	Contact surface—range potentiometer.	R-436				X			X	Petrolatum	Petrolatum		14P1	See Note 2.
	Spur gear—Veeder counter	N-401				X			X	Petrolatum	Petrolatum		14P1	
	Shaft bearing—Veeder counter	N-401				X		X		SAE #20	SAE #20	3050 or 9170		
TIC unit	Gear case—antenna slewing motor.	B-1002					S			Gulf plastic petrolatum, Type C.	SAE #10W	2075 or 9110		See Note 3.
	Contact surface—line voltage transf.	T-1003				X			X	Petrolatum	Petrolatum		14P1	
	Contact surface—plate voltage transf.	T-1002				X			X	Petrolatum	Petrolatum		14P1	
	Shaft bushing—slewing motor-switch.	S-1003				X			X		SAE #10W	2075 or 9110		
TCA unit	Contact surface—time delay relay.	K-501				X			X	Petrolatum	Petrolatum		14P1	
Antenna pedestal	Lower bearing						X		X	Socony BRB No. 1	Ball bearing grease #1.		O. S. 1350	
	Upper bearing						X		X	Socony BRB No. 1	Ball bearing grease #1.		O. S. 1350	
	Slip rings	E-901-908					S		X	Petrolatum	Petrolatum		14P1	
	Helical drive gears						S		X	Tenacious gear grease	SAE #90		14L4 Grade 90	
	1:1 Selsyn worm drive gear						S		X	Gear grease	SAE #90		14L4 Grade 90	
	Training motor	B-902					S	X		SAE #20	SAE #20	3050 or 9170		
	Differential gen. worm drive gear.						X				Soft gear grease		O. S. 1350	
	Oilite pin—chiksan joint		1000					X		SAE #20	SAE #20	3050 or 9170		See Note 4.
	Chicksan joint							X	X		B & R bearing grease #1.		O. S. 1350	See Note 5.
Antenna	L-R contact cam	S-1101					S		X		Petrolatum		14P1	
PPI unit	Blower motor	B-1201				S		X		Light oil	SAE #20	3050 or 9170		
BAC unit	Worm gear servo motor	B-1301				X			X	Petrolatum	Petrolatum		14P1	
All synchros														See Note 6.

NOTE 1.—Does not apply where external duplexer is used.

NOTE 2.—*Important:* See instruction book, Maintenance Section, for correct procedure. Damage may result from improper treatment of potentiometer.

NOTE 3.—SAE #10W (Navy Type 2075 or 9110) preferred.

NOTE 4.—Oilite Sleeve and Pin only. See instruction book, Maintenance Section.

S—Semiannually.

NOTE 5.—To be applied only when antenna is being overhauled and chicksan joint is out of equipment. Caution: Excessive grease will cause trouble by shorting inner conductor insulators.

NOTE 6.—Should be lubricated by competent gyro-technicians—preferably at time of annual Navy Yard overhaul. If necessary to lubricate in field, refer

LUBRICATION CHART (SA-1)

Proper maintenance requires periodic lubrication of the various components. This chart is intended to reference the units involved, time serviced, and to give the Navy type number if available. Reference must also be made to the instruction book for location of lubrication points and the quantity of lubricant required.

Equipment			Service					Lubrication data							
Unit involved	Name of component	Circuit symbol	Hours	Daily	Weekly	Monthly	Annual	Oil	Grease	Instruction book type	Commercial type	Navy type	Nearest Navy equivalent	Comments
Transmitter	Blower motor	B-101				S		X		SAE #20	SAE #20	3050 or 9170		
	Contacts—time delay relay	K-101				X			X	Petrolatum	Petrolatum		14P1	
	Miter gears—Veeder counter	N-102					S		X	Petrolatum	Petrolatum		14P1	
	Contact surface—fil control Variac.	T-104				X			X	Petrolatum	Petrolatum		14P1	
Receiver-indicator	Contact surfaces—range potentiometer.	R-436				X			X	Petrolatum	Petrolatum		14P1	See Note 1.
	Spur gears—Veeder counter	N-401				X			X	Petrolatum	Petrolatum		14P1	
	Shaft bearings—Veeder counter	N-401				X		X		SAE #20	SAE #20	3050 or 9170		
TIC unit	Contact surface—line volt transf.	T-503					S		X	Petrolatum	Petrolatum		14P1	
	Contact surface—plate volt transf.	T-502					S		X	Petrolatum	Petrolatum		14P1	
	Ratio gears—training motor	B-501					S	X		Socony Vacuum type 600 W.	600 W	5190 or 6135		See Note 2.
	Training motor	B-501				X			X	Andok, type C	Ball and roller bearing or Grade III.		14L3 Grade III	Plug fitting—see instruction book.
	Bevel gears	0532 and 0536.				X			X	Andok, type C	B & R bearing grease Grade III.		14L3 Grade III	
	Clutch cane surface and associated linkages.						S		X	Light ball bearing lubricant.	BR & bearing Grade I.		14L3 Grade I	
	Indicator drive chain	0517				X			X	Petrolatum	Petrolatum		14P1	
	Sprocket gears	0513, 0514, 0516.				X			X	Petrolatum	Petrolatum		14P1	
	Gear train	0512, 0515, 0510, 0511.				X			X	Petrolatum	Petrolatum		14P1	
	Spur gears—mechanical linkage.						S		X	Beacon type M-285	B & R bearing grease, #1.	O. S. 1350		
	Spline coupling—mechanical linkage.						S		X	Beacon type M-285	B & R bearing grease #1.	O. S. 1350		
Antenna pedestal	Spur and drive gears						S		X	Beacon type M-285	B & R bearing grease #1.	O. S. 1350		
	Main shaft bearings					X			X	Beacon type M-285	B & R bearing grease #1.	O. S. 1350		
Antenna	Gas tight joint						S		X	Beacon type M-285	B & R bearing grease #1.	O. S. 1350		Use sparingly—see instruction book.

NOTE 1.—*Important:* See instruction book, Maintenance Section, for correct procedure. Damage may result from improper treatment of potentiometer.

NOTE 2.—Check weekly. Drain and refill semiannually. See instruction book. S=Semiannually.

LUBRICATION CHART (SA–2)

Proper maintenance requires periodic lubrication of the various components. This chart is intended to reference the units involved, time serviced, and to give the Navy type number if available. Reference must also be made to the instruction book for location of lubrication points and the quantity of lubricant required.

Equipment			Service					Lubrication data						
Unit involved	Name of component	Circuit symbol	Hours	Daily	Weekly	Monthly	Annual	Oil	Grease	Instruction book type	Commercial type	Navy type	Nearest Navy equivalent	Comments
Transmitter	Blower motor	B–101				S		X		Navy type 3050 SAE #20	SAE #20	9170 or 3050		
	Contacts—time relay delay	K–101				X			X	Petrolatum	Petrolatum		14P1	
	Miter gears—Veeder counter	N–102					S		X	Petrolatum	Petrolatum		14P1	See Note 1.
Receiver-indicator	Contact surface—range potentiometer.	R–455				X			X	Petrolatum	Petrolatum		14P1	See Note 2.
	Spur gear—Veeder counter	N–401				X			X	Petrolatum	Petrolatum		14P1	
	Shaft bearing—Veeder counter	N–401				X		X		SAE #20	SAE #20	9170 or 3050		
TIC unit	Gear case—antenna slewing motor.	B–1002					S	X		Navy 1042	SAE #10W	2075 or 9110		
	Contact surface line voltage transf.	T–1003				X			X	Petrolatum	Petrolatum		14P1	
	Contact surface—plate voltage transf.	T–1002				X			X	Petrolatum	Petrolatum	2075 or 9110	14P1	
	Shaft bushing-slewing motor switch.	S–1003				X		X			SAE #10W			
	Contact surface—time delay relay.	K–501				X			X	Petrolatum	Petrolatum		14P1	
Antenna pedestal	Lower bearing						X		X	Navy ANG–3	Ball bearing grease #1		O. S. 1350	
	Upper bearing						X		X	Navy ANG–3	Ball bearing grease #1		O. S. 1350	
	Slip rings	K–901–908					S		X		Petrolatum		14P1	
	Helical drive gears						S		X	Tenacious gear grease	SAE #90		14L4 Grade 90	
	1:1 Selsyn worm drive						S		X		SAE #90		14L4 Grade 90	
	Training motor	B–902					S	X		Navy 3050	SAE #20	9170 or 3050		
	Differential gen. worm drive gear.							X		Navy ANG–10	Soft gear grease		O. S. 1350	
	Oilite pin—chicksan joint						X	X		Navy 3050	SAE #20	9170 or 3050		See Note 3.
	Chicksan joint		1000						X		B & R bearing grease #1.		O. S. 1350	See Note 4.
Antenna	L–R contact cam	S–1101					S		X		Petrolatum		14P1	See Note 5.
PPI	Blower motor	B–1201				S		X		Light oil	SAE #20	3050 or 9170		
BAC unit	Worm gear servo motor	B–1301				X			X	Petrolatum	Petrolatum		14P1	
All synchros														See Note 6.

NOTE 1.—Does not apply where external duplexer is used.

NOTE 2.—*Important:* See instruction book maintenance section, for correct procedure. Damage may result from improper treatment of potentiometer.

NOTE 3.—Oilite sleeve and pin only. See instruction book, maintenance section.

NOTE 4.—To be applied only when antenna is being overhauled and chicksan joint is out of equipment. Caution: Excessive grease will cause trouble by shorting inner conductor insulators.

NOTE 5.—Applies to all SA equipments and early SA-2 equipments (up to and including SA–2 serial #100).

NOTE 6.—Should be lubricated by competent gyro-technicians—preferably at time of annual Navy Yard overhaul. If necessary to lubricate in field, refer to

S=Semiannually.

REPAIR OF NEOPRENE COATED ANTENNAS

All of the SA-3 equipments and some of the stock spares of SA-2 will have antennas with a Neoprene coating. It is necessary to treat these antennas somewhat differently in making repairs and in overhauling operations.

The Neoprene coating covers all steel parts of the antenna but does not cover the feed systems and other parts made of copper, brass, or aluminum. This Neoprene coating thus permantently protects the steel parts from corrosion and no periodic refinishing operations will be necessary.

The repair of damaged parts requires a totally different treatment since the Neoprene must be replaced if corrosion is to be prevented. Damage which exposes the bare metal can not be cured through ordinary finishing operations as corrosion will take place after a month or so.

If damage occurs, a special kit is to be used. This kit contains the necessary priming cement, Neoprene and accelerator. Normally the Neoprene requires a curing cycle which requires about two days in an oven. However, repairs are made by using an extra amount of accelerator in the liquid Neoprene to provide a mixture which will jell in a few minutes. The mixture left over is, of course, to be discarded if not used immediately.

The Neoprene coating repair kits, containing the necessary liquids and a set of instructions, will be found in equipment spares, tender spares, and stock spares.

Contents of Kit:

One bottle--------- Priming cement.
Two bottles-------- Neoprene brushing cement.
Two vials---------- Accelerator.

NOTE: This kit contains sufficient materials for two individual minor repairs on Neoprene coatings.

All materials shall be applied by brushing. Use only materials contained in this kit.

Instructions: a. Clean, dry, and roughen the damaged area plus a 2-inch margin.

b. Brush on one coat of priming cement and allow to dry one-half hour. Do not apply beyond the roughened area.

c. Thoroughly agitate one vial of accelerator, and stir entire contents into one bottle of brushing cement. Apply six full brush coats of accelerated cement at one-half hour intervals to the damaged area.

ANTENNA ASSEMBLY SERVICE NOTES

Water in Antenna Support: It has been found that water collects in the antenna tubular support above pedestal. Rain water has not drained off because the slot cut in the flanges on top of the pedestal has been filled with the white lead used to join the two flanges. Also, the skirt surrounding the flanges has not been spaced out to allow water to flow from the slot; the spacing washer is often lost. A check should also be made to see that the companion flanges are put together so that the slots coincide; that is, when the back of the L-R cable junction box and mattress are parallel. Accumulation of water in the tubular section may permit water to leak around the coax flange gasket into the pedestal and damage the slip rings, motor, synchro and drive gears. (See Field Change 15.)

Cable to L-R Housing in Antenna: This cable is specially designed to be air-tight to prevent gas leakage from the L-R housing. When it is necessary to replace the cable, request a replacement RCA No. M-440275-501 stock No. 66052. The cable assembly includes a terminal tube with a vulcanized seal.

3/8-inch Rubber Gland, Inner Conductor, Antenna End Seal 7/8 and 1-5/8 Coax: When necessary to replace the 3/8-inch rubber gland used for sealing the inner conductors at the antenna end seals, they may be obtained by requesting RCA K-883891 Part 1 or Part 2, stock No. 66643 Gland Assembly.

Antenna Safety Switch: Some troubles have been experienced by the shaft of this safety switch cover jamming due to corrosion. Future shafts will be made of stainless steel. Trouble with straining of the switch handle itself will be avoided by having a switch cover permitting adjustable throw of the outside shaft.

SA PLATE VOLTAGE

Some field men have established 5 ma. plate current as a standard for the SA transmitter. Engineering Department feels that no rule should be laid down limiting it to this value. They point out that 5 ma. to 7 ma. are normal but not limiting values, especially at the higher end of the current range. On some early production models the plate Variac was incorrectly connected and gave 5 to 6 ma. at about point 7 on the Variac. See Field Change 7-SA. Before modification step 7 equalled approx. 12.5 kv, after mod. step 8 equals 12.5 kv and step 9 approx. 13.5 kv plate voltage.

It should be borne in mind that power output goes up as the square of the plate voltage; that is, an increase of 10 percent in plate voltage gives about 21 percent increase in power. Since range varies as the fourth root of the power, it is important to have all the power output possible, consistent with reliable operation.

LUBRICATING TIME DELAY RELAY IN TRANSMITTER

Several reports from the field indicate that the time delay has been sticking. The main trouble has been isolated, and is a result of burrs on the bearings inside the brass case housing the coil spring which spring loads the cam drive shaft. The spring housing is in the middle of the horizontal shaft, actuating the relay. Apply dry graphite in the slots on each side of the spring housing. This should be done on all units whether or not trouble has been encountered. This applies to SD transmitters also.

FIELD ADJUSTMENT OF RECEIVER-INDICATOR TYPE CRV-46ABA

Here are a list of adjustments on the SA/SA-1 Receiver-indicator Navy Type CRV-46ABA, which should not be touched in the field except in some few cases where new parts are installed or where unauthorized adjustments have already been made.

I–F Transformer Adjustments: These adjustments should never be touched after the equipment has left the factory except when a new transformer is installed or when all other methods fail to bring the receiver back to normal sensitivity. In this case, adjust only the affected transformer. Do not touch the remaining adjustments. The effect of a misadjustment of any one transformer is not particularly noticeable in the performance of the receiver. It is possible, however, by misadjustment of several of the transformers to seriously impair both the sensitivity and signal-to-noise ratio.

If any receiver exhibits low sensitivity it is probably due to old tubes with low mutual conductance. All tubes should be replaced every 1,000 hours.

Range Calibration Adjustments: There are three range calibration adjustments inside the deflection amplifier. These should never be touched unless a calibration potentiometer is replaced. In this case adjust only the replaced unit.

The effect of slight misadjustment of any of these potentiometers is simply a reduction in the accuracy of calibration on the 75- and 375- mile scale. A considerable misadjustment, however, may seriously affect the ability of the receiver to synchronize properly on the transmitter pulse.

Calibration Amplitude Adjustment: This adjustment is inside the deflection amplifier and should never be touched unless the potentiometer is replaced. Slight misadjustment of this control has no effect on the calibration accuracy. A large misadjustment may cause the receiver to synchronize poorly on the transmitter pulse.

Heater Thermostat: The adjustment on this thermostat should never be touched under any conditions. This adjustment does not vary the temperature at which the thermostat operates. Its only function is to determine the correct contact pressure for firm and reliable closure. This adjustment has been sealed at the factory where accurate equipment is available for measuring contact pressure.

Leeds and Northrup Ranging Potentiometer: No adjustments should be made on this unit in the field. It is permissible, however, to replace the sliding contact spring if the one on the unit shows signs of wear or reduced spring pressure. Under no conditions should the contact pressure be adjusted by bending the spring. This adjustment has been made at the factory where accurate gauges are available for measuring contact pressure. Excessive contact pressure may cause the resistance wire to wear unevenly and reduce the accuracy and life of the unit.

RECEIVER–INDICATOR SERVICE NOTES

"B" and "C" Ranges: Production limits for accuracy on the "B" range is plus or minus 2 miles and on the "C" range plus or minus 10 miles. A difference between "B" and "C" ranges of 12 miles is within limits. Correcting the ranges to agree on a single target may seriously affect the relative accuracy over the balance of the ranges. Gears to the Veeder counters should be meshed properly however to agree at "zero" of the range potentiometer.

Oscillation: The r-f receiver has been known to oscillate at certain dial settings when the front panel of the receiver and the chassis are not properly bonded. Tightening all the holding nuts, especially the ones which hold the front panel handle, will eliminate oscillation due to poor grounding.

Checking Emission of GL–446 (V–201): One means of quickly checking the emission of the above tube is to measure the voltage drops across the cathode resistor R-202. Values between 2 volts and 1.5 volts may be considered satisfactory.

Change in Value of R–203: R-203 has been changed from 1,000 ohms to 5,600 ohms to prolong the life of the GL-446 tube.

COVERING OF JACKS J–1202 AND J–1207

Jacks J-1202 and J-1207 are located on the back of the Master PPI Type CDU-55ADP near the bottom of the chassis.

When the equipment leaves the factory, plug P-1202 is in jack J-1202 and plug P-1207 is in jack J-1207.

Jacks J-1201 and J-1202 are the same type and are mounted one above the other. Cases have occurred in which plug P-1201 has been inserted in jack J-1202. To prevent this occurrence, the plug P-1202 should be left in the jack J-1202. If the original plug has been removed, item 71 of the equipment spares should be used.

A very high voltage exists at jack J-1207. As an added protection to servicing personnel, the plug P-1207 should be left in this jack. If the original plug has been removed, item 73 of the equipment spares should be used.

Vessels should request additional plugs to bring their equipment spares up to full complement. This is necessary since these plugs may be inadvertently removed while the equipment is serviced or moved.

TRAINING CONTROL AMPLIFIER SERVICE NOTES

S–501 Time Delay Relay (M–422407–1): This thermal time delay relay is factory adjusted and cannot be repaired in the field. Pleast return defective units so they may be referred to the vendor for correction.

Removing Paint from Panel: Remove paint from panel under ground terminals U and V on terminal board No. 1 in the train control amplifier for better operation.

DEHYDRATOR CARTRIDGE REACTIVATION

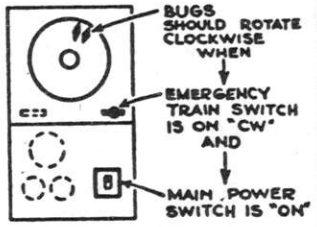
The Bureau has received reports of damage to the SA/SA-1 dehydrator cartridges because the proper temperature was not used and the correct procedure not followed.

ADJUSTMENT OF TRAINING CONTROL AMPLIFIER SA AND SA-2 RADAR EQUIPMENT

CW=CLOCKWISE
CCW=COUNTER-CLOCKWISE

WARNING: HIGH VOLTAGE (10,000 VOLTS) EXISTS AT 808 TUBE CONNECTIONS

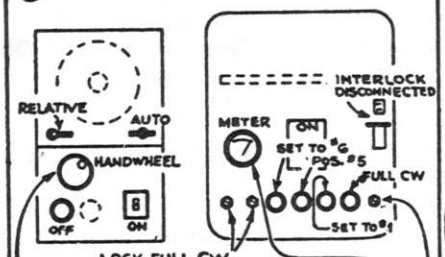
① PRELIMINARY TEST OF DRIVE SYSTEM.



NOTE:
ON INSTALLATIONS WITH PPI EQUIPMENT, SECTOR SWEEP SW. SHOULD BE "OFF"

SAFETY SWITCH ON ANTENNA PEDESTAL MUST BE "ON"

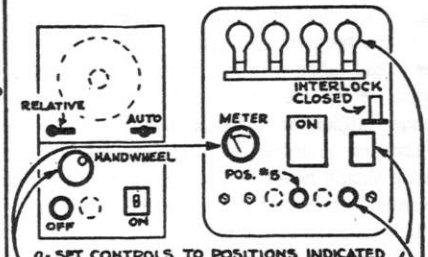
② SENSITIVITY ADJUSTMENT.



LOCK FULL CW.

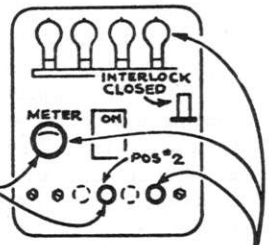
a- SET ALL CONTROLS TO POSITIONS INDICATED.
b- ROTATE HANDWHEEL TO POSITION GIVING MAXIMUM METER READING.
C- ADJUST SENSITIVITY CONTROL UNTIL METER READS 100 VOLTS.
d- REPEAT (b) AND (C); AND LOCK CONTROL.

③ BIAS ADJUSTMENT - 1ST. STEP.



a- SET CONTROLS TO POSITIONS INDICATED. WAIT FOR RELAY TO OPERATE.
b- TURN HANDWHEEL TO POINT WHERE METER READS "0" VOLTS.
c- TURN BIAS CONTROL CCW. THEN QUICKLY TURN IT FULL CW. TUBES SHOULD TURN RED (BLUSH).
d- IF NOT; REPEAT (b) AND (C).

④ BIAS ADJUSTMENT - 2ND STEP

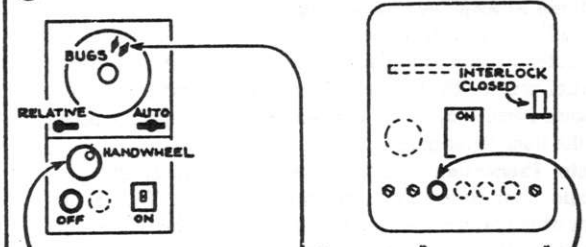


a- METER SHOULD READ APPROXIMATELY 85 VOLTS WITH EQUIPMENT CHECK SWITCH IN POSITION 2.

b- TURN BIAS CONTROL SLOWLY "CCW." TO POINT WHERE METER READING SUDDENLY DROPS BELOW 15 VOLTS, AND TUBE BLUSH DISAPPEARS.

C- SHIFT EQUIPMENT CHECK SWITCH TO POSITION 5; METER SHOULD READ "0" VOLTS. IF NOT REPEAT OPERATIONS ③ AND ④. LOCK, CONTROL.

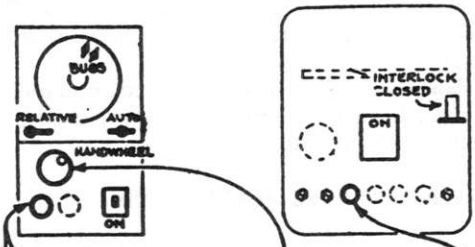
⑤ FEED BACK ADJUSTMENT



a- ROTATE HANDWHEEL SHARPLY ABOUT ½ TURN, BRING TO SUDDEN STOP. "BUGS" SHOULD COME TO STOP AFTER SWINGING THROUGH FINAL POSITION 3-4 TIMES.

b- ADJUST "FEED BACK" IN SMALL STEPS TO GIVE 3 OR 4 SWINGS AS REQUIRED IN (a) (TURNING "FEED BACK" CW. REDUCES HUNTING BUT MAKES SYSTEM LESS SENSITIVE. TURNING FEED BACK TOO FAR CCW MAKES SYSTEM UNSTABLE.)

⑥ FEED BACK CHECK.

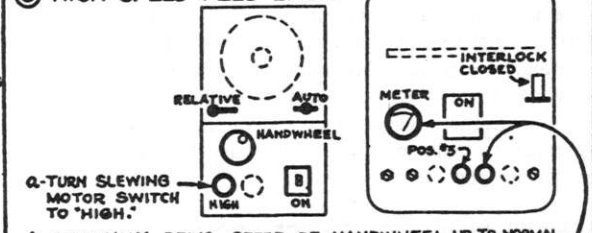


a- TURN SLEWING MOTOR SWITCH TO "HIGH".
b- ROTATE HANDWHEEL UNTIL IT PICKS UP NORMAL SPEED.
c- QUICKLY SHIFT SLEWING MOTOR SWITCH FROM "HIGH" TO "LOW". BUGS SHOULD OSCILLATE NO MORE THAN 5 TIMES BEFORE SETTLING DOWN AT LOW SPEED. READJUST FEED BACK CONTROL IF NECESSARY.

⑦

REPEAT OPERATIONS ③ AND ④

⑧ HIGH SPEED FEED BACK



a- TURN SLEWING MOTOR SWITCH TO "HIGH."
b- GRADUALLY BRING SPEED OF HANDWHEEL UP TO NORMAL.
C- ADJUST "HIGH SPEED FEED BACK CONTROL" FOR A METER READING OF 80 VOLTS AVERAGE.
d- IF ANTENNA FALLS OUT OF STEP, STOP HANDWHEEL, AND SLIGHTLY REDUCE HIGH SPEED FEED BACK CONTROL; RESTART HANDWHEEL, AND REPEAT (a), (b) AND (C).
e- LOCK ALL CONTROLS, REMOVE AUXILIARY INTERLOCK AND BOLT DOOR CLOSED. CHECK OVERALL OPERATION.

With each equipment there is supplied a compressor and dehydrator unit. Particular attention should always be given to reactivating the silica-gel dehydrator cartridge after initially drying out the line or whenever the indicator shows pink instead of the normal blue. The procedure is as follows:

a. Close off the dehydrator system from the transmission line.

b. Remove the silica-gel cartridge from the unit.

c. Detach the indicator and set it aside.

d. Place the silica-gel cartridge (less the indicator) in an oven and bake it for 4 or 5 hours at a temperature of 350° to 375° Fahrenheit. As a safety precaution the temperature should not reach 400° F., otherwise the soldered seams in the cartridge may open up.

e. Replace the cartridge and indicator.

f. The unit is now ready for operation.

Special attention is directed to step c which calls for removal of the indicator before the dehydrator cartridge is placed in the oven. Leaving the indicator with the cartridge will cause damage to the indicator. It is not necessary to dehydrate the indicator as it is very small in comparison to the main cartridge and will automatically be dehydrated when placed back in operation.

DRIVE MOTOR ARMATURE BINDING

There have been reported several cases of armature binding of the antenna drive motor. Investigation has shown that the bearing shield adjacent to the blower motor was oversize and had bound in the bearing housing.

This fault may occur in motors with serial numbers lower than 633506. Motors with serial numbers above this 633506 should not give any trouble.

In case of failure, the motor should be disassembled, the armature set up in a lathe and 0.015 inch removed from the aft bearing shield.

MODEL SA SERIES TROUBLE-SHOOTING NOTES

No Transmitter Plate Current:

a. Door interlocks S-105, S-107 not making contact.
b. Defective 8013 tube.
c. Open F-101, F-102.
d. Broken S-1004.
e. Open H.V. winding in T-102
f. Defective time-delay K-101.

Very High Transmitter Plate Current:

a. Defective 8014-A tubes. Replace both.
b. Defective C-101.
c. Defective 8013 rectifier or socket.
d. T1002 not set for proper plate voltage. Adjust slider and zero and maximum stops.
e. Door interlock S-107 not making contact.

Unstable Transmitter Operation, Plate Current Varies:

a. Interlock S-107 making intermittent contact.
b. Defective or aging 8014-A's.
c. Improper setting of 8014-A filament shorting bar.
d. T-1002 not set for proper plate voltage.
e. Coax trouble: water, dirt, loose connections, chicksan joint.
f. Wrong setting grid resistance or wrong setting grid lock-in voltage from T-103. NOTE: For normal operation of most SA's and SA-2's, lock-in voltage is on center tap, grid resistance 0.75 meg. to 1.25 meg.
g. Defective C-101.
h. Off frequency.

Weak Signal, Transmitter Normal:

a. Improper duplexer tuning.
b. Defective cable, poor connection in plugs, from duplexer to receiver.
c. Incorrect receiver tuning.
d. Defective r-f, i-f, or video tubes.
e. Defective rectifier, V-208.
f. Poor connection in plugs or cable carrying i-f from receiver to receiver-indicator.
g. In JF receiver only, P-1403 and P-1404 interchanged.

Oscillating Receiver

a. Receiver front panel not properly grounded.
b. Poor connection, i-f tube ground.
c. Defective i-f tubes.
d. Defective 9002 tube.
e. Defective GL-446 tube.

No Signals, Transmitter Output Normal, Receiver Gain Normal:

a. CAL-SYNC switch not on position 2.
b. Defective sync pulse cable or plug, loose connection at terminal board in transmitter.

Lobing Trouble: No Trace Separation:

a. Defective slip rings or brushes (E-901, E-902).
b. Lobing contacts S-1101 either remaining open or remaining closed. Clean and adjust contacts.
c. Defective V-406.
d. Lobing motor not running.
e. Defective V-301.
f. Plug P-404 out of socket.

Lobing Trouble; Insufficient Trace Separation:

a. Rotating lobing capacitor (in antenna) not in proper synchronization with lobing contacts and transmitter pulse. Reverse leads to lobing motor, 17D and 18D.
b. Leakage in cable from lobing motor to small junction box, 0917, on pedestal. Replace.
c. Moisture in small junction box, 0917, on antenna pedestal.
d. Defective V-406.
e. If none of above corrects trouble, check for indications of synchronizing by running range step along base line and noting if space of traces varies. If spacing varies, the following method may be used to adjust lobing contacts and synchronization:

(1) Connect vertical plates of test oscilloscope across output of S-1101. (Available at grids of V-406 and V-404, or at J-404.)

(2) Start lobing motor and note square wave output of S-1101. Adjust S-1101 for approximately 40 percent closed, 60 percent open as indicated by the square wave on the screen of the test scope.

(3) Using approximately 100 $\mu\mu$f to 200 $\mu\mu$f in series connect sync pulse (from J-301) also to high side of vertical test scope plates. This will put a marker on the square wave to show the position of the transmitter pulse. If pulse is not in center of square wave, loosen four nuts on lobing motor suspension bolts and rotate entire lobing motor until pulse appears in center. Be careful not to disturb S-1101 adjustment while rotating motor.

Lobing Trouble: Unequal Pips, Unable to Match:

a. Transmitter not tuned to proper frequency for antenna.

b. Defective antenna assembly.

Range Step Disappears or Jumps When Range Crank Is Rotated:

a. Sliding contact on range potentiometer shorting adjacent turns. File sliding contact to clear. See Field Change (SA) 21.

b. Range contact surfaces dirty. Clean carefully. See instruction book.

No Range Step:

a. Defective step amplifier, V-405.

b. Defective C-412.

Insufficient Number of Calibration Pips:

a. Dirt or grease placing high resistance short between turns of range potentiometer R-436.

b. Resistance wire on R-436 shorted to center supporting wire.

Weak Calibration Pips on Screen:

a. Poor connection on caps to deflecting plates of scope V-411.

b. Defective V-305.

c. Shorted C-312.

Calibration Pips on Screen, No Figure 8:

a. Defective calibration indicator.

b. Defective V-408 (SA-2 only).

c. Defective V-301, V-308.

No Calibration Pips on Screen, Figure 8 OK on V–309:

a. Broken lead in cable from indicator to J-304.

NOTE: In case of emergency where no spare cables are available temporary repairs may be made as follows:

(1) In cable from J-305, lead "N" is not used at present.

(2) In deflection chassis, disconnect at J-304, terminal D, read from R-321 and connect to N at J-305.

(3) In indicator chassis:

At TB14-11 disconnect lead to D to P-407. Run jumper from TB19-11 to TB19-16.

(4) Replace defective cable and reconnect as originally found at earliest opportunity.

No Calibration Pips on Screen, No Figure 8:

a. Defective V-304, V-305, V-306.

No Sweep on "A" Scope:

a. Open R-313 or L-301.

b. Poor contact S-302.

c. Defective V-303.

d. Poor connection J-304.

e. CAL-MIN control turned past zero setting, opening plate voltage supply to U-303.

f. Shorted tube in set causing voltage failure-check VR-105 for "No Glow."

Erratic Sweep on "A" Scope:

a. Defective V-301, V-302, V-306.

b. No 12-volt bias on V-301.

c. Defective V-303.

d. Loose connection pulse input jack J-301.

Nothing on "A" Scope:

a. S-403 not making contact.

b. Defective V-411.

c. Defective V-409.

Long Sweep on "A" Scope:

a. Defective V-408.

Short Sweep on "A" Scope:

a. Poor connection connector caps to V-411.

b. Defective V-407, V-411.

c. Shorted C-305, C-302.

d. Defective rectifier in receiver (5V4-G).

No Signals or Grass on "A" Scope:

a. Defective V-205, V-206, V-207, V-208, V-401, V-403, V-411.

b. Poor connection, defective plug J-204, J-401 or defective cable between.

c. Loose connection J-203.

Poor Focus on "A" Scope–Intensity and Focus Control Won't Correct:

a. R-427, R-429 wrong value.

b. Defective V-411, V-408, V-409.

c. If SA-2, see Navy Field Change No. 28.

Antenna Won't Train on "Emergency":

a. Poor connection at P-1004.

b. Safety switch S-901 open or defective.

c. Defective S-1006.

d. Loose or broken connection at terminals 13D, 14D, 15D, 16D in TIC unit, in 40-wire connection box, at "D" terminal board in antenna pedestal, or in connecting cables.

Antenna Won't Train on "True" but Okay on "Rel":

a. OSC power not being supplied from ship's gyro.

Antenna Won't Train on Either "True" or "Rel"–Okay on "Emerg":

a. K-501 not closing. Clean and burnish contacts. Check S-501.

b. Defective V-501, V-502, V-503, V-504, V-505, V-507, V-508, V-509, V-510, V-512.

c. C-516 and C-617 shorted.

d. Improper adjustment. See chart inside TCA door.

Antenna Trains Constantly in One Direction:
a. Defective V-506.
b. Defective V-507, V-508, V-509, V-510.

Antenna Hunts:
a. TCA not adjusted properly. See instructions inside TCA door. If impossible to adjust, check V-507, V-508, V-510 for balance; check V-501, V-502, V-503, V-504, V-505, V-512.

Antenna Repeater Sluggish, Locks in Two Places:
a. Open rotor circuit.

Antenna Turns, Bug in TCI Won't Follow, PPI Rotation Erratic:
a. PPI switch on TRUE, no power from gyro. Turn switch to RELATIVE position.

Signals Okay on "A" Scope, Nothing on PPI:
a. Anode cap off V-1220.
b. Defective V-1220.

Signals Okay on "A" Scope, PPI Spot Okay, No Sweep:
a. Defective V-1209.
b. Plug P-1201 or P-1301 out of socket.

Signals Okay on "A" Scope—Sweep but No Video on PPI:
a. Loose connection at J-1313 or J-1404, or defective cable between.
b. Defective V-1212, V-1213, V-1214.
c. Loose connection at J-1208 or J-302, or defective cable between.

Erratic Sweep on PPI:
a. Defective V-1209.
b. Defective V-1201, V-1202, V-1203, V-1204, V-1205, V-1206, V-1207, V-1208.
c. Defective R-1301.

Erratic Rotation of PPI Sweep:
a. Dirt or foreign matter in gear 0-1303, 0-1304, 0-1305 or associated gears.
b. Defective V-1301, V-1302, V-1303, V-1304, V-1305, V-1306, V-1307.

PPI Sweep Hunts Constantly When Antenna Is Stopped:
a. Improper adjustment of R-1302.

Notes on Recurrent Failures

NATURE OF OPERATION	TROUBLE FOUND AND REMEDY
Antenna (SA, SA-2)	
Check of equipment revealed lobing action inoperative.	Circuit was found open to lobe switch contacts. Cause of trouble was found to be a resin joint in the "E" box connecting antenna pedestal cable to receiver cable. Joint was solid physically but open electrically. Joint was remade and lobing operation found to be satisfactory.
A slight jump in the left-right trace was found to be caused by poor brush contact on the slip rings in the antenna pedestal.	These rings were cleaned and resulting operation found satisfactory.
The antenna completely failed to rotate, either by the hand train wheel or the emergency train switch.	A lead (wire) connecting on the motor, located in the antenna pedestal, had become open.
Set failed to give echoes at any range. After checking tuning and r-f output, we immediately suspected trouble in the antenna assembly.	Trouble turned out to be shutter on lobe-switching mechanism lodged in such a position as to prevent radiation.
While using lobing, the pip could not be separated.	This was remedied by replacing two broken brushes in the antenna pedestal.
On throwing the L. R. switch to single lobing position, the scope pattern became almost extinguished.	Due to incorrect phasing of lobing motor with transmitter pulsing. Corrected by reversing leads 17D and 18D in training control unit.
The disappearance of one of the lobing traces.	Diagnosed as poor contact on one of the slip rings in the pedestal. This was checked by putting an ohmmeter across cable at P-404. Lack of continuity was observed in two different positions of the antenna. The lobing motor was left running at the time of this test.
When using left-right switching, a position in train was found where one of the traces disappeared for about five degrees of train of the antenna.	Checked brush and slip ring assembly in antenna pedestal. Found a surface scar on cam switch slip ring of bearing position at which trouble had occurred. Also found the brush had been installed 90° out with the curvature of the slip ring. A subsequent check showed that 6 of the 8 brushes had been installed 90° out and the only contact was on two edges of each brush. Using fine sand paper, all slip rings were polished smooth, and all brushes recut for proper curvature and replaced correctly. The trace on the indicator scope still had a slight jump at a one degree position, but was not objectionable.
Broken "C" scale trace when lobing.	L. R. motor leads were reversed. Interchanged motor (L. R.) leads.
Training Control Amplifier (SA, SA-2)	
Unreliable training was reported.	We checked adjustment of system, and found that normal training could be had, but that frequent severe fluctuations of power supply voltage caused training to be erratic even though adjustments were proper.
Antenna keeps rotating; 808's in the training amplifier pulled greatly excessive plate current.	Intermittent filament in V-509, elements shorted. This is the second element shorted in 808 we have found.
Antenna rotation unsteady.	Decreased setting of input sensitivity in control amplifier remedied this.
Slewing motor switch control inoperative.	Loose cam on knob shaft. Replaced nut and tightened same.
Train control action sluggish.	Replaced a defective 808 tube in control amplifier, V-507. Then reset all adjustments to provide smooth training.

NATURE OF OPERATION	TROUBLE FOUND AND REMEDY
Antenna training in one direction.	Trouble was found to be in the train amplifier control unit. A tube clamp had vibrated loose from one of the tube sockets and shorted grid and plate of one amplifying tube causing unidirectional training. When removed the unit returned to normal operation.
Overload relay in train control amplifier would kick out continuously.	Trouble was due to a shorted 6X5GT rectifier tube of that unit.
Antenna began to hunt.	Difficulty found to be defective tube in training control amplifier, V–504 (6SN7).
Antenna would rotate continuously in one direction with all tubes except 808's removed. No training control.	Grid to filament short in 808. Replaced 808.
Antenna would train in only one direction.	6SN7 (V–503) bad, replaced same.
Antenna rotates in only one direction.	Bad 6X5 (V–506) in train control amplifier.
Erratic training of antenna.	Replaced direction rectifier (V–501) 6SN7 and amplifier (V–504) 6SN7.
Train Indicator Control Unit (SA, SA–1)	
Antenna rotating in wrong direction when S–1007 placed in true position.	Reversed wires to terminals 13 and 15 of train control indicator.
Transmitter (SA, SA–2)	
Found transmitter arcing badly.	Found transmitter tuned too low for correct frequency operation. Returned and adjusted for optimum performance in band No. 3. This corrected excessive arcing.
Steel shield had been built around transmitter to reduce interference, but the noise was still bad.	The bellows couplings made poor contact through their coating of oxide, and considerable radiation was taking place above the top of the shield. Before these couplings were sanded, sparks could be drawn from them with a screw driver. Bellows couplings were sanded, and the interference was reduced considerably. The shield was extended on up to the overhead.
Transmitter pulse was irregular and the transmitter plate current varied. Found that echoes were poor, and that the plate current would jump from 5 to 8 ma. as the antenna was trained. Adjustment of the grid leak and locking voltage of the transmitter did not remedy the pulsing. The grid capacitor had been changed in an effort to make the transmitter pulse properly, but to no avail. Double capacitor in RD pulsing circuit.	Removed the antenna from the ship and took it to the Yard where it was disassembled. The Chicksan joint was dirty and showed signs of poor contact. A new Chicksan joint was installed. After taking the antenna apart, it was found that the solderless coupling directly above the Chicksan joint had been arcing, due to poor contact. Also found that 2 half-shells holding the Chicksan joint in place were rather loose. This had introduced a slight wobble in the system as it was being trained. When this unit was reassembled a clamp was made to go around the midsection of the 2 half-shells. This strengthened them and reduced the tendency to wobble.

NATURE OF OPERATION	TROUBLE FOUND AND REMEDY
Oscillator plate current was found high and very unstable.	It was noted that the pressure gage on the line showed no pressure and that power supply to the dehydrator unit had been turned off. The line was then dried out with the antenna petcock open and dehydrator running for approximately 3 hours.
Transmitter firing erratically.	Transmitter door interlocks were removed and contacts (female) tightened. This immediately removed cause of erratic firing.
Equipment inoperative—plate circuit overload cut out.	Trouble due to shorted V–102 (8014A)–164 hours use. Replaced.
Weak echoes.	Replaced cable 2 symbol W–803 between transmitter and receiver with CASSF–50–1A, 50-ohm Copalene core cable. Equipment then operated normally.
Had high plate current which fluctuated badly and was uncontrollable.	Found condenser C–101A and B defective. Replaced and gear normal.
Transmitter arcing at very low plate voltage.	8014A shield removed. It was found that the filament leads had been arcing to the shield, below the fish paper. A longer piece of fish paper was installed in the shield.
High voltage leakage between filament and plate of 8014A tubes.	Removed date labels from 8014A transmitter tubes. These had been applied by the ship.
Standing wave ratio high. Erratic loading of transmitter at one bearing of antenna.	The coax line was loose at several joints near the antenna pedestal causing arcing at the junctions of the solderless couplings.
Shorting (arcing) between 8014A filament leads, in transmitter and corona shield.	Insulating in corona shield for preventing shorting and grounding of 8014A filament leads, failed to come low enough in shield to properly insulate. Replaced insulating material in corona shield with fiber board insulating material which extended over a greater length of the shield.
Trace would jump on the scope on the indicator unit.	Trouble was found to be caused by floating shield on grid lead to 8014A. Regrounded grid lead and retuned. Normal operation.
High transmitter plate current, no signals.	Decreasing grid bias on oscillator tubes 8014A, V–101 and V–102, stabilized oscillations so that plate current became normal and normal signals were received.
The transmitter was pulsing three times during the "C" range sweep period. The second and third pulses were comparatively weak and only reached saturation at maximum gain. They were not affected particularly by grid locking adjustments but varied in position with transmitter plate voltage.	C–101 in the transmitter was replaced to clear up the suprious pulsing.
There appeared on the scope what looked like interference. After a few days the interference seemed to get worse until there were three transmitter pulses on the scope at once.	The trouble was located in the transmitter oscillator circuit. The condenser C–101 was replaced and all the interference was cleared off the scope.
No signals; no "glow" in duplex tube. Plate current low.	Trouble due to very low emission V–103 (8013). Rectifier (215 hours use) replaced with new 8013 from ship's spares.
Plate current varying but remaining high causing arcing and safety switch to kick off.	Corrected trouble by changing 8014A oscillator tubes.

NATURE OF OPERATION	TROUBLE FOUND AND REMEDY
Trace very jumpy, pulse not locking in properly.	Adjusted locking voltage.
Receiver Indicator (SA, SA-2)	
The pulse indicating pattern on V-309 (2API) moved to the extreme right side of the screen.	Condenser C-326 had become slightly leaky and replacing it completely cured the trouble.
The crystal calibration oscillator failed to operate.	Replaced C-412 in indicator chassis which had developed a high resistance short.
Calibration signal 26,000 yd. range decreases in amplitude from left to right, on V-411.	Replaced V-304 osc. sync. tube in deflection amplifier chassis.
Range indicator trace jumping erratically at about 7000 yd.	Sliding contact on R-436 was touching adjacent turn shorting out a section of R-436. Filed off ends of contact extending to adjacent turn which remedied trouble. (NOTE: See Field Change No. 21 (SA)).
Control of horizontal centering was jumpy and erratic.	Replaced defective R-444, 75,000-ohm potentiometer which controls the circuit.
Trace incomplete on CR tube (V-411) on B and C ranges. Lacking about ⅓ full trace at right hand.	Corrected by replacement of V-307 (6X5, syn. rect.). (NOTE: See Field Change No. 3.)
Calibration figure was displaced off to one side of the screen of V-309.	Replacement of C-325 which was found with an indicated leakage corrected the displacement.
No trace on scope.	CAL-SYNC switch S-301 in wrong position (#3) for receiving. Turning to position #2 restored trace to screen.
Sweep not on scope.	By letting line voltage remain on for 15 or 20 minutes, normal operation was regained but trouble again appeared after shut down and turning on again. Trouble traced to resistor R-313 being open (occasionally R-312 was found to be open causing sweep to fail). Resistor replaced from spare parts and set operated normally.
Could not properly calibrate range step.	Found R-313 in the deflection amplifier open. Replaced from ship's spares. Calibration was then OK.
Blanking of the trace of the indicator tube was erratic.	The trouble was found to be due to a broken lead "H" in the cable between TB-19 and P-407. The break was repaired.
During the calibration it was noted the vertical amplitude of the trace varied erratically.	This was due to a broken lead "D" in the cable between TB-19 and P-407. This was repaired.
Short vertical and horizontal traces on screen.	Bad 5U4G tube (V-208). Replaced.
Horizontal trace on indicator tube was very erratic and multiple images appeared. The horizontal trace would be erratic for a time, then steady down—in either position #1 or #2 on "Cal-Sync" switch.	The trouble was found to be due to no 12-volt bias on multivibrator tubes, V-301, and V-302; the result of a broken lead at "A" of J-304.
No step marker on receiver-indicator scope.	Caused by 6AC7 (V-405) being bad.
Found that the sweep on the CRO went all the way across screen and part way around side. This necessitated recentering horizontally practically every time a range was to be taken out at the maximum end of the trace.	Replacing the 2X2 rectifier tubes corrected this condition and gave normal horizontal length of trace.
No vertical range step.	Trouble caused by failure of step rectifier tube V-404. Replacing it cleared the trouble.

NATURE OF OPERATION	TROUBLE FOUND AND REMEDY
Sweep on kinescope became jumpy and would jump up and down on screen.	Replaced V–403 type 6AG7 video amplifier tube. Sweep normal.
Receiver gain could not be held to normal—either too much grass (¾" to 1") or none.	V–205 (6AG7) bad, at 170 hours.
No trace on indicator scope.	Investigation showed heavy blue glow in V–408, 2X2 high voltage rectifier. Short suspected. Found dead short to ground in filter condenser C–418.
No trace on range scope.	V–409 was showing red plate. Replaced condenser C–420 which was found to be shorted to ground.
Veeder counter sticking.	Loosened mounting screws on Veeder counter. This relieved the strain on the frame, and allowed the gears to mesh properly.
Reported that the normal trace on the scope (V–411) was distorted.	Trouble was traced to a loose contact between the wire and cap that connects to the bottom deflection plate cap on V–411. This was resoldered. Normal.
Low intensity. Unable to focus range scope.	Found C–418 shorted. Replaced from spares and operation normal.
Checked lobing and found that trace did not blank on the #2 position of S–402.	Corrected by replacing V–406 (6SN7).
Found calibrating oscillator erratic.	Corrected by tightening shaft clamp on oscillator tuning capacitor (C–312).
Receiver oscillated badly.	Resoldered i-f socket ground rings.
The base line on the "A" scope shortened to about two-thirds natural length.	Found a burned out 15,000 ohm resistor (R–422) under 6AC7 (V–407) in the indicator section. The resistor was replaced and base line resumed its normal proportions.
Found receiver went into oscillation at gain setting of 3.	Clamp loose on shell of GL446. Tightened and corrected trouble.
Master PPI (SA, SA–2)	
The voltage regulator tube (V–1225) was found to be very erratic in operation.	Traced to a broken ground lug on condenser C–1234, located in the PPI Unit.
The voltage regulator tubes V–1225 and V–1226 were very erratic in operation.	Traced to shorted pins in P–1201. These pins were resoldered and insulated which cleared the trouble.
A double sweep was noted on the PPI tube.	Due to pins 3 and 4 being shorted together in socket X–1220. The trouble was cleared by bending the socket pins slightly away from each other.
PPI sweep rotation lagged about 20° behind antenna position.	Adjusted R–1301 until condition was corrected.

SA-213/U ROTARY SWITCH INCREASE EFFICIENCY OF OPERATION

Rotary Switch SA-213/U will stop or hang-up between switch positions because of insufficient detent spring tension.

Addition of spacers, as shown in figure 1, will increase the spring tension and allow proper operation of Rotary Switch SA-213/U.

The Rotary Switches SA-213/U are used in the following equipments:

Rotary Switch SA-233/U
Radar Distribution Switchboard SB-354/( ) /SP
Radar Distribution Switchboard SB-416 ( )/SP
Radar Distribution Switchboard SB-439 ( )/SP
Radar Distribution Switchboard SB-640/BP
Radio Frequency Switching Group OA-496 ( )/SSA

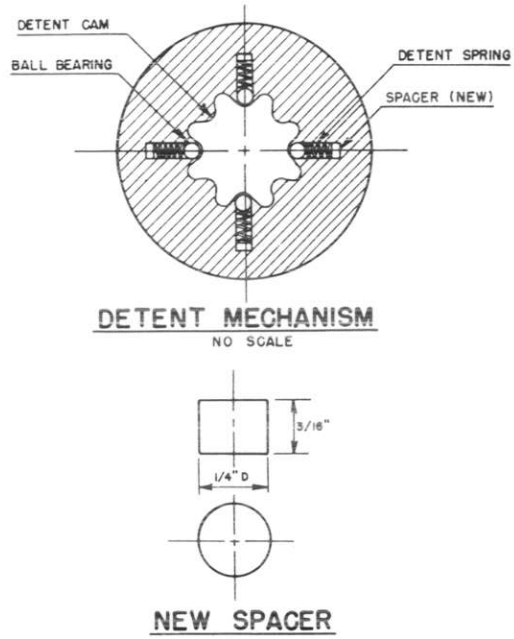


Figure 1

SA-233/U REMOVAL OF TERMINATION RESISTORS

The radar video and trigger terminating resistors, R-201 through R-224, in Rotary Switch SA-233/U are inaccessible after installation of interconnection cables. This fact was pointed out during the removal of terminating resistors prior to installation of the switch.

A variation of the proposal has been approved in that when plans for a specific installation require removal of the terminating resistors, they shall be removed prior to installation of the switches.

SA-233/U BLEEDER RESISTOR

A 1-meg, 1-watt bleeder resistor should be installed across C-201 in each Rotary Switch SA-233/U that has been modified for single-phase operation. It has been pointed out that Capacitor C-201, in the modified switch, holds a charge for a considerable time after power has been removed, and is in a position where persons working on the SA-233/U might easily brush against it.

Installation of the bleeder resistor is authorized to eliminate this safety hazard. No field change will be issued.

RADAR MODIFICATION TO SB-416, -416A/SP DISTRIBUTION SWITCHBOARDS

A modification to prevent crushing of video and trigger cables when closing doors of Radar Distribution Switchboards SB-416, -416A/SP has been submitted. The following material is needed to accomplish this modification:

1. One close wound spring 5/8" O.D., 12" long, No. 14 spring wire.
2. One 12" piece of 3/4" synthetic tubing to insulate spring.
3. One Timmerman No. 19A insulated cable slip, or equivalent.

The photos, show the door closing with, and without, the cable spring and the spring and clamp in operation.

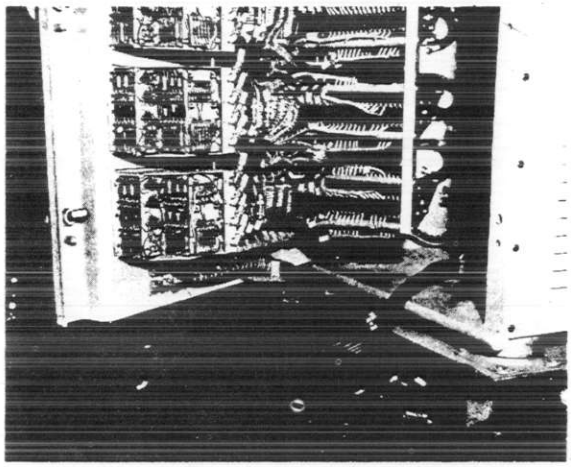


Figure 1 – Door Closing without Cable Spring.

Figure 2 – Door Closing with Cable Spring.

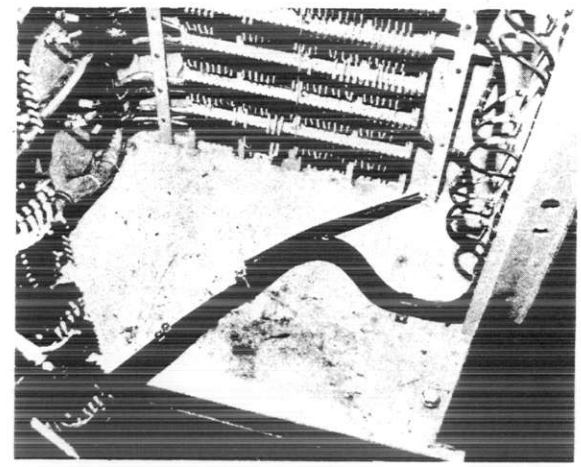


Figure 3 – Equipment showing cable spring and clamp in operation.

SB-440/SP, SB-441/SP AND SB-442/SP RADAR DISTRIBUTION SWITCHBOARD

Leads 40 and 90 in the following serial numbers of the radar distribution switchboards are reversed:

SB-440/SP 1 through 9 inclusive and 22
SB-441/SP 1 through 86 inclusive
SB-442/SP 1 through 18 inclusive

RADAR DISTRIBUTION SWITCHBOARDS SB-440, -441, AND -442/SP; PREVENTION OF FIRES IN

Three serious fires in Radar Distribution Switchboard SB-442/SP have been reported.

It has been determined that the fires were caused by electrical arcs, which formed across metallic wear-particle paths that has accumulated between the contacts used to switch synchro leads.

To prevent similar occurences it is recommended that all printed circuit switch and assemblies be removed, disassembled, and the switch cards be cleaned at the earliest opportunity. It is further recommended that the assemblies be cleaned therafter at 3-month intervals.

The following procedure should be followed to remove and clean the printed circuit switch cards:

1. Turn the applicable switch assembly to "OFF", before attempting its removal. The switch assemblies can then be removed and disassembled in accordance with 7-5(b) of NAVSHIPS 92903A. For the purpose of this article, the paragraphs pertaining to the removal of the solenoid and gearbox assembly should be disregarded.

NOTE: It is recommended that the switch assemblies associated with the indicators in CIC be cleaned first.

2. If spare printed-circuit assemblies are available, these should be inserted and the channel placed back into operation. To minimize system down-time, this should be done as soon as the switch to be cleaned is removed.

3. The recommended cleaning procedure follows:

a. Remove wear tracks on switch cards with a soft rubber eraser.

b. Wash off the cloudy film left by the eraser with laundry detergent.

c. Rinse in fresh water.

d. Dry the cards in warm air.

e. Hand buff the contact area with a clean, lint-free cloth to remove water spots.

f. Reassemble in accordance with figure 7-10 of NAVSHIPS 92903A. Caution should be exercised to prevent finger marks on the contact surfaces. Caution should also be exercised to replace the cards in the correct sequence. (See fig. 3-6 of NAVSHIPS 92903A.)

An investigation of the problem will continue. Any comments or recommendations by the fleet on this matter should be submitted to the Bureau of Ships on NAVSHIPS 3878.