Section 9
TRANSMITTING EQUIPMENT
T Series

SECTION 9. TRANSMITTING EQUIPMENT

MODEL TU SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Low output in TU–2 equipments.	One power-amplifier tube plate overheating indicating insufficient grid bias. Upon testing the grid circuit, the parasitic resistor measured 45,000 ohms instead of 15 ohms. Replacing the resistor restored normal operation.—U. S. S. *Omaha*

→INSTALLATION INSTRUCTIONS FOR MODELS TAB–6/7 RADIO TRANSMITTING EQUIPMENT

For installation procedures and directions for wiring interconnections on the Models TAB–6/7 Radio Transmitting Equipments, all installing activities are to follow the final instruction book, NAVSHIPS 900,379, in order to avoid certain errors in the preliminary instruction book. *1 1/49* ←

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CONTROL CIRCUITS FOR THE MODELS TAJ–11 THROUGH TAJ–18 TRANSMITTERS

The transmitter control circuit diagram (Fig. 1) which follows was prepared by the staff of the Radio Material School, Naval Research Laboratory. It is a simplified schematic diagram of the starting, stopping, and keying circuits for the models TAJ–11 through TAJ–18 transmitters.

It is not intended for this to be a complete schematic diagram of the entire equipment, but it is believed that it will be a help toward the understanding and servicing of the control circuits of these transmitters.

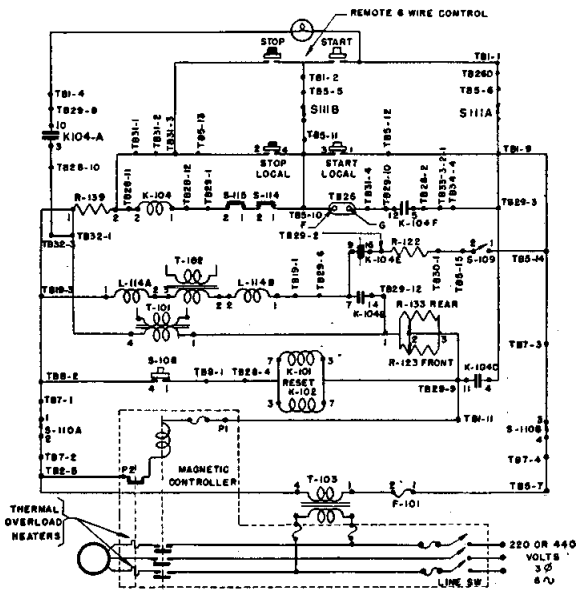

FIGURE 1.—Control circuits for models TAJ–11 through TAJ–18 transmitters, inclusive.

ERROR IN TAJ–11 INSTRUCTION BOOK

A report from a field activity has directed the attention of the Bureau to a discrepancy in the 220/440/3/60 schematic diagram, W–7351420, rev. 2, contained in preliminary instruction books furnished with the model TAJ–11 transmitting equipment.

Note no. 1 on the referenced drawings indicates that transformer T–103 is shown connected for 440-volt operation. This is incorrect, as it is the parallel or 220-volt connection which is shown. Note no. 1 should read as follows: "For 440-volt operation connect primary of T–103 terminal 6 to terminal 7. Remove jumpers 5 to 7 and 6 to 8. T–103 is now shown for 220-volt operation."

→ SHIPALTS REQUIRING REMOVAL OF MODEL TBL AND TAJ EQUIPMENTS FROM ACTIVE VESSELS DEFERRED

The problem of providing reliable communication during the entire twenty-four hour period out to a distance of 300 miles in certain vessels while operating in the auroral zone is under investigation and study by the Bureau of Ships. Pending completion of this study, it is desired to retain on board ship currently installed equipment operating in the 175–300 kc band but previously scheduled for removal in conformity with approved type installations. Acordingly, the Bureau of Ships by speedletter Ser. R–980–2178 dated 12 April has directed that:

"All outstanding shipalts requiring removal TAJ and TBL equipments from active vessels in accordance with approved type installations are hereby deferred pending study and resolution certain communication requirements for vessels while operating in auroral zone". *7/1/49.* ←

MODEL TAJ SERIES TROUBLE SHOOTING NOTES

DIFFICULTY ENCOUNTERED	CAUSE AND REMEDY
Necessity for tedious tuning procedure for power-amplifier.	Due to excessive interaction between antenna and power-amplifier circuits. Use the following procedure: (1) Adjust coupling control to a position of minimum coupling. (2) Tune power-amplifier to resonance with oscillator. (3) Tune antenna to resonance with power-amplifier. (4) Adjust coupling control for proper value of power-amplifier plate current.—*Navy Yard, Norfolk*
Whenever 3000 volts was approached there would be an arc-over in the lower portion of the transmitter and the supply line fuse would be blown.	It was found that the arcing was occurring between the high-voltage lead and the grounding strap for the lead shielding of this cable at the point of exit from the deck riser underneath the transmitter. Evidently the insulation had been nicked when cleaning the cable thus making a weak spot which eventually led to this breakdown.—U. S. S. *Leadstown*
TAJ–11.—The transmitter power-amplifier plate current meter read between 10 and 20 milliamperes, but this reading did not increase when tuned out of resonance. Antenna tuning had no effect.	All operating voltages and other current readings normal. The screen series resistor R–105 was very hot. The power-amplifier screen was found to be grounded through capacitor C–122.—U. S. S. *Bearss*
TAJ–11.—Motor-generator did not start when starting switch at transmitter was closed. Relay K–104 operated normally and the line contactor coil had proper operating voltage across it.	By disconnecting leads from line contactor coil N–113 and checking with an ohmmeter, the coil was found to be open. Normal operation was restored by installing new coil N–113.
TAJ–14.—Bias and plate signal lamps and meters showed no indication of operating voltages, but power signal lamp on the panel of the transmitter showed power.	Investigation showed that the transmitter motor-generator set would not operate. Further investigation showed the line contactor solenoid open. The solenoid was replaced and set operated normally.—U. S. S. *Mercy*
TAJ–11.—Transmitter relay chattering.	Relay K–104 would not lock in when the power was turned on. Inspection disclosed that the contactor spring was caught on the link connecting the contact system to the armature and causing it to bind. The spring was returned to its normal operating position and the set functioned properly.—U. S. S. *Callaway*
TAJ–14.—Transmitter would not key and keying relay was inoperative.	All voltages present and normal. All interlocks on band switches showed continuity. Discovered that contacts of overload relays K–103 had points that had worked loose and were not making contact when those relays were closed. After these points were readjusted operation of the transmitter returned to normal.—U. S. S. *Preston*
TAJ–15.—Starting relay K–104 chattered badly when start button was pressed.	Found contacts dirty and out of alignment.—U. S. S. *Deuel* (APA–160)

→TAJ–10.—Break down over insulation at capacitor C–151.

Investigation showed that cork insulator under connecting terminal was very thin, cracked and carbonized. Removed defective cork insulator and replaced with new insulator then returned capacitor to service.—U. S. S. *Astoria* (CL–90). ←

POWER-AMPLIFIER GRID LEAK RESISTOR FOR MODEL TBA–10 EQUIPMENTS

Power-amplifier grid leak resistors (R–115) for use with TBA–10, contract NOs–64824, are now being distributed to NYMI and NYNYK and are available upon request to the yards indicated. Contract number and symbol number should be referenced in making requests direct to the Supply Officer for Radio.

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FAILURE OF POTENTIOMETER R–130 IN MODEL TBA–6 TRANSMITTING EQUIPMENT

The Radio Laboratory of the Philadelphia Navy Yard has reported to the Bureau that potentiometer R–130 (10,000 ohms 100 watts) open-circuits both in the equipment and while in the spare parts box. The defective potentiometers are found to have a black residue on the wire which is probably some type of corrosion and the cause of the difficulty.

It is suggested that all activities having model TBA–6 transmitters check R–130 both in the transmitter and in the spare parts box for open circuits and if found notify the Bureau on failure report form NBS–383.

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→ TBA RADIO EQUIPMENTS FIELD CHANGE NO. 1

MODIFICATION OF METER M–111 BYPASS CIRCUIT (NO KIT)

Equipments affected.—All models TBA–6 and TBA–10 radio equipments.

Purpose.—To preclude failure of meter bypass capacitor C–149 and short-circuiting of meter-multiplier R–145.

Procedure.—Remove the low side of C–149 from the junction of M–111 and R–145 and connect it to ground at the junction of C–148 and M–111. A diagram of before and after this change is made is shown as Figure 1.

General.—Reference to the schematic diagram in the instruction book for the subject models indicates that the failure of meter bypass capacitor C–149 will short circuit the meter multiplier R–145, thereby applying a very high potential directly across the meter. By placing the "low" side of C–149 directly to ground at the junction of M–111 and C–148, the failure of C–149 would not damage the meter in any way.

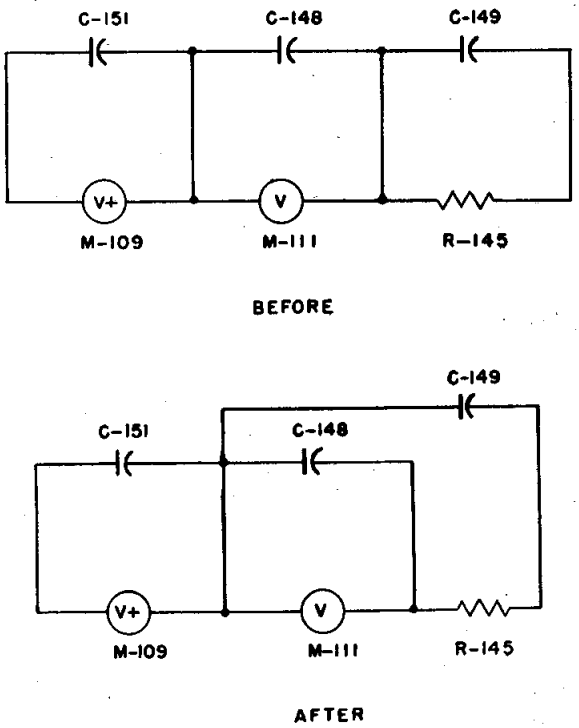

FIGURE 1.—Circuit before and after modification.

This change using available material is well within the scope of the ship's force. Instruction book and schematic diagrams should be changed accordingly.

A record of completion of this change should be made on the ship's "Radio Equipment Log" NAVSHIPS 900,039. Completion of this change should be reported on NBS–383 forms. *2/1/46*

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TBA RADIO EQUIPMENTS FIELD CHANGE NO. 2

BALANCED OUTPUT OPERATION (NO KIT)

Equipments affected.—Models TBA–3, –6, and –10 equipments when used with double-ended antennas.

Purpose.—To obtain balanced output for double-ended antenna operation.

Procedure.—Revise the circuit as shown in Figure 1 to provide satisfactory loading into a 600-ohm transmission line.

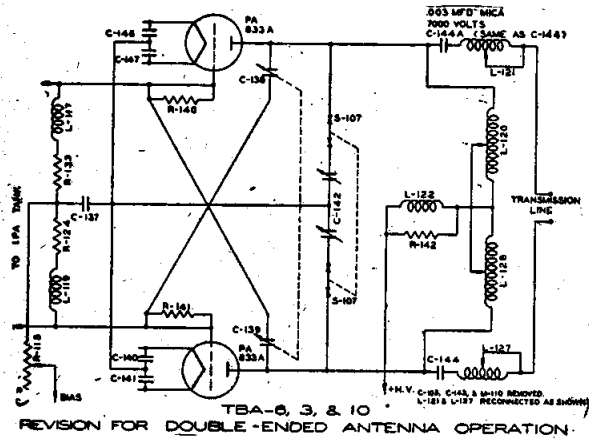

FIGURE 1.—Revision for models TBA–3, –6, and –10.

Operation over the complete range may be obtained by the addition of a small amount of inductance in series with L–121 and L–127. The Navy type 50118 antenna coupling unit provides balanced output for the TBA series equipments and should be used whenever available, and may be obtained from an Electronics Officer.

General.—This revision is not intended for general use but only as a temporary measure in specific instances where such operation is required and standard units which provide similar operation are not readily available. Instruction book and schematic diagrams should be changed accordingly.

This revision using available material is well within the scope of the ship's force. A record of this revision should be made on the ship's "Radio Equipment Log" NAVSHIPS 900,039. Completion of this revision should be reported on NBS–383 forms. *2/1/46*

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TBA RADIO EQUIPMENTS

FIELD CHANGE NO. 3

HIGH SPEED KEYING (NO KIT)

Equipments affected.—Models TBA–2 and TBA–6 equipments when high speed keying is used.

Purpose.—To obtain high speed keying.

Procedure.—Revise circuit as shown in Figure 1 for high speed keying of the TBA–2.

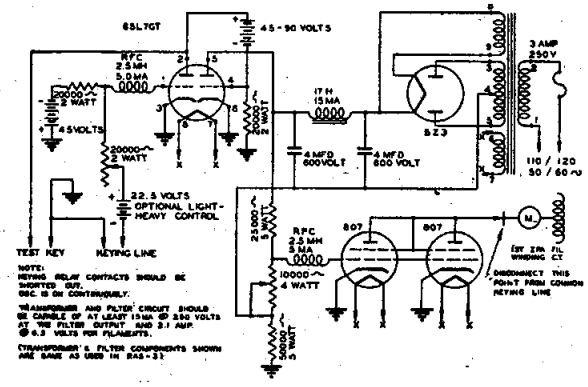

FIGURE 1.—Revision for model TBA–2.

Modification of the TBA–6 for high speed keying is shown in Figure 2.

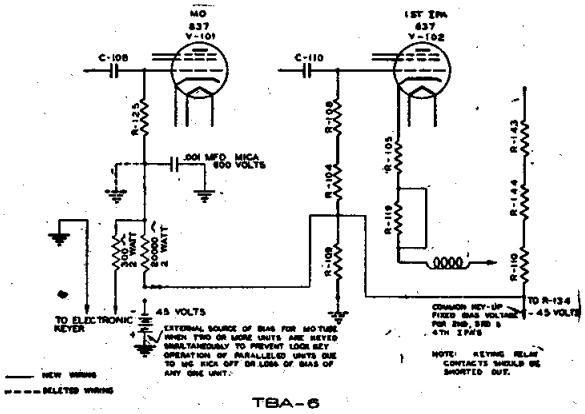

FIGURE 2.—Revision for model TBA–6.

General.—No standard Navy units to provide parallel operation of the TBA transmitters as shown in Figures 1 and 2 above are available at this time.

These revisions are not intended for general use but only as a temporary measure in specific instances where such operation is required and standard units which provide similar operation are not readily available.

Instruction book and schematic diagrams should be changed accordingly.

These revisions using available material are well within the scope of the ship's force.

A record of these revisions should be made on the ship's "Radio Equipment Log" NAVSHIPS 900,039. Completion of these revisions should be reported on NBS–383 forms *2/1/46*

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TBA RADIO EQUIPMENTS FIELD CHANGE NO. 4

MODIFICATION OF THE O–5/FR EXCITER UNIT (NO KIT)

Equipments affected.—All models TBA series radio equipments.

Purpose.—To permit use of the O–5/FR exciter unit with the master-oscillators of the equipments affected.

Procedure.—Modify the O–5/FR exciter unit as shown in Figure 1 (drawing RE67A107).

General.—For more detailed information on this modification and on the O–5/FR exciter unit, reference should be made to the Army Technical Manual entitled "Exciter Unit O–5/FR" TM–11–2205 which may be obtained from an Electronics Officer. Instruction books and schematic diagrams should be changed accordingly.

This modification using available material is well within the scope of the ship's force. A record of this change should be made on the ship's "Radio Equipment Log" NAVSHIPS 900,039. Completion of this change should be reported on NBS–383 forms. *2/1/46*

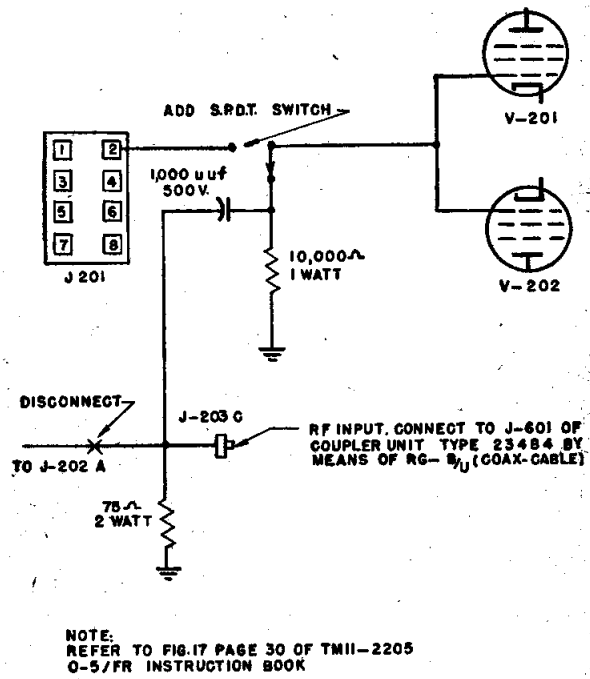

FIGURE 1.—Modification of the O–5/FR exciter unit to permit its use with the master-oscillators of the TBA, TBK and TBM series transmitters

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MODEL TBA SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
TBA–6.—No plate voltage in first i-p-a stage.	Broken solder connection on L–126.—U. S. S. *Indiana*
TBA–6.—Low plate voltage on all i-p-a stages, and upon keying the set, meter M–101 would read zero.	High voltage fuse A4 at the motor-generator blown.—U. S. S. *Indiana*
TBA–6.—Very low indication on power-amplifier grid meter and no output available from power-amplifier of the transmitter.	The power-amplifier grid leak resistor R–115 failed. Another resistor of the correct resistance and higher power rating was installed, and the operation of the equipment was returned to normal.—U. S. S. *Memphis*.

MARKING OF MOTOR-GENERATOR SETS SHIPPED WITH MODELS TBK–13 AND TBM–7 EQUIPMENTS

Due to a diversion of equipments, it became necessary to ship TBK–15 and TBM–8 motor-generator sets with models TBK–13 and TBM–7 transmitting equipments. This procedure resulted in motor-generators with armature shafts marked "TBK–13" or TBM–7" being shipped with models TBK–15 and TBM–8 equipments. Since the armatures of all of these equipments are entirely interchangeable, no harm results except that confusion might occur during the removal or replacement of the armature units.

Installation and maintenance activities should make specific note of the above fact in order that no confusion or delay will result when the irregularity is encountered.

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CONVERSION OF MODELS TBK AND TBM SERIES EQUIPMENTS TO A TWO-WIRE OUTPUT

The models TBK/TBM type of transmitters may be converted to two-wire line output by removing the ground from C–42 and attaching the feedlines to the normal antenna post and the rotor of C–42. The late models of these transmitters have C–42 mounted by three machine screws and metal sleeves. By replacing these sleeves with small standoff insulators, the ground is effectively removed. No other change or additional equipment is required. Tuning is accomplished in the normal manner. It will be noticed that the power-amplifier will load with decidedly less capacity in C–41, thus reducing harmonic and spurious radiation due to close coupling. There will be less interaction between the tuning of the antenna system and the power-amplifier, which will speed up the process of tuning to a new frequency. The line will be resonant and have the usual efficiency of resonant lines. The system may be used to feed any type of antenna throughout the frequency range. A center-fed half-wave antenna cut for 4 mc. with a spaced 600-ohm transmission line of any length adapts itself satisfactorily to any frequency. When using this type of antenna on its harmonics, care should be used in proper orientation as the directivity is marked.

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ERROR IN TBK INSTRUCTION BOOK

Drawing P–7708396 contained in the preliminary instruction books furnished with the first group of model TBK–13 equipments indicates improper connection to terminals #22 and #23 of the transmitter unit. The 1000-volt lead from the bias generator should be connected to terminal #22 and the 275-volt lead should connect to terminal #23. In other words, the connections to terminals #22 and #23 are reversed on drawing P–7708396.

The above error has been corrected on drawings being distributed at the present time. Corrections should be made on all available copies in the field in order to prevent possible improper connection and damage to the equipment.

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ADDENDA TO INSTRUCTION BOOKS FOR MODEL TBK–17 EQUIPMENTS

(Also applicable to models TBK–8, 10, 12, 14)

The following should be added to the subject instruction books:

4.68 IMPORTANT NOTICE—Instructions for correctly tuning the transmitter are given above in Paragraphs 4.41 to 4.67. These instructions are applicable up to and including 16 mc. Above 16 mc. due to tube variations, and other contributing causes, a somewhat different procedure is necessary. Two conditions may present themselves. In the first instance, when the antenna resistance is low enough to permit an indication of current on the "ANTENNA CURRENT" meter (M113), controls "F", "G", "I" and "J" should be manipulated as for frequencies below 16 mc. until further increase in coupling fails to result in an increase in antenna current. Increased coupling may, in fact, result in a decreased antenna current indication. Tune for maximum antenna current, which corresponds to optimum coupling. Plate current may be somewhat less than 300 ma. but if the peak of antenna current

has been attained, no attempt should be made to obtain a higher plate current value.

4.69 In the second instance, the antenna resistance may be too high to permit the "ANTENNA CURRENT" meter (M113) to give an indication of antenna current. When this is so, the coupling is adjusted by means of controls "F", "G", "I" and "J" as for frequencies below 16 mc. except that the p-a output circuit is loaded for an indication of approximately 225 ma. on the "PA PLATE CURRENT" meter (M107).

4.70 The most important point of paragraphs 4.68 and 4.69 is that, while the tuning operation is similar for all frequencies, the admonition of paragraph 4.55 is ignored for frequencies above 16 mc. The 300 ma. reading on M107, the "PA PLATE CURRENT" meter, is not attained for the higher frequencies, but is permitted to be some arbitrary value when tuning for maximum antenna current, and limited to approximately 225 ma. when the antenna current indication is too small for accurate tuning.

Typical Control Settings

Freq. kc.	Oscillator		Amplifiers		Power-Amplifier			Bias	Aux.	Ant.	Fil.	Output power watts
	I_{sg} ma.	I_p ma.	#1, I_p ma.	#2, I_p ma.	I_g ma.	I_p ma.	E_p v.	E_c v.	E_p v.	I_a amp.	E_f v.	
18100	13. 5	37	52	87	25	275	3000	230	1338	1. 8	11	280
16000	13. 5	37	56	93	27	300	3000	230	1300	2. 3	11	300

Typical Meter Readings

Kc.	A	B	C	D	E	F	G	H	I	J
18100	6	4238	83	2475	2746	2639	16	Volts	83	2845
16000	6	2025	78	2395	2689	2585	18	Volts	77	2775

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MODEL TBK CATHODE MODULATOR

The NYMI constructed a number of cathode modulator units to provide A_3 emission with the model TBK series transmitters. Inasmuch as a number of ships have these equipments and maintenance data is not available to these vessels, the following diagrams are supplied for assistance in the maintenance of this equipment. Figure 1 shows the schematic and Figure 2 shows the type plan wiring diagram.

Only a limited number of these modulators were built and the publication of this maintenance data should not be construed as Bureau authorization for installation of these modulators on ships not already having them.

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→ CORRECTION TO MODEL TBK CATHODE MODULATOR CIRCUIT DIAGRAM

The circuit diagram of the model TBK cathode modulator, Figure 1 on page TBK : 3, Supplement No. 8 of the C. E. M. B., incorrectly showed the choke (CH) next to the final 6L6 as being short-circuited. With supplement No. 20 there has been included a new page TBK : 3 with Figure 1 shown in its corrected form. *10/1/47* ←

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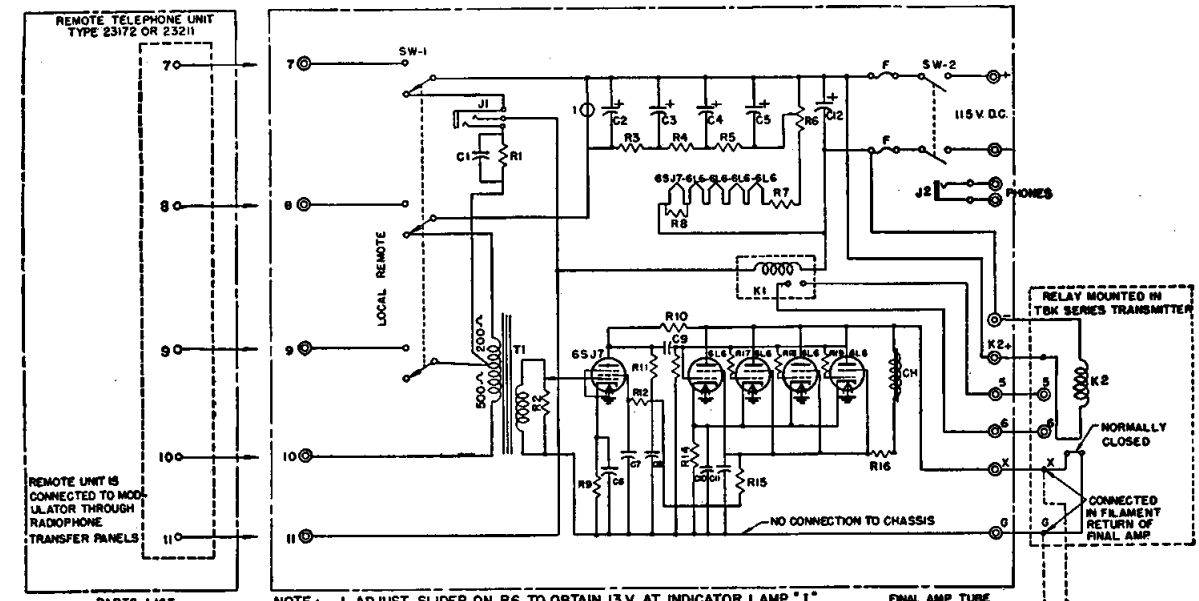

PARTS LIST

C-13	1. MFD. 1000 V.
C-12	40 μfd 150 V.
R-1	175 OHM 2 W
R-2	500,000 OHM POTENTIOMETER
R-3,R-4,R-5	1 OHM, 1 WATT
R-6	100 OHM, 200 W. ADJUSTABLE - NOTE 1
R-7	10 OHM, 60 WATT
R-8	10 OHM, 10 WATT
R-9	500 OHM, 1 WATT
R-10	500,000 OHM, 1/2 WATT
R-11	100, 000 OHM, 1 WATT
R-12	500,000 OHM, 1/2 WATT
R-13	100,000 OHM, 1/2 WATT
R-14	100 OHM, 60 WATT
R-15	10,000 OHM, 1 WATT
R-16	2,500 OHM, 10 WATT
R-17,18,19	100 OHM, 1 WATT
C-1	50 μfd 25 V.
C-2,3,4,5	25 μfd 25 V.
C-6	10 μfd 25 V.
C-7	.1 μfd 600 V.
C-8	8 μfd 450 V.
C-9	.05 μfd 600 V.
C-10	50 μfd 50 V.
C-11	8 μfd 450 V.

I	W.E. 12 V. SWITCHBOARD LAMP
F	3 AMP. GLASS FUSES
SW-1	ANTI-CAPACITY TYPE SWITCH (FEDERAL # 1424)
SW-2	DPST TOGGLE SWITCH
T-1	"STANCOR" TYPE A4351 (NOTE # 2)
CH	10 HENRY 65 MILLIAMPERE
J-1	SMALL SIZE "TIP RING SLEEVE" JACK
J-2	SINGLE CIRCUIT PHONE JACK
K-1	115 V. D.C. RELAY (NORMALLY OPEN)
K-2	115 V. D.C. RELAY (NORMALLY CLOSED)

FIGURE 1.—Schematic of the cathode modulator for the TBK.

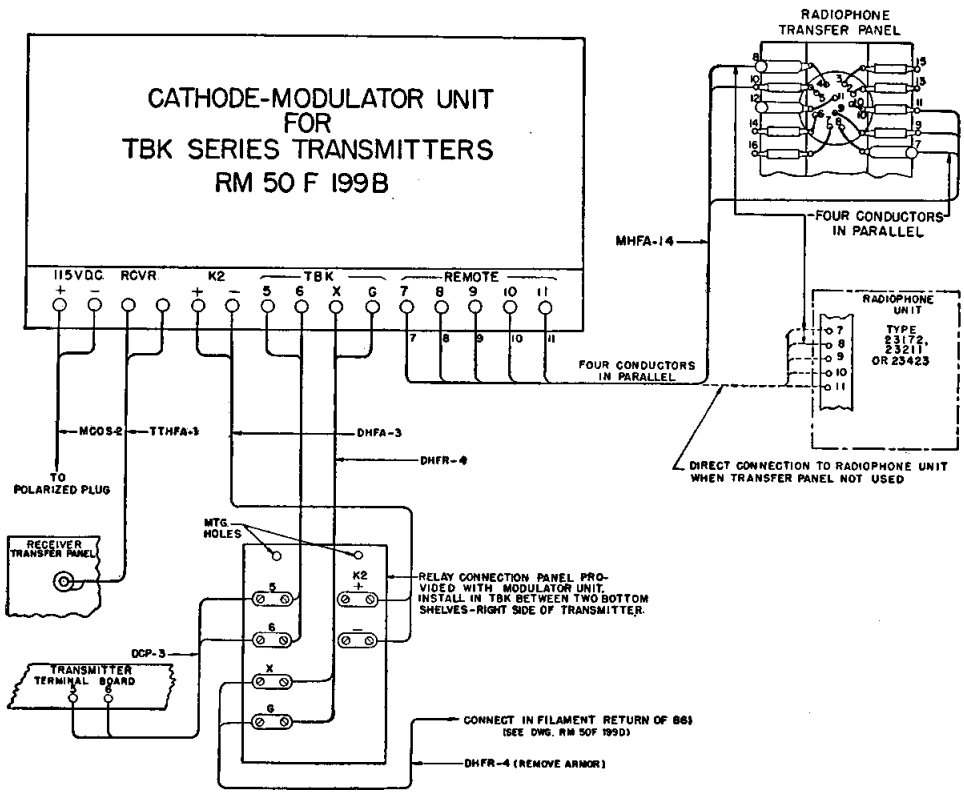

FIGURE 2.—Type plan wiring diagram of the cathode modulator for the TBK.

LUBRICATION OF BLOWER MOTORS IN MODEL TBK–17

The U. S. S. *Sitka* (APA–113) has pointed out to the Bureau that the blower motor (B–104A) for the TBK–17 transmitter was received from the factory without grease in the bearings and as a result the unit was damaged after about 25 hours service.

All maintenance activities are urged to check blower motors in all transmitters when received from the factory for proper lubrication and if insufficiently lubricated the bearings should be packed with Navy specification 14–L–3, Grade II ball bearing lubricant.

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TUNING PROCEDURE IN TBK–17 (TBK–8, –10, –12, –14) WHEN USING WESTINGHOUSE 861 TUBES

Due to slightly different characteristics between RCA and Westinghouse 861 type tubes, the instructions for tuning the transmitter for frequencies up to 16 mc. are correctly given in paragraphs 4.41 to 4.67 in the instruction book for both types of tubes and this applies also to the RCA 861 above 16 mc. When using the Westinghouse 861 above 16 mc. use the instructions given in paragraph 4.68 to 4.70 in the instruction book or as found in the article entitled "Addenda to Instruction Books for Model TBK–17 Equipments" on page TBK:2 of this bulletin.

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CONTROL CIRCUITS FOR THE MODELS TBK–5 AND TBK–6 AND TBK–13 TRANSMITTERS

The transmitter control circuit diagrams which follow were prepared by the staff of the Radio Material School, Naval Research Laboratory. They are simplified schematic diagrams

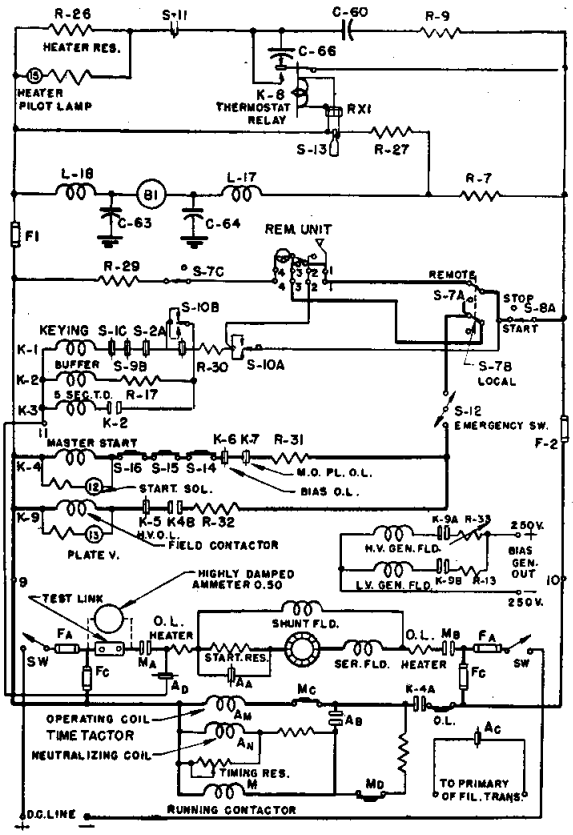

FIGURE 1.—Control circuits for models TBK–5 and TBK–6 transmitters.

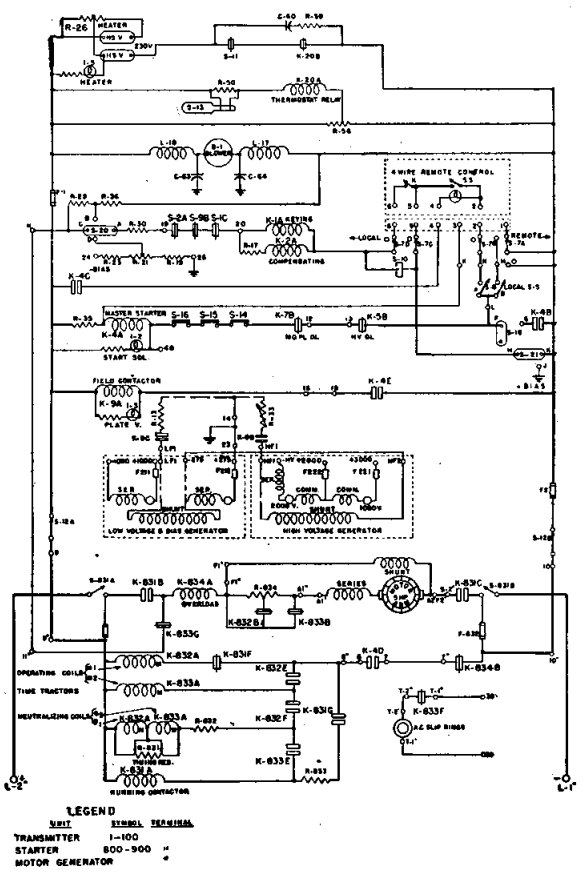

FIGURE 2.—Control circuits for model TBK–13 transmitters.

of the starting, stopping, and keying circuits for the TBK–5 and TBK–6 and TBK–13 transmitters.

It is not intended for them to be complete schematic diagrams of the entire equipment, but it is believed that they will be a help toward the understanding and servicing of the control circuits of these transmitters.

Figure 1 shows the control circuits for the models TBK–5 and TBK–6. Figure 2 shows them for the model TBK–13.

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→ TBK RADIO EQUIPMENTS

FIELD CHANGE NO. 1

METER M–107 ERRONEOUSLY LABELED

Equipments affected.—Model TBK–17 transmitting equipments purchased under contract NXss–28616.

Purpose.—To rectify any possible error in the marking of the M–107 label.

Procedure.—Correct label of any meter M–107 erroneously marked "First Amplifier Plate Current" to read "Power Amplifier Plate Current".

General.—Reports have been received by the Bureau that the meter M–107 has been erroneously marked "First Amplifier Plate Current" causing confusion to inexperienced technical personnel.

It is requested that vessels and Naval activities examine their equipments for similar errors and correct the label to read "Power Amplifier Plate Current".

A record of completion of this change should be made on ship's "Radio Equipment Log" NAVSHIPS 900,039. Completion of this change should be reported on NBS–383 forms. *2/1/46*

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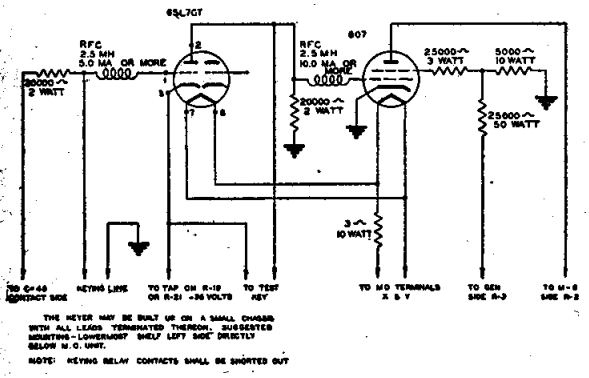
TBK RADIO EQUIPMENTS
FIELD CHANGE NO. 2

PARALLEL HIGH SPEED KEYING

Equipments affected.—All model TBK series radio equipments when parallel and high speed keying is used.

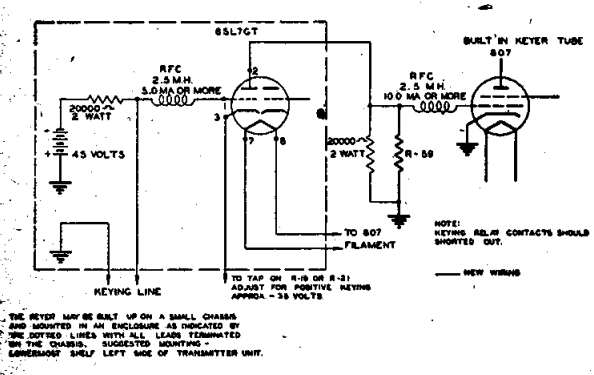
Purpose.—To provide parallel and high speed keying.

Procedure.—Revise the output circuit as shown in Figures 1 and 2.



CIRCUIT FOR PARALLEL HIGH SPEED KEYING OF TBK & TBM EQUIPMENTS NOT HAVING BUILT-IN KEYER TUBE

FIGURE 1.—Revision for TBK and TBM equipments not having a built-in keyer tube.



REVISION FOR PARALLEL HIGH SPEED KEYING OF TBK & TBM EQUIPMENTS HAVING BUILT-IN KEYER TUBE

FIGURE 2.—Revision for TBK and TBM equipments having a built-in keyer tube.

General.—The high speed keying circuits of Figures 1 and 2 are not intended for general use and should be used only in those instances where high speed keying and paralleling of transmitters is necessary. No standard Navy type units which will provide parallel keying are available at this time. Modification of the output circuit is within the scope of the ship's force.

Several methods of modification of the output circuit have been submitted to the Bureau, of which two are shown in Figures 1 and 2 above. Instruction books and schematic diagrams should be changed accordingly.

A record of this change should be made on the ship's "Radio Equipment Log," NAVSHIPS 900,039. Completion of this change should be reported on NBS–383 forms. *2/1/46*

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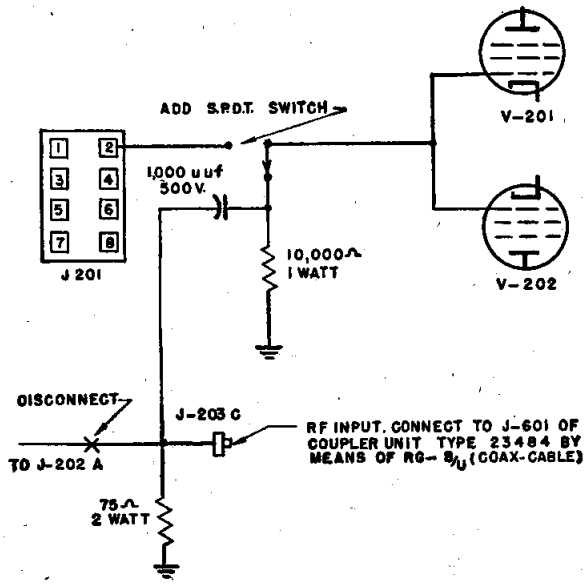
TBK RADIO EQUIPMENTS
FIELD CHANGE NO. 3

MODIFICATION OF THE O–5/FR EXCITER UNIT (NO KIT)

Equipments affected.—All models TBK series radio equipments.

Purpose.—To permit use of the O–5/FR exciter unit with the master-oscillator of the equipments affected.

Procedure.—Modify the O–5/FR exciter unit as shown in Figure 1 (drawing RE67A107).



NOTE:
REFER TO FIG. 17 PAGE 30 OF TM11-2205
O-5/FR INSTRUCTION BOOK

FIGURE 1.—Modification of the O–5/FR exciter unit to permit its use with the master-oscillators of the TBA, TBK and TBM series transmitters.

General.—For more detailed information on this modification and on the O–5/FR exciter unit, reference should be made to the Army Technical Manual entitled "Exciter Unit O–5/FR" TM–11–2205 which may be obtained from an Electronics Officer.

Instruction books and schematic diagrams should be changed accordingly. This modification using available material is well within the scope of the ship's force.

A record of this change should be made on the ship's "Radio Equipment Log," NAVSHIPS 900,039. Completion of this change should be reported on NBS–383 forms. *2/1/46*

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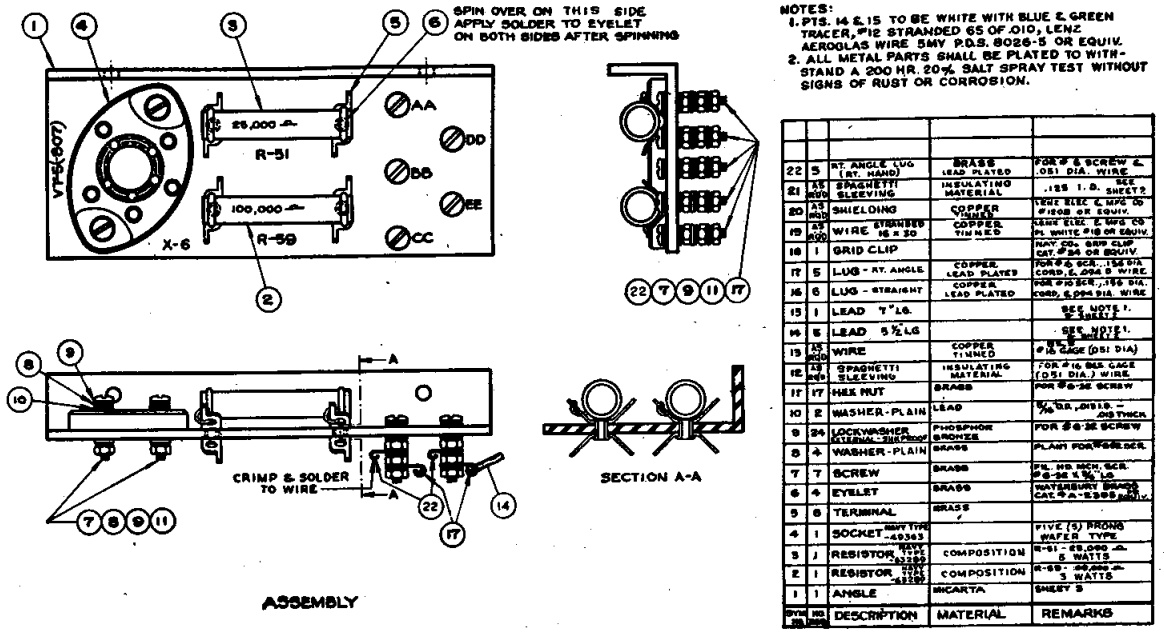
→ VACUUM TUBE KEYING ON TBK TRANSMITTING EQUIPMENT

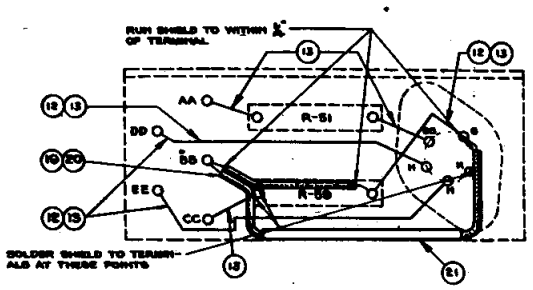
All shipborne model TBK series transmitting equipments subsequent to model TBK–8 and manufactured by Westinghouse Electric Corporation may be readily modified to provide high-speed vacuum tube keying anywhere up to and including 500 words per minute. The material, modifications, wiring, installations, etc., necessary to realize high-speed vacuum tube keying in the equipments operated from an a-c power source are shown on Figures 1 to 10 inclusive.

The vacuum tube keyer unit, built in accordance with drawing on Figures 1, 2 and 3 and including a type 807 vacuum tube, should be mounted directly behind and below the master oscillator tube access door. Refer to installation drawing on Figures 4 and 5. The keyer terminal strip, shown in detail on Figures 6 and 7, should be mounted, as shown on drawing, Figures 4 and 5, on the lower side of the panel immediately below the master oscillator chassis. (This terminal strip does not necessarily have to be in strict accordance with drawing on Figure 6 so long as the terminal strip employed performs the same functions.) A hole should be cut, as shown in detail on Figure 5, in the panel supporting the keyer terminal strip for the flexible leads connected between the keyer unit and the keyer terminal strip and also for the leads connected to the "Vacuum Keying-Relay Keying" switch. A felt collar should be provided around the edges of the hole to protect the leads from unnecessary wear. (The size and shape of this hole are only approximate—individual judgment should be exercised.) If desired and thought more practical, individual holes may be drilled



SYM.	NO. REQ.	DESCRIPTION	MATERIAL	REMARKS
22	5	RT. ANGLE LUG (RT. HAND)	BRASS LEAD PLATED	FOR #6 SCREW & .051 DIA. WIRE
21	AS REQD	SPAGHETTI SLEEVING	INSULATING MATERIAL	.125 I.D. SEE SHEET 2
20	AS REQD	SHIELDING	COPPER TINNED	LENZ ELEC. & MFG CO #1808 OR EQUIV.
19	AS REQD	WIRE STRANDED 16 x 30	COPPER TINNED	LENZ ELEC. & MFG CO PL WHITE #18 OR EQUIV.
18	1	GRID CLIP		NAV DEPT. GRID CLIP CAT. # 34 OR EQUIV.
17	5	LUG - RT. ANGLE	COPPER LEAD PLATED	FOR #6 SCR., .156 DIA. CORD, & .094 D WIRE
16	6	LUG - STRAIGHT	COPPER LEAD PLATED	FOR #10 SCR., .156 DIA. CORD, & .094 DIA. WIRE
15	1	LEAD 7" LG.		SEE NOTE 1.
14	6	LEAD 5½" LG.		SEE NOTE 1.
13	AS REQD	WIRE	COPPER TINNED	SEE NOTE 2. #16 GAGE (.051 DIA)
12	AS REQD	SPAGHETTI SLEEVING	INSULATING MATERIAL	FOR #16 SOL GAGE (.051 DIA.) WIRE
11	17	HEX NUT	BRASS	FOR #6-32 SCREW
10	2	WASHER-PLAIN	LEAD	⅜" OD, .093 ID, .093 THICK
9	24	LOCKWASHER (EXTERNAL-TOOTH)	PHOSPHOR BRONZE	FOR #6-32 SCREW
8	4	WASHER-PLAIN	BRASS	PLAIN FOR #6 SCREW
7	7	SCREW	BRASS	82° HD MCH. SCR. #6-32 x ⅜ LG
6	4	EYELET	BRASS	WATERBURY BRASS CAT. # A-1395
5	6	TERMINAL	BRASS	
4	1	SOCKET -40363		FIVE (5) PRONG WAFER TYPE
3	1	RESISTOR	COMPOSITION	R-51 - 25,000Ω 5 WATTS
2	1	RESISTOR	COMPOSITION	R-59 - 100,000Ω 5 WATTS
1	1	ANGLE	SHEET	SHEET 3

Figure 1.—Vacuum tube keyer unit.



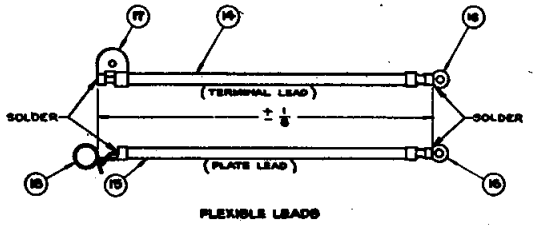


Figure 2.—Vacuum tube keyer unit wiring diagram (bottom view) and flexible lead details.

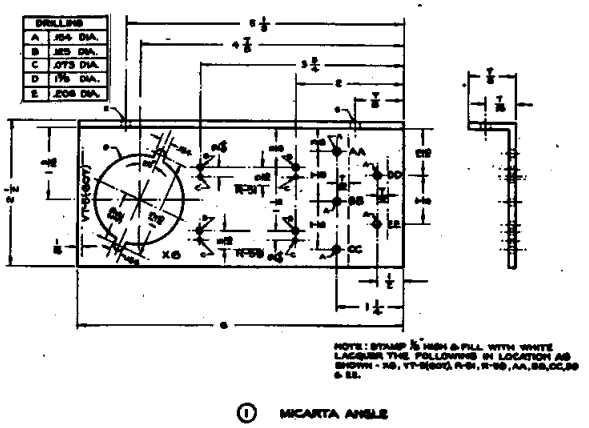


Figure 3.—Vacuum tube keyer unit details.

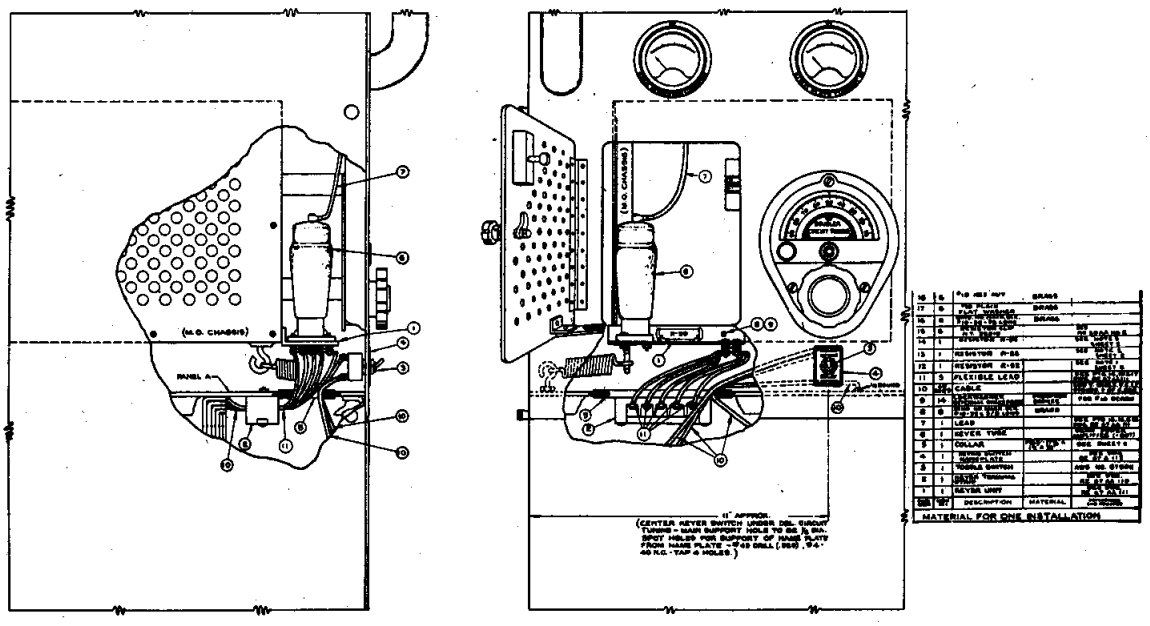


Figure 4.—Cutaway illustration of the master oscillator unit.

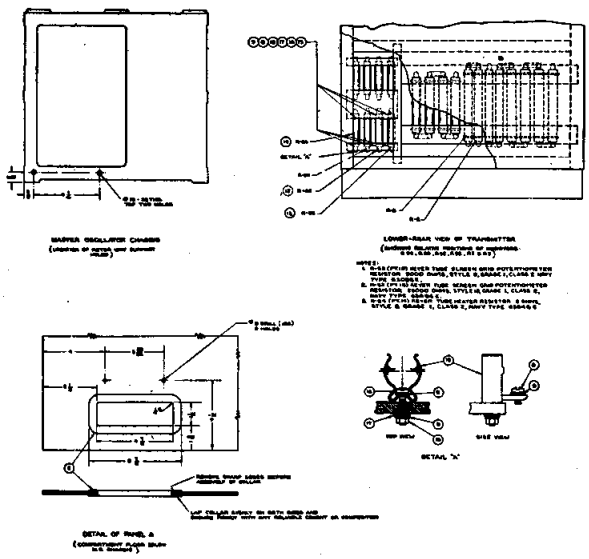


Figure 5.—Installation drawing for keyer unit.

in the panel and provided with rubber grommets for each lead instead of cutting a hole as called for above. Mount a double pole-single throw toggle switch (AWS no. ST50K), as shown on Figure 4, on the front panel of the transmitter immediately below the doubler circuit tuning control "C". In connection with this, be certain that a nameplate, in accordance with drawing on Figure 8, is mounted on the front panel of the transmitter over the toggle switch. (The location of the toggle switch and its nameplate may be varied somewhat from that shown on the drawing.) Mount three resistors, R–52 (5,000 ohms—Navy type 63085E), R–53 (25,000 ohms—Navy type 6309E), R–54 (5 ohms–Navy type 63046E) as shown on Figure 5, on the two resistor

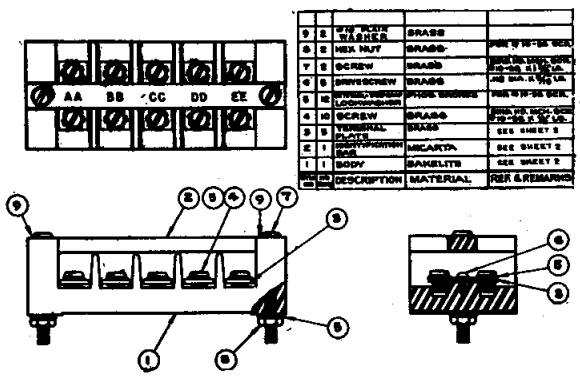


Figure 6.—Keyer terminal strip.

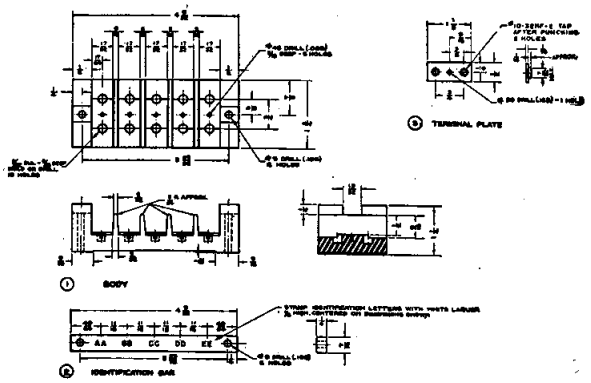


Figure 7.—Terminal strip details.

mounting strips located in the rear lower left hand side of the transmitter. (In some transmitters, resistor clips and terminals and dummy resistors are provided while in other transmitters only mounting holes are provided in the resistor mounting strips.) After the keyer unit and its associated components have been installed as explained above, the necessary wiring should be carried out as shown on the wiring diagram Figure 9, on the schematic diagram Figure 10, and on the installation drawing Figure 4. (Be sure that all notes on the referenced drawings are adhered to.)

The plate of the keyer tube is effectively connected in parallel with the screen grid of the master oscillator tube (Connect the flexible plate lead of the keyer tube to the positive terminal

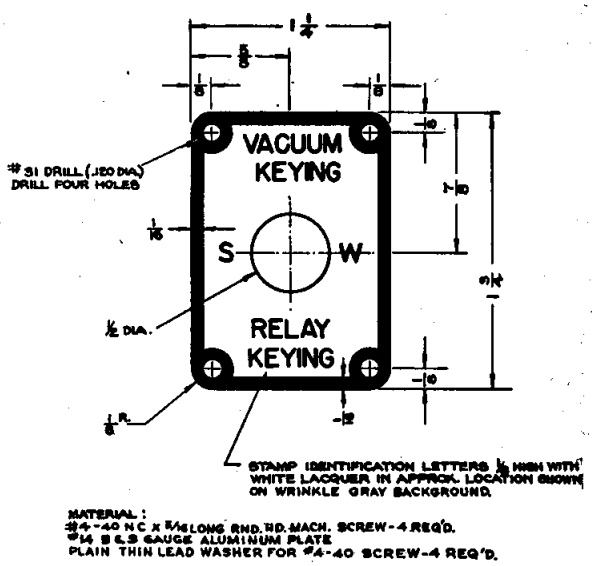


Figure 8.—Keyer switch nameplate.

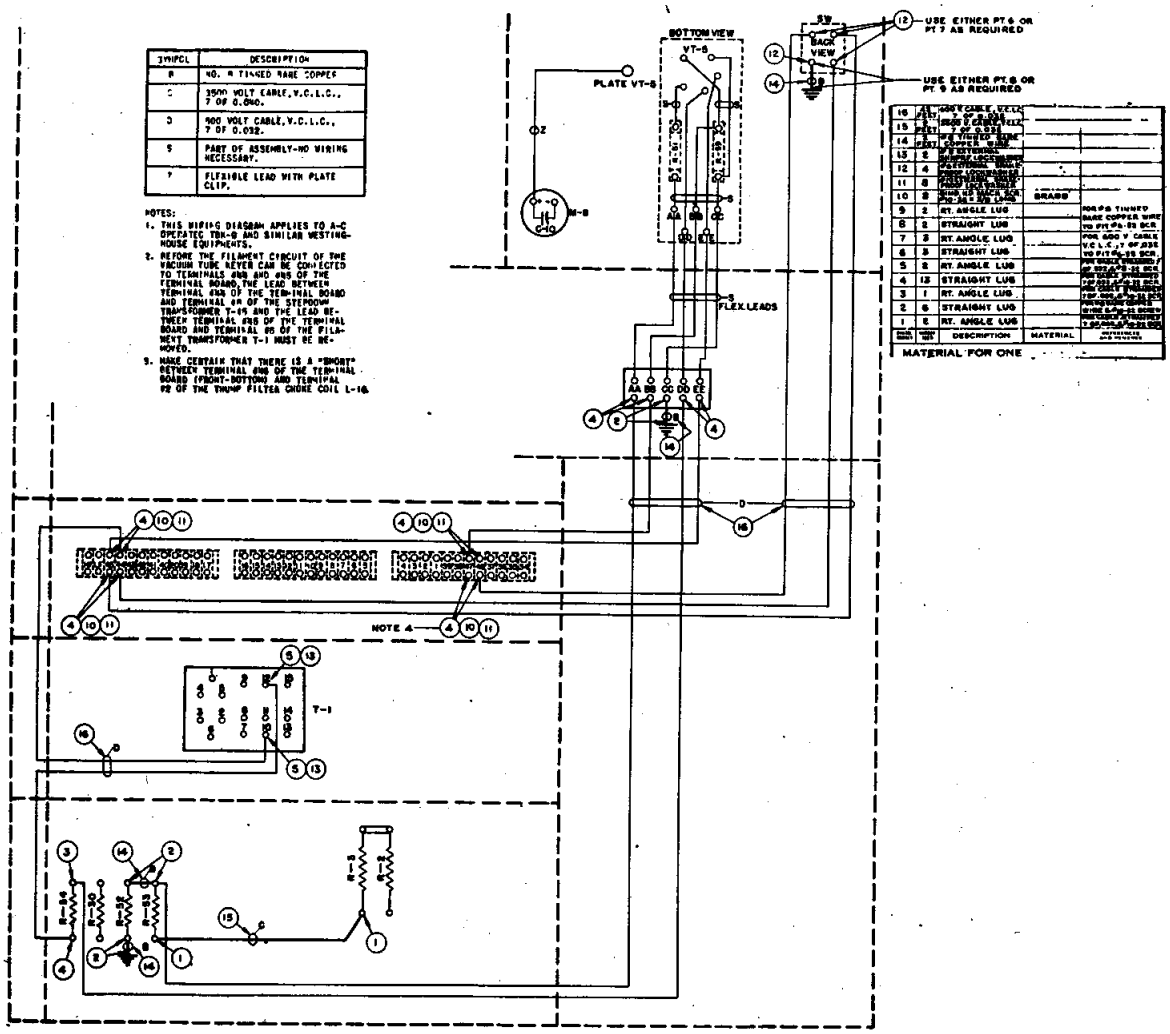


Figure 9.—Vacuum tube keyer wiring diagram.

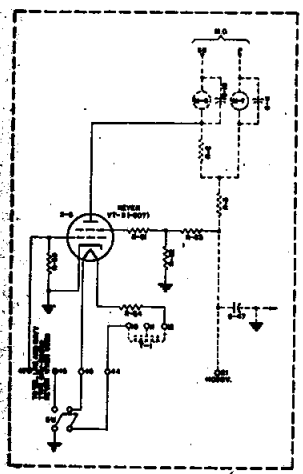


Figure 10.—Vacuum tube keyer schematic diagram.

of the master oscillator screen current meter M–8). The screen grid of the keyer tube is connected through dropping resistor R–51 to the keyer tube screen grid potentiometer consisting of resistors R–52 and R–53, which is connected across the 1000-volt master oscillator plate and screen grid supply. The control grid of the keyer tube is connected through resistor R–59 to the cathode of the keyer tube, which is grounded. The control grid of the keyer tube is also connected to terminal 47 on the transmitter terminal board. One side of the keyer tube heater circuit is connected to terminal 45 on the transmitter terminal board while the other side is connected through dropping resistor

R–54 to terminal 12 of the transmitter filament transformer T–1. Terminal 10 of transformer T–1 is connected to terminal 44 on the transmitter terminal board. (Before the heater circuit is connected to terminals 44 and 45 on the transmitter terminal board, make sure that there are no connections between terminal 44 and terminal 8 of the transmitter step-down transformer T–5 or between terminal 45 and terminal 6 of the transmitter filament transformer T–1). From terminals 44 and 45, the heater circuit is then connected in series with one pole of the "Vacuum Keying—Relay Keying" switch "SW" so that the keyer tube heater circuit can only be excited when switch "SW" is placed in the "Vacuum Keying" position ("ON" position of the double pole—single throw toggle switch). Next, terminal 46 of the transmitter terminal board is connected to the other pole of switch "SW" and the pole grounded so that when switch "SW" is placed in the "Vacuum Keying" position, the transmitter thump filter choke coil L–16 is shorted to ground (Make certain that there is a "short" between terminal 46 and terminal 2 of the transmitter thump filter choke coil L–16).

When the keyer tube heater circuit is excited (First the keyer switch "SW" should be thrown in the "Vacuum Keying" position and then the "Test Key" S–10 of the transmitter should be thrown in the "lock" position. It should be noted that when vacuum tube keying is employed, the "Keying Relay" K–1 and the "Compensating Relay" K–2 must be locked in (continuously energized) by either throwing the "Test Key" S–10 in the "lock" position or by some other convenient outside means), the plate of the keyer tube draws current through the master oscillator screen dropping resistor R–2; this reduces the master oscillator screen grid voltage to a low value and the master oscillator will not oscillate. When a voltage of the correct polarity is impressed on terminals 46 and 47 of the transmitter terminal board (a d-c potential of from 35 to 125 volts should be provided—the positive side of the keying voltage must be connected to terminal 46. The keying voltage may be applied and controlled by either a standard hand key or by a standard Navy keyer, such as the Navy type CRV–50059 keyer), the keyer tube is biased to plate current cut-off; the master oscillator screen grid voltage rises and the master oscillator will oscillate normally (It should be noted that when the keyer tube heater circuit is not excited, the vacuum tube keyer circuits do not in any way affect the operation of the transmitter circuits). *6/1/46*

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→OVERHEATING IN MASTER OSCILLATOR OVEN COMPARTMENTS ON MODEL TBK TRANSMITTERS

The following information regarding the Model TBK Transmitting equipments was submitted by the Service Force, U. S. Atlantic Fleet, and is reprinted as being beneficial to all maintenance personnel:

(*a*) In the last three TBK transmitters, it has been found that the master oscillator oven compartment was overheating as indicated by the mercury column being out of sight at the top of thermometer on the front of the compartment. This overheating resulted, not only in drifting of the master oscillator frequency, but in damage to components and changing of capacitor values.

(*b*) The oven compartment operates as follows: When the transmitter is initially turned on, with the temperature below 50° C., the mercury thermostat (S101) and the cartridge type thermostats (S102) and (S103) are all closed. The heater relay (K108 in a.-c. equipments and K118 in d.-c. equipments) is also closed and the amber indicating light (I104) is lit. When the temperature rises to 50° C., S102 opens, opening the auxiliary heating circuit. After the temperature reaches 60° C., S101 opens, opening the main heating circuit which extinguishes the amber indicating light (I104). In case either one or the other of the aforementioned switches fail to open, S103 opens both heating circuits at 70° C.

(*c*) In case No. 1, the complaint was that the master oscillator drifted when the transmitter was keyed, causing difficulty when used with the frequency shift keyer. When the transmitter was turned on, the mercury column in the thermometer rose rapidly. At 60° C. the amber indicating light went out, but the temperature continued rising until the mercury column was out of sight at the top of the thermometer. A voltmeter across S102 disclosed that it was not opening at 50° C. S102 was replaced and the oven compartment heated normally. (A voltmeter across any one of the three switches will indicate a voltage drop when the switch is open, but there will be no voltage drop when the switch is closed.)

(*d*) In case No. 2, the master oscillator would not tune on band 6. When the transmitter was turned on, the mercury column rose rapidly to the top of the thermometer and the amber indicating light remained on. The contacts of the heater relay were found to be stuck thus keeping the main heating circuit energized. Straightening of the contact arm corrected this trouble. This serious overheating of the compartment had damaged C107 and C108 in the grid circuit of the master oscillator so that oscillations could not be sustained on band 6, the highest frequency band of the master oscillator. Replacement of these capacitors resulted in normal operation on band 6.

(*e*) In case No. 3, the transmitter tuned up on dial settings which varied widely from the recorded settings. When the transmitter was turned on, the mercury column rose rapidly to the top of the thermometer and the amber indicating lamp flickered on and off. S101, the mercury thermostat, was found to be not opening at 60° C., therefore, S103 was opening both heating circuits at 70° C., actuating the amber indicating light. S101 was replaced and the compartment then heated normally. This oven compartment overheating had resulted in changes in values of two capacitors in the frequency determining circuit in the grid circuit of the master oscillator. Replacement of these capacitors brought the dial readings back in accordance with the original recorded readings.

1/1/50←

MODEL TBK SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Transmitter failed to key.	Trouble was located in the interlock of the frequency range switch. Spring tension was too light. This was remedied by bending the spring to the proper tension.—U. S. S. *Altair*
Output failed completely.	Corrected by cleaning all connections in transmitter and antenna trunks.—U. S. S. *Beale*
TBK–12.—Transmitter could not be made to double.	Defective 860 tube (first intermediate amplifier). Replaced.—U. S. S. *Monongahela*
TBK–12.—Master-oscillator oven failed to come up to proper temperature.	A check of the oven heater circuit showed that the leads to S–101 and S–103 were reversed. This allowed S–102 to open the circuit to the heaters when the temperature reached 50° C. The leads were connected in the proper way and operation was normal.—U. S. S. *Ammen*
Would not key or erratic keying.	The shaft holding one side of the switch interlock (S–107) had broken and the interlock would not close. A new shaft was made in the machine shop.—U. S. S. *Herndon*
No bias voltage on transmitter as indicated by meter.	The brushes on the bias generator were not making good contact.—U. S. S. *Herndon*
Plate voltage very low as indicated by plate voltmeter. Continuous heavy arcing across contact "B" of relay K–105.	Found capacitor C–153 shorted. Replaced—normal operation restored.—U. S. S. *Refuge* (AH–11)
Bad knock in low-voltage generator.	Found to be caused by loose flange in generator shaft coupling. Corrected by properly securing flange to shaft.—U. S. S. *Refuge* (AH–11)
TBK–13.—No plate voltage except in oscillator stage.	Wiping contacts on switch S–9A not making contact properly. Normal operation restored by cleaning and adjusting contacts.
TBK–14.—No high voltage output.	Bias voltage relay K–105 would not close. Adjusted spring tension and the set operated normally.—U. S. S. *Callaway*
TBK–12.—Could get no excitation into p-a stage. Monitoring receiver note "mushy" and unstable.	Cleaned sliding contacts on variable inductances and tightened springs on contact roller arms. Also tightened connection at r-f chokes. Operation then normal with good signal report.—U. S. S. *Mascoma* (AO–83)
TBK–10.—Transmitter would not load and first i-p-a tuning very critical.	Due to dirt on first i-p-a coil. Cleaned thoroughly and operation satisfactory. Also cleaned antenna coil and contacts on antenna transfer switch.—U. S. S. *Ludlow* (DD–438).
TBK–12.—Improper reading of meters as follows: Master-oscillator screen and plate current meters normal. First amplifier plate current meter 10 ma. Second amplifier plate current meter 4 ma. Power-amplifier plate and grid meters zero.	Found to be due to burned out R–134 which caused floating screen grid in first and second I-P-A—U. S. S. *Monongahela* (AO–42)

Difficulty Encountered	Cause and Remedy
TBK–14.—Continual blowing of fuses in heater circuit of transmitter.	Trouble was traced to soldering lug on the lead from the thermometer switch, secured under a binding post on the bakelite mounting strap. This lead shorted to the metal of the oven. The lead was secured so that it would not ground and no further trouble resulted.—U. S. S. *Sagittarius* (AKN–2)
TBK–14.—Noise interference in receivers when high voltage applied to TBK.	Found C–152 defective. Replaced.—*NOB Navy 1504*
TBK–15.—Poor CW note and frequency "wobble."	Caused by loose screw in master oscillator range switch S–1. To tighten properly, the entire MO unit must be removed.—U. S. S. *Gridley* (DD–380)
TBK–17.—No power available at generator. Main fuse kept blowing.	Found one of the leads on the line transformer T–103 shorted. Repaired same and unit functioned normally.—U. S. S. *Eugene* (PF–40)
TBK–18.—No output from transmitter; no screen voltage on the 861 tube.	Found the screen by-pass capacitor C–37, type 48037–10, shorted. Replaced from spares. Normal operation restored.
TBK–11.—M. O. drawing continuous plate current when on remote position but not on local.	Arc suppressor capacitor C–503 shorted to ground, causing keying relay K–14 to be continually energized, thereby closing the keying circuit. Trouble required replacement of the faulty capacitor.
TBK–12.—Motor-generator created interference such that reception on the RAO receivers was impossible. Int. peaked at around 8500 kc.	Cleaned and reseated the brushes on the motor-generator. A check revealed no interference detectable from this source with receivers operating at full gain. U. S. S. *Kaskaskia* (AO–27) *10/1/50*

ERROR IN TBL–13 PRELIMINARY INSTRUCTION BOOK

In the TBL–13 preliminary instruction book, figure 26, page 7–26 (Dwg. 7608924) indicates a connection running from the 2000-volt plus terminal of the high-voltage generator, through terminal No. 50 of the filter unit (CAY–53036–A) and terminating on terminal no. 19 of the transmitter unit (CAY–52249). Figure 27, page 7–27 (Dwg. 730021) shows the same 2000-volt plus lead terminating on terminal no. 23 of the transmitter unit. Figure 26 shows terminal 23 grounded. Figure 27 shows terminal 19 grounded. On the actual installation terminal 23 is grounded. Figure 27 is incorrect, and the numbers 19 and 23 shown on the diagram should be reversed.—*Asst. SupShips St. Louis.*

●

TBL RADIO EQUIPMENTS FIELD CHANGE NO. 1

MODIFICATION OF LABELING OF BAND CHANGE SWITCH

Equipments affected.—Models TBL–6 and TBL–7 radio equipments.

Purpose.—To rectify errors in the labeling of the band change switch, steps #6 and #7 on the equipment and in the instruction book.

Procedure.— 1—Correct labeling of band change switch, step #6, with "14.6" instead of "15.6" as the upper band limit and step #7 with "14.6" instead of "15.6" as the lower band limit.

2—Correct error in instruction books of the TBL–5/6, page 295, figure 43, and of the TBL–7, page 205, figure 35.

3—Correct error on the "H/F–M. O." nameplate for control B (located near the lower right-hand corner of the front panel) of some TBL equipments.

General.—Reports have been received in the Bureau that some model TBL–6 and TBL–7 equipments have been erroneously labeled on the panel and were supplied with similarly erroneous instruction books. Corrections are within the scope of the ship's force.

A record of corrections made should be entered in the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of corrections made should be reported on NBS–383 forms. *2/1/46.*

●

TBL RADIO EQUIPMENTS FIELD CHANGE NO. 2

WIRING CORRECTION TO AUDIO OUTPUT JACK J–101

Equipments affected.—Models TBL–8 and TBL–9 radio equipments, contract NXss–33180.

Purpose.—To correct wiring to frequency meter audio output jack, J–101.

Procedure.— 1—Remove the top left side shield from the transmitter to permit access to terminal board "E", which is located on the left side of the transmitter parallel to the jack. Disconnect the two leads from the jack at "E1" and "E2". The jack can now be taken out of the transmitter by removing the two mounting screws from the cover plate on the front panel.

2—With the jack removed from the transmitter, the two wires soldered to the inner leaves should be taken off and resoldered to the top and bottom contacts of the jack.

3—The jack can now be remounted on the transmitter in its former position. Connect the lead from the top of the jack to terminal "E2" and the lead from the bottom of the jack to terminal "E1."

General.—Reports have been received by the Bureau that approximately 120 equipments were shipped from the factory with incorrectly wired frequency meter audio output jacks, J–101. Vessels and Naval activities should examine their equipments to insure correct connections to the audio jacks, J–101. The wiring correction can be made by the ship's force.

A record of this wiring correction should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this wiring correction should be reported on NBS–383 forms. *2/1/46.*

●

CORRECTION TO MODEL TBL–13 PRELIMINARY INSTRUCTION BOOK AND MODELS TBL–5/6/7/12/13 INSTRUCTION BOOK, NAVSHIPS 900, 381

A correction should be made in the schematic diagram (drawing 7300720) which applies to

the 220/440-volt, 3-phase, 60-cycle, a-c power supply of the model TBL–13 transmitter. The diagram appears in two books: the model TBL–13 preliminary instruction book, and the final instruction book for models TBL–5/6/7/12/13, NAVSHIPS 900,381.

The lead from the second amplifier plate-current meter (M–8) is connected to the leads from meters M–5 and M–11, and the diagram should be altered to show the connection as in Figure 1. *10/1/47*

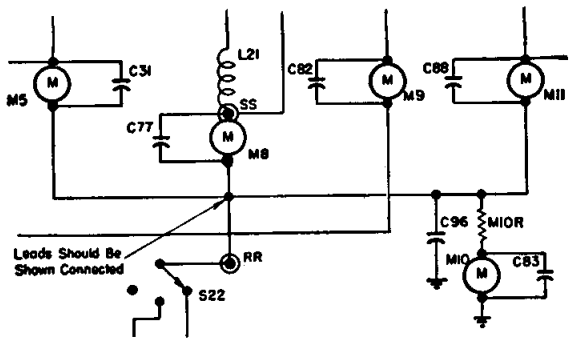

FIGURE 1.—Correction in schematic diagram of TBL–13 power supply.

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WARNING OF HIGH D–C POTENTIAL ON ANTENNA CIRCUITS OF MODEL TBL RADIO TRANSMITTING EQUIPMENTS

A report has been received by the Bureau stating that personnel were injured by a high d-c potential existing on the antenna circuit of a model TBL–12 transmitter. The person injured did not come in direct contact with the circuit itself. An electrical arc of over 3 inches was created between the circuit and the person's hand, resulting in shock and severe burns. The high d-c potential was due to contact between (1) the high-voltage bus (between the i-f P. A. range switch, S–20, and the i-f P. A. tank variometer, L–22) and (2) the lead from the i-f P. A. antenna tuning variometer, L–27, to the i-f antenna blocking-capacitors, C–91 and C–95. It is possible that the high-voltage bus had been riding on the edge of the insulated side of capacitor C–95, and that vibration caused the bus to shift position and come in contact with the lead to the variometer L–27.

Care should be exercised by installing activities and all vessels should periodically check their equipments to insure that all such leads and busses are supported properly in order to prevent casualties and safeguard personnel. *7/1/48*

●

DAMAGE TO TYPE –49309 TUBE SOCKETS OF THE MODEL TBL SERIES TRANSMITTERS

Several reports of difficulty in the use of type → 860 tubes with type −49309 tube sockets have been received by the Bureau. In some instances, the tube socket has been broken while the tube was being removed.

This trouble is being investigated by the Bureau. It is requested that all information regarding this type of difficulty be forwarded to the Bureau, att: Code 982. *1/1/49.*

●

INSTRUCTION BOOK CORRECTION FOR MODELS TBL–5/–6/–7/–12/–13 TRANSMITTING EQUIPMENT, NAVSHIPS 900,381

Figures 10–43 and 10–47 in the instruction book for Models TBL–5/–6/–7/–12/–13 transmitters, NavShips 900,381, are in error and should be corrected to be in conformance with the respective equipment. These figures are schematic diagrams of the Model TBL–13 transmitter. On both schematics, the numerals 19 and 23, identifying terminals on the +2000 V lead and ground, should be reversed. The terminal for the +2000 V lead should be marked "19" and the ground lead should be marked "23." In addition, a connection should be shown from terminal 23 to ground on the schematic in figure 10–47. *10/1/50*

→SHORTENING OF SHAFTS ON THE MODEL TBL MOTOR GENERATOR

Norfolk Naval Shipyard has submitted a recommendation to BuShips that the ends of the shafts on the Model TBL motor generator be shortened sufficiently to allow replacement of coupling discs without removal of individual units from the base.

There is only $^{13}/_{64}$ inch clearance between shaft ends of the individual units, and the coupling disc is $^{3}/_{8}$ inch thick, making it necessary to remove one or more of the units from the base to make the necessary repairs. This upsets the alignment and balance which is difficult to restore and impractical to accomplish by ships personnel.

It has been found that by shortening the shaft ends, approximately $^{3}/_{8}$ inch, bringing them flush with the coupling flanges, insertion of a new coupling disc may be made without disassembly of the unit. Repairs then may be made by ships personnel, eliminating the necessity of a yard overhaul.

The Bureau has no objection to the shortening of the shafts as indicated when found necessary by activities making repairs to Model TBL motor generator. *7/1/51* ←

MODEL TBL SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Modulation failed completely.	Corrected by repairing broken lead to terminal board in transmitter. —U. S. S. *Beale*
Output failed completely.	Corrected by cleaning all antenna connections in transmitter and antenna trunk.—U. S. S. *Beale*
Transmitter fails to start from bridge remote control unit.	Corrected by repairing broken lead on terminal board in remote control unit.—U. S. S. *Beale*
Transmitter not tuning properly.	Corroded contacts on p-a band switch. Cleaned all switch and relay contacts.—U. S. S. *Suwanee*
Plate voltage meter M–10 shows voltage when S–22 is in step 1 position.	Condenser C–26 shorted.—*RMO Galveston*
High-frequency m-o screen current meter M–1 shows current flow with key up.	Condenser C–12 leaky or shorted.—*RMO Galveston*
Motor solenoid indicator light I–9 burns when pressing "start" button but transmitter does not start.	K–13 series resistance (175 ohms) open.—*RMO Galveston*
Bias voltage indicator lamp I–4 burns too brightly.	Lamp connected to incorrect resistor tap at factory.—*RMO Galveston*
Receiver attenuator relays operate backward; i.e., close when carrier is off.	Check factory wiring to key relay contacts K6–A and K6–B.—*RMO Galveston*
Transmitter will not shut down when "stop" button is pressed.	Starting contactor relay stuck in closed position due to relay armature being held by sticky tar on magnet pole face.—*RMO Galveston*
Erratic tuning of master-oscillator.	Remove side from oscillator compartment. Tighten set screws of metal collars holding fiber shaft secure to metal shaft. This operation suggested as a routine check because in time these shafts become loose as a result of heating.—U. S. S. *J. Fred Talbott*
Erratic tuning of high-frequency intermediate-amplifier stages.	This trouble caused by poor contacts between wheel and cross bar and between moving contacts on end of coils. Suggested remedy—clean parts . . . —U. S. S. *J. Fred Talbott* Note: Use nonconducting abrasives such as sandpaper, crocus cloth, ink erasers, etc. *Do not use* conducting abrasives such as emery paper or cloth.
TBL–6.—Overheating of tube plates in final amplifier stage due to loss of bias.	During times of vibration or gunfire it was noticed the final amplifier tube plates were drawing excessive current as evidenced by plates showing a bright red color. This trouble was traced to the filter unit and, removing leads and bolts from the terminal strip, it was found that the heavily tinned solid conductors, especially those connected to terminals 59, 60, 61 and 62 were improperly soldered and could be turned within the lugs with only slight pressure. A proper solder job corrected the equipment.—U. S. S. *Saufley*

Difficulty Encountered	Cause and Remedy
Voice modulator equipment smoked when power applied.	Difficulty traced to bias network in filament circuit of the type 2A3 power output tubes. Replaced 10-mfd. 100-volt condenser and normal operation restored.—U. S. S. *Bowfin*
Blower motor developed excessive noise.	Found high resistance armature winding in motor.—U. S. S. *Bowfin*
TBL.—Would not start.	The trouble was traced to the keying position where wiring had forced the shorting bar on the stop side of the switch closed.—U. S. S. *Herndon*
Moisture condensation in submarine antenna trunks.	Submarine antenna trunks may be dried by placing a 200-watt incandescent lamp in lower end.—U. S. S. *Barb* (SS-220)
TBL-7.—Drop in bias generator output to 110 volts; drop in m-o plate voltage to 700 volts. Insufficient voltage to operate either master-oscillator when keyed.	Traced to loose bolted connection to generator field resistor, R-150.
TBL-7.—Transmitter inoperative from type COT-23211-A remote radiophone units. Model TDE-1 transmitter operated normally from same unit.	Found wire disconnected from speech input transformer in type CME-50064 speech input equipment due to poor soldering job. Normal operation restored by properly soldering wire to lug.—U. S. S. *Solomons* (CVE-67)
TBL-7.—Motor-generator stopping and starting with roll of ship.	Trouble traced to hasp on cover of type CAY-53036-A filter unit used with TBL-7 transmitter. By bending hasp in such a manner as to hold the cover firmly shut and the interlocks in place, making positive contact, normal operation was restored.—U. S. S. *Solomons* (CVE-67)
TBL-7.—Transmitter tuned up correctly but developed a large arc across the TUNE-OPERATE switch when thrown to full power.	Checked plate circuit for grounds—all OK. Found that trouble disappeared when antenna current meter was disconnected. Checked blocking capacitors between p-a plate and antenna—all OK. Found small scrap of metal from yard "chipper" or welder lodged between the antenna and plate coils. Normal operation restored when scrap was removed.—U. S. S. *Orlando*
TBL-7.—High-voltage relay would not throw out when door interlock was opened.	Cleaned and adjusted high-voltage relay.—U. S. S. *Orlando*
TBL-7.—Transmitter would not shut down. The motor-generator ran continuously whether interlocks opened or not.	Found starting contactor relay K-13 contacts welded shut. After the contacts had been filed down, the transmitter control worked properly.—U. S. S. *Knapp*
TBL-6.—No signal from the high-frequency master-oscillator tube. No indication on meter for first doubler tuning stage.	Discovered finger of high-frequency master-oscillator range switch S-1A to be making contact on two pins instead of one pin. The adjusting screw on the collar of the switch rod was loosened, the finger was set on the proper tap, and the set screw was then tightened. The transmitter functioned normally after these corrections were made.—U. S. S. *Bagley*

Difficulty Encountered	Cause and Remedy
TBL–5.—Frequency continually changing.	The plunger that goes back and forth on the worm and passes through the coil to tune the high-frequency master-oscillator tank coil, circuit symbol L–1, was loose on the worm. Shock or sudden movement or jarring action would cause the plunger to move and thereby change the frequency. This frequency drift is different than the frequency drift resulting from lack of proper oven heat. Increased spring tension between plunger and worm was effected and operation was satisfactory thereafter.—U. S. S. *Vixen*
TBL–6.—Faulty operation of relay K–16 caused by excessive residual magnetism.	Effect eliminated by pasting a piece of scotch cellophane tape over the face of the relay coil—U. S. S. *Spear* (AM–322)
TBL–7.—No plate voltage and no bias voltage.	Transmitter thoroughly checked and found normal. Motor-generator checked and found normal. Trouble found to be in the model CRV 29017 attenuator unit which is used in conjunction with the RAK–RAL receivers. This unit had the 115-volt d-c line reversed. Changed to proper polarity. Operation normal.—U. S. S. *Solomons* (CVE–67)
TBL–8.—Loud interference in audio phone jack and absence of signal from frequency meter made oscillator tuning impossible.	Found brush on 1600-volt generator badly pitted causing variation in oscillator plate voltage. Trouble eliminated by properly fitting brush with sandpaper.—U. S. S. *Scater* (AM–381)
TBL–12.—No. i-f oscillator filament voltage; h-f oscillator and 1st amplifier filaments burn continuously.	Nut and lock washer came off the bolt fastening the arm which throws S–6, S–8, S–37, and S–43. Repaired by replacing nut and using another nut for locking purposes by jamming it against the first.—U. S. S. *Hollandia* (CVE–97)
TBL–6.—High oscillator plate current.	No output from oscillator due to open oscillator tank capacitor C–63.—U. S. S. *Preble* (DM–20)
TBL–7.—Transmitter would not tune up beyond the first amplifier stage with range switch in the high position.	A continuity check with ohmmeter showed a very poor contact on switch S–9. After cleaning with crocus cloth and retensioning, the gear worked satisfactorily.—U. S. S. *Strickland* (DE–333)
TBL–7.—Transmitter keyed intermittently with the roll of the ship, although keying relay was not closing.	Found that the filament lead to the master-oscillator was grounding to the frame back of the oscillator compartment.—U. S. S. *Manlove* (DE–36)
TBL–7.—Excessive wearing of brushes in blower motor.	Found shaft of blower motor bent.—U. S. S. *Chimo* (ACM–1)
TBL–7.—No meter readings on amplifiers.	Tapping, h-f m-o coil would give readings. Tightened screws holding coil in place, bringing coil closer to variable capacitor. Transmitter then OK.—U. S. S. *Pinto* (AIF–90)
TBL–7.—Master-oscillator tuning erratically.	Found trouble in S–1, the h-f master-oscillator range switch. Tightened set screw of collar holding fiber shaft secure to metal shaft.—U. S. S. *Neuendorf* (DE–200)
TBL–8.—Transmitter power amplifier plate current erratic with frequent blowing of high voltage fuse and frequent operation of overload relay. Plate current was not greater than 300 ma.	Found that high voltage generator field connection was loose, the intermittent contact producing inductive surges or changes in plate voltage thus causing failure of the protective devices.—U. S. S. *Bivon* (DE–536)

Difficulty Encountered	Cause and Remedy
TBL–13.—Motor-generator would not start.	Found spring on K–351D mechanically latched on the set screw bolting it to its support. Reset contact.—U. S. S. *Luiseno* (ATF–156)
TBL.—Unable to tune 1st. IPA on the high-frequency side of the transmitter.	The roller on plate tuning coil had been removed in cleaning, thus changing the tunable range. Shifted roller to proper place.—U. S. S. *Sperry* (DD–697)
TBL–7.—The IF Master-Oscillator failed to oscillate on various occasions for no apparent reason.	Master-Oscillator plate current excessive (70 ma.). Plate and screen voltage high. Capacitor C–63 was removed from the tank circuit and checked. Its value had changed from 0.006 mfd. to 37 mmfd. Replacement of this capacitor restored operation to normal.—Robert Seraphin, RT 3/c—U. S. S. *Gandy* (DE–764)
TBL–12.—Excessive time required for master-oscillator compartment to reach operating temperature.	Found one brush of blower motor completely worn down and frozen to commutator. Cleaned commutator and replaced brushes for normal operation.—Monroe W. Baker, CRM, U. S. S. *Crevalle* (SS–291)
TBL–7.—Intermittent operation of transmitter after being turned on.	Contacts of relays K–17 and K–18 sparked. Cleaned contacts and tightened springs slightly to make better contact. Trouble cleared.—U. S. S. *Greenwood* (DE–679).
→ TBL.—No d.-c. voltage output when generator is rotating in proper direction. Low d.-c. voltage output when generator is rotating in reverse direction. Shunt field connected in series on low d.-c. self-excited generator. Excessive arcing at 1,000-volt d.-c. commutator.	Inspected brushes and replaced one 1,000-volt brush and one 250-volt brush, reseating all to neutral points to remove excessive sparking. Reversed shunt field properly, reversing shunt field and all d.-c. output connections for normal armature rotation. Operation then normal.—U. S. S. *Ellison* (DD–864). 1/1/00
TBL–7—No output.	Found screw loose in tuning condenser of multiplier stage. Plates shortened. Tightened and adjusted lock-nut. Operation normal.—U. S. S. *Gyatt* (DD–712). *1/1/50*
Motor generator fails to start.	A. Interlocks S151 (in filter unit), S30, S29, and S28 not making contact properly. B. Check fuses F3, F4 for continuity and supply voltage. C. Check relays K13 and K16 for proper operation and their resistors. D. Check links, A, O, F, and G. *1/1/50*
Motor generator runs only when start button is held in.	A. Relay K13B contacts fail to make properly. *1/1/50*
250-volt MG bias supply fails to build up.	A. Check bias supply voltage. B. Check 1,000-volt supply at terminal 14 and then check meter. C. Check over load reset K17 and K18. D. Check for short in both HV and LV circuits in transmitter. E. Check ground to K17 and K18 (check continuity to terminals 18 and 15 on terminal board). F. Check resistor clip holder for contact between R13 and R18. *1/1/50*
HV indicator lamp burns, but HV is not present.	A. Relay K16 (B contact) is not closing the HV field circuit. *1/1/50*
HF MO screen current meter reads without transmitter being keyed.	A. Check to see if keying relay K6 contacts is stuck. B. Condenser C12 is shorted. *1/1/50*

Difficulty Encountered	Cause and Remedy
2,000-volt MG supply fails to build up.	A. Check terminal 19 for HV and the HV voltmeter. B. Check contacts of relay K16B (Field ckt to HV motor generator). C. Short in HV supply in transmitter cause overload contacts to open or fuse F250 to open up. D. Resistor R23 or R37 open, causing HV to build up and drop slowly to zero. E. Wiper arm of switch S22 fails to make. *1/1/50*
HF MO plate current meter reads without transmitter being keyed.	A. Check keying relay for proper operation. B. Resistor R7 open or resistor combination R7, R6 wiring interchanged. C. Check complete plate circuit of MO in transmitter. *1/1/50*
HF MO plate and screen current readings approximately right, but oscillator fails to put out RF.	A. Check grid for proper bias. B. Condenser C6 (adjustment on front of panel) plates are shorted together because of improper adjustment. *1/1/50*
Readings on HF MO oscillator dial wrong on all band ranges.	A. Realign cylinder in coil L1. *1/1/50*
HF MO motor boats or breaks into spurious oscillations.	A. Clean contacts and wiper in S1. B. Check R5 (bias resistor) for proper tap. *1/1/50*
I-f MO fails to operate on all bands.	A. Clean contacts and wipers S1. B. Check C3, C4, C5. *1/1/50*
Filament of HF MO burns in standby condition but fails to operate when transmitter is operating.	A. Relay K11 contacts are bad or K11 fails to operate. B. Switch S8 contacts fail to complete K11 circuit. C. Check transformer T151 and fuse F150 (filter unit). *1/1/50*
I-f MO filament fails to burn.	A. Check switch S8 for proper operation. B. Check complete filament circuit. *1/1/50*
I-f MO has spurious oscillations.	A. Clean wipers and contacts S23. B. Check R13 for proper value. *1/1/50*
I-f MO fails to zero beat on 550 kc. band (will apparently come to a nul).	A. Check oscillator tank circuit condensers C61, C62, C63 (*especially C61*). *1/1/50*
Not enough RF drive to first HF IA.	A. Check adjustment of C16. B. Check value of C15, C18. C. Check contacts of S4. D. Check values tube voltages. *1/1/50*
First HF IA does not tune at right place on dial.	A. Check alignment of dial and condenser C28. B. Check contacts and positions S9. C. Check C27. D. Check spacing of rotor and stator plates of C28. *1/1/50*
NO RF or low drive to HF IA stage.	A. Check contacts of S10, S11. B. Check oscillator out put with neon bulb. C. Check tube operating voltages. *1/1/50*
First HF IA I_p meter fails to dip at proper place on dial.	A. Check dial alignment with L15. B. Check wiper contacts of S21. C. Check condenser C74, C75. *1/1/50*
First IA plate current meter reads without transmitter being keyed.	A. Check condenser C99, C39. *1/1/50*

Difficulty Encountered	Cause and Remedy
Apparently not enough drive to 2nd HF IA stage.	A. Check contacts S10. B. Check tube voltages. *1/1/50*
Second HF IA I_p meter reads without transmitter being keyed.	A. Check condenser C37, C76, and C79. B. Check IF–IA plate circuit. *1/1/50*
Second HF IA stage fails to dip and operate properly on either 2–4 or 4–18 mc. band.	A. Check alignment of C36 and L16. B. Check contacts of S12. C. Check C35 and C37. D. Check condition of roller contact on L23. E. Check spacing of rotor and stator of C47. F. Check all tube voltages. *1/1/50*
Not enough drive to HF-PA stage on 18 mc.	A. Check setting of condenser C38 and C16. B. Check alignment C47 and L23. C. Check tubes operating voltages. D. Check contacts S13 and S16. *1/1/50*
HFPAI_p fails to dip properly.	A. Check alignment C47 and L23. B. Check RF by pass C48. C. Check positions and contacts of S13, S15, and S16. D. Check all tube voltages. E. Check condition of roller contact on L23. *1/1/50*
HFPA dips improperly on 18 mc. and goes in to self-sustained oscillations.	A. Check to see condensers C40, C43, C44, and C45 have grounding bond. *1/1/50*
I-f PA fails to dip properly or dips intermittently.	A. Check contacts of S20. B. Check alignment of L22 and diameter. C. Check values of C84, C85, C86, and C87. *1/1/50*
I-f PA breaks down intermittently and circuit goes out of resonance.	A. L22 coil is breaking down between windings. Check windings for spacing and burned spots. B. Check C87. *1/1/50*
HF transmitter fails to load.	A. Check for loose bus bars. B. Check contacts S17 and S18. C. Check M13. D. Check C49. *1/1/50*
HF transmitter loads improperly.	A. Check alignment of C51 and L25. B. Check C48 and C49. C. Check roller on L25. *1/1/50*
I-f transmitter loads improperly.	A. Check M12 and ground. B. Check alignment of L27 and dial. C. Clean and check contacts S19. D. Check S18 contacts. E. Check C91 and C95. *1/1/50*
MCW audio oscillator tube filament fails to burn.	A. Check contacts of switch S6 and S7. *1/1/50*
MCW audio oscillator has no output.	A. Check switch S4 and S5. B. Check C26. C. Check condition of T4. *1/1/50*
Transmitter fails to key.	A. Check for proper ground to S27. B. Check all interlock switches S16A, S15A, S22A, S19A, S18A, S34A, and S20A. C. Check relay K6 for continuity. D. Check R38. E. Check R29 for value and proper tap, *1/1/50*

Difficulty Encountered	Cause and Remedy
→ Could not shut down motor generator at start-stop buttons either locally or at remote positions.	Traced trouble to link connected across S–44 terminals A and B. Ship used six wire remote control circuit which necessitates opening of link at S–44. *10/1/50* ←

MARKING OF MOTOR-GENERATOR SETS SHIPPED WITH MODEL TBM–7 EQUIPMENTS

See the article of similar title on page TBK:1.

EMERGENCY PARTS REPLACEMENTS FOR MODELS TBM AND TCM EQUIPMENTS

The following information has been received from U. S. Naval Advanced Base, Navy #3202:

"In view of the fact that considerable numbers of failures have occurred in the modulation transformers of TBM equipments and the fact that replacements are not always available, a Thordarson transformer, number T444–10, believed to have been removed from an Army Signal Corps set model RC–52 was substituted in two of our TBM transmitters and during its five months of service has been absolutely trouble free.

"Although the original transformer in the equipment has two separate windings in the secondary, one for each of the modulator output tubes, the above-mentioned transformer has a center-tapped secondary. The plate current meters of the modulator output tubes were paralleled in series with the center tap but could be put in the plate side of the secondaries and still give the value of current per tube.

"Also having experienced difficulty in obtaining replacement tubes type 836 for TCM equipments, which are high-vacuum rectifiers, type 866 mercury vapor tubes were substituted and have proven very satisfactory as emergency substitutes, until type 836 rectifier tubes were available for replacement."

Steps have been taken to modify the defective TBM modulation transformers. The type 866 rectifier is a satisfactory emergency substitute for the 836.

CONVERTING MODEL TBM TO A TWO-WIRE TRANSMISSION LINE SYSTEM

See the article of similar title at the bottom of page TBK:1.

REMOTE CONTROL OF MODEL TBM–8 RADIO TRANSMITTING EQUIPMENTS

The remote control telephone unit, type 2330, supplied with the TBM is designed to voice modulate the equipment from a remote point. It is possible for an operator at a remote point to start, apply carrier, and voice-modulate the equipment. However, it is not possible for the operator at the remote station to shut down the equipment. At present the equipment can be stopped only at the local or transmitter end. In order to effect automatic shutdown and certain other desirable features, the Bureau, working in conjunction with Westinghouse Electric Manufacturing Co., has developed certain modifications to the model TBM. Modification kits will be prepared by the contractor and made available to all field activities concerned. Since the delivery date of all the above modification kits is uncertain, the following method for effecting automatic shutdown is recommended. This method was suggested by the U. S. Marine Corps Air Station at the Naval Operating Base, St. Thomas, Virgin Islands:

(1) To obtain normal time delay and shutdown action (with S–405 in the modulator unit in voice position) remove the lead from terminal 4 in the CAY–50064–A modulator unit which makes the closing of contacts S–405F ineffective in shorting relay contacts K1B as described in paragraph 2–35 on page D–10 in the TBM–8 instruction book.

(2) To maintain the modulator unit in a condition of readiness during shut down periods, and keep all filaments lit, the lead from center terminal 11 in the CAY–24084 transfer panel can be transferred to center terminal 10; this will energize the primary of the filament transformer in the modulator unit by bypassing contacts K–361–B in the CAY–21411 motor starter panel.

102 of the above controls have been shipped and are now available as follows: 52 FRAY-3[illegible] 50 EPIC–32.

TBM RADIO EQUIPMENTS FIELD CHANGE NO. 1

INSTALLATION OF PEAK LIMITING THYRITE UNITS

Equipments affected.—All models TBM–4 through TBM–11 series equipments.

Purpose.—To prevent extremely high voltage surges across the primary windings of the modulation transformer.

General.—The installation of these resistors will limit the modulation peaks applied to modulation transformer T–405 in TBM modulator units, Navy type CAY–50065, CAY–50066, CAY–50065–A and CAY–50066–A. The kit is known as modification kit B. This modification is being incorporated in all production equipments beginning with model TBM–12.

A quantity of 1474 modification kits have been distributed. All vessels and shore activities should contact an Electronics Officer at the earliest opportunity for this kit. This change is within the scope of the ship's force.

Instructions are contained in the kit and should be kept with the instruction book for the modified equipment. A record of the completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 failure report card. *3/1/46*

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TBM RADIO EQUIPMENTS FIELD CHANGE NO. 2

PARALLEL HIGH SPEED KEYING (NO KIT)

Equipments affected.—Model TBM series radio equipments when parallel and high speed keying is used.

Purpose.—To provide parallel and high speed keying.

Procedure.—Revise output circuits as shown in Figures 1 and 2. (Figures appear on page TBK: 6 of Section 9 of the CEMB.)

General.—The high speed keying circuits of Figures 1 and 2 are not intended for general use and should be used only in those instances where high speed keying and paralleling of transmitters is necessary. No standard Navy type units which will provide parallel keying are available at this time. Modification of the output circuit is within the scope of the ship's force.

Figure 1 shows the modification necessary for equipments not having a built-in keyer tube while Figure 2 shows the changes necessary for equipments having the above tube. Instruction book and schematic diagrams should be changed accordingly. A record of the completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of modification should be reported on the NBS–383 card. *3/1/46*

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TBM RADIO EQUIPMENTS FIELD CHANGE NO. 3

MODIFICATION OF THE O–5/FR EXCITER UNIT (NO KIT)

Equipments affected.—Models TBM series radio equipments using frequency shift keyer.

Purpose.—To permit use of the O–5/FR exciter unit with the master-oscillators of the equipments affected.

Procedure.—Modify the O–5/FR exciter unit as shown in Figure 1 (drawing RE67A107). (Figure 1 appears on page TBK: 6 of Section 9 of the CEMB.)

General.—For more detailed information on this modification and on the O–5/FR exciter unit, reference should be made to the Army technical manual entitled "Exciter Unit O–5/FR" TM–11–2205 which may be obtained from an Electronics Officer.

Instruction books and schematic diagrams should be changed accordingly. This modification using available material is well within the scope of the ship's force. A record of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *3/1/46*

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FAILURE OF CAPACITORS IN TBM–5 THROUGH TBM–9 EQUIPMENTS

A number of failures of capacitors C–403, C–405, C–415, and C–422 (Navy type 48852A) in model TBM–5 through TBM–9 modulator units have been reported. Indications are that the voltage rating is too low. To alleviate this condition, a capacitor with higher voltage rating should be substituted. In case of failure of the old capacitors, the Navy type 482063 capacitor (1 mfd, 400 V) should be requested and substituted. These are available at major supply bases. *6/1/46*

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→FAULTY FUSES FOR MODEL TBM TRANSMITTING EQUIPMENTS

The Bureau has received information that several of the 1 ampere 5,000 volt, nonrenewable fuses (F–221) used in model TBM transmitters did not have center links although the ends had been soldered. These fuses had been in spares and had not been used prior to test.

It is to be noted that over a period of time, the links in these fuses will deteriorate. It is therefore recommended that maintenance personnel check the spare fuses of this type periodically in order that good ones will be on hand at all times. *1/1/50* ←

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MODEL TBM SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Modulation and signal strength very poor.	Power-amplifier tuning condenser shorted by a sliver of metal. Removed and cleaned.—U. S. S. *Ranger.*
No voltage on rectifier tube filaments, or control relay.	16-ohm resistor on generator's single-phase winding open. Replaced from spares.—U. S. S. *Ranger.*
Heavy arcing on main power switch.	Caused by accumulation of oil, dust, and paint chips. Disassembled front of rectifier unit, cleaned thoroughly and reassembled.—U. S. S. *Ranger.*
Overload relay trips.	Bypass condenser in p.-a. plate circuit shorted. Replaced from spares.—U. S. S. *Ranger.*
No carrier control.	Renewed points on voice control relay.—U. S. S. *Ranger.*
No remote voice control.	Relay coil in relay K–401 open. Replaced from spares.—U. S. S. *Ranger.*
Master-oscillator heater relay stuck.	Dressed points.—U. S. S. *Ranger.*
Master-oscillator dial coupling slipping.	Set screws backed out from vibration. Removed master-oscillator unit, tightened set screws, cleaned contacts and replaced.—U. S. S. *Ranger.*
TBM–7.—Transmitter performing poorly with low drive on the 2,000–4,000 kc. band. Working normally when band change switch is in the 4,000–18,000 kc. position.	Replaced C–53. Normal operation resulted.—U. S. S. *Chandeleur.*
TBM–4 and TBM–7.—Excessive play in tuning controls.	This is caused by loose taper pins in the shafts and set screws of flexible insulated coupling. Remedied by replacing flexible coupling screws with 6/32 machine screws, lock washers and nuts.—U. S. S. *Alabama.*
TBM–7.—Frequent failures of screen bypass condenser (C–403) CAY–48852–A in modulator unit CAY–50065–A.	The voltage rating of the condenser was too low. It was replaced with a commercial condenser of the same capacity but rated at 400 volts.—U. S. S. *San Francisco.*
TBM–7.—Each time the selector switch is thrown to the PHONE position, the high-voltage fuse F–222 blows. The transmitter works normally on CW.	Investigation showed that the modulation transformer T–405 was arcing to ground inside lead-through insulators on terminals No. 1 and No. 3. This condition was overcome by removing the mounting bracket, then bending the end on which terminals No. 1 to No. 4 are mounted 180°. This reversed end was then used to mount a Bakelite strip measuring 3″ x 5″ x ¼″. This strip projects above the transformer frame in the position of the original bracket. Terminals No. 1 to No. 4 were mounted on this Bakelite strip.—U. S. S. *Chandeleur.*
TBM series.—Failure of capacitors C–403, C–406, C–415, and C–422 in modulator type CAY–50065.	In view of the large number of failures of Navy type 48852A capacitors in the TBM series of equipments, it is recommended that in the case of future failures of this type of capacitor, regardless of circuit application, the Navy type 482063 capacitor with twice the working voltage be requested and substituted in lieu of type 48852A.

TBM–8.—Blowing of high-voltage fuses.	Step-down transformer T–14 breaking down internally and shorting to core. Rewound and reinstalled.—*U. S. Naval Station, Navy 129.*
Blowing of high-voltage fuses.	Condenser C–420 in modulator shorting to ground. Replaced.—*U. S. Naval Station, Navy 129.*
Blowing of high-voltage fuses.	Modulation transformer T–405 breaking down. Rewound and reinstalled.—*U. S. Naval Station, Navy 129.*
No carrier.	Carrier control relay K–401 burning out, Replaced.—*U. S. Naval Station, Navy 121.*
TBM–6.—High-voltage field rheostat R–33 did not control the generator output voltage when rotated.	The trouble was traced to an open circuit between three contacts of one unit of this resistance. Temporary repairs made by shorting out dead contacts with solder to give continuous circuit through rheostat.—*NAS, Lakehurst, N. J.*
TBM–7.—Equipment would not key. Voltmeter readings were apparently correct.	Wear of the contact strip of S–2A had reduced the contact pressure to a point where a continuous open circuit resulted. Restoring the contact action placed the gear in satisfactory operation.—U. S. S. *Acoutius.*
TBM–4.—Power-amplifier ammeter M–2 indicated excessive current, reading between 400 and 500 milliamperes.	Grid bias lead from the motor-generator set was shorted to ground behind the large terminal board at the base of the transmitter. This was caused by a metal link from another terminal position on the board touching it. This link was returned to its original position and operation again was normal.—U. S. S. *Curtiss.*
TBM–4.—The transmitter was not staying on frequency, the frequency was wobbling; and a bad note was reported.	Caused by master-oscillator range switch not making good contact. After the contacts were cleaned, the set operated normally.—U. S. S. *Curtiss.*
Failure of C–403, 1–mfd., 200-volt, Navy type 48852A.	For replacement use type 482063, 1-mfd., 400-volt. This also applies to C–406, C–415, and C–422.
TBM–9.—Overload relay kicked out every time the start button was pressed.	Found dashpot of relay K–824 dry. Refilled with proper oil and no further trouble was encountered.—U. S. S. *Grimes* (APA–172)
TBM–7.—Oscillator would vary in frequency over a range of several hundred cycles when transmitter was keyed.	Found to be due to dirty contacts in master-oscillator range switch S–1A and S–1B. Dirt apparently caused by carbon from blower motor B–1. Repaired by cleaning contacts.—U. S. S. *Core* (CVE–13).
TBM–7.—Frequent blowing of fuse F–211.	Found to be due to leaky C–47 with a d.-c. resistance of 300,000 ohms across the terminals of the capacitor. Replaced C–47 and no further fuses blew.—U. S. S. *Acontius* (AGP–12).
TBM–7.—Very low modulation (20 percent) with 150 mils plate current in modulator tubes.	Found to be due to leakage in capacitor, C–408. Normal operation restored (100 percent modulation) when capacitor was replaced.—U. S. S. *Portland* (CA–33).
TBM–11.—Coil L–20 burned out.	Caused by link AB not being removed, thus leaving the transmitter set for both 4- and 6-wire control.—U. S. S. *Lake Champlain* (CV–39).

TBM–7.—Transmitter inoperative. M. O. Screen grid current meter, M–8, indicated with key either up or down. All other stages dead.	Test M. O. tube and replace if necessary. If trouble still persists, remove M. O. tube and apply power. If meter continues to give reading, check bypass capacitor, C–6, for resistance to ground. Replace if defective.
TBM–8.—The TBM–8 transmitter serial 171 failed to key on the first six steps of the MO range switch. Steps 7 and 8 keyed normally. After rotating the switch through steps 1 through 8 the transmitter keyed on steps 6, 7, and 8.	Switch S1C was checked and was apparently making good contact. After checking all parts of the circuit S1C was removed. The contacts were dressed, bent slightly and the switch replaced. The transmitter now works properly on all 8 positions of the range switch. It will be noted that S1C is in the keying relay circuit and that when it is not making good contact the keying relay will not close.—*U. S. Naval Radio Station Astoria, Oreg.*
→ TBM–7.—No filament voltage applied to power amplifier tube in the high-power switch position.	P. A. filament switch S–3B inoperative due to frozen movable contacts. Freezing was due to switch being off center in relation to the mounting plate causing the two elements holding the movable contacts to bind. Replaced switch S–3B for normal operation.—*U. S. S. Pine Island. 7/1/49* ←

INCREASING SENSITIVITY OF MODEL TBP EQUIPMENTS

The sensitivity of the receiver portion of the model TBP equipment can be improved by grounding the open end of the regeneration control R8. The only undesirable condition involved is the grounding of the plate supply through resistors R8 and R10. If this modification is made and the batteries are left in place, there will be a continuous drain on the plate supply battery of about 0.3 ma. which would discharge the battery in about three months.

The constant drain on the battery when the equipment is not in use can be eliminated by replacing the variable resistor R8 with a commercial type 500,000-ohm carbon potentiometer with switch similar to Mallory-Yaxley type Y500 MMP with s.p.s.t. switch type 6. The switch is connected so that the open end of the control is connected in series with the switch and ground.

Where the modification is made as described above, it should be emphasized to operators that the regeneration control switch as well as the regular ON-OFF switch must be operated when turning the equipment on or off.

OSCILLATOR FAILURE IN MODEL TBS SERIES RECEIVERS

In certain model TBS series receivers, difficulty may be experienced in receiving signals at the low-frequency end of the range. This condition is apparently caused by crystal failure, but the actual trouble has been ascertained by the contractor to be due to an absorption circuit formed by the two capacitors, C–444 and C–445, and the inductance of the lead connecting them. It may be remedied by replacing the lead with a 270-ohm ½-watt resistor, R–457. Attention is invited to the fact that the 270-ohm resistor required will be found in the spare parts box under the designation R–457. Another 270-ohm ½-watt resistor should be requisitioned through regular channels to replace the one used for the modification.

It is desired that this modification be made at the earliest opportunity. It has already been made at the factory in some TBS–3 equipments so that no modification need be made in equipments which have R–457 installed. Receiver crystals should not be returned to the contractor as defective unless found to be so by actual test in an equipment already modified.

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ANTENNA FITTING FOR DESTROYER TYPE TBS ANTENNAS

In cases where the model TBS antenna is located in such a position that it is subject to strong vibration when the ship is underway there is the possibility of breaking of the connection between the bronze plug in the lower portion of the antenna and the antenna tubing. In the original construction of the antenna the lower portion consists of a bronze plug which projects three quarters of an inch into the copper tubing of the antenna proper. The contractor has changed the design to provide a better joint between tubing and plug. This change consists of enlarging the plug to fit over the outside of the tubing instead of inside, thus providing a greater adhering surface for the solder which holds the two parts together.

Failures due to breakage of the connection between the rod and the original design plug can be overcome where facilities are available by silver soldering the joint between plug and tubing. An alternative method, as suggested by U. S. S. *Chandeleur*, is to substitute a similar plug which projects into the antenna tubing for a distance of seven inches. Figure 1 shows the dimensions of the fitting.

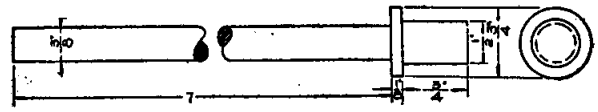

FIGURE 1.—Dimensions of the fitting.

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MODIFICATION OF TBS ANTENNA SUPPORT

The Assistant to the Naval Industrial Manager, Naval Station, Portland, Oreg., has advised the Bureau of a defect in the installation of model TBS antennas on the APA–151 to APA–235. In these vessels, the TBS antenna is supported by a section of 2″ standard pipe fitted with a stuffing tube at the upper end and a pipe cap at the lower end. It has been found that water leaks past the stuffing tube and collects in the lower part of the supporting pipe. The water rises up through the vent hole in the lower section of the TBS antenna thus changing its electrical length with the result that proper loading of the transmitter is impossible on some frequencies.

The difficulty may be corrected by removing the pipe cap and drying out the inside of the support, repacking the stuffing tube and drilling a ¼″ drain hole in the pipe cap. All ships encountering this difficulty should make this correction at the first opportunity.

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TUNING OF TBS RECEIVERS

At times radio personnel get into the habit of tuning TBS receivers by the signal from the associated transmitter. This practice should be discouraged as it results in poor tuning of the antenna, link, and detector circuits with a resultant loss in sensitivity.

These circuits are best tuned with random noise and should be rechecked again after turning the silencer control on.

●

KEYING OF MODEL TBS SERIES EQUIPMENTS

Heretofore the Bureau has directed that no telegraph keys shall be installed and no means shall be provided for the operation of Navy model TBS series equipments on A_2 emission. Recent advices from the fleet, however, indicate that keying of the TBS equipment has definite advantages under certain operational conditions. Where keying of this equipment is desired, it is satisfactory to the Bureau to install a type 26012 telegraph key adjacent to the TBS remote unit *or to connect the proper terminals from the transmitter terminal board to the R–RT (CW) transmitter patching panel where operation from standard operating positions is required.* Knockouts on the side of this unit provide for passing type MHFA2 cable for this purpose. The key terminals must be connected to terminals nos. 2 and 4 in the remote control unit.

In using the telegraph key, the transmitter is tone-modulated and keyed for m-c-w operation. Upon pressing the key, a series of relays are operated to transfer the antenna from the receiver to transmitter, apply plate voltage to the transmitter tubes, and apply a modulation tone of 1000 cycles to the audio input stage of the transmitter. The carrier remains on after the key is first closed and the key thereafter controls only the tone modulation. Should the key remain up for more than approximately one second, however, the carrier will be cut off automatically and the equipment returned to the condition of reception. During transmission, the receiver serves as a monitor and side tone will be heard at all points of audio output; that is, from the loudspeaker, from either hand set, or from headphones connected to the chest set, control units or receiver panel.

In view of the limited requirements for the above facilities, keys will not be installed in new construction vessels by the building yards, but should be installed by the ship's force when operational requirements indicate the necessity therefor.

●

SERVICING OF THE TRANSMITTER UNITS OF THE TBS SERIES EQUIPMENTS

Considerable difficulty has been experienced in servicing TBS series transmitters due to the construction of the equipment which prevents viewing of the relay operation and measurement of voltages while the transmitter is in operation. The TBS transmitter is constructed on a horizontal chassis which slides into an enclosing metal case. "Banana" type plugs mounted on a connection board on the chassis fit into corresponding jacks on a connection board mounted in the case.

In order to remedy the above situation, the New York Navy Yard has developed a portable patch cord which permits servicing under normal operating conditions. The device consists of two bakelite terminal boards, both mounted on individual movable weighted foundations and permanently interconnected by approximately six feet of flexible insulated cable, both exact replicas of the two boards attached to the case and to the transmitter chassis. The alignment of the two movable boards with the two permanently fixed boards must be exactly and perfectly made. The banana plugs mounted on one of the terminal boards and the banana jacks mounted on the other terminal board are arranged to fit into the corresponding fixed jacks and plugs in the transmitter case and chassis. The terminal board on the transmitter chassis should be plugged into the movable replica of the transmitter case terminal board. The movable replica of the transmitter chassis terminal board should be plugged into the terminal board on the transmitter case.

In view of the continuous use of the TBS and the resulting necessity for proper maintenance and hasty repairs, it is recommended that similar "servicing cables" and "terminal board sets" be built by all requiring activities.

Components required, and listed by instruction book symbol designations, follow:

Symbol Designation	*Function*	*RCA Drawing Number*
E–105	Terminal board assembly for the transmitter.	P–717250
J–101	Jack for E–105	K–99015
P–101	Plug connector for E–105	K–99025
E–120	Terminal lug for E–105	K–30042
E–122	Terminal lug for E–105	K–811691

Refer to the instruction book for complete description and usage. A drawing of the terminal boards and accessories giving actual di-

mensions and complete data is printed herewith as Figure 1. The various necessary parts, if not on hand, may be requisitioned from the nearest RMO or supply depot.

ately below them should be numbered L–1212.

(3) On page 4–8, Figure 4–14, R–1205 should be removed and coil L–1202 drawn in its place.

(4) On page 4–8, Figure 4–15, R–1215 should

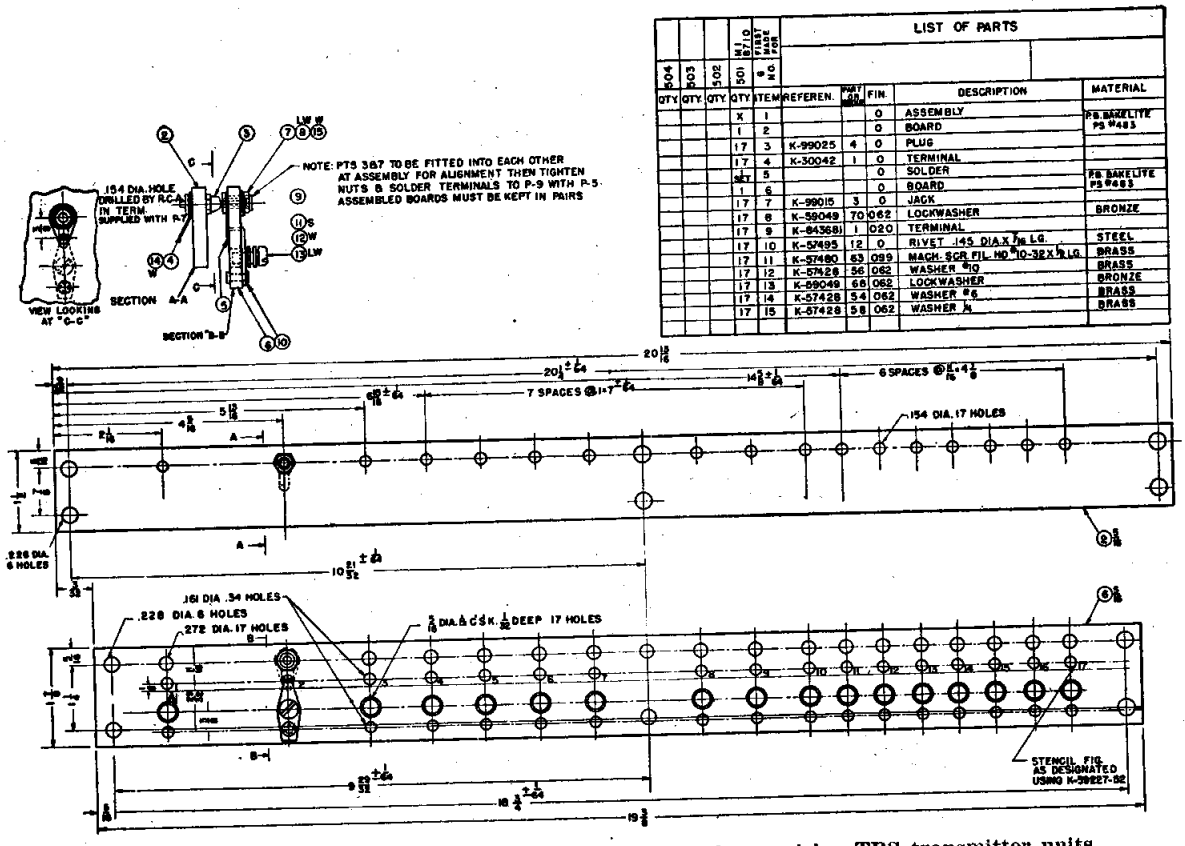

FIGURE 1.—Dimensions and data for the terminal boards for servicing TBS transmitter units.

CORRECTIONS TO THE PRELIMINARY INSTRUCTION BOOK FOR THE TBS–8 EQUIPMENTS

The following changes should be made to the "Instruction Book for Model TBS–8 Radio Transmitting and Receiving Equipment" NAVSHIPS 900,483 IB:

(1) On page 1–7, Figure 1–5, left-hand unit, the four resistors at the top should be numbered (from the outside in) R–1201, R–1202, R–1203 and R–1204. The unit immediately below them should be numbered L–1202.

(2) On page 1–7, Figure 1–5, right-hand unit. The four resistors at the top should be numbered (from the outside in) R–1211, R–1212, R–1213 and R–1214. The unit immediately below them should be numbered L–1212.

(3) On page 4–8, Figure 4–14, R–1205 should be removed and coil L–1202 drawn in its place.

(4) On page 4–8, Figure 4–15, R–1215 should be removed and coil L–1212 drawn in its place.

(5) On page 4–9, paragraph 3b (2), references L–1210A and L–1210B should be changed to L–1211A and L–1211B respectively.

→ TBS RADIO EQUIPMENTS FIELD CHANGE NO. 1

PROVIDING STANDBY CIRCUIT (NO KIT)

Equipments affected.—All model TBS through TBS–6 series transmitting equipments.

Purpose.—To provide a stand-by condition whereby the tube filaments are energized and the warm-up period eliminated.

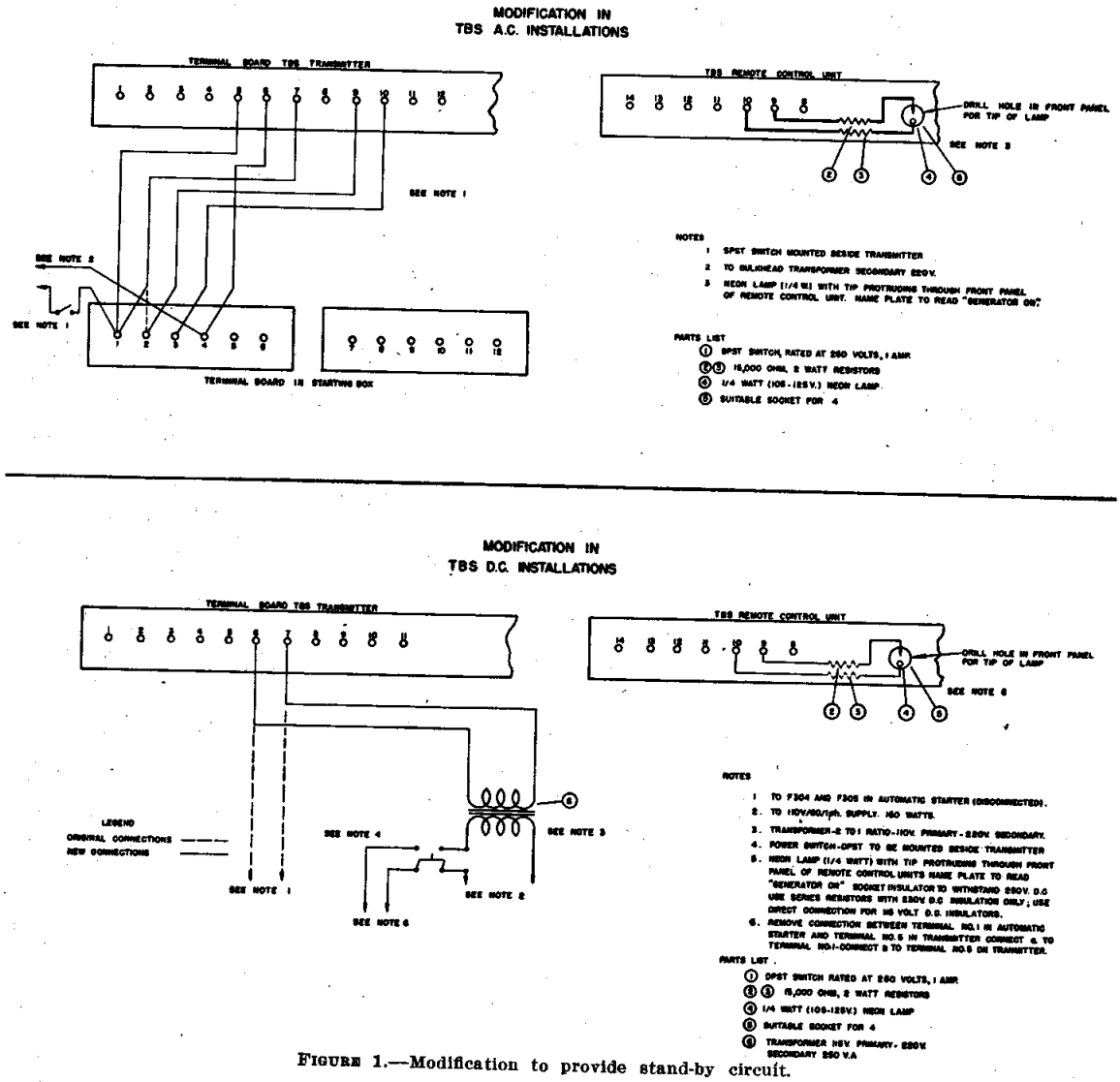

FIGURE 1.—Modification to provide stand-by circuit.

Procedure.—(This change should be accomplished as shown in Figure 1.)

(1) The nameplate for the indicator lamp in the remote control unit should be changed to read FILAMENTS ON instead of POWER ON as the filaments are operated directly from the ship's power lines.

(2) A nameplate labelled GENERATOR ON should be provided for the neon lamp which is added as shown in the diagram.

General.—Fleet reports indicate the following difficulties with model TBS series transmitting equipments as now installed:

(1) Approximately thirty seconds is required to start the transmitter from its cold condition.

(2) During a part of the warm-up period, the send-receive relay swings to the send position, disconnecting the receiver. While in the send position, there may be a few seconds during which the carrier is transmitted erroneously.

(3) It is undesirable to continuously run the motor-generator, as is now necessary, if the equipment is to be maintained ready for instant operation.

(4) It is essential to maintain the model TBS transmitting equipment in readiness for immediate operation at all times.

This change eliminating the above-mentioned difficulties for a-c and d-c operated equipments respectively should be accomplished

available material is within the scope of the ship's force.

The instruction book and schematic diagrams should be changed accordingly. A record of completion of this change should be made on the ship's "Radio Equipment Log" NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card.

NOTE.—If for any reason this field change cannot be made, it will still be desirable to prevent the difficulty listed in item (2) of *General* above. This may be done by open-circuiting all the contacts of relay K–101 by disconnecting them or by wedging them open. This is possible on all TBS model transmitting equipments *that do not utilize a telegraph key. 5/1/46*

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TBS RADIO EQUIPMENTS FIELD CHANGE NO. 2

INSTALLATION OF TRANSMISSION LINE FILTER CHW–53155

Equipments affected.—All model TBS series transmitters.

Purpose.—To reduce to a minimum the harmonics radiated from the antenna system.

Procedure.—The filter may be mounted in either of the two positions shown in Figures 1 and 2, as follows:

(1) Disconnect and remove the end of the flexible transmission line entering the upper junction box on the model TBS transmitter front panel.

(2) Remove the junction box from the panel of the transmitter.

(3) Store the junction box, cover plate, two thumbscrews, and lockwashers for possible future use.

(4) Remove paint and any corrosion products from the area on the panel where the filter box back will contact the panel, in order to provide a good electrical contact.

(5) Remove the filter cover and secure the filter to the panel with the two no. 6–32 machine screws and lockwashers provided.

(6) Secure the filter input strap connector to the transmitter binding post by means of the no. 8–32 nut and lockwasher previous removed.

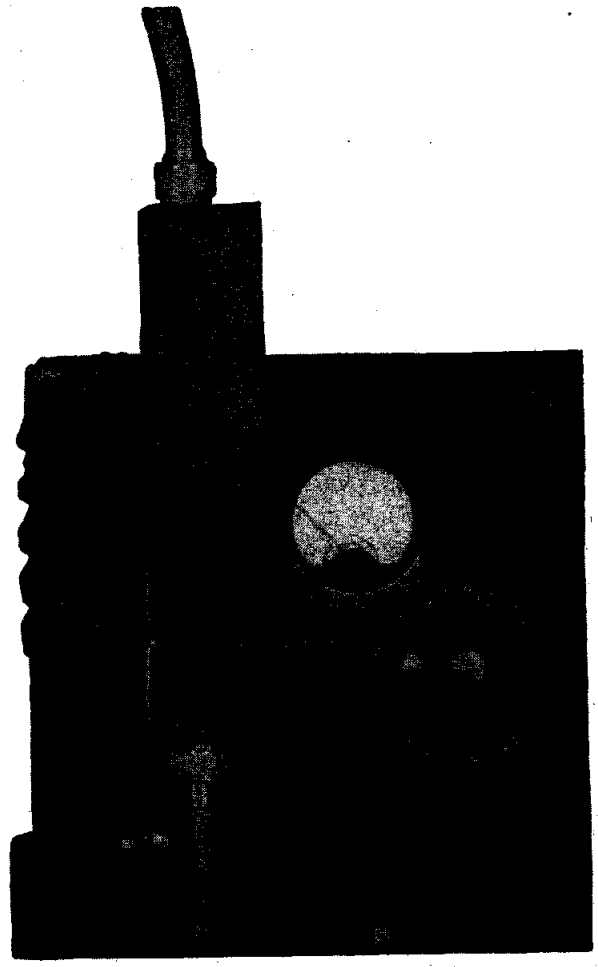


FIGURE 1.—Mounting position for filter.

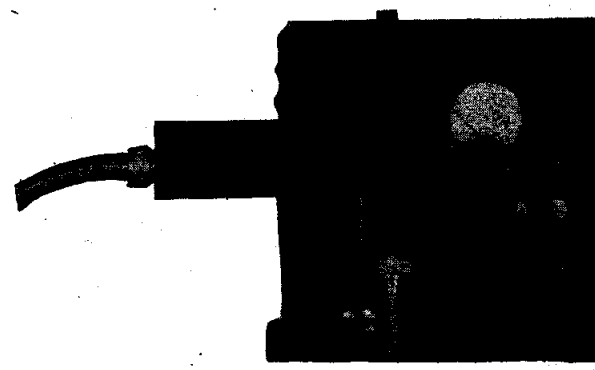


FIGURE 2.—Alternate mounting position for filter.

(7) Attach the flexible transmission line sheath to the filter case by means of the threaded fitting, and connect the inner conductor to the output end of the filter, using the nut and lockwasher provided.

(8) Bolt the filter cover in place by using the no. 6–32 machine screws and lockwashers provided.

Maintenance activities should obtain and attach Bakelite tags to fit the cover of the filter unit inscribed as follows, "Caution: Do not apply power to transmitter with antenna disconnected."

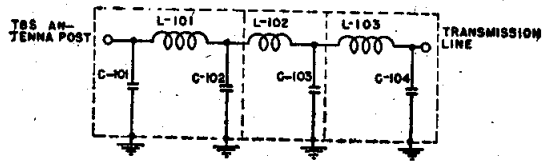
General.—A quantity of transmission line filters, type CHW–53155, were procured on contract NXsr–56756 and are available at maintenance activities. Vessels should contact an Electronics Officer at the earliest opportunity for the installation of this filter.

This filter is effective only in eliminating harmonic radiation from the antenna system; radiation from power wiring, interconnecting leads, and the equipment proper must be minimized by careful shielding and grounding.

The filter is a low-pass, three-section, constant "K" type, of 70 ohms characteristic impedance, designed to provide a maximum of attenuation (about 45 db) for frequencies above 110 mc. The schematic diagram and parts list for the filter unit are shown in Figure 3.

The installation of the filter may require a slight re-adjustment of the p-a tank tuning control. This control should be turned to an exact "dip" in the reading of the p-a plate milliammeter, because a slight mis-tuning will greatly increase the unwanted harmonic output of the transmitter. Also, the variable tap on the p-a plate tank coil may require a slight re-adjustment to give proper plate current loading on the p-a circuit. The use of the filter changes no provisions made in the TBS instruction book regarding steps to be taken to obtain proper tuning and loading adjustments, and should have no effect on the power output of the transmitter.

It is anticipated that the only service difficulty which may arise will be due to failure of the capacitors in the filter. This failure will probably result in inability to load the power-amplifier tube to rated plate current and/or in an abnormal value of r-f line current. Of course, a failure of either the transmission line or antenna may result in similar observations; consequently, the source of the failure should be determined before the filter is dismantled



SYMBOL DESIG.	FUNCTION	DESCRIPTION	NAVY TYPE NO.	NAVY DWG. OR SPEC.
		CAPACITORS		
C–101	SHUNT CAP.	CAPACITOR, MICA, 25–MMFD±10% 500 VOLT MAX. WORKING, LOW–LOSS CASE	482106	RE-48A-349
C–102	SHUNT CAP.	CAPACITOR, MICA, 50–MMFD±10% 500 VOLT MAX. WORKING, LOW–LOSS CASE	482107	RE-48A-349
C–103	SHUNT CAP.	SAME AS C–102	482107	RE-48A-349
C–104	SHUNT CAP.	SAME AS C–101	482106	RE-48A-349
		INDUCTANCE		
L–101	SERIES IND.	INDUCTANCE, 0.15 μh 4 TURNS OF #12 TINNED COPPER WIRE ON 0.437" DIA. FORM, UNIFORM SPACING TO LENGTH OF 0.5"		
L–102	SERIES IND.	SAME AS L–101		
L–103	SERIES IND.	SAME AS L–101		

FIGURE 3.—Schematic and parts list for filter.

for testing of the condensers. In replacing any of the condensers, caution should be exercised in soldering—otherwise the condensers may be damaged. No more heat should be applied in soldering than is absolutely necessary.

The following spare parts are furnished:

Quantity	*Item*	*Description*
2	Capacitor_____	25-mmfd. Navy type 482106
2	Capacitor_____	50-mmfd. Navy type 482107

The following should be noted when using the filter:

(1) The filter is easily damaged by excessive radio-frequency voltage such as occurs when it is attempted to tune up the TBS transmitter with the filter in place but with the transmission line to the antenna disconnected. This procedure causes very high radio-frequency voltages to appear across the capacitors in the filter due to the lack of termination and will cause either burn-out or shorting of the capacitors. For this reason *extreme care should be taken to see that the TBS transmitter is always tuned with the transmission line in place and connected or both the transmission line and the filter disconnected.* It is possible that the capacitors used in the filter may become open circuited, that is, the connection between the high-potential circuit and the capacitor may become disrupted or broken and, therefore, cause a change in the characteristics of the filter. This condition may be detected by measuring the capacitance of the filter between the input or output terminal and the

case using any type of accurate audio-frequency bridge. The capacity as measured in this manner should fall between the limits of 145 and 175 mmfd. and if outside this range, replacement of the defective capacitor or capacitors is in order. In this connection, attention is again invited to the fact that the capacitors employed are easily damaged by excessive heat and that no more heat than absolutely necessary should be used in soldering connections.

(2) The filter should be examined for short circuits between adjacent turns of any of the supporting coils. Also care should be taken not to alter or change the diameter, number of turns or spacing of the coils as a change in any of these parameters will greatly affect the inductance of the coils and hence change the attenuation and frequency range of the filter unit.

(3) It should be remembered that the line filter is effective only in reducing the amount of harmonic radiation from the antenna system of the TBS and that there is a certain amount of radiation of harmonic energy from the case and wiring of the TBS equipment. This fact must be considered and investigated if it is found that the filter is ineffective in suppressing the radiation of harmonics. Specific instructions for the elimination of this source of interference cannot be given due to the difference between the installations of TBS equipments in the field. The elimination of such radiation is largely a matter of "cut and try."

The instruction book and parts lists should be changed accordingly. A record of completion of this change should be made on the ship's "Radio Equipment Log" NAVSHIPS 900,039. Completion of this change should be reported on the NBS-383 card. *5/1/46.*

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TBS RADIO EQUIPMENTS FIELD CHANGE NO. 3

IMPROVING RELIABILITY OF RELAY K-101 (NO KIT)

Equipments affected.—All model TBS series transmitters.

Purpose.—To improve the reliability of relay K-101.

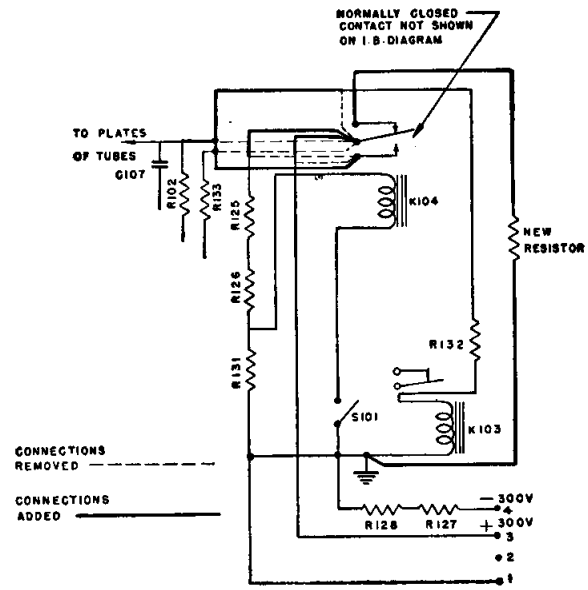

FIGURE 1.—Modification to improve the reliability of relay K-101 in the TBS equipments.

Procedure.—Referring to Figure 1, the modification is made as follows:

(1) Remove the three leads to the movable contact K-104.

(2) Remove the +300-volt lead and the lead from R-125 from the normally open stationary contact of K-104.

(3) Connect the +300-volt lead and the lead from R-125 to the movable contact of relay K-104.

(4) Connect the three leads to R-102, R-132, and R-133 to the normally open stationary contact of K-104.

(5) Connect a 5000-ohm, 40-watt resistor from the normally closed contact of relay K-104 to ground. The contact is not shown in the instruction book diagrams.

General.—The adjustment of K-101 is very critical since its operation is dependent upon the reduction of the plate current of the type 6A6 relay control tube to zero when the m-c-w telegraph key is pressed. In the original equipment, variations in 6A6 tubes, drain on the power supply, etc., cause the minimum plate current to be as high as 3 ma. instead of zero. This variation in minimum plate current causes erratic operation of relay K-101.

Adding a 5000-ohm resistor which bleeds current through the biasing resistors for the 6A6 tube insures at least cut-off bias for the 6A6 tube at all times. It should be noted that the new resistor is in the circuit only when K–104 is not energized. When the transmitter is keyed, K–104 removes the resistor from the circuit.

Attention is invited to the following requirements for the new resistor:

Only a grade 1, class I resistor such as Sprague Koolohm type 40F or equivalent (JAN type RW 14F 502) may be used.

The resistor should be mounted in a suitable mechanical manner to resist shock and vibration. Due consideration should be given to the effects of heat from the resistor on adjacent components.

This change using available material is within the scope of the ship's force and should be made at the earliest opportunity. The instruction book and schematic diagrams should be changed accordingly. A record of completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this change should be reported on the NBS–383 card. *5/1/46*

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→ TBS SERIES RF FILTER CHOKES L–407 AND L–408

Breakage of connection lugs to r–f filter chokes L–407 and L–408 during removal of receiver chassis has resulted in instances where these lugs have not been provided with sufficient clearance from the receiver housing. A visual inspection of all TBS series equipment installed should be made to determine if these lugs are cleared during handling of the receiver chassis. Greater clearance may be provided in some cases by bending the lugs closer to the choke case. Adequate care should be taken to preclude damage to the chokes in accomplishing this preventive maintenance. *8/1/46* ←

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MODEL TBS SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Model TBS antenna ground rods become loose due to vibration.	This condition is caused by the ground rod vibrating loose from the securing pin or loosening of the securing screw. This trouble can be corrected by pinning the ground rod to the head of the securing screw, using a pin about one-sixteenth inch in diameter and also drilling the threaded portion of the securing screw for a cotter pin. This modification prevents both difficulties.
Motor-generator fails to start.	Leather in suction pump in motor starter too stiff, causing cup to lose suction thus starting motor too fast and overloading circuit. Loosened leather and adjusted for proper suction.—U. S. S. *Arcturus*
Overload relay kicks out.	Readjusted for voltage and retuned transmitter.—U. S. S. *Arcturus*
Carrier comes on but no modulation.	Defective microphone cord. Replaced.—U. S. S. *Ranger*
Carrier on continually.	Relay in control unit in flag radio out of adjustment. Readjusted relay.—U. S. S. *Ranger*
Speakers on flag bridge out.	Volume controls in position exposed to weather—corroded and frozen. Cleaned volume controls, adjusted and replaced.—U. S. S. *Ranger*
Feed-back from pilot house caused howling when handset was used.	Control unit relay not closing, which allows speaker to operate during transmission. Adjusted relay.—U. S. S. *Ranger*
Power pack operation normal but on motor-generator operation, hand and chest set microphone buttons inoperative.	Test switch on transmitter operates equipment normally. Found tension on relay K-104 slack. Adjusted relay. Operation normal. U. S. S. *Ranger*
TBS-3.—Transmitter would not load properly into antenna. Receiver operation was normal.	The antenna transfer relay K-103 was not making proper contact when energized. The trouble was cleared by adjusting the contacts.—U. S. S. *Bush*
Shock of gunfire causes handset to fall off hook.	Original type holder may be modified by adding a coil spring or rubber strap in such a manner as to lock the handset in place.
Line starting relay closes due to shock of gunfire.	The armature of the line starting relay was weighted with thin sheets of lead to prevent accidental closing due to shock of gunfire or heavy vibration.—U. S. S. *Alabama*
Keying transmitter causes interference in other receivers due to relays operating.	Check grounding of floating receiver chassis. Good ground is necessary.—*RMO Galveston*
Feed-back howl when transmitter is keyed.	Muting relays in remote units improperly adjusted.—*RMO Galveston*
Transmitter keys at test switch S-101, but will not key from remote positions.	Spring tension of K-104 relay too tight.—*RMO Galveston*

Antenna ammeter M–102 jumpy.	Clean and check contacts of K–103 relay.—*RMO Galveston*
Unable to turn transmitter off. Starter resistance running red-hot.	One side "start-stop" line grounded. Removed ground.—U. S. S. *Suwanee*
Receiver will not pick up signals.	Check 956 tube. If found shorted, check resistor R–404.—*RMO Galveston*
Receiver badly distorts signal and has "running motor" sound with noise suppressor OFF.	Screen grid of first detector tube shorted to ground.—*RMO Galveston*
Press-to-talk button must be depressed at least partially to receive, and must be released to transmit.	Check handsets for defective factory wiring.—*RMO Galveston* (NOTE: Defects in the wiring of TBS handsets have been reported frequently and should be sought when trouble is experienced on new installations.)
Bridge speaker cut out when start button was depressed. Check showed transmitter shifted to m-c-w for a second or two after start button was pressed.	Replaced carrier control tube, 6A6. This cut-out action was natural but period was too long.—U. S. S. *Suwanee* The modification described on page TBS:1 will eliminate this difficulty.
Failure of type 5Z3 rectifier tube in TBS receiver.	If another type 5Z3 is not available, a temporary repair may be made by substituting a type 80 tube. The receiver d-c plate current drain is 65 milliamperes which is within the rating of the type 80. The only noticeable difference will probably be a slight reduction in the d-c output voltage.—U. S. S. *Ancon*
Failure of power transformer in TBS receiver.	Temporary repair may be made with transformer type CNA–30883 used in models RAO and RAO–1. Electrical characteristics of this transformer are almost identical with those of the TBS transformer. Appropriate mounting of the RAO transformer must be made when installing.—U. S. S. *Ancon*
Antenna connection between receiver and transmitter failed.	This was found to be due to excessive vibration. The wire was lengthened inside the shield and heavier lugs were installed on ends of wire.—U. S. S. *Sepulga*
Antenna relay failed.	One of the bolts which fastened antenna shield to the cabinet protruded through the panel enough to push relay bracket up, thereby grounding the receiver antenna. The screws were shortened and bracket straightened to correct angle.—U. S. S. *Sepulga*
TBS–2.—Failure of 956 tube and R–404.	When installed, the 956 tube in the receiver was put in backwards causing it and the associated R–404 resistor to fail.—U. S. S. *Monongahela* (Care should always be exercised to install Acorn tubes correctly, see page GEN:2.)
A metallic deposit was collecting on the ceramic insulators located in each end of the flexible transmission line connecting the transmitter to the transmission line terminating box.	Caused by rubbing of the insulator against the adjacent metal ring which does not put up tightly against the insulator, allowing the insulator to move under vibration. Bevel the inside edge of the nut with a hand scraper to remove about one thread. This will allow the nut to tighten up sufficiently to hold the insulator firmly in place.—*RCA*

Faulty operation of push button on handset.	Some of these handsets were installed with all wires connected correctly except the black wire from the receiver; this was erroneously connected to the top push button contact (nearest the cover) instead of to the center contact. To correct the wiring, remove this one wire from the top contact and connect it to the center contact.
Receiver exhibited severe fringe howl when receiving modulated signals.	Replacement of condenser C–456 remedied trouble.—U. S. S. *Saufley*
Symptoms: (1) Input meter goes off scale when input switch is placed in position 1. (2) Excessively high setting of noise suppressor control is needed to effect cut-out of noise. (3) Failure of a-v-c time control to have effect on signal level. (4) Excessive interaction of antenna, link and detector controls and apparent double tuning of doubler controls and detector control. (5) Distorted audio output.	After prolonged tests a conclusion was reached that the a-v-c circuit was not functioning properly. As the check of components had revealed all to be normal, a grounded a-v-c bus was the only solution. Due to the high resistance included in this circuit the first inspection had not revealed such a ground. The final inspection revealed that the ceramic insulator passing through the chassis in the r-f subchassis compartment, marked "terminal 5," at the junction of C–465 and R–401, had been broken and had allowed the machine screw to short to the chassis thus grounding the entire a-v-c circuit. The input meter had "pegged" as a result of insufficient grid bias on the r-f amplifier tube. This in itself is a good indication of the location of the trouble. Replacement of the insulator completely removed all of the difficulties.—U. S. S. *Saufley*
Receiver—erratic indication of meter M–401.	Look for loose connections at M–401 and the associated ground switching terminals. Note that the defective circuit can be isolated by determining the position of S–403 in which the erratic behavior occurs.—*Navy Yard, Pearl Harbor*
Intermittent reception—usually cut off entirely, and high static level.	Antenna coaxial lead shorting to ground at receiver terminal box due to physical looseness of lug on insulator post and also general detuning of receiver.—U. S. S. *Memphis*
Excessive noise and intermittent reception in receiver along with intermittent modulation when transmitting.	Antenna switching relay K–103 making poor contact.—U. S. S. *Wm. C. Miller*
Acoustic feedback occurring when two or more remote positions, with loudspeakers, were installed.	Hand telephone sets were incorrectly wired thus energizing the microphone whenever the transmitter was on, while earpiece was energized only when the press-to-talk button was used. Handsets may be checked for this condition by continuity testing between terminals 1 and 4 of handset plug. If correctly wired, 1 to 4 will read 35 to 50 ohms when press-to-talk button is actuated and infinite at all other times. If the above is not so, interchange two black leads at the press-to-talk button within the handset.—U. S. S. *Wm. C. Miller*
TBS–3.—Intermittent cutting out of received transmissions which seemed to correspond to vibration of the ship. Overload relay in transmitter kicked out for no apparent reason. Abnormal fluctuations in power-amplifier plate current were noted.	An intermittent short was discovered in the coaxial cable where it goes into the junction box that joins the gas-filled transmission line.—U. S. S. *Izard*
TBS–2.—Sensitivity low on all operating frequencies.	Realigned i-f circuits. U. S. S. *Indiana*

TBS–2.—Sensitivity low. Intermittently would cut out; other times severe noise indicating loose connection.	Contacts of antenna switching relay dirty. The grounding contact on TRANSMIT was not grounding the receiver antenna. Increased the tension by bending the contact arm.—U. S. S. *Indiana*
TBS–2.—Receiver intermittently would go into an oscillating condition; either high noise level or signal input would cause this.	Investigation revealed that the r-f amplifier was at fault. Various tests revealed no apparent circuit trouble. The r-f amplifier tube was tested and proved good; however, this tube was replaced with another manufactured by RCA and it was then impossible to make the receiver oscillate as before. Raytheon and Tung-Sol tubes were both tried in the circuit with the same results. Our second TBS receiver is not affected in this manner.—U. S. S. *Indiana*
Receiver broke into oscillation when detector, link or antenna controls were adjusted.	Replaced V–401 type 956 tube made by Tung-Sol with 956 made by RCA. Operation normal.—U. S. S. *Starling*
TBS–3.—Overload relay operates whenever transmitter is keyed.	Antenna transfer relay K–103 out of adjustment, causing plate voltage to be applied to tubes before the antenna was connected to the transmitter.—U. S. S. *Wm. C. Miller*
TBS–3.—Transmitter modulation very weak and accompanied by 1000-cycle note.	Connection #16 on transmitter terminal strip loose.—U. S. S. *Wm. C. Miller*
TBS–3.—No output from receiver; plate voltage only at last stage.	Caused by open section of filter choke L–406–B. As a temporary measure, reception may be restored by connecting a jumper wire between terminals #2 and #3.—U. S. S. *Wm. C. Miller*
TBS–3.—Transmitter was keyed whenever motor-generator was running; press-to-talk button was not actuated.	Green lead to terminal #2 on chest set jack J–202 of remote unit became disconnected and touched ground thus completing keying circuit.—U. S. S. *Wm. C. Miller*
TBS–3.—Receiver weak. Had to be run with noise suppressor off and full audio gain.	Checked voltages, all OK. Checked i-f alignment, found i-f amplifier peaked on 5.15 mc. instead of double humped on 5.3 mc. Realigned i-f amplifier in accord with instructions, operation then very satisfactory.—U. S. S. *Biloxi* (CL–80)
TBS–3.—Weak audio output, fringe howl when audio gain was advanced, d-c output voltage from rectifier dropped from 250 volts to 180 volts, and poor response at low audio frequencies.	Found power supply filter capacitors C–455 and C–456 to be "open." Replaced 30-mfd. 450-volt electrolytics and operation normal.—U. S. S. *Biloxi* (CL–80)
TBS–3.—No signals when model PD–1 voice recording equipment was attached to receiver.	Found that TBS–3 receiver output transformer secondary was grounded on opposite leg of circuit in relation to input transformer of model PD–1 equipment. Normal operation restored by changing ground on TBS–3 output transformer.—U. S. S. *Solomons* (CVE–67)
Sensitivity of receiver very low. All meter indications normal.	supply. Condenser C–455 in power supply was replaced. The voltages immediately were raised 50 volts and the receiver was Reduced plate voltages noticed. Failure was traced to the power operating normally.—U. S. S. *Cooner* (DE–172)

Overload relay kept kicking out.	The tripping of the overload relay was due to the increase in the final plate current. This was due to the grounding of the concentric line, from the transmitter to the antenna jackbox, to the sleeve of the box coupling, causing the transmitter to get out of resonance. Two isolantite beads were added to the concentric line at the lug end, thus keeping the line from touching the sleeve. After retuning the transmitter, the equipment operated normally. —U. S. S. *Sloat*
Weak signals (modulated or otherwise) and a continuous chirping were received. In addition, incoming signals were blocked.	Failure resulted from the shorting of screen bypass condenser C–429. When the condenser was replaced, the equipment functioned satisfactorily.—U. S. S. *Hogan* (DMS–6)
TBS–2.—Weak, distorted signals received. The radio-frequency ammeter reading was erratic. When tuning the final amplifier, the maximum plate current reading was obtained at resonance. The tuning indications were very similar to those obtained with an unneutralized amplifier.	Chassis connection bus bar #28 which is the 2nd doubler condenser to ground connection, made poor contact at the chassis. The ends of the bus bar and the chassis itself were cleaned. The holding contacts for the bus bar on the chassis were tightened and secured.—U. S. S. *Fomalhaut*
TBS–3.—Fuses in receiver and fuse box burned out.	Tested plate circuit and found it to be shorted to ground. Elimination tests made and found rectifier filter capacitor C–455 to have an internal short. Replaced the bad fuses and C–455, and unit was restored to normal operation.—U. S. S. *Micka*
TBS–3.—No plate voltage on transmitter.	High-voltage brush on 875-volt positive lead arcing considerably. Brush holder insulation discovered to have broken down, when checked by point-to-point tests. Arcing had caused low-voltage field to overload and blow bias field fuse. Water leaking on the brush cap had caused the arcing. It is suggested that insulated washers of bakelite or hard rubber be placed under all brush caps to prevent future damage from moisture.—U. S. S. *Natoma Bay* (CVE–62)
TBS–3.—The r-f amplifier was oscillating; usual remedies had no effect.	Added 10-ohm ½-watt resistor in series with the grid of V–401, connecting it between the grid and C–401. Complete stability was attained—U. S. S. *Gunason*
"Gets out" OK, but can't hear any stations unless they are almost alongside. All parts apparently operating normally and checked OK.	Investigation showed that the antenna change-over relay was not making contact in the RECEIVE position. Took short piece of wire and "jumped" it from the antenna to the receiver, resulting in perfect reception. Then opened up the change-over relay and made the necessary screwdriver adjustment to insure that good contact was made in the RECEIVE position. Most reports of poor reception can be traced to a defective or weak 956 r-f amplifier. —U. S. S. *Curtiss*
Transmitter could not be "shut down."	Inspection of remote station disclosed that the ON push-button switch on the bridge had shorted out, due to dampness. The switch was wiped dry, cleaned, and repaired. The set then operated normally.—U. S. S. *Callaway*
No transmitter output.	"Fingers" on relays K–101 and K–103 were not making good contact. Adjusted relays and cleaned contacts on antenna transfer relay K–103 and equipment operated normally.—U. S. S. *Callaway*

No receiver output.	Antenna transfer relay K–103 was sticking. The relay was adjusted and no further trouble was experienced.—U. S. S. *Callaway*
Unstable transmitter output.	Oscillator coil L–101 was checked and turns found improperly spaced. Turns respaced, and the equipment operated normally.—U. S. S. *Callaway*
TBS–2.—Receiver would break into oscillation whenever the dectector, link, or antenna controls were tuned.	It was found that replacing the type 956 r-f amplifier tube, V–401, cleared up the trouble. Incidentally, a tube tester will *not* locate this type of trouble, which is due to a manufacturing defect in the tube.—U. S. S. *Starling* (AM–64)
No reception on receiver; almost impossible to tune the transmitter when antenna was connected.	Found to be due to moisture in the coaxial transmission line. The trouble was located by holding the key down for a few minutes and feeling the coaxial line for warm spots indicating the location of points of loss. The coaxial line was opened and dried out, after which normal operation was resumed. As an emergency measure during the period when the TBS antenna system was being repaired, the VHF antenna and coaxial line were used with the TBS.—U. S. S. *Mustin* (DD–413)
TBS–2.—"Chirping" in receiver when transmitter was in operation.	Found to be caused by defective filter capacitor C–456.
TBS–2.—When the transmitter was modulated from the open bridge, feedback occurred.	This failure was traced to the remote position in the CIC. Upon inspection of the handset, Navy type 51019, a strand of wire was found to be shorting the grounded switch contact to the microphone switch contact. This meant that the microphone circuit was completed at all times; the keying circuit, however, was normal. Therefore, when the transmitter was modulated from the bridge, feedback occurred between the CIC microphone and the loudspeaker.—U. S. S. Core (*CVE*–13)
TBS–3.—Receiver dead.	The screw holding the receiver terminal of the transfer relay K–103 was grounding intermittently to the screw holding the relay in place. As there was about $\frac{5}{16}$'' of thread showing after the relay holding screw was tightened, about $\frac{1}{8}$'' of the screw was ground off, thus providing clearance and allowing normal operation.—U. S. S. *Samuel S. Miles* (DE–183)
TBS–3.—Transmitter would key the instant that the motor-generator would get up to speed. Could not modulate the transmitter.	Found lead from remote control terminal #13 to transmitter terminal #16 grounded.—U. S. S. *Brough* (DE–148)
TBS–3.—Transmitter failed to key from remote control station; operation normal at transmitter.	Found spring tension on relay K–104 too strong. Reduced tension by means of thumb screw adjustment.—U. S. S. *Kretchmer* (DE–329)
TBS–3.—Speaker remained connected when press-to-talk button was actuated, thus causing feed-back and howling.	Found that relay K–201 was not closing properly. Readjusted contacts and decreased spring tension.—U. S. S. *Vixen* (PG–53)
TBS–3.—Oscillation in receiver.	Voltage check showed normal conditions. Trouble was traced to R–404 which showed 10,000 ohms when hot instead of 1200, and C–19 which had a 1-megohm leakage resistance. Both parts showed normal values when cooled. Trouble completely eliminated by replacement of R–104 and C–19.—U. S. S. *Windsor* (APA–55)

Difficulty Encountered	Cause and Remedy
TBS–4.—After installation of new antenna rod found that power-amplifier plate current failed to dip more than 3 ma. and dipped at a radical dial setting.	Found that the socket into which the antenna rod was placed was oxidized and not making good contact with the rod. Trouble was completely eliminated by cleaning the socket walls and the antenna rod with crocus cloth.—U. S. S. *Hollandia* (CVE–97)
TBS–5.—Erratic operation of keying relay when using m-c-w (A_2) emission.	Found voltage output from generator to be low. Readjusted speed regulator.—U. S. S. *Barnstable* (APA–93)
TBS–5.—Equipment would not operate. A loud 60-cycle hum in the output of the receiver was heard.	Faulty electrolytic condensers in the filter circuit are usually the cause of this hum. The capacitor, circuit symbol C–442, in the d-c power filter was "open." Its capacity had decreased considerably.—U. S. S. *Marias* (AO–57)
TBS–5.—Receiver noise higher than usual. Reception intermittent.	Plunger contact on K–103 failed to free the receiver antenna input from ground on RECEIVE position. The intermittent reception was caused by dirty "antenna to receiver" contact. The other cause of the high receiver noise was a loose lead-in through the receiver chassis.—U. S. S. *Marias* (AO–57)
TBS–5.—Receiver picked up interference from model SL radar.	Found that the shield of the flexible section of the transmission line was not properly grounded at the connection box to the gas-filled section of the transmission line. Proper grounding completely eliminated the interference.—U. S. S. *Strickland* (DF–333)
TBS–6.—Receiver would cut out after several hours normal operation.	Tubes checked perfectly. Voltage measurements failed to isolate trouble. A small wire within oscillator coil L–401 was found to be expanding when heated and shorting a small fixed capacitor enclosed in the coil. The painted surface of the capacitor had worn off rendering it vulnerable to short circuits. The capacitor was replaced and the receiver resumed normal operation.—U. S. S. *Fancy* (AN–234)
TBS–4.—Push-to-talk button fails to operate transmitter.	Due to decrease in resistance of R–131.—U. S. S. *Jerauld* (APA–174)
TBS–5.—Considerable decrease in audio output with only slight reduction on tube socket voltages.	Found C–442 open. Replaced.—U. S. S. *Wisconsin* (BB–64)
TBS–6.—High reading of input meter on position 3. Low noise level and low reading on output meter.	R–432 increased in value from 100 ohms to 170,000 ohms. This resistor is in the cathode circuit of the second audio amplifier stage.—U. S. S. *Shangri-La* (CV–38)
TBS–3.—Erratic action of AVC noted by fluctuation of input meter when switch was in position A. The bias on the r-f amplifier tube was measured with a vacuum-tube-voltmeter and it varied from —2.2 volts to —1.4 volts.	Found defective capacitor C–421. Bias voltage was steady at —2.2 volts after replacement of this capacitor.—U. S. S. *Manitee* (AO–58)
TBS–5.—Intermittent operation of transmitter with varying plate current in final amplifier and overload relay kicking out.	Found to be due to loose mechanical coupling of the flexible coaxial line and the transmitter terminal. The clamping screw was tight but did not clamp the cable to the terminal. The antenna was removed and an additional insulating washer was inserted. This cleared up the trouble.—U. S. S. *Bougainville* (CVE–100)

Difficulty Encountered	Cause and Remedy
TBS–3.—Receiver would go completely dead and a slight jar or shake would cause it to operate for a few hours before going dead again. If the meter switch was thrown to position #3 (crystal oscillator cathode current) the receiver would start operating again.	New oscillator tubes did not help. The meter switch was left in position #3 and the next time the receiver went dead it was noted that the meter reading increased showing failure of the oscillator to oscillate. The crystal was replaced (Y–401) and the gear has operated satisfactorily since.—U. S. S. *Edsall* (DE–129)
TBS–2.—Receiver had intermittent, evenly timed noise.	This was found to be caused by a poor ground connection between the transmitter and receiver. Cleaned the connections and tightened bolts and resumed normal operation.—U. S. S. *Portland* (CA–33)
TBS–5.—Severe interference present in receiver whenever motor-generator set was turned on.	All power supply filter capacitors were tested and found to be OK. Checked brushes of motor-generator set and found them badly nicked and scratched. Replaced all of them. Cleaned carbon dust from between commutator segments and interference was completely eliminated—U. S. S. *Preston* (DD–795)
TBS–5.—Receiver would cut out intermittently and, while it was out, excessive noises were heard.	Found that choke L–406 was leaking oil over the chassis. Replaced and no further difficulties encountered.—U. S. S. *Toucan* (AM–387)
TBS–6.—Acoustical feed-back from loudspeaker.	Found that relay K–201 was not operating. Repaired by loosening spring tension on this relay.—U. S. S. *Renate* (AKA–36)
TBS–4.—Interference produced in low frequency equipments when transmitter was keyed.	Cleaning of keying relay had no effect. Ground braids from transmitter to receiver were tightened and from transmitter to ship's frame were cleaned and tightened. This eliminated the interference.—U. S. S. *Rockwell* (APA–230)
TBS–1.—Receiver operating very poorly; input meter fluctuating on position 3.	Found poor connection between transmitter and receiver, the shield at the antenna connection not being clamped on tightly enough. Found M–401 fluctuating because the bolts in socket X–404 were loose causing the shield around V–404 to be improperly grounded. Also found a cold solder joint at the cathode of V–403.—U. S. S. *Tattnall* (APD–19)
TBS–5.—Intermittent operation of receiver—signals very good and then very poor.	Antenna was found to move the insulator where transmission line joins antenna. Found connection very dirty. Cleaned and retightened—all OK.—U. S. S. *Chipola* (AO–63)
TBS–3.—No audio output from one of the remote units.	When unit was removed from its cabinet the output was normal. When unit was replaced in cabinet, the unused terminal of J–203 grounded out on the case. Bent lug upward to clear case and operation returned to normal.—M. J. Shannis, RT 3/c—U. S. S. *Swearer* (DE–186)
TBS–6.—The receiver operated fairly well, but with a slightly decreased output. The transmitter would not get through to neighboring control stations although it tuned up properly. Trouble was suspected in the transmission line.	A soldered connection in the transmission line approximately 8 inches above the junction box had become unsoldered. This connection is not mentioned in the preliminary instruction book for this gear. When this joint was remade the trouble cleared up.—Ingram Lee, ETM 3/c—U. S. S. *Horace A. Bass* (APD–124)

Difficulty Encountered	Cause and Remedy
TBS–3.—When transmitter was keyed on the TUNE step, the modulation meter needle hit the peg and did not return until the test switch was released. The condition occurred only on the TUNE position.	It was found that R–138 had been damaged during the removal of the transmitter from its case. Replaced.—U. S. S. *Ingersoll* (DD–652)
TBS–5.—No reception. Unable to tune oscillator. With S–403 in position 3, the needle of M–401 vibrated.	Only 2 volts on the heater of V–403. T–409 very hot. Heater wire was found to be shorted to ground through worn insulation.—U. S. S. *W. C. Cole* (DE–641)
TBS.—Transmitter keyed continuously.	Replaced tube 6A6, V–111, which had low emission. As the transmitter keying relay is held in the receive position by the 6A6, plate current, low emission in the 6A6 will result in continuous keying.—U. S. S. *DeHaven* (DD–727) *1/1/50* ←

MODEL TBW SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
No first i-a grid current. Keying relay K–301 not making contact.	Inspection revealed armature and isolantite contact holder severed. Threaded end of armature sheared off, causing relay to be inoperative. Threaded end was drilled out of insulated frame, care being taken not to ruin insulated threads. A hole was then drilled in armature with #29 drill and tapped with 8–32 tap. A brass screw secured to this and insulated frame, brass being less brittle than original armature metal, with less chance of breakage. After tests, equipment operated normally.—*NAS Seattle*
Failure of keying relay.	Those field activities having access to a supply of the obsolete model GP aircraft radio transmitters may use the GP keying relay interchangeably with that for the TBW as the units are identical.

MODIFICATION OF MODEL TBX–2 PORTABLE RADIO EQUIPMENTS HAVING SERIAL NUMBERS 509 TO 800, INCLUSIVE

In some of the type CG–43005 transmitter-receiver units of the model TBX–2 portable radio equipments, capacitors C–313 and C–314 were inadvertently transposed during manufacture. Under certain conditions of operation (if operated below 2200 kc. on ANT. COARSE adjustment on tap no. 1), the performance of the unit will be impaired due to this transposition. All units bearing serial numbers from 509 to 800 inclusive should therefore be examined, and, if the error is found to exist, it should be corrected in accordance with the following instructions:

Locate and examine the fixed mica capacitor C–313, mounted on the top side of the transmitter chassis immediately below the SEND-RECEIVE switch. When located, note the part number that is stamped on the edge of the capacitor nearest the panel. If this number is 7761328–27, these instructions should be disregarded since this is C–313. If the number is 7761328–16, however, C–314 has been used in place of C–313, and the two capacitors must be interchanged. C–314 is mounted on the same posts as C–313, but is on the underside of the transmitter chassis.

Carefully remove all wiring to the lower capacitor by heating with a soldering iron and at the same time using a small screw driver to pry open the loop in the end of the wire. On the capacitor mounted above the chassis, the wire leading from the lug nearest the p-a tuning capacitor should be unsoldered at the variable capacitor and ammeter junction, the other lead at the SEND-RECEIVE switch.

Remove the no. 6–32 hex nuts, 1⅛″ bolts, aluminum spacers and finally the capacitor. The upper capacitor may be removed by slightly bending the wire removed from p-a ammeter junction, sliding it toward edge of set in back of panel bracket.

Check the rating of 7761328–27 as 0.00008 mfd. and that of 7761328–16 as 0.01 mfd.

Remount the capacitors. Be sure that the shorter wire of C–313 is connected to left-hand lug facing nameplate side (this assures maximum clearance between lugs and shield) and that the red color-coded wires at C–314 are not short-circuited to ground.

EXTENSION OF THE FREQUENCY RANGE OF MODEL TBX SERIES EQUIPMENTS

The modification described here will increase the rated high-frequency limit of the TBX by 1475 kc. The TBX will operate at a frequency 475 kc. higher than its rated frequency without modification and another 1000 kc. can be added with the modification to follow. This modification is covered by specification RE 9361A which specifies an additional 800 kc. and which in practice is exceeded by 200 kc. making a 1000-kc. extension of the frequency band.

A modification kit, consisting essentially of new coils, has been obtained and distributed under contracts NXsr 56828 and NXsr 48311. If the kit has not been obtained, the coils may, as a temporary measure, be modified as follows:

(1) The materials required are a two-foot length of #14 tinned copper wire, 1 strip of thin copper approx. 3/16″ x 2½″ x 1/64″, and 1 sheet of mica or varnished glass tape approx. ⅜″ x 2½″ x 1/64″.

(2) The following steps are illustrated in Figures 1, 2, 3 and 4.

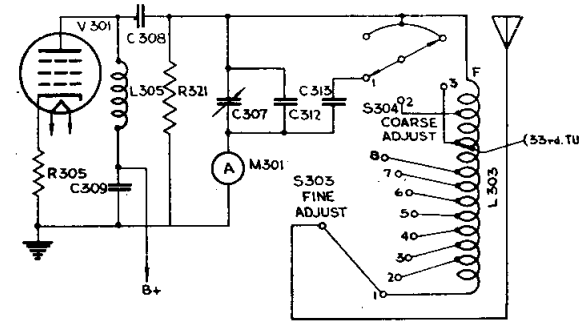

FIGURE 1.—Original output circuit.

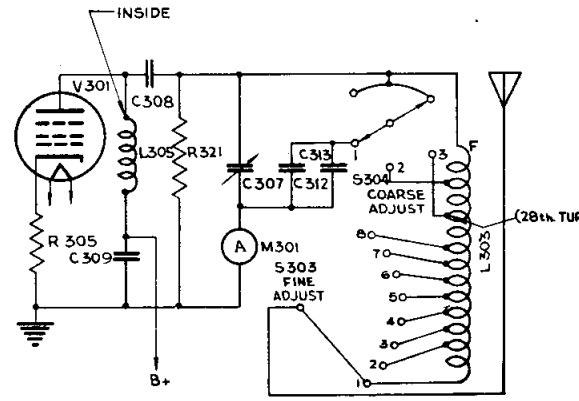

FIGURE 2.—Revised output circuit.

638971—45——18

(3) Remove r-f ammeter M–301 to permit access to the necessary connections.

(4) Remove jumper wire between capacitors C–308 and C–312, lugs 1 and 2. In TBX–4 only remove end of resistor R–321 from capacitor C–312 lug 1 and reconnect to capacitor C–308 lug 2.

(5) Remove wire from variable condenser C–307 lug connecting to lug 1 of capacitor C–312.

(6) Run a bus bar wire lead as short as possible from variable condenser C–307 lug 6 to capacitor C–308 lug 2.

(7) Run a bus bar wire lead direct from capacitor C–312 lug 1 to the left hand terminal of the r-f ammeter, viewed from the front panel.

(8) Remove the jumper between capacitor C–312 lug 4 and variable condenser C–307 lug 5 (attached to condenser C–307 frame).

(9) Run a new lead from capacitor C–312 lead 4 to the lead point 7 on switch S–304 and capacitor C–313 lug 8.

(10) Be sure that all leads are properly crimped and make secure mechanical connections before soldering.

(11) Connect r-f ammeter back into circuit.

(12) Locate the m-o inductance L–301 and note carefully the three coil taps. The tap on the 11th turn should be moved 4 turns toward the center of the coil and placed on the 15th turn. The tap on the 39th turn should be moved 3 turns toward the center of the coil and placed on the 36th turn. These changes should be made by slipping the wires out of the existing taps and making new taps from the copper cut into strips approx. $\frac{3}{16}'' \times \frac{7}{16}''$ and slipped under the correct turns after they have had the enamel removed by scraping with a knife. A strip of mica or glass tape approx. $\frac{3}{8}'' \times \frac{1}{2}''$ should be slipped under the copper strip next to the coil form to insulate new tap from adjacent turns.

(13) Locate the antenna tuning inductance L–303. When viewing the chassis facing the front panel, the tap on the 33rd turn should be moved five turns to the left, placing it on the 28th turn. This tap is the second from the right end of the coil. This change in tap location should be made as were the changes in L–301 as explained above in step (12).

(14) Recalibrate the transmitter. This may be done with a frequency standard such as the LD or LM. The transmitter is tuned to zero-beat with the frequency meter at the desired frequency and the dial readings recorded. Where a frequency standard is not available, the receiver calibration may be utilized to calibrate the transmitter. The receiver is tuned to the desired frequency using the receiver calibration chart. With the "netting switch" on and both power supplies in operation, the transmitter is tuned to zero-beat in the phones. The transmitter dial readings

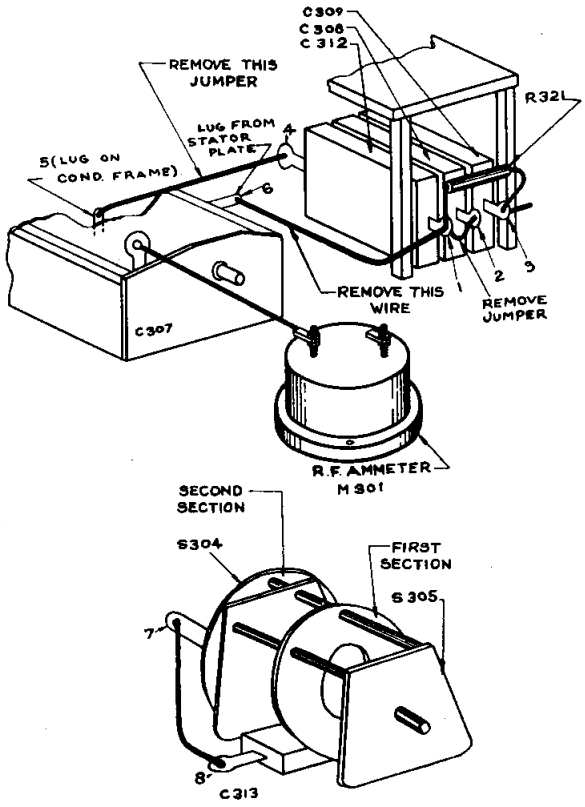

FIGURE 3.—Original connections

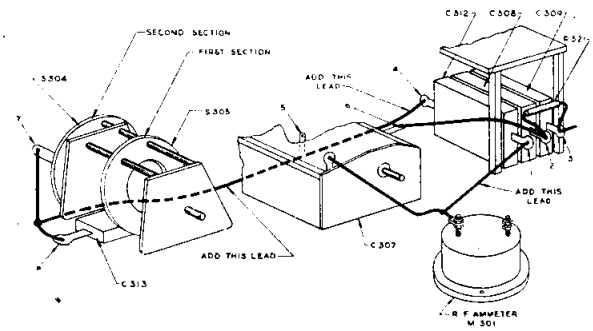

FIGURE 4.—Revised connections.

are then recorded. Improved accuracy can be obtained if a station of known frequency is located near the desired frequency. The receiver calibration can be corrected by means of the "wobbler" control, and this control left in that position when zero-beating the transmitter to the receiver. If such a station is not available, the "wobbler" control should be set at zero. It will be noted that band one of the transmitter can be plotted to the same chart scale as before, but band two will have to be plotted to a smaller scale (one-half) due to increased frequency coverage.

(14) The leads to transmitter plate choke L–305 are to be reversed. The plate lead of oscillator tube V–301 should be connected to the inside or start of choke winding and the outside or finish choke winding should be connected to the plate supply.

MODIFICATION TO IMPROVE THE SENSITIVITY OF MODEL TBY EQUIPMENTS

The sensitivity of models TBY, TBY–1 and TBY–2 can be improved by grounding the open end of the regeneration control R8. The only undesirable condition involved is the grounding of the plate supply through resistors R8 and R10. If this modification is made and the batteries are left in place, there will be a continuous drain on the plate supply battery of about 0.3 ma. which would discharge the battery in about three months.

The constant drain on the battery when the equipment is not in use can be eliminated by replacing the variable resistor R8 with a commercial type 500,000-ohm carbon potentiometer with switch similar to Mallory-Yaxley type Y500MP with s.p.s.t. switch type 6. The switch is connected so that the open end of the control is connected in series with the switch and the other side of the switch grounded.

Where the modification is made in accordance with the foregoing instructions, it should be emphasized to operators that the regeneration control switch as well as the regular ON-OFF switch must be operated when turning the equipment on or off.

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EXTENDING LIFE OF TBY BATTERIES

The Communications Office of the Navy Port Director, New York City, has developed the following method for extending the life of the model TBY type 19018–B dry battery power pack. This method consists of securing the TBY equipment to a wooden base and providing a cord and plug for plugging into several sets of batteries. Reports received by the Port Director's Office indicate that the life of the type 19018–B 25-hour dry battery power pack was extended to over 50 hours of useful operation. The following procedure is used in this system:

(1) Unsolder the top of a discharged 19018–B dry battery. Keep the socket and leads intact.

(2) Obtain a piece of board 1″ x 6 9/16″ x 9 3/8″ which will set inside the middle top of the old battery. A hole should be cut to accommodate the socket and then the board should be nailed inside the metal battery top.

(3) A wooden block should be added under each end of the board so as to raise the battery top about 3″ from the deck. This will allow the TBY to set on the old battery top and permit strapping the equipment to the board. (See Figure 1.)

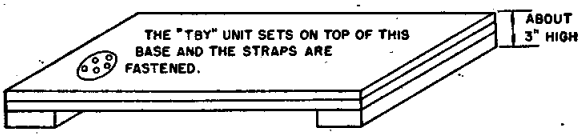

FIGURE 1.—Mounting block.

(4) Wires should be connected to the socket on the old battery top and run to a 5-prong plug which will fit into the socket on top of a type 19018–B battery. The wires should be laced together to provide a neat appearance and flexible wire should be used to permit bending of the cable as required. The length of the cable may be adjusted to suit conditions. (See Figure 2.)

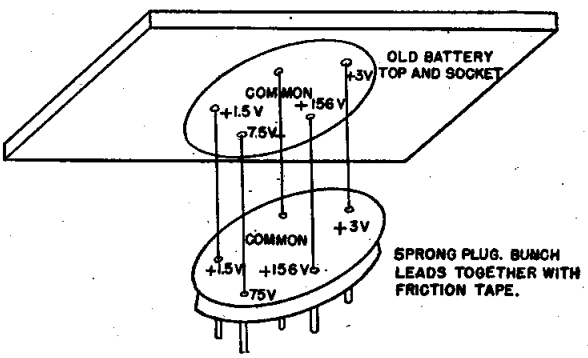

FIGURE 2.—Socket connections.

Provide four sets of type 19018–B batteries These four sets are used as follows: Use set no. 1 for four hours, then shift to set no. 2, which is used for four hours, then to no. 3 and so on. This procedure gives each battery a 12-hour build-up for depolarization before it is used again for a four-hour period. This method is considered to be superior to the operation of 19018–B battery packs in parallel as any defective cell will not

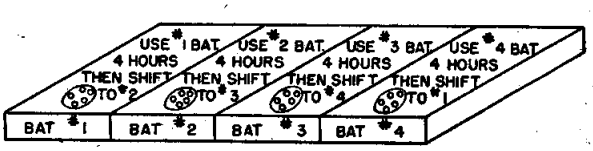

FIGURE 3.—Rotation of batteries.

cause deterioration of all other batteries connected in parallel with it. (See Figure 3.)

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BATTERY POWER FOR MODEL TBY EQUIPMENTS

The Bureau has developed several portable non-spill storage batteries and associated vibrator power units. To replace the type 19018 dry battery pack used with the TBY, the Bureau is supplying the following units:

Vibrator power unit CLG–20144
Battery CLG–19029
Battery charger CLG–20145

Low output or intermittent operation of the vibrators often indicates low battery voltage. The battery is shipped dry and filled with acid when placed in use, and when first filled with acid does not have complete plate contact. It may show full charge by specific gravity test, or by voltage test with a high resistance voltmeter, but it is not capable of delivering its rated current until it has been cycled by charging and discharging several times. It may be tested by using it in place of a properly operating battery.

While the instruction book advises leaving the battery attached to the vibrator for emergency charging from another storage battery, this practice is not desirable as a routine procedure. Some fumes escape from any battery and if charging is done regularly with the vibrator attached, eventual corrosion of the vibrator pack parts will occur.

→Vessels and activities should contact the nearest Electronics Officer for the portable storage batteries, vibrator power units and battery chargers when the local supply of type 19018–B dry battery power units becomes exhausted. ←

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ANTENNAS FOR TBY SERIES EQUIPMENTS EMPLOYED ABOARD SHIP

Inasmuch as the model TBY series equipments employed aboard ships are operated on a single frequency, there are a number of types of antenna installations which are practicable. Figures 1, 2, and 3 are sketches of several suggested antennas which are suitable. It is suggested that the ship's personnel make the installation using vertical polarization if possible. A ground connection to the chassis may or may not help, but should be tried. The length of the doublet in Figure 1 is often taken as 468 feet divided by the frequency in mcs. if the frequency is higher than

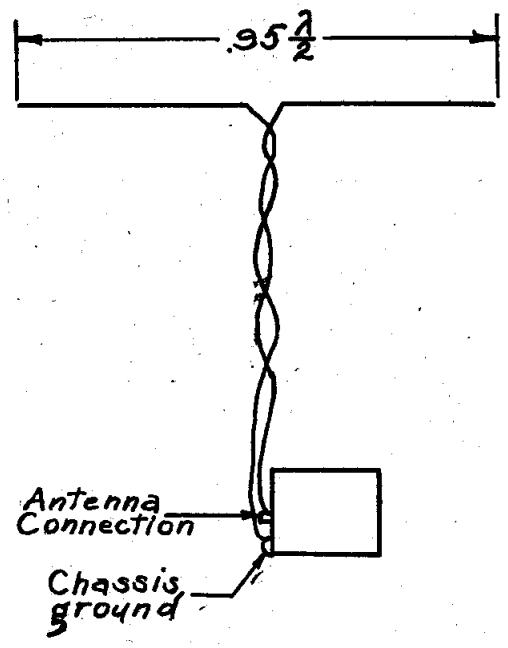

FIGURE 1.—Twisted-pair feeders.

56 mc. The feeders are: Figure 1—ordinary twisted pair; Figure 2—single wire feed; and Figure 3—low impedance coaxial line.

The velocity constant of CASSF–50–1 is 66% which means that a segment cut from this cable

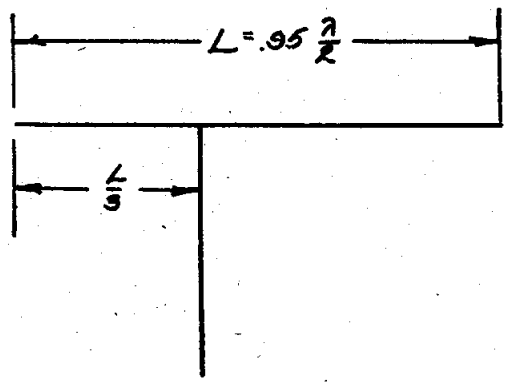

FIGURE 2.—Single wire feeder.

should have a length equal to .66 times the desired electrical length. For example, a half-wave line at 30 mc. is made 3.3 meters long instead of 5 meters.

Since the shipboard installation is to be operated at a single frequency, the transmission line used may be designed to effect a match at the TBY output connection. This is done preferably by using a transmission line of 50 ohms. Where a 50-ohm line is not available, a line of any impedance and having a length equal to a whole number of half wave-lengths at the TBY frequency may be used. A length of whole half-wavelengths is also desirable with 50-ohm lines.

The Navy type COA–66089 antenna kit, containing a ground plane vertical antenna together with two lengths of CASSF–50–1 transmission lines, is designed for application with the TBY series equipments employed on shipboard. Until such time as sufficient of these antennas are available, it is recommended that antennas for use with the TBY series equipment employed aboard ship be constructed as suggested above.

Model TBY–4 equipments incorporate a receptacle for connection to standard CASSF–50–1 flexible concentric cable end fittings. Included with each 66089 antenna kit will be a bracket incorporating a similar receptacle for use with TBY equipments earlier than the TBY–4. Where the

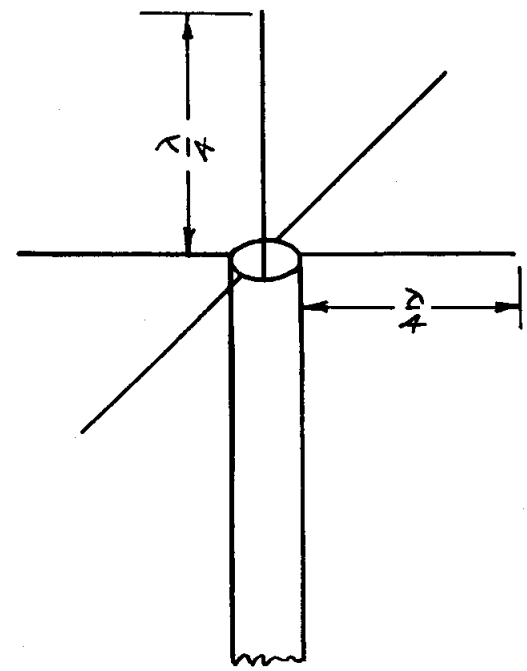

FIGURE 3.—Coaxial line feeder.

66089 antenna kit is not available, transmission line connections to TBY series equipments may be improvised in any suitable manner which does not involve access to the interior of the set.

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MODEL TBY SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Receiver section "dead."	Plate winding of audio interstage transformer open. Having no spare on hand, an emergency repair was made which consisted of placing a 25,000-ohm resistor across the open plate winding and a 0.01-mfd. condenser from the plate side of the primary to one of the grid leads of the 1E7G audio tube. The transformer was left in the circuit. This repair restored the equipment to nearly normal operation.—U. S. S. *Omaha*
Corroded contacts on switch "S-5."	Silver will be oxidized by contact with rubber having a sulphur content, or by exposure to fumes from such rubber at soldering temperatures. By using a different rubber this difficulty has been eliminated in model TBY series equipments subsequent to the TBY-7, serial no. 565. Equipments of earlier manufacture may have oxidation difficulty and may be cleaned as follows: Remove the switch, take off the rubber cover, soak the switch in carbon tetrachloride for 5 minutes, and rotate the immersed switch a dozen times; then remove switch from the fluid, permit it to dry, test it for continuity and reinstall.
TBY-1.—Operation apparently normal with proper mounting but could not contact nearby ships. Receiver hiss and signals from other transmitters very weak.	Found modulation transformer windings had changed value from 550 to 340 ohms for S #1 and from 240 to 650 for S #2.—U. S. S. *Sangamon* (CVE-26)
TBY-7.—Intermittent operation of equipment.	Found to be due to one of the lugs on regeneration control R-8 grounding to chassis. Repaired by bending lug so as to clear chassis.—U. S. C. G. C. *Duane*
TBY-1.—No super-regenerative noise.	Found open capacitor C-7.—U. S. S. *ATA 186*
TBY-4.—Transmitter loading and filament meter M-1 failed to read when S-5 was placed in the r-f filament rheostat position.	The trouble was found to be a loose connection from the meter shunting position, R-17 to S-5. Resoldered joint.—U. S. S. *Racoon* (IX-127)
TBY-4.—Meter M-1, bleeder resistor R-20, dropping resistor R-19, and receiving tubes V-1 and V-2 were damaged by arcing between contacts of meter switch S-5.	Arc was apparently caused by paint used to seal holes of the switches rubber cover.—*Branch Radio Shop*, Navy #122

REVISION OF MODEL TCC–3 EQUIPMENT FOR PARALLEL HIGH SPEED KEYING

The high speed keying circuit of Figure 1 is not intended for general use and should be used only in those instances where high speed keying or parallel high speed keying of TCC transmitters is necessary. No standard Navy type units which will provide similar operation are available at this time.

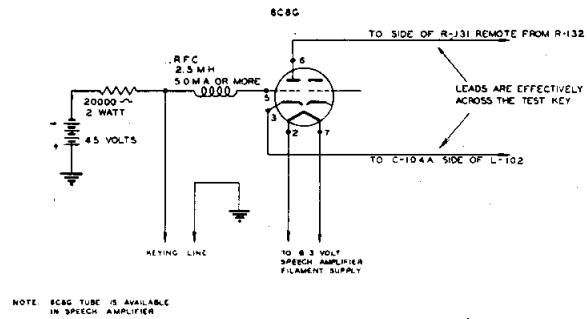

FIGURE 1.—Revision for TCC–3 equipments.

MODIFICATION OF MODEL TCE SERIES ANTENNA TUNING UNIT

The following objections and criticisms have been raised relative to the installation of model TCE series antenna tuning unit, Navy type CQH–481640, manufactured by the Hudson Supply Co., Richmond, Va.:

(1) The panel end of the condenser shaft is "hot" with respect to radio frequency and operators have received burns through the pointer hand knob.

(2) The variable condenser is mounted in such a way that the feed-through insulator on the top surface of the TCE equipment grounds against the frame of the condenser when a mounting in the usual manner is attempted.

(3) The variable tuning condenser is center-rear-mounted upon a single stand-off insulator, and front-mounted upon a single stand-off insulator which is off center. A shorting switch, integral with the condenser shaft and employing condenser bearings, depends upon friction to make each of two stationary contacts at each end of approximately 270 degrees of rotation. These friction contacts and the stiff bar switch arm employed, when the switch is thrown, place sufficient strain upon the condenser mounting insulators to cause fracture and breakage.

Field activities experiencing installation and operation difficulties similar to those listed above should modify the unit in accordance with the following procedure which has been developed and successfully employed by the Puget Sound Navy Yard. (See Figure 1):

(1) Remove top of cabinet, remove variable condenser from cabinet, and remove switch arm and dial knob.

(2) Remove rear entering insulator and reinstall on outside of cabinet. This provides additional space permitting variable condenser to be moved to rear of cabinet so that its frame will clear the TCE feed-through bowl.

(3) Remove bottom plate with condenser attached. Remove front-mounted stand-off insulator and replace front-mount with two insulators identical to the one removed. Construct a cross bar between the two insulators with a mounting hole for condenser frame centered on bar, thereby obtaining a solid tripod mount.

(4) Remove and replace condenser mounting angles so condenser will be placed in reversed position, top to bottom, and approximately $\frac{5}{8}$ inch to rear of original position, when replaced in cabinet. This permits additional clearance from TCE feed-through bowl.

(5) Saw off rear end of condenser shaft and bushing flush with frame, to increase clearance from cabinet.

(6) Place rear condenser mounting angle on rear stand-off insulator and line up shaft with front panel. Adjust twin insulator front-mounting bar so insulator nearest TCE bowl entering clearance hole is lined up $1\frac{1}{16}$ inches to the rear of the other insulator.

(7) Remodel original shaft-mounted switch arm, attaching spring copper arm in place of original non-spring copper bar.

(8) Attach remodeled shaft mounting switch arm to condenser shaft and adjust tension of contact wiper blades.

(9) Attach insulated coupling to front end of switch arm shaft.

(10) Install panel shaft-bearing bushing in center hole in panel-mounted dial plate.

(11) Attach brass shaft to front end of insulated coupling to extend through panel bushing and mount pointer knob, lining it up with condenser rotor and with switch arm.

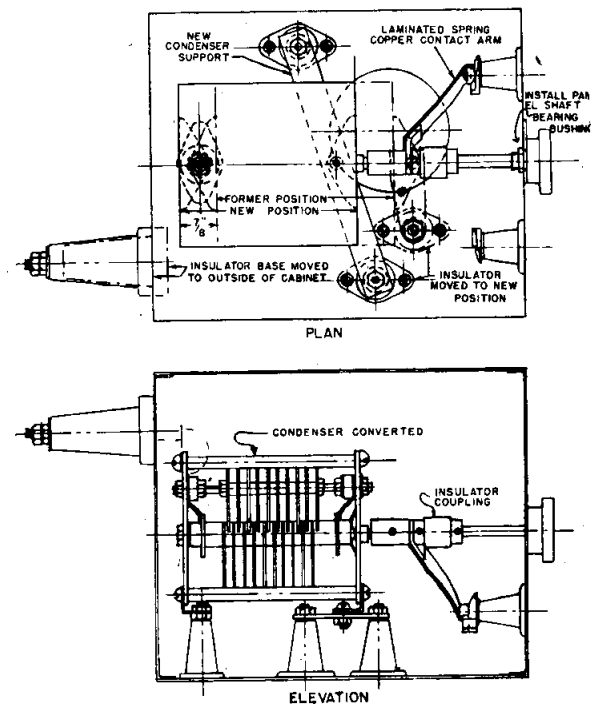

FIGURE 1.—Plan of modification.

(12) Replace wiring leads and replace top of cabinet.

Additional material required for the modification is as follows:

1 1½″ porcelain stand-off insulator.
1 piece .094 steel bar 1″ × 6¼″
1 contact arm assembly. (See Figure 2.)

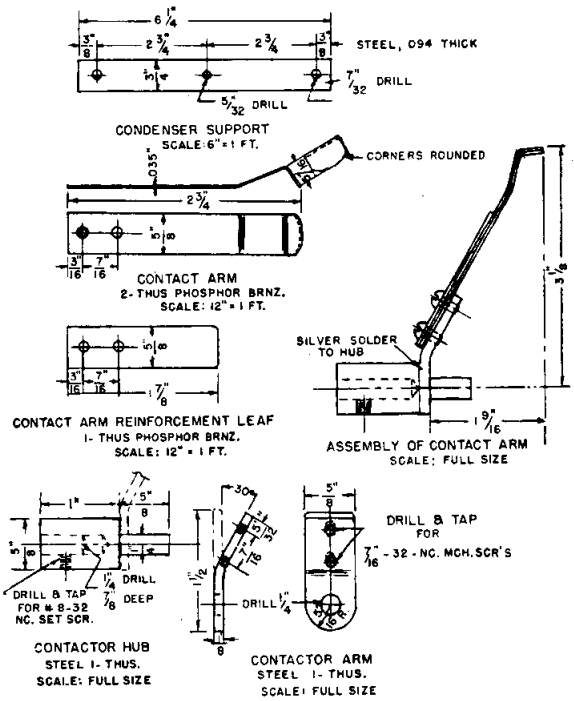

FIGURE 2.—Contact arm assembly.

1 insulated coupling, heavy duty, ¼″ shaft to ¼″ shaft
1 brass, n.p., panel shaft bearing bushing
1 pc. brass, n.p., shaft 3½″ long
2 6–32 f.h. machine screws, nuts and lockwashers.

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MAINTENANCE OF MOTOR-GENERATOR SETS FOR MODELS TCE, TCE–1 AND TCE–2 TRANSMITTERS

Navy Type Nos.

CC–21413	CC–21414	CC–21415
CC–21416	CC–21607	CC–21635
CC–21636	CC–21637	CC–21638
CC–21927	CC–21524	CC–21559

Motor-generator sets for the TCE series of transmitters are compact, light-weight units generating 120 volts AC at 800 cycles, and 14 volts DC.

SPEED GOVERNOR

IRREGULAR SPEED is usually due to the contact points requiring cleaning. Clean with fine sandpaper and polish with crocus cloth. After polishing, the contact gap should be reset and the speed adjusted if required.

ADJUSTMENT: Speed is adjusted by changing the tension of the coil spring at the end of the vibrating element. Increasing the tension of the coil spring increases the speed. Decreasing the tension decreases the speed. Approximate correct setting of the contact gap is .015 inches.

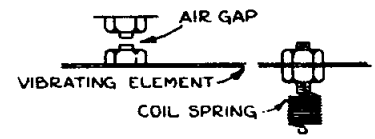

FIGURE 1.—Adjustment of speed regulator.

Install the generator set in an accessible location so that it can be given proper care at regular intervals. As the generator is self-excited at 14 volts, its brushes and commutators must be kept in the best possible operating condition at all times.

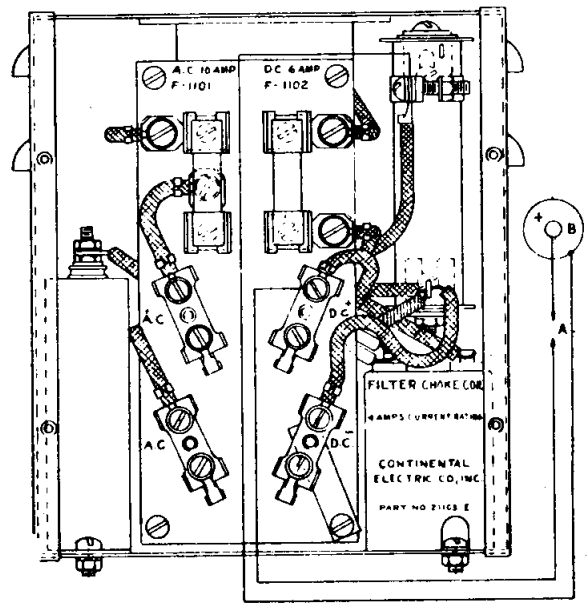

FIGURE 2.—Filter box.

Check the following points at regular intervals:

(1) Brushes and commutator must be clean.

(2) Brushes must move freely in holders. Generator brushes must have sufficient spring pressure (approx. 3 lbs. per brush) to break through low-voltage commutator film.

(3) Connections to brushholders, resistors and terminals must be tight.

If under adverse circumstances, the voltage fails to build up when the set is started:

(1) Check above points (1), (2) and (3).

(2) Determine whether or not generator is operating at rated speed. If speed of d-c motor is too high or too low, and voltage at motor terminals is correct, then adjust speed regulator as per Fig. 1.

(3) If generator still fails to pick up voltage, the fields may be flashed with a 1½-volt no. 6 dry cell. (See Fig. 2 for connections.) Flash fields with machine operating at rated speed.

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FREQUENCY SHIFT IN TCE–1 AND TCE–2 TRANSMITTERS

Several ships having TCE–1 and TCE–2 transmitters have been warned for being off frequency. Upon investigation, it was found that, on some bands, as the power control switch was turned from TUNE to OPERATE, the frequency shifted. The maximum shift found was 2.9 kc.; this was on band "D". This change in frequency is a result of the change in capacity of the oscillator circuit which is caused by the power-amplifier tube capacity.

Each frequency band is compensated for this change in capacity at the factory. In ranges "A", "B", and "C", the change in capacity is neutralized by inductive neutralization. This is accomplished by running a wire in the proximity of the power-amplifier and master-oscillator circuits, thereby applying coupling in a reverse ratio to offset the equivalent change in power-amplifier tube capacity. In ranges "D", "E", and "F" the change in capacity is neutralized by neutralization capacitors. In the TCE–1 and TCE–2 these capacitors are C–405, C–505, and C–605. The instruction book states that this wire on bands "A", "B", and "C" and the capacitors on bands "D", "E", and "F" are adjusted at the factory and should not be adjusted in the field. The physical location of each wire and condenser is in its respective plug-in tuning unit.

The obvious check for this shift in frequency is to measure the frequency by use of the frequency meter with the TCE control first in the TUNE and then in the OPERATE position for each band. The maximum allowable frequency shift for these bands, according to Communication Instructions 1944, is 0.02 percent. If the shift is more than the maximum amount allowed, consult the nearest Radio Material Officer because the adjustment to alleviate this condition is critical.

As an emergency measure, however, after the transmitter frequency has been set with the switch in TUNE position, it may be set exactly on the correct value by use of the frequency meter with the transmitter in the normal operating position. CAUTION—this puts the carrier on the air and should not become a regular practice. *—Comserforlant*

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→TUNING UNIT GASKETS FOR MODEL TCE SERIES TRANSMITTERS

It has been reported that the gaskets on the cover of the Model TCE Series Transmitter Tuning Units have been loosening. This is due to the gasket catching on the snap-on-studs whenever the covers are removed.

When this difficulty is encountered, the gasket should be removed from the cover as presently installed and cemented to the lip of the container. It is easier to cement the gasket to the container than to the cover. *1/1/50*

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MODEL TCE SERIES TROUBLE-SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Breakdown of insulation of r-f output lead inside tuning units.	This lead is normally clamped by means of a metal clip to the case of the units. Repairs can be effected by encasing this lead in "spaghetti."—*RMO Navy Yard, New York*
Difficulty in loading on certain frequencies and arcing from free end of antenna-loading coil to ground.	Due to resonance of the loading coil at certain frequencies. The remedy is to connect a jumper from the free end of the loading coil L–901 to the rotor of switch J (S–106). This shorts out the unused portion of the coil and prevents resonance of the "dead-end"; also it prevents autotransformer action from building up the voltage at the open end. It may also be necessary in some installations to add series tuning capacity to the antenna circuit in order to load the transmitter at certain frequencies. If such is the case, install "TCE antenna tuning unit no. 481643" which consists of a mounted 250-mmfd. variable condenser.
Failure to key.	Keying contacts stuck. Adjust in accordance with authorized servicing procedures as listed in instruction book.
Final stage will not load.	Inspect keying relay for broken leads to contacts.
Indication of heavy final loading—tuning final does not relieve.	High-voltage secondary of T–103 leaking to ground.
Will not key.	Check 6-ampere fuse in 12-volt circuit at generator.
Will not modulate but keys satisfactorily with microphone.	Defective microphone; defective modulator tube.
Failure to build up generated voltage.	See page TCE: 2.
Failure to build up generator voltage after flashing field, or requirement that flashing be applied continuously in order to maintain voltage.	It was discovered that the dash pot in the magnetic controller was not properly adjusted. After this adjustment, equipment worked normally.—U. S. S. *SC1269*
Failure to key after output from generator has been checked.	• • the keying relay K–101 circuit was checked in the connection box on the front of the generator for the required 12 volts DC, which was present. The keying relay was then tried by hand and found very difficult to move. The iron core of the coil was removed and cleaned with carbon tetrachloride. Core was then replaced and keying relay adjusted in accordance with instruction book.—U. S. S. *SC1269*
TCE–2.—Transmitter developed excessive feedback.	Chassis of transmitter found to have poor ground connection. Proper grounding of chassis eliminated the feedback.
TCE–1.—Motor generator did not rotate at normal speed.	Replace spring on speed regulator in motor generator.—U. S. S. PC–483.
➔ TCE–2.—The transmitter loaded up normally on the "TUNE" position but would not do so on the other positions of the Power Control Switch, S–103.	The contacts of the Power Control Switch, S–103, were cleaned. The transmitter then operated satisfactorily in all positions of the switch.—U. S. S. *Derrick* (YO–59). *1/1/50*

MODELS TCJ AND TCJ–1 INSTRUCTION BOOK CHANGES

Instruction book changes for the models TCJ and TCJ–1 equipments are now available for distribution. Activities holding books for these equipments should request changes from BuShips.

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PRELIMINARY INSTRUCTION BOOK FOR MODEL TCK–4 TRANSMITTERS

The early shipments of the model TCK–4 transmitters were made without instruction books. A supply of preliminary books has been sent to all Radio Material Officers for issue to any activities requiring these books.

CHANGES TO MODEL TCK INSTRUCTION BOOKS

Two revisions to the preliminary instruction book for model TCK equipments are now available: "Change Notice #1 for TCK–3 and TCK–5"; and "Change Notice #1 for TCK–4 and TCK–6".

These change notices will shortly be distributed to the various Radio Material Officers, and activities having model TCK equipments may secure them from the nearest Radio Material Office. When requesting these change notices, it is extremely important that the number designation be supplied in order that the correct sheets may be supplied.

INTERCONNECTION OF MODEL TCK SERIES TRANSMITTERS WITH STANDARD RADIOPHONE UNIT

Model TCK series transmitting equipment has recently been added to the radio allowance of certain Naval vessels. It is noted, however, that the instruction books for current models of this equipment do not indicate clearly the wiring necessary to incorporate the installation of the present "6-wire" system. This information will be included in the instruction books furnished with subsequent models. Meanwhile, the wiring shown in Figure 1 should be followed for current installations.

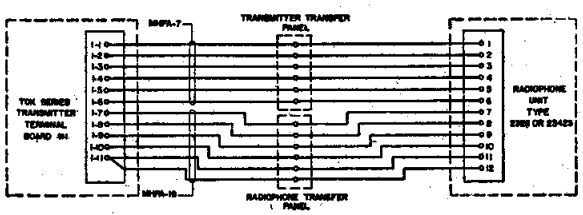

FIGURE 1.—Wiring necessary for interconnection of model TCK series transmitters with standard radiophone unit

BLOWER MOTOR FAILURES IN MODEL TCK EQUIPMENT

Reports from the field indicate that the blower motor, symbol B–101, for model TCK–3 equipment has a tendency to fail due to hardening of the grease used for lubrication of the bearings and races.

It was observed that this failure occurred in equipments which had been in service for less than a year, notwithstanding that the instruction books recommended replacing the lubricant only once a year.

It is recommended that activities using TCK series equipment inspect the blower motor to determine the condition of the lubricant—particularly if the equipment has been in service for six months or more. If the grease appears hardened, the blower motor should be disassembled, cleaned of all grease, and lubricated with Navy Specification 14L3, grade H lubricant. This should be done every six months instead of every year as indicated in the present instructions.

CORRECTION TO INSTRUCTION BOOK FOR MODEL TCK–4 TRANSMITTING EQUIPMENT

The preliminary instruction book for the model TCK–4 transmitter contains an error in Figure 9—external connection diagram (drawing P–7765682). This drawing shows two No. 15 wires in the flexible conduit going to TB20 in the rectifier unit. The wire to terminal 3 on TB20 should be numbered 16. Figure 1 shows the correct connection.

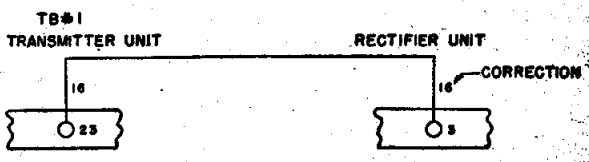

FIGURE 1.—Correction to Figure 9 of the TCK–4 preliminary instruction book.

INSTRUCTIONS FOR THE MECHANICAL ALIGNMENT OF THE TUNING MECHANISM IN THE MODEL TCK SERIES TRANSMITTERS

The instruction book for the models TCK and TCK–1 radio transmitters, General Electric publication GEI–16645, advises on page 29, paragraph 3, that instructions for the mechanical alignment of the tuning mechanism may be secured from the contractor upon request.

The Bureau has secured this information from the contractor and it is reproduced herewith for the assistance of Naval radio activities in adjusting the tuning mechanisms of the TCK series transmitters. This data is supplemental to that included in TCK series instruction books, and is as follows:

UNI-CONTROL MECHANISM (T–7661382)

Step I

a. Alignment of counters and drums. (Counters are indicators on left side of mechanism and drums are indicators on right side behind glass) This can be accomplished by loosening set screws in pinions and rotating on counter shaft until readings are obtained as follows:

First two numbers on counter to read "00" when "00" on drum just stops moving into full view.

For example: reading on band 1 should be 20 on counter and 00 on drum. Reading on band 2 should be 3000 on counter and 00 on drum etc.

Step II

a. Adjustment of counters can be accomplished by loosening set screws in bevel gears and rotating on jack shaft until simultaneous readings are obtained on counters as shown below.

Band	*Counter Reading*
1	2000
2	3000
3	4000
4	6000
5	8000
6	12000

Note.—Drums have already been adjusted and should read "00" on above positions.

The drum is spun onto the pinion and pinion fastened to counter shaft by set screws. Therefore, it is possible to get perfect alignment between counters and drums.

The bevel gears (large gears) are fastened to jack shaft (vertical shaft) by set screws and it is possible to get perfect alignment between the counters for each band.

After final adjustment, set screws should be staked with GE Glyptol #1276 to prevent screws from loosening. This can be accomplished by removing one set screw from a gear at a time, coating with Glyptol and tightening in place, then remove other set screw and repeat process. In this manner, adjustments will not be affected.

Gears should be set for minimum backlash, but not tight enough to cause binding.

Step III

a. Adjustment of stop. This is triangular piece that slides on three spacers in back of gear housing. This should be set so counter on band 2 reads 4475 when stop just begins to make contact with rubber stops nearest gear housing. To adjust stop, it is necessary to remove triangular plate on end of slides. To do this, remove 3 nuts on end of slide rods and remove plate. The stop is then threaded onto the screw that drives it and set as above. Replace plate and stake nuts.

It will be necessary to remove Uni-Control from transmitter to make above adjustments. To do this, remove mounting screws and loosen coupling to drive shaft. (For alignment with capacitors see below).

Step IV—Capacitors

a. Alignment of C–110 and C–124. C–124 and C–110 are variables mounted vertically in set. C–110 at bottom.

Loosen set screws in coupling between C–110 and C–124, so above capacitors can be rotated independently of each other. Then with spacer attached to each capacitor (be sure to use the correct spacer for each capacitor—check serial numbers) rotate to minimum capacity until spacer fits between rotor and stator. It will be easier to set C–110 first by rotating drive

shaft, then C–124. Tighten set screws in coupling and stake as per above.

b. Alignment of C–102 with C–124 and C–110. C–102 is MO unit variable.

With C–124 and C–110 in minimum positions as previously determined by spacers, set C–102 at minimum with its spacer so rotor and stator just touch spacer at same time. Fasten set screws in coupling. Stake.

At this point, all three capacitors, C–102, C–110, and C–124 should be in minimum capacity positions as determined by each capacitor gage and all couplings tight so drive shaft turns all three at same time.

Step V—Uni Control with C–102, C–124 and C–110.

a. Set Uni-Control so band 1 reads 3072.73 kc. and lock control. Then by rotating worm shaft until C–110 is at minimum capacity (with gage in position), tighten set screws on fixed hub of Uni-Control.

b. Check adjustment by rotating dial and return to 3072.73 kc. The spacer should just touch rotor and stator plates. If not, compensate by resetting set screws. Stake.

NOTE: When Uni-Control reads 3072.73 kc. on band 1, C–102, C–110, C–124, should be at minimum capacity (plates all the way out).

Step VI—Controls (Transmitter).

a. Antenna capacitor C–126 (top left dial on transmitter). Set dial to read "0" when capacitor plates are fully meshed.

b. Antenna inductance L–126 (Second dial from top left of transmitter). Set dial to read "0" when contact wheel is against stop at rear of coil.

c. Antenna coupling coils (top middle transmitter). Set dial to read "0" when coils are in minimum coupling position. That is, top of inner coils to be extended up to a distance of 1″ from top horizontal plate of coil assembly.

d. PA and 1PA trimmer capacitors C–125 and C–117 (knob top right transmitter for C–125 and knob middle Uni-Control for C–117). Set knob to point toward "Max" on name plate when capacitor plates are fully meshed.

●

TCK RADIO EQUIPMENTS FIELD CHANGE NO. 1

TCK REPLACEMENT BRUSH KITS

Equipments affected.—Model TCK series radio equipment.

Purpose.—To replace the brushes of the 12-volt motor-generator with improved brushes.

General.—A quantity of new improved brushes have been shipped to Electronic Pools for distribution to the fleet and Naval activities. The brush assemblies are designated "TCK Replacement Brush Kits." One set of brushes is to be supplied per equipment and twenty sets per each set of stock spare parts.

Vessels should contact an Electronics Officer at the earliest opportunity for the new brushes. The replacement is within the scope of the ship's force. A record of the completion of this replacement should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this replacement should be reported on the NBS–383 card. *3/1/46*

●

TCK RADIO EQUIPMENTS FIELD CHANGE NO. 2

REPLACEMENT OF TCK–4 FILAMENT TRANSFORMERS

Equipments affected.—Model TCK–4 radio equipments.

Purpose.—To replace the filament transformer T–303 with one of improved design.

General.—Rectifier filament transformers T–303, Navy type no. CG–301111, were found to be defective on all TCK–4 equipment shipped prior to 24 June 1944. The manufacturer has shipped new improved transformers to supply activities. Activities with early model TCK–4 equipments should contact an Electronics Officer for the installation of the improved transformer.

A record of completion of this replacement should be made on the "Radio Equipment Log", NAVSHIPS 900,039. Completion of this replacement should be reported on the NBS–383 cards. *3/1/46*

●

MAINTENANCE OF THE BLOWER MOTOR IN MODEL TCK SERIES EQUIPMENTS

Several failures of the blower motor B–101 used in model TCK series equipments have been reported to the Bureau. An analysis of the reports indicates that the majority of the failures are due to lack of maintenance.

This motor, under normal conditions, should require attention only *every six months.* Under severe operating conditions, high temperature, etc., the motor should be checked more often.

The lubrication of this motor, although a lengthy process, must be practiced if maximum performance is to be expected. The following instructions are listed as a guide for personnel assigned to maintain the equipment:

(1) Remove the m–o compartment, following the instructions in the instruction book.

(2) Remove the top of the box to gain access to the fan.

(3) Loosen the set screws holding the fan on the motor shaft and remove the screws holding the motor mounting.

(4) Disconnect the motor connections from the terminal board and remove the motor and shock mounting from the m–o chassis.

(5) Remove the two screws at each end of the motor which hold it to the shock mount and lift the motor free.

(6) Remove the two bolts extending through the motor and pull off the end bells. Normally, the bearings will remain on the armature shaft.

(7) Pull the bearings off of the shaft, by hand if possible, and wash them in clean naphtha. Dry thoroughly (by forced air if possible). Test for worn and rough bearings.

(8) Replace the bearings if they are worn or rough.

(9) *Pack the bearings ⅔ full of Navy Spec. 14L3 grease and reassemble motor. Make sure that the grease shield on each bearing faces to the outside of the motor.*

It is to be noted that these instructions deviate from those in earlier instruction books. These books should be corrected in order that the motors will be properly maintained. *5/1/46*

●

→MOUNTING OF VOLTAGE REGULATOR FOR MODEL TCK–4 RADIO EQUIPMENT

The following letter was submitted to the Bureau by the Norfolk Naval Shipyard:

Considerable difficulty has been experienced with the mounting of the voltage regulator, symbol VR301, in the model TCK–4 transmitting equipment.

This unit is mounted on four metal cylindrical pillars tapped at both ends and is located in the top section of the rectifier unit type CG–20219. Vibration which occurs both in transit from the manufacturer and in the shipboard installations sometimes causes the mounting screws to "back out" and leave the voltage regulator free. This invariably allows the unit to drop to the shelf below where it causes considerable damage.

To prevent this situation it is recommended that the metal pillars have holes drilled through them and a ¼-inch bolt be used to mount the voltage regulator. It is further recommended that a lock washer and two nuts, the second nut to be a lock nut, be used.

No further procurement of model TCK–4 is contemplated at this time. However it is recommended that all activities confronted with this problem proceed to correct it in the manner described above or in any other practicable way which will prevent the voltage regulator from falling out of position. *8/1/46* ←

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MAINTENANCE OF THE RESET CAPACITOR C–103 USED IN THE MODEL TCK SERIES TRANSMITTERS

Several of the reset capacitors used in the model TCK series transmitters have been reported to have become "frozen" tight. The clearance between the shaft and bearing of this capacitor is very small, and the unequal expansion of the shaft and bearing, resulting from the temperature of the master-oscillator compartment in which the unit is located, may produce jamming. This difficulty is not too serious, and is easily corrected by polishing the bearing surface with crocus cloth. Periodic inspection and maintenance in conjunction with the regular maintenance schedule is advised. *10/1/47.*

●

MAINTENANCE OF THE FILAMENT RHEOSTAT USED IN THE MODEL TCK TRANSMITTER

It has been reported that the contact arm surface of the filament rheostat in the model TCK series transmitter becomes burned and roughened in service. The cause has been traced down, and the difficulty has been found to arise when the pressure of the contact arm against the windings is too light. This pressure, which is provided in part by a coiled spring, will vary according to the amount of use and maintenance. Adjusting the spring and properly shaping the contact arm will set the pressure to the correct value, so that the arm rides firmly on the surface, and yet is not tight enough to bind. These rheostats were designed to have a long life, and with proper maintenance and care should give trouble-free operation over long periods of time. It is recommended that they be inspected at periodic intervals and corrective action be taken when necessary. *10/1/47.*

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BEARING-PULLER FOR MODEL TCK MOTOR-GENERATOR

It has been reported to the Bureau of Ships that difficulty has been experienced with the bearing puller supplied with the motor-generators of certain Model TCK series Radio Transmitting Equipment. One such report stated that a reasonable amount of pressure on the puller failed to force the bearings from the shaft. The unit in this case had to be taken to the shop for removal of the bearings.

All activities and vessels having Model TCK series transmitters with motor-generators aboard are requested to report all deficiencies of the bearing puller and any difficulties experienced to the Bureau of Ships, Code 982. *10/1/48.*

●

TCK REPLACEMENT BRUSH KITS FOR MODEL TCK RADIO EQUIPMENTS (Field Change No. 1)

For the past several months, reports have been received to the effect that replacement brushes for the 12 volt motor-generator (N. T.–21631) of the Model TCK series radio equipments, Field Change No. 1, have not been available.

The following data concerns both the kits of brushes and the individual brushes, and these facts should be borne in mind when submitting requisitions: A quantity of kits of brushes for Field Change No. 1 for Model TCK series radio equipment is available at the Ships Supply Depot, Naval Supply Center, Oakland, California, which are listed under stock number F16–M–384501–743. The correct Standard Navy Stock Number for the individual brushes (not kits) is N17–B–86308–8721. Maintenance brushes should be requisitioned using the Standard Navy Stock Number listed herein for prompt service. *4/1/50*

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TRANSFORMER CONNECTIONS IN POWER SUPPLY OF MODELS TCK–4 AND TCK–6 TRANSMITTING EQUIPMENT

Faulty operation of a Model TCK–4 transmitter rectifier power supply utilizing type 836 tubes has been reported. The report also stated that the difficulty was overcome by using type 866A/866 tubes.

The use of either type 836 or type 866A/866 tubes in the rectifier power supply is permissible providing the transformer connections are proper for the respective types. The connections must be changed if tubes of one type are replaced with tubes of another type. The proper connections for the use of type 836 tubes are shown in Figure 7–21, Rectifier Unit Schematic Diagram, of the instruction book, NavShips 900,210. A note on the schematic diagram lists the changes required when operating with type 866A/866 tubes. *7/1/50*

●

→MECHANICAL ALIGNMENT OF TURNING MECHANISM

The instruction book for the models TCK and TCK–1 radio transmitters, General Electric publication GEI–16645, advises on page 29, paragraph 3, that instructions for the mechanical alignment of the tuning mechanism may be secured from the contractor upon request.

The Bureau has secured this information from the contractor and it is reproduced herewith for the assistance of naval radio activities in adjusting the tuning mechanisms of the TCK series transmitters. This data is supplemental to that included in TCK series instruction books, and is as follows:

UNI-CONTROL MECHANISM (T–7661382)

STEP 1

a. Alignment of counters and drums. (Counters are indicators on left side of mechanism and drums are indicators on right side behind glass.)

This can be accomplished by loosening set screws in pinions and rotating on counter shaft until readings are obtained as follows:

First two numbers on counter to read "0" when "00" on drum just stops moving into full view.

For example, reading on band 1 should be 2,000 on counter and 00 on drum. Reading on band 2 should be 3,000 on counter and 00 on drum, etc.

STEP 2

a. Adjustment of counters can be accomplished by loosening set screws in bevel gears and rotating on jack shaft until simultaneous readings are obtained on counters as shown below:

Band	*Counter reading*
1	2000
2	3000
3	4000
4	6000
5	8000
6	12000

NOTE.—Drums have already been adjusted and should read "00" on above positions.

The drum is spun onto the pinion and pinion fastened to counter shaft by set screws. Therefore, it is possible to get perfect alignment between counters and drums.

The bevel gears (large gears) are fastened to jack shaft (vertical shaft) by set screws and it is possible to get perfect alignment between the counters for each band.

After final adjustment, set screws should be staked with GE Glyptol No. 1276 to prevent screws from loosening. This can be accomplished by removing one set screw from a gear at a time, coating with Glyptol and tightening in place, then remove other set screw and repeat process. In this manner, adjustments will not be affected.

Gears should be set for minimum backlash, but not tight enough to cause binding.

STEP 3

a. Adjustment of stop. This is triangular piece that slides on three spacers in back of gear

housing. This should be set so counter on band 2 reads 4475 when stop just begins to make contact with rubber stops nearest gear housing. To adjust stop, it is necessary to remove triangular plate on end of slides. To do this, remove 3 nuts on end of slide rods and remove plate. The stop is then threaded onto the screw that drives it and set as above. Replace plate and stake nuts.

It will be necessary to remove Uni-Control from transmitter to make above adjustments. To do this, remove mounting screws and loosen coupling to drive shaft. (For alignment with capacitors see below.)

Step 4—Capacitors

a. Alignment of C–110 and C–124. C–124 and C–110 are variables mounted vertically in set. C–110 at bottom.

Loosen set screws in coupling between C–110 and C–124, so above capacitors can be rotated independently of each other. Then with spacer attached to each capacitor (be sure to use the correct spacer for each capacitor—check serial numbers) rotate to minimum capacity until spacer fits between rotor and stator. It will be easier to set C–110 first by rotating drive shaft, then C–124. Tighten set screws in coupling and stake as per above.

b. Alignment of C–102 with C–124 and C–110. C–102 is MO unit variable.

With C–124 and C–110 in minimum positions as previously determined by spacers, set C–102 at minimum with its spacer so rotor and stator just touch spacer at same time. Fasten set screws in coupling. Stake.

At this point, all three capacitors, C–102, C–110, and C–124 should be in minimum capacity positions as determined by each capacitor gage and all couplings tight so drive shaft turns all three at same time.

Step 5—Uni-Control With C–102, C–124 and C–110

a. Set Uni-Control so band 1 reads 3072.73 kc. and lock control. Then by rotating worm shaft until C–110 is at minimum capacity (with gage in position), tighten set screws on fixed hub of Uni-Control.

b. Check adjustment by rotating dial and return to 3072.73 kc. The spacer should just touch rotor and stator plates. If not, compensate by resetting set screws. Stake.

Note.—When Uni-Control reads 3072.73 kc. on band 1, C–102, C–110, C–124, should be at minimum capacity (plates all the way out).

Step 6—Controls (Transmitter)

a. Antenna capacitor C–126 (top left dial on transmitter). Set dial to read "0" when capacitor plates are fully meshed.

b. Antenna inductance L–126 (Second dial from top left of transmitter). Set dial to read "0" when contact wheel is against stop at rear of coil.

c. Antenna coupling coils (top middle transmitter). Set dial to read "0" when coils are in minimum coupling position. That is, top of inner coils to be extended up to a distance of 1" from top horizontal plate of coil assembly.

d. PA and 1PA trimmer capacitors C–125 and C–117 (knob top right transmitter for C–125 and knob middle Uni-Control for C–117). Set knob to point toward "Max" on name plate when capacitor plates are fully meshed. *4/1/51*

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MODEL TCK SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Spurious ground when using 4-wire control on ships having d-c supply.	Each time the press-to-talk relay is closed, a ground is placed on one side of the ship's line. This is caused by one contact on K–151, drawing T–7661426, being grounded. The trouble can be readily overcome by removing this ground connection and running a new lead from this contact to link terminal "D" on terminal board #8.—*W. E. K., Astnavindman, Baltimore*
The 12-volt motor-generator units for TCK series equipments fail to build up—as shown by little or no plate current meter reading when the microphone press-to-talk switch is closed.	The following test procedure should be followed: (1) Operate test key. If transmitter operates, then check 12-volt generator voltage. (2) If no voltage is apparent in the generator, remove the generator brushes and examine for dust and film. Clean with fine sandpaper. Caution: Do not use emery cloth on the brushes. (3) Check commutator surface for dirt and film. Clean with soft, dry cloth. Note: This is only a temporary expedient. See TCK Field Change No. 1
→ When one-half power was applied, overload relay K–103 would kick out and line fuses would fail.	Rectifier filament transformer T–303 had developed an internal short between primary and secondary windings. Replaced the transformer and operating became normal. *7/1/49* ←

INSTALLATION MATERIAL FOR MODEL TCN–1 EQUIPMENTS

The following material procured for use with TCN–1 on contract Nos–98843 is available as follows for RMO disposition:

	NYNYK	*NYMI*
Shock mounts for xmtr. (m-f)	5	15
Shock mounts for xmtr. (h-f)	5	15
Shock mounts for rectifier power unit	5	15
Seven-conductor cable	750 ft.	2250 ft.
One-conductor cable	500 ft.	1500 ft.

MODEL TCO SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Receiver dead, no plate voltage on 6SK7 r-f amplifier. Found primary winding of r-f transformer T–105 open.	Emergency repair was made as follows: A 2.5-millihenry r-f choke was substituted for the primary winding by connecting it from the 6SK7 plate to the junction of R–125 and C–120. A 0.0005-mfd. capacitor was connected between the plate of the 6SK7 and the secondary of T–105 at the junction of C–119 and C–134. The modification necessitated realignment of the mixer stage.—U. S. S. *Ormsby* (APA–49)

MODEL TCP SERIES TROUBLE-SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
TCP–1.—Primary of r-f transformer burned out.	Investigation showed that this failure was due to r-f pick up from TBK–17; the antennas of both equipments were parallel and close by. A 100-watt incandescent lamp in series with the receiving antenna prevented this from recurring. The r-f transformer primary winding was rewound, reinstalled and the set operated normally after that.—U. S. C. G. C. *Taney* (AGC–37)
TCP–1.—Motor-generator for transmitter ran continuously. The transmitter operated normally when the push-to-talk button was pressed, but the motor-generator failed to stop when the remote telephone was replaced on the hook.	Found that the insulation between the motor start contacts in the remote position was breaking down. Repaired and normal operation restored.—U. S. S. *Dorothea L. Dix* (AP–67)
TCP–2.—When the hand telephone set was lifted from the cradle unit CRM–51026 in the remote position, the carrier came on *before* pressure of the push-to-talk button to the telephone unit.	Inspection revealed that the wire stays of the handset cradle on the main unit caused depression of the push-to-talk switch on the main hand set which was *not in use*. Repaired by bending the cradle so as to relieve pressure on push-to-talk switch on main handset.—U. S. S. *Chilton* (APA–38)
TCP–2.—Transmitter-receiver completely dead. Main fuze blew when transmitter was turned on.	The cause of this trouble was a short between the moving contacts of the motor-generator starter and the lead between resistor 86B and the overload relay. A recurrence of this trouble was prevented by drilling a hole through the switch panel and running a new lead between the panel and the asbestos. This eliminated wire from the front panel except for the connections.—U. S. S. *Rockwall* (APA–230)
TCP–3.—Could not resonate antenna circuit due to full-scale deflection of antenna ammeter before attainment of resonance.	Added extra 0.0015 mfd. capacitor as per instruction book. Could now attain maximum on plate current meter, but antenna ammeter deflected past full scale on modulation. Shunted antenna ammeter with #14 wire; this lowered reading to 3.5 amp. for carrier and 4.5 amp. on modulation.

TEMPORARY MODIFICATION OF MODEL TCS CRYSTAL CIRCUIT

The following suggestion submitted by the Radio Material Office at NYMI is published for possible use in the event that similar difficulties are encountered by other activities. *The modification should be made only in cases where trouble of this nature has been encountered.*

In some instances certain crystals in the TCS transmitter oscillator circuit operate sluggishly or fail to oscillate entirely. These same crystals when placed in another transmitter operate satisfactorily. This condition indicates that the fault was in the transmitter and not the crystal. The crystal oscillator circuit in the TCS transmitter was improved by replacing the one-millihenry choke (L–109) with a 2.5-millihenry choke. After this modification was made no further difficulty was experienced.

●

FAILURE OF GAIN CONTROLS IN MODEL TCS SERIES EQUIPMENTS

The Bureau has received a large number of failure reports, reporting failure of the r-f and audio gain controls in model TCS equipments. These controls are symbols R–216 and R–220.

The U. S. S. *Leyte* (ARG–8) reports that in most cases failure is due to operating personnel rotating the controls excessively or twisting them beyond the normal limits of travel.

All maintenance activities are urged to impress upon operating personnel that these controls can be turned just so far and *no more.*

●

IMPROVEMENT OF MODEL TCS RADIO RECEIVING EQUIPMENT'S SENSITIVITY

The following suggestions for improving the sensitivity of the receiver of model TCS were submitted by Radio Electrician Leslie L. Funston of the U. S. S. *Caldwell* (DD–605):

(1) The receiver input and transmitter output of the TCS unit were designed to operate effectively on a 20-foot vertical whip type antenna.

(2) During Navy yard installation, a single antenna approximately 35 feet long was installed. A type 47205 antenna loading inductance was incorporated in the antenna circuit. The type 47205 inductance was varied by means of 6 taps, tap 1 being the maximum inductance and tap 6 the minimum.

(3) In the installation on the U. S. S. *Caldwell* it was found that use of tap 6 resulted in greatly increased sensitivity of the receiver. Other taps either reduced the signals 50 to 75 percent or completely cut them out.

(4) It is suggested that operators of the model TCS determine by trial the optimum setting of the type 47205 inductor based on receiver performance and that if at all possible transmitter tuning should be accomplished with the loading inductor contained in the TCS transmitter.

●

→ TCS RADIO EQUIPMENTS FIELD CHANGE NO. 1

MODIFICATION OF MODEL TCS RELAY CIRCUIT (NO KIT)

Equipments affected.—Model TCS through TCS–11 series radio equipments.

Purpose.—To short the "make" contacts of relay K–101.

Procedure.—Place the jumper as indicated in Figure 1, from L–92 to L–92.

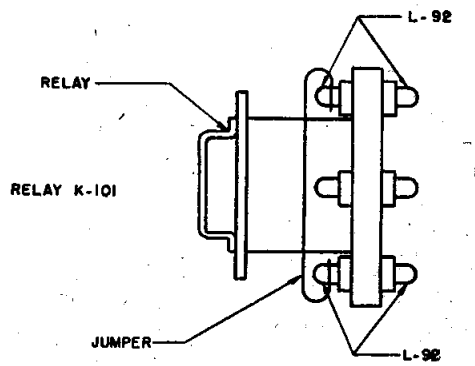

FIGURE 1.—Modification of relay K–101.

General.—Failure to make satisfactory contact when in the "energized" position is responsible for most of the difficulty. The trouble is reported to result from one or more of the following conditions: poor spring tension; contact

points not making; dirty or pitted contacts; or small contact area of points.

Placement of the jumper shorts the "make" contacts of the relay, thus eliminating possibility of any difficulty which might be encountered when the relay K–101 is energized. Inasmuch as the modulator tube filaments are not energized when the transmitter is in the c-w position, no harmful effects are experienced when the contacts are bridged.

In the TCS–12 and later equipments, an improved relay has been incorporated.

This change using available material is well within the scope of the ship's force.

The instruction book and schematic diagrams should be changed accordingly. A record of completion of this change should be made in the ship's "Radio Equipment Log" NAVSHIPS 900,039. Completion of this change should be reported on NBS–383 forms. *2/1/46*

●

TCS RADIO EQUIPMENTS FIELD CHANGE NO. 2

MODIFICATION OF TAP SWITCHES (NO KIT)

Equipments affected.—All model TCS series radio equipments.

Purpose.—To strengthen the fixed contacts (of the three multi-position tap switches, S101–S102, S104 and S103) which hold the spring mounted moving contact.

Procedure.—The switches (band switch, oscillator selector switch and antenna condenser switch) are located on the front panel of the TCS equipment.

The nature of the failure is that the spring mounted moving contact falls below the surface level of the fixed contact, and the spring action usually causes it to rest on the ceramic mounting plate. If a sudden or great force is exerted while the moving contact is in this position, the moving contact may be bent out of shape or broken off as shown in Figure 1.

Add sections of phenolic insulation (equal in thickness to the distance from the top of the fixed contact to the surface of the ceramic plate) to the ceramic plate, as shown in Figure 2.

General.—Modification should be made at the earliest opportunity to correct this fault in equipments now in service as this failure is serious under Naval service conditions since no spare switches are provided and a remedy of the condition calls for a major disassembly of the transmitter, thereby placing the equipment out of service for a considerable period. This change using available material is well within the scope of the ship's force.

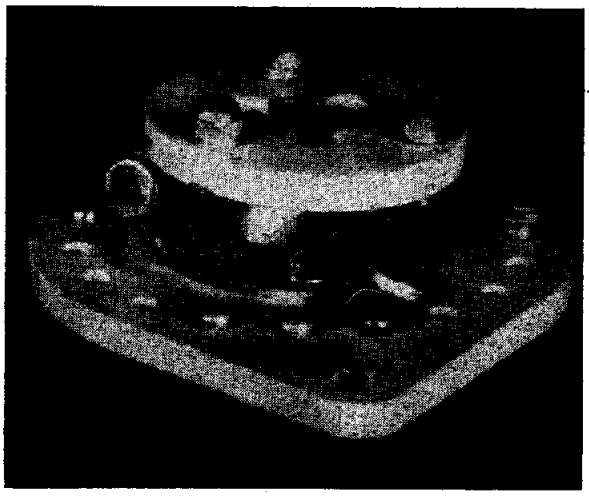

FIGURE 1.—Damaged tap switch.

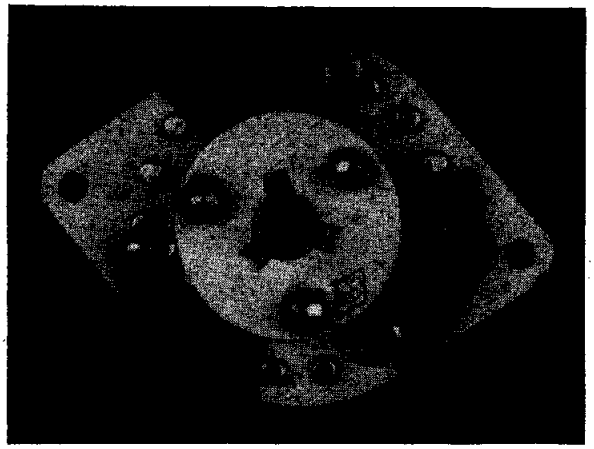

FIGURE 2.—Modified tap switch.

A record of completion of this change should be made on the ship's "Radio Equipment Log" NAVSHIPS 900,039. Completion of this change should be reported on NBS–383 forms. *2/1/46*

●

TCS RADIO EQUIPMENTS
FIELD CHANGE NO. 3

MODIFICATION OF THE LOADING COIL (NO KIT)

Equipments affected.—All model TCS series radio equipments.

Purpose.—To improve contact of the loading coil shorting wheel with the stop on the loading coil.

Procedure.—The nature of the failure is that the shorting wheel rises off the coil winding about 1/8". This causes an arc between the wheel and the coil which burns the insulation off the wheel causing failure of the transmitter until repair of the wheel is effected.

Connect the last turn of the loading coil to the stop with a small amount of solder in the 1/16" gap between coil and stop. This makes the stop stud at the same potential as the last turn; hence, there can be no arc since the stop will make contact with the roller.

The normal position of the shorting wheel is as shown in Figure 1.

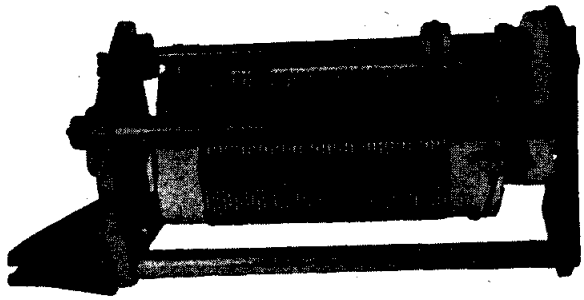

FIGURE 1.—Normal position of shorting wheel.

General.—This change using available material is well within the scope of the ship's force. A record of completion of this change should be made on the ship's "Radio Equipment Log" NAVSHIPS 900,039. Completion of this change should be reported on NBS–383 forms. *2/1/46.*

●

TCS RADIO EQUIPMENTS
FIELD CHANGE NO. 4

REPLACEMENT OF MOTORS AND GENERATORS

Equipments affected.—Model TCS–12 115-volt d-c transmitting-receiving equipments with the following serial numbers:

2632 to 2766, inclusive
3497 to 3511, inclusive
3912 to 4311, inclusive
5504 to 5703, inclusive
6554 to 6853, inclusive

Purpose.—To replace defective motors and generators.

General.—Vessels are requested to return the motors, manufacturer's type 230 0001 00, two in the motor-generator unit and one in the spares, and the high-voltage generators, manufacturer's type 231 0002 00, one in the motor-generator unit and one in the spares, to the nearest Electronics Officer who will replace them with improved motors and generators. In cases where the Electronics Officer cannot supply the improved motors and generators, they can be secured from NYNYK or NYMI. *The low-voltage generators, manufacturer's type 231 0001 00, are not to be replaced.*

Return of the defective motors and generators is essential as the replacements are coming from stocks needed to complete future production. Return of the defective motors and generators shall be made by the Electronics Officer direct to RINSMAT c/o Collins Radio Corporation, and not to the manufacturer.

A record of replacement should be made on ship's "Radio Equipment Log" NAVSHIPS 900,039. Replacement should be reported on NBS–383 forms. *2/1/46*

●

TCS RADIO EQUIPMENTS
FIELD CHANGE NO. 5

INSTALLATION OF POWER SUPPLY FILTER CTD–53173 OR CTD–53174

→ Replaced by Field Change No. 9—TCS—Installation of Radio Interference Elimination Kit. *5/1/46.* ←

●

TCS RADIO EQUIPMENTS
FIELD CHANGE NO. 6

TYPE 50159 NOISE LIMITER ADAPTER UNITS

Equipments affected.—All model TCS series radio equipments.

Purpose.—To permit operation of the TCS in the neighborhood of radar transmitters.

Procedure.—Insert coupling unit (noise limiter) in the second detector stage of the TCS receiver in place of the 12SQ7 tube which is used as part of the coupling unit.

General.—Vessels are requested to contact an Electronics Officer for the installation of the coupling unit.

Noise limiters have been procured from the United States Television Corporation on contracts NXsr–42133 and NXsr–48301 and have been distributed to various Electronic Pools.

An additional quantity of 10,000 Adapter Units, type 50159, have been distributed under contract NXsr–65286 with the U. S. Television Manufacturing Corp. Instructions for installation and operation are included in the kit. The instruction book and schematic diagrams should be changed accordingly.

A record of this change should be made on ship's "Radio Equipment Log" NAVSHIPS 900,039. Completion of this change should be reported on NBS–383 forms. *2/1/46*

●

TCS RADIO EQUIPMENTS FIELD CHANGE NO. 7

INSTALLATION OF TCS NOISE LIMITER

This change has been cancelled.

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TCS RADIO EQUIPMENTS FIELD CHANGE NO. 8

REPLACEMENT OF RESISTORS R–303 AND R–304 (NO KIT)

Equipments affected.—All model TCS series radio equipments.

Purpose.—To install resistors of higher power rating.

Procedure.—Replace resistors R–303 and R–304 stamped "Groves Corporation" and rated at 12,500 ohms ±5%, 12 watts, with 12,000-ohm±5%, 40-watt resistors, JAN type RW 14F 123.

General.—This change applies to all Navy type COL–20218 115-volt a-c rectifier power supply units including spares. Replacement resistors have been shipped to general stock. Vessels should contact an Electronics Officer at the earliest opportunity for the new resistors. The change is within the scope of the ship's force.

The instruction books, schematic diagrams and parts lists should be changed accordingly. A record of this replacement should be made on ship's "Radio Equipment Log" NAVSHIPS 900,039. Completion of this replacement should be reported on NBS–383 forms. *2/1/46*

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TCS RADIO EQUIPMENTS FIELD CHANGE NO. 9

INSTALLATION OF RADIO INTERFERENCE ELIMINATION KIT

Equipments affected.—Model TCS series equipments.

Purpose.—To add filter kits to the dynamotor or motor-generator for elimination of radio interference from the dynamotor or motor-generator power supply.

Special tools required.—Pipe tap $\frac{3}{8}''$–18, pipe tap $\frac{3}{4}''$–14, drill $\frac{37}{64}''$ for $\frac{3}{8}''$ pipe tap, and drill $\frac{59}{64}''$ for $\frac{3}{4}''$ pipe tap. These tools are necessary for drilling and tapping holes in CAYH filter boxes shipped prior to 1 August 1945. These operations will be performed at the factory on filter boxes shipped after above date.

General.—A quantity of 5,000 filter kits (type no. CAYH–10597) are being procured under contract N5sr–799 and are being shipped to supply activities. Instructions for the installation of the filter are included with the kit and should be kept with the instruction book for the equipment modified.

Vessels should contact an Electronics Officer at the earliest opportunity for this filter kit. The installation is within the scope of the ship's force.

A record of completion of this installation should be made on the ship's "Radio Equipment Log," NAVSHIPS 900,039. Completion of this change should be reported on the Field Change Report Card sent with the kit or on a NBS–383 form. *2/1/46*

●

TCS CRYSTALS IN ERROR

It has been discovered that on the Type TCS transceiver one of the frequency-control crystals has been supplied ground to an incorrect frequency. The Bureau of Ships desired to bring this error to the attention of all activities, so that appropriate corrective action may be carried out.

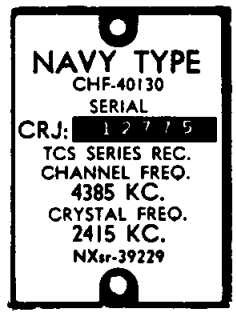

FIGURE 1.—Nameplate.

The incorrect unit is one of the four crystals in group A employed for reception, and is the one covering reception on the 4385-kilocycle channel. The other channels, incidentally, are at 2716, 3045, and 5335 kilocycles. Possessing an intermediate frequency of 455 kilocycles, the TCS must use a crystal operating at a fundamental frequency of 2420 kilocycles in order to provide optimum reception at 4385 kilocycles, utilizing the second harmonic. The faulty crystals were ground to a fundamental frequency of 2415 kilocycles (which would correspond to reception at a frequency of 4375 kilocycles instead). To aid in identifying the crystals, the figure showing the nameplate has been included. It is labelled to correspond to the frequencies to which the crystals are ground, and, since one crystal is incorrect, the label consequently is, too. These TCS crystals were procured under Contract NXsr 39229.

If the faulty crystals are used in the TCS equipments, very poor sensitivity and low output will result. It is recommended that, should these symptoms occur on the 4385 kilocycle band, the crystal be checked before any maintenance is undertaken. Furthermore, the faulty units should be returned as soon as possible—on the West Coast to the Mare Island Naval Shipyard, and on the East Coast to the Naval Gun Factory at Washington, D. C. All shipments should include a description of the unit, together with the cause for return. *8/1/47*

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ADDENDUM TO FIELD CHANGE NO. 6 ON MODEL TCS RADIO EQUIPMENTS

The installation instructions, NavShips 900,-005–IB, included with the Type 50159 Noise Limiter Adapter Unit kits procured under Contracts NXsr–42133, NXsr–48301, and NXsr–65286 from the United States Television Corporation, have been found to vary considerably. Personnel are requested to correct their instruction books where necessary, and when making this field change, to employ only the following directions and schematic diagram:

1. Disconnect the receiver from the power supply, loosen the two knurled nuts on the front panel to free the cabinet clamps, and remove the receiver unit from its cabinet.

2. Remove the 12A6 tube (V–207) from its socket (X–207), and also take out the 12SQ7 (V–206) from its socket (X–206).

3. Unsolder all wires from the switch S–203, and remove it. Remove the switch S–205 from its position, and remount it in the position formerly occupied by switch S–203.

4. In the position formerly occupied by switch S–205 mount the new rotary switch S–1, with the colored locating spot up. Place the switch plate A–2 in position on the front of the panel, then firmly attach both switches and plate to the panel. Solder the brown tracer wire (taken from switch S–203) to lug No. 3 on switch S–1. See schematic diagram figure 1, which portrays the rear view of the switch, in order to identify the lugs, since the numbers are not stamped on. Solder the white wire to lug No. 2, and solder the red-and-green tracer wire to lug No. 4 on switch S–1. Unsolder the orange tracer wire from the top tap of the audio gain control R–220, and solder it to lug No. 10 on S–1. Connect and solder the bare wire from lug No. 8 on S–1 to the top tap of the R–220 control. Remove the center screw, and lock the washer in the plate of the r-f chassis directly opposite the center of the socket X–206.

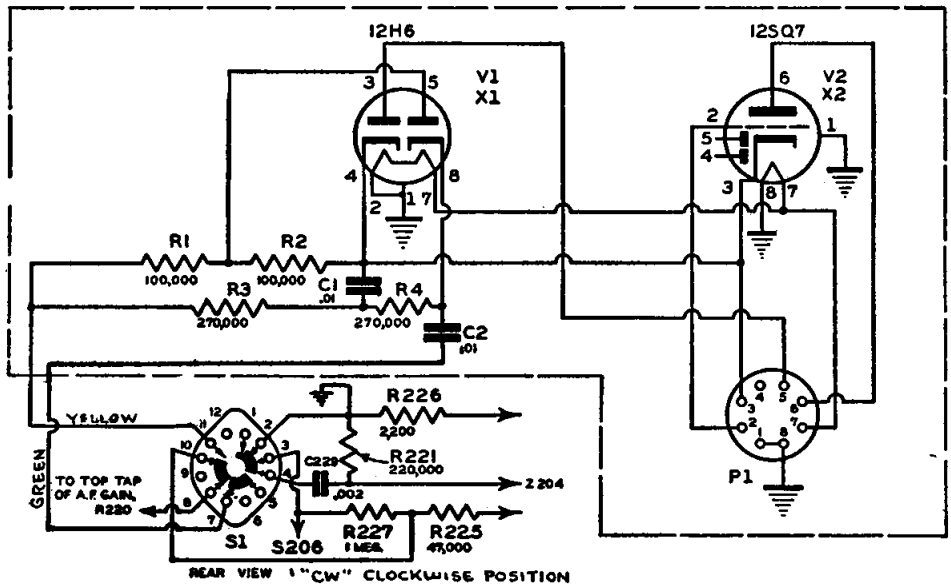

FIGURE 1.—Schematic diagram showing completed and correct changes to incorporate noise limiter adapter unit.

5. Replace the 12A6 tube (V–207) in its socket (X–207), and plug the Noise Limiter Adapter Unite into the socket X–207. See figure 1.

6. Replace the screw and lock washer in the r-f chassis, inserting the screw through the hole in the angle bracket of the adapter unit.

7. Solder the green wire of the adapter unit to lug No. 11 of the switch S–1.

8. Insert the original 12SQ7 (V–206) into the adapter socket X–2.

9. With the rotor of the switch S–1 in the c-w position—to the extreme clockwise position, that is—securely fasten the switch knob E–2 in place with the arrow pointing to CW on the switch plate A–2. *8/1/47*

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→ ADAPTER UNITS FOR MODEL TCS SERIES RADIO RECEIVING AND TRANSMITTING EQUIPMENTS

An adapter unit is required whenever the model TCS series equipments are to be interconnected into the standard Navy six-wire radio remote-control system.

On all future shipboard installations of the Model TCS equipments where an adapter unit is necessary, the installing activity will be required to manufacture this unit. Bureau drawings RE 65AA 255 and RE 65F 254 provide the necessary information for the construction of a standard unit. Full-size copies of these drawings may be obtained by application to the Bureau, Code 932B.

The following controls and indicating devices should be mounted on the front panel, with designations marked appropriately on the panel:

Symbol	*Name*	*Panel Marking*
S–601__	Adapter on-off switch_	*Adapter and TCS Rcvr.* (on-off).
S–602__	Transmitter start-stop switch.	*TCS Xmtr.* (start-stop).
S–603__	Remote-local switch_	*Remote* (on-off).
S–604__	Telegraph key circuit switch.	*Key* (on-off).
I–601__	Adapter on indicator.	*Adapter and TCS. Rcvr.*
I–602__	Transmitter motor-generator on indicator.	*TCS Xmtr.*
I–603__	Transmitter carrier on indicator.	*Carrier.*
R–603__	Earphone level control.	*Earphone level.*
J–601__	Handset jack_____	*Handset.*

The plug (P–601) should be located on the left side of the unit and be marked *To TCS.*

The following parts are used in the construction of the adapter unit:

Symbol Designation	*Rating and Description*
S–601	Toggle Switch capable of controlling 500 w at 250 v a-c/d-c.
S–602	Push-button normally-open switch (two push-buttons) capable of controlling one ampere instantaneous (0.5 ampere steady-state) of 250 v a-c (inductive circuit).
S–603	Remote-local switch (toggle or rotary); all contacts to be capable of controlling ½ ampere at 250 v a-c or d-c and carrying momentary currents of 1 ampere at 250 v a-c or d-c.
I–601	115/125 v candelabra screw-base indicator lamp to be viewed through red lens. Not more than 10 watts.
I–602	115/125 v candelabra screw base indicator lamp to be viewed through amber lens. Not more than 10 watts.
I–603	Western Electric 2F, 12 v, indicator lamp or equivalent. To be viewed through green lens.
T—601	Transformer: microphone/line, line/line. Microphone primary: impedance of 35 ohms, to be capable of carrying 100 ma d. c. Line primary impedance 600 ohms. Secondary impedance 75 ohms. Audio response to vary less than 1 db from the 1000-cycle level over the 100- to 3500-cycle range, with normal direct current flowing in 35-ohm primary and with the 600-ohm primary open. Leakage reactance to be a minimum. Same response to be obtained with 600-ohm audio source into 600-ohm primary with 35-ohm primary open.
K—601	Relay to operate on any d-c voltage between 8.5 and 15 volts; current required not to exceed 75 ma at 12 volts.
K—601A	Contacts to be capable of handling 0.5 ampere at 15 volts d-c.
K—601B	Contacts to be capable of handling 0.5 ampere at 15 volts d-c.
K—602	Relay to operate on any 60-cycle, a-c voltage between 35 and 65 volts; current required shall be 0.25 ampere ± 10 percent at 55 volts.
K—602A	Contacts to be capable of handling 0.75 ampere at 15 volts d-c.
K—602B	Contacts to be capable of handling 0.5 ampere at 125 volts a-c.
K—602C	Contacts to be capable of handling 0.5 ampere (steady-state) and 1 ampere peak at 125 volts a-c.
P—601	Plug connector, 10-ampere, 9-conductor, wall mounting, Cannon Electrical Development Co., type GK–9–32S or equivalent.
J—601	Jack, Amphenol, type AN–3102–14S–5S or equivalent, coded green.
PS–601	Power supply to convert 115-volt, 60-cycle, single-phase a. c. to a nominal 12 volts d. c., and shall include all necessary components for this purpose. Power supply shall not require more than 40 watts from the 110-volt source and shall furnish a nominal 12-volt d. c. with not more than 0.5% ripple-voltage at a continuous load of 735 ma., without damage or overheating. Temporary infrequent intervals of 1.3 amperes shall not cause damage. The output voltage shall remain within the limits of 9.5 to 15 volts under any load from no load to full load, and under any variation in line voltage up to ±5%.
R–601	Resistor, 120 ohms ± 10%, 2 watts.
R–602	Resistor, 400 ohms ± 10%, 30 watts.
R–603	Attenuator, constant input-impedance of 600 ohms, 1 watt, approximately uniform attenuation per degree rotation, 40 db attenuation range.
C–601	Capacitor, electrolytic, 100 mfd, 25 w. v.
C–602	Capacitor, paper, 4 mfd ± 10%, 400 w. v.
F–601	Fuse, 3 amp., 250 v.., a. c.
F–602	Fuse, 3 amp., 250 v., a. c.

The adapter unit should be adequately shielded and care should be exercised to preclude the introduction of noise or other undesired voltages in the microphone and audio output circuits. *7/1/48*

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MODIFICATION OF TCS POWER SUPPLY PP–380/U

Remote control of the TCS radio equipment when used with the PP–380/U Power Supply is made possible by means of a simple modification of the power supply to permit use with Remote Control N. T. 23270. This modification may be performed by Navy Yard personnel using parts obtained from standard stock. No special tools are necessary. The modification consists of installing one 10 ampere 9 conductor plug con-

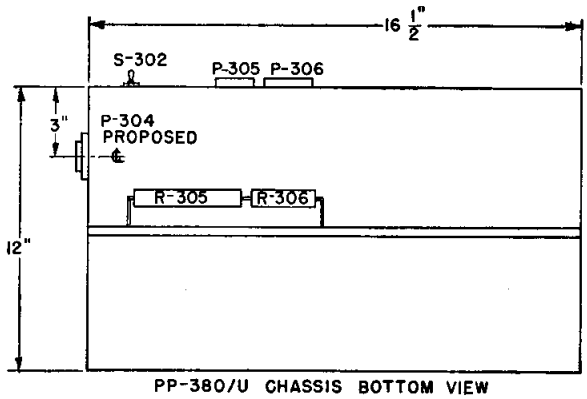

FIGURE 1.

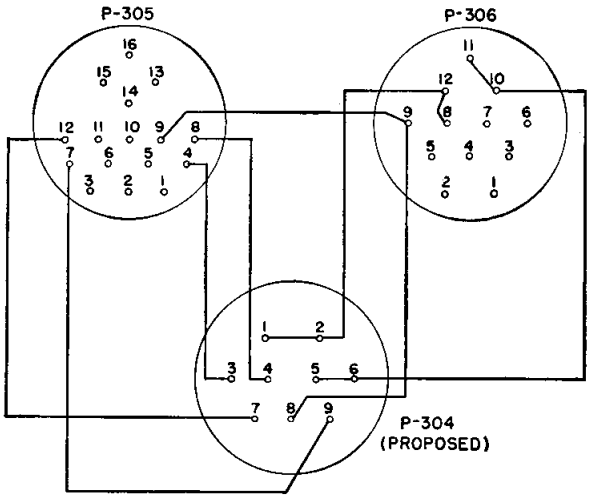

FIGURE 2.

nector, wall mounting type with mounting hardware manufactured by Cannon Electrical Development Company. Manufacturer's type GK–9–32S on the chassis of power supply PP–380/U as shown in Figure 1. Using wire similar to N. T. SRIB–3 Standard Stock No. 15–C–4688–45, wire in the new connector as shown in Figure 2. Remove ground leads from switch S–602 and connector P–601 in remote control unit N. T. 23270 and connect S–602 and P–601 as shown in Figure 3. Removing the above leads from ground is necessary since relay K–302 in the power supply is actuated by 110 volts alternating current in lieu of 12.6 volts direct current as in previous power units used with the TCS equipments.

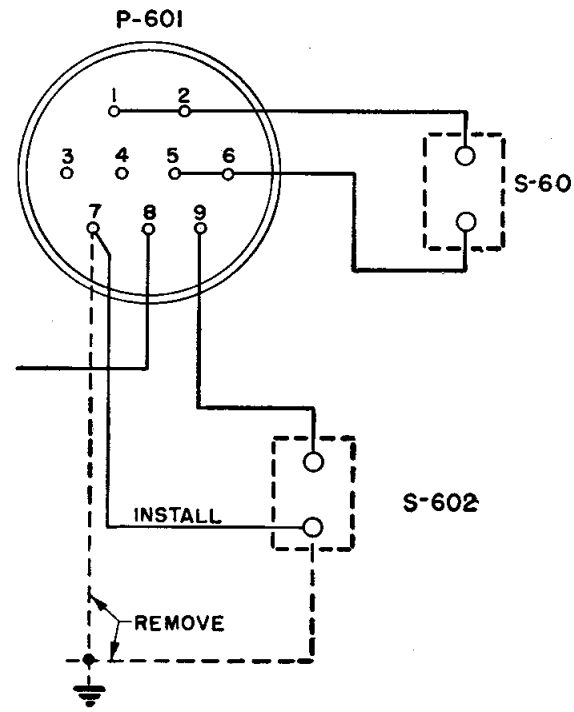

FIGURE 3.

The modification above is to be on an optional basis and no kits are to be supplied. This modification was suggested by Commander, Charleston Naval Shipyard. *10/1/50*

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→ ANTENNA LEAD MODIFICATION

Model TCS radio equipments are installed in some vessels with the transmitter section, type-52245 mounted on top and directly above the receiver section, type-46159 with the complete equipment located three feet in front of a radio operator's position. This arrangement results in numerous breaks and disarrangements of the antenna lead from transmitter to receiver due to operators accidently catching the lead with clothing, back of operator's chair, and patch cord leads. Various types of braided, twisted, and solid wire have been tried but did not eliminate the trouble.

A coaxial lead alteration was designed and installed on one pilot TCS equipment. No fur-

ther failures have occurred due to its additional strength above the previous hook-up method.

To install this alteration remove the antenna posts on both the transmitter and receiver, slightly enlarge the face-plate hole with a round file, and install a coaxial adapter, type-49194. Connect the units with a short length of RG–8/U cable using two connectors, type-49192 and one adapter type-49195 on each end, to achieve a double 90 degree bend so as to clear the operator's control handles. *7/1/51*

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IMPROVING THE EFFECT OF THE TCS INTERLOCK

The TCS equipment is equipped with an interlock that is not entirely effective from a safety standpoint. At present, opening the interlock only removes power from the equipment if the TCS remote switch is in the OFF position.

Mr. Dan B. Norton of the Puget Sound Naval Shipyard has suggested a modification of the TCS transmitter to improve the effectiveness of the interlock, the details of which are as follows:

a. Remove the jumper between pins 12 and 15 of transmitter plug P101 on the TCS power supply.

b. Remove the wire from pin 12 on transmitter plug P101 and connect it to pin 15.

c. Remove the wire from pin 7 on transmitter plug P101. This wire is also connected to the remote plug which is also on the power supply.

d. Connect the wire removed from pin 7 to pin 12.

e. Connect a wire from pin 12 of P101 to the side of switch S107 that is connected to interlock S106.

These wiring changes place the interlock switch in series with both power ON-OFF switches so that the power will be removed from the equipment whenever the interlock is open. *7/1/51*

●

→ ANTENNA CONNECTIONS

It has been found on some installations, that due to space limitations, the model TCS radio equipment has been installed approximately three feet in front of a radio operators position. This arrangement has resulted in numerous breaks and disarrangements of the antenna lead from the transmitter to receiver due to operators accidently catching this lead with clothing, back of operators position chair and patch cord leads.

To eliminate this trouble, install a coaxial cable and associated connectors in the following manner. Remove the antenna posts on both the transmitter and receiver. Enlarge the face plate holes left by the removal of the antenna posts and install two coaxial adapters type 49194. Connect the units with a short length of RG–8/U cable using one adapter type 49195 and one connector type 49192 on each end. This will then give a double 90 degree bend assuring the operator's controls being clear. *10/1/51* ←

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MODEL TCS SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Leads inside antenna loading coil arc over.	This is due to insufficient insulation and spacing between these leads to take care of the high r-f voltage built up across the loading coil when used with short antennas on certain frequencies. If the internal leads are of size #14 or larger, the remedy is to bend the two leads so that there is considerable clearance between them. The stiffness of the wire will tend to maintain this clearance.
Excessive noise in 24-volt d-c model TCS receivers installed in PT boats.	This noise is caused by the motor units in the power supply. It may be cured by bypassing the 24-volt line at the motor with a 0.5- to 1.0-mfd. 200-volt metal clad condenser. It has been found necessary in a few cases to bypass each brush to the motor frame with a 0.005-mfd. mica condenser. This must be mounted at each brush. In one unit the brushes were found to be reversed in their holders. Much less inerference was produced when, considering the direction of commutator rotation, the soft carbon, non-metallic half of the brush formed the trailing edge.—*RMO, New Orleans*
No modulation.	Relay K–101 not making contact in voice position—*MTD Sqdn. 16*
No plate current. Generators running.	Lead from power supply broken at K–502 in motor-generator unit.—*MTB Sqdn. 16*
Hum on carrier when using voice.	Bad tube, V–106 or V–107 in push-pull modulator.—*MTB Sqdn. 16*
Fuse F–502 blowing constantly.	Shorted condenser, C–501, C–504, C–506 or C–515.—*MTB Sqdn. 16*
Fuse F–501 blowing constantly.	Shorted condenser, C–510, C–511, C–512 or C–516.—*MTB Sqdn. 16*
No dip of plate current.	Check oscillator tube V–102 and its selector switch and crystal.—*MTB Sqdn. 16*
Low antenna current.	Insulator at base of antenna shorting to wet deck at times. Keep antenna free of wet cloths, etc.—*MTB Sqdn. 16*
Relay trouble.	Frequent check of dirty contacts and proper spring tension is well worth your time.—*MTB Sqdn. 16*
Main radio fuse failure.	After radar and fluxgate compass were installed we found that the 30-ampere fuse for radio in distribution panel in engine room required a 60-ampere fuse.—*MTB Sqdn. 16*
Receiver squeals or chirps over entire band.	Faulty receiver oscillator tube V–203, or poor contacts on receiver gang switch.—*MTB Sqdn. 16*
Could not "raise" anyone with transmitter although tuning was normal and antenna current was 3 amperes. Receiver operation was normal.	Ohmmeter reading from the antenna to ground showed a low resistance between these two points. Found antenna insulators were covered with paint. Cleaned off the paint and, as a good measure, put in new power-amplifier tubes. Opened up the antenna trunk and found a piece of steel, dimensions ¼" x 5", which had fallen inside the trunk. Also found bits of welders' "slag" and bits of metal caused by a Navy yard "burner." This shorted out antenna when any amount of RF was on it, but allowed signals to pass to the receiver. When the piece of steel was removed and the bits of slag and metal, the sets worked normally.—U. S. S. *Curtiss*

Difficulty Encountered	Cause and Remedy
TCS–9.—Both transmitter and receiver dead; rectifier tubes in a-c power pack lit.	Found no power being supplied to transmitter—checked control relay K–301. Found defective insulation under relay, cracked and broken, with pieces lodged against relay contact arms causing sticking. Replaced.—U. S. S. *ATB, Solomons, Md.*
Receiver dead. Transmitter generator does not start. No output voltage from receiver high-voltage generator. Finally, receiver generator runs "hot."	C–512 brush hash filter capacitor shorted. Replaced capacitor and set operated normally.—U. S. S. *Calvert*
TCS–5.—Receiver dead. No plate voltage.	A short circuit developed in the transmitter power cable which caused a very heavy current to flow through the reactor. As the reactor L–503 overheated, the pitch filling forced its way out of the can, allowing the choke to short out partially to ground. Replaced reactor from spares after removing short circuit. Set then operated normally.—U. S. S. *Calvert*
TCS–8.—Receiver operated properly until transmitter was turned on; then both would go dead.	Found bad connection at battery connection to TCS. The joint allowed the 4.5 amp. receiver current to pass, but opened when the 9.5 amp. current for the transmitter was added.—*LCT–810—Flot. 17 staff*
TCS–12.—Receiver faded out at 3- to 4-minute intervals.	Found that the power output from the generator dropped during fadeout periods, the 240 volts dropping to 90 volts and the 12½ volts dropping to 4 volts. Found to be due to defective field coils in motor-generator.—U. S. S. *LSM–350*
TCS–12.—C–225 was found to be shorted.	Was probably caused by a very strong signal picked up from a nearby transmitting antenna.—U. S. S. *Mugford* (DD–389)
TCS–6.—Transmitter would not modulate.	Found to be due to a modulator power relay K–101 not making contact, causing lack of plate voltage on modulator. Repaired by readjustment of relay.—U. S. S. *Hickox* (DD–673)
TCS–12.—No 12-volt output and consequently no field excitation or 240-volt output from generator. Measured output from 12-volt winding was 1 volt.	Commutator was slightly carbonized. Cleaned commutator and brushes but still no output. Flashed field with 12 volts and output was normal for about two minutes then dropped off again. Noticed considerable sparking at 12-volt brushes. Heavily applied brush seating stone and normal operation resumed. Checked commutator and found it 0.001" off. Turned down commutator- reapplied seating stone and all okay.—U. S. S. *LSM (R) 503*
TCS–13.—Output of transmitter considerably reduced.	Meter M–102 burned out. Placed a jumper across meter to effect an emergency repair.—U. S. S. *Luiseno (ATF–156)* Editor's Note: *Meter should be replaced at first opportunity.*
Impossible to load transmitter (Model TCS–12).	Antenna loading-knob was difficult to turn. Short lead from shaft holding movable contact for inductor L–108 had broken. Plate on which lead was connected had come loose and was rotating with the coil. Replaced lead and fixed plate. Equipment operates properly.—*U.S.S. R.K. Huntington (DD–781). 1/1/49.*
R202 in receiver heats or is burned out.	Check for a rotor-stator short in C201–B. *1/1/50*

Difficulty Encountered	Cause and Remedy
The transmitter would load normally, but as soon as you spoke into the microphone, antenna current would drop to zero. By returning the plate capacitor, conditions would return to normal. Since the symptom would not appear in "CW" position of S–105, even when the transmitter was keyed, the trouble was thought to be in the modulator section, and replacement of the modulator tubes, V–106, and V–107 appeared to bear out this contention as the trouble did not immediately reappear. However, a short time later, the trouble did reappear. This time the receiver also began to operate intermittently, as if the antenna were being grounded out.	Antenna loading coil was checked. All connections were tight on the front of the unit, but removal and inspection revealed that the nuts were loose on the back of both feed through insulators connecting the loading coil to the transmitter and the antenna respectively. The connections were tightened and the trouble remedied. USS PC (C) 1244 *7/1/49*
Receiver noise level normal—no signal.	Check pin No. 2 of P–201 to ground for resistance. Correct resistance is 39,000 ohms. If higher than this figure, wipers on S–202 may not be making good contact. Removal of backplate is most feasible method of access to said switch. *1/1/50*
Receiver inoperative.	(*a*) Check rear contacts of K103 in the transmitter. Said contacts control screen voltage on receivers. (*b*) Voltage check shows no plate voltage on V206. Z204 may be shorted. (*c*) Check operation of local oscillator. Connect V. T. V. M. from control grid to ground. Vary tuning control. If V. T. V. M. reading does not change, check leads on local oscillator section. (*d*) Check jack J–201. These have been found grounded out in several instances. (*e*) Check R214 for open circuit. (*f*) Check C228 for open circuit. *1/1/50*
Low receiver sensitivity on band No. 1 but fair sensitivity on bands 2 and 3.	Check cathode bypass condenser section of S202 for bent wipers or defective contacts. *1/1/50*
Low receiver sensitivity—all bands.	(*a*) Check plate voltage on V206. If low, check C230 for high resistance leak. (*b*) Check screen voltages on V202 and V205. If low check R215 and R205 for increase over normal value. (*c*) Check C225 for change in value. *1/1/50*
Low receiver sensitivity on any 1 band with other 2 bands normal.	Look for burned out antenna coil on band which is low. *1/1/50*
Receiver band 3 inoperative—bands 1 and 2 normal.	Check S201 for bent wipers or high resistance contacts. *1/1/50*
Low receiver sensitivity band 3—other bands normal.	Check RF padder C225. *1/1/50*
No AVC action in receiver.	(*a*) Check Sw206. (*b*) Check ground connection on r.-f. gain pot. *1/1/50*

Difficulty Encountered	Cause and Remedy
Receiver sensitivity changes suddenly.	Check remote control unit. *1/1/50*
Receiver local oscillator inoperative.	Check C218. *1/1/50*
Receiver RF amplifier has no gain.	Check C206. *1/1/50*
Receiver motorboats in several positions on dial.	Check C202. *1/1/50*
Transmitter relays not operating.	Check ground on mike jack. *1/1/50*
Heavy loading and very small resonant dip in IP at frequencies less than 2,000 kc.	Check for shorted turns on L107. *1/1/50*
Downward modulation in transmitter.	Look for mismatch in loading network. *1/1/50*
Transmitter M101 reading off scale.	Check meter shunt. *1/1/50*
No transmitter grid drive to final.	(*a*) Check for dirty or bent contacts on S101. (*b*) Check relay K101. *1/1/50*
No modulation in transmitter.	(*a*) Check C127 for short circuit. (*b*) Check C125 for short circuit to ground. *1/1/50*
Excessive transmitter plate current.	Check C116 for short to ground. *1/1/50*
Low output H. V. supply.	Check for 230-volt connections on primary of power-supply transformer. *1/1/50*
High-voltage condensers not bleeding off.	Check power-supply bleeder resistors—seems like obvious fault but is quite prevalent. *1/1/50*
Fuses blow out.	(*a*) Mounting screws for power supply relay K301 shorting to ground. (*b*) Low-voltage rectifier tubes gassy. *1/1/50*
Relay K301 inoperative.	Contacts bent, closed. *1/1/50*
No high voltage.	Shorted 5R4G tube. *1/1/50*
Blows fuses on low voltage side.	Receiver B+ grounded. Note.—Check both 6X5 tubes prior to reapplying power. *1/1/50*
→TCS–12—Low receiver sensitivity on all bands—audio volume control had no effect on signal strength but did effect the the noise level.	Replaced V1 of field change No. 6, a 12H6 detector and noise limiter. Both sections were suffering from weak emission. *USS Deliver ARS–23 7/1/50* ←

MODEL TCY SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Equipment started normally but stopped upon being keyed. Within few seconds started operating but stopped again when keyed. Upon completion of cycle could not be restarted.	Tests indicated fully charged battery. Voltmeter at external battery terminals showed 6 volts but dropped to fraction of 1 volt when equipment start button was pressed. Examination showed lead covered lead-through bolt coated with a hard brown scale. This was removed and operation again normal.—U. S. S. *Refuge* (AH–11)

RECOMMENDED TUNING PROCEDURE FOR TCZ EQUIPMENTS

Practice has shown that the 813 tube has critical dynamic characteristics. The problem of building a general purpose tube for wide application is difficult. Transmitters of various circuit designs employing the 813 respond in different manners. The 813 functions properly in types TDO and TDM, but is extremely critical in the TCZ. The erattic operation is due to the screen grid design. The basic design was made to JAN specifications which are evidently too broad in scope. These characteristics result in low off-resonance plate current even though the control grid current is normal, showing sufficient drive.

When tuning the TCZ under loaded conditions little or no dip in plate current is experienced when passing through the resonant point.

When adjusting the final amplifier of the TCZ, make certain the antenna coupling is loosened before attempting to find the resonant dip. After the positive dip is found, tighten the antenna coupling to the point where the plate current will show a slight drop when the final amplifier tuning control is swung through resonance.

●

OPERATION OF TCZ–1 AT EXTREME LOW TEMPERATURES

Field activities contemplating operation of Navy model TCZ–1 transmitting equipment at ambient temperatures of minus 30° C. or below are advised to replace the 15-amp. fuse, F–1804, with a similar 20-amp. fuse. *12/1/45*

●

TCZ RADIO EQUIPMENTS FIELD CHANGE NO. 1

REPLACEMENT OF 28-VOLT GENERATOR BRUSHES

Equipments affected.—Models TCZ and TCZ–1 transmitting equipments.

Purpose.—To replace the brushes of the 28-volt generator with brushes of different composition.

General.—Generators of models TCZ and TCZ–1 transmitting equipments already in service should be checked to determine the state of wear of the 28-volt generator brushes. Some difficulty has been experienced in the rapid wearing of these brushes and the commutators.

To differentiate between the old brushes producing excessive wear and the new brushes, the following notations are used. The old type brushes, both positive and negative, are marked with the number 105 stamped into the side of the metal spring tab. The new type brushes, both positive and negative, are marked with the number 113 stamped into the side of the metal spring tab.

New equipments coming out will have the new brushes, but all equipments should be inspected in any case to insure this fact. New brushes for this generator, plus a set for the spare parts box are available at the nearest supply activity. A quantity of the brushes are available at ESB NSD Oakland and at ESA Long Island City, New York.

Vessels should contact an Electronics Officer for the new brushes. This change is within the scope of the ship's force and should be accomplished at the earliest opportunity. A record of completion of this replacement should be made on the ship's "Radio Equipment Log," NAVSHIPS 900,039. Completion of this replacement should be reported on the NBS–383 card. *3/1/46*

●

TCZ RADIO EQUIPMENTS FIELD CHANGE NO. 2

REMOVING OF AUDIO INPUT GROUND OF TYPE COL–23410 REMOTE CONTROL UNIT (NO KIT)

Equipments affected.—All model TCZ radio transmitting equipments used with Navy standard receivers, such as models RBA, RBB, and RBC.

Purpose.—To correct the short-circuit of the secondary winding of the receiver output transformer and retain a balanced-to-ground audio line between the received and the control unit.

Procedure.—Remove the ground from the input transformer of the type COL–23410 remote control unit.

General.—In making installations of model TCZ transmitting equipments, outputs from Navy standard receivers are required to be connected to the remote control unit, a part of model TCZ transmitting equipment. Inasmuch as the secondary of the output transformer of the Navy standard receivers has a grounded center tap and the COL–23410 control unit has one side of the audio input grounded it is readily seen that improper operation will result due to the fact that half of the secondary winding of the output transformer is short-circuited.

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

A record of the completion of this change should be made on the ship's "Radio Equipment Log," NAVSHIPS 900,039. Completion of this change should be reported on the NBS 383 failure report form. *3/1/46*

●

KEYING RELAYS FOR MODEL TCZ SERIES RADIO TRANSMITTING EQUIPMENTS

Several reports have been received by the Bureau of extremely slow keying speed in the model TCZ Series Radio Transmitting Equipments. It must be remembered that the rated keying speed of this type transmitter is 30 words per minute. The keying relay employs multiple contacts timed to close in sequence. Improper timing will cause improper operation. It is suggested that all vessels examine and retime these relays if required, possibly with the aid of an oscilloscope.

These relays will operate with a minimum of 18 volts d. c. applied to the coil, but will only follow keying of eight impulses per second with this voltage. With 28 volts d. c. applied, the armature will follow proper keying speeds. The maximum voltage that should be applied to the relay coil is 32 volts d. c.

Instructions for adjustment of the keying relays are included in the appendix in the rear of the equipment instruction books. It is to be noted that the tension of the armature return-spring, as measured at the top of the Bakelite strip, should be about 24 ounces. Note also that the contacts should be adjusted so that the gap between the movable contacts and the fixed contacts, when the relay is unoperated, is between 0.015 inch and 0.020 inch. These adjustments may be made using the scales and gauges included in the TE–50A teletype repair kits. If the necessary tools are not readily available, the relays should be replaced, and the defective parts repaired and properly adjusted at the earliest opportunity. *4/1/49*

●

IMPROVING OPERATION OF MODEL TCZ TRANSMITTER

➔The following report covering the operation of Model TCZ transmitters aboard the U. S. S. *Juneau* (CLAA–119) is published to assist personnel of other vessels and activities in improving performance of their equipment.

The Bureau desires that all activities and vessels report operating deficiencies and the remedial measures be taken in order that such may be disseminated to the field for the benefit of all concerned. These reports should be forwarded to the Bureau, Code 983.

1—The U. S. S. *Juneau* (CLAA–119) reported that the performance of the equipments installed in radio I and II was poor to unsatisfactory and that the transmitter installed in radio III had not been used because of completely unsatisfactory performance.

2—The following checks were made on the equipment installed in radio I. The transmitter was tuned to 2716 kcs. It appeared to tune normally, except that the settings of dials "C," "D" and "E" did not correspond to the data supplied in the instruction book. An operational check was conducted with poor results. A further check was made at a frequency of

4235 kcs. Again the dial settings did not correspond to instruction book data, although tuning appeared normal. At this frequency, the operation was excellent at the short range check.

3—A wavemeter was obtained to check the transmitter output frequency. It was felt the "PI" network used to tune the final amplifier, while completely satisfactory when properly tuned, might easily be tuned to the second harmonic of the desired output frequency. The transmitter was dialed to the original frequency of 2716 kcs., and the output checked with the wavemeter. This check revealed that there was no output at 2716 kcs., but that the output frequency was 5432 kcs., the second harmonic. Checks made at other frequencies confirmed that the final power amplifier was tuned to twice the desired frequency. Attempts to tune the transmitter using data from the instruction book for the settings of dials "C," "D" and "E" gave harmonic output frequencies in this range.

4—At 4235 kcs. the wavemeter check indicated that the output frequency was correct. This accounts for the satisfactory check previously made on this channel. By variation on controls "C" and "E", it was found that the output frequency could be doubled and normal tuning indications, including good current, would be present.

5—At 215 kcs., the oscillator settings on the low-frequency range were normal. However, after tuning the loading coil, it was found that the transmitter was actually tuned to the second harmonic again, 430 kcs. By further adjustment of the loading coils, the XMTR was set at the desired frequency and very satisfactory communication checks were made. A check indicated that in the 200 to 575 kcs. range the highest frequency that could be doubled by the loading coil tuning was 285 kcs. above this frequency the range of the loading coil was not sufficient to tune to a second harmonic.

6—Checks conducted in a similar manner on the TCZ installed in radio II indicated that the same conditions existed as were previously found in radio I.

7—Conditions in radio III, insofar as the equipment was concerned were the same as in the other two spaces. However, satisfactory checks could not be held at 215 kcs. even when the transmitter was properly tuned. Investigation of the antennas revealed the following conditions: In the original installation in radio III, there had been two transmitters and consequently two individual lines. Since only one transmitter, the TCZ, was now in use in this space, one of the lines had been sealed. However, it was found that the trunk line connected to the ship antenna supposedly connected to the TCZ was actually the sealed one, and that the TCZ was connected to a trunk line which did not terminate in an antenna. Correcting this error resulted in operation of this equipment comparable to the other two.

8—It was found that the tuning information for the dials "C", "D", and "E" and for the low-frequency loading coils was not reliable. It is believed that the reason for this unreliability is that the TCZ is designed for aircraft, where the structure surrounding the antenna is similar in all installations and the approximate settings given would be satisfactory. However, in a shipboard installation the capacity reflected into the "PI" network because of trunk lines and superstructure surrounding the antenna permits the network to be tuned to the second and sometimes the third harmonic of the desired frequency. Many times there is no indication at the transmitter that doubling, or tripling is occurring. Since this reflected capacitance will vary from ship to ship, it is recommended that a calibration curve for each equipment be taken, using the tuning methods in this bulletin and the instruction book and covering the entire transmitter range. A rough curve was made for the equipments installed in the U. S. S. *Juneau* (CLAA-119), using the wavemeters previously mentioned. *7/1/49*

MODEL TCZ SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
The transmitter developed a hum on the carrier sounding like about 400-cycle AC. Transmitter output and operation otherwise normal.	All stages of transmitter including modulator checked and found normal. Power bay checked and high voltage found normal. Examination of low-voltage dynamotor D1901 disclosed shorted segments of the commutator. Commutator turned down and undercut. Operation normal. Examination of the commutator showed that this was caused by the use of test prods with sharp points when checking the armature on the assembly line. Examination of the armature in the spare parts showed the same test prod punctures of the segments.
→ The main power fuses failed when the emission selector switch was in CW or MCW position, and excessive sparking at the contacts of K–1904 took place when the emission selector switch was turned to the OFF position.	Found L–1904 grounded and the 1150-volt lead grounded. Replaced L–1904 and K–1904, and removed ground on the 1150-volt lead, resulting in normal operation. ←

FAILURE OF THE R-F ANTENNA CURRENT METER IN THE MODEL TDD TRANSMITTERS

Where an efficient antenna has been erected for use with the TDD transmitter, it has been noted in some instances that the antenna current is of such a value as to overload the r-f current meter enough to cause it to burn out.

The specifications of the TDD transmitter call for an output of 15 watts, but the manufacturer purposely designed it for an output capability of 30 to 35 watts to allow for the considerable loss in the large loading coil when used with a short antenna. If the output of the transmitter is not to exceed 15 watts, when using a fairly efficient antenna, it will be necessary to reduce the power input to the transmitter.

In cases where more than 15 watts output is purposely needed, or if an antenna meter reading is 1.2 amperes with no modulation, the meter should be shunted in order to reduce the reading of the meter to a safe value.

Satisfactory shunts can be made by using four or five turns of #20 or #16 gauge wire, one-half inch in diameter, connected across the meter terminals.

→ TDE RADIO EQUIPMENT FIELD CHANGE NO. 1

MICROPHONE MODIFICATION KIT

Equipments affected.—Model TDE transmitting equipments, serial nos:

1 to 256	1183 to 1248
393 to 441	1250
448 to 611	1293 to 1471
613 to 880	1475
993 to 1124	

Purpose.—1. To permit the use of a type 51004C hand microphone assembly for making tests and adjustments at the transmitter unit without resorting to a control unit.

2. To operate the equipment locally in case of a casualty to remote stations and/or cables.

Material required.—

Each modification kit consists of the following material, shown in Figure 1, packed in

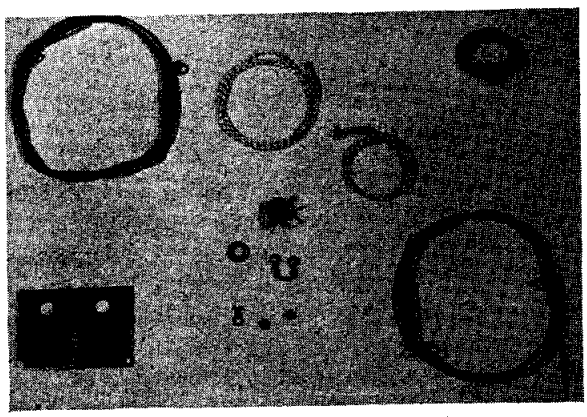

Figure 1.—Contents of kit.

a cardboard carton 9″ x 9″ x 3″ and marked "Microphone Modification Kit for Model TDE Radio Transmitter":

1 Microphone jack
1 Extruded spacer
1 Instruction plate
1 Solder lug
2 Nuts, #6–32
1 "A" wire (32-inch length of lead covered wire with solder lugs attached)
1 "B" wire (37-inch length of lead covered wire with solder lugs attached)
1 "C" wire (16-inch length of #16 wire with solder lugs attached on both ends)
1 Bus wire bent to proper shape with two solder lugs attached
1 Three-foot length of #16 wire
1 Four-yard length of waxed cord
2 Instruction book addenda, including wiring and interconnection diagrams
1 Set of modification instructions, including dwg. #7710285

Tools required.—The following tools will be required to accomplish the modification:

Screwdriver
#4 drill
¼ inch drill
Soldering iron
Knife
9/16 inch open-end wrench
½ inch drill
Hammer
Pliers
Center punch

General.—Modification kits procured under contract NXs–3179 have been distributed to electronic pools in sufficient quantities to fill all requirements. These kits contain the necessary parts and instructions for installing a local microphone jack in the front panel of the model TDE series (CAY–52267) transmitters which were not provided with same before shipment from the manufacturers. All equipments shipped since approximately 1 October 1943 have this jack included as will all future equipments of this series.

Vessels should contact the Electronics Officer for this kit. The modification involves fairly complicated wiring changes and it is advisable that shore-based activities, tender and repair ships forces (having experienced radio repair personnel available) accomplish the modification at the earliest opportunity. The modification shall not be accomplished by commercial installation activities.

Complete instructions including drawings, which are included in the kit, should be kept with the instruction book for the modified equipment. A new instruction book addendum dated 2–15–44 replaces the addendum which

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was supplied in the kit. Upon receipt of the new addendum, the original one should be destroyed.

Record of completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039.

Completion of this change should be reported on the NBS–383 card. *6/1/46*

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FAILURE OF THE LIFTING EYES DURING THE INSTALLATION OF MODEL TDE TRANSMITTERS

Extreme care should be exercised in handling the model TDE series transmitter units when using the lifting eyes provided thereon. Preliminary reports indicate that there is a possibility of seriously damaging the equipment when unusual strain is placed on any one of the lifting eyes.

●

CORRECTION OF TDE–1/–2 INSTRUCTION BOOKS

TDE–1/–2 instruction book drawings 7300540, 7710307, 7710308, 7710309, and 7710310 have been found to be in error. New drawings with equivalent drawing numbers replace these and should be inserted in the instruction book when received. These new drawings are numbered 7300540 sub 10, 7710307 sub 5, 7710308 sub 5, 7710309 sub 7, and 7710310 sub 6.

●

MODIFICATION OF MODEL TDE–1 FOR USE WITH TYPE CAY–23050 FOUR-WIRE CONTROL

An undesirable control characteristic has been found to exist in the TDE–1 115-volt, single-phase, 60-cycle equipments. Normal operation exists when this equipment is used with Westinghouse 4-wire control CAY–23305, Westinghouse 6-wire control CAY–23381, and Navy 6-wire control type CAY–23146.

For the Navy 4-wire control, type CAY–23005, normal operation exists except that one side of the supply line is grounded in the power supply. Therefore, when CAY–23005 4-wire control is used, transformer T–502 must be connected as a "one-to-one" ratio transformer to effect the isolation of the control circuit from the power supply to prevent grounding one side of the power supply line.

A new schematic is provided in Figure 1. The modification is to be made to transformer T–502 as follows:

(1) Connect links between 1 and 3 terminals and between 2 and 4 terminals. Place both secondary links between 6 and 7. Make certain that lead from S–507A connects to terminal 1.

(2) Make certain that the lead from S–503B connects to terminal 4.

(3) Make certain that the lead from S–502B connects to terminal 5.

(4) Make certain that the lead from S–504C connects to terminal 8.

Make certain that terminal 8 is grounded.

●

DISCREPANCY IN TUNING CURVES FOR MODEL TDE SERIES EQUIPMENTS

The ASTINDMAN, Terminal Island, San Pedro, Calif., has pointed out to the Bureau the fact that the tuning curves in the instruction book for the model TDE series transmitters do not give the correct dial settings for proper tuning of the equipment. All ships and stations using model TDE series equipments are warned to look out for this discrepancy. While the instruction book curves may be used as a general guide, they cannot be used as an effective tuning device.

Whenever the TDE is set up on a new frequency, the frequency must be checked with a heterodyne frequency meter and circuits tuned to resonance regardless of the dial settings given in the instruction book.

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LINK POSITIONS FOR REMOTE CONTROL

LINK	TYPE OF REMOTE CONTROL					
	NAVY			WESTINGHOUSE		
	4 WIRE		6 WIRE	4 WIRE	6 WIRE	
	A.C.	D.C.				
S209	A TO B	A TO C	A TO B	A TO B	A TO B	A TO B
S210	A TO C	A TO C	A TO B	A TO C	A TO B	A TO B
S211	D TO E	D TO F	D TO E	D TO E	D TO E	D TO E
S212	A TO C	A TO B	A TO C	A TO C	A TO C	A TO C
TSII-2 TO TSII-4	OPEN	OPEN	CLOSED	OPEN	CLOSED	

RECTIFIER MOTOR GENERATOR AND POWER SUPPLY LINK POSITIONS

LINK	DC		3 PH AC	SINGLE PHASE AC	
	115 V	230 V	230/460 V	115 V	230 V
S502	A TO C	A TO C	A TO B	A TO B	A TO B
S503	A TO C	A TO C	A TO B	A TO B	A TO B
S504	A TO B	A TO B	A TO C	A TO C	A TO C
S505	A TO B	A TO C	A TO B	A TO B	A TO B
S506	A TO C	A TO B	A TO C	A TO C	A TO C
S507	A TO C	A TO C	A TO B	A TO B	A TO B
S508	A TO C	A TO C	A TO B	A TO B	A TO B
S509	A TO C	A TO B	A TO B	A TO B	A TO B
S510	A TO C	A TO B	A TO B	A TO B	A TO B
S511	A TO C	A TO C	A TO B	A TO B	A TO B

NOTE:
FOR 230 V DC USE LINK FROM S510 C TO S511 C AS SHOWN
FOR 230 V DC USE LINK FROM S508 C TO S509 C AS SHOWN
FOR OTHER VOLTAGES LEAVE THESE LINKS OPEN

TRANSFORMER LINK POSITIONS

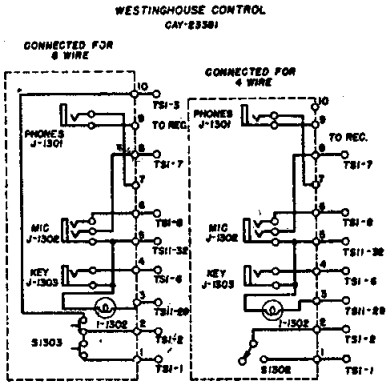
VALUE-FORMER	MFRS TYPE NO.	POWER SOURCE					
		D.C.		3 PHASE A.C.		SINGLE PHASE A.C.	
		115 V	230 V	220 V	440 V	115 V	230 V
T 501	30928	1 TO 5	1 TO 5	1 TO 4	1 TO 4	1 TO 4	1 TO 4
		2 TO 6	2 TO 6	3 TO 6	3 TO 6	3 TO 6	3 TO 6
T 501	30929	1 TO 5	1 TO 5	1 TO 4	1 TO 4	1 TO 4	1 TO 4
		2 TO 6	2 TO 6	3 TO 6	3 TO 6	3 TO 6	3 TO 6
T 502	30925			1 TO 3	2 TO 3	8	1 TO 3
				2 TO 4			2 TO 4
T 503	30927		1 TO 3	1 TO 3	2 TO 3	9	1 TO 3
			2 TO 4	2 TO 4			2 TO 4

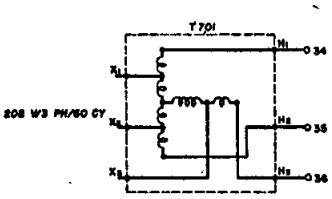
NOTE: LEADS NORMALLY CONNECTED TO TERMINALS #1 AND #4 SHOULD BE CONNECTED TO TERMINALS #5 AND #8 AND ALL LINKS PLACED ACROSS #1 TO #3 OR #2 TO #4

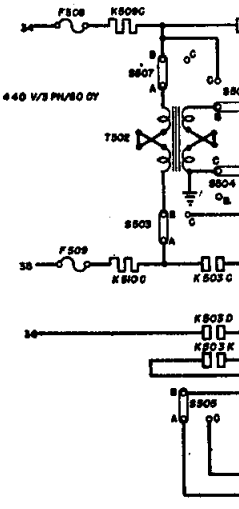
A NOTE: CONNECT LINKS 1 TO 3 AND 2 TO 4. PLACE BOTH SECONDARY LINKS 6 TO 7

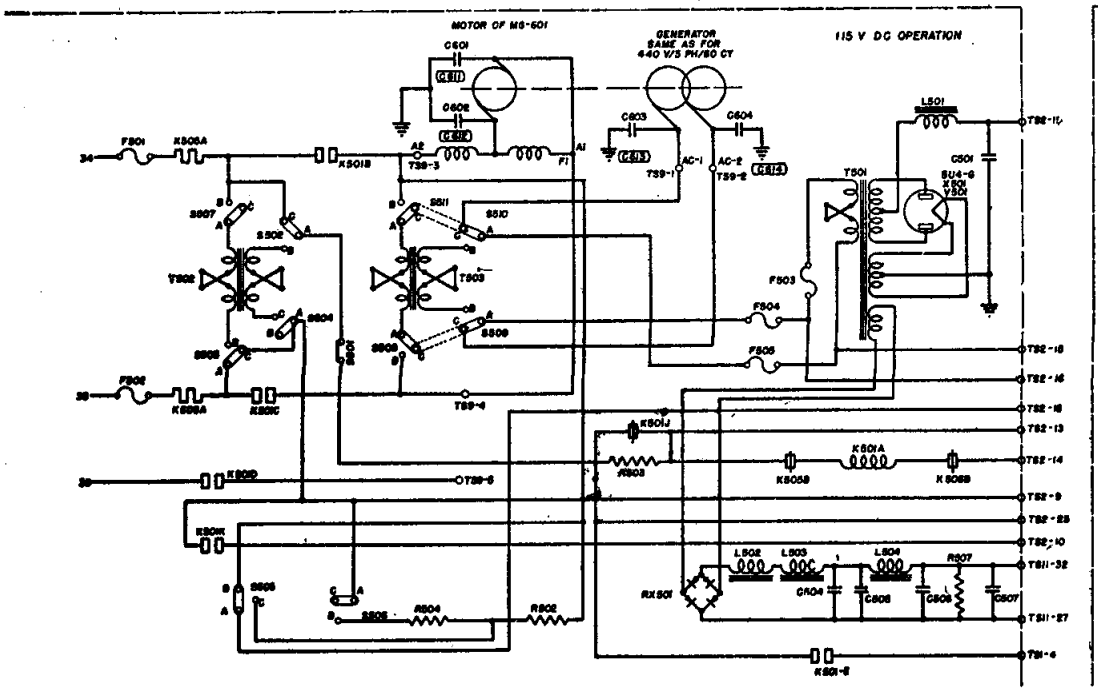
FOR 230 V D.C. OPERATION

CIRCUIT IS SAME AS FOR 115 V D.C. OPERATION EXCEPT AS FOLLOWS:
MOTOR OF MG-601 REPLACED BY MOTOR OF MG-602
R 503 IS REPLACED BY R 504
K 501 IS REPLACED BY K 502 (COIL-HEATER ONLY)
USE SYMBOLS ENCLOSED THUSLY FOR MG CAPACITORS.









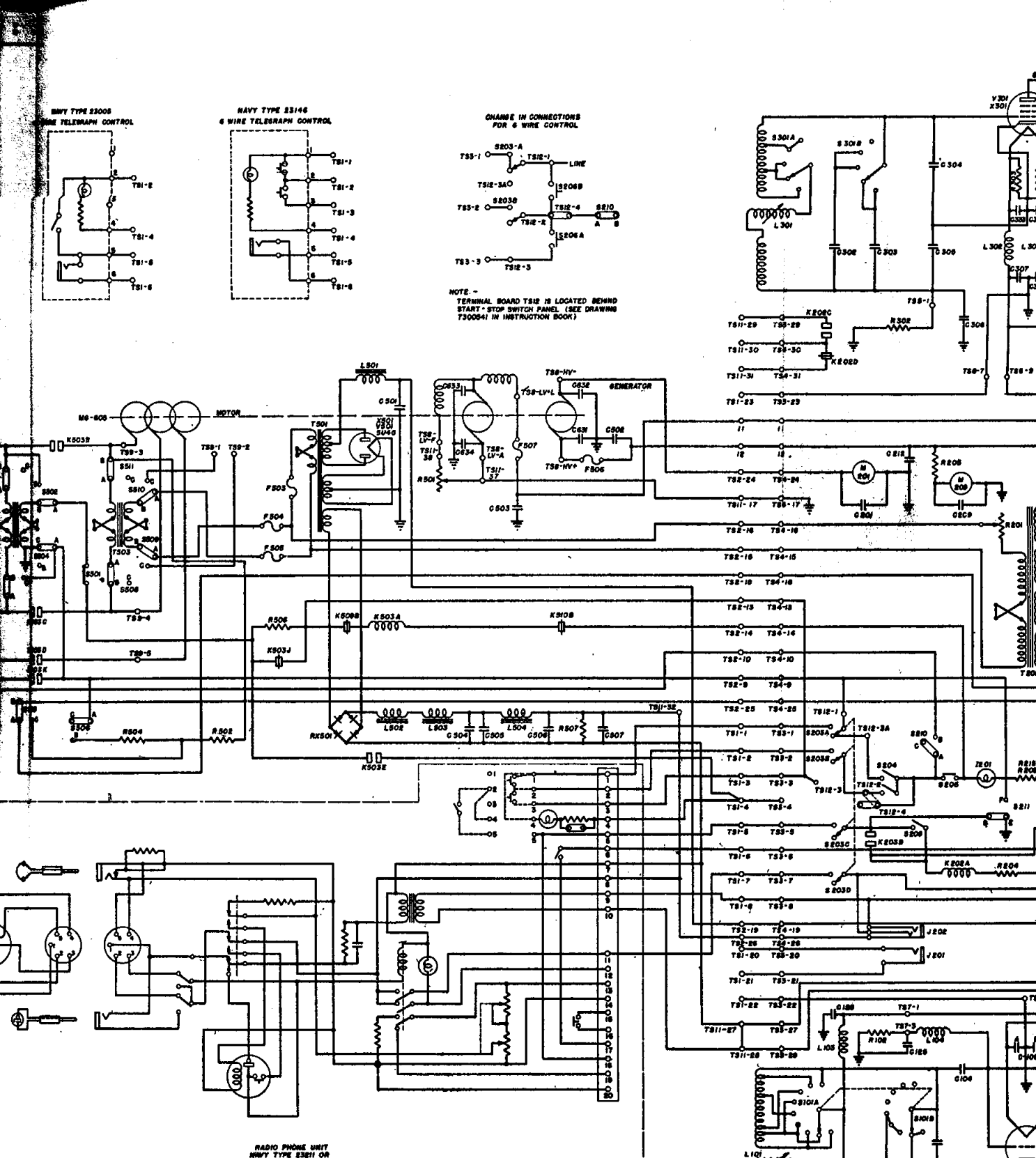
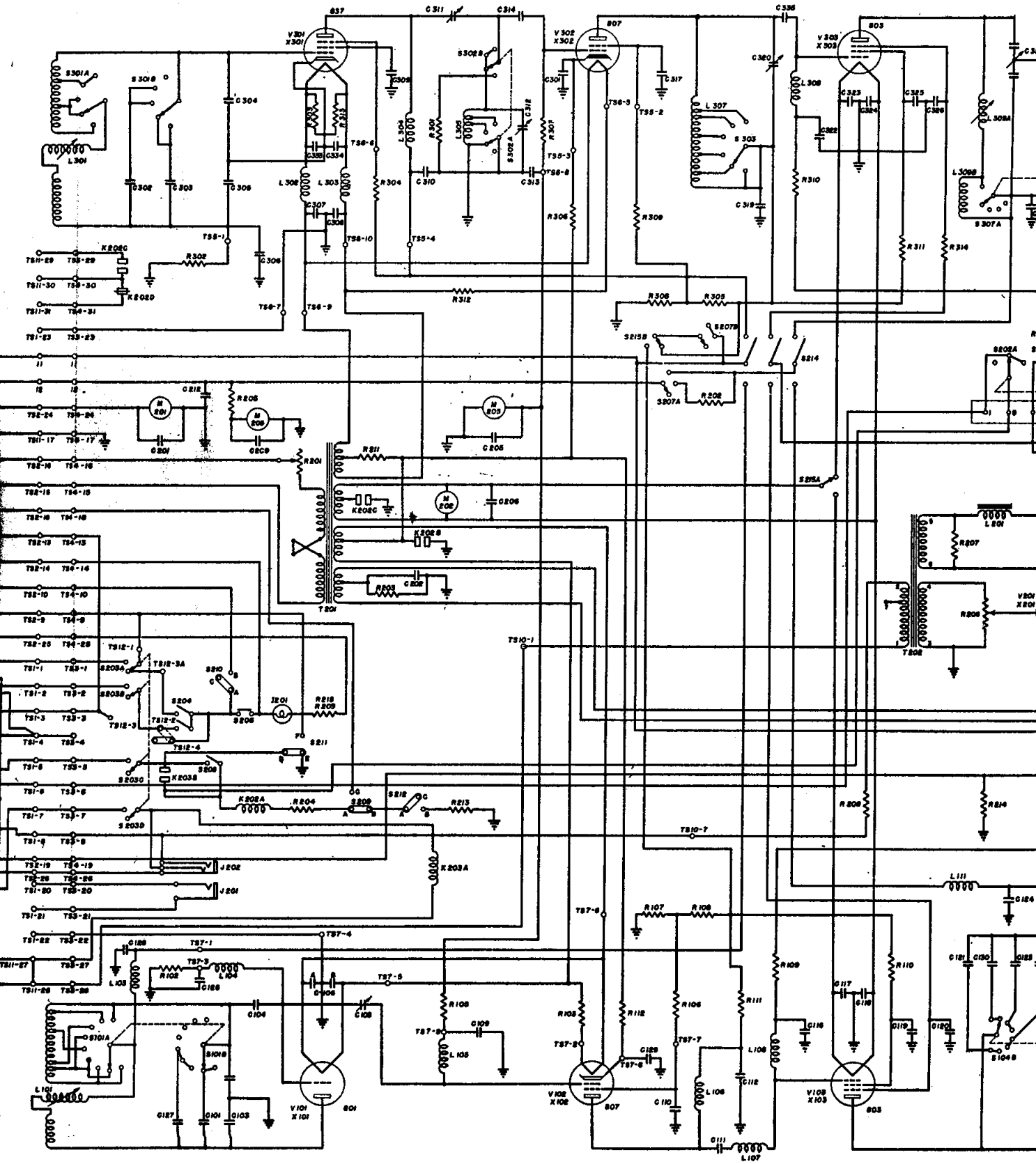
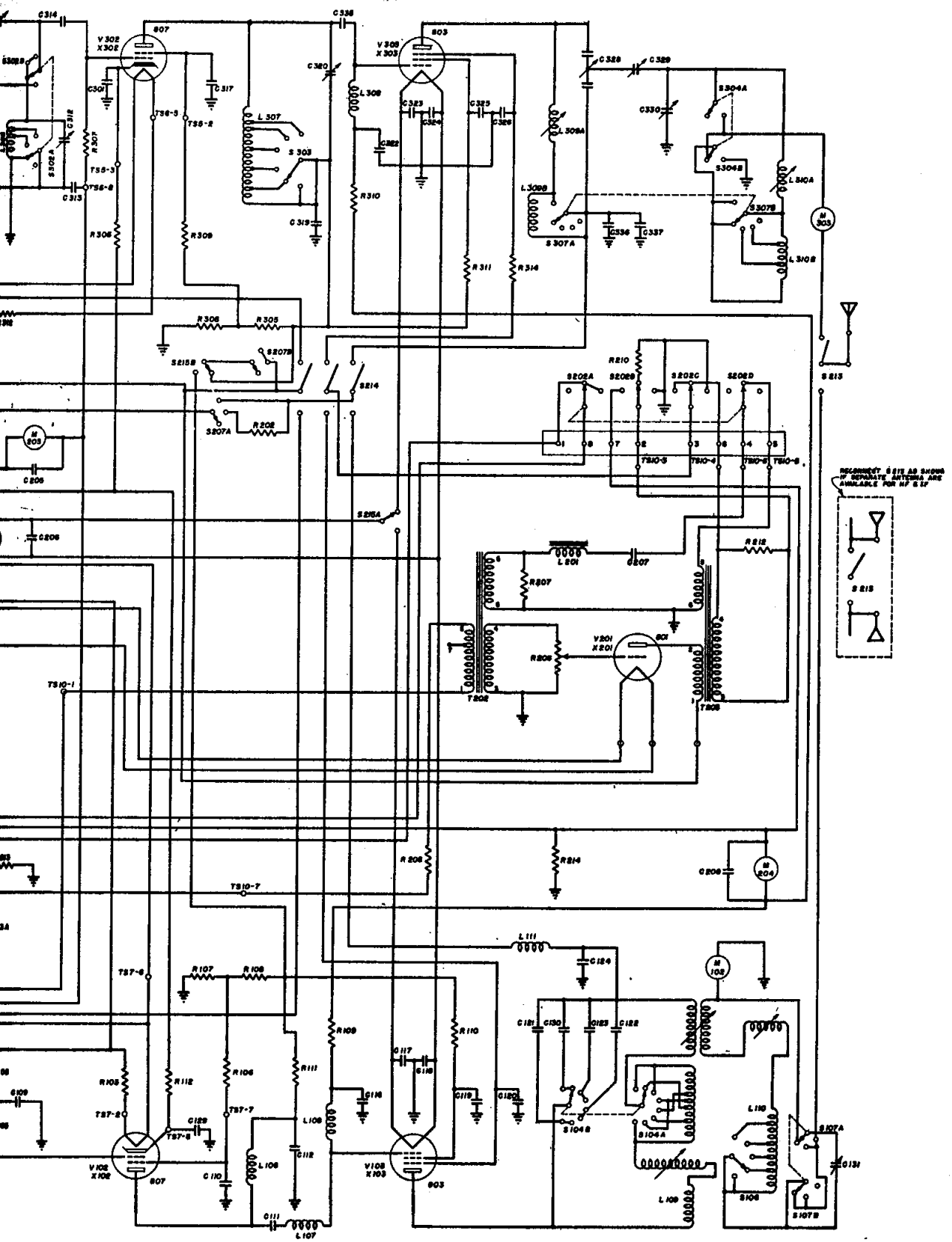


FIGURE 1.—Revised schematic of model TDE.





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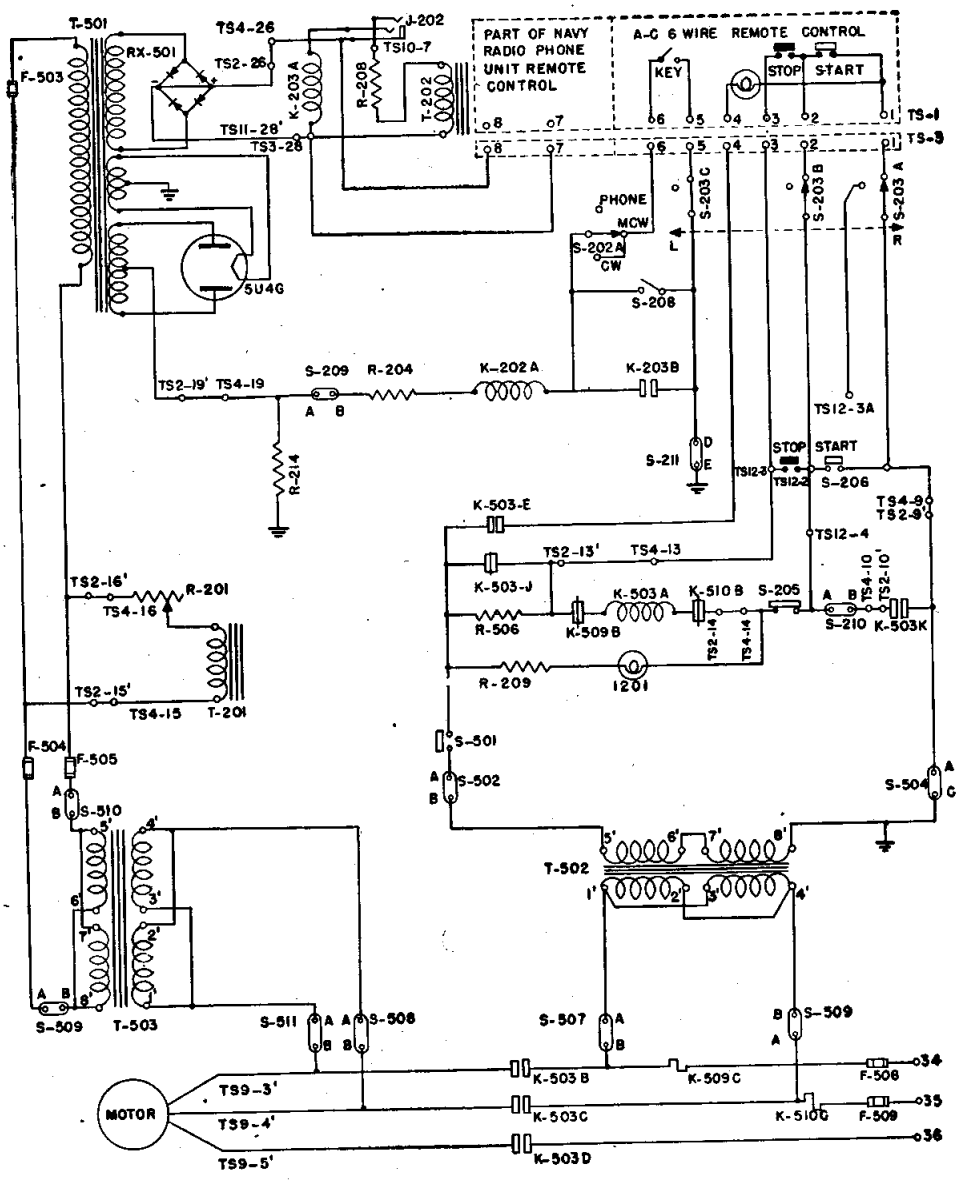
CONTROL CIRCUITS FOR THE MODEL TDE–2 TRANSMITTER

The transmitter control circuit diagram (Fig. 1) which follows was prepared by the staff of the Radio Material School, Naval Research Laboratory. It is a simplified schematic diagram of the starting, stopping and keying circuits for the model TDE–2 transmitter.

It is not intended for this to be a complete schematic diagram of the entire equipment, but it is believed that it will be a help toward



LEGEND

UNIT	SYMBOL	TERMINAL
TRANSMITTER	200-299	NUMBER
POWER SUPPLY	500-599	NUMBER

FIGURE 1.—Control circuits for model TDE–2 transmitters.

the understanding and servicing of the control circuits of these transmitters.

●

TDE RADIO EQUIPMENT

FIELD CHANGE NO. 2

INSTALLATION OF FILAMENT WARM-UP CIRCUIT (NO KIT)

Equipments affected.—All model TDE series transmitting equipments.

Purpose.—To provide a quick warm-up circuit whereby the cathode heating elements are continually energized.

Material required.—One DPDT type XXXII–1S–W. T. rotary snap switch.
One type M–1S branch junction box.
One pilot light type TS37–115V–6W.
One red jewel bullseye assembly.
Four 115-volt, 12-ampere fuses (two for spares).
DHFA–4 and MCOS–2 cable cut to length.

General.—Overheating of the model TDE transmitter motor-generator under continuous use has been reported. When the motor-generator is not in continuous use a quick warm-up circuit is very desirable. The 115-volt power from the ship's a-c supply is led to transformer T–201. A double pole double throw switch is installed for selectivity. When the ship's a-c supply is selected, the cathode heating elements are continually energized. It is then necessary only for the TDE motor-generator to reach speed to make the equipment available. This period is about 3 seconds.

Procedure.—(1) Remove the conductor connecting terminal #16 on terminal strip #2 with terminal #16 on terminal strip #4.

(2) Remove the conductor connecting terminal #15 on terminal strip #2 with terminal #15 on terminal strip #4.

(3) Mount the DPDT Type XXXII–1S–W. T. rotary snap switch in the power unit on bracket from top of unit allowing switch shaft to protrude from the front cover of the power unit.

(4) On the front of the same bracket, mount the branch junction box adjacent to the rotary switch.

(5) Adjacent to the junction box and within one inch of the front cover (cover in position) mount the pilot light in a suitable assembly.

(6) Drill the front panel and mount the red jewel bullseye assembly on the panel in front of the pilot light.

(7) The wiring and cable connections should be made in accordance with Figure 1. All wiring should be made in a manner customary with Naval installations. NOTE: In vessels having a-c ship's supply, the 115V/1Ø/60 cycle power may be taken from the a-c source for radio receivers.

(8) Appropriate nameplates should be placed to identify power from the model TDE motor-generator or from the 115V a-c ship's supply.

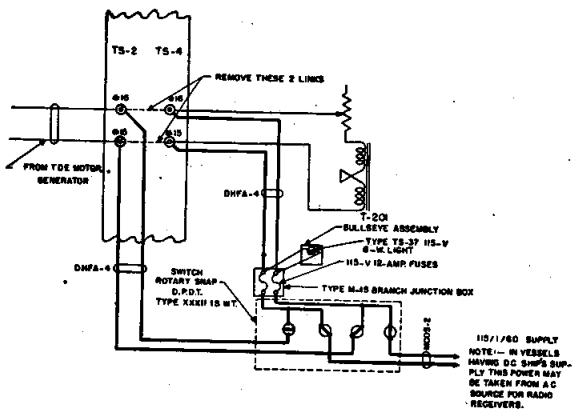


Figure 1.—Filament warm-up circuit.

Routine instructions.—Vessels should contact the Electronics Officer at the next opportunity for the installation of this circuit.

The instruction book, schematic diagrams and parts lists should be changed accordingly.

Record of completion of the installation of this circuit should be made in the "Radio Equipment Log", NAVSHIPS 900,039.

Completion of the installation of this circuit should be reported on the NBS–383 card.

6/1/46

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TDE RADIO EQUIPMENT
FIELD CHANGE NO. 3
INSTALLATION OF IMPROVED RANGE SWITCH S-307B

Equipments affected.—

Contract NXss–3179	All TDE transmitting equipments
Contract NXss–20802	All TDE–1 transmitting equipments
Contract NXsr–33634	TDE–2 serial #1 to 340, 115v. DC.
Contract NXsr–33634	TDE–2 serial #372 to 516, 230v. DC.
Contract NXsr–33634	TDE–2 serial #517 to 835, 440/3/60
Contract NXsr–33634	TDE–2 serial #1046 to 1065, 220/3/60
Contract NXcr–38682	TDE–2 serial #1066 to 1351, 230v. dc.

Purpose.—To eliminate the possibility of flash-over at the switch contacts S–307B.

General.—A quantity of 3,307 kits have been shipped to Electronic Pools. The kits were shipped without a field change number or title. For future reference this change will be known as field change no. 3.

Complete instructions for this change are included in the kit and should be kept with the instruction book for the modified equipment.

Vessels should contact the Electronics Officer for this kit. This change is within the scope of the ship's force.

Record of completion of this replacement should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039.

Completion of this change should be reported on the NBS–383 card. *6/1/46*

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MODEL TDE RADIO TRANSMITTING EQUIPMENT
ADDENDUM TO FIELD CHANGE NO. 2

On vessels where the supply voltage for model TDE transmitters is 115 volts d-c, 230 volts d-c, 220 or 440 volts three-phase a-c, or 230 volts single-phase a-c, the voltage on the primary windings of the filament transformer T–201 is approximately 85 volts when operated with the TDE motor-generator. The primary voltage can be regulated by the filament rheostat R–201 to approximately 80 volts, in order to obtain the required filament voltage of 10 volts on the secondary.

In this type of service the primary winding connections are such that when the 115-volt single-phase 60-cycle stand-by supply power is applied to the primary, the secondary voltage will be far above the value of 10 volts as required. Also, the filament rheostat will not supply a large enough IR-drop in the primary voltage to lower the secondary voltage to the required value.

In order to overcome this difficulty, a 25-ohm 100-watt variable resistor should be appropriately installed in the 115-volt single-phase 60-cycle stand-by supply circuit, as shown in Figure 1.

The filament rheostat R–201 and the new variable resistor should be adjusted so that the filament voltage will read 10 volts with the switch in either the "Stand-by" or "TDE M–G" position. Very little adjustment of either the rheostat or resistor will be required after the correct setting is made.

The recommended resistor to install in this circuit is JAN type RP252FE250KK. Resistors of this type are being made available as follows: A quantity of 250 for NSD, Bayonne; 250 to SSD, NSC, Oakland; 100 to NYD, Mare Island; 100 to NYD, Puget Sound; 100 to NYD, Norfolk; 100 to NYD, Boston; and 100 to ESB, NSC, Pearl Harbor.

Previous instructions covering this change inadvertently called for the use of fuses rated at 115 volts, 12 amperes. The correct fuse to use in this installation is rated at 115 volts, 3 amperes. Inasmuch as watertight integrity is not required, the junction and fuse boxes and watertight type switch called for in previous instructions are not necessary. The switch, fuses, and lamp may be mounted on a bakelite panel and installed in either the left- or right-

hand upper corner of the power supply compartment.

Equipments already modified using previous instructions should not be changed except for the installation of the 25-ohm, 100-watt potentiometer. Equipments which require this change should be modified in accordance with Figure 1.

Vessels should contact the cognizant Electronics Officer at the next opportunity for installation of this change.

Personnel making the field change shall record the completion of the change on the Electronics Equipment History Card, NAVSHIPS 536, and the completion date on the Field Change Record Card, NAVSHIPS 537.

Completion of the installation of this Field Change should be reported on the NBS-383 card.

The instruction book schematic diagrams and parts list should be corrected accordingly. *7/1/48.*

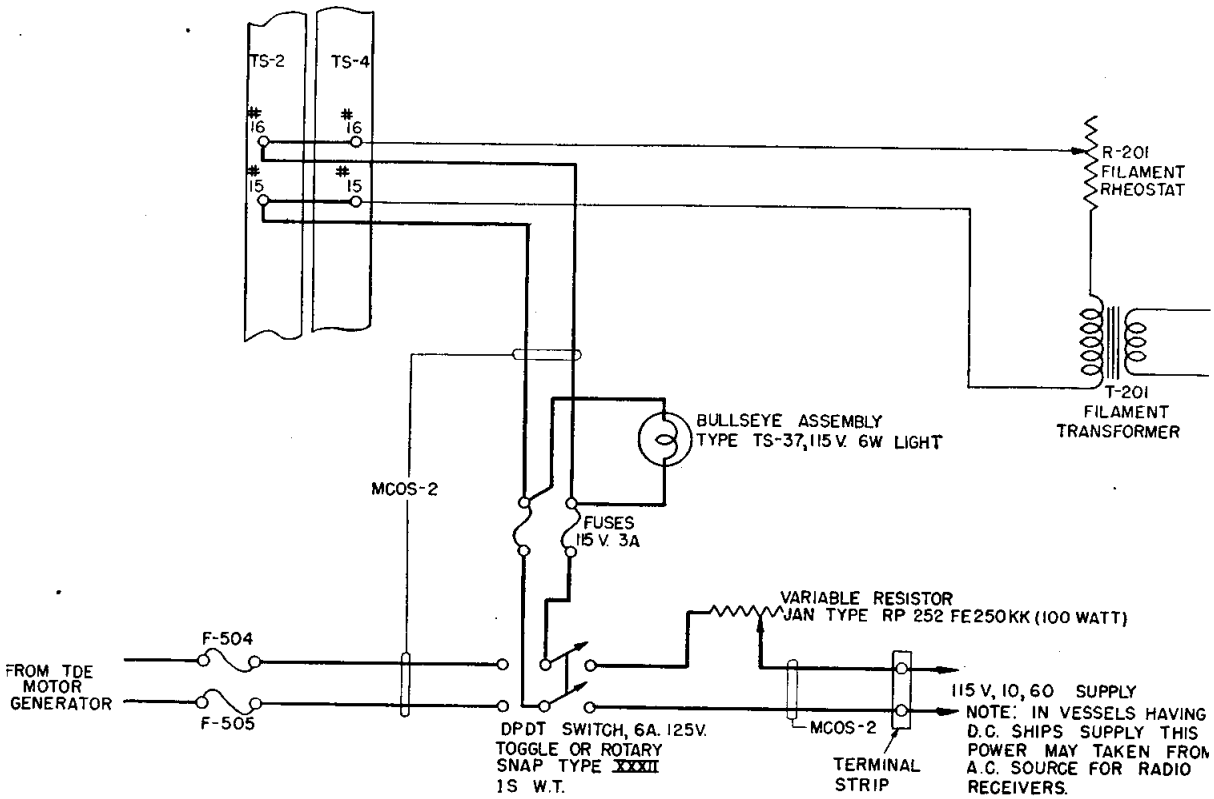

FIGURE 1.--Circuit for adding variable resistor to bring filament transformer secondary voltage to correct value.

→RELOCATION OF RELAY ON POWER SUPPLY PP–338/U USED WITH TDE TRANSMITTERS

A Beneficial Suggestion submitted by William W. Beam of the Puget Sound Naval Shipyard proposed remounting relay K–101 of power supply PP–338/U. Presently this relay is mounted on the under side of the chassis which renders it extremely difficult to maintain and inspect. Mounting this relay on the upper side of the chassis as shown in Figure 1 will effect a saving of time and personnel in the maintenance and repair of this unit. The modification requires construction and installation of

a simple angle bracket, as shown in Figures 1 and 2. The leads to the relay may be brought up through a rubber grommet, as shown in Figure 1. The modification may be performed by Navy Yard personnel using standard stock material. No special tools are required. *1/1/51*

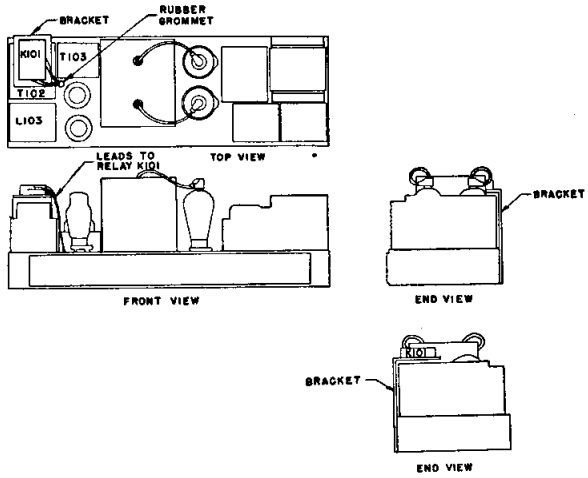

FIGURE 1.—Outline of power supply PP–338/U showing location of relay K–101.

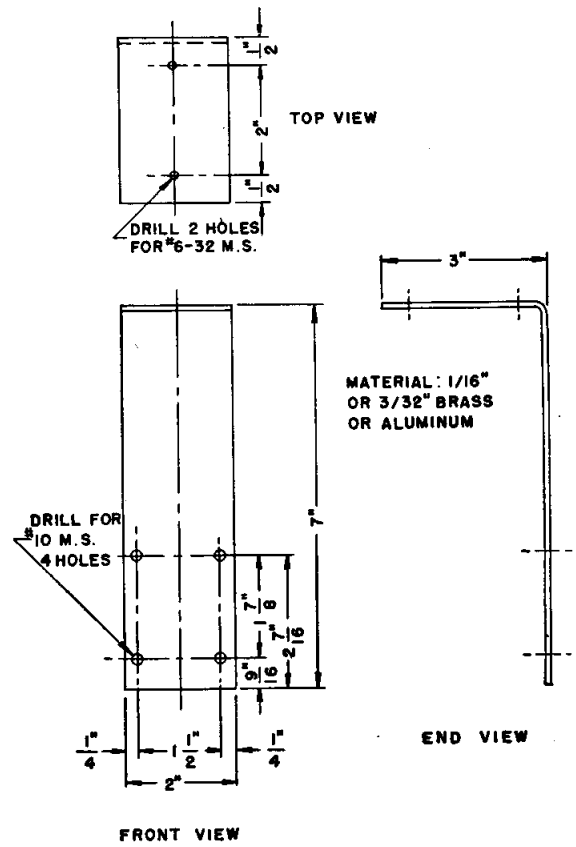

FIGURE 2.—Dimensions for bracket to mount relay K–101.

MODEL TDE SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Will not key; or keys only momentarily, falling off when key is held down.	Failure when in high-frequency position, replace 837 tube. Failure when in intermediate-frequency position, replace 807 tube. Failure when in both positions, replace 5U4 tube.—*RMO, Galveston*
Will not modulate.	Check gain control setting (the gain control is easily overlooked) Check K–203–A.—*RMO, Galveston*
Radio-frequency arc-overs.	Under certain i-f antenna conditions where characteristics exceed the antenna limits for which the equipment was designed, excessive r-f potentials may be developed. In such cases, reduce coupling (dial S) so that the power-amplifier plate current is reduced to 150 ma. when operating on voltage feed (dial T) below 400 kc. Refer to Fig. 31 in rear of instruction book, also paragraphs 3–54–d, 4–19, 4–23, 4–24, 4–25, 4–28.
Start-stop contacts K–503 would drop out immediately upon releasing remote starting button.	Contact K–503J dirty. Cleaning controller contacts restored transmitter to normal operation.—U. S. S. *Nevada*
No high- or low-voltage output from motor-generator set.	Inspection of m-g set revealed: (1) All brushes in good condition. (2) Low-voltage commutator in good condition. (3) High-voltage commutator smooth but contained many small particles of copper between segments. Apparently, commutator had been turned down but not undercut. Removed armature and undercut the high-voltage commutator. Operation then normal.—U. S. S. *Wm. C. Miller*
TDE–2.—While tuning the transmitter power-amplifier stage, the plate milliammeter reading was greater than full scale reading.	When the transmitter switch was placed in ADJUST position, the same condition existed. Failure was traced to capacitor C–631 inside of the motor-generator set by the ohmmeter method. This capacitor was replaced and set operated normally.—U. S. S. *Hollandia*
Voltage dropped from the normal 2000 volts to 200 volts as indicated by the plate voltmeter.	Motor-generator was faulty. Voltage measured from low side of motor-generator read 28 volts. Voltage from high side read 168 volts. Replaced armature and shaft assembly, which resulted in normal operation of equipment again.
TDE–1.—Audio signals from model LR–1 frequency meter very weak at audio output jack of model TDE–1 transmitter.	Checked for ground and discovered that the wrong side of the jack at the frequency meter patch panel was grounded. Normal operation was restored by reversing wires at patch panel.
TDE–2.—No power to voice relay or microphone transformer. Unable to use voice on this equipment.	Jumper missing between the two filter reactors. Installed missing jumper and set worked.—U. S. S. *Burleson*
Output generator voltage would not exceed 140 volts. Motor-generator set not operating correctly.	The generator is of the self-excited type. The voltage would build up to about 140 volts due to residual magnetism. Indications showed that the high-voltage winding was not receiving excitation from the low-voltage or 550-volt winding. It was found that the low-voltage winding of the armature was shorted. The armature was replaced and the generator returned to normal operation.

Motor-generator set would not start, K–503–A relay did not operate normally, pilot light did not go on, transformer T–502 began to "smoke."	Checked T–502 and found the two secondary windings shorted out. Replaced T–502 and normal operation was resumed.—U. S. S. *Amesburg*
The brushes in the motor-generator set apparently were much too hard and the commutation was continually "grooved". After each grooving, the equipment had to be taken apart and a cut had to be taken on the commutator, resulting in the equipment frequently going off the air.	Hard brushes replaced by softer brushes. Softer brushes were shaped to fit the motor-generator and all the hard brushes were replaced. Equipment operated satisfactorily from then on.—U. S. *Curtiss.*
No power output. Motor controller arced excessively.	Loose connections to relay K–502 in motor controller found. Inspection disclosed dirty and burnt relay contacts. Contacts were cleaned and burnished. The unit then operated normally.—U. S. S. *Callaway*
Low-frequency power-amplifier would not resonate.	Visual inspection showed p-a tank capacitor C–123 to be cracked and swollen. Bridge measurements gave capacity to be about .001 mfd., insulation resistance about 2 megohms. After the capacitor was replaced, the equipment operated normally.—U. S. S. *Ocelot*
Master-oscillator calibration dial reading on high-frequency master-oscillator variometer tank coil was about 200 divisions off from calibration curves.	Variable portion of coil slipped out of proper adjustment due to loose coupling collar on shaft—caused by deterioration of gasket material and continued "salvo" shock. The master-oscillator was set on a known frequency, and the coil held firmly in place by hand while dial was adjusted to proper reading. The coupling was tightened. U. S. S. *Pensacola*
TDE–2.—Transmitter would start when start button was depressed but would stop as soon as button was released.	Starting contactor K–501 contact points were found to be fused together. By separating the fused points, normal operation resulted.—U. S. S. *Nutmeg*
The microphone would not operate when plugged into the remote control unit.	Both the key and the microphone worked at "Local" position, and the key also worked from the local "Remote" position. In the transmitter, rough contact points were discovered on the LOCAL-REMOTE switch. Equipment worked perfectly after contacts were filed smooth.—U. S. S. *Neshanic*
A fuse was continually blowing. The set was inoperative.	Upon attempting to "fire up" the transmitter, a fuse blew. Upon replacement of the fuse it blew again. Meter readings showed a short in the plate circuit of the master oscillator. This was found to be caused by a small nut wedged in the gear causing a complete short. This nut was removed, the choke (which had burnt out) was replaced and the operation of the equipment was returned to normal.—U. S. S. *Anaqua* (AN–40)
High-voltage meter (M–205) indicated 2500 volts and could not be adjusted to proper voltage by R–501 the field rheostat.	Found loose screw lying on TS–8 from LV–F to grounded lead sheath of cable. This shorted out R–501.—U. S. S. *Dale W. Peterson* (DE–337)

TDE–2.—While transmitter was being keyed, output suddenly ceased.	It was found that M–201 (power-amplifier plate current meter) was "pegged" by excessive current without the transmitter being keyed. M–201 is in the negative return of the high-voltage generator and is grounded on one side. Checks with an ohmmeter revealed that C–631 was shorted, grounding the positive side of the high-voltage generator and placing M–201 directly across the generator. When C–631 was replaced, normal operation was restored.
TDE–2.—Antenna lead ran too close to h-f contact on A switch causing a break down or arc whenever the i-f section was loaded enough to draw over 60 ma. plate current.	Remedied by bending lead away from h-f contact.—*RMO–9th Naval District*
TDE–2.—Master oscillator did not oscillate continuously, but in short pulses at the rate of about 120 per minute.	The pulses of operation were of much shorter duration than the periods between pulses. The power-amplifier plate current was steady at about 115 milliamperes with TUNE-OPERATE switch in either position. It could not be dipped. The intermediate-frequency master-oscillator grid resistor, circuit symbol R–102, was checked with an ohmmeter and was found to be several megohms. Replaced the defective resistor and the set thereafter operated satisfactorily.
TDE–1.—Transmitter keyed erratically and with lower than normal current readings. Finally would not key at all on h-f side, while OK on i-f side.	Found master-oscillator grid lead R–302 grounded on both sides. Traced circuit and found the stiff bare wire from C–302 to S–301B was in contact with the chassis. Probably caused by vibration. Repaired equipment by bending the wire away from the chassis.—U. S. S. *Carondelet* (IX–136).
TDE.—Gear would work normally for a few minutes and then the p–a plate current meter would show the normal key closed reading with the key open.	Found to be due to a defective p–a grid current meter bypass C–208. Replacement of this capacitor cleared the trouble.—U. S. S. *LST–511*
TDE–1.—Excessive sparking when tuning the p–a tuning dial (dial J). A burning odor and smoke was also observed.	Found to be due to poor insulation on wire leading from cap of V-303 to C–328. The wire was shorted by a screw on C–328.—U. S. S. *Shakamaxon* (AN–88)
TDE–1.—Transmitter on the air continuously.	Found wiring wedged under microphone relay K–203 causing continuous contact which in turn energized the keying relay (K-202) continuously.—U. S. S. *Shakamaxon* (AN–88)
TDE.—Smell of hot insulation.	Inspection showed that the p–a stage had lost its grid bias and the bias rectifier tube V–301 (type 5U4G) had red hot plates. Sparking was observed around the switch S–209 which was loosened from its frame and checked for grounds and shorts. None were found, but it was noted that the insulation had worn through on some wires that had been previously taped up. Reinsulating these wires cleared the trouble.—U. S. S. *Hoggatt Bay* (CVE–75)
TDE–3.—Transmitter keying continuously, on TUNE or OPERATE position of switch.	Traced the trouble to short in microphone relay coil K–203 circuit causing coil to be energized and holding contacts K–203A shut. Replaced relay.—U. S. *Tonawanda* (AN–89)

TDE.—High voltage was arcing to the HF–IF switch (S–214) vertical control, when set to the IF position and the TUNE–OPERATE switch at OPERATE.	This was due to a screw becoming loose that held a rod at the bottom end, allowing the rod to come close enough to a screw holding the HF–IF capacitor to draw an arc from it. Tightening this screw restored equipment to normal operation.—U. S. S. *Hoggatt Bay* (CVE–75)
TDE–1.—Transmitter would not stay in operating condition.	Found that relay K–501 contacts were not "making" and that some were burned. Replaced contacts.—U. S. S. *Hoggatt Bay* (CVE–75)
TDE–1.—Transmitter would go off and on at will or with a slight jar.	Found interlock S–205 cracked and loose on its holder. Replaced.—U. S. S. *Hoggatt Bay* (CVE–75)
TDE–2.—Both line fuses blew as soon as power was applied.	Replaced shorted START–STOP switch. Fuses blew again due to improper sequence of operation in motor starter. Corrected by tracing wiring and changing improper connections. Motor then ran OK, but no output on h-f side. Replaced gassy 803 tube. Operation OK at high frequencies but poor in 2-mc. band. Changed antenna to a longer one and then finally all OK.—U. S. S. *PGM–27*
TDE–2.—Transmitter failed to key on CW, MCW, or PHONE on either the IF or the HF side. F–503 blew when transmitter was keyed.	The bias rectifier filter capacitor C–501 was found to be leaky. Checked 175 ohms. Replaced. Joseph E. Strenk RT 2/c—U. S. S. *LST–924*
TDE.—Radiating when not keyed. Audio tone picked up on receiver tuned to same frequency. I-F amplifier grid current 3 ma. Condition existed only in TUNE and OPERATE positions.	C–301 found leaky. Keying is accomplished by grounding the cathode. This cathode capacitor leaking to ground furnished partial keying and radiation was strong enough to be picked up by receiving antenna.—M. R. Lambert, RT2/c—U. S. S. *Scribner* (APD–122).
TDE.—Erratic operation of transmitter from remote position. Normal operation from local position.	Contact K–503K was binding occasionally. The cotter pin, holding the spring on the shaft, had worn into the bakelite guide pin on which it traveled. Made a new guide pin of bakelite and installed. A new cotter pin was installed and carefully centered to make as little contact with the bakelite guide pin as possible. Cleaned contacts. Transmitter resumed normal operation.—U. S. S. *Greenwood* (DE–679)
TDE–2.—The bias rectifier fuse, F–503, kept blowing out.	Contact #28 on terminal board 11 had shorted to ground. Short was cleared. Normal operation restored.—U. S. S. *PCE–893.*
TDE–3.—Low and distorted output on voice. Too low to be received.	Circuit tracing showed a near short circuit across the primary of audio transformer T–202 caused by lugs of terminals 3 and 6 in CFN–23381 remote control unit being soldered together. Removed soldered connection and equipment operated properly.—U. S. S. *Typhoon* (ARL–28).
→ TDE–1.—On the PC–1176 the line fuse would blow as soon as the motor turned over.	Removal of the 2000-volt d-c brushes returned the motor to normal operation. Replacement of these brushes again resulted in blown line fuses, but it was noted that the high-voltage fuse F–506 remained unharmed. Capacitor C–631 that runs from the positive high-voltage brush to ground was found shorted and replaced. Gear operated normally.—Max J. Green ETM 3/C U. S. S. *PC–780.*

Difficulty Encountered	Cause and Remedy
TDE–3.—When the transmitter was tuned to any frequency on either the intermediate or high frequency bands, and a receiver tuned to the same frequency, an audio note could be heard which cut out all stations. This happened in the TUNE and OPERATE positions only of the ADJUST-TUNE-OPERATE switch.	The capacitor C–301 between cathode and ground of the intermediate amplified tube V–302 had developed a high resistance to ground. Since plate voltage is applied to the tube when the switch is in either TUNE or OPERATE position, and since keying is accomplished by grounding the cathodes, this high resistance short to ground caused the oscillators and intermediate amplifiers to draw reduced current without being keyed and so radiate a signal. This signal was strong enough to be radiated from the antenna. M. R. Lambert, RT 2/C(T) U. S. S. *APD–122.*
TDE–3—The TDE–3 which was operating on 4295 kc, kicked out when the adjacent TBA–11 was keyed. Arcing was noted in the motor-generator compartment and the odor of burnt insulation was present. The TDE–3 was started, overload reset and the following indications noted: (*a*) PA plate current meter hit the peg. (*b*) Plate voltage below normal and not adjustable. (*c*) Fuse F–507 continued to blow.	Continuity check revealed a ground between generator and F–506. All other power supply circuits checked normal. Further investigation revealed that terminals HV (pos) and LV (pos) on terminal strip 8 (located on generator) shorted and fused together. The short was removed, leads separated as much as possible, and the equipment returned to normal operation.—U. S. *Pocono* (AGC–16)
TDE.—At the time the low frequency section M. O. was adjusted for zero beat with the frequency meter, a low audible beat was heard. It extended over the complete range of the M. O. When the test key was pressed, all meters read low and fluctuated with the frequency of the audio note in the phones.	Resistor R–302 was checked and found to read 15,000 ohms. Replaced R–302 and equipment operation returned to normal.—U. S. S. *John Bliss.*
TDE—Unable to load antenna, and transmitter arced at HF antenna feed switch	Found insulator in switch S–304–A broken causing arc. Wafer on switch S–304–B was broken also. Replaced both switches and cleaned contacts on HF–IF transfer switch. U. S. S. *LST–532.* *7/1/49*
→TDE–1.—Equipment keys continually.	Lead No. 4 on keying relay grounded. Removed ground. Equipment operates normally. U. S. S. *Sabine* (YO–25). *1/1/50*
Transmitter keys all the time when in remote position.	A. Contacts of K202B shorting together. B. Wires near relay K202B holding relay in operated position. *1/1/50*
Transmitter keys all the time.	A. Clear ground in test key ckt. B. Check for loose wires behind control panel. *1/1/50*
Xmt. fails to key.	A. Check T501. B. Relay K207A contacts are out of adjustment. C. Check S208 for proper operation. D. Check fuse F503. E. Check link S211. *1/1/50*
Transmitter fails to key in remote position.	A. Check contacts and condition of X203. B. Check for jumper between TS11–32 and TS1–5. C. Check link S209. *1/1/50*
Oscillator HF or IF oscillates and blocks.	A. Check R302 HF side. B. Check R102 IF side. C. Check L104 IF side. *1/1/50*

Difficulty Encountered	Cause and Remedy
Oscillator (HF side) fails to zero beat on various bands.	A. Check S301 contacts. B. Check C302, C303, C305. *1/1/50*
HF oscillator output to IA stage is normal except on range 1.	A. Check R301. B. Check S302A. *1/1/50*
HF and IF readings are not found at right spot on dial.	A. HF side check alignment of L301 and dial "C." B. IF side check alignment of L101 and dial "P." *1/1/50*
Low grid drive HF-IF stage.	A. HF side adjust C311. B. IF side adjust C108. C. Check tubes voltages on HF and IF side. *1/1/50.*
No Screen voltage to 807 HF and IF side.	A. Check C110. B. Check driver network. *1/1/50.*
No grid drive to grid of 803 HF side.	A. L307B shorted to C320. B. Check R310. C. Check tube voltages. D. Check M204. *1/1/50.*
HF stage fails to resonate properly on all bands.	A. Check S303. B. Check alignment of dial "G" and C320. C. Check tube operating voltages. *1/1/50.*
IF stage fails to furnish enough drive to PA stage.	A. Check tube voltages. B. Check C–116 and C109. *1/1/50.*
Low grid drive to HF-IF 803.	A. Check R214. B. Check IF stage. C. Check tube voltages. *1/1/50.*
PA grid current meter reading in reverse direction with transmitter unkeyed.	A. Check C111 in IF section of transmitter. B. Check C335 in HF section. *1/1/50*
Transmitter will not operate in tune position.	A. Check R209. B. Check S207 for proper operation. *1/1/50*
PA plate current meter reads all the time.	A. Check C631 (in MG on HV end). B. Check C212. *1/1/50*
Transmitter does not modulate in phone or MCW position.	A. Check C326 HF side. B. Check C120 IF side. C. Check gain control R206. D. Check contacts S202. *1/1/50*
No modulation in MCW position.	A. Check contacts switch S202D. B. Check ground to case of transformer T203. *1/1/150*
HF side loads, but breaks down intermittently.	A. Check for loose connections in antenna loading network. B. Check condition of roller on L310A. C. Check contact of switches S304, S307, and S213. D. Check M303. E. Check rotor and stator spacing C329, C330, and C328. *1/1/50*
HF side fails to load.	A. Check for loose connections in antenna loading network. B. Check condensers C328, C329, and C330 for stator and rotor alignment. C. Check roller on L309A and L310A. *1/1/50.*
Motor generator turns over at very low speed.	A. C631 (in MG frame under inspection plate) shorted out. B. Series field shorted or connected improperly. *1/1/50.*

Difficulty Encountered	Cause and Remedy
IF side loads, but breaks down intermittently.	A. Check for loose connections in antenna loading. B. Check M102. C. Check switch operation of S104, S106, and S107.
IF side fails to load properly.	A. Check alignment of dials and switches "R" and L109, "S" and L109. B. Check for loose connections. C. Check contacts of switches, S104 and S106. D. Check M102. *1/1/50.*
Motor generator fails to start, contactor fails to close.	A. Interlocks S205 and S501 fails to make contact properly. B. Contacts K503J out of adjustment, or dirty. C. Contacts K509B need adjustment. D. T502 links are not in proper position. *1/1/50.*
High-voltage meter fails to read.	A. Check R205 in MG unit. B. Check M205. C. Check fuse F506. D. Check resistance of terminal 12 to ground. *1/1/50.*
High-voltage fuse blows.	A. C212 breaks down under high voltage (no ohmmeter indication of break-down). B. Short in HV supply in transmitter. *1/1/50.*
Voltage output of MG low.	A. Check MG speed with tachometer. B. Check series field. C. Check condensers C634 and C631. D. Check link board on motor end. *1/1/50.*
High-voltage meter reads in wrong direction.	A. Check polarity of M205. *1/1/50.* B. Check phase relation of line to transmitter. *1/1/50.*
Start and stop switch does not stop the transmitter. (6-wire control circuit).	A. Link S210 in wrong position. B. Check contact adjustment K503K. C. Check circuit for ground. *1/1/50.*
MG set will run only when start button is held in. (6-wire control).	A. Check link S210. B. Check adjustment of K503K. *1/1/50.*
Pilot lamp 1201 burned out. Voltage to lamp high. Transmitter operation normal.	A. Check links on transformer T502. B. Check R209, R215. *1/1/50.* ←

CARRIER-OFF ALARM FOR MODEL TDG TRANSMITTER

The Navy model TDG transmitters, presently being used in connection with the carrier control system—Navy model UN, do not have an alarm circuit to indicate when the carrier of the transmitter fails.

To correct this condition the Bureau has arranged for the shipment of a Sigma type 4F relay for each transmitter installed within the various Naval districts.

To install the alarm relay it is suggested that a review be made of figure 3, page 54 of the Navy model TDG radio transmitting equipment instruction book (X–63611, issue 1). A resistor coded R51 is removed and replaced with the 4F relay. (See Fig. 1.)

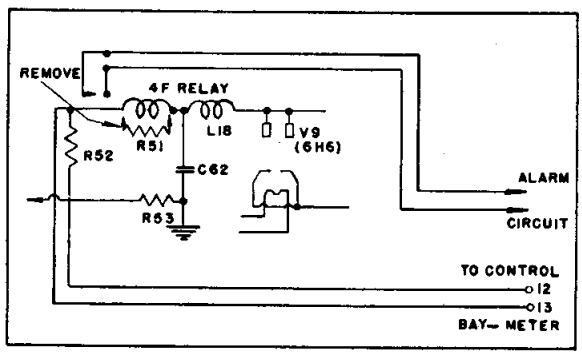

FIGURE 1.—Alarm circuit.

FUSE MODULATOR TUBES IN TDG TRANSMITTER

An internal short circuit in either of the modulator tubes (V7 or V8) of the TDG transmitter permits a current to flow through the primary winding of the modulation transformer of sufficient magnitude to cause the modulation transformer to burn out. The main fuse (F2) will not give protection in this case until after the transformer has failed. To eliminate this operational difficulty, a ⅛-ampere fuse should be installed in series with the common cathode resistor circuit of the modulator tubes. A "little fuse" recessed type fuse holder should be used mounted on the outer edge of the chassis between V7 and T3. The time required is that necessary to drill the hole, mount the fuse holder and hook up the cathode circuit. The fuse is then accessible from the rear under the cover. *4/1/50*

TIME DELAY RELAYS IN MODELS TDH AND TDO TRANSMITTERS

The Bureau's attention has been directed to the unsatisfactory operation of the time delay relay, circuit symbol designation K–114, installed in the models TDO and TDH transmitters. This relay is used to delay the application of plate voltage until the tube heaters have reached operating temperature, the normal time of delay being set at forty-five seconds.

It has been pointed out that the operation of these relays has been erratic, some remaining open, some closed, while the closing time of others would vary from five seconds to over a minute, regardless of adjustment.

Inasmuch as the models TDO and TDH transmitters are intended to be installed in remote, unattended locations, the failure of this relay makes it necessary in such cases to establish a watch in order to operate the relay manually. Some activities have solved the problem by the installation of thermal type or telechron operated relays.

In order that the Bureau may take the necessary action to replace those relays found defective, it is requested those activities having experienced this failure make the proper report on form NBS–383A, giving all necessary information.

●

MODEL TDH TRANSMITTER KEYING CONVERSIONS

The following is an excerpt from a Chollas Heights memo: "Operation of the TDH at Chollas Heights is such that use of the remote control unit is undesirable. Use at present is confined to telegraph only—starting, stopping and frequency changes accomplished by personnel at transmitter upon request—. Changes made are shown in accompanying schematic (Fig. 1);—"

Carrier control of the TCC–TDH equipments without the use of the remote control unit may be accomplished by the use of a 22.5-volt "B" battery in series with the local polarized keying relay, or, if a local relay is not used, by measuring the resistance of the control line loop and calculating the necessary grid voltage for an approximate five-milliampere load. The carrier may be used for either manual or automatic keying or push-to-talk radiotelephone.

It has been observed at various installations that the TCC–TDH transmitters are being fed

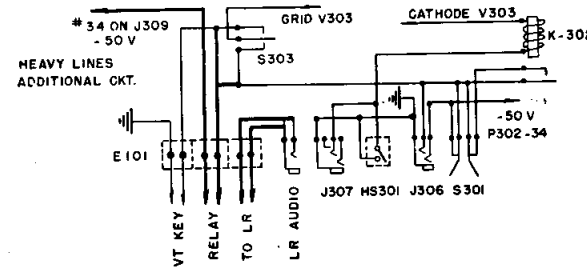

FIGURE 1.—Revised schematic of remote control unit.

directly into a non-resonant line antenna system without taking into account that one side of the system is at ground potential. The device explained below and shown in Figure 2 has been

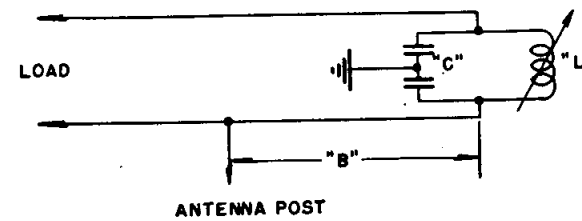

FIGURE 2.—Auxiliary antenna coupler.

used by radio electrician W. J. Breuer at several installations in the South Pacific.

To realize the full output and gain from directive types of resonant or aperiodic antennas used in conjunction with TCC and TDH transmitters, this auxiliary antenna coupler has been devised and used to great advantage in several installations. "C" may be .0005 mmfd., such as Navy type 48967 or 48968. "L" may be any coil wound with #10 wire or larger with provisions for tap variance, or rotating coil type. "B" may be any convenient length. Experience has shown an optimum point to be anywhere between ten and twenty feet. The pi-matching section of the transmitter will tune with better power transfer to the reflected loads between these points. Tapping directly to the antenna device is to be discouraged as the radiation resistance is normally too low to be matched by the pi-network.

If the range of the frequencies used is limited

to the 2- to 8-mc. range, the L/C circuit may be adjusted at a 4-mc. output frequency. Tune the transmitter to a 4-mc. output frequency and adjust "L" to the point where the current is the same in both feeders. If the transmitter is to be used through the full spectrum of operational frequencies, adjust the antenna device for a medium frequency such as 12 mc. The pi-matching section of the transmitter will "look into" the presented reflected load and the transmitter will then operate on any frequency without excessive mis-match. Once the antenna device is adjusted, no further attention is required. Any resonant (co-linear, lazy "H", extended or double Zepp) or aperiodic ("V" or rhombic) antenna may be fed in this manner.

●

FIELD REPORTS ON TUNING DIFFICULTIES OF THE MODEL TDH

Experience with the TDH master-oscillator auto-tune control has shown this unit to be extremely critical. The difficulties encountered when setting up the full eleven channels are proportionate to the skill of the operator in setting the control stops.

On the lower frequencies any slippage during the calibration of the stops other than the one being calibrated may be slight and the frequency tolerance will not be overstepped. But this slippage, however minute, will be multiplied in the process of doubling to the higher frequencies and the variation will be considerably greater.

To adjust the stops to a new frequency loosen the locknut just enough to allow movement of the cam stop. By setting the cams on a rough adjustment from the instruction book curves on the high side and then bringing them into the calibrated frequency with the stop bearing against the pawl less trouble will be encountered with slippage.

In tests run on six hundred dialing operations of eleven channels on a TDH, 579 operations or 96.5 percent reset within a frequency tolerance of .005 percent. For this test the transmitter was set up in the laboratory and was operated under more or less ideal conditions. Transmitters that are in operation in advance base locations can expect variance from these results due to failures caused by high humidity and salt-water corrosion.

Due to the constants of the circuits involved, it will be necessary to check each calibrated frequency upon redialing before turning the transmitter over to the control operator. Shortly after the initial installation of the transmitter, resetting faults should fall to a minimum and such close monitoring will not be required. The ideal setup for this equipment would be a micrometer assembly (TCT) for fine adjustment while using the auto-tune control for rough settings.

Weather changes have a marked effect on the power-amplifier loading. Day and night variations will overload the transmitter, causing the protective relays to trip and close the equipment down. Other antennas in close proximity to that of the TDH will also have a marked effect on the loading. It is suggested that the equipment be tuned to 100 milliamperes less than the maximum loading to afford a margin for these absorptions.

●

→ MODEL TDH–4 TRANSMITTER DISCREPANCIES

During the initial testing of a model TDH–4 transmitter, it was observed that the plate blocking condenser, symbol C–155, would arc over upon application of high power plate voltage for A–1, and on peaks when A–3 operation was used. These arc-overs were apparently due to parasitic oscillations causing C–155 to corona and short the plate supply to ground through coils, symbols L–123, L–125 and L–126.

Circuit investigation indicated discrepancies between figures 81 and 82 of the model TDH–4 instruction book.

(*a*) Parasitic damping resistor, symbol R–174, shunted across L–101 was shown on figure 81 but not on figure 82. Further investigation disclosed that this resistor was omitted in the transmitter.

(b) Choke, L–139, is shown between the plate of the power amplifier stabilizing tube V–116 and the power amplifier grids on figure 82 while on figure 81 the plate of the stabilizing tube and the grids of the power amplifier tubes

are directly connected. The transmitters were incorrectly wired, i. e., according to figure 81.

It is requested that all activities receiving model TDH–4 transmitters check the equipment for the above discrepancies. The spare parasitic damping resistor, R–174, contained in the spare parts, should be installed and the power amplifier grid parasitic suppressor choke, L–139 should be rewired and connected as shown on figure 82.

Figure 1 is a corrected diagram of the final amplifier showing the proper placement of components.

The Bureau has no information relative to the number of equipments shipped possessing the above discrepancies; however, it is probable that all instruction books contain the errors enumerated herein. Figure 81 should be corrected according to the accompanying diagram. *8/1/46*

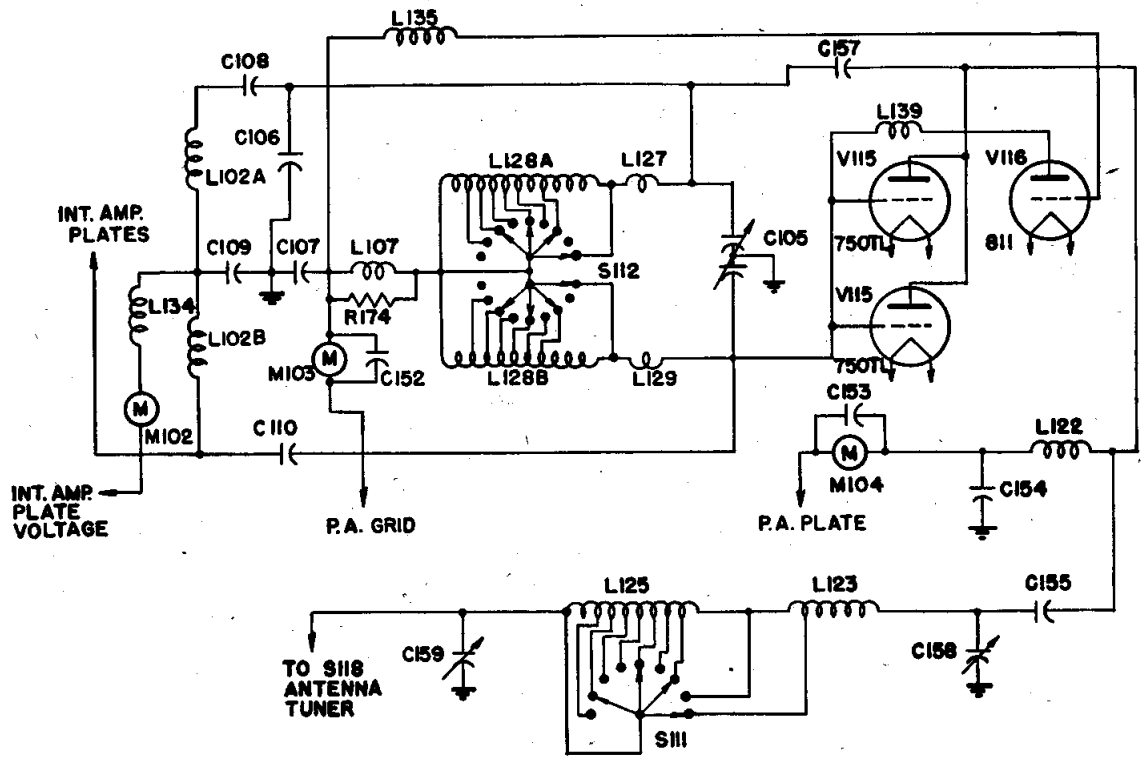

FIGURE 1.—Corrected wiring diagram of TDH–4 final amplifier.

COLLINS AUTOTUNE SYSTEMS IN TDH–3 RADIO EQUIPMENTS

The following is a service note sent to C. A. A. 2d Regional Office for inclusion in their manual of service notes, by Hugh P. Sherrill, Liaison Maintenance Officer:

MALFUNCTIONING OF THE COLLINS AUTOTONE SYSTEMS

The following information may be of value to those engineers and technicians on duty with the Navy or at overseas stations:

At several locations erratic operation of the Collins Autotune systems have occurred, which caused the autotune meter fuses to blow. At first this failure will be infrequent but will increase in frequency as time passes and unless corrected, will cause the equipment concerned to be useless for remote control or multi-channel work. This trouble is most prevalent with the type TDH–3 kw transmitters. The fuses blow when the phase is shifted to reverse the direction of rotation of the motor. The equivalent circuit is sketched on figure 1.

The contacts on K–103 were found burned badly and when changed the trouble cleared only to reappear a few months later. Condenser C–164 in each case was found to be in good condition, but just to be sure was changed. A closer analysis was made and it was noted that excessive sparking occurred at the contacts of K–103 when less than six (6) mfd capacitance was used from the contacts of this relay to ground. This sparking causes an eventual breakdown of the insulation between circuits on the movable arm of K–103 and occasionally the a-c supply will break across this poor insulation and short the two phases together, thereby blowing the fuses. Capaciter C–164 was paralleled with 4 mfd on each side and relay K–103 changed. This completely eliminated the trouble and on a new installation completed a few months ago this modification was made on C–164 and K–103 has remained in good condition and given good service. *8/1/46*

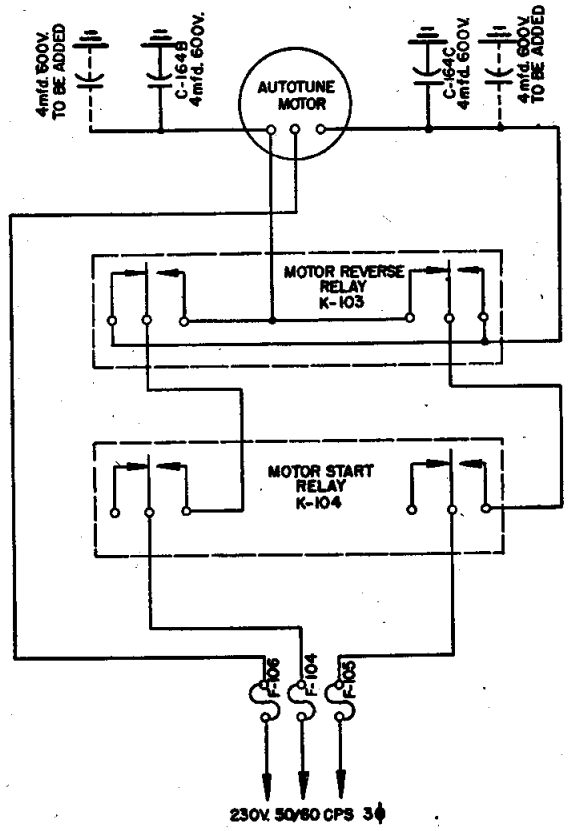

FIGURE 1.—Equivalent circuit of autotune system.

→MODIFICATION OF MODEL TDH TRANSMITTER FOR FREQUENCY SHIFT KEYING

The master oscillator circuit of the model TDH transmitter is designed for a frequency range of 1000 to 1510 kilocycles. When frequency shift keying is employed for these equipments, it becomes necessary to set the master oscillator frequency 200 kilocycles below the frequency normally employed with on-off keying. As a result, there are certain frequencies that cannot be obtained when frequency shift keying is employed.

In order to alleviate this condition, the Naval Radio Station, Annapolis, modified the model TDH transmitter at that activity to the extent of inserting an additional capacity of 0.0013 microfarads across the grid tuning inductors of the TDH oscillator assembly. This modification was made, using this value of capacity connected in parallel with the master oscillator grid tuning capacitor, through a toggle switch in order to connect or disconnect the additional capacity for frequency shift or on-off keying as desired. The frequency range of the master oscillator was found to be from 800 to 1210 kilocycles, with the additional capacity connected and from 1000 to 1510 kilocycles with the additional capacitor disconnected from the circuit. With this arrangement, any frequency within the range of the transmitter could be set up, using either frequency shift or on-off keying as desired.

Any activity experiencing similar difficulty with the model TDH series of equipments is authorized to make the above modification, making appropriate records of the modification in the instruction book of the equipment. *4/1/46* ←

REVERSING RELAY FAILURE

The Autotune Motor Reversing Relay, symbol K—103 of the model TDO and TDH transmitters has failed on several occasions. This failure is most easily identified by the fact that the Autotune Motor runs continuously and cannot be reversed. Failures of the above relay have usually been due to shorted turns, resulting in a total resistance of approximately 20 ohms. Normal resistance should be approximately 170 ohms. *6/1/47*

→ SHOCK-HAZARD ELIMINATION IN MODEL TDH RADIO TRANSMITTER

The District Communication Officer of the Eleventh Naval District, San Diego, Calif., in a conference held on 11 October 1948, pointed out that a dangerous situation exists in the model TDH radio transmitting equipment as a result of a field modification for RATT (Radio and Teletype) operation of the TDH transmitters.

The RATT coupler unit is so installed that when an operator or technician opens the access door to tune the coupler, his hand must pass within 3 inches of the 50-volt bias circuit which is not deenergized by the interlock on the access door. This voltage is required in order to adjust the oscillator and coupler unit.

The Collins Radio Co., manufacturer of Model TDH equipment, was contacted and "recommended that a strip of three-sixteenths bakelite approximately 6" wide and of a length equal to the front to back width of the chassis be bolted to the chassis lips at the front and back of the power amplifier chassis. The conditions hazardous to operating personnel would then be essentially eliminated and this would not have a detrimental effect on the ventilation of the transmitter."

All activities using the Model TDH equipment please note that such a hazard exists and initiate action to eliminate this dangerous condition. *1/1/50* ←

FREQUENCY METER CONNECTIONS FOR MODEL TDN EQUIPMENT INSTALLED IN THE MODEL MBK TRAILER

The patch board panel, type CFT–23472, as supplied with the TDN equipments, includes a voltage divider consisting of a 3000-ohm and a 10-ohm resistor which are normally connected in series across the output of each r-f oscillator type CFT–35059. Voltage for making frequency measurements is obtained by connecting a transmission line across the 10-ohm resistor and feeding it by means of this line to the frequency meter. In the MBK installation, con-

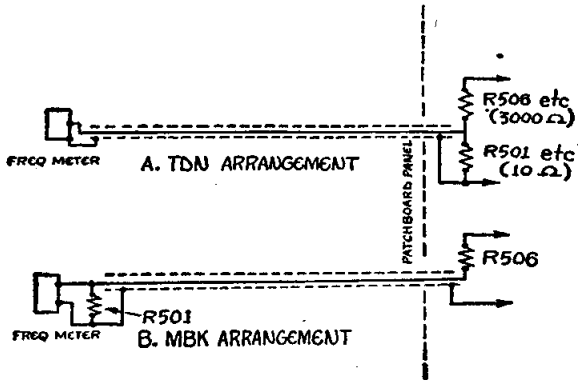

FIGURE 1.—Frequency meter connections for model TDN equipment installed in the model MBK trailer.

siderable cross-modulation resulted when this equipment was installed in the trailer.

It was found that the difficulty was eliminated by simply connecting the 10-ohm resistor across the receiving end, instead of the sending end of the transmission lines connecting the patch board panel to the frequency meter jacks. Consequently, the MBK trailers are wired in this manner. The change from the TDN to the MBK connection is shown in Figure 1.

●

MODEL TDN TRANSMITTER BLOWER MOTORS

The Bureau has received several failure reports of the blower motor, symbol B–1, a component of the model TDN–3 transmitter. Cause of failure apparently has been clogging of the ventilator screen in the rear of the motor. This has resulted in overheating and consequent shorting of the motor field coil.

It is requested that all activities possessing the model TDN series of equipments ascertain that the ventilator screen behind all blower motor units be cleaned regularly. Each model TDN has a sufficient number of spare blower motors enclosed in the spare parts kit. *6/1/47*

●

→RELOCATION OF OSCILLATOR CONTROL CONDENSER C–1

Model TDN equipments using crystal control require that the crystal oscillator circuits be retuned periodically due to change in ambient temperature, frequency adjustment and checking. The tuning adjustment for this transmitter is condenser C–1. It is accessible only by drawing the crystal oscillator compartment forward from the transmitter. When the oscillator compartment is reinserted, the flexible cables connected to it do not pass backward readily between the oscillator section and the transmitter frame opening. When this occurs, the cables jam and prevent closing the oscillator section. This necessitates withdrawal of an entire transmitter section to adjust the cables to provide for closing of the oscillator compartment. Safety requirements dictate that all transmitter sections, using the power supply providing power for the transmitter being adjusted, must be secured so that this cable may be properly placed.

The Bureau has authorized a modification to the Model TDN which eliminates the necessity for possible disabling of four (4) circuits when making frequency adjustment on one (1) transmitter section.

This modification consists of relocating the crystal oscillator control condenser C–1, to the inside of the oscillator compartment front panel as shown in Figure 1. This control is presently installed on the oscillator compartment deck. It is required that three (3) holes be drilled in the front panel as shown in Figure 2. The lead from the crystal socket to C–1 is threaded through a grommet inserted in the shaft hole of the original position of condenser C–1. A ground wire is then installed from C–1 to the crystal socket mounting screw.

This modification is to be made on an optional basis. No kits or parts are to be supplied, nor are any special tools required. *1/1/51*

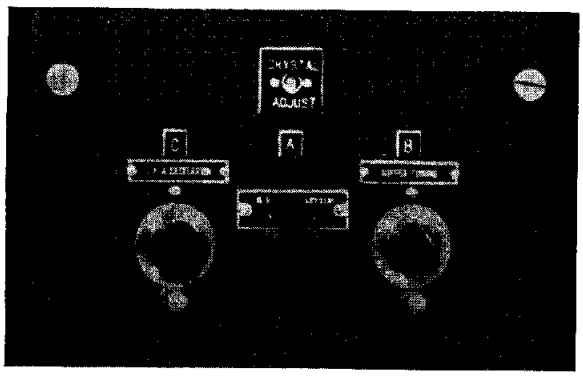

FIGURE 1.—Front panel of TDN equipment showing location of crystal adjust capacitor C–1.

NOTES

1. Drill 3 holes in panel for relocation of C–1.
2. Install insulated bushing in shaft hole of original position of C–1 for lead from crystal socket to C–1. Install ground wire direct from C–1 to crystal socket mounting screw.
3. For circuitry see NAVSHIPS 900, 709, FIG 2–44.

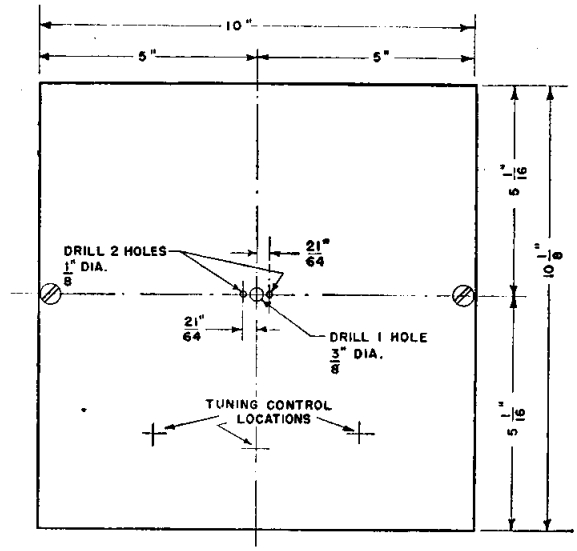

FIGURE 2.—Template for relocation of TDN capacitor C–1.

TIME DELAY RELAY IN MODEL TDO TRANSMITTERS

See the article entitled "Time Delay Relays in Models TDH and TDO Transmitters" on page TDH:1.

●

HEATER SPARES FOR MODEL TDO TRANSMITTERS

Heater spares for use with TDO transmitters on contract NXs–20834 will soon be available at Navy Yard Mare Island, Navy Yard New York and Navy Yard Pearl Harbor. These are ¾-amp. Slo-Blo fuses, part no. 264N427. Requests for these parts should be made direct to the Supply Officer for Radio of the activities indicated, referencing contract and part numbers.

●

→ REVERSING RELAY FAILURE

See the article entitled "Reversing Relay Failure" on page TDH:5. *6/1/47* ←

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→CORRECTION TO INSTRUCTION BOOK FOR MODEL TDP–1 LORAN TRANSMITTING EQUIPMENT, NAVSHIPS 900, 263–A

In the model TDP–1 instruction manual, NAVSHIPS 900, 263–A text matter and a table (Table 2–3) are given referring to admissible lengths of the RG–8/U coaxial cable which runs from the transmission line ammeters (M–402 or M–403) in the transmitter to those (M–901 or M–903) in the coupling unit. The material is in the right-hand column of page 2–4 under paragraph 7 ("External Connections") of Section II, and should be corrected in accordance with the following:

The length of this cable is critical and should not be a multiple of a quarter-wavelength at the frequency used, as there may be an accidental mismatch of impedance present. Such a mismatch would tend to accentuate standing wave effects and consequently reduce operating efficiency. It must be remembered that this mismatch condition is possible even though an impedance-measuring device is used in making the initial adjustments.

The safest solution to this problem is to cut the cable to an odd number of one-eighth wavelengths; it will be satisfactory, however, if multiples of quarter-wavelengths are avoided by a reasonable margin. The following table, compiled to cover practically all types of installations, gives cable lengths which avoid multiples of quarter-wavelengths by plus or minus 10 feet. That is to say, if the cable lengths lie within the ranges shown in the table, the difficulty occuring at multiples of a quarter-wavelength will be safely avoided.

TABLE 2–3.—*Ranges in Feet within which RG–8/U transmission line cable should Lie for three operating frequencies.*

1950 KC	1850 KC	1750 KC
0–73	0–78	0–83
93–157	98–166	103–176
177–240	186–253	196–268
260–323	273–341	288–361
343–406	361–429	381–454
426–490	449–517	474–547
510–573		

As it is practically impossible in many cases to plan an installation wherein the distance between the transmitter and coupling unit will be equal to any one of the prescribed lengths given in the table, it will be necessary to cut the cable to a longer length as shown in the table, and coil up the excess near the transmitter end of the line. *10/1/47* ←

CRYSTAL FAILURES IN MODEL TDQ SERIES EQUIPMENTS

See the article entitled "Crystal Failures in Models RCK and TDQ Series Equipments" on page RCK : 1.

●

LENGTH OF TDQ ANTENNA TRANSMISSION LINE

Paragraph 4.16 (a) of the pre-preliminary instruction book covering the model TDQ transmitting equipment specifies that the antenna should *not* be more than 100 feet from the transmitter unit. This limitation in length of transmission line is not intended to be restrictive to the extent of causing improper installations or preventing installations of the equipments in certain types of vessels.

The 100-foot limitation may be exceeded where necessary to accomplish the most efficient installation, from the standpoint of location of units; but the over-all cable length, in any case, shall be held to the absolute minimum, consistent with the above. As is true for all such transmission lines, the efficiency decreases considerably as the length of the line increases.

One hundred feet of type RG–10/U or CASSF–50–1A transmission line cable is furnished with each equipment; however, this length of cable may be turned into stock and a longer length substituted where required. Splices in this class of cable are difficult and should be resorted to only in cases of necessity. In such cases, the splice shall be in strict accordance with instructions contained in Splicing Instructions RA 62A 299.

●

FAILURE OF MODEL TDQ TRANSMITTERS

The post-graduate school, U. S. Naval Academy, Annapolis, has reported to the Bureau two defects in the construction of the model TDQ transmitter. This activity has found that the output coupling loop L–105 occasionally shorts to the power-amplifier tank inductance L–104 when the system is adjusted for maximum coupling. They have also found that the control grid lead of the second tripler tube V–103 sometimes shorts to the metal shield.

Other maintenance activities encountering these difficulties are requested to so advise the Bureau in order that they may be brought to the contractor's attention and eliminated.

●

FAILURE OF MODEL TDQ ANTENNA CONNECTORS

The Bureau has received several failure reports from ships concerning failure of the type 66095 antenna assembly for the model TDQ equipment, the failure being due to the collecting of water in the antenna and coaxial connectors.

This trouble is not due to defective design in the equipment, but to poor workmanship or improper installation of the antenna assembly and connectors.

Ships are urged to check their TDQ antennas for this condition and, if found, to effect repairs at once. Collection of water in antenna systems may be detected by "megger" or insulation resistance tests on the connecting cables supplemented by actual inspection. Special attention should be paid to antenna insulation resistance measurement during the routine check-up, as this will detect the subsequent collection of moisture.

●

DAMAGING THE KEYING RELAYS OF MODEL TDQ EQUIPMENTS

The U. S. S. *Alaska* (CB–1) has pointed out that there is very little clearance between the m-c-w keying relay K–201 and the mounting rack, and that if the modulator chassis is not carefully removed from the frame the relay will catch in the rack and be bent.

This matter should be brought to the attention of all maintenance personnel in order that the relay may not be inadvertently damaged when removing the modulator chassis from the frame.

●

CONTROL CIRCUITS FOR THE MODEL TDQ TRANSMITTER

The transmitter control circuit diagram (Fig. 1) which follows was prepared by the staff of the Radio Material School, Naval Research Laboratory. It is a simplified schematic diagram of the starting, stopping, and keying circuits for the model TDQ transmitter.

It is not intended for this to be a complete schematic diagram of the entire equipment, but it is believed that it will be a help toward the understanding and servicing of the control circuits of these transmitters.

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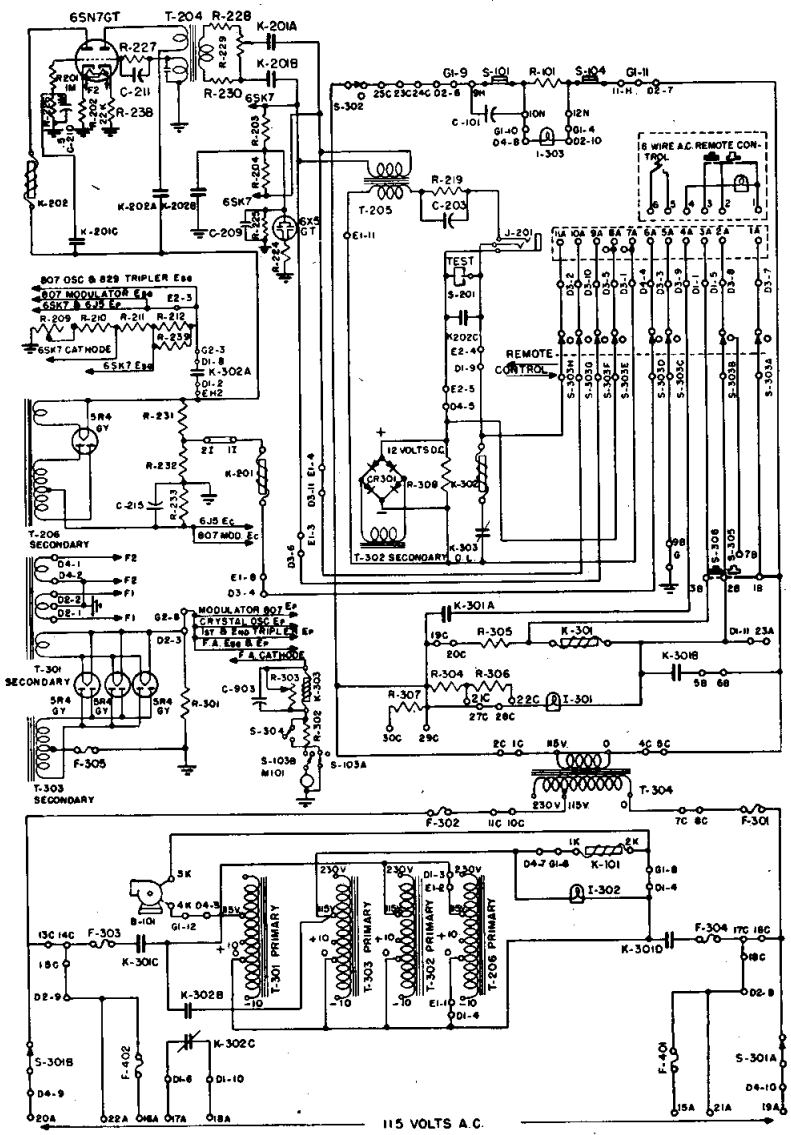

UNIT	CONNECTORS	TER'M'L' BD.	SYMBOL
R.F. CHASSIS	G1 & G2	H & K	0-199
MOD. CHASSIS	E1 & E2	I	200-299
POWER SUPPLY	D1, D2, D3, & D4	B & C	300-399
CABINET (BOTTOM)		A	400-499

FIGURE 1.—Control circuits for model TDQ transmitters.

→ TDQ RADIO EQUIPMENTS FIELD CHANGE NO. 1

OVERLOAD RELAY K-303 CHANGE (NO KIT)

Equipments affected.—All model TDQ radio transmitting equipments.

Purpose.—To prevent the bending of the reset catch spring.

Procedure.—Elongate the mounting holes in the bakelite base of the high-voltage overload relay with a small rat tail file. Position the relay so that maximum travel of the push button is just sufficient to latch the relay without bending the latch spring.

General.—On many of the TDQ equipments it may be possible to push the high-voltage overload reset button in far enough to cause a permanent bending of the reset catch spring. When this occurs the relay cannot be reset. This alteration will make it possible to latch the relay without bending the latch spring.

This change is particularly applicable to stock spares for TDQ equipments with serials below #2100, but all vessels and activities should check their equipments at the earliest opportunity and accomplish this change if it is necessary. This change is within the scope of the ship's force.

A record of completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this change should be reported on the NBS 383 card. *3/1/46*

●

TDQ RADIO EQUIPMENTS FIELD CHANGE NO. 2

MODEL TDQ TRANSMISSION LINE FILTER TYPE CRV-53232

Equipments affected.—Model TDQ radio transmitters, serial #1 through #2881.

Purpose.—To reduce the magnitude of the harmonics radiated by the antenna system of the TDQ transmitter.

Procedure.—Due to the harmonics radiated by the antenna system of the model TDQ transmitter, a low-pass filter has been designed to reduce the magnitude of these harmonics. The unwanted harmonics may interfere with other types of equipments on the same ship or on nearby ships. This filter is not useful in reducing unwanted harmonics radiated from the model TDQ transmitter frame or power wiring. The transmission line filter is a three pi-section, lowpass type, for attenuation of frequencies above 171 mc., and has a characteristic impedance of about 50 ohms.

The filter and associated male cable connector replace the existing cable connector between the antenna switch and the outlet chassis fitting. This is shown in Figures 1 and 2.

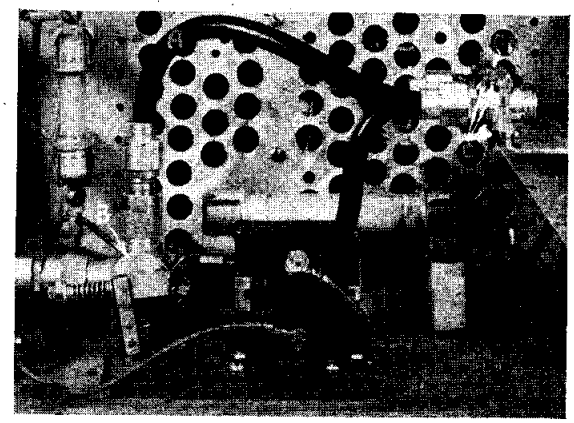

FIGURE 1.—Model TDQ before installation of transmission line filter.

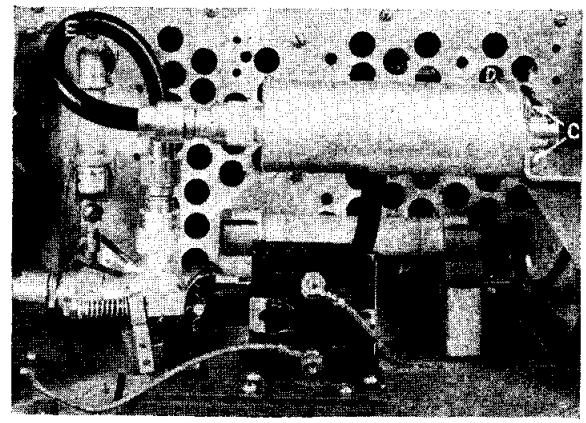

FIGURE 2.—Model TDQ with the transmission line filter installed.

The procedure for mounting is as follows (letters refer to lettering on the figures):

(1) Remove r-f unit from transmitter case. Disconnect cable A from antenna switch B. Remove four screws C and lock washers holding

chassis fitting. Store cable A for possible future use.

(2) With a no. 27 drill, ream out the four tapped holes in bracket D where the screws C were secured.

(3) Remove burrs and any corrosion products from bracket in order to provide a good electrical contact. Secure the filter to the bracket with the four 4–40 machine screws C and lock washers previously removed.

(4) Connect the cable E, provided with the filter, between the antenna switch B and the input to the filter.

The installation of the filter may require a slight readjustment of the p-a tank tuning control and the antenna loading control. The p-a tank control should be tuned to an exact "dip" in the reading of the p-a plate milliammeter because a slight mis-tuning will increase the unwanted harmonic output of the transmitter.

General.—The use of the filter changes no provisions given in the "Instruction Book for the Model TDQ Equipment" regarding steps to be taken to obtain proper tuning and loading adjustments.

Because of the delicate construction of the model TDQ filter no component spare parts are provided. Consequently, if a filter unit should fail, it should be replaced by a new unit.

The filter units were procured under contract NXss–29644 and should be installed on the first 2881 model TDQ transmitters. Vessels should contact an Electronics Officer at the earliest opportunity for the installation of this filter. A record of completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this change should be reported on the NBS 383 card. *3/1/46*

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TDQ RADIO EQUIPMENTS FIELD CHANGE NO. 3

CAUTION NAMEPLATES FOR TDQ TRANSMITTER

Equipments affected.—All model TDQ transmitters.

Purpose.—To aid in eliminating trouble when the transmitter r-f section is removed without first removing the antenna connection.

Procedure.—Remove the G ANTENNA COUPLING and F PA TUNING existing nameplates. Install the new nameplate using the same mounting holes. Figure 1 illustrates the design of the new nameplate.

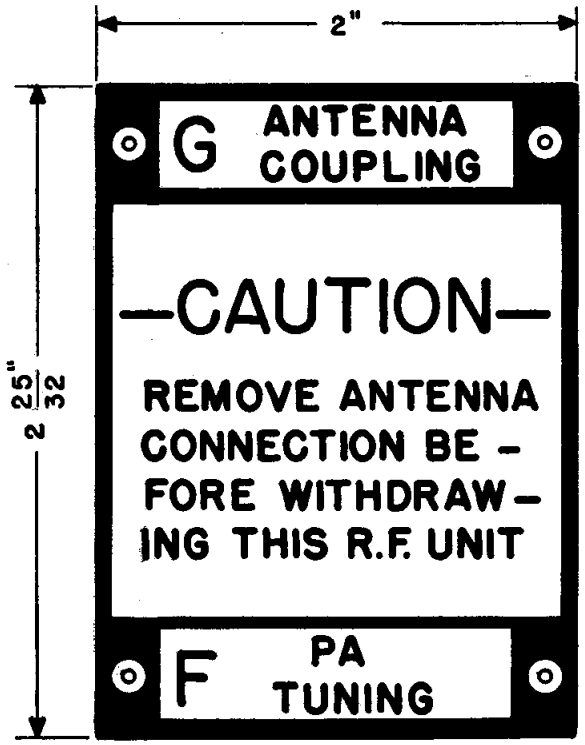

FIGURE 1.—New CAUTION nameplate for model TDQ transmitters.

General.—A quantity of 4,080 nameplates is under procurement on contract N5sr–14265P. The nameplates will be available shortly at supply activities.

Vessels should contact an Electronics Officer at an early opportunity and obtain a nameplate. The change is within the scope of the ship's force. A record of completion of this change should be made on the ship's "Radio Equipment Log", NAVSHIPS 900,039. Completion of this change should be reported on the NBS 383 form. *3/1/46* ←

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CAUTION NAMEPLATES FOR MODEL TDQ TRANSMITTER

Quantities of caution nameplates for model TDQ transmitters, field change no. 3, contract N5sr–14265P (refer RJB 160), have been shipped to supply activities as follows:

Quantity	Invoice No.	Destination
200	590944	Electronics Supply Officer, Norfolk Naval Shipyard, Portsmouth, Va.
200	590957	Supply Officer, Naval Supply Depot, Electronics Control Branch, Bayonne, N. J.
200	590960	Electronics Supply Officer, Boston Naval Shipyard, Boston, Mass.
200	590958	Electronics Supply Officer, Charleston Naval Shipyard, Charleston, S. C.
200	590959	Electronics Supply Officer, Philadelphia Naval Shipyard, Philadelphia, Pa.
200	591056	Supply Officer, Naval Supply Depot, Electronics Control Center, Electronics Supply Branch, Bayonne, N. J.
1,000	591071	Electronics Supply Officer, Naval Supply Depot, Mechanicsburg, Pa.
200	591059	Electronics Supply Officer, Naval Shipyard, Terminal Island, Calif.
200	591058	Electronics Supply Officer, Mare Island Naval Shipyard, Mare Island, Calif.
200	591057	Electronics Supply Officer, Puget Sound Naval Shipyard, Bremerton, Wash.
200	591060	Electronics Supply Officer, Naval Supply Depot, Electronics Supply Branch, Oakland, Calif.
6	591070	Supply Officer, Naval Research Laboratory, Anacostia, Washington, D. C.

Additional kits of the caution nameplates will be supplied as they become available. Electronics officers should ascertain that all model TDQ transmitters in their jurisdiction are provided with the nameplates. *10/1/46*

ANTENNA FAILURES IN MODEL TDQ V–H–F RADIO TRANSMITTING EQUIPMENT

Several reports have been received by the Bureau recently concerning failure of the Type 66095 antenna as used with the Model TDQ equipment. Many of the reports state that the mounting-gaskets deteriorate over a period of time, allowing moisture to enter the housing and thereby grounding the antenna. Investigation reveals that these faults can be attributed either to poor installation or to loosening of the bolts by vibration.

As to the former cause, installing activities are cautioned to install the gaskets and insulators properly and to make sure that the bolts are drawn up tight. Glyptol should be applied to the bolts to aid in preventing them from becoming loose.

Vibration is the cause of the majority of failures. It is therefore necessary that the Type 66095 antennas be inspected for low resistance and grounds more frequently than is done in routine maintenance procedure. It is recommended that the arrays be disassembled and inspected when low-strength radiation and reception are experienced. Failures of this type cannot be determined by visual inspection alone. After inspection and cleaning, the arrays should be reassembled. New gaskets should be used and care should be taken that the gaskets and insulators are installed properly and that the bolts are drawn up tight. Glyptol should again be applied to the bolts in each instance to insure against loosening due to vibration.

To illustrate the importance of close inspection and proper maintenance, a number of cases have occurred where requests were made that the antenna be relocated. Investigation disclosed that the antenna had a ground or short. After the antennas were repaired, the efficiency was brought up to such a degree that the need for relocation was unnecessary.

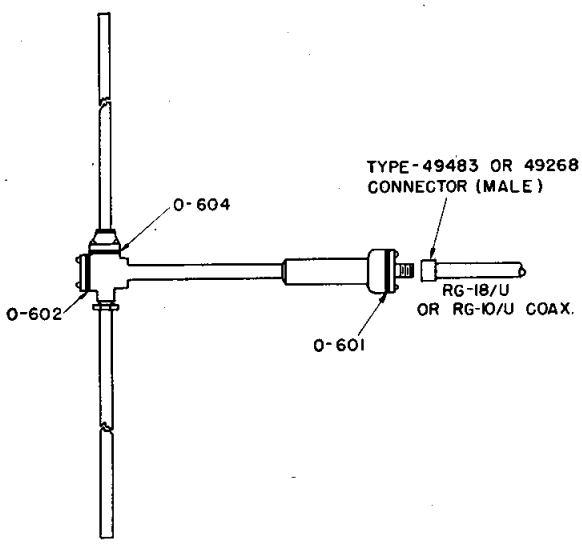

FIGURE 1.—Location of TDQ gaskets to be checked on antenna.

The gaskets are carried as part of the equipment, tender, and stock spares. Figure 1 is an illustration of the antenna, and shows the gaskets, 0–601, 0–603 and 0–604, that should be checked. *7/1/48*

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CRYSTAL FAILURES IN MODEL TDQ RADIO RECEIVING EQUIPMENTS

See item on page RCK: 5 entitled "Crystal Failures in Models RCK and TDQ Radio Equipments." *4/1/49*

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→ ADAPTING MODELS TDQ AND RCK FOR CCL SERVICE AT SHORE STATIONS

The following field changes are recommended in order to relieve the shortage of the TDG–1 and RBQ–1 transmitter and receiver which are presently utilized with the Model UN (Western Electric Type 42–A–1) Carrier Control System and also in order to fully utilize the capabilities of the Army Type CF–1 four-channel telephone terminal when utilized alone or when the Type CF–1 terminal is utilized with the Navy Model UF Carrier Telegraph Equipment.

To obtain best use of the Army Type CF–1 telephone terminal the u-h-f transmitter and receiver should have a flat frequency response up to 12 kc. The unmodified TDQ transmitter is down about 16 db at 10 kc and the unmodified RCK receiver is down about 8 db at 10 kc when band switch is set to "wide."

In their present form the Models TDQ/RCK combination will permit use only of channels one and two of the four channels of the Type CF–1 terminal.

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MODEL TDQ RADIO EQUIPMENT FIELD CHANGE NO. 4

PROVIDE EXTENDED AUDIO RANGE FOR COMMUNICATION CONTROL LINK SERVICE

Equipments affected.—Any Model TDQ transmitter when used in communication control link service, provided increased audio bandwidth is required.

Purpose.—The following field change is to be made in the Model TDQ transmitter to improve its audio characteristics to about 12 kc.

Time required.—One man-hour.

Material required.—No special tools, equipment, or wiring are required.

Procedure.—Remove capacitors C–216, C–217, C–218 from the circuit.

NOTE.—These capacitors should not be physically removed from equipment since reconversion may be desired at some future date if the transmitter is used for other general service purposes.

General.—All references to capacitors C–216, C–217, and C–218 should be deleted from the Model TDQ transmitter instruction book.

Capacitors C–216, C–217, and C–218 should be removed from all wiring diagrams of the Model TDQ transmitter instruction book.

All TDQ transmitters on which the above detailed modifications have been made shall be redesignated Model TDQ-a. This change should be made in the instruction books and on the nameplates, preferably by steel stamping or engraving, of all affected equipments. Inventories are to be changed accordingly.

When changes are completed, the Bureau is to be advised of such action with the serial numbers of the affected equipment and any operational results when available.

The above redesignation is to be made on modified transmitters as presently authorized by the Bureau, previous to issue of this field change.

These changes will provide a response for the Model TDQ transmitter down about 2 db at 12 kc.

Unless specifically directed by the Bureau, the change is optional and is to be made at the discretion of the Electronics Officer.

Routine.—When a field change has been completed, the responsible technician should make sure that the person completing the field change follows the routine given below:

1—Fills out NavShips 383 to give installation data and mails it to the Bureau.

2—Records the field change on the "Record of Field Changes" NavShips 537. *7/1/49*

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→ TOOL FOR CONTACT ALIGNMENT

A beneficial suggestion submitted by Ellis C. Harder and Verne C. Harris of the Mare Island Naval Shipyard makes provisions for aligning the spring contacts in the rear drawer connectors of the TDQ transmitter. By use of this contact alignment tool the porcelain connector may be assembled in much less time than normally required to align these twelve (12) contacts and insert them into the top half of the porcelain connector.

The tool is composed of two pieces of 1/16" sheet-brass formed as shown in Figure 1. The two comb-like pieces are inserted from adjacent sides of the contact assembly as shown in Figure 2. This compresses and aligns the spring contacts which allows the top half of the contact assembly to be easily placed in position. The tool is then withdrawn and the connector secured to the chassis in the required manner.

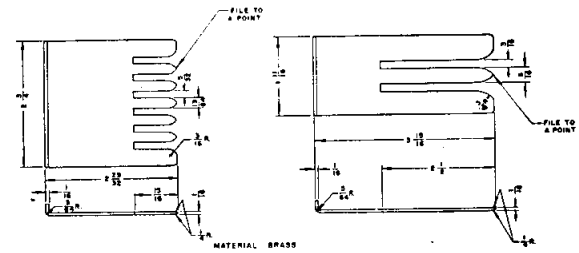

FIGURE 1.—TDQ contact alignment tool.

The tool can be made by station personnel from scrap pieces of brass. *1/1 51* ←

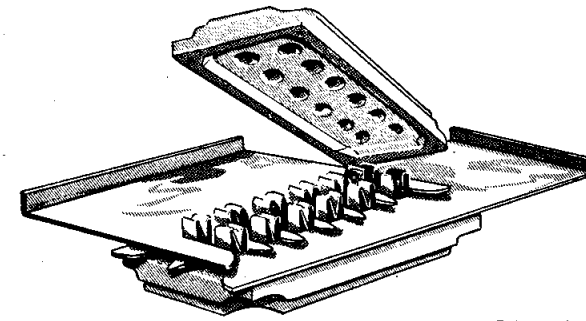

FIGURE 2.—Illustration showing the use of the TDQ contact alignment tools.

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MODEL TDQ SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
No ventilation from blower.	Check clamp around canvas blower boot where boot joins ventilation tube. This clamp works loose. Canvas tube may be seized in place.—U. S. S. *Chester* (CA–27).
Unable to load plate current any higher than 100 milliamperes.	The coaxial transmission line was found to be broken. Upon repairing transmission line, transmitter operated normally.—U. S. S. *Callaway.*
TDQ.—Line fuse blew when START button was pressed.	Investigation showed signs of T–206 overheating as evidenced by smell of hot pitch and leakage of pitch out of corners of transformer case. Disconnected T–206 and checked all circuits connected to it. All O. K. Next checked windings of T–206. Found primary had resistance of 2 ohms instead of 7.2 ohms.—U. S. S. *Mission Bay* (CVE–59). *Bureau comment: Other ships having this difficulty are requested to supply the Bureau with details as there is some evidence that this might be due to settling of the transformer in its case and shorting out the windings. If so, replacements under the guarantee can be secured.*
TDQ.—Intermittent and erratic operation of the crystal oscillator.	Found braided wire connecting the crystal plate and the crystal holder had become frayed so that only one or two strands were still connected. Replaced wire to effect a cure.—U. S. S. *Alaska* (CB–1).
Short-circuit between tank coil and coupling link, thus grounding the d.-c. supply.	Eliminated future similar trouble by covering the tank lines with spaghetti in the vicinity of the coupling link.—U. S. S. *Alaska* (CB–1).
Unable to key the transmitter from either local or remote positions.	Visual inspection showed that the tube retainer ring for V–104 had worked loose due to shock and vibration and had fallen onto the tube in such a way as to short-circuit it. This opened the main fuse F–303 to the high voltage power supply, thus putting the transmitter out of operation. Repaired the trouble by replacing the tube retainer ring and securing it in position.—U. S. S. *Preston* (DD–793).

TUNING PROCEDURE FOR MODEL TDT EQUIPMENTS

Due to the fact that minimum plate current and maximum output do not occur when loading this transmitter, the following procedure should be used to load the type 704A antenna to this transmitter:

(1) Turn antenna coupling link in as nearly a vertical position as possible, and turn antenna tuning condenser to maximum capacity.

(2) Tune transmitter in usual manner for resonance.

(3) Tune antenna tuning condenser to maximum load. If necessary, move link closer to final tank coil for proper loading. Do not change setting of final tuning after it has been tuned to resonance without load.

(4) Recheck all tuning adjustments but the final for maximum output.

—Manufacturer

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→ TDT RADIO EQUIPMENTS FIELD CHANGE NO. 1

ADDITION OF A SEND-RECEIVE RELAY (NO KIT)

Equipments affected.—All model TDT series transmitting equipments.

Purpose.—To incorporate a send-receive relay.

Material required.—

One relay, Meissner type no. 28–1004, 100 volts AC.

One resistor, 75-ohm, 20-watt.

One metal box 3″ x 4″ x 6″ with a front panel of bakelite 3″ high and 6″ wide.

One pin plug.

One pin jack.

2 sets of Amphenol coaxial fittings (original antenna connections).

Coaxial cable, 50-ohm, solid dielectric, 12 inches long.

Wire, connection, short lengths.

Procedure.—Connections should be made as shown in Figure 1, as follows:

(1) Insert a 75-ohm 20-watt resistor in the circuit from SRR to ground.

(2) Construct a metal box 3″ x 4″ x 6″ with a front panel of bakelite. The box houses the Meissner 28–1004 antenna change-over relay. On the panel are mounted two terminals for coaxial cable—one for the receiver line and one for the antenna lead-in.

(3) Remove the original antenna fittings from the cover of the model TDT transmitter and substitute a length of 50-ohm solid dielectric cable to connect the output of the transmitter to the antenna relay as shown in Figure 1.

(4) Mount the entire assembly consisting of the box with the relay and terminals on top of the transmitter, on the left side, immediately over the coaxial cable fitting.

(5) Connect the receiver to be used to the receiver terminal on the bakelite panel.

General.—After this change has been made, the antenna can be switched from the RECEIVE position to the TRANSMIT position by depressing the push-to-talk switch or the key.

Activities should contact an Electronics Officer for parts required in making this change. The addition of the send-receive relay is within the scope of the activity's personnel.

Instruction books, parts lists, and schematic diagrams should be changed accordingly. A record of the completion of this change should be made on the "Radio Equipment Log." Completion of this change should be reported on the NBS–383 card. *4/1/46*

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TDT RADIO EQUIPMENTS FIELD CHANGE NO. 2

REDUCING VOLTAGE SURGES ON RECTIFIER TUBES (NO KIT)

Equipments affected.—Model TDT transmitting equipments, serial numbers 1 to 30 inclusive.

Purpose.—To reduce the voltage surges on the rectifier tubes.

Procedure.—Equipments with serial numbers 1 to 10 inclusive: Connect a 10-watt, 20,000-ohm resistor across the terminals of input choke X–1. Equipments with serial numbers 1 to 30 inclusive: Disconnect wire #36 from C–24; Splice an additional length of wire to wire #36 and connect it to the terminal of X–4 that carries wire #20.

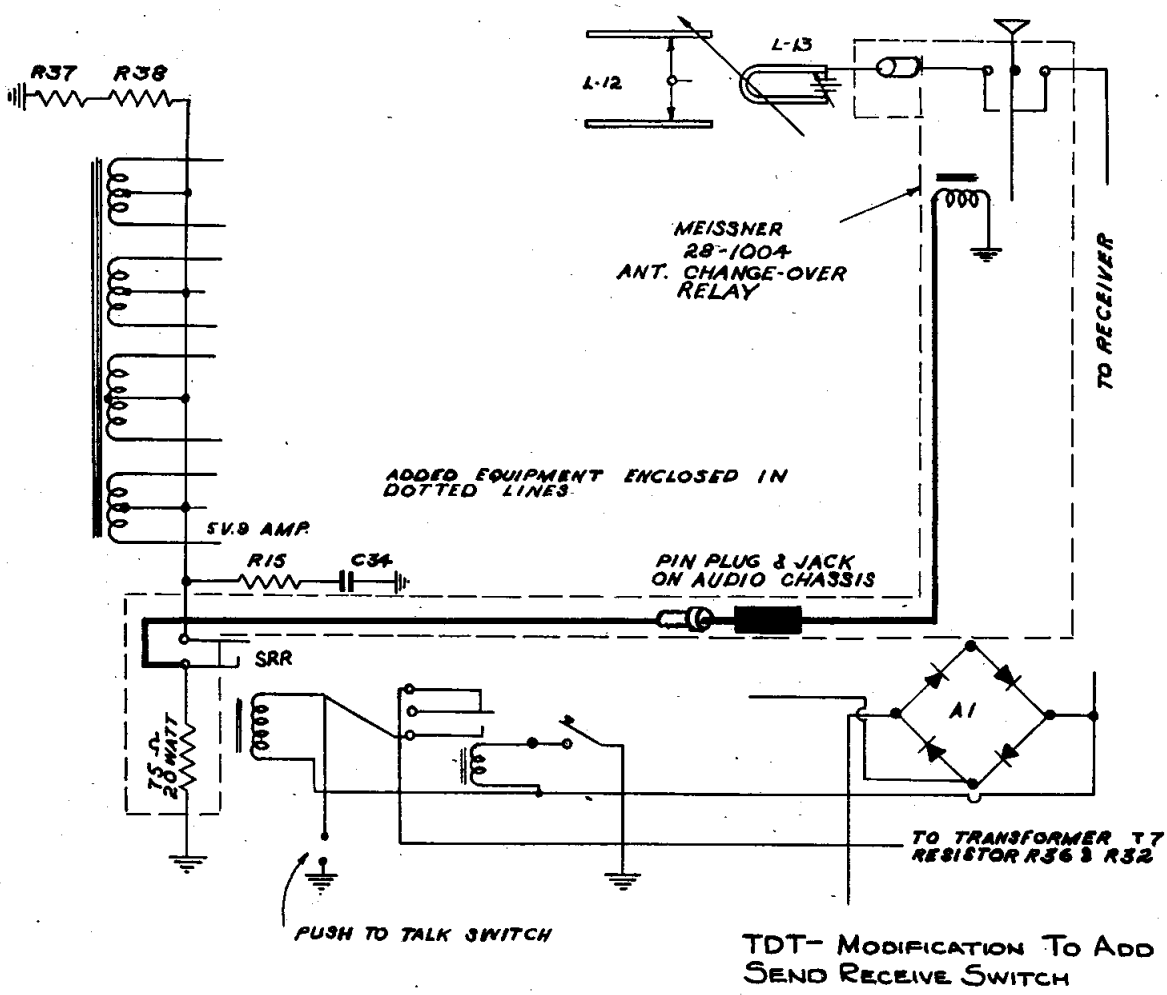

FIGURE 1.—Addition of a send-receive relay.

General.—In making this change, the bottom plate of the transmitter has to be removed. To do this, lay the transmitter on either side and remove the mounting screws. The rubber shock mounts from the bottom plate do not have to be removed.

This change, using available material, is within the scope of the activity's personnel and should be accomplished at the earliest opportunity.

The instruction book, parts lists, schematic and wiring diagrams should be changed accordingly. A record of completion of this change should be made on the "Radio Equipment Log". The completion of this change should be reported on the NBS–383 card. *4/1/46*

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TDT RADIO EQUIPMENTS FIELD CHANGE NO. 3

REPLACEMENT OF RESISTORS R–10, R–11, AND R–13 (NO KIT)

Equipments affected: Model TDT transmitters.

Purpose.—To replace failing resistors R–10, R–11, and R–13.

Procedure.—Replace failing resistors with Navy type resistors as follows:

63088F (8000 ohms, 40 watts) for R–10
63029F (10000 ohms, 50 watts) for R–11
63154F (10000 ohms, 90 watts) for R–13

General.—Failure reports have been received in the Bureau showing an excessive number of failures of resistors R–10, R–11, and R–13 in the model TDT transmitter. These failures have been found to have occurred during the normal operation of the equipment, and in some cases, upon test, the resistors were found to be defective.

Activities should contact an Electronics Officer at the earliest opportunity for the new resistors. The change is within the scope of the activity's personnel. A record of this replacement should be made on the "Radio Equipment Log". Completion of this replacement should be made on the NBS–383 card. *4/1/46*

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TDT RADIO EQUIPMENTS FIELD CHANGE NO. 4

INSTALLATION OF BLOWER MOTOR REACTOR (NO KIT)

Equipments affected.—Model TDT transmitting equipments.

Purpose.—To reduce the input voltage of the Wagner Electric type TM–Fr43R blower motor to 80 volts in order to reduce the temperature rise to safe limits.

Procedure.—Insert a 50-ohm reactor in series with the TM–Fr43R blower motor.

General.—Reactors are to be installed in sets originally shipped without reactors. Sets which incorporate the later-designed motor do not require the reactor.

Naval activities should examine their equipments at the earliest opportunity and should contact an Electronics Officer for the reactor if it is found necessary to accomplish this change.

The installation of this reactor is within the scope of the activity's personnel. Instructions for the installation have been supplied with the reactors.

The instruction book, parts lists, and schematic diagrams should be changed accordingly. A record of the completion of this change should be made on the "Radio Equipment Log." Completion of this change should be reported on the NBS–383 card. *4/1/46* ←

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MAINTENANCE NOTES FOR THE MODEL TDU EQUIPMENTS

The Radio Material Officer, Navy no. 116, recently reported several arc-overs of the model TDU transmitter installed in that area. These arc-overs were found to be in the second amplifier plate tuning capacitor, symbol 3C32. The arc-overs were apparently started by small insects a number of which were found lodged between the plates of the capacitor.

The replacement capacitor was fitted with a sealed Plexiglass housing before installation in the transmitter, and no more arc-overs were experienced.

Where there is a possibility of similarly caused failures, it has been suggested that the plate tuning capacitor of all model TDU equipments be equipped with a Plexiglass housing similar to the above.

The Radio Material Officer also mentions the following relative to operation of the TDU:

"Recently the TDU has been operated with on-off keying at high power, instead of frequency-shift keying at low power. Trouble is being experienced with overheating of the power-amplifier keying filter reactor (2L4). Since this is the second occurrence of this trouble (the spare having been previously installed) investigation of cause and remedy is under way. Tests showed the presence of fairly large r-f current in the bus connections of 2L4, and also keying transients across 2L4, of the order of 250 volts when keying approximately 1.8 amperes through the reactor with 4000 volts on the power-amplifier plates. While the transients have not been measured with the power-amplifier operating at 7000 volts, they should be somewhat over 400 volts, since the plate current is approximately 3.1 amperes. A .001-mfd. bypass to ground has been temporarily installed in the filter rack, at the point of connection of the power-amplifier plate feed cable. After the installation of this bypass there was no more indication of r-f, the keying transients across this reactor were greatly reduced and the temperature of the choke was much cooler."

It is likewise suggested that in cases of similar heating of the keying filter reactor (2L4), that a .001-mfd. bypass to ground be installed at the point of connection of the power-amplifier plate feed cable.

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REMOVAL OF THE MODEL TDYa/1a RECEIVING ANTENNA CRP66ALK

It has been adjudicated feasible to delete the receiving antenna of the model TDYa/1a transmitting modification kit. The change is based on the fact that the high frequency antenna of the model DBM–1 direction finder equipment and present high frequency receiver antenna obtain for the RADCM system similar functions more efficiently.

Consequently, in the event this installation is contemplated with a primary receiving device such as the model DBM–1 series equipment, and the receiving antenna, type CRP–66ALK is not to be used, the modification outlined below must be made. This change will permit automatic operation of the waveguide switch by removing the cam and microswitch assembly from the receiving antenna, and installing it in one of the CRP–66AKG transmitting antennas.

Reworking Procedure

Basically, the change entails interchanging of the reflector drive assemblies in the receiving antenna and in one transmitting antenna. To do this, it is necessary to completely disassemble the two antennas. The procedure follows.

(a) Uncrate or dismount the receiving antenna and one transmitting antenna, and place them on the deck for reworking.

(b) On the CRP–66ALK antenna (receiving) remove the turret assembly by removing all of the cap screws around the base of the antenna. Tilt the turret assembly and remove the nut holding the reflector in place. Remove reflector.

(c) Remove the top access cover plate. Disconnect the synchro cabling at the terminal strip. Remove the 5/16 bolts that anchor the reflector drive assembly to the upper wheel casting. At the terminal strip cut the microswitch cable at terminals 164, 165, and 166, then carefully lift the reflector drive assembly out of the turret assembly.

(d) On the CRP–66AKG transmitting antenna, open the external cabling access door and disconnect the monitor leads 59 and 60 from terminal strip E–302. Remove the E–301 and E–302 terminal strips from their mounting brackets by loosening the captive screws. Remove all of the cap screws around the base of the antenna and carefully separate the turret assembly from the pedestal.

(e) Tilt the turret and by working inside the turret, remove the reflector by taking off the nut on the end of the shaft.

(f) Remove the access plate at the top and disconnect the synchro cables from the upper terminal strip. Remove the eight 5/16 bolts that anchor the reflector drive assembly to the upper wheel casting and carefully lift out the reflector drive assembly from the turret assembly.

(g) Install the reflector drive assembly (removed in the previous step) in the CRP–66ALK receiving antenna. Replace the 5/16 bolts and secure. Reconnect the synchro cables to the terminal strip.

(h) Tilt the turret and reinstall the reflector. Replace the turret assembly on the pedestal and secure it with the captive screws.

(i) Repack the CRP–66ALK antenna and add it to stock spares or dispose of it as directed.

(j) Make up a three-wire, color-coded cable, nine feet, four inches long. Scratch the number 65 on the E–302 marker strip on the 66AKG antenna over the terminal adjacent to terminal 64. Scratch the number 66 over the remaining blank terminal on the strip. Connect the three-wire cable to terminals 64, 65, and 66 at strip E–302. Run the new cable along the main antenna cable and secure by lacing the two cables together. Several feet of wire must be left at the top of the antenna for connection to the microswitches.

(k) Install the remaining reflector drive assembly (one having the cam and microswitch bracket) in the transmitting antenna. Secure and reconnect the synchro cabling. Remove the remnants of the old cable from the microswitches. Run a single jumper between one terminal of each microswitch and connect this lead to terminal 64 of E–302 using the new three-wire cable. Connect the free terminal of S–501 to terminal 65, and the free end of S–502 to

terminal 66 of E–302. Dress the three-wire cable and clamp as necessary.

(l) Replace the reflector and secure. Replace the turret assembly on the pedestal and install the cap screws. Fasten the terminal strips in place and reconnect the monitor leads 59 and 60.

(m) Reinstall the CRP–66AKG antenna and reconnect the external cabling. Pick up two spares in the external cable and connect them to the newly-created terminals 65 and 66.

(n) At the CRP–23AHE antenna control unit disconnect the external cabling (if any exists) to terminals 265 and 266 on terminal strip E–202. At the antenna control unit pick up the two spare leads used in the previous step and connect them as follows: terminal 65 on E–302 to terminal 265 on E–202, terminal 66 on E–302 to terminal 266 on E–202.

(o) Realign the synchro system and the microswitch cams as outlined in the modification instruction book that accompanies the TDY conversion kit.

NOTE.—As soon as practicable a kit composed of the microswitch cable, several Adel clamps, a new marker strip, and a more detailed procedure will be assembled and distributed. Upon receipt of these parts, the temporary modification made above should be changed to include the new parts. For this rework, it will not be necessary to dismount the transmitting antenna, as the only work required will be the replacement of the marker strip and the cable, and the installation of several Adel clamps. The new cable can actually be installed through the top and bottom access doors, making it unnecessary to remove the turret assembly. *12/1/46*

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RADAR COUNTERMEASURES

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A complete list of field changes for the model TDY–1 countermeasure equipments has been published in the Radio Installation Bulletin No. 198 and in this bulletin (see following article).

Shipping instructions for field changes nos. 12 and 15 applicable to the model TDY–1 on contract 48345 are listed below. Kits for these two changes contain two copies of the applicable instruction book. They are marked as follows:

Field Change No. 12 for TDY–1—"Addition of Second Magnetron Seal Blower."
Field Change No. 15 for TDY–1—"Replacement of Pump Seal assembly."

Priority list—NXsr–48345—Field Change No. 12 "Addition of Second Magnetron Seal Blower"

Priority	Quantity	Ship to—	Mark for—
1–12	12	ESO, Boston Naval Shipyard	Stock.
13–24	12	ESO, New York Naval Shipyard	"
25–36	12	ESO, Philadelphia Naval Shipyard	"
37–48	12	ESO, Norfolk Naval Shipyard	"
49–60	12	ESO, Mare Island Naval Shipyard	"
61–72	12	ESO, Puget Sound Naval Shipyard	"
73–84	12	ESO, San Francisco Naval Shipyard	"
85–96	12	ESO, Terminal Island Naval Shipyard	"
97–116	20	ESO, ESB, NSD, Bayonne, N. J	"
117–136	20	ESO, ESB, NSD, Oakland, Calif	"
137–150	14	ESO, NSD, Mechanicsburg, Pa	"

Priority List—NXsr-48345—Field Change No. 15 "Replacement of Pump Seal Assembly"

Priority	Quantity	Ship to—	Mark for—
1–12	12	ESO, Boston Naval Shipyard	Stock.
13–24	12	ESO, New York Naval Shipyard	"
25–36	12	ESO, Philadelphia Naval Shipyard	"
37–48	12	ESO, Norfolk Naval Shipyard	"
49–60	12	ESO, Mare Island Naval Shipyard	"
61–72	12	ESO, Puget Sound Naval Shipyard	"
73–84	12	ESO, San Francisco Naval Shipyard	"
85–96	12	ESO, Terminal Island Naval Shipyard	"
97–111	15	ESO, ESB, NSD, Bayonne, N. J	"
112–126	15	ESO, ESB, NSD, Oakland, Calif	"
127–134	8	ESO, NSD, Mechanicsburg, Pa	"

4/1/47

→ FIELD CHANGES FOR MODEL TDY SERIES COUNTERMEASURES EQUIPMENT

Field Change No.:	Title
1–TDY	Addition of stop start resistor.
2–TDY	Extension of lower frequency of TDY with manual antenna mount.
3–TDY	Installation of motor driven antenna mount and control indicator.
4–TDY	Modernization kit.
5–TDY	Conversion of Model TDY to TDY–a and model TDY–1 to TDY–1a.
6–TDY	Simplification of monitor system.
7–TDY	Tube injector modification.
8–TDY	Replacement of two reflectors in TDY–a/TDY–1a antenna system.
9–TDY	Cancelled.
10–TDY	Addition of remote antenna RF switch in CAPR–10AFJ antenna pedestal.
11–TDY	Cancelled.
12–TDY	Addition of second magnetron seal blower.
13–TDY	Cancelled.
14–TDY	Cancelled.
15–TDY	Replacement of pump seal assembly.
16–TDY	Improved conversion of model TDY to TDY–a and model TDY–1 to TDY–1a.
17–TDY	Cancelled.
18–TDY	Upper frequency kit.

Field changes numbered 1, 2, 3, 4, 6, 7, and 10 are considered by the Bureau as having been completed on all of the affected equipments and are listed for identification only.

Electronics officers should be contacted for the kits of parts required in field changes 12 and 15. These changes are within the scope of the ships force and the kits include complete detailed instructions and all of the parts and material required.

Field changes 5, 8, and 16 require yard availability and Electronics officers should be contacted for their accomplishment. Each kit includes complete instructions and the necessary parts. Complete information on field change 18 is not available but will be disseminated as soon as possible.

The instructions furnished with the kits should be placed within the instruction book of the modified equipment.

These changes should be made at the earliest opportunity and when completed should be recorded on the Electronics Equipment History Card, NavShips 536, and the Field Change Record Card, NavShips 537, and should be reported on the Electronics Field Change Report card, NavShips 2369. *10/1/48* ←

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TDY COUNTERMEASURES EQUIPMENT FIELD CHANGE NO. 5

CONVERSION OF MODEL TDY TO TDYa AND MODEL TDY–1 to TDY–1a

Equipment affected.—Model TDY and TDY–1 *equipments only as directed.*

Purpose.—To convert the model TDY and TDY–1 equipments to S-band operation.

Time required.—Approximately 112 man-hours.

Material required.—The following components are included in each kit:

(*a*) One power oscillator unit CRP–35 ABV.

(*b*) Three antenna assemblies CRP–66 AKG.

(*c*) One dummy antenna CRP–66 AKF.

(*d*) One antenna control unit CRP–23 AGL.

(*e*) One OSC synchro amplifier CM–211103A.

(*f*) One electrical amplifier CM–50131A.

(*g*) One line-voltage regulator CRP–301556.

(*h*) Two line stretchers CRP–49AAB and CRP–49AAL.

General.—1. A quantity of 25 kits have been furnished on contract NXsr–81474 for the accomplishment of this change.

2. The power oscillator unit CRP–35ABV covers the S-band frequencies. Power output is in the order of 50 watts. Three sets of tubes are included.

3. The antenna control unit, CRP–23AGL, houses the bearing control and antenna synchronizing hand cranks, bearing indicator dials, and synchronizing, switches, output monitoring meter and two differential synchros for producing antenna rotation and stabilization (1 and 36 speed).

4. The line stretchers are used to vary the length of each transmission line so that proper match can be made. *4/1/47*

●

TDY COUNTERMEASURES EQUIPMENT FIELD CHANGE NO. 8

REPLACEMENT OF TWO REFLECTORS FOR MODELS TDYa AND TDY–1a ANTENNA SYSTEMS

Equipments affected.—Models TDY's and TDY–1a equipments which incorporate field change no. 5.

Purpose.—To replace, on each transmitting antenna the reflector and the synchro clips with improved units and also to strengthen the reflector drive assemblies.

Time required.—Approximately 16 man-hours.

General.—1. Since the kits for field change no. 5 were shipped, a number of improvements have been made. A quantity of 50 kits are being furnished on Contract NXsr–81474 for incorporating the improvements in the affected equipments.

2. A new reflector has been designed to be installed on existing CRP–66AKG transmitting antennas.

3. The synchro clips are to be replaced with an improved type to facilitate synchro adjustment.

4. It has been determined that the ¼″ bolts used to mount the reflector drive assembly on its mounting plate are not strong enough. In order to strengthen the assembly, 5/16″ bolts are to be used. The antennas of the equipments affected are to be modified by disassembling the antenna, enlarging the holes and installing the larger bolts. On the early antennas, the synchro cables are held in place by Adel clamps fastened under two of the ¼″ bolts. Since the size of the bolts is to be increased, the Adel clamps can no longer be held in place by them, making it necessary to drill and tap two 8–32 holes for fastening the cables. *4/1/47.*

●

TDY COUNTERMEASURES EQUIPMENT FIELD CHANGE NO. 12

ADDITION OF SECOND MAGNETRON SEAL BLOWER

Equipments affected.—Model TDY–1 equipments, Serial No. 1 through No. 150.

Purpose.—To increase ventilation of the magnetron seal.

Time required.—Approximately 5 man-hours.

General.—A quantity of 150 field change kits are being supplied on contract NXsr–48345. The kits include all of the necessary parts and complete detailed instructions for installing the second blower. *4/1/47*

TDY COUNTERMEASURES EQUIPMENT FIELD CHANGE NO. 15

REPLACEMENT OF PUMP SEAL ASSEMBLY

Equipment affected.—Model TDY–1 equipments, Serial No. 1 through No. 134.

Purpose.—To replace the pump seal assembly and correct end play in the pump motor shaft.

Time required.—Approximately 2 man-hours.

General.—A quantity of 134 field change kits are being supplied on Contract NXsr–48345. Included in each kit are all of the necessary parts and complete detailed instructions for the replacement. *4/1/46*

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TDY COUNTERMEASURES EQUIPMENT FIELD CHANGE NO. 16

IMPROVED CONVERSION OF MODEL TDY TO TDYa AND MODEL TDY–1 TO TDY–1a

Equipment affected.—Model TDY and TDY–1 equipments *only as directed.*

Purpose.—To convert the model TDY and TDY–1 equipments to S-band operation.

Time required.—Approximately 112 man-hours.

General.—Field change No. 16–TDY is an improved version of field change No. 5–TDY. A quantity of 34 kits have been supplied on Contract NXsr–90814. Included in each kit are all of the necessary parts and complete detailed instructions for the change. *4/1/46*

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→ MODEL MX–833/SL MODIFICATION KIT SWITCHING ARRANGEMENT FOR USE WITH TDY–1 AND DBM–1

1. The model MX–833/SL is designed for use with the model TDY–1 jamming transmitter and model DBM–1 radar direction finder. It is intended to provide the operator with remotely-controlled switching facilities for any and all antennas, associated receivers, panoramic adaptors, and pulse analyzers in the radar countermeasure system.

2. This modification kit obsoletes the manual method for antenna-selecting heretofore employed in the Radar Countermeasure System Room arrangement, eliminating thereby such equipment as the J–116/SPR antenna selection panel and the CWI 24695 switch. Furthermore, it makes possible automatic switching to either of the two model TDY–1 antennas installed on the pedestal.

3. Attention is invited to the fact that these modification kits will only be available as outlined in the Material Improvement Program Project No. 125, Bureau of Ships, No. 67–23, dated 20 May 1947, due to the fact that only twenty-five have been procured from the supplier, Designers for Industry, Cleveland, Ohio, under Contract NObsr–30017 dated 14 May 1946. The first two equipments have been submitted to the Operational Development Force for evaluation tests. The balance will be shipped to Mechanicsburg, Pennsylvania, for reshipment. Each equipment weighs approximately 293 pounds when crated, and 194 pounds when uncrated. Seven packages make up the complete equipment, including equipment spares. Operation is from 110±10%-volt, 60-cycle, a-c supply, the maximum current required being 30 amperes. These 25 equipments provide an automatic control feature as an interim measure to the present radar countermeasure until such time as the model AN/SLR–1 shipborne radar communication intercept system (formerly the AN/SPR–5) and the AN/SLT–1(SN) radar countermeasure jamming equipment (a portion of the AN/SLR–1 system) becomes available for shipborne installation. The availability date for this latest equipment has been tentatively assumed to be late 1949.

4. In the meantime, with the MX–833/SL switch arrangement it is possible to use either the DBM antennas or the TDY–1 antennas as search or direction-finder antennas. Facilities are provided for connecting search receivers to the various antennas. By means of remotely-controlled coaxial switches, the individual units of the TDY–1 and DBM–1 can be connected in several combinations. Control is accomplished from a central point, and pilot lights are provided for indicating the position of all coaxial switches.

5. The external wiring for the switching, including associated equipment and antennas em-

ployed, is given in Bureau of Ships Drawing No. RE 100 J 209A, which supersedes RE 100 J 190C. Copies of this drawing may be secured by writing to the Bureau, Electronics Division, Navy Department, Washington, D. C. It is expected that the elementary outline and interconnecting dimensional drawings for the MX–833/SL will be available for distribution in October 1947.

6. The MX–833/SL modification kit installation can be accomplished by a ships force of two men in approximately two weeks time, if the radar jamming transmitters and receiving equipments are combined in one room. If a ship has two spaces allowed, one for each function, then Navy Yard availability will be required. *10/1/47* ←

→ TYPE 2C39 TUBES IN MODELS TDZ AND MAR RADIO EQUIPMENTS

The Bureau has received information that one cause of the failure of Type 2C39 tubes in the model TDZ and MAR radio equipments is inoperation of the blower motors B–101 and B–102. Failure of these motors to operate may result from defective bearings or from reversed motor connections. When tube failure occurs, these blower motors should be inspected immediately and the necessary corrections made. Moreover, periodic preventive inspections should be carried out in advance of any failure.

Although correspondence and verbal reports indicate that these tubes are failing in relatively large numbers, the Bureau has received very few Type 2C39 failure reports. This is unfortunate because, in order to carry out an effective maintenance program, it is essential that all failures of this nature be reported at once. All reports should include all possible information regarding the failure, such as condition of the blower motors, tube voltage, and operating frequency.

A previous request which stated that defective tubes should be sent to the Naval Research Laboratory for study has been cancelled. It is now requested that the first five defective tubes, with the exception of those accidentally broken or mishandled, be sent to:

Commander, New York Naval Shipyard,
Material Laboratory,
Naval Base Brooklyn 1, N. Y.
Attn: Mr. J. T. Fetsch—Problem No. 1102–ET–6.

This new request does not in any way alter the necessity for failure reports, which should be forwarded to the Bureau by *AIRMAIL. 8/1/47* ←

TDZ RADIO TRANSMITTING EQUIPMENTS FIELD CHANGE NO. 1

MODIFICATION TO AUTOMATIC TUNING SYSTEM AND DRAWER MECHANISM

Equipment affected.—Navy model TDZ radio transmitting equipment, serial numbers 1 to 100 inclusive; also serial numbers 107, 108, 109, 111, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 128, 129, 130, 131, 132, 133, 134, 136, 137, and 140.

Purpose.—To improve the dependability of the equipment.

Time required.—Approximately 60 man-hours.

Material required.—Each kit contains all material required to change one equipment and one set of equipment spare parts. An itemized list of this material is included in each kit.

Tools and instruments required.—The special instruments required that are not normally carried in a radio technician's tool kit are as follows:

1. Continuity meter, Navy model OE or any similar device or means of indicating continuity of a circuit.
2. Wrench of special length for No. 6 Bristol set screw. This is supplied with the field change kit.
3. Portable hand drill with twist drills of the following diameter:

(*a*) 0.204 inch (No. 6). (*c*) $^{11}/_{32}$ inch.
(*b*) $^{9}/_{32}$ inch. (*d*) $^{3}/_{8}$ inch.

4. Countersink for ¼-inch flat head screw.
5. Taper tap ¼″—20 thread.
6. Tap handle, for ¼″—20 taper tap, for hand use.
7. Pliers of special design for crimping contact springs. One pair is supplied with each field change kit.

General.—This change may be best described by breaking it down into four headings as follows:

1. *Replacing S125 and S127.*—This part of the change replaces the automatic tuning channel control switches S125 and S127 with switches of improved design. The new design incorporates S125C and S127B as integral parts of the switch assemblies S125 and S127, respectively. S125C and S127B consists of a single-pole breaker type switch, actuated by an accurately cut cam. These are connected effectively in parallel with, and function as a vernier control of, S125A and S127A, respectively. The hold-in circuits of the tuning motor control relays,

K117 and K118, are now finally made and broken through these added breaker switches. The rotary switches S125A and S127A serve as distributors to route the circuits for the proper channel through the breaker switches. Since these added switches have final control over K117 and K118, inconsistencies between the making and breaking points of the several contacts on the rotary switches do not affect relay operation. The cam-operated breaker switch is inherently more accurate, and since finer control is thus achieved, the system becomes more dependable.

2. *Installing snubber assemblies.*—This part of the change consists of installing sets of neoprene snubbers at the rear of the sliding drawers in the transmitter. These snubbers serve to restrain relative motion between the drawers and the cabinet under conditions of severe vibration or shock. The rear wiring channel is also secured to the cabinet frame at two additional points to give it additional support and to prevent its flexing between the original points of support.

3. *Installing contact springs.*—This part of the change consists of attaching auxiliary contact springs to the existing contacts at the rear of the sliding drawers in the transmitter and to the test harnesses which plug into the transmitter cabinet when the drawers are removed for servicing. These added contact springs provide greater contact pressure and limit the travel of the contact under accidental stress.

4. *Replacing lubricant.*—This part of the change consists of replacing the lubricant in the gear box of the master automatic tuning system. The new lubricant has better adhesive properties and provides better lubrication of the motor-drive worm and its mating gear.

Routine instructions.—Field change kits are being made available in sufficient quantities to fill all requirements. These kits will contain detailed instructions and two instruction books. The detailed instructions should be turned over to the cognizant Electronics Officer upon completion of the job. The books titled "Instruction Book Change No. 1" and dated 12 September 1946 shall be inserted in the instruction books originally furnished with the equipment.

The change should be performed by qualified Shore or Tender technical personnel. On completion this change should be recorded on the Equipment Machinery History Card and reported on the Field Change Report Card (NavShips 2369). The report form should be filled out and mailed by the personnel making the change as soon as the work has been accomplished. *4/1/46*

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TDZ RADIO TRANSMITTING EQUIPMENT FIELD CHANGE NO. 2

MODIFICATION TO ALLOWANCE OF TENDER SPARE PARTS

Equipments affected.—Five sets of Tender spare parts for model TDZ transmitting equipment. The five sets can be identified from the following:

Priority	Quantity	Date shipped	Destination
1t	1	1/4/46	ESO, NSY Charleston.
2t–4t	3	1/4/46	ESO, NSD San Pedro, Calif.
10t	1	3/25/46	ESO, Electronics Supply Annex, Long Island City, New York.

Purpose.—To modify the tender spare parts in conjunction with model TDZ transmitting equipment Navy field change No. 1–TDZ, "Modification to Automatic Tuning System and Drawer Mechanism."

Time required.—Approximately 1 man-hour.

Material required.—Each kit contains all material required to change one set of tender spare parts. An itemized list of this material is included in each kit.

General.—This change consists of replacing and adding certain items in the tender spare parts to make them conform to possible needs of the equipment after Navy field change no. 1–TDZ is completed. This change may be per-

formed by personnel of the organization to which the affected equipment is assigned.

Procedure.—Follow the procedure described in the field change bulletin included in each kit.

Routine instructions.—Field change kits are being made available in sufficient quantities to fill all requirements. Completion of this change should be recorded in the Equipment Machinery History Card and reported by means of Field Change Report Card (NavShips 2369). One field change bulletin shall be retained for each modified set of tender spare parts. *4/1/45*

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TDZ RADIO TRANSMITTING EQUIPMENT FIELD CHANGE NO. 3

INSTALLATION OF PROTECTIVE GUARD ON TELEPHONE TYPE DIAL

Equipment affected.—Model TDZ transmitting equipment, Navy type 52342, serial numbers 1 to 1000, inclusive.

Purpose.—To provide additional safety against accidental improper operation by the operator.

Time required.—Approximately 1 man-hour.

Material required.—Each kit contains all material required to modify one equipment. An itemized list of this material is included in each kit.

General.—This change consists of installing a guard on the telephone type dial on the panel of the control unit (bottom drawer) to prevent the dial from being accidentally rotated while the operator is manipulating the adjacent metering switches.

Procedure.—Follow the step by step procedure described in the field change bulletin included in each kit.

Routine instructions.—Field Change kits are being made available in sufficient quantities to fill all requirements and the change is within the scope of the ships' force. Completion of the change should be recorded in the Equipment Machinery History Card and reported on the Field Change Report Cards (NAVSHIPS 2369). These cards which are included in each kit should be filled out and mailed by personnel making the change as soon as the work has been accomplished. *4/1/46*

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TDZ RADIO TRANSMITTING EQUIPMENT FIELD CHANGE NO. 4

ADDITION OF DRAWER FASTENERS TO EQUIPMENT SPARE PARTS

Equipments affected.—One thousand sets of equipment spare parts for model TDZ transmitting equipment, type 52342, serial numbers 1 to 1000, inclusive.

Purpose.—To provide additional spare parts.

Time required. Approximately 1 man-hour.

Material required.—Each kit contains all material required to modify one set of equipment spare parts. An itemized list of this material is included in each kit.

General.—This change consists of complementing the equipment spare parts with sets of drawer fasteners. It may be performed by personnel of the organization to which the affected equipment is assigned.

Procedure.—Follow the procedure described in the field change bulletin included in each kit.

Routine instructions.—Field change kits are being made available in sufficient quantities to fill all requirements. Completion of this change should be recorded in the Equipment Machinery History Card and reported on the Field Change Report Cards (NavShips 2369). These cards which are included in each kit should be filled out and mailed by personnel making the change as soon as the work has been accomplished. *4/1/46*

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DISTRIBUTION OF CRYSTAL OVEN EXTRACTORS FOR MODEL TDZ EQUIPMENT

See the article entitled "Distribution of Crystal Oven Extractors for Models RDZ and TDZ Equipments" on page RDZ:3 *6/1/47*

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CORRECT CRYSTALS FOR USE WITH MODEL TDZ EQUIPMENTS

Model TDZ equipments, serials 1 through 100, are designed for use with crystals, Navy type –40161. Equipments, serial 101 and thereafter are designed for use with crystals, Navy type –40162. Due to possible inactivity of crystals and off-frequency operation, field activities are cautioned not to use crystals and equipments interchangeably. *2/1/46*

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CRYSTAL OVENS FOR MODEL TDZ RADIO EQUIPMENT

See the article entitled "Crystal Ovens for Models RDZ, MAR and TDZ Radio Equipments," on page RDZ: 1 of this Bulletin. *6/1/46*

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CRYSTAL OVEN EXTRACTOR

See the article entitled "Crystal Oven Extractor" on page MAR: 2 of this bulletin. *12/1/46*

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→ ADDITIONAL INFORMATION ON CRYSTAL OVENS FOR MODELS RDZ, MAR, AND TDZ RADIO EQUIPMENTS

After a lapse of several months, shipment of Crystal Ovens for Models RDZ, MAR, and TDZ radio equipments was resumed in July 1947. Additional improvements have been incorporated in these new ovens. These improvements include changes in the thermostats and heater windings to make operation more positive with less work on the part of the thermostat (that is to say: maintain an even temperature with fewer cycles of operation). The new ovens, supplied under contracts NXsr–86362, NObsy–39267, and NObsr–42053, will have the type number CFT–40148A embossed on the cover as well as having the two internal screws color coded for easy identification. See Figures 1 and 2.

A complete résumé of the ovens, color coded by the month of manufacture, is given in the following table (Note: Ovens manufactured from December 1945, up through November 1946, are designated as Navy type CFT–40148, and those from July, 1947, up through July 1948, are designated as Navy Type CFT–40148A. This may be used for identification if color-code duplication occurs.

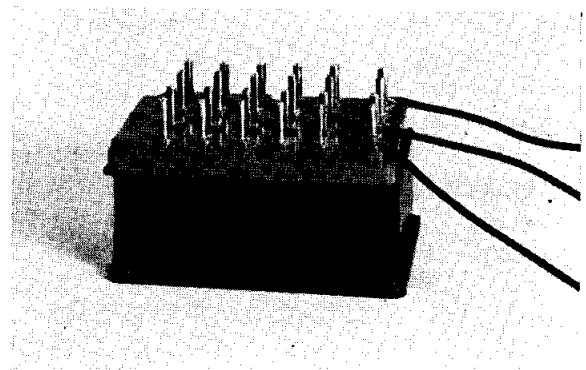

FIGURE 1.—Bottom view of crystal oven showing test leads connected to heater pins W, Y, and Z.

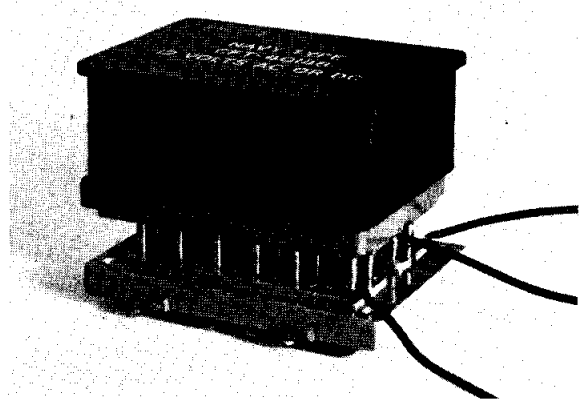

FIGURE 2.—Crystal oven and oven socket showing test leads connected.

When type CFT–40148 ovens are utilized, it should be determined that they are heating properly. After a few minutes of operation, the ovens should feel very hot to the hand. If they do not warm up, the thermostat can be checked by the following simple method: First, the oven is removed and short leads are connected to the heater pins W, Y, and Z. The oven is then replaced. Either two 12-volt pilot lamps or voltmeters should be connected as shown in the accompanying diagram of Figure 3. The equipment is then turned on. The lamp or voltmeter across W and Z (the low side) should go out or register zero after a few minutes of warm-up. The lamp or voltmeter across Y and Z (high side) should continue to register for a few minutes after the low side

has "cut off", and then should begin to "cycle", indicating that the thermostat is maintaining the oven at an even temperature.

Month of manufacture	Color-Code	
	Screw nearer heater pins	Screw away from pins
Dec. 1945	Red	Blue.
Jan. 1946	Red	Yellow.
Feb. 1946	Red	Green.
Mar. 1946	Blue	Yellow.
Apr. 1946	Blue	Blue.
May 1946	Brown	Brown.
June 1946	Red	Red.
July 1946	White	White.
Aug. 1946	Black	Black.
Sept. 1946	Orange	Orange.
Oct. 1946	Yellow	Yellow.
Nov. 1946	Gray	Gray.
Dec. 1946 through June 1947	None shipped.	
July 1947	Green	White.
Aug. 1947	Red	White.
Sept. 1947	Brown	White.
Oct. 1947	Black	Black.
Nov. 1947	Yellow	White.
Dec. 1947	Blue	White.
Jan. 1948	None manufactured.	
Feb. 1948	Green	Black.
Mar. 1948	Red	Black.
Apr. 1948	Brown	Black.
May 1948	Yellow	Black.
June 1948	Blue	Black.
July 1948	Green	Red.

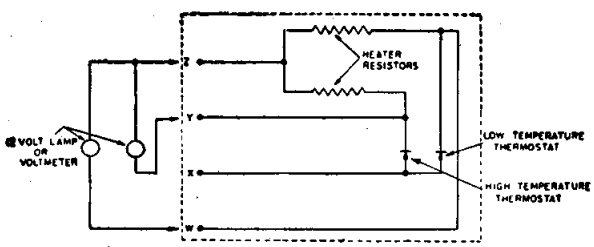

FIGURE 3.—Simplified heater circuit of crystal oven.

Activities should utilize all of the old-type ovens before resorting to the use of the new ones. It is requested that the defective ovens should not be surveyed, but instead returned to the Supply Officer in Command, NSD, Clearfield, Utah, Attn: Electronics Supply Officer, and marked "For Disposition by Bureau of Ships". *4/1/48.*

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OBTAINING CRYSTALS

See the article entitled "Obtaining Crystals for Models MAR, RDR, RDZ, and TDZ" on page MAR: 6. *4/1/48.*

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TDZ TUNING HINTS

When manually tuning the TDZ transmitter, one should carefully follow the instruction book. However, the following hints which were contained in Atlantic Fleet Letter No. 40L–48 are considered excellent and should prove helpful:

1—Turn locking bars in center of dials counterclockwise ¼ turn and tune up the transmitter properly on one channel with low power, disregarding the autotune.

2—Log the dial settings when proper operation is obtained.

3—Set each autotune for this channel by the following procedure (items 3–11): Back the dial counterclockwise at least one-third of the way to zero. Note that this is seven complete turns of the multitune dials.

4—Bring the dial clockwise to the logged figure, approaching the final setting slowly so as not to overpass it.

5—Turn the dial counterclockwise one or two divisions so that it may be held with one hand without going beyond the logged setting, while the locking bar is tightened with the other hand.

6—Proceed similarly with the other dials.

7—Check all dials to see that their autotunes are locked.

8—Dial some other channel.

9—Redial the channel just tuned.

10—Compare each dial setting with the logged setting and readjust any that has come up incorrectly.

11—Check the transmitter operation on low power to see that the logged settings, when tuned by the autotune, result in satisfactory operation.

There is one other point which, although brought out in the instruction book, is considered to be sufficiently important to print again. While manually tuning the TDZ transmitter, the operator must be sure that the "tune-operate" switch is in the "tune" position and the PA grid current does not exceed 40 ma.

In "operate" position, the total PA plate current should not exceed 100 ma. (This is determined by subtracting the total PA grid current from total PA cathode current.)

The Bureau is now supplying dial cranks as Field Change No. 5–TDZ for the purpose of manually tuning and setting up channels on the TDZ. These dial cranks may be obtained from the Electronics Officer of any Naval Shipyard or NSD, Bayonne, and NSC, SSD, Oakland. It will be found that the cranks will help considerably in making adjustments. *1/1/49.*

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MODEL ME 11/U R–F WATTMETER USED WITH TDZ EQUIPMENTS

See item on page ME–11/U:1 entitled "Model ME–11/U R–F Wattmeters." *1/1/49.*

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MODEL TDZ TUNING PROCEDURE

Improper TDZ transmitter operation is a prime contributor to the unsatisfactory condition as well as the short tube life reported for the 2C39. Tuning of this equipment must be carefully done. An improved tuning method for this equipment is shown below. This method should be followed closely in order to reduce damaging transient surges, improve channel selection and maintain optimum output on all channels.

WARNING: IMPROFER TUNING WILL CAUSE DAMAGE—INSTANTANEOUS OVERLOADS RUIN THIRD TRIPLER AND POWER AMPLIFIER TUBES

1—Place the remote local switch, in the LOCAL position.

2—Insert correct crystals and fill in the two cards on front panel.

3—Place the automatic tuning on-off switch (inside door on left side of middle drawer), in the ON position.

4—Place the emergency operate-stop switch, in the OPERATE position.

5—Place the tune operate switch, in the TUNE position.

ADJUSTMENTS FOR TUNE POSITION

6—Depress start button of start-stop switch. Power on indicator I101 should light in approximately 60 seconds. Allow 10 minutes for warm-up when equipment has not been used for several days.

7—Place the tuning indicator toggle switch, in the ON position.

8—Turn all dial (B through L) locking bars clockwise with fingers until tight.

9—Dial the channel to be tuned with the channel selector dial. The tuning system should operate approximately 30 seconds before tuning is completed.

10—Observe the local channel indicator for correct indication of the selected channel. Control A and the channel indicator should always read the same.

11—Loosen all dial (B through L) locking bars by turning bars one-fourth turn counterclockwise.

12—Set all dials except G, H, K, L, to approximate position for frequency being tuned. See figure 3–26 (pp. 3 to 37) of Instruction Book. Set controls G, H, K, L, to dial position of O. If Instruction Book not available set all controls to O.

13—Check crystal oven for heating by placing fingers on oven (mounted behind door in middle drawer). If the oven does not get warm, a technician should check heating system.

14—When tuning depress carrier switch momentarily to obtain meter readings. Do not place switch in LOCK position.

15—Set grid meter switch to DBLR position. Tune dial B for maximum grid current (15 to 18 ma). ALWAYS SELECT THE FIRST POINT OF RESONANCE WHEN ROTATING DIALS CLOCKWISE.→For those dials which are preset, first turn dials counterclockwise (B and C ½ revolution and all others 2 revolutions) and then clockwise to resonance. ←

Note.—Controls B and C are very sensitive and require extreme care in adjustment. Resonant points should be approached very slowly with clockwise rotation of the dials.

16—Set grid meter switch to second trip position. Tune dial C for maximum grid current (18 to 20 ma).

NEVER PERMIT THIRD TRIPLER AND PA GRID CURRENT TOTALS TO EXCEED 35 MA. NEVER PERMIT THIRD TRIPLER AND PA CATHODE CURRENT TOTALS TO EXCEED 100 MA

17—Set grid and cathode meter switches to third tripler total position. Tune dials D and E for maximum grid current (approximately 20 ma).

18—Tune control F for dip in cathode current.

19—Set grid and cathode meter switches to PA total position. Manipulate controls G and H until grid meter reading is obtained. Retune control F for peak PA grid current not to exceed 35 ma. Reduce third tripler coupling by dials G and H to maintain current below 35 ma.

20—Tune controls I and J for peak grid current not to exceed 35 ma. (Note PA cathode current. If excessive reduce coupling by G and H).

21—Tune controls K and L for maximum indication on tuning indicator or ME–11/U wattmeter.

22—Retune dials F, I, and J for peak grid current not to exceed 35 ma.

23—Retune controls K and L for maximum indication on the tuning indicator or ME–11/U wattmeter.

24—Retune dials F, I, and J for peak grid current not to exceed 35 ma.

Note.—The third tripler and PA grid and cathode currents should be balanced. The grid currents should balance within approximately 5 ma. cathode currents should balance within approximately 15 ma. It is usually possible to improve balance by manipulation of controls, F, G, H, I, and J.

No definite procedure can be followed to maintain balance of these currents which necessitates a trial-and-error method. If balance is not obtained, consult technician regarding previous setting at midband frequency of third tripler and PA balancing resistors. Inability to obtain balance within above limits by these methods indicates a possible inferior tube.

25—Place tune-operate switch on OPERATE.

ADJUSTMENTS FOR OPERATE POSITION

NEVER PERMIT THIRD TRIPLER AND PA GRID CURRENT TOTALS TO EXCEED 50 MA. NEVER PERMIT THIRD TRIPLER AND PA CATHODE CURRENT TOTALS TO EXCEED 150 MA

26—Make quick check of third tripler and PA total grid currents and total cathode currents. If excessive, place equipment in TUNE position and reduce drive to third tripler by control D. Place equipment in OPERATE position and again make quick check of these currents.

27—Place meter switches to total PA grid and cathode current positions. Tune dials G and H for PA peak grid current not exceeding 50 ma while maintaining total cathode current below 150 ma.

28—Tune dials K and L for maximum indication on tuning indicator or wattmeter and dials J, I, and F for peak grid current of 50 ma. Maintain total grid current below this value and total cathode current below 150 ma with dial D until no further increase can be made on tuning indicator or wattmeter with dials K and L.

29—If necessary, obtain balance as outlined in note under step 24.

30—An output of approximately 20 watts with tubes operating within the limits specified is considered satisfactory although up to 35 watts may be obtained at certain frequencies.

31—Place equipment in TUNE position and log all meter readings. Make certain that all final dial settings have been approached in the clockwise direction. Lock all dials by turning all locking bars with fingers until tight. Care should be taken to prevent dial movement while locking. Prevent binding of locking bar with

stop nubs on metal plate behind bar by rotating stop nubs clockwise with finger to provide sufficient clearance. After locking, check dials by grasping them firmly and turning them smartly, first counterclockwise, then clockwise against their stops.

32—Log all dial settings.

33—Dial another channel. Redial channel tuned and with equipment in TUNE position, check to see that meter readings and dial settings are same as logged in steps 31 and 32. If not the same, controls B and C are usually responsible. Try to obtain proper meter readings by retouching these controls and redialing. Consult technician if normal readings are unobtainable.

34—Place equipment in OPERATE position, and determine that third tripler and PA total grid and cathode currents are not exceeded. *4/1/49*

●

TDZ—1B CORRECTION

In figure 7–119 of the TDZ instruction book, Practical Wiring Diagram, Control Unit, Conductor No. 98 should be connected to P–157–1 instead of P–157–2. *1/1/50*

●

TDZ AND RDZ—CRYSTAL OVEN FAILURE

Commander Cruisers, Atlantic Fleet, reports that a frequent but easily overlooked cause of a TDZ or RDZ failure is a cold crystal oven. Naturally, when a crystal oven fails, the results show up as weak or lost signals. Technicians should check crystal ovens daily to prevent such failures or locate them as soon as possible. *1/1/50*

●

FAILURE OF TDZ ANTENNA TRANSFER SWITCHES

The Bureau has frequently been advised of failure of the cable connectors on the TDZ antenna transfer switch. These connectors have a symbol number of J–105 and J–106 in the TDZ Instruction Book and have ESO stock number N16–R–2713. The Navy Type number is 491212 and the Standard Navy Stock No. is 17–C–73108–5910.

All electronic officers should make sure their stock of spare connectors is adequate. *1/1/50*

●

→ UHF CASE HISTORIES

A total of 144 field reports of 281 Model TDZ/RDZ transmitting-receiving equipment failures reveals that approximately 92% of all the failures encountered are chronic troubles. These troubles are listed in the first column of the following chart in the order of their frequency of occurrence. The second and third columns give the exact nature of these troubles and the symptoms they produced.

Type of failure	Symptom	Cause
Tubes	Low output or no output. No modulation or poor modulation.	V107—V120; most likely, V115—V119. V101—V102 V110.
Tuning	Low output or no output. Tube failure. Failure of R–122–R124.	Tuning to harmonic. Improper locking of heads. Faulty tuning.
Autotune system	Controls not stopping at preset positions. Slipping, unable to lock, no rotation. Master or slave Autotune system inoperative.	Worm gear not meshed. Limit-switch circuit broken. Clutch too tight. Improper synchronization. Lack of lubrication. Set screws not tightened.
Drawer contacts	Starting light out. No channel indication. Unable to key. No power output.	Drawer not centered, tightened. Dirty or broken contacts.

Type of failure	Symptom	Cause
Control relays	Wrong channel selected. Wrong channel indication. Start button inoperative. Unable to key. High antenna current. Overload reset inoperative.	S114 worn or making poor contact. K106, M103, K108, or K106 Antenna relay K110.
Antenna, cable, and couplings	Weak or no power output	Damaged antenna. Open or loose couplings. Open transmission line. Short in transmission line due to moisture or corrosion.
Poor preventive maintenance	Faulty and inefficient operation. Equipment dirty. No field changes completed.	Lack of training. Improper supervision.
Components	Smoke or odor. Hum on carrier. Unable to balance tubes. Phone inoperative.	C118, C119, C120B, or C104. R172—R174 burned by improper tuning. Winding 1–2 of T101.
Meters	Indicator inoperative. Abnormally high reading.	Open meter coil M103. Defective V119 Antenna relay.
Tube sockets	Low or no output	X115—X119 easily damaged by rough handling or by improper removal and insertion of tubes. Heater and cathode diameters vary for various manufacturers.
Crystal oven	Cold oven. Improper heating	Short or open thermostat. Oven loose in socket, T107, winding 9–10.
Power supply	No primary power. Blower motors inoperative. Microphone voltage failure. No 115-volt power. No high voltage.	Drawer contacts. 12-volt supply. Defective rectifier. F104, F105, F103, T107. V107—V110. T104, winding 3–11.
Miscellaneous	Vibration. Harmonic interference	Loose drawers or shock mounts. R-f filter not connected. Tube clamps not tightened.

1/1/51

ADJUSTMENT FOR PROPER FILAMENT VOLTAGE OF 2C39 TUBES

The table for 2C39 tube filament voltage adjustment shown in figure 3–22 of the TDZ Instruction Book was predicated upon average performance of equipment components. These values may vary slightly due to tolerances permitted in the component design. Therefore, prior to final adjustment of tapswitch S–113, actual voltage measurements should be taken and the tapswitch set to provide as near the required 6.3 volts as possible, regardless of settings shown in figure 3–22. *7/1/51*

←TDZ TRANSMITTERS

1. By far the most common complaint with TDZ's is the rapid failure of 2C39 tubes. There seems to be little that can be done about the uncommonly high mortality rate but perhaps the following suggestions will help.

A. There are three types of 2C39's being used in the fleet. They are General Electric, Machelett and Eimac. The Eimac tubes seem to hold up somewhat better than the other two.

(1) Before inserting a General Electric type in the socket examine it closely on the bottom for a crack in the glass seal between the filament and grid connection of the tube. This

seems to be a weakness of the GE types and if broken the tube is no good. Because of this weakness the tube should be inserted into the socket as gently as possible to prevent breakage of the same seal when inserting.

(2) Machelett tubes are slightly larger, a few thousandths, than either of the other two. They are frequently more difficult to remove or insert than the others. The plating is rather thin too and some tubes are found to be rusting through at the thinner plated spots on the tube. This is particularly true of the center filament pin. This should be examined before installing the tube and if rusty inside the bottom pin the rust should be removed with a thin bladed knife or other tool that will get up inside of the pin and scrape the rust off. Another note along this line is that most tubes are twisted or rotated when inserting and removing to facilitate their going in or out. If rust is present it flakes off and drops down between the two filament pins causing a low resistance short or breakdown between the pins. This has been the cause of trouble on more than one TDZ.

(3) Eimac tubes sometimes suffer shorts across the filament pins because of the inner filament connection being fluted out by the socket center connection when inserting.

B. The most successful way that has been found to test the 2C39 tube is by removing the co-ax connector from the output jack of the Power Amplifier stage and inserting it in the output jack (J112) of the Third Tripler. The transmitter is then set up on 277.8 megacycles and all tubes removed (2C39's that is) except the number 1 third tripler. (left hand 2C39) The transmitter is then tuned for maximum output to the ME–11/u wattmeter by juggling controls E, F, and K, L, and occasionally D. It should be tuned in the tune position then switched to operate when circuits are in resonance. The output will vary from TDZ to TDZ and from one frequency to another but on this frequency the output should be approximately 15 watts, for a good tube. 10 watts is a fair output. It is also possible that some Wattmeters are slightly different from others depending upon the state of their crystal, etc. One Antenna control (L) will be found to tune around 2000 and the other (K) approximately 1500 to 1700. The K control should be repeaked for each new 2C39 tested, as well as peaking of the E and F controls. Approximately 2 minutes should be allowed for heating of a tube before applying plate power. Readings can be taken of the Grid and Cathode currents of the various tubes tested and the more nearly balanced ones can be placed in the transmitter.

C. There has been a lot of talk about "baking in" the tubes. This has been done on several ships. Tubes have been kept warm for several days in a standby condition, but when installed in the transmitter they were found to be very weak. This indicates that emission of the filaments is used up even in the standby condition, without plate current applied. You can check this yourself by tuning up the transmitter for a given output and then letting it set with filaments on for a 12-hour period and again checking the output. The output will usually drop off several watts. Therefore it is important that the transmitter be turned off at all times when it is not being used. That is, in port, when not being used, and at other times when other circuits are energized and the TDZ is not actually standing by to be used.

D. The cathode adjustment potentiometers should be kept turned to the fully counter-clockwise position at all times. Shorted tubes are less frequent when this is done. There is no great amount of self bias on either the Power Amplifier or Third Tripler. With these pots turned counter-clockwise all of their resistance is in the circuit and they seem to keep shorts down due to their "limiting resistance" action.

E. There are many different methods of tuning the TDZ. My favorite is to tune everything to resonance and then drop the drive to the power amplifier by adjustment of the G and H controls. Several positions of these controls will be found where the same drive can be obtained on the Power Amplifier. The ones to

use are the ones whose settings put the least load on the Third Tripler. This can be checked by reading the Third Tripler Plate Current. It should give a good clean dip, when tuned through resonance, and in most cases should dip to around 75 milliamperes. This also varies from one transmitter to another and from one channel to another. THE POWER OUTPUT SHOULD BE 20 WATTS FOR A PLATE CURRENT READING OF 100 TO 120 MILLIAMPERES. This is fairly consistent in transmitters. Grid currents will vary from 20 to 40 milliamps for this output. A good set of tubes will give 20 watts output with 100 milliamps of cathods current and 20 grid milliamps, providing that the transmitter itself is in good condition.

F. It is essential that the plate lines of the Power Amplifier and Third Tripler and all moving contacts in same be absolutely clean. On numerous occasions it has been possible to increase the output of a TDZ several watts by removing the cover plate over the plate lines and cleaning them thoroughly with standard Navy Bright Work Polish. The surfaces of the lines and sliders along the sides of the box should be kept free of dirt always.

(1) The blower motor should also be kept clean and free of dust. When the blowers become dirty they blow dirt into the plate circuits and the lines soon become coated with an oily dust.

(2) Bad unbalances have also been known to clear up when these lines were cleaned and polished.

(3) The same is not as true of the grid circuits, however, since the small amount of dirt that filters down through the socket usually winds up on the bottom of the cover and does not settle on the lines, although in extreme cases the grid lines of the Power Amplifier were also found to be dirty.

G. After the transmitter is completely tuned using the ME–11/u it should be connected to the antenna and the power amplifier dial reset to resonance as indicated by maximum on the relative indicating output meter. Even though the standing wave ratio is low on some lines there is usually enough reactance present to cause the power amplifier to resonate in a different spot very near the one found using the Wattmeter. However, if the relative indicating output meter reads excessively high with the antenna connected it is possible that the antenna is open or shorted reflecting a bad standing wave to the transmitter. Be sure and check the Antenna and coaxial line to be sure that the antenna is good and that the co-ax is not open going to the antenna.

2. The second greatest failure in the transmitter following the 2C39 tubes is the cathode adjustment potentiometers. They will burn out less frequently if turned to the fully counterclockwise position as mentioned previously. They may be checked by pulling out the covers in front of them and rotating their shafts. They should turn through 270 degrees. If they do not it is usually a sign that they are burned and have bulged out due to heat.

3. The Autotune system can be quickly checked by opening the door to the crystal oven and throwing the switch from automatic to manual tune. All dials should then stop on 2000 when the transmitter stops channeling. If all knobs are not reading to their extreme high end the system is out of synchronization, and should be synchronized by the procedure in the book.

A. The channel stepper relay can also be checked by dialing all ten of the positions. Occasionally the stepper relay does not return to its start position when a new channel is dialed. If after dialing channel 1, for example, number 2 channel is dialed and the transmitter comes up on channel 3 this is what is happening. Sometimes when channel 10 is dialed and then another the selsyn system continues to come up on channel 10, which is again another indication of the same symptom. It can be remedied most of the time by applying a little light oil to the bearing shaft of the stepper. The little ratchet which keeps the stepper on what-

997271°—52——3

ever channel it is dialed to may be released by sticking a small screwdriver in through the hole in the side fo the relay frame and disengaging the ratchet. After oil has been applied the relay should be operated several times manually to free the bearing on the shaft.

B. The selsyn indicators sometimes give trouble. This can also be checked by cleaning the wiper arms that slide up and down the stepper contacts. The relay can be operated manually past the number 10 channel position revealing these contacts or placing them in a position that they can be cleaned.

C. The reset accuracy of the TDZ mechanical system is very good. In spite of this many of the ET's and Radiomen that tune it do it the wrong way. They most always hold the outer dial when tightening the locking bar. This is incorrect procedure and should not be done. If you tune the transmitter with one hand in your pocket or behind you this will not occur. Come up on the setting slowly then tighten the locking bar without holding the dial. The entire operation can be easily done with one hand.

D. Occasionally the pauls of the autotune head do not fall into their detents. Most of the time that this happens the dial goes all of the way to the end of the rotation up to 2000. If this happens a little oil on the shaft holding the pauls will generally clear up the trouble. Operation of the pauls is sluggish and they need oiling. Do not, however, get any oil in the clutch mechanism.

4. Most other troubles with the TDZ are minor, although others do exist. If the output on the wattmeter falls off gradually after keyed it is usually an indication of gassy tubes or tube. It can be caused by the 2C39's but sometimes developes in the exciter portion, either the 807 or the 829 should be changed.

5. Be sure and test the 807's frequently in the modulator. If they become weak the modulation will be low and frequently distorted. R–106 should not be turned up too high (extreme background noise will result) but high enough for good modulation percentage especially when used with the AN/SGC–1 tone keyer.

6. On several occasions when using the transmitter on RATT the MCW oscillator circuit has been found to be energized. Usually because of a short on the keying circuit, but sometimes because of improper wiring up of the AN/SGC–1. Remove the output tube of the AN/SGC–1 or the 6SG7 input tube of the TDZ and hold down the space bar of the Teletypewriter. If there is still a tone on the transmitter it is coming from the MCW oscillator in the transmitter and that circuit should be checked. If this is allowed to continue during operation of the Tone Keyer there will usually be bad garbled transmitting.

7. Drawers should always be in tight. Be sure that the fasteners are holding when tightened down.

8. The output of the transmitter should be checked frequently. Several times each day in use if possible, as frequently as possible otherwise. If it has dropped off it may be raised by increasing the coupling to the P. A. Grid by adjustment of the G and H controls.

9. Some operators lower the output by throwing either the 2d Tripler control D off resonance or by tuning control E off resonance. To tune control D off resonance puts a much greater strain on the 829 stage, which will limit the life of the 829. To throw E off resonance can cause a bad unbalance in the output of the Third Tripler thus placing a stress on one of the tubes there, and limiting the life of a 2C39 (which isn't too good already). It is better to allow for the loss in the coupler between the third tripler plate and the power amplifier grid.

10. Antenna relays give occasional trouble by not closing properly or by shorting out due to breaking of contacts. This is usually an obvious trouble. The relative output meter reads high but there is no indication on the wattmeter.

11. Outputs are sometimes low because of bad 3C23 tubes in the power supply of the transmitter. If readings are low and nothing seems to bring up the output look for trouble here.

12. For 20 watts output the following readings should be obtained providing the transmitter is operating normally.

Grid	*Cathode*
1st Doubler 20 milliamperes	60–80 milliamperes
2d Doubler 10–20 milliamperes	100 milliamperes
3d Tripler 30 average milliamperes	75–100 milliamperes
P. A. 20–40 milliamperes	100–120 milliamperes

Relative uptput meter about 0.2 ma. in most cases. 4/1/52 ←

MODEL TDZ SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Causes and Remedy
→Improper operation.	First—always check dial settings against logged settings. *1/1/49.*
Channel not tuning properly on autotone or dials stopping at any random setting.	(1) Bad contact between multiple plug and connector. Examine and clean. (2) Slipping clutch caused by excessive lubricant. Disassemble and clean. (3) Pawl not falling in place on autotone cam drum. Remove burr from edge of cam. *1/1/49.*
No audio for m-c-w operation.	Replace 6SN7 audio oscillator tube. *1/1/49.*
Low emission.	Check 2C39 third tripler and power amplifier tubes. *1/1/49.*
Binding of autotone mechanism.	Shaft of C–158 for third tripler broken. Repair or replace. *1/1/49.* ←

FIELD SERVICE NOTE ON THE MODEL TEB TRANSMITTER

The EFSG has reported the following field service note relative to the TEB transmitter at the Naval Radio Station, Manila.

One TEB transmitter at this station showed 6400 volts on the main power supply rectifiers. Visual inspection of the rectifier tubes, V–25 and V–30, showed that there was no internal flashover under load. Renewal of these tubes made no change in operation. Removal of the plate connection on V–29 permitted V–30 to flash and likewise the removal of the plate connection on V–26 permitted V–25 to flash. It was apparent that a high-resistance connection existed some place in this circuit, either primary or secondary. This high resistance was located in the contacts of RL–5 and RL–6. The contacts were badly pitted and the movable contact pigtail jumpers were badly burnt due to the poor condition of the contacts. These contacts were cleaned and readjusted and the pigtail jumpers renewed with appropriate Belden braid. The TEB returned to satisfactory operation. *8/1/47*

●

REDUCED FILAMENT VOLTAGE ON TYPE 889RA ELECTRON TUBES IN TEB EQUIPMENT

The average life in hours of the type 889RA electron tube has been increased by over 95 percent at the Naval Communication Station, Annapolis, Md., by decreasing the applied filament voltage from 11 volts to 10 volts. No reduction in power output or other abnormalities of operation result from this reduction. In view of the economy resulting from increased tube life, the Bureau recommends that this type of tube be operated with a filament voltage of 10 volts, wherever suitable voltage regulation is maintained. *1/1/49.*

●

IPA BAND CHANGE SWITCH (S501) REPLACEMENT

The original IPA band change switches have proved unsatisfactory in operation in TEB transmitters. The Bureau has procured on Contract NObsr–49055 newly designed switches which have been delivered to activities where TEB transmitters are installed. Current inventory data was used to determine the number of switches to be shipped to activities using this transmitter. If additional switches are required, they will be supplied by the various stocking points of the Electronic Supply System under stock number N16–S–14010–2. *10/1/50*

●

BIAS CIRCUIT MODIFICATIONS

The "bias" indicator on the Models TEB and TEC transmitters are located in the common supply circuit of the bias plate transformer and the low power supply transformer. In this location the light, when not energized, indicates only that the common supply circuit is inoperative. The prime function of the "bias" light is to indicate presence of D. C. bias voltage for the PA tubes of the transmitter. Naval Radio Station, Annapolis, has submitted a modification to the subject transmitters to cause the "bias" light to be energized only when this D. C. bias is present. The modification consists of connecting the light and its series resistor from the junction of the bias bleeder resistors to ground.

The Bureau approves of this modification to be made on an optional basis. *1/1/51*

●

SHAPER CONTROL CIRCUIT

The following report of connection errors in the Model TEB Radio Transmitter Shaper Control Circuit has been received from the Electronics Officer, U. S. Navy Radio Station (T), Barrigada, Guam. The troubles cited and the corrective measures indicated have been checked by cognizant technical codes of the Bureau of Ships.

"1. It was noted that r.-f. excitation in the IPA Stage in the Model TEB Radio Transmitters installed at this activity, was much lower than the value called for in the manufacturer's instruction book.

"2. Investigation disclosed the following condition existing in all thirteen (13) presently installed TEB transmitters;

a. It was discovered that R–604 (2,000 ohms) and R–605 (10,000 ohms), both located in the Keyed Stage Power Supply, had been interchanged.

b. This placed R–605 (10,000 ohms) in series with R–110 (10,000 ohms) and the entire combination in parallel with R–604 (2,000 ohms).

c. The result being that the Shaper Control, R–110, could only pick off a maximum of 200 volts for the screen grid supply of the Buffer Tube and the Keyed Tube, instead of the otherwise nominal value of approximately 330 volts.

d. With this circuit and the Shaper Control (R–110) set on Position No. 3, only 5 to 10 ma. of grid current could be drawn by the Intermediate Power Amplifier State instead of the required 30 to 50 ma. This greatly decreased the transmitter output.

"3. When the circuit was connected up properly in accordance with the manufacturer's schematic diagram, IPA grid current of 30 to 50 ma. was obtained.

"4. Inasmuch as the schematic diagram was correct, but the resistor clips in question were incorrectly labeled, it is felt certain that the error occurred during the assembly of the transmitter at the factory . . ."

The shaper circuit in question is shown in figure 1.

NOTE.—The diagram below shows the circuit after resistors have been installed in accordance with the manufacturer's diagram. *4/1/51.*

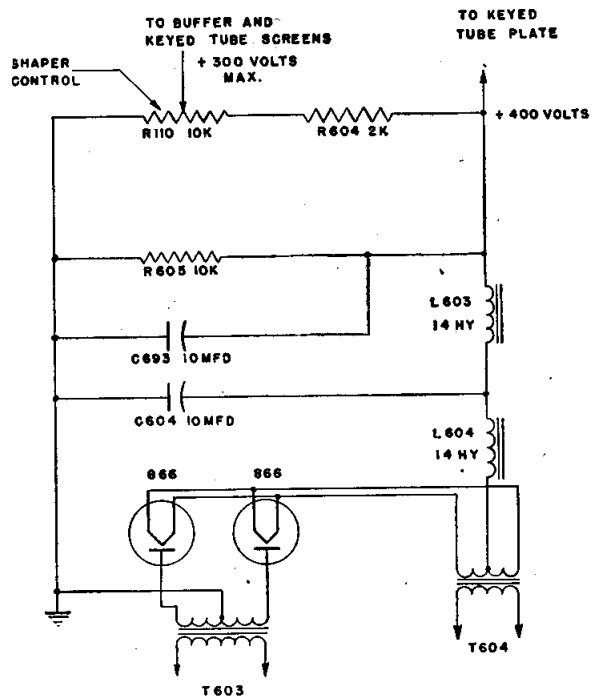

FIGURE 1.—Model TEB Shaper Control Schematic Diagram Simplified.

→ FAILURE OF THE TEB TIME INTERLOCK MECHANISM

The time interlock mechanism of relay K–801 incorporated in the Model TEB transmitter has on occasion failed to short out filter condensers C 612 and C 613 when the high voltage was off at the 7 KV rectifier. To prevent a serious hazard due to such a failure, it is stressed that these mechanisms be given periodic maintenance inspections to insure that all mechanical parts are clean and free acting. Relay K–1126 of Model TEC transmitters should be similarly checked. *1/1/52* ←

→ JACK OUTLET FOR THE PLATE VOLTMETER OF MODEL TED EQUIPMENTS

The plate voltmeter should be provided with a jack outlet on the back of the low power high frequency stage of the transmitter to facilitate carrier balance adjustments and other tests which require the use of the meter at the back of the transmitter.

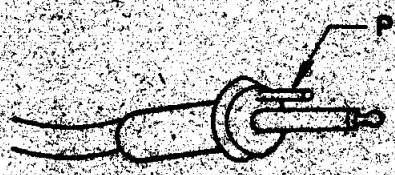

FIGURE 1.—Polarized jack plug to protect the microammeter of the meter set used with the model TED equipment.

A meter set made up of a 0-2 milliammeter and a 0-50 microammeter should be provided. Protection of the microammeter can be secured by using a polarized type of jack plug. An example of one method of providing this protection is shown in Figure 1.

●

A HINT ON SERVICING THE VARIABLE INDUCTANCES OF MODEL TED EQUIPMENTS

The variable inductances in the high power stages are very difficult to service. In order to facilitate their removal and replacement it is suggested that the following modification be made at the time of installation of the equipment. The inaccessible mounts of the coils should be modified by sawing slots to replace the mounting holes on the coil brackets. Small phospher bronze leaf-type springs should be mounted on the standoff insulators which the modified brackets normally are bolted to. The tension of the springs should be preadjusted by adjustment of the bolt to give a snug fit for the spade connectors on the coil mounts. Figure 1 shows this modification.

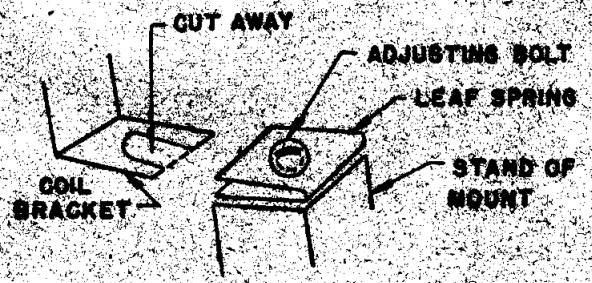

FIGURE 1.—Revised method of mounting the variable inductances of the model TED equipment. ←

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TEC RADIO EQUIPMENTS FIELD CHANGE NO. 1

CHANGE OF 3 KV. PLATE CONTACTOR K-1122

Equipments effected.—All Model TEC Transmitter Equipments.

Purpose.—To eliminate unsatisfactory operation of present contactor.

Procedure.—Replace present 25-ampere contactor with Allen Bradley contactor size 2, 50 amperes. JAN Type 29678. Reverse normally closed auxiliary contact on this contactor to normally open contact which is required for TEC. This change is a screwdriver operation.

General.—This contactor should be requisitioned direct by the installing activity from Electronics Supply Officer where it is carried in stock under number 17–R–70651–3749. Completion of this change should be reported on NBS–383 Forms. *10/1/50*

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→ BIAS CIRCUIT MODIFICATIONS

See page TEB : 1 ←

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INSTALLATION OF THE DISTORTION MEASURING VOICE FREQUENCY TESTING AND LINE BAY EQUIPMENT

When installing the distortion measuring voice frequency testing and line bay equipment, used in conjunction with the D156000 TEF transmitter, certain precautions should be observed when making the installation tests.

The equipment includes coils in which it is necessary to avoid injury due to core magnetization. Ordinary d-c buzzers and similar devices should never be used for continuity tests. Only continuity test sets which can cause a *maximum test current of one milliampere to flow* should be used.

It is essential that parts and contacts in the above equipment be clean since the failure of a circuit to function properly may often be traced to dirty contacts. In case a contact may be suspected of not being reliable, it may be checked by bridging a receiver across the contact through which current is flowing. Absence of fluttering in the receiver is evidence of a reliable contact. *10/1 45*

●

TRANSMITTER MONITOR

A simple monitoring device has been designed by John Tocarsic, CETM, and adopted by the Naval Radio Station at Annapolis. Designed for use with the model TEF single-side band transmitter, but adaptable to other models, it shows continuously whether the transmitter is on or off the air. Without its use, the operator at the transmitter must depend on the operator at the receiving station for notification of failure.

The monitor consists essentially of a tuned-circuit loosely coupled to the antenna transmission-line, a diode-connected detector, two neon lamps, and associated components and wiring. With r-f signals of sufficient amplitude in the tuned circuit, the lamps will glow.

Figure 1 shows the monitor as designed for use with the model TEF transmitter. The four-position switch selects the pre-set trimmer capacitor resonant with L_1 at the carrier frequency being used. The rectified output voltage across B_1 and B_2 is sufficient to light the lamps unless the TEF power output is below normal.

Although this monitor was designed for use with the Model TEF equipment, it can be readily adapted to any radio transmitter. The trimmer capacitors must, of course, be resonant at the transmitter frequencies being used, and the degree of r-f coupling to the monitor, depending on the individual installation and the power output of the transmitter, must be determined by experiment.

Symbol in figure 1	*Component*
L_1	3½ turns No. 20 enameled wire.
S_1	4-position frequency selector switch.
C_1, C_2, C_3, C_4	0.00014 μf trimmer capacitors.
C_5	0.001 μf paper, 600 volts.
R_1	1 meg., 1-watt carbon.
B_1, B_2	115-volt neon lamps.

4/1/48

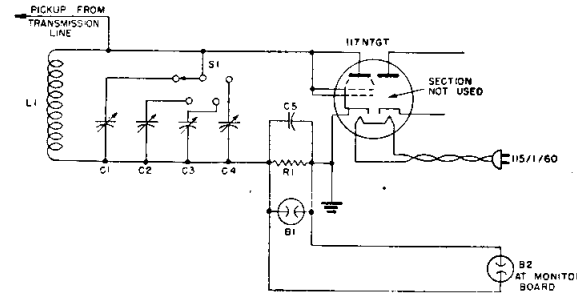

FIGURE 1.—Transmitter monitor.

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→MODIFICATION OF FILAMENT CONNECTORS FOR TEF SIDEBAND TRANSMITTER

The Bureau has been notified that deficiencies exist in the power amplifier tube filament connectors of the Model TEF single sideband transmitters. The connector material is flat, tinned copper braid, used as flexible connectors. Both ends of the braid are filled with solder for about one-half (½) inch to make them stiff. Holes are drilled in each stiffened end, for securing one end to a screw terminal, and for attaching a split cylindrical terminal to the other end. The cylindrical terminal is designed to fit over the tube filament prongs, relying on friction for mechanical and electrical contact. After prolonged usage the connectors show two (2) deficiencies. The terminal screws loosen at both ends, due to cold flowing of the soldered braid, and the cylindrical

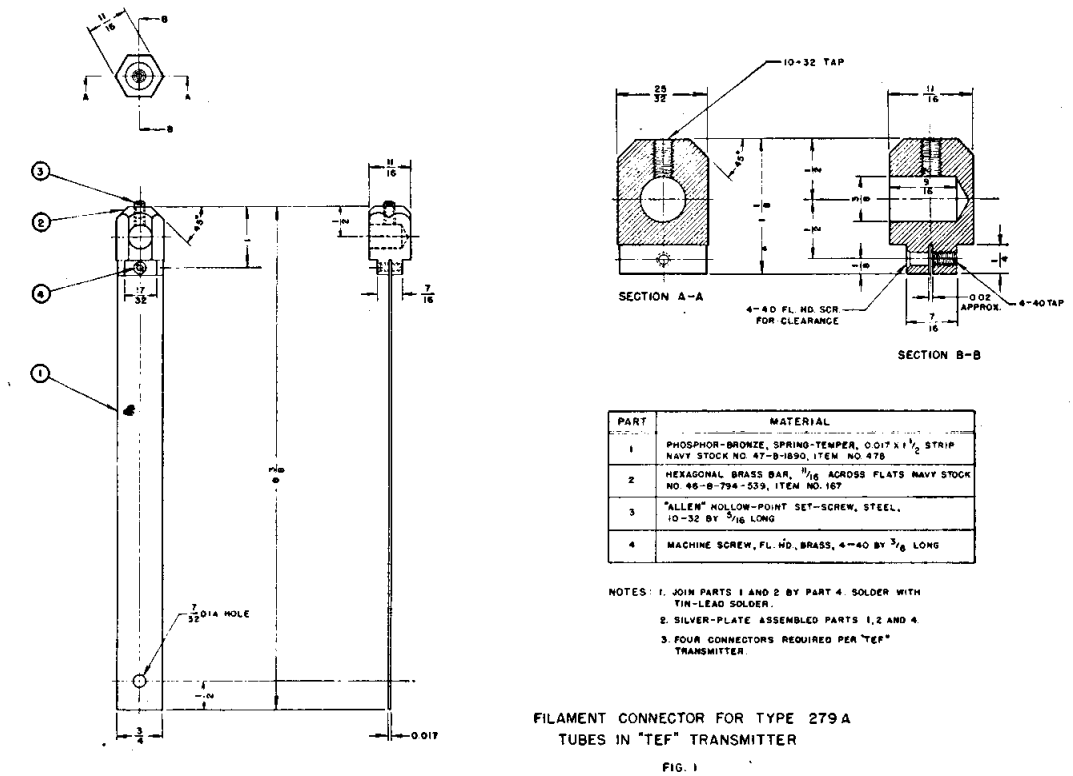

FIGURE 1. –Filament connected for type 279A tubes in "TEF" transmitter.

sleeves overheat, discolor and lose stiffness due to insufficient metallic contact area for the filament current.

Navy Communication Station, Annapolis, has designed a connector which has overcome these deficiencies. Figure 1 shows this connector together with a list of materials and instruction for assembly.

The Bureau approves this modification to be made on an optional basis. No kits are to be provided. Materials may be obtained from Navy Stock. *1/1/51* ←

→ MODIFICATION OF TAP-CHANGING TIMING RELAY K–249 OF MODEL TPA POWER AMPLIFIER

A field installation reports that difficulties have been encountered with the automatic, plate transformer tap-changer of the TPA power amplifier. The tap-changer mechanism could not be adjusted to change the taps on the plate transformer and simultaneously close the associated plate interlock contacts under all conditions of normal operation. The timing adjustment could be made reliable for either clockwise or counterclockwise rotation of the tap-changer mechanism but not for both directions of rotation. (Closure of plate interlock contacts depends on the rotation of the tap-changer mechanism to a degree sufficient to allow the interlock contacts to close. The extent of rotation is controlled by an adjustable timing circuit using an electronic tube, as shown in detail on the schematic diagram, Fig. 2–15, of the TPA instruction book.)

To effect satisfactory operation, the timing circuit has been modified to provide two automatically selected timing adjustments, one for clockwise rotation of the tap-changer mechanism and the other for counterclockwise rotation. The circuit modification is shown in figure 1.

The circuit modification consists of the addition of a 10,000-ohm wire-wound potentiometer, or rheostat, and a pair of normally open contacts. The effect of the modification is to employ a different grid voltage on the electronic timing tube for each direction of the tap-

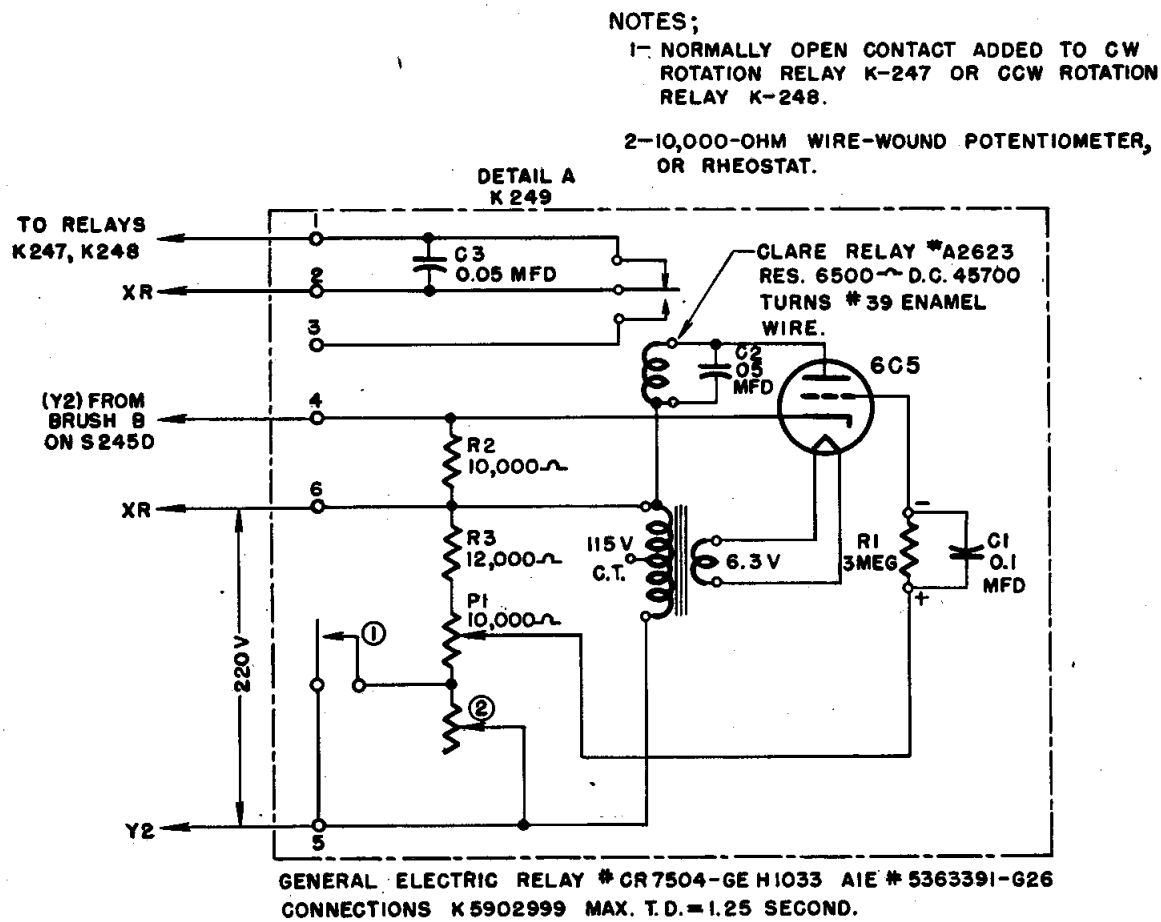

FIGURE 1.—Modified tap-changing timing relay K–249.

changer rotation. The original timing circuit components are effective for one direction of rotation while in the other direction the additional potentiometer is in the circuit, automatically changing the grid voltage on the timing tube. The additional contacts are mounted on one of the tap-changing motor control relays, either on relay K–247 or relay K–248, depending upon which direction of rotation requires it.

Modification instructions.—1—Prior to modifying the circuit, adjust potentiometer P1 so that the tap-changer synchronizes with the plate interlock relay in one direction of the tap-changer rotation, and overshoots the interlock closing position in the other direction of rotation. Overshooting is indicated by the plate voltage ready light coming on momentarily and then going out as the tap-changer reaches its position of rest.

2—Identify the motor control relay, either K–247 or K–248, as being operative when the tapchanger and the interlock contacts synchronize properly.

3—Install on this relay an additional pair of normally open contacts.

4—Install a 10,000-ohm wire-wound potentiometer, or rheostat, in conjunction with the normally open contacts provided above, as shown on the attached schematic diagram.

5—Adjustment of the additional potentiometer, or rheostat, is made by repeated trials with the tap-changer mechanism rotating in the direction in which the additional potentiometer, or rheostat, is effective.

Field installations are cautioned that the above modification is not approved unless the "TPA-Field Change No. 3" has been effected, or is effected concurrently with the above modification. *7/1/49* ←