RL-216/UG Tape Winder—Possible Shock Hazard

The purpose of this article is to alert all personnel who perform maintenance on M28 torn tape system teletype equipment, using Tape Winder RL-216/UG (TW-15), of a possible 115 volt shock hazard and to provide a temporary fix to eliminate this condition.

The hazard can be easily corrected by using the materials and procedures contained in Field Change 1-AN/UGC-20, AN/UGC-25 and AN/UGC-43, NSN 1N5815-00-057-9350. All holders of RL-216/UG tape winder should order this field change for installation at the earliest opportunity.

(EIB 880/900)

RO-280/UYK Line Printer — Maintenance Hint

DS1 Nelson R. Holt (USS INDEPENDENCE) forwarded an EIB/UATM comment sheet describing a problem discovered in the RO-280/UYK line printer. He also described the problem's cause/solution. The efforts of DS1 Holt are appreciated and his findings are passed on for the benefit of anyone with similar symptoms.

After installation of the RO-280/UYK line printer, the primary winding fuse (A6F2), for the main power supply transformer (A6T1), displayed a consistent tendency to blow when energizing the equipment.

Extensive trouble shooting revealed no apparent malfunction in the equipment. Voltage readings were high but within PMS tolerance limits of plus or minus 10%. The power supply control assembly (A6) was removed and it was noted that the primary of the input power transformer (A6T1), terminals 1 and 14 (labeled 103V) were connected to 115V source. The input was rewired to terminals 1 and 2 (labeled 115V) achieving normal voltage readings and an end to fuse A6F2 blowing during equipment energizing.

Data processing equipment is in limited supply and it is not unusual for a piece of equipment to be moved from one user activity to another. To facilitate varied usage, power supplies are frequently designed to utilize a range of input voltages and the installing activity connects the terminals most nearly matching the prevailing input voltage. However, if things didn't go wrong occasionally we wouldn't need technicians.

The power supply control assembly (A6) should not be removed for inspection without sufficient reason as units A5 and A6 are quite heavy and awkward to handle. Paragraphs 6-85 and 6-86 of NAVSEA 0967-LP-303-9910 caution that at least two men are required to lift these assemblies. The best guideline to follow would be either, if your PMS voltage checks are consistently near the tolerance limits, or if you must remove the power supply assemblies for some other reason, then the effort expended is justified to confirm that the proper primary voltage terminals have been connected for your installation. (EIB 933)

RO-313/G AUTODIN Low Speed Card Punch, Part of AN/FYA-71(V); Improvement for Printed Circuit Card A52668-001, NSN 7440-00-910-1920 – Announcement of Authorization to Make Subject Improvement

The U.S. Army Electronics Command and the Tri-Service AUTODIN Configuration Control Board (CCB) have approved a minor alteration to the RO-313/G Low Speed Card Punch which will reduce the high failure rate of Printer Solenoid Driver Circuit Card No. A51668-001 by replacing several resistors with their higher wattage counterparts. Constant overheating of the presently installed resistors has caused fatigue and value change to the resistors, plus subsequent damage to surrounding components namely Q3 and Q4 on the same PC card.

The engineering analysis conducted by the Army for the Configuration Control Board proved that R2, R4, R6, R16, R17 and R19 are carrying more power than designed for. Therefore, to reduce the high failure rate for Printer Solenoid Driver Circuit Cards, resistors R2, R6, R16 and R19 should be changed from 1/4 watt to 1 watt and R4 and R17 from 1/4 watt to 1/2 watt during the next preventive maintenance period for the RO-313/G Card Punch.

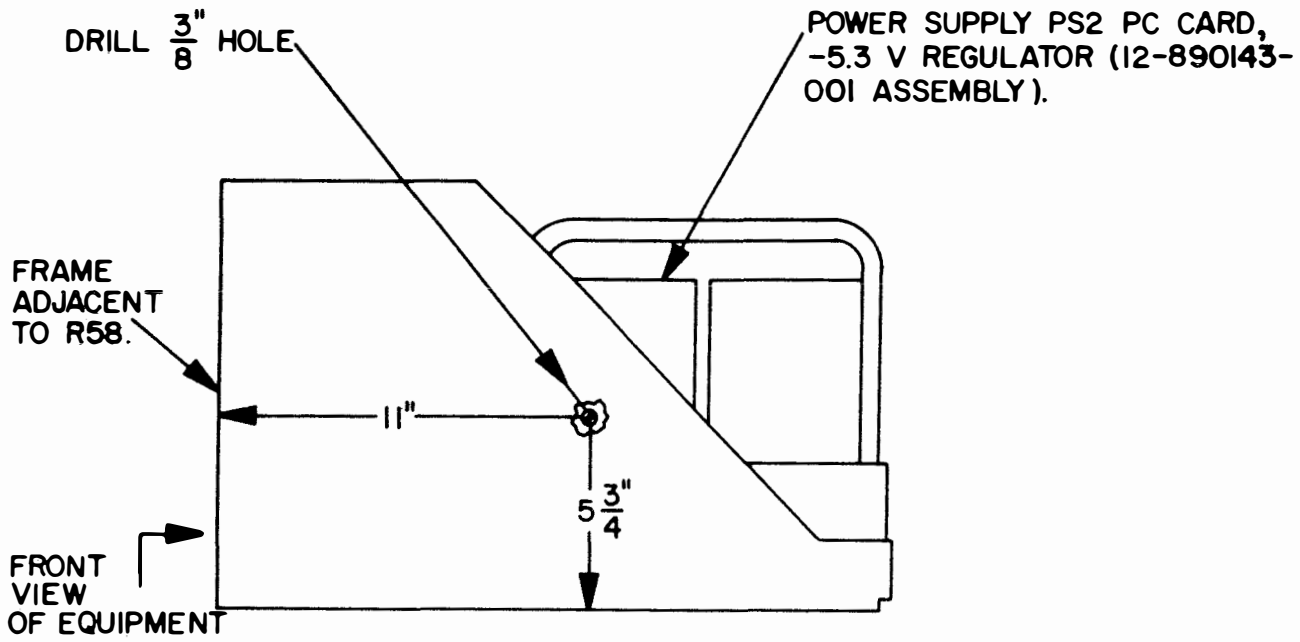
"The NSN for the 1 watt resistors to replace R2 and R19 is 5905-00-279-1682. The NSN for the 1 watt resistors to replace R6 and R16 is 5905-00-279-2645. The NSN for the 1/2 watt resistors to replace R4 and R17 is 5905-00-279-5434." (EIB 78-963)

RO-314/G AUTODIN High Speed Paper Tape Punch, Part of AN/FYA-71(V); Minor Change to Eliminate Physical and Equipment Hazard—Announcement of Authorization to Make Subject Minor Change to Equipment

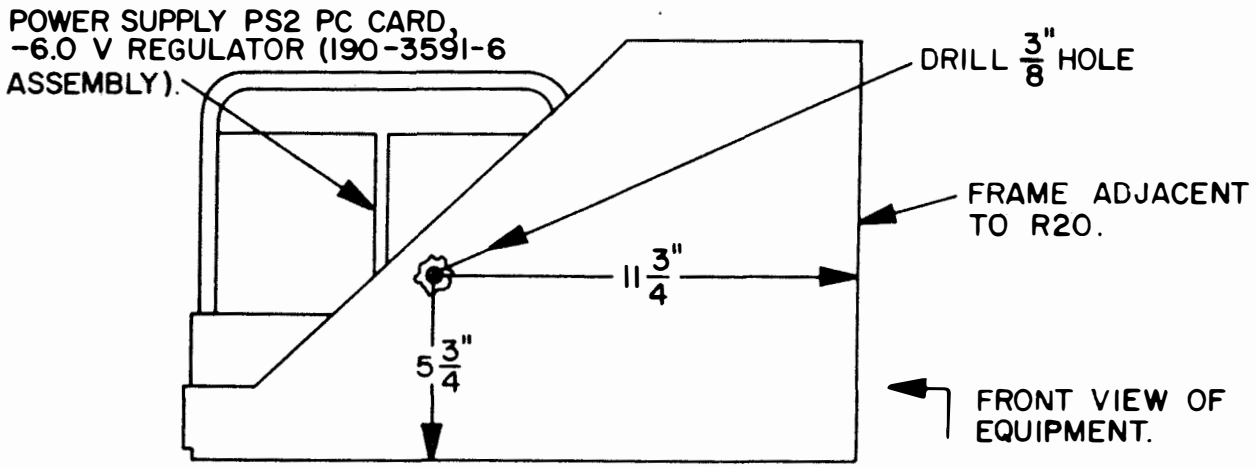
The U.S. Army Electronics Command, NAVELEX and the Tri-Service Configuration Control Board (CCB) have approved a minor alteration to the RO-314/G High Speed Paper Tape Punch to eliminate a condition which is hazardous to both personnel and equipment. Because of the minor nature of this change it is not being promulgated as a field change.

Voltage adjustments to the Printer Interpreter Power Supply, items 16 and 42, Figure 4-49, NAVSHIPS 0967-324-0060, requires the use of an offset screwdriver which creates a hazard of short circuiting and damage to personnel and equipment. To eliminate the hazard and to facilitate making future adjustments to the -5.3 and -6.0 volt DC power supplies, 3/8-inch holes must be drilled through the equipment frames adjacent to R-53 (-5.3 V regulator) and R-20 (-6 V regulator) to permit adjustment with normal tools.

The foregoing alteration should be performed during the next maintenance period on the RO-314/G punch equipment. Use standard hand tools and assure power to the equipment is turned off and that adequate protective covering is placed over surrounding circuit boards and chassis. It is suggested that assemblies 12-890143-001 and 190-3591-6 be removed prior to drilling to prevent possible damage to these printed circuit cards. (See figure 1 for details.)



RIGHT SIDE VIEW OF CONTROL LOGIC ASSEMBLY



LEFT SIDE VIEW OF CONTROL LOGIC ASSEMBLY

NOTE: DISTANCES SHOWN ARE APPROXIMATE.

(EIB 948)

Figure 1. Control Logic Assembly.

RO-415/GMH-6(V) Recorder, Radar Facsimile--Maintenance Information

The purpose of this article is to assist maintenance personnel with the trouble-shooting and repair of Recorder, Radar Facsimile, RO-415/GMH-6(V).

A problem recently arose concerning a failure of the recorder to print a picture with an incoming signal. This particular problem was traced to the "Marking Output Circuit" of the recorder. An initial examination of the printing circuit revealed that two components on PC card "DC Marking Amplifier Assembly 9290-4-5A," resistor R-534 and zener diode CR-505, were burned out. However, when a new card was installed, resistor R-534 on the replacement card also burned out. Further investigation localized the primary problem to an emitter to collector short in transistor Q-1301 on PC card "Marking Amplifier Output Assembly 9271C-4-13A." This short caused excessive current to flow in the printing circuit, burning out R-534 and CR-505 and melting the solder connection between resistor R-4001 and the Helix.

The failure of transistor Q-1301 was probably not sudden. It began with a slow leakage of current that caused a printed spot to appear on the facsimile paper when the Helix drum was not rotating. This printed spot is a clear indication of current leakage in the marking output circuit, and all maintenance technicians should, as part of their periodic maintenance, verify the presence or absence of helix current when a picture is not being printed. In addition, a replacement card should not be installed in the circuit until all components have been checked.

(842)

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

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

AN/SRC-20, –21 –ADJUSTMENT OF V–106(4X–150A) TO ACHIEVE LINEAR AMPLIFICATION IN RF AND PA AMPLIFIER OF RT-581/URC-9 AND REDUCE FAILURE RATE

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

R-1051( )/URR, T-827( )/URT and RT-618( )/URC Equipments; Internal Frequency Standard (A2A5)—Compare Lamp Indications

See article in R-1051( )/URR section with the same title.

(EIB 907)

WIRING CHANGE TO SWITCHING UNIT SA-484/GGA-1

When the TSEC/HW keyer is installed on the AN/GGA-1, the associated teletypewriter equipment may fail to recognize consistently the figure function. To correct this malfunction, the following wiring change to the SA-484/GGA-1 switching unit of the AN/GGA-1 is authorized.

Refer to SA-484/GGA-1 wiring diagrams:

1. Reverse leads going to pins 9 and 13 of IBM relay.
2. Add a wire from pin 5 of IBM relay to terminal 7 of plug J5.
3. Correct technical manual schematics accordingly.

NONCONFORMITY OF SWITCHBOARDS

The SB-83/SRT equipments have been procured from numerous sources. San Francisco Naval Shipyard has reported that those supplied under Contracts NObsr-52024 and NObsr-57241 do not conform mechanically with the others in that the switch rows are 5/8-inch below the specified level.

This discrepancy becomes apparent when Field Change panels had been cleaned when they were installed. Numerous 1-SB-83/SRT is accomplished. The horizontal rows of switches must be in alinement on successive switchboards to install the field change, which necessitates remounting the switchboards if some are of the non-standard type. This disrupts the top and bottom lines of the installation and complicates mounting.

It is recommended that the switchboards bearing the Contract numbers NObsr-52024 and NOsr-57241 be grouped prior to installation and mounted together and not intermixed with those supplied under other contracts. In addition make a thorough inspection of all switchboards (especially those supplied under Contract NObsr-52024) prior to installation to insure the absence of faults such as cold solder joints, frayed or insufficient insulation, and lack of continuity.

MOUNTING AND WIRING

See article in SB-82/SRR under same title.

APPROVED METHOD OF TESTING SB-83/SRT AND SB-82/SRR TRANSMITTER AND RECEIVER TRANSFER SWITCHBOARDS

An approved method of testing SB-83/SRT and SB-82/SRR, transmitter and receiver-transfer switchboards, was submitted.

It was suggested that shipyards fabricate a portable testing apparatus that could quickly check the completed wiring of receiver-transmitter transfer switchboards installed aboard ship. Interested shipyards may request the fabrication drawing (RE 60F 2046) SB-82/SRR and SB-83/SRT transmitter, or receiver switchboards test equipment, from the Bureau of Ships.

CONTROL PANEL, TELEGRAPH KEY SB-315( )/U INSTALLATION PROCEDURE

During a recent ship insurv trial attended by a Bureau of Ships representative, it was noted that the Control Panel, Telegraph Key SB-315( )/U was improperly installed. The SB-315 ( )/U had been installed in the proper location, but the mounting hole in the radio-operating position had not been enlarged sufficiently to allow proper recessing of the complete panel. The installation noted placed the key assembly at an inconvenient height which caused operator fatigue.

Activities installing the SB-315 ( )/U shall locate the control panel so that the phenolic panel is mounted flush with the operating position mounting surface.

ANTENNA HINTS

Antenna Transfer Panel SB-346/S, shown in BUSHIPS drawing No. RE 49F 680, is mounted in an aluminum box. No provision (mounting holes, lugs, etc.) has been made for installing this unit aboard ship because each installation may be made under slightly different conditions.

When an SB-346/S is to be installed, the aluminum box (part 3, RE 49F 680) should be removed and drilled for bolts, or mounting lugs should be attached. After the box is prepared for installation, it should be inspected for chips, burs or other faults before actual reassembly and installation.

SB-2622/USQ-20(V) Launcher System Module—Control of ECCM Flip/Flops

Flip/flops in the LSM set by associated pushbutton indicators A29, A31, A32, A34, A35, A37, A38 and A40 on the bullnose may be reset by decreasing the dimmer illumination control. Other internally generated noise may also cause this problem. To eliminate this crosstalk condition, if it does exist, the following wires in the cabinet should be shortened and rerouted to follow the most direct path possible between tie points.

FROM	TO	NET NO
A7J1-F2	A8J3-F2	22Y09
A7J4-H14	A8J3-H14	23Y75
A7J4-G1	A8J3-G1	23Y74
A7J4-G2	A8J3-G2	23Y73
A7J4-G3	A8J3-G3	23Y72
A7J3-F1	A8J3-F1	23Y76
A7J3-E13	A8J3-E13	21Y77
A7J3-E14	A8J3-E14	20Y77
A7J4-H13	A8J3-H13	21Y66
A7J3-E8	A8J3-E8	20Y66
A7J3-E9	A8J3-E9	20Y67
A7J3-E10	A8J3-E10	20Y68
A7J3-E11	A8J3-E11	20Y69
A7J3-E12	A8J3-E12	20Y70
A7J3-E1	A8J3-E1	20Y85
A7J3-E2	A8J3-E2	20Y65
A7J3-E3	A8J3-E3	20Y58
A7J3-E4	A8J3-E4	20Y62
A7J3-E5	A8J3-E5	20Y63
A7J3-G5	A8J3-B14	22Y109
A7J1-E12	A8J3-B14	22Y109
A7J1-E5	A8J1-B12	30M00
A7J1-E6	A8J1-B13	30M00
A7J1-E7	A8J1-B6	20G00
A7J1-E13	A8J1-B14	20G00

(818)

OA-7781/USQ-20(V),(SB-2622/USQ-20(V) and SB-2624/USQ-20(V)), CV-2036/USQ-20(V)(KCMX), OJ-166/UYA-4(V) and OJ-167/UYA-4(V), CP-789(V)/UYK Center Drive Shaft--Maintenance Hint

See article in OA-7781/USQ-20(V) Section under the same title.
(EIB 913)

OA-7781/USQ-20(V),(SB-2622/USQ-20(V) and SB-2624/USQ-20(V)), CV-2036/USQ-20(V)(KCMX), OJ-166/UYA-4(V) and OJ-167/UYA-4(V), CP-789(V)/UYK Center Drive Shaft--Maintenance Hint

See article in OA-7781/USQ-20(V) Section under the same title.
(EIB 913)

SB-3189/FGC Patch Modules–Maintenance Hint

Naval Shore Electronics Engineering Activity, Pacific (NAVSEEAPAC) has received several reports of jacks on the SB-3189 patch module torn loose from their mountings. Investigation shows that the failures are due to the mounting screws extending only 5/32 inches into the mounting strip causing the threads to strip when the plug is inserted. As an expedient, disabled jacks were remounted by tapping the retainer screw holes with an 8-32 inch bottom tap and securing the jacks with 8-32 x 3/8 inch screws with no lockwasher.

A preventive measure which has been taken is to replace the 6-32 x 1/4 inch retainer screw and lockwasher with a 6-32 x 3/8 inch screw and no lockwasher.

Recommended action is:

1. Remove the 6-32 x 1/4 inch screw with lockwasher and discard.
2. Install a 6-32 x 3/8 inch screw with no lockwasher. (774)

SB-3189A/FGC or SB-3189B/FGC (Low Level) DC Patch Module Patching Sequence

The purpose of this article is to provide the correct patching sequence for the standard shore station low level DC digital patch module to prevent possible interconnection of two "hot" circuits (Signal and Step/Timing) during the patching process between LINE and EQUIP jacks.

Due to the presence of + or - 6 volts (Signal) on the Tip of the jack circuit and + or - 6 volts (Step/Timing) on the Ring, and because the Tip of the patch plug always makes contact with the Ring of the Type 280C jack as the plug is inserted into the jack, it is necessary to initiate the patch by (1) inserting one end of the patch cord into the LINE jack and (2) completing it by insertion of the other end into the EQUIP jack of the circuit(s) involved.

This procedure will result in momentary connection between either a "live" and a "dead" circuit, or between two "dead" circuits; never between two "live" circuits. *(EIB 857)*

SCR-300 TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
SCR-300.--Mechanical failure of flexible gooseneck of antenna AN-130-A.	Tests show that the failure of the gooseneck is not due to a weakness in the material used for its construction, but rather to the method of fastening the gooseneck to the base bushings. It has been determined that an external spring covering the joint of the gooseneck and the base shell bushing will considerably improve the gooseneck's resistance to breakage. Signal Corps nomenclature AN-130-B has been assigned to the antenna incorporating the reinforced spring. Current procurement of antennas for replacement purposes will require antenna AN-130-B.
SCR-300.--Inadequate carrying method for radio set SCR-300 which tires personnel.	The standard Army quartermaster pack board can be utilized. A light-weight model of SCR-300 has also been developed. The pack board is obtainable, through channels, from the Marine Corps.
SCR-300.--Failure of antenna AN-130-A due to breakage of the base shell.	A stronger base shell is now being manufactured. Procure through regular channels.
SCR-300.--Insecure fastening of tube shields of radio receiver and transmitter BC-1000.	During initial production, the tube shields were too tight and contributed to the excessive tube breakage experienced with early sets. The loose tube shield is a compromise solution of the problem. It is believed that the tube shields in current production are adequately secured.
SCR-300.--Breakage of trunk catches holding chassis and battery cases together.	Signal Corps modification work order M W O SIG 11-242-2, dated 20 November 1944 details instructions for replacing original catches with catches of a strong mechanical construction. Procure these modification work orders through channels. Production changes are now being made.
SCR-300.--Insufficient clearance between B-plus lug on coil L-3 and chassis, resulting in water grounding B-plus lug to chassis, causing resistor R-6 to burn out.	Manufactures are providing, on all future models, additional clearance by proper dressing of lug.

DPST SWITCH IMPROVES SCR-300 TRANSCEIVER

Installation of a DPST switch to lengthen battery life in SCR-300 transceivers has been suggested by Martin G. Levitt of the New York Naval Shipyard.

A number of SCR-300 transceivers are used for passive defense and must be kept ready for emergencies with batteries installed. The transceivers have BA-70 batteries equipped with an on/off switch SW2. In the off position, only the filament voltage is broken. The B+, 90V, and 60V voltages remain connected with the associated circuits.

As a result, the shelf life of the batteries was less than half the normal expectancy, and lowered voltages were causing poor transceiver operation. Tests were made by inserting a milliammeter in the (B) supply. It was discovered that 10 milli-amperes was being drawn from the battery, through leakage of bypass condensers, with the unit stored in off position.

Substitution of a DPST switch for the SW2 switch was proposed. Additional wiring was installed to permit the B voltage to be turned on/off simultaneously with the filament voltage by breaking the B-lead with the second section of the switch.

With this system, there is no drain on the battery when it is not in use. Therefore, excessive battery replacement is eliminated, and the transceivers are in top operating condition whenever they are needed.

SCR-608 Troubleshooting Notes

Difficulty encountered:

SCR-608: Very low percentage of modulation when operating from local position.

SCR-608A: Relays S-101, S-102, and S-103 were lagging when microphone button was released.

Cause and Remedy:

Due to remote microphone being in parallel with local microphone. Rearranged switch contacts in remote control to disconnect remote microphone when not in use.

Found remote control cable to be grounded in box on bridge. Cleared ground, cleaned relay contacts and all O.K. again.

RECEIVER TUBE PROTECTION IN SCR-610 RADIO EQUIPMENTS

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

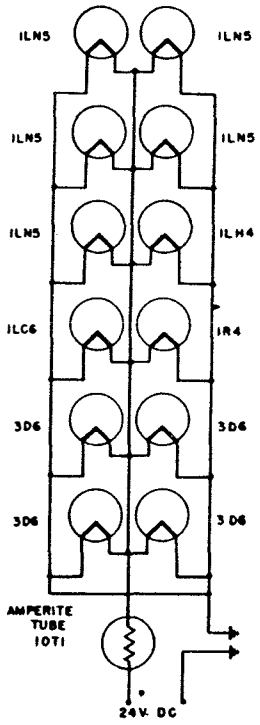


FIGURE 1. Receiver filament circuit.

REMOVE AND DISCARD DESSICANT

It has suggested that the dessicant bags be permanently removed from the SCR-610. He states that this measure will save repairs on the equipment since the bags, if not properly maintained, defeat their purpose by releasing the accumulated moisture into critical areas of the equipment.

Since the harm done by over-saturated dessicants can be much greater than the benefit derived from properly maintained units, remove and discard the Silica Gel bags fastened inside the equipments. The SCR-610 is obsolescent and will be replaced in the near future so no field change will be issued.

SCR-610 TROUBLE SHOOTING NOTES

Difficulty Encountered

SCR-61.--Continually blew line fuses.

Cause and Remedy

Faulty voltage regulator tube VT-195, and a shorted filter condenser, C-403, were discovered. These were replaced and the set operated normally.

FAILURE OF CAPACITORS IN SCR-624 RADIO EQUIPMENT

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

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

SCR-624 TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
SCR-624.--The by-pass capacitor, symbol No. 102-1, 6800 mmf. 300 V DCW has been reported as failing.	Replace 102-1 with a mica capacitor, 6800 mmf. 600 V. DCW Navy type CM 45 B682K.

SG-354/U–ANTENNA AND TRANSMISSION LINE CHECKER, AVAILABILITY OF

Bureau of Ships has under procurement antenna checkers in the flashlight form factor. These checkers are commèrcial equipment made by Thompson-Ramo Wooldridge. They are to be requisitioned from stock through regular supply channels. Nomenclature has been assigned as SG-354/U. The RF output below 1000 mc is 25 db minimum above 1 microvolt per megacycle bandwidth as measured with an Empire Devices Corporation model NF-105 Noise Intensity Meter, using an antenna-to generator spacing of 50 inches. Above 1000 mc the R.F. output is 500 microvolts minimum as measured with a Polarad Model TSA Spectrum Analyzer, using an AT antenna spaced two (2) inches from the checker.

The flashlight checker employs an 18 volt dry cell battery. Battery life is about 50 hours, based on 10 minutes operation per day. A battery is supplied with each equipment.

The output signal level of the flashlight shaped antenna checker cannot be guaranteed from unit to unit or over any period of time. The output is subject to deterioration due to aging of the battery and the interference generator head. Therefore this instrument should be considered as a rough go-no-go signal source rather than a calibration device. It can be used for checking antenna systems and their associated transmission lines and receivers for catastrophic failures.

SAFETY PRECAUTIONS FOR RCA MODEL SSB-1 SINGLE SIDEBAND TRANSCEIVERS

Extreme caution should be exercised while making tuning adjustments on the transmitter or receiver of the RCA SSB-1 single-sideband transceiver which is presently undergoing evaluation by the Navy. The following specific precautions should be taken:

1. Both terminals of the plate-current metering jack are at 600 volts with respect to ground. Therefore, the treansmitter should be de-energized when either making or breaking this connection.

2. The top of the neutralizing capacitor and the plates of the final amplifiers are at a potential of 600 volts with respect to ground and are in an exposed position when the top of the transmitter cabinet is opened. Extreme caution should be exercised to prevent bodily contact with these points while working in this area.

3. The final plate tank and the antenna-loading coil are at a high r-f potential with respect to the chassis of the equipment and ground. Extreme caution should be exercised to prevent bodily contact with these points while working in this area. The transmitter should be de-energized before attempting to move taps on either the final plate-tank coil or the antenna-loading coil.

RCA-SSB-1 SPEECH CLIPPER REMOVAL

The Bureau has received information that a number of ships have experienced improved performance of the Transmitter-Receiver RCA-SSB-1 when the Speech Clipper unit was removed.

Ships desiring to do so may make on-the-air checks with and without the unit. If the results of the test indicate use of the speech clipper is not desired, the unit may be removed. When the unit is removed, it is necessary to install a dummy plug. Instructions for this plug are contained on the equipment schematic diagram in the Technical Manual (NAVSHIPS 92917). The removed unit must be retained aboard and supplied with the equipment when removed from the ship.

RCA SSB-1 AND ELDICO S-100 PERFORMANCE AND OPERATIONAL REPORTS

Performance and Operational Reports for Single-Sideband Equipments RCA SSB-1 and Eldico S-100, may be discontinued except where failures occur in the equipment.

Specific information on the equipment failure detailed in the "General Remarks" space on this form is helpful in providing necessary equipment field changes.

TRANSCEIVER SSB-1 SAFETY PRECAUTIONS

The single-sideband transceiver SSB-1 is a commercial equipment provided for fleet use. Recent reports have indicated that personnel have been receiving electrical shocks from various components of the equipment when retuning channels.

The original intent for use of this equipment was to initially preset four designated channels for operational use. The equipment was not intended for complete frequency changing with other crystals during the course of an operation. Reports have indicated that at times, radio men have been required to change frequencies on ten minutes notice. This increases the electrical shock hazard in addition to damaging components designed for normal commercial usage.

The Bureau of Ships have a field change under preparation for the elimination of all known danger points of this equipment. The field change will permit the replacement of metal tube caps with ceramic type caps, protection for the neutralizing capacitor, final tank components, and the ac power input connections.

The Bureau is also currently procuring an Antenna-Tuning Group AN/SRA-20 for use with the SSB-1. This antenna-tuning group is a four-preset-channel type.

All personnel are cautioned to use extreme care in the tuning of the SSB-1 equipment.

RADIO TRANSCEIVER SSB-1

Recent reports have indicated difficulties with the adjusting screws for the tunable inductance coils shearing off. These coils must be adjusted with each crystal-frequency change.

The USS SPINAX (SSR-489) has recommended that on-board repairs can be made by soldering a nut in place of the existing screw head.

The Bureau concurs with this recommendation and suggests that this repair be initiated on all SSB-1 equipments until improved methods can be established.

RCA SSB-1/AN/SRA-20 and Eldico S-100/AN/SRA-25; Removal from Ships

A number of ships and shipyards removing Radio Set SBB-1 have failed to concurrently remove the associated Antenna Tuning Group AN/SRA-20 (installed as Field Change 2-SSB-1). Stock activities have also reported that ships have turned in the SSB-1 and Control Unit C-2372/SRT but have not included the RF Tuner TN-329/SRT.

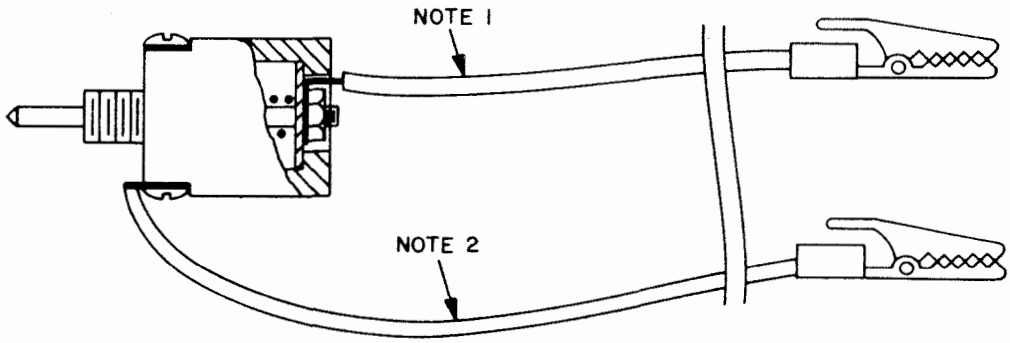
Failure to turn in the AN/SRA-20 or only portions thereof has resulted in equipment shortages, a stock control problem, and has reduced the quantity of equipment available for reissue.

All concerned are reminded that upon removal of the SSB-1 the associated antenna tuning units (AN/SRA-20) must also be removed as these units are a part of the prime equipment and were installed as an equipment field change.

A similar problem concerns the Eldico S-100 equipment and its associated antenna tuner AN/SRA-25 (Field Change 2-S-100).

T-347( )/SRT Radio Transmitting Buoy - Battery Test Harness Information

Planned Maintenance System Feedback Reports indicate problems in performing step 1.d of Maintenance Requirement Card number C-82 Q-1 due to incorrect lead polarity of external battery test harness. These test harnesses are now being manufactured for use with negative ground equipment such as Radio Transmitting Buoy T-616/SRT. The T-347( )/SRT, however, has a positive ground. Users are cautioned to observe the polarity of leads when assembling the test harness. Correct assembly of the battery test harness for use with the T-347/SRT and T-616/SRT is shown in figure 1. The test cable harness assembly for Radio Transmitting Buoy T-347( )/SRT was assigned a new Federal Stock Number 9G5995-295-2855; this FSN appeared in EIB 647. Users are advised to reverse the assembly of leads, if required, to agree with instructions on the Maintenance Requirement Card. (788)



NOTES

1. For use with T-347( )/SRT this lead should be black. For use with T-616/SRT this lead should be red.
2. For use with T-347( )/SRT this lead should be red. For use with T-616/SRT this lead should be black.

Figure 1. Battery Test Harness Assembly.

T-616/SRT and T-616A/SRT Radio Transmitting Buoy—Information on

This article provides general maintenance information relative to the T-616/SRT buoy.

1. After completing the periodic operating check required by NAVSHIPS 0967-234-3020 (formerly NAVSHIPS 95867.42) Maintenance Standards Book for Radio Transmitting Buoy T-616/SRT, wrap battery test plug insert with one wrap of teflon tape dope and tighten securely. This simple procedure will improve the watertight integrity of the buoy.

2. A cause of erratic keying has been attributed to the code wheel drive motor mount becoming loosened through vibration. If this deficiency becomes apparent, replace the 8-32 x 3/8" hardware which secures the motor mount to the chassis with 8-32 x 1/2" machine screws, flat washers and hexagonal elastic stop nuts. *(EIB 862)*

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

See Article under AM-3924(XN-2)/URT with the same title. (EIB 720

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

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

R-1051/URR AND T-827B/URT-EQUIPMENT DAMAGE CAUSED BY APL ERRORS

See article under R-1051/URR with same title. (EIB 730)

R-1051D/URR Radio Receiver and T-827D/URT Transmitter--Maintenance Hint

See article under R-1051D/URR with same title. (849)

R-1051( )/URR, T-827( )/URT and RT-618( )/URC Equipments; Internal Frequency Standard (A2A5)–Compare Lamp Indications

See article in R-1051( )/URR section with the same title. (EIB 907)

MODIFICATION OF D.C. CONVERTER TA-142

The Naval Ship System Command has been adivsed of difficulties encountered when using the TA-142 converter to operate 6-volt "FM" equipments in 12-volt vehicles of either Ford or Chevrolet manufacture. The problem is one of decreased resistance to ground when the vehicle's ignition switch is turned off, thus occasionally causing the vibrator reed of the TA-142 to operate. This condition has resulted in drained batteries.

The following information describes the problem and solution in detail.

The vibrator control reeds of the TA-142 converter are connected so that the converter will be turned off with the ignition switch. This eliminates the possibility of the equipment being left on when the operator leaves the vehicle. Figure 1 is a schematic of the TA-142 converter unit. The connections added on the bottom represent the battery, control-head, and ignition-switch connections.

Under normal operation, the lead to the R or reed terminal is carrying 800 ma at 12v. When the ignition switch is turned off, the reed occasionally will continue to operate. Under this condition, the current is reduced to 250 ma and reverse direction. The voltage reading from the ignition switch to ground is around 2 volts. If the vibrator fails to continue vibrating with the ignition switch off, the voltage reading from the ignition switch contact to ground is 0 volts. The double-arrowed patch in figure 1 represents the current flow for normal operation. The single-arrowed path represents the flow which occasionally occurs when the ignition switch is open. RACC represents the remaining accessories in the vehicle such as oil indicator, light, and so forth. A measurement of this load with an ohmmeter indicates approximately 2 ohms of resistance.

The vibrator will stop if the control-head switch is opened. It will also stop if the accessories represented by RACC are all disconnected except for the converter. If the ignition switch is opened at the instant that the reed contacts are open, it evidently stops the vibrator. This explains the intermittent operation.

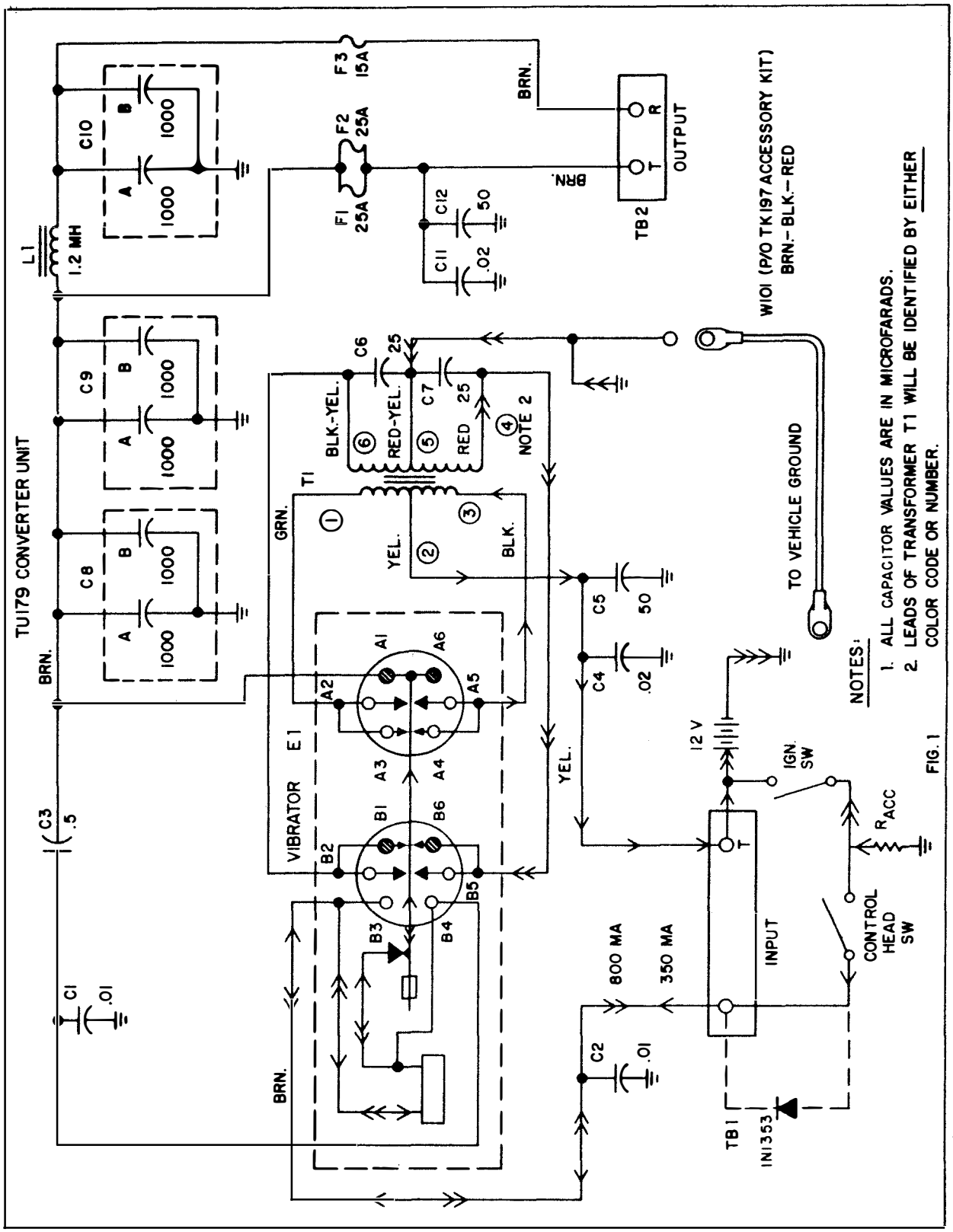
To permanently correct this condition, a diode type 1N1353, FSN N5960-821-8581, was placed in the lead from the ignition switch to the reed contact. The diode is shown dotted in on figure 1. It is polarized so that current will flow in the normal direction, but will block reverse-flow current such as occurs when the ignition switch is opened. This procedure was considered more satisfactory than that of depending upon the vehicle operator to turn the control-head switch off when leaving the vehicle. It is requested that where this modification is used, the stations Equipment History Cards be so annotated. When it is no longer required, the equipment is to be restored to its original condition.

INCREASING RELIABILITY OF MOTOROLA CONVERTER TA142

The output to transmitter of the d.c. Converter TA142 is fused with two 25-ampere fuses F1 and F2 in parallel to carry 35 to 50 amperes. The extractor-type fuse holders, furnished as part of the converter, overheat resulting in melted connections and repeatedly blown fuses. It has been reported that the present fuse holders, which are made of commercial-grade molded material with commerical-type connection lugs attached, willfail during operation at maximum rating of the Model TA142. A suggested method of improvement which will increase the reliability in the operation of the converter TA142 has been submitted.

It is recommended that the present fuse holders F1 and F2 be replaced with two Fuse Indicator Corporation "Non-Indicator Fuse Holders, Type 300A" each rated at 30 amperes. (Fuse Type F03 per MIL-F-15160). These fuse holders are made of glass fibre alkyd with connection studs molded in the material. The larger connection screw, molded stud, and the glass fibre alkyd material all combine to reduce the heat problem. The fuses are single hole panel mounting type and are to be installed in the F1 and F2 panel locations.

It is expected that these fuses will not develop the heat of the present fuses and will provide adequate current carrying capacity resulting in increased reliability. (570)


TU179 CONVERTER UNIT
L1
1.2 MH
C10
C9
C8
A
B
1000
F1 25A
F2 25A
F3 15A
BRN.
TB2
OUTPUT
R
T
C12
50
C11
.02
W101 (P/O TK197 ACCESSORY KIT)
BRN.- BLK.- RED
C6
25
C7
25
BLK.-YEL.
RED-YEL.
RED
NOTE 2
T1
GRN.
YEL.
BLK.
TO VEHICLE GROUND
C5
50
C4
.02
A1
A2
A3
A4
A5
A6
E1
VIBRATOR
B1
B2
B3
B4
B5
B6
C3
.5
C1
.01
C2
.01
12 V
IGN. SW
R ACC
800 MA
350 MA
INPUT
CONTROL HEAD SW
TB1
IN1353
NOTES:
1. ALL CAPACITOR VALUES ARE IN MICROFARADS.
2. LEADS OF TRANSFORMER T1 WILL BE IDENTIFIED BY EITHER COLOR CODE OR NUMBER.
FIG. 1

TA-790/U Microphone Element—Maintenance Hint

Several failures of Raonwell part number 113950 microphone element (part of TA-790/U telephone set) have been reported recently. The failures are due to broken wires internal to the element.

This article provides a procedure for repairing the element. Use of this procedure is recommended only in an emergency situation when a replacement microphone is not available.

The microphone element is a factory sealed unit. The seal must be broken in order to effect repair. Caution must be exercised in both breaking and restoring the seal.

Material Required:

Scotchweld Adhesive #1838 B/A or equivalent

#28 AUG Stranded Wire Cotton

Tools Required:

Screwdriver, flat, 1/8 inch blade

Soldering Iron, 25-30 watt

Solder, 60/40, Resin core

Test Equipment Required:

None

Procedure:

Proceed as follows:

NOTE

USE CAUTION WHEN SOLDERING TO AVOID INTERNAL DAMAGE

1. Construct a jig to hold the microphone element during the disassembly and assembly operation.
2. Using a small screwdriver gently tap to puncture seal. Continue around the periphery of the element.
3. Cautiously separate black portion of microphone from red portion to expose broken wire.
4. Remove broken wire and replace with 2 inches of #28 AWG stranded wire.
5. Place a ball of cotton between the internal element and the case sufficient to preclude vibration of the element under normal conditions.
6. Place black portion of microphone over red portion in the original alignment.
7. Seal with sealant.

(EIB 895)

TA-790/U Handsets—Susceptibility to EMI From Own Ship Radar

Recent investigations by the Shipboard Electromagnetic Improvement Program (SEMCIP) and Mobile Technical Unit (MOTU) 5 reveal that some ships are still experiencing EMI to voice communications when own ship radar transmissions penetrate the unshielded microphone element of TA-790/U handsets. This type of interference is particularly troublesome when the handsets are located in exposed areas such as the pilot house or open bridge.

Interference of this type can be eliminated by replacing the unshielded element with an improved version which employs shielding of the self-contained amplifier. The improved microphone element is stocked in the Navy Supply System under NSN 5965-00-0503587 (old FSN 9N5965-050-3587) and can be identified by the symbol R/c stamped on the mouthpiece cover.

(EIB 901)

METER PROTECTIVE COVERS

See article in TAB-7 section under the same title.

METER PROTECTIVE COVERS

See article in TAB-7 section under the same title.

TAB-7 FAILURE OF TERMINATION TRANSFORMER

It has been brought to the attention of the Bureau that frequent failures of transmission-line-terminating transformer, T-801, part of field change 1-TAB-7, in the antenna-tuning unit, have been experienced at NRS(T) Kodiak, and NRS(T) Adak, Alaska. Up to this time, at least seven Transformers have failed for no apparent reason when operating the transmitter at or near full power output. This condition prevailed, even though the transmitter output and the antenna were carefully tuned.

Investigation disclosed that corona discharge was taking place around the body of transformer, T-801, and its connecting leads. This caused an eventual breakdown of the insulation between the primary and secondary windings and the core piece.

To correct the condition, transformer T-801 was insulated from ground by mounting it on four NT-60128 (Stock number N-17-68771-9001) conical-procelain stand-off insulators. The transformer-terminal leads, connecting to the tap switch, were replaced with high-voltage insulated wire.

Since the modification, operating stability of the transmitter and antenna system improved, and no further failures have occurred.

It is recommended that all shore stations using the modified TAB-7 with a remote antenna-coupler installation, accomplish this change as soon as practicable. In view of the simple change required, a field change kit is not in order. However, the equipment history--record card should contain a notation of the modification referring to this article for the authorization.

The above modification was submitted as a beneficial suggestion to the Puget Sound Naval Shipyard by Mr. Frank Osborn, Electronics Technician, of the Assistant Industrial Manager's Seattle Office.

METER PROTECTIVE COVERS

To safeguard personnel against contact with high voltage, protective covers should be installed over the 3-1/2-inch plate current meters on Low Frequency Transmitters TAB-5, -6, and -7. The following tabulation of TAB meters includes those which have one terminal and/or the case at ground, but which, on becoming ungrounded for any cause, could present dangerous potentials.

Meter Function	PA Ip	PA Ip (LH)	PA Ip (RH)	PA EP	M-O Ip	M-O EP	IPA Ip	A-O Ip	I Ant
Circuit Symbol	M113	M105	M106	M110	M101	M108	M103	M102	M107
Navy Part No.	22009	22002	22002	22324	22059	22305	22065	22059	22325

The addition of meter protective covers requires no circuit change in the transmitters and should be accomplished at the earliest opportunity by maintenance personnel at the activity or ship having cognizance of the affected equipment.

This action falls within the definition of an "alteration equivalent to a repair" in accordance with Chapter 67.32.2.d of the Bureau of Ships Technical Manual

Ships or Shore Stations having transmitters affected by the above should requisition the required quantity of meter covers from Navy stock under N6625-344-0216.

Equipment history and field change records shall be annotated in accordance with Chapter 67.127.1 of the Bureau of Ships Technical Manual.

Cognizant Technical Field Authority is requested to include this item in his annual inspection program.

SHIPALTS REQUIRING REMOVAL OF 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.

CONTROL CIRCUITS FOR TAJ-11 THRU TAJ-18 TRANSMITTERS

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

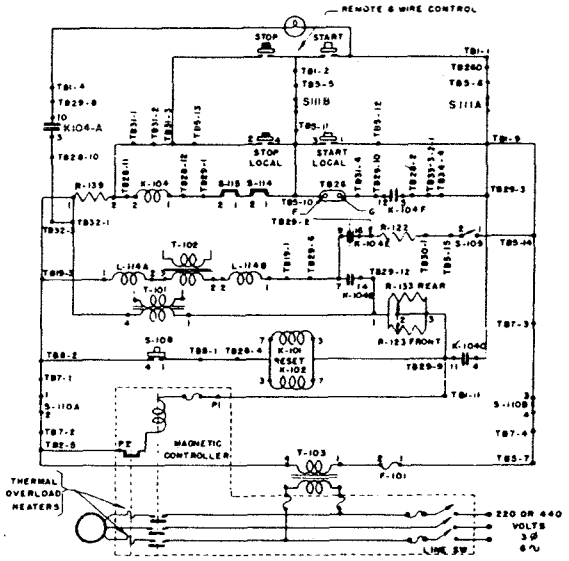


FIGURE 1.--Control circuits for models TAJ-11 through TAJ-18 transmitters, inclusive

TAJ SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Necessity for tedious tuning procedure for power-amplifier.	Due to excess 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.
Whenever 3,000 volts was reached 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 marking a weak spot which eventually led to this breakdown.
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.
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.

Difficulty Encountered	Cause and Remedy
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.
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.
TAJ-15.--Starting relay K-104 chattered badly when start button was pressed.	Found contacts dirty and out of alignment.
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.

TAQ SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Operating test key inoperative.	Contact shorting bar of tube protective relay not making contact. Cleaned and dressed contacts.
TAQ-9.--Quit keying. Would not key from either a local or remote position.	Investigation showed that keying relay contact surfaces were dirty. After cleaning with contact burnishing tool and carbon tetrachloride, the set operated normally.
TAQ-9.--I-P-A meter M-102 was drawing current intermittently. Equipment would not key continuously and the transmitter would not stay in operation for long periods of time.	Set tuned up all right, initially, but operation erratic. Replaced i-p-a 803 tube and the set again operated normally.

POWER-AMPLIFIER GRID LEAK RESISTOR FOR 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. Contact number and symbol number should be referenced in making requests direct to the Supply Officer for Radio.

MODIFICATION OF POWER SUPPLY PP-531/UR

Upon installation of subject equipment, no provision exists to incorporate the overload relays in the TBA-10 transmitter as a means of removing plate voltage in case of overloads. The fuses which are incorporated in the rectifier, however, provide adequate protection, but excessive fuse consumption while tuning the equipment is considered unfeasible.

To retain the original protective function of the transmitter overload relays, K-103, K-107 and K-108, the Bureau directs the following modification to be made to the equipments and technical manuals.

The portion of the control circuit of the TBA-10 transmitter, consisting of the series circuit through the normally closed contacts of K-103, K-107 and K-108, is disconnected and brought out to unused terminals 7 and 8 of TB29. The original control circuit in the transmitter is then completed with a wire connection.

The connection from the coil of control relay K-705 which extends to the 115-volt supply is removed and run to unused terminal E702-9. A connection is then made between unused terminal E702-8 and terminal E702-5. Two (2) wires are then installed from rectifier terminals E702-8 and E702-9 to the transmitter terminals TB29-7 and TB29-8.

It is necessary to complete the circuit through the transmitter and land line control unit, which is normally connected through motor generator power transfer switch terminals 61-23 and 61-33 and the door interlock circuit, by connecting a lead between terminals 51-8 of the control unit and 29-3 of the transmitter.

The modification to the transmitter is for the TBA-10. Other series of the TBA require the same modification, but the leads are brought out to unused terminals other than TB29-7 and TB29-8. The door interlock circuit through the motor-generator transfer switch on these transmitters is connected to terminal 51-8 of the land line control unit.

Any changes made to the equipments should be noted in the equipment technial manuals.

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.
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.
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.

INSTALLATION INSTRUCTIONS FOR RECTOX UNITS

Rectox units FSN N6130-696-8306, part No. 58-B-7668, used in rectifier units for Transmitters TBK and TBM, Symbol CR-916, were procured as replacements for FSN N6130-250-2189, part No. 1312218.

Some activities have been unable to make the proper hook-up of the replacement units because of difficulty in determining the correct terminals to use. The following instructions published by the manufacturer are printed here for information:

1. Connect (+) terminal of rectifier to No. 8 on terminal board.
2. Connect (−) terminal of rectifier to AC on terminal board.
3. Do not use AC terminal on the selenium rectifier.

*4. Connect CR-916 No. 8 to CR-918 No. 8.

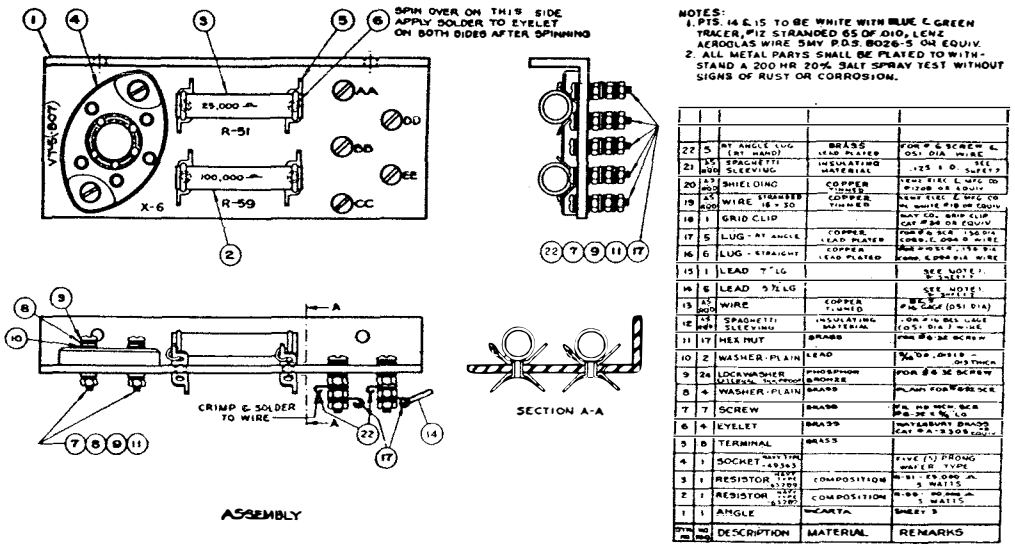
*5. Connect CR-917 No. 4 to CR-919 No. 4.

*6. For 1000V DC output required on TBK-16, connect T-904 No. 8 to AC on terminal board.

VACUUM TUBE KEYING ON TBK TRANSMITTING EQUIPMENT

All shipborne TBK series transmitting equipments subsequent to 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 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



NO.	QTY.	DESCRIPTION	MATERIAL	REMARKS
22	5	AT ANGLE LUG (INT. HANDY)	BRASS LEAD PLATED	FOR #6 SCREW & .051 DIA WIRE
21	AS REQ'D	SPAGHETTI SLEEVING	INSULATING MATERIAL	.125 I.D. SEE SHEET 2
20	AS REQ'D	SHIELDING	COPPER TINNED	SEE SHEET 2
19	AS REQ'D	WIRE STRANDED 16 × 30	COPPER TINNED	SEE SHEET 2
18	1	GRID CLIP		
17	5	LUG - AT ANGLE	COPPER LEAD PLATED	
16	6	LUG - STRAIGHT	COPPER LEAD PLATED	
15	1	LEAD 7" LG		SEE NOTE 1 SHEET 2
14	6	LEAD 9½ LG		SEE NOTE 1 SHEET 2
13	AS REQ'D	WIRE	COPPER TINNED	SEE SHEET 2 #16 SOLID (.051 DIA)
12	AS REQ'D	SPAGHETTI SLEEVING	INSULATING MATERIAL	.104 I.D. SEE SHEET 2 (.051 DIA) WIRE
11	17	HEX NUT	BRASS	FOR #6-32 SCREW
10	2	WASHER-PLAIN	LEAD	⅜ OD .040 THICK
9	24	LOCKWASHER SPLIT LOCKWASHER	PHOSPHOR BRONZE	FOR #6-32 SCREW
8	4	WASHER-PLAIN	BRASS	PLAIN FOR #6 SCREW
7	7	SCREW	BRASS	FIL HD MCH SCR #6-32 × ⅜ LG
6	4	EYELET	BRASS	WATERBURY BRASS CAT # 9305 SIZE 2
5	8	TERMINAL	BRASS	
4	1	SOCKET MFG'S TYPE 49363		FIVE (5) PRONG WAFER TYPE
3	1	RESISTOR MFG'S TYPE 63085	COMPOSITION	R-51 - 25,000Ω 3 WATTS
2	1	RESISTOR MFG'S TYPE 63046	COMPOSITION	R-54 - 5Ω 5 WATTS
1	1	ANGLE	"CARTA"	SHEET 3
ITEM NO.	NO. REQ'D	DESCRIPTION	MATERIAL	REMARKS

FIGURE 1.--Vacuum tube keyer unit.

*Refer Figure 14-31 (Schematic Diagram Rectifier Power Unit Type CAY-20228) in TBK-16 Technical Manual.

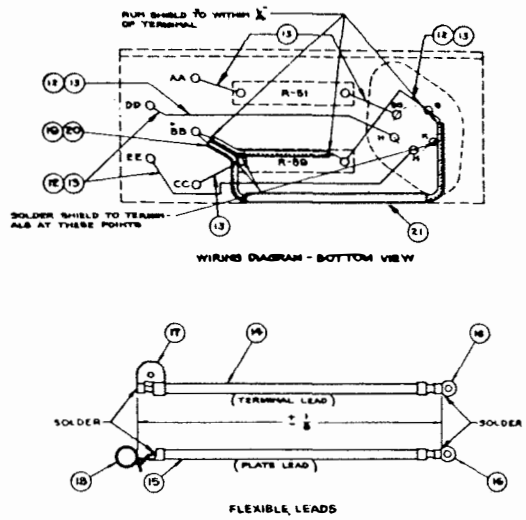


FIGURE 2. --Vacuum tube keyer unit wiring diagram (bottom view) and flexible lead details

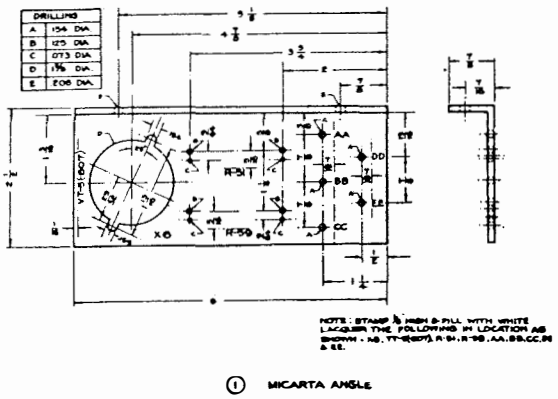


FIGURE 3.--Vacuum tube keyer unit details

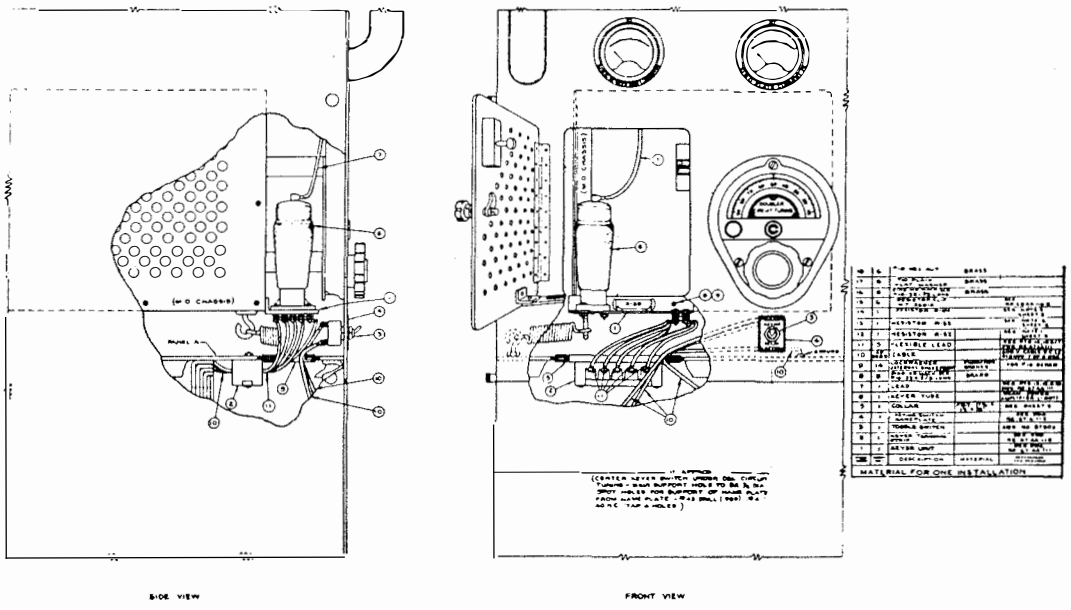


FIGURE 4.--Cutaway illustration of the master oscillator unit

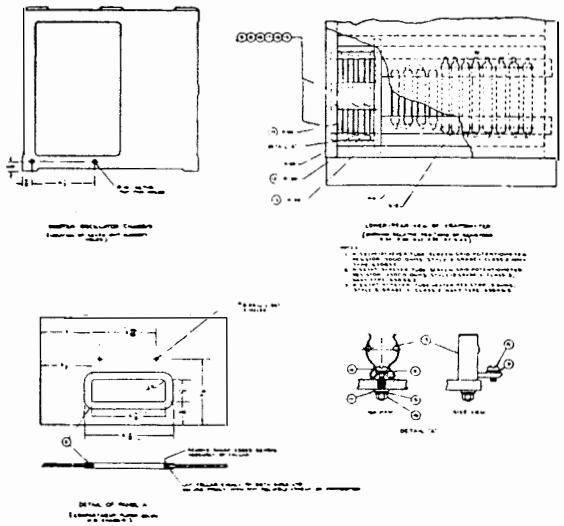


FIGURE 5. --Installation drawing for keyer unit

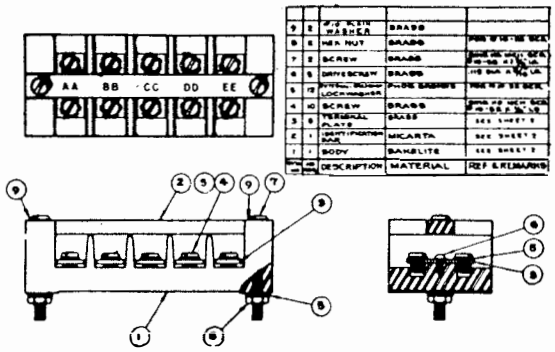


FIGURE 6. --Keyer terminal strip

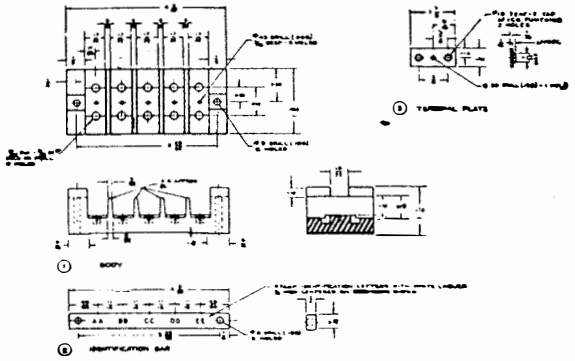


FIGURE 7. --Terminal strip details

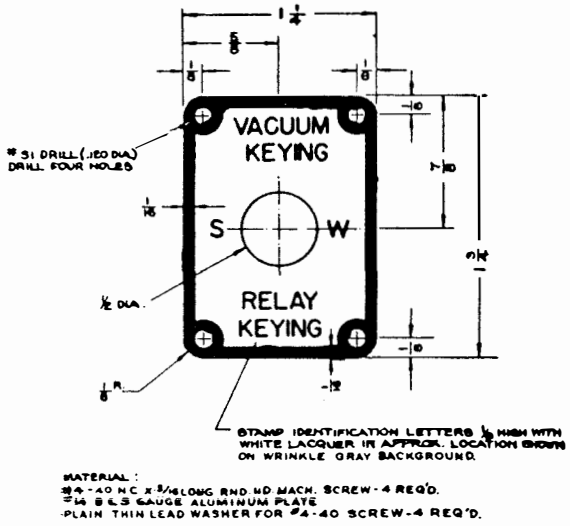


FIGURE 8. --Keyer switch nameplate

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 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

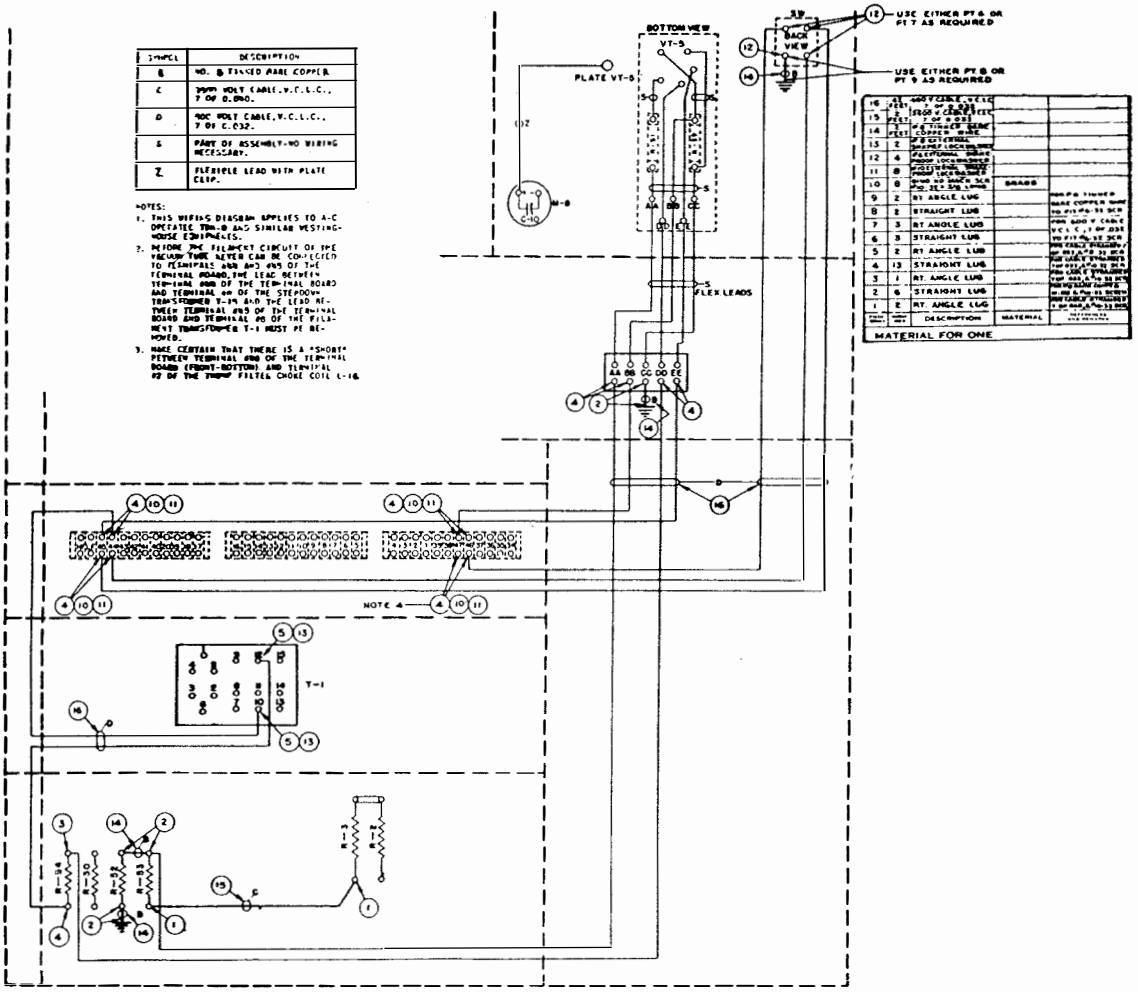


FIGURE 9. --Vacuum tube keyer wiring diagram

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

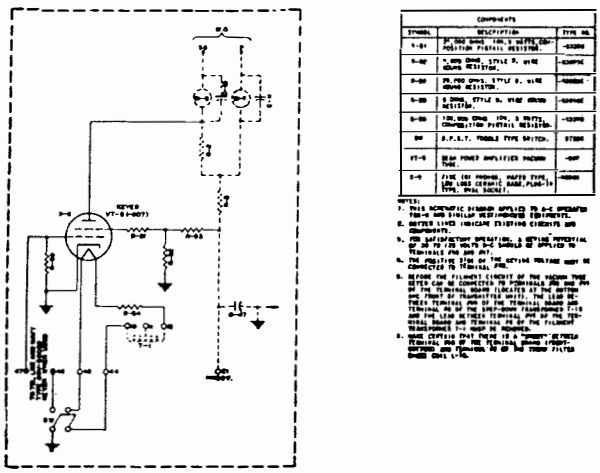


FIGURE 10. Vacuum tube keyer schematic diagram.

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).

TBK CATHODE MODULATOR

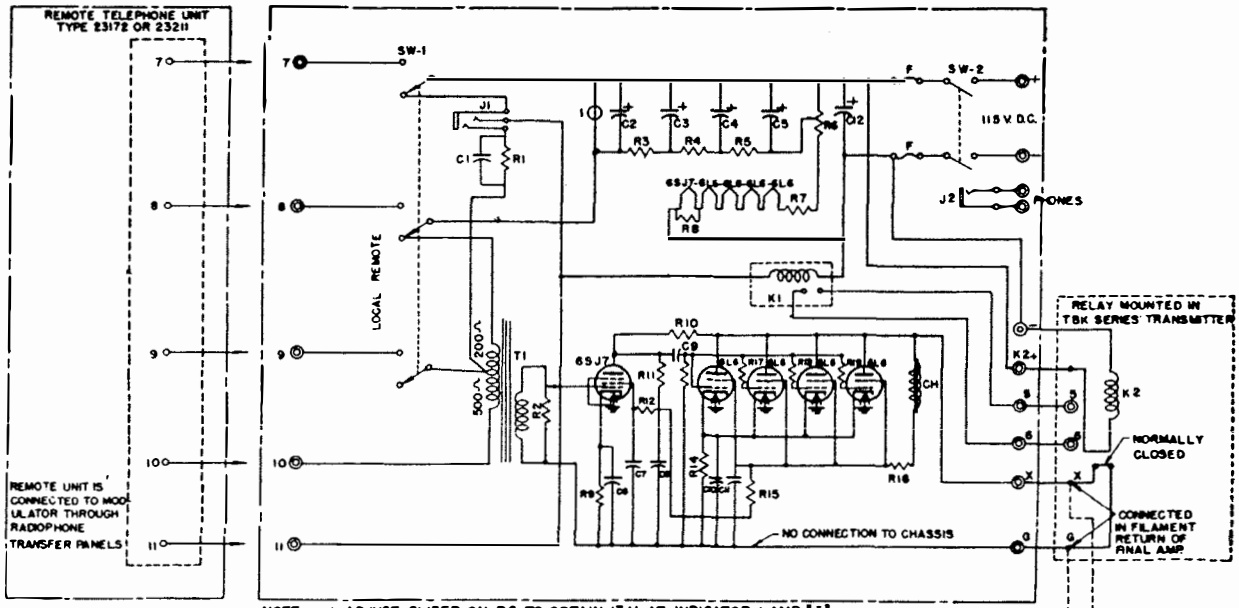
The NYMI constructed a number of cathode modulator units to provide A_3 emission with the TBK series transmitters. Inasmuch as a number of ships have these equipments and maintenance data is not available to these vessels, the following diagrams are supplied for assistance in the maintenance of this 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.

OVERHEATING IN MASTER OSCILLATOR OVEN COMPARTMENTS ON TBK TRANSMITTERS

The following information regarding the 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



PARTS LIST

C-13	1 MFD 1000 V.
C-12	40 µFD 150 V.
R-1	175 OHM 2 W
R-2	300,000 OHM POTENTIOMETER
R-3,R-4,R-5	1 OHM, 1 WATT
R-6	100 OHM, 200 W. ADJUSTABLE NOTE 2
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. DC RELAY (NORMALLY OPEN)
K-2	115 V. D.C. RELAY (NORMALLY CLOSED)

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

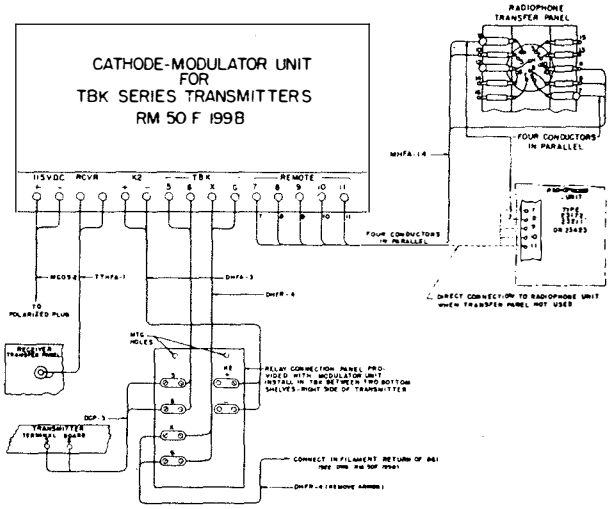


FIGURE 2. Type plan wiring diagram of the cathode modulator for the TBK.

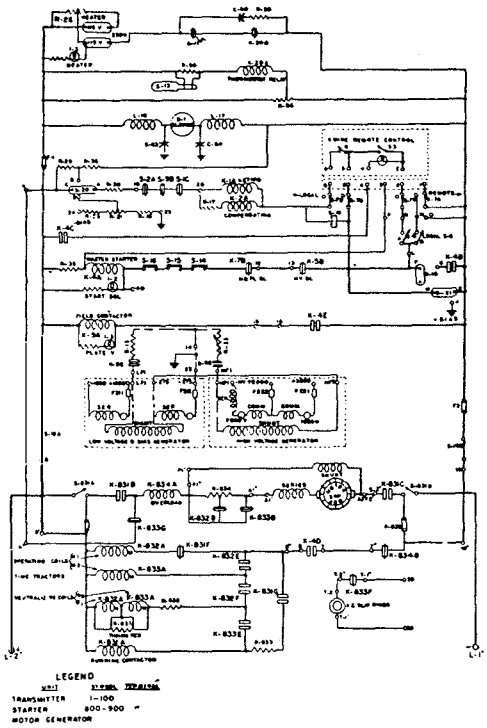


FIGURE 2. Control circuits for model TBK–13 transmitters.

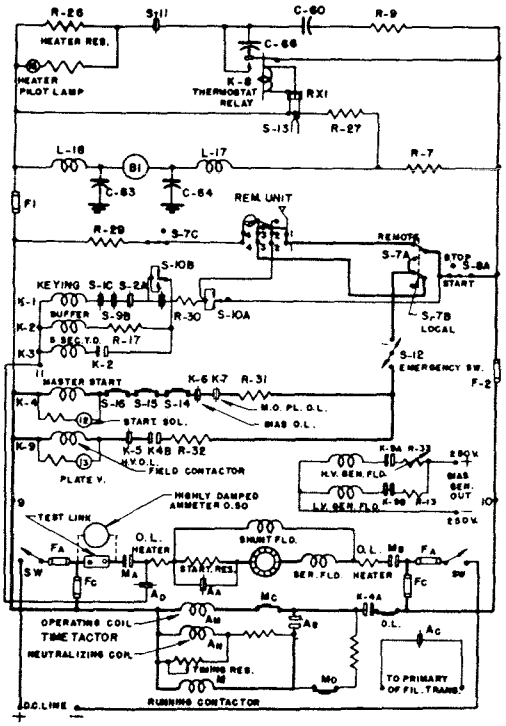


FIGURE 1. Control circuits for models TBK–5 an TBK–6 transmitters.

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 transmiter 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.

CONTROL CIRCUITS FOR TBK-5, 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 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 TBK-5 and TBK-6. Figure 2 shows them for the TBK-13.

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

The 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.

MARKING OF MOTOR-GENERATOR SETS SHIPPED WITH 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 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 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.

LUBRICATION OF BLOWER MOTORS IN TBK-17

It has been 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 bearing should be packed with Navy specification 14-L-3, Grade II ball bearing lubricant.

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 technical manual.

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.
Output failed completely.	Corrected by cleaning all connections in transmitter and antenna trunks.
TBK-12.--Transmitter could not be made to double.	Defective 860 tube (first intermediate amplifier). Replaced.
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.
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.
No bias voltage on transmitter as indicated by meter.	The brushes on the bias generator were not making good contact.
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.
Bad knock in low-voltage generator.	Found to be caused by loose flange in generator shaft coupling. Corrected by properly securing flange to shaft.
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.
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.
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.
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.
TBK14.--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.
TBK-14.--Noise interference in receivers when high voltage applied to TBK.	Found C-152 defective. Replaced.
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.
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.
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. Replace from spares. Normal operation restored.

TBK SERIES TROUBLE SHOOTING NOTES--Continued

Difficulty Encountered	Cause and Remedy
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.

MODEL TBL RADIO TRANSMITTER CAUTION REGARDING STAR WASHERS

Several model TBL transmitters in which the micalex end plates of H.F. antenna inductance L-25 had been so badly burned due to corona discharge that replacement of the end plates was necessary. The cause was traced to the use of sharp pointed star washers used in the assembly of the inductance. Very noticeable burn marks were observed near each point of the star washers. Some TBL inductances have been observed to have been assembled utilizing flat washers. No difficulty due to corona discharge has been apparent in this case.

It is recommended that all repairs and reassemblies of TBL HF antenna inductances be made using flat washers anchored with glyptol. Inspections of all transmitter finals should include action to eliminate any sharp points that are in close proximity to final amplifiers.

WARNING OF HIGH D-C POTENTIAL ON ANTENNA CIRCUITS OF 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 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 capactior 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.

SHORTENING OF SHAFTS ON THE TBL MOTOR GENERATOR

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

There is only 13/65 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 couplings flanges, insertion of a new coupling disc may be made without disassembly of the unit. Reports 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.

TBL SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Transmitter fails to start from bridge remote control unit.	Corrected by repairing broken lead on terminal board in remote control unit.
Transmitter not tuning properly.	Corroded contacts on p-a band switch. Cleaned all switch and relay contacts.
Plate voltage meter M-10 shows voltage when S-22 is in step 1 position.	Condenser C-26 shorted.
High-frequency m-o screen current meter M-1 shows current flow with key up.	Condenser C-12 leaky or shorted.
Motor solenoid indicator light I-9 burns when pressing "start" button but transmitter does not start.	K-13 series resistance (175 ohms) open.
Bias voltage indicator lamp I-4 burns too brightly.	Lamp connected to incorrect resistor tap at factory.
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.
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.

TBL SERIES TROUBLE SHOOTING NOTES--Continued

Difficulty Encountered	Cause and Remedy
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 . . . 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.
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.
Blower motor developed excessive noise.	Found high resistance armature winding in motor.
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.
Moisture condensation in submarine antenna trunks.	Submarine antenna trunks may be dried by placing a 200-watt incandescent lamp in lower end.
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 CME-50064 speech input equipment due to poor soldering job. Normal operation restored by properly soldering wire to lug.
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.
TBL-7.--High-voltage relay would not throw out when door interlock was opened.	Cleaned and adjusted high-voltage relay.
TBL-7.--Transmitter would not shut down. The motor-generator ran continuously whether interlocks	Found starting contactor relay K-13 contacts welded shut. After the contacts had been filed down, the transmitter control worked properly.
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.

TBL SERIES TROUBLE SHOOTING NOTES--Continued

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.
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.
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.
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.
TBL-6.--High oscillator plate current.	No output from oscillator due to open oscillator tank capacitor C-63.
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.
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.
TBL-7.--Excessive wearing of brushes in blower motor.	Found shaft of blower motor bent.
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.
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.
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.
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.
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.
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.
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.

TBL SERIES TROUBLE SHOOTING NOTES--Continued

Difficulty Encountered	Cause and Remedy
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.
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.
HV indicator lamp burns, but HV is not present.	A. Relay K16 (B contact) is not closing the HV field circuit.
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.
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 M37 open, causing HV to build up and drop slowly to zero. E. Wiper arm of switch S22 fails to make.
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.
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.
Readings on HF MO oscillator dial wrong on all band ranges.	A. Realign cylinder in coil L1.
HF MO motor boats or breaks into spurious oscillations.	A. Clean contacts and wiper in S1. B. Check R5 (bias resistor) for proper tap.
I-f MO fails to operate on all bands.	A. Clean contacts and wipers S1. B. Check C3, C4, C5.
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).
I-f MO filament fails to burn.	A. Check switch S8 for proper operation. B. Check complete filament circuit.
I-f MO has spurious oscillations.	A. Clean wipers and contacts S23. B. Check R13 for proper value.
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).
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.

TBL SERIES TROUBLE SHOOTING NOTES--Continued

Difficulty Encountered	Cause and Remedy
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.
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.
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.
First IA plate current meter reads without transmitter being keyed.	A. Check condenser C99, C39.
Apparently not enough drive to 2nd HF IA stage.	A. Check contacts S10. B. Check tube voltages.
Second HF IA I_p meter reads without transmitter being keyed.	A. Check condenser C37, C76, and C79. B. Check IF-IA plate circuit.
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 c d stator of C47. F. Check all tube voltages.
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.
HFPA I_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.
HFPA dips improperly on 18 mc. and goes in to self-sustained oscillations.	A. Check to see condensers C40, C43, C44, and C45 have groundsing bond.
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.
I-f PA breaks down intermittently and circuit goes out of resonance.	A. L22 coil is breaking down between windings. Check winding for spacing and burned spots. B. Check C87.
HF transmitter fails to load.	A. Check for loose bus bars. B. Check contacts S17 and S18. C. Check M13. D. Check C49.
HF transmitter loads improperly.	A. Check alignment of C51 and L25. B. Check C48 and C49. C. Check roller on L25.
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.
MCW audio oscillator tube filament fails to burn.	A. Check contacts of switch S6 and S7.
MCW audio oscillator has no output.	A. Check switch S4 and S5. B. Check C26. C. Check condition of T4.

TBL SERIES TROUBLE SHOOTING NOTES--Continued

Difficulty Encountered	Cause and Remedy
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.
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.
Frequency shifts as transmitter is keyed.	Dirty Contacts on oscillator band switch. Loose connections on oscillator coil. Clean contacts and tighten any loose connections.

MODIFICATION TO BLOWER MOTOR FOR ALL TBL TRANSMITTERS

The following beneficial suggestion concerning a method of reducing the failure of the TBL Transmitter Blower Motor has been received.

The Bureau approves the installation of a copper screen 4 inches in diameter over the motor fan. Type of screen recommended is 18 by 14 meshes per linear inch with a WIRE gauge of 0.011 inch in diameter. This eliminates the possibility of a screw or nut falling into the fan well, causing the motor to jam and burn out.

TBL BLOWER MOTOR LUBRICATION

Paragraph 6.45 of NAVSHIPS 900,373, Instruction Book for Radio Transmitting Equipment TBL states that the bearings of the TBL blower motor should be repacked in grease at yearly intervals. This has not proved satisfactory due to both the high temperatures in the area of the motor and the type of grease recommended. The use of Navy Grade--A-Soft Specification Number 14L3 or a similar type should be discontinued. It is recommended that a grease with a Lithum-Stearate base be used in its place. MIL-G-3278, a standard stock item, is recommended. MIL-G-3545 may also be used if specified as a Lithum-Stearate base.

TBL LINE-VOLTAGE SWITCH ON SUBMARINES

It has been pointed out that instances of MO Blower and Heater burn-out in the TBL equipment installed on submarines.

This trouble is the result of an excessive increase in TBL supplyline voltage during battery-charging operations and the failure of personnel to place the TBL Line-Voltage, Normal-High Switch in the HIGH position. It is recommended that maintenance personnel place warning instructions at battery-charging-switch-panels reminding the operator to place the TBL switch in the proper position.

MODEL PP-1211/U A.C. POWER SUPPLY FOR USE WITH TBL SERIES XMTR W-A-R-N-I-N-G N-O-T-I-C-E

The model PP-1211/U power supply furnishes ac and rectified ac power to model TBL radio transmitters originally designed to operate from a dc power source. Input voltages are 220/440, 3 phase, 60 cycles.

It has come to the attention of the Bureau of Ships that there is a safety hazard to personnel involved in the model TBL radio transmitter when connected to the PP-1211/U as shown in the PP-1211/U Technical Manual, NAVSHIPS 92861. The TBL safety--interlock circuits are inoperative as well as the local START-STOP switch. All maintenance and operating personnel are cautioned not to perform maintenance on the TBL until ON-OFF switch S-101 in the PP-1211/U is in the OFF position.

The Bureau of Ships is presently investigating this matter. All activities that have received the PP-1211/U are hereby warned of this malfunction. It is recommended that the PP-1211/U equipments not be used until proper corrective information or field changes are developed by the Bureau of Ships.

F.C. 7-TBL-5, -6, -7, -121-13 NAVSHIPS 981060 CALIBRATION INTO A 50 OHM LOAD

The Bureau has received reports from several ships, submarines and activities indicating difficulty in tuning the TBL-( ) when using an antenna tuner similar to the AN/BRA-3, AN/BRA-5 or AN/SRA-18 ( ).

Investigation has disclosed that activities installing this field change have not pre-calibrated the TBK-( ) output loading controls into a staisfactory 50 OHM resistive load. The field change bulletin provides SAMPLE charts to indicate loading adjustment.

It is the intent of the field change, that the installing activity tune and operate the TBK-( ) into a 50 OHM load (500 Watt) such as the DA-91/U and prepare calibration charts for the individual transmitter. THE CHARTS IN THE BULLETIN ARE ONLY REPRESENTATIVE and should not

be used for the field changed equipment. Dial and component shippages, minor circuitry differences, etc. will cause dissimilar readings to those shown in the bulletin,

The requirement for a preliminary 50 OHM calibration chart is also applicable to the forthcoming field change bulletins for TBK, TBM and TDE equipments.

The Bureau is currently investigating a more complex TBL-( ) modification, as proposed by USNUSL, that will enable the switching of the TBL output circuitry to match a 50 OHM load and to eliminate the requirement for a calibration chart and several tuning adjustment steps.

REMOTE CONTROL OF TBM-8 RADIO TRANSMITTING EQUIPMENTS

The remote control telephone unit, type 23304, 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 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 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 modifications kits is uncertain, the following method for effecting automatic shutdown is recommended.

(1) To obtain normal time delay and shutdown action (with S-405 in the modulator unit in voice position) remove the lead from terminal 43 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 shutdown 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-32, 50 EPIC-32.

EMERGENCY PARTS REPLACEMENTS FOR TBM AND TCM EQUIPMENTS

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.

FAULTY FUSES FOR TBM TRANSMITTING EQUIPMENTS

The Bureau has received information that several of the 1 ampere 5,000 volt, nonrenewable fuses (F-221) used in 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.

FAILURE OF CAPACITORS IN TBM-5 THRU TBM-9 EQUIPMENTS

A number of failures of capacitors C-403, C-405, C-415, and C-422 (Navy type 48852A) in 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.

MARKING OF MOTOR-GENERATOR SETS WITH TBM-7 EQUIPMENTS

See the article of similar title in TBK series.

CONVERTING TBM TO A TWO-WIRE TRANSMISSION LINE SYSTEM

See the article of similar title in TBK series.

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.
No voltage on rectifier tube filaments, or control relay.	16-ohm resistor on generator's single-phase winding open. Replaced from spares.
Heavy arcing on main power switch.	Caused by accumulation of oil, dust, and paint chips. Disassembled front of rectifier unit, cleaned thoroughly and reassembled.

TBM SERIES TROUBLE SHOOTING NOTES--Continued

Difficulty Encountered	Cause and Remedy
Overload relay trips.	Bypass condenser in p-a plate circuit shorted. Replaced from spares.
No carrier control.	Renewed points on voice control relay.
No remote voice control.	Relay coil in relay K-401 open. Replaced from spares.
Master-oscillator heater relay stuck.	Dressed points.
Master-oscillator dial coupling slipping.	Set screws backed out from vibration. Removed master-oscillator unit, tightened set screws, cleaned contacts and replaced.
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.
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.
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.
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-thru 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 1/4". 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.
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.
Blowing of high-voltage fuses.	Condenser C-420 in modulator shorting to ground. Replaced.
Blowing of high-voltage fuses.	Modulation transformer T-405 breaking down. Rewound and reinstalled.
No carrier.	Carrier control relay K-401 burning out, Replaced.
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.
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.
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.
TBM-4.--The transmitter was not staying on 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.

TBM SERIES TROUBLE SHOOTING NOTES--Continued

Difficulty Encountered	Cause and Remedy
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.
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.
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.
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 capaci tor was replaced.
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.
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.
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.

OSCILLATOR FAILURE IN TBS SERIES RECEIVERS

In certain 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.

ANTENNA FITTING FOR TBS ANTENNAS

In cases where the 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 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.

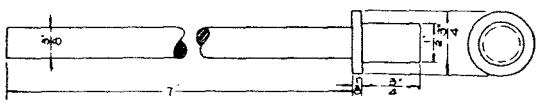


FIGURE 1.--Dimensions of the fitting

MODIFICATION OF TBS ANTENNA SUPPORT

The Bureau has been advised of a defect in the installation of 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 1/4" drain hole in the pipe cap. All ships encountering this difficulty should make this correction at the first opportunity.

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 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 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

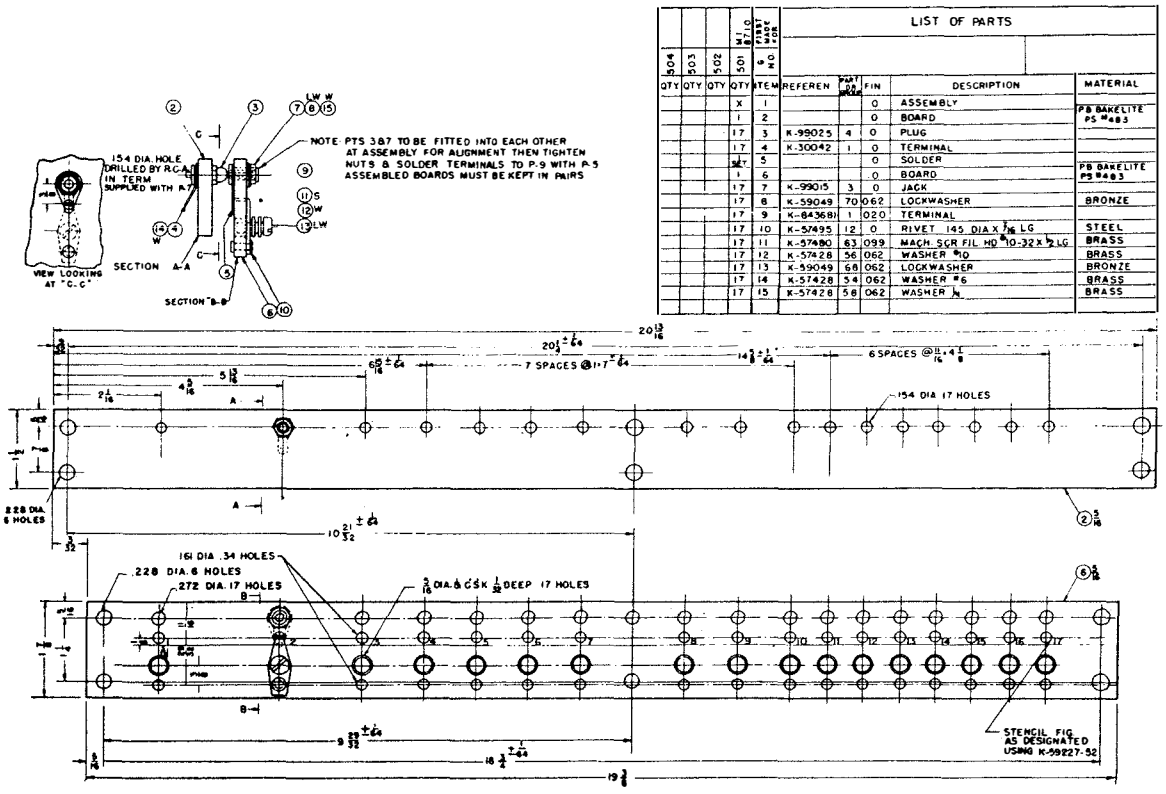


FIGURE 1.--Dimensions and data for the terminal boards for servicing TBS transmitter units

Refer to the technical manual for complete description and usage. A drawing of the terminal boards and accessories giving actual dimensions 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.

RF FILTER CHOKES L-407 AND L-408 IN TBS EQUIPMENTS

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.

TBS SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
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 per suction.
Overload relay kicks out.	Readjusted for voltage and returned transmitter.
Carrier comes on but no modulation.	Defective microphone cord. Replaced.
Carrier on continually.	Relay in control unit in flag radio out of adjustment. Readjusted relay.
Speakers on flag bridge out.	Volume controls in position exposed to weather--corroded and frozen. Cleaned volume controls, adjusted and replaced.
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.
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.
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.
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.
Keying transmitter causes interference in other receivers due to relays operating.	Check grounding of floating receiver chassis. Good ground is necessary.
Feed-back howl when transmitter is keyed.	Muting relays in remote units improperly adjusted.
Transmitter keys at test switch S-101, but will not key from remote positions.	Spring tension of K-104 relay too tight.
Antenna ammeter M-102 jumpy.	Clean and check contact of K-103 relay.
Unable to turn transmitter off. Starter resistance running red-hot.	One side "start-stop" line grounded. Removed ground.
Receiver will not pick up signals.	Check 956 tube. If found shorted, check resistor R-404.
Receiver badly distorts signal and has "running motor" sound with noise suppressor OFF.	Screen grid of first detector tube shorted to ground.

TBS SERIES TROUBLE SHOOTING NOTES--CONTINUED

Difficulty Encountered	Cause and Remedy
Press-to-talk button must be depressed at least partially to receive, and must be released to transmit.	Check handsets for defective factory wiring. (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. The modification described on page 1 of TBS series 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.
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.
Antenna connection between receiver and transmitter failed	This was found to be due to excess vibration. The wire was lengthened inside the shield and heavier lugs were installed on ends of wire.
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.
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.
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.
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.
Symptons (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 cutout 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.	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

TBS SERIES TROUBLE SHOOTING NOTES--CONTINUED

Difficulty Encountered	Cause and Remedy
(5) Distorted audio output.	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 trouble. Replacement of the insulator completely removed all of the difficulties.
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.
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.
Excessive noise and intermittent reception in receiver along with intermittent modulation when transmitting.	Antenna switching relay K-103 making poor contact.
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.
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.
TBS-2.--Sensitivity low on all operating frequencies.	Realigned i-f circuits.
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.
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.
Receiver broke into oscillation when detector, link or or antenna controls were adjusted.	Replaced V-401 type 956 tube made by Tung-Sol with 956 made by RCA. Operation normal.
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.
TBS-3.--Transmitter modulation very weak and accompanied by 1000-cycle note.	Connection # 16 on transmitter terminal strip loose.
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.
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.

TBS SERIES TROUBLE SHOOTING NOTES--CONTINUED

Difficulty Encountered	Cause and Remedy
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.
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.
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.
Sensitivity of receiver very low. All meter indications normal.	Reduced plate voltages noticed. Failure was traced to the power supply. Condenser C-455 in power supply was replaced. The voltages immediately were raised 50 volts and the receiver was operating normally.
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.
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.
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 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.
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.
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 insulatedwashers of bakelite or hard rubber be placed under all brush caps to prevent future damage from moisture.
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.
"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 changeover 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.

TBS SERIES TROUBLE SHOOTING NOTES--CONTINUED

Difficulty Encountered	Cause and Remedy
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.
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.
No receiver output.	Antenna transfer relay K-103 was sticking. The relay was adjusted and no further trouble was experienced.
Unstable transmitter output.	Oscillator coil L-101 was checked and turns found improperly spaced. Turns respaced, and the equipment operated normally.
TBS-2.--Receiver would break into oscillation whenever the detector, 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.
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.
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 strain 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.
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 5/16" of thread showing after the relay holding screw was tightened, about 1/8" of the screw was ground off, thus providing clearance and allowing normal operation.
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.
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.
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.
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.

TBS SERIES TROUBLE SHOOTING NOTES--CONTINUED

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.
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.
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.
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.
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.
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.
TBS-4.--Push-to-talk button fails to operate transmitter.	Due to decrease in resistance of R-131.
TBS-5.--Considerable decrease in audio output with only slight reduction on tube socket voltages.	Found C-442 open. Replaced.
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.
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.
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.
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.
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.
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.

TBS SERIES TROUBLE SHOOTING NOTES--CONTINUED

Difficulty Encountered	Cause and Remedy
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.
TBS-4.--Interference produced in low frequency equipment 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.
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.
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.
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.
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.
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.
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.
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.

EXTENSION OF THE FREQUENCY RANGE OF 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 2 1/2" x 1/64", and 1 sheet of mica or varnished glass tape approx. 3/8" x 2 1/2" x 1/64".

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

(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-313 lug 8.

(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.

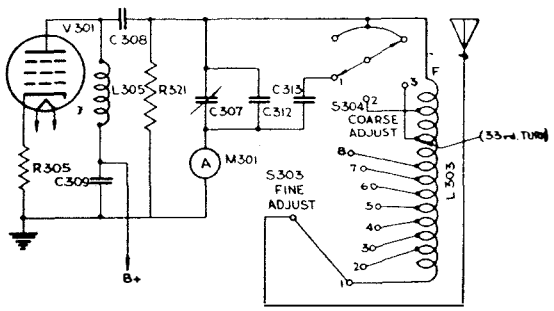


FIGURE 1.--Original output circuit

(12) Locate the r-f 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. 3/16" x 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. 3/8" x 1/2" should be slipped under the copper strip next to the coil form to insulate new tap from adjacent turns.

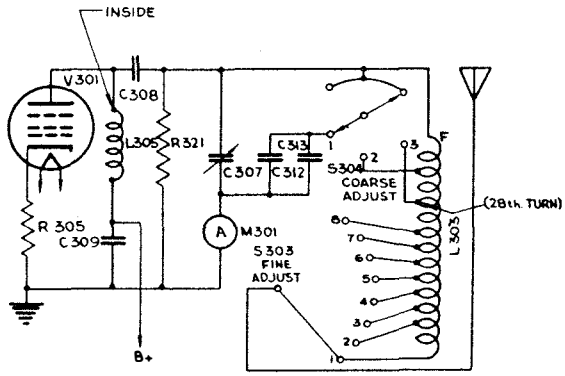


FIGURE 2.--Revised output circuit

(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 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 of finish choke winding should be connected to the plate supply.

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

In some of the type CG-43005 transmitter-receiver units of the 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, 1 1/8" 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 lefthand 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.

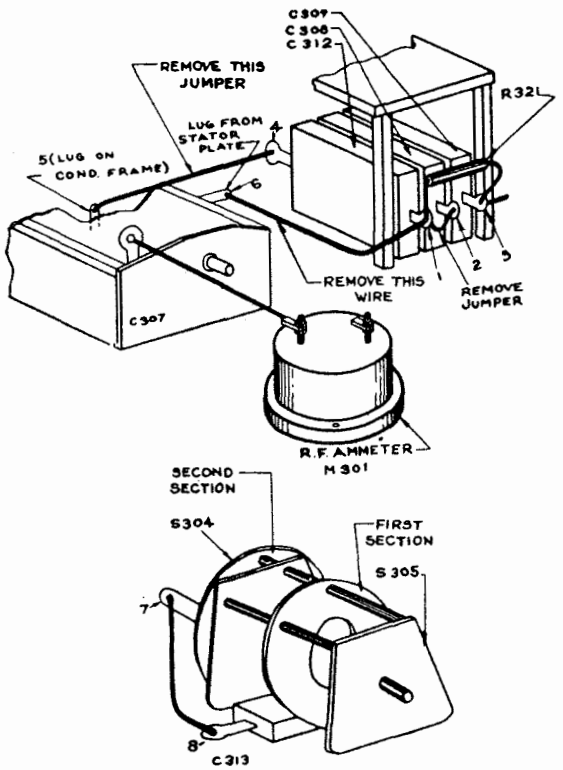


FIGURE 3.--Original connections.

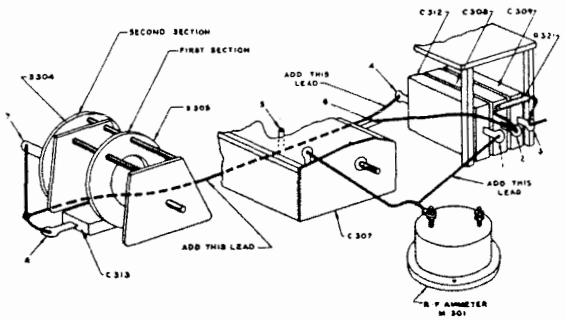


FIGURE 4.--Revised connections.

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 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 setting 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 IPA 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.

BLOWER MOTOR IN TCK SERIES

Analysis of failures in the blower motor (symbol B-101) used in Radio Transmitting Equipment TCK Series indicates lack of maintenance. Under normal conditions this motor requires a check every six months; but under severe operating conditions-high temperature, etc.--more frequent checks are necessary.

The following instructions are a guide for personnel assigned to maintain the equipment:

(1) Remove left side and rear panels of the transmitter.

(2) Remove rear cover of the master oscillator unit.

(3) Remove the two grill heaters from their standoff insulators.

(4) Pull the heaters out of the unit, leaving the leads attached.

(5) Use a number 8 allen wrench to loosen the set screws holding the fan on the motor shaft, and remove the fan.

(6) Remove the motor leads from the terminal block.

(7) Remove the motor mounting capscrews and withdraw the motor.

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

(9) Pull the bearings off 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.

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

(11) Pack the bearings 2/3 full of Navy Specification 14L3 grease and reassemble the motor. Make sure that the grease shield on each bearing faces to the outside of the motor.

These instructions deviate from those in the instruction book, NAVSHIPS 900,210.

MAINTENANCE OF THE FILAMENT RHEOSTAT USED IN THE TCK TRANSMITTER

It has been reported that the contact arm surface of the filament rheostat in the 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.

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

Several of the reset capacitors used in the 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

INTERCONNECTION OF TCK SERIES TRANSMITTERS WITH STANDARD RADIOPHONE UNIT

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.

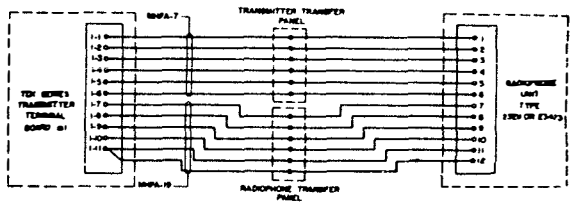


FIGURE 1. Wiring necessary for interconnection of model TCK series transmitters with standard radiophone unit

BEARING PULLER FOR 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 TCK series 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 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.

MOUNTING OF VOLTAGE REGULATOR FOR MODEL TCK-4 RADIO EQUIPMENT

Considerable difficulty has been experienced with the mounting of the voltage regulator, symbol VR 301, 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 lockwasher and two nuts, the second nut to be a locknut, be used.

No further procurement of 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.

TRANSFORMER CONNECTIONS IN POWER SUPPLY OF TCK-4 AND TCK-6 EQUIPMENT

Faulty operation of a TCK-4 transmitter rectifier power supply utilizing type 836 tubes has been reported. The report also 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 technical manual, NavShips 900,210. A note on the schematic diagram lists

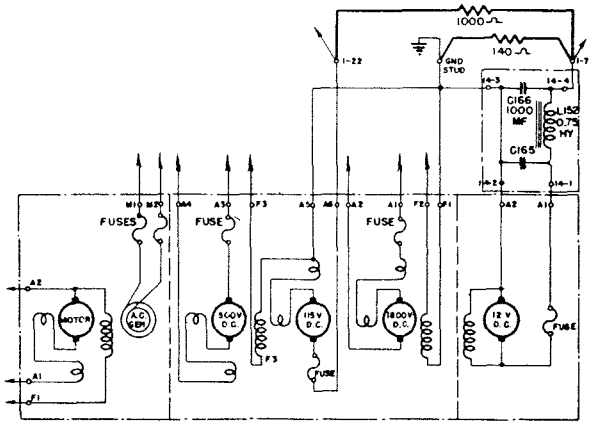


FIGURE 1. Model TCK.

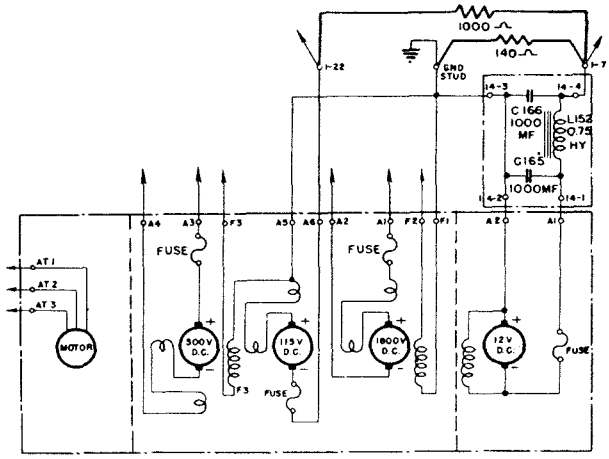


FIGURE 2. Models TCK and TCK-1.

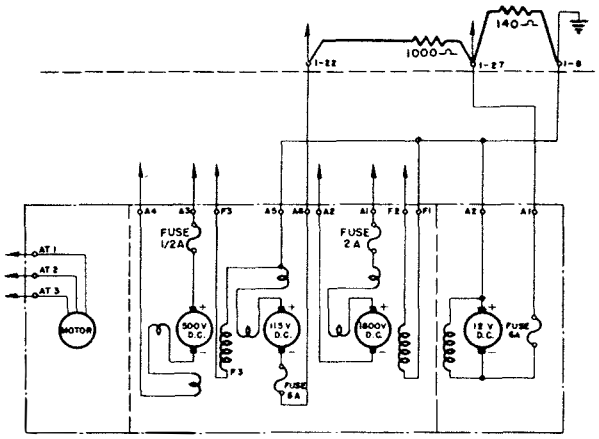


FIGURE 3. Models TCK-2 and TCK-3.

the changes required when operating with type 866A/866 tubes.

EXCITATION TO 12-VOLT MOTOR GENERATOR

Difficulty has been experienced with the motor generator of the TCK in that it is sometimes necessary to momentarily excite the field from an external source to start the 12-volt unit generating to supply voltage to the microphone and the carrier control relay.

A modification to the TCK Series equipment which eliminates the necessity for using the external voltage has been proposed.

This modification consists of exciting the field of the 12-volt motor generator from the output of the 115-volt D-C bias generator. This may be accomplished by permanently connecting, in a suitable manner on the TB-1 in the base of the transmitter, one 1000-ohm 30-watt resistor JAN STYLE RW 34G 1000 (MIL-R-26B) and one 140-ohm 2-watt resistor JAN STYLE RC 42GF 141J (MIL-R-11A) as shown on figures 1 through 4.

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-766 1426, 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.
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 operation became normal.

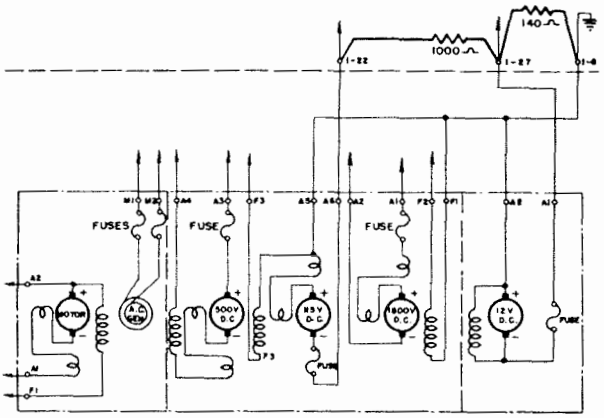


FIGURE 4. Models TCK-3 and TCK-5.

TCO SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered

Receiver dead, no plate voltage on 6SK7 r-f amplifier. Found primary winding of r-f transformer T-105 open.

Cause and Remedy

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.

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.
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.
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
TCP-2.--Transmitter-receiver completely dead. Main fuse 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.
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.

TCS NON-MAGNETIC CABINETS FOR USE ABOARD MINESWEEPING VESSELS

Long Beach Naval Shipyard in complying with Field Changes 10-TCS-1 through TCS-15 entitled SUBSTITUTION OF NON-MAGNETIC-ALUMINUM CABINET IN PLACE OF STEEL CABINET, discovered that some original cabinets being replaced were made of non-magnetic chrome-nickel stainless steel. These stainless steel cabinets were found to have a magnetic permability of less than 1.2 when measured on a permability indicator.

In view of the above and in the interest of economy, activities should accomplish this field change only on original equipment cabinets found to be magnetic by actual test when these equipments are to be installed on wooden or non-magnetic nine-sweeping vessels.

TCS EMERGENCY OPERATION

The batteries used with the TCS equipment aboard ship are primarily intended as an emergency supply of power in case of ac power failure. They should be maintained fully charged at all times. In cases where the TCS equipment is not used for long periods of time, it is recommended that the batteries be placed on trickle charge at regular intervals. Normally, this may be accomplished by turning on the Power Supply PP-388/U for one hour each day. Longer periods of charging should be used if necessary.

SUBSTITUTE GENERATOR

In the interest of economy, FSN N6115-248-0398 (NT-211219B) Generator will not be procured. In lieu of this, stock on hand under FSN N6115-248-1905 (NT-211219A) will be utilized for use with TCS series equipment. This is an acceptable substitute. Activities that receive this substitute generator should obtain the repair parts listed in SNITs, Navy Type 21826, symbols C-1607, C-1612, G-1602A, B, C, H, M, P, V and W.

MX-1743/SRC INSTALLATION OF TCS CONTROL ADAPTER

The MX-1743/SRC control adapter used for adapting the TCS series radio-receiving and transmitting equipment to the conventional-shipboard, remote-control system presents some difficulty in making the proper connections to the TCS equipment. This adapter is a replacement for the type 23524 adapter which has a built-in plug receptacle to accommodate the cable plug on TCS cable No. 65F-10 originally connected to the TCS remote type 23270. The MX-1743/SRC contains terminal strip, TB-602, which necessitates the removal of the plug from cable No. 65F-10 before the conductors can be connected.

The INSTALLATION INSTRUCTIONS AND LIST OF PARTS, which accompanies the MX-1743/SRC adapter, includes BUSHIPS Drawing No. RMHP-23-D-127 (Rev. A). However, this drawing does not indicate the cross connections from terminals 20 through 28 on TB-602 to the TCS cable and a considerable amount of time may be lost in tracing out the TCS circuits.

Figure 1 indicates the cross connections from TB-602 to the conductors of the TCS cable No. 65F-10.

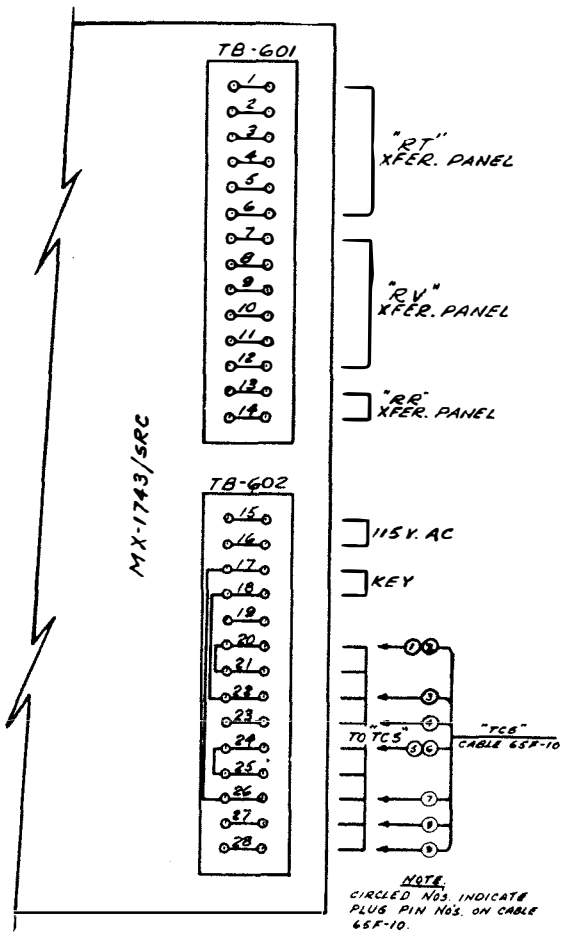


Figure 1

ADAPTER UNITS FOR TCS SERIES RADIO RECEIVING AND TRANSMITTING EQUIPMENT

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

On all future shipboard installations of the 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 991.

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 1/2 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 Electric Development Co., type GK-9-32S or equivalent.
J-601	Jack, Ampnenol, 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.

TEMPORARY MODIFICATION OF TCS CRYSTAL CIRCUIT

The following suggestion 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 modi- was made no further difficulty was experienced.

ANTENNA LEAD MODIFICATION

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 further 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.

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 connector, 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, 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 alternating current in lieu of 12.6 volts direct current as in previous power units used with the TCS equipments. K-302 in the power supply is actuated by 110 volts.

The modification above is to be on an optional basis and no kits are to be supplied.

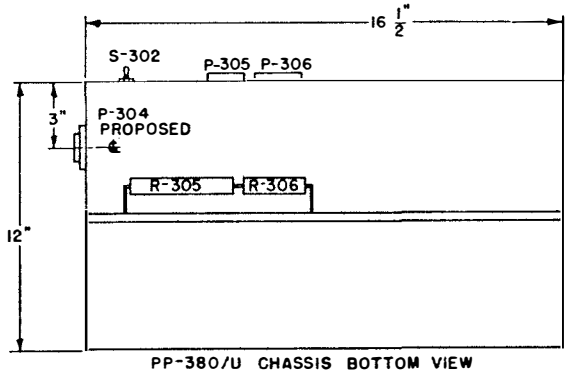


FIGURE 1.

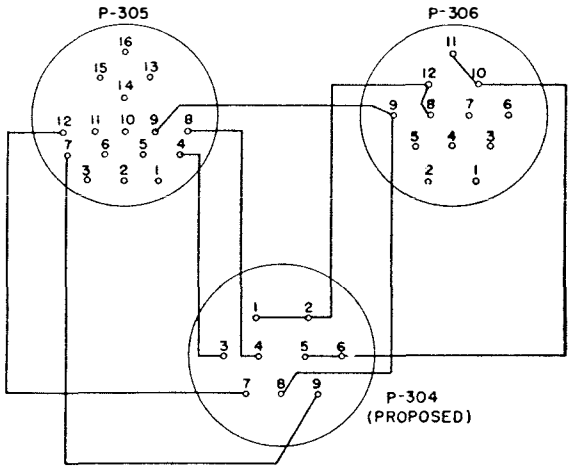


FIGURE 2.

IMPROVEMENT OF TCS RADIO RECEIVING EQUIPMENTS SENSITIVITY

The following suggestions are to improve the sensitivity of the receiver of model TCS:

(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

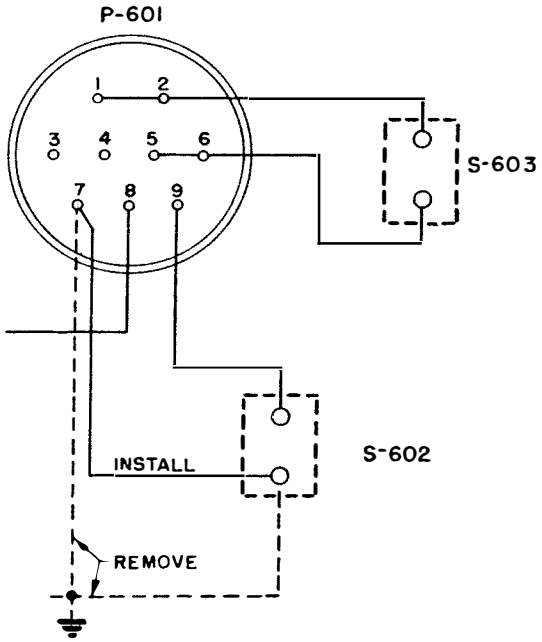


FIGURE 3.

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 determined 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.

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.

It has been 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.

FAILURE OF GAIN CONTROLS IN TCS SERIES EQUIPMENTS

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

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.**

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 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.

TCS SERIES TROUBLE SHOOTING NOTES--Continued

Difficulty Encountered	Cause and Remedy
	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 interference was produced when, considering the direction of commutator rotation, the soft carbon, nonmetallic half of the brush formed the trailing edge.
No modulation.	Relay K-101 not making contact in voice position
No plate current. Generators running.	Lead from power supply broken at K-502 in motor-generator unit.
Hum on carrier when using voice.	Bad tube, V-106 or V-107 in push-pull modulator.
Fuse F-502 blowing constantly.	Shorted condenser, C-501, C-504, C-506 or C-515.
Fuse F-501 blowing constantly.	Shorted condenser, C-510, C-511, C-512 or C-516.
No dip of plate current.	Check oscillator tube V-102 and its selector switch and crystal.
Low antenna current.	Insulator at base of antenna shorting to wet deck at times. Keep antenna free of wet cloths, etc.
Relay trouble.	Frequent check of dirty contacts and proper spring tension is well worth your time.
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.
Receiver squeals or chirps over entire band.	Faulty receiver oscillator tube V-203, or poor contacts on receiver gang switch.
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 1/4" 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.
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.
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.
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.
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.

TCS SERIES TROUBLE SHOOTING NOTES--Continued

Difficulty Encountered	Cause and Remedy
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 12 1/2 volts dropping to 4 volts. Found to be due to defective field coils in motor-generator.
TCS- 12.--C-225 was found to be shorted.	Was probably caused by a very strong signal picked up from a nearby transmitting antenna.
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.
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.
TCS-13.--Output of transmitter considerably reduced.	Meter M-102 burned out. Placed a jumper across meter to effect an emergency repair. 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.
R202 in receiver heats or is burned out.	Check for a rotor-stator short in C201-B.
The transmitter would load normally, but as soon as you spoke into the microphone, antenna current would drop to zero. By retuning 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.
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.
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.

TBS SERIES TROUBLE SHOOTING NOTES--CONTINUED

Difficulty Encountered	Cause and Remedy
	(e) Check R214 for open circuit.
	(f) Check C228 for open circuit.
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.
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.
Low receiver sensitivity on any 1 band with other 2 bands normal.	Look for burned out antenna coil on band which is low.
Receiver band 3 inoperative--bands 1 and 2 normal.	Check S201 for bent wipers or high resistance contacts.
Low receiver sensitivity band 3--other bands normal	Check RF padder C225.
No AVC action in receiver.	(a) Check Sw206.
	(b) Check ground connection on r.-f. gain pot.
Receiver sensitivity changes suddenly.	Check remote control unit.
Receiver local oscillator inoperative.	Check C218.
Receiver RF amplifier has no gain.	Check C206.
Receiver motorboats in several positions on dial.	Check C202.
Transmitter relays not operating.	Check ground on mike jack.
Heavy loading and very small resonant dip in IP at frequencies less than 2,000 kc.	Check for shorted turns on L107.
Downward modulation in transmitter.	Look for mismatch in loading network.
Transmitter M101 reading off scale.	Check meter shunt.
No transmitter grid drive to final.	(a) Check for dirty or bent contacts on S101.
	(b) Check relay K101.
No modulation in transmitter.	(a) Check C127 for short circuit.
	(b) Check C125 for short circuit to ground.
Excessive transmitter plate current.	Check C116 for short to ground.
Low output H.V. supply.	Check for 230-volt connections on primary of power-supply transformer.
High-voltage condensers not bleeding off.	Check power-supply bleeder resistors--seems like obvious fault but is quite prevalent.
Fuses blow out.	(a) Mounting screws for power supply relay K301 shorting to ground.
	(b) Low-voltage rectifier tubes gassy.
Relay K301 inoperative.	Contacts bent, closed.
No high voltage.	Shorted 5R4G tube.
Blows fuses on low voltage side.	Receiver B + grounded.
	Note.-- Check both 6X5 tubes prior to reapplying power.
TCS-12--Low receiver sensitivity on all bands--audio volume control had no effect on signal strength but did effect the noise level.	Replaced V1 of field change No. 6, a 12H6 detector and noise limiter. Both sections were suffering from weak emission.

IMPROVING OPERATION OF TCZ TRANSMITTER

The following report covering the operation of TCZ transmitters is published to assist personnel of 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 shall be forwarded to the Bureau.

1--It has been 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 the 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, using the wavemeters previously mentioned.

OPERATION OF TCZ-1 AT EXTREME LOW TEMPERATURES

Field activities contemplating operation of 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.

KEYING RELAYS FOR TCZ SERIES RADIO TRANSMITTING EQUIPMENT

Several reports have been received by the Bureau of extremely slow keying speed in the TCZ series 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 returnspring, 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 guages 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.

RECOMMENDED TUNING PROCEDURE FOR TCZ EQUIPMENTS

Practice has shown that the 913 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 erratic operation is due to the screen grid design. The basic 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.

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. Examinations 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.

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

A suggestion 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.

FAILURE OF THE LIFTING EYES DURING THE INSTALLATION OF TDE TRANSMITTERS

Extreme care should be exercised in handling the 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.

DISCREPANCY IN TUNING CURVES FOR TDE SERIES EQUIPMENTS

The tuning curves in the instruction book for the TDE series transmitters do not give the correct dial settings for proper tuning of the equipment. All ships and stations using TDE series equipments are warned to look out for this discrepancy. While the technical manual 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.

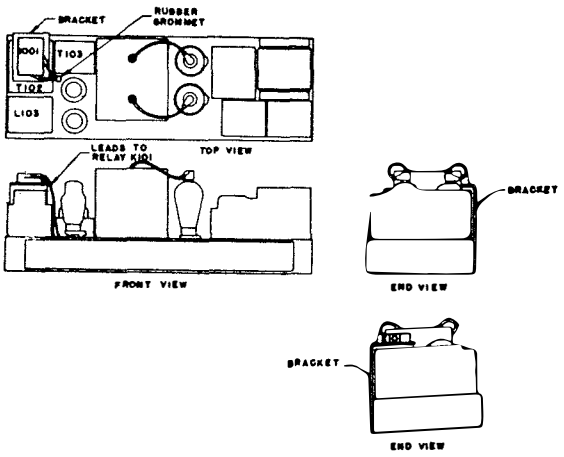


FIGURE 1. Outline of power supply PP-338/U showing location of relay K-101.

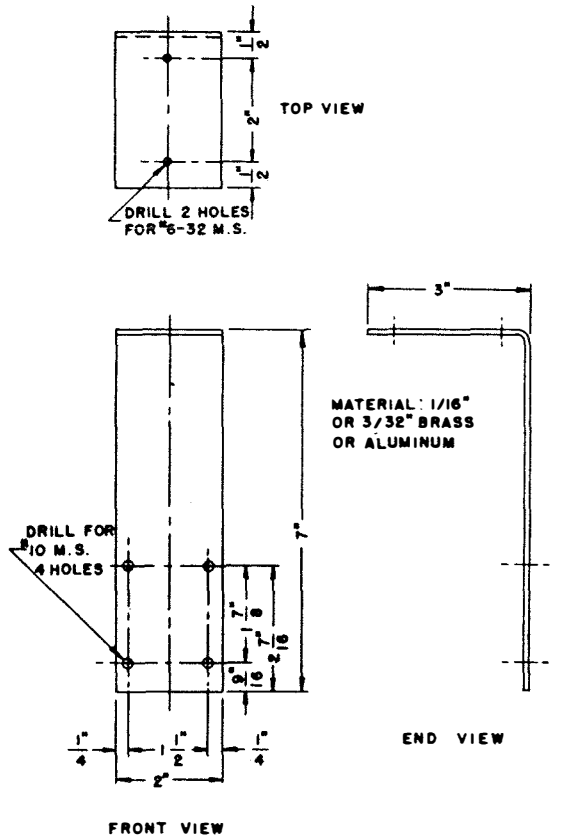


FIGURE 2. Dimensions for bracket to mount relay K-101.

MODIFICATION OF 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 equipment. 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-504-C connects to terminal 8.

Make certain that terminal 8 is grounded.

CONTROL CIRCUITS FOR THE TDE-2 TRANSMITTER

The transmitter control circuit diagram (fig. 3) 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 the understanding and servicing of the control circuits of these transmitters.

SAFETY PRECAUTIONS FOR LINE FUSE HAZARD

A potential exists at fuses F-501 and F-502 (in the power supply of TDE) even when the transmitter switches and safety interlocks are open. The solder lugs carrying

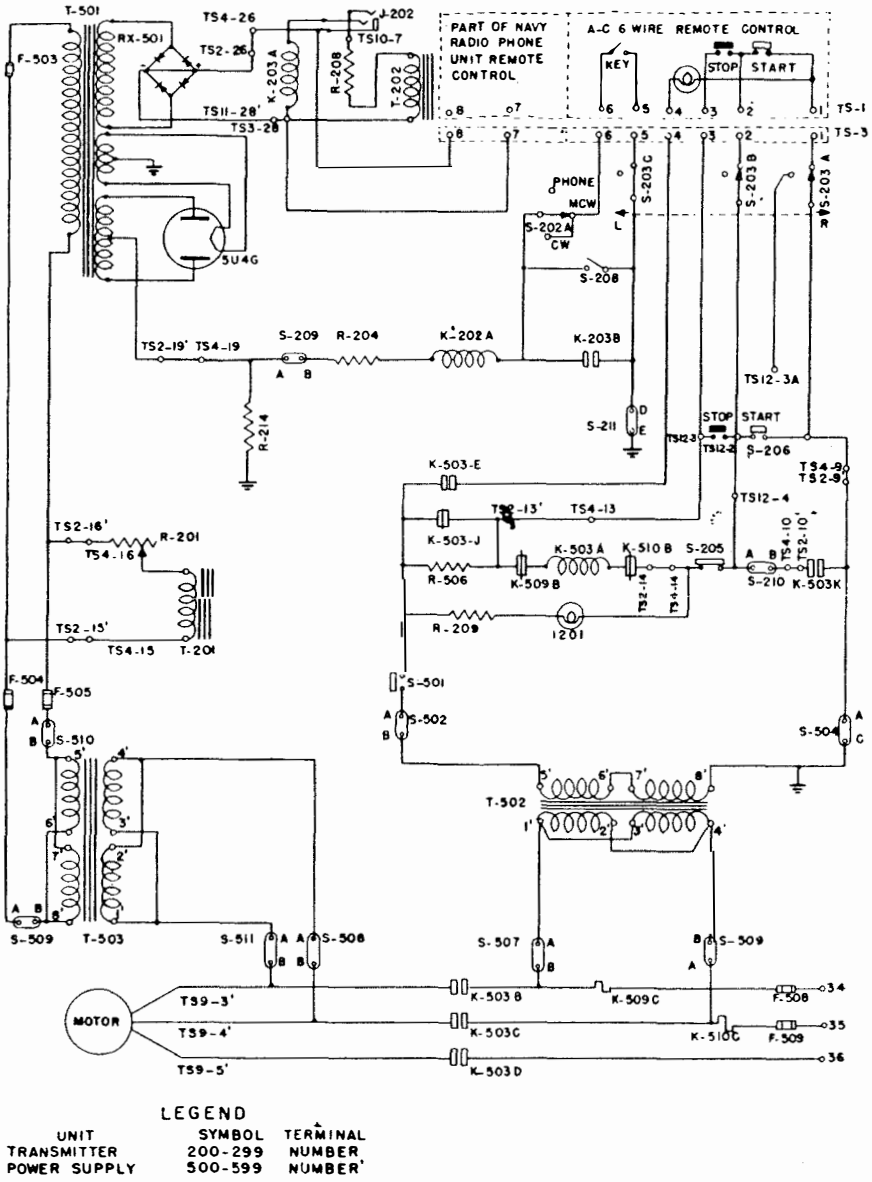


FIGURE 3. Control circuits for model TDE-2 transmitters.

440 volts a.c. to the fuses protrude slightly from under the fuse block protective cover. After the fuse access door is opened or the power supply panel is removed, these lug connections may become a safety hazard unless the main power switch is opened. It is also possible for the access-door stop to contact these lugs if the power-supply panel is allowed to drop when the panel retaining knobs are released. Warning signs on the power-supply panel and on the protective cover over the fuses, indicating the presence of high voltage; and warnings in the technical manual for TDE to open the main power-supply switch before servicing the transmitter, if adhered to, would avoid the hazards described.

It has been suggested changing the type of fuse clips and extending the cover to eliminate the hazards mentioned. In view of the warning signs on the equipment and admonitions contained in the technical manual, the Bureau believes the time and expense required to modify the fuse block or cover is unwarranted. However, in the interest of providing all practical protection to personnel, the exposed solder lugs should be wrapped with vinyl insulating tape as as additional safety precaution.

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.
Will not modulate.	Check gain control setting (the gain control is easily overlooked) Check K-203-A.
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, reduced 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.
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. Remove armature and undercut the high-voltage commutator. Operation then normal.
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.
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 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.

TDE SERIES TROUBLE SHOOTING NOTES--Continued

Difficulty Encountered	Cause and Remedy
Output generator voltage would not exceed 140 volts. Motor-generator set not operating correctly.	The generator is of the self-exciter 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 I-502 began to "smoke."	Checked T-502 and found the two secondary windings shorted out. Replaced T-502 and normal operation was resumed.
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.
No power output. Motor controller arced excessively.	Loose connections to relay KV502 in motor controller found. Inspection disclosed dirty and burnt relay contacts. Contacts were cleaned and burnished. The unit then operated normally.
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.
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.
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.
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.
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 to 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.
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.
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

TDE SERIES TROUBLE SHOOTING NOTES--Continued

Difficulty Encountered	Cause Remedy
	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.
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.
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.
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.
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.
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.
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.
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.
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.
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.
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.

TDE SERIES TROUBLE SHOOTING NOTES--Continued

Difficulty Encountered	Cause Remedy
	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.
TDE-2.--Transmitter failed to key on CW, MCW, or PHONE on either 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.
TDE.--Radiating when not keyed. Audio tone picked up on received 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.
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.
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.
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.
TDE-1.--On the PC-1176 the line fuse would blow 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 ground was found shorted and replaced. Gear operated normally.
	C-631 that runs from the positive high-voltage brush to
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.
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.
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.

TDE SERIES TROUBLE SHOOTING NOTES--Continued

Difficulty Encountered	Cause and Remedy
TDE—Unable to load antenna, and transmitter arced at HF antenna feed switch.	Found insulation 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.
TDE-1.--Equipment keys continually.	Lead No. 4 on keying relay grounded. Removed ground. Equipment operates normally.
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.
Transmitter keys all the time.	A. Clear ground in test key ckt. B. Check for loose wires behind control panel.
Transmitter 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 .
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 in link S209.
Oscillator HF or IF oscillates and blocks.	A. Check R302 HF side. B. Check R102 IF side. C. Check L104 IF side.
Oscillator (HF side) fails to zero beat on various bands.	A. Check S301 contacts. B. Check C302, C303, C305.
HF oscillator output to IA stage is normal except on range 1.	A. Check R301. B. Check S302A.
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."
Low grid drive HF-IF stage.	A. HF side adjust C311. B. IF side adjust C108. C. Check tubes voltage on HF and IF side.
No Screen voltage to 807 HF and IF side.	A. Check C110. B. Check driver network.
No grid drive to grid of 803 HF side.	A. L307B shorted to C320. B. Check R310. C. Check tube voltages. D. Check M204.
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.
IF stage fails to furnish enough drive to PA stage.	A. Check tube voltages. B. Check C-116 and C109.
Low grid drive to HF-IF 803.	A. Check R214. B. Check IF stage.
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.
Transmitter will operate in tune position.	A. Check R209. B. Check S207 for proper operation.
PA plate current meter reads all the time.	A. Check C631 (in MG on HV end). B. Check C212.
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.
No modulation in NCW position.	A. Check contacts switch S202D. B. Check ground to case of transformer T203.

TDE SERIES TROUBLE SHOOTING NOTES-Continued

Difficulty Encountered	Cause and Remedy
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.
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.
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.
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.
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.
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.
High-voltage fuse blows.	A. C212 breaks down under high voltage (no ohmmeter indication of break-down). B. Short in HV supply transmitter.
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.
High-voltage meter reads in wrong direction.	A. Check polarity of M205. B. Check phase relation of line to transmitter.
Start and stop switch does not stop the transmitter. (6-wire control circuit).	A. Link S210 in wrong direction. B. Check contact adjustment K503K. C. Check circuit for ground.
MG set will run only when start button is held in. (6-wire control).	A. Check link S210. B. Check adjustment of K503K.
Pilot lamp 1201 burned out. Voltage to lamp high. Transmitter operation normal.	A. Check links on transformer T502. B. Check R209, R215.

CONTROL CIRCUITS FOR THE TDQ TRANSMITTER

The transmitter control circuit diagram (Fig. 1), 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.

CAUTION NAMEPLATES FOR MODEL TDQ TRANSMITTER

Quantities of caution nameplates for model TDQ transmitters, field change No. 3, contract N5sr-14265P (refer RIB 160), have been shipped to supply activities as follows:

Qty.	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 TDQ transmitters in their jurisdication are provided with the nameplates.

LENGTH TDQ ANTENNA TRANSMISSION LINE

Paragraph 4.16 (a) of the pre-preliminary technical manual 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 Splicing Instructions RA 62A 299.

TOOL FOR CONTACT ALIGNMENT

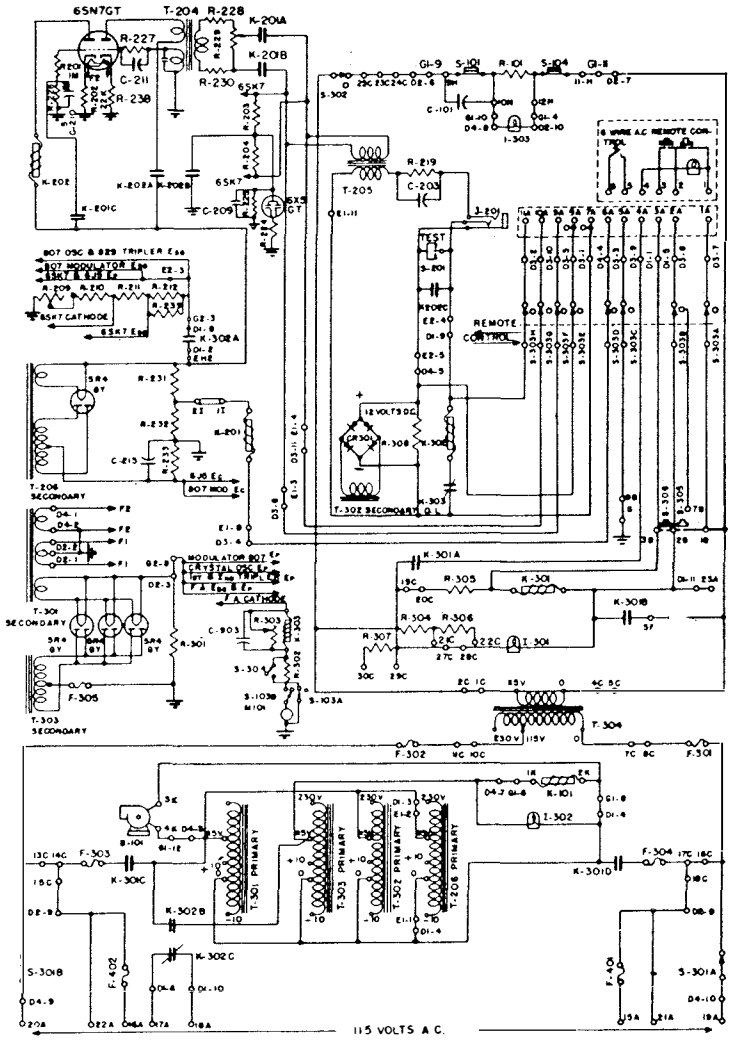
A beneficial suggestion submitted by Mare Island Naval Shipyard makes provisions for aligning the spring contacts in the rear drawer connectors of the TDQ transmitter. By use of this contact alignment tool the procelain connector may be assembled in much less time than normally required to align these twelve (12) contacts and insert them into the top half of the procelain 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.

The tool can be made by station personnel from scrap pieces of brass.

ANTENNA FAILURES IN TDQ V-H-F RADIO TRANSMITTING EQUIPMENT

Several reports have been received by the Bureau recently concerning failure of the Type 66095 antenna as



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

used with the 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. Glypotal 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.

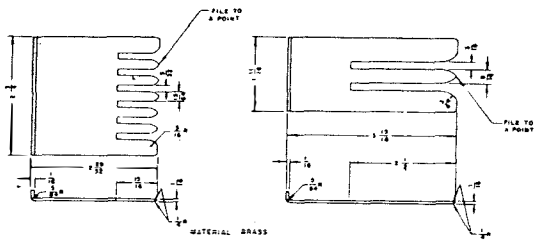


FIGURE 1.--TDQ contact alignment tool

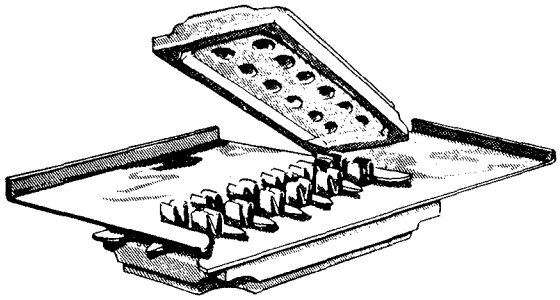


FIGURE 2.--Illustration showing the use of the TDQ contact alignment tools

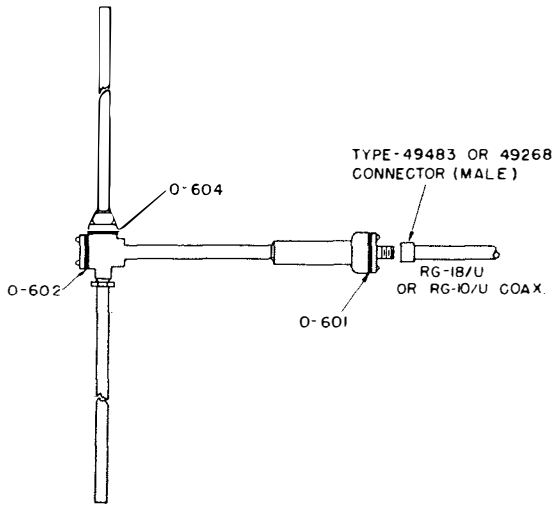


FIGURE 1.--Location of TDQ gaskets to be checked on antenna

After the antennas were repaired, the efficiency was brought up to such a degree that the need for relocation was unnecessary.

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, O-601, O-604, that should be checked.

FAILURE OF TDQ ANTENNA CONNECTORS

The Bureau has received several reports from ships concerning failure of the type 66095 antenna assembly for the 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.

FAILURE OF TDQ TRANSMITTERS

The post-graduate school, U.S. Naval Academy, Annapolis, has reported to the Bureau two defects in the construction of the 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.

DAMAGING THE KEYING RELAYS OF TDQ EQUIPMENTS

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.

ADAPTING 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 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 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 TDQ/RCK combination will permit use only of channels one and two of the four channels of the Type CF-1 terminal.

CRYSTAL FAILURES IN TDQ RADIO RECEIVING EQUIPMENTS

See article entiled "Crystal Failures in RCK and TDQ Series Equipment", in RCK series.

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.
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.
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. 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.
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.
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.

TDZ STOWAGE OF DIAL CRANK

Local activities, that find stowing the TDZ Dial Crank a problem, will appreciate the simple holder suggested by Mr. Ralph H. Hitchcock of the Boston Naval Shipyard.

Two phosphor-bronze fuse clips (ferrule contact type) G17-C-11200 or equivalent should be attached in a convenient place on the side of the transmitter cabinet with 6-32 screws. The two clips should be spaced approximately 180 degrees apart so that the circular portion of the dial crank is firmly gripped on each side.

TDZ INTERFERENCE FILTER

Filter F-141/U and filter box CY-1856/U have been procured to reduce the interference feeding back from the TDZ (radio transmitter) into the ship's 440-volt, a-c power circuits. The filter, filter box, and parts may be obtained through normal supply channels. Installation information and a material list are shown in figure 1. The filter should be firmly mounted near the transmitter and connected in the existing-power cables. No field change will be issued.

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

IMPROPER TUNING WILL CAUSE DAMAGE —INSTANTANEOUS OVERLOADS RUIN THIRD TRIPLER AND POWER 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.

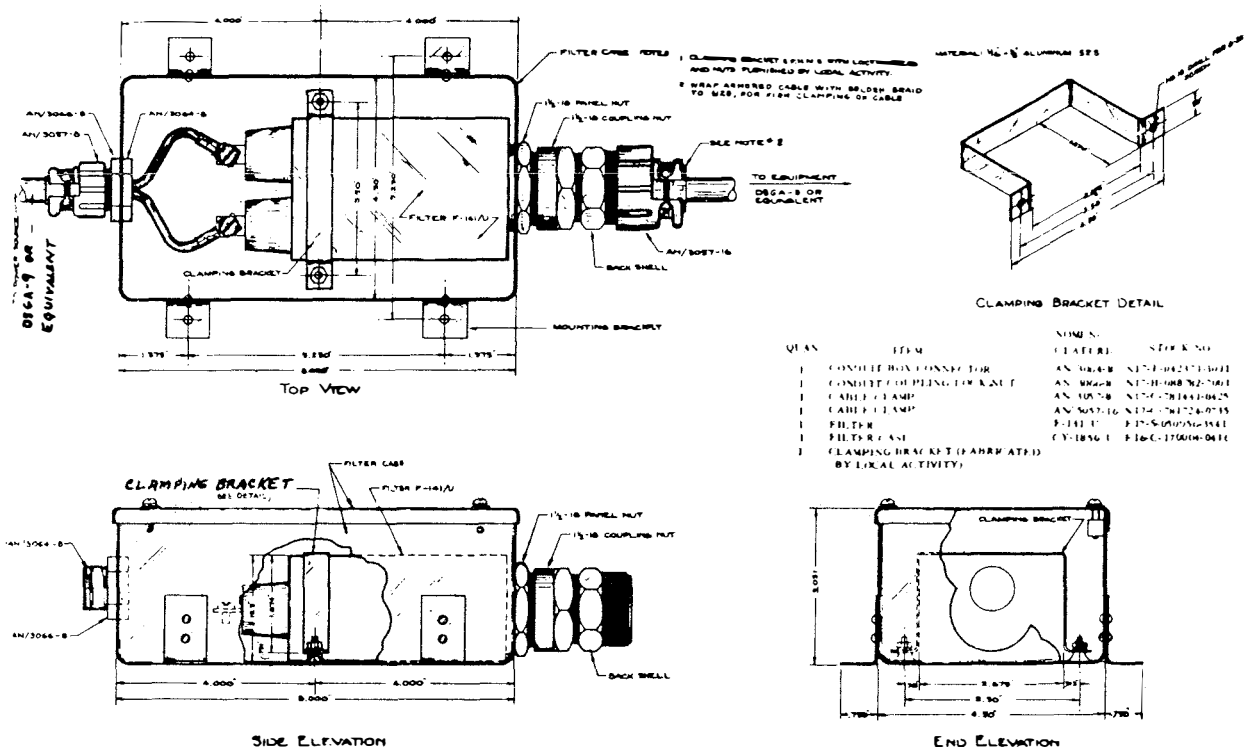


Figure 1

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 0. If Instruction Book not available set all controls to 0.

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 1/2 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.

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 1/4 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.

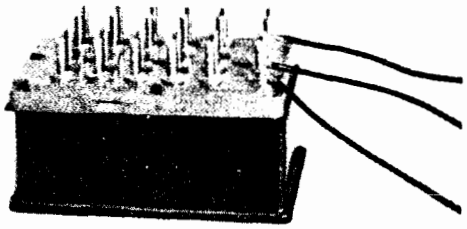


FIGURE 1.—Bottom view of crystal oven showing test leads connected to heater pins W, Y, and Z

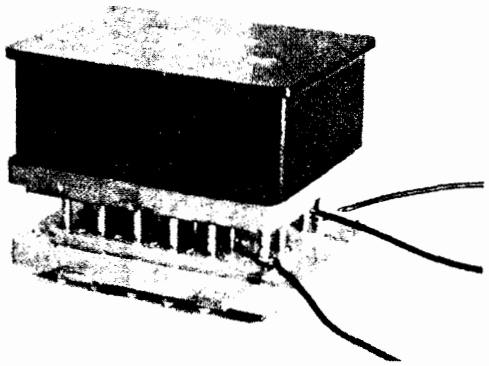


FIGURE 2.--Crystal oven and oven socket showing test leads connected

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. It will be found that the cranks will help considerably in making adjustments.

ADDITIONAL INFORMATION ON CRYSTAL OVENS FOR RDZ, MAR, AND TDZ RADIO EQUIPMENTS

After a lapse of several months, shipment of crystal ovens for 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.

Month of manufacture	Color-Code: Screw nearer heater pins	Color-Code: 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.

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.

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".

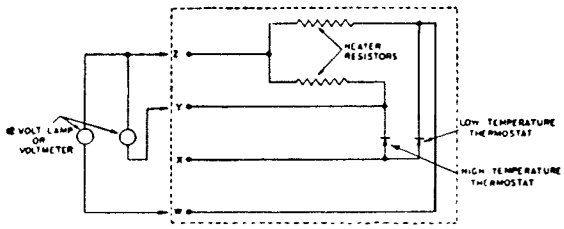


FIGURE 3.--Simplified heater circuit of crystal oven

CORRECT CRYSTALS FOR USE WITH TDZ EQUIPMENTS

TDZ equipments, serial 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.

TDZ AND RDZ--CRYSTAL OVEN FAILURE

A frequent but easily overlooked cause of a TDZ and 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.

CRYSTAL OVENS FOR TDZ RADIO EQUIPMENT

See the article entitled "Crystal Ovens for RDZ, MAR and TDZ radio equipments", in RDZ series.

OBTAINING CRYSTALS

See the article entitled "Obtaining Crystals for MAR, RDR, RDZ, and RDZ", in MAR series.

TYPE 2C39 TUBES IN TDZ AND MAR RADIO EQUIPMENT

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 motor.

TDZ equipment furnishes a very poor visual figure 1.

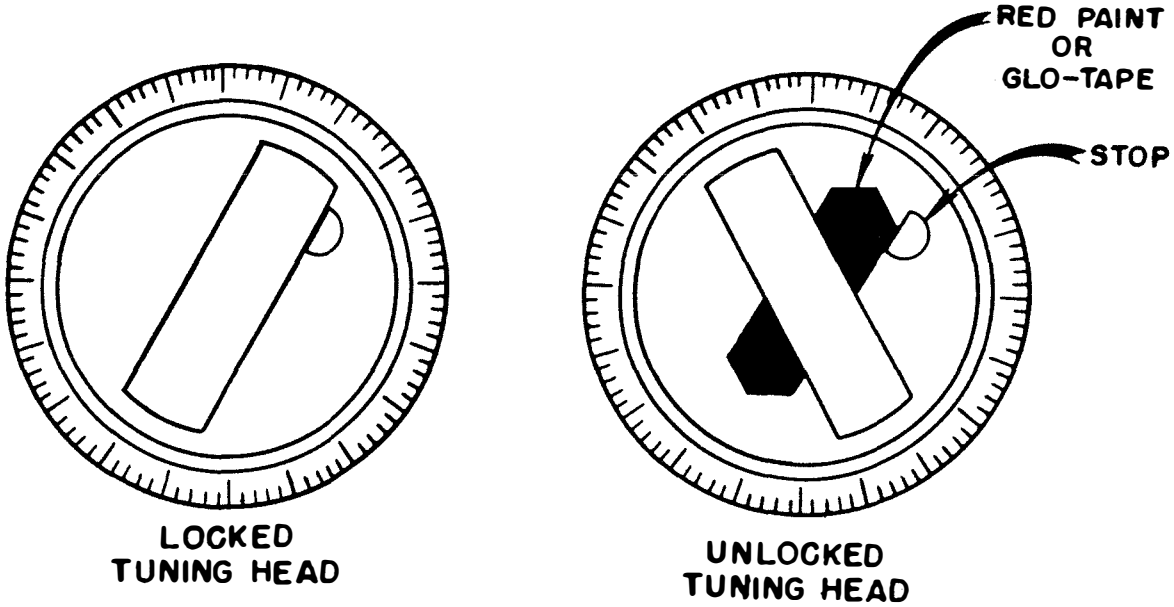


FIGURE 1.

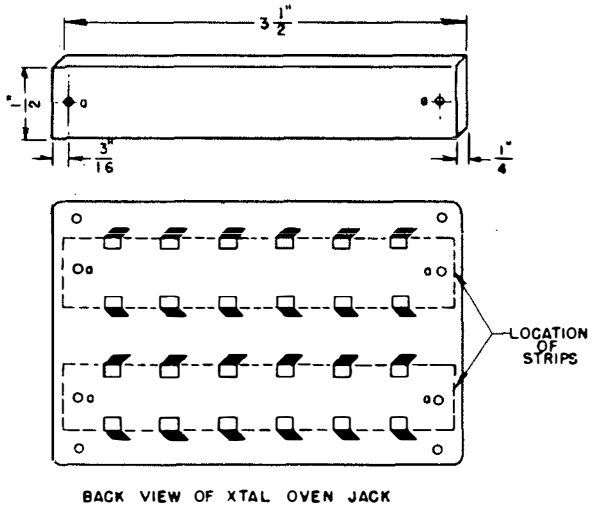


FIGURE 2.

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.

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.

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 Technical Manual. The Navy Type number is 491212.

All electronic officers should make sure their stock of spare connectors is adequate.

LOCKING INDICATOR FOR DIALING MECHANISM OF TDZ

Radio Transmitting Equipment TDZ employs 11 autotune mechanisms by means of which ten channels may be manually preset for automatic tuning. The entire 10 channels must be retuned if these autotune mechanisms are not locked prior to switching channels automatically.

The Bureau has been informed that the TDZ equipment furnishes a very poor visual indication of whether a tuning-dial lock is in the locked position.

It has been suggested that a red indicator be placed on the tuning-dial (see fig. 1) to show by a quick glance at the dials if they are locked. The Bureau concurs in this suggestion. It is recommended that red paint or Glo-Tape be procured locally and used to give the necessary indication as shown in figure 1.

OVEN JACK FAILURE

The Bureau has received reports of oven jack failures in the TDZ equipment due to pin socket contacts being forced from their mounting holes when the crystal oven is pushed into place.

The use of back-up strips of bakelite to prevent dislodging the contacts has been proposed. (See fig. 2.) A suitable low loss bakelite may be used; or better, use two strips ½ inch x 3½ inch each of ¼ inch silicone resin glass cloth laminate. Attach these strips to the back of the oven jack with No. 6-32 binder head screws as shown in the sketch. No field change will be initiated by the Bureau for this suggestion.

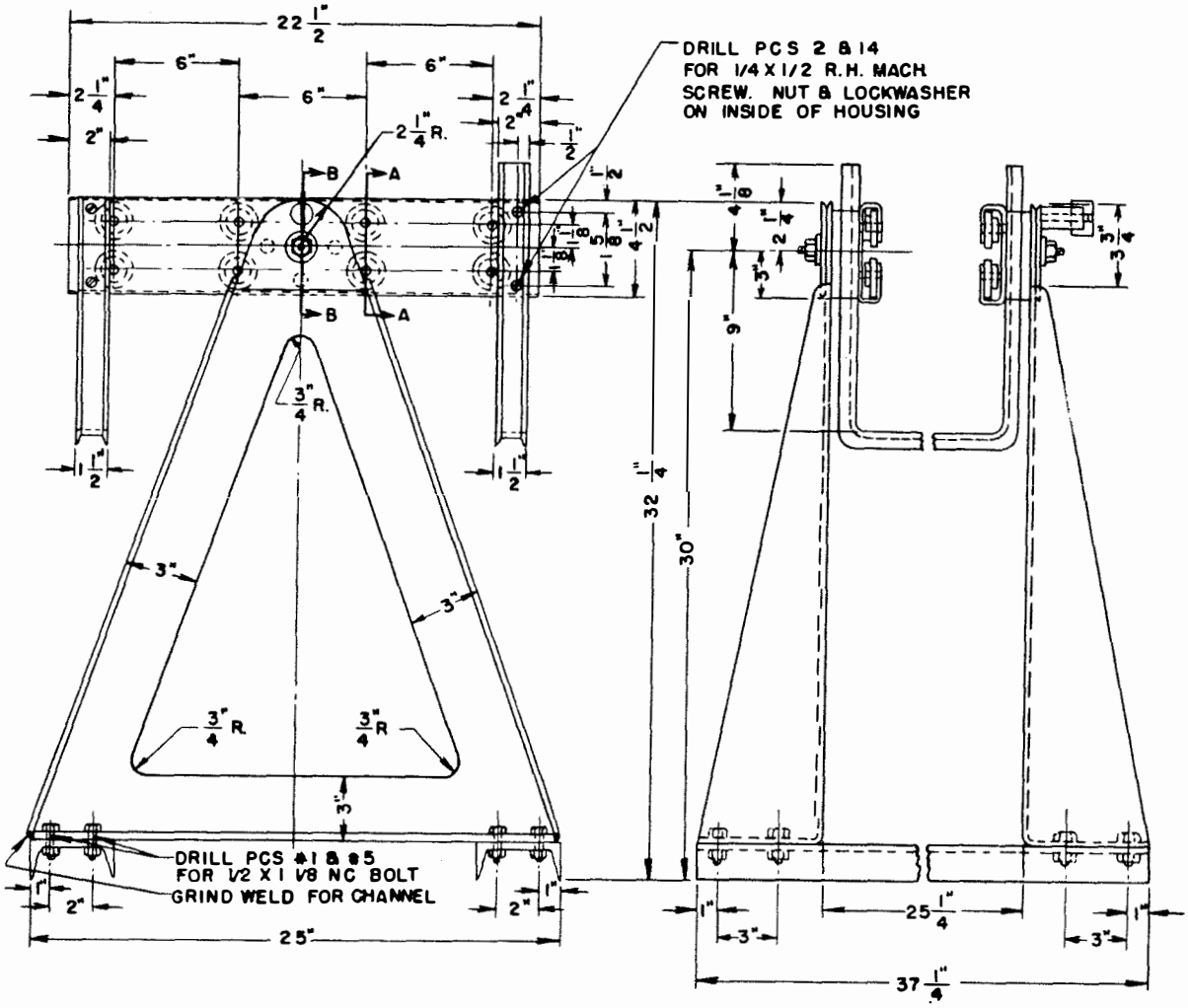


FIGURE 1. Construction Details For TDZ Test Rack.

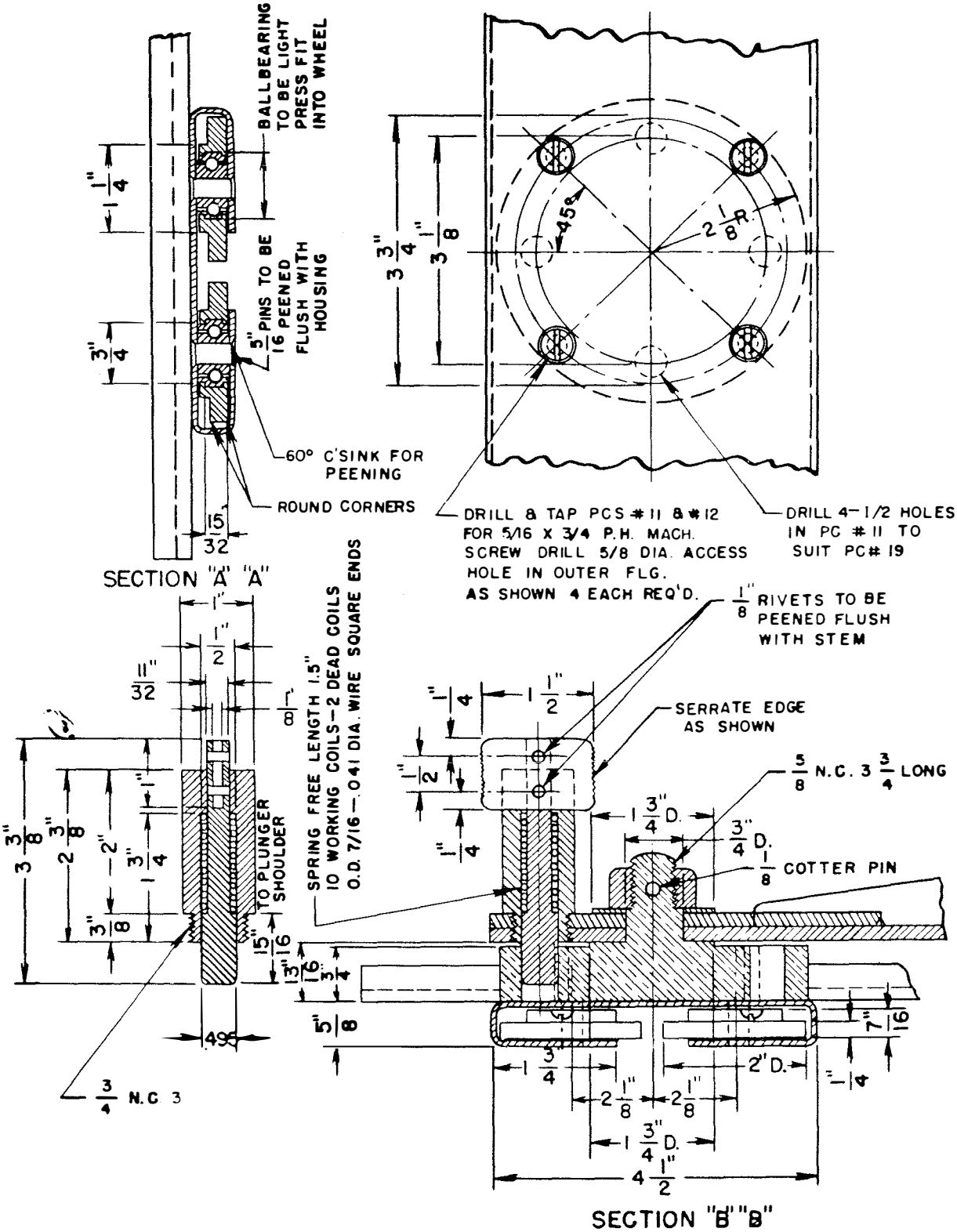


FIGURE 2. Construction Details For TDZ Test Rack (Cont.)

FSN's FOR AUTOTUNE DIALS

A suggestion has been instrumental in the assignment of stock numbers to the autotune-mechanism tuning dials and crystal-selector dial of the TDZ Equipment. Prior to this action, it was necessary to stock complete autotunes in order to provide these dials for replacement purposes. The autotune dials (used with E-102 through E-113 inclusive) have been assigned stock number **N5355-546-4682;** and the dial for the crystal-selector (used with E-101), stock number **N5355-233-3601.** This makes it possible to order and stock these dials as individual items. Therefore, stocking and ordering complete units for the purpose of obtaining replacement dials should be discontinued immediately.

Symbols 0-292 (autotune dial) and 0-293 (crystal selector dial) have also been assigned to designate these two items.

PORTABLE TEST RACK

A portable test rack for use with the TDZ equipment has been proposed.

In testing the equipment, technicians must now remove a drawer from the transmitter cabinet to use the test cables. Two or more technicians are required to handle this heavy, bulky drawer.

The portable test rack eases the job of doing maintenance and test work and lessens the possibility of equipment damage during these procedures. Construction details are shown in the accompanying figure for those activities desiring to fabricate the test rack.

While the Bureau considers the need for this test rack to be limited, it may be useful in shops where extensive TDZ repairs are made.

TDZ SERIES TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Improper operation.	First-always check dial settings against logged settings.
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.
No audio for m-c-w operation.	Replace 6SN7 audio oscillator tube.
Low emission.	Check 2C39 third tripler and power amplifier tubes.
Binding of autotone mechanism.	Shaft of C-158 for third tripler broken. Repair or replace.

TDZ TROUBLE SHOOTING NOTES

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 R122-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.
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 or 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	X115–119 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.

FAILURE OF BLOWER MOTOR

Failures of the ventilating system in Radio-Transmitting Equipment, TED Series, have been traced to excessive wear of the blower-motor brushes. The brushes supplied with the first procurements of these equipments proved to be too soft, resulting in rapid wear. Although the instruction books call for weekly checks for adequate brush length, continuous operation of the equipment in some cases has resulted in failures in spite of adherence to maintenance schedules.

Equipments containing black motors, manufactured by Rotron Mfg. Co. (Ser. No. 300 and above on TED-1), were supplied with brushes of harder material. Life tests on these brushes have shown that at least 1, 000 hours use can be expected. Gray motors, also manufactured by Rotron and used in all TED and low serial number TED-1 equipments, had brushes of soft material.

Replacement brushes of the hard material are being distributed to supply points by the Electronics Supply Office. The new brushes bear the same stock number (SNSN No. N17-B-86231-1301) as the old since they are entirely interchangeable. Stock on hand should be used before requisitioning the new brushes.

JAMMING PA TUNING DIAL

The power-amplifier chassis of the TED equipment has its top cover secured by six, size 4-40, fh screws; five of which normally are 3/8-inch long, and one is 1/4-inch long. The short screw must be used in the front-center hole directly above the tuning dial.

Mr. S. E. Lanotte of Shop 67, New York Naval Shipyard, through a beneficial suggestion has brought to light a jamming condition of this dial due to personnel inadvertently placing a 3/8-inch long screw in this location when re-installing the cover after routine maintenance. A review of this condition had developed that this human factor can be eliminated by replacing all six screws with size 4/40 fh screws, 5/16-inch long. Local activities should make this substitution in all TED equipments during routine maintenance. No field change will be initiated by the Bureau.

CARBON DUST

Reports have reached the Bureau that carbon dust from the blower-motor brushes in Radio-Transmitting Equipment TED is fouling the rf unit. Apparently the carbon dust escapes through the small space around the motor-power cord. This can be prevented by sealing this space with DC-4 (Dow Corning silicone compound), N51-C-5194-1500). The cord should be resealed after the motor is removed for servicing during routine maintenance.

ELIMINATION OF SPURIOUS OSCILLATIONS IN TED SERIES

Recent investigations have disclosed that, under certain conditions, a spurious audio oscillation may appear on the rf carrier of Radio Transmitting Equipment TED Series and cause impairment of voice modulation. These spurious oscillations are caused by rf feedback to the first audio-amplifier stage in the modulator. The extent of these oscillations depends largely upon the placement of interconnecting cables. Further investigations are expected to determine a satisfactory corrective measure. In the meantime, if such oscillations occur in the TED equipment, operate the equipment with the CLIP FILT Switch (S-103) and the EXP (S-104) OFF and the AVC Switch (S-102) ON. Under this condition, the feedback level is not sufficient to maintain oscillations.

HUM

The Bureau has received reports of high-frequency hum in the output of the TED Series equipments, resulting from imperfect grounding of the blower-motor shaft. This shaft is grounded by a spring contact which in time may become worn or lose tension, allowing the rotor to electrically float above ground. This may cause interference including an 8000-cycle hum superimposed on the signal when phone or MCW operation is used. Where such a condition is encountered, the spring contact should be removed and bent slightly to restore good contact with the motor shaft.

TED AIR VENTS

Plastic air vents, which guide the air stream across the p-a tube, cooling fins in the TED Series equipment, will warp or melt if the blower-motor fails and the equipment is kept in operation. Since air-vent spares were not originally supplied with TED, TED-1, and TED-2, it has been necessary to fabricate replacement vents locally. Vents are included in equipment spares for TED-3 to TED-6 inclusive and are now a stock item for all TED Series equipments.

Mr. Oscar Berenberg of the New York Naval Shipyard has suggested that Teflon be used in local fabrication of air vents because machining and heat-tolerance characteristics are superior to those of the original polystyrene vents. This suggestion has merit and may be used in an emergency when replacement vents are not available.

Damage to air vents and other components of the TED Series equipments resulting from blower failure should be virtually eliminated by a forthcoming Field Change (1-TED). The kit, which will be available about 1 July 1955, includes a protective thermal switch to shut down the equipment in case the blower fails.

TED SAFETY HAZARD

Mr. Edward F. Carmanica, Boston Naval Shipyard, in a beneficial suggestion, indicated a safety hazard in Radio Transmitting Equipment TED. The metal case of capacitors C-130 and C-187, located underneath the power chassis, is 600 volts above ground. Since the metal case

of this type capacitor is normally expected to be at ground potential, this is a particularly dangerous condition.

BUSHIPS will initiate a field change providing decals to mark these capacitors in red: "DANGER, CAPACITOR CASE 600 VOLTS TO GROUND". In the meantime, Electronics Technicians are cautioned to avoid contact with these capacitors when servicing the TED (See BUSHIPS Manual, Chapter 67, Part 12 Safety Precautions.)

TED CLAMP TO SUPPORT POWER CABLE

Mr. Julian Kupchynski and Mr. Salvatore Uvino, of the New York Naval Shipyard, have suggested that an additional cable clamp be installed in the cabinet of the TED Series (radio transmitter) equipment to prevent the power cable from sagging with subsequent damage as the cable becomes worn from sharp edges of the set.

A rubber-lined cable clamp should be used, such as an Adel No. 12 (round type) or equivalent. This clamp should be located about midway between the rear of the cabinet and the forward clamp. It should be secured by means of a No. 8-32 oval-head screw, nut, and lockwasher. Use a No. 18 drill for drilling the mounting hole. A forthcoming Field Change will correct this deficiency and will include other modifications to the TED Series equipment.

TUBE TYPE 4X250B VERSUS 4X150A IN TED SERIES AND AN/GRC-27

The substitution of electron tube Type 4X250B in sockets of the TED Series and AN/GRC-27 requiring the use of tube Type 4X150A is neither authorized nor recommended. It should be noted that both tubes 4X150A and 4X250B are identical except for the types of seals used; 4X150A (glass to metal seal) and 4X250B (ceramic to metal seal). Type 4X150A tubes procured prior to 15 April 1959 had external anode fins or radiators soldered on, while those of Type 4X250B are brazed. This condition allowed the 4X250B to operate at a higher-plate dissipation and temperature than the 4X150A. However, the 4X150A (with a brazed radiator), now being procured to the latest military specification, MIL-E-1/160G is, comparable to the 4X250B, and is capable of operation at 250 watts of plate dissipation with lower-plate temperature and less cooling air than earlier 4X150A tubes.

Tube substitutions are evidenced by the demand being made on the supply system for the 4X250B, and tube failure reports listing the TED Series or AN/GRC-27 as applications. It is believed such substitutions are being made soley on the basis of the tube's past performance problem and the assumption that the use of the 4X250B will increase equipment reliability. Such assumptions are not based on operating facts. The availability of the 4X250B is, and always has been, very limited, due to the manufacturer's inability to solve the tube-sealing problem (ceramic to metal sealing).

Recent control-comparison tests (conducted under identical conditions by Aeronautical Radio Incorporated (ARINC) for the Bureau of Ships) to determine the merit of reliability of the 4X150A (with a soldered radiator), 4X150A (with a brazed radiator), and the 4X250B, indicated the following mean time between failure (MTBF): 4X150A (soldered radiator), 2200 hours; 4X150A (brazed radiator), 3000 hours; and 4X250B, 1130 hours.

The results of exhaustive investigations, testing, and analysis by the Naval Material Laboratory, ARINC, and the Air Force, on earlier 4X150A's with soldered radiators, indicate that:

1. The 4X150A will provide satisfactory service when operated within the tube and equipment specification.
2. The 4X150A, as used in the TED-Series equipment is being used beneath its maximum rating, and no advantage is gained by using the 4X250B.
3. The 4X150A, as used in the AN/GRC-27, is being operated near its maximum rating; however, due to the fact that the 4X250B is, for all practical purposes, the same as the 4X150A, no advantages are realized by this substitution.
4. The major causes of unreliability can be attributed to improper maintenance; operation under adverse conditions (such as improper loading, insufficient cooling, improper alinement, or tuning (off resonance)); application of high voltage without filament voltage; and insufficient drive. These conditions will result in reduced life and damage to any power tube.

WIRING ERRORS IN TED TRANSMITTER

It has been reported to the Bureau of Ships by field activities that wiring errors have been discovered in power transformer T104 of the TED Transmitting Equipment.

Examples of such wiring errors are described as follows: (Refer to Figure 7-30 of technical manual NAVSHIPS 91585 or Figure 7-21 technical manual NAVSHIPS 91357).

(1) The white-black wire was connected to terminal 3 instead of terminal 1. The white-red wires to terminals 2 and 4 were reversed. When the jumper was connected between terminals 2 and 3 for 230 volt operation, the 230 volt line was short circuited.

(2) The white-black wire was connected to terminal 3 instead of terminal 1. When jumper was connected between terminals 2 and 3 for 230 volt operation, 230 volts was applied to only one-half of the primary winding.

It is requested that all field activities installing the TED transmitter carefully check the wiring in power transformer T104 for conformance with the wiring diagrams in the technical manuals.

MAINTENANCE OF AIR FILTER SCREENS IN TED SERIES RADIO TRANSMITTING EQUIPMENT

The Bureau of Ships has received reports of failure of the TED series radio transmitting equipment as a result of overheating. The cause of this overheating has been traced to clogged air-filter screens.

Preventive Maintenance Check Charts in Technical Manual NAVSHIPS 91357 and 91585 (A) indicate that these

screens should be cleaned monthly. In some installations such as at shore stations or when a ship is at a yard or dock, the dust content of the air may be high.

In such cases it is recommended that airfilter screens be cleaned weekly. This maintenance schedule applies to all electronic equipment operating under similar conditions.

Use of gasoline or other inflammable solvents or carbon tetrachloride is not permitted for cleaning air filters aboard ship. The approved cleaning material for this purpose is dishwashing compound. Wash the screens thoroughly in a fresh-water solution of this compound, then rinse and dry. Following this, dip the screens in Navy Type 2190T or 3100 lubricating oil and drain for one-half hour to remove excess oil.

TED SERIES, INSTALLATION MOUNTING INSTRUCTIONS FOR SHIPBOARD USE

Installation instructions for the TED, TED-1 and TED-2 radio transmitters as given in NAVSHIPS 91357, 91475 and 91585(A), are not completely clear in regard to the method of mounting these equipments on a bench or shelf. The only approved installation mounting is as follows:

(1) Where the equipment can be mounted within three inches from the front edge of the mounting surface, bolt the cabinet directly to the mounting surface. Do not use the four steel mounting supports supplied with the equipment. The foundation and cabinet drilling layout is shown in Figures 3-6 and 3-14 of NAVSHIPS 91357, and 91475 or 91585(A) respectively.

(2) Where the equipment must be mounted three inches or more back from the front edge of the mounting surface, the four steel mounting supports must be used. These permit the front of the withdrawn chassis to be lowered sufficiently to allow removal of the chassis from the cabinet. Location of the center of the mounting supports is shown in Figures 3-6 and 3-14 as indicated above. These center holes in the cabinet should be 1 inch diameter instead of 5/16-inch to permit use of a socket wrench in securing the mounting bolts. The four holes (9/32-inch diameter) for attaching each mounting support to the cabinet should be spotted from the mounting supports. Never use rubber type shock mounts in the installation of this equipment.

SHORE STATION INSTALLATION AND MAINTENANCE OF TED

The Bureau of Ships has received numerous complaints from shore field activities concerning high failure rates of the TED transmitter. Most of the reports indicate the same type of failures and the recurrence thereof. These are, namely, rapid wear of the brushes, burn-out of the blower motor, and as a result of failure of the blower, the 4X-150 vacuum tubes fail and the polystyrene air vents melt due to excessive heat. The failure of brushes and the pile-up of carbon dust in the motor is the result of the high rotational speed of the blower motor which must of necessity turn at 8,000 RPM to provide the required 145 cubic feet of air per minute to assure proper cooling.

The Bureau is now investigating the possibility of providing a lower speed motor of the brushless type or an improved long life unit to be installed as a field change to this equipment. As considerable time will elapse before such a replacement is available, the following preventive maintenance schedule should be put into effect to reduce equipment failures:

1. Inspect blower motor brushes once weekly, and replace when worn to one-half inch in length. Disregard statement in the instruction books to replace brushes when worn to one-eighth of an inch.

2. Every 30 days, remove the complete blower motor assembly and disassemble in accordance with the instructions contained in the instruction manual under Corrective Maintenance, Blower Motor. Care should be taken to assure removal of all carbon dust from the bearings, armature, and field assemblies. If the commutator is pitted or scored, it should be cut down to a smooth surface on a lathe and under cutting of the insulation between commutator bars should be accomplished. If the commutator is badly pitted or scored, the complete motor assembly should be replaced.

3. If the air filter screen is allowed to collect a large amount of dirt, the blower motor will not provide enough air to cool the equipment, with consequent failures. The air screen should be inspected weekly and if found to be clogged, service in accordance with preventive maintenance procedures contained in the instruction manual.

WARNING!

Failure to observe the above preventive maintenance procedures may result in equipment failures that can produce serious consequences when this equipment is used on circuits requiring a high degree of dependability, for example, Naval Air Station Air Traffic Control.

4. The polystyrene air vents may be ordered from Electronic Supply Office stock under **N 5820-311-8766** in the event that equipment spares are expended.

SHORE STATION INSTALLATION

Installation of the TED transmitter should be accomplished in accordance with information contained in the instruction book. However, if installation consists of mounting in a CY-597/G rack cabinet or similar rack mount, the following precautions apply.

1. No more than three transmitters are to be installed in one rack.

2. Establish clearance space of at least twelve inches between equipments in each rack.

3. The rack cabinet rear door must be removed completely to allow proper air circulation. Operation of the equipment should not be attempted with the door in place.

4. Installation of both transmitters and receivers in the same cabinet is not recommended. Each transmitter

will dissipate 700 watts in the form of heat, and close proximity to receiver equipment may contribute to receiver failure.

It is requested that field activities supply the Bureau with complete failure reports on the TED transmitter and the Bureau invites comments or suggestions for improved operation and maintenance of this equipment.

FAILURE OF BLOWER MOTOR

Failures of the ventilating system in Radio Transmitting Equipment TED series have been traced to excessive wear of the blower motor brushes. The brushes supplied with the first procurements of these equipments proved to be too soft, resulting in rapid wear. Although the instruction books call for weekly checks for adequate brush length, continuous operation of the equipment in some cases has resulted in failures in spite of adherence to maintenance schedules.

Equipments containing black motors manufactured by Rotron Mfg. Co. (Ser. No. 300 and above on TED-1) were supplied with brushes of harder material. Life tests on these brushes have shown that at least 1000 hours use can be expected. Gray Motors (also manufactured by Rotron), used in all TED and low serial number TED-1 equipments, had brushes of soft material.

Replacement brushes of the hard material are being distributed to supply points by the Electronics Supply Office. Stock on hand should be used before requisitioning the new brushes.

RADIO TRANSMITTERS TED THROUGH TED-6 AND AN/URT-7 THROUGH AN/URT-7C

Numerous requests have been received by the Bureau of Ships for clarification of the field change bulletins which apply to the subject radio transmitters. A careful review has revealed that the instructions in these bulletins direct a duplication of work and material procurement. A brief explanation of each bulletin is given below with recommended action.

(a) FC-1-TED through 1-TED-5 and 1-AN/URT-7 (NAVSHIPS 98630)

(b) FC 2-TED through 2-TED-5, and 2-AN/URT-7 -7A, -7B (NAVSHIPS 98815)

(c) FC 5-TED, 3-TED-1 through 3-TED-6, 1-TED-7, -8, 3-AN/URT-7, -7A, -7B, and 1-AN/URT-7C (NAVSHIPS 981164)

(d) FC 6-TED, 4-TED-1 through 4-TED-6, and 4-AN/URT-7, -7A, -7B (NAVSHIPS 981423)

(e) FC 7-TED, 5-TED-1 through 5-TED-6, and 5-AN/URT-7, -7A, -7B (NAVSHIPS 981339)

Explanation and Recommendations:

1. Reference (a) NAVSHIPS 98630: This field change is identical to NAVSHIPS 981339 (see paragraph 5, reference (e)) except that NAVSHIPS 981339 does not include a connector for the blower motor power line. This connector is no longer required because of the extended life of the new blower. (See NAVSHIPS 981164, paragraph 4, reference (d).)

2. Reference (b), NAVSHIPS 98815: The purposes of this field change are: (1) to add a warning nameplate to capacitors C139 and C187 in the TED series and to capacitors C410 and C412 in the AN/URT-7 series to indicate the presence of high voltage, and (2) to add a nameplate to the equipment to caution maintenance personnel to clean and check the blower motor. No corrections or changes are required.

3. Reference (c), NAVSHIPS 981423: This field change bulletin is identical to paragraph 2, reference (b), except that one nameplate, which cautions personnel to make the blower air filter and brush checks, has been modified to eliminate the brush check. The field change required by NAVSHIPS 981423 applies only to those sets on which Field Change NAVSHIPS 98815, reference (b) above, was not accomplished.

4. Reference (d), NAVSHIPS 9881164: This field change replaces blower B101 (B601) with a blower having long-life and low-maintenance characteristics. Field Change NAVSHIPS 98630, reference (a) above, must be accomplished prior to installation of this field change.

5. Reference (e), NAVSHIPS 981339: This field change has purposes identical to those described in Field Change NAVSHIPS 986630 except that NAVSHIPS 981339 does not include a connector for the blower motor power line. This connector is no longer required because of the extended life of the new blower installed in Field Change NAVSHIPS 981164. This field change should not be installed on those equipments in which NAVSHIPS 98630 has been accomplished.

TED AND AN/URT( ) SERIES RADIO SETS-BYPASSING OF RELAY THEREOF

U.S. Naval Air Station, Cubi Point, Philippines, has submitted the following beneficial suggestion:

> Antenna Change-Over Relays K-104 and K-401 of the TED and AN/URT( ) series Radio Sets sometimes become defective and reduce transmitter power output or cause complete operational failure. At sites which do not require antenna switching function, i.e. where the receiver is not colocated, it is suggested that the relay be bypassed.

The Bureau is aware that this is already the practice at several Naval activities. Application of the suggestion where warranted is a matter of local choice.

A satisfactory mechanical and electrical arrangement may be obtained by disconnecting the antenna and transmitter coaxial cables from the relay and mutually reconnecting the cables through a BNC straight through coaxial connector. The connector should be secured in a fuse holder attached by a 6-32 hex nut to one of the relay base attachment screws.

Personnel making this unnumbered change shall record its completion on the Electronic Equipment History card, NAVSHIPS 536, and on Field Change Record card, NAVSHIPS 537.

TED SERIES TRANSMITTERS, FERROUS HARDWARE

MAINTENANCE HINT:

A TED transmitter undergoing overhaul recently in the Electronics Shop at Charleston Naval Shipyard exhibited extreme losses in the RF tank circuit. This heat loss was concentrated in the stator plates of the capacitor in Z-102. The heat was so intense that the solder melted and the retaining plate (collar) loosened. Subsequent investigation disclosed that the 6-32 securing nut was steel instead of brass. The nut had been dipped and resembled brass from outward appearances.

The Electronics Maintenance Engineering Center recommends a procedure adopted by Charleston Naval Shipyard wherein the securing nuts for the Z-102 capacitor stators are checked with a magnet, and any steel nuts found are replaced with brass nuts. This procedure applies particularly when symptoms of excessive RF losses are apparent and/or when Z-102 is replaced.

SHIELD FOR RELAY K104 TED TRANSMITTER

Boston Naval Shipyard points out that damage to relay K104 may occur when the chassis is removed from the case, and suggests that a protective shield installed over the relay will serve to prevent such damage. The Boston Naval Shipyard recommends fabrication of the shield from 3/4-inch wide 1/8-inch stock bent to form a 2-inch square and bolted to the high voltage cover plate. Use of this suggestion is approved wherever such protection is considered as needed.

Defective TED Transmitters—Identification and Repair

Mobile Technical Unit FIVE has detected manufacturing defects in certain models of TED radio frequency units. These defects have been found more frequently in TED-9 transmitters, but are not necessarily limited to this model.

Specifically, the PA grid stage of some TED transmitters manufactured by Nevada Air Products cannot be properly aligned. All TED transmitters, especially those manufactured by Nevada Air Products, should be checked for the following condition.

Inspect the connections from the PA grid tuning capacitor (two sections) to the grids of the two PA tube (4x150) sockets. These connections should consist of a solder lug attached by a screw to each grid capacitor section, a solder lug attached by a screw to the grid connection of each PA tube socker, and a length of silver plated lead soldered from each grid solder lug to it's respective capacitor section solder lug, as illustrated in figure 1.

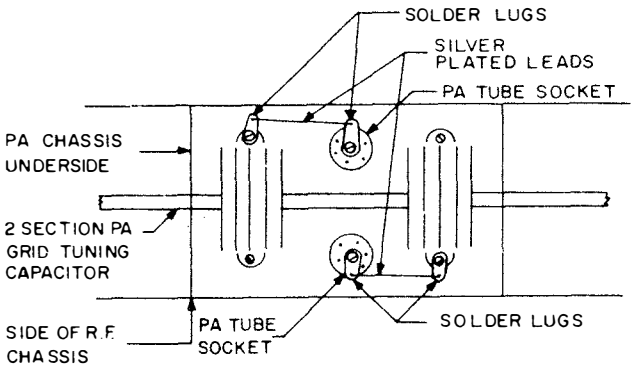


Figure 1. PA Grid Stage (Partial), Wiring Diagram

In the defective TED's, no silverplated lead wire is installed. The connection between the capacitor section and the respective PA (4x150) tube socket grid connection was made by turning the solder lugs at right angles from the position shown in figure 1 so that the ends of the solder lugs overlapped. The lugs were then soldered together. In this fashion, the lugs were made to serve as leads.

The alignment indications observed in the defective transmitters are as follows:

1. When aligning TED for high frequency end of range, trimmer capacitor C-179 (not shown) must be placed toward or to full capacity. In some cases, a minimum PA drive (PAig) meter reading of 110 at the high frequency alignment point cannot be obtained.

2. At the low frequency alignment point, a minimum PAig reading of 75 cannot be obtained, even when trimmer capacitor C-179 is in the full minimum position.

NOTE

When properly aligned, both the low and the high end frequency alignment points should provide a maximum PAig meter reading deflection with the C-179 trimmer capacitor screwdriver slot in the same position for both frequencies. This trimmer capacitor screwdriver slot position should be displaced between 10 and 80 degrees from the vertical.

The repair for defective TED transmitters is as follows:

1. Unsolder and separate the PA grid lead solder lugs.

2. Slightly loosen the screws holding the two solder lugs to the grid connections of both PA tube sockets. Loosen the two screws holding the other two lugs to their respective PA grid tuning capacitor section.

3. Turn the solder lugs for each PA tube out toward the respective outside edge of the chassis, with the unconnected ends of the solder lugs spread further apart than the ends held by the screws, figure 2. Tighten solder lug screws to hold lugs in this position but not tight enough to make lugs unmoveable.

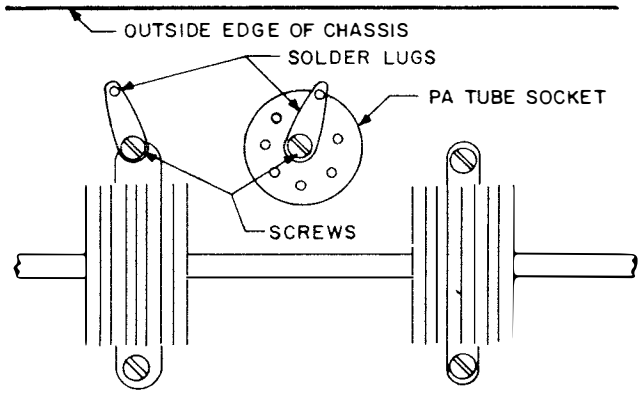


Figure 2. Alignment of Soldering Lugs

4. Obtain two pieces of silver plated wire of the same guage as the wire used for variable inductances L105, L107, L112 and L110. (A spare coil can be used to obtain the required leads.) Fashion one lead as illustrated in figure 3. Using the first lead formed as a model, from the second lead to as close a twin as possible. (Since this is a push-pull stage, both sides should be identical to assure equal drive to both tubes.)

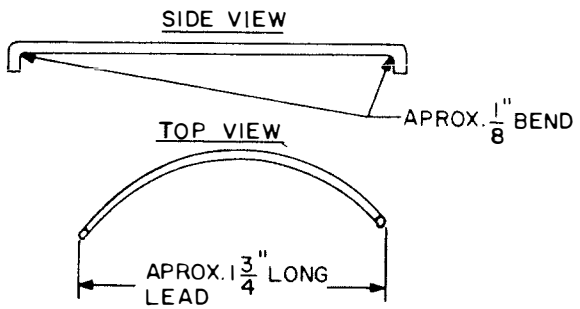


Figure 3. Forming Lead Wires

5. Install leads as illustrated in figure 4. RF chassis up-right and insert bent tabs of new lead through holes in solder lugs (do not bend around lug). Solder leads in position.

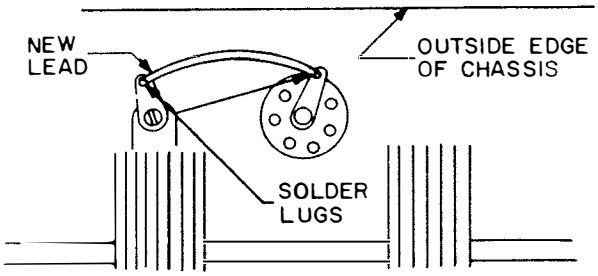


Figure 4. Installation of New Leads

6. The best length of lead can be determined by trial and error only. Try aligning PA grid. If the PAig meter reading is maximum for both the low and the high frequency, and the trimmer capacitor (C-179) screwdriver slot is within 3 degrees of the same position, the lead length is sufficient. More precise alignment can be obtained by rocking in the low and high ends using C-162 at high frequency and L-112 at low frequency. These components are in the plate tank of the second doubler.

7. If conditions of step 6 are not met, proceed as follows until this condition occurs.

a. If PA trimmer capacitor C-179 requires greater capacity at the high frequency end than at the low end, the lead is too short. Install longer lead.

b. If PA trimmer capacitor C-179 requires less capacity at the high frequency end than at the low end, the lead is too long. Unsolder one end of lead, cut off a short section, reform the end, and resolder.

c. Repeat steps a. and/or b., as needed.

8. After correct length lead is obtained, check solder connections and tighten screws holding lugs.

Additional Suggestions:

1. To position C-179 screwdriver slot closer to the horizontal (more capacity), spread the turns of PA grid tank coil L-117 further apart.

2. To position C-179 screwdriver slot closer to the vertical (less capacity), squeeze turns of PA grid tank coil (L-117) closer together.

3. In general, RCA manufactured 4x150 tubes will require a longer PA grid lead than those tubes manufactured by EIMAC. (688)

TED AND TED-1 THROUGH 9 RADIO TRANSMITTING EQUIPMENT—CABINET MODIFICATION

Antenna relay K-104 in TED series transmitters is often damaged when the transmitter main chassis is being removed from the cabinet. The damage occurs when the relay strikes the top framing edge of the cabinet. The following modification should be made in order to reduce such damage:

After removing the equipment main chassis, mark off a 3-inch section of the upper framing edge of the cabinet, directly in line with the position of relay K-104. The section will begin approximately 4-1/2 inches from the left outside edge of the cabinet and extend to a point 7-1/2 inches from this edge. Carefully saw through the framing edge at the points marked, cutting to the top of the cabinet, but not through it. Using vise-grip pliers, gently bend the 3 inch section back and forth until it breaks. Using a file, smooth rough spots and round off edges.

After this modification, the relay should easily pass through the slot during chassis removal, without damage. (EIB 715)

Parallel Operation of Two TH-39( )/UGT, TMC TIS-3A Tone Intelligence Units on a Common, 600-ohm Line

Information reaching the Naval Shore Electronics Engineering Center indicates that the tone outputs of two TH-39( )/UGT tone terminals are sometimes connected in parallel to a common, 600-ohm line in order to meet a particular operational requirement. One example occurs when it is desirable to simultaneously transmit FAX and RATT in one sideband of an independent sideband radio transmitter committed to a broadcast circuit (figure 1).

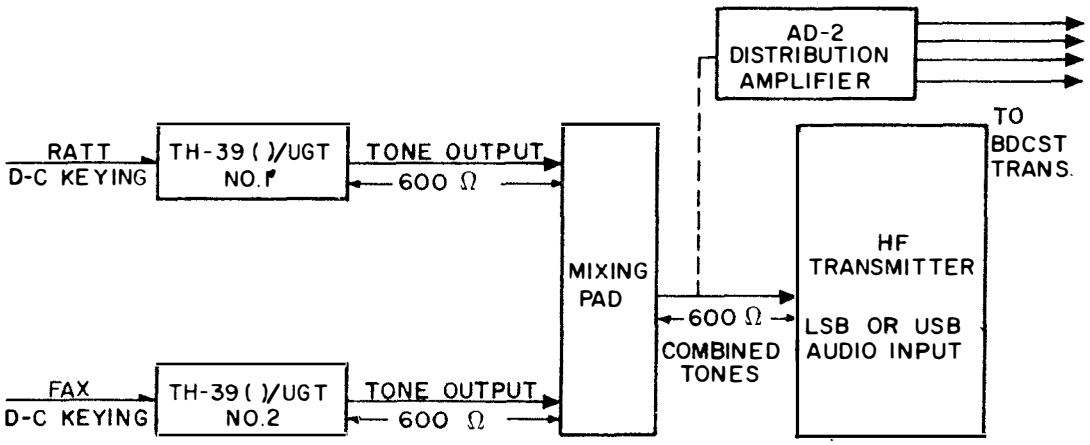


Figure 1. Mixing Pad

The mixing pad shown in figure 1 serves two purposes: It provides impedance matching in all directions (600-ohm nominal) and it provides a high degree of isolation between the tone outputs of TH-39( )/UGT, numbers 1 and 2. Isolation is necessary to keep the tone signals which appear in the output of one TH-39( )/UGT unit from actuating the output level meter in the other TH-39( )/UGT unit. It is also required to minimize the generation of intermodulation products which result from the mixing of undesired tones in the plate circuit of either TH-39( )/UGT output amplifier stage.

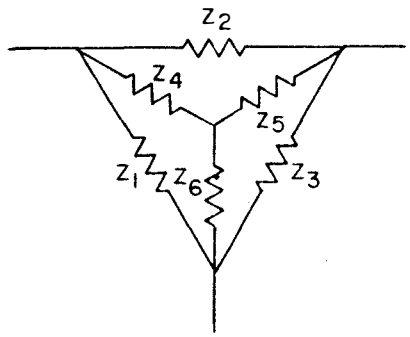


Figure 2. Basic Star/Delta Network

The simplest acceptable device is the Star/Delta network shown in figures 2 and 3. It has the following general properties:

1. $Z_1 = Z_2 = Z_3 = Z_4 = Z_5 = Z_6 = Z$.
2. Any impedance in the network can be replaced with a generator having the same internal impedance (figure 3).

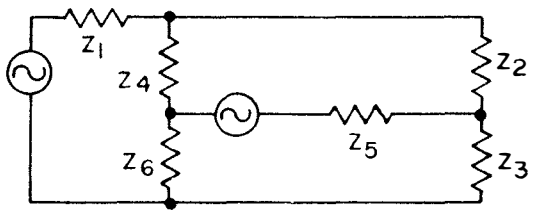


Figure 3. Star/Delta Network in Which Impedances Z_1 and Z_5 Are Replaced by Generators Connected for Maximum Isolation

3. Assuming perfectly-matched impedances in all legs, isolation is theoretically infinite between any impedance on a delta leg and the opposite impedance in the star configuration. For example, isolation is maximum between Z_1 and Z_5 (figure 3).

4. The insertion loss in the direction of transmission is only 6 db.

All activities which require parallel tone outputs of two TH-39( )/UGT tone units on a common, 600-ohm line are to use a Star/Delta mixing pad to achieve this requirement. The schematic diagram for a typical application is shown in figure 4. (For simplicity, neither IDF frames nor patch fields are shown.) All impedances and generators are 600 ohm. The "Z" symbols are significant only for correlation with the basic circuit shown in figure 1. Note that only three additional 1/2-watt, 600-ohm resistors are required to make up a Star/Delta pad because the two TH-39( )/UGT tone terminals and the audio input to the transmitter or distribution amplifier supply the other three impedances.

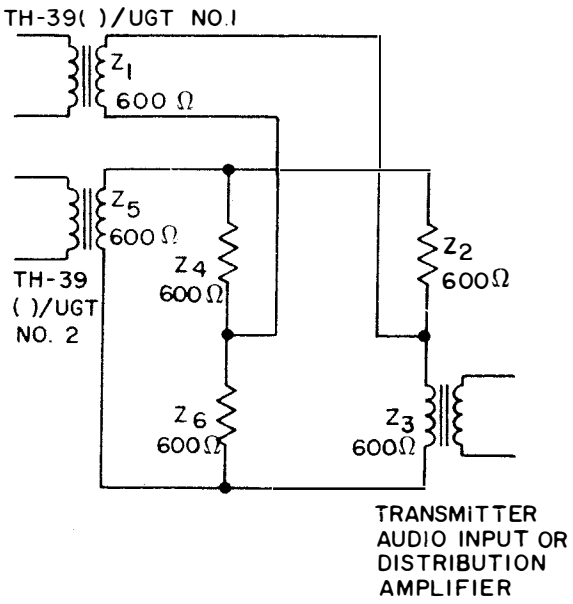


Figure 4. Schematic Diagram for a Typical Star/Delta Mixing Pad.

Figure 5 illustrates the manner in which three 600-ohm, ± 1-percent, 1/2-watt, carbon film resistors can be mounted on a 6-terminal, barrier-type terminal strip for installation in an equipment rack. These connections allow two TH-39( )/UGT tone terminals to feed a common, 600-ohm line to a transmitter audio input or distribution amplifier.

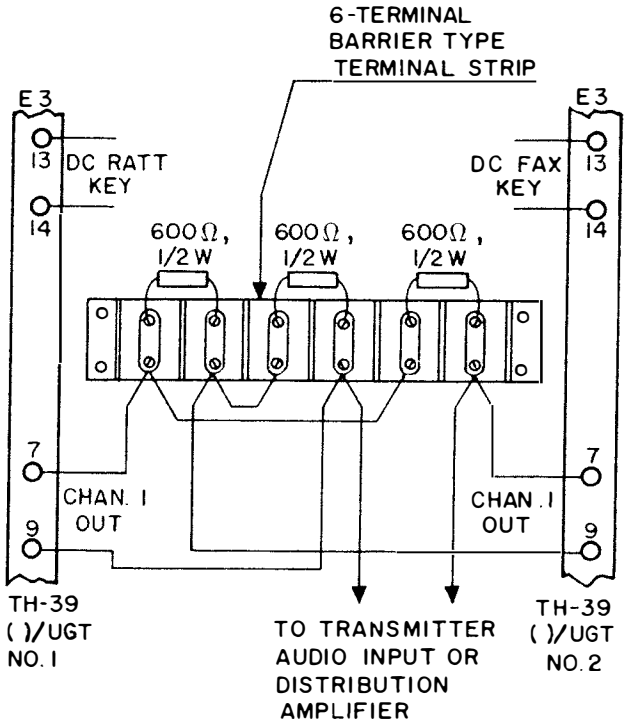


Figure 5. Three 600-ohm, ± 1-Percent, 1/2-Wott, Carbon Film Resistors Mounted on a 6-Terminal, Barrier-Type Termination Strip

ORIGINAL

Figure 6 illustrates typical circuitry for use where association of the mixing pad with the audio patch field is desirable. This arrangement is recommended where maximum flexibility of operation is required.

For maximum isolation between the tone outputs of the two TH-39( )/UGT units, use 600-ohm, ± 1-percent, 1/2 watt, Carbon Film Resistors FSN 5905-605-8788. These resistors are available from ESO at approximately $1.00 each. As an interim measure, usable pads can be constructed using ± 5-percent resistors of either 560 or 620 ohm. (16S)

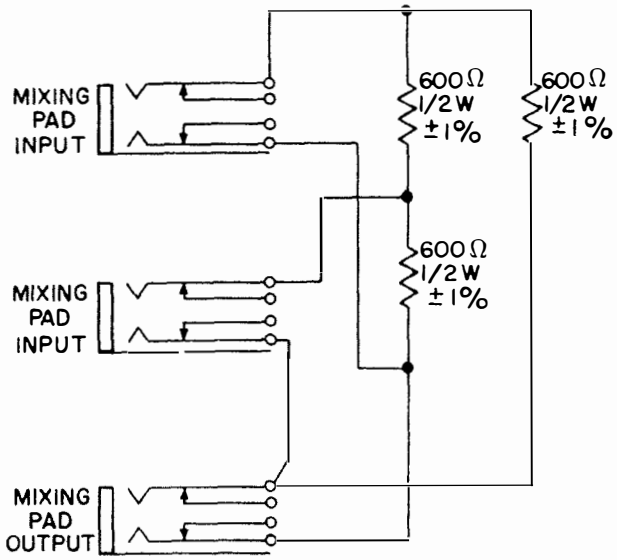


Figure 6. Typical Circuitry Where it is Desirable to Associate the Mixing Pad with the Audio Patch Field

TK-188/UG Teletypewriter Tool Kit

This article advises that stock of TK-188/UG Teletypewriter Tool Kit, FSN 5180-950-8152 is now depleted. No future procurements of this kit are planned. Activities requiring subject tool kits can requisition the component parts, which make up the TK-188/UG kit, through normal supply channels. The following Federal Stock Numbers apply:

Description	FSN
Oiler, Presto	4930-L00-2222
Oiler, Pump, Hand	4930-274-5713
Oil Can (4 oz)	9150-257-5449
Applicator, (Plastic)	5815-869-9149
Test Cable	5995-949-7662
Plug Assembly	5815-015-1294
Tape Gauge w/pins	5815-784-0316
Maintenance parts kit (9 wrenches)	5815-888-0794
Tuning Fork Case	5140-356-3891
Cleaning Cloth	Exeter #114666
Handwheel, large	5815-856-5311
Handwheel, small	5815-015-1292
Loctite (Cement)	5815-015-1296
Soldering Iron	3439-631-6821
Ungar Soldering Tip #4033	3439-827-3938
Ungar Soldering Tip #1235	3436-317-2732
Ungar Soldering Tip #333	3439-346-3537
Allen Handi-Hex Key 5/64"	5120-224-2508
Allen (all with handles) .50"	5120-293-9206
Allen (all with handles) .035"	5120-203-5107
Allen (all with handles) 7/64"	5120-L00-2221
Allen (all with handles) 1/16"	5120-293-2219
Wrench, Hexagon Key, Long	5120-954-5596-TX2X
Allen Wrench .110 or 7/64"	5120-889-2162
Allen Wrench .35"	5120-198-5400
Allen Wrench .050"	5120-198-5401
Allen Wrench 5/64"	5120-224-2504
Allen Wrench .062"	5120-198-5398
Allen Wrench .093"	5120-242-7410
Burnisher Control Tool (Contacts)	5120-247-1726
Armature Clip	5815-852-4288
Punch Bail Arm Gauge	5815-784-0317
Non-Fluid Oil	9150-252-6173
Scale, 70 Gram	6635-599-5507
Scale, 64 oz	6670-171-3987-FX5X
Tool Box	5140-494-2015
Pictorial Tool List	Not assigned

Description	FSN
Identification Plates for Tool Chest (Serialized)	Not assigned
Top Plate Adjusting Gauge	5815-784-0319
Tape Lid Gauge	5815-790-3718
Gauge Set w/metal case (TTY)	5815-448-3624
Contact Adjusting Tool (TTY)	5815-325-2204-GZ
Tommy Wrench (TTY)	5815-370-1289
Punch Block Cleaning Tool	5120-448-2082
Key Lever Remover	5815-370-1301
Alignment Tool (Orange Stick)	5120-293-2081
Contact File 6"	5110-392-2318
Spring, Hook-Pull	5120-873-4006
Spring, Hook-Push	5120-873-3998
Tool, Universal Function Bar	5120-859-7528
Socket Wrench - T	5815-370-1270
Offset Wrench 1/4" Open End	5815-412-5312
Pliers, Retaining Ring	5120-288-9717
Forceps, Retaining Ring	6515-334-7100
Forceps, Hemostatic Curved	6515-334-4300
Pliers, Long Nose	5120-247-5177
Pliers, Slip Joint	5120-223-7396
Pliers, Diagonal Cutting	5110-240-6209
Hammer, Hand, Machine	5120-243-2985
Screw Driver, 90 Degree Offset	5120-287-2130
Screw Driver, Phillips	5120-234-8913
Screw Driver 1"	5120-222-8866
Screw Driver 2c Small	5120-227-7377
Screw Driver 4"	5120-278-1282
Screw Driver 4-1/2"	5120-236-2127
Screw Driver 6" w/Holder	5120-293-3159
Screw Driver 8"	5120-278-1280
Screw Driver 10" w/Holder	5120-293-3178
Screw Driver, Jewelers	5120-180-0728
Screw Driver with Blades	5815-370-1241
Tweezers	5815-370-1242
Gauze, Tape 6" with 32nd and 05 scale	5815-125-4850
Rule 6C Machinist	5210-234-5223
Wrench, Spintite 3/16"	5120-224-2599
Wrench, Spintite 1/4"	5120-241-3188
Wrench, Spintite 5/16"	5120-224-2596
Wrench, Open End 7/16" and 3/8"	5120-277-2342
Wrench, Open End 5/16" and 3/8"	5120-277-2307
Wrench, Open End 1/4"	5120-184-8445
Wrench, Open End 3/16"	5120-184-8441
Wrench, Open End 3/8" and 9/16"	5120-293-0809
Wrench, Open End (Teleprinter)	5120-015-0811
Brush 6"	7510-550-8446
Brush 12"	7510-550-8448
Grease Gun	4930-356-3924
Grease, 8 oz tube	9150-985-7245

(798)

TN-229/SRT DEFECTIVE R-F TUNERS

The Bureau of Ships has been notified by various installing activities that r-f Tuner, TN-229/SRT was found defective when received from stock. The cause was attributed to the unit leaking nitrogen gas.

These tuners, when received by the Navy from the manufacturer, are pressurized to 20 lbs psi. This pressure will gradually decrease due to leakage. After unpacking the r-f Tuner, the installer should check all screws to make sure they are tight. Before energizing the unit, the pressure should be checked. If the pressure gauge shows less than 20 psi, the unit should be repressurized, using Pressurization Kit MK-260/U.

TN-342/WRT-2 Antenna Tuner—Availability of Coil L-3302 Alt A and Related Problems

A new heavier constructed coil (L-3302 Alt A) is now available as a replacement part in the supply system under FSN 5950-106-2680.

The heavier construction coil included in the kit F.C. 17-AN/WRT-2 gives considerably more life expectancy than the old coil, however, "cleanliness is next to long life" and even this coil must be handled with clean hands. Destruction of a coil is many times related to the burnup of the centerboard of the coil or the end caps of the vacuum capacitor E-3301 and it is difficult to distinguish which failed first. The fibre glass material of any of these parts is very durable when the raw or machined surfaces are coated with clear glyptal or plastic spray, and the local fabricator should take precaution to have the surfaces sealed. Sealing not only prevents moisture absorption, but also minimizes the problem of grease and dirt collection.

Activities requiring a new coil to replace the one contained in F.C. 17-AN/WRT-2 should inspect several other components for contributory damage and possible beginning of deterioration. Requisitions can all be submitted concurrently.

1. Check the shorting ring E-3304 for torn and/or poor contacting fingers. The nylon guide shoes may have exploded if F.C. 16-AN/WRT-2 (EIB 701) was omitted. Discolored guide shoes are a potential problem and new ones should be fabricated from sheet nylon. E-3304 should be ordered if the contact fingers are in poor condition and it will contain new guide shoes. Drilling a small hole in each of the shoes as shown in EIB 701 is recommended.

2. Check the center board of the coil form for burn streaks. The burn marks can be routed out and the raw edges resealed with clear glyptal if local fabrication of a whole new board is impossible. NAVSECNORDIV will provide the necessary drawing if a Chinese copy cannot be made of the old board.

3. Check the end caps of the vacuum capacitor E-3301. Treat minor burns like the center board and coat all over with clear glyptal if it has no glazed appearance. Local fabrication may be necessary.

4. Check the main antenna terminal E-3305 for hidden arcing through the screw threads. Handling the tuner by the insulator causes breaks in the teflon which are invisible from the outside, but they break down easily with high RF voltage. The nomenclature of this insulator assembly is IL-59/U and the FSN is 5970-543-9042.

5. Check the spark gap E-3307 for a setting of 1/8 inch.

Installation of a replacement L-3302 Alt A should be done under as clean conditions as possible. The installer should use clean disposable wipers or other device to keep bare hands from touching the wire or coil form material. After the assembly is finished and the cover is ready to be replaced, a wipe down of the coil form and wire with a wiper LIGHTLY dampened with tricloroethylene will pick up any residual oil or grease.

Purge and pressurize the tuner with 20 psig of dry nitrogen using the MK-260/U pressurizing kit and wait overnight to observe for a pressure drop due to a leak.

The power and RF cables must be weatherproofed; tape them with black plastic tape or shrinkable tubing (EIB 742, page 3) and then coat with preservative compound. Zinc chromate before grey paint will keep the tape from softening by the paint solvent. Small brush-in-cap cans of Skotchkote (3M) are being used by some shipyards to preserve the tape as recommended.

The armor must not be clamped in the connector. Cut the armor back four inches and serve with plastic tape. An armor ground clamp can be placed before the tape. Cover the tape over the armor end and the ground clamp with weatherproofing compound. (784)

AN/SRA-18, TN-342/WRT-2 and TN-345/WRT-1 Antenna Tuners—Improved Method of Sealing Feedthrough Insulator (IL-59/UR)

See Article under AN/SRA-18 with same title. (801)

TN-342/WRT, TN-345/WRT Antenna Tuner—Maintenance Information

If the switch S3301 tends to bind or seize, inspect the switch wiper to determine if its slot is cut off center; if so, file the slot to center it on the switch contact.

(825)

TN-342/WRT Antenna Tuner; 2Z5820-00-818-1620 Maintenance Level Change — Information Concerning

The purpose of this article is to advise Fleet activities that the TN-342/WRT has been designated a depot level maintenance item. The shipboard technician is no longer authorized to perform repairs.

The applicable Allowance Parts List (APL) and the Master Repairable Item list will be updated to reflect this policy.

Fleet activities should conduct a physical inventory and turn-in to the following stock points any excess or inoperable TN-342's on board:

(a) Naval Supply Center, San Diego
(b) Naval Supply Depot, Subic Bay
(c) Naval Supply Center, Norfolk
(d) Naval Supply Center, Charleston

NAVELEX Instruction 4440/6B of 14 August 1973 establishes policies and procedures for requisitioning and turn-in of 2Z cognizance material. Copies of the document have been distributed to all Fleet activities and should be available in the ship's supply office. However, for the benefit of the technician, information pertinent to requisitioning and turn-in of the TN-342 is provided:

Turn-in:

Turn-in inoperable or excess TN-342's to the supply activities indicated above. Turn-in action must include the document number of the issue requisition. Advise NAVELEX, Code 504821 of turn-in action/information within 10 days of receipt of material.

Requisition:

Activities requiring a TN-342 should submit a MILSTRIP requisition to NAVELEX-SYSCOM and insert demand code "R" in cc 44, the proper project code in cc 57-59, and proper advice code in cc 65-66. Appropriate project and advice codes are to be assigned in accordance with NAVSUP Publication 437. MILSTRIP requisitions which do not contain the explanatory codes as stated above must be accompanied with complete justification.

The present quantities of Ready For Issue (RFI) TN-342's are sufficient to support Fleet demands. However, if each activity does not take immediate action to off load excess or inoperable equipments, stock quantities will be depleted and replacement TN-342's will not be available when needed. (EIB 933)

AN/SRA-18, TN-342/WRT-2 and TN-345/WRT-1 Antenna Tuners—Improved Method of Sealing Feedthrough Insulator (IL-59/UR)

See Article under AN/SRA-18 with same title. (801)

TN-342/WRT, TN-345/WRT Antenna Tuner--Maintenance Information

See article under TN-342/WRT with same title. (825)

TS-890( )/URN-3 Pulse Analyzer-Signal Generator and SG-121( )/URN-3 Pulse Generator—Calibration as a Unit

Currently, the SG-121( )/URN-3 and the TS-890( )/URN-3 are turned in for calibration separately. Calibration procedures used in the calibration labs require the use of an SG-121( ) as the pulse generator to calibrate the TS-890( ). An SG-121( ) may or may not be available at the Calibration Laboratory when the TS-890( ) is available for calibration; consequently, a delay in calibration of the TS-890( ) may result.

The calibration turn-around period would be improved if users would turn in the TS-890( ) and the SG-121( ) together. It is recommended that users turn in both the SG-121( ) and the TS-890( ) as a unit for calibration.

(EIB 970)

OA-3953/SYA-4(V), OA-3955/SYA-4(V), TS-1780/SYA-4(V)-Maintenance Hint

See article in OA-3953/SYA-4(V) section under the same title. (684)

TSEC/KWT-26 and TSEC/KW-7 Transmit Line Isolation Device Application

See article in TSEC/KWT-26 section under the same title. (11S)

Performance and Operational Reports

Electronic Performance and Operational Reports, NAVSHIPS 3878, are to be submitted in accordance with Bureau of Ships Technical Manual, chapter 67, paragraph 67-127(b) (3), for the TSEC/KW-22, TSEC/KW-36, TSEC/KW-37, and TSEC/K●-6A.

TSEC/KW-26 Maintenance

1. Air filters in the TSEC/KW-26 equipments should be checked frequently for cleanliness, and should be cleaned in accordance with paragraph 4505, page 264, of KAM-378/TSEC. Dirty or clogged filters may cause undesirable high temperatures within the equipment. The TSEC/KW-26 should be operated with the drawers closed to provide proper circulation of air.

2. When turning on the ac switch (S-1) on the transmitter and receiver units of TSEC/KW-26, the operator must wait at least one minute before turning the dc switch (S-2) on these units, to prevent possible damage to tubes and other components.

3. The life of the 6216-type tubes used in the BA1000 package of TSEC/KW-26 may be increased by operating the receive teletypewriter printers at less than 60 ma. It is recommended that the output line current to the receive printers be reduced to a minimum which will still maintain proper printer operation. NOTE: When changing the TTY-line current, balance must be maintained by adjusting the dummy load potentiometer.

4. When requisitioning the 6216-type tube, Federal Stock Number N5960-752-5393 should be used to insure receipt of the improved type tube with gold plated grids, identified by red paint on the tube envelope tip. Some gold-plated-grid tubes without red paint on the tip are included along with the non-plated-grid type under stock number N5960-636-2221; however, the new-stock-numbered tube should be used in TSEC/KW-26.

5. The pulse transformers T-301, T-302, T-501, and T-503 have been the cause of failures in TSEC/KW-26, due to poor insulation in the transformer. When these transformers develop internal shorts, a number of associated components are destroyed. It is anticipated that the Bureau will furnish holders of TSEC/KW-26 with bulk replacements for all transformers of inadequate design. Details of distribution will be forwarded to holders, by the Bureau.

TSEC/KW-26

The Series 72 Sigma Relay (K202) in the KW-26 should not be discarded if erratic operation is experienced due to contact wear or maladjustment. All shipyard CRF's have been supplied with Sigma Relay Testers for alinement purposes and repair kits for the replacement of the relay armature and contacts. Relays from security equipment afloat which require realinement or the armature and/or contacts replaced should be taken or shipped to the nearest shipyard CRF for repair. The CRF's have not been supplied with the necessary parts to perform any other repairs on these relays since such repairs would exceed the cost of a replacement relay. No charge will be made by the CRF for this service. In emergencies or in unusual circumstances shipyard CRF's will do this work for shore activities. Normally shore activities are expected to maintain and repair their relays.

All KW-26 holders listed in the enclosure to Bureau letter Ser 687G-0142 of 6 September 1960 are advised that there will be about a 60-day delay in the shipment of these tools previously scheduled for shipment prior 30 November 1960.

TSEC/KW-37

The equipment front-panel meter-selector switch should be in the OFF position during operating periods so as not to interfere with the output signal to the teletype equipment. This switch is intended for initial set-up and checking purposes and is not required for monitoring during operating periods.

Maintenance personnel are cautioned about the heater in the dessicator unit which is turned on only when the equipment drawer is extended. For safety reasons, this dessicator-heater unit should be disconnected by unplugging its power plug (P1) during prolonged maintenance periods in which the drawer is extended. The top of the equipment cabinet can reach a temperature at which minor burns will be received by personnel touching the cabinet if this practice is not followed. Personnel are further cautioned that 110 volts a.c. is present at the dessicator-fuse clips when the equipment power switch is in the OFF position. A safety interlock will be added to interrupt this voltage when the fuse cover is removed. Additional information will be published at a later date.

Installing activities should secure the KWR-37 receiver with four bolts up through the mounting shelf into the threaded holes in the equipment feet, as outlined in KAM-78A/TSEC. This method is preferred over the installation information on BUSHIPS drawing RE-67-F-2162G which shows 16 mounting bolts (4 per foot), since installation and removal of the equipment would be simplified. Activities which now have the equipment installed using all 16 holes need not change the installation, since both methods are satisfactory.

TSEC/KWT-26 and TSEC/KW-7 Transmit Line Isolation Device Application;

Discussion:

This article offers guidance to enable TSEC/KW-26 and TSEC/KW-7 equipments to be properly interfaced with 260 volt telephone lines for transmit purposes.

Many field reports of contact failure in the transmit line relay of subject equipments have been forwarded. Engineering studies of the problem have revealed the following condition:

The relay internal arc suppression network is designed for operation in loops not exceeding 130 volts. Immediate damage to the contacts, by inadequate arc suppression, occurs when a 260 volt line is installed and keyed.

The input circuitry of these equipments needs no special treatment. The KW/7 input filter in A17 is rated, on the component, at 140 volts maximum. However, the component manufacturer confirms reliable filter operation at 2.5 times the specified maximum limit.

In those instances where the telephone company is unable to supply loop voltages of 130 VDC or less, the installation of an isolation device is recommended. Suggested materials and procedures for effecting such isolation is contained in the following paragraphs.

Material Required:

The following types of relays are acceptable for installation

1. a Automatic Electric, Model 204 (Electro-Mechanical)
   b WECO, Model 255A (Electro-Mechanical).
   c STELMA, Models ER-21 or ER-21A (Solid-State).
   d ORTRONIX, Model 4503 (Solid-State).
   e Any device, Electro-Mechanical, or Solid-State, which is equivalent to any of the above.
2. Suitable rack or device which allows mounting the isolation device separate from the subject equipment.

Procedure

Suggested layouts for two methods of operation are included for guidance (figures 1 and 2). No set procedure of installation is offered. Listed are considerations which will be applicable during the planning of this installation.

1 The isolation device *shall not* be installed on the crypto device.

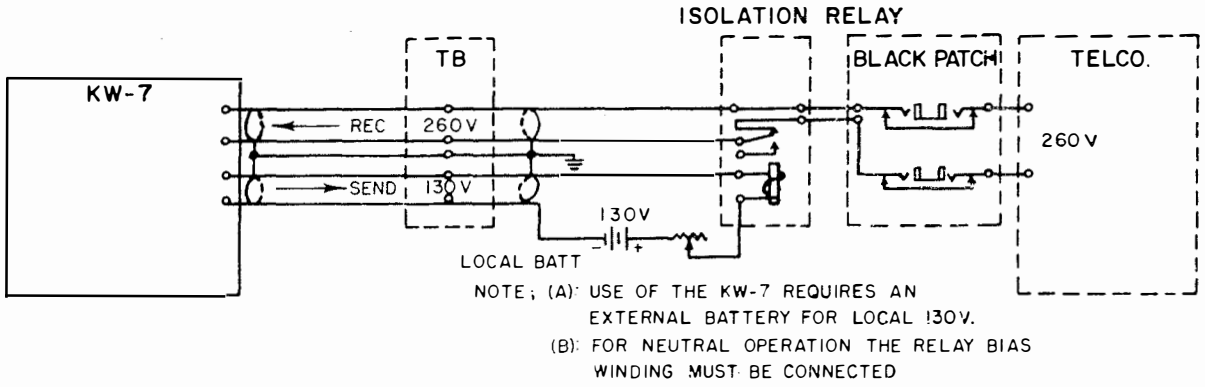
2 If the isolation relay is used with the KW-7, battery must be obtained from a local source external to the KW-7

3 If the isolation relay is used with the KWT-26, battery will be obtained by programming the KW-26 as the supply source.

4. It is recommended that a jack be provided at each side of the relay for maintenance purposes.
5. The installation will be guided by the criteria contained in BUSHIPS Instruction 011120.12( ).

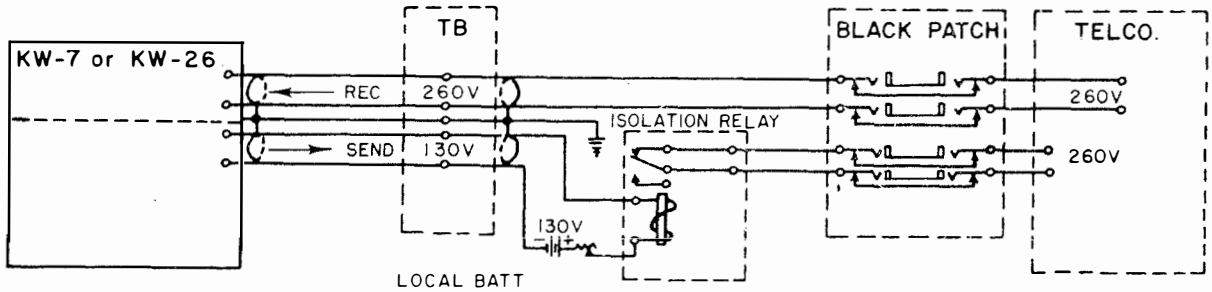
Routine Instructions

Comments relative to this article are solicited and should be addressed to INDMAN PRNC, Code 433. (11S)



NOTE; (A): USE OF THE KW-7 REQUIRES AN EXTERNAL BATTERY FOR LOCAL 130V.
(B): FOR NEUTRAL OPERATION THE RELAY BIAS WINDING MUST BE CONNECTED

Figure 1. Half Duplex



NOTES; (A): NOTES FOR HALF DUPLEX APPLY
(B): KW-26 CAN BE PROGRAMMED TO PROVIDE INTERNAL BATTERY TO SUPPLY THE RELAY
(C): RELAY CONNECTIONS ARE FOR ILLUSTRATION ONLY.

Figure 2. Full Duplex

MEASUREMENT OF TELETYPEWRITER LINE CURRENT ON SHIPS WITHOUT A TT-23( )/SG TELETYPEWRITER PANEL

It has been suggested that the teletypewriter loop current be adjusted on ATF class ships. The ATF ships use CV-89( )/URA-8A Converters, TT-47( )/UG Teletypewriters and a PP-1010/UG Power Supply, or equivalent equipments.

The current may be measured by plugging in the AN/PSM-4 phone plug adapter into the teletype loop jack on the converter, tuning in a mark signal on the receiver and adjusting the line current rheostat on the PP-1010/UG for a 60 milliampere reading on the AN/PSM-4 meter. If a PP-424/U power supply is used, the current may be adjusted by changing the input and output taps on the power transformer.

The line current should be checked weekly. (444)

APPLICATION OF MODIFIED RD-92( )/U, TT-41B/TXC-1B AND CV-172(U)/U

See article in CV-172( )/U section under the same title.

OPERATION WITHOUT LINE-SHUNT RELAY

When the line-shunt relay (Symbol No. K-1101, **Stock No. N5945-237-1139)** is deenergized, it contacts close the signal line circuit in the teletypewriter. When this occurs, the teletypewriter becomes inoperative. This condition may be caused by: (a) Loss of main a-c power; (b) Blown fuse; (c) Turning the a-c power switch to the "off" position; (d) Removing the typer unit from its base; (e) An open line-shunt relay coil.

Of the above cases, an open relay coil is the most difficult to detect and repair.

Reports from naval shipyards indicate that vessels have turned in for repair teletypewriters with only a defective line-shunt relay. In some instances, the coil had opened and insulating material had been inserted between the relay contacts. A spare relay was not provided with the equipment and a replacement was not immediately available from stock. Therefore it became necessary to disconnect the coil and contacts from the internal a-c and d-c circuitry to restore the teletypewriter to service and thereby meet the ship's availability date s.

It has been suggested that the relay be disconnected from the internal circuitry when the relay is defective and a replacement is not immediately available. The procedure suggested, to render the relay inoperative is as follows:

(1) In TT-47/UG, TT-48/UG, TT-69/UG, TT-70/UG. (See technical manual, NAVSHIPS 91393). Remove and tape leads C-25-0 and C-40-BL on switch S-1103. This removes the a-c from the coil of relay (K-1101). Remove and tape lead C-9-W on terminal 10 of the terminal block (TB-751). This removes the relay contacts from the d-c signal line.

(2) In TT-47/UG, TT-48A/UG, TT-69A/UG, TT-70A/UG. (See technical manual, NAVSHIPS 91713). Move the strap on terminal No. 5 to terminal 4 on terminal board TB-1104. This removes the a-c from the coil of K-1101. Remove and tape lead A-19-W on terminal 10 of terminal board TB-751. This removes the shunt contacts from the d-c signal line.

To restore a teletypewriter to service with an open shunt relay coil, it is recommended that the relay be temporarily disconnected in accordance with the above procedure. However, a replacement for the defective relay should be obtained from stock and installed as soon as practicable.

Note that with the line-shunt relay disconnected from the internal circuitry, there is no automatic means to close the signal line to prevent the teletypewriter (or other teletypewriters in the same signal circuit) from running open in case the a-c power switch is turned off or the typer unit is removed from its base. If the signal line or loop is opened because of these conditions, it will be necessary to close the line at the teletype panel by inserting a plug in the set jack.

LINE CURRENT REQUIREMENTS

TELETYPEWRITER TT-47/UG, TT-47A/UG, TT-48/UG, TT-48A/UG, TT-69/UG, TT-69A/UG, TT-70/UG, TT-70A/UG

The above teletypewriter equipments and later equipment including keyboard typing reperforators are equipped with a holding magnet selector mechanism and are wired for 60 milliampere operation. Their internal selector magnets are connected in parallel. Although this equipment is capable of satisfactory performance on a line current as low as 20 milliamperes by connecting their magnets in series, other considerations are necessary. Older equipments installed aboard ship require a 60 milliampere line current because of their type of pulling magnet selector mechanism. Until such time as certain improvements are incorporated in all terminal, teletypewriter and auxiliary equipment, each loop connecting equipment through Teletype Panel TT-23( )/SG must be adjusted to operate on a current of 60 milliamperes.

In connection with integration of radio teletypewriter equipment in a send loop, certain voltage requirements are also necessary. In the Keyer, KY-75/SRT, or similar keyers, and transmitters which have a built in f-s keyer, such as Radio Transmitting Set AN/UR T-2, 3, and 4, the teletypewriter key line input is terminated by resistors which vary from 40,000 to 150,000 ohms. One side of the resistor is normally grounded. This resistance is sifficiently high to reduce line current to a value far below the required 60 ma. It is therefore necessary to insert a parallel resistance to obtain the 60 ma. for the teletypewriter and 40 to 80 volts for the f-s keyer. The most desirable location for the parallel resistor is across line terminals 1 and 2 of the TT-23( )/SG panel. Location of the resistor at this point confines loop current to the panel and local teletypewriter lines. Voltage developed across this resistor is applied to the f-s keyer at a current of less than 1 milliampere. The value of such a resistor has been determined to be 800 ohms (JAN type RW-51-G-801, 10 watt, 5%, wirewound, dimensions, 2 in. X 5/8 in.).

Typical circuitry of a send loop in TT-23( )/SG, terminated by a teletypewriter across terminals 3 and 4, and a f-s keyer and terminating resistor across terminals 1 and 2, is shown in send circuitry portion of accompanying illustration. The 1000 ohm limiting resistor in the positive leg of each loop should never be strapped out of the circuit because it serves to protect the panel meter and teletypewriter selector magnets in the event of a cable or equipment ground.

With 120 volts applied to the loop, the following table shows the minimum and maximum loop currents and keyer input voltages obtained with the 800 ohm resistor across terminals 1 and 2:

Total Loop Resistance	Total Loop Current	F-S Keyer Input Voltage
1860 ohms	64 ma	51 volts
4360 ohms	27 ma	21 volts

The polarity of the voltage applied to the teletypewriter input terminals at the filter (Z-752) should be in accordance with that shown so that effective use is always made of the filter across key contacts in the teletypewriter. Contrary to other published information, the polarity shown on the miscellaneous jacks in the accompanying illustration is correct, and should be observed.

The internal loop circuitry in sertain TT-23/SG, TT-23A/SG, TT-23B/SG, TT-23C/SG, TT-23D/SG, and TT-23E/SG panels has been found to be contrary to that shown in the illustration. Exceptions to the illustrated circuitry will not only restrict use of the panel but could introduce sufficient difficulties to cause unsatisfactory performance.

Lock nuts, metal washers, and insulating washers on jacks in various TT-23( )/SG panels have been found to vary in thickness. These should be of proper size to permit positive tip and sleeve connections between the patch cord plug and jack.

Typical loop circuitry terminated in a teletypewriter and f-s converter is shown in receive circuitry portion of illustration, figure 1.

TELETYPEWRITER MAINTENANCE

This material was included in a beneficial suggestion which proposed that the additional trouble shooting data be published for activities involved with the operation and maintenance of teletypewriter equipment.

This article includes only a portion of the data submitted.

Figures 2 and 4 contain copy samples with errors. Figures 3, 5 and 6 cover typical troubles and their cure, with reference to the copy sample involved.

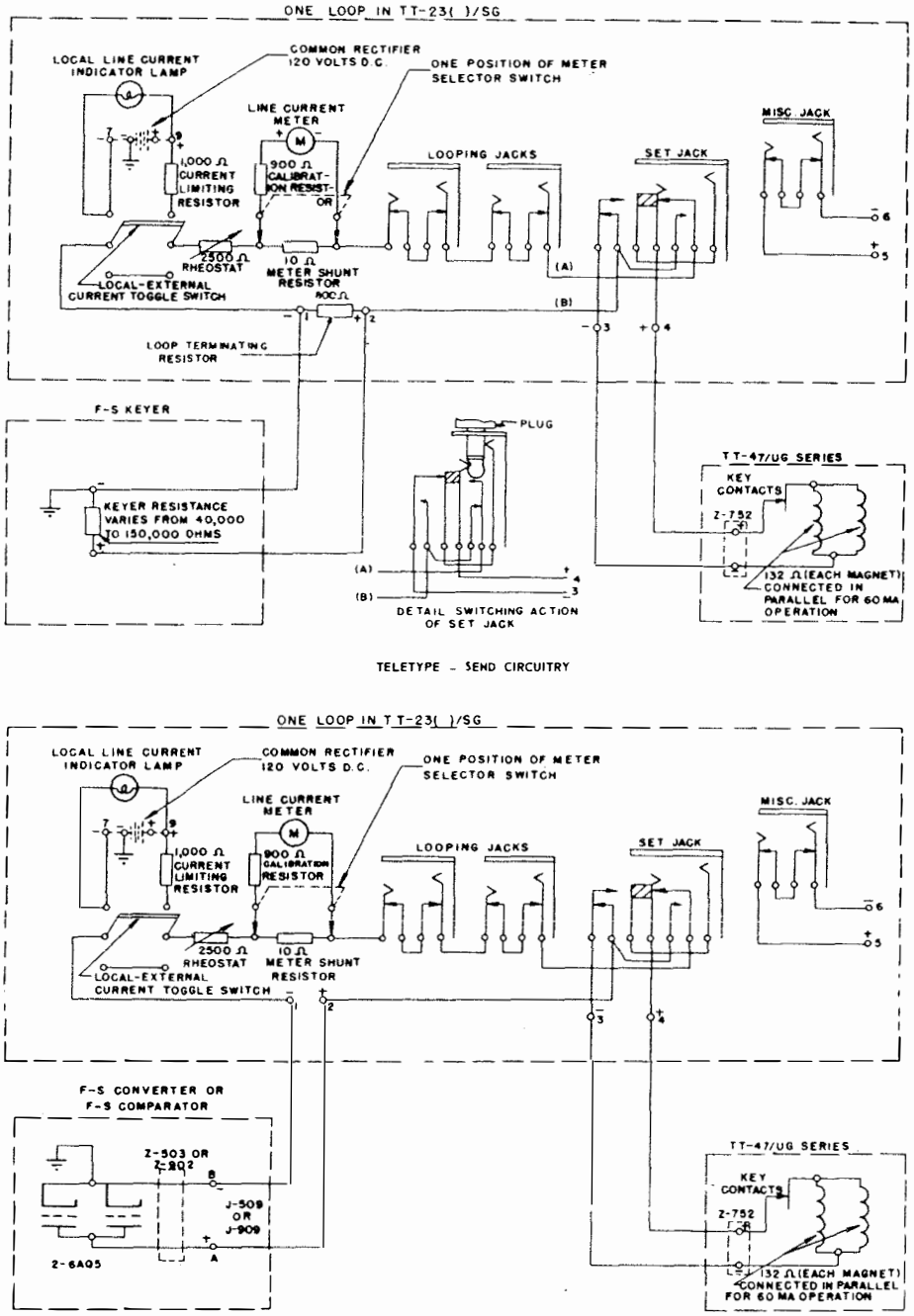


Figure 1. Teletype – Receive Circuitry

1
HE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 DTS SENDING
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 DTS SENDING

2
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 DT
SENDING
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 DT
SENDING

3
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 DTS
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 DTS

4
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 DTS SENDING

THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 DTS SENDING

5
NGHE QUICK BROWN FOX JUMPED OVER A LAZY DOG J S BACK QWERTYUIOP DTS SENDING
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG J S BACK QWERTYUIOP DTS SENDING

6
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG' B
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG' B K

7
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 DTS SENDING
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 DTS SENDING
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 DTS SENDING

8
THZ QQPCK BROWN FOX JUMPZD OVER A LAZYHDOG'S BACK 12"4561090 DTS SENDING
THZ QQPCK BROWN FOX JUMPZDHOVERHW LAZYHDOG'S BACK 12"4561090 DTS SENDPNG

9
THE QUICK BROWN FO JUM D OV R LAZY DOG'S BACK 1234567890 DTS SENDING
THE QUICK BROWN FOX J M D OVER AZY DOG' BACK 1234567890 DTS SENDING

10
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACKi234567890 DTS SENDING
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK1234567890 DTS SENDING

11
THE QUICK BROWN FOX JUMPED OVER A LAZY DOGJS BACK QWERTYUIOP DTS SENDING
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 123 4567890 DTS SENDING

12
5 3178:(?492 , !9/ '7. 03$ 9;34 -)-"6 $9&' ?-:(1234567890 $5 3, $8, &
5 3178:(?492, !9/ '7. 03$ 9;34 -)-"6 $9&' ?-:(1234567890 $5 3, $8, &

13
HHS QUICK ZROWN FMX KUMPSD MVSR U PAZY FOG'S XACK 12345678.0 FTS SSNFINV
HHS QUICK ZROWN FMX KUMPSD MVSC U PAZY FOG'S XACK 11345678. 0 FHS SSNFINV

14

Copy Samples with errors

TROUBLE	REMEDY	COPY SAMPLE #
First two characters on a line not spaced correctly	Spacing drum-stop arm adjustment. Spacing gears out of phase	1
Automatic carriage return and line feed mechanism operating too soon.	Automatic carriage and line feed adjustment.	2
Message overprints on right side.	Spacing cutout lever adjustment.	3
Extra space between lines.	Refine automatic carriage return and line feed adjustment.	4
More than one function not operating properly.	Function reset bail extension arm adjustment. Function reset bail blade adjustment	5
Right side of line does not print.	Printing track adjustment.	6
Paper spindle too tight in bakelite guide blocks.	File end of spindle until a small amount of end play is evident when spindle is in its bakelite guide blocks.	7
Gains and loses fifth pulse.	Left decelerating slide spring broken or missing.	8
Misses several characters.	Horizontal positioning lock lever adjustment.	9
Incorrect spacing after figures shift.	Shift linkage adjustment.	10
Intermittent errors when shifting.	Slide plates adjustment.	11
Type box will not shift to letters position.	Shift lever link adjustment.	12
	Letters function pawl broken or inoperative. (Emergency repairs can be made by using unshift on space function pawl.)	
Picks up third pulse.	Shift lever link adjustment.	13
Message piles up on left side.	Spacing cam plate adjustment. Function pawl stripper adjustment.	14

B

R

15 O

W

N

16 THE QUICK BROWN FOX JUMPED OVER A LAZY DOGJS BACK QWERTYUIOP DTS SENDING

THE QUICK BROWN FOX JUMPED OVER A LAZY DOGJS BACK QWERTYUIOP DTS SENDING

17 (Copy transmitted) 12345 6789 12345 YUIO
12345 6789 12345 YUIO (Copy received)
12345 6789 12345 YUIO

18 THE QUICK BROWN FOX JUMPED OVER A LAZ DOG'S BACK 1234567890 DTS SENDING
THE QUICK BROWN FOX JUMPED OVER A LAZY DOG'S BACK 1234567890 DTS SENDING

19 THZ QUICK BROWN FOX JUMPZD OVZR A LWZY DOG'S BWCK 12"4567890 DTS SENDING
THZ QUICK BROWN FOX JUMPZD OVZR A LWZY DOG'S BWCK 12"4567890 DTS SENDING

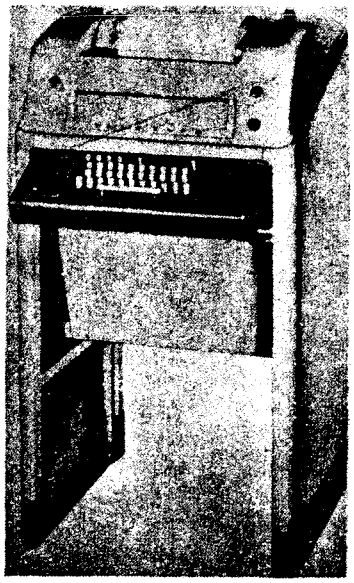
20 THEZQUICKQBRGWNHFYXFJUMPIDB VCZGAWLRZESDBG;S BACKQ12345678908DBS SESDEH;
THEZQUICKQBRGWNHFYXFJUMPIDB VCZGAWLRZESDBG;S BACKQ12345678908DBS SESDEH;

21 OME QUICK BRO N FOX JUMVED OVER A LAZY DOG'S BACK 3456789; DTS SENDING
OME QUICK BRO N FOX JUMVED OVER A LAZY DOG'S BACK 3456789; DTS SENDING

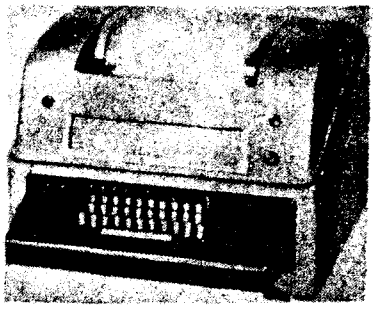
22 THZHQQPCKHBROWNHFOXHJQMPZDHOVZRHWHLWZYHDOG'YHBWCKH12"4561090HDTYHYZNDPNG
THZHQQPCKHBROWNHFOXHJQMPZDHOVZRHWHLWZYHDOG'YHBWCKH12"4561090HDTYHYZNDPNG

23 THE QUICK BGOWN FOX JUMPED OVER A LAZY DOG S BACK 1234567890 DTS SENDING
THE QUICK BGOWN FOX JUMPED OVER A LAZY DOG S BACK 1234567890 DTS SENDING

Copy Samples with errors



TT-47/UG
TT-48/UG



TT-69/UG
TT-70/UG

TROUBLE	REMEDY	COPY SAMPLE #
Copy appears as illustated.	Automatic Carriage Return and Line Feed Bell Crank not engaged properly with code bar extension. This can happen when front plate is replaced	15
Type box will not shift to figures position.	Figures function pawl broken or inoperative.	16
Copy appears as illustrated.	Unshift on space function not disabled.	17
Irregular spacing and overprinting.	Spacing feed pawl spring broken or missing.	18
Picks up fifth pulse.	Shift slide drive mechanism adjustment.	
	Right decelerating slide spring broken or missing.	19
Printing carriage incorrectly positioned.	Printing carriage position adjustment.	20
Copy appears as illustrated.	Horizontal motion stop slide springs broken or missing.	
	(Top group-Upper slide spring)	21
	(Middle group-Common slide spring)	22
	(Bottom group-Lower slide spring)	23
Keytop will not return to upward position after operation under power and printer will keep repeating selected keytop.	Non-repeat lever adjustment.	
	Code bar reset bail adjusting screw adjustment.	
	Code bar bail adjusting screw adjustment.	
Keytop will not return to upward position after operation under power.	Keytop guide not positioned correctly. (Keytops rubbing on keytop guide hole).	
	Code lever bail latch lever eccentric adjustment.	
	Keylever lock ball track adjustment.	
	Code bar bail bumper adjustment.	

COPY SAMPLE #

TROUBLE	REMEDY
Space bar will not return to upward position, all other keytops do.	Broken lever Space bar pivot adjustment
Time Delay Mechanism Attempts to stop motor while copy is being received.	Adjust Add clearance between start magnet core and anti-freese rivet on start armature.
Two teletypewriters operate satisfactorily on separate loops but not together on the same loop.	Refine Selector Armature Spring Tension.
Errors received that can not be eliminated by refining tuning of associated radio equipment and signal sounds normal.	Patch another teletypewriter into signal loop and take first unit out of loop. If trouble still exists, most likely it is caused by associated equipment. If trouble has disappeared, original teletypewriter is faulty, most likely in automatic typer:
Ribbon does not feed properly after all adjustments and parts have been checked and re-checked. (applies to TT-47/UG, TT-48/UG, TT-69/UG, and TT-70/UG only)**	Most common trouble has been found to be too much tension on the right ribbon spool shaft spring. This has been corrected by reducing tension of spring (located under ribbon spool) by cutting off 1/2 turn at a time and re-checking ribbon feed operation each time

**The TT-47A/UG, TT-48A/UG, etc., teletypewriters have a different ribbon feed mechanism. No repetitious troubles with this mechanism have been noticed.

TELETYPEWRITER (Part 2) MAINTENANCE
TT-47( )/UG, TT-48( )/UG
TT-69( )/UG, TT-70( )/UG

The previous article carries some trouble shooting data in a unique form. The originator of the material also included point-to-point checks to aid trouble isolation and assure proper operation. The point-to-point checks are presented in this second and final installment.

You can readily see that the form used lends itself to additional steps and procedures which may evolve through use of this material. If you find yourself adding a bit here and there, pass the information along and we'll try to publish revised tables from time to time so everybody can benefit.

SELECTOR UNIT CHECK

Procedure	Observation	Instructions
Patch teletypewriter into a steady 60 M.A. supply at the TT-23/SG panel.		
Alternately type "R" and "Y" and move selector unit range scale arm up toward 100 until errors occur in copy.	Note the highest reading obtained with no errors in copy.	
Move the selector unit range scale arm down away from 100 until errors again occur in copy.	Note the lowest reading obtained with no errors in copy.	
	For the TT-47/UG, -48/UG, -69/UG and -70/UG, the high reading should be between 90 and 100 and the low reading should be between 30 and 40. When the lower reading is	If reading is okay, set the selector unit range scale arm between 75 to 80. (This is the setting usually found to be correct after check-

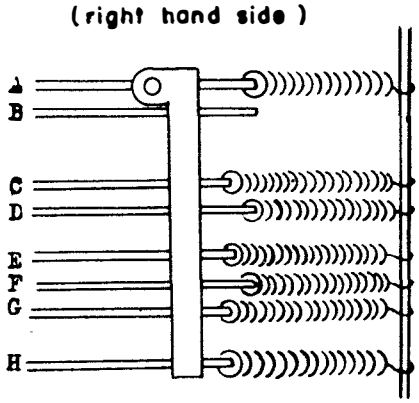
Procedure	Observation	Instruction
	subtracted from the higher reading, the result should be 60 points or more. For TT-47A/UG,-48A/UG,-69A/UG -70A/UG, the high reading should be between 110 to 120 and the low reading should be between 30 and 40. When the lower reading is subtracted from the higher reading, the result should be 70 points or more.	teletypewriter on a bias test set. If reading is okay, set the selector unit range finder knob between 70 to 75. (This is the setting usually found to be correct after checking the teletypewriter on a bias test set. If reading is not right go to next step
Check selector unit adjustments.		If trouble not found go to next step.
Check assemblies between check point #2 and check point #3 (see Block Diagram).		If trouble corrected go to Check Point #3 procedure.

C H E C K P O I N T O N E

Procedure	Observation	Instructions
Power off, select letter "R".	Observe the right hand end of code bars. Code bars #2 and #4 should move to right or mark position, #1, #3 and #5 should stay at left or space position.	If correct action takes place do next step, if not, go to step 3.
Rotate motor by hand until signal generator clutch is disengaged Select letter "T".	Code bars #1, #3 and #5 should move to right, #2 and #4 should stay at left.	If operation is satisfactory go to Check Point #2 procedure. If operation is unsatisfactory go to next step.
Make visual check of code bars and springs.		If trouble not found go to next step.
Remove automatic typer, rotate keyboard signal generator shaft by hand until signal generator clutch is disengaged, select any character or function.	The selected signal code calls for a code bar to go to the right or marking position and it does not operate.	Check for missing springs or binds in code levers, code bars or keyboard lock bar. Refer to Theory of Operation of the instruction books.

A common cause of intermittent trouble at this check point can be found in the following manner. Rotate the signal generator shaft until the signal generator clutch is disengaged and select "R".	Code bar #2 and #4 go to right.	Next step.
Now tap keylever "R" a few times while it is in its downward position.	See if code bars #1, #3 or #5 slip to right.	Next step.
Repeat check with letter "Y".	Observe if any code bar slips to the right when the teletypewriter signal code does not call for a mark pulse.	Check the code lever bail latch lever adjustment.

KEYBOARD CODE BARS
(right hand side)

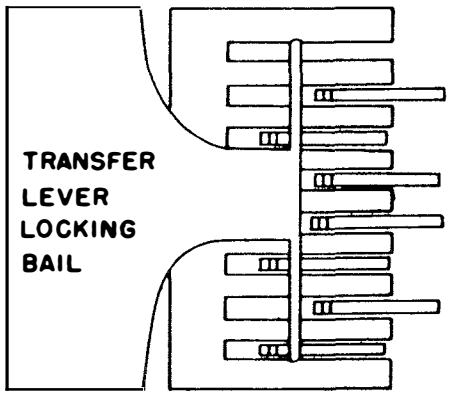


A. CLUTCH TRIP BAR
B. UPSTOP
C. No.1 CODE BAR
D. No.2 CODE BAR
E. No.3 CODE BAR
F. No.4 CODE BAR
G. No.5 CODE BAR
H. KEYBOARD LOCK BAR

Code bars positioned as at left when letter "R" keylever is depressed.

MARK SPACE

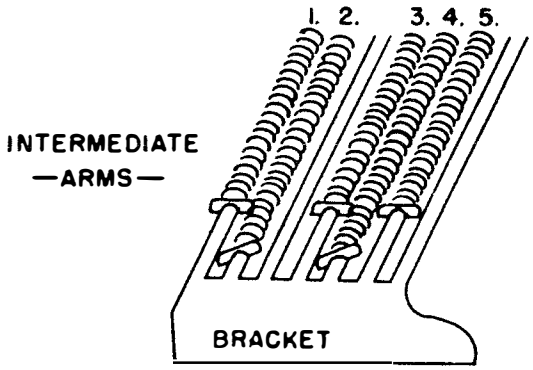
KEYBOAD TRANSFER LEVERS
(as viewed from top)



No.1 TRANSFER LEVER
No.2 TRANSFER LEVER
STOP (Permanent Right)
No.3 TRANSFER LEVER
No.4 TRANSFER LEVER
No.5 TRANSFER LEVER
START (Permanent Left)

MARK ← SPACE →

TRANSFER LEVERS POSITIONED AS ABOVE WHEN LETTER "R" KEY LETTER IS DEPRESSED



MARK (forward)
SPACE (rear)
(as viewed from the front of the automatic typer)

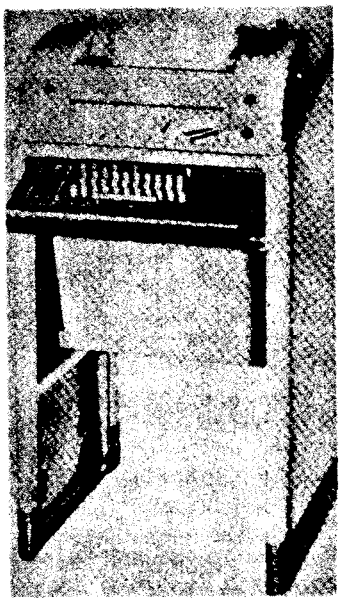
INTERMEDIATE ARMS POSITIONED AS SHOWN ABOVE WHEN LETTER "R" IS SELECTED (as viewed from the right side of the automatic typer)

C H E C K P O I N T T W O

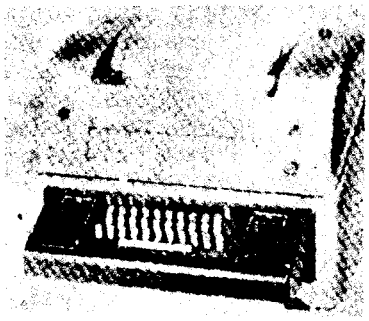
Procedure	Observation	Instructions
Power off, select letter "R".	Observe upper end of transfer levers. Upper end of transfer levers #2 and #4 should move to left, #1, #3 and #5 should stay at right.	If correct action takes place, do next step, if not go to step 3.
Rotate motor by hand until signal generator clutch is disengaged. Select letter "Y".	Upper end of transfer levers #1, #3 and #5 should move to left, #2 and #4 should stay at right.	If operation is satisfactory go to Check Point #3 procedure. If operation is not satisfactory and Check Point #1 is satisfactory, go to next step.
Check signal generator mechanism.		If trouble not found go to next step.
Check locking bail spring tension.	A common cause of intermittent trouble at this check point was found to be an insufficient amount of tension on the locking bail spring.	Turn power on, apply pressure downward on the transfer lever locking bail with one finger, type with other hand. If errors stop, increase tension on locking lever bail spring.

C H E C K P O I N T T H R E E

Power on, type letter "R".	Observe intermediate arms and associated springs. Intermediate arms #2 and #4 should be forward in a mark position, #1, #3 and #5 should be toward the rear in a space position.	
type letter "Y".	The opposite conditions exist from those above.	
Repeat step 1 test by alternately typing "R" and "Y".	Watch for any intermittent operation of intermediate arms.	If intermediate arms operate correctly, go to Check Point #4 procedure. If intermediate arms not operating correctly and Check Point #2 is okay, go to next step.
Check assemblies between Check Point #2 and Check Point #3 (see Block Diagram).		When trouble corrected, go to Check Point #4 procedure.



TT-47/UG
TT-48/UG



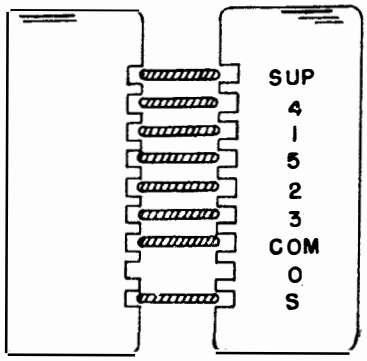
TT-69/UG
TT-70/UG

CHECK POINT FOUR

Procedure	Observation	Instructions
Power on, type any character.	The code bars should be in the left position for a mark pulse and the right for a space pulse.	
type letter "R".	Code bars #2 and #4 should go to left, #1, #3 and #5 should go to right.	
type letter "Y".	Condition of Code bars are opposite from above (for R).	
Repeat above, alternately typing "R" and "Y".	Watch for any intermittent operation of code bars.	If Code bars do not set up right, check assemblies between Check Point #3 and Check Point #4 (see Block Diagram). If code bars set up okay and trouble is a function error, go to next step. If code bars set up okay and trouble is a printing error, go to step 5.

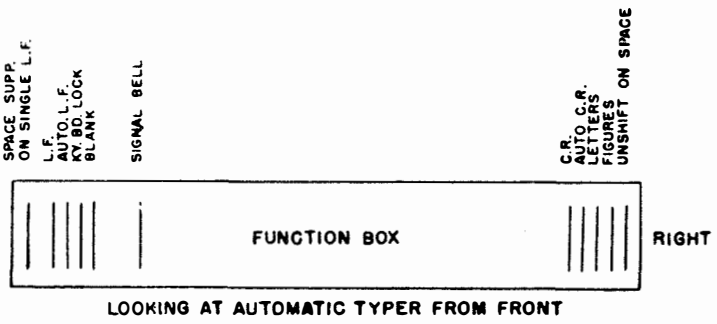
AUTOMATIC TYPER CODE BARS

MARK (left)--SPACE (right)
(as viewed from front of automatic typer)



Function Error:
Turn motor off, remove automatic typer, and lift roll of paper out of typer so that function box can be observed.

Set up function desired by pushing transfer levers or code bar shift bars to the rear when the teletypewriter signal code calls for a mark pulse; ie; to check line feed, hold #2 transfer lever or #2 code bar shift bar to a rear position.



LOOKING AT AUTOMATIC TYPER FROM FRONT

Rotate main shaft by hand.

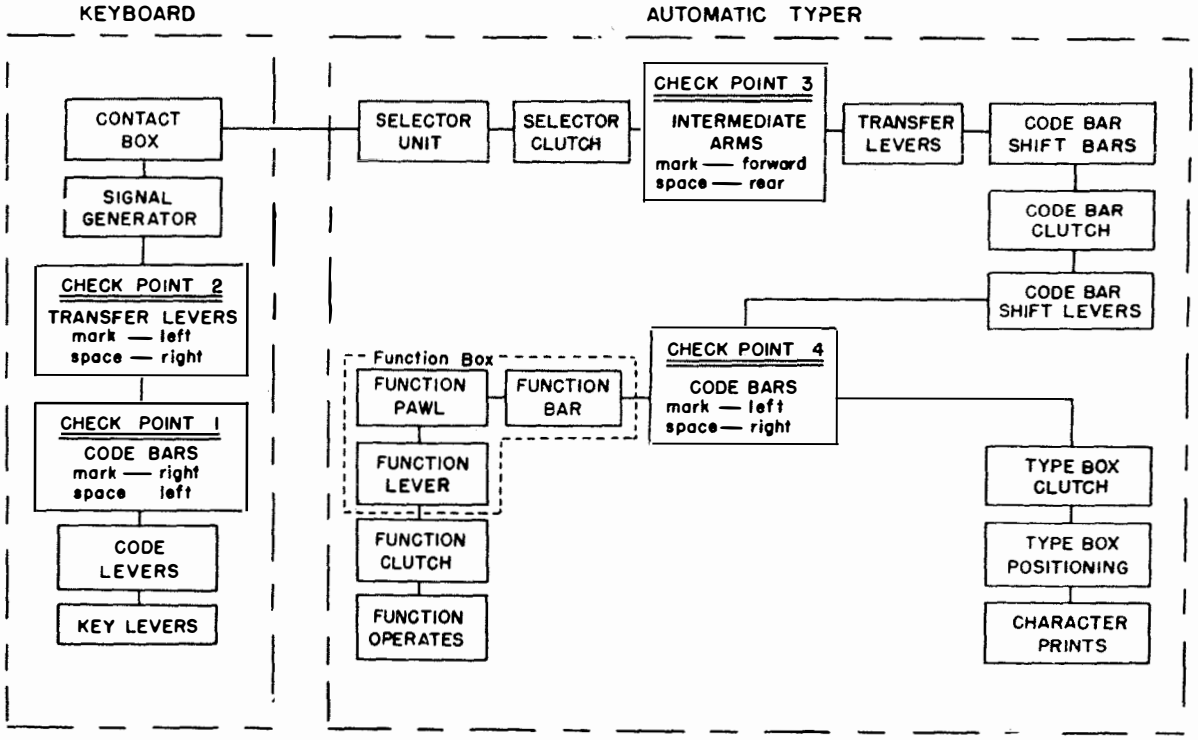
Observe action of function bar, function pawl, and function lever of suspected function.

Repeat Function Error test above as necessary.

If trouble is not apparent check Instruction Book theory of operation of the function causing trouble.

Procedure	Observation	Instruction
Printing Error: Set up code bars by pushing transfer levers or code bar shift bars to the rear when the teletypewriter signal code calls for a mark pulse; ie; to check "R", hold #2 and #4 transfer lever or #2 and #4 code bar shift bar to a rear position.	**Observe horizontal and vertical positioning mechanism.**	**If trouble is not apparent, check Instruction Book 'theory of operation' of vertical and horizontal positioning mechanism.**
Errors received that can not be eliminated by refining taning of associated radio equipment and signal sounds normal.	**If function trouble is indicated, start at check point #4. If intermittent or garble perform Selector Unit Check.**	
Errors appear in copy while typing at local keyboard.	**Refer to check point #1 procedure.**	

BLOCK DIAGRAM FOR TROUBLE SHOOTING MOD. 28 TELETYPEWRITER



CAREFUL MAINTENANCE REQUIRED FOR HIGHER SPEEDS IN TELETYPEWRITERS

Maintenance personnel are hereby advised that more careful and exacting maintenance will be required when teletypewriters are geared for 100-word-per-minute speeds.

Equipments operating at 100 words per minute will require greater mechanical maintenance than those operating at 60 words per minutes.

NAVSHIPS 93241 and NAVSHIPS 92361, technical manuals for teletypewriters, contain detailed instruction for the maintenance of equipments which will be geared for 100 words per minute. Further operating experience at 100-word-per-minute speeds may indicate the need to make changes in the maintenance standards contained in Chapter 6 of the Technical Manual. Suggestions from operating and maintenance personnel are welcome.

Particular emphasis should be placed on the selector margin minimum requirements, listed in section 6 of the manuals. If a signal distortion test set is available, the printer should show a range of 72 points for zero distortion. At midpoint orientation range setting, the printer should tolerate 35-percent end distortion, as well as 35-percent marking or spacing bias.

The orientation range setting should be checked by striking the R and Y keys alternately on the local keyboard. The selector margin should be 72 points and the final range setting should be midway between the determined limits.

The manufacturer's recommended lubrication interval was omitted from NAVSHIPS 93241. This omission should be corrected by inserting the following table at the end of subparagraph 5-5a, page 5-6 of the manual.

Operating speed (Words per minute)	Lubrication and Preventive Maintenance (Whichever Occurs First)
60	3000 hours or 1 year
75	2400 hours or 9 months
100	1500 hours or 6 months

TEMPORARY HANDLES FOR TELETYPE EQUIPMENT

The purpose of this article is to provide fabrication details of handles for use in handling the TT-47, TT-48, AN/UGC-5, AN/UGC-6, AN/UGC-15, and AN/UGC-16 Teletypewriters.

The fabrication details are shown in figure 1. Parts required are standard items and are available in most sheet metal or machine shops. Two handles should be fabricated. Handles mount in existing holes located on sides of teletypewriter cabinet (see figure 2).

List of Material Required (for one handle):

Qty	Description
1	Square Steel Tubing, 7/8 in. x 16 in. long
2	Round Head Screws, 5/16 in. x 18 in. x 1-3/8 in. long
2	Extension Studs, 5/16 in. x 1 in. long
2	Steel Plates, 3 in. x 3 in. 1/16 in. thick
2	Felt Pads, 3 in. x 3 in. square
2	Nuts, 5/16 in. x 18 in.
2	Flatwashers, 5/16 in.

Fabricate two handles in accordance with details shown in figure 1.

The distance of 13-3/4 inches between the two studs is required in order that handles will fit existing holes in teletypewriter cabinet. The felt pads are glued permanently to the steel plates to protect cabinet finish. Figure 2 illustrates how handles are mounted on side of cabinet.

Handles can be used in lifting, or to tie machine to pallets in moving, relocating, hoisting aboard ship, and so on. Handles should be marked for return to teletype shop or repair area for reuse.

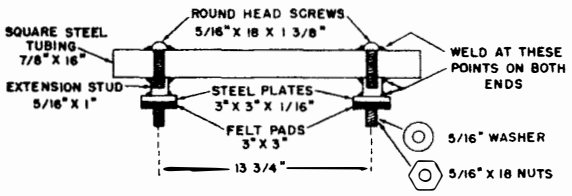


Figure 1. Temporary Handles for Teletype Equipment

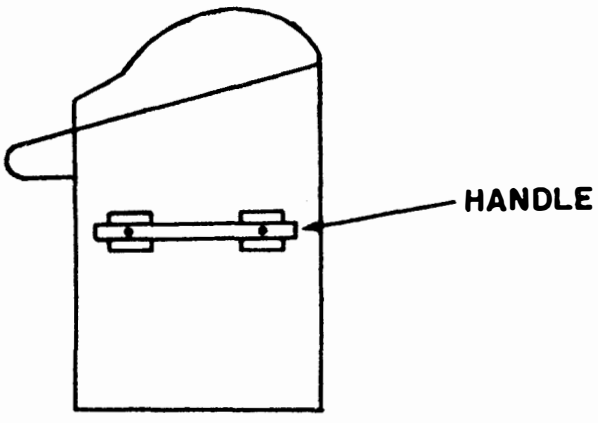


Figure 2. Mounting Location of Handles

TEMPORARY HANDLES FOR TELETYPE EQUIPMENT

Refer to article in TT-47 section under the same title.

TT-176/UG and TT-176A/UG Teletypewriter—Information Concerning

The purpose of this article is to advise holders of the TT-176/UG and TT-176A/UG teletypewriters not to remove certain features of this equipment.

It has been reported by repair activities that holders of the TT-176/UG and TT-176A/UG have been removing the local backspace and local reverse linefeed features from the equipment. In the interest of maintaining configuration control and the reduction of overhaul costs, it is requested that these features not be removed. (851)

RECOMMENDED TOOLS FOR SERVICING TT-298 AND T-299 SERIES MITE TELETYPEWRITERS

The recommended tools for servicing the Model 28 Series teletypewriter equipment as well as all models of the TE-50 tool kit are not intended to service the TT-298 and TT-299. An entirely different set of tools is required for this new equipment. The following tools are recommended for servicing the TT-298 and TT-299 equipment and should be requisitioned through normal Navy supply channels by equipment holders:

Item	Mite Corp. Part No.	FSN
Wrench	4534	1N5120-015-1291
Wrench	2241	1N5120-015-0811
Handwheel	4533	1N5815-015-1292
Wrench	4535	1N5120-015-1293
Plug	4597	1N5815-015-1294
Loctite	5145-2	1N5815-015-1296
Allen Key	5120-1	1N5120-015-1297
Allen Key	5120-2	1N5120-015-1303
Allen Key	5120-3	1N5120-015-1304
Allen Key	5120-4	1N5120-015-1313
Allen Key	5120-5	1N5120-015-1305
Allen Key	5120-6	1N5120-015-1306
Allen Key	5122-1	1N5120-015-1307
Allen Key	5122-2	1N5120-015-1308
Handle	5121-1	1N5120-015-1309
Handle	5121-2	1N5120-015-1298
Handle	5121-3	1N5120-618-3214
Handle	5121-4	1N5120-015-1300
Handle	5121-5	1N5120-015-1301
Handle	5121-6	1N5120-015-1302
Wrench	5029-1	1N5120-824-1485
Wrench	5029-2	1N5120-051-2894
Wrench	5029-5	1N5120-051-2895
Cable Test	561	1N5995-571-7248
Grease	5041-1	9W9150-261-8297
Oil, Light (1 qt. can)	5042-1	9W9150-261-4129
Oil, Light (4 ox. can) (638-646)	5146-1 or MIL-O-6085A	9W9150-257-5449

TT-298B/UG AND TT-299(SERIES)/UG—MAINTENANCE HINTS

The electrical and mechanical systems of the teletypewriter set are delicate equipment and must be so treated. Many cases of equipment malfunction can be attributed to **CARELESS ATTEMPTS** at repair or adjustment by maintenance personnel. Caution must be exercised to prevent abuse to the unit. Only qualified graduates of an approved maintenance course should repair this teletypewriter. Pay particular attention to the following:

1. Never lift the printer from the base by the advance drum or take-up drum, because of their fragility. The mounts bend, which causes a misalignment of the advance ratchet, and the check or feed pawls. This can damage the dum and cause excessive wear of the pawls.

2. After twenty-four hours of operation, it is necessary to clean the cylinder, yoke, and hammer shafts with a soft lint-free cloth. If exceptionally dirty, apply a few drops of oil to the shafts while they are running, and then wipe completely dry. Wipe off all dust, lint, and paper shavings.

3. Never use a cotton ribbon. Use only nylon, as recommended.

4. The Mite Corporation has developed a new, recommended lubricant with the trade name, Non-Fluid-Oil (NFO). This is the only oil to use on the clutches and other locations, as recommended by the Technical Manual, NAVSHIPS 95898. The normal lubrication interval for NFO is 500 hours. (672)

RECOMMENDED TOOLS FOR SERVICING TT-298 AND TT-299 SERIES MITE TELETYPEWRITERS

See article in TT-298 section under the same title.

TT-299B/UG Teletypewriter—Assignment of Port Number and Federal Stock Number for Pinion Gear and Pin

Pinion gear failure on the MITE TT-299B/UG teletypewriter motor, part No. 03416, can now be repaired by replacing the pinion gear only. Formerly, repair required replacement of the entire motor. The manufacturer's part number for the pinion gear is No. 02919; the FSN is 2RM3020-842-8347-E121.

A fastening pin to anchor the pinion gear to the shaft must also be ordered. The manufacturer's part number for the pin is Pin, Spiral No. 9Z5315-058-9698, the FSN is KZ5315-058-9698.

These parts may be ordered through regular channels. The Manufacturer claims that if the pinion gear is lubricated in accordance with the technical manual lubrication schedule, the part should not fail. (703)

AN/UGC-43, TT-299A/UG, TT-298B/UG and TT-299B/UG—Maintenance Fixture Availability

See article in AN/UGC-41 section under the same title.

TT-321A/UX RECEIVER-TRANSMITTER, FACSIMILE – FINAL TECHNICAL MANUAL, NAVSHIPS 0967-284-9010

All recipients of Receiver-Transmitter, Facsimile TT-321A/UX from contract NObsr 93233 received preliminary technical manuals. The final technical manual for this equipment is NAVSHIPS 0967-284-9010 and should be ordered through regular channels of the naval supply system. Upon receipt of the final technical manual, the preliminary manuals should be destroyed. (EIB 724)

TT-331/UG, TT-331A/UG Model 28 Torn Tape Teletypewriter Equipment Receive Group Modified for Low Level - Elimination of Electrical Shock Hazard

A shock hazard exists at the equipment tape feed-out magnet terminals after conversion to low level using modification kit MK-1110/UG. When the equipment is rewired in accordance with the modification kit installation instructions, the tape feed-out terminals are placed on the hot side of the A.C. line presenting a hazard to operating personnel when changing tape.

The following wiring change initiated by NAVCOMSTA SAN DIEGO is forwarded to all users for implementation to eliminate this hazardous condition.

1. In Teletype Corporation wiring diagram package WDP-0057, refer to AAC terminal block on wiring diagram 8424WD.
2. Change equipment wiring as follows:
   a. Relocate wire BD-27-P from terminal AAC-2 to AAC-5
   b. Relocate wire BC-27-BL from terminal AAC-4 to AAC-5
   c. Relocate wire AP-1-W from terminal AAC-5 to AAC-2 *(803)*

RECOMMENDED IMPROVEMENT FOR TU-316-N ANTENNA ASSEMBLY P/P AN/VRC-37

This Bureau has been advised by the MCAS El Toro, California, that a problem of insulator breakage in the subject antenna was found during installation. The problem concerned the insulators (Motorola Parts #14K857738 and 14K847739) breaking when the ferrule (Motorola Part #43A480576) had to be tightened beyond practical limits in an attempt to achieve proper and positive electrical contact between the antenna rod (Motorola Part #47K847719) and the center conductor of the impedance matching cone (Motorola Part #1V839953).

To remedy this problem, a small globule of silver solder was applied to the small coil on the base of the rod, keeping this material flat on the topside which fits against insulating washer (#14K857739) and forming a bead or convex surface at the extremity of the rod, thus forming a silver contact to the center conductor, instead of steel. It was further indicated that care must be exercised in the process of silver soldering to avoid destroying the spring temper of the rod or possible crystalization of the rod. This process involved dropping the antenna rod through a seventy-thousandths (0.070) hole drilled in a block of steel three-quarters inch thick. Heat is applied by using a small conventional acetylene torch and then allowing the rod to cool in the block without quenching. The time quoted to accomplish this improvement is five minutes.

*UNIVAC Model 1840 Magnetic Tape Transport—Tape Speed Adjustment Procedure

This article pertains to UNIVAC Model 1840 transports using PC Card type 7601953-00 for the Capstan Ramp/Tape Speed Adjustments. The 7601953-00 PC card is a direct replacement for the 7600178 PC card which is no longer available and contains an additional pot R40 that the 7600178 PC card did not. Pot R40 has been added to achieve diode balance between CR1 and CR5.

NOTE:

Reference Figure 1 for pot location.

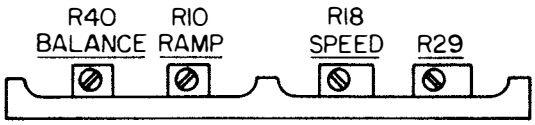


Figure 1. 7901953 PC Card.

1. Mount 800 BPI master alignment (skew) tape.

NOTE:

Make only full passes forward and reverse, do not rewind at high speed.

2. Set ROU FORWARD/REVERSE switch to FORWARD.
3. Connect digital voltmeter to test point B22TP2-3 (Capstan Ramp) and the common lead to the card rack chassis.
4. Set ROU RUN/STOP switch to RUN. Measure and record the voltage while tape is moving forward (should be approximately -9 volts).
5. Set ROU FORWARD/REVERSE switch to REVERSE. Measure and record the voltage while tape is moving in reverse (should be approximately +9 volts).
6. Adjust pot A8-R40 clockwise or counterclockwise to reduce to a minimum the difference between the forward and reverse readings taken in steps 4 and 5. Example: If the forward reading was -9.0 volts, and the reverse reading was +8.0 volts, the difference to be adjusted would be 1 volt, not 17. The end result would be approximately -8.5 volts going forward and +8.5 volts going in reverse. The difference must be within 0.01 volts.
7. Connect scope (Tecktronix 545 or equivalent) to test point C24-TP1-4 and scope ground to card rack chassis. Set scope TIME/DIV. to 5 µsec, SYNC to INT.
8. Set ROU FORWARD/REVERSE switch to FORWARD and the ROU RUN/STOP switch to RUN. Measure the time in µsec between the first and third pulses, and record this timing.
9. Set ROU FORWARD/REVERSE switch to REVERSE. Measure the time in µsec between the first and third pulses, and record this timing.
10. Adjust pot A8-R29 clockwise or counterclockwise to reduce to a minimum the difference between the forward and reverse timing readings obtained in steps 8 and 9 above. Once this timing is adjusted to be the same (±1 µsec), it assures the forward and reverse speeds are the same.
11. Adjust pot A8-R18 for 33.5±1 µsec between the leading edges of the first and third pulses. This now assures the tape speed is correct.
12. Recheck and adjust, if necessary, A8-R40 (refer to step 6) to obtain a voltage difference no greater than 0.01 volts.
13. Adjust start and stop times in accordance with paragraph 5-5.g, page 5-43, of 1840 Technical Manual, NAVSEA 0967-LP-323-3030 (FEB 9)

Univac 1840 Tape Transport—Reel Drive Null Adjustment Procedure, Maintenance Hint

This procedure will provide reel stability for approximately 50% of the reel (10½-inch reel) from BOT. Total reel stability from BOT to EOT varies, depending on sea level reference.

NOTE

Tape transport should be on for 1/2 hour before adjustment.

1. Turn PWR OFF and extend PC card A18.
2. Mount a 10½-inch full reel of magnetic tape on the transport to be adjusted.
3. Turn PWR ON and advance tape to Load Point.
4. Set oscilloscope for internal positive sync and sweep speed of 1 ms/cm.
5. Adjust pot A18R20 until supply column tape loop just stops moving into the supply column and record pulse width of positive pulse at A18 pin 47. (A pulse width of approximately 4 ms will be observed.)
6. Adjust pot A18R20 for pulse width recorded in step 5 plus 0.5 ms.
7. Turn PWR OFF, replace PC card A18, and extend PC card A16.
8. Turn PWR ON and position tape at Load Point.
9. Adjust A16R20 until takeup column tape loop just stops moving out of the takeup column and record pulse width of pulse at A16 pin 47. (A pulse width of approximately 3 ms will be observed.)
10. Adjust pot A16R20 for pulse width recorded in step 9 minus 0.5 ms.
11. Turn PWR OFF, replace PC card A16, and remove tape.
12. Perform steps 1 thru 11 for remaining tape transport. (FEB 9)

UNIVAC Model 1840 Magnetic Tape Transport—Vacuum Chamber Sensor Lamp Replacement Procedure—Maintenance Hint

This article pertains to all 1840 tape transports concerning the replacement of vacuum chamber sensor lamps DS-1 thru DS-8. Trouble has been reported with the terminal posts breaking when the sensor lamp assemblies are unsoldered and replaced in the loop box assembly. In order to inhibit physical damage to the terminal posts and lamp leads, the maintenance technician should adhere to the maintenance procedures provided in NAVSEA 0967-LP-323-3030 Technical Manual Volume I dated June 1972 with the following maintenance suggestions:

1. Use only the recommended 15 W Soldering Iron, referred to in Table 5-1 on Page 5-2, to prevent overheating the terminal post.

2. A Sold-a-pullit (or equivalent) solder sucker is the recommended solder-removing tool because it requires less heat and time to remove solder from an electrical connection than a Solder-Wick (or equivalent).

3. To prevent damage to the fragile lamp leads do not substitute needle nose pliers for the recommended tweezers as referenced on Page 5-39.

4. For easier removal of the lamp leads, do not wrap the leads more than 360 degrees, around the terminal post.

(EIB 978)

USN/USL 7476, 7712 Teletype Control Panels – Switch-Stack Assembly Test Set

The Switch-Stack Assembly Test Set described in this article allows repair and service personnel to check out, in a rapid and orderly manner, the switching and indicating functions of switch-stack assemblies. This includes the systematic check of the individual pushbutton switch contacts, resistors, and indicator lamps.

Construction:

The Test Set shown in figures 1 and 2 is a laboratory model. The arrangement plan, figure 3 describes a configuration of a compact, inexpensive Test Set that can be assembled by FBM submarine tender personnel, using the material listed in Table 1. Figure 4 is a wiring diagram of the Test Set and assembly under test.

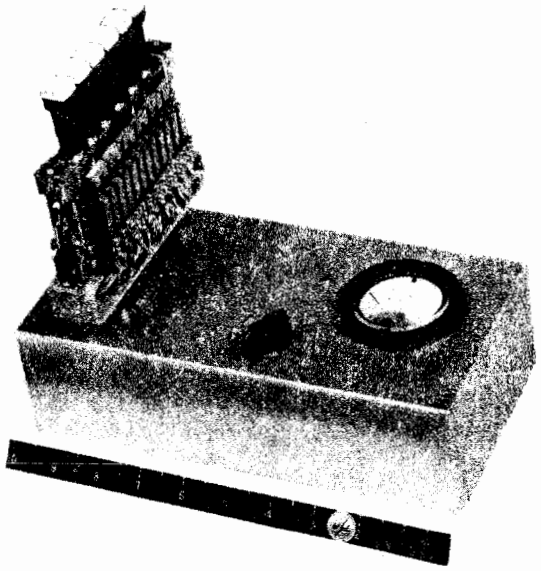


Figure 1. Switch-Stack Assembly Test Set, Top View

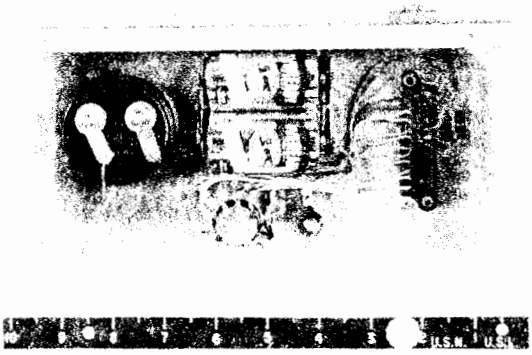


Figure 2. Switch-Stack Assembly Test Set, Bottom View

Operation:

The Test Set is calibrated to measure current readings of switch-stack assembly **line** circuits, **lamp** circuits, and the **equipment** circuit. Two D-size batteries contained in the Test Set are used to energize the circuit being tested. Meter M1 indicates the current, in milliamperes, flowing in the circuit. Detailed test procedures are as follows:

1. Insert switch-stack assembly to be tested in Test Set connector J1.
2. Set meter switch S1 to position 1. Meter M1 should indicate approximately 10 ma when pushbutton switch No. 1 is in the **up** position.
3. Depress assembly pushbutton switch No. 1 Meter M1 should indicate approximately 20 ma.
4. Repeat this procedure for assembly pushbutton switches No. 2 through No. 6, using meter switch settings 1 through 6, respectively. Meter readings at each setting should be as indicated in steps 2 and 3.
5. Set meter switch S1 to position 7. A steady-state current reading of approximately 70 ma should be observed on meter M1 when each pushbutton switch is depressed.

NOTE

Further checks should be made if meter readings vary appreciably from the approximate readings specified.

The schematic diagrams for Teletype Control Panels USN/USL 7476 and 7712 are E43254H and E43529H, respectively (E.B. drawing Vault No. 9068-7449A). (706)

TABLE 1 – Switch-Stack Assembly Test Set, Material Required

Item	Qty.	Symbol	Description	FSN
1	1	M1	Meter, 0-100 ma, round, 2-1/2 inch dia.	
2	1	S1	Meter switch, minitap, Grayhill 12 No. 12001-6 (2P 10T) or equiv.	
3	1	---	Index plate (to indicate positions of S1)	
4	1	---	Knob, 1/4 in. shaft dia.	9Z-5355-341-2477
5	1	J1	Connector, Amphenol (Blue Ribbon 26-190-24)	9N-5935-201-3952
6	1	R1	Resistor, 60 ohms, 2w	9N-5905-279-3525
7	1	R2	Resistor, 15 ohms, 2w	9N-5905-279-1959
8	1	---	Battery holder, Allied Stock No. 18A5914, Type Keystone 186 or equiv.	
9	2	---	D Battery, Eveready, No. 950	9G-6135-542-6216
10	1	---	Chassis, aluminum, 3 in. H, 4 in. W, 6 in. D; Allied Stock No. 42A7904, Type AC-430 or equiv.	

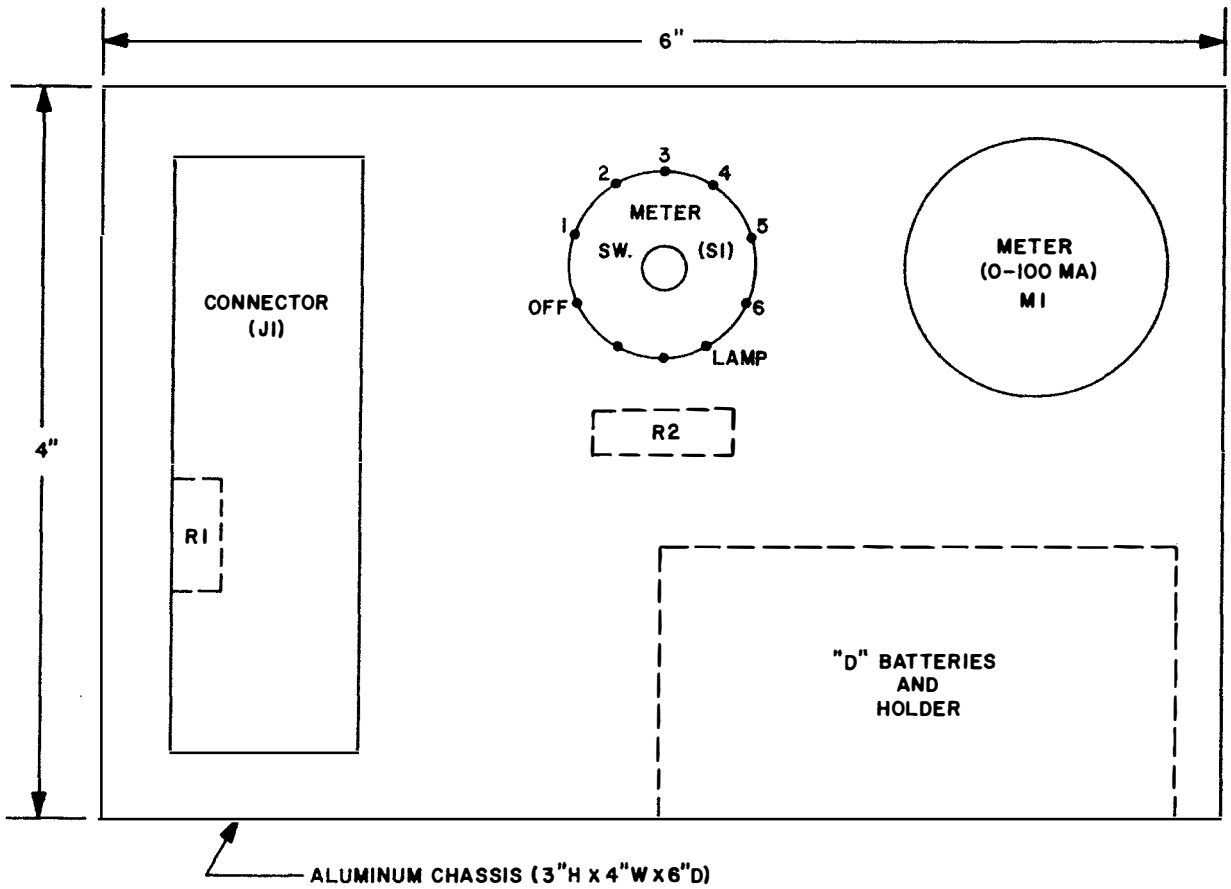


Figure 3. Switch-Stack Assembly Test Set, Arrangement Plan

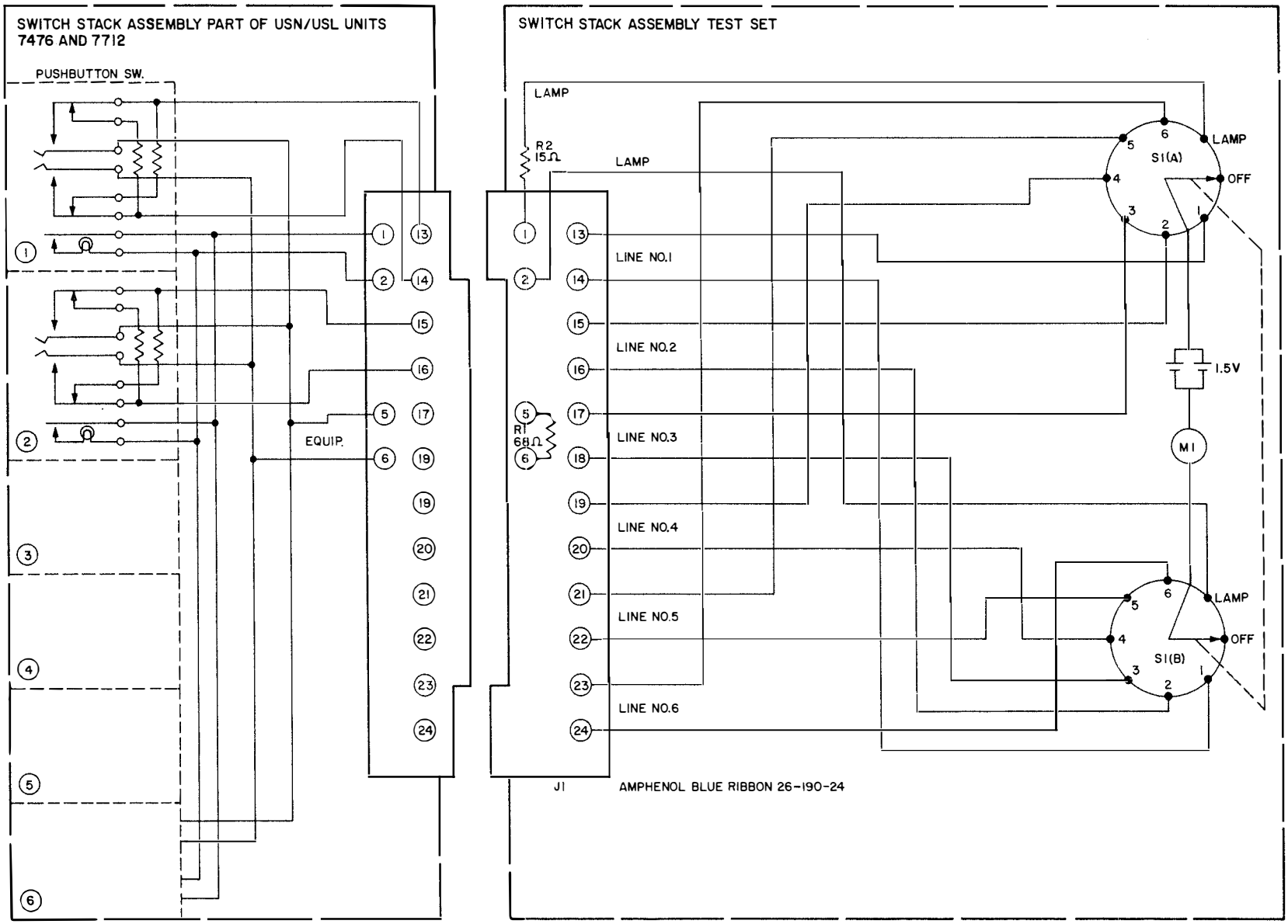


Figure 4. Test Set and Assembly under Test, Wiring Diagrams

TYPE 7476 USN/USL TELETYPE CONTROL PANEL – PREVENTIVE MAINTENANCE ACTION

The power transformer T1 furnished with Teletype Control Panel Type 7476 may not meet the Construction Specification approved by NAVSHIPS (USL # E 43253B) in some SSBN's.

Excessive failure of the various switch stack resistors has been attributed to excessive output voltage (approximately 20V) of power transformer T1, which results in excessive line loop current.

SSBN's having the Type 7476 USL/USN Teletype Control Panel installed should take the following preventative maintenance action pending issuance of a field change:

1. Measure output voltage of power transformer T1 across terminals 3 and4. The voltage should read approximately 90V if an approved power transformer is installed.
2. If T1 output exceeds approximately 90V, precautionary measures should be taken by operating personnel. Ensure that the line rheostat, associated with each line, is adjusted to a maximum of 60 MA of current on the line meter when teletype equipment is switched either in or out of Loop. (712)

Modification to Eliminate Possible Shock Hazard and Oscillation in 1MC General Announcing System Built by Galbraith Pilot Marine Corporation and Installed on PG84 through PG90 and PG92 through PG101

Oscillation and possible shock hazard can occur in the Model E-1750 General Announcing System (1MC) built by Galbraith Pilot Marine Corporation, if breakage occurs in the connection which grounds the cable shield extending inward from the microphone connector.

To preclude the possibility of oscillation and shock hazard in this system, a flexible bonding strap should be installed between the case and front panel. (787)

SECTION 5 - REFERENCE DATA

This section is under preparation. When completed, it will contain reference data applicable to communications equipment. These data will be supplied in later changes to this handbook.

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