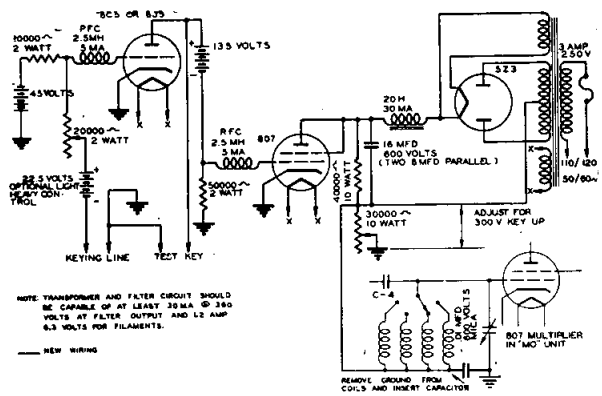
Section 12
MISCELLANEOUS EQUIPMENT AND COMPONENTS

SECTION 12. MISCELLANEOUS EQUIPMENT AND COMPONENTS

REVISION OF AVT–22B EQUIPMENT FOR HIGH SPEED KEYING

The high speed keying circuit of Figure 1 for the RCA AVT–22B is intended for use only as a



CIRCUIT FOR HIGH SPEED KEYING OF RCA AVT-22B

FIGURE 1.—Revision of RCA model AVT–22B equipments.

temporary expedient where such operation is necessary. A standard commercial high speed keyer unit for this equipment is in existence and should be used on all permanent installations.

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CONVERSION OF MACKAY RECEIVERS MODELS 117–A AND 117–B TO MODEL 117–C

Radiation in excess of the maximum limit (0.1 microvolt per meter at one nautical mile) as prescribed by the Chief of Naval Operations has been experienced in the operation of the models 117–A and 117–B Mackay radio receivers. The radiation of these receivers can be limited by the following modification:

(1) Modify "C" plug-in coil assembly only. Remove shield covers from "C" plug-in coil assembly.

(2) Scratch a reference line on base of bakelite coil forms and "hold down" clamps to facilitate reassembling in same position.

(3) Remove both coil forms from sub-panel. Insert a 100-mmfd. (.0001-mfd.) mica condenser in both coils (bend leads in shape of "U" with body of condenser) and solder leads into prongs #3 and #5. This provides additional capacity across the secondary windings of both coils.

(4) Reassemble coils on sub-panels and insert in receiver. The hold down clamps should be loose to permit realignment of coil prongs with sockets. Tighten hold down clamps, remove sub-panel from receiver and reassemble balance of "C" coil.

(5) Stamp the letter "M" in the upper right-hand corner of sub-panel to indicate the assembly has been modified.

(6) Install nameplate "Type 117–C frequency range 16 to 530 kc." using metal nameplates to replace metal and bakelite on receivers where name is engraved in panel.

(7) Correct tuning cards to show new dial positions for frequencies of 500, 468, 425, 375 and 355 kc. (Preferable to use portable battery-operated signal generator for calibration of dial.)

(8) Correct wiring diagram in instruction book to show the 100-mmfd. condensers installed across terminals no. 3 and no. 5 of "C" assembly and change title of drawing to "Type 117–C".

Two 100-mmfd. (.0001-mfd.) silver mica condensers plus or minus 10% *to be matched* are necessary for this modification. It is necessary that these condensers be of *equal value* as they are bridged across the gang tuning condensers of the receiver. If such condensers have a greater capacity than 100 mmfd. the frequency will be altered and the 500-kc. distress frequency may not be heard. Correction should also be made by backing off the trimming condensers to reduce the minimum capacity and raise the frequency range to cover the 500-kc. channel.

It is requested that any modifications made to the subject receivers be reported to the Bureau.

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ALIGNING THE WE–233A TRANSCEIVER WITH THE HICKOK 19X SIGNAL GENERATOR

It has been found difficult in certain instances to make sensitivity measurements or align the WE–233A transceiver using the Hickok model 19X generator; attenuation controls having no effect, and the full output of the generator seeming to be fed to the receiver with the attenuation controls turned off. The attenuation controls operate satisfactorily at lower frequencies, leading to the belief that they are not at fault. The only other means of radiation would be the power cord. The power cord is bypassed by a .25-mfd. condenser from each lead at the entrance to the 19X. However, there is a loop of about 2½ inches between the cord knot inside the power supply case and the end of the cord, or rather two loops—one in each of the two wires. These loops should be removed, the cord going directly out of the case. The .25-mfd. condensers from each branch of the cord to ground should be paralleled with .0005-mfd. condensers.

●

MODIFICATION OF DUMONT 241 CATHODE-RAY OSCILLOSCOPE

The Carrier Aircraft Service Unit Seven has found that condenser C–42, rated at 0.05 mfd. at 1600 volts, breaks loose from its mounting and renders the "Z" axis amplifier inoperative. The condenser is shown in Figure 1 as originally installed by the manufacturer. It is supported only by its mounting leads, and these break off under conditions of shock and vibration.

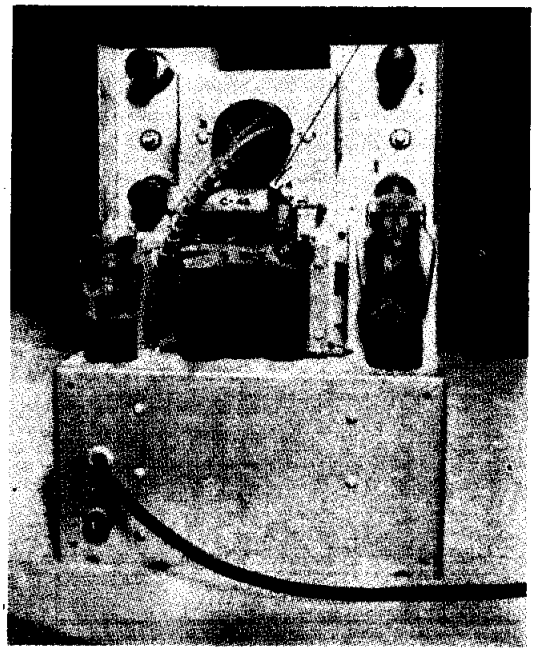

FIGURE 1.—Original mounting of C–42.

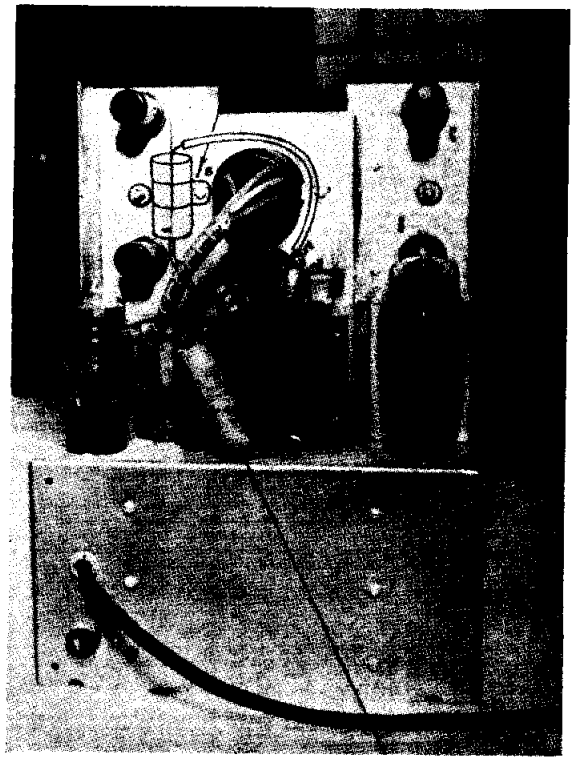

FIGURE 2.—C–42 broken loose from its original mounting, and new mounting position for it.

It is recommended that a strip of thin brass or aluminum be formed into a band to mechanically secure the condenser to the instrument frame. It may be mounted alongside the cathode-ray tube socket, the metal supporting strap being secured under screw "B".

This mounting position is indicated in Figure 2. The lead from C–42 to terminal "A" should be covered with spaghetti tubing to prevent short circuits and present a workmanlike appearance.

●

PLACEMENT OF RECTIFIER UNITS FOR THE WILCOX 96C TRANSMITTER

The Bureau has procured a number of model 96C transmitters for use in various supplementary activities. The instruction book stipu-

lates that the proper location of the type 36A rectifier unit is between the type 50A modulator and the adjacent r-f units. The outside and mounting dimensions of both rectifier and modulator units are similar. In order to provide for the possible future addition of frequency shift keying adapters to these equipments it is necessary that the rectifier unit be mounted on the extreme right in the above equipments. Accordingly, it is requested that all activities ascertain that all future installations of the 96C transmitters be made with the type 36A rectifier placed on the extreme right (facing equipment) of the assembly. For those equipments now installed and in operation, the above instructions may be held in abeyance until such time as it definitely is ascertained that the frequency shift keying adapters will be added.

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MULTI-CHANNEL RADIOTELEGRAPH SYSTEMS OVER-ALL OPERATION

Telegraph signals have been transmitted over radio paths practically since radio transmission was made possible. There has been a constant effort to increase the speed of transmission and to eliminate the need for human processes. Thus, we had the ordinary manual telegraph key, the speedier "bug" key leading to automatic high speed tape transmission and reception of dot-dash signals. The latter is now widely used by means of efficient vacuum tube circuit arrangements.

The use of printing telegraph equipment affords many advantages in eliminating the human tape decoding factor, and in other ways provides speed and convenience advantages. However, the problems presented by short wave radio transmission and the high degree of transmission stability demanded by printing telegraph equipment are comparatively difficult to overcome. While printing telegraph equipment has been used over radio circuits, it has usually been necessary either to design a new teletypewriter arrangement or to otherwise incorporate features of new design. The multi-channel radiotelegraph system soon to be furnished to the Navy provides for the transmission of as many as six standard 60-word speed teletypewriter circuits over one of the two voice channels of a single sideband short wave radio system.

It should be noted that the sudden and urgent need for multi-channel radio teletypewriter operation, because of the war, prohibited any prolonged equipment development. Standard teletypewriter equipment, standard telegraph land lines, and standard radiotelephone facilities were available and it was necessary to devise arrangements to permit the successful interconnection of these facilities. In the multi-channel radiotelegraph system, this interconnection is provided by a specially designed voice frequency carrier telegraph system.

A standard single sideband short wave radiotelephone system incorporates many transmission advantages. Briefly, these advantages comprise the effective improvement in signal to noise by 9 db due to the effective suppression of the carrier and the use of only one sideband thus using maximum transmitter power for the intelligence carrying frequencies and minimizing noise by reducing the receiver band width. Furthermore, the system is less subject than a double sideband system to the effects of selective fading and interference. However, a single sideband radiotelephone circuit, nevertheless, is affected at times by severe radio fading.

We have long had the voice frequency carrier telegraph system wherein as many as 18 d-c teletypewriter circuits are combined in the voice frequency spectrum of a telephone circuit. Such systems were designed for land line telephone circuits and are highly effective for this purpose. The standard voice frequency carrier system is basically an amplitude modulation system and, with level compensation, operates efficiently with the comparatively small attenuation changes affecting land line telephone circuits. The comparatively large and fast attenuation changes and noise affecting long haul short wave radiotelephone circuits make impracticable the use of such standard voice frequency carrier telegraph systems and it has been necessary to design a special voice frequency carrier telegraph system which will be less subject to the difficulties resulting from radio fading and noise. Briefly, the new carrier telegraph system provided for the replacement of amplitude modulation by using certain essentials of frequency modulation, by using frequency diversity and teletypewriter signal synchronization.

The various components of an over-all multi-channel radio telegraph system are shown in Figure 1. At the left in Figure 1 are shown six tele-

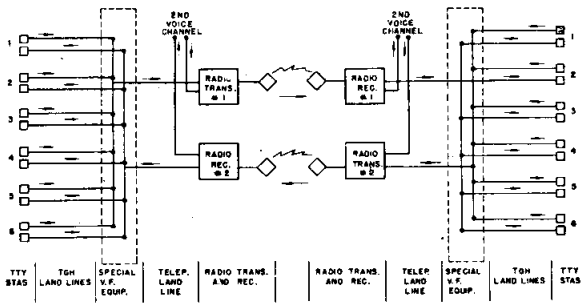

FIGURE 1.—Components of an over-all multi-channel radiotelegraph system.

typewriter stations which communicate respectively with the six teletypewriter stations at the right. The respective stations are operated on a full duplex basis, i.e., two separate one-way circuits for simultaneous operation. The transmitting source of signals consists of a standard transmitter distributor, whereby teletypewriter characters from perforated tape can be continuously transmitted to the telegraph line or consists of a teletypewriter keyboard. While signals can be received by a teletypewriter, they are usually received by a typing re-perforator whereby the received messages are in the form of perforated tape on which the message is also imprinted, thus providing for the immediate retransmission of this tape to another location. Signals to and from the six stations at the left of Figure 1 are respectively transmitted over six standard full duplex land line telegraph circuits to the special voice frequency carrier telegraph terminal.

The specially designated voice frequency carrier telegraph equipment transforms the six d-c signals in one direction into six two-tone voice frequency carrier signals. The discrimination between marking and spacing is conveyed by a change from one tone to another so as to permit constant amplitude operation during both conditions. The combined voice frequency tones are transmitted over the radiotelephone system in the same manner as speech signals.

The short wave single sideband radiotelephone system provides two separate telephone circuits. Thus, radio transmitter no. 1 on Figure 1 provides for two voice input channels. The six teletypewriter signals in the form of voice frequencies of one voice channel constitute one of the two channels of the radio transmitter. It may be noted that the other radiotelephone circuit afforded by the single sideband system is not required for the over-all multi-channel radiotelegraph system and may be used for telephone purposes, telephoto, or other transmission including the transmission of a second group of six teletypewriter circuits. The radio transmitter transforms the voice frequency signals to radio-frequency signals in the range of four to twenty-two megacycles and feeds them to the directional rhombic antenna where they are radiated.

Radio signals from transmitter no. 1 are received by the rhombic directional antenna and single sideband radio receiver no. 1. Here the two demodulated voice channels are derived and passed over separate one-way telephone lines. The voice channel which comprises the original six teletypewriter signals is sent to the special voice frequency carrier equipment where it is converted into six separate teletypewriter signals for transmission over six land line teletypewriter circuits to the six respective stations. Transmission in the reverse direction is exactly similar and requires duplicate equipment in the reverse order. The two directions of transmission are electrically separate throughout.

The successful operation of the multi-channel radiotelegraph systems lies in the degree to which the fading and noise of the radiotelephone circuit can be overcome. A number of these systems have been used by the Army for some time with successful results.

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HOW TO USE THE TUNING FORK AND STROBOSCOPIC TARGET TO ADJUST TELETYPEWRITER MOTOR SPEEDS

The motors which operate teletypewriter apparatus are equipped with a speed measuring device which consists of a stroboscopic target having alternate black and white spots. This target is viewed through a special tuning fork and when the motor speed is correct the target spots appear stationary.

Occasionally difficulty is experienced since there are other incorrect motor speeds at which the target spots will appear stationary. To alleviate this difficulty some motors are equipped with

two targets and it is not always clear which target should be used.

Also, occasionally, due to rather special circumstances, it is necessary to change the motor speed of transmitter-distributors, teletypewriters, or other teletype equipment from the standard speed. This, of course, should not be done except when the necessity is clearly indicated, such as in the case when American machines operate on a network having both American and British teletypewriters. This article gives some information concerning methods of computing motor speeds and records some computations of available speeds.

The standard American teletypewriter tuning fork vibrates 87.6 times per second and is equipped with slotted shutters so that the target on the motor shaft is viewed 175 times per second (2×87.6). In the case of a motor with a 10 black spot target and a speed of 35 revolutions per second, the number of black spots passing a given point in a second will be 350. This is divisible by 175 and therefore during the interval of time between views of the target exactly two spots would pass a given point and the spots would appear stationary. If the motor speed were 17.5 revolutions per second every spot would be viewed. If, however, the target had 20 black spots instead of 10 and every spot was viewed, the motor speed would be half of 17.5 revolutions per minute. From this discussion it will be fairly clear that:

$$\frac{\text{R.P.S.} \times \text{N}}{175} = \text{I (Whole number 1, 2, 3, 4, etc.)}$$

$$\text{R.P.S.} = \frac{175\text{I}}{\text{N}}$$

$$\text{R.P.M.} = \frac{60 \times 175\text{I}}{\text{N}} = \frac{10{,}500\text{I}}{\text{N}}$$

R.P.S. = Revolutions per second of motor
N = Number of black spots on target.
I = An integer.

A tuning fork which vibrates at the rate of 96.19 cycles per second is also available. This fork was designed for use with teletypewriters which operate at 404 operations per minute and coordinate with British machines. This fork gives speeds which are about 10 percent higher than the standard 87.6-cycle fork.

Tables A, B, and C record computations of speeds obtainable with various targets and various tuning forks.

Targets with a large number of spots have the disadvantage that there are several speeds at which the target will appear stationary and hence the speed may be adjusted to the incorrect value.

TABLE A.—*Motor speeds obtainable with targets having a certain number of black spots*

Target	*Motor speed (revolutions per minute)*		*Target*	*Motor speed (revolutions per minute)*	
	87.6 Fork	96.19 Fork		87.6 Fork	96.19 Fork
7, 14, 21, 28, 35	1502	1649	31	2035	2234
34	1546	1698	35, 30, 25, 20, 15, 10, 5	2102	2308
27	1557	1710	34	2164	2376
20	1577	1732	29	2175	2388
33	1593	1749	24	2190	2405
13, 26	1617	1776	19	2213	2430
32	1642	1803	33	2230	2449
19	1660	1823	14, 28	2252	2472
25	1682	1847	23	2285	2508
31	1695	1861	32	2300	2525
6, 12, 18 24, 30	1752	1923	9, 18, 27	2336	2565
35	1802	1978	31	2374	2605
29	1812	1989	22	2389	2623
23	1828	2007	35	2403	2638
17, 34	1855	2036	13, 26	2426	2664
28	1877	2061	30	2453	2693
11, 22, 33	1911	2098	17, 34	2473	2715
27	1947	2138	21	2503	2748
16, 32	1971	2164	25	2523	2772
21	2002	2198	29	2537	2785
			33	2548	2798
			4, 8, 12, 16, 20, 24, 28, 32	2628	2886
26	2021	2219			

TABLE B.—*Motor speeds obtainable with targets having a certain number of black spots and 87.6-cycle fork*

Target (number of black spots)	*Motor speed (revolutions per minute)*			
	(1)			
4	2628			
5	2102			
6	1752			
7	1502	(2)		
8		2628		
9		2336		
10		2102		
11		1911	(3)	
12		1752	2628	
13		1617	2426	
14		1502	2252	
15			2102	(4)
16			1971	2628
17			1855	2473
18			1752	2336

19		1660	2213	(5)		
20		1577	2102	2628		
21		1502	2002	2503		
22			1911	2390		
23			1828	2285	(6)	
24			1752	2190	2628	
25			1682	2102	2523	
26			1617	2021	2426	
27			1557	1947	2336	(7)
28			1502	1877	2253	2628
29				1812	2175	2537
30				1752	2102	2453
31				1695	2035	2374	(8)
32				1642	1971	2300	2628
33				1593	1911	2230	2548
34				1546	1855	2164	2473
35				1502	1802	2102	2403

(2) Indicates every second spot is viewed, etc.

TABLE C.—*Motor speeds obtainable with targets having a certain number of black spots and 96.19-cycle fork*

Target (number of black spots)	*Motor speed (revolutions per minute)*						
	(1)						
4	2886						
5	2308						
6	1923						
7	1649	(2)					
8		2886					
9		2565					
10		2308					
11		2098	(3)				
12		1923	2886				
13		1776	2664				
14		1649	2472				
15			2308	(4)			
16			2164	2886			
17			2036	2715			
18			1923	2565			
19			1823	2430	(5)		
20			1732	2308	2886		
21			1649	2198	2748		
22				2098	2623		
23				2007	2508	(6)	
24				1923	2405	2886	
25				1847	2308	2772	
26				1776	2219	2664	
27				1710	2138	2565	(7)
28				1649	2061	2472	2886
29					1989	2388	2785
30					1923	2308	2693
31					1861	2234	2605	(8)
32					1803	2164	2525	2886
33					1749	2098	2449	2798
34					1698	2036	2376	2715
35					1649	1978	2308	2638

(2) Indicates every second spot is viewed, etc.

When the motor speed is fast it will be noted that the target spots appear to travel in the direction of rotation and when the motor speed is slow the target spots appear to travel opposite to the direction of rotation. The amount of speed deviation in any case can be estimated as in the following example: If a motor operated at a speed of about 35 revolutions per second and was equipped with a 10-spot target, 350 black spots would pass a given point in a second. If 351 black spots passed a given point the spots would appear to progress at the rate of 1 per second. Therefore, the actual speed would be:

$$\frac{351}{350} = 1.00286 = 0.286 \text{ percent fast}$$

In case the motor speed desired is in doubt, various methods may be used to determine the one to use. One method which is very useful on such machines as tape distributors is to measure the length of tape passed through the distributor in 1 minute. The tape is perforated with 10 characters per inch so if, for example, 368 characters were desired 36.8 inches of tape should pass through the gate in 1 minute. When the motor speed is about correct as determined in this manner, it may be adjusted more accurately by means of the tuning fork and target.

The ratio of the gears used in transmitter-distributors is occasionally in doubt. For example, it may be known that the gear ratio is either 7:40 or 9:44. One method of determining which gears are installed is to turn the motor over by hand. If 7:40 gears are installed, it will be found that the motor must be turned 40 revolutions for the brush arm to return to its starting point, while if 9:44 gears are installed it will be necessary to turn the motor 44 revolutions.

It is convenient to be able to remember some of the constants such as the rates of vibration of the tuning forks. The speed of the standard American tuning fork can be remembered fairly easily by noting that the first number is 8 and the next two numbers are obtained by subtracting 1 from each preceding number (87.6).

The 96.19 fork is 10 percent higher, less about two parts in a thousand.—*Signal Corps Technical Information Letter*

TELETYPEWRITER EQUIPMENT MAINTENANCE AND SPARE PARTS

The following information, taken in part from BuShips policy letter serial 945–1584 dated 2 August 1944 and with certain modifications, is published for guidance in obtaining spare parts for teletypewriter equipments.

In addition to the small kit of expendable spare parts packed with each Navy teletypewriter (equipment spares), spare parts for teletypewriter equipment are being procured by the Bureau of Ships for stocking at certain Cryptographic Repair Facilities and Supply Officers for Radio. These parts are to be distributed to other Naval activities on a no-cost basis. For convenience in distribution the spare parts were divided into two major groups as follows:

(1) "Group 'A' Teletype Maintenance Parts" contains the majority of parts subject to replacement under normal operating conditions and comprises some 500 different items.

(2) "Group 'B' Teletype Maintenance Parts" contains larger quantities of all the parts supplied in group "A" and in addition includes parts needed for more extensive repairs and major overhauls of the equipment. This group comprises some 1600 different items.

Tabulations of group "A" and group "B" parts will be furnished activities receiving these parts. These lists should be used as guides for future stocking and ordering of parts but they are not intended to limit the stock (items or quantities) required by an activity. The lists were prepared in an attempt to gain the following objectives: to provide an adequate selection of those parts most commonly used, to provide parts in sufficient quantities to meet maintenance demands, and to avoid the stocking of large quantities of parts which are not often needed.

"Group 'A' Teletype Maintenance Parts" will be stocked by the following Cryptographic Repair Facilities:

Naval Operating Base	Adak
Industrial Manager, U. S. N.	Balboa
Naval Base	Brisbane
Naval Base	Espiritu Santo
Naval Operating Base	Londonderry
Convoy Escort Base	Milne Bay
Naval Base	Noumea
Naval Operating Base	Oran
Naval Operating Base	Recife
Com 10	San Juan
Naval Base	Manas

"Group 'B' Teletype Maintenance Parts" will be stocked by the Supply Officer for Radio, Navy Yard, Pearl Harbor; the Supply Officer for Radio, Navy Yard, Mare Island; the Supply Officer for Radio, Navy Yard, New York; and the Naval Code and Signal Laboratory, Washington, D. C.

In general, when teletypewriter parts are needed at locations outside the continental limits of the United States, they should be ordered by speedletter or dispatch (depending on the urgency) from the nearest Cryptographic Repair Facility or Supply Officer for Radio stocking either group "A" or group "B" teletype maintenance parts. *In all cases complete shipping instructions shall accompany original and relayed requests, so that shipment of parts can be made direct to the activity originating the request for parts.*

If the activity receiving the request stocks group "A" parts only, and does not have any or all of the material requested, the unfilled portion of the order shall be forwarded by that activity to the nearest Supply Officer for Radio stocking group "B" maintenance parts, with complete shipping instructions. If the Supply Officer for Radio [1] stocking group "B" maintenance parts is unable to supply any or all of the material requested, the unfilled portion of the order shall be forwarded by speedletter or dispatch (depending on the urgency) with complete shipping instructions.

All users of teletype equipment located east of the Mississippi River [2] shall place their orders for spare parts with the Supply Officer for Radio, Navy Yard, New York. All users of

[1] The Supply Officer for Radio, Navy Yard, Pearl Harbor, shall forward all unfilled orders to the Supply Officer for Radio, Navy Yard, Mare Island, with complete shipping instructions.

[2] Spare parts required for those activities located within the Potomac River Naval Command shall be procured from the Naval Code and Signal Laboratory through the Radio Material Officer, Navy Yard, Washington, D. C.

teletype equipment located west of the Mississippi shall place their orders for spare parts with the Supply Officer for Radio, Navy Yard, Mare Island, Calif.

Care should be taken not to order parts in excessive amounts, as this delays the production of basic equipments.

Teletype ribbons, paper, printer tape and perforator tape are stocked at Naval Supply Depot, Norfolk; Navy Supply Depot, Oakland; and Naval Supply Depot, Pearl Harbor, under Class 53 material and should be ordered from these activities.

NAVSHIPS 900,031, a publication entitled "Advanced Base Teletype Installation and Maintenance Practices," is available to facilities concerned and may be requested from the Bureau of Ships.

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EXTENSION CORDS FOR MODEL 15 TELETYPEWRITERS

The fifteen-foot #14–2 SJ extension cord (NXs 53323) provides a convenient connection of electrical service to teletypewriter model 15. It is a two-conductor Tirex cord, fifteen feet long with a molded rubber convenience plug (non-polarized parallel blades) on one end and two terminal lugs on the other end. The two terminal lugs should be connected to terminals 1 and 2 on the service assembly block of table XRT–115. The non-polarized plug can be connected to a standard receptacle. These cords will be available on request to NYMI, NYNYK, LEFT, EPIC, FRAY and DISH supply activities.

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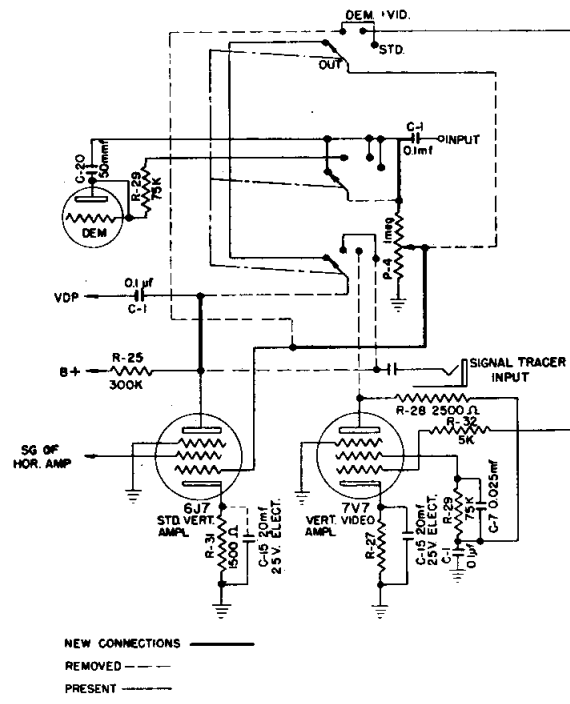
TELETYPEWRITER MANUAL DISTRIBUTED

"Advanced Base Teletypewriter Installation and Maintenance Practices" (NAVSHIPS 900,031) has been recently published and distributed. This manual covers a description of the more commonly encountered items of teletypewriter equipment, maintenance of the equipment, and design considerations in establishing a teletypewriter network. It should prove especially useful to those dealing with teletypewriter equipment from day to day.

The manual is stocked by the Radio Material Officers at Navy Yards, New York, Mare Island, and Pearl Harbor. Requests for copies should be forwarded to these activities.

MODIFICATION OF HICKOK MODEL RFO–5 CATHODE-RAY OSCILLOSCOPE

The Naval Training School, Chicago, has developed the following modification to improve the frequency response of the vertical deflection amplifier in the Hickok model RFO–5 cathode-ray oscilloscope.



MODIFICATION OF HICKOK OSCILLOSCOPE MODEL RFO-5

FIGURE 1.—Modification of Hickock model RFO–5 oscilloscope.

(1) The grid of the vertical deflection amplifier, formerly connected to the attenuator through the IN-OUT switch, was connected directly to the attenuator.

(2) The plate of the vertical deflection amplifier, originally connected to the plate load through the IN-OUT switch, was connected directly to the plate load.

(3) The cathode bypass capacitor of the vertical deflection amplifier was removed.

Elimination of the IN-OUT switch and cathode bypass capacitor reduced the gain at lower frequencies but extended the useful range of the amplifier up to 100 kc. Changes in wiring are shown in the attached diagram, figure 1. It should be noted that the modification removes the "signal tracing" and "video" functions of the instrument.

Naval activities having Hickok model RF O–5 oscilloscopes are authorized to modify them in this manner provided that equipments so modified are suitably tagged or otherwise identified. Attention is invited to the fact that Navy model OBL series oscilloscopes have a nearly flat response to above 100 kc. and therefore do *not* require modification.

●

SERVICING DATA FOR SUPREME MODEL 542 MULTIMETER

The type 10233 electronic repair kit has been furnished with four different types of meters included therein—the meters being manufactured by Supreme, Hickok, Simpson, and Triplett. Normally a sheet of instructions for the meter is packed with each electronic kit, but due to the fact that these sheets are often lost or mutilated, schematic diagrams and servicing notes for these meters are being disseminated in the Communication Equipment Maintenance Bulletin.

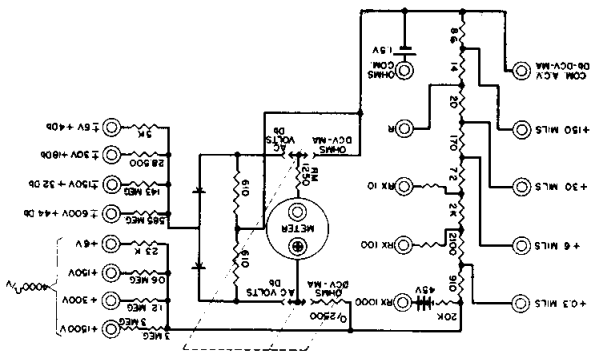


FIGURE 1.—Schematic diagram of Supreme model 542 multitesters, with serial numbers above 1950.

The attached diagrams, figures 1 and 2, show the circuit and back view of the Supreme model 542 multimeter furnished with the electronic repair kit. As additional circuit diagrams and information on other meters become available, they will be included in the Communication Equipment Maintenance Bulletin.

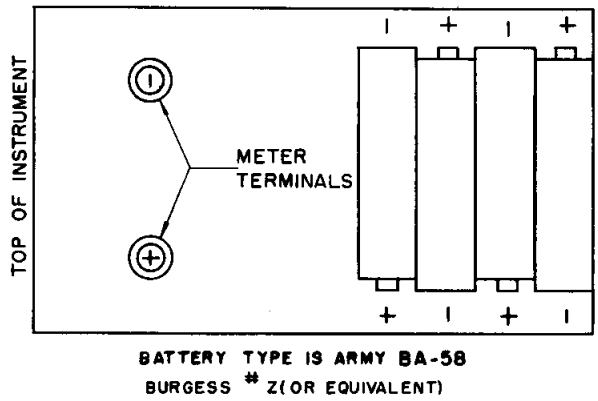


FIGURE 2.—Back view of Supreme model 542 multitester, showing position of cells.

Attention is invited to the fact that repairs to meters must be made *only* by personnel trained and equipped for this purpose. Attempted repairs by other personnel will cause only grief and unsatisfactory results.

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NOISE AND FEEDBACK IN THE WE–233A EQUIPMENTS

Reduction of Noise Due to Excessive I.–F. Gain

In certain isolated cases the i.-f. gain or squelch control is not usable over the proper range. This is evidenced by the inability of the control to eliminate noise that opens the set and is passed along to the audio output. A rather careful check should be first made to determine that the noise level of the ship has not risen. If all components are normal this faulty condition can sometimes be remedied by the substitution of a metal 12SJ7 for the regular glass tube at V4R, the first intermediate-frequency amplifier, which substitution shifts the operating range of the gain control. A realignment of this stage is then necessary due to the differences in the tube capacitances. This procedure is covered in section V, paragraph 10, of the "Handbook of Maintenance Instructions for the AN/ARC–4 (CO AN 08–20–6)."

Elimination of Feedback in Harmonic Generators

Feedback is sometimes caused by a parasitic condition in the third harmonic generator V2R. If, after the usual attempts at suppression (such as the correction of ineffective shielding, replacement of open bypass condensers, etc.) have been made, no improvement results, inspect the bottom of the tube socket. It will be noted that the heater bypass condenser is grounded at one point while all other ground returns associated with the circuit are brought to another common ground. It sometimes happens that this single lead oscillates parasitically, and under this condition the trouble can be cleared up by lifting the single ground and returning it together with all the others to the common stud.—*ARMN.*

●

MODIFICATION TO THE TRANSMITTER CONNECTOR PANEL USED FOR FREQUENCY SHIFT KEYING

A change is being made in the transmitter connector panel used for frequency shift keying. The purpose of the change is to eliminate the Jones connector used for the keying signal and replace it with a type AN–3102–14s–1S connector. All future transmitter connector panels supplied in kits or in transmitters as well as frequency shift keyer cable terminations will have the type AN connector and plug.

Equipments which have been delivered should be modified by the addition of the type AN connector. The modification may be made by utilizing the present panel, enlarging the present square mounting hole with a rat-tail file and drilling the necessary mounting holes to accommodate the type AN–3102–14s–1S connector. This change should not be made on installations which utilize the AN/FGC–1A keyer together with a coupler unit which requires plate and filament power from the keyer unless separate provision is made to obtain such power from the transmitter.

The equipments and symbol designations of connectors affected by this change are as follows:

Equipment	*Symbol designation*
AN/FGC–1A:	
Keyer connector panel.	P–1615.
TBA panel	J–1605.
TBC panel	J–1605.
TDU panel	J–1803.
TEB	J–118.
TEC	J–1101.
TBK coupler kit	J–605.
TBA coupler kit	J–605.
96C coupler kit	4 connectors and 4 plugs per equipment involved.
FSB connector cable	P–15.

Parts required for this modification are as follows:

1 connector	AN–3102–14s–1S.
1 plug	AN–3106–14s–1P.
1 clamp	AN–3057–6.
4 screws	4/32 R. H. machine, 3/8 inches long with hex nuts and lock washers.

Since the parts required are standard Navy components and should be available in RMO stocks no separate provision is being made to supply these parts. An immediate source of supply is in the spare parts of TEB, TEC, FSA, and FSB equipments.

●

RADIO TELETYPE NOTES

The following notes were taken from EFSG engineers reports on a ship radio teletype project:

(1) In cases of faulty operation of the type 23484 frequency shift keyer transmitter coupler used with the model TBK series, check the electrical continuity between the tuning capacitor rotor and the "cold" end of the tank coil. Apparently, this connection was intended to be made through the front panel, but a wire jumper may be necessary due to the excellent insulating properties of the panel enamel.

(2) In equipments using type 255A polar

relays, trouble has been encountered in cases where these relays have been moisture and fungus proofed. The material used in the treatment evolves gases which cause fouling of the contacts and eventual failure. An interim remedy, pending the outcome of further study, is to operate the relays with the covers removed for a period of about three months, at which time the evolution of gases decreases to a negligible quantity and the covers may be replaced. Additional notes on relay maintenance will be found in the article entitled "Relay Maintenance" on page GEN : 28 of this bulletin.

A recent field report has indicated that trouble may develop in the FS–12–A frequency shift keyer due to the plates in the crystal holder being nonparallel, and to the presence of dirt inside the holder. These conditions may cause a serious variation in the shift, as well as a ragged note. The crystal and its holder should be scrupulously clean for stable operation.

●

FAILURE OF WE 323–A TUBES IN THE MODEL 19 TELETYPEWRITER

Reports indicate that a great number of failures are occurring in the WE 323–A tubes due to open filaments. These tubes are used in the REC–30 rectifier, a part of the 19 teletypewriter.

The trouble, in most cases, is due to poorly soldered pin connections on pins 2 and 4. Eventually, it seems as though a high resistance develops at these points due to oxidizing or corrosion, which throws all the load on pins 1 and 5.

The seven-ampere filament current plus the anode current is too much for the soldered connections inside the tube base, causing the solder to melt out. This results in the filament showing an open-circuit when checked at the tube pins.

Such a large number of failures occur in some areas that it is almost impossible to obtain replacements. In one particular case, in order to keep the 19 TTY in service the following experiment was performed:

(1) By tilting the tube on its side, it is possible to inspect the filament. If the filament seems to be in good condition saw off the bakelite base ¼ inch above the bottom of the base, being careful not to injure the wires from the tube to the base pins. Do not cut higher than ¼ inch or you may break the tube seal.

(2) Using a hot soldering iron on the pins of the tube base, carefully remove the sawed off section of the base.

(3) Check the filament for continuity. If it is not open-circuited, resolder the connections inside the tube base (1 to 2 and 4 to 5).

(4) Tin the leads to pins 2 and 4 (copper leads). Clean the solder out of the pins and insert the wires in their proper pins. Tape the tube base with friction tape and serve with serving twine. (It gets sticky from the heat but it will hold).

(5) Turn the tube upside down and fill the pin holes with solder, making sure some solder runs down on the wires for a better connection.

In the case mentioned, 85% of the "burned out" tubes were reclaimed and placed back in service. *10/1/45*

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SPARE 323–A's FOR TTY EQUIPMENTS

The Bureau has received reports that some radio teletype equipments have been received without spare type 323A tubes. These tubes are stocked at Electronic Pools, and vessels are requested to contact an electronics Officer for a full complement of spares. Electronics Officers are requested to ascertain that adequate spare tubes are supplied to vessels having radio teletype equipments. *1/1/46*

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FRA FREQUENCY SHIFT RECEIVER CONVERTER FIELD CHANGE NO. 1

INSTALLATION OF CAPACITOR C–120

Equipments affected.—Model FRA frequency shift receiver converters, serial numbers 1 through 16.

Purpose.—To improve stability and reduce drift during warm-up periods.

General instructions.—The capacitor, C–120, a 20 micromicrofarad ceramic capacitor with a temperature coefficient of 750 parts/million/degree centigrade is being supplied by the contractor to the same destinations to which the original equipments were shipped.

Instructions are supplied with the capacitor. These are repeated herewith for the convenience of the maintenance personnel:

Solder C–120 across terminals 3 and 5 of tube socket V–104 (6H6, discriminator tube).

Owing to the additional capacity, it will be necessary to realign T–104 in accordance with the procedure outlined in section 7 of NAVSHIPS 900,613.

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

Personnel should check their equipments and contact the Electronics Officer to effect this change. This installation is within the scope of the personnel of the activity and should be accomplished at the earliest opportunity.

Completion of this installation should be reported on the field change report card (NAVSHIPS (2369) or, if NAVSHIPS 2369 is not available, on the NBS–383 failure report card and should be recorded in the space provided in the instruction book and in the ships "Radio Equipment Log", NAVSHIPS 900,039. *6/1/46*

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MODEL 15 TELETYPEWRITER TROUBLE-SHOOTING CHART

The trouble-shooting chart shown on Figure 1 page MISC: 13 indicates in detail the steps that should be taken in the analysis of different kinds of trouble. Its use should be found beneficial to all activities concerned with the maintenance of the model 15 teletypewriter. *6/1/46*

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→ FRA—CORRECTION TO I. B.

On page 7–19 of the FRA Instruction Book, figure 7–9, I. F. chassis, top view, the designations of T103 and T104 are reversed. Figure 7–10, figure 7–11, and figure 7–7 are correct in this respect. T104 is the one farthest from the panel side of the I. F. chassis. This error is not noted on the errata sheet. *1/1/50* ←

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TELETYPEWRITER TROUBLE SHOOTING CHART

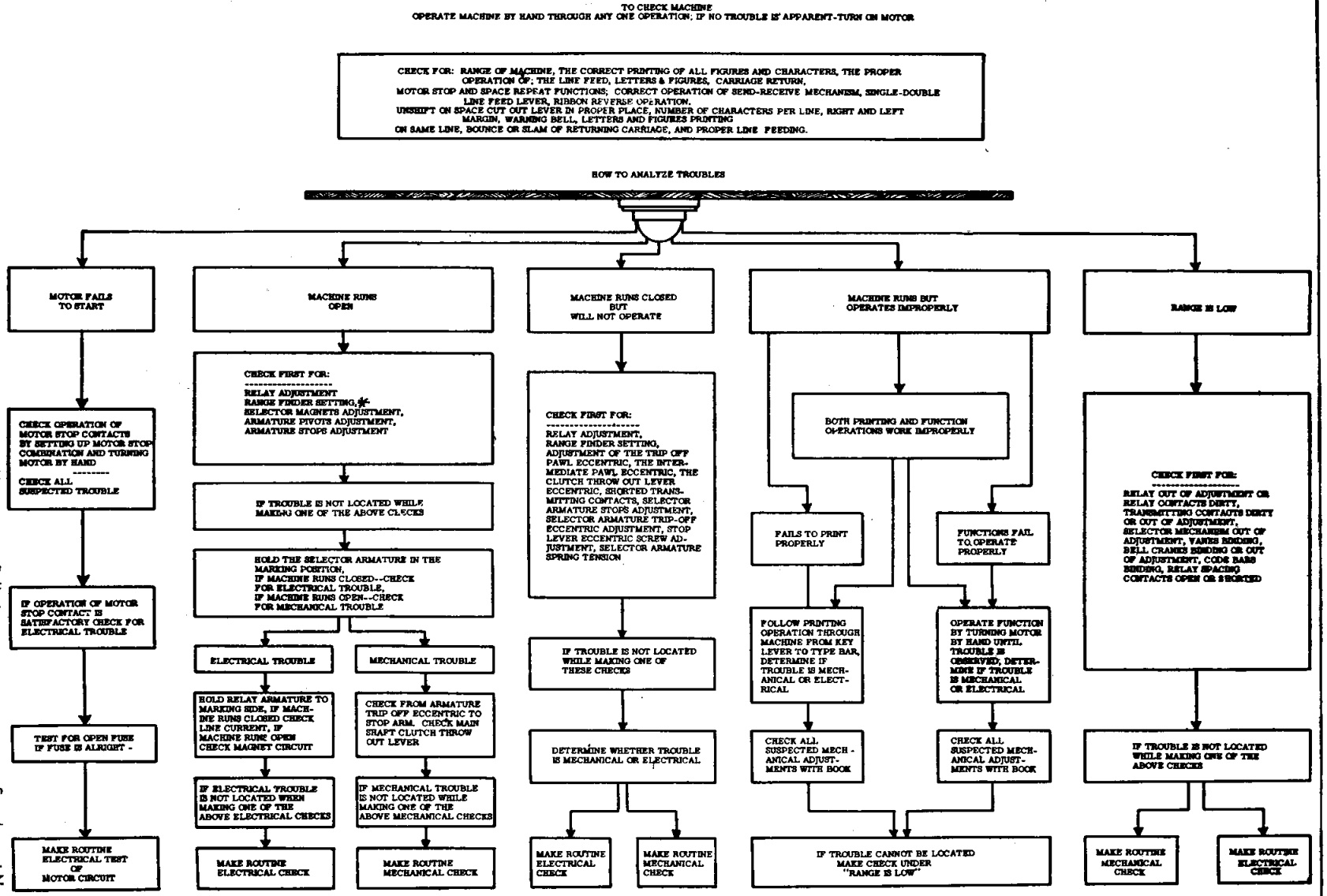

Figure 1.—Teletypewriter trouble-shooting chart.

→MODIFICATION OF TELEGRAPH TERMINAL TH–1/TCC–1 FOR USE WITH MAR AND RDZ EQUIPMENTS

The TH–1/TCC–1 equipment was originally designed to provide simultaneously one voice-channel and a duplex carrier telegraph or teletype channel over a single voice-frequency telephone circuit. It provided the necessary ringing features for the voice channel, modulation equipment for conversion of the d-c telegraph or teletype signals to audio-frequency tones for transmission, and demodulation of the received tones to d-c telegraph or teletype signals.

In order to hurriedly provide essentially short-haul radio teletype service between ships and from ships to shore, a group of the TH-1 equipments were modified to provide the necessary features to operate in this service using AN/TRC–1 transceivers and model 1498 link transceivers. The original features of speech plus telegraph were retained, but since the line side of the TH–1 was a two-wire circuit, it was necessary to furnish a special hybrid adaptor unit to connect the four-wire radio circuit (one pair for transmitting and one pair for receiving) to the two-wire line (used for both transmitting and receiving) of the TH–1 equipment. Such a unit was built in a separate case for use with the AN/TRC–1 transceiver and built into the 1498 transceiver as a modification.

It is now necessary to vacate the radio frequencies on which the AN/TRC–1 and 1498 operate and to move this service to the UHF band. This entails the use of different radio equipment. The Bureau has determined the necessady modifications to the TH–1/TCC–1 to make it suitable for use with the model MAR transmitter and the model RDZ receiver. The receiver in the MAR will not be used for teletype.

Because of the nature of the MAR and RDZ equipments, some of the original operating features of the TH–1 cannot be retained. The new system will provide the following features:

(a) Two way teletype communication (duplex) will be available if two radio frequencies are used. If only one radio frequency is used, half-duplex or one-way reversible operation is possible.

(b) No speech channel is provided. If it is desired to talk over the associated radio equipment it will be necessary to disconnect the TH–1 from the radio transmitter and receiver and connect the microphone and headphones or speaker in the normal manner.

(c) The hybrid adaptor is not required and cannot be used. The TH–1 will be modified for direct connection to the transmitter input and receiver output.

(d) Because no carrier-controlled relay is provided in the RDZ receiver (this existed in both AN/TRC–1 and 1498) no provision is made to hold the receiving teletype "running closed" when the distant transmitter is off the air. Hence, it will be necessary to turn off the teletype motor during such periods.

(e) Since the teletype will not respond to incoming signals with its motor not running, provision is made to notify the receiving operator when a message is to be sent. The use of EE8A hand telephone set has been retained for this purpose. Although the voice channel of the TH–1 cannot be used for speech, the ringing circuit is modified so that cranking the magneto of the EE8A set at the transmitting end of a circuit will ring the bell in the EE8A set at the receiving end, thus indicating to the receiving operator that he should turn on his teletype motor.

(f) A switch and pilot light were added to the modem panel of the TH–1/TCC–1 to operate the transmitter control circuit. (This switch was added per modification for radio teletype shipboard use as outlined in pamphlet "Radio Teletype-Speech Plus Duplex" dated 15 December 1944.) It is also possible, when full duplex operation is employed, to keep both transmitters on the air and sending a marking signal. In this case it would not be necessary to use the ringer.

Figure 1 illustrates the general circuit layout before and after modification with emphasis (in heavy lines) on the new terminal strip and added wiring of the modified unit.

Following are the modification details. It should be remembered that the TH–1/TCC–1 must previously have been modified for radio

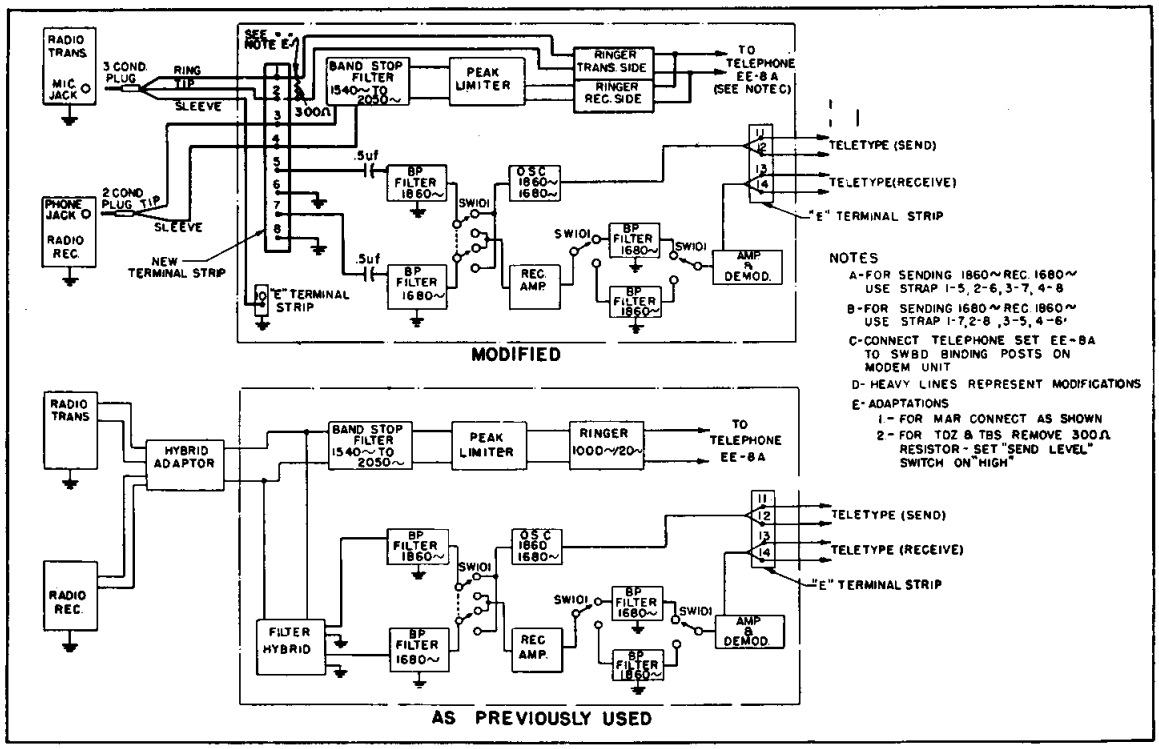

FIGURE 1.—Modification of the TH-1/TCC-1 for UHF Teletype.

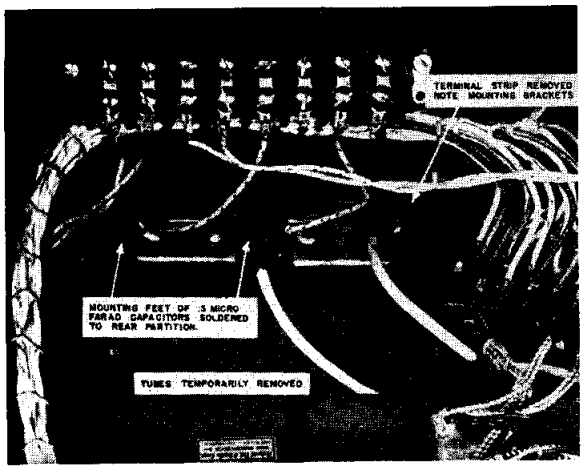

FIGURE 2.—View showing placement of capacitors.

teletype shipboard use. This procedure is outlined in a pamphlet entitled "Radio Teletype—Speech Plus Duplex" dated 15 Dec. 1944. This pamphlet was widely distributed when first printed. Additional copies, if required, may be obtained from Code 982, Bureau of Ships.

A. *Removal of Filter Hybrid (T-9)* (see Figure 52, page 107 of TM 11-2206)

1. Remove wires from lug 8 of T-9, solder together and tape.

2. Remove wires from lug 9 of T-9, solder together and tape.

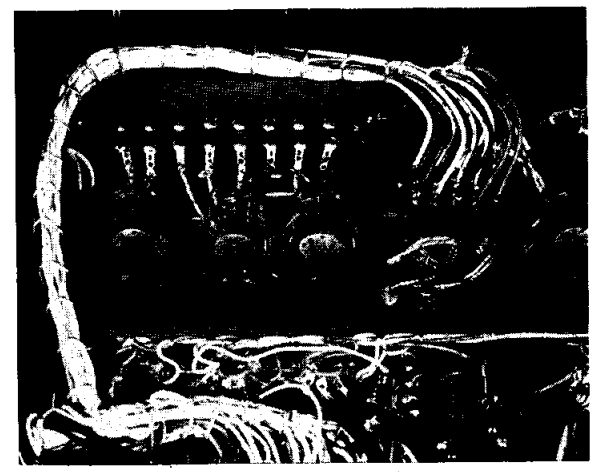

FIGURE 3.—Tubes and terminal strips in place—Straps not shown.

3. Remove wires from lug 10 of T–9, solder together and tape.

4. Remove shielded lead from lug 2 of T–9 and its shield connection from lug 3 of T–9 and label them lead-A and shield-A respectively.

5. Remove shielded lead from lug 4 of T–9 and its shield connection from lug 5 of T–9 and lebal them lead-B and shield-B respectively.

6. Remove entire filter hybrid (T–9).

7. In the space from which T–9 was removed, mount two 0.5 microfarad 600-volt capacitors, labelled A and B (bathtub type preferred), and a terminal strip with eight lugs. Each lug should preferably have provisions for soldering two wires and screw connections for two wires (Jones #8–142). See Figures 2 and 3 for location of parts.

8. Number the new terminal strip 1 through 8.

9. Connect lead-A to one terminal of capacitor A. Connect other terminal of capacitor A to lug 5 of the new terminal strip and connect shield A to lug 6.

10. Connect lead-B to one terminal of capacitor B. Connect other terminal of capacitor B to lug 7 of new terminal strip and connect shield-B to lug 8.

B. *Ringer Modification*

1. Remove wire (Wh) from lug 16 of modem "B" terminal strip, and tape end (Figure 52, page 107 of TM 11–2206).

2. Remove wire (WhRd) from lug 17 of modem "B" terminal strip, and tape end.

3. Connect lugs 16 and 17 of modem "B" of terminal strip to lugs 3 and 4 on new terminal strip.

4. Lift wires from upper lug 1 of relay RB in ringer (Figure 47, page 97 of TM 11–2206); solder these wires together and label them junction "A."

5. Lift wires from lower lug 1 of relay RB in ringer; solder these wires together and label them junction "B."

6. Lift wire (WhYel) from lug 13 of ringer terminal board "C" and solder it to junction "A" and tape (Figure 48, page 97 of TM 11–2206).

7. Lift wire (Wh) from lug 14 of ringer terminal board "C" and solder it to junction "B" and tape.

8. Run twisted pair from lugs 13 and 14 of ringer terminal board to lugs 1 and 2 on new terminal strip.

9. Connect a 300-ohm, 2-watt resistor from lug 1 to lug 2 on the new terminal board.

C. *Monitoring relay modification.*—1. Remove and tape the wire from terminal 2 of the monitor relay socket. Strap lugs 3 to 4. (Figure 53, page 109 of TM 11–2206.) NOTE: The monitor relay in the TH–1 as originally modified for shipboard radio teletype is actuated by the carrier controlled relay in the radio receiver and functions to keep the teletype running closed when the distant transmitter is off the air. Since no carrier-controlled relay is provided in the RDZ, the monitor relay in the TH–1 must be disabled or the teletype will be held continuously closed and will not print.

D. *Selection of Sending and Receiving Audio Frequencies:* The SEND FREQUENCY switch no longer completely controls the selection of sending and receiving audio frequencies. It is also necessary to make several connections on the new terminal strip.

1. For sending on high frequency (1860) and receiving on low frequency (1680):

(*a*) Set SEND FREQUENCY switch on high.

(*b*) Strap lugs 1 to 5; 2 to 6; 3 to 7; and 4 to 8.

2. For sending on low frequency (1680) and receiving on high frequency (1860):

(*a*) Set SEND FREQUENCY switch on low.

(*b*) Strap lugs 1 to 7; 2 to 8; 3 to 5; and 4 to 6.

Interconnection of the TH–1/TCC–1 and the MAR and RDZ is as shown on Figure 1. Connection from TH–1/TCC–1 to teletypewriters are the same as previously used. (See Figure 1.) *8/1/46* ←

MODIFICATION OF BD–100 SWITCHBOARDS AND TYPING REPERFORATORS

This modification provides a *receiving only control circuit* for simplex operation with the 19 type set when used in conjunction with the BD–100 switchboard. The purpose of the circuit is shut off a reperforator while transmitting from the 19 set tape transmitter and to automatically restore it to a receiving condition when transmission ceases.

The relay and added wiring details for the modification of both a-c and d-c operated release magnet circuits are shown in figure 1. The details for modifying the different circuits are as follows:

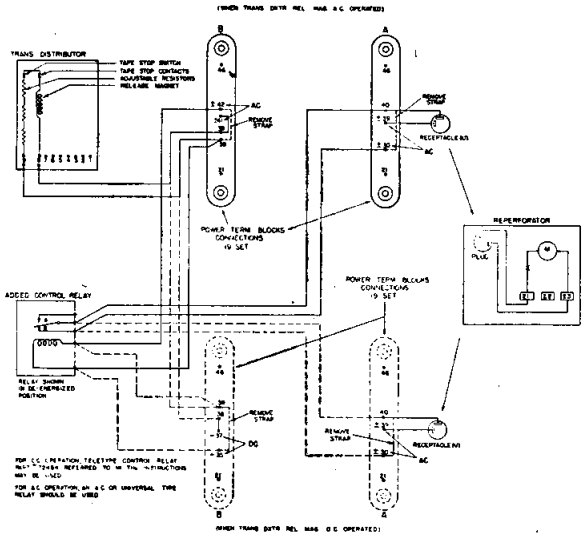

FIGURE 1.—Wiring details for reperforator control modification.

(A) *A-C operated release magnet circuit:*

1. Connect the coil windings of an a-c or universal type relay across terminals 38 and 42 on block B after removing strap.

2. Connect the normally closed contacts of the relay (A and B) across terminals 30 and 40 on block A after removing strap.

(B) *D-C operated release magnet circuit.*— A motor control relay assembly part No. 72484 will be found in the left rear corner of the motor base of the type 15 printer. This assembly is not in use so it can be wired in for this modification in either its present location or in some convenient place under the 19 set table.

The procedure for the change in the d-c circuit is as follows:

1. Connect the coil windings of the relay assembly No. 72484 across terminals 35 and 39 on block B after removing strap.

2. Connect the normally closed contacts of the relay (A and B) across terminals 30 and 40 after the removal of the strap.

(C) *Non-relay operated reperforator.*— There is a great possibility that a number of the reperforators in the field are not relay operated. It is therefore suggested that in these cases the added control relay contacts be used to short the tongue (T) and marking (M) contacts of the reperforator 255 relay instead of controlling the motor.

The modified circuit operates in the following manner: Transmission from the 19 set tape transmitter causes closure of the tape stop switch (tape arm) and the tape stop contact (sixth pin). This closes the magnet circuit and the control relay energizes. The contacts of the relay which are normally closed now open. These contacts are acting as a single pole switch in the power line to the reperforator motor receptacle, consequently the power to the motor is cut off and the repreforator remains unoperative. This condition is maintained until the transmission terminates and then the system returns to normal.

REMARKS

1. The current in the release magnet circuit is ample for the operation of both the release magnet and the added control relay so it will not be necessary to make any resistance changes in this circuit.

2. It is obvious that under this modification keyboard operation of the 15 set will not cut out the reperforator. Moreover this feature was not considered to be a liability since tape tending will be the normal procedure. *10/1/46*

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TELETYPE LETTER

See article titled "TELETYPE LETTER TO ALL SHIP'S AND STATION'S" on page GEN: 77 of the publication.

10/1/46

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PROCUREMENT SOURCE OF TELETYPE-WRITER SPARE PARTS

The following is quoted from BuShip's Letter UL–955CX–8950 dated 10 July 1946. It supersedes the article on page MISC:7 of this bulletin.

"Effective at once, all activities shall follow the plan outlined below for the procurement, stocking, and distribution of teletype spare parts and spare parts of AN/TGC–1 package units:

(a) Activities east of the Mississippi River shall forward requisitions for all teletype spare parts (regardless of whether or not they are listed in the Army Signal Corps SIG–5 Catalog) to the Officer in Charge, Electronics Control Center, Naval Supply Depot, Bayonne, New Jersey.

(b) All continental naval activities west of the Mississippi River shall forward requisitions for all teletype spares directly to the Officer in Charge, Electronics Supply Branch, Naval Supply Depot, Oakland, California.

(c) All naval activities in the Pacific Ocean Area shall forward requisitions to the Requisition Control Unit, Commander, Western Sea Frontier, San Francisco, in accordance with established procedures. After processing by CWSF, requisitions from that area will be forwarded to the Officer in Charge, Electronics Supply Branch, Naval Supply Depot, Oakland, California. Attention is invited to the fact that *no* shipments of electronics material shall be made to any West Coast activity for transshipment to the Pacific Ocean Area without prior clearance from Commander, Western Sea Frontier. The symbol "WE" immediately following the basic requisition number will indicate that the request has been processed by Commander, Western Sea Frontier, and that shipment is authorized.

(d) The Electronics Control Center, Naval Supply Depot, Bayonne, New Jersey, and the Electronics Supply Branch, Oakland, California, will stock items listed in the SIG–5 Catalog, and will supply direct to requisitioning activities all items which may be in stock. The items not in stock which are in SIG–5 will be extracted by Oakland or Bayonne, as the case may be, to the Office of the Chief Signal Officer, Storage and Issue Agency, 150 South Broad Street, Philadelphia; and the Storage and Issue Agency will in turn place the order on Chicago Signal Depot or Sacramento Signal Depot, depending upon the ultimate destination of the material.

(e) Requests for items not listed in the SIG–5 Catalog will be forwarded by ECC Bayonne or ESB Oakland to the Navy Purchasing Office, Chicago, Illinois. ECC and ESB are authorized to maintain adequate, but not excessive, stocks of items not listed in SIG–5, but for which there has been demonstrated a recurring demand. In submitting requisitions for such parts, requiring activities should clearly identify the material requested by the proper teletype part number, in addition to the required nomenclature. They should also show the name and model number of the equipment for which the part is required and whenever possible, the name of the catalog or other publication from which the part number and nomenclature were taken. Stocking activities should, as a temporary measure, and until the assignment of standard stock numbers, identify such parts by local stock numbers similar to those indicated for parts listed in Section 3 of the Electronic Materials cross reference published by ECC Bayonne, Edition #7.

(f) In urgent cases, under certain circumstances, CWSF may choose to pass supply action direct to NPO Chicago, S & I Agency, Philadelphia, or BuShips, depending upon the urgency and type of material involved.

3. (a) The use of standard BuSanda requisition forms is mandatory; and special, locally prepared forms are not authorized. The basic requisition number is to be assigned by the activity requesting the material; and it is necessary that this number be maintained throughout the flow of papers covering supply action. Reference to this basic requisition number should be plainly indicated on shipping containers and associated shipping documents.

(b) When direct shipment of material to the forward area or fleet vessels has been requested by ESB Oakland, the Commander, Western Sea Frontier is to be advised of sub-

sequent action taken, which will include shipping data for each item involved. In an effort to reduce unnecessary paper work, information copies of such correspondence need not be addressed to Oakland or to ECC Bayonne. Once an item has been passed to another activity, and the originator (and ComWesSeaFron, in the case of requisitions from the POA) has been advised, ESB Oakland and ECC Bayonne should consider their supply action to be complete and the folder filed, except where other uncompleted items are involved. In each case, when passing supply action to another agency, the new supply point should be informed that the basic requisition is to retain its original identification, so that any necessary follow-up may be facilitated.

"4. It is directed that all activities cease requisitioning of 'coded items' from Navy Purchasing Office, Chicago, inasmuch as these items cannot be classified as spare parts. Requisitions for such material should be forwarded to the Bureau of Ships via normal channels (i. e., via CWSF, Oakland, or Bayonne, as appropriate), together with a letter justifying the request. 'Coded items' are subassemblies, such as covers, rectifiers, tables, keyboards, etc. Teletype 'coded item' numbers are designated by a prefix of two or more letters, except in the case of covers, which are prefixed by 'C' only. Examples are C105 Covers, MU–4 Motor Assemblies, XRT–119 Tables, REC–29 Rectifiers, BP 93/105 Typing Units, BK–24–FX Keyboards, etc. They are readily distinguished from teletype piece parts, since piece parts are identified by numbers only, such as Washers—97306. (Note: This latter item appears in SIG–5 as 4T97306, and in Edition #7 of the New York Stock Catalog as AL–16–TE–97306.)

"5. Attention is invited to the fact that the Western Union Package Unit, known as the AN/TGC–1, is a Signal Corps item; and the stock numbers of spare parts for this unit are listed in the SIG–5 catalog. Copies of the Signal Corps SIG–5 catalog may be obtained by requesting BuShips Code 253 for shipment." *12/1/46.*

TELEPHONE HANDSET HOLDERS

Two telephone handset holders designed especially for naval shipboard use have been distributed in quantity to Electronic Supply Offices for use with all applicable shipboard electronic installations. One of these carries the Navy type Designation–51085; the other does not carry any Navy type number, but is identified only by the Federal Standard Stock Catalogue number 17–B–33793.

The 17–B–33793 handset holder should be used for all electronic installations which do not require holders that contain switches and terminal boards, (such as are contained in types –51009 and –51085). This holder has been shock-tested and adopted as a standard item for interior communication and electronic shipboard installation. It is anticipated that it will eliminate the possibility of handsets becoming detached from their holders under the shock of gunfire. Also, the 17–B–33793 handset holder is adjustable, and will accommodate practically all types of handsets now in use aboard Naval vessels.

The Navy type –51085 handset holder supersedes the Navy type –51009 holder. This holder, which contains a switch and terminal board, should be used only in vessels and spaces specifically designated by the Electronic Equipment Type Allowance Book, NAVSHIPS 900,115, or as otherwise directed. Sufficient quantities of these holders to fill authorized needs, however, have been distributed to the Electronic Supply Offices, and use of the superseded types –51009 and –51009-A holders should be discontinued.

Electronic requirement figures for the 17–B–33793 holders should be submitted to the Bureau of Ships in the usual manner, as followed for government-furnished electronic material. All future requisitions and requirement figures for telephone handset holders should specify either the type –51085 or 17–B–33793, or both, whichever choice applies. The procurement and use of all other types of holders are now to be discontinued. *10/1/47*

REPLACEMENT OF GRID-BIAS BATTERY IN MODEL UP EQUIPMENT

Difficulties are being experienced in obtaining replacements for the 22.5-volt dry-cell type battery Western Electric (Bell System) No. KS–7105. This battery supplies grid-bias potential in the 24-volt regulated rectifier W. E. X–63673A which is part of the Navy model UP terminal equipment. In order to alleviate the situation, the Bureau of Ships is now establishing initial stocks at Oakland and Bayonne of the equivalent Army-Navy type battery BA–230/U. This battery provides tapped voltages of 3, 4.5, 6, 9, 10.5, 16.5, and 22.5. A voltage of 19.5 may be obtained if desired by connection to the 3- and 22.5-volt terminals, and other voltages may be obtained similarly. The lack of a 19-volt terminal is not considered important. *1/1/48*

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REPLACEMENT OF OBSOLETE AMPLIFIER IN TRANSMISSION MEASURING SET

The Western Electric 13A transmission measuring set and the Navy type CW–60036 set, as supplied with the Navy models UP and UN carrier control system respectively, for use where portable apparatus is required to measure received testing power, utilize a type 25A6 amplifier tube which is now obsolete. If replacements for this tube are not available from the normal sources of supply, a type 25L6GT/G tube can be substituted. In order to retain overall accuracy, calibration will be required if the tube is replaced, as substitution will introduce about a one-db change. Calibration should be made with a 1000-cycle source accurately adjusted so that it will furnish an output power of one milliwatt when fed into a load of 600 ohms. *1/1/48*

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→ PERFORMANCE OF RM AND CONVENTIONAL DRY BATTERIES

In certain types of batteries, either the Ruben-Mallory (RM) or the LeClanche (conventional sal-ammoniac), dry batteries may be used interchangeably, and are both procured and issued with this in mind. The length of service, however, provided by the RM battery is usually several times that of the conventional sal-ammoniac type. As a help to those requisitioning and procuring such batteries, so that some idea may be gained in advance of future replacement needs, comparative studies have been made of the expected lengths of life. The results of these studies are expressed as procurement and issue ratios, which are simply the ratios of the length of life of a given RM battery to the length of life of the approximately-equivalent conventional type. The ratios are expressed to the nearest whole number.

The ratios have been determined for a number of RM batteries having military applications and with a conventional counterpart. They are listed in the following table:

RM Battery Type	*Length of Service Ratio*
BA–1002	3
BA–1015A	2
BA–1028	4
BA–1033	3
BA–1035	2
BA–1036	2
BA–1037	2
BA–1038	5
BA–1039	4
BA–1040	6
BA–1203	1
BA–1208	3
BA–1210	3
BA–1211	2
BA–1222	1
BA–1246/U	[1] 3
BA–1043	2
BA–1048	1
BA–1049/U	5
BA–1053	5
BA–1059	3
BA–1063	5
BA–1080/U	[2] 2
	[3] 4
BA–1228	5
BA–1231	1
BA–1233	2
BA–1234	2

[1] If issued in place of BA–51; not applicable in all cases due to size.
[2] If issued in place of BA–70.
[3] If issued in place of BA–80.

The type BA–1247/U RM battery has no conventional or LeClanche counterpart. *4/1/48*

DEFECTIVE DRY BATTERIES

The Bureau of Ships has been advised that type BA–51, 67.5-volt dry batteries (navy type 19032), manufactured prior to 15 December, 1947, by the National Carbon Company (trademark "Everready"), may have defects which will reduce their service life. Notification was by Signal Corps letter SIGAI–5A4, of 5 February 1948.

In order to reduce to a minimum the operational failure of equipment using these batteries, it is recommended that issue and use of batteries of the type described, failing the following test, be avoided whenever possible:

(1) Connect a 2,000-ohm, 5-watt resistor across the battery to be tested.

(2) Read the battery voltage within 15 seconds after the resistor is connected. Use a voltmeter having at least 1,000 ohms-per-volt resistance.

(3) The battery voltage should be 63 volts or higher at the end of the 15-second test period for an acceptable battery. If the battery voltage is below 63 volts at the end of the test period, the battery is not suitable for use. *4/1/48*

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FRF FREQUENCY-SHIFT CONVERTER FIELD CHANGE NO. 1

ADDITION OF SHOCKMOUNTS FOR SHIPBOARD INSTALLATIONS

Equipment Affected.—All model FRF equipments which are to be installed in ships.

Purpose.—To reduce the amount of vibration and shock in the equipment when installed in ships. It is desirable that this change be made by the installing activity at the time of installation in order to obtain maximum performance from equipment.

Time Required.—Eight man-hours.

Material Required.—

6 Type C–2090 shockmounts manufactured by L. N. Barry Co., Cambridge, Mass., (furnished in kit).
4 Steel blocks, 2″ x 2″ x ¾″ (furnished by installing activity).
2 Steel blocks, 2″ x 2″ x ⅝″ (furnished by installing activity).
4 Diagonal steel plates, 4″ long on each leg and 1/16″ thick (furnished by installing activity).
6 Size ⅜″-16 bolts, 1½″ long (furnished by installing activity).
Black paint (furnished by installing activity).

Tools and Instruments Required.—

Welding equipment and rods.
Portable grinder.
Electric drill.
5/16″ twist drill.
⅜″-16 tap.
Tap wrench.
Center punch.
Hammer.
Socket wrench to fit head of ⅜″-16 bolts.
Small paint brush.
Hand hacksaw and blade.
3-ft. steel folding rule.
File, 12″ flat bastard.

General.—These kits are available upon requisition to the Naval Supply Depot, Mechanicsburg, Pa. The kits were received at that activity on BuShips S. O. 99914, dated 16 October, 1947.

Routine Instructions.—When this field change has been completed, personnel making the change shall:

(1) Record the completion of the change on the Electronic Equipment History Card, NAVSHIPS 536, and enter the completion date on the Field Change Record Card, NAVSHIPS 537.

(2) Fill out and mail the self-addressed Electronics Field Change Report Card, NAVSHIPS 2369, which is included as a part of the field change.

(3) Insert one copy of this field change bulletin in the front of each FRF instruction book, NAVSHIPS 900,208. *4/1/48*

783528°—48——5

REPLACEMENT OF ELECTRONIC TIMERS IN NAVY MODEL UF TELETYPE EQUIPMENT

See article on page AN/FGC–1 : 1, entitled "Replacement of Electronic Timers in Navy Models AN/FGC–1, AN/FGC–1A, AN/FGC–1B, and UF Teletype and Tone Equipments." *4/1/48*

●

RADIO-TELETYPE REPEATER

The following is a suggestion received from the industrial manager of the Seventh Naval District. Designed by Mr. R. W. Ekis of that activity, it covers a simple method of constructing a radio-teletype repeater capable of accepting a neutral d-c output from a frequency-shift-keyer receiver-adapter and repeating this signal into a single send/receive loop, and capable of accepting a signal from the send/receive loop and repeating it through to a frequency-shift-keyer. Through the arrangement shown, the incoming signal from the f-s-k receiver-adapter does not repeat back to the keyer on the send side, and the use of a single send/receive loop teletypewriter on a two-way radio circuit is permitted, with operation on a simplex basis.

The Bureau of Ships has procured standard repeater equipment to perform the function of this simple repeater and other functions as well. This equipment is known as the Navy Model PM Teletypewriter Repeater. Occasions may arise, however, when conditions would warrant the construction of the unit described in the following paragraphs as an interim or emergency measure. The suggestion is passed on to the field, therefore, to be used wherever and whenever it may become desirable.

Description of the radio-teletype repeater.—The RATT Repeater allows the operation of duplex radio-teletype into one- or two-wire simplex. It consists primarily of three relays (Western Electric Co. 255–A), a bias meter, a model 10 rectifier, and a current-regulating resistor, all mounted on a chassis 4 inches wide, 4 inches deep, and 12 inches long.

This repeater unit was designed to allow the operation of radio-teletype with existing station equipment, thus eliminating the necessity for the terminal machines that are generally used. This also allows any station in the local network to use radio-teletype directly, with the existing switchboard or concentrator system, and eliminates the necessity for relaying radio-teletype messages between the central station and stations not equipped with radio-teletype by the use of the regular calling procedure.

Theory of operation.—A transmitted signal from the station coming into the switchboard or concentrator is sent through the "mark" winding on relay 1 and on through the contacts of relay 2. This signal activates relay 1, opening and closing the contacts, and thus keying the FSA line and transmitter. The signal received from the switchboard has no effect on relay 2, since it goes through the contacts which are closed on the steady marking signals from the model FRF converter.

When a radio-teletype signal is being received, the FRF keys both relay 2 and relay 3 as previously stated. (The line from the switchboard goes through the contacts of relay 2.) When the FRF keys relay 2, it opens and closes the switchboard circuit, keying the machine that is patched into the switchboard. To avoid keying the transmitter with the received signal, relay 3 is used. The winding of relay 3 is in series with relay 2, and consequently both are keyed at the same time by the FRF signal. The contacts of relay 3 are wired so as to short out the line to the FSA on the spacing impulses; thus, the circuit to the FSA is kept closed at all times while a signal from the FRF is being received.

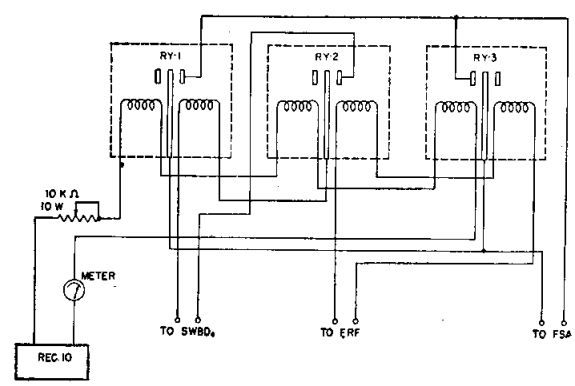

FIGURE 1.—RATT radio-teletype repeater.

This repeater has been built and given a thorough test. It keys equally well by hand or with automatic transmitter, but only a simplex operation is now permitted. In one test the station actually conducting the test was 70 miles from the radio transmitter and receiver, but performance was still entirely satisfactory. *4/1/48*

●

MODEL UN OR WESTERN ELECTRIC TYPE 42–A–1 CARRIER CONTROL SYSTEM RESISTORS

Instructions for modifying the navy model CW–50102 modulator in the model UN and Western Electric type 42–A–1 carrier control system were disseminated in BuShips letter, Serial R–976–555, of 15 May, 1944. This modification, which changed the model CW–50102 modulator to conform with the models CW–50102-A and -B, involved the installation of a set of four new resistors. With the receipt of recent requests for additional sets of these resistors, the Bureau of Ships is procuring new sets, providing for stocking sets at Naval Supply Depots to meet any further requirements that may develop for replacements of further modifications. It is requested that the Bureau be kept advised of any modifications to modulators at present unmodified.

One of the resistors in the set, the Western Electric type 18CB 955-ohm resistor, is erroneously referred to as W. E. type 19CA. Both have 955 ohms resistance, but the latter has a tap which is not used. Current procurements are of the 18CB type. *4/1/48*

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MODEL 14 TRANSMITTER–DISTRIBUTOR FIELD CHANGE NO. 1

REPLACEMENT OF MOTOR-GOVERNOR RESISTOR

Equipment affected.—All Model 14 transmitter-distributors having either No. 107151 or No. 6708 a–c, series, governed motors.

Purpose.—To enable the motors to maintain a set, governed speed of 2102 rpm during wide variations of input voltage. This field change should be accomplished at the earliest opportunity by maintenance personnel of the activity or vessel to which the affected equipment is assigned.

Time required.—One man-hour.

Material required (No kit).—Two 500-ohm resistors, teletype part No. 70722.

Tools and instrument required.—Type TE–50–A tool equipment.

General.—These resistors may be obtained from teletype spare parts or requisitioned from Ships Supply Center, Oakland, Calif., or Ships Supply Center, Bayonne, N. J.

Routine instructions.—When this field change has been completed, personnel making the change shall:

(1) Record the completion of the change on the Electronic Equipment History Card NAVSHIPS 536, and enter the completion date on the Field Change Record Card, NAVSHIPS 537.

(2) Fill out NAVSHIPS Form NBS-383, giving installation completion data, and mail it to the Bureau of Ships, Washington, D. C.

(3) Insert one copy of the Field Change Bulletin in the front of the model 14 transmitter-distributor instruction book. *4/1/48*

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NAVY FIELD CHANGE NO. 1–TT–23/SG FOR TELETYPE PANEL TYPE TT–23/SG

REPLACEMENT OF JACK WASHERS AND NUTS AND REWIRING OF METER CIRCUIT

Equipment affected.—All Teletype Panels Type TT–23/SG.

Purpose.—(1) To allow sufficient tightening of jacknuts and to eliminate shorting of jacks to panel. (2) To relocate the meter in the positive leg of looping circuit in order that it cannot be in any common return which might be caused by grounding of one side of the keying circuit of two or more equipments (when a common power supply is used). (3) To reverse the meter connections where required.

Time required.—Two man-hours.

Material required.—The following material is supplied with this field change:

24 Insulating bushings.
24 Flat insulating jack washers.
24 Jacknuts.
3′ Type SRIR–1 (7) hook-up wire (orange).
2 Instruction pamphlets.

Tools and instruments required—

1—½″ Spintite or socket wrench.
1—9/16″ Spintite or socket wrench.
1—Soldering iron and solder.
1—Pliers, long nose.
1—Pliers, diagonal, wire cutting.
1—⅜″ Spintite or end wrench.

Procedure.—Complete instructions for accomplishing this change are contained in the bulletin accompanying the field change kit.

Routine instructions.—When this field change has been completed personnel making the change shall:

(1) Scrap all parts removed from the Teletype Panel TT–23/SG.

(2) Make the proper entry on the Electronic Equipment Machinery History Card, NAVSHIPS 536, and enter completion date on Field Change Record Card, NAVSHIPS 537.

(3) Fill out and mail the self-adressed notification card, NAVSHIPS 2369, which is included as part of this field change.

(4) Destroy the original List of Parts and Circuit Diagram supplied with the equipment and these field change instructions. Replace with the new Instruction Pamplet supplied with this field change.

This field change can be obtained through the Electronics Officer of any Naval Shipyard or from the Electronics Supply Centers. *1/1/49.*

●

→"HISPEED B" DITTO PAPER FOR RADIOPHOTO USE

General Stores Supply Office, Philadelphia, is taking action to establish a supply of "Hi-speed B" ditto paper (13 by 19 inches, 24-pound basis weight), as a general stores item under stock number 53–P–12946–100. This paper is used with radiophoto equipment to provide immediate duplication of copy from direct-recording facsimile equipment.

An initial supply of 400 reams is being established at each of the General Supply Depots at Naval Supply Centers Norfolk and Oakland. When the issue rate and usage points can be determined, additional quantities will be purchased and stocked accordingly. *4/1/49*

●

MODIFICATION OF MODEL KY–43/URT FREQUENCY-SHIFT KEYER

The model KY–43/URT frequency-shift keyer is used for frequency-shift keying of the model TAB–5 radio transmitting equipment, and works well in most installations. In some installations, however, the desired 170-cps shift at 100 kc. is not obtained. This is due to insufficient grid excitation of the 6SA7 tube V–801. Individual differences in keyers and transmitter oscillators are enough to cause this to happen in those equipments affected.

This difficulty was corrected at the Naval Communication Station, Annapolis, Md., by changing resistor R–811 from 1,000 to 2,400 ohms. It is to be noted, however, that this alteration also changes the frequency-dial settings of the keyer. It is necessary to recalibrate these dials for all frequencies.

Personnel at the Annapolis station also report that the fine-control potentiometer R open-circuited when set in the extreme clockwise position. This was remedied by connecting a wire between the terminals of the moving-contact arm and the low-potential end of the potentiometer.

All KY–43/URT frequency-shift keyers should be checked for these troubles, and corrected if necessary. *4/1/49* ←

DANGER—

RADIOACTIVE ELECTRON TUBES

See page GEN:115

●

MODEL UP

FIELD CHANGE NO. 1

TWINNING OF TELETYPE CHANNELS

Equipments affected.—All Model UP single-sideband voice-frequency terminal equipments presently in the field and the equipments being made available on Contract NOBsr-39292.

Purpose.—To provide for twinning teletype channels without interruption of the receive loop circuits when twinning channels in one direction. This will obviate necessity for twinning both ends of the radio circuit simultaneously.

Time required.—Two man-hours.

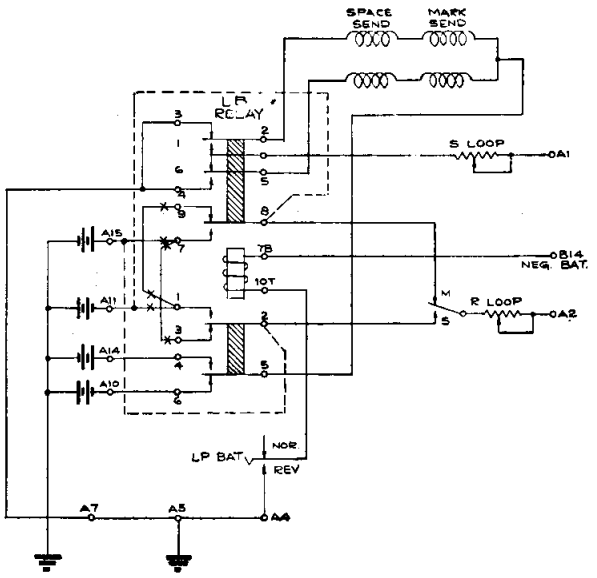
Material required.—No special tools, equipment, or wiring are required.

Procedure.—The wiring of each TTY channel in the Model UP SSB terminal equipment, as shown on WECo., schematic diagram ES-712878 Sheet No. 1, provides a polarity reversing feature for both the send and receive loop circuits. There is no necessity for providing a polarity reversing feature on the receive TTY loop circuits. However, on the send TTY loop circuits this feature is necessary in order to permit twinning of the SSB TTY channels. Since the "LP NORM-REV" switch, located on the marking detector panel of each TTY channel, reverses the polarity of both the send and receive TTY loop circuits, it requires that when channels are twinned, both ends of the radio circuit must twin the channels simultaneously. This in many cases is not desired or is impractical to accomplish. In most cases it is desirable to twin channels in one direction and operate the channels normal in the other direction. The following simple change of connections on the terminals of the "LB" relay, one located on each marking detector panel, will prevent interruption to the receive loop circuits when twinning channels in one direction:

Refer to attached schematic diagram Figures 1 and 2 to perform the following changes:

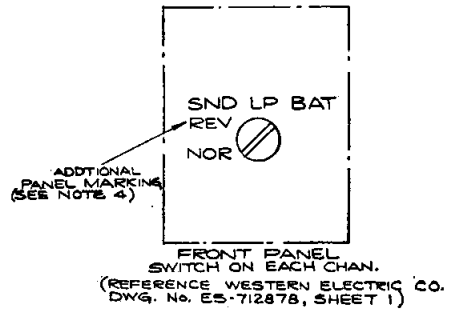
1—Remove strap between terminals 1B and 9T.

2—Remove strap between terminals 7T and 3B.



NOTES:

1. REMOVE STRAPS BETWEEN TERMS 1B-9T & 7T-3B
2. REMOVE POS. BAT. LEAD FROM TERM. 3B, RECONNECT TO 2 B.
3. REMOVE NEG. BAT. LEAD FROM TERM 1B, RECONNECT TO 8T.
4. REDESIGNATE "LP BAT" ROTARY SWITCH ON EACH MARK CHANNEL AS SHOWN.
5. EXISTING WIRING ————————
6. MODIFICATION WIRING - - - - - - -
7. DISCONNECT WHEN MODIFIED "X"



FIGURES 1 and 2.—Modification to Model UP single sideband terminal equipment loop battery relay.

3—Remove the positive battery lead from terminal 3B and reconnect to terminal 2B.

4—Remove the negative battery lead from terminal 1B and reconnect to terminal 8T.

5—Redesignate the "LP BAT" switch on the front panel of each of the six marking detector panels, by stenciling to read "SND LP BAT".

General.—Additional frequency diversity action provided by twinning teletype channels between stations employing single side band radio circuits over that normally obtained with the "Double Modulation Diversity" equipment employed in the Model UP, will decrease the radio circuit outage time during adverse circuit conditions. The advantage of this modification is more desirable than the existing receive loop current reversing feature.

Modification can be effected easily by station personnel during a regular weekly maintenance period.

Routine.—When a field change has been completed, the responsible technician should make sure that the person completing the field change follows the routine given below:

1—It is requested that NavShips 383 be filled out to give installation data and mailed to the Bureau.

2—Records the field change on the "Record of Field Changes" NavShips 537. If serial numbers for the Model UP are not assigned it is requested that the Bureau be advised so that assignment can be made. *7/1/49*

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MODEL UP

FIELD CHANGE NO. 2

SWITCHING TELEPHONE TERMINATING CIRCUIT FROM TWO-WIRE TO FOUR-WIRE OPERATION

Equipment affected.—All Model UP single-sideband voice-frequency terminal equipments.

This field change has been distributed in bulletin form —NavShips 98166—to all activities concerned. It is available, if required, by → writing the Bureau of Ships, code 929. *1/1/50*

●

ALIGNMENT AND MAINTENANCE OF LINK 11UF/12UF FM RECEIVERS

Many Link (11UF–12UF) FM receivers in the field have been found to be improperly tuned, thus losing many of the advantages of FM reception and greatly reducing the range.

A method of alignment which has proven itself in practice will be outlined in "step by step" progression. No signal source other than an FM transmitter is necessary. The instruments and tools needed are as follows:

1—0–1 d-c milliammeter.

2—0–100 d-c voltmeter.

3—50–0–50 d-c galvanometer or microammeter.

4—Non-metallic "screwdriver" (this may be a neutralizing tool).

Two types of instruments incorporating the above meters, mounted in a small portable oak case are available. They are Link Type 1288 and 1617. (They may also be used for the transmitter adjustment and Type 1617 includes a wavemeter.)

The following tuning procedure is recommended:

1—Allow a 15-minute "warm up" period.

2—Using the 0–100 d-c voltmeter as an indicator, carefully adjust the oscillator trimmer T9 to maximum voltage, by taking a reading between the condenser shaft and ground. This should be about 60–80 volts. No signal is necessary for the adjustment. This completes oscillator tuning.

3—Plug the 0–1 milliammeter into jack T5A (J1 in mobile receiver) which is first limiter grid. Use a fairly strong signal of the exact frequency and tune T1 (antenna trimmer), T2 (r-f stage), T3B, T4B and T5A for maximum reading of the 0–1 milliammeter.

4—Plug 0–1 milliammeter into jack T6A (J2) which is second limiter grid and tune T6A for maximum reading using fairly strong signal.

5—No signal used. Visually set the primary trimmer of T7 (discriminator) so that the factory painted red lines coincide. The primary trimmer is the one nearest the 6AC7 tube. Should the red line be missing, set the trimmer midway in its travel as any misadjustment of the primary may be compensated for by the secondary tuning. This completes the primary tuning of the discriminator.

6—Use a fairly strong input signal. Plug the galvanometer into "Balance" jack. Tune the secondary trimmer of T7 so that the galvanometer reads "zero". This may be checked by cutting off the input signal in which case the meter will read several divisions off "zero". The meter should return to "zero" when the same input signal is reapplied. The tuning of the discriminator (T7) is now complete and no further adjustments need be made.

7—To obtain the utmost in performance it is necessary to realign T1, T2, T3B, T4B and T5A using a very weak input signal. Plug the "zero center" galvanometer into T5A (J1) and tune all these carefully for maximum deviation.

8—Still using a very weak signal plug the 0–1 milliammeter into jack T6A (J2) and tune for maximum deflection. Sometimes the added sensitivity of the galvanometer may be taken advantage of in this jack but unless the signal is very weak it will go "off scale."

9—Setting the squelch is the final adjustment. It is plainly marked "squelch" and is located directly below T10. The proper adjustment is slightly beyond the point at which the rushing noise stops, and it must be adjusted without any input signal. The receiver is now properly tuned.

The equipment should be retuned at weekly intervals for a month until it has heat cycled and settled down. Thereafter semimonthly tuning is adequate.

Always have the motor in the vehicle operating at a "fast idle speed when adjusting mobile stations.

Two grounds are advisable in vehicular installations. One should be one-half inch copper braid running from the mobile station ground to the car battery cable ground.

It is advisable to note that T2 and T9 are "calibrated" from one to ten so their approximate frequency can be interpolated from the position of the red line marked on the condenser shaft. This reading (expressed in megacycles) is determined from the second numeral of the frequency. Sample settings are as follows: 36.140 Mc, six; 38.300 Mc, eight; 30.300 Mc, zero; etc.

Should a signal generator be used for alignment, let it warm up for an hour and zero beat it frequently against a signal of the known proper frequency.

In addition to the usual test of tubes in a tube checker try them in an equipment which is known to be operating correctly and discard any which prove defective. This is of paramount importance.

Other things being equal, antenna height is the deciding factor in 30–40 Mc communication. Strive for "in the clear" antenna locations in both fixed and mobile stations. It is always well to locate the fixed station antenna in a high electrically quiet location and remote control the station itself.

Remote controls require an a-c source (60 watts at 110 volts) and a telephone pair. They will operate the fixed station at distances up to twelve miles. Any number can be used and they furnish complete operation (transmitting and receiving) and occupy much less space than the fixed station.

Motor (or other) noise should be eliminated

exactly as if an AM installation were to be made. A test may be made by using so weak a signal that it will only partially quiet the receiver and then listening with and without the noise. The ideal, of course, is to be able to detect no difference. *7/1/49*

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MODEL YA–1/YA–2 RADIO LOCALIZER MODIFICATION KIT MX–850/UR

The Bureau has made arrangements for the conversion of all operational radio localizers (Model YA–1 or YA–2) to operate simultaneously voice and range signals. This is accomplished by the installation of modification kit MX–850/UR.

Standard Navy YA–1 and YA–2 localizer facilities after modification will simultaneously transmit the conventional beam pattern (A and N) localizer signals and voice-modulated signals. The simultaneous operation is accomplished by the use of two transmitters operating on frequencies which differ by 1020 cycles. The transmitter which furnishes the r-f power for the range signals is known as the side-band transmitter. The other transmitter furnishes r-f power for the voice channel in simultaneous operation and is known as the carrier transmitter. The system is unique in that the loop radiators are used to radiate both sources of r-f energy, 1020 cycles apart in frequency, which "beat" together in a receiver to give a difference frequency of 1020 cycles audio signal. A radio-frequency transformer capacitor combination is connected so as to permit feeding the loop uprights in phase with the carrier transmitters r-f energy which is radiated to produce a circular pattern. The loop radiators are simultaneously fed in series with the side-band transmitter r-f energy which produces the conventional figure-of-eight patterns for range operation. The broadcast antenna is used for voice operation when either of the transmitters are used singularly as a standby transmitter.

The functions of turning the transmitters on and off, setting up either transmitter for stand-by operation, turning the obstruction lights on and off, signaling for intercontrol point communication, signaling prior to voice transmission, and for voice modulating either transmitter are all under the control of an operator at either the local or remote control positions.

By dialing one or two digit numbers on an aumomatic telephone-type dial which is a part of the local and remote control units the transmitters may be set up for simultaneous operation, or either one of the transmitters may be used alone as a nonsimultaneous radio localizer.

The parts supplied with this kit were purchased on Contracts N5sr–10575 and NOBsr–39027. The Bureau has made contractual arrangements with the Civil Aeronautics Administration for the installation of these kits. Several facilities have now been converted and the remaining units are scheduled for conversion within the next few months. *7/1/49*

●

WIRE REPLACEMENT IN MODELS 15 AND 19 TELETYPEWRITERS

Mr. Fred W. Homad and Mr. Frank M. Orsborn of the Puget Sound Naval Shipyard have submitted a beneficial suggestion for the Models 15 and 19 teletypewriters. The suggestion was designed to eliminate some servicing, and permit more reliable operation of the equipments.

The suggestion recommends that on Models 15 and 19 teletype machines the existing solid wire connection from point #4 on the line relay mounting block to the 400-ohm resistor be removed and a stranded wire put in its place. The existing solid wire connection becomes loose, broken, or develops a high-resistance soldered joint due to the vibration of the machine, causing grables and disruption of communications on the circuit.

The trouble caused in these instances most often appears only when the machine is operating. Thus, due to the complex nature of a teletype machine circuit when operating with a case of intermittent trouble, this fault is a very difficult thing to trace.

Several such cases have arisen at this station, and upon contact with teletype repairmen at

other stations it has been found that they also have had the very same trouble with their machines. The recommended flexible connection will serve to cushion vibration between the two points and help prevent trouble from developing there. *7/1/49*

●

BATTERIES OF STOCKED ELECTRONIC EQUIPMENT

Present instructions require that dry batteries be removed from all stocked electronic equipment. Equipment now in stock, particularly electronic test equipment, should be checked to prevent damage from deteriorating batteries. Naval supply activities should test all removed batteries. Good batteries should be placed in stock, and defective batteries should be disposed of as scrap.

All new test gear is procured without batteries. When a piece of equipment is issued by a supply activity, that activity should supply tested batteries from stock. *7/1/49*

●

AVAILABILITY OF "TIMEFAX" PAPER FOR RADIO PHOTO USE

The Electronics Supply Office, Great Lakes, has assumed control of a supply of "Timefax" paper (12″ by 18 1/16″) and has assigned the Class 16 Stock Number N16–P–2392–513. This paper is used with radiophoto equipment for facsimile direct recording.

The last procurement of "Timefax" paper by the Bureau, prior to transfer of control, was for 100 reams on Contract NObsr–43251. This paper was shipped on 19 May 1949 to selected supply points. *7/1/49*

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→CORRECTION TO FIELD CHANGE NO. 1— MX–802/MRC NAVSHIPS 98159

There are only two pages (one sheet) to this field change despite the page numbering which says that there are four pages. It should read page 1 of 2 and not page 1 of 4. *1/1/50*

●

MODEL TT–41/TXC–1B FACSIMILE EQUIPMENT FIELD CHANGE NO. 1

PROVISION OF HALF-SPEED MODIFICATION

Equipment affected.—All Model AN/TXC facsimile equipments which have not been modified to date. With this modification the equipment becomes a Model TT–41/TXC–1B.

Purpose.—To provide a half-speed modification for two-speed operation which will furnish increased definition and improved quality particularly under adverse communications conditions, and also to provide a more efficient mounting of the various components as compared to previously modified equipments.

Time required.—Approximately 12 man-hours.

Material required.—Kits complete with all necessary components, wire, instructions for making the change and spare parts consisting of one spare for each component, except the 12AU7 tube for which there are three spares, required to accomplish this field change are being shipped on Contract NObsr–44843 to the following activities:

Number of kits	
2	Radiophoto Unit, Washington.
2	Radiophoto Unit, San Francisco.
4	Radiophoto Unit No. 4, Pearl Harbor.
4	Radiophoto Unit No. 3, Guam.
2	Radiophoto Mobile Unit No. 1, Washington.
2	Radiophoto Mobile Unit No. 2, Washington.
6	Radiophoto Stock, Naval Gun Factory, Washington.

Routine.—When a field change has been completed, the responsible technician is to follow the routine below:

1. NavShips 383 is filled out to give installation data and mailed to the Bureau.
2. Record the field change on the "Record of Field Changes," NavShips 537. *1/1/50*

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MODIFICATION OF MODEL UN CARRIER CONTROL SYSTEM

(A) INCREASING SENSITIVITY OF THE "ADJUST BIAS" CONTROL AND CORRECTING INPUT IMPEDANCE MISMATCH OF DEMODULATOR CW-50124

1. The Bureau was advised by the Navy Communication Station, Annapolis as to modification of Demodulator CW-50124 to increase sensitivity of the "Adjust Bias" control and to correct input impedance mismatch as follows:

(*a*) The Demodulator Navy Type CW-50124 of the Model UN Carrier Control System Equipment is not entirely satisfactory because of decreasing sensitivity of the "Adjust Bias" control, P-1, at input levels below −6 dbm. The permissible input level range described in the Instruction Book for Demodulator Navy Type CW-50124, NavShips 900,816, is from −10 dbm to zero dbm. The optimum steady carrier input level recommended is −6 dbm. The "Adjust Bias" potentiometer, P-1, has a scale graduated from 0.0 to 10.0. P-1 should be set between 1.5 and 2.5 on the graduated scale to obtain 50/50 keying at normal steady carrier input levels between −10 dbm and zero dbm. This is an agreement with the general description given by the manufacturer in the instruction book. It has been found that the "Adjust Bias" control setting to obtain unbiased 50/50 keying is erratic at steady carrier input levels between −8 dbm and —10 dbm; and all control is lost at about −12 dbm. There is also no apparent reason why a very limited portion of the "Adjust Bias" control scale should be used.

(*b*) The setting of the "Adjust Bias" control to obtain 50/50 keying varies in direct relation to the signal introduced to the grids of the 6SL7 noise biasing tube. R-8 and R-22 the resistances in series with the "Adjust Bias" potentiometer, P-1, are of such values that at low input levels it is impossible to adjust P-1 for the correct bias necessary to obtain unbiased 50/50 keying.

(*c*) Local tests of the UN equipment reveal that the levels described in the instruction book are those which can be taken with a 600-ohm Transmission Line Measurement Set. Since the Transmission Line Measurement Set is introduced into the circuit at points where there are normal through jacks, there is no other load shunting this meter. The readings of the input level to the load would be accurate however, if the load impedance were approximately 600 ohms. The load impedance into the Demodulator Type CW-50124 is not 600 ohms, though the input level comes from a 600-ohm filter output impedance. The input impedance of the demodulator is about 200 ohms or a mismatch of about three to one. Consequently any input level read by a Transmission Line Measurement Set across the input to the Demodulator Type CW-50124, is approximately 8 db high.

(*d*) To provide adequate range of the "Adjust Bias" control two alternatives are indicated: (1) To correct the mismatch and thus introduce more signal to the grids of the 6SL7 noise biasing tube, or (2) to change the value of R-8 to a higher value. Both were tried with excellent results as outlined below.

(*e*) The input transformer had a turns ratio of 1 to 35, with a 600-ohm resistance, R-27, shunted across the primary and 400,000 ohms load on the secondary. The reflected load of 300 ohms shunting the 600 ohms gave a 200-ohm load to the 600-ohm filter output. Experiment determined that the best match was obtained by disconnecting R-27 and moving the lead on secondary tap 7 to tap 3. Comparative measurements were taken with the modified and unmodified circuit, using an oscilloscope connected across the input transformer. Vertical deflection resulting from equal input levels gave a scale ratio of 17 to 7, showing a gain of 7.8 db. A further check was made with a 20,000-ohm db meter based on 6 milliwatts in 500 ohm; calibration of the meter indicated a conversion factor of plus 6.2 was necessary to give a correct reading in dbm. The following readings were obtained for the unmodified keyer:

Input T. M. Set—3.7 dbm Hi Z db meter $-18+6.2=-11.8$ dbm.

For the modified keyer:

Input T. M. Set—3.7 dbm Hi Z db meter $-9 + 6.2 = -2.8$.

The gain resulting from the modification was therefore 9 db. Matching the input impedance also resulted in moving the position of the "Adjust Bias" control from 2 to 3.3. Increasing the value of R–8 to 200,000 ohms brought the "Adjust Bias" control setting to 4.0 at an input of −3.7 dbm.

(*f*) As the instruction book states that an input level of plus 5 dbm is not to be exceeded because of danger to the varistors, tests were also made to determine Ip of the 6SL7 and the relative primary voltage of transformer INT as measured with an oscilloscope from the tape monitor jack. The results show a gain of less than 1 db at transformer INT, which should in no way overload the varistors at input levels to the demodulator of from −10 to 0 dbm. These results are shown in the table below, with the unmodified demodulator designated "A" and the modified demodulator designated "B."

Input Level T.M. Set dbm	Bias Adjust for 50/50 Keying		Locked Key I_p (Ma.) 6SL7		Relative Scope Monitor Jack	
	A	B	A	B	A	B
-3.5	2.1	4.1	0.14	0.165	10.0	11.0
-5.5	1.8	3.5	0.14	0.16	10.0	11.0
-7.5	1.7	3.0	0.13	0.15	10.0	10.5
-9.5	1.5	2.6	0.12	0.14	10.0	10.5
-11.5	1.3	2.2	0.12	0.14	9.5	10.5
-13.5	No. Cont.	2.0	----	0.135	----	10.0

(*g*) The following are the recommended modifications:

1. Disconnect the 600-ohm resistance, symbol R–27.

2. Change the secondary tap connection of the input transformer, symbol IT, from tap 7 to tap 3.

3. Replace the 150,000-ohm dropping resistor, symbol R–8, with a 200,000-ohm 2-watt resistor.

(*h*) The modified demodulator showed greatly improved performance of the "Adjust Bias" control to obtain 50/50 keying and an excellent output pattern on the oscilloscope.

2. In view of the general operating results obtained from the changes, the Bureau approved the modifications and recommends all activities using this demodulator perform the modifications. The modifications are optional and are to be made at the discretion of the electronics officer.

3. It is requested that a 2-watt resistor be utilized in replacing the 150,000-ohm resistor, symbol R–8, of subparagraph 1–(*g*) (3) above, for reasons indicated in part B below. Suitable replacement resistors that can be used are types RC41AE204J and RC41AF204J.

4. If these modifications are made, it is requested that all demodulators so modified be redesignated Navy Type 50124–A, and the letter "A" be added to the name plate, preferably by steel stamping or engraving. Inventories are to be changed accordingly. The following corrections are to be made in the Instruction Book for Demodulator Navy Type CW–50124, NavShips 900, 816:

(*a*) In section 9, page 9–3, figure 9–1, Demodulator CW–50124, Schematic Diagram, disconnect 600-ohm resistance R–27, change secondary tap connection of input transformer IT from tap 7 to tap 3, and change R–8 from 150,000-ohms to a 200,000-ohm, 2-watt resistor.

(*b*) Also make the changes indicated in paragraph (*a*) above to the Wiring Diagram for Demodulator CW–50124 in section 9, page 9–7, figure 9–3. It is requested, also, that instruction books be corrected to indicate changes, as appropriate, to the existing text. Corrections of instruction books should be made similarly for those modifications previously recommended, changing the CW–50103 demodulator to conform to CW–50103–A and the CW–50102 modulator to conform to CW–50102–A or B.

5. The Bureau is investigating a similar improvement to the demodulator CW–50103 or CW–50103–A. Information for preparing such a modification will be published when available.

(B) REPLACEMENT OF THE RESISTORS SYMBOL R–8 IN DEMODULATORS CW–50124 AND CW–50103

1. Prior to the above modification to the Demodulator CW–50124, the Bureau was advised

by the Naval Communication Station, Annapolis, of failures of the series resistor, symbol R–8. Indications were that the resistor was inadequately rated in wattage. Investigation with the manufacturer resulted in the following report from the Western Electric Co.:

"The resistance in question is the W. E. Co. 107A per D–164887A, a 150,000-ohm resistance, rated at 1 watt, with a trouble rating of 2 watts. As used in the demodulator at normal load and normal a.-c. line voltage (115 volt) this resistance dissipates 1.1 watt: at high line voltages (125 volt) it dissipates approximately 1.3 watt. Since the resistance is rated at 1 watt, this is technically an overload, but the resistance is conservatively rated and should not fail at the loads mentioned above unless there are other unfavorable conditions existing at the same time. We believe that your impression that the resistor originally furnished was of ½ watt rating comes about due to an error in the spare parts list for the demodulator; Bulletin NavShips 900,816, section 8, page 14 lists R–8 as a ½ watt resistance, but this is incorrect since R–8 is a 1 watt resistance per D–164887A."

2. The manufacturer has provided, subsequently, 1,200 replacement resistors, type RC40BF154J per specification Jan–R–11, Allen Bradley (a 2-watt, 150,000-ohm composition resistor, 5-percent tolerance). Six hundred of these were shipped to Naval Supply Depot, Bayonne, and 600 to Naval Supply Center, Oakland, on 21 May 1948. Western Electric Order 571639 applies, on contracts NXsr–79965 and NXsr–83392.

3. Whenever failure of this resistor occurs in demodulator CW–50124, it is recommended that one of the above 2-watt resistors be used for replacement. If failures have occurred consistently, then replacement at once is recommended to avoid further failures.

4. A 1-watt resistor, symbol R–8, in demodulator CW–50103, would prove inadequate similarly. It is recommended, consequently, that a 2-watt, 130,000-ohm resistor replacement be used as above. Suitable replacement resistors that can be used are JAN types RC42VF134J, RC40VF134J, and RC41VF134J.

5. It is requested that the following typographical errors be corrected in the instruction book:

(*a*) Correct NavShips 900,816 Parts List Section 8, page 8–14, resistor, symbol R–8, for demodulator CW–50124 to read "±1 percent, 1W" in lieu of "± 10 percent, ½ W."

(*b*) Correct figure 9–2, demodulator CW–50103, Schematic Diagram, page 9–5 of NavShips 900,816 to read "130 K" for resistor R–8 in lieu of "100 K."

(*c*) Correct Parts List section 8, page 8–6, resistor R–109 to read "±½ percent" in lieu of "±10 percent".

It is possible that the parts list for resistor R–8 of demodulator 50103 is similarly in error and should read "±1 percent, 1 W." *1/1/50*

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NONAVAILABILITY OF MAINTENANCE PARTS FOR ELECTRIC SPRAYIT COMPANY MOTORS

The Teletype Corporation has informed the Electronic Supply Office that maintenance parts for the TE106875 and TE107151 motors cannot be supplied, principally because tools and casting molds for these two motors have been scrapped. The parts that are affected are as follows:

Teletype Part No.	Description	SNS Stock No.
110 306	Bearing Lock plate.	N17–T–350012–219.
110 307	Armature	N17–T–350012–220.
110 308	Bolt	N17–T–350012–221.
110 312	Washer, spring	Not assigned.
110 314	Washer, felt	N17–T–350012–223.
110 316	Brush, cap	N17–T–350012–224.
110 323	Felt, retainer	Not assigned.
110 324	Felt, washer	N17–T–350012–225.
110 325	Felt, retainer	N17–T–350012–226.
110 326	Set screw	N17–T–350012–227.
110 327	Fiber bushing	N17–T–350012–228.
113 941	End shield	Not assigned.
113 943	Armature	N17–T–350012–390.
113 942	Field and shield	Not assigned.

Due to a quantitative supply of Sprayit motors in the Electronic Supply System, all activties are requested to requisition a replacement motor TE106875 SNS No. N17–M–350011–839 or TE107151 SNS No. N17–M–350004–512 instead of the above-listed maintenance parts. The inoperative Sprayit motors are to be cannibalized by all activities for maintenance parts.

As soon as stocks are exhausted, the Electronic Supply Office will replace all Electric Sprayit Company's motors with TE77953 motors, SNS No. N17–T–350004–850. *1/1/50*

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SCHEMATICS FOR RCU/RCT SERIES RADIO-PHONOGRAPHS

Shown on page DRAW: 18 and 19 are the schematics for models RCT, RCU, RCU–1, and RCU–2 radio phonographs. These are published here pending the reprinting of the instruction books for these equipments. *1/1/50*

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➡FACSIMILE TRANSCEIVERS MANUFACTURED BY TIMES FACSIMILE CORP. MODIFICATION TO INSTALLATIONS AND MAINTENANCE PRECAUTIONS TO ENSURE SAFETY OF PERSONNEL

Because of the presence of high voltages, as noted in the "Safety Notice" of the instruction books, during normal operation of the Model TT–41/TXC–1B and other transceivers manufactured by Times Facsimile Corporation, maintenance personnel are urged to exercise caution in performing maintenance work. The following measures are required to ensure adequate safety to personnel. These instructions apply to all Navy owned facsimile transceivers installed, or whenever installed in the future, as follows: Model TT–41/TXC–1B, TT–1/TXC–1, TT–1A/TXC–1, AN/TXC–1, AN/TXC–1A, AN/TXC–1B, FX, FX–1A, FX–1B, TT–66/TXC, Times Facsimile Corporation equipments RC–120, RC–120–A, and RC–120–B.

(1) All maintenance personnel are cautioned to read "SAFETY NOTICE" in instruction book TM11–2258 prior to performance of maintenance on equipment.

(2) Stencil on External Motor Cover "*CAUTION HIGH-VOLTAGE, TURN POWER SWITCH OFF BEFORE REMOVING COVER.*"

(3) Permanently install an insulated flexible ground lead in the cable form from the ground connection on the terminal strip adjacent to the motor to the bottom end bell of the motor. This ground lead shall remain connected during maintenance testing of the motor.

(4) Earth ground all equipment. *4/1/50*

●

TEST-TOOL SET AN/USM–3

A case has been reported of a technician attempting to open the case of the test-tool set while it is upside down. The name plate, of course, is on the top of the case and serves as a guide in opening the case. Furthermore, if the case is opened while inverted it will be difficult to lift and, if forced, will cause some of the pen type probes to crack.

In order to prevent a recurrence of this difficulty it is suggested that the word "BOTTOM" be stenciled on the bottom of the case.

The Bureau is extremely desirous of obtaining comments on the usefulness and applicability of the test-tool set. Since it was designed primarily for emergency use under battle conditions reports of trial repairs under simulated emergency battle conditions are solicited.

Please address comments, reports, suggestions, etc., to the Bureau of Ships, Code 983E. *4/1/50*

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FAILURE OF NOISE GENERATOR SG–23/U IN TEST-TOOL SET AN/USM–3

The Bureau has received some reports of defective noise generators in Test-Tool Set AN/USM–3. These units should be checked

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immediately upon arrival, with a fresh battery. If inoperative and incapable of being adjusted as described in paragraph 3 of Section 5 of NavShips 91146—(Instruction Book for Test-Tool Set AN/USM–3), the defective noise generator should be shipped to the Radio Frequency Laboratories, Inc., % the Inspector of Naval Material, Newark, New Jersey, together with a duplicate copy of the NavShips–383 failure report. This action should be recorded on the Bureau of Ships' copy of the NavShips–383 failure report. Information copies of any correspondence forwarding these units to the Inspector should be sent to the Bureau of Ships, Code 983E.

A similar procedure should be followed for any of the other probe type units in the test-tool set which are defective upon arrival.

Replacement units should be ordered in the usual manner since contractual replacements will be made into the supply system rather than to individual activities. *4/1/50*

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TELETYPEWRITER MOTOR REMOVAL SUGGESTION

The electronics shop at Mare Island Naval Shipyard has made the beneficial suggestion that a male and female line-cord plug be inserted in the Model M–14 teletypewriter motor leads where they pass behind the typebar comb. The connector is shown inserted in the motor leads in Figure 1. In Figure 2 the location of the plug is shown when the motor is in operating position. *4/1/50*

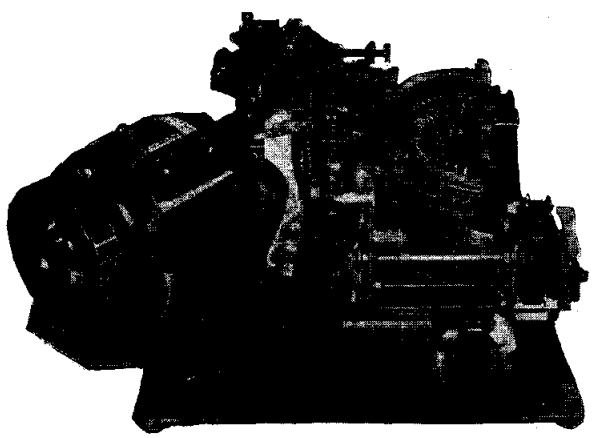


FIGURE 1.—Model M–14 teletypewriter showing plug in motor leads.

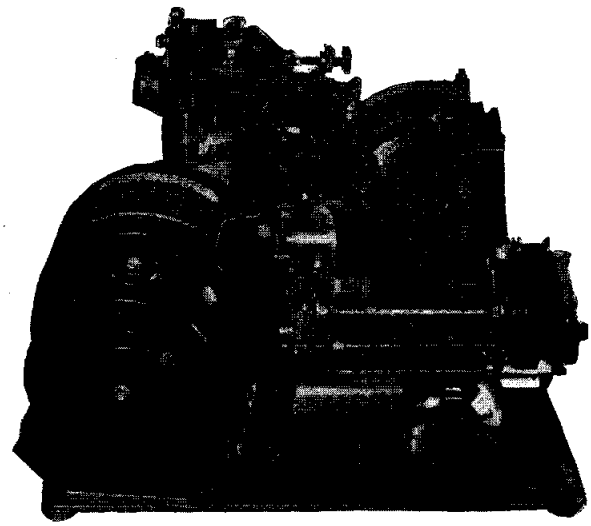


FIGURE 2.—Model M–14 teletypewriter showing motor in approximate operating position.

●

TELETYPE TEST ADAPTOR

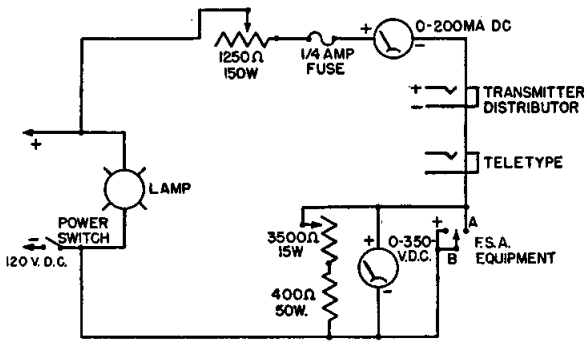
A beneficial suggestion for a d-c test adaptor to facilitate testing FSA keyers, FRA receivers, and teletype printers has been submitted by the San Francisco Naval Shipyard. This test adaptor provides for testing facilities where 120-volt d-c power is available, thus eliminating the need for a bulky and heavy rectifier unit.

Model 15 Teletype Equipments and Projector Equipments intended for shipboard use are designed to use d-c power furnished directly by the ship's generator room. Since the adaptor weighs only four pounds its portability and convenience are far superior to that of a suitable portable rectifier, which weighs about 45 pounds.

The adaptor is so designed that it may be plugged in directly to a 120-volt d-c line. It allows the servicing technician complete local

control and provides meter readings of all voltage and current being used by the teletype equipment. The local control feature of this adaptor eliminates the danger of energizing a circcuit that may involve other personnel or equipment.

In addition to the safety and convenience factors noted above, this adaptor permits considerable savings in time when servicing and testing teletype equipment. When used to test the FSA keyer, the adaptor eliminates the need for disassembling the plug of the keyer and the transmitter-distributor to get the desired signal. This signal, which should be of a specified voltage, may be regulated and measured by use of this adaptor. In this way the FSA keyer may



Test Adapter Circuit

be checked for operation at maximum and minimum signal input.

By using the stand-by switches, the adaptor may be employed to check the FSA keyer without the use of any signal source. This may be done by setting Switch No. 2 to "Stand-by" and setting Switch No. 1 to "Operate."

Previously, no test of the FRA Receiver could be made without the use of extensive makeshift wiring. By placing the transmitter-distributor in the circuit, the FRA Receiver may be checked for "mark" and "space" pulses with the test adaptor.

For additional checking a teletype printer may be jacked into the panel for monitoring; this also was not possible without the test adaptor.

By use of the adaptor, the teletype equipment may also be tested by feeding a minimum current to the magnets. This is a quick way to tell whether the machine is in proper adjustment or not. If adjustments are not correct, the machine will not operate correctly.

The adaptor permits checking the teletype machine while it is running for long periods of time. Thus constant readings of voltage and current in the circuit are possible and any changes of these values may be easily noted. *4/1/50*

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AUTOMATIC TELETYPE CARRIAGE-RETURN AND LINE-FEED ATTACHMENT

The Bureau of Ships has procured a quantity of kits manufactured by Teletype Corporation (part no. 105382). These kits have been assigned stock number N17–T–350004–341. They were designed to eliminate letter "pile-up" and line "over-lap" on those teletype printers operating over radio circuits wherein fading of the received signal might cause loss of the line-feed or carrage-return signal. Installation instructions are included with the kit. *10/1/50*

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NEW SWITCH SHAFTS FOR SB–82/SRR RECEIVER TRANSFER SWITCHBOARDS

The phenolic switch shafts of the SB–82/SRR receiver transfer switchboards have been breaking usually during installation. As a result, the Bureau has redesigned this shaft. The new shaft is of brass with a phenolic cam. These new shafts have been delivered and are available at ESO, Great Lakes, under stock number N 16–S–2650–3. Activities installing these switchboards should keep a supply of the new shafts on hand. New panels under procurement will be furnished with the new type shafts installed. *10/1/50*

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→ ADJUSTMENT OF NOISE GENERATOR SG–23/U

The contractor has informed the Bureau of Ships that many of the SG–23/U Noise Generators returned in accordance with previous instructions were simply not adjusted correctly and agrees that the instructions given in the instruction book for this equipment were somewhat ambiguous. Figure 5–13a, Buzzer Adjustment, Interference Generator SG–23/U from this instruction book is reprinted below as Figure 1 together with a revised procedure for information. Only those SG–23/U Noise Generators which cannot be made operable when these instructions are followed should be forwarded to the contractor. If, however, a unit does not remain operative, but requires constant readjustment, it should be forwarded as a unit which has failed, with the notation that the unit fails to keep in adjustment.

Interference Generator SG–23/U will not function when its BUZZER I–301 is out of adjustment. Readjustment of the buzzer can easily be made with AN/USM–3 TEST-TOOL SET equipment. The accompanying illustration shows the equipment used and a convenient method for making the adjustment. With this method the buzzer is energized through the screw-driver and the battery terminal and will buzz when the adjusting screw is turned to the correct setting.

Caution.—Pressure against the adjusting screw with the screw-driver bit will cause the buzzer to buzz at a false setting. Use very light touch with screw-driver.

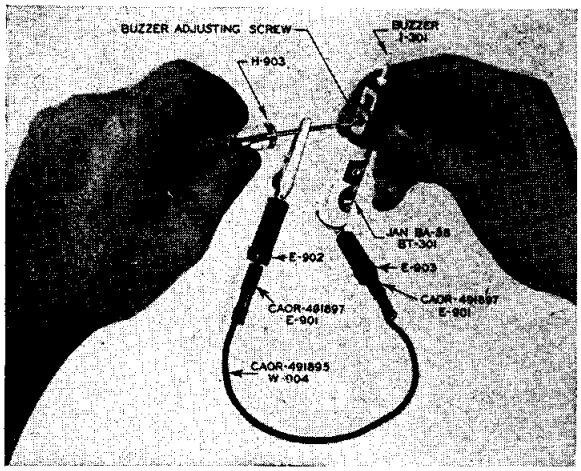

FIGURE 1.—Items required for and a method of adjusting noise generator SG–23/U.

TELETYPE COVER PAD RETAINING SPRINGS

The Teletype Corporation has discontinued manufacture of the following pad retaining springs which are no longer used on new covers or furnished as maintenance parts for old covers of the teletype equipment:

Teletype part No.	*Standard Navy Stock No.*
82404	N17–T–350006–533
82405	N17–T–350006–534
82406	N17–T–350006–967
82407	N17–T–350006–535
82408	N17–T–350006–536
82409	N17–T–350006–537
82410	N17–T–350006–538

The pads are now to be secured to the inside of the covers by means of an adhesive. This cement can be obtained under Stock Number N52–C–1142–675.

When the present stock of springs is depleted, these stock numbers will be cancelled. *1/1/51*

●

MODEL UN FIELD CHANGE NO. 1

Information has been promulgated which indicated that the bulletin for Field Change No. 1 to the Model UN was available. This modification was contracted for on an experimental basis and the Bureau of Ships does not propose to proceed with Field Change No. 1 modification to UN equipments in the field. The publications applicable to this field change, NavShips 98157, 91261, 91264, and 91267, have been printed in conjunction with the experimental work only and are not available for distribution to field activities. *1/1/51*

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MODIFICATION OF MODEL UN CARRIER CONTROL SYSTEM, DEMODULATOR TYPES 50103 AND 50103–A

1. Mare Island Naval Shipyard has proposed modification of Navy type demodulator 50103 which will (*a*) lower the minimum, or threshold, sensitivity to audio tone input signals and also produce a much more gradual range of adjustment of the ADJ SIG BIAS control, (*b*)

stabilize the input circuit impedance at approximately 600 ohms, (c) remove shunt loss caused by the ADJ GAIN control potentiometer, P2, and (*d*) in connection with (*a*) above, will greatly improve the sensitivity of this demodulator as follows:

(*a*) *Introduction.*—(1) On page MISC: 30 there is an article entitled, "Modification of Navy Model UN Carrier System." This article contains a description of a study made at Navy Communication Station, Annapolis, to determine the cause of certain unsatisfactory performance characteristics of the Navy Type CW–50124 Demodulator. It also recommends specific modifications to correct these unsatisfactory characteristics.

(2) The existence of these unsatisfactory characteristics has long been recognized at the Navy Communication Stations in the Twelfth Naval District. Accomplishment of the recommended modification has resulted in a substantial improvement.

(3) There are approximately thirty Navy Model CW–50103 Telegraph Demodulators in use on various Navy Model UN Communication Control Systems in the Twelfth Naval District. These demodulators also have several unsatisfactory characteristics. Due, however, to fundamental differences in the circuits of these two types of demodulators, the remedial measures recommended by Electronics Installation Bulletin No. 266 cannot be directly applied to the Navy Type CW–50103 demodulator.

(*b*) *Practical operating difficulties with Navy Type CW–50103 Demodulator.*—(1) Extensive operating experience with this demodulator used on Navy Model UN carrier telegraph channels in the Twelfth Naval District has shown that it is subject to the following operational difficulties.

(2) Operation of the ADJ SIG BIAS potentiometer, P1, is very unsatisfactory. Small changes in the position of the operating knob of this potentiometer near the lower end of its range produce large changes in the performance of the demodulator. That portion of the range above step 4 of this potentiometer knob is not useful at normal operating levels of audio input signals to the demodulator.

(3) The operation of this demodulator at input audio power levels below −6dbm is difficult, if not critical. Part of this difficulty is due to the unsuitable range of control of ADJ SIG BIAS potentiometer, P1. Instruction Book, NavShips 900,816, pages 1–3, states that this demodulator can be operated with input audio power levels as low as −10dbm. Our experience with these demodulators does not verify this statement.

(4) The input impedance of this demodulator is much less than 600 ohms, and is not constant. It varies both with the setting of the ADJ SIG BIAS potentiometer, P1, and with the setting of the ADJ GAIN potentiometer, P2. This fact makes it impracticable to use a bridging type of audio input power level meter, such as the Type TS 629/U for measuring input power level. This low input impedance also causes a waste of audio input power due to impedance mismatch since the driving circuits are of 600 ohms impedance.

(5) This demodulator is highly sensitive to changes in the level of the audio input signals upon which it is operated, particularly when these signals have passed through carrier telegraph sending and receiving channel filters. These filters cause a rounding off of these signals at the input of the demodulator. The function of the demodulator is to convert these rounded spurts of tone into square waves of DC output. For any given level of tone input signal within its operating range, this demodulator can be adjusted so that these DC output signals will be free from signal bias. If the input signal fluctuates in level, marking or spacing bias will appear in the output signal unless the demodulator is readjusted. Since fluctuations in input signal level appear to be inevitable in the operation of Navy Model UN carrier telegraph systems, frequent readjustment of the control knobs on the demodulators is necessary if the demodulator is not to introduce bias into the signals passing through it.

(*c*) *Investigation of operating bias on Tube VR.*—(1) The operating bias on the grids of the input tube, VR, of this demodulator is determined by the setting of the ADJ SIG BIAS potentiometer, P1. Electrical measurements of

the performance of this tube over a wide range of values lead to the following conclusions.

(2) Operation of tube VR can be changed from Class A, through Class B, and into the Class C region, by changing its grid bias from 0 volts to about −1.0 volt. These grid bias changes produce large changes in the amplification of tube VR, and hence directly determine the minimum audio input signal level to which the demodulator will respond. In general, the lower the grid bias on tube VR, the more sensitive the demodulator. The rapid change in this grid bias produced by rotating the knob of the ADJ SIG BIAS potentiometer, P1, is shown by the curve labeled Case 1, on Figure 1.

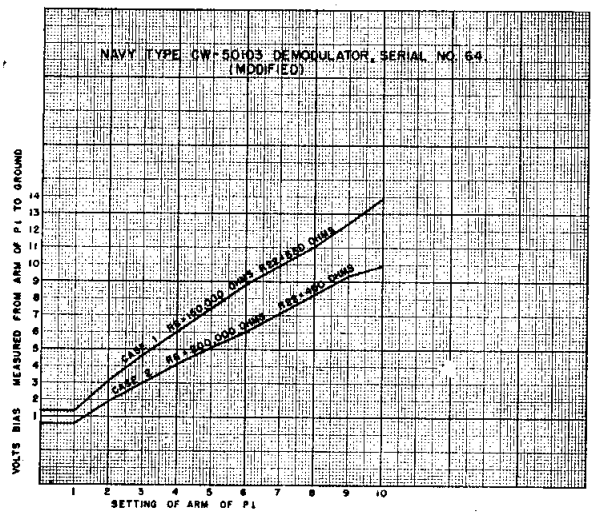

FIGURE 1.—Curves of volts bias vs. arm setting.

(3) Due to the relative magnitudes of the grid and plate voltage on tube VR, and also to the manner in which these voltages are derived from bleeders across the high voltage power supply circuit, small changes in the bias voltage produce relatively large changes in the net plate voltage. This contributes to make the change described in subparagraph (*c*) (2), above, occur very rapidly as the knob of P1 is rotated. Tube VR of the demodulator studied was found to be completely cut off for settings of P1 above step 4.

(4) The minimum practicable operating bias for tube VR, was found to be about −0.75 volt. This value permits tube VR to operate with fairly high gain providing reasonable sensitivity. If the operating bias is reduced below −0.75 volt, operation of the demodulator tends to become unstable allowing 60 cycle hum and noise to appear in the DC output wave.

(5) The curves of Figure 1 show the actual operating bias applied to the grids of tube VR, for the two following cases:

Case 1 represents the case in which this particular demodulator was found, in which:

R8=150,000 ohm, 2 watt carbon resistor.
P1=5,100 ohm, wire wound potentiometer.
R22=550 ohm, 1 watt carbon resistor.

Since the above description of resistors R8 and R22 does not agree with the specified values found in the instruction book, it is presumed that the original resistors provided in this demodulator had been replaced due to necessity for repairs in the field prior to commencing these tests.

Case 2, represents the conditions after certain substitute resistors were installed, as follows:

R8=200,000 ohm, 2 watt carbon resistor.
P1=5,100 ohm, wire wound potentiometer.
R22=400 ohm, 2 watt carbon resistor.

(6) This change, which is hereby proposed as a Field Change modification for the Navy Type CW–50103 demodulator, has considerably lowered the minimum bias on the grid of tube VR, as well as making the change in grid bias voltage much more gradual as the operating knob of the ADJ SIG BIAS potentiometer, P1, is rotated. This change will lower the minimum, or threshold, sensitivity of this demodulator to audio tone input signals, and also produce a much more gradual range of adjustment of the ADJ SIG BIAS control.

(*d*) *Investigation of input impedance.*—(1) In measuring the input impedance of the Navy Type CW–50103 demodulator several different conditions in the input circuit were studied. Case A refers to the input circuit arrangement shown in Figure 2, which is the factory wired condition.

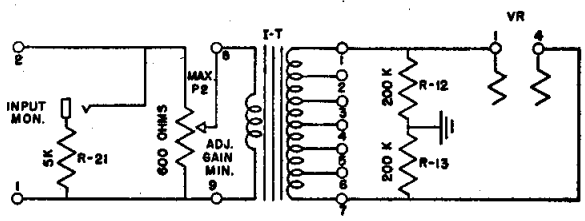

FIG. 2 CASE A

FIGURE 2.—Input circuit of demodulator CW–50103 as case A.

TABLE 1.—MEASURED VALUES OF INPUT IMPEDANCE FOR CASE A

Setting of ADJ GAIN, P2	Input impedance measured at 1,000 cycles	
	With AC power off (ohms)	With AC power on (ohms)
1	600	600
2	590	580
3	555	550
4	525	510
5	483	460
6	440	405
7	395	353
8	350	297
9	297	243
10	250	180
Maximum	217	146

(2) While taking the measurements recorded in Table 1, the grid bias voltages on tube VR were as shown in Case 1 on Figure 1. If the AC power is on, the input impedance *also* varies with the setting of the ADJ SIG BIAS potentiometer, P1. Impedance values shown in Table 1, with AC power on were measured with P1 set for a minimum bias of 1.35 volts. If the AC power is off, the setting of P1 has no effect on the input impedance. These data indicate that the tube VR is drawing grid current, hence loading the input circuit, as well as showing that the input impedance is far from constant.

(3) Careful observation of oscilloscope patterns, appearing at both the TAPE MON jack, and across the output load resistor of this demodulator under a variety of operating conditions, leads to the conclusion that the ultimate effect of the ADJ SIG BIAS control, P1, and the ADJ GAIN control, P2, are practically identical. The ADJ GAIN control, P2, is therefore unnecessary. This is verified by the omission of this control from the Navy Type CW–50124 demodulator.

(4) Removal of the ADJ GAIN control potentiometer, P2, from the input circuit of the Navy Type CW–50103 demodulator removes a shunt loss and raises the input impedance. Both of these increase the sensitivity of the demodulator.

(5) If the ADJ GAIN control potentiometer, P2, is removed, the effect of the input transformer, IT, can be examined independently. This transformer has turns and taps as shown in Figure 3.

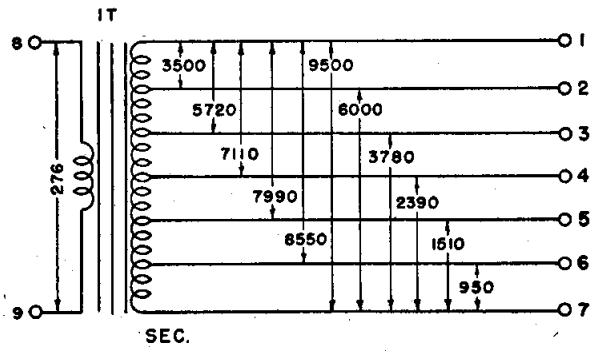

FIGURE 3.—Input transformer Western Electric type D–171691.

(6) If P2 is disconnected, and the secondary load resistors, R12 and R13, 200,000 ohms each, remain connected across the secondary of IT, the input circuit of this demodulator has impedance as shown in Table 2.

(7) Case B represents the condition in which P2 is disconnected, but the secondary loading resistors, R12, and R13, 200,000 ohms each, remain connected across the secondary of input transformer, IT. Table 2 exhibits the input impedance of this demodulator when the input circuit is connected as per Case B.

(8) Table 2 contains information from which the optimum arrangement of secondary taps and impedance ratio can be predicated. The criteria used were:

(a) The impedance reflected by the secondary load resistors, R12 and R13, into the primary circuit should be about 600 ohms. The impedance values entered in Table 2 assume that the grids of the tube VR do *not* load the

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TABLE 2.—INPUT IMPEDANCE FOR CASE B

Secondary taps in use	Turn radio	Impedance ratio	Secondary load resistors reflected into the Pri. Ckt. (ohms)	Measured impedance at 1,000 cycles AC power off (ohms)	1,000-cycle voltage across Sec. with constant E across Pri.
1–2	12. 7	161. 3	2490	1900	4. 8
1–3	20. 7	428. 5	935	850	7. 6
1–4	25. 7	660. 5	606	575	9. 6
1–5	28. 9	835. 0	480	463	10. 7
1–6	31. 0	961. 0	415	410	11. 3
1–7	34. 4	1185. 0	336	336	12. 5
2–7	21. 7	470. 9	850	800	8. 0
3–7	13. 7	187. 7	2, 130	1750	5. 1
4–7	8. 7	75. 0	5, 330	--------	--------

secondary circuit of transformer, IT. This assumption is contrary to the facts of any practicable operating condition. It is therefore necessary to select a secondary tap arrangement which will provide a nominal reflected impedance higher than 600 ohms. This nominal reflected impedance will then be reduced somewhat by the action of grid current in tube VR.

(b) The turn ratio selected should be as high as practicable in order to deliver the maximum signal voltage to the grids of VR.

(9) Study of the data of Table 2 in the light of these criteria narrows the choice down to secondary tap arrangements 1–3 or 2–7. Secondary tap connections 1–4, although delivering slightly more signal voltage to the grids of tube VR, was eliminated because of its low reflected impedances.

(10) Careful operating tests with secondary tap arrangements 1–3 and 2–7 indicate only minor differences between them. Tap arrangement 2–7 was finally selected when it was determined that the dynamic input impedance of the demodulator did not differ materially from 600 ohms, even over a considerable range of audio input tone signal levels. In this connection, it was observed that as the level of the audio input tone signals is increased, corresponding increase of the grid bias on tube VR, by manipulation of the ADJ SIG BIAS potentiometer, P1, is necessary to deliver DC output signals which will be free from signal bias. This increase of bias on tube VR, offsets to some extent, the higher signal voltage applied to the grids of VR. The net result of this process is that the grid current drawn by tube VR, does not in any case observed, reduce the input impedance of this demodulator below 600 ohms.

(11) Figure 4 shows the arrangement of the input circuit of the Navy Type CW–50103 demodulator which is known herein as Case B. This arrangement was finally selected as being the most suitable.

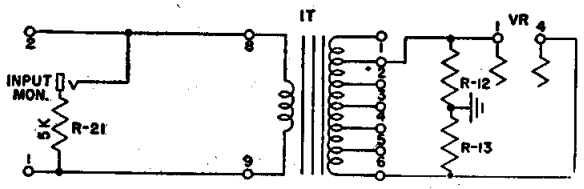

FIGURE 4.—Input circuit of demodulator CW–50103 as Case B.

(12) The input circuit arrangement shown in Figure 4 is hereby proposed as a Field Change modification for all Navy Type CW–50103 demodulators. Its adoption will result in the following improvements:

(a) Stabilization of the input circuit impedance at approximately 600 ohms.

(b) Removal of shunt loss caused by ADJ GAIN control potentiometer, P2.

(c) In connection with modification of ADJ SIG BIAS control circuit described in paragraph (*c*) (6) above, will greatly improve the sensitivity of this demodulator.

(*e*) *Operating Tests After Modification.*—(1) After making the circuit modifications described herein as Case 2 and Case B, dynamic operating tests yielded the data shown in Table 3.

In each of the above operating conditions, the input impedance of this demodulator measures 600 ohms, or slightly higher.

(2) In performing the above operational tests, the following test conditions were standardized:

1. Demodulator Audio Input Signals.

(a) Frequency, 1105 cycles.

(b) Levels measured on steady marking

TABLE 3.—DYNAMIC OPERATING TEST DATA

Navy Type CW–50103 Demodulator, Serial No. 64 Modified as per Case 2 and Case B

ADJ SIG bias setting	Bias on tube VR with no input signal (volts)	Input signal level for unbiased output signal (dbm)	Remarks concerning output signal
Minimum	0. 60	−25. 0	Somewhat unsteady, fair wave shape, probably usable, no control of signal bias.
1½	1. 30	−14. 5	Steady, good wave shape, good control of signal bias.
2	1. 90	−9. 7	Excellent in all respects.
3	3. 05	−5. 0	
4	4. 10	−1. 9	
5	5. 15	+. 2	Excellent wave shape, but limited range of bias control.
6	6. 05	+1. 8	Excellent wave shape, but very limited range of bias control.

signals, using Navy Type CW–60036 transmission Measuring Set, at CHAN OUT jacks.

(c) Signals passed through one medium band receiving channel filter, Western Electric Type D–164942, to produce rounded shape. Signals were *not* passed through any sending channel filter.

(d) During dynamic runs, these signals were keyed with square unbiased dots at 60 cycles per second.

2. Demodulator DC output Signals.

(a) Loaded into 2583 ohms non-inductive resistor, Navy Type CW–634217–1.

(b) Steady mark and space currents equal, 25 milliamperes.

(c) Presence or absence of output signal bias determined by reading of output milliammeter, MA, (at or near 0), and by observing pattern on oscilloscope connected across the output load resistor.

(3) The static operating curves of this demodulator after modification as per Case 2 and Case B, are shown in Fig. 5, which may be compared with similar curves in Fig. 7–2 on page 7–4 of Demodulator Instruction Book, NAVSHIPS 900,816, approved 29 September 1945.

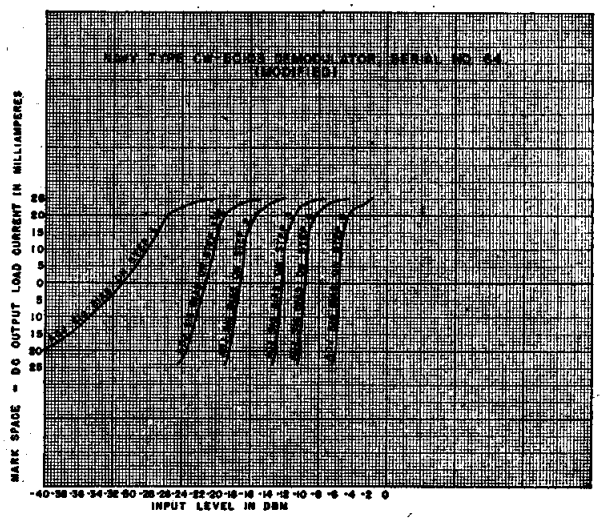

FIGURE 5.—Static operating curves of demodulator CW–50103.

(*f*) *Additional comments.*—(1) Subparagraph (*b*) (5) above mentions that this demodulator is highly sensitive to changes in audio input signal level. This factor is apparently unaffected by modifying the circuits of this demodulator to change the range of the ADJ SIG BIAS control and to adjust the input impedance to 600 ohms, as decribed herein. It was noted that changing the level of the audio input signal level by a db, introduced about 20% signal bias into the DC output signal. This factor appears to be independent of the original operating input signal level, provided the ADJ SIG BIAS control, P1, is correctly adjusted before the input signal level is changed.

(2) While it is well recognized that the introduction of signal bias is a serious obstacle to smooth operation in handling traffic, no effort was made to correct that condition in this study.

(*g*) *Discussion and conclusions.*—(1) Examination of the data shown in Table 3 of this report shows that the modifications of the Navy Type CW–50103 demodulator described in Case

2 and Case B in this report will overcome the practical operating difficulties described in paragraphs (*b*) (2), (*b*) (3), and (*b*) (4).

(2) Comparison of the data shown in Table 3 of this report with a similar table which appears in the article entitled "Modification of Model UN Carrier Control System" in Electronics Installation Bulletin No. 266, dated 16 November 1949 (relating to Navy Type CW–50124 Demodulator only) shows:

(*a*) That it is entirely practicable to modify Navy Type CW–50103 demodulator so that its performance will be similar to that of Navy Type CW–50124 demodulator after modification.

(b) That it is possible to secure satisfactory operation of a modified Navy Type CW–50103 demodulator at audio input signal levels as low as −16dbm. This indicates a lower threshold sensitivity than shown by the table in Electronics Installation Bulletin No. 266 for the Navy Type CW–50124 demodulator.

(3) The modifications proposed in this report require only minor inexpensive components. The actual work can be accomplished by a Radio Mechanic at the rate of about 6 demodulators per man day of labor. It is not necessary nor desirable to remove the demodulators from the Navy Model UN equipment cabinets to make this modification.

(4) Simple instructions for performing this modification follow:

This modification consists of two parts:

Part (A), Change range of ADJ BIAS control, P1.

Part (B), Change input impedance to 600 ohms.

To make change (A) take the following steps:

(*1*) Disconnect and remove the 130,000 ohm resistor, R8.

(*2*) Measure the resistance of R22. If this resistance does not lie between 375 ohms and 425 ohms, replace R22 with a new 1 watt carbon resistor whose resistance does lie between those limits.

(*3*) Replace R8 with a new 200,000 ohm, 2 watt carbon resistor, whose measured resistance lies between 190,000 ohms and 210,000 ohms.

(*4*) Connect a DC voltmeter having a resistance of 20,000 ohms per volt from the slider of the ADJ BIAS control, P1, to the chassis. With no input tone signal applied to the demodulator, this voltmeter should read approximately as follows:

ADJ BIAS setting:	*Volts*
1	0.6
5	5.0
10	10.0

●

To Make change (B), take the following steps:

(*1*) Disconnect the 600 ohms, ADJ GAIN potentiometer, P2.

(*2*) On the input transformer IT, move the lead wires from secondary terminal 1 to secondary terminal 2. When these two changes have been made, the input circuit of this demodulator will be connected as shown in Fig. 6.

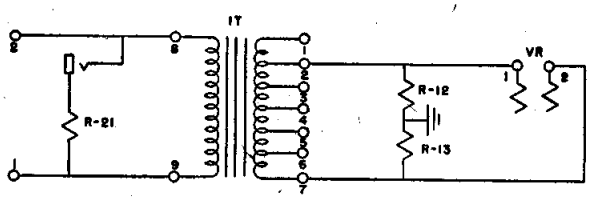

FIGURE 6.—Input circuit of demodulator CW–50103 as modified.

2. The modification as proposed above is quite satisfactory, should improve operation, and has been approved by the Bureau. It is recommended that all activities using this demodulator perform the modifications. The modification is optional and is to be made at the discretion of the Electronics Officer.

3. In making replacement of resistor R8 with a 200,000 ohm, 2-watt resistor, it is recommended that types RC41BE204J and RC41BF–204J be used. These types are preferable, also, in performing similar replacement in the Navy Type 50124–A demodulator modifications.

4. In performing these modifications, it is requested that all demodulators so modified be redesignated Navy Type 50103–B and the let-

ter "B" be imprinted on the name plate, preferably by steel stamping or engraving. Inventories are to be changed accordingly. The following corrections are to be made in the Instruction Book for Demodulator Navy Type CW–50103, NAVSHIPS 900,816:

(*a*) In Section 9, Page 9–5, Figure 9–2, Demodulator CW–50103, Schematic Diagram, disconnect the 600 ohms, ADJ GAIN potentiometer, P2, change secondary tap connection of input transformer IT from tap 1 to tap 2, and change R–8 from 130,000 ohms to a 200,000 ohm, 2-watt resistor.

(*b*) Also make the changes indicated in paragraph (*a*) above to the Wiring Diagram for Demodulator CW–50103 in Section 9, Page 9–9, Figure 9–4. It is requested also that instruction books be corrected to indicate changes, as appropriate to the existing text.

5. Similar modification to the Navy Type demodulator 50103–A may be made as desired on a trial basis only and results forwarded to the Bureau for approval. *1/1/51*

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SWITCHING MODEL UO EQUIPMENT TO SINGLE SIDE BAND RADIO CIRCUITS

The Officer in Charge of Radio Central, Navy Department, has proposed installation of a Western Electric U–199 relay in the Model UP single side band voice terminal equipment on which provision is made for use of Model UO voice control and speech privacy equipment on the telephone circuit. Use of the relay will obtain improved operation in eliminating use of patch cords as follows:

(*a*) When the relay is operated, by means of a remote switch located on the Supervisor's control cabinet in the central control area, the associated Model UO equipment's send and receive radio lines are connected to the radio circuit for normal operation.

(*b*) When the relay is in the unoperated position, the four wire-two wire terminating equipment in the Model UP cabinets is connected to the radio circuit and the Model UO equipment's send and receive lines are disconnected, a condition frequently desired when use of speech privacy is not required during maintenance and regular operational periods.

(*c*) Use of the relay makes it unnecessary to use patch cords except when the UO equipment normalled to a circuit is unoperative. A substitute equipment may be patched either for relay switching or directly to the radio circuit.

The Bureau recommends, to all activities concerned, the addition of the relay as outlined below. The addition of the relay is optional and is to be made at the discretion of the Electronics Officer. Wherever a relay is installed, it is requested that the Bureau be advised of each individual Model UP/UO terminal installation and copy of these installation instructions be attached to each instruction book affected.

INSTRUCTIONS

(*a*) *Material required* (for one (1) Models UP/UO Washington installation—to be procured locally):

Quantity:	*Description*
1	1¾" x 19" relay rack panel.
1	W. E. U–199 relay.
1	W. E. 203–A terminal strip.
1	W. E. 28–B terminal strip bracket.
1	W. E. 18–GF 800 ohm resistor.
2	W. E. 19–FG 100–100 ohm resistors.
1	4000 ohm 20 watt resistor—stud mounting.
1	S. P. S. T. toggle switch or equivalent.
Miscellaneous wire.	

(*b*) *Procedure.*—Figures one and two provide detailed circuit connections. A six DB pad is connected into the UO send line in order to balance the output level of the UO with that from the subset and line amplifier when the UP voice terminaling equipment is on the circuit. The 6DB pad provides a balance of levels at about +3DB peak levels at Washington. When a different balance is desired then the pad would have to be changed accordingly.

The relay, 6DB pad and terminal strip are all mounted on 1¾ inch relay panel. The relay rack panel is mounted in upper section of the channel restorer bay of the Model UP equipment.

The 4000 ohm current limiting resistor in the relay coil circuit is located in the carrier Supply Bay Number 2 of the Model UP equipment.

The resistor mounting and fusing is similar to the telegraph loop resistor and fuse mounting in this cabinet. *1/1/51*

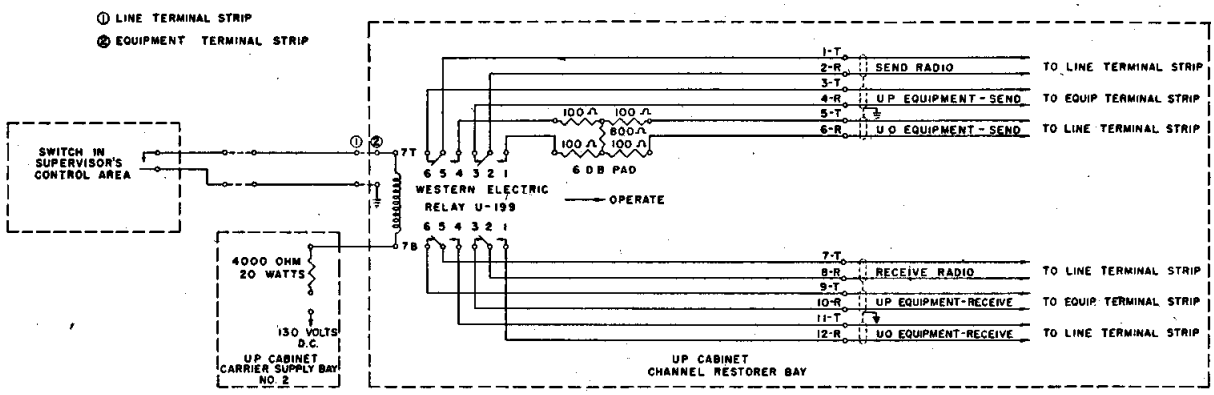

FIGURE 1.

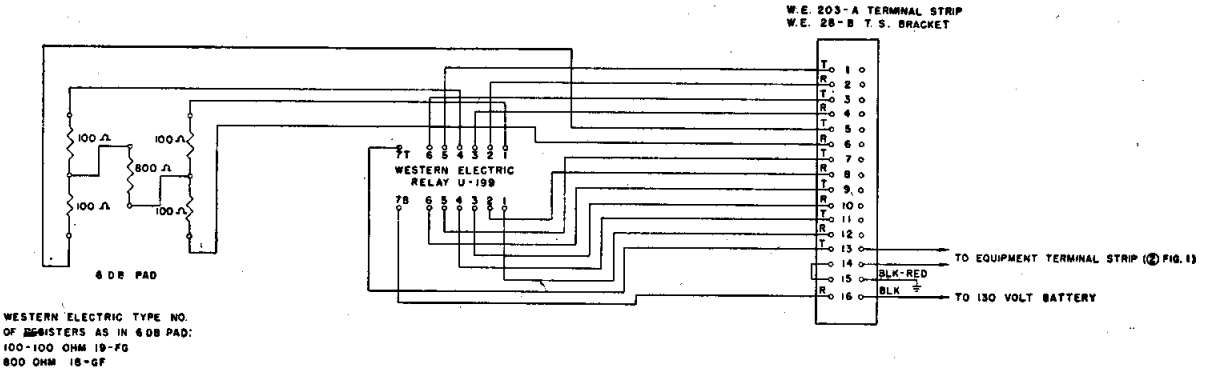

FIGURE 2.—Schematics of relay for switching model UO to SSB operations.

TONE MIXING ON UHF TELETYPE THROUGH CONTROL UNIT C-492/SG

Several reports have been received recently regarding difficulty with the Model TDZ transmitter when used in conjunction with the AN/SGC-1 terminal equipment and type C-492/SG teletype control unit.

The difficulty arises when the "send-receive" switch in the control unit C-492/SG is thrown to the "send" position, thereby causing the MCW oscillator tone in the TDZ to mix with the tone output of the AN/SGC-1. This results in tones other than those desired being transmitted.

Under normal conditions where an M-15 teletypewriter is used for UHF communications, one of the following remedys will be found satisfactory.

(*a*) If the teletypewriter in question is used for UHF communications only, the "send-receive" switch and carrier control contacts of the control unit C-492/SG should not be connected and the signal line should go directly from the printer to the teletype panel, leaving the only function of the control unit to turn the transmitter power on and off. It should be noted that the carrier control feature of control unit C-492/SG is not required, as this function is controlled automatically by the AN/SGC-1 terminal unit.

(*b*) In a second system where the teletypewriter might also be used in HF receive only or HF send-receive circuits, the C-492/SG control unit should be wired in the normal method, that is with the signal line and carrier control circuit fed through the control unit. When this condition exists, instead of throwing the "send-receive" switch to the "send" position when it is desired to communicate on UHF, simply throw it to the "receive" position and perform the necessary patching in the TT-23/

SG teletype panel. This is possible since the printer and keyboard of a M–15 are connected in series.

Each of these systems, the conditions of which might be common in certain ships, has merit. It is believed, however, that the latter method will be found more satisfactory in that it allows the teletypewriter to also operate in other circuits. *1/1/51*

●

END-SEAL SOCKET WRENCH

The installation of end seals (Navy Type 62111) in radio antenna panels or antenna termination boxes is a difficult and time-consuming process. Because of the construction of the end seal and the limited space provided for the securing nut an ordinary wrench of the proper size cannot be used. The nut which secures the end seal is almost as large as the opening into which the wrench must fit. The present method of securing the end seal requires the use of pump pliers. It is a long and tedious process and occasionally the porcelain is damaged and the end seal has to be replaced, requiring additional time, labor, and parts. Figure 1 shows the Navy Type 62111 end seal and the space limitations involved.

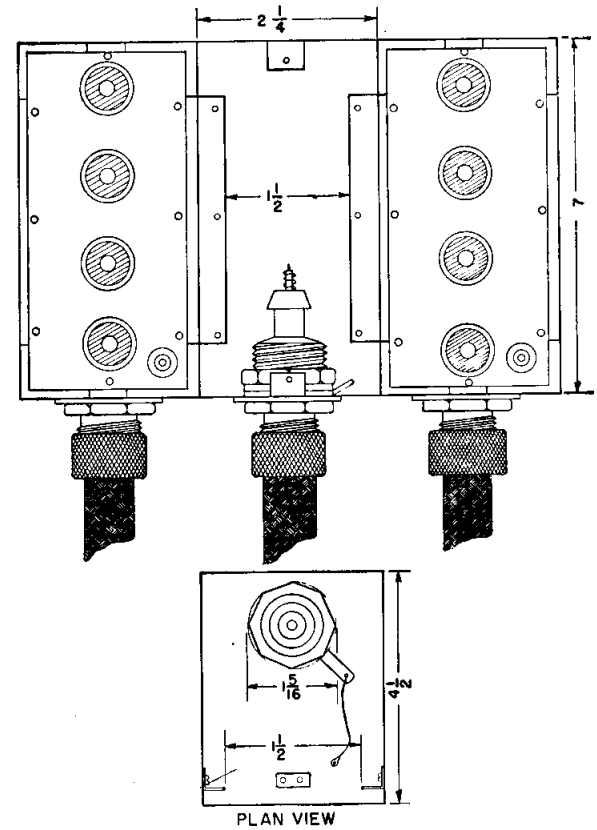

FIGURE 1.—Navy Type 62111 end seal.

Robert H. Dewey and Don M. Kinder, of the Puget Sound Navy Yard, Bremerton, Washington, have designed a special end-seal socket wrench which simplifies the installation of these end seals and effects a considerable saving of time and labor. The end-seal socket wrench is shown in Figure 2. The socket fits over the end-seal nut and can be turned with a ¼-inch drive ratchet until tight. Final tightening can be done with a ⅝-inch box wrench or an adjustable crescent wrench, which most mechanics have in their tool boxes. The reverse procedure can be used to remove the end-seal nut. Since the tools for tightening the special socket are found in most mechanics' tool boxes, no additional expense is involved once the end-seal socket has been manufactured.

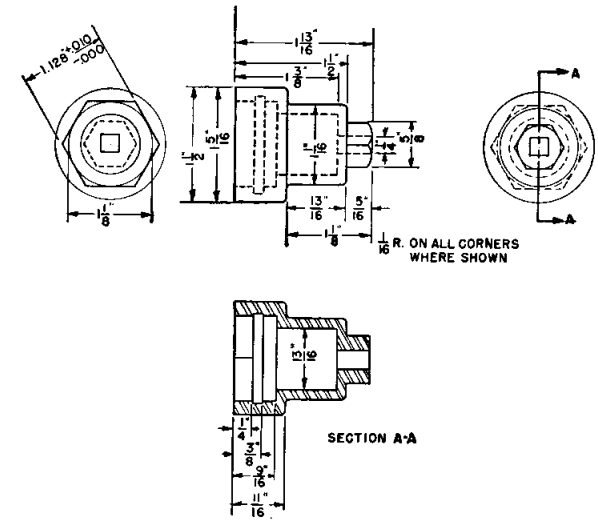

FIGURE 2.—Dimensions of end seal socket wrench.

About four man-hours are required to manufacture one end-seal socket, but if several are made at one time, much less time is required per unit. The use of an end-seal socket should save at least 10 or 15 minutes in the installation of each end seal in an antenna panel or antenna termination box. The special socket will also

prevent skinned knuckles, and will lessen the possibility of breaking procelain when securing or removing the end seal.

An end-seal socket has been in use for several months at Puget Sound Navy Yard and has proved to be very efficient. *1/1/51*

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ERROR IN INSTRUCTION BOOK FOR POWER SUPPLY PP-380/U

The standard navy stock number shown in the instruction book on page 5-4 for transformer T-305 is given as 17-T-73318-3005. This number is in error. It should be 17-T-73318-3001. The NavSandA form 217 involved in 932B-100846. *1/1/51*

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ALIGNING MODEL FRA

There has been a tendency in the Navy to use signal generators, such as Model LP, for aligning receiver and teletype converter i. f. amplifiers. In the case of Model FRA and the receivers with which it is used (usually RBB/RBC) the resulting inaccuracy of alignment has been found to contribute very materially to difficulty of tuning with the existing tuning meter (rather than OS-6/U) and to difficulty in obtaining accurate copy. This difficulty can be minimized by using Model LM or, if necessary, Model LR, for providing a signal for alignment.

The first problem is to align all receivers likely to be used with Model FRA. This may be done by placing a coil of a few turns of insulated wire up under the first detector tube in the left-hand side of the RBB or RBC receiver, and connecting the wire to the Model LM. Place the i. f. switch in the "sharp" position. Follow the alignment procedure outlined in the instruction book, but reduce the output of the Model LM to the minimum usable for the alignment, in order to avoid apparent broadness due to overloading the receiver. When the alignment is complete, rock the dial of the LM through 400 kc to prove that the center of the i. f. amplifier peak is exactly on the correct frequency.

In aligning the FRA according to the instruction book, it is necessary to connect a vacuum-tube voltmeter to the discriminator. This slightly detunes the discriminator. After the adjustment has been completed, remove the v. t. v. m. lead and rock the LM through 400 kc to see how far off the alignment is. Then reconnect the v. t. v. m. lead and try realigning the FRA to a frequency that is incorrect in the same amount but opposite direction as indicated in the above test. This should bring it into proper alignment. When connected to the RBB or RBC receiver, the tuning meter will work properly under these conditions. *1/1/51*

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MODIFICATION OF THE FSA FREQUENCY SHIFT KEYER

INTRODUCTION

1. Radio facsimile transmission requires a linear relation between keying, or modulating voltage, and frequency deviation, or shift. In other words, rather than abruptly shifting the frequency between "Mark" and "Space," the facsimile signal frequency modulates the radio frequency carrier. The frequency deviation is a function of the shade of the copy being scanned by the facsimile transceiver at any instant. When the copy shade varies from extreme black to extreme white in a gradual manner, the frequency is required to shift in a like manner.

2. The facsimile transceiver output signal is unsuitable for application as keying voltage to a frequency shift keyer. The facsimile signal is an 1,800 cycle amplitude modulated voltage. The frequency shift keyer requires a d.-c. keying voltage whose magnitude varies directly with the modulating or envelope frequency of the facsimile transceiver signal. Keyer adapter, N. T. KY44 performs this function of demodulation and extracts the required modulating frequency from the facsimile transceiver output signal. For the reasons outlined, to operate an FSA keyer for facsimile operation, modification of the FSA is necessary as well as the use of the keyer adapter KY44.

INSTALLATION

1. The modification chassis is mounted on the right rear corner (looking from the front) of the FSA oven, directly over V–107.

2. Two (2) mounting ears are provided, one (1) will mount under the middle fillister head screw on the right side of the rear oven plate. The other will mount under the round head screw which secures the right hand lifting bar to the chassis proper.

3. A one-half inch hole is drilled one-fourth inch to the rear of and in line with X–107 to allow for passage of leads. The supplied rubber grommet is inserted for protection of the leads.

4. The leads between pin No. 8 of V–107 and R–170; and between pin No. 8 of V–108 and R–168, are removed. Leads from the modification chassis are then connected as shown in the schematic diagram.

OPERATION

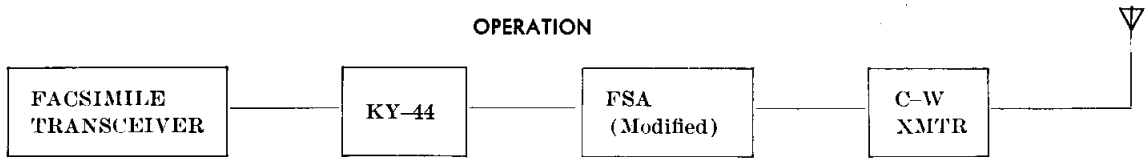

FIGURE 1

1. Figure 1 is a block diagram showing the equipment sequence for facsimile transmission. For shore installations the KY–44 would be rack mounted in one (1) of the cabinets at the control position. It has a 600 ohms output and is capable of simultaneously keying four (4) or more modified FSA keyers.

2. The pulsating d.-c. voltage output of the KY–44 has a positive polarity and is applied to the keying signal grid (pin No. 8) of eeither of the two (2) reactance modulators, V–107 or V–108, of the FSA. Pin No. 8 of the other tube is then grounded. In order to obtain a substantially linear relation between keying voltage and frequency deviation, the biasing arrangement shown in the schematic diagram is used. A negative five (5) volts, plus or minus one-half (½) volt is desired at the junction of the 120K, 100K and 5K resistors. The voltage of this junction may be too high in some installations, in which case shunting the 5K ohm resistor with a suitable resistor (10K–20K ohms) will bring it down to the required five (5) volts.

3. Two (2) toggle switches are used, one (1) to set up the keyer for facsimile or teletype operation, the other to apply the facsimile keying signal to one (1) or the other of the reactance modulators, V–107 and V–108. Throwing this switch from REV to NORM causes the white and black radiated frequencies to be interchanged. With the TTY–FACS switch in the TTY position, the FSA is restored to its original circuitry.

TUNING ADJUSTMENTS

1. Patch the facsimile transceiver output to the input of the KY–44.

2. With the facsimile transceiver set up for plus 2 db output, adjust the gain control of the KY–44 for ten (10) volts output.

3. At the transmitter, patch the KY–44 output into the keying signal jack located on the modification chassis.

4. Place the TTY–FACS switch in the FACS position.

5. Place the REV–NORM switch in the NORM position.

6. Tune the FSA keyer and the F/S coupler in the same manner as when setting up for radio-teletype operation.

7. Set the frequency meter up on the transmitter output frequency, *plus* 450 cycles.

8. Adjust the FREQ CONTROL knob on the FSA for zero beat.

9. Reduce the KY–44 output to 2.5 volts and adjust the FREQ SHIFT control on the FSA for a 900 cycle shift. Shift measurement can

readily be made by tuning the signal in on a local C-W receiver and applying the audio beat note to the vertical plates of an oscilloscope. The output of a calibrated audio oscillator is applied to the horizontal plates. Set the oscillator for 2,000 cycles and adjust the receiver tuning for a circular scope pattern. Then reduce the KY-44 output from 10 volts to 2.5 volts. Without touching the receiver, vary the audio oscillator frequency until the circular pattern is restored. The difference between the original 2,000-cycle oscillator setting and the new setting represents the shift, in cycles, of the transmitter.

If unable to obtain the required 900 cycle shift with the keyer shift control fully advanced, reduce the TRANS MULT FACTOR switch on the FSA one division.

10. Repeat steps (7), (8) and (9) until the shift is correct and a zero beat is obtained as in (8). *4/1/51*

This article applies only to shore installations. In order to accomplish this change in shipboard equipments, the Bureau is providing a modification kit, MX-1220/SX. This kit modifies the FSA to FSA-b for facsimile use, eliminating the necessity for the KY-44/FX Keyer Adapter. Kits are now in production, and are being distributed by the Bureau of Ships as directed by the Chief of Naval Operations. *7/1/51*

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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 instruction books.

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 Model TBA-10. Other series of the Model 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 instruction books. *4/1/51*

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→ REPAIR OF STROMBERG MODEL 12 AUTO TIME STAMPS

Stromberg automatic time stamps, Model 12, are commonly used in shore communication offices. Recently, there has been considerable trouble resulting from the rubber platten, against which the time stamp strikes, becoming detached from the steel base. The Rubber Laboratory at Mare Island Naval Shipyard has proposed a cure which has been satisfactory at Naval Communication Station, San Francisco. It is outlined below.

Obtain ½ pint or less of Vulcalock Cement from B. F. Goodrich Co., Akron, Ohio. Apply it as follows:

a. Clean and roughen rubber with tire-tube roughing tool.

b. Clean steel to bare metal with buffer.

c. Apply one thin coat of Vulcalock Cement to both the rubber and steel. Allow to dry. This requires about an hour.

d. Apply another thin coat of the cement to both the steel and the rubber and let dry until tacky.

e. Put pieces together and keep under pressure for approximately one week. *7/1/51*

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STOCK STATUS AND DIMENSIONS OF FACSIMILE RECORDING PAPER

All facsimile recording paper is produced in standard dimensions and stocked under the following standard stock No.'s.

Equipment	*Paper size*	*Type of paper*	*Sheets per pkg.*	*Stock number*
TT–41/TXC–1B_____	12" x 18–11/16"	Timefax N. D. or Teledeltos____	250	N16–P–2392–513
RD–92/UX Recorder__	12" x 19–1/8"	Timefax N. D. or Teledeltos____	250	N16–P–20001–112

Times facsimile duplicating paper ("TIMEFAX") is a dry recording paper which contains aniline dye with a gelatin pad backing for use in producing multiple copies.

Times facsimile nonduplicating paper ("TIMEFAX N. D.") is a single copy white surface paper with a white paper backing. Procurement of the above paper is at the rate of 2,000 packages per year.

"Teledeltos" paper is gray surface paper with a graphite base back. "Teledeltos" is a single copy paper. There is an emergency stock of Teledeltos paper for the TT–41/TXC–1B at NSC, SSD, ESB Norfolk under Signal Corps stock no. ASC NO. GM–877–2. Paper may be obtained by requisition through NSD Norfolk.

Procurement of all paper in bulk quantities is under the cognizance of ESO Great Lakes. Stocking points are as follows: NSD Bayonne, NSC, SSD, ESB, Norfolk, and NSD, SSD, ESB Oakland. *10/1/51*

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MODEL TV–3/U TUBE TESTER HAZARD

All personnel working with the TV–3/U Tube Tester are warned to exercise caution when testing metal shell and metal base tubes in the octal socket, X–107, of the above mentioned tube tester. A line voltage is present at pin #1 of X–107 when Short Test switch, S–113, is in any of the short test positions. Metal tubes have pin #1 connected to the shell or base and consequently line voltage is present at the metal shell or base of the tube. In addition, when any of the selector switches are in the positions shown below and the SHORTS switch is in the TUBE TEST position, a fraction of the line voltage (thru C–105, 0.1 mf) is present at the metal shell or base of the tube. These voltages are present regardless of the position of the line switch, S–106. It is not removed by grounding the chassis of the tube tester.

It is recommended that an insulated rod be used for tapping on the short test and that the operator make certain that the switches are not in any of the positions mentioned when inserting or removing a metal shell or base tube (NOTE: Filament switches will never normally be in this position. In most cases the Suppressor switch will be in position 2.)

The factors contributing to this hazard have been corrected in later equipments and are not present in the Model TV–3/U Tube Testers of serial 981 and above. To correct this hazard in Tube Tester TV–3/U's below serial 981, the Bureau of Ships is processing a Field Change. *10/1/51*

Filament	*Filament*	*Grid*	*Plate*	*Screen*	*Cathode*	*Suppressor*
C	S	2	None	None	2	2

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TELETYPE PANEL TT–23 ( )/SG

Because of a difference in construction and location of jacks in TT–23( )/SG (series) panels, patching between panels is not recommended. Subsequent to inspection and issuance of a field change, installation and maintenance activities should insure that where more than one Teletype Panel is required in an installation, they should be of the same type.

Applicable panels are: TT–23/SG, TT–23A/SG, TT–23B/SG, TT–23C/SG, TT–23D/SG and TT–23E/SG. *4/1/52*

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→ A. C. GOVERNED MOTOR PD–18/U ON TELETYPEWRITTERS TT–48/UG AND TT–70/UG

When the motor shaft on the PD–18/U motor unit protrudes beyond the governor hub, the governor spring may become grounded to the armature shaft, thereby damaging the motor. To prevent this condition, it is recommended that supplementary insulation be added to the early PD–18/U series motor unit (Teletype Code LMU4) as follows:

a. Remove the screened guard and the governor cover.

b. Insert two layers of Scotch Electrical Tape ¾ inches wide between the motor shaft and the governor spring.

To do this:

1. Cut two pieces of tape about 6 inches long and lay one on the other so that one sticky side remains exposed.

2. With the speed adjusting screw at 12 o'clock, insert the tapes between the spring and the shaft (with sticky side toward the shaft) so that the ends of the tape extend equally beyond the governor at about 5 and 11 o'clock.

3. Press the tape firmly to the rim of the governor cover. Secure it in place by mounting the governor cover over it. Trim off surplus tape.

To prevent damage to the motor, later series motor units have been modified by the manufacturer in the following manner:

a. The governor spring has been insulated.

b. The length of the armature shaft protruding toward the governor spring has been reduced .062 inches.

c. The height of the governor hub into which the shaft is assembled has been reduced .062 inches.

Items (b) and (c) have been instituted as an added precaution to eliminate possible mechanical interference between the governor spring and the armature shaft or governor hub. *7/1/52*

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FACSIMILE TRANSCEIVER TT–41( )/TXC–1B

A standard Navy Stock No. N17–L–6627–28 has been assigned by ESO to exciter lamp (symbol E–1) in the Facsimile Transceiver TT–41( )/TXC–1B. All activities should use this stock number in requisitions to ESO when ordering a replacement exciter lamp.

Correct commercial designation for this exciter lamp is General Electric No. 1605 (C–2V filament). It is a 6-volt lamp of the prefocused filament type drawing approximately 2.75 amperes. It serves as a source of light which is reflected from a facsimile copy to the phototube during transmission of a picture.

Navy Instruction Books NAVSHIPS 91068, NAVSHIPS 91442, Army Technical Manual TM 11–2258, and supplement parts lists thereto on TT–41( )/TXC–1B should be corrected accordingly. *7/1/52*

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JAN DESIGNATIONS FOR TELETYPE AND TERMINAL EQUIPMENT

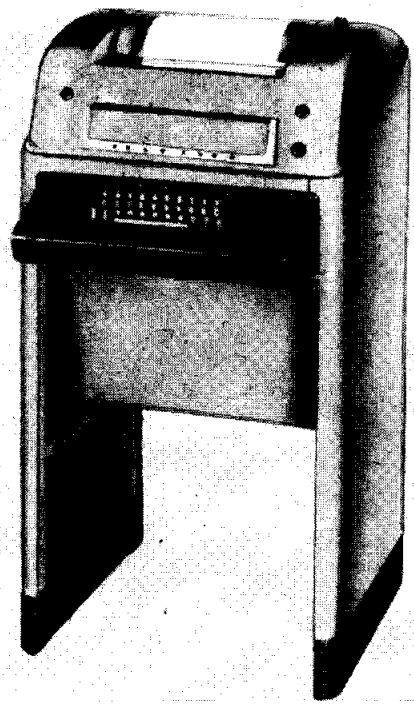
This article contains official JAN designations for teletype and associated terminal equipment. The Bureau of Ships realizes that information on teletype nomenclature has been

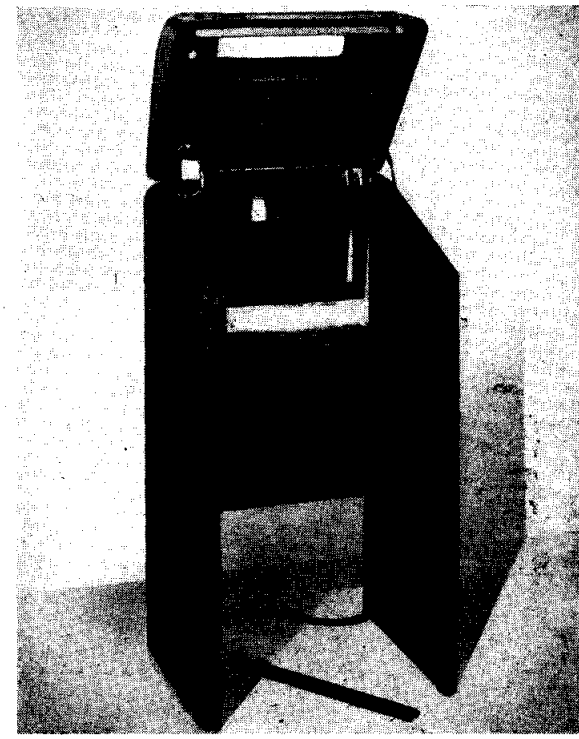
urgently needed. The material presented therein is intended to fill that need. (The list contains designations for all general service teletype equipment used by Naval Shore Activities.)

Correspondence from field activities concerning teletype equipment has referred to JAN type designations which have since been superseded and are not in current use. In many instances equipment descriptions are not informative enough for prompt and proper action. It is recommended that this list be used for identifying and reporting purposes.

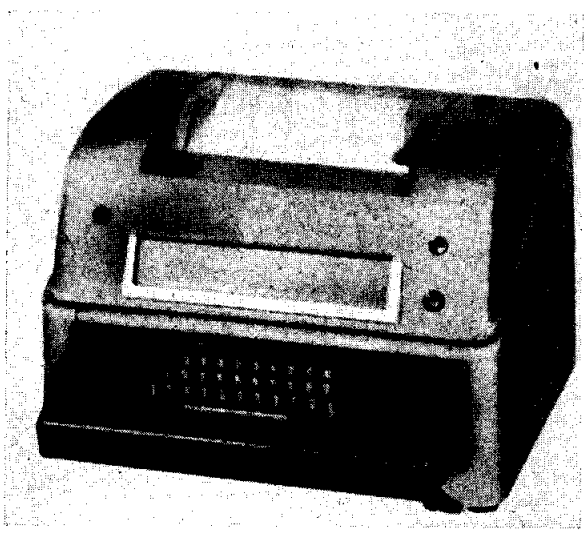
Subsequent to this publication a directive is to be promulgated by the Bureau of Ships to all shore activities which, when used in conjunction with the description, will enable activities to identify and label all general service teletype equipment.

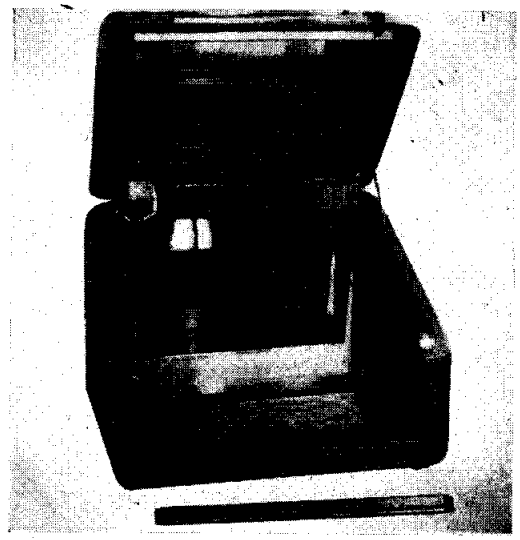
A quantity of copies of this article has been distributed to Industrial Managers and other commands responsible for shore installation and maintenance work, for further distribution to field activities in their respective areas. Additional copies may be obtained by request from the Bureau of Ships, Code 993.





TT–47/UG Communications characters with synchronous motor
TT–48/UG Communications characters with series governed motor
TT–128/UG Weather characters with synchronous motor
TT–129/UG Weather characters with series governed motor





TT–69/UG	Communications characters with synchronous motor
TT–70/UG	Communications characters with series governed motor
TT–130/UG	Weather characters with synchronous motor
TT–131/UG	Weather characters with series governed motor

NOTE.—The key to the abbreviations used in the table is as follows:

C/O	Consists of.
F. P. M.	Feet per minute.
P/O	Part of.
R	Receive only.
S	Send only.
Series	Series governed motor.
S/R	Send-receive.
SYNC	Synchronous motor.
U/W	Used with.
W. P. M.	Words per minute.
WX	Weather characters.
X	Item is included in subject equipment.

TELETYPE CORPORATION MODEL 14

Item No.	Description	Speed w. p. m.	Key board	Table	Rectifier	High base	Low base	Type operation	Remarks	JAN Designation	
										Synchronous motor	Series governed motor
1	Tape printer	60	X	X			X	S/R	⅜" Tape	AN/FGC–31	AN/FGC–4
2	Tape printer	60	X				X	S/R	⅜" Tape	TT–125/FG	TT–126/FG
3	Tape printer	60		X			X	R	⅜" Tape	AN/FGC–32	AN/FGC–33
4	Tape printer	60					X	R	⅜" Tape	TT–127/FG	TT–89/GF
5	Nontyping reperforator	60		Low		X		R	Table on casters		TT–15/FG
6	Typing reperforator	60	X	X	X		X	S/R	Reperforator with keyboard.	TT–103/FG	TT–102/FG
7	Typing reperforator	60		X	X		X	R		TT–45/FG	TT–46/FG
8	Typing reperforator	60					X	R		TT–92/FG	TT–53/FG
9	Typing reperforator	60		Low		X		R	Table on casters	TT–91/FG	TT–16/FG
10	Typing reperforator	75					X	R		TT–93/FG	
11	XMTR/DIST with typing reperforator.	60	X	X	X		X	S/R	Reperforator with keyboard.	AN/FGC–12	
12	MXTR/DIST with typing reperforator.	60		X	X		X	S/R	Receive only reperforator.	AN/FGC–16	
13	XMTR/DIST with typing reperforator.	60		X	X	X		S/R	Receive only reperforator.	AN/FGC–15	
14	Typing reperforator	60		Low		X		R/WX	Table on casters	TT–104/FG	TT–17/FG
15	Typing reperforator	60	X				X	S/R	Reperforator with keyboard.	TT–105/FG	TT–74/FG
16	XMTR/DIST	75						S	XD86DJ	TT–43/FG	
17	XMTR/DIST	60						S		TT–57/FG	TT–52/FG
18	Typing reperforator	60		X			X	R		TT–132/UG	TT–133/UG

TELETYPE CORPORATION MODEL 15

Item No.	Description	Speed w. p. m.	Key board	Table	Rectifier	Type operation	Remarks	JAN Designation	
								Synchronous motor	Series governed motor
19	Page/printer	60		X	X	R		AN/FGC–13	TT–51/FG
20	Page/printer	75		X	X	R		TT–96/FG	
21	Page/printer	60		X	X	R/WX		TT–101/FG	AN/FGC–34
22	Page/printer	60	X	X	X	S/R		AN/FGC–10	TT–5/FG
23	Page/printer	75	X	X	X	S/R		AN/FGC–17	
24	Page/printer	60	X	X	X	S/R–WX		AN/FGC–18	TT–6/FG
25	Page/printer	60	X			S/R	Lightweight Console Mounting.	TT–49/UG	TT–50/UG

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TELETYPE CORPORATION MODEL 19

Item No.	Description	Speed w. p. m.	Key board	Table	Rectifier	Type operation	Remarks	JAN Designation	
								Synchronous motor	Series governed motor
26	Page/printer XMTR/DIST	60	X	X	X	S/R		AN/FGC–9	AN/FGC–8
27	Page/printer XMTR/DIST	60	X	X	X	S/R–WX		AN/FGC–19	TT–8/FG
28	Page/printer XMTR/DIST	60	X	X	X	S/R	Shock Mounted for Shipboard use.	AN/SGC–2	AN/FGC–11
29	Page/printer XMTR/DIST	75	X	X	X	S/R		AN/FGC–24	

TELETYPE CORPORATION MODEL 28

Item No.	Description	Speed w. p. m.	Key board	Table	Type operation	Remarks	JAN Designation	
							Synchronous motor	Series governed motor
30	Page/printer	60–75–100	X	X	S/R	Console-Shock mounted	TT–47/UG	TT–48/UG
31	Page/printer	60–75–100	X	X	S/R–WX	Console-Shock mounted	TT–128/UG	TT–129/UG
32	Page/printer	60–75–100	X	X	S/R	Shock Mounted	TT–69/UG	TT–70/UG
33	Page/printer	60–75–100	X	X	S/R–WX	Shock Mounted	TT–130/UG	TT–131/UG

MISCELLANEOUS TELETYPE EQUIPMENT

Item No.	Commercial identity	Description	JAN Designation
34	Package unit W. U. SC–1A	Consists of 2 typing reperforators with rectifier and multiple XMTR/DIST 60 w. p. m.	AN/TGC–1
35	Package unit MFG Bunnell	Same as above capable of 60 or 100 w. p. m	AN/TGC–1A
36	Package unit MFG Edison	Same as above capable of 60 or 100 w. p. m	AN/TGC–1B
37	Subscriber set 132A2 W. E. Co	Consists of typing reperforator, receive only and XMTR/DIST series motor, 60 w. p. m. table and rectifier, repeater and synchronizing unit.	TT–10/FG
38	Tape relay system	SYNC C/O transmitting, receiving and monitoring cabinets, 3 circuits	AN/FGC–6
39	Subscriber set 133A2 W. E. Co	C/O typing reperforator receive only and XMTR/DIST, 2 repeater units, 60 w. p. m., table and rectifier, series motor.	AN/TGC–3
40	EX-postal telegraph teletype central office set.	C/O TT–80/TGC–4 to TT–88/TGC–4 Provides facilities for 24 line finder circuits, 36 duplex circuits and 12 single line circuits.	Complete AN/TGC–4
41	Typing reperforator and XMTR/DIST P/O AN/TGC–4.	C/O Table, panel, XMTR/DIST, S/R typing reperforator with keyboard, SYNC motor—985A table—991A panel.	TT–80/TGC–4
42	Typing reperforator and XMTR/DIST P/O AN/TGC–4.	C/O Table, panel XMTR/DIST, S/R typing reperforator with keyboard, SYNC motor—985A table—922A panel.	TT–81/TGC–4
43	XMTR/DIST assembly P/O AN/TGC–4.	C/O 12 XMTR/DIST, 910A table for tandem operation—912A terminal shelf 914 relay box.	TT–82/TGC–4
44	XMTR/DIST assembly P/O AN/TGC–4.	C/O 12 XMTR/DIST, 910A table for use with line finder 930A—911A Terminal shelf 913A relay box.	TT–83/TGC–4

MISCELLANEOUS TELETYPE EQUIPMENT—Continued

Item No.	Commercial identity	Description	JAN Designation
45	XMTR/DIST assembly P/O AN/TGC–4.	C/O Arms, reel and card holder, 6 MXD4 multiple number XMTR/DIST units on MXB–5 base.	TT–84/TGC–4
46	Reperforator assembly P/O AN/TGC–4.	C/O 2 typing reperforators, receive only, SYNC motor 920–A chassis, 1042A relay box, 921A stand; 925–A tape winder.	TT–85/TGC–4
47	Reperforator assembly P/O AN/TGC–4.	C/O 8 typing reperforators, receive only, SYNC motor and 1 MXB6/MXD6 single unit XMTR/DIST.	TT–86/TGC–4
48	Tape puller P/O AN/TGC–4	Vacuum operated, part of AN/TGC–4	TT–87/TGC–4
49	Reperforator assembly P/O AN/TGC–4.	C/O 2 typing reperforators, receive only, 2 1045A XMTR/DIST 912A stand, 1040A trunk chassis, 1041A relay box, 2–925A tape winder.	TT–88/TGC–4
50	Tape rewinder 929–A P/O AN/TGC–4	2 reels, capacity 1,000′ tape, manually operated	TT–18/FG
73	Teletype Distribution Panel	C/O 24 jacks; 12 looping, 6 set and 6 miscellaneous, 6 line current rheostats, line current meter.	TT–23( )/SG
74	Switchboard	Ten line telegraph switchboard for interconnecting teletypewriter station lines and trunk circuits P/O Telegraph central office set TC–3.	BD–100

AUTOMATIC TELEGRAPH EQUIPMENT (BOEHME)

Item No.	Commercial identity	Commercial Nomenclature	JAN Designation
75	Boehme amplifier	Boehme 4C amplifier	AM–103/U
76	Keying head	Boehme 4E, ⅜″ tape, 15–400 w. p. m	KY–14/U
77	Keying head drive	Boehme 4D series E	MX–439/U
78	Tape puller d. c	Boehme 4F	MX–442/U
79	Tape puller a. c	Boehme 8F	MX–1365/U
80	Tape puller a. c	TP200 DELISSER 110 volts, 60 cycles, 4 to 40 f. p. m	TT–2/FG
81	Tape puller d. c	TP100 DELISSER 110–120 volts d. c	TT–3/FG
82	Reperforator, automatic	Wheatstone automatic reperforator	TT–94/FG
83	Wheatstone perforator	Teletype w. p. e.–3/1SS	MX–491/U
84	Tape bridge	Boehme 4K	MX–481/U
85	Tape bridge	McElroy	MX–481A/U
86	Tape bridge	DELISSER	MX–481B/U
87	Rectifier for Wheatstone perforator	REC 32 Output 1.2 amp., 120 volts d. c	PP–189/U
88	Tape reel	Boehme 7H	MX–480/U
89	Rewinder reel attachment	Boehme 4FA, series E	MX–478/U
90	Magnetic release for tape puller	Boehme 7FA, series E	MX–477/U
91	Ink recorder	Boehme 4G	RD–17/U
92	Ink recorder	Waters Conley	SC–10

ALPHABETICAL CROSS INDEX

JAN Type No.	Item No.
AN/FGC-4	1
AN/FGC-5	60
AN/FGC-6	38
AN/FGC-7	67
AN/FGC-8	26
AN/FGC-9	26
AN/FGC-10	22
AN/FGC-11	28
AN/FGC-12	11
AN/FGC-13	19
AN/FGC-15	13
AN/FGC-16	12
AN/FGC-17	23
AN/FGC-18	24
AN/FGC-19	27
AN/FGC-24	29
AN/FGC-31	1
AN/FGC-32	3
AN/FGC-33	3
AN/FGC-34	21
AN/SGC-1	61
AN/SGC-2	28
AN/TGC-1	34
AN/TGC-1A	35
AN/TGC-1B	36
AN/TGC-3	39
AN/TGC-4	40
AM-103/U	75
BD-100	74
CAIU-20484	64
KY-14/U	76
MX-439/U	77
MX-442/U	78
MX-477/U	90
MX-478/U	89
MX-480/U	88
MX-481/U	84
MX-481A/U	85
MX-481B/U	86
MX-491/U	83
MX-1365/U	79
PP-108A/TG	63
PP-189/U	87
PP-315/GGA-1	65
PP-424/U	68
PP-765/U	66
RD-17/U	91
SB-6/GG	71
SB-66/FGC	72
SC-10	92
TE-50A	55
TH-7/FG	62
TT-2/FG	80
TT-3/FG	81
TT-5/FG	22
TT-6/FG	24
TT-8/FG	27
TT-9/FG	52
TT-10/FG	37
TT-14/FG	54
TT-15/FG	5
TT-16/FG	9
TT-17/FG	14
TT-18/FG	50
TT-23( )/SG	73
TT-26/FG	51
TT-30/AGA-1	57
TT-31/AGA-1	69
TT-32/AGA-1	70
TT-34/AG	58
TT-35/AG	59
TT-43/FG	16
TT-45/FG	7
TT-46/FG	7
TT-47/UG	30
TT-48/UG	30
TT-49/UG	25
TT-50/UG	25
TT-51/FG	19
TT-52/FG	17
TT-53/FG	8
TT-54/FG	53
TT-57/FG	17
TT-69/UG	32
TT-70/UG	32
TT-71/UG	56
TT-74/FG	15
TT-80/TGC-4	41
TT-81/TGC-4	42
TT-82/TGC-4	43
TT-83/TGC-4	44
TT-84/TGC-4	45
TT-85/TGC-4	46
TT-86/TGC-4	47
TT-87/TGC-4	48
TT-88/TGC-4	49
TT-89/FG	4
TT-91/FG	9
TT-92/FG	8
TT-93/FG	10
TT-94/FG	82
TT-96/FG	20
TT-101/FG	21
TT-102/FG	6
TT-103/FG	6
TT-104/FG	14
TT-105/FG	15
TT-125/FG	2
TT-126/FG	2
TT-127/FG	4
TT-128/UG	31
TT-129/UG	31
TT-130/UG	33
TT-131/UG	33
TT-132/UG	18
TT-133/UG	18

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MISCELLANEOUS EQUIPMENT TROUBLE SHOOTING NOTES

Difficulty Encountered	Cause and Remedy
Scott SLRF receiver.—CW beat oscillator dead, no beat notes heard.	Beat oscillator condenser had plates bent causing short across condenser. Repaired condenser—conditions normal.—U. S. S. *Leedstown*
Abbott Model MS.—Setting transmitter and receiver on frequency.	Harmonics of model LM frequency meter may be used for this purpose. Care must be used to properly identify the proper harmonic. Dials must be carefully adjusted as tuning of the MS is sharp. Also the MS must be checked frequently as there is a tendency to drift.—*NAVY 116*
Triumph Oscilloscope Model 830 (Navy type 60018).—Pattern goes off screen on lower side and centering control fails to center the beam vertically.	Caused by break-down in insulation on the yellow lead from R–120 to the "external synch" jack J–1. Lead is cabled with another wire. Replaced with wire having better insulation and units functioned normally.—*Radio Station, San Juan, P.R.*
RCA Voltohmist Model 162.—This commercial test equipment would not read d-c volts or ohms. When the selector switch was put in any of these positions, the meter would bang "hard over".	A check showed a 500-ohm reading to ground from the unconnected side of the 7000-ohm potentiometer "ohms adjustment" R–21. The lubricant inside R–21 was found to be running around on the insulation. This was corrected by washing the interior of the potentiometer case and the wires with carbon tetrachloride. The equipment worked perfectly upon reassembly. Possibly, a result of tropical climate.—U. S. S. *Curtiss*