RESTRICTED

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JANUARY 1, 1944

Restricted

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RADIO AND SOUND BULLETIN

NAVY DEPARTMENT,
BUREAU OF SHIPS,
January 1, 1944.

COPPER OXIDE RECTIFIER POWER UNIT

As a result of considerable development and research on the part of the radio division of the Westinghouse Electric & Manufacturing Co., a new type of power supply, a copper oxide (rectox) rectifier is now available for operation with naval radio transmitting equipment. This equipment is illustrated in figures 1 and 2.

This new source of power supply for radio transmitting equipment has been made possible as a result of recent developments in the processing and manufacture of copper oxide rectifier materials. The copper oxide, or rectox, rectifier elements consist of a copper disk, in present designs about 1½ inches in diameter and 0.050 inch thick. Only one side of this disk is oxidized by a special process, which gives it the property of a rectifier in that it will conduct current readily in one direction but will pass very little current in the opposite direction. In practice, to obtain the required current and voltage rating, a number of these disks are assembled together on an insulated bolt to form a stack.

The rectox disks or "stacks" are assembled within an enclosed frame with the necessary transformers, filters, etc., to form a complete rectifier unit. Auxiliary equipment consisting of output circuit fuses, main line switch, voltage adjusting tap switch, magnetic contactors for remote control of the rectifier unit, blower motor, and fan for cooling the rectox disks are also assembled as a part of the complete rectifier unit.

A quantity of these new high-voltage rectifiers are being procured from Westinghouse for use in lieu of motor generator sets or tube rectifiers for the TAB–6, TAB–7 and TBU–4 radio transmitting equipments for installation at shore stations. These sets are already coming off the production lines and are being delivered to various activities. They will be followed by similar copper oxide rectifiers for the TBL–10, TBL–11, TBM–10 and TBK–16 shore installations. The rectifier units are the same height as the transmitter units with which they are used and match the transmitter in type of construction and finish, except that the rectifiers have steel frames and panels in lieu of aluminum.

The copper oxide type of high voltage rectifier has several advantages over the motor generator power supply, which may be enumerated as follows:

(a) With the exception of a blower motor, there are no rotating parts in a rectox rectifier unit as compared with the armatures and bearings of a motor generator. Servicing requirements are, therefore, greatly reduced.

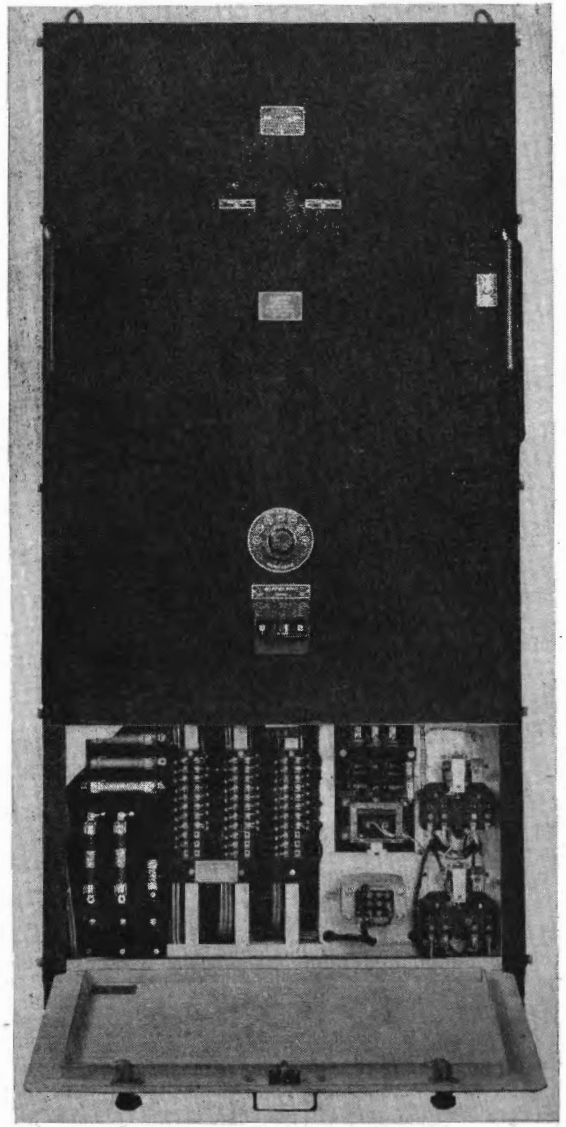


FIGURE 1.—Navy type CAY–20167, copper oxide rectifier power unit, front panel view.

(b) The efficiency is usually better than a motor generator.

(c) The starting current or power required from the line during starting is much less than with a motor generator set. This results in less line disturbance, and flicker of lights. In some cases it may permit the use of a smaller power plant.

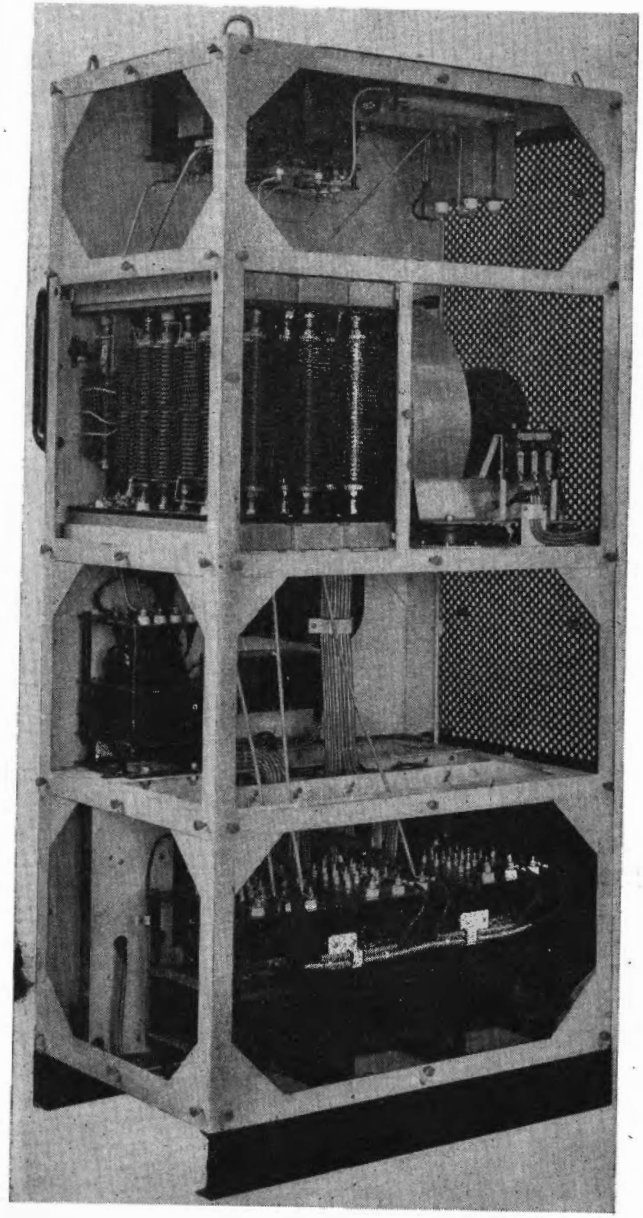


FIGURE 2.—Navy type CAY–20167, copper oxide rectifier power unit, rear view, shields removed.

(d) Armature failures usually occur without warning. Rectox failures will normally occur as a gradual reduction in power output allowing replacement to be made at the convenience of the operator. Shut-downs during vital periods should not be necessary.

(e) Performance of equipment is not as susceptible to changes in line frequency as with a motor generator set.

(f) Motor starters or controllers are not required.

Some advantages over tube type rectifiers are:

(a) Since no tubes are used, it is possible to eliminate various relays and contactors required in the tube rectifier for accurate control of filament voltages and temperatures and two-step time delayed starting.

(b) The copper oxide rectifier may be thrown directly on the supply line and d. c. output is instantly available.

(c) The rectox stacks are very rugged and will stand considerable rough treatment without damage as compared with tubes.

(d) The number of transformers required is reduced.

These copper oxide rectifiers provide the same d. c. voltages for bias, master-oscillator plate, intermediate amplifier plate, and power amplifier plate circuits as the motor generators previously supplied for this purpose. On the front panel are mounted a main line switch with thermal overload trip, a seven-point tap switch for control of the main d. c. output voltage, two signal lights indicating supply line power on and high voltage d. c. on, and an air interlock re-set push button. A door at the bottom of the panel provides convenient access to terminal blocks, high voltage d. c. fuses, and contactors. The copper oxide rectifying elements are assembled in stacks as subassemblies easily removable from the frame. Air is drawn through them from louvers in the right-hand side shield by means of an induction motor-driven fan. Air discharges through perforated shields on the back and left side of the unit. If, for any reason the cooling air is interrupted, a thermally operated interlock in the control circuit acts to shut down the rectifier.

These copper oxide rectifiers have been so designed that they may be connected to any three-phase supply line having a voltage of 220 or 440 volts and a frequency of 50 to 60 cycles. The step-up transformers and fan motor are wound for both 220 and 440 volts with suitable terminals brought out so that by proper placing of links and connections at time of installation either voltage may be accommodated. The transformers and fan motor will operate equally well on either 50 or 60 cycles.

These rectifier units include three separate rectifiers: (1) a single-phase bridge type, supplying bias voltage; (2) a single-phase bridge type, supplying master-oscillator plate voltage; and (3) a three-phase

full wave rectifier, supplying intermediate amplifier and power amplifier plate voltage. This latter rectifier is arranged with taps on the transformer primaries and a seven-point switch so that d. c. voltages between 50 and 110 percent of normal may be readily obtained for reduced power operation of the transmitter or for full power operation when the supply line voltage is 10 percent below normal. The seven-point tap switch is complete in itself and may be removed from the rectifier unit and installed adjacent to the radio transmitter at stations where it is necessary to install the rectifier unit at a distance from the transmitter. Terminals to facilitate this arrangement are provided on the rectifier terminal board.

In addition to the regular operating spares, the rectifier spares include complete rectox stacks, which are easily installed.

In regard to performance, the over-all conversion efficiency from a. c. supply line to filtered d. c. output is about the same as that of the equivalent motor generator set, being about 70 percent when the unit is new and gradually reducing after a long period of time to about 60 percent. The voltage regulation of the rectifier will not be quite as good as that of a compounded high-voltage generator, but the instantaneous regulation which affects lilt and high transient voltages during keying is better with the rectifier than with the motor generator. The power required for starting the rectifier is not over that required for full load key-down operation, which is much less than the power required when starting a motor generator. The power required under standby or key-up conditions is about the same for rectifier and motor generator.

The rectifiers for use with TAB and TBU transmitters are identical except for the nameplates. The TBU transmitter thus does not use the full capabilities of the rectifier. The rectifier to be furnished with TBM and TBK equipments is provided with the necessary transformer taps and connection changes so that it may also be used to furnish d. c. power to a TBK–8, TBK–12, or TAJ–11, 12, 13, or 14 transmitter. The additional features included with the TBM and TBK design of rectifier were included at the request of the Navy to provide maximum flexibility in the event that future developments made it desirable to extend their use to transmitters requiring approximately similar a. c. voltage and current inputs. The rectifier to be furnished with TBL–10 and TBL–11 equipments may also be used with any Westinghouse model TBL–7 or subsequent a. c. operated model TBL transmitter.

It is felt that these rectifiers will be reliable and will give satisfactory performance in comparison with motor generator sets or tube rectifiers. The copper oxide rectifying elements have been used for a number of years in Westinghouse radio broadcast transmitters where

their ruggedness, reliability, and freedom from trouble has been established. The life of these units should be indefinitely long.

Oscillographs showing the operation of this equipment in conjunction with TBU–4 transmitter are shown in figures 3, 4, and 5.

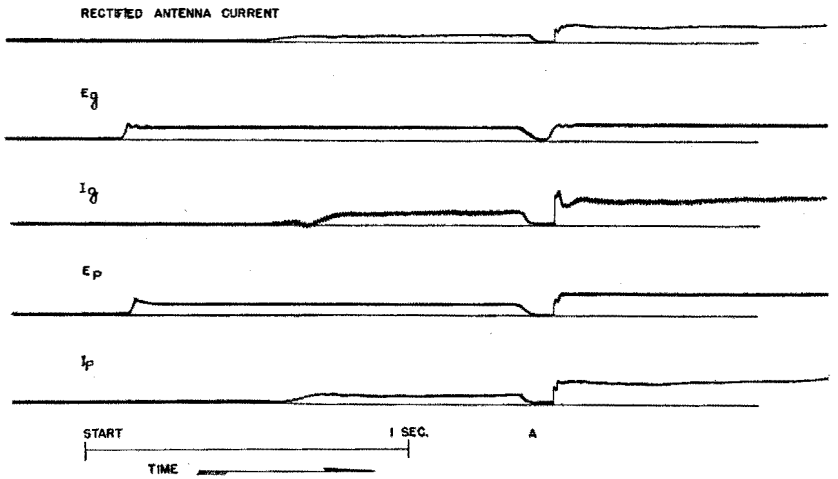


FIGURE 3.—Oscillographs showing conditions when equipment is started with test key closed and "adjust-tune-operate" switch in step No. 2. At time A it is switched to "operate."

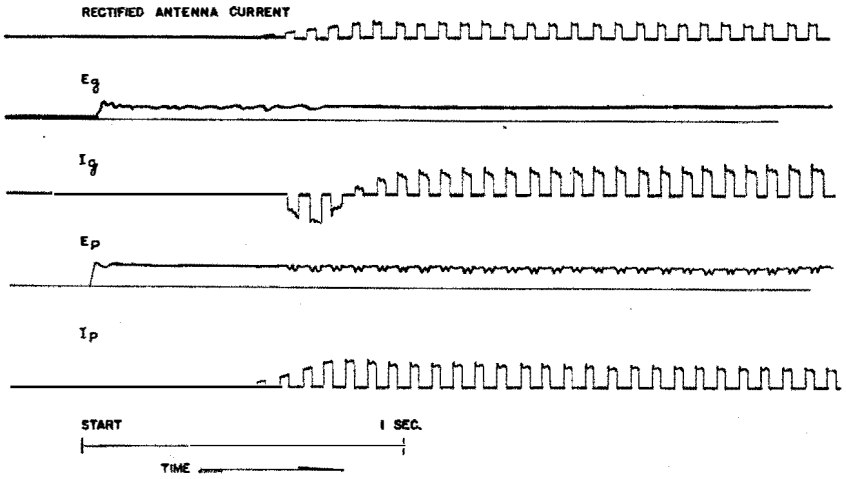


FIGURE 4.—Oscillographs with equipment operating on C. W. and keyed at 40 words per minute.

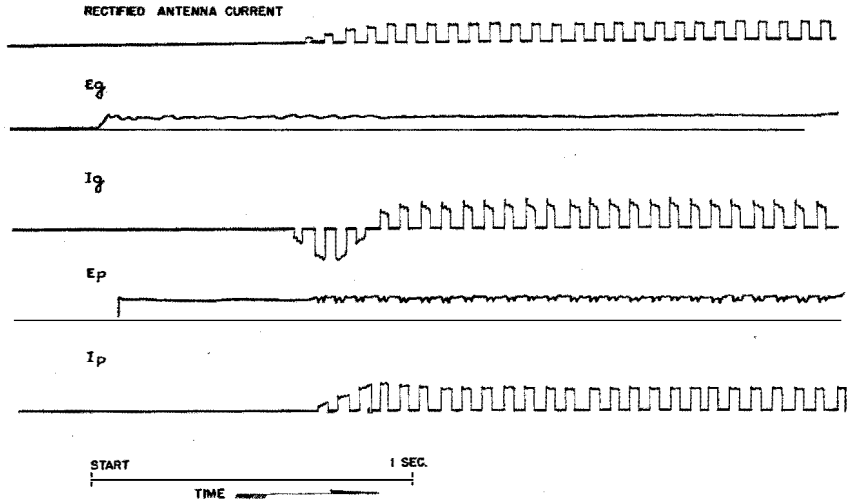


FIGURE 5.—Oscillographs with equipment operating on M. C. W. and keyed at 40 words per minute.

DATA SUMMARY

For use with Navy model	Input supply			D. c. output			Dimensions (in.)			Weight (lb.)	Navy type No.
	Volts	Cycles	Phases	Volts	Amps.	Kw.	Ht.	Wd.	Deep		
TAB-TBU	220/440	50/60	3	2,300 1,000 230	2.2 .3 .5	5.475	72	34	24⅞	1,170	CAY-20167
TBL	220/440	50/60	3	2,000 1,000 250	.7 .2 .5	1.725	72	27½	24	900	CAY-20195
TBK TBM	220/440	50/60	3	3,000 2,000 1,000 275 *Optional voltages* 3,000 1,500 600 1,200 1,500 250 115	.35 .75 .10 .60 .385 .240 .150 .150 .130 .500 .830	2.815	72	32	24	1,000	CAY-20228

As this article goes to press, information has been received that the Westinghouse Electric & Manufacturing Co. has about 90 percent complete a compact horizontal design of copper oxide rectifier intended for use with the Westinghouse series of TBL communication equipments installed on vessels. It is the intention of the Westinghouse radio design group to offer this new design of rectifier to the Navy for an extended service test on naval surface craft before presenting it for possible naval procurement.

DISTRIBUTION OF RADIO, RADAR, AND SONAR INSTRUCTION BOOKS

I. INTRODUCTION

Changes in the method of distributing radio, radar, and sonar instruction books have taken place from time to time, and further modifications are being undertaken to make these publications more readily available to the people who use them. Accordingly, the purpose of this article is to summarize briefly the various means of handling books as well as to outline contemplated changes.

In general, instruction books are distributed in one of two ways: (1) through the Registered Publications Section of the Chief of Naval Operations, or (2) directly by the Bureau of Ships.

II. BOOKS THROUGH REGISTERED PUBLICATIONS SECTION

Instruction books handled through the Registered Publications Section are always classified as confidential. They can be identified by the short title of ENG followed by a number. The ENG prefix gradually will be replaced by the prefix SHIPS, but both kinds of titles will be in use for some time. There is no relation between ENG and SHIPS titles; for example, ENG 216 and SHIPS 216 are entirely different publications.

Books distributed through the Registered Publications Section are issued by local issuing offices on the basis of allowance lists established by the Bureau of Ships. Issuing offices should be visited frequently for information about new or revised instruction books.

This somewhat indirect method of distribution causes some unavoidable delay in the utilization of instruction books, so a faster and more direct plan of distribution has been started. Generally, but not always, instruction books are packed in the boxes with the apparatus itself. If books are packed with the apparatus, the report of material shipped indicates the books accompanying the shipment and designates the box in which they are packed. Allowance Lists of the Registered Publications Section (RPS 6A) also indicate books that accompany apparatus by notes such as, "Basically two per equipment, packed with the equipment."

Activities that do not receive apparatus but require the related instruction books will draw them in the usual way from the issuing office. Any activity not listed in RPS 6A can secure publications by requesting them from the Chief of the Bureau of Ships, with an explanation of the need for such publications. An exception to this

general procedure has been introduced in recent allowance lists. These carry notes that "Radio Material Officers are authorized to draw in excess of their allowance for their own use, or for reissue to activities under their cognizance." Activities that have been omitted from allowance lists, then, can request publications from the nearest Radio Material Officer, instead of writing to the Chief of the Bureau of Ships.

Occasionally instruction books cannot be prepared in time to accompany the first units of a new type of apparatus. Until instruction books can be completed, manufacturers are instructed to pack with the equipment some form of installation instructions, interconnection diagrams, and schematic drawings. Complete instruction books should be drawn as soon as they become available.

III. BOOKS DISTRIBUTED BY BUREAU OF SHIPS

Books not handled through the Registered Publications System will in most case be classified as restricted. The basic distribution of these books will be effected by packing with the equipment (usually two per equipment). The most important weakness in the past with respect to restricted books has been that activities concerned with installation and maintenance of the equipment, but not actually having the gear aboard, have had no means of securing the necessary books. This situation is being corrected with the institution of a new policy of utilizing the radio material offices as distribution points for bulk supplies of books.

As soon as complete instruction books are ready, a supply is forwarded to each Radio Material Officer, who will, in turn, distribute the material as needed to his assistants and to activities under his cognizance. Until this system becomes better established, Radio Material Officers should inform the Bureau of Ships promptly if the quantity of books allotted to them is too large or too small.

Radio Material Officers may, at their discretion, establish branch distribution points to speed up distribution. Anything that will eliminate written requests for publications is to be encouraged, and no accounting to the Bureau of Ships will be required. The stocks of Radio Material Officers will be replenished from a central supply maintained by the Bureau.

Only the most recent contracts provide enough instruction books to carry out this plan in its entirety; therefore, ships and stations should not request books from Radio Material Officers until they have been informed by published notice that such books are available. Requests for all other books should be addressed directly to the Chief of the Bureau of Ships, as usual.

IV. CONCLUSION

Distribution can be simplified and improved if a few simple rules are followed:

1. Before a confidential book is requested, find out from the nearest Registered Publications Issuing Office whether the book is available, and whether the activity in question is covered by the allowance lists.
2. If the activity is not on the allowance lists, request the publication from the Chief of the Bureau of Ships, telling why it is needed.
3. Make a habit of securing from issuing offices all changes and replacing editions of books as soon as they become available.
4. Read the Radio and Sound Bulletin, the Radar Maintenance Bulletin, the Communications Equipment Maintenance Bulletin, and the Underwater Sound Bulletin for notice of books available from Radio Material Officers.[1]
5. Avoid requesting books in general terms as "all radio, radar, and sonar instruction books." Several thousand items would be needed to fill such an order.
6. If your request to the Bureau of Ships cannot be filled, it does not mean that your request is being ignored. An adequate stock of many books simply is not available.

[1] The Radio Installation Bulletin normally carries the first notice of the shipment of books to Radio Material Officers.

ARMY-NAVY STANDARD LIST OF RADIO FREQUENCY CABLES

The following Army-Navy Standard List of Radio Frequency Cables has been selected jointly by the Signal Corps and the Bureau of Ships. The purpose of this list is to effect an immediate reduction in the number of types of cables used for radio, video, intermediate frequency transmission, radio frequency test equipment, and direct current pulse transmission used in radio and radar Service equipments.

Careful study and investigation by the qualified representatives of the services and industry has determined that the first or preferred category of the Standard List is capable of supplying cables for the above applications for all radio and radar equipments now in production or in the design stage. The second category provides additional cables which are currently being used in production equipments or for replacement of rigid lines in existing equipments.

It is mandatory that all radio frequency cables, for the above applications, to be used in new equipments or equipments in the early design stage which are under the jurisdiction of the Signal Corps or the Bureau of Ships, be selected from the first or preferred category. Further, it is mandatory that only cables from both categories of this Standard List be used in radio and radar equipments now in production under the jurisdiction of the Signal Corps or the Bureau of Ships. No other cables of the subject type shall be manufactured for Army or Navy end use except when directly purchased by the services for maintenance of equipments already in the field and for which no cable on this Standard List is applicable.

In the event that it is believed that certain equipment for the Signal Corps or Navy requires a cable of specialized design, for which a suitable cable is not included in the Standard List, a specific waiver to use such a cable must be obtained from the Service concerned. Requests for such waivers, made in duplicate and accompanied by a statement giving the engineering considerations which make the proposed type necessary, shall be forwarded to the Commanding Officer, Signal Corps Standards Agency, 12 Broad Street, Red Bank, N. J., when Signal Corps equipment is concerned; and to the Chief of the Bureau of Ships, Navy Department, Washington, D. C., attention Code 930G, when Navy equipment is concerned. All such requests will be referred to the Army-Navy R. F. Cable Coordinating Group for engineering review and technical recommendation. Where Signal Corps equipment is concerned, final approval will be made by the

Signal Corps Standards Agency and transmitted to the organization requesting the waiver. Where Navy equipment is concerned, final approval will be made by the Bureau of Ships and transmitted to the organization requesting the waiver.

Where cables of the subject type not covered by the Standard List are being used in existing production lines they may continue to be produced and used pending action on requests for waivers.

The provisions of this directive are in no way intended to hamper or restrict new developments in the field of radio frequency cables.

The provisions of this directive take effect 18 November 1943.

FIRST CATEGORY PREFERRED CABLES

November 15, 1943

Army - Navy type No.	Replaces old cable number	Inner conductor	Dielectric material [1]	Nominal diameter of dielectric (inch)	Number of shielding braids	Protective covering	Nominal over-all diameter (inches)	Weight, pounds per foot	Nominal impedance, ohms	Nominal capacity, mmfd. per foot	Maximum attenuation, db/ft. 100 mc.	Maximum attenuation, db/ft. 3000 mc.	Maximum operating voltage, rms.	Average power rating (watts) [2] 200 mc.	Average power rating (watts) [2] 3000 mc.	Remarks
RG-58/U	RG-4/U [3]	20 A. W. G. copper.	A	0.116	1	Vinyl	0.195	0.025	51	30	0.062	0.403	1,900	160	35	General purpose small size flexible cable.
RG-59/U	Uniradio 32,[3] [4] EX-391 [3] [4]	22 A. W. G. copperweld.	A	.146	1	do	.242	.032	70	22	.050	.33	2,300	225	45	General purpose small size video cable.
RG-5/U	RMA 16 [3]	16 A. W. G. copper.	A	.185	2	do	.332	.057	51	30	.04	.28	3,000	310	65	Small microwave cable.
RG-6/U	KS 9168,[3] KS 9226 [3]	21 A. W. G. copperweld.	A	.185	2	do	.332	.082	75	20	.037	.26	2,700			Small size video and I. F. double shielded cable.
RG-7/U	AS-45, WC547, 62064, K31,[3] [4] 21B-255-7/30-XV [3] [4]	19 A. W. G. copper.	A	.280	1	do	.370	.080	95	14 (max.)	.030					Low capacitance, air spaced dielectric cable.
RG-8/U	PT5, WC548, WC-549, CASSF-50-1.	7/21 A. W. G. copper.	A	.285	1	do	.405	.106	52	29	.027	.25	4,000	480	90	General purpose, medium size, flexible cable.
RG-9/U	B492	do	A	.280	2	do	.420	.150	52	29	.027	.25	4,000	480	90	Double shielded, medium size, low level circuit cable.
RG-10/U	CASSF-50-1A	do	A	.285	1	Vinyl and armor.	.445	.146	52	29	.027	.25	4,000	480	90	Same as RG-8/U armored for naval equipment.
RG-11/U	WC552, WC562,[3] CASSF-70-1,[3]	7/26 A. W. G. copper.	A	.285	1	Vinyl	.405	.096	75	20	.027	.25	3,500			Medium size, flexible video and communication cable.
RG-12/U	CASSF-70-1A [3]	do	A	.285	1	Vinyl and armor.	.445	.141	75	20	.027	.25	3,500			Same as RG-11/U armored for naval equipment.
RG-13/U	21B-290-7/26 XXV, B492	do	A	.280	2	Vinyl	.420	.126	75	20	.027	.25	3,500			Double shielded I. F. cable.
RG-14/U	RMA 10, KS 9269 [3]	10 A. W. G. copper.	A	.370	2	do	.545	.216	51	30	.022	.20	6,000	730	135	General purpose semi-flexible power transmission cable.
RG-15/U	KS 9220	15 A. W. G. copperweld.	A	.370	2	do	.545	.197	75	30	.022	.20	5,500	650	115	Medium power cable designed for continuous flexing.

See footnotes at end of table.

FIRST CATEGORY PREFERRED CABLES—Continued

Army-Navy type No.	Replaces old cable number	Inner conductor	Dielectric material [1]	Nominal diameter of dielectric (inch)	Number of shielding braids	Protective covering	Nominal over-all diameter (inches)	Weight, pounds per foot	Nominal impedance, ohms	Nominal capacity, mmfd. per foot	Maximum attenuation, db./ft. 100 mc.	Maximum attenuation, db./ft. 3000 mc.	Maximum operating voltage, rms.	Average power rating (watts) [2] 200 mc.	Average power rating (watts) [2] 3000 mc.	Remarks
RG-16/U	KS 9286	0.125 copper tube	A	.460	1	do	.630	.254	52	30	.018	.16	7,500	940	165	Medium power cable with hollow inner conductor for pressurization.
RG-17/U	CASSF-50-2, KS 9256.	0.188 copper	A	.680	1	do	.870	.460	51	30	.014	.15	11,000	1460	225	Large, high-power transmission cable.
RG-18/U	CASSF-50-2A	do	A	.680	1	Vinyl and armor.	.910	.585	51	30	.014	.15	11,000	1460	225	Same as RG-17/U armored for naval equipment.
RG-19/U	CASSF-50-3	0.25 copper	A	.910	1	Vinyl	1.12	.740	51	30	.012	.125	14,000	2050	285	Very large, high-power transmission cable.
RG-20/U	CASSF-50-3A	do	A	.910	1	Vinyl and armor.	1.16	.925	51	30	.012	.125	14,000	2050	285	Same as RG-19/U armored for naval equipment.
RG-21/U	KS 9230	16 A. W. G. resistance wire.	A	.185	2	Vinyl	.332	.07	51	30	.16	.93				Special attenuating cable with small temperature coefficient of attenuation.
RG-22/U	WC551	2 cond. 7/26 A. W. G. copper.	A	.285	1	do	.405	.107	95	17	.04		1,000			Small size, twin conductor cable.
RG-23/U	B 601, B 602	2 cond. 7/21 A. W. G. copper.	A	.400	2	do	.650 x .995	.490	125	13	.05		3,000			Balanced dual coaxial cable.
RG-24/U	B 601A, B 602A	do	A	.400		Vinyl and armor.	.715 x 1.010	.670	125	13	.05		3,000			Same as RG-23/U armored for naval equipment.
RG-25/U	A2, 62101, KS 8623,[3] KS 9311.	19/0.0117 tinned copper	D	[5] .308	2	Neoprene	.565	.205	50	60	1 mc., 0.007		8,000 (peak)			Medium size, pulse cable.
RG-26/U	A1, KS 9347	do	D	[5] .308	1	Vinol and armor.	.475	.280	50	60	1 mc., 0.007		8,000 (peak)			Similar to RG-25/U armored for naval equipment.
RG-27/U	B1, 62102, KS 9036	19/0.0185 tinned copper.	D	[5] .455	1	do	.650	.273	50	60	1 mc. 0.004		17,000 (peak)			Large size pulse cable armored for naval equipment.
RG-28/U	B2, 62103	do	D	[5] .455	2	Neoprene	.805	.370	50	60	1 mc., 0.004		17,000 (peak)			Large size pulse cable.
RG-57/U	RG-43/U, TCSSF-95-1, WC 550.	2 cond. 7/21 A.W. G. copper.	A]	.472	1	Vinyl	.617	.225	95	17	.04		3,000			Large size twin conductor cable.
RG-39/U	KS 8086	22 A. W. G. copperweld.	C	.196	2	Waxed cotton braid.	.292	.10	70	28	10 mc., 0.018		1,000			Rubber cable to be used where high flexibility is required.
RG-41/U	62039,[3] KS 8498 [3]	16/30 A. W. G. tinned copper.	C	.250	1	Neoprene	.425	.15	70	28	10 mc., 0.014		1,000			Rubber cable used for twisting applications.

SECOND CATEGORY CABLES

November 18, 1943

RG-29/U	KS 9137	20 A. W. G. copper	A	0.116	1	Waxed cotton braid.	0.179	0.021	51	30	0.062	0.403	1,900	160	35	Small size video cable for equipment wiring.
RG-54/U	G. E. delay cable RG-30/U.	7/26 A. W. G. copper.	A	.185	1	Vinyl	.275	.041	58	27	.04	.28	1,500			Designed for a specific equipment.
RG-31/U	PT5, CASSF-50-1, WC 549.	7/21 A. W. G. copper.	B	.285	1	do	.405	.106	51	31	.028	.30	2,000			To be replaced by RG-8/U.
RG-33/U	KS 8919	10 A. W. G. copper	A	.370		Lead sheath	.470	.390	51	30	.020	.175	6,000	730	135	Cable designed for a specific equipment.
RG-34/U	Bendix No. A 107145A.	7/21 A. W. G. copper.	A	.460	1	Vinyl	.625	.224	72	21	.018	.163	6,500			Do.
RG-35/U	CASSF-70-2A	9 A. W. G. copper.	A	.680	1	Vinyl and armor.	.910	.525	71	21	.013	.138	10,000			Cable to replace rigid lines in naval equipment.
RG-36/U	CASSF-70-3A	0.162 copper	A	.910	1	do	1.16	.805	69	22	.011	.116	13,000			Do.
RG-37/U	D164818	20 A. W. G. tinned copper.	C	.140	1	Waxed cotton braid.	.190	.04	50	38			1,000			Cable designed for a specific equipment.
RG-38/U	D163296	17 A. W. G. tinned copper.	C	.196	2	do	.292	.11	50	38	10 mc., 0.018	1.05	1,000			Attenuating cable.
RG-40/U	D163480	22 A. W. G. copperweld.	C	.196	2	Neoprene	.420	.15	70	28	10 mc., 0.018		1,000			Cable designed for a specific equipment.
RG-42/U	KS 9167	21 A. W. G. resistance wire.	A	.196	2	Waxed cotton braid.	.297	.05	76	20	.175	1.02				Special attenuating cable with small temperature coefficient of attentuation.
RG-55/U	KS 9138	20 A. W. G. copper	A	.116	2	do	.201	.034	51	30	.062	.403	1,900	160	35	Small size I. F. cable for equipment wiring.

[1] Dielectric materials: A, stabilized polyethylene; B, polyisobutylene mixtures; C, synthetic rubber compound; D, synthetic rubber compound with layers of conducting rubber.
[2] Average power rating calculated on basis of inner conductor having 70° F. rise in temperature above ambient.
[3] Replaces with minor mechanical variations.
[4] Replaces with minor electrical variations.
[5] This value is the diameter over the second layer of conducting rubber.

STANDARDIZATION OF CONNECTORS FOR RADIO FREQUENCY CABLES

Considerable work has been done towards standardizing connectors in use with radio frequency cables. The following tables and illustrations give tentative Army-Navy standards.

U. H. F. CONNECTORS

The family of connectors described in the following table and illustrated in figures 1 to 11 are coaxial. These connectors are not

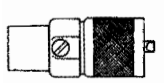


FIG. 1

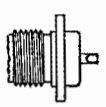


FIG. 2

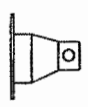


FIG. 3

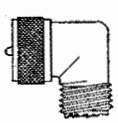


FIG. 4

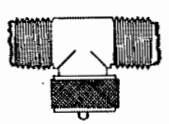


FIG. 5

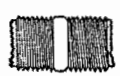


FIG. 6

U.H.F. CONNECTORS

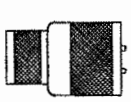


FIG. 7

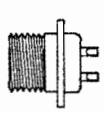


FIG. 8

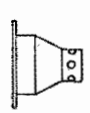


FIG. 9

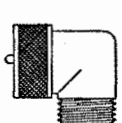


FIG. 10

FIG. 11

TWIN U.H.F. CONNECTORS

weatherproof. Consequently, special precautions must be taken when these connectors are exposed to the elements. They are not of the constant impedance type. Because their voltage reflection may be high, these connectors are not recommended for service use where the frequency is higher than 500 megacycles.

Outline	Navy type No.	Navy drawing No.	Use with A/N type cables	Cable specifications	Comment	Manufactured by—	Army type No.	Army drawing No.
For plug outline see fig. 1	49185	RE-49F-167	RG-7/U RG-8/U RG-10/U RG-11/U RG-13/U	RE-9205 RE-9206 RE-9208 RE-9219 RE-9211		Selectar Mfg. Corp. Astatic Corp Western Electric Udinite Corp Connector Corp. American Phenolic Corp.	PL-259A	SC-D-5850, SC-C-5918.
For receptacle outline see fig. 2	49194	RE-49F-167	Same as fig. 1	Same as fig. 1	Same as fig. 1	Same as fig. 1	SO-239	SC-B-5849, SC-C-5918.
For hood outline see fig. 3	49193	RE-49F-167	do	do	do	do	M-360	SC-D-5890, SC-D-5891, SC-C-5918.
For right angle outline see fig. 4.	49192	RE-49F-168	do	do	do	do	M-359	
For "Tee" outline see fig. 5	49190	RE-49F-172	do	do	do	do	M-358	SC-D-5889, SC-D-5891, SC-C-5918.
For junction outline see fig. 6.	49191	RE-49F-169	do	do	Similar to fig. 1	do	PL-268	SC-D-5887, SC-C-5918.
For plug outline see fig. 1	49190	RE-49F-175	do	do	Similar to fig. 4 except improved electrical characteristics.	do	PL-259	
For right angle outline see fig. 4.	49192A	RE-49F-168	do	do		Astatic Corp., Selectar Mfg. Corp.		
For twin plug outline see fig. 7.	49188	RE-49F-173	RG-43/U	RE-9232		Selector Mfg. Corp., Astatic Corp. Udinite Corp., Connector Corp., American Phenolic Corp.	PL-265	SC-C-5918.
For twin receptacle outline see fig. 8.	49196	RE-49F-173	RG-43/U	RE-9232		Same as fig. 7	SO-265	SC-C-5918.
For twin hood outline see fig. 9.	49208	RE-49F-173	RG-43/U	RE-9232		do	M-365	SC-C-5918.
For twin right angle outline see fig. 10.	49198	RE-49F-171	RG-43/U	RE-9232		do	PL-325	SC-C-5918.
For junction outline see fig. 11.	49189	RE-49F-174	RG-43/U	RE-9232		do	PL-305	SC-C-5918.
For small twin plug outline see fig. 7.			RG-22/U	RE-9220	Similar to the above except smaller and for smaller twin cable.	American Phenolic Corp.	PL-284	SC-D-5940, SC-C-5918.
For small twin receptacle outline see fig. 8			RG-22/U	RE-9220	do	do	SO-264	SC-D-5941, SC-C-5918.
For small twin hood outline see fig. 9.			RG-22/U	RE-9220	do	do	M-360	SC-B-5849, SC-C-5918.
For small right angle outline see fig. 10.			RG-22/U	RE-9220	do	do	PL-293	SC-C-5918, SC-D-5943, SC-B-5942.
For small junction outline see fig. 11.			RG-22/U	RE-9220	do	do	PL-285	SC-C-5918.

TYPE "N" CONNECTORS

The family of connectors described in the following table and illustrated in figures 12 to 22 are of the constant impedance type; namely, 50 ohms. These connectors are recommended for all frequencies through the "S" band. However, these connectors are not recommended for use where a voltage in excess of 500 volts peak will be encountered. It should be borne in mind that the following drawings are not to scale.

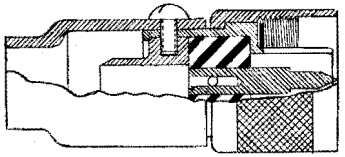


FIG. 12

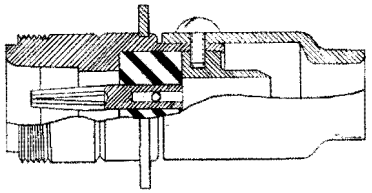


FIG. 13

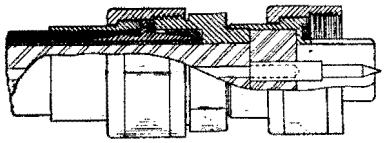


FIG. 14

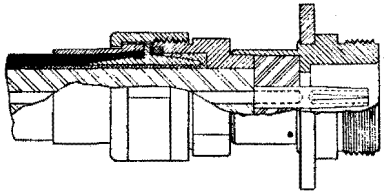


FIG. 15

TYPE "N" CONNECTORS AND FITTINGS

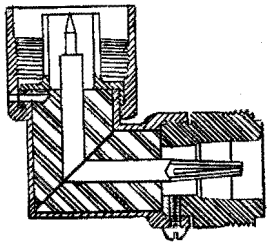


FIG 16

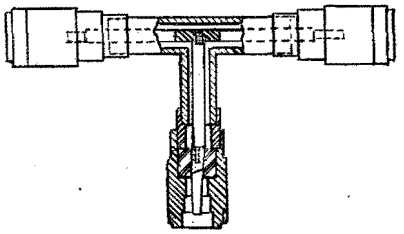


FIG 17

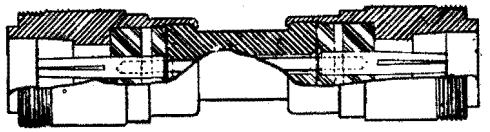


FIG. 18

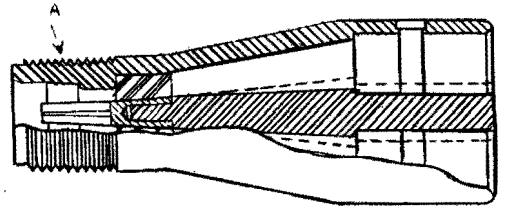


FIG.19

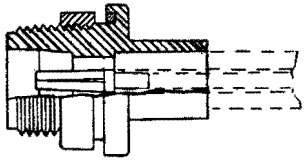


FIG 20

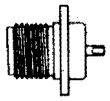


FIG 21

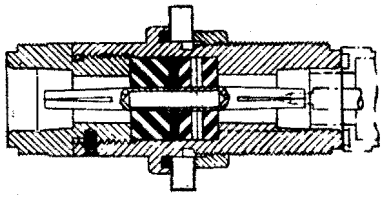


FIG 22

Outline	Army-Navy type No.	Navy type No.	Navy drawing No.	Use with A/N type cables	Cable specifications	M. I. T. drawing	Comment	Manufactured by—
For plug outline see fig. 12.	UG-12/U	49205	RE-49F-180	RG-8/U RG-10/U	RE-9206 RE-9208		Non-weatherproof	Western Electric, Ucinite Corp., Cundy-Bettoney.
Do	UG-15/U	49288		RG-38/U		2306		Same as fig 12.
Do	UG- 9/U	49426		RG-5/U	RE-9203	2306		Do.
For jack outline see fig 13.	UG-13/U	49206	RE-49F-180	RG-8/U RG-10/U	RE-9206 RE-9208		Non-weatherproof	Do.
Do	UG-14/U	49296	RE-49F-180	RG-8/U RG-10/U	RE-9206 RE-9208		Same as 49206 except less mounting plate.	Do.
Do	UG-16/U	49289		RG-38/U		2309		Do.
Do	UG-17/U	49297		RG-38/U			Same as 49289 except less mounting plate.	Do.
Do	UG-10/U	49427		RG-5/U	RE-9203	2309		Do.
Do	UG-11/U	49428		RG-5/U	RE-9203		Same as 49427 except less mounting plate.	Do.
For plug outline see fig. 14.	UG-21/U	49268	RE-49F-188	RG-8/U RG-10/U	RE-9206 RE-9208		Weatherproof	Mendelsohn Speedgun Co., Astatic Corp., Selectar Mfg. Corp.
Do	UG-24/U	49284		RG-9/U	RE-9207	3194-Type I		Same as fig 14.
Do	UG-18/U	49286		RG-5/U	RE-9203	3194-Type III		Do.
For jack outline see fig. 15.	UG-22/U	49269	RE-49F-188	RG-8/U RG-10/U	RE-9206 RE-9208		Weatherproof	Do.
Do	UG-23/U	49298	RE-49F-188	RG-10/U	RE-9208		Same as 49269 except less mounting plate.	Do.
Do	UG-25/U	49285		RG-9/U	RE-9207	4040—Type I		Do.
Do	UG-26/U	49445		RG-9/U	RE-9207		Same as 49285 except less mounting plate.	Do.
Do	UG-19/U	49287		RG-5/U	RE-9203	4040—Type III		Do.
Do	UG-20/U	29299		RG-5/U	RE-9203		Same as 49287 except less mounting plate. mounting plate.	Do.
For right angle outline see fig. 16.	UG-27/U	49267				B-2066		Astatic Corp., Selectar Mfg. Corp., Mendelsohn Speedgun Co.
For "Tee" outline see fig. 17.	UG-28/U	49450				Astatic Corp. B-7560.		Astatic Corp., Selectar Mfg. Corp.
For coupling outline see fig. 18.	UG-29/U	49451				Astatic Corp. B-7540.		Do.
For adapter outline see fig. 19.	UG-32/U (50Ω)	49261	RE-49F-187				Cable is connected at pt. "A" to adapter by use of Navy type 49268, 49284 or 49286 plug.	Astatic Corp.
	UG-33/U (70Ω)	49263	RE-49F-187					
For panel jack outline see fig. 20.						C-3209	Couples to 9/16" rigid line	Selectar Mfg. Corp., Mendelsohn Speedgun Co., Astatic Corp.
For receptacle outline see fig. 21.		49470				Astatic Corp. B-7570.		Astatic Corp.
For pressurized chassis or bulkhead connector outline see fig. 22.	UG-30/U					B-4756	Use Navy type 49268, 49284 or 49286 or 49267, 49288 or 49426 plug both on ends of this connector.	Selectar Mfg. Corp., Mendelsohn Speedgun Co., Astatic Corp.

INSTRUCTIONS FOR ASSEMBLING R. F. CABLES TO CONNECTORS

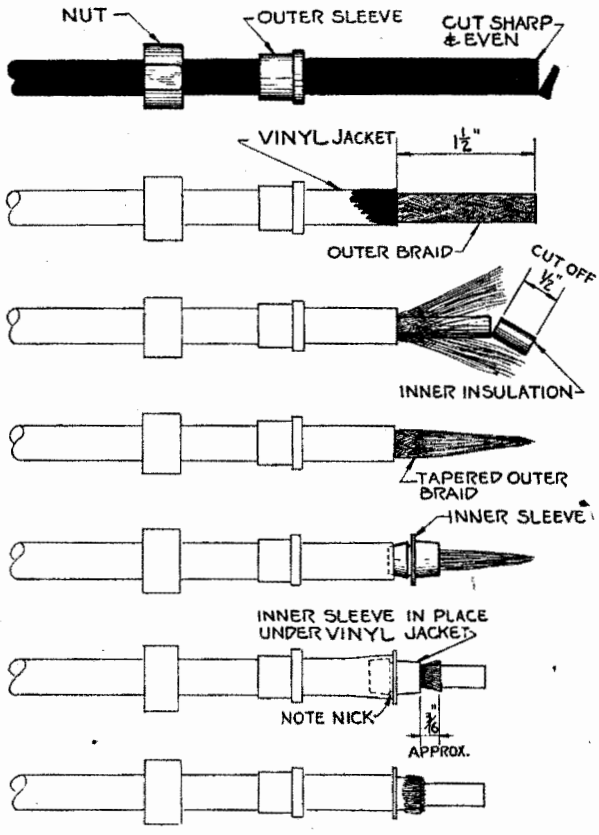
I. Instructions for assembling Navy type 49268 50-ohm weather-proof connector or type 49269 jack with Army and Navy type RG-8/U or RG-10/U cable.[2]

A. Component parts of connector.

B. Procedure.

Step by step procedure for cable to connector assembly is set forth in the drawings appearing on the two following pages.

[2] Superseding designation for CASSF-50-1 and CASSF-50-1A cables.



A. CUT END OF CABLE EVEN
(1) B. SLIDE THE OUTER SLEEVE AND THE NUT OVER CABLE

(2) CUT OFF VINYL JACKET 1½" FROM END OF CABLE EXPOSING BRAID BEING CAREFUL NOT TO NICK THE BRAID.

(3) FAN BRAID OUT. CUT OFF INSULATION AND CENTER CONDUCTOR ½". (PURPOSE OF THIS IS TO LEAVE SHARPEND.

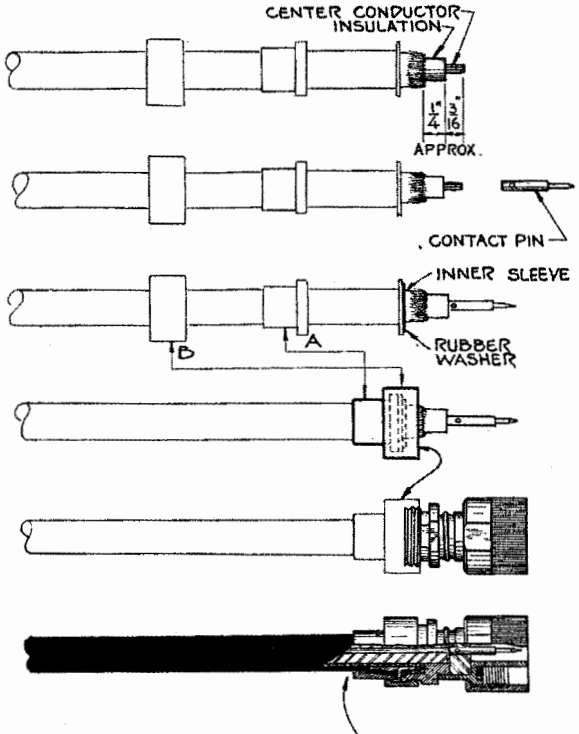
(4) TAPER END OF BRAID (AS SHOWN) PURPOSE OF THIS IS TO SLIP INNER SLEEVE OVER BRAID & UNDER

(5) SLIDE INNER SLEEVE OVER TAPERED BRAID AND FORCE UNDER OUTER VINYL JACKET.

(6) WITH INNER SLEEVE IN PLACE. CUT BRAID APPROX. 3/16"

(7) FOLD BRAID BACK OVER INNER SLEEVE & SMOOTH.

22



(8) A-CUT INNER INSULATION APPROX. ¼" MEASURING FROM INNER SLEEVE. B-REMOVE INNER INSULATION LEAVING 3/16" CENTER CONDUCTOR EXPOSED C-TIN CENTER CONDUCTOR.

(9) HOLD CONTACT PIN WITH PLIERS. FILL HOLE WITH SOLDER. TIN CENTER CONDUCTOR AND INSERT INTO PIN

(10) REMOVE EXCESS SOLDER SLIP RUBBER WASHER OVER INNER SLEEVE (AS SHOWN)

(11) SLIDE OUTER SLEEVE "A" & NUT "B" AS CLOSE AS POSSIBLE IN PREPARATION TO RECEIVING CONNECTOR ASSEMBLY

(12) CONNECTOR ASSEMBLY (ILLUSTRATED) SLIDE CABLE INTO CONNECTOR ASSEMBLY. SCREW NUT INTO PLACE WITH A WRENCH. DO NOT TURN CONNECTOR WHILE TIGHTENING NUT AS THIS TWISTS THE RUBBER WASHER MAKING THE CONNECTOR OR JACK NON WATERPROOF.

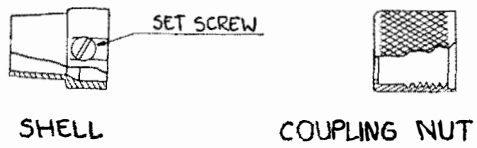
(13) COMPLETED ASSEMBLY SHOWN IN SECTION.

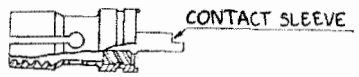
Note: IF CABLE IS ARMORED TERMINATE ARMOR AT APPROX. THIS POINT & FASTEN WITH TAPE OR ANY OTHER SUITABLE MEANS.

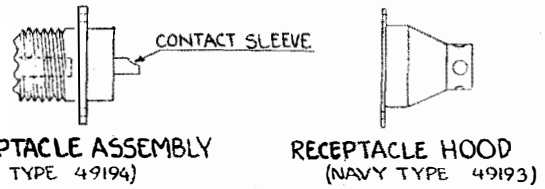
28

II. Instructions for assembling Navy type 49193, 49194, and 49195 U. H. F. non-weatherproof connector assemblies with Army and Navy type RG–8/U, RG–10/U, RG–11/U or RG–12/U cables.[3]

A. Component parts of connectors.



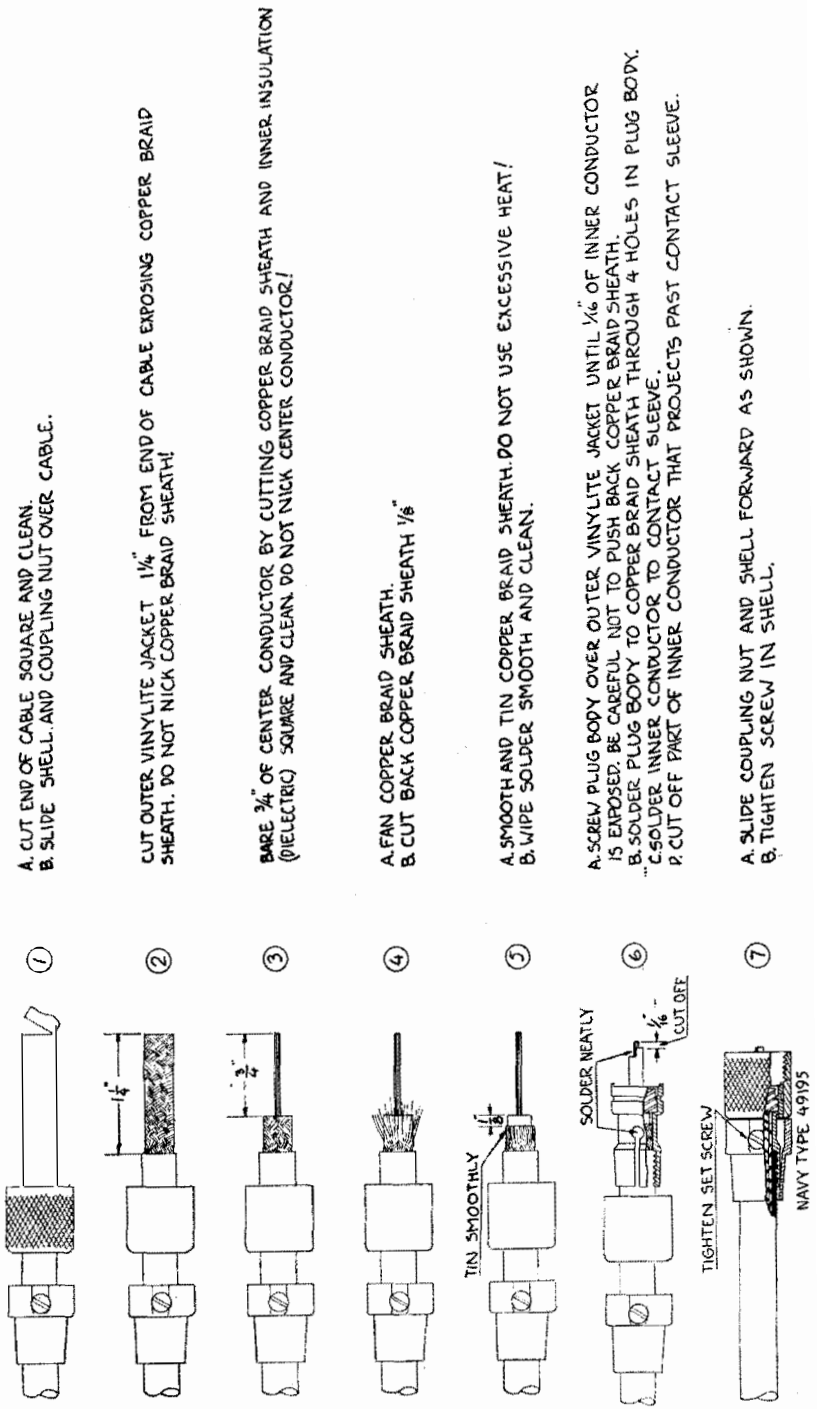




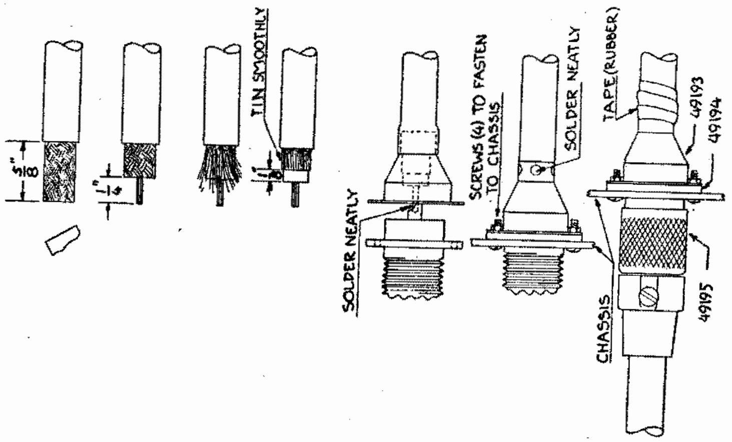
B. Procedure.

Step by step procedure for cable to connector assembly is set forth in drawings on the two following pages.

[3] Superseding designations for cable types CASSF–50–1, CASSF–50–1A, CASSF–70–1, and CASSF–70–1A, respectively.



IF IT BECOMES NECESSARY TO CONNECT THE ABOVE CABLE TO A RECEPTACLE THE FOLLOWING PROCEDURE IS USED:



① A. CUT END OF CABLE SQUARE AND CLEAN.
B. CUT OUTER VINYLITE JACKET 5/8 FROM END OF CABLE EXPOSING COPPER BRAID SHEATH.

② BARE 1/4" OF INNER CONDUCTOR BY CUTTING COPPER BRAID SHEATH AND INNER INSULATION (DIELECTRIC) SQUARE AND CLEAN. DO NOT NICK CENTER CONDUCTOR!

③ A. FAN COPPER BRAID SHEATH.
B. CUT BACK COPPER BRAID SHEATH 1/8".

④ A. SMOOTH AND TIN COPPER BRAID SHEATH. DO NOT USE EXCESSIVE HEAT!
B. WIPE SOLDER SMOOTH AND CLEAN.

⑤ A. SLIDE RECEPTACLE HOOD OVER TINNED COPPER BRAID SHEATH AND FORCE UNDER VINYLITE JACKET AS SHOWN.
B. PLACE INNER CONDUCTOR IN CONTACT SLEEVE OF RECEPTACLE ASSEMBLY AND SOLDER.

⑥ A. PUSH HOOD FLUSH UP AGAINST RECEPTACLE ASSEMBLY AND BOLT HOOD WITH ASSEMBLY TO CHASSIS.
B. SOLDER HOOD TO COPPER BRAID SHEATH THROUGH 4 HOLES IN HOOD.
C. TAPE AT JUNCTION OF HOOD AND VINYLITE JACKET (IF NECESSARY).

⑦ INSERT PLUG BODY CONTACT SLEEVE INTO RECEPTACLE ASSEMBLY AND TIGHTEN COUPLING NUT.

SONAR

There has been an apparent need for a convenient and descriptive title for material heretofore classified as underwater sound equipment. Accordingly, the word "SONAR" has been coined to designate underwater sound equipment used for submarine detection and navigation. The use of this term has been approved by the Chief of Naval Operations.

Like the term "RADAR," Sonar has been derived from the equipment usage: SO for sound, NA for navigation, and R for ranging. It is requested that every effort be made to use and popularize this term.

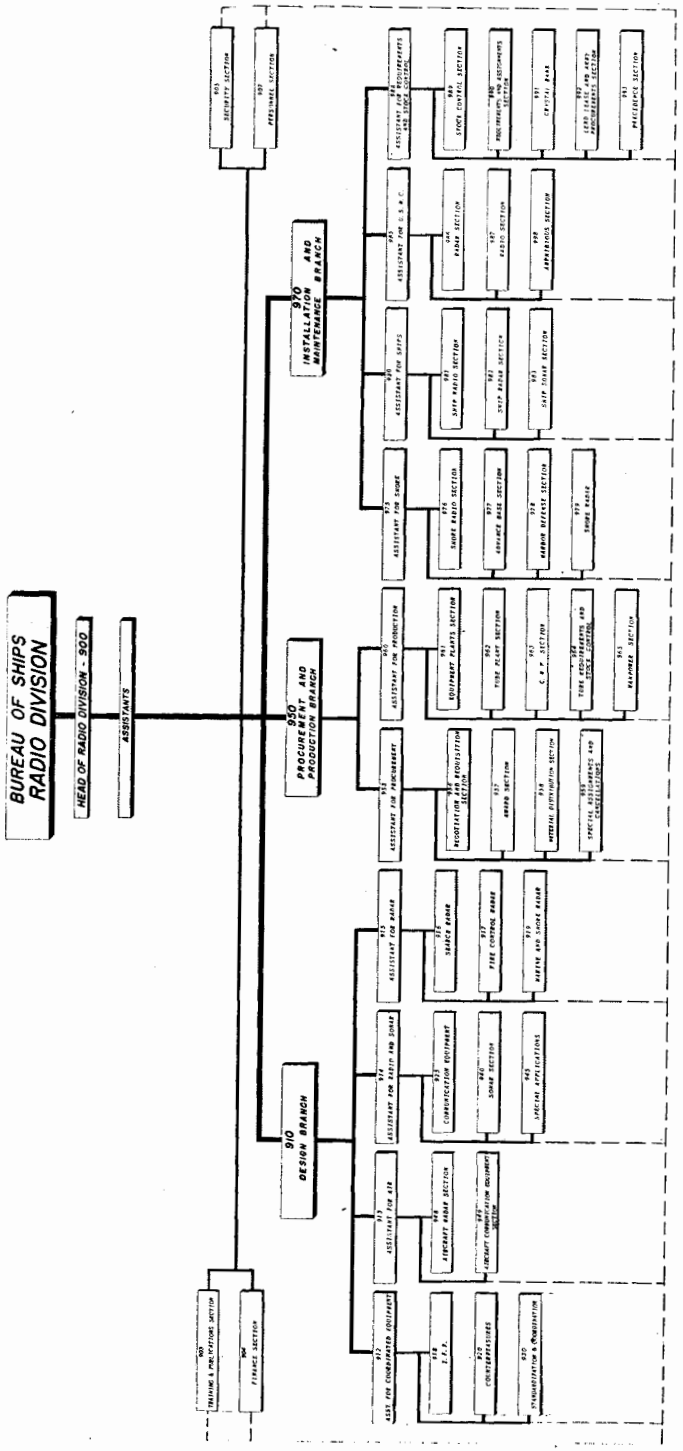
* * *

AVAILABILITY OF CONFIDENTIAL PUBLICATIONS

Word continues to reach the Bureau that confidential instruction books and other classified publications are, on occasion, withheld from the personnel to whom the information is directed. Since all instruction books are now nonregistered, this situation should no longer exist.

There is nothing inconsistent between adequate security and allowing all interested personnel to have ready access to classified publications. It is quite obvious that books locked up in safes will not be of much value to operating and maintenance personnel. Custodians should make every effort to see that *all* personnel who require their use have access to instruction books. This includes enlisted personnel, and civilian employees of the Navy and of contractors. Reports have been received that field engineers of companies who have been retained to service radar equipment have been denied access to the instruction books for the equipment they are hired to maintain. While such practice is, fortunately, not general, it would be desirable for all activities to check their policy on the custody of confidential instruction books to assure that books are available to personnel who need them.

ORGANIZATION CHART OF RADIO DIVISION



A DESCRIPTION OF THE SCR–573–A AND THE SCR–574–A SIGNAL CORPS EQUIPMENTS

INTRODUCTION

The increased use of certain Army equipments by Naval forces, makes it desirable to furnish information concerning these equipments from time to time.

Signal Corps radio receiving equipment SCR–574–A and Signal Corps radio transmitting equipment SCR–573–A, together with their associated remote-control equipment, are completely transportable units. When used together, they are especially suited for a local sector transmitting-receiving station or for a forward relay transmitting-receiving station for communicating with aircraft out of range of a local sector station. If suitable wire lines are provided, satisfactory operation of these equipments is obtainable at distances up to 90 miles from a remote operating point.

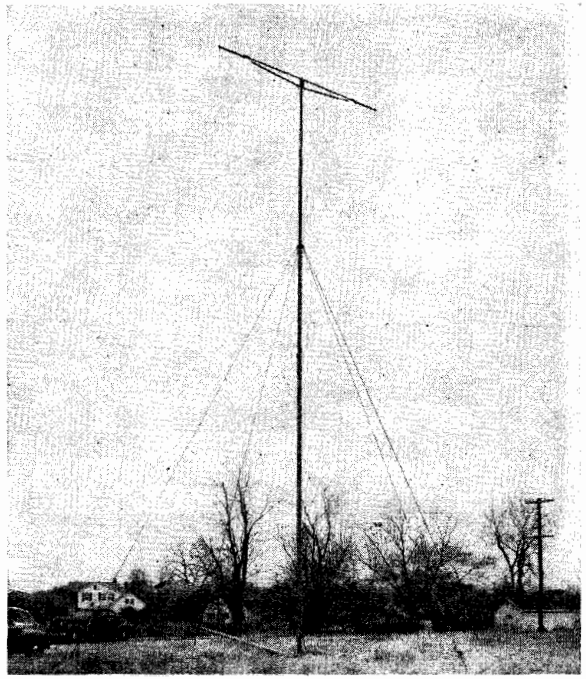


FIGURE 1.—Antenna assembly, 75-foot plywood mast, two dipoles on spreader boom, and erector boom at side near ground, of the Models SCR–573–A and 574–A.

Physically, each set is contained in one truck, model K–53, and one trailer, model K–63. Each set has its own power supply assembled on the trailer. Each set has its own 75-foot antenna-mast (see fig. 1), antennas, and coaxial cables, etc., disassembled and stored in the truck.

In the following pages it is proposed to discuss the remote-control equipment, radio receiving set SCR–574–A, and radio transmitting set SCR–573–A in the above order. It is believed that this subject matter can best be served by this sequence.

ASSOCIATED REMOTE-CONTROL EQUIPMENT

The Navy remote-control equipment referred to is to be used in conjunction with two transmitters and two receivers with their accessory equipment. The assembly of two transmitters, for which this auxiliary equipment is designed, mounted on a truck with a trailer equipped with a gasoline-driven power supply, is known as model SCR–573–A. The assembly of two receivers mounted on another similar truck with similar power supply is known as SCR–574–A. A third truck (model SCR–572) with remote-control equipment was orginally designed to go with the transmitter and receiver trucks to make the equipment complete. The following items of auxiliary equipment with Navy type numbers serve the purpose of the equipment of the third truck for Naval and Marine Corps use:

Selector control unit	CRR–23367
Selector unit [1]	CRR–23368
Audio motor unit	CRR–49295
Relay unit	CRR–29218
Carrying case (trunk)	CNW–10205

[1] This selector unit replaces the BC–685 originally furnished by the Army as part of radio set SCR–574–A. For selector control unit CRR–23367 to control the operation of the SCR–574–A and associated SCR–573–A, this substitution must be made.

Figure 2 shows a possible lay-out between two radio sets SCR–573–A and two radio sets SCR–574–A which contain four transmitters and four receivers under the control of operators at positions A1 and A2, and operators at each of the truck locations B1 and B2. An officer at position C supervises the operations at A1 and A2.

The operator at A1 can select either of the two transmitters and either of the two receivers at B1. One transmitter and one receiver at B1 may be called channel one, and the remaining transmitter and receiver may be called channel two. On either channel, when the press-to-talk switch of a microphone is closed at either A1 or C, connections are made for modulating the transmitter. The opening of the press-to-talk switch at either A1 or C makes connections that provide for the reception of signals from B1 at these points. Switch-

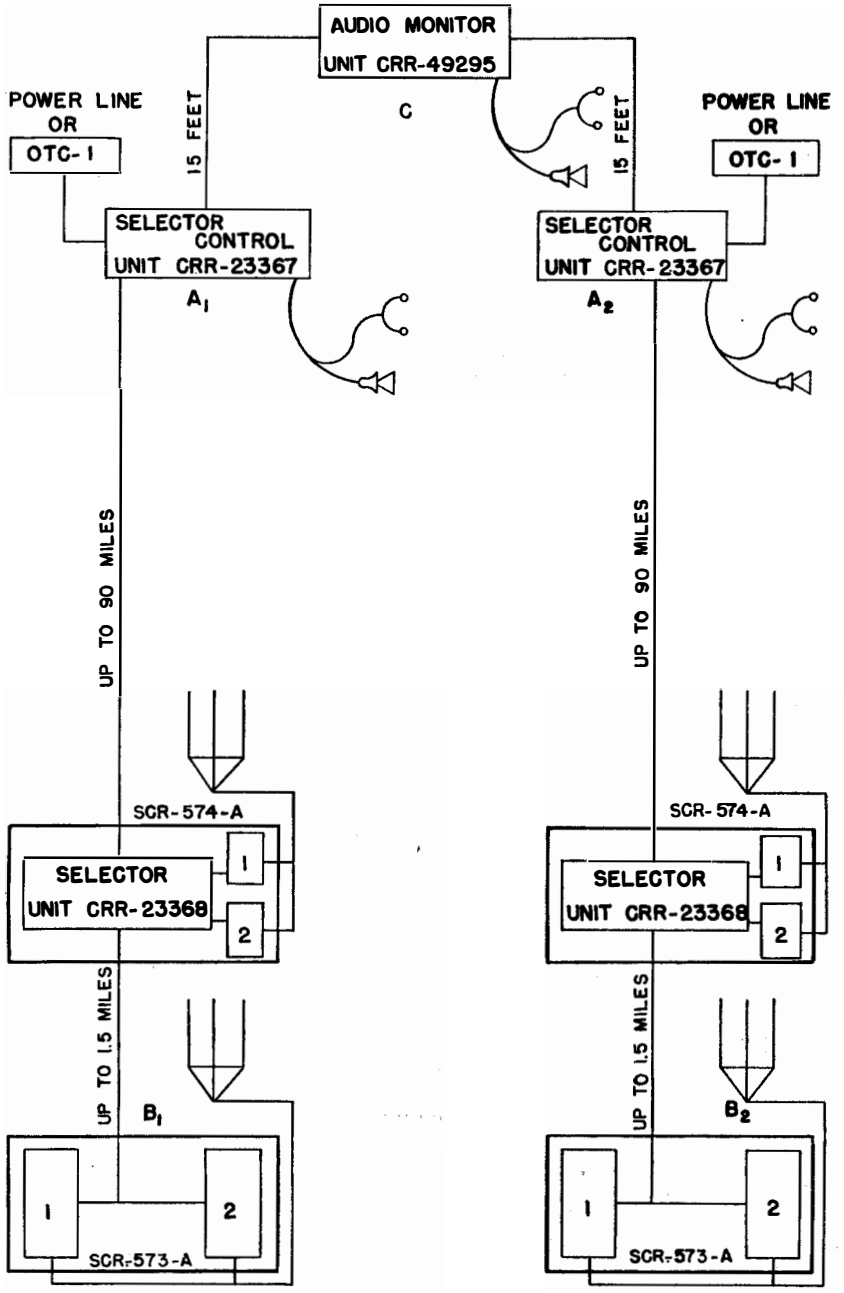


FIGURE 2.—Audio monitor unit, two selector control units, transmitting sets, and receiving sets in block diagram relationship.

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ing to line one of the CRR–49295 audio monitor unit operates B1 through A1, and switching to line two operates B2 through A2. Selection of the wanted channel may be made at either A1 or B1 for B1, and at either A2 or B2 for B2 equipment. The audio monitor unit at position C is an extension of the microphone and headphone connections of the selector control units CRR–23367 at A1 and A2.

Cranking a telephone hand-generator at A1 temporarily connects the generator to the telephone line to B1, and disconnects other circuits of the selector control unit, while a ringer in the Radio set SCR–574–A at B1 signals the operator. The RADIO–I/C switch in the selector control unit CRR–23367 when put in the I/C (intercommunication) position, makes possible telephone conversation between A1 and B1 without placing either transmitter of the SCR–573–A on the air. When the switch is placed in the RADIO position, operating the press-to-talk switch places one of the two transmitters on the air. This applies to either the press-to-talk switch at A1 or C. The selection of the channel is made by a switch at A1. The position of this switch determines the frequency of the impulse that goes over the line to B1, and after being received by the selector unit at B1 determines whether the microphone input is connected to channel one or channel two. The length of the impulse on the opening of the press-to-talk switch is of different duration (from the length of the impulse on the closing of the press-to-talk switch) and is received by the selector unit at B1, which connects the appropriate receiver to the remote line.

The selector control unit (located at A1 or A2) is self-contained and suitable for rack mounting. It consists of a telephone hand generator, fixed oscillator, variable oscillator, timing relay, oscillator output amplifier, line amplifier, and rectifier to operate on 110-volt a. c. supply together with other accessory jacks, relays, etc. The crank for the generator is located on the upper front panel. To the right is a duplex female a. c. outlet. To the left is a jack for a monitor line and terminals for connection to the telephone line. At the lower right is a panel for the on-off switch, a. c. input receptacle and a fuse for each side of the a. c. line. At the lower left is another panel with RADIO–I/C switch, microphone and telephone jacks, channel "1" and "2" switch, and volume control.

The channel switch connects the coil of the variable oscillator circuit so that the beat note produced with the fixed oscillator is either 40 or 80 cycles. Setting the RADIO–I/C switch to the I/C position opens the supply voltage to the oscillator plates independent of the action of the press-to-talk switch. In the RADIO position, operating the press-to-talk switch supplies plate voltage to the oscillators for 1.25 seconds on contact and 0.12 second on the break.

Timing is accomplished by the timing relay circuit and the send-receive (S/R) relay. When the tubes are warmed up, the plate current of the timing relay tube restrains the relay which withholds the plate voltage from the oscillators. On contact of the press-to-talk switch the S/R relay connects a charged condenser to a biasing resistor which reduces the plate current and operates the relay connecting plate voltage to the oscillators for 1.25 seconds. On "break" of the press-to-talk switch a smaller condenser is connected to the same resistor so that oscillator plate voltage is supplied for 0.12 second. Thus the "dash" at 40 cycles provides connections for modulation of the channel 1 transmitter and the "dot" provides channel 1 reception. The same at 80 cycles operates channel 2.

Duplicate connections are provided at the rear of the unit so that leads may be brought either to the front or the rear for a. c. supply, telephone line, and monitor line.

The audio monitor unit (position C) is a steel-encased unit with all connections and controls on the front panel. There are two jacks for incoming telephone lines. Two jacks are provided for connection to a microphone and head telephones. A switch to connect the microphone and headphones to line 1 or 2 is provided.

The selector unit (position B1 or B2) is of the rack-mounted type. At the lower right is the ON-OFF switch and the channel-change switch. Pilot lights indicate operation on channel 1 or 2. To the left is a knob for control of sensitivity, and a jack for phones.

When commercial 60-cycle power is not available at A1 and/or A2, a gasoline generator (OTC–1 with modifications) is used.

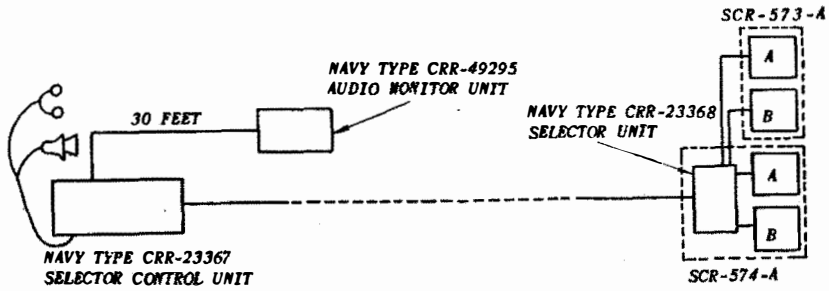


FIGURE 3.—Audio monitor unit, one selector control unit, one truck with two transmitters, and one truck with two receivers in block diagram relationship.

Figure 3 shows the set-up using only one SCR–574–A and only one SCR–573–A.

Figure 4 shows an audio monitor unit, in conjunction with a Navy type CRR–29218 relay unit, controlling send-receive switching of one transmitter-receiver combination. Another line from the audio

monitor unit to another relay unit would accomplish the same result on a second transmitter-receiver combination.

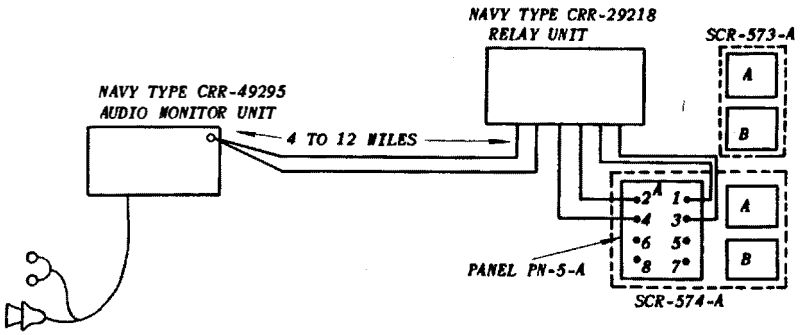


FIGURE 4.—Audio monitor unit, with relay unit, for controlling one truck with two transmitters and one truck with two receivers, in block diagram relationship.

RADIO RECEIVING SET SCR–574–A

Radio set SCR–574–A operates over a frequency range of 100 to 156 mc. (1.92 to 3.0 meters). The set consists of one model K–53 truck (2½ ton, 6 x 6, van-body), one radio receiver RC–72–A, one radio receiver RC–155–A, one antenna AN–86–A, two antenna equipments RC–81–A, one power unit PE–99–A, and one model K–63 trailer (1-ton, cargo) and all associated equipment.

Physically, radio set SCR–574–A is a transportable unit completely assembled in one truck and one trailer. The truck houses all the operating radio equipments, maintenance and test equipments, and necessary antenna equipments when the radio set is in transit. The trailer houses the power unit for the radio set. Included in this trailer are spare parts for the power unit, one 150-foot length of three-wire power cable, and one 200-foot length of cable for remote control of the power unit. A canvas tarpaulin covers the equipment in the trailer when in transit.

One antenna AN–86–A is furnished as a part of each radio set SCR–574–A. This is a 75-foot plywood antenna mast designed to support the coaxial cable and antenna equipments RC–81–A. The mast and boom sections of the antenna are carried in a rack fitted against the front and rear roadside corners of the truck. These sections are removed from the vehicle when the radio set is set up for operation.

Radio set SCR–574–A may be located a considerable distance from a remote operating point. If suitable wire lines are provided, satisfactory operation of the station is possible at distances up to 90 miles

from the remote operating point. Radio set SCR–574–A is used both as a local sector receiving station and as a forward relay receiving station for communicating with aircraft out of range of a local sector receiving station. It is used in conjunction with radio set SCR–573–A to form a complete radio receiving and radio transmitting station. The transmitting station, radio set SCR–573–A is connected to and is controlled through the receiving station, radio set SCR–574–A.

Two radio receivers permit simultaneous, two-channel remote operation, if two 2-wire telephone lines are provided. With one 2-wire line, one channel at a time may be used. Normally, two telephone lines will be connected to the station, and both will be equipped for automatic switching. However, if both lines should fail, the station may be operated locally by the station operator or operators.

The station will be operated locally only in emergency cases due to failure of the relay unit and control units, or upon orders from the remote operating point. All operations will normally be carried out automatically from the remote operating point through the line amplifiers BC–686–A, selector units Navy type CRR–23368, and control unit RM–18–A.

The send-receive and channel signals are sent from the remote operating point in accordance with the position of the send-receive switch and channel switch on the selector control unit at the remote operating point. Provisions have been made for feeding the receiver output back over the same line that is used for the incoming speech for transmitter modulation. This is accomplished through line amplifier BC–686–A which contains a hybrid network to enable the receiver output to be fed back over the same line without allowing it to be fed into the transmitter input equipment.

Simultaneous two-channel MCW radio-telegraph operation of transmitting and receiving stations, SCR–573–A and SCR–574–A, from radio set SCR–574–A is provided. This type of operation provides keying of a 1020-cycle audio tone on the carrier. The carrier itself is not keyed. MCW radio-telegraph operation is not provided for from the remote control location.

Radio set SCR–574–A ordinarily obtains all its operating power from its own power unit, PE–99–A, which is a three-phase, 110-volt, gasoline-engine-driven alternator with 7.5 kva. capacity. This radio set will operate from any single- or three-phase, 110-volt, AC supply such as a 110-volt, 50–60 cycle, commercial service line. This radio set requires a minimum of 4.5 kw. for normal operation.

Radio set SCR–574–A requires one 75-foot antenna mast AN–86–A and two antenna equipments RC–81–A plus two 200-foot lengths of coaxial cable. This equipment is supplied with the radio set. The two dipole antennas are mounted on the cross arm on top of the an-

tenna AN–86–A. The coaxial cables which convey the signals from the antenna dipoles to the radio receivers are brought up through the center of antenna AN–86–A and connected to the antenna equipments RC–81–A. In order that antenna-mast AN–86–A may be raised and lowered safely, and in order that the coaxial cables will reach the truck without difficulty, this antenna mast should be set up at a distance of 100 feet from the truck with which it is to be used. The 200-foot coaxial cables are connected to the radio receivers through the coaxial cable box on the side of the van body of the vehicle.

RADIO TRANSMITTING SET SCR–573–A

Radio set SCR–573–A operates over a frequency range of 100 to 156 mc. (1.92 to 3.0 meters.) The set consists of one truck model K–53 (2½ ton, 6 x 6, van-body), two radio transmitters BC–640–A, one antenna AN–68–A, two antenna equipments RC–81–A, one power unit PE–99–A, one trailer model K–63 (1-ton, cargo), and all associated equipment.

Physically, radio set SCR–573–A is a transportable unit completely assembled in one truck and one trailer. The truck houses all the operating radio equipments, maintenance and test equipments, and necessary antenna equipments when the radio set is in transit. The trailer houses the power unit PE–99–A, spare parts for the power unit, one 150-foot length of three-wire power cable, and one 200-foot length of cable for remote control of the power unit. A canvas tarpaulin covers the equipment in the trailer when not in use.

Radio set SCR–573–A is generally located ½ to 1½ miles away (never closer than ¼ mile) from the SCR–574–A set, to place the receiving set out of range of sources of electrical disturbance from the transmitting set. The transmitting station must be far enough from the airfield so that the 75-foot plywood antenna will not interfere with the operation of aircraft.

Both radio transmitters can be used simultaneously, when the SCR–573–A is connected to the associated SCR–574–A by two 2-wire lines. Each transmitter may be operated locally in an emergency, for testing the transmitters, or upon orders from the remote operating point.

Radio set SCR–573–A ordinarily obtains all its operating power from its own power unit, PE–99–A, which is a three-phase, 110-volt, gasoline-engine-driven alternator with 7.5 kva. capacity. This radio set will operate from any single- or three-phase 110-volt, AC supply, such as a 110-volt, 50–60 cycle, commercial service line.

When the radio set is set up for operation, the antenna equipments are removed from the vehicle and erected nearby. The mast is of plywood, sectional, and is assembled with accessories, and erected with

the aid of a boom. Suitable storage locations are provided for all parts when not in use.

A coaxial cable box is located on the lower left-hand side. Two entrance receptacles are provided in each box to which the coaxial cable plugs from the antennas are connected.

The two transmitters are located on a rack, in the center of the truck floor, which is shock mounted at the top and bottom. One coaxial cable stub connects each of these radio transmitters to the coaxial cable box on the side of the vehicle.

* * *

RETIREMENT OF LAWRENCE HASLETT

After more than 40 years of service in the Navy Department, Lawrence Haslett has retired. Of perhaps greatest interest to radio personnel is the fact that Mr. Haslett was the only full-time employee in radio work at the time of his employment in 1903. At that time he assisted Lt. J. L. Jayne and Lt. J. M. Hudgins who were devoting only part time to radio.

The following letter was sent to Mr. Haslett by Capt. J. B. Dow, U. S. N., Head of the Radio Division:

29 NOVEMBER 1943.

LAWRENCE HASLETT,
Radio Division, Navy Department
Washington, D. C.

DEAR MR. HASLETT: There are not many words adequate to fully express my sincere appreciation for the work you have done so well during your many years of employment in the Navy. I do wish, however, to thank you very kindly for your long and faithful service, your devotion to duty, and the splendid contribution you have made to the growth of the Radio Division.

All officer, enlisted, and civilian personnel of the Division join me in wishing you the best of luck, happiness, and enjoyment of many years of well-earned retired life.

Very sincerely yours,

J. B. Dow,
Captain, U. S. N.

EFFECT OF NOISE ON INTELLIGIBILITY OF RADIO RECEPTION

A report from the Department of Transport, Ottawa, Canada, sets forth some informative data on the dependence of intelligibility on the signal to noise ratio. These results correspond very closely to similar quantitative measurements made by the Aircraft Radio Section of the Bureau of Ships.

Figure 1 presents curves showing percentage errors as a function of signal to noise ratio. These curves are based on actual listening tests conducted in Toronto and Montreal.

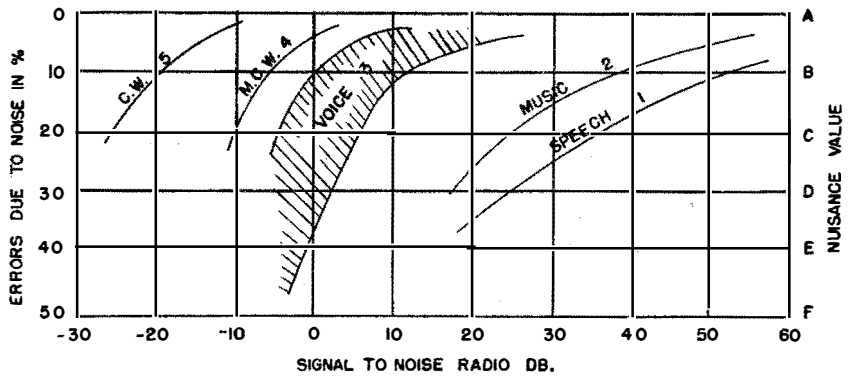


FIGURE 1.—Graph showing effect of signal to noise ratio on the intelligibility of signals.

Curves 1 and 2 indicate results for music and voice respectively from the broadcast listeners' standpoint. The ordinate is based on an arbitrary nuisance value scale as follows:

A—Reception entirely satisfactory.
B—Reception very good, background unobtrusive.
C—Reception fairly satisfactory, background fairly evident.
D—Background very evident, but speech easily understood.
E—Speech understandable only with severe concentration.
F—Speech unintelligible.

Curves 3, 4, and 5 indicate results for voice, M. C. W. and C. W. respectively. For these curves the ordinates are actual percentage errors made by a jury of commercial operators copying code and speech with noise superimposed at various levels. The hatched area in curve 3 represents limits of several investigations.

From figure 1, it is seen that with a signal to noise ratio of minus 20 db, approximately 90 percent of the received C. W. signals are intelligible. For M. C. W. signals, however, a signal to noise ratio of at least minus 5 db. is necessary for 90 percent intelligibility. To afford an intelligibility of at least 90 percent for Voice (speech), the signal to noise ratio must be equal to or greater than about plus 6 db. In other words, for a given signal to noise ratio C. W. signals are more intelligible than M. C. W. signals and M. C. W. signals more than Voice.

* * *

CATALOGUE OF NAVAL RADIO EQUIPMENT

The Bureau of Ships has undertaken the production of a series of publications describing in summarized form the general characteristics of naval radio equipment. The first edition has been prepared under the title, "Catalogue of Naval Radio Equipment—Transmitters." This publication is classified as nonregistered confidential and is distributed through the Registered Publications System. It is currently available in the local issuing offices. A second edition covering certain receivers, direction finders, and additional transmitters is now in preparation and will be available by February 1.

The allowance list established for these publications allocates them only to activities requiring a reference on characteristics, accessories, and physical dimensions in general terms. The catalogue does not provide exact and detailed information such as is contained in instruction books on specific equipments.

Activities requiring this publication should apply to the nearest Registered Publications Issuing Office. If they are not on the allowance list, application may be made to the Bureau of Ships by letter. Since the number of copies of this catalogue is based on a limited distribution, only activities having a real need should apply.

REINFORCING THE SCR-399 TO PREVENT DAMAGE IN SHIPMENT

1. INTRODUCTION

Reports of damage to radio sets SCR–399 during shipment have been received by the Bureau of Ships. Information from the Chief Signal Officer, Headquarters Army Service Forces, indicates that field modifications may be performed to eliminate the possibility of damage. Sets bearing serial numbers 1 to 1991 will require alteration.

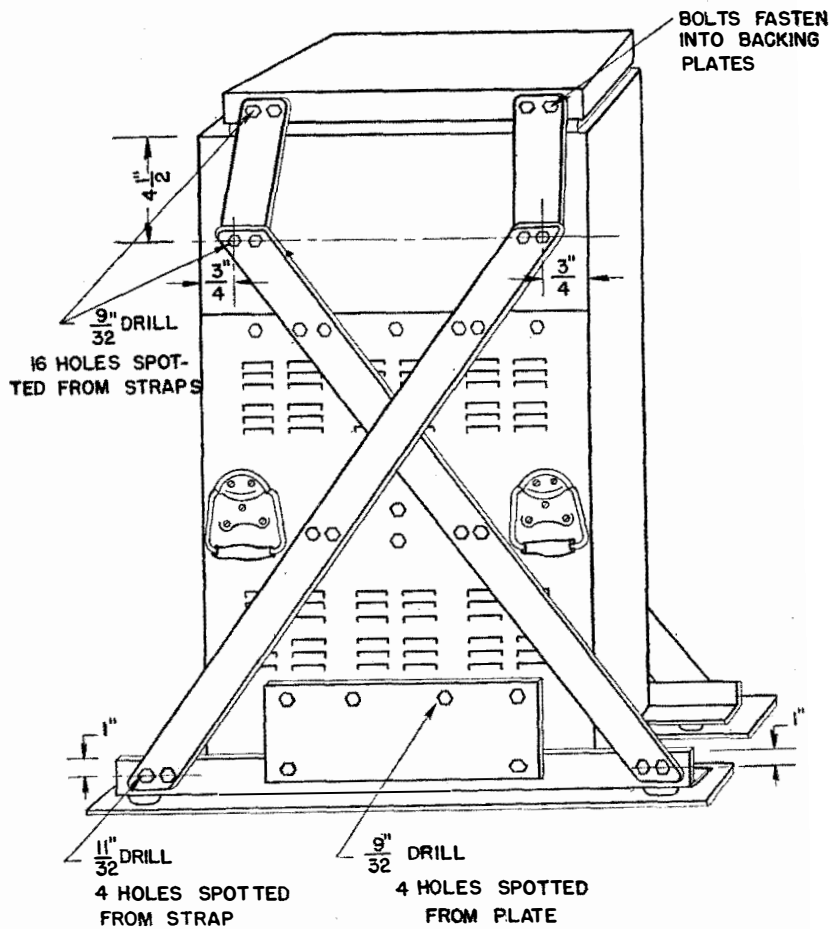


FIGURE 1.—Drawing of radio set SCR–399 with reinforcing modification.

The modification consists of installing reinforcing straps and plates on the sides of the equipment to prevent the transmitter (BC–610) housing from breaking loose from its mounting frame. The cover is also made more secure to prevent damage to the antenna tuning unit (BC–939). The general appearance of the altered equipment is indicated in figure 1.

As further security, the entire mounting chests (CH–120–A and CH–121) are reinforced by installing turnbuckles which hold the chest to the walls of the Shelter (HO–17). This arrangement is pictured in figure 2.

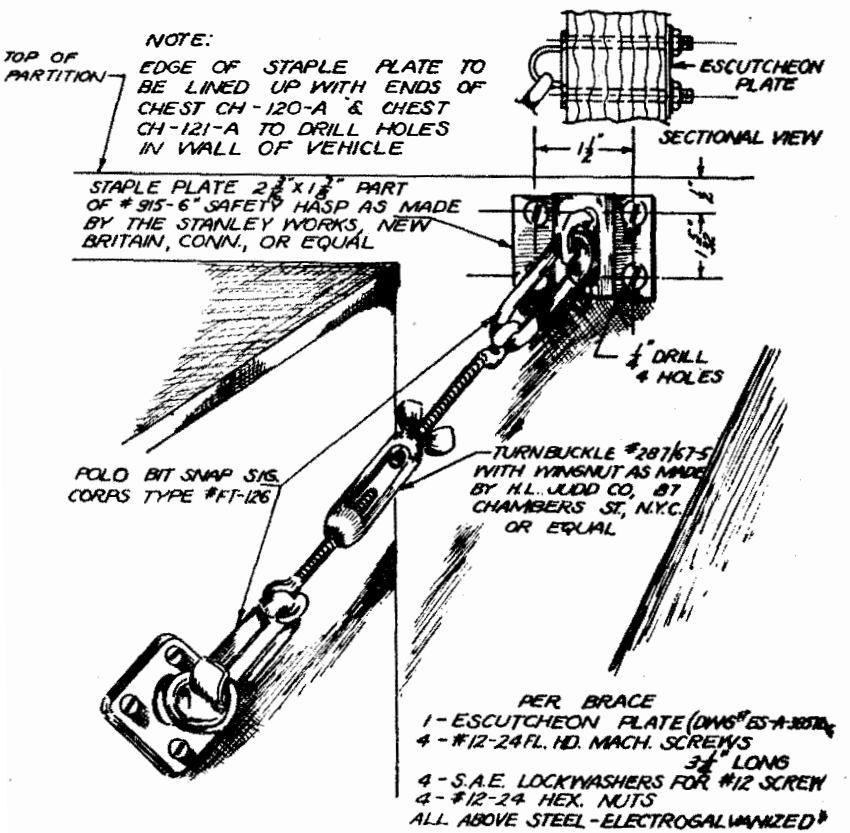


FIGURE 2.—Drawing of turnbuckle brace used to hold chest in shelter.

2. PROCEDURE FOR REINFORCING TRANSMITTER

(*a*) Remove rear panel of transmitter by removing six wing bolts.

(*b*) Remove two ½-inch bolts holding right side of transmitter to shock-mounted steel angle.

(*c*) Using existing ½-inch bolts, install the steel reinforcing plate shown in figure 3.

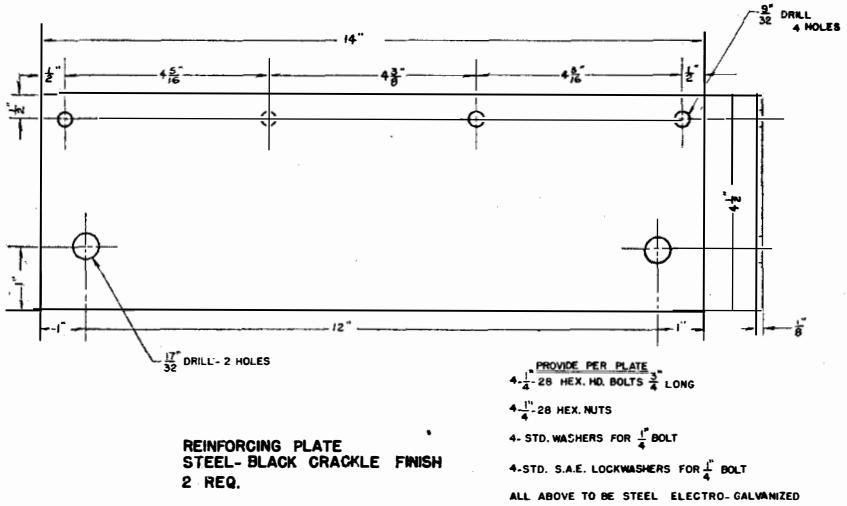


FIGURE 3.—Detail of reinforcing plate.

(*d*) Guided by holes in reinforcing plate, drill four holes in side panel using a 9/32-inch drill.

(*e*) Fasten plate to side panel of transmitter using bolts, nuts, lock washers, and flat washers.

(*f*) Locate, center punch and drill four holes on side of transmitter to secure the top of the cross straps as shown in figure 1.

(*g*) Mount cross straps and top straps using bolts, nuts, flat washers, and lock washers as shown in figure 1. Use flat washer, lock washer, and nut on inside of case. Straight top strap mounts on rear portion of case. Details of the cross straps and top straps are shown in figures 4, 5, and 6.

(*h*) Locate and drill [1] four holes in angle iron of mounting frame as shown in figure 1, using an 11/32-inch drill.

(*i*) Fasten lower portion of straps, using bolts, nuts, flat washers, and lock washers.

[1] Care must be taken to keep drilling chips out of case of transmitter. Use paper or rags to catch chips on inside of case while drilling.

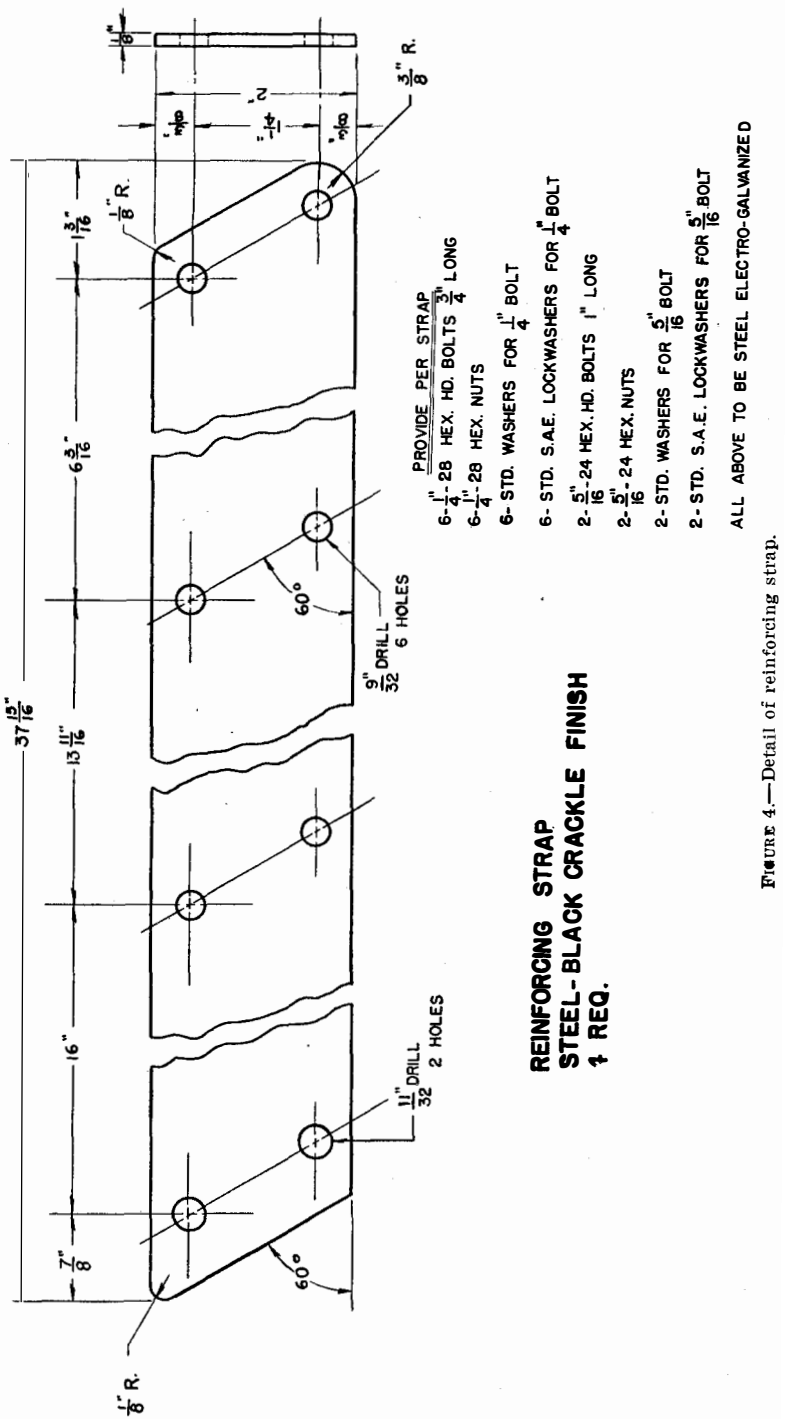
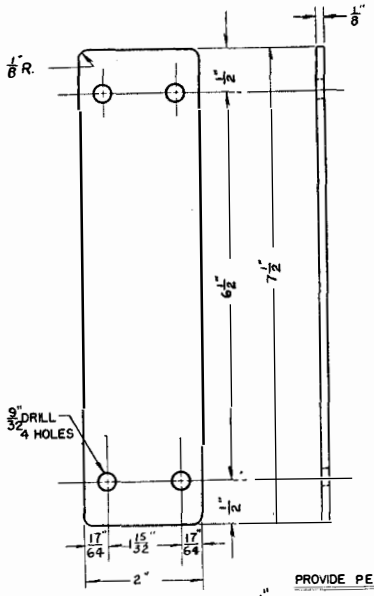


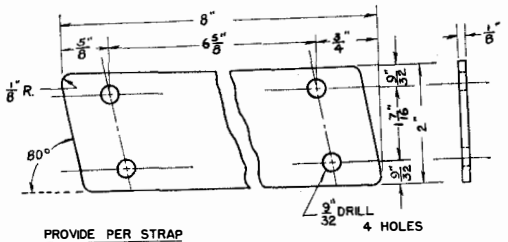
FIGURE 4.—Detail of reinforcing strap.



PROVIDE PER STRAP
2-1/4"-28 HEX. HD. BOLTS 3/4" LONG
2- STD. WASHERS FOR 1/4" BOLT
2- STD. S.A.E. LOCKWASHER FOR 1/4" BOLT
ALL ABOVE TO BE STEEL ELECTRO-GALV.

REINFORCING STRAP
STEEL - BLACK CRACKLE FINISH 2 REQ.

FIGURE 5.—Detail of reinforcing strap for cover.



PROVIDE PER STRAP
2-1/4"-28 HEX. HD. BOLTS 3/4" LONG
2-STD. WASHERS FOR 1/4" BOLT
2-STD. S.A.E. LOCKWASHERS FOR 1/4" BOLT
ALL ABOVE TO BE STEEL ELECTRO-GALVANIZED

REINFORCING STRAP
STEEL-BLACK CRACKLE FINISH
2 REQ.

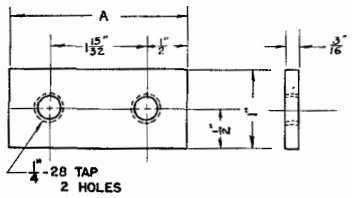
FIGURE 6.—Detail of reinforcing strap for cover.

(*j*) Drill[1] remaining 12 holes through side panel and side of top cover as shown in figure 1, using existing holes in straps as guides; use a 9/32-inch drill.

(*k*) Fasten cross straps, using bolts, nuts, flat washers, and lock washers.

(*l*) Using the tapped backing plates, fasten reinforcing straps on top cover, using bolts, flat washers, and lock washers as shown in figure 1.

(The extra long backing plate is to be used in the right rear corner of the cover, which is difficult to reach.) Details of the backing plates are shown in figure 7.



BACKING PLATE
STEEL - ELEC. GALVANIZED
3 REQ.- A = 2 1/2"
1 REQ.- A = 6 1/4"

FIGURE 7.—Detail of backing plates for cover.

(*m*) Reinforce opposite side of transmitter BC–610, using same procedure.

(*n*) Replace rear panel, using six existing wing bolts.

3. INSTRUCTIONS FOR INSTALLING TURNBUCKLE BRACE TO HOLD CHESTS CH–120–A AND CH–121–A IN SHELTER HO–17

(*a*) Locate position for staple plate as shown in figure 2.

(*b*) Using staple plate as a template, locate and drill four holes as shown in figure 2 using a 1/4-inch drill. Care must be taken to drill the holes straight and at right angles to the wall so that escutcheon plates will fit properly.

(*c*) Install staple plate using escutcheon plate shown in figure 2, using bolts, nuts, and lock washers. Detail of escutcheon plate is shown in figure 8.

(*d*) Install turnbuckle and polo bit snaps.

(*e*) Adjust tension with turnbuckle and lock in position using wing nut.

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[1] Care must be taken to keep drilling chips out of case of transmitter. Use paper or rags to catch chips on inside of case while drilling.

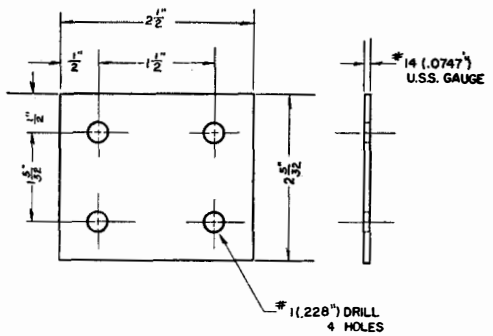

FIGURE 8.—Detail of escutcheon plate.

(*f*) Using this procedure, install turnbuckle assembly on each side of chests CH–120–A and CH–121–A.

4. MATERIAL LIST FOR REINFORCING TRANSMITTER

(*a*) Two plates as shown on figure 3.

(*b*) Four reinforcing straps as shown on figure 4.

(*c*) Two reinforcing straps as shown in figure 5.

(*d*) Two reinforcing straps as shown in figure 6.

(*e*) Four backing plates as shown in figure 7.

(*f*) Forty bolts, hex hd. ¼-inch 28 x ¾ inches long, steel electrogalvanized.

(*g*) Thirty-two nuts hex ¼-inch 28 steel, electrogalvanized.

(*h*) Forty lock washers SAE std., for ¼-inch bolts, steel, electrogalvanized.

(*i*) Eight bolts hex hd. 5/16-inch 24 x 1 inch long, steel electrogalvanized.

(*j*) Forty standard flat washers for ¼-inch bolts, steel, electrogalvanized.

(*k*) Eight nuts, hex, 5/16-inch, 24 steel, electrogalvanized.

(*l*) Eight lock washers SAE std. for 5/16-inch bolts, steel electrogalvanized.

(*m*) Eight standard flat washers for 5/16-inch bolts, steel, electrogalvanized.

5. MATERIAL LIST FOR TURNBUCKLE BRACE

(*a*) Four staple plates, 2 3/16 inches x 1 7/8 inches, part of Safety hasp No. 915–6 as made by the Stanley Works, New Britain, Conn., or equal.

(*b*) Four turnbuckles No. 287/67–5 with wing nut as made by H. L. Judd Co., 87 Chambers Street, New York City, or equal (electrogalvanized).

(*c*) Four escutcheon plates as shown in figure 8.

(*d*) Eight polo bit snaps, Signal Corps Type No. FT–126.

(*e*) Sixteen machine screws, flat head, No. 12, 24 x 3¼ inches long, steel, electrogalvanized.

(*f*) Sixteen lock washers for No. 12 screw, SAE, steel, electrogalvanized.

(*g*) Sixteen nuts, hex, No. 12, 24, steel, electrogalvanized.

PREVENTION OF BURN-OUT OF AMMETER IN THE MODEL MZ AND MAA RADIO EQUIPMENT

The 60–0–60 ammeter used to show the charge-discharge rate of the generator and storage batteries has been subject to a number of failures in shipment, installation, and use. These failures were found to be caused by shorting at the cables and terminal strips associated with the power take-off generator and its storage batteries. Changes in design as outlined below have been made which will minimize the possibility of short circuit inherent in the equipment itself. However, it is still necessary to observe considerable care when working with or around these terminals and cables, even though the generator is not operating, to prevent short circuits or grounds. It can readily be seen that a shorting of the battery through the 60–0–60 ammeter will quickly destroy the ammeter, since the battery current may be several

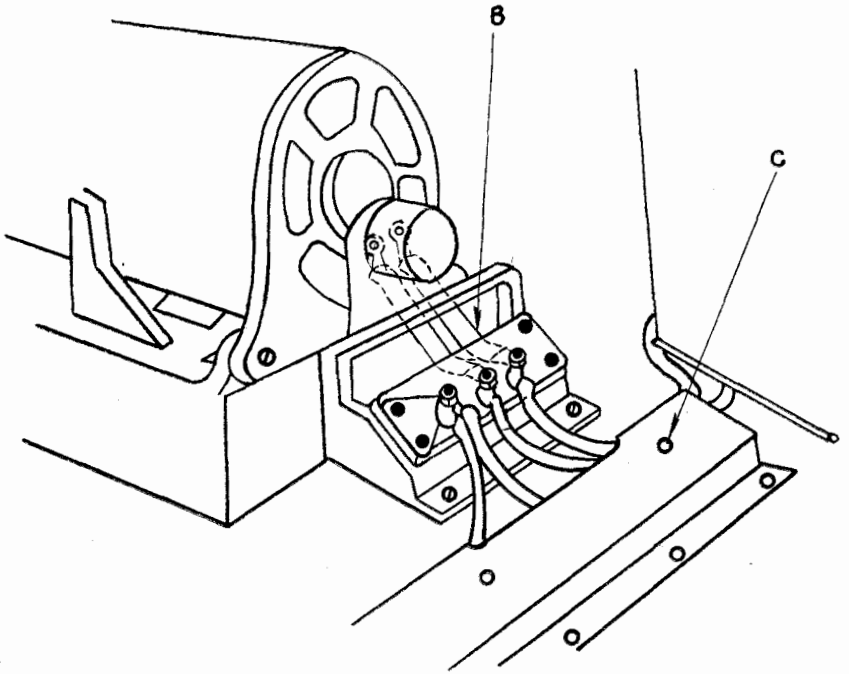

FIGURE 1.—Drawing showing modification to power take-off generator.

hundred amperes under this condition. In addition, if the battery or radio lead is shorted or grounded, the battery will be discharged and may be damaged. This information may be of use to men in the field who are operating and maintaining Model MZ and Model MAA Radio Equipments.

(*a*) The screws furnished by the manufacturer for fastening the slanted terminal cover at point "C" in figure 1 were short enough to prevent chafing or cutting into the cables in the cable cover. These screws have been lost at times and replacing screws have been long enough to enter the cable cover channel and chafe through the cable insulation to cause a ground and short circuit. This was eliminated by the manufacturer by changing the two clinch nuts to welding nuts in the cable cover and changing the two holes in the terminal cover to two slots.

(*b*) The leads from the generator terminal strip to the radio power strip were of such a length that it was difficult to prevent a short circuit from the lugs on these leads to the frame. There was also the possibility of insulation being frayed against the frame. The leads have been lengthened and a Vinylite tube, as shown at "B" has been placed over each lead, covering as much of each lug as possible and providing improved resistance to abrasion.

(*c*) The leads from the generator terminal block, as now shipped, are disconnected from the terminals and taped up with friction tape to prevent their vibrating loose in shipment and causing short circuit.

(*d*) A fish paper insulator is being added to the inside of the generator terminal block (slanted) cover to aid in avoiding short circuits when applying or removing this cover.

THE FORUM

AN INFORMAL DISCUSSION OF COMMUNICATION MATERIAL MATTERS OF INTEREST TO THE SERVICE

The purpose of THE FORUM is to provide a means for publishing informal comments by members of the naval service on matters of interest to others in the radio field. These contributions need not have official status, and thus a medium is offered for the expression of personal opinion and observation. Comments, suggestions, experiences, difficulties, and other items concerning radio equipment are welcome at all times. Material of this kind is not only interesting to other radio personnel but is of great value to the Bureau.

Contributions may be prepared as informally as desired. They should be forwarded via the commanding officer to the Radio and Sound Bulletin, Bureau of Ships (Code 903), Navy Department, Washington, D. C.

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STOWAGE OF TYPE 861 VACUUM TUBES SPARES

The following communication has been received from the U. S. S. *Hall:*

At the present time there is no adequate stowage space aboard new destroyers of the FLETCHER class for the two spare power amplifier tubes No. 861 for TBK and TBL transmitters which are part of the ships allowance of radio spare parts. They are delivered on board packed in individual wooden boxes, which are unsatisfactory for permanent stowage containers due to the delicate construction and bulkiness of these large transmitter tubes. Figure 1 is a sketch of the cages devised by the ship's radioman for stowage of the tubes. These cages are suggested as a possible solution for other new destroyers.

One of these cages is secured to the bulkhead inside the door of the radio spare parts locker, located on the port side of compartment No. A–202–EA. The other cage is secure to the bulkhead in emergency radio compartment No. B–107–CL.

The advantages of this type stowage boxes are: (a) it occupies a minimum amount of space, (b) it reduces the fire hazard, (c) it provides a cushioned shock absorber insuring satisfactory protection against roll of the ship and vibration from gunfire and depth-charge detonation.

Details of spring arrangement and dimensions of cage for stowing spare power amplifier tubes No. 861:

There are three springs attached to the collars holding the lower part of tube and two springs holding the upper part of tube. The three springs are attached to two separate collars which have a rubber lining. The lower springs are attached to two rubber collars which slip over the top neck of the tube.

The clearance of the sides of the tube from the sides of the cage are as follows:
From door to bulge of tube, 4¾ inches.
From back to bulge of tube, 3 inches.
From left side to bulge of tube, 3¼ inches.
From right side to bulge of tube, 2 inches.
From top of tube to top of locker, 1¾ inches.
From bottom of tube to bottom of locker, 4 inches.

The upper left spring is attached to the left side of the cage close to the door in order to eliminate one spring and reduce hazard of tube striking against back of cage.

Type of spring used is optional.

Sides of cage are made of ½-inch expanded metal which are spot-welded to 1-inch angle-iron.

Springs are hooked to metal strips which are bolted to sides of cage.

Sizes and type of hinges and hasp for door are optional.

Bureau comment.—In order to eliminate the possibility of resonant vibration in the springs, the use of web straps in place of metallic springs is suggested.

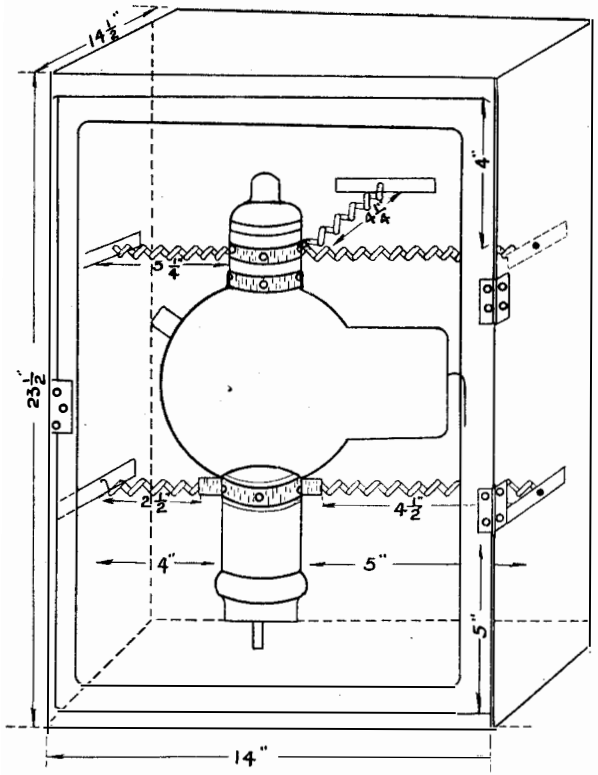

FIGURE 1.—Drawing showing outline of protective cage for type 861 spare vacuum tubes.

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