RESTRICTED

BUREAU OF SHIPS

RADIO AND SOUND BULLETIN

No. 18

(NAVSHIPS 900,011.18)

APRIL 1945

UNITED STATES
GOVERNMENT PRINTING OFFICE
WASHINGTON: 1945

THE NEW MODEL MBF EQUIPMENT

A new transmitter-receiver known as the Model MBF is now in production and will appear in the field in the near future.

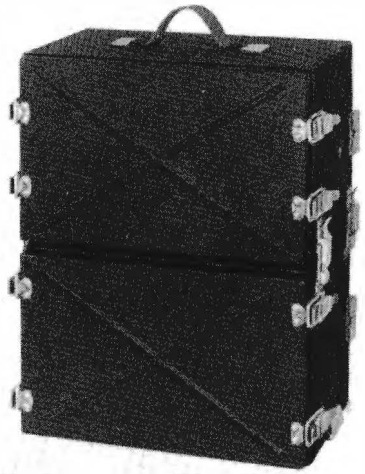


Figure 1.—Complete MBF equipment, ready for transportation.

It is a 3½ watt transportable voice equipment operating on a single crystal-controlled channel in the 60 mc to 80 mc range. The equipment is intended for surface craft use to provide telephone communication between points separated by line of sight distances up to ten miles. The equipment is complete in two units, which latch together for carrying and are separable for installation as shown in figure 1. One unit contains the transmitter-receiver (figure 2); the other unit is the accessory case containing antenna, transmission line, handset, power cord, spare crystals, lamps and fuses, tools, and tuning meter. (See figures

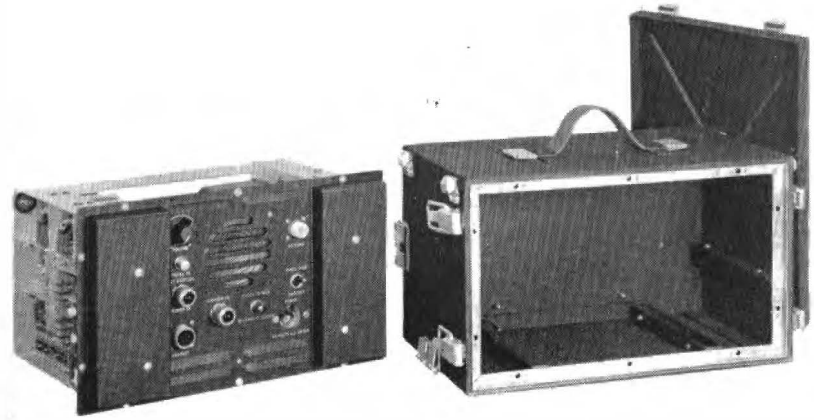


Figure 2.—MBF transmitter-receiver unit, chassis removed from case.

3 and 4). With the front panel of the transmitter-receiver unit exposed (front cover open), the unit is drip-proof; with front covers of both units closed, the equipment is submergence-proof and will float. Retractable handles are provided for "suitcase" carry of units either separately or latched together; web shoulder straps provide for

Figure 3.—Complete MBF equipment, front cover off accessory case.

Figure 4.—MBF accessory case unit, transmission line and reel, handset with cord, and spare parts container.

temporary "back-pack" carry. Bracket mountings are affixed to the bottom of the transmitter-receiver unit to permit its attachment to a shock mount assembly, when necessary. This unit may be mounted on a desk or bulkhead shelf. The dimensions of the equipment are shown in figure 5. The weight of the equipment, including items housed in the accessory case, is less than 55 pounds; the weight of each individual unit is not over 35 pounds.

The front panel of the transmitter-receiver unit as shown in figure 6 contains all the controls necessary for operation; those controls not used during normal operation are screwdriver adjustable and are concealed under two detachable covers. Tuning meter and tools are furnished for making adjustments. A transducer is provided on the front panel which operates as a loudspeaker for reception and as a microphone for transmission. A "Speaker ON–Speaker OFF" switch is provided on the front panel for controlling the loudspeaker reception. A green circuit handset receptacle is provided on the front panel for use when remote control is desired. A standard Navy handset with 20-foot cord is furnished, but the MBF is usable with handsets having cord lengths up to 200 feet. A toggle switch "Press to Talk–Release to Listen" transfers audio and control circuits from the local operating position to the handset for remote control. Red lamps are provided to indicate "power on" and carrier emission and modulation. No visible light is emitted from the set other than that furnished by these lamps, which can be controlled in brilliance or turned off.

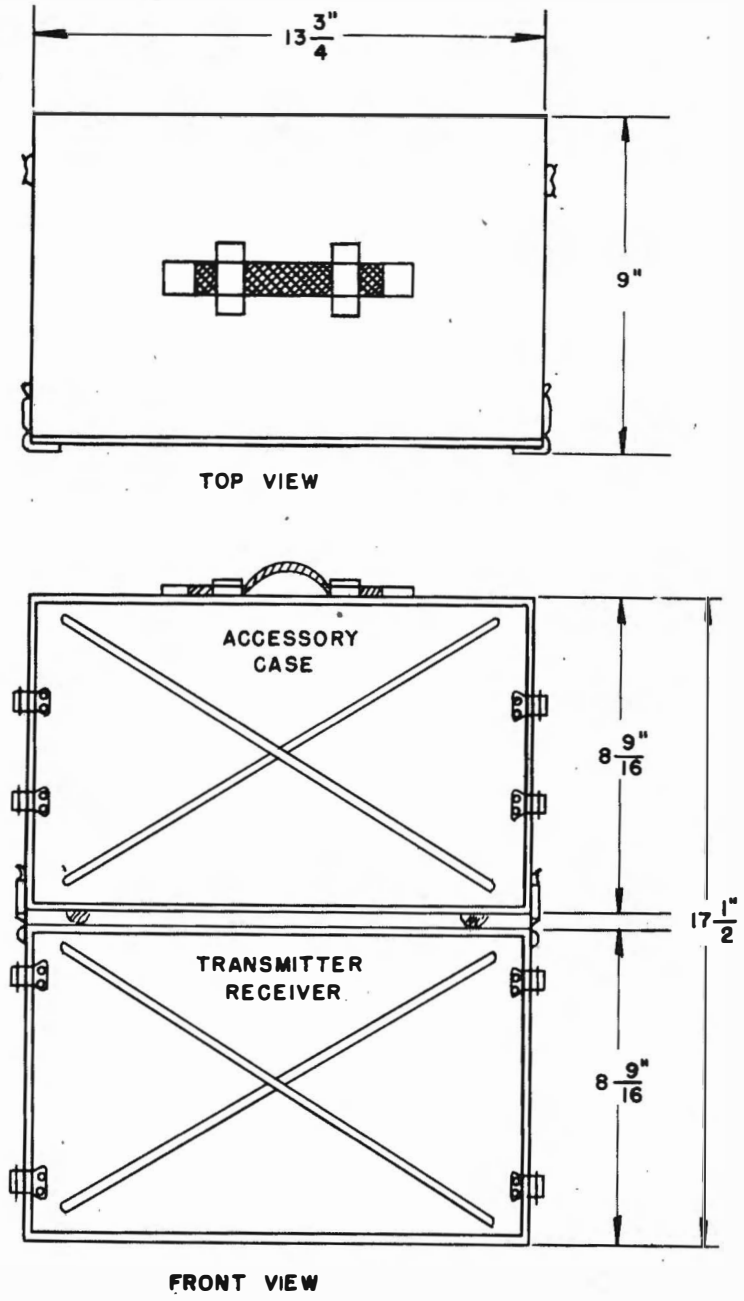


Figure 5.—Dimensions of complete MBF equipment.

Standard TBS transmitter and receiver crystals, either large or small size, may be used interchangeably with this equipment. One crystal is required for transmitter and one for the receiver. Four sets of crystals

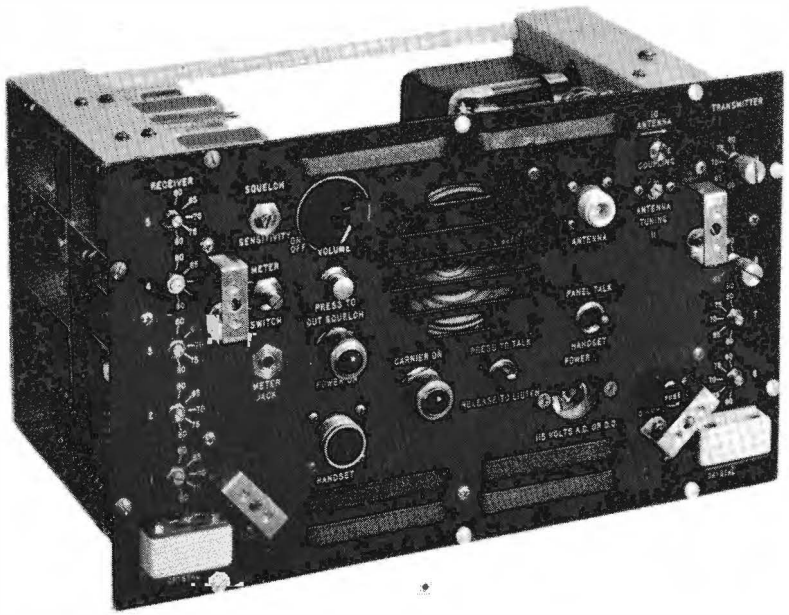


Figure 6.—MBF transmitter-receiver chassis, front view.

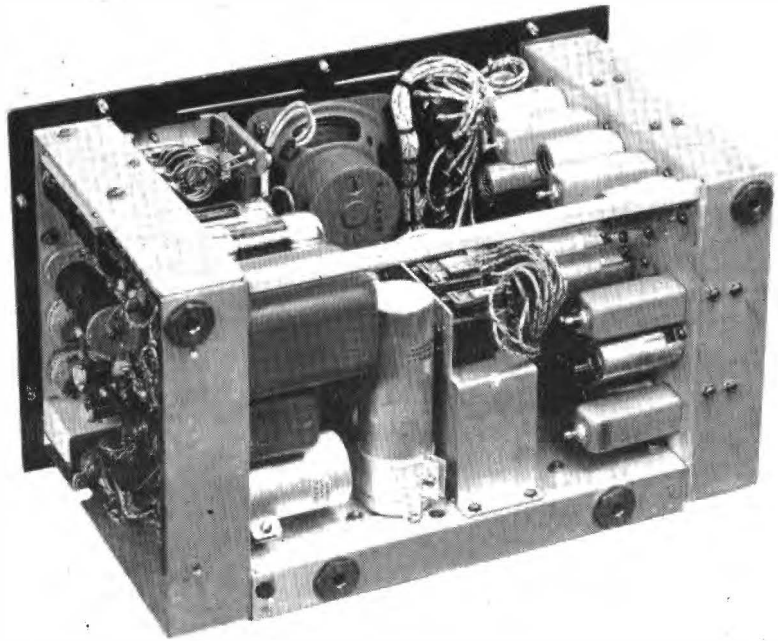


Figure 7.—MBF transmitter-receiver chassis, rear view.

for primary frequencies are shipped with the equipment. The receiver has an intermediate frequency of 5.3 megacycles. The tube complement of twenty-two tubes is as follows. The tubes are removable only by withdrawing the chassis from the case; one spare tube of each type is mounted on the chassis. (See figure 8).

Tube Complement

Location	*No. of Tubes*	*Type*
Transmitter		
R. F. Oscillator	1	6C4
First Doubler	1	6C4
Second Doubler	1	6C4
Power Amplifier	1	28D7
Receiver		
R. F. Amplifier	1	6AK5
Oscillator	1	6C4
Quadrupler	1	6C4
First Detector	1	6AK5
I. F. Amplifier	3	6AK5
A. V. C.	1	6AQ6
Second Detector-Noise Limiter	2	6C4
Squelch	1	6AQ6
Audio System and Modulator		
First A. F. Amplifier	1	6AQ6
A. F. Drive	1	6C4
Power Amplifier	2	28D7
Output Limiter	1	6C4
Rectifier	2	25Z6
Polarity Rectifier	2	6C4
Total	24	

All tubes are of miniature type except the 28D7 and 25Z6 tubes. The miniature tubes are held fast into sockets by overall metal sleeves; the 28D7 tubes are locktal type, with locking center pin; the 25Z6 tubes are held fast by top clamps.

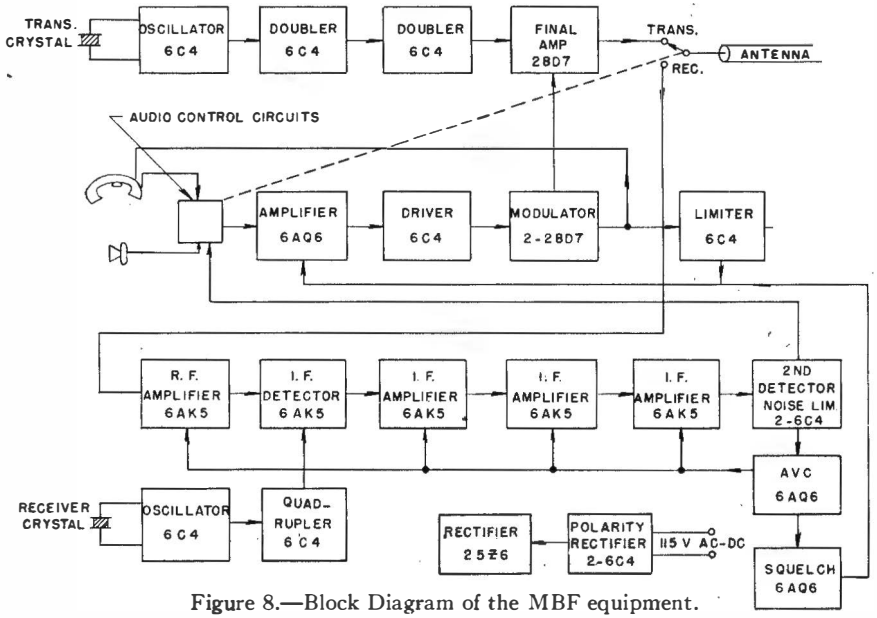


Figure 8.—Block Diagram of the MBF equipment.

IMPROVISED VHF ANTENNAS

The following article is taken from a study conducted by the Bell Telephone Laboratories under contract with the National Defence Research Committee.

This report covers an investigation of simple VHF antennas which can be improvised in the field for emergency use with ground radio sets when standard antennas and feed lines are not available. Reports from combat areas have suggested that dipole antennas made up of ordinary field wire and using paired field wire for the feed line might be used in such cases. There is obviously considerable loss introduced by the use of paired field wire as a transmission line, particularly at the higher VHF frequencies, and the purpose of the investigation was to evaluate these losses and to devise a more efficient arrangement which could be readily improvised from available materials.

The types of wire considered were those which are widely used in the theaters, such as ordinary field wire (W-110-B), long range tactical wire (W-143) and spiral-four cable (WC-548). Measurements were made of the losses of these wires and of two other less common types at frequencies from 30 to 150 mc. As expected, these wires were found to introduce serious losses, reaching values of 10 to 25 db or more per 100 feet at frequencies around 100 mc. Even at frequencies as low as 30 mc ordinary field wire when moist had losses as high as about 15 db per 100 feet.

Due to these high losses, the use of spaced leads for the feed line appeared imperative. An improvised antenna which performed satisfactorily was devised, consisting of a half-wave dipole and a spaced transmission line with a quarter-wave matching section at each end as shown in figure 9. While horizontal polarization is indicated in the figure, the antenna can, of course, be oriented to provide vertical polarization. The transmission line consists of two conductors spaced about 2 inches apart, while the quarter-wave matching sections consist of suitable lengths of paired wire. One matching section serves as an impedance transformer for connecting the dipole antenna to the transmission line; the other matching section is used between the transmission line and the radio set where the latter is designed for operation with a low impedance line (50 to 70 ohms). Detailed instructions covering the construction of this antenna are included in the report.

Tests with two different types of military radio sets, rated at 50 watts output, indicated that transmitters would load satisfactorily, and that with a 100-foot transmission line the power radiated was only a few db less than that obtained using a dipole antenna with a flexible coaxial lead-in cable. The losses were 2 to 4 db greater at fre-

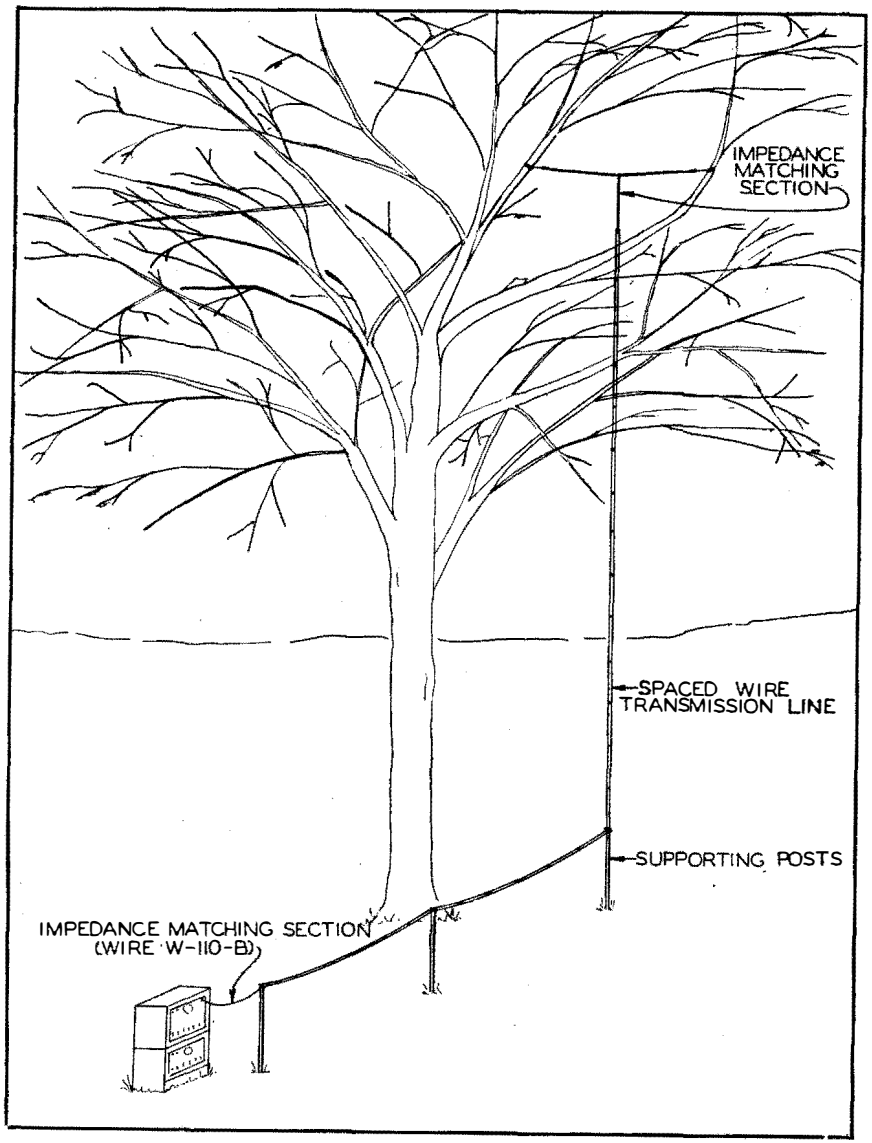


Figure 1.—Pictorial view of a completely installed improvised antenna.

quencies around 30 to 40 mc and 3 to 6 db greater at frequencies between 70 and 100 mc. With the line wet, the losses increased an additional 1 to 3 db. When the improvised antenna is used for receiving, these losses are relatively unimportant except under conditions where set noise is controlling.

In certain cases where the radio circuit is not marginal, it may be sufficient to use paired field wire as feed line without resorting to the spaced construction described above. The chances of successful operation with this arrangement are greatest at the lower frequencies and can be improved by using one of the lower loss wires and by keeping the line as short as possible.

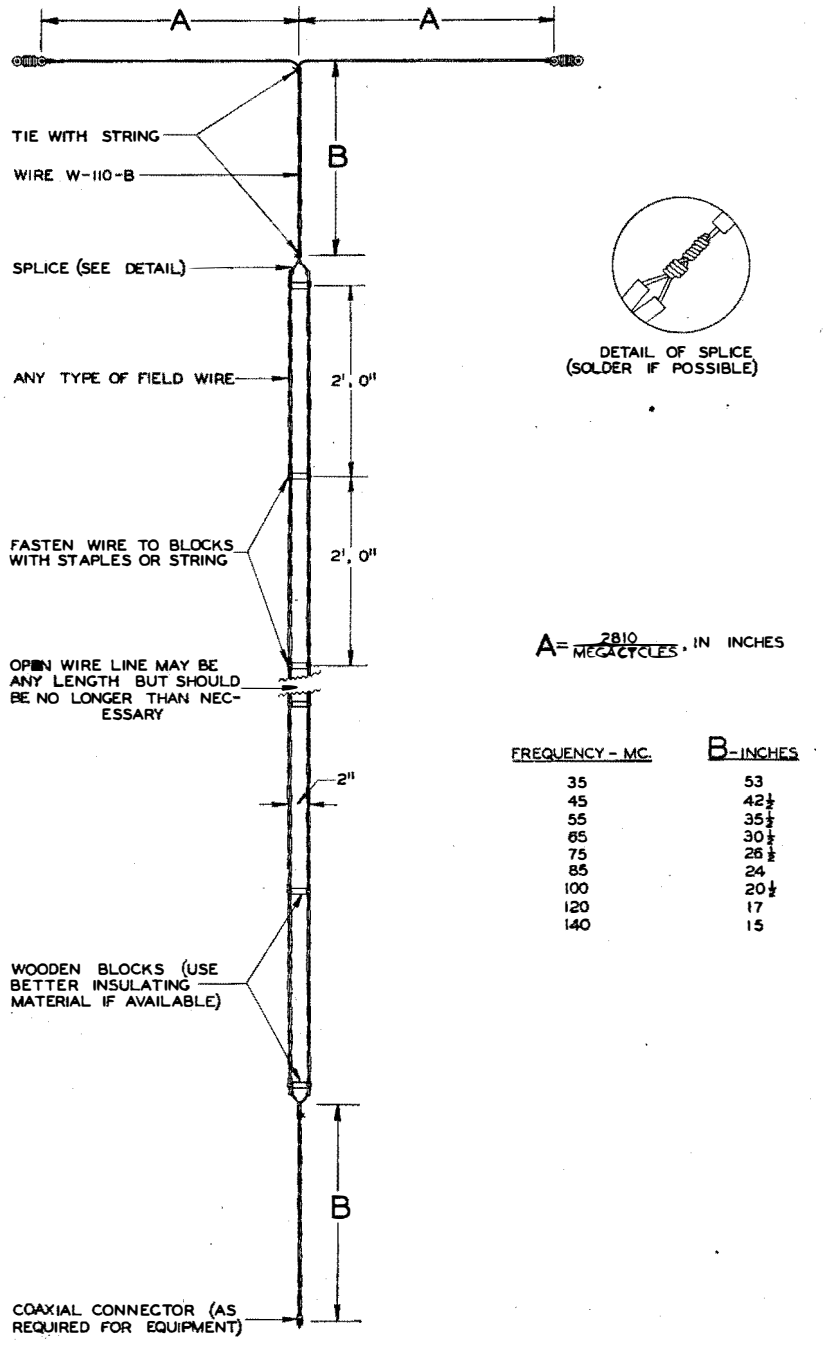
Construction

The improvised antenna which was devised is shown in figures 2 and 3. Figure 2 shows the construction of the antenna and figure 3 shows several methods of mounting it. The open-wire transmission line, while employing field wire, has relatively low loss. The matching section at the antenna end approximates the necessary impedance transformation to match the 70-ohm dipole matching section at the other end makes the input impedance about 70 ohms. When the line is used for transmitting, this latter section may not be required if the transmitter will load into a 400-500 ohm impedance. If the transmitter does not load properly, the length of the lower matching section may be altered slightly to provide the required impedance.

The antenna proper is a half-wave dipole which may be formed by separating the two conductors of Wire W-110-B used in the top matching section. If the standard dipole antenna is available but the coaxial cable is missing, the standard antenna may be used with the cable replaced by the improvised transmission line.

As shown in figure 2, the transmission line employs two conductors of any available type of insulated wire separated 2 inches by wood blocks at about 2-foot intervals. Paired wire such as W-110-B may be used in which case the two conductors of each pair are connected together and used as one side of the line. The wire can be fastened to the blocks either with staples, tape or string. The matching sections are made from one pair of Wire W-110-B cut to the dimensions indicated in the table on figure 2. Since tests indicate that the length of the matching section is not very critical, the tabulated value nearest to the operating frequency will generally be satisfactory. However, the dipole antenna should be cut to length for the particular frequency used.

Figure 3 suggests a few of the many possible methods for mounting the antenna. It may be oriented for either horizontal or vertical polarization, as desired. For vertical polarization, the antenna mounting should be such that the down lead is at least one-quarter wave length from the dipole.



FREQUENCY - MC.	B - INCHES
35	53
45	42½
55	35½
65	30½
75	26½
85	24
100	20½
120	17
140	15

Figure 2.—Construction details of the antenna matching sections and transmission lines.

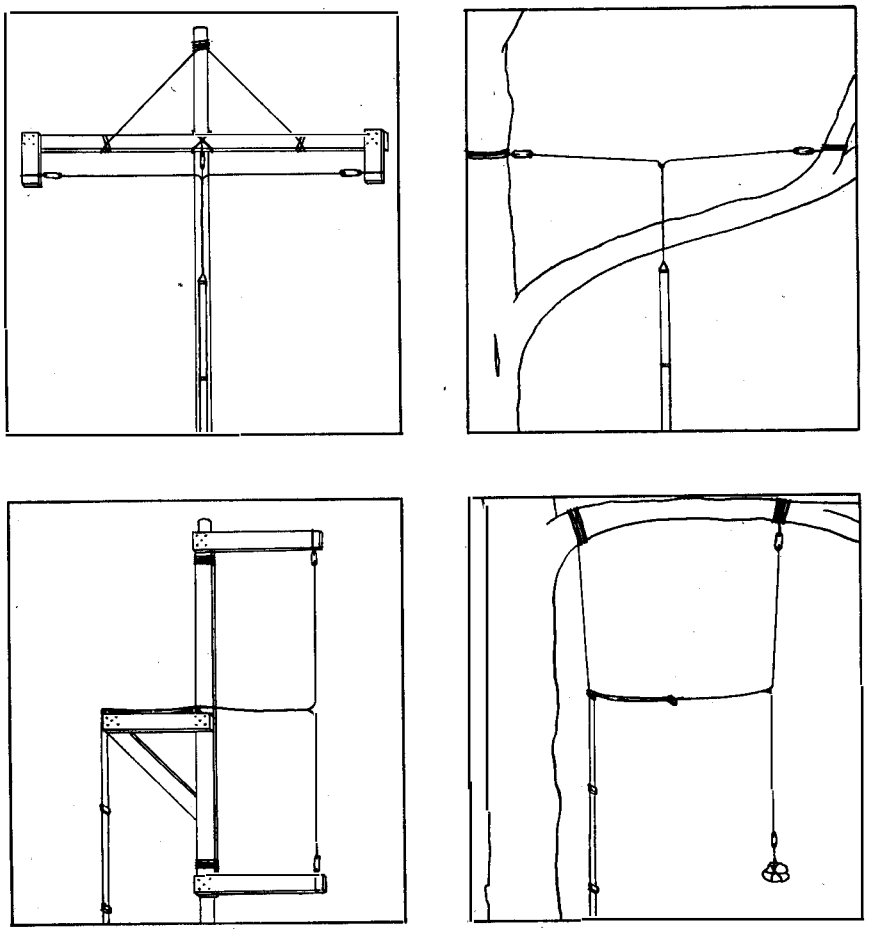


Figure 3.—Methods of mounting antenna.

THE SURFACE VESSEL BATHYTHERMOGRAPH

The surface vessel bathythermograph is a compact, rugged instrument which can be lowered by winch from a vessel under way to obtain a permanent graphical record of water temperature against depth. A lowering can easily be performed by two men and takes less than 5 minutes. Most of the time, one lowering every watch will give all the information needed aboard ship. On vessels doing survey work, and in certain situations on other vessels, additional lowerings may be useful.

It should be noted carefully that, while the bathythermograph is rugged and compact, it is also a sensitive instrument. Considerable care must be taken to insure against damaging or losing the bathythermograph during an observation.

Through usage the abbreviation "BT" for bathythermograph has become well known throughout the fleet and in shore establishments handling the equipment. When referring to the bathythermograph hereafter in this article, the abbreviation "BT" will be used.

EQUIPMENT

The following types of winches have been manufactured for use with the different types of power supply as shown below:

Bristol	115V D. C. ¾ H. P.
CBM 10152	AC–DC 115–110V ¾ H. P.
Bristol	220/440V 3 ph 60 cyc 2½ H. P.
Bristol	115V DC 2½ H. P.
CTB 10318	220/440V 3 ph 60 cyc 2½ H. P.
CAOJ 10318	220/440V 3 ph 60 cyc 2½ H. P.
CTB 10319	115V DC 2½ H. P.
CAOJ 10319	115V DC 2½ H. P.

Practically speaking the Bristol Company winch ¾ H. P. and the type CBM-10152 winch are obsolete. These should be replaced in the fleet wherever possible as equipment becomes available.

The CTB and CAOJ types of winches are the same in design and operation. The different type letters indicate different manufacturers only. These show a marked improvement in design over the old Bristol and CBM types in that they have eliminated the V-belt and split pulley clutch system of power take-off.

While the older winches are obsolete and are no longer being furnished to the fleet, they can still be overhauled and used on training vessels which ordinarily do not attain speeds of over 12 knots. Therefore, when replaced, they should not be scrapped, but should be held for overhaul and for further disposition.

BT's of two types are supplied: one recording to 180 feet, the other to 450 feet. The deep instrument (type CTB-40080A) should be used when the presence of a deep temperature gradient is suspected. The

shallow instrument (type CTB-40120A) should be used particularly when evidence of "afternoon effect" is sought.

For towing the BT, stainless steel seven by seven strand formed airplane control cable in 1200 (sometime 1000) foot lengths is furnished in two sizes, 1/16 inch and 3/32 inch. The smaller wire is suitable for use on vessels which seldom operate at speeds above 15 knots. On faster ships, it is necessary to use the heavier wire in order to avoid losing instruments.

The spare parts and accessories for the BT winch and instrument are always supplied with the equipment at the time of the installation. Items such as wire, sheaves, slides, and revolution counters which are classified as accessories, rather than as spare parts, are replaceable by requisition to the nearest Radio Material Officer.

Mounted grids to replace those which have been damaged, or destroyed in the fleet can be obtained by requisition to the Resident Inspector of Naval Material at the American Brass Company, Waterbury, Connecticut. The requisition must list the type and serial number of the instrument for which the grid is desired, as the grids are all calibrated for individual instruments.

The lacquer used in preserving the smoked slide BT record is Navy type 52L13 (INT), and is obtainable at any Naval Supply Depot. The lacquer thinner is also obtainable at Naval Supply Depots.

All other spare parts and accessories including those mentioned above are in the tender and base spare parts kits noted under the paragraph on maintenance.

INSTALLATION

The first consideration in installing surface vessel BT equipment is the location of the winch. In general it should be located on the main deck, always aft of the midship section, and preferably not more than 20 to 40 feet forward of the stern. If the winch is located forward of the mid-ship section, the BT cannot clear the slip-stream, and a moderate roll or yaw will allow it to be drawn down into the propellers. Although this difficulty could be minimized by the use of a long boom, it is seldom possible to use one extending outboard more than 10 feet. (On vessels such as YM's, YP's, SC's, etc., an even shorter boom may suffice.)

Another primary consideration in the location of the winch and boom is the fact that they must be installed in such a position that they are not in the way. Avoidance of gun traverses, gun blast areas, depth charge racks, depth charge loader racks, and "K" guns is necessary. To accomplish this BT winch gate boom plans, BuShips drawing number RE 40Z 146B, have been forwarded to all installing activities. In these plans, the boom is constructed of one-inch and one and one-half inch pipe and is swung from a 30-inch king-post. It is installed in such a manner that the entire assembly may be removed and stowed out of the way if the necessity arises.

A modification of the plan RE 40Z 164B is under preparation. This will show a stiff, one-inch pipe in place of the wire rope forward vang as given on the present plans. (See figure 1. The king-post and brace arrangement in the picture differs from that shown on the effective gate-boom plans inasmuch as the installation was made from earlier data.)

This change will make it simple to launch and retrieve the BT with a minimum of personnel.

In general, it is believed that installation according to RE 40Z 146B will prove to be much more satisfactory than the old nine-foot king-post and boom formerly used. The applicability of the gate boom has not yet been determined for other than DD and DE types of vessels. Recommendations in this matter are desired from field activities.

Ordinarily the winch may be mounted 2 or 3 feet inboard without obstructing passage. On smaller vessels, however, it may be necessary to mount it at the edge of the deck. In this case, the older types of winches should be turned around so that the removable side faces inboard where working space is available. The drum should then be reversed so that the wire pays off properly. Care must be taken to see that the wire leads fairly from the drum to the towing block, without rubbing against the boom or bulwark. The end of the boom must be

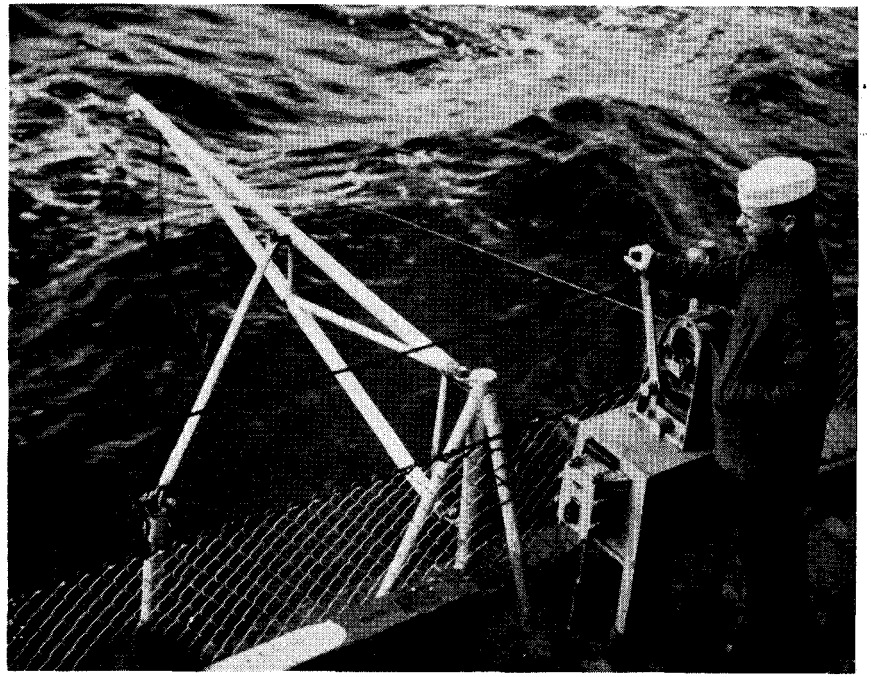


Figure 1.—Typical gate boom installation.

guyed so that the towing block lines up with the drum and the wire does not bend over the flanges of the drum or cut into the sides of the block.

In installing the new types of winches, CTB-10318, CTB-10319, CAOJ-10318, and CAOJ-10319, the power supply is brought to the winch through a type "B" terminal tube mounted on the underside of the motor control box. Connection to a power source should be made in accordance with the information on the motor nameplate. In the case of an AC motor, determine whether the connections are for 220- or 440-volt operation, and make any changes necessary. (See figure 2).

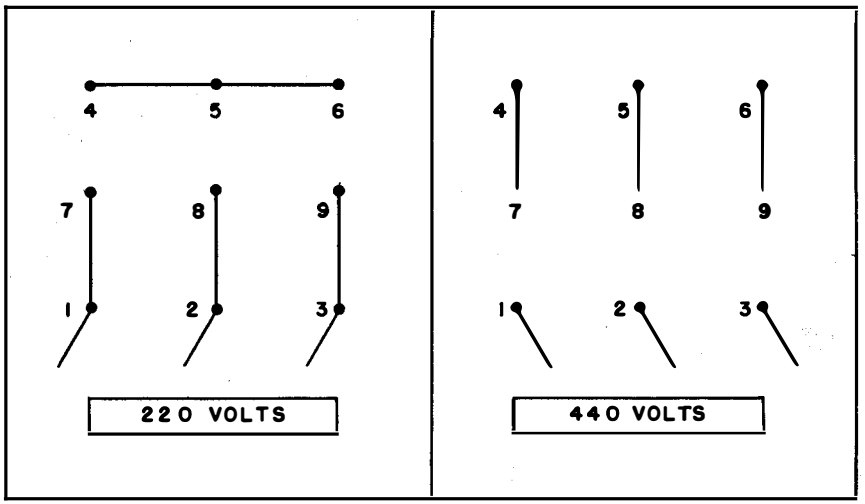


Figure 2.—Terminal box connection diagram.

The power source should be capable of delivering current as follows:

220 volts AC—20 amperes
440 volts AC—10 amperes
115 volts DC—20 amperes

OPERATION

The obvious prerequisite to successful use of the BT during tactical operations is complete understanding between the bridge and the operator of the winch as to the probable movements of the vessel during the time the instrument will be overboard. However, if an unexpected turn is made away from the side on which the lowerings are made, the operator should apply the brake immediately, and leave it on until the ship is on the new course and the wire is again clear of the stern.

The two greatest difficulties which occur in the operation of the BT are: (a) lowering the instrument to the full depth for which it is calibrated, and (b) when full depth has been attained, hauling it in

again. In order that the instrument may fall as freely as possible, the wire must pay out with constraint. On a vessel hove-to, it may sometimes be necessary to "ride" the wire to prevent the winch overrunning; when under way this is unnecessary even at slow ship's speeds. The winch should be adjusted so that when the lever is in neutral, the drum can be turned freely by hand. While the wire is paying out neither the clutch nor the brake should be allowed to drag. The handbook describes the construction and use of accessories designed to increase the diving speed. However, instruments not fitted with these accessories have been used successfully.

The BT should be towed for a half minute at the surface as directed in the handbook. If for some reason this has not been done, the observer must be careful to read the temperature of the surface from the "up" trace on the slide.

It is suggested that every new operator make a few trial lowerings with a dummy BT or a sounding lead before attempting to operate the equipment.

MAINTENANCE

The loss of a BT sometimes occurs because of insufficient attention to maintenance. The hitch by which the wire is secured to the swivel on the nose of the instrument cannot be expected to last long. It should be examined before each lowering, and if signs of weakness are observed, several feet of wire should be cut off, thrown away, and a new hitch made.

Steel clamps for $\frac{3}{32}$" wire rope will be furnished with the tender and base spare parts kits described below which will eliminate the necessity for the hitch mentioned above. While these clamps are not listed in the Navy Standard Stock Catalog, they should be available at Naval Supply Depots.

To keep the old types of winches operating at full power and efficiency, they should be overhauled and lubricated every 60 days. Pulleys should be checked for alignment and all set screws tightened. The tension of the V-belts should be kept in adjustment and the belts should be replaced when they are worn. The winch case must be kept watertight to prevent corrosion of the mechanism.

Corrosion of the BT itself, which frequently causes a leak in the thermal element, thus putting the instrument out of commission, can be retarded by frequent use of Tectyl 511 or by washing the instrument occasionally in fresh water. Damage of the thermal element can be recognized by the fact that the stylus lies at the low temperature end of its range and does not respond when the thermal element is dipped in lukewarm water.

Damaged BT's should be forwarded to the U. S. Navy Radio and Sound Laboratory, San Diego 52, California, by vessels in the Pacific, and directly to the Bristol Company, Waterbury, Conn., by vessels in

the Atlantic. Repaired instruments will be returned to the Radio Material Officers' pools for issue, instead of to the ship from which it was originally received.

A contract for BT tender and base spare parts kits is at present being negotiated with the Bristol Company. These kits will contain sufficient spare parts for all of the various types of winches now in use to keep them adequately repaired and in operation. Until these kits are received, old and inoperable winches, which have been replaced by new equipment, should be held in storage if they cannot be repaired with the materials at hand. The Bureau of Ships will make recommendations to the service forces concerning future disposition of these equipments.

MANUALS AND HANDBOOKS

The following manuals and handbooks are in current use throughout the fleet:

1. Prediction of Sound Ranges from Bathythermograph Observations (rules for preparing sonar messages) Navships 943–C2.
2. Instructions for the Care and Use of the Surface Vessel Bathythermograph (types CTB–40080 and CTB–40120). Navships 943–A2.
3. Instructions for the Care and Use of the Surface Vessel Bathythermograph (types CTB–40080A and CTB–40120A). Navships 900,231–IB.
4. The Sonar Range Book. Navships 900,040.
5. Workbook for Prediction of Maximum Echo Ranges. Navships 900,055.
6. Installation, Operation and Maintenance Instructions for the Model OAM Surface Vessel Bathythermographs. Navships 943–B.
7. Preliminary Instruction Book for Winch Assembly Navy Type CAOJ–10318 and Navy Type CAOJ–10319.

The above instruction books and manuals can be obtained by any concerned activity from the Bureau of Ships.

Nothing in this article is meant to supersede the above instruction books. It is intended to emphasize and expand those points in the instruction books which apply to the most common difficulties experienced by operators at sea as reported in correspondence received by the Bureau of Ships, the Radio and Sound Laboratory, San Diego, and the Woods Hole Oceanographic Institution.

RECORDS

Slides, logs, and comments sent by BT operators have proved to be of the greatest value. In order to facilitate the work of the Hydrographic Office and other agencies using these records, several details should be attended to carefully.

It is essential that the surface temperature be taken within 5 minutes of a lowering and that it be read to the nearest half of a degree. Accurate surface temperature readings are the operator's best check on the performance of his instrument and are of fundamental importance in plotting the data for use in the sound ranging charts and the supplements to the sailing directions used by submariners.

If there are two operators, while one is lowering the BT, the other can obtain surface temperatures from readings of the injection thermometer. Surface temperatures taken from the engineer's log are usually not accurate enough to serve the purpose for which they are required, and for this reason they should not be used.

Slides which are unreadable are occasionally forwarded. If a slide is smoked on the wrong side, badly smoked, flaked, or spotted, throw it over the side and pick out a good slide to insert in the BT. Likewise, after the slide is removed and before it is washed and lacquered it should be held up to the light. If no trace is visible immediate steps should be taken to obtain a record. whether this involves merely remembering to pull a sleeve down before lowering the instrument again or repairing the instrument, or using a different one.

It is more desirable to number slides consecutively during a whole cruise than to start the serial numbers over again each day. If a vessel is at sea for a week and makes 30 lowerings, the slides should be numbered from 1 to 30. Months should be shown by Roman numerals. Positions should be written on the slides to the nearest degree, but in logs to the nearest minute. Latitude and longitude should be labelled N or S, and E or W, on *all* slides and log entries, not on just occasional ones.

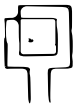
Directions for the disposition of the BT slides and log sheets, are contained in the instruction manuals. However, since complaints have been received by the Bureau that slides are arriving at the wrong destinations they are repeated here. Records and logs taken in the Pacific and Indian Oceans should be forwarded to the Director of the U. S. Navy Radio and Sound Laboratory, San Diego 52, Calif. Records and logs taken in the Atlantic Ocean and Mediterranean Sea should be forwarded to the Commanding Officer of the U. S. Navy Underwater Sound Laboratory, Fort Trumbull, New London, Connecticut.

STANDARD ELECTRONIC SYMBOLS

The following symbols have been set up as standard for electronic drawings.


Antenna


Counterpoise


Loop


Battery (Long line is positive)

Fixed capacitor

Variable or adjustable


Variable differential

Note: Where it is necessary to identify the capacitor electrodes, the curved element shall represent the outside electrode in fixed paper-dielectric and ceramic-dielectric capacitors, the negative electrode in electrolytic capacitors and the moving element in variable and adjustable capacitors. When it is desired to especially distinguish trimmer capacitors, the letter "T" should appear adjacent to the symbol.

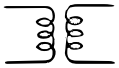

Crystal detector

Piezo electric crystal

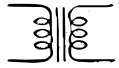

Air core inductor

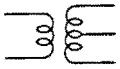

Variable inductor

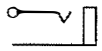

Magnetic core inductor

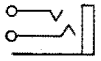

Transformer


Variable transformer


Magnetic core transformer

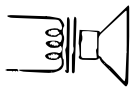

Transformer with tapped winding

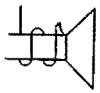

Two conductor jack

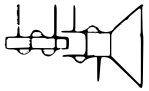

Three conductor jack


Telegraph key

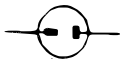

Switchboard lamp


Loudspeaker—magnetic armature


Loudspeaker—permanent magnet with moving coil


Loudspeaker—electromagnetic with moving coil

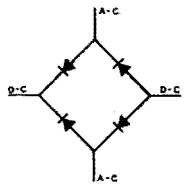

Single—button microphone


Polarized plug


Fuse


Double headset


Polarized receptacle



Full wave rectifier


Relay—with make contact


Relay—with break contact

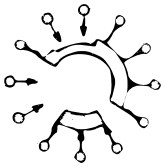

Fixed resistor


Variable resistor


Rheostat


Tapped resistor


Ten-point selector switch


Wafer switch


Source of alternating voltage


Wires not connected


Connections

FITCAL

The Army's Preventive Maintenance System

The Signal Corps has "coined" a new word, and if you have anything to do with maintenance of electronic equipment, especially communication equipment, it's a word you should know about. The word is "FITCAL", and it's made up of the first letters of *F*eel, *I*nspect, *T*ighten, *C*lean, *A*djust, *L*ubricate. These are the vitally important preventive maintenance services. If performed regularly and carefully, they will enable maintenance personnel to keep equipment in good working order at all times with a minimum of effort.

Briefly, the services involve the following.

FEEL.—Feel for overheating and loose connections. If bearing housing or trunnions on rotating machinery become too hot to the touch in less than 10 seconds something is wrong. Terminals and connections which overheat indicate poor contact or poor soldering. Remember to take precautions against electric shock and corrosive acids before you start to work.

INSPECT.—Look for mildew, discoloration, excessive moisture, blistering, bulging, leakage, oxidation of contact surfaces, dirt, corrosion, fungus growth, loose clamping rings and connections, cracked or charred insulators, broken or loose wires, loose mounting bolts or screws. Touch parts gently so you don't displace them. Be thorough!

TIGHTEN.—Tighten vacuum tube shields, fastenings, cable connectors, fuses and other parts. Handling and transit may jar them loose, and firm mountings and connections are extremely important to successful operation of communications equipment. Be especially careful not to jiggle vacuum tubes in their sockets to find out whether or not they are loose. Instead, press them straight down in their sockets. Jiggling may crack their seals. Be careful not to overtighten other parts. You're apt to damage them or cause misalignment.

CLEAN.—Keep parts clean but remember that the less they are handled the less chance there is that they'll be loosened or bent or thrown out of line. Don't wash and wipe equipment unless it needs to be cleaned.

ADJUST.—Adjustments must be made by skilled personnel only in emergencies, or when they are authorized to do so. Don't make adjustments just because you like to "tinker".

LUBRICATE.—Lubricate only in accordance with directions contained in instruction books. Lubricate faithfully. Don't lubricate too much or too often.

REVISED SYSTEM OF CABLE AND WIRE MARKING

An amendment to General Specifications for Machinery S28-2, *Designating and Marking Electrical Installations*, has been initiated to provide a new and standardized method of designating cable and wire marking in electronic installations. This amendment will cover cable marking, standardization of wire terminal marking, and the use of synthetic sleeving for identification purposes.

CABLE MARKING

All shipboard electronic installations are to be marked as follows:

RADIO COMMUNICATIONS (R-R)
- R–RA = Transmitting and receiving antenna (radio frequency)
- R–RB = Broadcast distribution (audio frequency)
- R–RF = Frequency meter extension (radio frequency)
- R–RP = Power (between distribution panels and equipments and between units of equipments).
- R–RR = Receiver output (audio frequency)
- R–RT = Transmitter, keying and controls
- R–RV = Radio phone (audio frequency and control)

RADAR (R–ER)
- R–ER = Repeaters
- 1R–ER = Air search
- 2R–ER = Surface search
- 3R–ER = IFF equipment
- 4R–ER = Main battery fire control
- 5R–ER = Secondary battery fire control
- 6R–ER = Auxiliary anti-aircraft battery
- 7R–ER = Heavy machine gun battery
- 8R–ER = Torpedo director circuits
- 9R–ER = Beacon circuits

SONAR (R–S)
- R–SA = Attack aids
- R–SD = Depth determination
- R–SL = Listening
- R–SR = Ranging
- R–SS = Sounding
- R–ST = Shipboard anti-sub attack teacher

COUNTERMEASURES (R–C)
- R–CA = Antennas
- R–CC = Control circuits
- R–CM = Modulators
- R–CP = Power circuits
- R–CT = Trigger circuits

Where more than one unit of a particular type is installed, an additional number is added following the General Specification letters as listed above to represent such additional units. For example, for four radio transmitters the designation would be R–RT1, R–RT2, R–RT3 and R–RT4. Where only one unit is involved, the one after the classification letter may be omitted.

Numbers designating the various equipments are to be selected in accordance with the section of the General Specification S28-2-D.

Following the general designation and classification as above, additional numbers will be added to indicate the particular cable in the classification. Particular cables will be numbered consecutively.

Examples:

1R–ER–14	Electronics—Radar—Air Search No. 1 unit (Starboard Forward) Cable No. 14.
R–RV12–70	Electronics—Radio—Voice Control No. 12 unit (Port) Cable No. 70.
R–SR2–3	Electronics—Sonar—Ranging No. 2 unit (Port) Cable No. 3.
R–CA3–3	Electronics—Countermeasures—Antenna No. 3 Antenna (Starboard) Cable No. 3.

TERMINALS

Wire terminals (lugs) shall be marked or tagged to correspond with the marking of the terminal board terminal to which it is to be attached.

The stamping of the wire marking on the tongue of the terminal is the preferred method of designation. Where this is impractical, due to the size of the terminal, either fibre tags or branded synthetic sleeving may be used for material under the cognizance of the Bureau of Ships.

In all cases where wires or cables are fanned out a distance of 6 inches or more from the wire terminals, fibre tags or synthetic sleeving shall be used and marked to indicate the cable designation as well as the terminal designation, the terminal designation following the cable designation.

Pending reprinting of the Specification or the issue of a supplement, the instructions above are to be considered in effect. It is important that all installation, maintenance and training activities concerned with these changes be made familiar with them. X51 Shops should in particular be informed as to these changes.

RUGGED TYPE RADIO ELECTRON TUBES

To assure greater dependability for war usage a program is underway for the mechanical improvement of the following radio electron tube types: 6SL7GT, 6SN7GT, 6AC7, 6L6GA, 6L6, and 807. Additional types will be added from time to time. In general, the specifications for the rugged versions of these types are the same as for the standard type with the addition of shock, fatigue and mechanical resonance tests, and a more stringent vibration test.

The rugged tubes will be designated by the letter "W" (for "war usage") immediately following the last number combination in the type designation.

The rugged tubes, in all cases, are intended to be interchangeable with, and supersede the regular standard respective types. This can be summarized as:

Regular Type	*Rugged Type*
6AC7	6AC7W
6SN7GT	6SN7W
6SL7GT	6SL7W
6L6GA	6L6WGA
6L6	6L6W
807	807W

Several cases of difficulties with the type 6SN7W tube in equipments under Navy Contract have come to the attention of the Bureau. In general these difficulties are due to the fact that the diameter of the metal sleeve base used on the rugged tube is slightly smaller than the diameter of the "GT" type base. In some cases this results in the failure of tube clamps to hold the rugged type tube rigidly. In the case of some clamps this difficulty can be overcome by slight modifications of the clamps themselves. However in other cases the design of the tube clamp is not sufficiently flexible to permit modifications to be made. Otherwise the 6SN7W is an electrical and mechanical replacement for the 6SN7GT.

COMPARATIVE PERFORMANCE OF WAVE ANTENNAS AND INVERTED L'S

The possible field use of the frequency band of 0.4 to 0.8 megacycles for point to point communication has been limited because of the low efficiency of available antennas. A recent report prepared by General Headquarters, South Pacific Area, Office of the Chief Signal Officer, has indicated that communication in this range is entirely practical through the use of wave antennas.

Communication at this frequency is particularly useful in hilly or mountainous terrain since the radio waves tend to cling to the contour of the ground. This provides a flexibility not available in higher frequencies where transmission tends to be limited by line of sight.

The wave antenna which was used in these tests consisted of one or preferably two wires about two wave lengths long spaced from one to several feet apart and supported on poles 12 to 20 feet above ground. The wires are connected together at each end. The antenna is energized to ground at the transmitter end and terminated at the far end in a resistance of about 350 ohms to a radial type counterpoise consisting of from 8 to 12 wires at least 25 feet in length in close contact with the ground. Where low resistance ground is not available, a similar counterpoise will be found useful at the transmitter end. Such an antenna has been found to radiate a vertically polarized wave of intensity in the direction of the far end equal to that radiated by a quarter-wave mast antenna. This is true for both dry ground and moist soil. The radiation is uni-directional which is important from the security standpoint. Furthermore, when used as a receiving antenna, it is considered less sensitive to atmospheric disturbances than is a quarter-wave vertical.

Tables I and II provide range data under various conditions of atmospheric noise and intervening terrain at 0.4 megacycles and 0.8 megacycles respectively. The data contained in these tables are based on the use of wave antennas two wave lengths long and from 12 to 20 feet above ground at both the transmitting and receiving stations. The arrangement is indicated in figure 1. The data in the tables for the inverted L antenna assume horizontal and vertical members each 50 feet in length at both transmitting and receiving stations as indicated in figure 2. The reactance of the inverted L is assumed to be balanced out with suitable inductance coils.

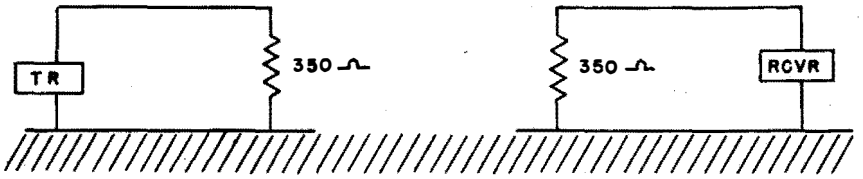


Figure 1.—Arrangement of wave antenna.

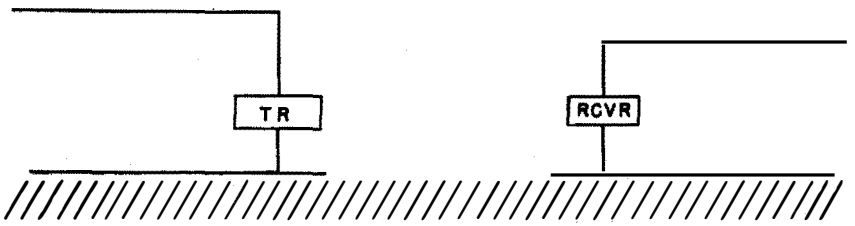


Figure 2.—Arrangement of inverted L antenna.

TABLE I: Comparison of Ranges at 0.4 Megacycles

Atmospheric Noise and Emission	Range in Miles					
	Dry Ground		Moist Soil		Sea Water	
	Wave Ant.	Inv. L	Wave Ant.	Inv. L	Wave Ant.	Inv. L
100 microvolts/meter:						
C.W.	115	35	470	130	560	170
Voice	45	10	180	20	240	25
2000 microvolts/meter:						
C.W.	35	7	120	10	150	12
Voice	10	1	20	1	20	1

TABLE II: Comparison of Ranges at 0.8 Megacycles

Atmospheric Noise and Emission	Range in Miles					
	Dry Ground		Moist Soil		Sea Water	
	Wave Ant.	Inv. L	Wave Ant.	Inv. L	Wave Ant.	Inv. L
25 microvolts/meter:						
C.W.	100	35	340	180	630	400
Voice	40	15	185	70	400	120
500 microvolts/meter:						
C.W.	30	10	145	45	310	70
Voice	10	3	45	8	70	8

TUBE TEST DATA FOR MODEL OZ TUBE CHECKERS

The following information is supplied for use with the Model OZ Tube checkers. This information will also be usable on the Hickok 540 equipments.

Tube Type	*Socket*	*Select* A	B	*Fil. Volts*	*Potent.* L	R	*Mut. Cond.*	*Press*	*Notations*
2C26	8-pin blk	7	2	6.3	54	15	1500	AMPL	1
2D21	Red Min	9	9	6.3	40	40	....	Rect. Std.	Read in green, Short on 3.
2E22	5-pin	12	1	6.3	..	0	4000	AMPL	1
6AL5	Red Min	12	1	6.3	50	0	....	Diode	Short on No. 2
6AL5	Red Min	1	1	6.3	50	0	....	Diode	
6AQ6	Red Min	12	2	6.3	45	5	1150	AMPL	
6AQ6	Red Min	4	8	6.3	0	82		Diode	Diode No. 1
6AQ6	Red Min	1	8	6.3	0	82		Diode	Diode No. 2
2C34 or RK 34	7-pin	2	7	6.3	65	0	2650	AMPL	[2]Plate No. 1
RK 34	7-pin	8	7	6.3	65	0	2650	AMPL	[2]Plate No. 2

Data previously presented for the 6AK5 tubes should be replaced by the following. Previous test setting have been found to damage tubes.

Tube Type	*Socket*	*Select* A	B	*Fil. Volts*	*Potent.* L	R	*Mut. Cond.*	*Press*	*Notations*
6AK5[3]	Red Min	1	9	6.3	55	20	....	AMPL	Read in good or bad.

Notes:

1. Indicates that the *plate cap* of the tube should be connected to the *upper left* contact of the 6-pin socket.
2. Connect plate cap to plate contact (right hand) of 5-pin socket.
3. Set Micromho range switch on 3000. Tube will normally show short on 4-5.

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SALVAGE OF SILICA GEL

Silica Gel is a solid chemically inert dehydrating agent that prevents corrosion, and other undesirable effects due to the presence of moisture, by absorbing the moisture from within the enclosure in which it is placed. This of course implies that the area which is to be kept dry must be surrounded by some enclosing moisture barrier which will keep out atmospheric moisture.

Reports have reached the Bureau to the effect that when Silica Gel has become moisture saturated, it is thrown away. Since Silica Gel can be reactivated as many as eight times, it is obvious that this is a wasteful practice, and because the material is critical, attempts should be made to reuse the Silica Gel wherever practicable.

It may be reactivated in the following manner:

(a) Remove the Silica Gel from its bag or other container and spread the granules over the bottom of a small clean metal pan.

(b) Place the pan in an electric oven and bake for approximately one and one-half hours between 350° and 400° Fahrenheit.

(c) Turn the oven off and allow the pan to remain in the oven until cool enough to handle.

(d) Store the Silica Gel in a clean airtight container until required for use.

The weight of Silica Gel required to dehydrate a given space depends upon the size of the enclosing moisture barrier such as flat bags or sheet material. In the event that the equipment is in a rectangular container, the area is the sum of all the sides. For example, a box 36″ x 30″ x 10″ would be considered as having an area of:

2 (36″ x 30″ + 36″ x 10″ + 30″ x 10″) = 3480 sq. in.

If there is included within the waterproof container, hygroscopic packing material such as pads, wood blocks, etc., the total amount of Silica Gel should be increased by one-half the weight of such material.

The formula for determining the quantity of Silica Gel required is as follows:

$$G = 0.1A + \tfrac{1}{2}D$$

where G = Silica Gel in pounds

A = Area of enclosing barrier in square feet

D = Weight of hygroscopic dunnage in pounds.

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RADIO INTERFERENCE ELIMINATION

FILTERS

Where interference is to be eliminated at the source by the use of filters, it is necessary to decide on the type to be used.

Figure 1 shows a condenser connected across the terminals of a generator. The purpose of the condenser is to provide a low impedance path between the terminals for the interfering currents. The effectiveness of this device will be inversely proportional to the ratio of the impedance of the condenser to that presented by the line (and load) at the terminals. This means that reactance of the condenser (including leads) must be much lower than that presented by the line *at the lowest frequency to be suppressed.* This, in turn, means large capacity at the lower frequencies and extremely short leads at the higher frequencies.

Every condenser has a series resonant frequency determined by its capacity and inductance (the inductance may be low but never zero). Below this resonant frequency the reactance is capacitive; above, it is inductive. Large capacitors ordinarily have relatively high inductance and therefore are not suitable for the higher frequencies. Small capacitors may be made with rather low inductance but they are not effective at the lower frequencies. For this reason, two capacitors are sometimes used in parallel, a large one for the lower frequencies and a small one for the higher frequencies. Large capacitors cannot be used in places where the capacity would affect the normal operation of the equipment. Examples of this will be pointed out later.

In many cases a simple capacitor connected as shown in figure 1 will have little, if any, effect at any frequency. The reason for this is that while it may place the two sides of the line at the same r.f. potential, it does not, as a rule, ground the lines for the r.f. potential. Therefore, a voltage exists between the lines and ground that can affect the receiver circuits. To eliminate this effect, two condensers are used, one from each side of the line to ground, as shown in figure 2. This forms a low-impedance path between the lines and ground as well as across the line. This is the fundamental circuit of most of the condenser-filters in use. Figure 3 shows the same thing with a more direct return to the generator housing and is usually more effective.

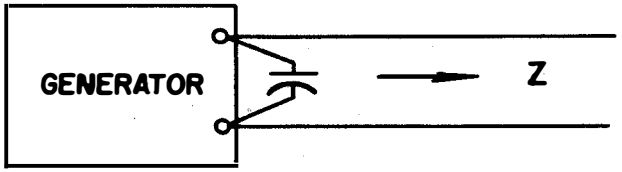

Figure 1.—Simple filter connected across the terminals of an interference source

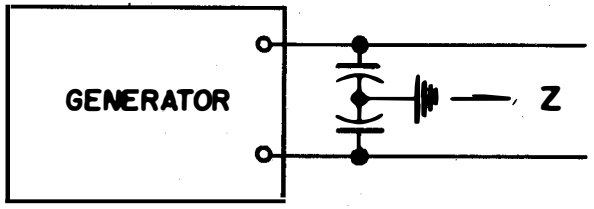

Figure 2.—Filter connecting both sides of interfering source to ground.

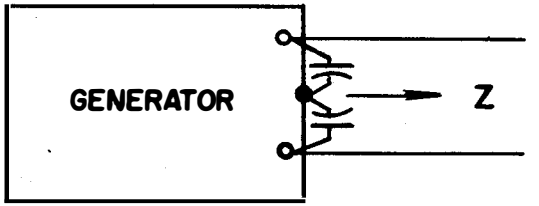

Figure 3.—Direct path to ground provided by grounding filter to housing of noise source.

LC FILTERS

A complete summary of the factors that influence the choice of a filter system to be applied to a given source of inteference shows that consideration must be given to each of the following factors:

a. The intensity and spectrum of the interference.
b. The limits to which suppression is necessary or desirable.
c. Space and weight limitations.
d. Voltage, current, capacity, and frequency limitations.
e. Temperature, humidity, and other climatic conditions.
f. Costs.

Regardless of the type of filter to be used, there are certain fundamental rules that apply in all cases:

1. The impedance of the capacitive path across the interfering source must be made low for the frequencies to be suppressed and high for the frequencies to be passed.
2. The impedance of the series inductance should be high for the frequencies to be suppressed and low for the frequencies to be passed.
3. The filter components should be shielded and the output leads isolated from the input leads.
4. The shield box should make good electrical and mechanical contact with the housing of the device to be filtered.
5. The condensers and filter terminals must be able to withstand the maximum impressed voltage.
6. The filter must carry the desired current without over-heating or excessive voltage drop. If iron core material is used, saturation should be avoided.

The impedance into which a filter works should be high compared with the impedance of the filter itself; otherwise the filter cannot act as an effective shunt for the interference. Since this is normally not the case for a simple condenser filter over a wide band of frequencies it becomes necessary to increase the ratio of these impedances by some means. This can be accomplished by using a series inductance as shown in figure 4(a). Additional sections may be added as shown in figure 4(b), and terminal condensers are frequently used as shown in figure 4(c) or 4(d). These are common filters for use when one side of the line

is grounded. If both sides are above ground, and especially where the line is balanced, equal values of inductance are inserted in series with both sides of the line as shown in figures 5(a) and 5(b). Other forms in common use are shown in figures 6(a) and 6(b).

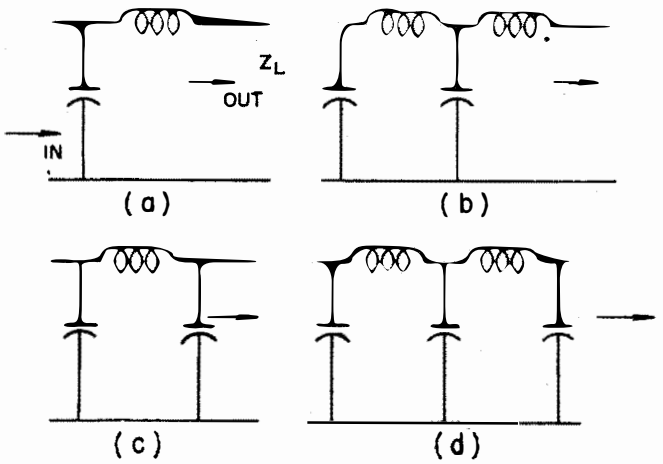

Figure 4.—Common LC filters with one side of line grounded.

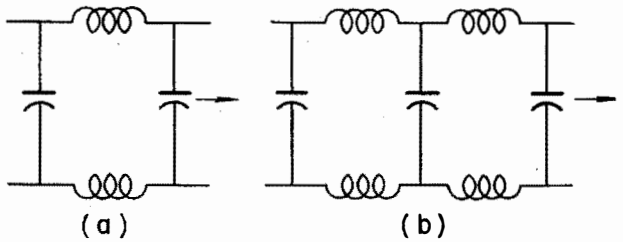

Figure 5.—LC filters required when both lines are above ground.

The effect of poor conductivity in the filter connections is shown in figures 7(a) and 7(b), in which the resistance in the return leads of the condensers allows the interference currents to take the capacitive path around the inductance, thus making the filter much less effective. The application of these fundamentals is essential if good filtering is to be obtained over a wide band of frequencies.

The attenuation of filters for naval use is usually measured for 20 ohm terminations; that is, during measurement the filter is inserted in an artificial 20 ohm line under so-called *ideal* conditions in which the input and output terminals are completely shielded from each other. If the input and output terminals are not completely shielded from each other the attenuation will be less than the rated value. If the source and load impedances differ from the 20 ohm value, as is

usually the case, the attenuation which will be obtained in a given installation will be higher or lower than the rated value.

The spectrum of the interference is dependent upon the type of interference source and the electrical dimensions of various parts of the installation that may act as resonant circuits and radiators. Commutator interference is usually greater at the lower frequencies but may also have peaks in the neighborhood of 20 to 50 mc. Ignition interference is more pronounced in the HF and VHF ranges. Interference from radar modulators is heaviest on the low and medium frequencies but usually goes through a large number of maxima and minima.

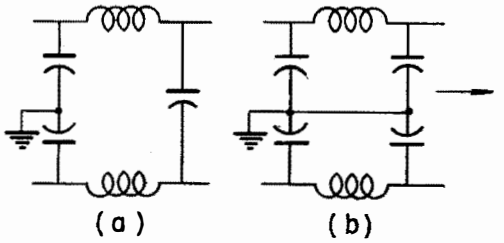

Figure 6.—Other common forms of LC filters.

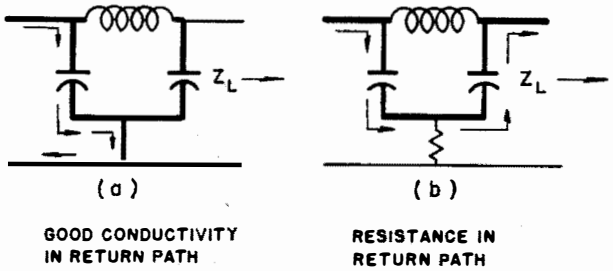

Figure 7.—Effect of poor conductivity in return path of filter.

A number of standard Navy power-lines filters have been developed to give attenuations of 60 db (voltage ratio of 1000 to 1) or better between 150 kc and 150 mc. They are listed below together with their voltage and current ratings:

Navy Type	*Voltage (volts)*	*Current (amperes)*
CTD 53171	30	15
CTD 53172	250	30
CTD 53173	30	30
CTD 53174	40	30
CTD 53175 (dual)	150	1.5
CTD 53176 (dual)	250	2.5
CTD 53177	440	100

(EDITOR'S NOTE: *This is the third of a series of articles on interference elimination.*)

INDUCTANCE CHART FOR COIL WINDING

By means of the two charts printed here, it is possible to determine quickly the proper winding data for single-layer inductance coils.

Knowing the desired inductance and the physical dimensions of the coil, the charts provide information on the number of turns and wire size required. In the chart of figure 1 the ratio of the inductance, L, in microhenries to the coil diameter, d, in inches is the right hand ordinate. The ratio of the length of the winding, l, in inches to the diameter of the coil is the horizontal coordinate. The correct number of turns is read from the left hand ordinate.

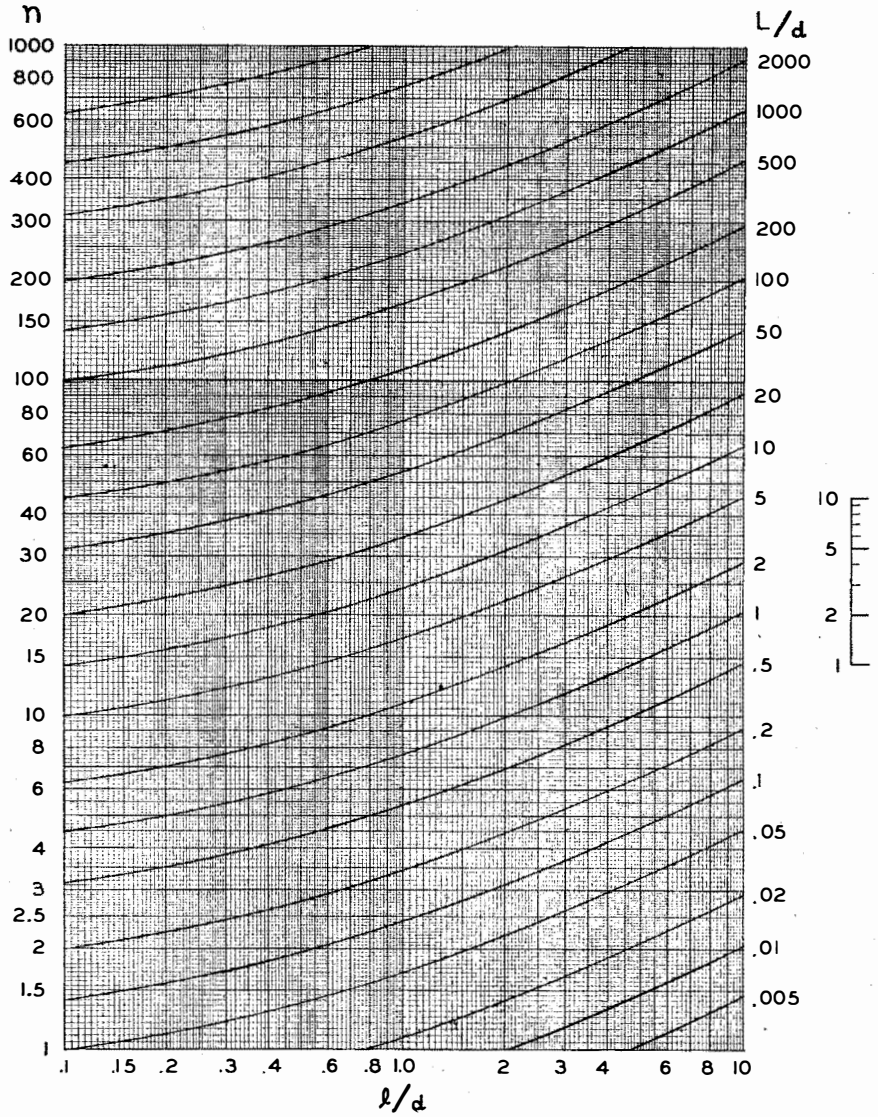

Figure 1.—Inductance chart.

Having determined the number of turns required, the chart of figure 2 indicates the size and type of wire which can be used.

Example: Presume a coil of 100 microhenries inductance is to be wound on a form two inches in diameter with an available winding space of two inches. The ratio of $\frac{L}{d}$ is 50 and $\frac{l}{d}$ is 1. Entering the chart at $\frac{L}{d}$ equals 50, follows the curved line down till it intersects the

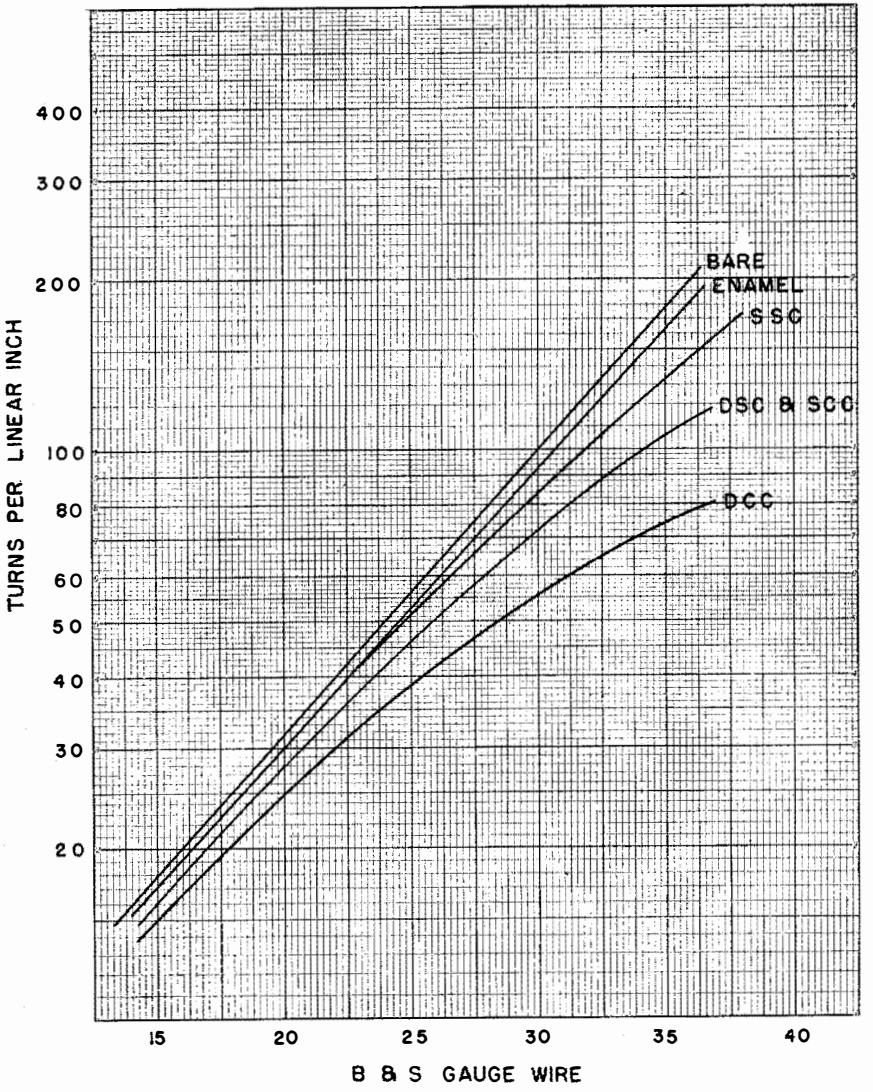

Figure 2.—Wire chart.

vertical coordinate for $\frac{l}{d}$ equals 1. Running across horizontally to the left hand scale, we read n equals 54 turns.

With a winding space of two inches, this is equivalent to 27 turns per linear inch, close wound. Figure 2 shows that No. 18 enamel or single-silk, No. 20 double-silk or single-cotton, or No. 22 double-cotton-covered wire would be used close wound. No. 25 bare wire, double space, could also be used.

Should the value of desired inductance fall between the curves drawn in figure 1, interpolation may be accomplished by means of the small logarithmic scale shown on the right of the chart.

★ ★ ★

SUGGESTED STOCK LIST OF VACUUM TUBES

The USS *Whitney* (AD4) has made a careful tabulation and analysis of all vacuum tubes issued during the past year. From this they have formulated maximum and minimum quantities which they consider necessary for stock purposes.

This data is tabulated for the benefit of other stocking activities in forward areas.

Type Tube	*High Limit*	*Low Limit*	*Type Tube*	*High Limit*	*Low Limit*
C1B	26	10	5LP1	4	2
C5B	20	10	5T4	16	8
C6A	10	4	5U4–G	150	80
O1A	6	4	5V4G	8	4
OA4G	8	4	5W4	36	18
1B4P	8	4	5X4	30	15
1C7–G	8	4	5Y3–GT	50	30
1D5–GP	8	4	5Y4G	20	10
1D8–GT	8	4	5Z3	110	50
1E7–G	8	4	5Z4	40	20
1H4–G	8	4	6A3	6	3
1H6–G	8	4	6A6	40	15
1LH4	30	15	6A7	10	5
1LN5	36	18	6A8	8	4
1N–21	40	25	6AB7	60	45
2A3	80	50	6AC7	250	150
2A5	10	5	6AG7	50	30
2AP1	6	3	6B4G	8	4
2C26	18	12	6B7	8	4
2J26	10	6	6C5	20	10
2J27	10	6	6C5GT	8	4
2X2	80	50	6C6	100	75
3AP1	36	15	6C8G	20	10
3BP1	6	3	6D6	125	75
3B24	50	20	6E5	20	9
3D6	12	6	6F5	20	7
3Q5	6	3	6F6	20	9
5BP1	20	10	6F6G	12	6
5CP1	20	14	6F7	10	5
5CP7	5	2	6F8G	8	4
5D21	10	5	6G6G	8	4
5FP7	12	6	6H6	75	50
5HP1	6	3	6H6GT	20	12
5JP1	12	7	6J5	75	50

Type Tube	*High Limit*	*Low Limit*	*Type Tube*	*High Limit*	*Low Limit*
6J5G	16	8	6J7	50	30
6J6	60	30	6J7G	20	5
7H7	30	14	6K5	8	4
7N7	30	14	6K6–GT	100	60
7V7	8	4	6K7	50	25
7W7	20	10	6K8	20	10
10	5	3	6L6	100	75
12A6	25	10	6L6G	50	25
12DP7	10	6	6L7	8	4
12J7	8	4	6L7G	10	4
12K7	12	6	6N7	80	40
12K8	8	4	6N7G	30	20
12SA7	30	10	6R7G	8	4
12SG7	30	15	6S7	30	15
12SH7	8	4	6SA7	16	8
12SJ7	30	16	6SC7	45	22
12SK7	36	18	6SF5	20	8
12SQ7	50	35	6SG7	30	10
12SR7	8	4	6SH7	80	39
15E	75	50	6SJ7	60	30
21–2	8	4	6SK7	60	30
22	8	4	6SL7	50	25
24A	8	4	6SN7–GT	170	100
25Z5	30	15	6SQ7	25	12
27	8	4	6U5/6G5	8	4
30	10	6	6U6–Gt	8	4
31	8	4	6V6–GT	100	36
32	8	4	6X5GT	70	35
RK34	8	4	6Y6G	40	18
35	8	4	7B4	3	1
35L6–GT	40	18	7B7	8	4
35Z5–GT	40	20	7BP7	30	16
36	8	4	7C7	8	4
37	16	8	7E6	20	10
38	8	4	7F7	8	4
39	8	4	RX233A	10	6
40	8	4	WE274B	30	20
41	40	18	304th	60	30
42	8	4	316A	90	60
45	8	4	326A	2	1
47	8	4	327A	250	150
48	8	4	446A	120	60
50	8	4	446B	50	30
50L6GT	20	10	GL451	30	15
53	40	25	ZP455	8	5
56	8	4	GL464	12	8
57	6	4	GL471	20	10
58	8	4	700A	6	3
59	8	4	700B	5	3
6–8–B	20	12	700C	8	4
70L7–GT	8	4	700D	12	6
71A	8	4	701A	40	20
RKR72	40	20	702A	60	40
RKR73	12	6	703A	75	50
75	30	12	704A	20	10
76	80	40	705A	30	15
77	10	6	706AY	10	6
78	10	6	706BY	12	6
80	30	16	706CY	26	14
81	8	4	706FY	8	4
82	8	4	706GY	10	5
83	24	12	707A	8	4
83–V	10	6	707B	80	60
84	30	16	708A	30	15
85	8	4	709A	70	35
89	8	4	713A	8	4

Type Tube	High Limit	Low Limit	Type Tube	High Limit	Low Limit
EIMAC–100T/H	4	2	715A	20	10
114B	8	4	717A	16	8
117Z6–GT	8	4	721A	200	125
FG–178	4	2	722A	10	6
203A	10	6	726B	20	10
217C	8	4	801–A	20	10
227A	30	16	803	20	10
991	24	10	807	60	40
1614	40	20	808	40	20
1616	30	16	811	16	8
1624	30	15	813	8	4
1625	40	20	826	8	4
1635	8	4	829	30	16
1960	10	4	832	20	10
2050	60	40	836	8	4
UX6653	12	8	837	8	4
7193	40	20	838	20	10
8013A	20	10	843	8	4
8014A	50	30	845	30	16
9001	30	15	851	6	4
9002	30	16	860	20	10
9004	20	10	861	4	4
38015	8	4	864	2	1
38111A	8	4	865	6	4
38205	50	30	866A	30	16
38250	40	20	868	10	6
38282	4	2	872	10	6
38401	6	4	874	30	16
38402	20	10	876	10	6
38403	6	2	884	50	25
38404	4	2	885	6	4
38674A	20	10	902 or 902P1	10	6
38897	4	2	905	8	4
954	30	16	955	30	16
956	90	60	957	8	4
958	10	6	959	10	6

PUBLICATION NEWS

NEW BOOKS OUT

PERIODICAL

RCM Letter—Confidential—NAVSHIPS 900,072. A monthly news letter containing technical information on RCM equipment. Distributed only to submarines, destroyers and larger combatant ships; commands; schools. 4 pages.

NON-PERIODICAL

Catalogue of Electron Tube Types—Unclassified—NAVSHIPS 900,075. List of tube types stocked by the Navy with approved designations and tube description. Distributed to all ships, radio stations and supply activities. 50 pages.

Maintenance Manual for BDI—Restricted—NAVSHIPS 900,047. Complete maintenance instructions on the equipments. Distributed to all ships having the equipments. 218 pages.

Mechanical Shock—Restricted—NAVSHIPS 900,052. Mathematical background and theory of shock phenomena. Limited distribution to manufacturers. 35 pages.

Maintenance Manual for QCQ–2—Restricted—NAVSHIPS 900,046. Complete maintenance instructions on the equipment. Distributed to all ships having the equipment. 286 pages.

Maintenance Manual for QCS, QCS–1, QCT, QCT–1, QCQ–1, QCR–1—Restricted—NAVSHIPS 900,026. Complete maintenance instruc-

tions on the equipments. Distributed to all ships having the equipments. 265 pages.

Prototype Radar Beacon Quonset Hut Installation—Confidential—NAVSHIPS 900,062. Describes typical advance base radar beacon installation. Profusely illustrated. Limited distribution to concerned activities. 45 pages.

Radio Equipment Log—Restricted—NAVSHIPS 900,039. A bound log book for maintaining a complete history of communications and direction finder equipment. Distributed to all ships and stations on the basis of one for each radio space. 335 pages.

Instructions for Operation of SA2–PPI with JF Receiver—Confidential—NAVSHIPS 900,050. Simplified operating instructions. Distributed to all ships having the equipment. 84 pages.

SF/SF–1 Instructional Diagrams—Confidential—NAVSHIPS 900,049. Schematic diagrams are broken down into small functional components. Blank pages are supplied for notes. Distributed to ships having the equipment and to schools. 81 pages.

SO Series Maintenance Handbook—Restricted—NAVSHIPS 900,071. Simplified maintenance procedures for non-technical personnel. Profusely illustrated. Distributed to ships having the equipment. 20 pages.

Installation and Maintenance of Submarine Cable for U.E.P. System of Harbor Detection—Confidential—NAVSHIPS 900,074. Limited distribution to activities concerned with equipment. 25 pages.

THE RADIO EQUIPMENT LOG

The second of three equipments logs is now out. It is called the *Radio Equipment Log*. It is a book of about 300 pages designed to keep a complete equipment history for approximately two years. It has been distributed on the basis of one log for each radio space.

We hope the *Log* will make it easier to keep these important records. Certainly maintenance of the equipment will be simpler if the records called for in the *Log* are carefully entered.

Should more copies be required, they may be obtained from Radio Material Officers or from the Bureau of Ships.

RECENT INSTRUCTION BOOK DISTRIBUTIONS

The Instruction Books listed below have been distributed recently and should be available through Radio Material Officers or Registered Publications Issuing Offices (those having "SHIPS" short titles). Be sure to replace preliminaries with finals where they are indicated as availables.

Model	*Short Title*	*Edition*[1]
AN/TPS-1B	Ships 296	P
DP-18/19		F
DAE-2		F
DAG-2		F
DAS/DAS-2	Ships 255A	F
DBB-1	Ships 332	P
LM-18	Navships 900,002-IB	F
LP-3		F
Mark 8, Mod 2 Stable Element		F
OAO-2	Ships 269	F
OBM		F
QBC-1	Navships 900,313-IB	F
QBD		P
QBE-3a		P
RBB-2/RBC-2	Navships 900,374-IB	P
RBG-1/2		F
RBK-12		F
RBL-5/6	Navships 900,349-IB	P
RBP		F
SA-1	Ships 211	F
SA-2	Ships 277	F
TAB-6		P
TAJ-8	Navships 900,295-IB	F
TBK-13, TBM-5/7		P
TBK-19	Navships 900,482-IB	P
TBS-8	Navships 900,483-IB	P
TBW-5		P
TCP-2		F
UE-1		P
VF	Ships 288	P
VG/-1/-3	Ships 261	P
YE-1		F

1. "F" equals "Final". "P" equals "Preliminary".

Final instruction books covering the Models TCS-7/9/10/11/12 Equipments have been distributed to Radio Material Officers. Activities holding preliminary editions should replace them on the basis of two per equipment.

LORAN MAINTENANCE INFORMATION

It has come to the attention of the Bureau on several occasions that maintenance activities were not acquainted with the fact that maintenance information on Loran equipment appears in the *Communication Equipment Maintenance Bulletin*. You will find it on the "DAS" pages.

THE FORUM

THE FORUM is a means of exchanging views on an informal basis. In this column new ideas, personal opinions, and comments are always welcome. Send them via your commanding officer to The Editor, Radio and Sound Bulletin, Bureau of Ships (Code 993), Navy Department, Washington, D. C.

LOST C.E.M.B. FOUND

In Radio and Sound Bulletin No. 17 we printed a letter in which the writer aired a gripe about not having received his C.E.M.B. issue 9 or 10. We sent replacing copies but suggested a little bet that a real good look around the ship would unearth the missing issues. We have just received another letter from the same CRM. It says in part:

"It's a good thing I didn't bet you that Thanksgiving turkey—I'd have lost. I found the missing C.E.M.B.'s in a safe. I've given the word to pass the Bulletins along, so I don't think they'll be held up in the future."

PORTABLE DAVIT FOR REMOVAL OF RADAR ANTENNAS

USS *Whitney*

The following suggestion has been submitted by the USS *Whitney*.

Recently it has been necessary to remove radar antennas on DD, DE and other vessels whose masts heights were beyond the reach of available booms.

The following installation was used very successfully. Bracket *A* and *B* of figure 1 were fitted and welded to the mast approximately 36″ apart, *A* carrying a foot bracket, *B* being a simple ring bearing. The davit is mounted as shown and is swung by hand to the desired position.

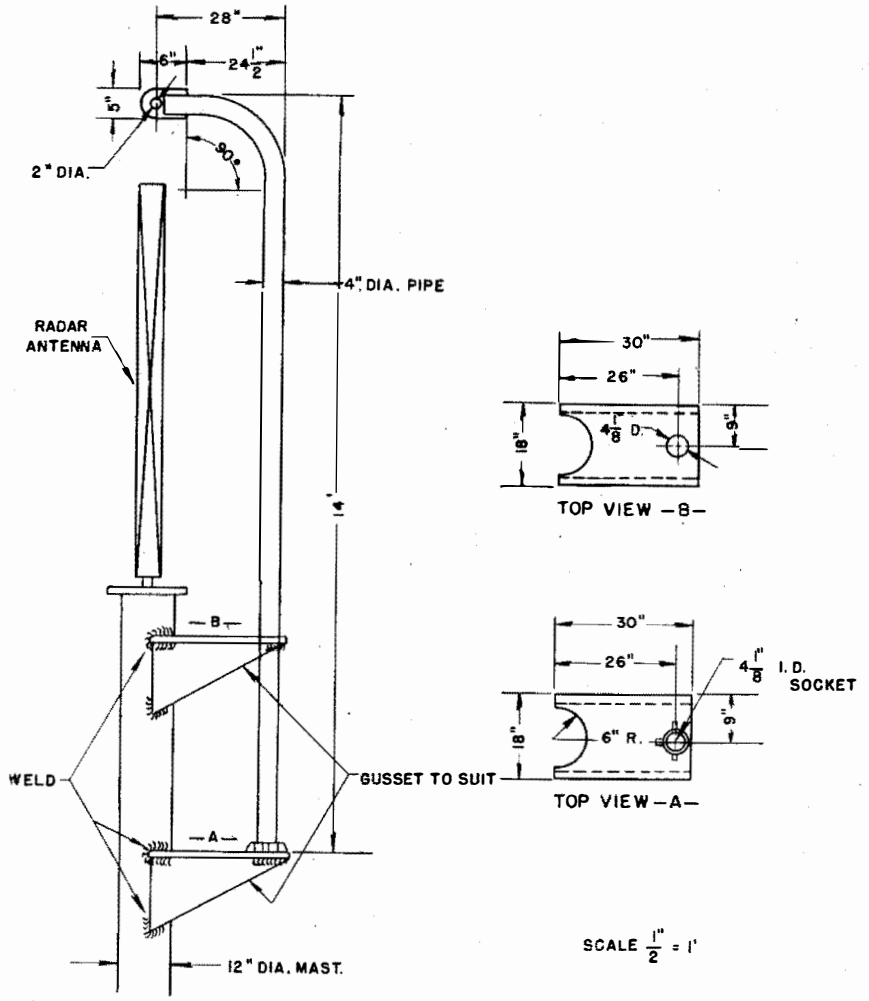

Figure 1.—Details of portable davit for removal of radar antennas.

Care should be taken in installation to allow proper clearances for required movements and type of antenna. The davit has been used repeatedly on SC-1 and SC-2 antennas.

This entire arrangement has been installed in three hours and dismantled in one and one-half hours.

ELECTRON PROD

ARTHUR E. ERICSON, Navy Yard, Boston

In the diagnosis of radio receivers and audio amplifiers, the most difficult situations are encountered when voltages, resistances, and tubes check correctly, but the unit still doesn't function properly.

The Electron Prod described in this article will quickly and accurately check the circuit for proper operation and gain as the prod point is moved from stage to stage.

I have used the electron prod in may own shop for over 15 years. I made the first one from sheer necessity and have been improving them ever since. The original model used batteries and headphones.

For circuit tracing, the prod is first placed at the antenna circuit. Then it is moved to the grid of the first r.f. amplifier tube, than to the plate and so on through the circuit. When a point is reached where no signal is heard or the gain is not normal, a complete check of all components of that stage is made.

Power supplies can be checked for hum due to faulty filter condensers, chokes, etc. The prod point is touched to the input and output sides of a filter system and no hum whatsoever should be heard on the output side.

A photograph of the equipment and a schematic diagram appear as figures 1 and 2.

The tester also functions as a vacuum tube voltmeter by use of a Magic-eye tube (6E5). This has the advantage that applying excessive voltages will not damage the equipment as would be the case with a vacuum tube voltmeter using a meter.

The 6E5 tube is driven by the prod amplifier after rectification by the 6H6 and in this way it will function as an output indicator when the four-position switch is in position 1.

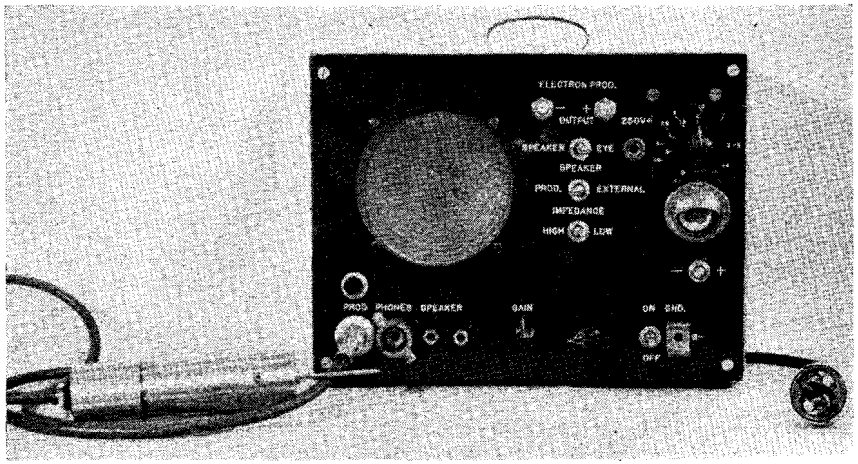

Figure 1.—Photograph of Electron Prod.

The Magic-eye also serves as a calibrated voltmeter in positions 2, 3 and 4 when used with a vacuum tube voltmeter prod. In position 2, the VTVM prod is connected to the grid of the 6E5 through the 1.175 megohm bias resistor to provide a voltage scale of 0–3.4 volts. In position 3 the prod is connected through a 10 megohm resistor to the 6E5 to provide a scale of 0–34 volts. Position 4 places the .130 megohm bias resistor in the circuit and gives a scale of 0–340 volts.

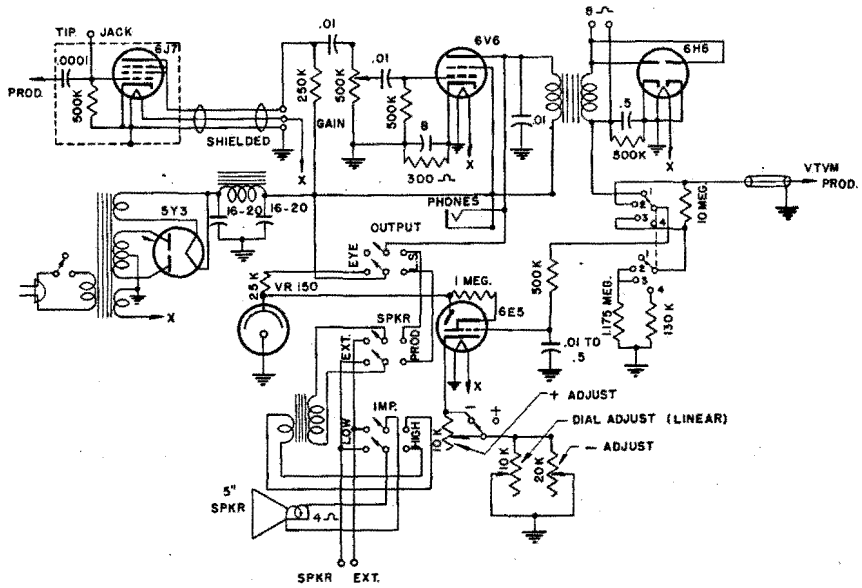

Figure 2.—Schematic drawing of Electron Prod.

Two screwdriver adjustments provide zero adjustments; one for negative voltages and the other for positive. To zero adjust the eye for negative polarity, throw the toggle switch to the negative position and turn the voltage measuring dial to the extreme counter-clockwise position. Now adjust the negative zero-adjust until the eye just starts to open. To zero-adjust for positive polarity, throw the toggle switch to the positive position, turn the voltage dial to the extreme clockwise position, and adjust the positive zero-adjust until the eye is closed. On the positive position the eye overlaps and opens toward the center position when approaching voltage under test.

In order to read the voltages, set the polarity switch in the desired position (plus or minus); then adjust the four position switch to whatever voltage scale is desired. Adjust the voltage dial until the eye just begins to close and read the scale. This control has two scales, the inner one is for reading negative voltages and is calibrated clockwise from 0 to 3.4. The outer scale is for positive voltages and reads counter-clockwise with 0 at the extreme right and 3.4 at the extreme left.

The loudspeaker may be used externally at either high or low impedance by means of toggle switches provided. The phone jack permits direct high impedance output to a speaker under test. The high impedance output can also be used to drive a power amplifier stage for test or emergency operation. Also a pair of tip-jacks provide 8 ohm output for testing permanent magnetic speakers.

The tester can be used as P.A. amplifier regularly or in an emergency.

The prod handle has a tip-jack about an inch down from the point end by means of which a direct connection can be made to the 6J7 tube or through a .25 mfd capacitor for coupling in an audio or low frequency input. The prod is permanently connected in series with the grid of the 6J7 through a .0001 mfd mica condenser. This size was found to be best so that both r.f. and audio signals can be picked up by the prod. Even with this small condenser, audio signal at 4 ohms impedance are readily picked from a speaker voice coil. Terminals are provided in the tester for delivering 250 volts D.C. at 50 m.a. and 6.3 volts A.C. at 5 amps.

I have found the Electron Prod to be of great value to me in my work

★ ★ ★

The following verse was received from a heavy cruiser but the author was not disclosed:

'Twas the night before Christmas, and all 'round the ships,
The air was all cluttered with Bogies and pips.
The boys were all bedded on deck 'neath the moon,
With dreams of a Christmas that can't come too soon.
When all of a sudden, the bugle and bell
Announced the arrival of Bastards from hell.
We stumbled to stations and manned every gun,
Then waited and waited the start of the fun.
But the Bastards were cautious and stayed far away,
So we cussed and we swore and crawled back in the hay.

24 December 1944

CODE PRACTICE AT OPERATING POSITIONS

RUFUS H. CARRIGAN, C.R.E. *USNR*, USS *Solomons* (CVE--67)

To lend reality to operating and code drill instruction and at the same time remove the monotony, it was found advisable to utilize regular operating positions in Radio Central, Air Plot, Radar Plot, Radio Two and the Direction Finder room. This was done by plugging the audio oscillator keying circuit into a Type No. RN-23201 Transmitter Transfer Panel trunk line to Radio Central by connecting the oscillator keying circuit to pins number five and six on the Type Number CSR--49127 plug. The output of the oscillator was plugged into the receiver Patch Panel in the same manner by use of a telephone plug.

In Radio Central the oscillator was taken from the trunk lines and patched to the paralleling receptacles, thence to any operating position not in use.

The oscillator is installed in the Radio Transmitter Room near the Transmitter Transfer Panel.

Messages of all types and precedence are drafted for use on the circuit and distributed to the operators participating. The drill circuit is monitored and controlled by the supervisor of the particular watch under instruction. It is also his duty to call attention to any discrepancies and take steps to correct same.