BUSHIPS

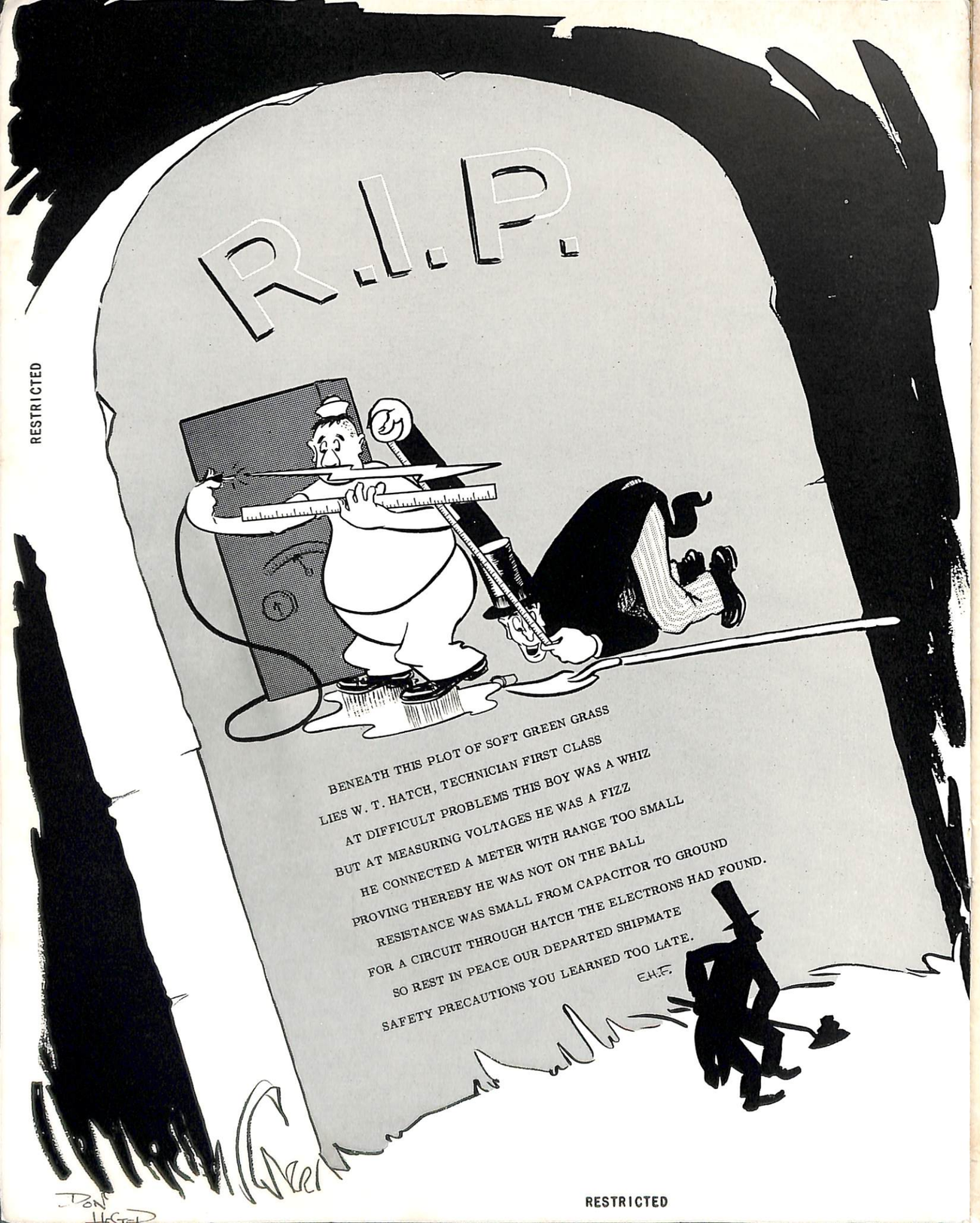
ELECTRON

FEBRUARY 1950

NavShips 900,100

Commanding Officers

See Page 6!



BUSHIPS Electron

THIS ISSUE

A MONTHLY MAGAZINE FOR ELECTRONICS TECHNICIANS

VOLUME 5 FEBRUARY NUMBER 8

RESTRICTED

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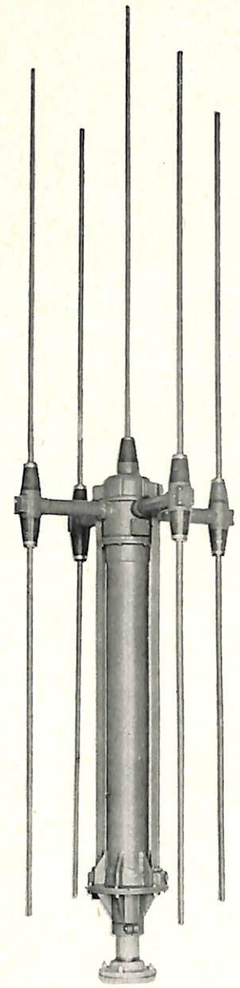
Direction Finder Set AN/URD-2

by
J. A. SOLGA
Electronics Design and Development Division,
Bureau of Ships

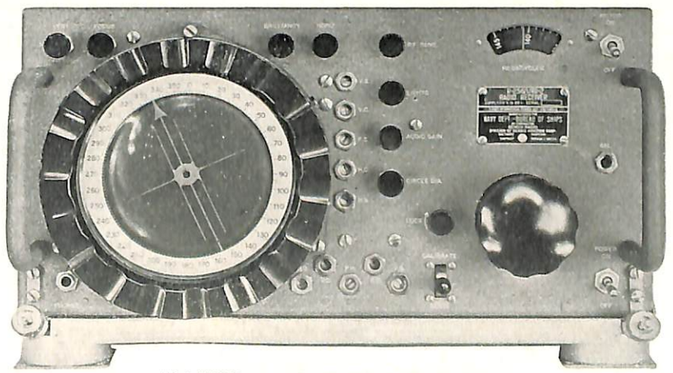
Often history repeats itself and it seems such is the case with radio direction finders for navigational purposes. With the advent of loran and other navigational aid systems, direction finding found itself a "has been" in the field of navigation—a service that was once considered a "must" for radio direction finders. At that time the vehicle carried the D/F and the source of the radio emission was from a fixed point such as a radio beacon station.

It is well known that in the meantime a new vehicle, the aircraft, has come into prominence. The requirement for navigational aids was intensified because of the new element of speed which accompanied the aircraft (as well as the increased numbers of the vehicle). Medium frequency direction finding in its older role still plays an important part in getting the aircraft to its destination. However at the destination (an airstation or carrier) the plane must land on a single lane "one-at-a-time" strip. There may be others desiring to land and at times the air activity around an air station may reach a very high degree. The need for a control tower and radio communications becomes apparent. Because the control tower operator must know which plane he is talking to, and where it is, radio direction finding has entered a new service. The system of direction finding is inverse to the conventional method in that the D/F is at a fixed point and the source of radio emission is on the vehicle. This is an economical arrangement as one D/F (per air station) suffices for an unlimited number of planes and the transmitter on the aircraft already exists because of its communications function. Because the v-h-f range is used for communications, the D/F must also operate in the v-h-f range.

The Model DBF–1 v-h-f direction finder has been in the field for sometime in air station control towers and with GCA units. In control towers it provides bearings on lost planes within an effective range of approximately 100–150 miles depending upon propagation conditions, transmitter power, etc. Theoretically the line-of-sight limitation should prevail. However distances beyond line-of-sight are not uncommon. The tower operator is able to locate and vector lost aircraft into the local traffic area or the radar scan of the GCA unit by means of regular control tower radio communications. The aircraft can then be given landing instructions in a routine manner, or if weather necessitates,turned over to GCA control on a regularly assigned GCA frequency. Instances have been reported where, under extreme conditions, aircraft have been vectored down on the landing strip with the D/F alone. This is not an intended function of the D/F but not too long ago a pilot, lost in a hurricane fringe on the East coast with a nearly empty gas tank, pleading for guidance from various stations with whom he was able to establish communications but who were helpless to guide him, was extremely grateful, to say the least, when NAS Patuxent vectored him onto the field with an experimental v-h-f direction finder undergoing operational evaluation. The radar screen was cluttered because of the storm. The pilot indicated that he was ready to bail out, which would have been unfortunate for he was well out to sea. Navy budget makers were quick to see that saving this one plane and pilot paid for the v-h-f development program.



AN/URD–2 ANTENNA. The center column houses the goniometer motor and two-phase alternator.

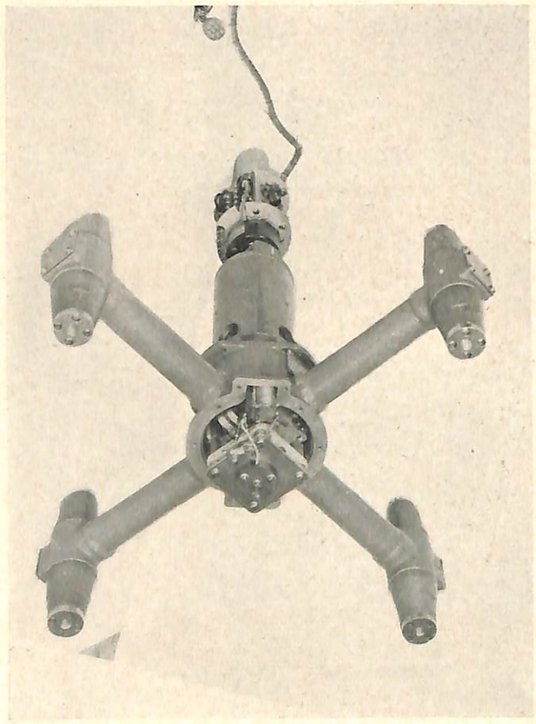


AN/URD–2 RECEIVER-INDICATOR

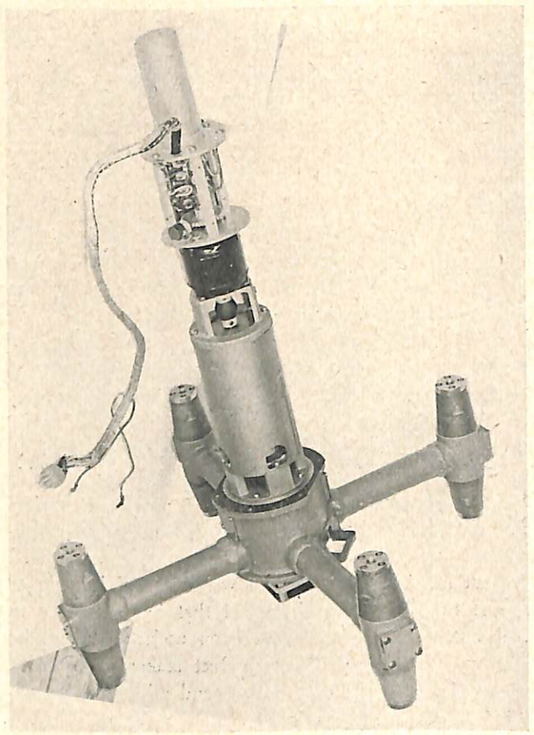
When operating in conjunction with the GCA unit, the D/F permits identification of any one of the "blips" that appear on the radar screen by indicating the planes bearing when the unit communicates with the plane. The "blip" appearing at the bearing indicated is the plane being talked to. If doubt exists, a port or starboard maneuver by the plane, when so directed, will verify the indication. It is thus possible to avoid such disastrous things as directing the wrong plane.

After finding that the original supply of DBF–1 equipments was not adequate, production of additional v-h-f direction finders was contracted for and they are now being delivered (60 for the Navy and a quantity of 62 to be supplied to the air forces). Approximately two years were spent in trying to improve the new equipment. AN nomenclature was assigned and the new equipment will be known as the AN/URD–2. The outward appearance of the AN/URD–2 (Figures 1 and 2) resembles that of the DBF–1, but a considerable amount of circuit redesign has been made. However certain changes in the physical appearance of the AN/-URD–2 antenna (Figure 2) will be noted. A more symmetrical arrangement of dipole elements to the center column and sense antenna has been made. Rigid and shielded horizontal transmission lines feed from the dipole elements to the goniometer within the center column replacing the unshielded flexible lines on the DBF–1. A reduction in instrumental error has resulted. The method of coupling r-f circuits to the goniometer in addition to other changes in the antenna results in an overall improvement in sensitivity. Careful avoidance of the use of dissimilar metals has been made—a fault found in the DBF–1 antenna.

The receiver-indicator improvements include a nearly ideal a-v-c characteristic. The a-v-c circuit is permanently operative, no provision being made to switch it

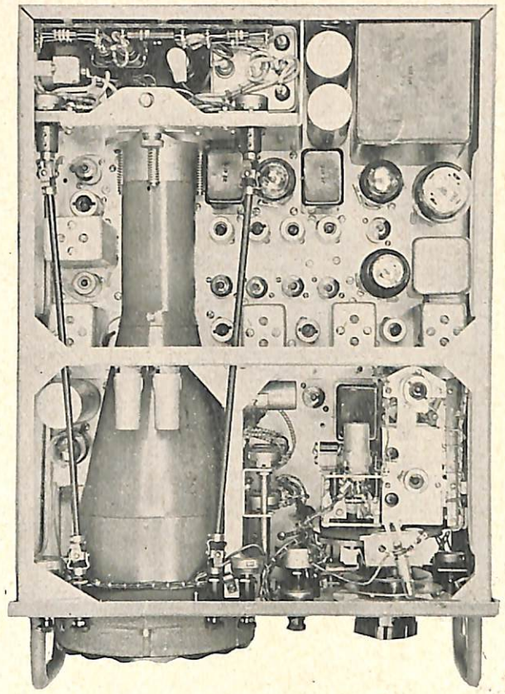


GONIOMETER on the antenna.



TWO-PHASE ALTERNATOR and MOTOR which drives the alternator and goniometer.

on or off. As a result the direction finder is ready at all times to handle weak or strong signals and display a normal bearing pattern on the cathode-ray tube without adjustment. A unique circuit feature that also aids in the automatic presentation of a normal bearing pattern is a special form of automatic video bias control that is applied to the indicator circle diameter circuits. The circuit allows the circle trace on the indicator tube to expand when there is no signal present so that the noise pattern fills the indicator screen. Readable bearings are therefore possible at very low signal-to-noise ratios. With strong signals the receiver noise level decreases because of a-v-c action and the circle size returns to normal. This action results in keeping the tips of the



INTERNAL VIEW of the receiver-indicator.

bearing pattern near the edge of the cathode-ray tube screen and the azimuth scale regardless of the strength of the signal being received.

Another minor feature in the AN/URD–2 that may occasionally prove very useful is the addition of an "on-off" switch on the goniometer motor. If the voice modulation on the signal received becomes unintelligible because of the garble caused by the rotation of the goniometer it will now be possible to switch off the motor and receive a clear signal. Space does not permit describing all of the detailed improvements in the AN/-URD–2. Generally, they include greater accuracy, sensitivity, ease of operation, ease of alignment and better mechanical design. The instrumental error of the equipment has been reduced to an extremely low figure. It is important that proper alignment of the receiver-indicator be maintained in order to realize continued excellent performance from the AN/URD–2. When properly aligned the indicator is accurate to within one degree. It has been determined that, with all controls maladjusted, an experienced operator can completely align the indicator in ten minutes. Precise instructions for alignment are included in the AN/URD–2 instruction book.

The degree of bearing accuracy to be expected from the AN/URD–2 will depend upon certain factors such as site conditions for the D/F antenna, alignment of equipment, vertical angle of arrival of signal, etc. Calibrating the direction finder for each frequency used will improve the accuracy although it is expected that the AN/URD–2 will be used uncalibrated. Tests indicate that if the equipment is installed at a good site the following accuracies can be expected:

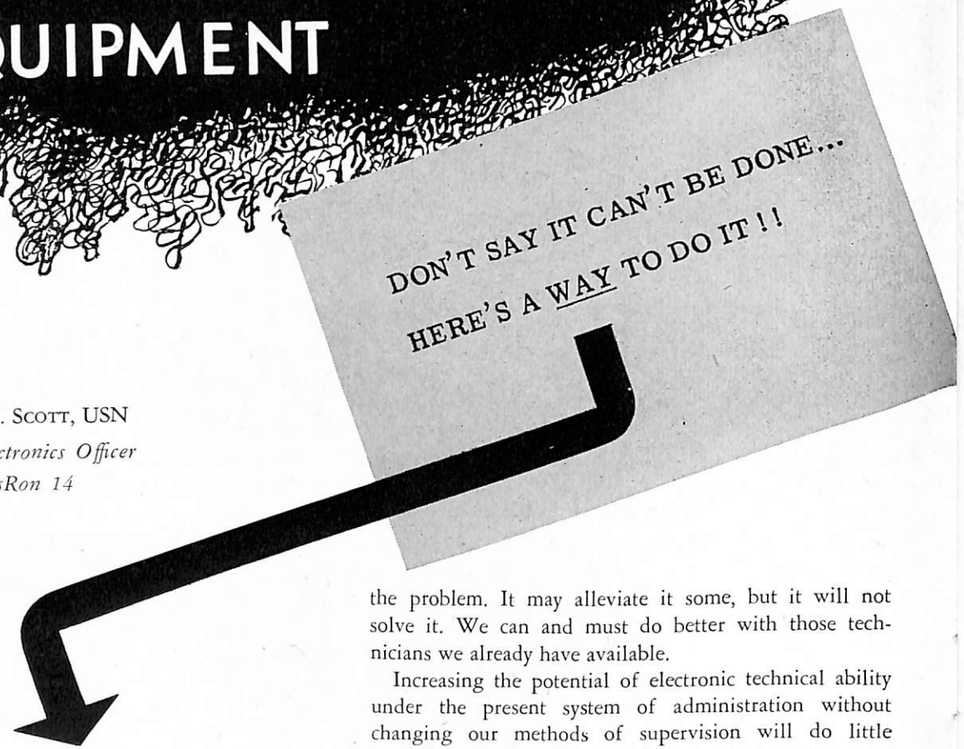
1—71% of the observed bearings will be within 1° of correct.
2—96% of the observed bearings will be within 2° of correct.
3—All of the observed bearings will be within 3° of correct.

Greater accuracies may be obtained if calibration is made or if correction factors are applied through shifting of the zero axis of the error curve for each frequency used. Steeply downing signals are known to produce unreliable sense performance and greater bearing error. Signal arrivals from a 60° vertical angle produce completely unreliable sense indications and bearing errors up to 10°. This limitation should be considered in the service of the AN/URD–2 although it is not considered a serious handicap, for such steeply arriving signals mean that the plane is almost directly over the air station or carrier. A plane at 5000 feet subtending an angle of 60° to a point on the ground would be at a horizontal distance of 2885 feet from that point or in other words close enough not to require the use of the direction finder.

With proper installation, maintenance and operation the AN/URD–2 should provide a great service in aircraft homing and guidance.

Type of Approach	Through November	To Date
Practice Landings	11,344	294,452
Landings Under Instrument Conditions	329	11,264

YOU CAN MAINTAIN YOUR ELECTRONIC EQUIPMENT



by
LT. CDR. WALTER E. SCOTT, USN
Communications Electronics Officer
Staff, ComDesRon 14

It was recognized at the last CIC conference in Washington that the problem of maintaining shipboard electronic equipment has assumed major importance. Why can't it be recognized in the fleet that a serious problem exists? And, having recognized it, why doesn't the fleet do something about it except write adverse comments which emphasize the lack of technical skill and the inadequate number of trained electronics technicians? The Destroyer Force has publicized the slogan of "Doing The Best It Can With What It Has." But the point has been reached where the best is not good enough—it's got to be better! Increasing the number of electronics technicians in the fleet is not going to solve the problem. It may alleviate it some, but it will not solve it. We can and must do better with those technicians we already have available.

Increasing the potential of electronic technical ability under the present system of administration without changing our methods of supervision will do little toward increasing the effectiveness of our electronics maintenance program. There is hardly a command in the fleet that has its full allowance of ET's on board. Yet, some of our ships are in excellent condition electronically. These ships appear to have little or no trouble in maintaining their equipment in good operating condition. They submit very few repair requests to the tender. When they must ask the tender for assistance it is definitely a job that requires services they cannot furnish themselves. Why is it that some ships are able to operate in this fashion and others are unable to approach it? Well, it is not a problem or a question of technical ability. No. it is one of administration on the ship itself. The best technicians in the fleet would have difficulty maintaining the equipment of a ship with poor administration and supervisory personnel. In plain words, we can do better with what technicians we've got on some of our ships in the fleet. Most of our ships have two rated ET's and possibly two strikers on board. This is the usual distribution on board most of our destroyers. It is sufficient, providing they are properly supervised in the execution of their duties and in handling their work load. If you need strikers—ask for them; they might be available.

The author believes that the condition of the electronic equipment is representative of the amount of supervision exercised by the command. If the command is lax and fails to recognize or discharge its responsibilities in connection with electronics maintenance, then the technicians are going to be lax and as a result they will do no more than is required. It is taken for granted by far too many officers that we have too few trained men in the Navy and that those we do have are short-timers who are lazy. These officers use that as an excuse to pass over their own shortcomings—their own lack of ability to properly supervise the men. This is not criticism, it is a fact. And it is a deplorable fact that such a condition is knowingly allowed to exist within any command. It is very gratifying to discover that some commands have recognized these conditions and have done or are doing something definite about them. These commands are to be congratulated. You, also, can maintain your electronic equipment. Don't say that it can't be done. During routine inspections the inspecting officers point out discrepancies and make suggestions for improvement, but they are seldom telling the Commanding Officer things that are not already known to him. Commanding Officers are usually well aware of these discrepancies but many choose to take the passive viewpoint on the grounds that the conditions are Navywide and nothing can be done about them. That is definitely not the course to assume. Something can be done and it is within the reach of most commands to do it. All it takes is a little push in the right direction. The discrepancies are not necessarily the result of a shortage of trained men, nor due to the lack of the ability of the men we have. The writer is convinced that improvement of the existing condition is hampered by the lack of proper supervision. An Officer does not have to be a graduate of any electronics school or hold engineering degrees to be a good supervisor or a good administrator of his division. In fact, there are some officers who, in spite of their engineering background, are poor supervisors. This is not criticism —it is a fact.

Some of us realize that the ET is seriously handicapped in his work because the destroyer has no electronics workshop. Facilities for properly servicing electronic equipment are provided on relatively few ships, but it goes without saying that those ships with the electronics workshop have a better organization, more efficient operation and maintain their equipment in a better than acceptable state of readiness. The Bureau of Ships has given its permission for Commanding Officers to improvise workshops wherever they have the space available. In some cases, the unused magazine spaces have been made into electronics workshops without altering the permanent magazine fixtures. This meets with the approval of the Bureau of Ordnance, but not always with the approval of the Gunnery Officer. It may seem like a small point about which to make an issue, but be assured it is a very important point. The ET workshop must become a reality on all destroyers before the problem of electronics maintenance will be solved. This analysis is only common sense. A shop equipped with the proper facilities is required in order to service electronic equipment. Records, files and instruction books should be centrally located and easily available to the ET. Also, provide storage for radio tubes and repair parts. Don't throw up your hands and scream that it can't be done! It can be done. Destroyers have more unused space in overheads of compartments than they realize. The overhead in COC will hold several hundred spare tubes including some of the larger sizes. Space is not a problem; it is there . . . use it to the best advantage. With a place to do this work and a place to keep his test gear and repair parts, the ET will take an active interest in his work—at least his pride in doing a good job will increase. Until this is done, the electronics administration can hardly be better than satisfactory.

The selection of the Electronics Officer must be carefully considered. Although it is a most important billet it can be a collateral duty. It requires an officer who has demonstrated his ability as a good organizer and supervisor. George Ensign should not be assigned unless it is believed that he has the necessary qualifications. Technical skill alone is not sufficient. The officer selected for this job need know little or nothing about the technical side of electronics. What he does need is an interest in getting the job done. It is likely that the Operations Officer is the logical candidate. If the ship is fortunate enough to have an officer on board who is a graduate of an electronics school he can be the Assistant Electronics Officer and do most of the leg work. But the boss man should have some rank in order to keep the division in order. Electronics is a vital part of the operations department and the administration should be in that department where it rightfully belongs. Put it there and establish the organization of the ET division in writing.

Set up the preventive maintenance schedules and see that they are carried out. This requires officer super-

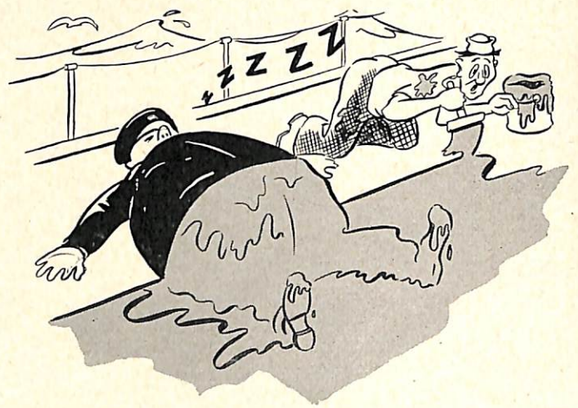
vision. It requires personal contact by the officer and not directives issued from the wardroom over a cup of coffee. He must get out, get around and see that necessary orders are being executed by those who have been designated as being responsible. Preventive maintenance is to be performed by the personnel who operate the equipment. That idea should be impressed on all operating personnel as soon as possible. The operators are going to have to learn how to do certain things—things that they have not done before. They can and will be taught these things. The ET's can teach them and the ET's can check on them to see that they do the job correctly. Preventive maintenance and the daily check-off sheets are an important factor in starting the proper administrative organization of the ET diivsion. This simple schedule will go a long ways toward bringing the electronic equipment up to an acceptable standard of operation and maintenance. Get it in effect and keep it so. Get the training program started for the operators. Designate the men and show them what they must do. Show them how until they know exactly what to do and how to do it. Then see that the orders are obeyed.

We now have covered three steps toward improvement in electronics administration: FIRST, we established an ET workshop and provided a readily accessible stowage for spare parts. SECOND, we have the Electronics Officer in the operations department, and all the ET's work for the Electronics Officer. THIRD, we have started a training program to teach the operators how to perform simple preventive maintenance and to fill in the daily check-off sheets. Operators include all personnel who normally operate electronic equipment including the fire control technicians. The job of maintaining F/C radar is going to remain a part-time if not a full time responsibility of the Electronics Officer.

Now we have made a good start toward building an efficient electronics organization within the operations department. And all this has been done by tackling the job within the ship itself. It can be done regardless of the kind of personnel you think you have. Give them a chance, give them the training and they'll probably be much better than you realize.

Now then, there are still several items left to consider. We must recognize electronics maintenance as a job of major importance. It will be hard to get the First Lieutenant or the gun boss to agree. Regardless of the narrow-minded viewpoints of other heads of departments, the fact remains that electronics plays an important and vital role in everything we do and it must receive its share of efficient operation.

Therefore it is a pointless argument for anyone to say that electronics maintenance requires no time. It is a full time job for the ET's, and under ordinary conditions, a large order for the Electronics Officer. It must be recognized as such throughout the fleet, and it must be considered the primary duty of all electronics personnel. In plainer words, ET's rarely should be given duties not connected with electronics maintenance and then only under the most unusual circumstances. With the proper supervision most of them will be working eight to twelve hours every day anyhow, which is considerably more than some ratings spend at their specialties. The Executive Officer recognizes the importance of keeping his yeoman in the ship's office. It is seldom that we see a yeoman standing watches or running guard mail trips. But the ET is sometimes assigned to guard mail duties, watches, etc., by some XO's who think nothing of it. Those gentlemen will have to be taught to think differently. Fortunately, they are few in number and the job should not be too difficult. There are still some old die-hards in the Navy who say that everyone should stand watches. . . . We agree with that statement, 100 percent. Everyone in the Navy should take his share of the watch and duty load, that is part of his job. When underway, the ET should be on watch but his watch should be in connection with



There IS more to electronic maintenance than just painting everything that doesn't move.

electronics repair work. There is always something to be done in keeping up with the electronics work load. The mid-watch is an ideal time to work on a receiver in the ship. While in the shop the ET is on call should anything go wrong in Radio, in COC, on the bridge or anywhere else having an electronic installation.

Certainly, by all means, put the ET on the watch list. But put him in the shop and give him some work to do. It's a great idea and we think that it's right. Don't make him a radar operator or a RADCM operator, or anything that will tie him down. If the radar goes out and he has to fix it, then you'd have to find a relief for him. That would upset the watch list. Provide for the fact that casualties happen and then the ET will be available when they do.

Recognize the fact that electronics is here to stay and that it is a big job to keep it going. Preventive maintenance and corrective maintenance are important items and if administered properly will pay great dividends. Let's forget all about this so-called "defeatist" or "no can do" attitude which is spreading through some sections of the fleet. This is a germ which must be destroyed. It has spread to departments other than electronics, and if not stopped may undermine the whole structure of the ship's organization. Look to the repair department and you will understand better what is meant. We have heard of work requests turned in to the tender and returned with a "no can do." Why? Is it because they are lazy? No, that isn't the trouble. Their administration is poor. When they see a tough job to be done they sometimes unconsciously think of reasons for not doing it. (On the other hand some ships request the tender to do work or make repairs which the ship itself should do.) This point of view must be discouraged. Every job that develops should be a personal challenge to the ego. Don't scream that it can't be done. Think it over; then, if there is a good sound reason why it can't be done or why it won't work, take it to the Captain and talk it over. If we can't justify our attitude we're only wasting time and spreading the "no can do" germ. When we get the word that something has to be done, we should say to ourselves "all right, let's go to work. We'll do this thing or we'll know the reason why it can't be done." Our point of view should be to assume that the job can be done unless it can be proven beyond all doubt to be impracticable of accomplishment.

It was recommended at the CIC conference last year that the Bureau of Naval Personnel attempt to bring Naval Reserve Electronics Specialists back on the active duty list. The intention is to alleviate the shortage of trained officers. Why in the world do anything like that? It is doubtful if it could be done, but the idea makes little sense. We are complaining about the shortage of qualified Electronics Officers in the Navy, then we turn right around and fail to make full use of the ones we have trained for the job. A certain squadron staff in DesLant had, at one time, three electronics school graduates on board. One, a senior lieutenant, was a graduate of MIT electronics, the other two, both junior lieutenants, were graduates of the long course at Great Lakes. The MIT graduate was performing the duties of Communications Officer, among other things, but had nothing to do with electronics, and by his own admission knew very little about communications. One of the juniors was the Squadron Electronics Officer and the other was sort of a George on the staff, having several collateral jobs. Another case, for purposes of illustration, is a certain DesLant ship that has had a Treasure Island graduate on board for nine months—and he has had nothing to do with electronics.

These conditions are fine. It is not advocated that an officer should do nothing except electronics duties, or that he must be especially trained in order to administer electronics maintenance and operation. These conditions are pointed out (there are many others) to emphasize that we do have officers trained in electronics and that we are not using them to the fullest advantage. We've got the electronics officers in the fleet now—let's use them as such. If we need more officers in the Navy to do the work now being done by these electronics officers that is a different matter. It would be a fine idea to bring back a few thousand of the reserve officers who are qualified as deck watch officers and let them relieve the qualified electronics officers of some of their collateral duties. That might put us out in front. There is another thought to consider in bringing back the Reserve Electronics Specialists. What would prevent them from being assigned to other duties by their Commanding Officers? Nothing. All we would be getting is more officers in the Navy and it's not clear that we need them.

Proper scheduling of the work load and personal supervision by the Electronics Officer are two items that will help any administration. The daily work should be planned. Then, the First Lieutenant will not jump the Operations Officer because the ET's are sitting around drinking coffee. If such a condition is allowed to exist the Operations Officer deserves to be jumped on, and by the Commanding Officer. Schedule the work properly and the ET's will be busy during regular working hours, the same as everyone else and they will be doing their share; we can be sure of that. But they are only human and can do only so much. Schedule some time for the training program and by all means use the operating personnel to assist the ET's in performing corrective maintenance. By doing this the operating personnel will become familiar with the equipment and learn more about how to carry out preventive maintenance.

So, let's not admit that we have a poor electronics organization and that we are poor administrators. We can do the job if we put our hearts into it. We have the men, the material and the know how, and deep in our minds we know that the job can be done. So let's all put our shoulders to the wheel and do something about it.

Bureau Comment: This is a frank sincere approach to a very real problem. Other opinions on this subject are desired. What do YOU think? Write it down and mail it to the editor of *Electron* Magazine.

MODEL VRT-1

Short Memory Recorder

The use of sound recording devices on Naval vessels began in 1941, when the first wartime needs were realized. The original application was to provide a record of battle noise for playing back over large loudspeakers for the purpose of training gun crews and other operating personnel under these conditions. The search for a device that would work under the conditions of pitch and roll on the ship caused the Bureau of Ships to investigate magnetic wire recording, being studied at that time by the Armour Research Foundation.

The need for recorders aboard ship for the purpose of monitoring radio circuits on records which could be conveniently filed led to the development of disc recording of the embossing type which used spring loaded recording and playback heads which would operate under the conditions found on Naval vessels.

Experience had proven that, while copying voice and code transmissions, many operators were prone to miss words or short portions of such transmissions. This resulted in the necessity for requesting a repetition from the transmitting station thereby weakening the security of the communication system. In view of this fact, efforts were concentrated on producing a type of recording system which could be used as an adjunct to assist the operator in obtaining "solid" copy and at the same time maintain communication security. The knowledge gained through considerable experience with wire recording developments was such as to convince the Bureau that the mechanical problems involved in wire recorder design, although not necessarily insurmountable, made them at best a troublesome medium which should be avoided in favor of other media where possible.

Research and development by various interested agencies resulted in the production of Short Memory Recorder Model VRT–1 (Figure 1). This unit consists of a three-channel magnetic steel tape recorder-reproducer which can be located in any unattended space protected from the weather. When connected to a communication circuit, it can be operated easily and quickly by relatively inexperienced personnel from one, two or three remote stations. The equipment will operate for long periods of time without attention and can repeat messages almost immediately.

One of the first of these units was installed in the *USS Mississippi* (EAG–128) by the ship's force, assisted by representatives from Commander Operational Development Force, for evaluation by the Operational Development Force. The report of this evaluation is used as the basis for this discussion.

As can be seen from Figure 2 the incoming signal from the communication circuit, after being amplified, is recorded simultaneously on three individual stainless steel "endless" tapes contained in magazines which are driven by a common synchronous motor. Playback heads are continuously engaged and the time interval between recording and playback is a function of the length of the tape in each magazine. Delays of 10, 20, and 40 seconds are available in the VRT–1. To eliminate the possibility of overlapping of recordings on the tapes, each tape must pass through erasing heads before returning to the recording heads. These erasing heads are excited by a supersonic signal which removes the recorded signals by re-orienting the magnetic pattern of the tapes.

The recorder unit contains a "no delay" output jack and a recording level indicator, both of which are actuated by the amplified signal input. Three individual amplifiers derive their respective inputs from the three playback heads and have sufficient power to excite a loudspeaker. Three remote units identical in design are supplied with the equipment. These units contain a local volume control, on-off indicator light, and a switch for selecting the desired delay.

When in operation, the system functions as follows: A pair of headphones or a loudspeaker is connected as shown in Figure 2. The operator is normally receiving the signal direct from the No Delay Playback Amplifier through Switch S–101. If for some reason he misses a word or portion of the transmission, he immediately shifts to one of the magnetic tapes to obtain a retransmission of that word or portion. The length of the portion missed determines which tape the operator selects, ranging from 10 to 40 seconds. However, once he shifts to a tape for a retransmission, that particular tape is no longer of any use if he misses another portion of the incoming transmission. Thus the operator should shift back to "straight-through" copy at the first opportunity. This will enable him to have available three tapes for retransmission purposes a maximum amount of time.

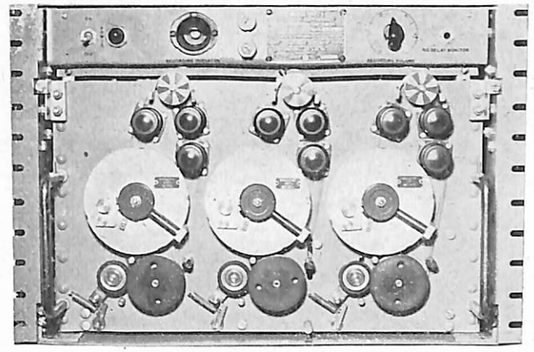


FIGURE 1—Front view of the main unit of the Model VRT–1 with front cover removed showing location of magazines and pulleys.

This recorder-reproducer is particularly helpful, as mentioned previously, when copying voice transmissions or weak code signals. We have all experienced the interruption of such transmissions due to bursts of static, key-click interference or other objectionable sources of interference.

All driving power for the tapes is provided by a 1/30 hp sleeve bearing motor. A pulley on the motor shaft drives a belt which in turn drives all tape driving pulley assemblies in the same direction. The tape drive pulley has a groove in which the tape rides. As the tape moves across the head it is supported by a pulley which serves the dual functions of a tape guide and a tape movement indicator. The outer side is sectionally painted alternately red and yellow. A window in the front cover permits observation. The appearance of these two individual colors indicates that the tape is not running, but a blend of orange reveals that the tape is moving to spin the pulley.

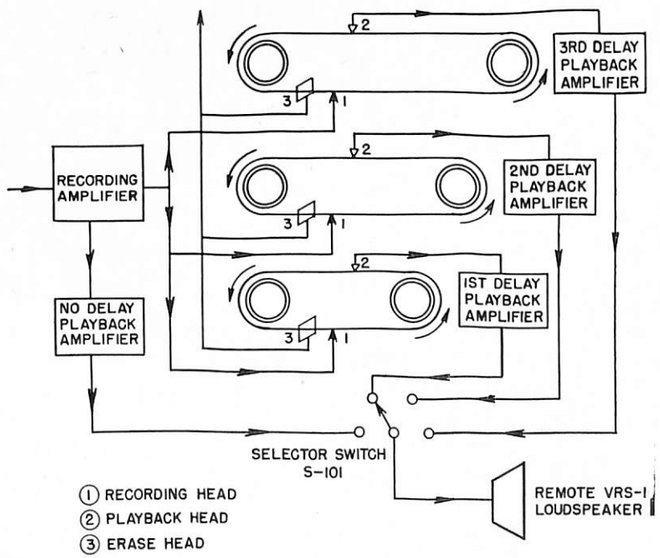
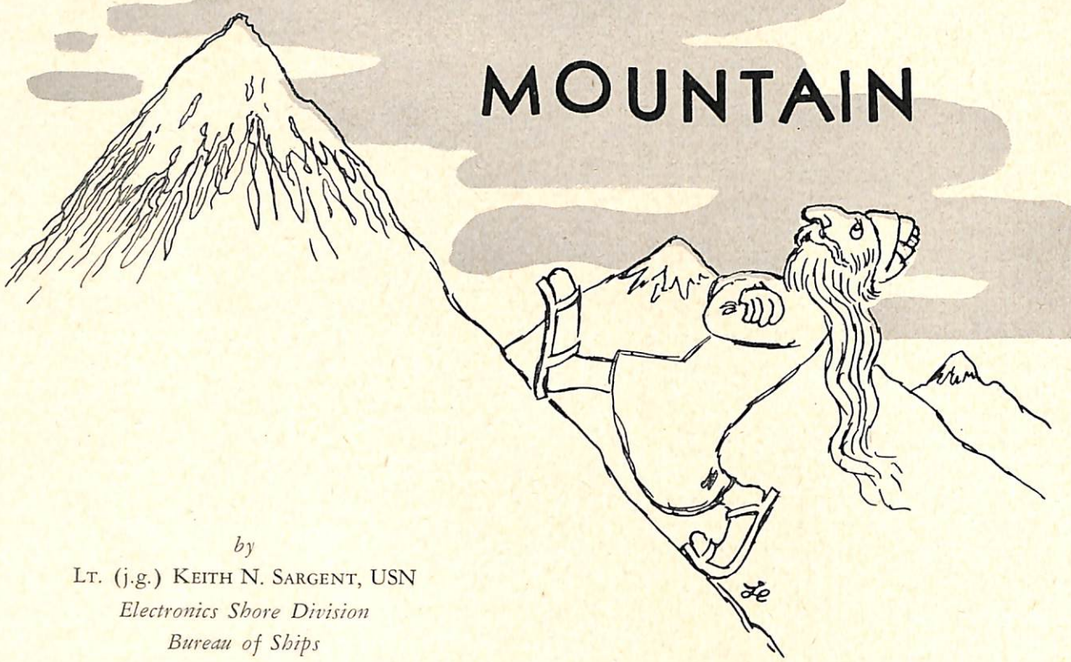


FIGURE 2—Simplified block diagram of the Model VRT–1 illustrating signal sequence and time delay repeat operation.

BRINGING Mahomet TO THE MOUNTAIN



by
LT. (j.g.) KEITH N. SARGENT, USN
Electronics Shore Division
Bureau of Ships

Since the early stages of advanced base operations during World War II, Electronics Officers in the field have recognized the need for some means of adequately performing electronic repairs to ships and craft in the stream. Generally, in advanced areas, dockside facilities were at a premium and first priority was given to hull, machinery, or ordnance repairs which could not be performed at the anchorage. Dockside space, when available to electronics, was usually required for radar antenna or other heavy unit installation or replacement. Boat pool transportation was at best limited, and consequently not a dependable means of access for electronics maintenance and repair work required on board vessels which could not be docked or landed.

The Electronics Divisions or the Bureau of Ships recognized this need and undertook a means of "bringing Mahomet to the mountain." A review of World War II reports indicated that many EO's at advanced bases had solved their problem by obtaining small craft (by devious means) which were outfitted for electronics repair service and manned by EO personnel. They were thus able to more fully carry out their responsibilities. This was notably effective at English channel ports prior to and after the Normandy landings when all vessels and landing craft had their electronic equipment inspected, and all but heavy repair work done in midstream.

As a result, the Advanced Base Electronics Facilities Engineering Branch of the Bureau of Ships has obtained authority from the Chief of Naval Operations to develop a floating counterpart of the Navy Model OCM Mobile Electronic Repair Shop to be included in Advanced Base Initial Outfitting Lists. This equipment has been designated the AN/SSM–1( ) Electronic Repair Craft.

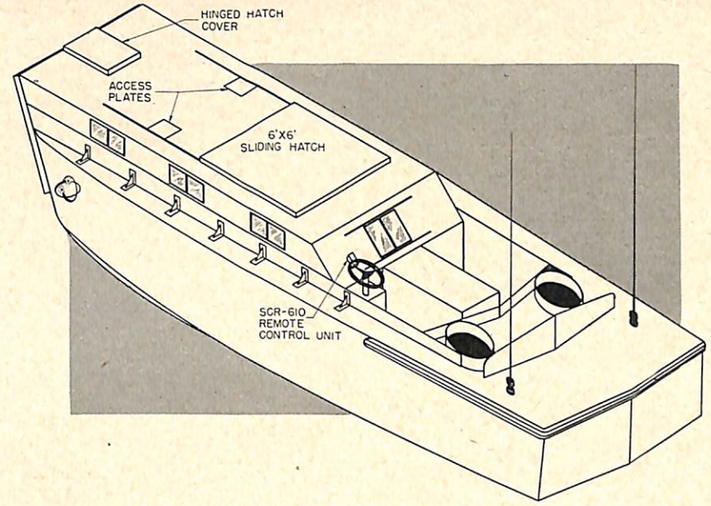


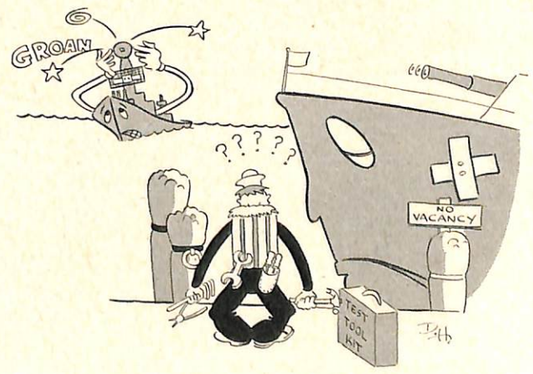
FIGURE 1

The AN/SSM–1( ) will consist of test equipment, tools, and maintenance parts in an enclosed LCVP (see Fig. 1). Other small craft were considered but the increased headroom available in the LCVP as well as its single compartment capacity made it more desirable than the other types. This large single compartment provides an adequate working area which can also be utilized to transport equipment to a ship for installation or from a ship to shore shop facilities when repairs are beyond the capacity of ships' forces or the forces and facilities of the AN/SSM–1( ) itself.

The general layout of the equipment will be in accordance with Figure 2. It is not anticipated that this layout will be materially changed in that the locations have been assigned to achieve maximum stability of the craft and still retain compact stowage and adequate working space. The port workbench (Fig. 3) and the starboard workbench (Fig. 4) will be generally as shown but are subject to modification dependent on the final test and power tool equipment allowances. Table 1 shows the general types of equipment which are contemplated. The selection of specific equipment will be guided by the recommendation of BUSHIPS ELECTRON's readers.

All spare vacuum tubes will be stowed in cabinets above the deck line of the hull and extending to the overhead. The two workbenches will be located just aft of the forward lift eyes of the craft. Rectifier power supplies and wire reel holders will be mounted under the two workbenches. Incorporated into the workbenches will be the installed test equipment, the mounted power tools, and hand tool racks as well as storage space for the portable test and power tool equipment. The exact positioning of the equipment to be incorporated into the workbenches has not been firmed and is another feature about which field comment is invited. The remaining longitudinal bulkhead spaces will be used for the new standard electronic parts storage bin sections. The after part of the shop compartment will contain racks for battery, replacement component, and armature stowage.

Two types of operating communication equipment will be installed in the after gunner's cockpits. One, for RDF calibration work, will be a 2- to 20-Mc, 25-watt AM/CW transmitter-receiver and the other, for control and dispatch of the AN/SSM–1( ), will be a 5-watt line-of-sight FM transceiver. Both equipments will feed into whip antennas mounted on the decking aft of the cockpits. The operating position for the AM equipment will be located adjacent to the port work-



The pre-AN/SSM–1( ) era .....

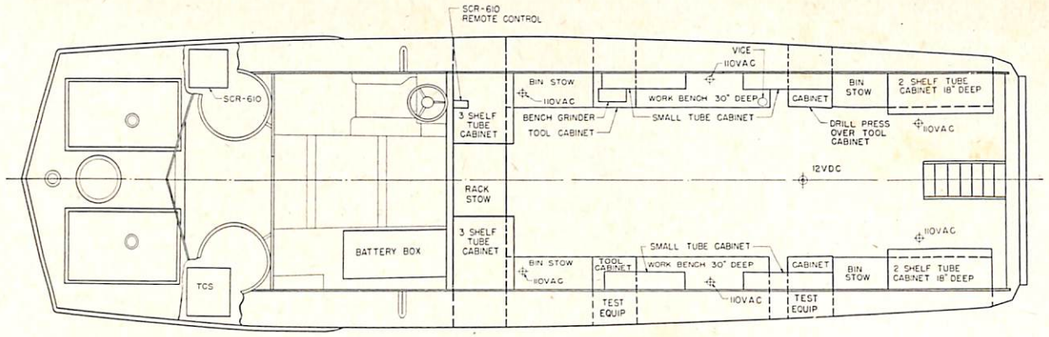
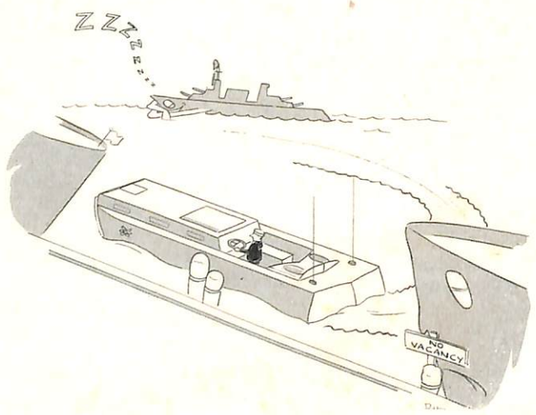


FIGURE 2

bench while the operating position for FM equipment will be located adjacent to the helm.

Power for lighting, test and power tool equipment supply, and equipment testing purposes will be supplied by a 110-volt 60-cycle single-phase engine-driven generator located on the center line aft of the main engine. Six and twelve volts direct current will be supplied to the work benches from auxiliary storage batteries in the starboard side of the engine room. It is planned that the 110/60/1 from the generator as well as 28, 32, 60, 115, 250 and 500 d-c volts will be supplied to the workbench panels.

Hull alterations to the LCVP in addition to the shop compartment housing will include closing off the access way in the forward engine room bulkhead and covering the gunner's cockpit, as well as necessary alterations to the main engine and generator housings for acoustic and electromagnetic noise suppression. Additionally the runways and runway guides will be removed and replaced by a linoleum covered deck lowered to achieve optimum headroom and level deck expanse. The mean headroom of the shop compartment will be approximately 7'2".



. . . . . and the AN/SSM–1( ) era itself.

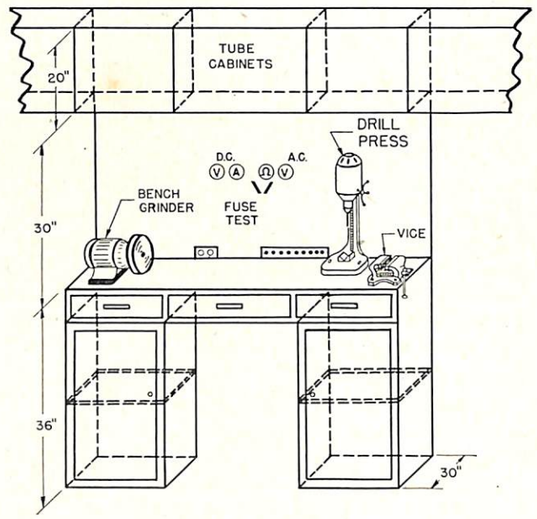


FIGURE 3

The shop compartment housing will extend from the forward engine room bulkhead to the bow ramp and will have one sliding 6' x 6' hatch in the after part of the enclosure for equipment handling and a smaller hinged hatch forward for personnel. A pivoted ladder, leading to the personnel hatch, will be suspended from the housing. The ladder can be raised and secured to the overhead to permit removal of equipment over the lowered bow ramp or to increase temporary storage space in the bow.

Also included in the housing will be fixed windows, port and starboard, with a double sliding window aft and lift-eye access plates. Forced ventilation for the shop compartment will be provided for personnel safety and comfort.

The advanced base planners in electronics feel that the AN/SSM–1( ) provides an answer to the problem of access for electronic repairs to ships and craft anchored away from shore shop facilities. However, since the AN/SSM–1( ) is strictly a field equipment,

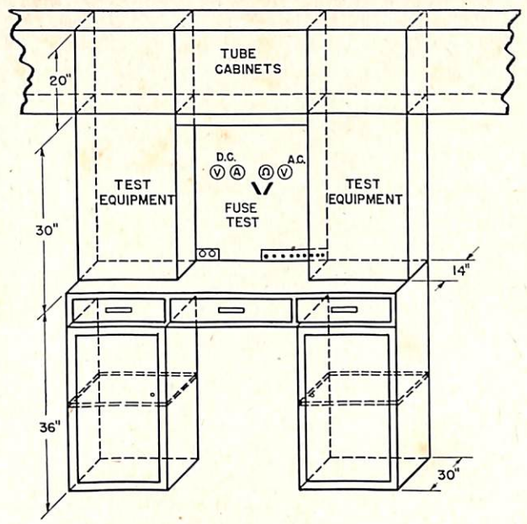


FIGURE 4

it is considered that opinions based on field experience should be the primary guide in its development. Consequently the comments, criticisms and suggestions of ELECTRON readers are invited—especially from those officers and enlisted men who have had advanced base experience.

TABLE I

Installed

1 *Receiver Analyzer*
1 *Tube Tester*
1 *AF/RF Signal Generator (demountable)*
1 *Oscilloscope (demountable)*
1 *VTVM (demountable)*
1 *Bench Grinder*
1 *Drill Press*
1 *Transmitter-Receiver*
1 *FM Receiver*
1 *Rectifier 28/32/60/-115 volts DC*
1 *Rectifier 115/250/500 volts DC*
2 *Work Bench (approx. 30" x 5')*
80 *12" x 12" x 18" Stock Bin Units*
26 *VDC 200 AH Storage Batteries*
2 *Whip Antenna Mounts*
2 *Whip Antennas*
1 *D-C Voltmeter (multi-range)*
1 *A-C Voltmeter (multi-range)*
1 *D-C M.A. Meter (multi-range)*
1 *Ohmmeter (multi-range)*
1 *R-F Indicating Probe*
1 *Power Megaphone*
1 *5 kw 110/60/1 Generator*

Portable

1 *Receiver Analyzer*
2 *Electronic Repair Kits*
1 *Frequency Meter*
1 *Portable Drill*
1 *Wavemeter*
1 *Oxy-acetylene Brazing Outfit*
1 *Portable Typewriter*

Stowed

Hand Tools
Electronic Maintenance Parts
Shop Consumables
Miscellaneous Hardware
Limited Office Supplies and Forms

IMPROVED MODEL FRA ALIGNMENT PROCEDURE

After the completion of Step 13, Page 7–1, Section 7, of the Model FRA Frequency Shift Receiver-Converter Equipment instruction book, there is no voltage output from the discriminator. However, when the signal generator is re-connected as in Step 14, there will be an output sometimes as high as 3.5 volts. This occurs even though the frequency of the signal generator has not been changed. One reason for this seems to be that ungrounding the grid of the locked oscillator in Step 12 causes it to show a different reactance to the discriminator and thereby changes the discriminator center frequency. As the locked oscillator is now (with the signal generator connected, Step 14) locked into frequency with the signal generator, the discriminator should be re-centered for zero output voltage. This will decrease the error that will be noted when the signal generator is removed again, but will not eliminate it, as the re-tuning of the discriminator shifts the free running frequency of the locked oscillator. Therefore alternate adjustments should be made, with the locked oscillator operating, adjusting the locked oscillator to the discriminator center with the signal generator off, and then adjusting the discriminator secondary with the signal generator on. After a few such adjustments the discriminator output voltage will be found to be zero whether the signal generator is on or off. This is the condition sought for proper alignment of the Model FRA.

If the procedure is gone through only once, as detailed in the instruction book, the discriminator center will be in error, sometimes as much as 700 cycles. This error is not as bad as it sounds, since in operation the receiver is tuned so that the signal frequency is centered on the discriminator frequency, so the effect is to shift the signal over toward one side of the pass band of the receiver and converter tuned circuits. In some cases, however, an improvement in operation has been noticed when the converter was re-aligned using the procedure outlined above.

MODELS TDZ AND RDZ COMPONENT FAILURES

Commander Cruisers, Atlantic Fleet, reports that "A frequent but easily overlooked fault is cold crystal ovens." When the ovens fail in these equipments, the results show up as weak or lost signals. Technicians should make a practice of checking ovens daily.

NEW

RADIO REMOTE CONTROL TRANSFER SWITCHBOARDS

The present radio remote control transfer plug panels have become too cumbersome to install and operate in the vastly expanded shipboard radio installations. A new type of control panel utilizing switches in place of the present plugs and patchboards is now in production and will be installed in new construction and conversion vessels. Two new types of unit-constructed panels will provide all of the facilities now available in the present three types of plug panels and will provide greater flexibility in the remote control system.

The new Receiver Transfer Switchboard, Type SB–82/SRR, and the new Transmitter Transfer Switchboard, Type SB–83/SRT, both operate on the same highly flexible principle; i. e., cross-mat parallel wiring of the switches. The receiver switchboard has five vertical rows of ten double-pole, single-throw switches, continuously rotatable in either direction. The transmitter switchboard has five vertical rows of ten twelve-pole, single-throw switches, continuously rotatable in either direction. The wiring plans of both switchboards are similar. One side of each switch in a vertical row is wired in parallel with the same sides of the other nine switches in that row. Similarly, the side of each switch that is not wired in parallel vertically, is wired in parallel horizontally with the other sides of each of the other four switches in the same horizontal row—hence the term cross-mat paralleling.

It may readily be seen that with an equipment connected to each vertical row of switches and a remote unit connected to each horizontal row of switches, any or all equipments may be switched to any or all remote units merely by a turn of the proper switch or switches. The knob of each switch is marked with a heavy white line, providing instant and positive information as to the communication setup. Since in almost every instance a vessel's communication remote control system requires more remote stations than there are equipments, the standard installation of the switchboards will be in a vertical position. Switchboards are furnished with the knobs in the "off" position when the white line is vertical. This provides for five equipments (vertical rows) and ten remote station (horizontal rows). However, by the simple expedient of turning the switchboard to a horizontal position and rotating each switch knob 90° with respect to its shaft, (all shafts have two flat sides for set screws to provide for this) the switch panel provides for ten equipments and five remotes. The purpose of rotating the switch knobs with respect to the shafts is to standardize on switches being in the OFF position when vertical. Also for further standardization, in every installation, equipments should be connected to the vertical rows of switches, and remote stations connected to horizontal rows, after the position of the switchboard has been determined.

The receiver switch panel carries the receiver output circuit only, as in the receiver transfer plug panel. However, in the transmitter switch panel each switch carries the start-stop, indicator and keying circuits (6 conductors) as in the transmitter transfer plug panel, and in addition, carries the 12 volts d.c., microphone, carrier control and carrier indicator circuits (6 conductors) as is carried in the radiophone transfer plug panel, thus reducing the number of panels required in the present remote control system. All external wiring is brought into the panel through terminal tubes and is connected to a terminal block located in the back of the cabinet. The panels themselves are designed as units and as many units as required for a particular installation may be mounted together on a common bracket. To facilitate interconnections for group installations, the Bureau will provide two types of cable harnesses for each type panel, one for vertical and one for horizontal interconnection of each type panel. Distribution of cable harnesses will follow the distribution of the panels as closely as possible.

The number of panels of each type required for a particular installation should be determined by judicious choice of equipments and remote stations. Proper grouping of equipments and remote stations will reduce considerably the number of panels required in the

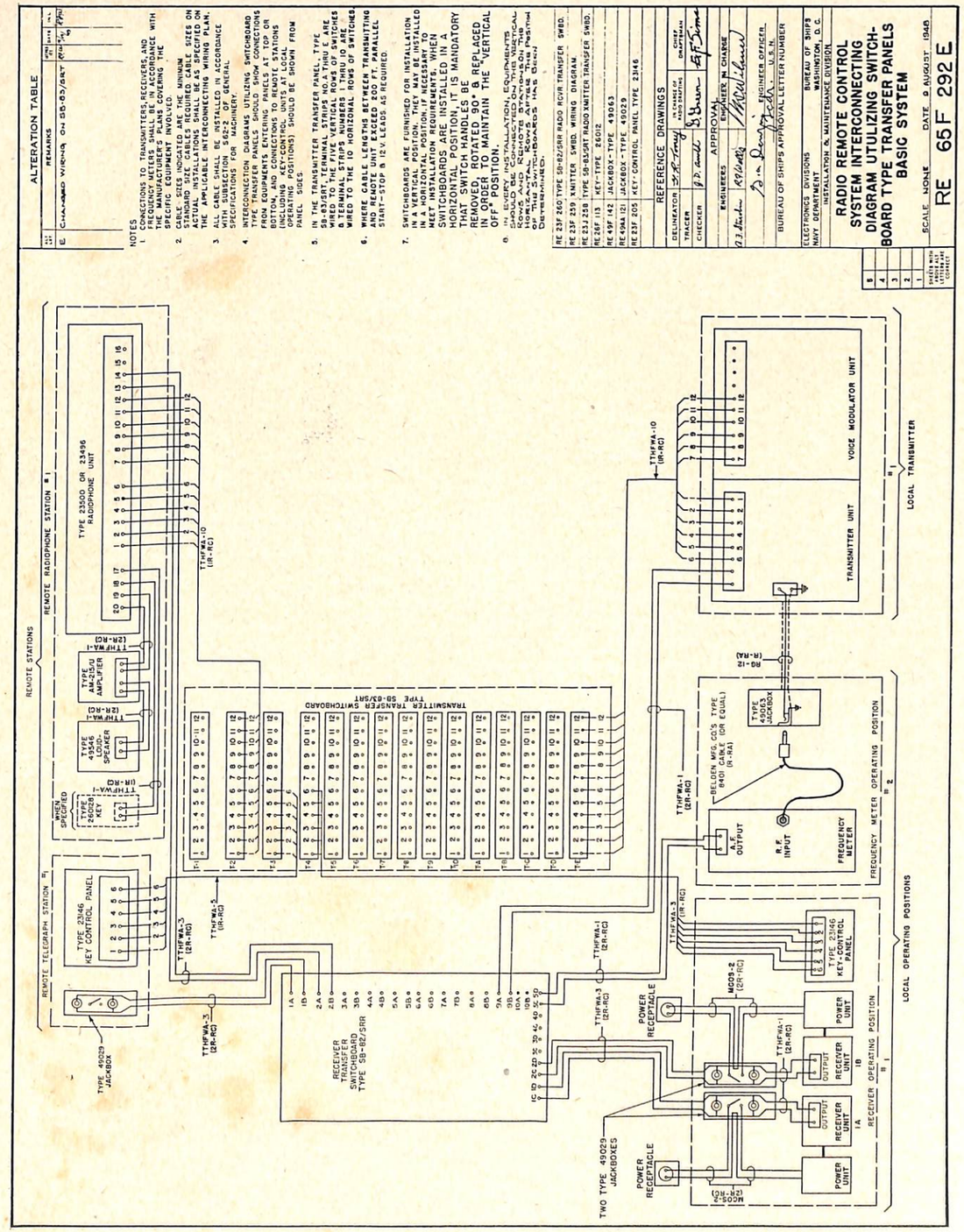
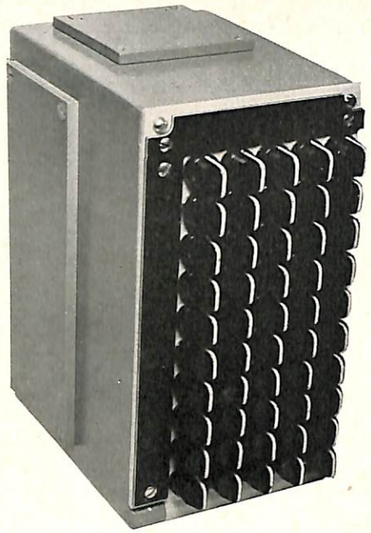
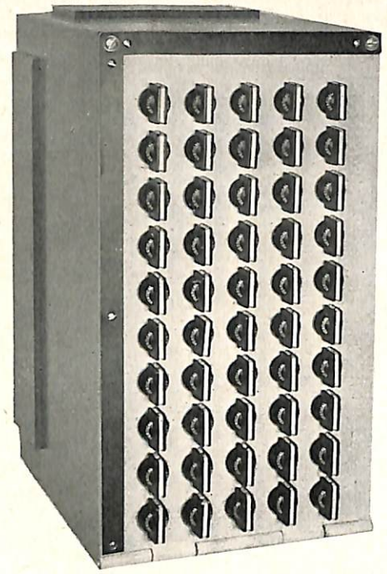


FIGURE 1



Type SB–82/SRR receiver transfer switchboard.

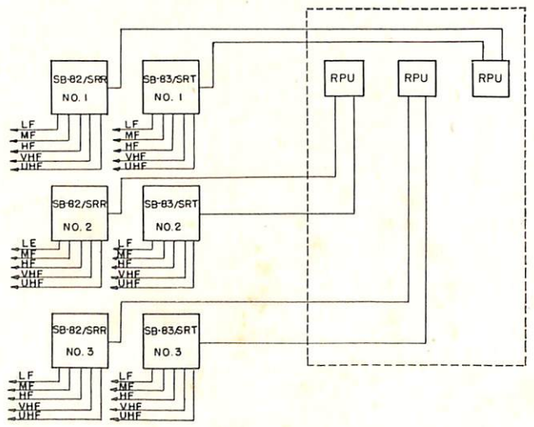


Type SB–83/SRT transmitter transfer switchboard.

larger vessels. For instance, where a vessel requires three radiophone units in the Pilot House these may be grouped as shown in Figure 1. This illustration assumes the vessel's allowance to be three each l-f, m-f, h-f, v-h-f and u-h-f transmitters with appropriate receivers, and is used only as an illustration of grouping. The Bureau of Ships will provide sketches showing the desired grouping. For small vessel installations such grouping will not be required.

The fabrication of grouped panels should be accomplished in the shop. The proper number of panels should be bolted to an appropriate frame and the panels wired together, using the cable harnesses furnished. A 1/32" washer should be inserted between each horizontal switchboard in order to provide clearance for opening the front panels. Switchboards should be bolted together utilizing the bolt holes available when the terminal tube plates are removed. To facilitate wiring, the bot screw in the front panel stop should be removed and the panel dropped down. Care should be exercised to avoid injury to knobs when the front panel is dropped. The receiver terminal block should be unbolted to facilitate soldering the connections. Soldering connections in the transmitter panel will be less difficult; however, it must be borne in mind that the proper operation of these panels is dependent upon good solder connections and extreme care should be exercised at all times in making these connections.

Since the flexibility of the transmitter switchboard permits the paralleling to two or more transmitters on one remote unit, the Bureau of Ships has established a project to provide a common power supply for the control circuits of all transmitters in a given installation in order that they may be safely paralleled. Whenever possible, there should be at least one spare vertical and one spart horizontal row of switches in both the receiver and transmitter switchboard installation. This permits increased flexibility, and in some cases a reduction in wiring between similar panels in various spaces aboard ship. An interconnecting diagram for a radio remote control system utilizing these transfer switchboards accompanies this article. Installation drawings covering these units have been distributed to all installing activities.



Grouping of equipments and remote stations on transfer switchboard.

JAN Teletype Nomenclature

JAN nomenclature, after being in existence for several years, has finally reached teletype equipment. Very few if any of the equipments used in the fleet have been marked with the new designations. Those in stock, however, are being labeled and issued in accordance with JAN nomenclature.

Since this nomenclature is now used and becoming recognized by all Naval activities, the Bureau of Ships desires that the JAN designation be stenciled on each equipment not having a standard nameplate. The following list contains many of the available designations for teletype and associated equipment. A complete list will be issued at a later date in the form of a catalogue.

JAN Type	*Sig Corps No.*	*Mfr's. Type*	*Description and List of Units*
TS–2/TG	4TED57GG	ED57GG	Test Set TM–11–2208
TS–383/GG	3F4312	DXD4–DTS	Distortion Test Set Series
TS–577/FG	4A1485	X66421A	Telegraph Monitor
TS–611/FG		WE:118C2	Test Set
TS–612/FG		WEL110C1	Test Set
TS–652/GG		DXD4–MU–4	Test Set Sync Motor
TS–657		WE:119A	Test Set
TS–658		ED51DT	Test Set Sync Motor
TS–659		ED58HE	Test Set Series Motor
TS–660		161A1	Test Set
TT–2/TG	4A2769–2	Delisser TP–100	Tape Puller A.C.
TT–3/TG	4A2769–3	Delisser TP–100	Tape Puller D.C.
TT–4/TG			Portable Lightweight Teletypewriter, part of AN/PGC–1
TT–5/FG	4T2.18A–1	Model 15 (2 box set)	Page Printer—send, receive BP22/210, BB44, MU27, BK22/SK, XRT–115, REC29, etc., standard keyboard
	4T2.10A–1	Model 15 (3 box set)	Page Printer—send, receive BP128/247, BB44, MU27, BK22LD, XRT–115, REC29, etc.
TT–6/FG	4T2.16A–1	Model 15	Page Printer—send, receive BP93/221, BB44, MU27, BK22KQ, XRT–115, REC29, etc., weather keyboard
TT–7/FG	4T4.15A–1	Model 19	Teletypewriter Set BB22/210. BB44, PEX–25JX XD86FR, MU27, XRT–116, REC30, etc., standard keyboard

JAN Type	*Sig Corps No.*	*Mfr's. Type*	*Description and List of Units*
	4T4.30–1	Model 19 (6 box set)	Teletypewriter Set BP128/247, BB44, PEX-25LD, XD86FR, MU27, XRT–116, REC30, etc., standard keyboard
TT–8/FG	4T4.13A–1	Model 19	Teletypewriter Set BP93/221, BB44, PEX-25KQ, XD86FR, MU27, XRT–116, REC30, etc., weather keyboard
TT–10/FG	4TW132A2	WE:X–61859A	Teletypewriter—receiving only 132A2 Table, KS–5988 Power Supply, FPR21GB226, FB43, etc.
TT–11/FG		Model 15	Teletypewriter Printer—receiving only
TT–12/FGQ–1	4TXD79EY	XD79EY WE:14AB	Transmitter Distributor Series Motor, TM11–2221 Manual
TT–13/FGQ–1	4TXD79EZ	XD79EZ WE:14AA	Transmitter Distributor Sync Motor
TT–14/FG	4TW61859–19	WE:X–61859 List 19	Splicer, Teletype Tape
TT–15/FG	4T9.2–1FP	Model 14	Reperforator, non typing receiving only, Series Motor RPE26 Reperforator Unit MU27 C122, RY30, RT34, etc.
TT–16/FG	4T10.4A–3	Model 14	Reperforator, typing receiving only, Series Motor FPR23GB246, FK110LD, C–166, REC–29, RY30, XRT–115, etc., standard keyboard
TT–17/FG	4T10.5A–3	Model 14	Reperforator, typing, receiving only, Series Motor, weather keyboard
TT–18/FG	4T1000–15	W.U. 929A	Rewinder, Tape
TT–19/FG	4TW128C2	W.E. 128C2	Repeater, Teletypewriter 209FB and 215A Relays
TT–20/FG	4TW128C2–2	W.E. 128B2	Repeater, Teletypewriter 209FG and 125H Relays
TT–21/FG	4TWD100GW	Teletype XD100GW	Transmitter Distributor Series Motor
TT–22/FG	4TEP93/221	Teletype BP93/221	Typing Unit, Page Printing, part of TT–8/FG
TT–24/FG		Teletype Model 26	Teletypewriter—send and receive, GP11BY-167, GR–6GX, C–129, 90305, 50012C Sync Motor
TT–25/FG	4TXD95GW	Teletype XD95GW WE:14ABM	Transmitter Distributor p/o AN/FGQ–1 Series Motor
TT–26/FG	4TXD91GL	Teletype XD91GL	Transmitter Distributor p/o TT–10/FG and AN/TGC–4 Series Motor
TT–27/F	4A2787	McElroy HDR–243	Rewinder, Tape used with BC–1016
TT–28/U		Boehme 11–F	Tape Puller, used with Tape Bridge MK–481/U
TT–33/UG		Teletype Model 28	Teletypewriter, sending and receiving standard keyboard
TT–45/FG		Teletype Model 14	Reperforator, typing, receiving only, sync., standard keyboard
TT–46/FG		Teletype Model 14	Reperforator, typing only, receiving only, series Chadless tape
TT–47/UG		Teletype Model 28	Teletypewriter, send-receive sync. console cabinet standard keyboard
TT–48/UG		Teletype Model 28	Teletypewriter, send-receive series, standard keyboard console cabinet
TT–49/UG		Teletype Model 15 (Modified)	Teletypewriter, send-receive, lightweight, sync., standard keyboard
TT–50/UG		Teletype Model 15 (Modified)	Teletypewriter send-receive, lightweight, series standard keyboard
TT–51/FG		Teletype Model 15	Teletypewriter receiving only BP119/210, BB50, MU27, C105, RY30, XRT–115, REC. 29, sync.
TT–52/FG		Teletype XD86FR	Transmitter Distributor series motor
TT–53/FG		Teletype Model 14	Reperforator, typing receiving only, Series Motor FPR21GB226, FG43/15
TT–54/FG		Teletype 99214	Splicer
TT–57/FG		Teletype XD200AA/AJ	Transmitter Distributor

MODEL TBK Master Oscillator Oven Compartment Overheating

The following information regarding Model TBK Radio Transmitting Equipments was submitted by Service Force, U.S. Atlantic Fleet, and is reprinted for the benefit of all maintenance personnel:

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

The oven compartment operates as follows: When the transmitter is initially turned on, with the temperature below 50° C, the mercury thermostat S–101 and the cartridge type thermostats S–102 and S–103 are all closed. The heater relay (K–108 in a-c equipments and K–118 in d-c equipments) is also closed and the amber indicating light I–104 is lit. When the temperature rises to 50° C, S–102 opens, opening the auxiliary heating circuit. After the temperature reaches 60° C, S–101 opens, opening the main heating circuit which extinguishes the amber indicating light I–104. In case either one or the other of the aforementioned switches fail to open, S–103 opens both heating circuits at 70° C.

In case number one, the complaint was that the master oscillator drifted when the transmitter was keyed, causing difficulty when used with the frequency shift keyer. When the transmitter was turned on, the mercury column in the thermometer rose rapidly. At 60° C, the amber indicating light went out, but the temperature continued rising until the mercury column was out of sight at the top of the thermometer. A voltmeter across S–102 disclosed that it was not opening at 50° C. S–102 was replaced and the oven compartment heated normally. A voltmeter across any one of the three switches will indicate a voltage drop when the switch is open, but there will be no voltage drop when the switch is closed.

In case number two, the master oscillator would not tune on Band six. When the transmitter was turned on, the mercury column rose rapidly to the top of the thermometer and the amber indicating light remained on. The contacts of the heater relay were found to be stuck thus keeping the main heating circuit energized. Straightening of the contact arm corrected this trouble. This serious overheating of the compartment had damaged C–107 and C–108 in the grid circuit of the master oscillator so that oscillations could not be sustained on Band six, the highest frequency band of the master oscillator. Replacement of these capacitors resulted in normal operation on band six.

In case number three, the transmitter tuned up on dial settings which varied widely from the recorded settings. When the transmitter was turned on, the mercury column rose rapidly to the top of the thermometer and the amber indicating lamp flickered on and off. S–101, the mercury thermostat, was found to be not opening at 60° C. Therefore S–103 was opening both heating circuits at 70° C, actuating the amber indicating light. S–101 was replaced and the compartment then heated normally. This oven compartment overheating had resulted in changes in values of two capacitors in the frequency determining circuit in the grid circuit of the master oscillator. Replacement of these capacitors brought the dial readings back to the original recorded readings.

REMOVAL OF ELECTRONIC EQUIPMENTS FOR RECONDITIONING

It has been noted in recent reports from repair activities that when electronic equipments and their special accessories are removed from ships or shore stations they are in extremely poor condition. This situation is definitely caused by hasty and careless removal of these items. Special cables have been cut instead of being disconnected and waveguide sections have been cut and deformed. Parts of these equipments have been found missing when they are received for reconditioning, and unrelated parts have been shipped with the equipments.

With few exceptions most of the equipments removed from vessels and shore stations, including those which are obsolete, are reconditioned and reinstalled either in other vessels or stations or at training activities and Naval Reserve Centers. For this reason it is requested that all activities exercise extreme care when removing electronic equipments from vessels or shore stations, and when storing or shipping these equipments. Such care is necessary to restrict reconditioning costs, and the costs of replacing special accessories to a minimum.

RADCM EQUIPMENT INSTRUCTION BOOKS

A reprint of the Model REJ instruction book, NavShips 91,217, is now available. The applicable instruction books for the other countermeasures equipments are listed below:

Equipment	Instruction Book
AN/SPR–1	NavShips 900,483(A)
AN/APR–1	NavShips 900,483(A)
AN/SPR–2	NavShips 900,654
AN/APR–5AX	NavShips 900,655
AN/SPA–1	NavShips 900,768
X–RDJ and RDJ	NavShips 900,253(A)
RDO	NavShips 900,527 1B
RDP	NavShips 900,555
DBM–1	NavShips 900,587(A)
RDJ–1	NavShips 900,823
TDY and X–TDY	NavShips 900,307 1B
TDY–1	NavShips 900,342(A)
TDY–a/–1a	NavShips 900,551(A)
Antenna Pedestal Type 10AFJ and Pedestal Control-Indicator Unit Type 23AGN	NavShips 900,728

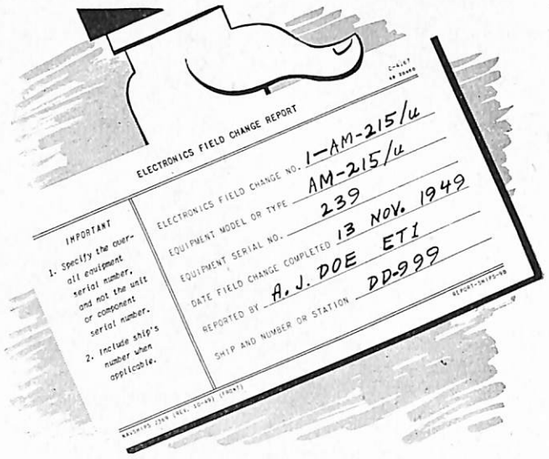
The majority of these instruction books are presently in short supply. Copies should not be requested unless there is an absolute need for their use.

MODEL REM TRANSFORMER T–104 FAILURES

The Model REM Dual Panoramic Adaptor Equipment has a high-voltage power supply transformer, T–104, which has been failing in service. Information presently available indicates that T–104 may be of faulty design. The one-year guarantee period extends until June 1950.

When transformer T–104 fails, it should be replaced immediately from spares and the faulty unit shipped to the Radio Corporation of America, Camden, New Jersey via the Inspector of Naval Material, Camden, New Jersey. A forwarding letter should accompany the transformer. The failure report card NavShips 383 should be forwarded to the Bureau of Ships at the same time.

REPORT YOUR FIELD CHANGES COMPLETELY



Investigation reveals that some of the field changes reported to the Bureau of Ships as being accomplished, are reported on cards woefully lacking in information. Reports of completion of field changes must be complete and accurate to be of use to the Bureau.

To assist in making out correct reports of completed field changes, an Electronics Field Change Report Card, NavShips 2369, with the required information properly entered is illustrated. Note that this information is the minimum necessary to completely report the accomplishment of a field change.

INDICATING DIALS FOR W.E. 164A TRANSMISSION MEASURING SETS

A total of thirty-one new indicating dials for the Western Electric Model 164A Transmission Measuring Sets procured under Contract NXsr–91924 have been obtained from Western Electric Company and are being distributed to the activities to which the Model 164A sets were allocated under Contract NXsr–91924. The activities which have Model 164A sets and have not received new indicating dials from Western Electric Co. may obtain new indicating dials from Naval Supply Center, Ships Supply Depot, Norfolk or Oakland.

DETERIORATION OF MODEL SA–2 ANTENNA MATTRESS

Norfolk Naval Shipyard has submitted some photographs of Model SA–2 Radar Antenna Mattress deterioration. Figures 1 and 2 are of a mattress which was not previously coated with neoprene. Figures 3 and 4 are of an antenna which had been coated. All photographs were taken after the antennas had been sand-blasted.

Before the sand blasting process the neoprene coated antenna had many visible signs of rust but it was not apparent from visual inspection that disintegration had developed to such an extent. It is believed that this disintegration resulted from pin holes in the neoprene coating, allowing moisture to enter beneath the antenna coating. This verifies the fact that when rust is noticed on the dipoles or framework of an antenna, immediate action should be taken to clean the entire surrounding surface as noted in BuShips Electron of June 1949.

Attention is also invited to the arrows on Figure 4 and on Figure 2. On Figure 2 the lattice work of the array touches the horizontal hollow member. Approximately every third mesh-hollow member junction is spot welded. Corrosion is evident at all junctions which are not welded. There is no corrosion of the hollow horizontal member in the case where all mesh-hollow member junctions are welded as shown in Figure 4. In this case the meshes which are not welded to the hollow member are cut off so that they do not touch this member. It is suggested that in all future overhauls of SA type antenna arrays all mesh-hollow member junctions be spot welded or that the mesh be cut so as not to touch the hollow member when it is not welded.

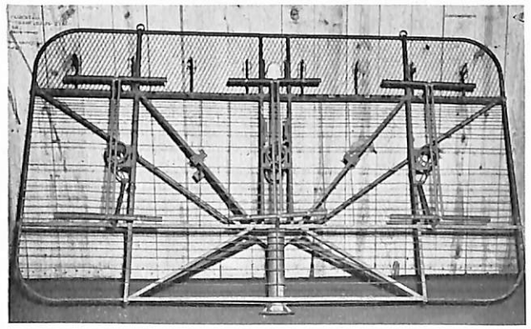


FIGURE 1

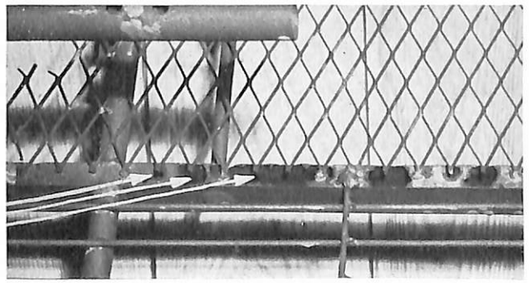


FIGURE 2

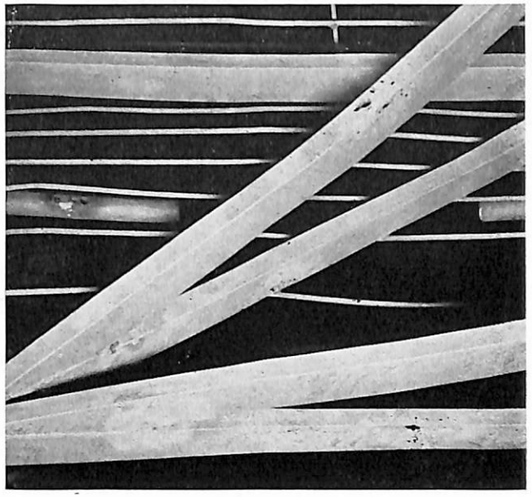


FIGURE 3

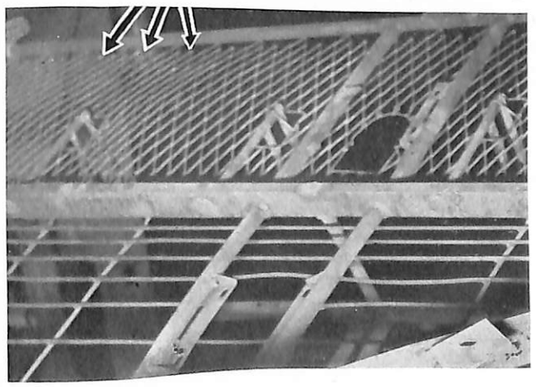


FIGURE 4

ELECTRONICS
FIELD CHANGE INDEX

Field Change Number	Field Change Title	Date of Field Change	Serial Numbers of Equipment Affected	Modifying Activity	Man-Hours Req'd	Source of Material	Stock Number of Kit	Instruction Bulletin	Contract Number
TDT Radio Transmitting Equipment									
1	Addition of Send-Receive Relay	Jan. '46	All	SF	2	Stock	None	CEMB	None
2	Reducing Voltage Surges on Rectifier Tubes	Jan. '46	1 thru 30	SF	2	Stock	None	CEMB	None
3	Replacement of Resistors R–10, R–11 & R–13	Jan. '46	All	SF	1	Stock	None	CEMB	None
3	Installation of Blower Motor Reactor	Jan. '46	All	SF	1	Stock	None	CEMB	None
AN/ARC–1 Radio Transmitting-Receiving Equipment									
1	Reducing Radio Interference Caused by Dynamotors	Apr. '49	All Model DY–9/ARC–1 DY–ARC–1 and DY–9B/ARC–1 Dynamotors with serial numbers prior to 89111.	SF	2	Stock	None	CEMB	None
AN/APN–9 Radar Set									
1	Improved Crystal Clamp	Apr. 1 '46	All shipboard installations	SF	1	Stock	None	CEMB	None
AN/UPM–2 Wavemeter Test Set									
1	Replacement of Crystals	Apr. '48	All	SF	¼	Stock	None	CEMB	None
DAK Radio Direction Finding Equipment									
1	Modulator Tube Balance Kit		Not applicable						
DAK–1 Radio Direction Finding Equipment									
1	Modulator Tube Balance Kit	Mar. 1 '46	All	SF	3	Kit			NXsr–97674
DAK–2 Radio Direction Finding Equipment									
1	Modulator Tube Balance Kit	Mar. 1 '46	All	SF	3	Kit			NXsr–97674
DAK–3 Radio Direction Finding Equipment									
1	Modulator Tube Balance Kit	Mar. 1 '46	All	SF	3	Kit			NXsr–97674
DAQ Radio Direction Finding Equipment									
1	Installation of Improved Loop Antenna	Aug. 22 '45	All	YF	12	Kit		NavShips 900,801	NXsr–96333 NXsr–9553
DAS Radio Navigation Equipment									
1	Relocate Station Selector Trimmers	Nov. 1 '45	1 thru 5	SF	4	Kit		Ships 225A	
2A	Change Time Corrector Circuit	Nov. 1 '45	1 thru 106	SF	1	None req'd		Ships 225A	
2B	Increase Slow Sweep Length	Nov. 1 '45	1 thru 106	SF	2	Stock		CEMB	
3	Change DAS to DAS–a (Change Pulse Rate and Improve Cathode-Ray-Tube Focus)	Nov. 1 '45	1 thru 200	SF	2	Kit		Ships 225A	NXsr–26190
4	Remove Filament Ground in Indicator	Nov. 1 '45	1 thru 200	SF	1	None req'd		Ships 225A	
5	Improve Balance Gain Control Circuits	Nov. 1 '45	1 thru 200	SF	4	Kit		Ships 225A	NXsr–26190 NXsr–35364
6	Change Gain and Fine Delay Controls	Nov. 1 '45	1 thru 200	SF	4	Kit		Ships 225A	NXsr–26190 NXsr–35364
7	Add Resistors R–285	Nov. 1 '45	1 thru 200	SF	½	Stock		Ships 225A	
8	Adjust B+ to 280 Volts instead of 300	Nov. 1 '45	All	SF	½	None req'd		CEMB	
9	Change DAS–a to DAS–b, DAS–2 to DAS–2b (Modify coils for 4 medium frequency channels)	Nov. 1 '45	All	SF	2	Kit			NXsr–35364 NXsr–68004
10	Add Two Microsecond Markers for Monitoring	Nov. 1 '45	Shore Monitoring Receivers only	YF		Kit			S & A order #22515
11	Change Ampl. Balance to B. F. Amplifier	Cancelled							
DAS–1 Radio Navigation Equipment									
1	Change DAS–1 to DAS–1a (Add PRR Switch)	Nov. 1 '45	All	SF	2	Kit		NavShips 900, 752	26792 NXsr–40989 93961
2A	PRR Adjustment (If Field Change No 1. is not available)	Nov. 1 '45	All	SF	1	Stock		NavShips 900, 752	26792 NXsr–40989 93961
2	Change DAS–1a to DAS–1b (Modify Receiver Coils for 4 medium frequency channels)	Nov. 1 '45	All	SF	2	Kit		NavShips 900, 752	
3	Receiver Diode Connection	Nov. 1 '45	All	SF	½	Stock		NavShips 900, 752	
4	Nameplate Change	Nov. 1 '45	1 thru 140	SF	½	See CEMB		NavShips 900, 752	

Field Change Number	Field Change Title	Date of Field Change	Serial Numbers of Equipment Affected	Modifying Activity	Man-Hours Req'd	Source of Material	Stock Number of Kit	Instruction Bulletin	Number Contract
5	Grounding Change	Nov. 1 '45	All	SF	1	Stock		NavShips 900, 752	
6	Insulate Capacitor C107/C207	Nov. 1 '45	All	SF	1	Stock		NavShips 900, 752	
7	Change Slow Sweep Resistor R167/R267	Nov. 1 '45	All	SF	½	Stock		NavShips 900, 752	
8	Change Capacitor C37/C137	Nov. 1 '45	All	SF	½	Stock		NavShips 900, 752	
9	Add Resistor R31 in Receiver	Nov. 1 '45	All	SF	¼	Stock		CEMB	
DAS–2 Radio Navigation Equipment									
1	Relocate Station Selector Switches		Not applicable						
2A	Change Time Corrector Circuit		Not applicable						
2B	Increase Slow Sweep Length		Not applicable						
3	Change DAS to DAS–a (Change Pulse Rate and Improve Cathode-Ray-Tube Focus)								
4	Remove Filament Ground in Indicator	Nov. 1 '45	201 thru 375	SF	1	None req'd		Ships 225A	
5	Improve Balance Gain Control Circuits	Nov. 1 '45	201 thru 408 Except 405, 406	SF	4	Kit		Ships 225A	{NXsr–26190 NXs–35364
6	Change Gain and Fine Delay Controls	Nov. 1 '45	201 thru 580	SF	4	Kit		Ships 225A	{NXsh–26190 NXsr–35364
7	Add Resistor R–285	Nov. 1 '45	200 thru 770	SF	½	Stock		Ships 225A	
8	Adjust B+ to 280 Volts instead of 300	Nov. 1 '45	All	SF	½	None req'd		CEMB	
9	Change DAS–a to DAS–b, DAS–2 to DAS–b Modify Coils for 4 medium frequency channels)	Nov. 1 '45	All	SF	2	Kit			{NXsr–35364 NXsr–68004
10	Add Two Microsecond Markers for Monitoring	Nov. 1 '45	Shore Monitoring Receivers only	YF		Kit			S & R order #22515
11	Change Ampl. Balance to R. F. Amplifier	Cancelled							
DAS–3 Radio Navigation Equipment									
1	Change DAS–1 to DAS–1a (Add PRR Switch)		Not applicable						
1A	PRR Adjustment (If Field Change No. 1 is not available)		Not applicable						
2	Change DAS–1a to DAS–1b (Modify Receiver Coils for 4 Medium Frequency Channels)		Not applicable						
3	Receiver Diode Connection		Not applicable						
4	Nameplate Change		Not applicable						
5	Grounding Change	Nov. 1 '45	1 thru 164, 166 thru 213, 223, 228, 229, 330, 232	SF	1	Stock		NavShips 900, 752	
6	Insulate Capacitor C107/C207	Nov. 1 '45	1 thru 420, 423, 424, 427, 435, 437, 445, 460, 461, 468, 470, thru 473 475, 477, 496, 503, 504, 507, 509, 517, 518,	SF	1	Stock		NavShips 900, 752	
7	Change Slow Sweep Resistor R167/R267	Nov. 1 '45	1 thru 524	SF	½	Stock		NavShips 900, 752	
8	Change Capacitor C37/C137	Nov. 1 '45	1 thru 541 except 496, 524 532, 538, 539	SF	½	Stock		NavShips 900, 752	
9	Add Resistor R31 in Receiver		Not applicable						
DAS–4 Radio Navigation Equipment									
1	Waterproof Antenna Loading Coil	Nov. 1 '45	1 thru 177	SF		Stock		CEMB	
2	Change Feedback Capacitor C219	Nov. 1 '45	1 thru 75, 77 thru 87, 93, 94, 97	SF		Stock		CEMB	
3	Reduce Inductance of L101	Nov. 1 '45	1–508, 512–516, 519–526, 528, 529, 531 536, 543, 545, 562, 564, 570, 577, 585	SF	2	None req'd		CEMB	
4	Change Slow Sweep Circuit Resistor R269	Nov. 1 '45	1 thru 585	SF	1	Stock		CEMB	
5	Change Feedback Capacitor C220	Nov. 1 '45	1 thru 585	SF	1	Stock		CEMB	
DAU Radio Direction Finding Equipment									
1	Installation of Improved Loop Antenna	Aug. '45	All	YF		Kit		NavShips 900, 801	{NXsr–96333 NNXsr–9553
2	Scanning Selectivity Kit	Jan. 6 '46	1–50 inclusive	SF	4	Kit		FC–41–46	N5sr–10564
DBE Loran Receiving Equipment									
1	Increase Wattage Rating of R–209 and R–211	June 1 '46	1–36 inclusive	SF	2	Stock	None	CEMB	None
DBM–1 Radar Direction Finding Equipment									
1	Changing Wiring of S–107	Apr. 1 '46	1–100	SF	6	Kit			NXsr–80024
2	Changing Scanning Capacitor Coupling	Apr. 1 '46	1–100	SF	1	Kit		FC–10–45	NXsr–80024
3	Changing Bullet in Antenna R.F. Rotary Joint	Apr. 1 '46	1–252	SF	1	Kit		FC–26–45	NXsr–80024

Field Change Number	Field Change Title	Date of Field Change	Serial Numbers of Equipment Affected	Modifying Activity	Man-Hours Req'd	Source of Material	Stock Number of Kit	Instruction Bulletin	Contract Number
4	Installing an Equalizer in the Low Frequency Antenna	Aug. 1 '46	1–289	YF	1	Kit		FC–49–46	NXsr–80024
FRA Frequency Shift Converter									
1	Installation of Capacitor, C–120	May '46	1–16	SF	1	Kit	——	CEMB (and with Kit)	N5sr–7266
FRF Frequency Shift Converter									
1	Addition of Shockmounts for Shipboard Installations	Mar. '48	All installed aboard ships	YF	8	Kits	——	NavShips 98027	N5sr–5971
LRN–1 Loran System Receiver-Indicator									
1	Add PRR Switch	Nov. 1 '45	All	SF	2	Kit & Stock			NXsr–40989
1A	PRR Adjustment (If Kit for Field Change No. 1 is not available)	Nov. 1 '45	All	SF	1	Stock	——	CEMB	
2	Change LRN–1 to LRN–1M, LRN;1A to LRN–1AM (Modify Coils for 2 medium frequency channels)		Superseded by F.C. #2A						
2A	Change to LRN–1b and LRN–1Ab (Modify coils for 4 medium frequenccy channels)	Nov. 1 '45	All	SF	2	Kit			NXsr–40989
3	Change Interconnecting Cable	Nov. 1 '45	Not applicable						
4	Change CRT Intensifier Circuit	Nov. 1 '45	Not applicable						
5	Add Resistor to Stabilize Square Wave Generator	Nov. 1 '45				Stock	——		
6	Feceiver Diode Connection	Nov. 1 '45	All	SF	½	Stock	——	CEMB	
7	Grounding Change	Nov. 1 '45	All	SF	1	Stock	——	CEMB	
8	Insulate Capacitor C107/C207	Nov. 1 '45	All	SF	1	Stock	——	CEMB	
9	Change Capacitor C37/C137	Nov. 1 '45	All	SF	½	Stock	——	CEMB	
10	Add Resistor R31 in Receiver	Nov. 1 '45	All	SF	¼	Stock	——	CEMB	
LRN–1A Loran System Receiver-Indicator									
1	Add PRR Switch	Nov. 1 '45	All	SF	2	Kit & Stock			NXsr–40989
1A	PRR Adjustment (If Kit for Field Change No. 1 is not available)	Nov. 1 '45	All	SF	1	Stock	——	CEMB	
2	Change LRN–1 to LRN–1M, LRN–1A to LRN–1AM (Modify Coils for 2 medium frequency channels)		Superseded by F.C. #2A						
2A	Change to LRN1b and LRN–1Ab (Modify coils for 4 medium frequency channels)	Nov. 1 '45	All	SF	2	Kit			NXsr–40989
3	Change Interconnecting Cable	Nov. 1 '45	1–75	SF	½	Kit			
4	Change CRT Intensifier Circuit	Nov. 1 '45	All (If Req'd)	SF	1	Stock	——	CEMB	
5	Add Resistor to Stabilize Square Wave Generator	Nov. 1 '45				Stock	——		
6	Receiver Diode Connection	Nov. 1 '45	All	SF	½	Stock	——	CEMB	
7	Grounding Change	Nov. 1 '45	All	SF	1	Stock	——	CEMB	
8	Insulate Capacitor C107/C207	Nov. 1 '45	All	SF	1	Stock	——	CEMB	
9	Change Capacitor C37/C1337		All	SF	½	Stock	——	CEMB	
10	Add Resistor R31 in Receiver		All	SF	¼		——	CEMB	
MAR Radio Transmitting-Receiving Equipment									
1	Additional Shockmounts for Shipboard Installation Kit	Oct. '47	Model MAR Radio Equipments with Power Supplies, Navy Type –20379 with Serial Numbers 1 thru 1400	FY	4	Kit	——	CEMB and with Kit	NXsr–60008
2	Adding Ballast Resistor (R–530) to Operating Spares	Oct. '46	1–500	SF	¼	Kit	——	CEMB and with Kit	NXsr–60008
3	Replacement of Time Delay Relay in Universal Power Supply Unit, Type –20379	Mar. '47	Model MAR Radio Equipments with Power Supplies, Navy Type –20379 with Serial Numbers 1 thru 500	SF	¼	Kit	——	CEMB and with Kit	NXsr–60008
4	Addition to Allowance of Equipment Spare Parts for AC/DC Universal Power Supply Unit	Apr. '47	Model MAR Radio Equipments with Power Supplies, Navy Type –20379 with Serial Numbers 501 and up	SF	¼	Kit	——	CEMB and with Kit	NXsr–60008
5	Addition of Noise-Suppression Kit for Dynamotor and Blower Motor	July '47	All	SF	4	Kit	——	CEMB and with Kit	NXsr–60008
MBF Radio Transmitting-Receiving Equipment									
1	Improving the Squelch Sensitivity	Feb. '46	1–1000	SF	1	Stock	None	CEMB	None
2	Improving Intelligibility	Feb. '46	1–750	SF	1	Stock	None	CEMB	None

Field Change Number	Field Change Title	Date of Field Change	of Equipment Affected Serial Numbers	Modifying Activity	Man-Hours Req'd	Source of Material	Stock Number of Kit	Instruction Bulletin	Contract Number
RDJ Pulse Analyzer Equipment									
1	Incorporating Changes to Improve Operation of Model RDJ Pulse Analyzer Equipment	Apr. '46	1 thru 250	SF	2	Stock	None	CEMB	None
RDR Radio Equipment									
1	Shockmount Replacement	Oct. '46	Shipboard installation kits which include a NT-10508 shock-mount assembly	YF	1	Kit	None	CEMB	NXsh-60008
2	Added Dynamotor Noise Suppressor	June '47	All	SF or YF	4	Kit	None	IB38464 (with Kit)	NXsh-60008
1	Removal of C-149 Capacitors	Mar. '46	1 thru 896	SF	½	None	None	CEMB	None
2	Adjustment of Tuning Inductance	Oct. '46	1 thru 500	SF	2	Kit	None	CEMB	None
3	Bonding for Auto-Tune Unit	Mar. '47	1 thru 2348	SF	½	Kit	None	CEMB	NObsh-37514
4	Modification to Improve Stability of I-F Amplifier	Sept. '48	All	SF	⅓	Kit	None	CEMB	NObsr-42026
RDZ Radio Receiving Equipment									
1	Removal of C-149 Capacitors		Not applicable						
2	Adjustment of Tuning Inductance		Not applicable						
3	Bonding for Auto-Tune Unit	Mar. '47	1 thru 1100	SF	½	Kit	None	CEMB	NObsr-37514
4	Modification to Improve Stability of I-F Amplifier	Sept. '48	All	SF	⅓	Kit	None	CEMB	NObsr-42026
TDY Radio Transmitting Equipment									
1	Addition of Stop-Start Resistor	Aug. '45	All	SF	1	Stock	None	CEMB	
2	Extension of Lower Frequency of TDY with Manual Antenna Mount		Superseded by F.C. #4						
3	Installation of Motor Driven Antenna Mount and Control Indicator		Superseded by F.C. #4						
4	Modernization Kit	Aug. '45	All	YF	12	Kit		CEMB	NXsr-46934
5	Conversion of Model TDY to TDYa and Model TDY-1 to TDY-1a	Aug. '45	As directed	YF	112	Kit		NavShips 900, 551	NXsr-81474
6	Simplification of Monitor System	Aug. '45	All	SF	6	None req'd	——	CEMB	
7	Tube Injector Modification	Aug. '45	All	SF	4	None req'd	——	CEMB	
8	Replacement of Two Reflectors in TDY-a/ TDY-1a Antenna System	Aug. '45	TDY-a/TDY-1a	YF	16	Kit			NXsr-81474
9	Relocation of Magnetron Tube Clamp		Cancelled						
10	Addition of Remote Antenna RF Switch in CAPR-10AFJ Pedestal		Cancelled						
11	Replacement of Magnetron Filament Leads		Cancelled						
12	Addition of Second Magnetron Seal Blower	Aug. '47	TDY Equipments using 35 ABL Oscillators having Serial #1-150	YF	5	Kit	——		NXsr-46934
13	Installation of Spacer Band for Magnetron Filament Leads		Cancelled						
14	Change and Relocation of Bleeder Resistors		Cancelled						
15	Replacement of Pump Seal Assembly		Not applicable						
16	Improved Conversion of Model TDY to TDY-a and Model TDY-1 to TDY-1a	1945	As directed	YF	112	Kit		NavShips 900, 551 A)	NXsr-90814
17	Cancelled		Cancelled						
TDY-1 Radio Transmitting Equipment									
1	Addition of Stop-Start Resistor		Not applicable						
2	Extension of Lower Frequency of TDY with Manual Antenna Mount		Not applicable						
3	Installation of Motor Driven Antenna Mount and Control Indicator		Not applicable						
4	Modernization Kit		Not applicable						
5	Conversion of Model TDY to TDYa and Model TDY-1 to TDY-1a	Aug. '45		YF	112	Kit		NavShips 900,551	NXsr-81474
6	Simplification of Monitor System	Aug. '45	All	SF	6	None req'd	——	CEMB	
7	Tube Injector Modification	Aug. '45	All	SF	4	None req'd	——	CEMB	
8	Replacement of Two Reflectors in TDY-a/ TDY-1a Antenna System	Aug. '45	TDY-a/TDY-1a	YF	16	Kit	——		NXsr-81474
9	Relocation of Magnetron Tube Clamp		Cancelled						
10	Addition of Remote Antenna RF Switch in CAPR-10AFJ Pedestal		Cancelled						
11	Replacement of Magnetron Filament Leads		Cancelled						
12	Addition of Second Magnetron Seal Blower	Aug. '45	TDY-1 Equipments using 35ABL Oscillators having Serial #1-150	YF	5	Kit	——		NXsr-46934

Field Change Number	Field Change Title	Date of Field Change	Serial Numbers of Equipment Serial Numbers	Modifying Activity	Man-Hours Req'd	Source of Material	Stock Number of Kit	Instruction Bulletin	Contract Number
13	Installation of Spacer Band for Magnetron Filament Leads		Cancelled						
14	Change and Relocation of Bleeder Resistors		Cancelled						
15	Replacement of Pump Seal Assembly	1945	Serial #1–134	YF	2	Kit			NXsr–46934
16	Improved Conversion of Model TDY to TDY–a and Model TDY–1 to TDY–1a	1945	As directed	YF	112	Kit		NavShips 900,551 (A)	NXsr–90814
17	Cancelled		Cancelled						
TDZ Radio Transmitting Equipment									
1	Modification to Automatic Tuning System and Drawer Mechanism	Feb. '46	1 thru 100 107 thru 109 111 113 thru 124 128 thru 134 136 thru 137 140	YF	60	Kit	None	CEMB	NXsr–55652
2	Modification to Allowance of Tender Spare Parts	Feb. '46	Tender Spares, Priorities 1t, 2t, 3t, 4t and 10t	YF or SF	1	Kit	None	CEMB	NXsr–55652
3	Installation of Protective Guard on Telephone Type Dial	Feb. '47	1 thru 1000	SF	1	Kit	None	CEMB	NXsr–55652
4	Addition of Drawer Fasteners to Equipment Spare Parts	Mar. '47	1 thru 1000	YF or SF	1	Kit	None	CEMB	NXsr–55652
5	Provision of Dial Cranks	Jan. '49	All	SF or YF	0	Kit	None	None	NXsr–55652
X–DBS Loran Receiving Equipment									
1	Improvements to Model X–DBS to Increase Similarity to Model DBS Loran Equipment	Feb. 15 '46	2–6	SF	5	Kit	——	(With Kit)	NXsr–87700
X–RDJ Pulse Analyzer Equipment									
1	Incorporating Changes to Improve Operation of Model X–RDJ Pulse Analyzer Equipment	Apr. '46	1 thru 25	SF	3	Stock	None	CEMB	None
YE Radio Homing Equipment									
1	Installation of Matching Transformer Type CRV–47194	Nov. '45	All	SF	3	Stock	None	CEMB & I.B. 38147	None
2	Modification to Antenna Assembly Drive Unit Heater Circuit	Nov. '45	All	SF	1	Stock	None	CEMB	None
3	Addition of Capacitors to Gyro Selsyn System	Nov. '45	All	YF	2	Stock	None	CEMB	None
4	Shorting of Interlock Switch S–114	Nov. '45	All	SF	1	Stock	None	CEMB	None
5	Change in Value of Spark Absorbing Resistor 503	Nov. '45	All	SF	1	Stock	None	CEMB	None
6	Elimination of Interference in Radio and Radar Equipments	Nov. '45	All	SF	1	Stock	None	CEMB & I.B. 38147	None
YE–1 Radio Homing Equipment									
1	Installation of Matching Transformer Type CRV–47194	Nov. '45	All	SF	3	Stock	None	CEMB	None
2	Modification to Antenna Assembly Drive Unit Heater Circuit	Nov. '45	All	SF	1	Stock	None	CEMB	None
3	Addition of Capacitors to Gyro Selsyn System	Nov. '45	All	YF	2	Stock	None	CEMB	None
4	Shorting of Interlock Switch S–114								
5	Change in Value of Spark Absorbing Resistor 503	Nov. '45	All	SF	1	Stock	None	CEMB	None
6	Elimination of Interference in Radio and Radar Equipments	Nov. '45	All	SF	1	Stock	None	CEMB	None
YE–2 Radio Homing Equipment									
1	Installation of Matching Transformer Type CRV–47194	Nov. '45	All	SF	1	Stock	None	CEMB & I.B. 38147	None
2	Modification to Antenna Assembly Drive Unit Heater Circuit	Nov. '45	All	SF	3	Stock	None	CEMB	None
3	Addition of Capacitors to Gyro Selsyn System	Nov. '45	All	SF	1	Stock	None	CEMB	None
4	Shorting of Interlock Switch S–114	Nov. '45	All	YF	2	Stock	None	CEMB	None
5	Change in Value of Spark Absorbing Resistor 503	Nov. '45	All	SF	1	Stock	None	CEMB	None
6	Elimination of Interference in Radio and Radar Equipments	Nov. '45	All	SF	1	Stock	None	CEMB	None
YE–3 Radio Homing Equipment									
1	Installation of Matching Transformer Type CRV–47194	Nov. '45	All	SF	1	Stock	None	CEMB & I.B. 38147	None
2	Modification to Antenna Assembly Drive Unit Heater Circuit	Nov. '45	All	SF	3	Stock	None	CEMB	None
3	Addition of Capacitors to Gyro Selsyn System	Nov. '45	All	SF	1	Stock	None	CEMB	None
4	Shorting of Interlock Switch S–114	Nov. '45	All	YF	2	Stock	None	CEMB	None
5	Change in Value of Spark Absorbing Resistor 503	Nov. '45	All	SF	1	Stock	None	CEMB	None
6	Elimination of Interference in Radio and Radar Equipments	Nov. '45	All	SF	1	Stock	None	CEMB	None

Intuition

has aided navigators to chart safe courses, has been applied advantageously by strategists and tacticians in locating, closing and destroying the enemy, has been relied on by aerologists in predicting weather conditions, and has, in countless other instances, proven a deciding factor throughout the course of military history. Yes, a great asset, intuition. It WAS a great asset ... until the unpredictable eye of the mind was replaced by the infallible eye of science ... until ELECTRONICS became the adjutant of the Navy.

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