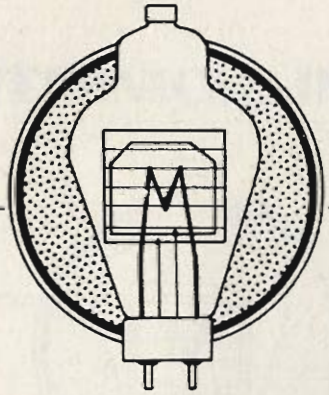


SIGNAL CORPS

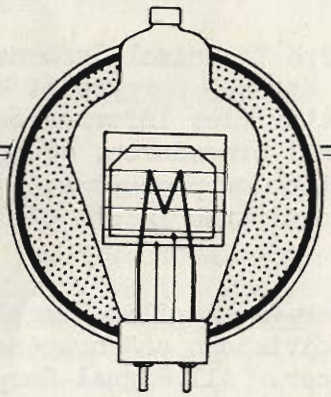
Technical Information Letter No. 16

WAR DEPARTMENT, OFFICE OF THE CHIEF SIGNAL OFFICER

WASHINGTON, D. C.

MARCH 1943

SIGNAL CORPS TECHNICAL INFORMATION LETTER



NUMBER 16 MARCH 1943

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This document contains information affecting the national defense of the United States within the meaning of the Espionage Act (U.S.C. 50:31, 32). The transmission of this document or the revelation of its contents in any manner to any unauthorized person is prohibited.

Classification canceled

by authority of The Chief Signal Officer

by N M Young
N. M. YOUNG, Capt, SigC

Date 15 Sep 50

WAR DEPARTMENT, HEADQUARTERS, SERVICES OF SUPPLY

OFFICE OF THE CHIEF SIGNAL OFFICER

EXECUTIVE OFFICE, SPECIAL ACTIVITIES BRANCH

SIGNAL CORPS TECHNICAL INFORMATION LETTER

Signal Corps Technical Information Letter (SCTIL) is issued monthly for the purpose of keeping officers in charge of field activities informed on the newest training methods, operational procedures, equipment under development, standardization or procurement, and other pertinent information as coordinated in the Office of the Chief Signal Officer.

This Letter is compiled largely from information available in the divisions and branches of the Office of the Chief Signal Officer. All Signal Corps training centers and other agencies are invited to submit items of general interest. Such items should reach the Office of the Chief Signal Officer (SPSAY) not later than the 20th of each month for inclusion in the Letter of the following month.

Distribution of the Letter is made to army, corps and division signal officers; commanding officers of signal companies and battalions; service command and department signal officers; post, camp, and depot signal officers; the signal officers of bases and task forces; Signal Corps inspection zones, procurement districts, training centers and laboratories; directors of Signal Corps ROTC units; signal officers of Army Air Forces and Army Ground Forces headquarters and major commands; overseas headquarters; signal officers of bases and task forces; units of the Office of the Chief Signal Officer and of Headquarters, Services of Supply. If any such activity is now receiving a number of copies either insufficient or excessive for its present needs, a memorandum addressed to the Chief Signal Officer (SPSAY) will serve to correct the mailing list.

This Letter is for information only. Requisitions for new types of equipment will not be submitted on the basis of data contained in this Letter.

TABLE OF CONTENTS

I. Tactical Long Lines Wire Equipment. 5

II. Substitutions Provide Substantial Savings 15
Conserving "Black" for Dry Batteries. 16
Fuel and Lubrication Charts Being Prepared. . . . 16
Radio Set Gets Road Test. 17
Clamp for Mast Sections 17

III. Accessories for the Versatile Headset HS-30 . . . 17

IV. Selenium Rectifiers 20

V. Testing of Plastics 21

VI. Equipment Coordination. 25

VII. Signal Corps Board. 28

VIII. Activation and Movements of Units 32

IX. Fort Monmouth Enlisted School 34

X. Combined Radio Procedure. 35

XI. German Radio Beams for Attacking Through Smokescreen. 35

XII. Signal Security 36

XIII. Lessons from Recent Fighting in Tunisia 37

XIV. Officer Promotions. 39

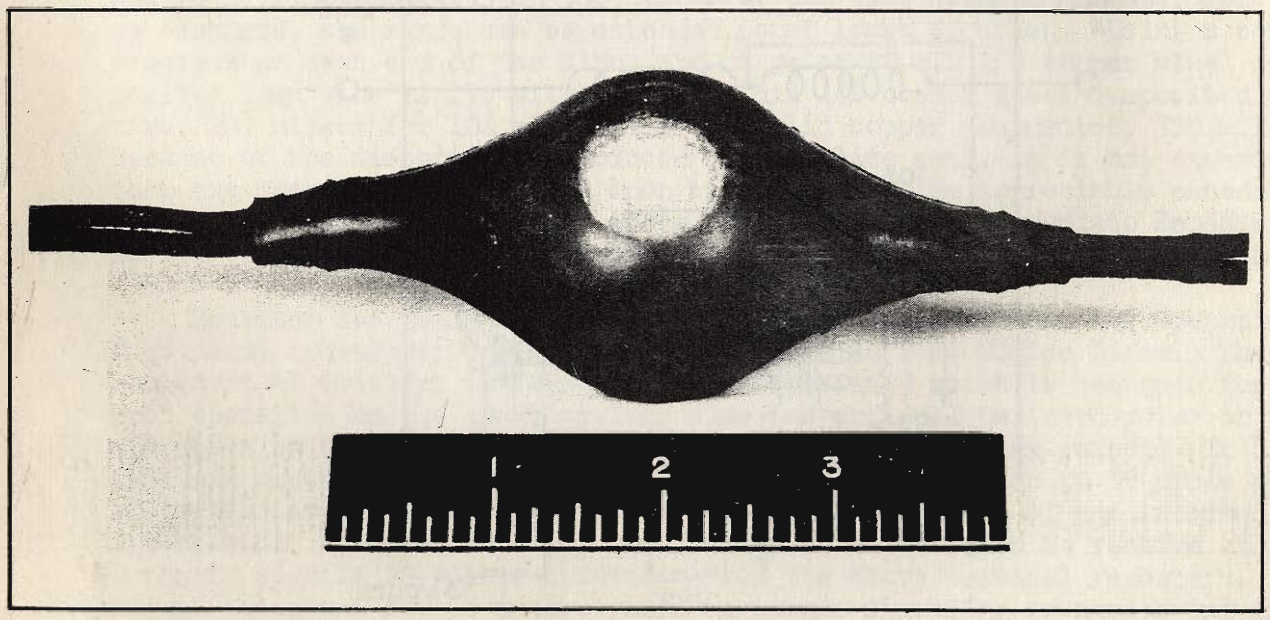
I. TACTICAL LONG LINES WIRE EQUIPMENT

The need for better long lines wire equipment for tactical forces has been realized for some time. Intensive development work has been carried on in the laboratories to meet this need, and numerous items have been developed and standardized. Until this equipment is available in quantity, and, in certain instances, pending determination of final designs, it is planned to make limited quantities available from a stock pile for urgent needs of task forces.

Procurement of the recently standardized equipment is being expedited, and instruction books for each type have been prepared or are in the process of preparation. Pending the issuance of this equipment on a regular basis with accompanying instructions, a survey of the tactical long lines picture, as it appears at the present time, is herewith presented.

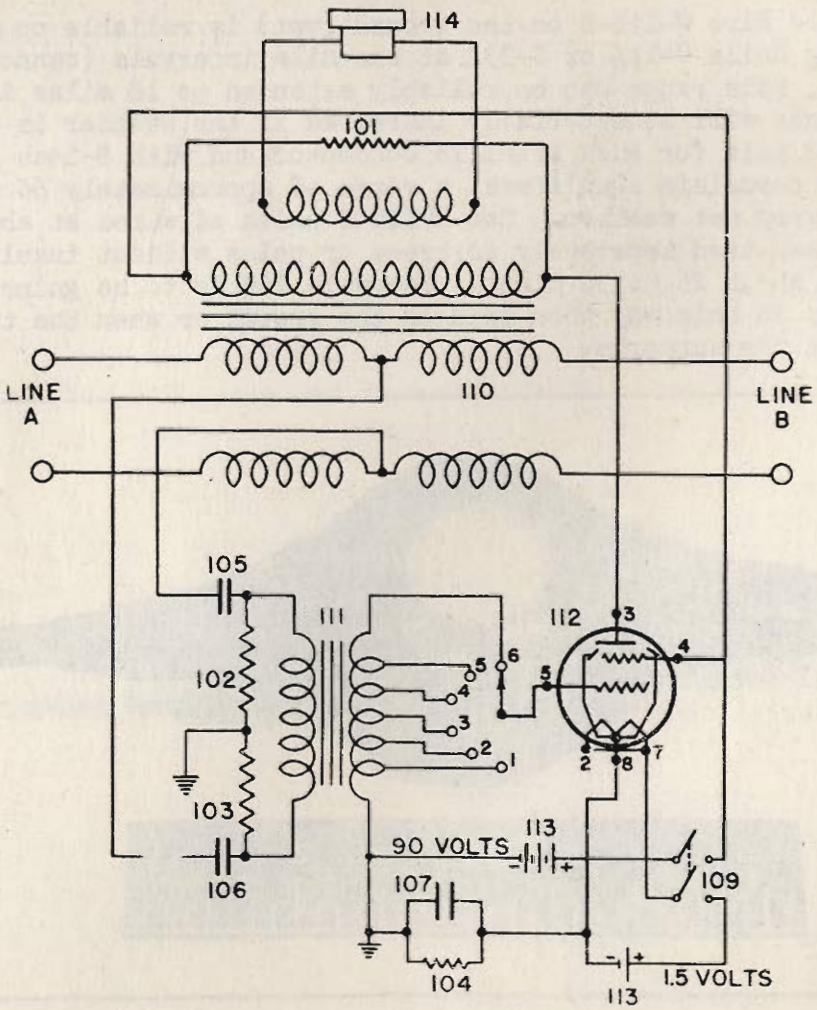
Wire W-110-B and Voice Frequency Repeaters

Non-loaded field Wire W-110-B on the ground (wet) is reliable up to 11 miles. With Loading Coils C-114 or C-334 at one mile intervals (cannot be mixed in same line), this range can be reliably extended to 18 miles in wet weather. These ranges will be materially increased if the weather is dry. By using one W-110-B pair for each metallic conductor and with 8-inch or more spacing on glass or porcelain insulators, a range of approximately 65 miles may be obtained in very wet weather. Two W-110-B pairs of wires at about 12 to 18 inch spacing and tied separately to trees or poles without insulators can give a range of about 25 to 30 miles. There is little to be gained from the use of two pairs in this way when laid on the ground or when the two pairs are tied together at the supports.



COIL C-334

By inserting one Repeater EE-89-T3 (now being service tested) somewhere within the center third of the line, the range of W-110-B wire on the ground wet can be extended to 18 or 20 miles without loading. By inserting two Repeaters EE-89-T3 in the line at the one-quarter and three-quarter points, the range of non-loaded W-110-B wire can be extended to 25 miles. These repeaters are of the "21 type" (2-way, 1 element) arranged for self contained dry battery operation. Battery BA-40 (1.5 volts "A" and 90 volts "B") is used to provide approximately two weeks continuous operation. The repeater is slightly larger than a Telephone EE-8 and weighs 13 pounds with battery. Normal operation of simplex telegraph circuits is possible on a line in which one or two of these repeaters are installed. Similarly, 20 cycle ringing will operate through the repeater. The maximum usable 1000 cycle gain of this repeater is approximately 24 d.b. However, it will not usually be possible to use all of this gain. In particular, if the impedances on the two sides of the repeater are very different, either because of humidity conditions or because of damaged wire on one or both sides, only small gains may be obtainable. A single monitoring receiver is provided. A small number of these repeaters are available and an additional procurement is being initiated.



TELEPHONE REPEATER EE-89-T3, SCHEMATIC DIAGRAM

Wire W-110-B can also be used on a four-wire basis by inserting the standardized Repeater Set TC-29-( ) (Voice frequency, 4-wire) at approximately 10-mile intervals and at each terminal to convert from 4 to 2 wire operation. The major component of this set is Telephone Repeater EE-99-( ). Vibrator Power Supply PE-204 is issued with this repeater for operation on 12 volt storage battery. Dry "A" and "B" battery operation can be had if specified. A set of dry batteries will operate the repeater for two weeks continuously. To operate a fifty-mile, 4-wire line using these repeaters, it will be necessary to adjust the gain and possibly equalization at least twice a day, and more often when heavy rainstorms occur after a period of dry weather. In addition to the gain adjustment, three equalizer settings are provided: (1) flat gain, (2) dry field wire and (3) wet field wire. With repeaters at ten mile intervals, the following ranges can be covered: up to 30 miles on an unattended basis; 30 to 50 miles on a semi-attended basis, and 50 to 70 miles on a constantly attended basis at all repeaters. It is necessary to use the phantom circuit for ringing or to use 1000/20 cycle ringers described under a carrier equipment. This repeater is 8" x 12" x 14" and weighs approximately 35 pounds. It appears that its most useful field of application is for distances from 25 to 50 miles. A universal 2-wire repeater of the 22 type is being developed primarily for use with stabilized long-range wire, open-wire lines, and spiral-four cable or the equivalent. These will not be available for some time.

D.C. Telegraph Repeaters

Telegraph Repeater Set TC-18 (Terminal) and Telegraph Repeater Set TC-19 (Intermediate) have recently been standardized and procurement is under way. These repeaters are intended primarily for extending the range of teletypewriter Sets EE-97-( ) or EE-98-( ), or equal, over W-110-B wire. Using one terminal repeater set on each end of the line with W-110-B wire on the ground (wet) simplexed, the reliable range is 50 miles. By inserting one Repeater Set TC-19 (Intermediate) in the center of the line between Repeater Sets TC-18 at each end, the range can be extended to at least 80 miles. Using a terminal repeater on each end of the line, the range of 80 mil 40% copper steel composited open wire is 135 miles; for 104 mil 40% copper steel composited open wire, 200 miles; for 104 mil hard drawn solid copper composited, 350 miles. Because of the distortion introduced by composite sets, it is not expected that the range over composited open wire line will be appreciably extended beyond the distances indicated above, by the use of intermediate Repeater Sets TC-19. Operation of two sections of open wire in tandem is not recommended.

Repeater Set TC-18 may also be used as an applique unit for operating U. S. Army teletypewriter equipment over British Post Office Lines. The main component of this set is Repeater TG-30 (Terminal) which is designed for neutral operation on the local or loop side and optional two path polar or polar operation on line side, the change being effected by a key switch. It has a built-in rectifier for operation from 115 or 240 volts, 50 to 60 cycle power and weighs approximately 125 pounds. The main component of the intermediate Repeater Set TC-19 is Repeater Set TG-31. It is designed to receive and transmit signals in either direction from the above terminal repeaters. A manual telegraph set is incorporated to permit signaling or monitoring in the event local teletypewriter equipment is not available or is disabled. A

built-in rectifier and vibrator unit are included, providing for operation from 115 or 230 volts, 50 or 60 cycles. It also operates from 115 volts D.C. or 12 volts D.C. Immediate action is being taken to procure the above telegraph repeaters but some time may elapse before the manufacturers can deliver.

Long Range Field Wires

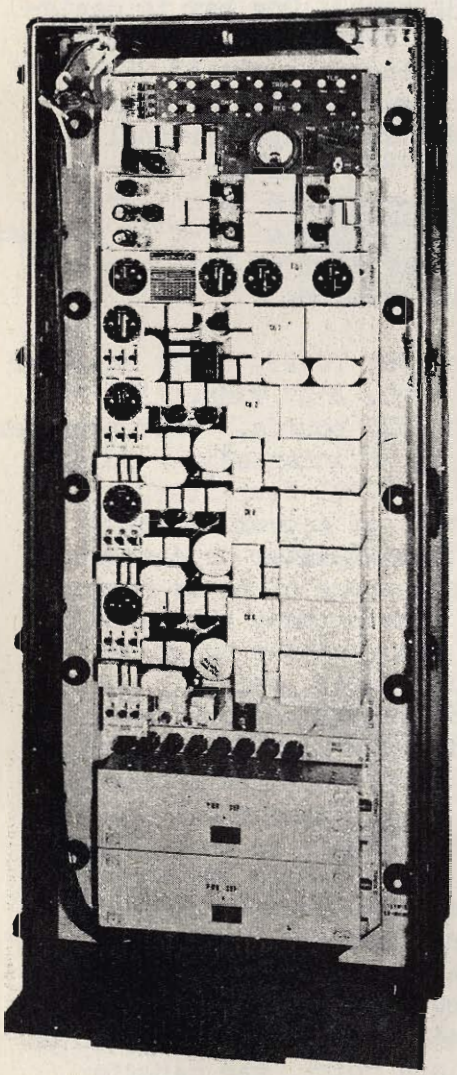
Considerable development work is being done on long range field wires and associated two-wire repeaters. However, since development is not complete and present facilities for manufacture are inadequate, long range field wires recommended and procured in the near future must be considered as expedients rather than final solutions to the problem. One of the new development type voice frequency long range field wires is Wire W-143-T7 which has a voice frequency range of 27 miles on the ground (wet) without loading and 90 miles with Loading Coils C-334 at 3/4 mile intervals and 100 miles with Loading Coils C-114 at 3/4 mile intervals. Loading intervals as great as one mile may be used; however, whatever spacing is employed, it is important that it be uniform throughout the length of the line. Coil C-114 is the 88 mh loading coil in a metal case which is now being issued. Coil C-334 is a 44 mh loading coil in a molded rubber case, with two-wire pigtails on each end for splicing into the line, which is replacing Coil C-114. While in this instance the new coil appears to reduce the range, its use is more satisfactory because of the higher frequency cut-off and greater resistance to rough handling and extreme climatic conditions. Wire W-143-T7 consists of two parallel stranded copper conductors, each equivalent to a No. 15 gauge, covered by one overall rubber insulation, which is, in turn, covered with impregnated cotton braid. 3/4 of a mile will be wound on Reel DR-5. In addition to its long range, this wire has relatively stable electrical characteristics which will permit its use with an unattended two-wire repeater. However, because of its construction, it must be handled with greater care than Wire W-110-B. Procurement is being initiated at this time for limited use pending further experience and development work on this type of wire. Due to limited manufacturing facilities, it may be necessary to substitute Wire W-50 on requests for Wire W-143-T7 until such time as it is available. Wire W-50 is No. 14 High Conductivity Drop Wire consisting of No. 14 solid copper conductors, twisted, with insulation similar to W-110-B. It has a range on the ground (wet) of 30 miles non-loaded or 60 miles when loaded at one mile intervals with either Loading Coils C-114 or C-334. It is a very unstable wire and takes over fifty percent more shipping space than Wire W-143-T7 and therefore its continued use is not desirable. Only 2,000 feet can be wound on a DR-5 Reel. Because it is unstable, its range is considerably increased over the figures given above under dry conditions, whereas the range of W-143-T7 wire remains constant.

Carrier Equipment and Spiral-Four Cable

The carrier telephone and telegraph equipment developed and standardized for use on Spiral-Four Cable is capable of providing four 6 d.b. telephone channels or three telephone and four telegraph channels over distances up to about 150 miles when installed aerially or laid on the ground and up to about 400 miles when buried. The necessary equipment is assembled in four different "sets." A carrier system consists of one Telephone Terminal Set TC-21, one Telegraph Terminal Set TC-22 and two Ringer Sets TC-24 employed at each end of a carrier line made up of Cable Assemblies CC-358 and Repeater Sets

TC-23, located every 25 miles along the cable between terminals. For especially long systems, it may be desirable to reduce the repeater spacing to reduce the noise.

Telephone Terminal CF-1 is the major component of Telephone Terminal Set TC-21. This telephone terminal is mounted in a bay 5'6" high, 2'4" wide and 1'7" deep, weighing approximately 475 pounds. This terminal provides for the simultaneous transmission of four voice frequency telephone circuits over the Spiral-Four Cable. Channel No. 1 is a straight voice frequency circuit restricted to a band of approximately 0 to 3 kc. Channels 2, 3 and 4 are provided by the lower sidebands of carrier frequencies located at 5.9, 8.85, and 11.8 kc respectively. Since each pair is used for one direction only, the same frequencies are employed for both directions of transmission on any channel. The terminal is designed for a 115-230 volt, 50-60 cycles primary source of power. The power drain of CF-1 is approximately 60 watts. Automatic emergency operation on a 12 volt battery supply is provided by two BB-55, 6 volt storage batteries.



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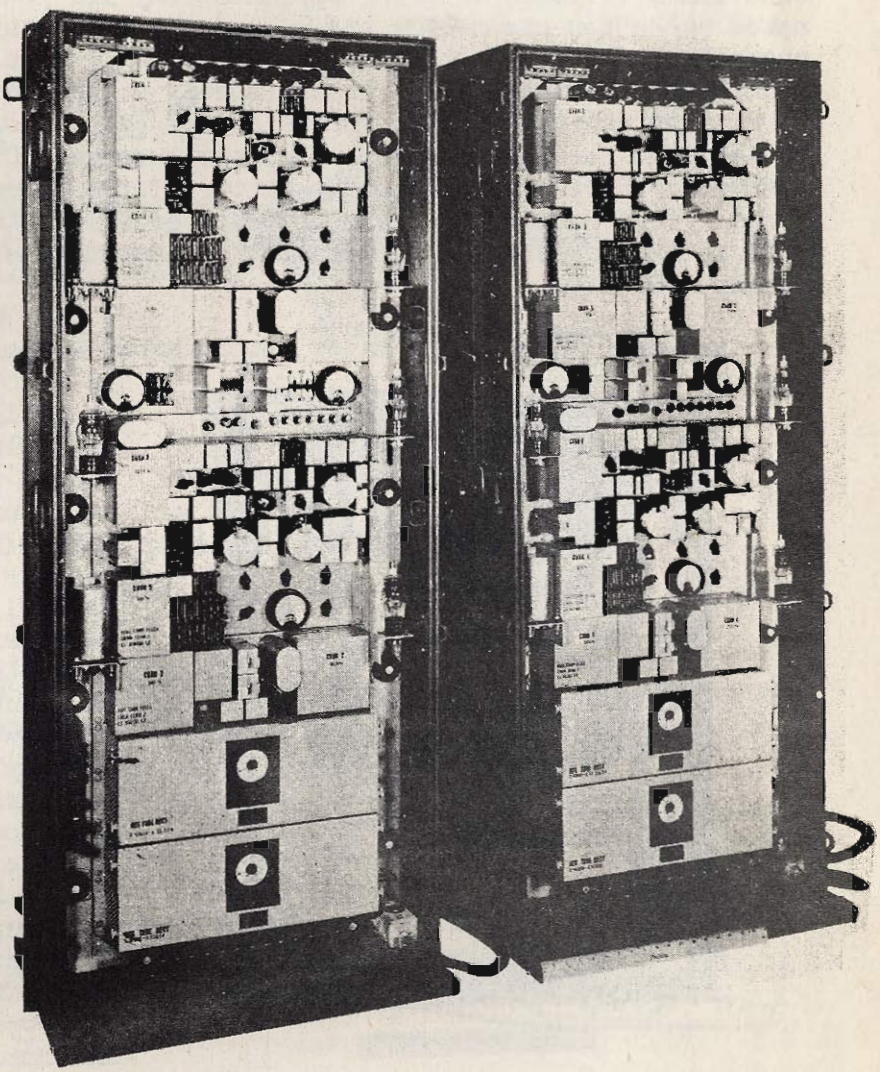
CF-1

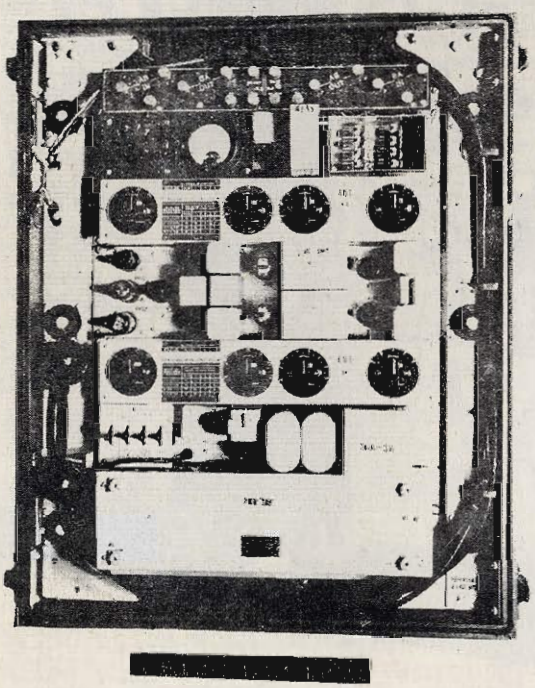


CF-2

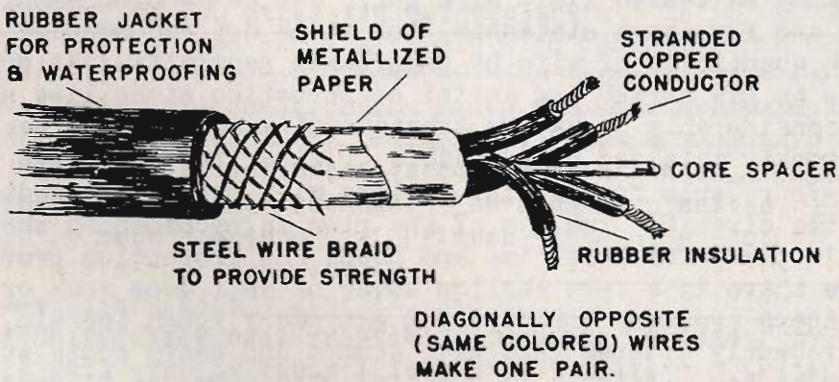
Two Ringing Equipments EE-100-A, or one Ringing Equipment EE-101-A, comprise the major component of Ringer Set TC-24. These ringing equipments are used on each of the four channels employed as telephone circuits. The ringing equipment converts 20 cycle impulses on the voice frequency circuit to 1000/20 cycle impulses for transmission on the Spiral-Four telephone channels and likewise converts incoming 1000/20 cycle impulses from the Spiral-Four circuits to low frequency impulses for transmission on the voice frequency circuits. This low frequency ringing signal normally supplied from these ringers is 60 cycles unless 20 cycles is supplied from an external source. Ringing Equipment EE-101-A is the electrical equivalent of two EE-100-A's mounted in a single box. The ringing equipments are designed for the same type of power source as CF-1 and are plugged into available a.c. outlets on CF-1 when used in the same location. The power drain of either EE-100 or EE-101 is approximately 30 watts.

Telegraph Terminal CF-2 is the major component of Telegraph Terminal Set TC-22. This telegraph terminal is mounted in two bays each 5'6" high, 2'3½" wide and 1'7" deep, weighing approximately 525 pounds each. One bay is designated telegraph channels 1 and 2, and the other bay is designated telegraph channels 3 and 4. When connected to one of the telephone channels of CF-1 (preferably channel 3), or to any normal voice frequency circuit, a total of four telegraph or teletype channels will be provided. Telegraph Terminal CF-2 is designed for the same type of power source as CF-1, with the exception that automatic throw-over to storage battery for emergency operation is not provided. When used at the same location as CF-1, the a.c. cord of CF-2 is plugged into an available outlet on CF-1. The maximum power drain of CF-2 is approximately 450 watts.

Repeater CF-3 is the major component of Repeater Set TC-23. This repeater is 2'10" high, 2'4" wide, 1'2" deep and weighs 225 pounds. This repeater is employed at intermediate points within the spiral-four line, spaced at intervals of approximately 25 miles. This repeater is designed for the same type of power source as CF-1. The primary source of power at the repeater point is Power Unit PE-214, which is rated at 300 watts, 115 volts, 60 cycles. The power drain of CF-3 is approximately 30 watts. This repeater provides amplification for all four telephone channels in both directions of transmission and equalization for both incoming pairs. A monitoring hand set is provided for monitoring or talking on the voice frequency channel No. 1 only. If drop circuits are required at an intermediate point, the repeater must be replaced with two CF-1's connected back to back.

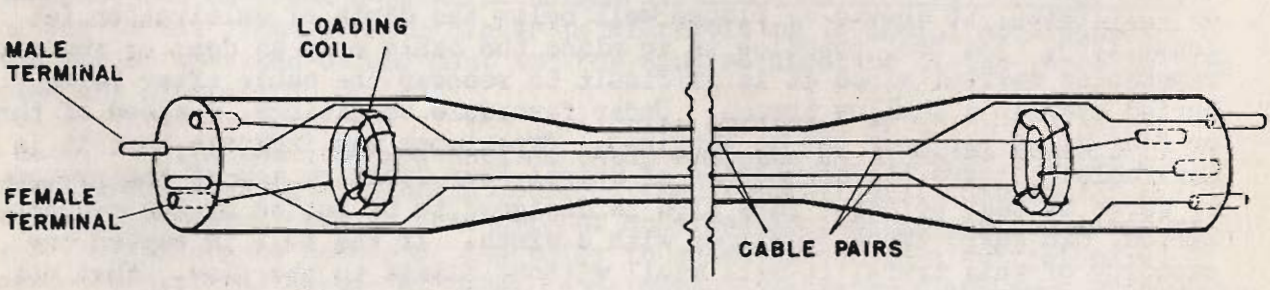


Each of the four major components of the carrier equipment sets is supplied with an instruction book covering that component. Technical manuals covering the complete sets are being prepared. "Running Spares" are furnished with CF-1, CF-2, CF-3, EE-100, and EE-101 when initially shipped. These spares include vacuum tubes, fuses, vibrators, relays and protector blocks and are mounted in the equipment in dummy holders. Maintenance parts groups, consisting essentially of one each of every part used in CF-1, CF-2, etc., are being procured for (fourth echelon) depots on a ratio of one maintenance parts group for each 20 CF-1, CF-2, etc., delivered. Voltohmmeter I-166 has been placed on the parts lists of TC-21 and TC-23 for first and second echelon maintenance. For rear echelon maintenance, involving major repair or salvage of carrier equipment, Test Set I-120 consisting of an audio-oscillator, a transmission measuring set and a gain adjunct has also been specified. Testing equipments for setting up carrier equipments in an operating condition are integrally contained within the major components CF-1, CF-2, and CF-3.



STRUCTURE OF THE SPIRAL-FOUR CABLE

Spiral-Four Cable Assembly CC-358 is composed of Cable WC-548 terminated on each end with a molded connector with integrally contained loading coil.



SCHEMATIC WIRING DIAGRAM, CABLE ASSEMBLY CC-358

Four assemblies are required per mile. Cable Assembly CC-368 is a 100-foot length of Spiral-Four Cable WC-548 terminated on each end with a standard connector, less loading coil. This assembly will be used when a damaged CC-358 is replaced by a CC-358 which happens to be slightly shorter than the damaged CC-358 and for short extensions to a repeater or terminal point, and also for supplying the extra length needed when a damaged portion of a CC-358 is cut out and the cable spliced. Cable Stub CC-356 is issued with Cable Assembly CC-358 in addition to being supplied with carrier equipment. These stubs will be used for connections to test sets, etc. These may be used also for replacing damaged molded connectors terminating Cable Assembly CC-358; however, caution will be required to insure that the connections are made so that each pair in the repaired reel has one loading coil.

Plow LC-61 (Cable Burying)

This plow was designed and standardized to meet the specific requirements involved in burying military communication lines. It can be used to plow in wire or cable up to approximately 1" in diameter. Two Spiral-Four Cables, or as many as six pairs of field wire, can be plowed in at one operation. As many as twelve field wire pairs can be handled simultaneously at a slow speed and for short distances, but it is not recommended that the plowing of such quantities of wire be undertaken generally. In general, it is undesirable to mix buried and aerial construction since line noises may be increased considerably by having substantial amounts of an aerial construction in a poorly shielded buried cable or wire line, and vice versa. Burying Spiral-Four Cable for carrier systems will materially reduce noise and stabilize the circuit. The use of the plow is recommended where the wire is to remain in place for some time and needs the protection provided by burying. Where there is a very shallow cover of soil over rock or tough subsoil and where there are many boulders and extremely rough terrain, large swamp areas, or recently cleared land with stumps and heavy roots still in place, plowing may be too difficult to justify. The plow was illustrated in SCTIL No. 15.

The wire or cable may be first layed out on the ground in the usual manner and then picked up and buried by the plow as it advances; or the wire or cable may be paid out directly from reels mounted on a reel trailer. Where more than one cable or wire is involved, a combination of these methods may be employed. The depth at which the wire or cable is placed must be such as to protect it against ordinary disturbances likely to occur along the route. The plow will place wire or cable at any desired depth from 6 to 18 inches under favorable plowing conditions. Where the line crosses fields which may be cultivated, it should be placed well below the depth of cultivation (at least 12"). The best practice is to place the cable only as deep as the circumstances warrant since it is difficult to recover the cable after being buried even in a shallow trench. Under favorable conditions, a speed of three or four miles per hour can be obtained. Experience may indicate that it is desirable to leave the connectors of Spiral-Four Cable on top of the ground to serve as test points. This plow is designed to be pulled by the standard $2\frac{1}{2}$-ton, 6x6 cargo truck, equipped with a winch. If the pull is beyond the capacity of this truck, it will stall without damage to the plow. When not in use, the plow can be towed behind the vehicle at usual road speeds, or can be carried in a cargo truck. The weight of this plow is about 1,500 pounds.

RESTRICTED

Tactical Pole Line Construction

The military need for the rapidity and economy of material in pole line construction has prompted the development of a new type of pole line construction of extreme simplicity requiring a minimum of material. The equipment and procedure are now being service tested.

Temporary Pole Line: The pole employed for the new temporary type pole line consists of two 2" x 4"s, 20' long nailed together to form one single 4" x 4" x 20' pole. These are spaced 150' apart. A 7'2" crossarm is mounted in a gain obtained by offsetting the two 2" x 4"s before nailing together. 80 mil copper steel wire is used, mounted on standard insulators with 8" spacing between wires and 16" spacing between pairs with 4 pairs on the crossarm. This arrangement provides the maximum flexibility in that all pairs can be used for commercial type "C" or "H" carrier and, if no other carrier is on the line, any two pairs can be used for TC-21 four-wire carrier. All four pairs may be used for TC-21 4-wire carrier by proper selection of the directions of transmission on the various pairs and with suitable restrictions on the repeater spacings and the lengths of the systems. This temporary type of line is satisfactory for 120 miles without repeaters. It is expected that this type of line may be used satisfactorily with carrier repeaters up to a distance in excess of 1,000 miles. However, for lines of such length a semi-permanent type of pole line construction using the same crossarms on Class 9 poles at 300 foot spacings would be preferable. When a temporary type pole line in excess of 120 miles is contemplated, repeaters should be employed at intervals depending on the expected use. For general planning, 90 mile spacing is suggested as most consistent with future developments.

Because of the light material used and the simplicity of construction under average conditions, it should be possible to construct this temporary type pole line in considerably less time and with less transportation than is required to construct the semi-permanent type of pole line.

A unique feature of the construction of the temporary type of pole line, and an important reason for the speed obtained in this type of construction, is the Vibrator Digger LC-58. This equipment provides a rapid means of making a hole which gives exceptionally good support since the walls of the holes are tamped hard in the process of digging. The digger consists of a variable speed lightweight gasoline engine which is connected by means of a centrifugal clutch to a 14' flexible shaft and a digging head. This entire assembly weighs only 275 pounds as compared to the standard earth borer equipment mounted on Truck K-44 which weighs 4,752 pounds exclusive of the weight of the truck. The vibrator digger is simple in construction and operation and can be operated by one man, and the time required to dig one hole is less than one minute.

Although a square pole has been recommended, a round pole of equivalent cross-section and length could be used if available. Because of the lightweight poles used in this type of construction, it may be necessary to guy a considerable number of the poles in order to obtain a sufficiently strong line. The number of poles to be guyed depends upon the type of terrain and the type of weather experienced in the locality. 134 mil galvanized iron wire is used for guying.

In line with the structural simplicity of this type of pole line, it is thought desirable that the method of requisitioning the materials also be simple. Therefore, in order to eliminate detailed analysis in the field of the material needed for constructing this type of pole line, tabulated lists have been prepared showing the types and amounts of materials, less tools, required to construct either 1 mile, 25 miles, or 100 miles (or multiples of these quantities) of the new temporary pole line. This list includes sufficient materials for making 10 percent of the line of the "X-Frame" type of structure where ground surfaces are such that holes cannot be made.

X-Frame Pole Line: This type of structure is employed in rocky terrain or over other ground surfaces where the digging of 4" holes for supporting the 4" x 4" upright pole would present a serious problem. The X-Frame structure is fabricated from 20' x 2" x 4" timbers overlapped to form an X-type of structure which supports the 7' 2" crossarm. It is necessary to guy all X-frames on both sides of the structure by fastening the guys to the center bolt hole of the crossarm and fastening the other end of the guy wire to stakes about 20' from the structure on each side of the support and located along the lead. This type of construction should be used only in localities where rocky terrain or other ground surfaces where holes cannot be dug are encountered, since this type of construction cannot be installed as rapidly nor is it as satisfactory as the above outlined temporary pole line construction. Tabulated lists have been prepared showing the types and amounts of materials, less tools, required to construct either 1 mile, 25 miles, or 100 miles (or multiples of these quantities), of the X-Frame type pole line.

Conversion to Semi-Permanent Pole Line: In the event it is desired to convert either the temporary upright structure, or the X-frame structure, to the semi-permanent type pole line using 25' and 30' Class 9 poles at 300' spacing, the materials should be ordered in accordance with a tabulated list, which shows the types and amounts of materials, less tools, required to convert either 1 mile, 25 miles or 100 miles (or multiples of these quantities), of either the temporary 4" x 4" upright type pole line or the X-frame type pole line to the semi-permanent type of pole line.

Supporting Spiral-Four Cable on Temporary Upright and X-Frame Structures: In the event it is desired to support Spiral-Four Cable CC-358 on a portion of the temporary upright structure, or the X-frame structure, materials should be ordered in accordance with a prepared tabulated list showing the types and amounts of materials, less tools and cable, required to suspend 1 mile, 25 miles, or 100 miles of Spiral-Four Cable on these types of structures. Extensive use of cable suspended under crossarms on temporary pole lines is not desirable since sag on 150 ft. spacing will result in a clearance of about 11 ft. between cable and ground.

II. SUBSTITUTIONS PROVIDE SUBSTANTIAL SAVINGS

Substantial savings are being made through the substitution, wherever possible, of less critical materials for those in which more acute shortages exist. The following is a partial list of substitutions reported from the Materials and Pre-Service Tests Branch of the Fort Monmouth Signal Laboratory:

Substitute Material	Where Used	Saving per 1000 Units
Zinc alloy	Case and cover of Key J-5-A	110 pounds aluminum
Steel	Body and panel of Switchboard BD-70	2,160 pounds "
Steel	Hinge of Switchboard BD-70	170 pounds brass
Steel	Contact supports, nuts, screws and washers of Key J-5-A	60 pounds brass
Steel	Studs of Panel Buffer Assembly	550 pounds brass
Malleable iron	Key lever of Key J-5-A	100 pounds cast bronze

Various substitutes for mica have also been sought and found. The following table shows how savings have been accomplished in various radio sets:

Substitute Material	Capacitors (mfd.)	In radio set	No. of Mica Capacitors Saved per 1000 units
Paper	.0009 to .01	British Set B-9	35,000
Paper	.0009 to .01	British Set B-48	31,000
Paper	.0009 to .01	BC-312-N and BC-342-N	21,000
Paper or ceramic	.001 to .009	DM-35-A	3,000
Paper	.0009 to .01	SCR-194	8,000
Ceramic	under .0009	SCR-211-P	1,000
Paper	.0009 to .01	SCR-243-A & SCR-244-A	15,000
Paper or ceramic	.0009 to .01	SCR-284	42,000
Paper	.001 to .009	SCR-543	10,000
Paper	.0009 to .01	SCR-195	8,000

A further saving in aluminum will be provided by substituting grey gloss enamel for aluminum paint used by Signal Depot Companies and Signal Installation Companies for repair work.

Meters will be conserved, too, for the Test and Maintenance Section at the Camp Coles Signal Laboratory reports that the dynamotor test sets utilizing five meters and those utilizing nine meters are to be discontinued in favor of dynamotor test sets employing but one meter, together with the associated shunts and multipliers which permit that meter to replace several meters; this simplified test equipment is being developed at the Laboratory. The saving of meters will amount to 80 percent saving in one case, and to 89 percent in the other.

CONSERVING "BLACK" FOR DRY BATTERIES

Acetylene black, a substance required for the manufacture of Signal Corps dry batteries, is a strategic material, and much thought is being given not only to increasing production, but to conserving what we have for our armed forces, and those of other members of the United Nations.

Recommendations have been made by the Special Projects Section, GSEB, for the initiation of a research project on the development of a process for manufacturing acetylene black in the United States, if the Canadian process is unsuitable for use here, and to develop a substitute for this material. It has also been recommended that the use of acetylene black be curtailed or stopped in industries other than dry battery manufacture, and in commercial dry batteries. To aid in achieving these ends, the Fort Monmouth Signal Laboratory has gathered information on the amount of this material used in each type of Signal Corps dry battery.

Obviously, the longer a battery can be made to last, the further the supply of acetylene black can be made to stretch, and, fortunately, as the current drain is decreased, the battery life is increased in a greater ratio. By substituting 150 milliampere lamps for the 300 milliampere lamps used in Flashlight TL-122-A and TL-122-B, the life of the batteries is increased by the proportion of 2.5 to 11, or about 1 to 4, while the light is decreased only about 50 percent. Action has been initiated to effect this change and to have the specification for TL-122-A and TL-122-B changed accordingly.

FUEL AND LUBRICATION CHARTS BEING PREPARED

A project is under way at Fort Monmouth Signal Laboratory to list all models and components of ground signal equipments which may require fuel or lubricants, and to prepare fuel and lubricant charts for each item of equipment. These charts will be used by personnel in the field to indicate the proper fuel or lubricant under various conditions of temperature. This information will be available to all interested arms through Maintenance Section, Ground Signal Equipment Branch, OCSigO. Similar lists will soon be compiled for Aircraft Radio and Electronic equipments.

RADIO SET GETS ROAD TEST

A model of Radio Set SCR-299-D was driven from Chicago to Camp Coles Signal Laboratory by members of the Vehicular Radio Section. Throughout the entire 900-mile trip, communications were continuously maintained with a laboratory model of Radio Set SCR-299-A installed at Fort Monmouth. The SCR-299-D is similar to the SCR-299-A, SCR-299-B and SCR-299-C, except that it is arranged for break-in operation.

CLAMP FOR MAST SECTIONS

A set of four antenna clamps known as Clamp MC-421, MC-422, MC-423 and MC-424, used for holding Mast Section MS-49, MS-50, MS-51, MS-52 and MS-53 secure, will soon be available for issue from Circular 10. Action has been initiated for procurement. A set of the four clamps weighs less than one pound.

III. ACCESSORIES FOR THE VERSATILE HEADSET HS-30

Headset HS-30, the new universal type headset which can be worn comfortably under a Helmet M-1, or a gas mask, will eventually replace most other headsets for the Army Ground Forces, for it is designed to be used with various accessories such as impedance matching transformers, junction boxes, cords, etc., that will adapt it to any use. These accessories are shown in the accompanying drawing.

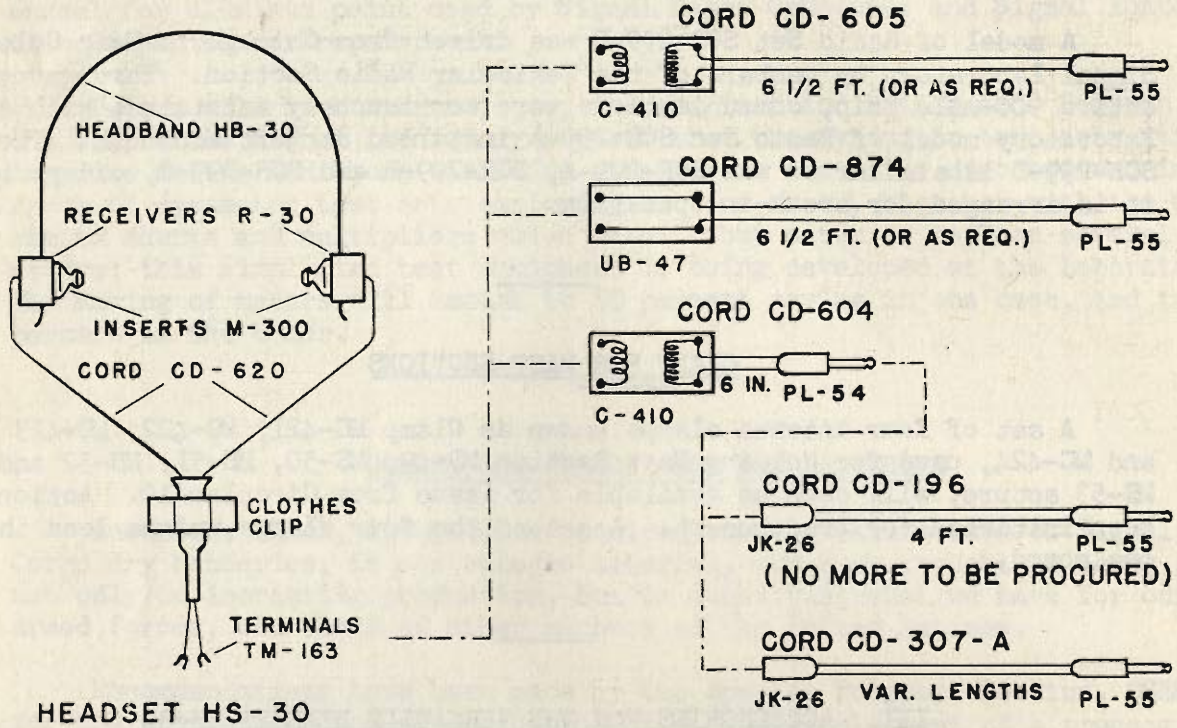
Headset HS-30-( ) consists of a Headband HB-30-( ), two each Receiver R-30-( ), two each Insert M-300, a Cord CD-620-( ) and Terminals TM-163. Cord CD-620-( ) includes a clip for attachment to the clothing, thus taking the weight of the cord and accessory equipment off the head of the user. It terminates in a pair of spade tips TM-163. Nothing else is supplied unless specifically ordered.

The impedance of HS-30 is 256 ohms. To match it into the output of high output impedance radio receiver, a 256:8000 ohm impedance matching transformer is required. This unit, Transformer C-410, is available as part of either of two cords: Cord CD-604 and Cord CD-605.

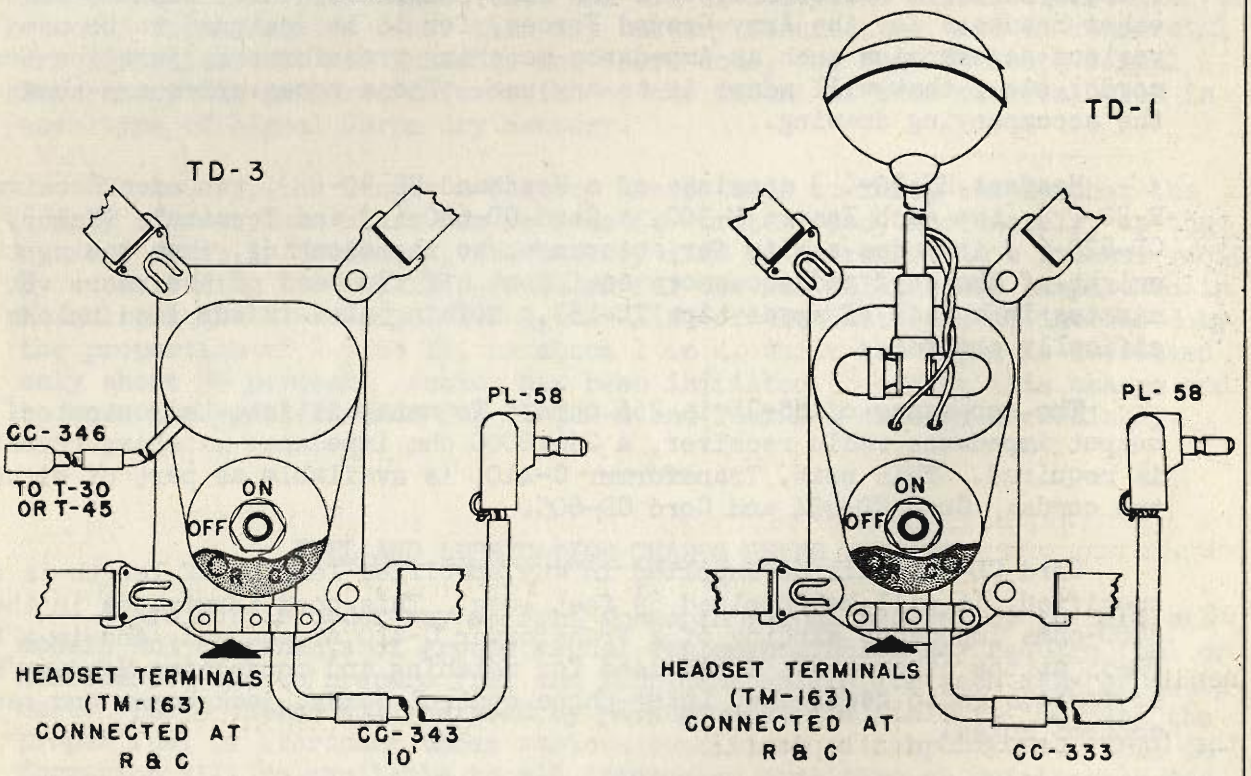
Cord CD-605 will be supplied in any specified length; if length is not specified, it will be supplied 6½ feet long. This cord terminates in the 8000-ohms impedance winding of a Transformer C-410 at one end, and in a Plug PL-55 at the other end. It is used for matching and connecting Headset HS-30 to various radio receivers, inter-phone control boxes, jack boxes and radio control boxes.

Cord CD-604 is 6 inches long. One end terminates in the 8000 ohm wind-

HEADSET HS-30 WITH ASSOCIATED CORDS FOR USE WITH RADIO EQUIPMENT



CHEST SETS USED WITH HS-30



ing of Transformer C-410; the other end, in a Plug PL-54. A Cord CD-307-A is commonly used in conjunction with this. Cord CD-307-A is obtainable in various lengths, as ordered. At one end it has a Jack JK-26 (to receive the Plug PL-54 of Cord CD-604); at the other, a Plug PL-55. This combination serves the same purpose as Cord CD-605, but has the advantage of being separable, which permits the operator to leave his equipment without removing HS-30. Cord CD-307-A replaces 4-foot Cord CD-196, no more of which are to be procured.

Where it is desired to feed Headset HS-30 from low impedance outputs, Cord CD-874 should be ordered. This cord is furnished in 6½-foot lengths, or in any other length requested. At one end it has a Junction Box JB-47 for attachment of HS-30; at the other end, a Plug PL-55.

In conjunction with various chest sets, HS-30 replaces Head and Chest Sets HS-19-A, HS-17-A, and HS-27-( ). The chest sets must be ordered in addition to HS-30 if they are desired.

Chest Set TD-1, for use with HS-30 to replace HS-19-A, consists of a Chest Unit T-26, to which is connected a six-foot Cord CC-333 terminating in a Plug PL-58. This is part of GR-3-C, GR-4-A, TC-12, TC-10, and TC-4.

Chest Set TD-2, for use with HS-30 to replace HS-17-A, consists of a Chest Unit T-26, a 10-foot Cord CD-343-A and a Plug PL-58.

Chest Set TD-3, for use with HS-30 to replace HS-27-( ), consists of a Chest Unit T-46, Straps ST-24 and ST-25, a Plug PL-58 and Cords CC-343-A and CC-346. This is part of TP-4. It does not include a microphone, but will accommodate T-30 or T-45.

Other accessories are being developed for use with HS-30; the output of future radio receivers will match its impedance. Under development is a junction box which will be strapped to the user, and which will incorporate retractable cords for a microphone and for connection to a radio set, the necessary attachment plugs, and a push-to-talk switch.

Headset HS-30-( ) is considered a large step toward effecting standardization of headsets and reduction of critical materials used, thus making mass production and interchangeability more practical than heretofore.

REMEMBER . . . None of the accessories -- transformer, cord, plug, etc. -- are included when only a Headset HS-30 is ordered. One or more will be needed in order to use the HS-30. The necessary accessories must be specified on the order.

IV. SELENIUM RECTIFIERS

One of the most recent developments for supplying direct current for communications purposes has been the selenium type dry-disc rectifier. This rectifier has been utilized to a large degree on the continent and throughout the United Kingdom but has only recently experienced a large demand in the United States. Large-scale facilities for the production of copper-oxide rectifiers have been utilized in this country for some time; and, consequently, the utilization of selenium rectifiers has been restricted, due to initial development costs and a patent situation discouraging to facilities entering this field.

Selenium is a metal with physical and chemical properties similar to those of sulphur. This element was discovered in 1817 and the first commercial usage was in photoelectric cells. It rarely occurs in a pure state, but is usually found in combination with heavy metals such as lead or copper. In the United States selenium is obtained in considerable quantities as a by-product from copper smelting works.

A recent study made of the selenium-rectifier field indicates that an adequate supply exists for the selenium, but that facilities are limited for the fabrication of the selenium discs. Large-scale orders are being placed upon facilities in this country for International Aid orders and preliminary studies indicate that an expansion of the facilities for the production of selenium rectifiers may be found necessary. An investigation is currently under way to determine whether or not copper oxide facilities may be converted for the production of selenium rectifiers. If this proves favorable, it is probable that selenium-type dry-disc rectifiers will supersede copper-disc type rectifiers for post-war usage. The major advantages of selenium rectifiers over other types of dry-disc rectifiers are as follows:

1. A higher permissible working temperature (up to 85° C);
2. A higher current density;
3. Higher permissible reverse voltage;
4. Contact pressure not critical;
5. Smaller sizes and weights compared to power output;
6. High efficiency.

The above characteristics may readily be seen as making the selenium rectifiers highly desirable for use by the Signal Corps in battery chargers, meter rectifiers, motion picture machine arc rectifiers, and telephone exchange rectifiers. The development of these rectifiers, used with reliable electrolytic condensers for smoothing out ripple voltages associated with the output, has made these rectifiers suitable for application in practically all types of communications transmission systems.

V. TESTING OF PLASTICS

A few years ago an article on plastics would have been of minor interest to Signal Corps personnel, but recent developments in this industry, coupled with the lack of strategic metals, have resulted in greatly broadening the applications of plastics to communication equipment.

It is estimated that about 50 percent of the plastics purchased by government agencies is used by the Signal Corps. While the use of plastics may solve many problems, a complete understanding of their limitations is necessary in order to avoid serious errors. This is not an easy matter, as there are many types of plastics on the market under various trade names. Also, a perfectly good material could be ruined by improper molding technique or fabrication.

Plastics are customarily classified as follows:

a. Thermoplastic - Material which is rigid at normal temperatures, but softens when heated and then deforms with applied pressure. When the temperature is returned to normal and the pressure is released, the material returns to its initial state, i.e., no chemical change takes place. An example of this type of material is cellulose acetate.

b. Thermosetting - Material which may be thermoplastic at certain temperatures, but which will undergo chemical and physical changes during the manufacturing process to become infusible and insoluble. An example of this type of material is the phenolics.

Why Plastics are Used

Applications of plastics to Signal Corps equipment occur under the following conditions:

a. Where there is a shortage of strategic metals and the plastic possesses the desired physical properties;
b. Where the plastic has superior qualities such as lightness, chemical resistance, low cost, and corrosion resistance;
c. Where a large procurement of an item permits mass production molding which would be rather difficult or impossible by other methods.

Plastics have replaced aluminum in many cases, and many instances are on record where engineers have employed plastics mainly for reducing weight.

A list of the principal plastics used in Signal Corps equipment includes the phenolics, polystyrene, polyvinyl formal, cellulose derivatives including ethyl cellulose, rubber hydrochloride. Applications of phenolics are switchboards, telephone handsets, insulating sleeves, name plates, coil forms, coil supports, brush holder supports, switch parts, and terminal strips. Phenolics are adequate for most power frequency requirements.

Polystyrene is equal in many respects to inorganic materials previously employed for high frequency work. It has excellent dielectric qualities, particularly at radio frequencies, due to low dielectric loss factor, surpassed only by fused quartz. While it is hard to machine and is quite brittle it can be easily injection molded into intricate shapes. Polystyrene is also used for coaxial cable supports and as insulation for condensers.

Polyvinyl formal coated wire, commercially known as Formex and Formvar, is commonly used for armature windings, and is superior to enameled coating due to its flexibility. It has made possible increased production of armature winding by relatively unskilled help.

Polystyrene, ethyl cellulose and cellulose acetate insulating foils are slowly replacing specially treated paper as the insulator in coils and condensers. The chief advantages of ethyl cellulose are due to its flexibility at temperatures down to -40 degrees C. It can be injection molded and extruded, and has been made into insulating foils .001" thickness for coils and condensers.

Rubber Hydrochloride (Pliofilm), ranging from .001 to .0025 inch foils, is a rubber derivative obtained by treating natural rubber with a solvent and passing hydrogen chloride through the solution. Rubber Hydrochloride has flexibility and stretch, and is used as insulation in wires. It should be noted that pliofilm insulation liberates hydrochloric acid vapor at high operating temperatures such as are likely to be encountered in the armored force service. Use of pliofilm insulated wire is prohibited for operation at 75 degrees C. or above.

This brief review should give the reader a picture of the part plastics are playing in Signal Corps equipment. As one example, the Signal Corps has placed orders for over a million flashlights to be fabricated from ethyl cellulose by injection molding. These were formerly made from sheet brass.

It is highly desirable to conduct laboratory tests on articles molded or fabricated from plastics to demonstrate whether or not the material will stand up under service conditions. The following tests should be made: physical, electrical, chemical, molding and thermal.

Specific requirements have been set by the American Society for Testing Materials.

Conditioning of Plastics for Testing

It is highly important to condition all plastics prior to testing. This means preliminary exposure for several days to standard conditions of temperature and humidity, usually 50 percent relative humidity at 25 degrees C. In addition, temperature and humidity during the test period must be noted for both thermosetting and thermoplastic materials.

Where conditioning is specified perfectly dry, a dessicator containing calcium chloride or a hot box at 125 degrees F. can be used. About one week is required in the dessicator, and 48 hours in the box.

Physical Tests

Tensile Testing methods are covered by ASTM specification D229-39. Standard specimens 9 inches long and 3/4 of an inch wide at the ends, with a reduced section 2.25 inches long by 1/2 inch wide are cut from the sample. Sheet stock may be used up to 1/2 inch thick, molded stock specimens should be about 1/8 inch thick.

The specimen is tested in a standard universal testing machine and the ultimate tensile strength computed from the ratio of the maximum tensile load to the cross section area of the test portion. A stress-strain curve may be drawn, the slope of the first portion being the modulus of elasticity. Measurement of elongation requires more skill and gage marks must be carefully made to avoid scratching the surface. An arm connected to a gage graduated to .0001 inch or .001 inch and cemented or taped to the test specimen may be used.

Compression Tests are conducted on a cylindrical specimen 1 1/8 inch diameter by 1 1/4 inch long. These dimensions may vary 5 percent for hot molded plastics, and 10 percent for cold molded. The load is measured when the pointer of the universal testing machine starts to decline.

Shear Tests are useful for analyzing the strength of cemented joints or checking the strength of laminations. Two shear methods are used, one for compression and the other for tension.

Flexural or Transverse Strength Tests are conducted by applying load at the center of a beam between supports 4 inches apart. The load required to produce failure is recorded and the flexural strength computed from a standard formula.

Impact Strength

Two types of tests are performed: Charpy Impact Test and Izod Test. In the Charpy Test the specimen is placed horizontally and ruptured by a blow delivered half way between the supports. In the Izod Test the specimen is notched and held as a vertical cantilever beam. It is broken by a blow delivered at a certain distance from the clamped edge.

Hardness

The types of hardness tests usually used for plastics are as follows:

a. Ball Indentation Tests (Brinell and Rockwell). The values vary with temperature and time the load is applied;

b. Scratch Resistance is obtained by measuring the width and depth of a groove made by drawing a diamond point across the surface of the plastic;

c. Durometer measurements are useful for softer plastics and use a needle type penetrometer;

d. Abrasion Tests may be conducted with abrasion materials, noting the loss in weight of the plastic.

RESTRICTED

Electrical Tests are specified in ASTM specification D149-39T. Dielectric strength tests are usually made with a 50,000 volt transformer. The puncture voltage divided by the thickness of the material is the dielectric strength in volts per mil. Plastics may break down at high voltages and a sample having a large area must be used to avoid flashover at the edges.

Insulation Resistance is covered by ASTM specification D257-38. A distinction should be made between volumetric resistance and surface resistance. Volumetric resistance is the resistance to leakage thru the material while surface resistance is dependent on surface roughness and moisture absorption.

The capacitor discharge consists of applying a voltage to a capacitor which is charged, and then discharged into the unknown resistance. Measurement of the time of discharge to a certain value indicates the insulation resistance.

Arc Resistance - Plastics which carbonize due to a spark discharge possess poor arc resistance.

Thermal Tests. The flammability of a plastic may be obtained by determining how much it supports combustion. A short length of plastic is suspended vertically and ignited at the lower end. The length of plastic which burns is a measure of the flammability of the material.

Thermal Expansion - Volumetric expansion may be determined by placing a specimen in light oil and raising the temperature slowly. When the specimen is heated, it expands and the change in apparent weight is measured on a balance. The volumetric expansion is determined from the change in weight.

Thermal Conductivity. As outlined in ASTM specification D325-31T, thermal conductivity is obtained by comparing the temperature gradient of the unknown sample against that of a standard sample of known thermal conductivity.

Heat distortion point is obtained by immersing test samples $\frac{1}{2} \times \frac{1}{2} \times 5$ inches in heated oil both between supports 4 inches apart. The temperature is raised at a rate not exceeding one degree C per two minutes. A weight of $5\frac{1}{2}$ lbs. is applied at the center of the sample and when the deflection at the center measures .010 inch, the temperature is read and recorded as the heat distortion point.

Humidity and Sunlight Tests - Certain plastics are affected appreciably by humidity. This can be detected by alternate 24 hour tests in dry and moist atmospheres, until failure occurs. Samples placed about one foot from a powerful sunlamp and subjected to humidity may warp or discolor.

These laboratory tests are extremely useful in comparing different plastics but it must be remembered that they must be supplemented by other tests on the finished product. Many valuable tests may be conducted on a finished article to check its operation under service conditions. It must be emphasized that plastics have a definite place in Signal Corps applications, but the limitations of plastics must be carefully studied for each particular job.

VI. EQUIPMENT COORDINATION

The itemized lists of equipment submitted by the SCTC to the SOS, and of approvals by the SOS, for standardization, adoption of military characteristics, etc., will no longer be printed in the detailed form carried in previous issues of this Information Letter. Henceforth, the salient items which do not carry a classification higher than "restricted" will be described in summarized form as reported by Equipment Coordination Branch, OCSigO. The outstanding actions for the last month follow:

Reel Unit RL-44-T3

The development project resulting in the development model of RL-44-T3 was based on military characteristics specifying a wire laying and recovery device utilizing a power take off on a 1/4 ton vehicle for Infantry use in handling Wire W-130. In view of serious defects found by the Infantry Board, the development project on Reel Unit RL-44-T3 has been suspended and it has been recommended that this project be closed out.

Anemometer ML-58

Action was taken to have the Anemometer ML-58 classified to limited standard as this item is not under procurement, and a standard item, the Anemometer ML-80, exists.

Public Address Set PA-5-( )

Military characteristics were approved for the adoption and standardization by the Commanding General, Services of Supply, of a portable public address system to be known as Public Address Set PA-5-( ). This set is to be comprised of an assembly of standard commercial parts assembled into a single carrying case suitable for transport and operation in a 1/4 ton, 4 x 4 truck. The components are to be a combination 20 watt amplifier and transcription unit 78 R. P. M. with a variation of 10 percent, capable of operation from a 6 volt D.C. battery or 110 volt 60 cycle power source, 2 weatherproof loudspeakers, battery, battery charger, necessary cables and accessories. It is not expected that the item will be available for issue in quantity prior to June 1943.

Meteorological Balloons

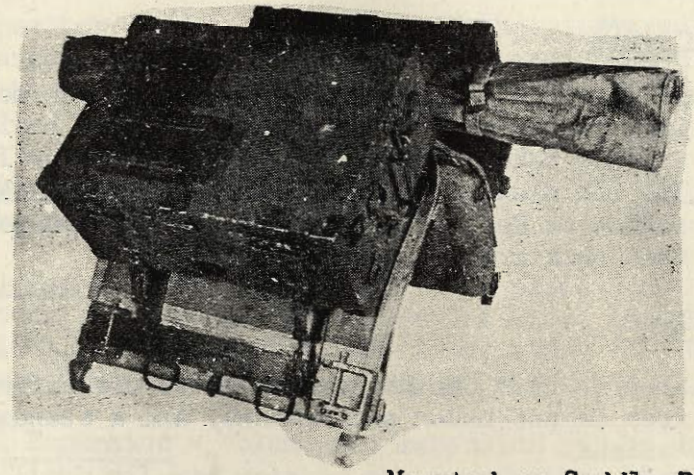
Authorization has been given for service test by the Army Air Forces of meteorological balloons constructed of neoprene latex. Several hundred of the balloons have been shipped to the service testing agencies and tests will be conducted to determine their suitability for military use.

Blackout Adapter M-374

Military characteristics were presented to the Signal Corps Technical Committee for adoption and authorization for the development of Blackout Adapter M-374. This item is an adapter for use with standard Flashlights TL-122-A when constructed of either metal or plastic. The filter to be provided shall be an approved War Department Standard Filter. The adapter shall have ample space to carry a spare bulb and several filters.

Radio Set SCR-583-( )

Recommendations for the standardization of Radio Set SCR-583-( ) were presented to the Signal Corps Technical Committee. This set consists of a transmitter and receiver designed for Cavalry use to replace Radio Set SCR-203. Radio Set SCR-583-( ) is arranged in two chests for pack animal loading and can also be frame mounted for use in vehicles. Power sources are dry battery for the receiver, hand generator for the transmitter, and the set will also operate from 6 or 12-volt vehicular systems. The recommendations included the reclassification of Radio Set SCR-203 from Standard to Limited Standard.



Mounted on Saddle Pack

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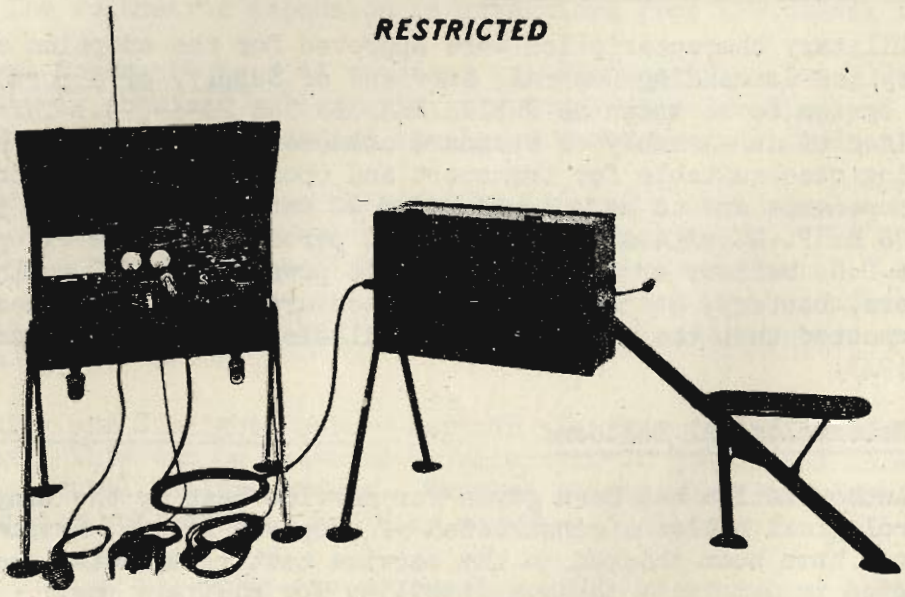

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Prepared for Field Operation

RADIO SET SCR-583

Daylight Projection Box PH-420 - Film Viewer PH-419

Daylight Projection Box PH-420 and Film Viewer PH-419 (16 mm) were submitted to Signal Corps Technical Committee recommending that consideration be given to standardization. The Daylight Projection Box PH-420 is a collapsible unit which when set up permits viewing of projected still or motion pictures under natural or artificial illumination. The Film Viewer PH-419 can be used with Film Repair Equipment PH-206 or Rewinder PH-416 (16 mm). It provides a means to edit and repair a 16 mm film which is not now provided by any existing equipment.

Reports on Excessive Maintenance

In order to expedite corrective measures where excessive maintenance is required on signal equipment, return address official post cards are being distributed to all units using Signal Corps equipment in the field. The text side of the card is shown here in facsimile.

TO: CHIEF SIGNAL OFFICER, WASHINGTON, D. C.
SUBJECT: ITEMS REQUIRING EXCESSIVE MAINTENANCE

ECHELON OF MAINTENANCE_____

ITEM NOMENCLATURE_____

WHERE USED IN SET_____ PART OF_____

PERSONNEL USING (check one) Experienced___Inexperienced_____

TYPE OF FAILURE (check one) Breakage___Burned Out___Melted _____
Approx. tem._____Frozen _____ Other_____

USED BY (Using Arm-Inf.,Art.,etc.)_____

WHAT HQ. (Regt.,Bn.,etc.)_____

LOCATION OF UNIT (check one) Tropical___Jungle___Frigid___Temp___

FREQUENCY OF THIS TYPE OF TROUBLE (check one) daily___weekly_____
Monthly_____ _____monthly_____

PERCENTAGE OF UNITS OF THIS TYPE FAILING:

_____per day_____week_____month_____(check one)

REMARKS:

(please specify nature of trouble)

A noteworthy feature of this means of reporting is that the card does not contain numerical designation or geographical location of the reporting unit. Thus the cards can be dispatched by a means of transmission no higher in classification than that of the particular equipment on which the report is made. In the case of unclassified equipment, the card can be sent by ordinary mail. Prompt replies on these forms from tactical units will facilitate action to provide maintenance material in the necessary quantities or, if warranted, to initiate action for redesigning the equipment so as to lessen the probability of failure.

VII. SIGNAL CORPS BOARD

Reports of the Signal Corps Board on the following cases have been approved by the Chief Signal Officer during the past month:

SIGNAL CORPS BOARD CASE No. 343 - Approved January 19, 1943.

Lineman's Climbers

This subject was previously studied under the original case No. 343, which was approved by the Chief Signal Officer May 20, 1941. One of the recommendations of this case was that at least ten pairs of the Brooks Adjustable Climber be procured for examination and service test.

It was particularly desired to ascertain if the Brooks Adjustable Climber, which would be used as a tree climber, was a suitable substitute for issue in place of the regular Lineman's Climber.

The Signal Corps Board tested these climbers and modified two pairs in a manner which they considered an improvement over the commercial equipment. Tests were made on both commercial and modified climbers.

The approved recommendations follow:

a. That the Brooks Adjustable Climbers be not adopted as an alternate for procurement under Specification 29-7, nor as a separate type of tree climber.

b. That Lineman's Climber (Tree) be adopted for use in climbing trees of such character that the standard pole climber is inadequate. Examples (Klein Standard Tree Climber, Graybar Electric Company, No. 1907).

c. That the following basis of issue for Lineman's Climbers be adopted:

Article	Basis of Issue	
Lineman's Climbers	Per 10 Linemen	641
	Per 10 Linemen	643

SIGNAL CORPS BOARD CASE No. 480 - Approved February 6, 1943.

Luminous Compounds

The Signal Corps Board was directed to conduct an investigation of luminous compounds to determine if a need existed for such compounds, on what equipment they could be practicably used, and to suggest a basis of

issue. The study was made with particular reference to blackout conditions in the forward combat area. The Board coordinated its study with previous studies of the Engineer Board and tested new materials. Three general types of luminous compounds were considered:

a. Luminescent compounds, which are capable of emitting visible light without being heated to incandescence;

b. Fluorescent compounds, which emit visible light during exposure to radiant energy of another length;

c. Phosphorescent compounds, the usable members of which not only fluoresce during exposure to radiant energy of suitable wave length, but also continue to emit visible light for appreciable periods of time after removal of the energizing radiation.

The Board concluded that phosphorescent and fluorescent compounds were of very limited military use due to lack of security, short life, or difficulties in preparation and activation. Radioluminescent compounds were of little value for use where legibility is required at medium and long distances. A further disadvantage of this type of compounds is expense for materials and labor. However, radioluminescent compounds had a very definite military value when used for illuminating small signs, identifying markings, dial and scale markings, etc., on signal equipment.

The following recommendations were approved:

a. That no further consideration be given at the present time to the use of phosphorescent compounds and materials in the Signal Corps;

b. That no further consideration be given at the present time to the use of radioluminescent signs for medium and long distance visibility purposes;

c. That arrangements be made to obtain recommendations from the Army Ground Forces as to the specific items of Signal Corps equipment and parts thereof requiring radioluminescent treatment, such recommendations to be based on tactical security needed for operation of the equipment under blackout conditions in forward combat areas;

d. The Signal Corps Ground Signal Service be directed to:

(1) Make a study to determine the availability of radioluminescent compounds for the anticipated use of these compounds in the illumination of Signal Corps equipment.

(2) Prepare specifications for the application of radioluminescent compounds to Signal Corps equipment, these to include life and performance specifications for the compounds themselves.

e. When recommendations of paragraph c above are received from the Army Ground Forces, the Signal Corps Ground Signal Service be directed to

amend specifications and include in new specifications provisions for the illumination of Signal Corps equipment with radioluminescent compounds.

f. The Signal Corps Technical Committee be directed to include in Military Characteristics proposed for adoption, a requirement for treatment of Signal Corps equipment with radioluminescent compounds wherever intended use indicates a tactical need for such treatment.

SIGNAL CORPS BOARD CASE No. 513 - Approved February 1, 1943

Use of Guy Clamps on Stranded Wire

The Signal Corps Board was directed to consider the use of the wrapped splice method of terminating stranded guy wire, and to inspect, test and report upon the efficiency of a special serving tool manufactured by the Bethlehem Steel Company

It was thought that the use of a wrapped splice at one end of a guy wire would eliminate the use of one standard three-bolt clamp and so result in a saving of critical materials, labor and transportation. The tool was considered as a means of accomplishing a secure workmanlike splice by personnel of limited experience and skill.

The Board concluded that there was a possiblity of a saving of fifty percent in the number of clamps required, but that no labor would be saved as the time required for making the wrapped splice was the same as in installing the clamp. The creeping of the served eye is negligible for normal loadings.

The approved recommendations are as follows:

a. It is recommended that:

(1) Instructions issued to the field be amended to instruct personnel in:

(a) Both the wrap method and eye-bolt method of attaching guys.

(b) The use of the serving method of attaching guys using pliers in order to reduce the number of guy clamps required in making up guys.

(2) This tool be considered for installing fixed plant.

SIGNAL CORPS BOARD CASE No. 487, Supplement I - Approved February 12, 1943.

Helicopter and Autogiro for Signal Corps Use

The Signal Corps Board was directed to make an investigation of the Sikorsky Helicopter and of commercial autogiros. A report covering the technical capabilities of these machines and their possible uses by the Signal Corps was desired.

The Board analyzed information available concerning the Helicopter, studied reports of the use of similar machines in the British Army and sent representatives of the Board to view tests and make flights in the Helicopter. It was also learned that the Army Air Forces had on order several of these machines in an approved model.

The Board concluded that the Helicopter, due to its ability to ascend and descend vertically at low speeds and to hover above a particular point for a considerable length of time, appeared to have characteristics valuable in signal operations. The members did not feel, however, that the data at hand was sufficient.

The approved recommendations were as follows:

a. That arrangements be made to secure from the Army Air Forces at the earliest practicable date, recommendations as to the best type of aircraft for the performance of the following Signal Corps functions:

(1) Message pick-up and delivery;
(2) Signal reconnaissance;
(3) Transportation of Signal Corps personnel;
(4) Transportation of signal materiel;
(5) Radio beam work, calibration of radio direction finders, measurement of radio beam widths, etc.

b. That arrangements be made with the Army Air Forces for the conduct of service tests to determine the practicability and the feasability of employment of helicopters for Signal Corps purposes in combat zones, together with arrangements for representatives of the Signal Corps Board, and other interested organizations of the Signal Corps, to coordinate the conduct of the tests.

VIII. ACTIVATION AND MOVEMENTS OF UNITS

The 820th Signal Motor Messenger Company was constituted by War Department letter dated January 10, 1943, and was activated by the Commanding General, First Service Command, at Fort Ethan Allen, Vermont, on January 25, 1943, with an authorized strength of ten officers and one hundred fifty-five enlisted men. The unit will be prepared for functional duty. Upon activation and prior to movement the unit is assigned to the First Service Command for preparation for extended field service.

The 828th Signal Pigeon Replacement Company was constituted as of January 11, 1943, and will be activated at Fort George G. Meade, Maryland, on February 15, 1943, with an authorized strength of fourteen officers and two hundred sixteen enlisted men. Upon activation, the unit is assigned to the Third Service Command for preparing combat teams and individuals for extended field service.

The 289th Signal Company, one of the elements of the 4th Engineer Amphibian Brigade, was constituted on January 13, 1943, and was activated by the Commanding General, Engineer Amphibian Command, on February 1, 1943, at Fort Devens, Massachusetts.

The Commanding General, Second Army, issued orders to transfer a detachment of the 282d Signal Pigeon Company, consisting of one officer and one combat section, from Camp Crowder, Missouri, to Camp Hale, Colorado. Upon arrival at Camp Hale, Colorado, this unit will be relieved from assignment to the Second Army and will be assigned to the Mountain Training Center.

The 847th and 848th Signal Training Battalions were constituted on January 14, 1943, and will be activated at the Central Signal Corps Training Center, Camp Crowder, Missouri, by the Commanding General of the Central Signal Corps Training Center. The units are assigned to the Seventh Service Command and will be prepared for extended field service. The function of these units will be to train units for overseas duty.

The signal units listed below will move from Camp Crowder to the stations indicated:

Unit	New Station
59th Signal Battalion	Fort Jackson, S. C.
94th Signal Battalion	Camp Edwards, Mass.
96th Signal Battalion	Camp Livingston, La.
98th Signal Battalion	Camp Blanding, Fla.

These are permanent changes of station.

Upon arrival at new stations these units are relieved from attachment to the Second Army and are assigned as indicated:

Unit	Assigned to
59th Signal Battalion	XII Corps
94th Signal Battalion	XIII Corps
96th Signal Battalion	IV Corps
98th Signal Battalion	VII Corps

The 245th Signal Operation Company will move, upon conclusion of temporary duty in Third Army maneuvers, from its station in the Louisiana maneuver area (permanent station, Camp Barkeley, Texas) to Fort Sam Houston, Texas. This is a permanent change of station.

The 44th Signal Company, stationed at Fort Lewis, Washington, is relieved from assignment to the Western Defense Command and reassigned to the Army Ground Forces and to the IX Corps.

On January 21, 1943, the 1st Signal Training Battalion, was constituted and activated as a part of the Western Signal Corps School.

Effective as of January 25, 1943, the 15th and 16th Signal Radio Installation Teams (Type A) were constituted and will be activated by the Commanding General, Second Service Command, at the Eastern Signal Corps Training Center, Fort Monmouth, New Jersey. Upon activation the units will be assigned to the Second Service Command and will be prepared for extended field service.

The 7th B Platoon, Signal Photomail Company, was activated on February 1, 1943, at Fort Meyer, Virginia, by the Commanding General, Military District of Washington, with an authorized strength of two officers and twenty-one enlisted men. Upon activation, the 7th B Platoon, Signal Photomail Company, was assigned to the Military District of Washington and will be prepared for extended field service.

The 32d Signal Construction Battalion, affiliated with the General Telephone Corporation, will be organized on March 25, 1943, at the Signal Corps Unit Training Center, Camp Crowder, Missouri, by the Commanding General, Seventh Service Command. Upon organization the unit will be assigned to the Seventh Service Command and will be prepared for extended field service.

The 805th Signal Service Company was constituted on February 2, 1943, and was activated on February 10, 1943, by the Commanding General, Second Service Command at the Bell Telephone Laboratories, 463 West Street, New York City, New York, with an authorized strength of thirty officers and fifty-eight enlisted men. Upon activation the unit was assigned to the Second Service Command and placed under the control of the Chief Signal Officer for training only.

On or about March 1, 1943, the 79th Signal Company will be transferred from Camp Blanding, Florida, to Shelbyville, Tennessee, for temporary duty in the Tennessee maneuver area. This is a temporary change of station and the unit will not return to Camp Blanding, Florida, but will be ordered to a new permanent station to be announced.

Upon request of the proper authorities, the following affiliated Signal Corps units will be ordered into the active military service of the United States and will be organized as early in March, 1943, as practicable:

5th Armored Signal Battalion
34th Signal Construction Battalion
61st Signal Battalion

The 29th Signal Construction Battalion (negro enlisted personnel) has been transferred from Camp Gordon, Georgia, to the Desert Training Center, Camp Young, California, for permanent change of station.

The Headquarters and Headquarters Companies of the following Corps (including signal sections) have moved from their present stations to the new stations listed below:

Hq & Hq Co	Present Station	New Station
IV Corps	Camp Beauregard, La.	Ft. Lewis, Wash.
IX Corps	Ft. Lewis, Wash.	Camp Young, Calif.
IV Armd Corps	Camp Young, Calif.	Camp Campbell, Ky.

These are permanent changes of station.

The following units are constituted and will be activated by the Commanding General, Second Service Command, at the Eastern Signal Corps Training Center, Fort Monmouth, New Jersey, each with an authorized strength of one officer and fourteen enlisted men:

17th V. H. F. Installation Crew
18th V. H. F. Installation Crew
19th V. H. F. Installation Crew

Upon activation these units are assigned to the Second Service Command and placed under the control of the Chief Signal Officer for training only.

IX. FORT MONMOUTH ENLISTED SCHOOL

Approximately 200 students from the Engineer Amphibian Command will be sent to the Enlisted School for special training in radio and wire subjects.

The Enlisted School had approximately 5,000 students on February 1. There were 41 students from the 829th Signal Service Battalion who were given training on FM equipment during January.

Wire students are receiving instruction on Facsimile equipment, RC-120, which recently arrived at the school.

Training Literature

X. COMBINED RADIO PROCEDURE

Preparation has begun for the revision of FM 24-10 in order to prescribe the procedure that has recently been approved by the Combined Communications Board for use in the combined United States-British services. Revision also has begun on all related manuals on radio procedure.

Military Intelligence

XI. GERMAN RADIO BEAMS FOR ATTACKING THROUGH SMOKESCREEN

A German manual, as reproduced in translation in "Tactical and Technical Trends" (Restricted), and quoted here by permission of G-2, sets fort various means of indicating direction to troops attacking through an area covered by a smokescreen. Among these means is directional radio. The description follows:

"A radio beam -- a transmitter and several receivers working in conjunction with it. The transmitter is set up at the line of departure, and lays a radio beam about 20 meters wide through the smoke in the direction of the objective. By using the receiver, one can check at any time whether he is on the radio beam, i.e., in the line of the attack, or has deviated to a flank. This equipment is mainly intended for the leading units of the forces carrying out the attack. Transmitter, receiver, and service personnel will be provided by a special communications unit. For such employment they are attached to the attacking unit."

The same manual also lays emphasis on the need for extensive use of radio for communication. Quoting again:

"The lack of observation in the smoke-covered area makes necessary the extensive use of radio, even for lateral communication. When the far edge of the battle zone is reached, communications with the artillery must be established by all means available. The increased requirement for means of communication makes it clear that additional signal units should be provided."

IT'S IMPORTANT TO VARY YOUR SHOTS

In 1918 the German Artillery with its unreasoning love of order followed a series of strictly precise intervals between shots in the bombardment of Paris. The French consequently always sought shelter when another shot was expected.

AND JUST AS IMPORTANT TO VARY YOUR TEXT

"The factor which was of decisive importance for the solution of (German) ciphers . . . consisted in the constantly increasing knowledge on the part of the French experts of the subject of the general aspect of the German radio telegrams, such as the style of the telegrams, the terminology and structure of ordinary reports and orders, ordinary abbreviations, introductory and closing service expressions, etc., all of a highly standardized and stereotyped nature. During the whole war . . . this stereotyped style formed one of the most valuable sources for the French experts in the work of cryptanalysis, especially in the solution of the code books later used by the Germans."

- From "The Contribution of the Cryptographic Bureaus in the World War" by Yves Gylden.

AVOID A STEREOTYPED STYLE

ANY WORD OR PHRASE CAN BECOME STEREOTYPED BY HABITUAL USE

XIII. LESSONS FROM RECENT FIGHTING IN TUNISIA

The following extracts from a Training Memorandum published in North Africa have been issued by The Adjutant General for information and guidance in conducting the training of units and individuals. This information is brought to the attention of those officers who are directly responsible for this training. It will be noted that the extracts pertain to those subjects which have been repeatedly emphasized by the Training Division, Headquarters, SOS.

"In general, the mistakes which have been made are repetitions of those which have been made during peace-time maneuvers. The current mistakes have been paid for with precious lives. The solution is the inculcation of such a state of discipline that men will, in the excitement of battle, instinctively do the things which they have been taught to do in the classroom, on the drill field, and on maneuvers.

"Slit trenches. In the case of almost all troops in their first action, slit trenches were not dug until too late. A great many avoidable casualties have resulted — principally from dive bombers and armored attack. There are numerous cases of men being crushed by tanks because of slit trenches being too shallow. When suitable trenches were constructed and properly used, casualties from dive bomber attack were negligible. It is not correct for those charged with training to assume that men in battle will not have to be told to dig in. Many lives which are lost while learning the lesson on the battlefield can be saved by proper instruction and strict battlefield discipline.

"Cover and concealment. Again the mistakes made during maneuvers have been repeated on the battlefield, but now at the cost of lives instead of an assessment of casualties by an umpire. Use of haystacks has been one of the most effective improvised means. In areas where there is no natural cover, reliance must be placed on dispersion. The object of dispersion is not only to reduce the effect of bombing but to produce a target which the enemy will consider not worth the bombing. Under these conditions a minimum dispersion of 100 yards between vehicles is necessary.

"Air-ground mutual recognition. There has been one reported case of our own troops being attacked by friendly planes after having been fired upon by the ground troops. Such incidents have a morale factor all out of proportion to the resulting casualties.

"Leadership. The necessity for command and staff supervision at the critical point of a battle, or maneuvers preceding battle, has been demonstrated time and again in the current operations. In general, personal leadership by commanders has been of the highest order, and there have been many examples of the personal bravery of officers and non-commissioned officers inspiring their men to superhuman effort.

"Results from use of antitank rifle grenades have been disappointing because of lack of marksmanship training. No weapon can be effective unless men are trained to use it. Thorough preliminary training must precede expenditure of service ammunition for training purposes. Instances have

occurred in which men fired antitank grenades for practice but had had no previous instruction in such elementary subjects as loading and aiming. Such practice results in lack of confidence in the weapon and is wasteful of ammunition.

"Motor transport. There have been instances of troops detrucking in the zone of hostile small arms fire. Severe losses were incurred which could have been avoided by proper reconnaissance and security measures. Kitchen trucks were destroyed by enemy action while carrying the noon meal to front line elements. Despite the lessons of years, we still operate truck columns on roads in daylight, sometimes closed up, when the movement could have been made at night.

"The armament of enemy attack aircraft appears in some cases to be so adjusted that a small cannon fires on a motor column while machine guns sweep the ditches on both sides of the road. If men leave vehicles to escape strafing, they should disperse into the fields at least 50 yards beyond the ditches. The aircraft usually bomb first, then return for fire attack. In many cases opportunities for effective fire at hostile aircraft within easy range of small arms have not been exploited. The cumulative fire power of a number of rifles, together with that of every other available weapon, will contribute effectively to the protection of either foot or motor columns against low-flying aircraft. Experience has shown that when enemy aircraft meet such a volume of fire from ground troops, they cease attacking at low altitudes. The duty of every individual soldier to contribute his share of fire, small as it may seem to him, is obvious.

"Destruction of equipment which is to be abandoned has not been effected, in all cases. The loss of equipment, which the enemy puts into use, is the equivalent of the loss by destruction of double the amount of equipment. The usual reason given for failure to destroy an abandoned vehicle is that it may be recovered. No such assumption can be made when engaged in a retrograde movement.

"Booby traps are being employed extensively by the enemy. Anything left lying about on the ground which has just been gained, which might be considered a good souvenir, should be studiously avoided. Small bombs are frequently dropped from planes which will explode when picked up. These are usually in the form of fountain pens, pencils, attractively colored balls, etc.

"Route reconnaissance. Again the mistakes made in maneuvers have been repeated on the battlefield, resulting in much loss of motor equipment which requires so much precious tonnage to transport to the theater, in one case reducing the combat efficiency of a unit to almost zero -- all because of failure to make a route reconnaissance, or failure to appreciate the true condition of the route selected. Seldom will circumstances justify a move by a motorized element over an unknown route without prior reconnaissance. In a withdrawal, route reconnaissance is particularly important. To be stampeded by enemy direct pressure into a movement without reconnaissance is simply playing into his hands. That is what he wants us to do. Route reconnaissance by motorized units is continuous - and in all directions. What is a good road today may be impassable tomorrow. A road which is perfectly safe to traverse in daylight may be extremely hazardous for a movement of large convoy at night."

XIV. OFFICER PROMOTIONS

The following promotions have occurred among Signal Corps personnel during the period from January 22, 1943, to March 4, 1943, inclusive:

Lieutenant Colonel to Colonel (Temporary)

Brown, Charles Brundy
Kunesh, Fred Wallace
Mandelbaum, Albert Joseph
McGraw, James Freeland
Palmer, Glenn Hunter
Pogue, Virgil Richard

Major to Lieutenant Colonel (Temporary)

Balkow, Ernest Carl
Belden, Arthur W.
Bess, Walter Bernard
Blackmon, Cnarles Mason
Bodine, Donald Read
Bonar, Harold Ernest
Bradley, William Tatum
Brickson, Herbert Olause
Briskin, Samuel Jacob
Crockatt, George W.
Davenport, James Franklin, Jr.
Elser, Fred Johnson
Eubank, Charles Grandison
Gran, Conrad Leonard
Harris, John Darling
Hoff, Stuart Sheets
Johnson, Kenneth Dewey
Kaiser, George B.
Laird, Orville
Leeds, Charles Tileston, Jr.
Madden, Joseph Patrick
Maynard, Perry Coates
Montague, Joseph Leon
Mower, Nathaniel Lincoln
Moynahan, George Francis, Jr.
Nash, Garvin Wright
Niehaus, John Mark
Pengilly, Joseph Hill
Prina, Frank
Ropp, J. Gus
Rusk, Ralph Hayes
Snouffer, William Noel
Snyder, Nathan Claude
Taylor, Hubert Leland
Tigner, Oscar Clyde
Wagner, Victor Hermann
Westphal, George A.
Williams, Robert O.
Yates, Charles Potter

Captain to Major (Temporary)

Adams, Clyde Benton
Andrus, Edward Delevan
Badden, William Earl
Bagley, Ray Mason
Banks, Charles Thomas
Bigelow, Rolland Arlington
Bohm, Louis Joseph
Britchey, Jerome Morris
Brombach, Charles Urban
Burch, Charles Herpel
Butler, Everett Lindon
Byers, Clyde Whitfield
Campbell, William B.
Carvill, Edward T.
Chapin, Edward Luther
Cooney, William Henry

RESTRICTED

Cont'd

Captain to Major (Temporary)

Crone, Charles Frederick
Dahl, Earl Barnum
Daniel, Vincent Eldridge
Dansereau, Raymond Henry
Davis, William Tuck
Dees, Allen DeWitt
Dewey, Charles Clifford
Diamond, Alfred E.
Dickinson, William Dewoody, Jr.
Dorsey, Leonard Edward
Doty, William Joseph
Dunlap, Joseph Herbert
Dunn, Thomas Joseph, Jr.
Earl, Edwin Osborne
Earlix, Louis
Eastmond, Leon Elbert
Fay, Charles Joseph
Fazakerley, Franklin James
Fischer, Morton
Fiske, Willard Arthur
Franklin, William Warren
Furse, Stephen Smith
Gaghagen, Howard Raymond
Galusha, Morris Edgar
Garwood, Paul Simpson
Genet, Ira H. R.
Goodrich, Raymond Harold
Green, Austin Herbert
Grimes, Willard Mudgette
Harrison, Charles Thomas, Jr.
Harvey, Daniel Martin
Heath, Milton Weeks
Heavner, William Stewart
Helton, Burrell Washington
Heng, Edward Jacob
Henry, James John
Higginson, George Mercer
Hill, Arthur Culiver
Hoenig, Harold
Hoke, Archie Stanley
Hoover, Blaine, Jr.
Hull, John William
Jay, Mack Carter, Jr.
Johenning, Alvy Grayson
Kilbourne, Lawrence Wilford
Krohn, Norris Fredrick
Kuhn, Kenneth
Lidke, Frank John
Lutz, Frederick Henry
Lynch, Victor Theodore, Jr.
Marshall, Elmer Preble
Martin, Benjamin Wallace
Mautz, Matthew Charles
Maywald, Frederick John, Jr.
McCullagh, George Henry
McDougle, Darrel Bennawell
McKinley, Harold Alexander
Mellinger, Penrose Strawn
Meyers, Robert Alan
Misener, Garland Clyde
Molstad, Perry
Morin, Arsene Walter
Muir, Willard Andrew
Mull, Emerson Ewell
Munson, George Poindexter, Jr.
Nelson, Russell Conrad
Nicholas, Jack Voorhies
Nicholson, Harvey Henry
Norton, John Edward
Osborne, Eric Robert
Parker, James DeBlois
Parrish, Donald Maltby
Peavey, Frank Hutchison
Pomy, Herman John
Rhoad, Edward Jay, Jr.
Rosen, Leo
Rowlett, Frank Byron
St. Clair, Orla
Scholl, Raymond George
Sharp, Samuel Miles
Sheard, Thomas Ed
Simmons, Harry Dady
Smith, Ellis
Stratmann, Cletus John
Thomas, James Kieling
Tighe, James Stewart
Tindall, Robert Francis
Turner, Art
Turner, Grady T.
Ulans, Roman Irodian
Wardell, William LaClair
Watson, James Cecil
Whitney, Walter North
Wilson, Harvey James
Wilson, Maurice Dean
Wisniski, William Herman
Wood, Cecil Henry
Wood, William Horner
Wynne, Edward Patrick
Yarbrough, Henry Bowen
Yocum, Charles H.

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