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SIGNAL CORPS
Technical Information Letter
FEBRUARY · 1945

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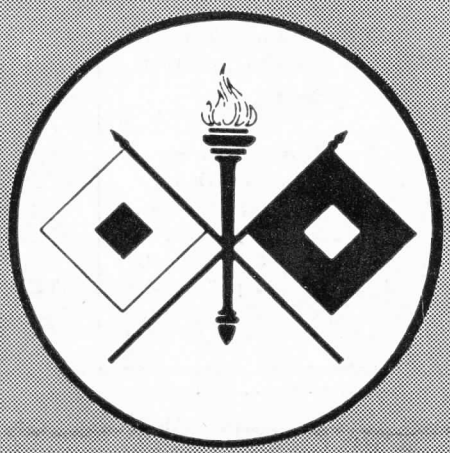

SIGNAL CORPS

TECHNICAL INFORMATION LETTER

PURPOSE THE SIGNAL CORPS Technical Information Letter is a monthly publication designed to keep Signal Corps personnel and other military personnel using Signal Corps equipment informed on Signal Corps matters. It provides means for the dissemination and interchange of information of a widely-varied nature, both technical and tactical.

SOURCE THE LETTER is compiled mainly from information available in the divisions and branches of the Office of the Chief Signal Officer. Signal Corps and other communications personnel are invited to submit, through channels, material of general interest. Information on problems encountered and overcome by combat and service communications troops is desired. Such items should reach the Chief Signal Officer (SPSAY) not later than the 15th of each month for inclusion in the letter for the following month.

DISTRIBUTION DISTRIBUTION overseas is made by The Adjutant General on the following basis: Theaters of Operations (25); Armies, Corps, Departments, Island Commands, Air Forces and Base Commands (10); Divisions and AAF Commands (7); AAF Wings and Groups (4); AAF Squadrons (2); Signal Battalions (6); Signal Companies and separate Signal units (2).

Within the continental limits of the United States the Letter is distributed to Signal and other Ground and Service Forces units and installations by the Chief Signal Officer (SPSAY), Washington 25, D. C. Distribution to Army Air Forces units and installations in the continental United States is made by the Commanding General, Army Air Forces (AFMPB), Gravelly Point, Virginia.

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WARNING THIS publication is issued solely to give proper and speedy dissemination to timely, useful information concerning pertinent trends and developments. Nothing herein is to be construed as necessarily coinciding with United States Army doctrine. Changes in official doctrine, as they become necessary, will be officially published as such by the War Department.

Publication approved by Bureau of the Budget, Executive Office of the President

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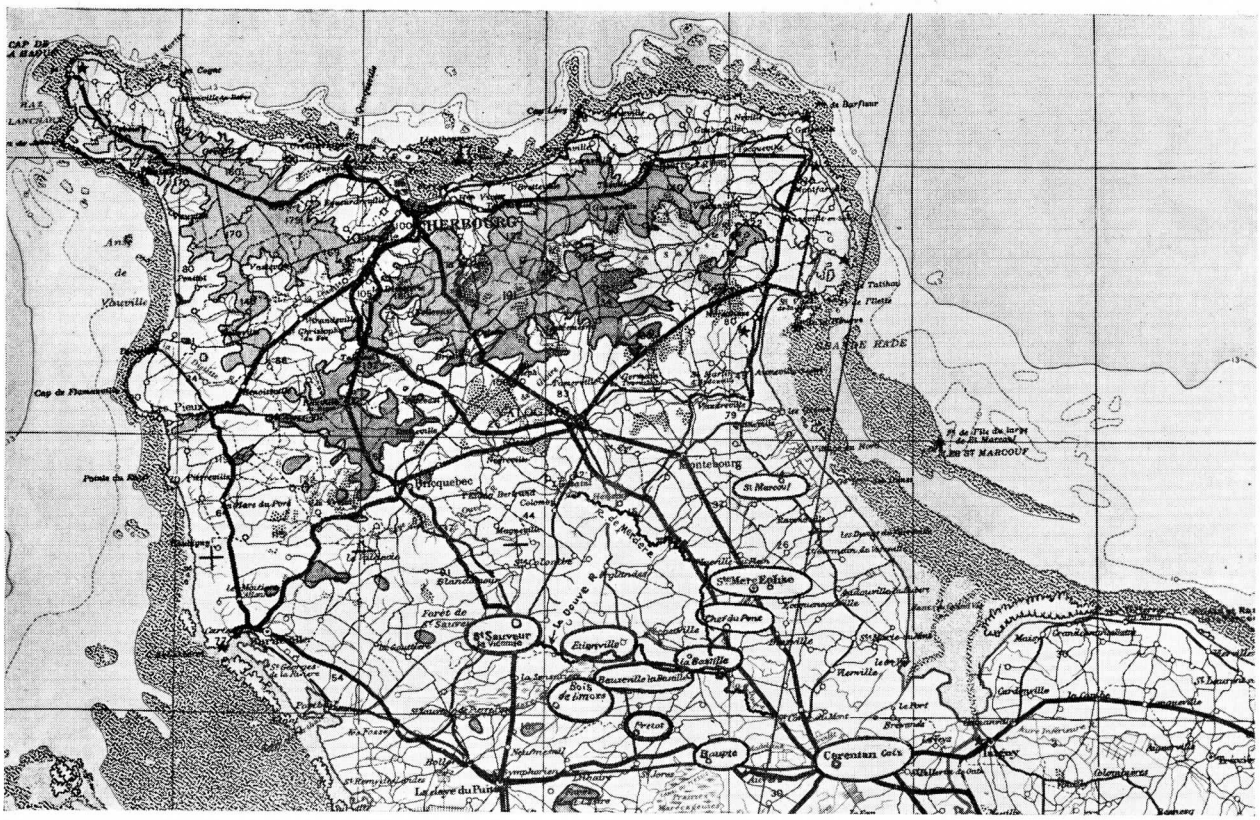


82D SIGNAL COMPANY (A/B)

The Story of the 82d Airborne Division and of Its Signalmen Who Won a Unit Citation for Their Work During the Invasion of France

A GRAPHIC account of the exploits of the 82d Airborne Division during the period from 6 June 1944 to 8 July 1944 has been received in the War Department. The extracts that follow are printed as a sample of the type of fighting in which the 82d Airborne Signal Company participated and which won for it a Unit Citation.

Thirty days after the 82d Airborne Signal Company had been awarded the coveted gold-bordered blue ribbon, General Orders No. 89 announced the same award to the 101st Airborne Signal Company. Unfortunately, no account of the activities of the 101st Airborne Division during the invasion of France is available at this writing.

For its attack on Fortress Europe, the 82d Airborne Division consisted of headquarters and headquarters company, a glider infantry regiment, three parachute infantry regiments, and organic artillery, engineer, antiaircraft, medical, signal, quartermaster, and ordnance troops. Attached to the Division for the operation were a cavalry troop, field artillery units; tank, tank destroyer, and chemical battalions, quartermaster truck companies and other units. For this operation, the 82d Airborne Signal Company was reinforced until its strength was approximately that of the 1942 T/O's.

The French town of Ste. Mere Eglise was the target for leading elements of the Division the night of 5/6 June. To the north of this little town was the drop zone for paratroops of the First Parachute Infantry,[1] division headquarters, field artillery detachments, and a platoon of engineers. In this same area was the landing zone for glider-borne detachments from division headquarters, headquarters company, antiaircraft battalion, signal company, and Division artillery.

Slightly to the west of this zone, was the drop zone for the Second Parachute Infantry. South

[1] For purposes of security unit designations have been omitted. For easier reading the three regiments have been numbered chronologically.

General Orders No. 83
27 October 1944

The Eighty-second Airborne Signal Company is cited for extraordinary heroism and outstanding performance of duty in action against the enemy in the initial assault on the northern coast of Normandy on 6 June 1944. The forward echelon of the company landed by parachute and glider on D-day prior to H-hour on the Cotentin Peninsula in the area surrounding Ste Mere Eglise, France. Drops and landings were made in the face of artillery, machine gun, antiaircraft, and mortar fire which resulted in severe casualties and the destruction of valuable signal equipment behind enemy lines to prevent its capture. When a complete assembly of available personnel and equipment was effected, only the barest minimum requirements for communication within the division were made available. But the technical skills, ingenuity, resourcefulness, and untiring devotion to duty displayed by every officer and man of the company effected restoration of communications with higher echelons and base headquarters in the United Kingdom. The Eighty-second Airborne Signal Company remained in close proximity to the forward lines at all times. Duties were performed unhesitatingly with utter disregard for personal safety and with superior efficiency. The courage and preseverance shown by members of the Eighty-second Airborne Signal Company are worthy of emulation and reflect the highest traditions of the Army of the United States.

of this location, due west of Chef du Pont, was the drop zone for the Third Parachute Infantry, a company (–) of engineers, and other detachments from division headquarters, headquarters company, division artillery, and signal company. The landing zone for the medical company, field artillery, engineers and other units of the Division was directly to the east of Chef du Pont. These landings were made the evening of 6 June 1944. On the morning of 7 June the glider infantry regiment arrived at this same landing zone, east of Chef du Pont.

Seaborne elements of the 82d Airborne Division arrived beginning 6 June 1944. They included a parachute field artillery battalion, a quartermaster company, an ordnance maintenance company and attached unit plus detachments of other division organizations.

THE ACTION

At 0430, 6 June 1944 (H minus 3 hours), the Third Battalion of the First Parachute Infantry captured Ste. Mere Eglise. In conjunction with the Second Battalion of the same regiment these members of the Eighty-second never relinquished the town despite heavy and continuous enemy attacks from the north and from the south.

The First Battalion of the First Parachute Infantry, together with elements of the Second and Third Regiments, forced the enemy west of the Merderet River.

During two days of intensive fighting (6 to 8 June), a force from the Second Parachute Infantry captured Chef du Pont, and the Third Parachute Infantry contacted the Second Battalion of its regiment which was isolated 2 miles southwest of La Fiere. Throughout this phase of the Battle of the Merderet fighting was particularly heavy. Both the enemy and United States troops sustained heavy losses.

The Merderet River was crossed on the night of 8/9 June by the First Battalion, Glider Infantry, east of Amfreville. The Third Battalion, Glider Infantry Regiment, in conjunction with the Second Parachute Infantry and a tank battalion company, forced another Merderet River crossing at La Fiere on the morning of 9 June. Part of the Third Parachute Infantry then crossed at La Fiere and advanced to the southwest to contact its isolated Second Battalion. This secured the bridgehead. Again, throughout this phase of the battle fighting was particularly severe and heavy casualties were sustained by both sides.

During this period the First Parachute Infantry, with the Second Battalion, Glider Infantry,

AIRBORNE TROOPS ENTERING A FRENCH VILLAGE DURING THE EARLY DAYS OF THE INVASION OF THE CONTINENT.

INTO A TOWN DEVOID OF INHABITANTS COME THESE AIRBORNE FIGHTERS. THE TOWN IS BELIEVED TO BE STE. MERE EGLISE AND THE SOLDIERS FROM THE 82d AIRBORNE DIVISION.

had been fighting the enemy entrenched northwest of Ste. Mere Eglise. On 12 June, the enemy was driven from his positions and after a see-saw battle, these two units cleared the area northwest to Le Ham. This action seriously delayed an enemy division from making contact with his beach defense forces.

On the night of 12/13 June, the Third Parachute Infantry forced a crossing of the Douve River in the Beuzeville-La Bastille area and swept the enemy from the Cretteville-Baupte area. Engineers of the Eighty-second Airborne Division operated the assault boats during the crossing and remained to assist VII Corps engineers in building a bridge over the causeway.

Passing through the 90th Division on 14 June, the Glider Infantry and the Second Parachute Infantry attacked abreast and forced the enemy steadily westward from Etienville (Pont L'Abbe). During the afternoon of 15 June, the First Parachute Infantry relieved the Second Parachute Infantry and continued the assault. After heavy fighting the enemy was driven across the Douve River on the night of 15 June. Heavy casualties were sustained by both sides. The German division furnished stubborn opposition throughout this phase of the operation. The next day, 16 June, the First Parachute Infantry forced the Douve River at St. Sauveur le Vicomte, and, in conjunction with the Third Parachute Infantry, drove the enemy west, north, and south, establishing a bridgehead for the Ninth Infantry Division which drove the enemy to the sea and cut the peninsula in two.

On the night of 18/19 June, the Glider Infantry, with the Third Battalion, Third Parachute Infantry, forced the crossing of the Douve River at Etienville, and advanced southward while the Second Parachute Infantry made a coordinated attack westward from Cretteville. Again Division engineers operated the assault boats for the river crossing and later VII Corps engineers constructed a bridge on the causeway.

On 20 June the First Parachute Infantry occupied Bois de Limors. From then until 3 July the division defended the Etienville bridgehead along the line Bois de Limors-Pretot. This period was marked by sharp local actions, combat patrol attacks, and mortar fire, with casualties moderate to heavy on both sides.

AIRBORNE SIGNAL COMPANY

THE AIRBORNE Signal Company is organized under T/O and E 11–557, 1 August 1944, and, as of this writing, consists of 7 officers and 123 enlisted men. A ground signal company (infantry division) is organized under T/O and E 11–7, and normally has a complement of 8 officers and 237 enlisted men.

The airborne signal company is divided into a division signal officer section, and headquarters, message center, radio, wire, and parachute platoons. The headquarters platoon is composed of two sections—headquarters and supply and maintenance.

Members of the airborne signal company who jump with combat personnel of the airborne division comprise the parachute platoon. This platoon incudes 4 officers and 25 enlisted men. Ranks and specialties of the enlisted men are:

1 technical sergeant—message center chief.
3 staff sergeants—chief field lineman, assistant message center chief, assistant chief radio operator.
1 sergeant—messenger dispatcher.
1 corporal—assistant chief field lineman.
19 enlisted men (with rank from pfc to t/3)—1 message center clerk, 4 field linemen, 3 messengers, 6 radio operators, 2 telephone switchboard operators, 1 radio repairman, and 2 cryptograph technicians.

Equipment furnished the airborne signal company is naturally less than that allotted a regular infantry signal company, but in some categories is more. This is particularly true of lightweight radio sets. The following table of selected common radio and wire equipments lists some of the differences between an airborne signal company and a ground infantry company:

Airborne	*Equipment*	*Ground*
14	SCR–300	6
10	SCR–536	10 to 25
7	SCR–619	10
12	SCR–694	1
2	BD–71	1
1	BD–72	5
6	TG–5	6
30	EE–8	72
0	SCR–399	1
4	SCR–499	0
2	CC–345 (500′ long)	14

In addition to this equipment, airborne signal companies also include, among other radio and wire material, 4 Radio Receiver and Transmitter RT–12/TRC–2 (which is similar to the BC–1306 of Radio Set SCR–694, except for frequency range), one TC–12, and 45 miles of Wire W–130–A on Reel DR–4 and 5 miles of Wire W–130–A on Spool DR–8.

Ground signal companies, of course, are furnished many more items of equipment not mentioned above. Such equipments as teletypewriters, repeaters, spiral-four cable, Wire W–110–B, facsimile apparatus, and other types of radio sets are not listed on the airborne signal company allotment of signal equipment.

In the matter of vehicles the airborne signal company is furnished 9 scooters, 2-wheel, airborne; 11 quarter-ton 2-wheel, cargo, trailer; and 11 quarter-ton 4 by 4's. This compares with the 18 1-ton 2-wheel, cargo trailer, 16 quarter-ton 4 by 4's, 19 three-quarter-ton 4 by 4's, 4 1½-ton 6 by 6's and the 17 2½-ton 6 by 6's furnished the regular infantry signal company.

Jumping off on the morning of 3 July as part of an VIII Corps attack, the Glider Infantry, the First and Third Parachute Infantry, and the Second Battalion of the Second Parachute Infantry opened an offensive southwest of the Etienville area. The remainder of the Second Parachute Infantry, initially in division reserve, swung into action the following day. The Division captured Hill 131, and part of La Poterie Ridge on the first day and the remainder of the objective on the second day.

Following this offensive the Division went into defensive positions along the perimeter of the division zone of action.

On 11 July the Division was withdrawn into Army reserve.

COUPLING SEVERAL RECEIVERS TO A SINGLE ANTENNA

A Method of Working Two or More Receivers From One Antenna Can Be Improvised

REPORTS HAVE been received recently from the field which describe several novel and ingenious methods of coupling two or more receivers to a single antenna to improve the over-all operation at such an installation. To avoid the necessity for such improvisation in the future, a project has been established at the Signal Corps Ground Signal Agency to develop Antenna Coupling Unit CU–52/URR. This device is intended as an all-purpose coupling unit to permit operation of five receivers from one antenna.

Pending standardization, procurement, and issue of these units, the information contained in this article may aid the construction of improvised units in the field.

Essentially a multicoupler unit must do two things: (1) Properly match the receivers into the antenna without appreciable loss in over-all performance. (2) Isolate the several receivers from each other to minimize interference or interaction.

There are, in general, three possible circuit types which can be used to provide a low impedance coupling from an antenna into a receiver. These are: (1) The old reliable plate coupled circuit (fig. 1). (2) The recently developed cathode follower (fig. 2). (3) A combination of both plate coupled and cathode follower circuits (fig. 3).

The diagrams show both single ended and balanced inputs and outputs. For a particular installation the type of input and output circuit will of course depend on the types of antenna and receiver inputs employed. For instance, a doublet antenna and balanced transmission line requires a balanced input (push-pull) at the multicoupler. For best operation the transmission line should be properly terminated, particularly where directional antennas are employed. Although not as important, the output impedance of the coupler should match the receiver input. (The impedance values shown in the diagrams are merely representative.)

In selecting the vacuum tubes for the coupler, it is important that tubes having the highest possible transconductance (Gm) be used. (A high amplification factor is not required.) In general, if high Gm tubes are used, the type of circuit employed is of secondary importance. A list of suitable tubes which are on the Army-Navy preferred list, arranged in order of rated Gm, accompanies this article.

The next most important tube characteristics are: (1) Low input capacitance (grid to cathode). (2) Low output capacitance (plate to cathode). (3) Low inherent noise level (equivalent noise resistance).

The input and output tube capacitance values are of greater importance on the higher frequencies. It should also be noted that generally the tube capacitances will be greatly increased by tube sockets and wiring. Every effort should be made therefore in the choice of parts, layout, and construction of the unit to keep these shunting capacitances as low as possible.

In general, triodes have lower equivalent noise resistance than pentodes and, therefore, have wider application in coupling units. A high Gm tube will introduce less noise than a low Gm tube. Furthermore, any tube will introduce the least noise when operated under such conditions that the ratio $\frac{Gm}{I_p+I_s}$ is a maximum where I_p is the plate current and I_s the screen current of the tube. In addition, for pentodes, $\frac{I_p}{I_s}$ should be a maximum.

The following factors should be considered in selecting the type of circuit:

1. *Frequency range.*—At low frequencies much higher tube shunting capacitances may be tolerated than at high frequencies; a circuit, therefore, should be selected for use on higher frequencies which introduces a minimum of additional capacitance.

2. *Interference.*—When interference is experienced from receiver oscillators radiated from the receiver inputs over the transmission lines, a plate coupled circuit is to be preferred since it will provide more isolation than the cathode follower circuit.

DIAGRAM LEGEND

A—Single-ended connectors for concentric cable, such as SO–239, AN–3102–10S–2S, AN–3102–14S–4S, AN–3102–16S–3S, AN–3102–18–16S.

B—Dual connectors for balanced line, such as SO–264, SO–265, AN–3102–10S–4S, AN–3102–12S–3S, AN–3102–14S–9S, AN–3102–16S–4S, AN–3102–16–13S, AN–3102–18–3S, AN–3102–20–5S, AN–3102–20–23S, AN–3102–22–1S, AN–3102–24–9S.

C—Capacitors having values equal to the capacitance of the single-ended connectors.

NOTE.—If trouble is encountered due to oscillations, it may be necessary to put a choke of 2 or 3 millihenries in series with the 40-ohm degenerating and bias resistor in the cathode circuit of the driving tube. This will consist of 3 or more plies of about 100 turns each of No. 28–36 d. c. c. or d. s. c. copper wire on a form ¼- to ½-inch diameter.

3. *Cross modulation* (*cross-talk*).—The production of cross-modulation products in a multicoupler unit may be serious where transmitters are located in close proximity to the receiving antennas. In that event these effects may be reduced by the use of a high plate-cathode impedance, a low plate resistance tube, or by degeneration. The cathode follower circuit is more immune to cross modulation than the plate coupled circuit. However, it has been found that high Gm tubes of the same type vary widely in cross-modulation characteristics.

There are several useful rules which can be followed in designing an antenna coupling unit. These rules are listed as follows:

1. Select the basic type of circuit which will best meet the particular local conditions.

2. From the tubes available, pick the ones which have the highest Gm.

3. From the tubes chosen, pick the ones which have the lowest input and output capacitances. From these, select the tube with the lowest equivalent noise resistance as the basis of your coupling unit.

4. Operate all tubes under those conditions which give least noise, as explained above. Be sure that all tubes are operated at the cathode tem-

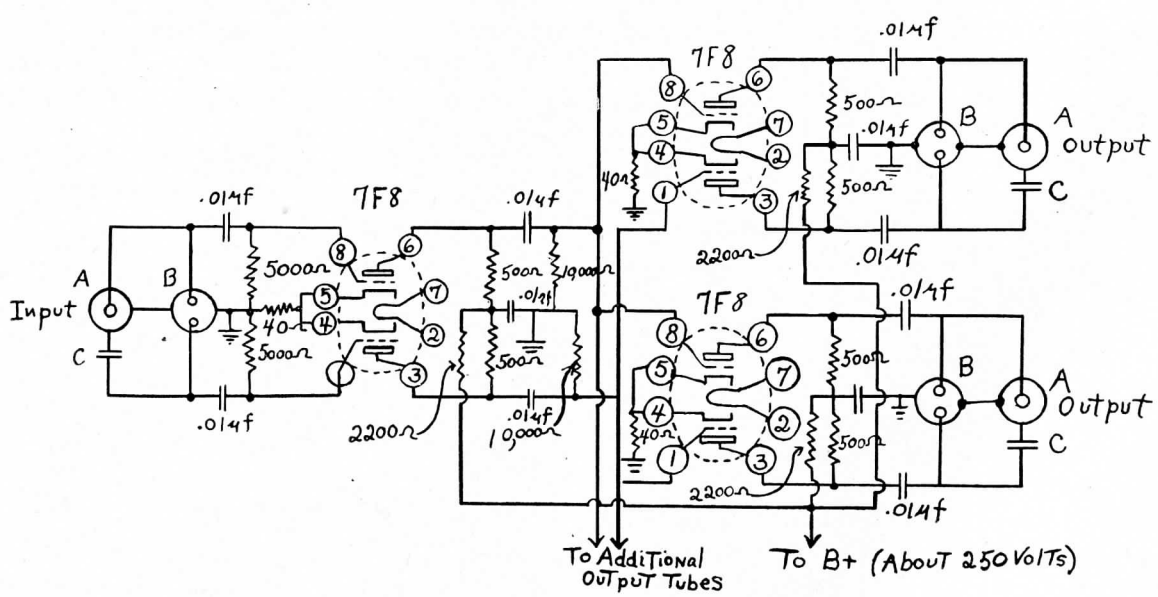


Figure 1 - Plate-Coupled Output Circuit

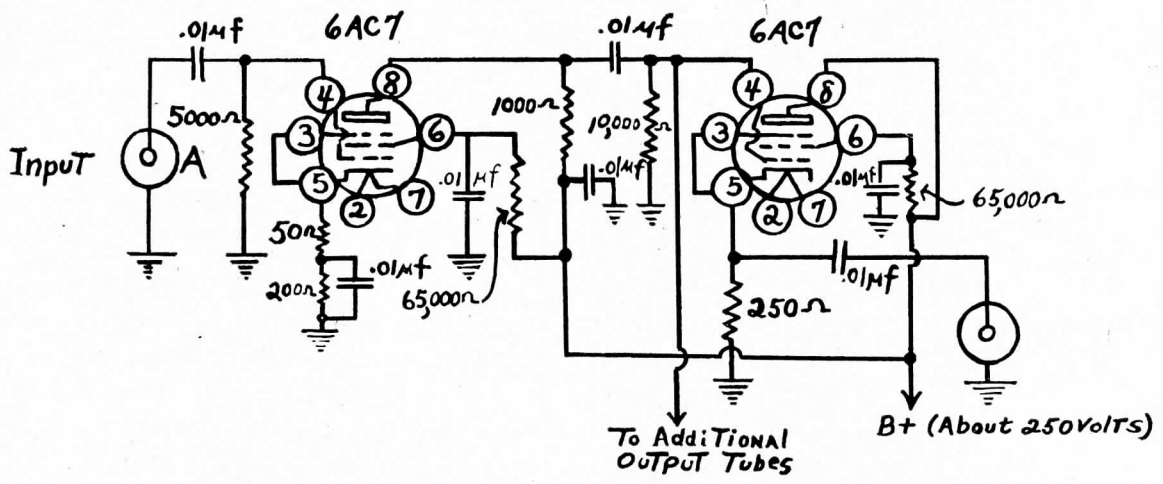


Figure 2 - Cathode Follower Coupled Output Circuit

peratures for which they are designed. Low cathode temperatures (inadequate heater currents) tend to increase tube noise.

5. Layout a circuit which uses the minimum number of circuit elements—resistors, capacitors, and inductors.

6. Provide a mechanical arrangement which keeps all connecting wires as short as possible.

7. If the coupling unit is to provide a two terminal balanced output or input, keep the circuit arrangement as symmetrical as possible.

8. Avoid the use of inductance, unless it is really required; for example, if the coupling unit is to be tuned, inductance is necessary. But for wide

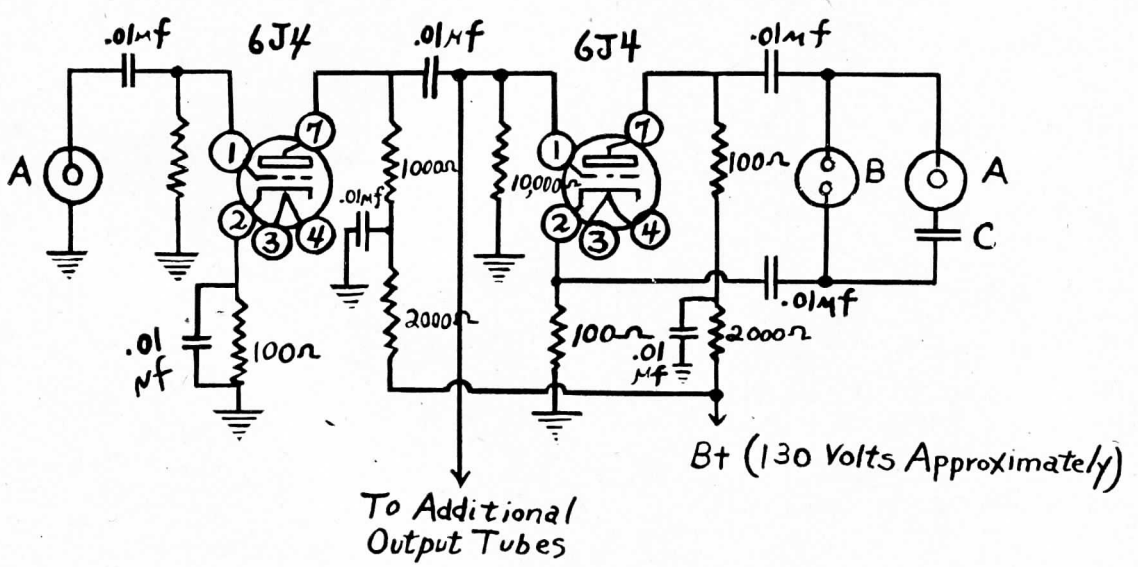


Figure 3 - Plate-Coupled, Cathode Follower Coupled Output Circuit

Tube type			AVERAGE TRANSCONDUCTANCE Gm (umhos)	NOISE FACTOR equivalent noise resistance (ohms)
AMPLIFIER		POWER triode or pentode		
Triode	Pentode			
6J4			11,000	250
	6AC7/1852		9,000	700
	6AG7		7,700	2,000
7F8			7,000	400
		6Y6G	7,000	1,700
		6L6	6,000	4,100
	7W7		5,800	2,000
6J6			5,300	500
	6AK5		5,100	1,800
		6B4 (2A3)	5,000	500
	6AB7/1853		5,000	2,500
	14W7		5,000	1,000
	6A5G		4,800	1,600
	6SG7		4,100	3,200
	6SH7		4,000	2,300
		6V6GT/G	3,700	4,600
6C4			3,100	800
7E5 (1210)			3,000	850
2C22			3,000	850
		12A6	3,000	7,700
6J5			3,000	850
6SN7			3,000	850
	6SK7		2,400	11,500
3A5			2,200	1,150
9002 (955)			2,200	1,150
	9003		1,800	1,300
	6SJ7		1,600	6,500
	9001		1,400	6,300
	1L4		1,025	31,000
	1LN5		800	11,000
	1S5		625	18,000

NOTE 1.—If twin triodes are operated with the 2 units in parallel, the Gm of the combined unit will be approximately twice that of a single unit; however, the noise factor may only be reduced by a factor of 1.9. Tube capacities will be increased by a factor of 2 or greater.

NOTE 2.—The 12.6-volt heater equivalents of the above tubes may be used.

band operation, the use of inductance should be avoided.

9. If one wishes to drive more than two receivers from a single antenna, it is generally better to use an extra tube ahead of the output tubes for a single-ended antenna or two extra tubes if the antenna is balanced. This arrangement keeps the input capacitance across the antenna at a reasonably low value, provides a little reserve gain to make up for what is lost in the output tube, and usually gives a higher over-all signal to noise ratio.

10. Do not try to get any voltage gain from the coupling unit. Design it for the highest possible signal to noise ratio for a one-to-one transfer of antenna power.

11. Provide a power supply which has adequate power available at the plate voltage chosen. This does not mean that a high plate voltage is required. As a matter of fact, once one supplies a minimum of about 100 volts at the plate of each coupling tube, the return on an investment of more plate voltage usually diminishes rapidly, unless large power outputs are required. Make certain that the power supply is adequately filtered and that

A WORD TO THE WISE

IT IS felt that a note of warning should be added to this article. The use of an antenna coupling unit is not a cure-all for all the problems which result from the common operation of many receivers on one antenna. It is entirely possible that there will be oscillator coupling between the several receivers via common power supply lines; and, if the receivers are operated in close proximity, there may also be oscillator coupling via the mutual radiation of receiver cases.

This oscillator coupling between receivers produces the well-known and objectionable "birdies" when one receiver is tuned through the frequency of the local oscillator of a neighboring receiver. The only part of this oscillator coupling which the antenna coupling unit avoids or reduces is that part which is obtained via a common antenna, and very often this coupling is much smaller than that obtained otherwise, as indicated in the article.

Again, it must be understood that a small price must be paid in signal to noise ratio when several receivers are operated from one antenna, even though a coupling unit is provided. The performance of several receivers thus operated from one antenna will never be equal to the performance of one of the receivers operated from the antenna alone. In general, the performance of several receivers operated through a coupling unit from a single high gain antenna will be better than the performance of several receivers each operated separately from smaller and less efficient antennas.

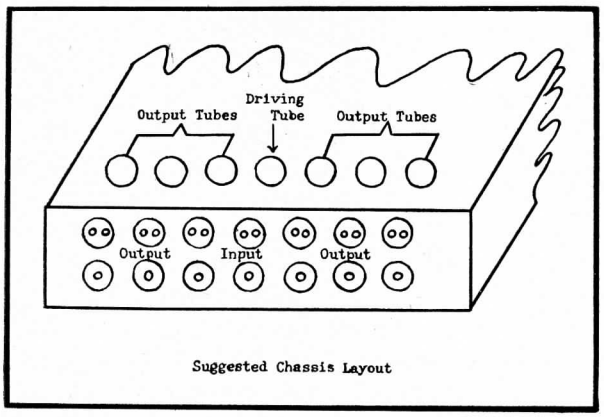
To cure the coupling of receiver oscillators due to common power lines, it may be necessary to put r-f filters, consisting of chokes and condensers, in the individual receiver power cords, both at the base of the receiver and also where the cord plugs into the common power line.

There is no very good cure for radiation from the receiver case itself, except adequately grounding the case, moving the receivers as far apart as possible, or reducing the coupling of the local oscillator with the case by means of the proper placement of grounds.

proper ground connections are provided so that power supply noise is not introduced in the coupling unit.

12. To avoid construction of special power supplies, the use of standard receiver power supplies is suggested. Suitable standard dynamotors or rectifier units include the following:

Power Supply Unit RA–61–( )
Rectifier RA–20
Power Supply Unit RA–84–( )
Rectifier RA–87
Dynamotor DM–21–( )
Dynamotor Unit BD–( )–81
Dynamotor Unit BD–( )–83
Dynamotor Unit BD–87–( )
Dynamotor Unit PE–133–( )



Suggested Chassis Layout

A dynamotor will of course provide only plate voltage; other sources such as ordinary storage batteries may be used for tube filament or heater supply.

W–110 ANTENNA FEEDER

FROM ITALY comes a report of how wire W–110 was used successfully as a transmission line in order to overcome lack of range of a Radio Set SCR–508–( ).

An armored field artillery battalion located its command post in and around a large three-story building during the last 2 weeks of August 1944 at La Cava, Italy. The fire direction center utilized for communications a remotely powered Radio Set SCR–508–( ) from a room on the ground floor. Before this time satisfactory communications had been established with a remote antenna fed by an 8-foot length of coaxial cable. However, the antenna could not be placed high enough to overcome the masking effect of the building and surrounding elevations in the new location, and communications with the battalion's forward elements suffered.

Various measures were tried without result and the movement of the command post to a new location seemed to be the only solution.

Before taking this step, it was decided to elevate the antenna to the roof of the building since it was believed that this would overcome the masking effect of the site. Since no coaxial cable was available in the proper length it was decided to try wire W–110 as a feeder for the antenna. The lead was 75 feet long and it was hoped that the resulting loss of energy would be overcome by the elevation of the antenna.

Continuity of the twisted pair was checked with one lead going from the binding post on the radio to the antenna proper and the other from the ground on the radio chassis to the metal antenna mounting. This second strand was used to reduce radiation along the line allowing the antenna proper to operate more efficiently. After a single trial, which convinced personnel that communication was considerably better, the antenna was moved to several positions on the roof to find the best spot.

From then on communications with forward elements of this battalion remained excellent during the time the command post remained at this location. This method of using wire W–110 was used by the battalion at various other times under similar situations and gave favorable results.

Although this report of the use of wire W–110 as a transmission line has shown it to have been effective, it is pointed out that in other situations this expedient might not prove so successful.

INTERFERENCE BETWEEN RECEIVERS

USING ORGANIZATIONS have reported difficulties due to blocking of the two receivers of Radio Set SCR–508–( ) and SCR–608–( ) Tests conducted by Communications Department, Tank Destroyer School, and Communications Department, Cavalry School, have indicated that when the two receivers of either of these radio sets are tuned to frequencies (or channels) differing by 2.6 or 2.7 megacycles, mutual blocking will result. For example, if one receiver of the SCR–608–( ) is tuned to 30.0 mc. and the second receiver is tuned to 32.6 32.7 27.3, or 27.4 mc. neither receiver will operate satisfactorily as long as both are turned on. Serious distortion of incoming signals is caused at short mileage ranges (up to a mile and a half), and at greater distances the inability of either receiver to accept an incoming signal is generally complete. There appears to be no exception to this pattern of blocking frequencies throughout the entire frequency range of the sets.

The difficulty reported above has been investigated by Camp Coles Signal Laboratory of Signal Corps Ground Signal Agency and it has been found that when the two receivers of these radio sets are operated simultaneously and on frequencies which differ by an amount approximating the intermediate frequency of the receivers, mutual blocking of the receivers will occur due to the oscillator of one receiver radiating on the signal frequency of the second receiver and the oscillator of the second receiver radiating at the image frequency of the first receiver. The intermediate frequency of these receivers is 2.65 megacycles; hence the effect reported is pronounced when the receiver frequencies differ by 2.6 or 2.7 mcs. Investigations made by the laboratory indicate that the blocking condition cannot be reduced to a satisfactory level because of coupling between the two receivers which is introduced by common antenna, audio, and power systems. Modification of the receivers to overcome this difficulty either in production or in the field would be so extensive as to necessitate complete redesign of the receiver and it is not considered to be practical.

The difficulty caused by mutual blocking of the receivers in Radio Set SCR–508–( ) and SCR–608–( ) can be minimized by assignment of net frequencies so that no channel in any one set will differ by 2.6 or 2.7 megacycles from any other channel which may be used simultaneously, in the same set. For each channel selected as a preset frequency there are usually four other channels that must not be selected for the same set. Satisfactory operation will result if frequencies differing by 2.7 and 2.6 magacycles are avoided. If the assignment of frequencies to a unit by higher headquarters does not permit avoidance of all frequencies which will block, care should be exercised to avoid the use of blocking frequencies in channels which will normally be used simultaneously.

Information with reference to assignment of net frequencies as set forth above has been furnished to using organizations by Headquarters, Army Ground Forces.

SYMBOL USAGE

IF SIX meant nine, five meant three, seven meant two, and one meant four—how long do you think it would take to figure out the Dodgers' batting average? The answer is that it would take about as long as it takes to figure out the maintenance forms of certain organizations that do not use the standard symbols adopted by the Army.

Symbols are like numbers. They should always have the same meaning. They should always be used by everybody.

Four easy-to-remember symbols are authorized by the Army for use on the various automotive maintenance forms. They are prescribed and defined in TM 9–2810 as follows:

1. Mark the box with a V if found satisfactory.
2. Mark the box X if adjustment is required.
3. Mark the box XX if repair or replacement is required.
4. When a defect is corrected by organization or higher echelon mechanics, place a circle around the X or XX.

Simple, isn't it? There is no understandable reason why these symbols shouldn't be used by all organizations. There are two excellent reasons why they should be:

1. They save time and eliminate confusion.
2. TM 9–2810 which is backed-up by AR 850–15 says they should be used!

AMERICAN TROOPS GOING ASHORE DURING THE INVASION OF SOUTHERN FRANCE ON 15 AUGUST 1944. THE PHOTOGRAPH ABOVE, TAKEN 30 MINUTES AFTER H-HOUR, SHOWS SUPPORTING TROOPS LANDED FROM CRAFT IN BACKGROUND MOVING UP BEHIND THE ASSAULT WAVES.

SHORE FIRE CONTROL PARTIES

Operation of Artillery Spotters and Navy Liaison Sections in the Invasion of Southern France

IN THE invasion of Southern France the need for naval shore fire control parties (NSFCP's) was anticipated by the Seventh Army. Planning, training, and actual operation of these parties resulted in the successful support of assault troops by naval vessels along the coast and the further support of ground forces during the advance along the Mediterranean coast. This article is based on a consolidated Seventh Army report and presents the observations of the officers who actually lead the parties during the period concerned.

THE PLANNING PHASE

The major problem during the planning period was a question of which *fire-control code* should be used. After the War and Navy Departments directed that naval spotting technique be used for the control of all naval gunfire, a board composed of Army, Navy, and Air Force officers developed a compromise code known as *Mediterranean Bombardment Code*. However, since this code was not distributed until 1 August, naval publications were used during the training.

On 24 February 1944, 20 field artillery replacement officers in the grade of lieutenant were attached to the 85th Infantry Division then undergoing amphibious training at the Invasion Training Center at Arzew, in Algeria. This assignment had been requested by Seventh Army so that these officers might be trained as naval gunfire observers around which observer parties could be built When the Invasion Training Center moved to Salerno, Italy, these officers moved also and it was in Italy that they received the final part of their training and drew the equipment for the consolidated personnel of each party.

Each officer fired three to six problems during this early training period and a majority of them

observed a bombardment from on board a firing ship, thus familiarizing themselves with naval fire control equipment and technique.

The organization of the parties followed that previously used in the Mediterranean Theater. Each party was provided enough transportation to make it completely mobile, and a complete duplication of all radio channels was provided by equipping each party with both a-m and f-m radio sets. This latter organization was based on past experience which showed failures in radio communication to be the major factor in the breakdown of gunfire support. In addition, sufficient men were provided for each party so that one or two casualties would not cripple it.

As organized, the *spotter* section with the artillery officer was the eyes of the team and the liaison section with the naval officer, the communications center. The T/O and E used is published separately.

TRAINING

The plans in March 1944 called for the spotter and naval liaison officers to be trained for 2 months at the Invasion Training Center, the equipment drawn and issued, and finally, the enlisted men assigned in time to give the group as a whole one full month of training. Due to the postponement of D-day and the temporary low priority of the Seventh Army however, neither enlisted men nor equipment were made available until 1 July. Thus the officers were in training 4 months, which was far too long as evidenced by lagging interest in May and June, but which was fortunate in another respect since each officer was able to organize and train his own party, quickly molding it into a team The training task would have been impossible without this lengthy officer training if inexperienced officers and enlisted men had been assigned to the parties in July, as there were only five qualified instructors for this type of assignment in the theater at that time.

The plan for the utilization of NSFCP's was that Seventh Army would furnish five teams to each of the three assault divisions and each division was to organize four additional parties. This made a total of nine parties per division, one for each infantry battalion.

The Invasion Training Center at Salerno was given the task of organizing and training the parties with a member of the artillery section, Seventh Army, attached to supervise and direct the training.

Three additional parties for the First Special Service Force which was to make sneak landing in rubber boats before H-hour were formed. These parties were composed of volunteers and were quickly trained, equipped, and sent to the first SSF for specialized training. No naval liaison section was provided. The spotter parties received special radio equipment after they joined the first SSF. The items were Radio Set SCR–694 and SCR–619, replacing the heavier and bulkier Radio Set SCR–284 and SCR–609.

Training included map reading, naval gunnery, radio procedure, the use of Navy codes and ciphers, physical conditioning and communication exercises. The naval liaison officers and fifteen trained artillery officers did the actual instruction.

On 9 July the entire detachment of 30 parties moved to Camerota, Italy. The next 4 days were spent in extensive service practices. Each party fired at least one problem; each man doing his regularly assigned job as he would at an observation post. Division air OP's were flown from the airfield at Paestum.

The entire group returned to Salerno on 13 July and 3 days later all parties joined their divisions to participate in the amphibious training and exercises under way.

COMMUNICATIONS

The communications plan for the control of naval gunfire was designed to be as simple as possible. Radio nets were kept independent of any existing Army and Navy channels by using frequencies assigned to follow-up units. The Navy communication plan drew a clear-cut line between assault and post-assault communications. During the assault phase each party had at least one ship assigned to fire for it. Naval liaison officers were to be with infantry commanders and control was to be completely decentralized; speed of supporting fires to be primary. The post-assault phase was to go into effect upon the order of the fire support group commander (Navy) and at that time control was to be centralized to provide deliberate prearranged fires. Naval liaison officers in this phase were to move to artillery fire direction centers. Thus Navy liaison officers at division artillery headquarters were to coordinate requests for fires with artillery missions, and ships

were generally to be on several hours call rather than continuously in the fire support areas. The naval liaison team, with corps headquarters, was to coordinate requests for ships.

For the assault phase each party was to have an independent firing frequency on both a-m and f-m radios working directly to an assigned ship. Furthermore, each division was to have a common bombardment channel on both a-m and f-m. These channels were to be used for the exchange of information, requests for additional ships, and administrative instructions. The common f-m channels were also to be used for artillery air OP's to permit them to adjust naval gunfire. Thus each a-m radio had a primary frequency working directly to an assigned ship and an alternate frequency which was common. At the same time each f-m radio had an A (firing) frequency and a B (common) frequency. Each ship was equipped with a Radio Set SCR–608–( ) and monitored both a-m frequencies and listened on both f-m channels.

For the post-assault phase there were to be two fire support groups—one on each sea flank. Each group was to have seven firing and one common channel on both a-m and f-m. All requests for fire support were to be sent on the common channel and the fire support group commander was to assign a firing channel when detailing a ship to do the shooting. In addition, the corps liaison team was to communicate with both groups by using the two existing common channels. Daily requests for the following days expected requirements were to be consolidated and forwarded by this corps liaison team.

OPERATION OF NSFCP's

Assault Phase

The morning of D-day, 15 August 1944, found shore fire control parties landing with assault infantry battalions. Some of the artillery officers were offshore in control craft directing the pre-H-hour bombardment and reporting the advance of assault troops. These officers either rejoined their parties ashore or, where their parties had not yet left the transports, returned and landed with their men.

Resistance ashore was so scattered that heavy naval concentrations were unnecessary and, therefore, few missions were fired by the NSFCP's. The missions that were fired were all very successful and it was reported that in some instances without the accurate gunfire support provided, some units would have had much more difficulty in reaching their objectives.

NAVAL SHORE FIRE CONTROL PARTY

	1	2	3	4	5	6
	Unit	Technician grade	Observer section	Liaison section	Total	Basis of issue and remarks
1	First lieutenant, FA	----	1	----	----	Observer.
2	Lieutenant (jg), USN	----	----	1	----	Naval liaison officer, furnished by Naval Commander concerned.
3	Total commissioned	----	1	1	2	
4	Staff sergeant (645)	----	1	----	1	Chief of section and observer's assistant.
5	Radio operator, low speed (776).	4	1	1	2	1 per SCR 694 (or 284).
6	Radio operator, low speed (776).	5	1	1	2	1 per SCR 694 (or 284).
7	Radio operator, voice (177)	5	1	1	2	1 per SCR 610 & SCR 619.
8	Wireman and telephone Operator (641).	----	1	1	2	Also drive ¼-ton truck.
9	Total enlisted	----	5	4	9	
10	Aggregate	----	6	5	11	
11	O Binoculars, M–8	----	2	----	2	1 for FA officer, 1 for S/Sgt
12	O Carbine, cal. .30	----	4	4	8	
13	O Pistol, automatic, cal. .45.	----	2	1	3	1 per officer and S/Sgt.
14	O Trailer, ¼-ton	----	----	1	1	For radio spare parts chests.
15	O Truck, ¼-ton, 12-volt	----	1	1	2	1 per SCR 694 (or 284).
16	S Radio set, SCR 694 (or 284).	----	1	1	2	
17	S Radio set, SCR 610	----	----	1	1	
18	S Radio set, SCR 619	----	1	----	1	
19	S Reel, RL–39	----	1	1	2	
20	S Telephone, EE–8–B	----	1	1	2	
21	S Tool equipment, TE–33.	----	1	1	2	1 per operator, telephone.
22	S Wire, W–130, miles	----	1	1	2	
23	Q Stove, vehicle, 1-burner	----	1	1	2	1 per truck, ¼-ton.
24	O Compass, M–2	----	1	1	2	1 for FA officer, 1 for S/Sgt.

Parties landed on various schedules and with definite items of equipment. However, all parties landed initially only with Radio Set SCR–609–( ). Radio Set SCR–284–( ) was supplied them later with the transportation.

Communications followed the plan exactly and were excellent.

Divisions moved inland beyond the range of naval gunfire early on D-day. The 34th Infantry Division was actively supported by gunfire during its advance west along the coast toward Toulon. However, most of this fire was deep supporting and was adjusted by aircraft or by the ship's own top observation rather than by shore fire control parties. NSFCP's were quickly converted to forward observers parties for divisional artillery in the assault divisions and by D plus 4 Army NSFCP's were withdrawn from the divisions and held in

reserve pending further amphibious operations and advances along the coast.

Post-Assault Phase

On 19 August 1944, Seventh Army NSFCP's were attached to the Frst Airborne Task Force which was given the Franco-Italian frontier as a sector of operations. Destroyers were assigned on standby missions and cruisers on call of the naval liaison officer with the task force artillery officer. This attachment lasted until approximately the middle of October when the units on the coast assumed responsibility for directing the very limited naval support needed.

Communications during the post-assault phase functioned as planned. The distance from the west to the east flank was so great, however, that the corps naval liaison teams were unable to contact both fire support areas. Control therefore was decentralized and each fire support group operated independently. Information and administrative messages were all sent on the common frequencies. Unfortunately this defeated the purpose of the common calling frequency by overcrowding it with nontactical messages.

On 25 August, 3 Army parties were attached to the 9th Colonial Infantry Division (French) attacking Toulon, and 4 parties to the 3d Moroccan Infantry Division (French) attacking Marseilles. British artillery forward observer teams were already directing gunfire, but officers with f-m radios were needed for liaison work. These parties had functioned only 24 hours when both cities surrendered.

All Seventh Army NSFCP's were returned to Army control and some of the officers and men were released to the units as replacements. The remainder remained as a nucelus for field artillery battalions.

SUMMARY AND CONCLUSIONS

Based on the experience in Southern France, it was felt that Seventh Army NSFCP's did an excellent job of directing and controlling support gunfire. It was also felt that:

1. The Mediterranean Bombardment Code was a satisfactory code for controlling naval gunfire.
2. It is advantageous to have mobile NSFCP's.
3. Radio Set SCR-609-( ) is excellent for ship-to-shore communication.
4. It is decidedly helpful for the parties ashore to be personally acquainted with the firing ship supporting them.
5. Observers offshore in control craft can definitely aid the control of pre-H-hour bombardment and can direct the support gunfire until NSFCP's can get ashore and into position to observe.
6. A naval officer is not necessary with each infantry battalion. Liaison officers with regimental headquarters initially are sufficient. These officers can later move to artillery fire direction centers.
7. In specialized operations, such as that undertaken by the First Special Service Force, a naval liaison officer must be provided for the controlling headquarters ashore.

KEEP TELETYPEWRITER TAPE DRY

SIGNAL CENTERS in several theaters of operation have indicated difficulty with teletypewriter tape due to incomplete perforation of holes. Investigation has shown that this difficulty is due to moisture in the paper which permits the tape to stretch during perforation.

Tests have shown that the trouble can be overcome by subjecting the tape to a low steady heat for 24 hours before using. The heat dries the moisture in the tape and makes it more brittle, thus giving sharper perforations when the tape is punched.

A simple tape-drying arrangement improvised in the Mediterranean theater of operations can be made by keeping spare rolls in a metal can inside of which is placed a 10- or 15-watt bulb for heat. Ordinarily teletypewriter tape packages should be stored in a dry location and the packages should be opened only as required. Individual teletypewriter tape rolls should be kept in a dry location and protected from dust or dirt as well as accidental damage.

REMOTE CONTROL OF SCR-193

Operation From a Distance or Separation of Transmitter and Receiver Can Be Accomplished

REPORTS HAVE been received from users of Radio Set SCR–193–( ) in the various theaters of operation that a requirement exists for remote control operation of the set. This requirement has taken a number of forms; one for the operation of the receiver and transmitter of Radio Set SCR–193–( ) from a remote position and another for the remote operation of the transmitter of the SCR–193–( ) with the receiver spaced at a distance from the transmitter at the remote control position.

Remote Control Operation by Means of Remote Control Equipment RC–289

It has been determined by test that Remote Control Equipment RC–289 is suitable for remote operation of Radio Set SCR–193–( ). Remote Control Equipment RC–289 consists of Control Unit RM–39, Telephone EE–8–B, Key J–47, Case CS–76–J and associated cords and batteries. Considering that an *operator* is located at the remote operating position and an *attendant* at the radio set, the four operating positions of Control Unit RM–39 function as follows:

1. *Telephone.*—The attendant and operator can conduct normal telephone conversation as between two Telephone EE–8 field telephones.

2. *Through.*—The operator can carry on voice communication which can be monitored by the attendant.

3. *Radio.*—The attendant can operate the radio set in voice as though Control Unit RM–39 were not installed.

4. *C–W.*—Either the operator or attendant can operate the radio set on c-w or tone.

Choice of the mode of communication, adjustment of frequency, adjustment of beat frequency, and adjustment of volume must be effected by the attendant.

Action has been taken by Headquarters, Army Ground Forces, to add Remote Control Equipment RC–289 to T/O and E's for use with Radio Set SCR–193–( ) as follows:

T/O & E 11–7	8	T/O & E 6–110–1	1
T/O & E 11–18	4	T/O & E 6–26	1
T/O & E 11–97	4	T/O & E 6–36	1
T/O & E 6–10–1	1	T/O & E 6–46	1
T/O & E 6–20–1	1	T/O & E 6–56	1
T/O & E 6–12	1	T/O & E 6–76	1
T/O & E 6–50–1	1		

Remote Control of Transmitter by Means of the Receiver Spaced From the Transmitter

A signal organization in the European Theater of Operations has devised a system whereby the receiver of Radio Set SCR–193–( ) can be separated from the transmitter up to a distance of 250 feet and used as a remote control for the transmitter without the need for any additional remote control equipment. This system has been investigated by Camp Coles Signal Laboratory and it was concluded that the system is simple and satisfactory. Separation of the receiver from the transmitter affords protection to radio operators in combat by saving operators from the efforts of hostile fire. The operators have operated safely in dugouts while strafing and shelling were damaging the vehicles in which radios were installed.

This remote control system enables the transmitter and the receiver to be separated, the receiver being at the operating position, the transmitter remaining installed in the vehicle. From the operating position the transmitter can be turned on or off and can be keyed through the receiver key jack. The receiver is connected to the transmitter

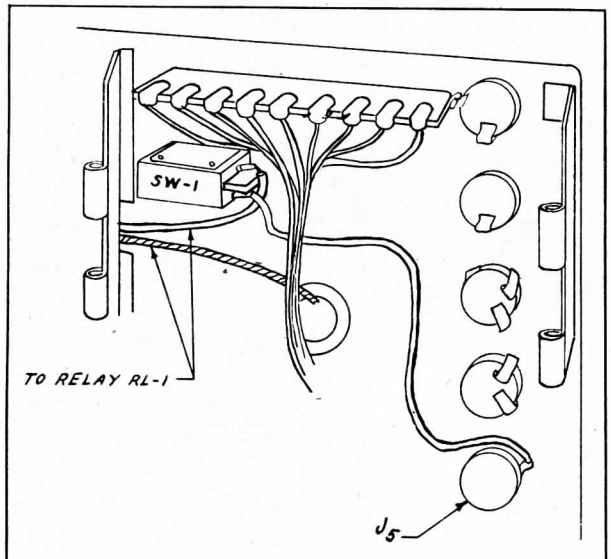


FIG. 1 - INSIDE VIEW OF RADIO RECEIVER BC-312-N SHOWING LOCATION OF SWITCH SW - 1 BEFORE MODIFICATION

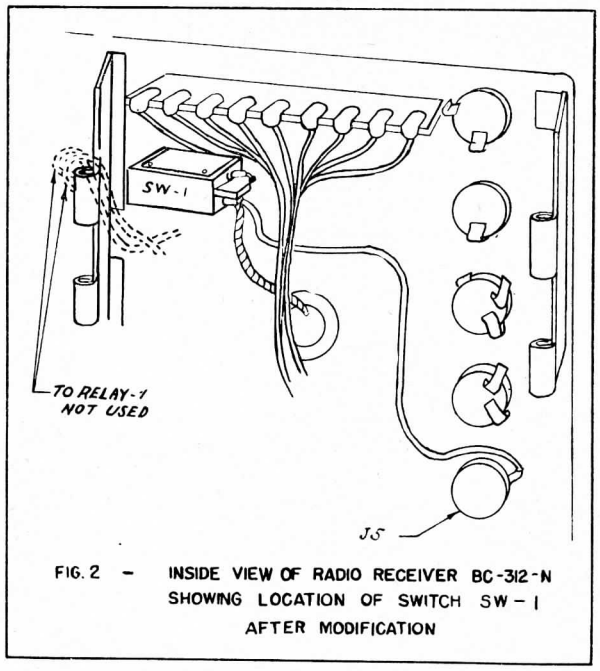


FIG. 2 – INSIDE VIEW OF RADIO RECEIVER BC-312-N SHOWING LOCATION OF SWITCH SW-1 AFTER MODIFICATION

by the cord described below. The only components needed are 1 Plug PL–114, 1 Plug PL–74, and up to 250 feet of 4-wire cable or 2 each 2-wire cables of No. 18 stranded rubber covered wire. The time to make this modification should be approximately 4 to 5 man-hours. The following instructions apply when and if this modification is desired.

Radio Receiver BC–312–( ): Loosen the five knurled screws on the front panel of Radio Receiver BC–312–( ) and remove the chassis assembly from the case.

Remove the first i-f tube from its socket and remove the two studs holding Dynamotor DM–21–( ), one at the corner of the receiver and one in front of Capacitor C–16. Turn the set upside down and remove the two studs from the dynamotor mounting hinges. Lay the receiver over on its face, slip the dynamotor out of its supports and place it out of the way of the area where the modification is to be made. Care must be exercised not to break any of the leads from the dynamotor to the terminal strip.

Locate Switch SW–1 (see fig. 1). There are two black wires connected to the switch terminals. One lead is connected to Jack J–5, the other joins a black wire with white tracer and goes to Relay RL–1 located up near the antenna alignment capacitor. Figure 1 shows these wires as they appear in Radio Receiver BC–312–N before modification. When this modification is made on other issues of BC–312–( ), trace the wires to see if they are connected to the same switch terminals shown in figure 1. If they are reversed proceed accordingly.

Unsolder from the switch the black wire which leads to Relay RL–1. Pull it back through the hole in the dynamotor mounting hinge.

Cut the black wire with white tracer near the dynamotor mounting hinge. Strip the end and solder it to the same switch terminal to which is connected the black wire to Jack J–5 (shown in fig. 2).

Secure the free ends of the relay leads by tying them around the spare fuse holder. The modification is now completed and should look similar to figure 2. Both wires should be connected to one or the other leg of Switch SW–1.

Return the dynamotor to its initial position and replace the four studs. Insert the first i-f tube into its socket. Replace the set in its case and tighten the five knurled locking screws.

Radio Transmitter BC–191–( ): Unlock and remove the Transmitter Tuning Unit TU–5–( ), TU–6–( ), or TU–7–( ). Remove the screws from

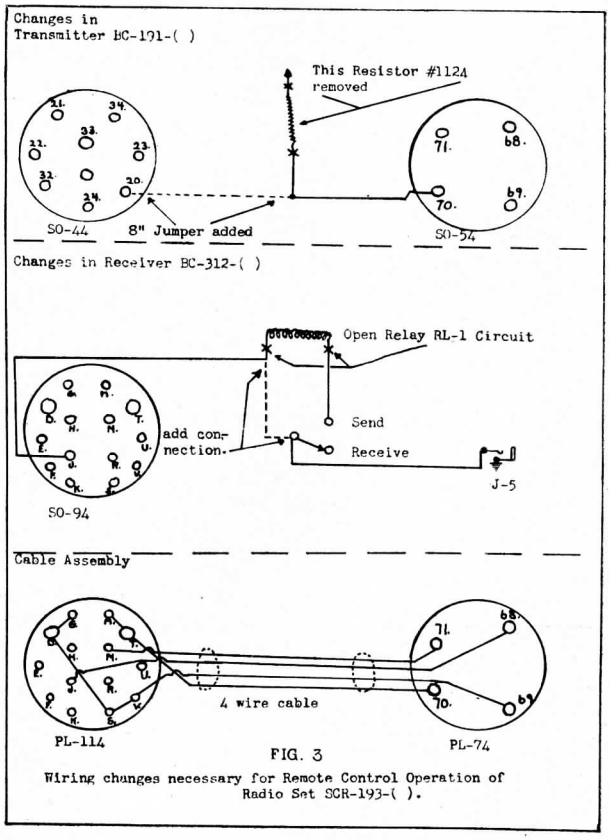


FIG. 3

Wiring changes necessary for Remote Control Operation of Radio Set SCR-193-( ).

the rear panel and remove the panel from the transmitter.

Locate Resistor No. 1124 which is a 30-ohm, 5-watt, wire-wound ceramic-insulated resistor, seventh from the left in the bank of resistors just above the tuning unit compartment. This may be located in Technical Manual TM 11–800, figure 22. Clip the wires and remove Resistor No. 1124 from its holder.

Remove bakelite strip covering the auxiliary sockets located on the base of the transmitter by removing the four screws.

Locate Terminal No. 20 on Socket SO–44. An orange and black lead is connected to the terminal. Solder an 8-inch length of No. 16 stranded, insulated wire to this terminal. Solder the other end of this wire to Terminal No. 70 on Socket SO–54, to which an orange wire is connected.

Replace the bakelite strip and secure the four screws. Replace the rear panel and tuning unit.

Cord Assembly Instructions: Required: 1 Plug PL–114, 1 Plug PL–74, 10 to 250 feet 4 conductor cable, No. 18 stranded rubber insulated wire, rubber covered cable. Recommended cable: Cordage CO–135.

Disassemble Plug PL–114 by removing the back cover, then, referring to figure 3, make connections as shown. Secure the cable to the proper terminals noting the colors of each wire for reference. Reassemble the plug.

Disassemble Plug PL–74 and secure the opposite end of the cable in accordance with figure 3. Reassemble the plug, and the cable is ready for installation. Care should be exercised to see that proper connections are made throughout the complete assembly.

Assembly Instructions: Install Plug PL–74 into Socket SO–54 on Radio Transmitter BC–191–( ) and unroll the cable to its extended or predetermined length. Set up Radio Receiver BC–312–( ) and erect a wire antenna for the receiver. Install Plug PL–114 in Socket SO–94 on the front of the set. Plug in Key J–45 or Microphone T–17 in the proper jack. Install Headset P–19 in the proper jack, and the installation is completed and ready for remote operation.

RADIO COMMUNICATION—NEW GUINEA

A SIGNAL Corps group composed of members of the Operational Research Staff, Engineering and Technical Service, and the Camp Coles Signal Laboratory has recently returned from New Guinea with results of measurements of radio wave absorption in the New Guinea jungles. The results of these measurements demonstrate that radio waves through the New Guinea jungles are absorbed to a somewhat lesser degree than they are in the Panama jungles. Nevertheless in both Panama and New Guinea jungles it was found that the radio signals following the path along the ground is absorbed to such an extent that communications for distances over approximately one-half mile or a mile cannot be maintained using this ground wave signal even using the most powerful tactical Signal Corps transmitter.

However, two alternative paths do exist and are recommended to provide communication for ranges greater than approximately 1 mile: One path is above the top of the jungle using very high frequency equipment; the other is one that is vertically upward to the reflecting ionosphere and down, using high frequency equipment. These methods are explained in detail in Signal Corps Technical Bulletin TB Sig–4, "Methods for Improving the Effectiveness of Jungle Radio Communication."

With regard to radio transmission via the ionosphere, there recently has been established in the Office of the Chief Signal Officer a Radio Propagation Section. This section prepares radio propagation data for the Army, specifically for each theater of operation. Some of this information is at present distributed monthly to the field in the form of the TB 11–499–( ) series, *Basic Radio Propagation Predictions For—*, each of which contains information published three months in advance. These technical bulletins may be requisitioned through Adjutant General channels. Such data relating to ground and sky wave distance ranges for tactical communications (0 to 200 miles) are issued for particular set-antenna combinations to various theaters as periodical reports according to theater requirements.

Other problems regarding ionospheric and general radio propagation data may be submitted directly to the O C Sig O, Communication Liaison Branch, Radio Propagation Section, Room 3D–241, The Pentagon, Washington 25, D. C.

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LESSONS LEARNED IN COMBAT

Here Is What the Men of the 34th Infantry Division Think of Operational Communications

NOT LONG ago the 34th Infantry Division published a little booklet entitled "Lessons Learned in Combat." The booklet contained the observations of the men of this division after 2 years of active operations in North Africa and Italy—in their own words. The following extracts, reprinted from the AFHQ Monthly Bulletin, are concerned with communication matters.

MESSAGE CENTER

All new replacements were trained as foot messengers and motor messengers even though they were to later become code or counter clerks. This has resulted in the technicians and noncoms knowing more of the basic messenger routine.

• • •

Constant changing of relief drivers on motor messenger runs resulted in all drivers knowing unit locations for next scheduled or special runs. Our messengers have always watched closely for any troop movements and are instructed to stop and make inquiries of headquarters along their routes. This information is reported to the message center chief upon return. This method has kept our message center better posted on locations than was possible if they depended upon staff sections or lower units to report.

• • •

During periods of combat, priority and urgent messages were delivered immediately upon receipt. Routine traffic was delivered every hour on the hour. When not in combat, priority and urgent traffic was delivered immediately upon receipt, but routine traffic was delivered every hour on the hour from 0600 to 2000 hours. Originally we kept all message center records for a period of 7 days. This has now been increased to 30 days as several messages, particularly of an administrative nature, had to be traced after the 7-day period. The encoding of all messages is checked for correctness. Urgent messages are passed to transmitting agency and then checked. Priority and routine messages are checked even before transmission starts. This causes a delay in the individual message but has saved much time on the total of encoded traffic. All cryptographic errors that come to our attention are called to the attention of the one making the mistake as soon as possible.

RADIO COMMUNICATION

The signal company operated in four nets Those were the corps net, division command net "B" (which covered attached units and liaison net) division command net "A" which comprised the infantry regiments and division artillery. The liaison net was comprised of stations at each infantry regiment, flanking divisions and the commanding general.

• • •

Quite frequently, notably on the Anzio beachhead, an SCR–193 radio can be used satisfactorily in the corps command net. A single SCR–399 is sufficient for the signal company. The radio link to corps proved valuable, especially during very rapid operations when corps could not keep wire communications in. In 1 day the division command post moved from a point slightly north of Rome into Civitavecchia, a distance of 41 miles. The division command net "A" and liaison net resulted in a duplication of sets and personnel at all infantry regiments. The traffic load of both nets could well be handled by a single net. Those nets have now been combined, personnel increased in number and ability, duplication eliminated. The combined net will handle all crytographic and message center duties to include delivering traffic directly to staff sections. This will eliminate the inevitable *Message Center* delay. All traffic will be filed with the unit message center at the end of each 24-hour period. The teams will be composed at the out stations of four operators each. At the division net control station it is composed of additional message center and crytographic personnel.

• • •

Originally SCR–193 radios mounted in ¾-ton vehicles were attached to the infantry regiments. When the forward command post is initially established generally nothing larger than a ¼-ton vehicle is taken forward. As a result when wire did fail and radio communication was needed, only the rear command post could be reached. The

regimental sets have been installed in ¼-ton vehicles and now travel directly with the S–2/S–3 sections, giving us the desired emergency communication when wire fails.

• • •

Staff officers continue to be quite unaware of the capabilities and limitations of radio communication and equally ignorant regarding security. Virtually all security breaches are made by officers and in many cases over the advice of radio operators. It is believed that two procedures would correct the above failings. *First*, all officers should receive more training of the subject before coming into action. This should be live and practical training and not theory or a lecture. *Secondly*, by command action they should be made to use the radio during training periods and at regular intervals so that when the emergency arose they would be prepared. This should be followed up closely by disciplinary action for security breaches.

• • •

Division command net "B" is not normally operated except when wire fails or the rear echelon is out of range of field wire. A notable use of this net was from the Anzio beachhead to the Naples area. Two SCR–193's were used with *flat top* antennas. An average of 10 messages were handled over this net per day, for a period in excess of 2 months. The only other method of communication was a *water messenger* requiring 3 days to make the round trip. The net was continued during the breakout from the beachhead and actually functioned well between Rome and Naples, a distance far in excess of the sets' normal ratings.

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The infantry is making maximum use of the SCR–300's. All attached tank, tank destroyer, chemical battalion, or other supporting troops must be equipped with their own SCR–300's for infantry support. The infantry T/E does not allow sets being supplied by them. The SCR–300's have worked excellently between tanks and infantry. One regiment operated an SCR–300 net composed of infantry, tanks and a Cub plane for observation. Results were good.

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In my regiment three of the SCR–536's in the heavy weapons company are each on a different frequency (that of a rifle company). Thus when a machine-gun platoon is attached to support any one company, it draws the SCR–536 to work with that company. This insures much closer support. The other three SCR–536's of the heavy weapons company are used by the mortar sections.

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A 536 to the heavy machine-gun platoon is very good because there will be communication with the advancing assault platoons or by company to tell the machine-gun platoon officer when to give support fire or cease fire as the situation may call for. This company used this system in the attack from Cecina to the Arno River, and found that we had better control over our attached weapons. Consequently we were able to get them into position from 5 to 30 minutes sooner than any time previously.

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The infantry regiment much prefer to use the SCR–300 to the SCR–284 for the regimental command net. It has given excellent range and its light weight makes it much easier to transport, especially in mountainous terrain. Where distance or intervening terrain makes the SCR–300 inoperative, the SCR–284 has been used and results have been satisfactory. The 284 is used consistently between regiment and service company.

WIRE COMMUNICATIONS

The signal company wire personnel followed basic principles for wire communication. However, it was learned that widely varying practices had to be adopted depending upon the terrain, rate of movement, number of units being served and the road network.

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When the situation was slow moving all lines were overheaded whenever possible. This minimized trouble from vehicular traffic, road repair work, short circuits, or line losses due to heavy rains. When time permitted the original installation was overheaded as laid but when time did not allow this practice it was overheaded at the first opportunity.

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Only Wire W–110–B was used by the construction platoon. This type wire properly constructed and used with repeaters EE–89 gave sufficient range for every problem that was encountered. On many occasions lines from 20 to 26 miles long were made to talk satisfactorily. The use of spiral-four or long range field wire, especially in heavily shelled areas, is considered not practicable because of the difficulty of splicing as compared to W–110–B.

The ¼-ton vehicle was used to lay virtually all the wire during this phase. It was the only vehicle that could operate on the highly concentrated and congested narrow roads without causing traffic tie-ups, confusion, and accidents. Many of the narrow roads were made one way except for ¼-ton wire and messenger vehicles. The ¼-ton vehicles continued to be the only practical one for wire laying. Much wire was laid cross country by hand and gave good service after being installed. Trouble shooting on foot was slow but absence of vehicular traffic served to keep wire failures low.

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At the Anzio beachhead we were favored with a good road network and dry weather. Also the hazards from mine fields were minimized after the positions had been occupied for a short period. The division took over intact the wire system from the unit relieved. It was found to be excessive for our needs and nearly half of the less reliable lines were abandoned. The areas of heavy shelling such as road junctions and gun positions soon became apparent to wire personnel and lines were either rerouted or buried. Many of the forward lines could not be maintained during daylight due to enemy observation and fire.

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Underground or buried lines were used for the first time and worked very well. After a short period grounds developed which prohibited their being simplexed for telegraph but they worked very well for telephone. Test points were installed every quarter mile and TM–184 Terminal Strips used. This greatly facilitated trouble shooting.

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Burial was accomplished by use of a cable plow borrowed from the corps signal battalion. It proved a very arduous and time-consuming task but paid dividends considering the time that was spent in the position. All lines that couldn't be rerouted away from specific targets were buried.

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On the beachhead 80 percent of wire failure was caused by shellfire, bombs, and falling flak. In one instance all locals at division command post were lost by an AP bomb landing within a few yards of the switchboard dugout. The locals had been buried to within a few feet of the switchboard, but were above ground just as they entered the dugout. The AP bomb scattered sufficiently to get this one small vulnerable spot. Where burial is needed henceforth it will be complete. Line construction must be especially good when operating with tanks. Every conceivable crossing must be well overheaded or buried. Burial at crossings should exceed eight inches to protect the wire from tanks. All wire must be dressed off the shoulders of the road and preferably up on ledges and banks. During July the signal company recovered 897 miles of W–110. The artillery recovered an additional 300 miles.

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Issue of maps to key wire noncoms and keeping them oriented on the situation helped very much. All wire personnel report CP changes or locations as rapidly as learned. Reconnaissance must always be made well ahead of wire laying.

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Infantry regiments preferred to use W–110 except for forward observers and laid W–130 only as a last resort. When they moved up on W–130 lines they replaced them with W–110 as soon as possible.

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It is not at all practical for infantry units to recover wire. The personnel required to install and maintain their wire system is far greater than the number allotted on present T/O's.

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Repeaters EE–89 were often loaned to artillery for use on long circuits. Repeaters were kept in readiness at all major switchboards and were plugged into the circuit to boost calls from distant points.

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From experience in carrying the SCR–300 radio I have found that the harness which supports the set while carrying on the back allows the sharp under edge of the case to dig into the back of the operator. In order to keep the set from shifting and throwing the operator off balance the carrying straps must be made very tight. My company has remedied these faults by mounting the set on a packboard and securing by ropes. The weight of the set is carried on the shoulders as before, but the canvas on the inside of the board distributed the load to the back and the balance of the operator was more easily maintained. This is especially important in mountainous terrain.

IMPROVED SPIRAL-FOUR CABLE

New Manufacturing Techniques and Material Substitutions Have Changed Performance

SPIRAL-FOUR cable as now manufactured is materially different in design and mechanical performance from earlier production types. This difference consists of a number of improvements in the cable resulting from improved manufacturing techniques, experience gained from field usage of the cable, and extensive destructive laboratory tests to determine points and frequency of failures. Additional differences are the results of material substitutions necessitated by shortages of the materials formerly required.

The changes in design of spiral-four cable which have already been incorporated in production, together with the reasons for the changes, are as follows:

The jacketing material which was originally rubber was changed to neoprene, a synthetic rubber-like material, and the conductor insulating material was changed from rubber to Buna S, synthetic rubber. These changes were made because of the shortage of crude rubber.

A metal end cap is now provided on all the connectors of spiral-four cable assemblies and stubs. This end cap, which replaces the former plastic cap, provides a watertight seal and mechanical protection to the end of the connector.

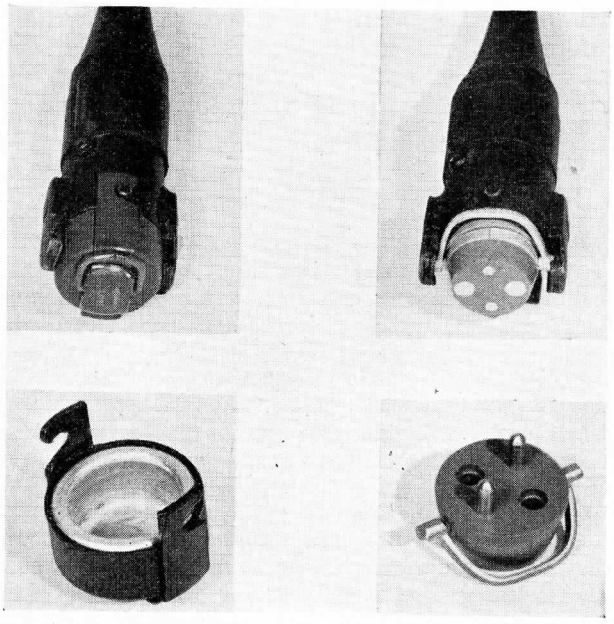
The method of terminating the steel braid to the internal yoke of the connector and the method of terminating the conductors to the loading coil of the connector has been changed to insure a more durable and positive connection.

The metal nomenclature ring, formerly placed around the cable approximately 9 inches from the face of the connector, has been relocated to a point 12 inches from the face of the connector so as not to interfere with cable clamps when connector tension bridges are constructed.

Factory splices are no longer permitted in the conductors of cable which is issued to tactical organizations. It is believed that the elimination of these splices will result in a reduction in the amount of trouble caused by open circuits in cable under tension or in suspension, frequently encountered in the early production quantities of this cable. Conductor splices at cable splices, identified by enlargement, are still permitted, but improved factory testing and inspection procedures are required.

In addition to the above changes, the following design changes in spiral-four cable will be introduced in production on or about 1 March 1945:

An improvement in the manufacture of the cable connector will provide greater protection from moisture penetration. The need for improvement of the connector in this respect became evident when field reports indicated that failure had been caused by moisture seeping into the connector, corroding the internal parts and sometimes causing circuit interruptions. Upon investigation, it has been found that, in general, this moisture seepage is due to the lack of bonding of the rubber and synthetic rubber materials to the internal metal parts of the connectors. The frequency of occurrence of such failures is apparently relatively small, but it is expected that failure from this source will be greatly reduced, if not entirely eliminated, by more specific and definite specification requirements and redesign of the connector parts. This improvement should eliminate the



PLASTIC END CAP, RIGHT, WILL REPLACE THE METAL END CAP, SHOWN ON THE LEFT, AND GIVE IMPROVED PROTECTION TO CONNECTOR TERMINALS AGAINST MOISTURE AND DIRT. TEST TERMINALS ON OUTSIDE PERMIT TESTING CABLE WHILE ON REEL DR–15.

necessity for removing the external metal collar from the connector and applying rubber and friction tape to the connection of two cable assemblies, as reported by some field organizations.

The external ferrous parts of the connector (steel case, through bolt, and nut) will have a supplemental coating of zinc chromate. This coating will provide an olive drab finish instead of the black color of the present finish. The purpose of this treatment is to provide a more protective finish on the external metal parts.

An improved plastic end cap, which may be easily attached onto or removed from the face of the connector, will give mechanical protection to the connector terminals and provide a seal against moisture and dirt entering the connector. Test terminals are provided on the outside face of the end cap to permit testing the cable while on Reel DR–15. The end cap is made captive to the connector by means of a short length of chain. This cap will supplant the metal end cap described above, and should be kept in place whenever the cable assembly is not in use.

The internal core of the cable will be changed from a hard plastic material to a glass yarn covered with Buna S rubber in order to improve the resistance of the cable to impact and crushing.

The pigtail end of Cable Stub CC–356–( ) will be molded, in order that moisture will be more effectively excluded from the open end of the stub.

As an added protection, Cable Assembly CC–358–( ), which is issued on Reel DR–15, is now being packaged in a sheet steel drum. One end of the drum is welded and the other is removable. The removable end, when in place, provides additional protection to the cable from moisture and from damage due to rough handling during shipment and storage. The connector housing on Reel DR–15 has been redesigned to hold the cable connector more securely.

In order to distinguish spiral-four cable manufactured with the improvements and changes outlined above from the earlier production types, nomenclatures *Cable WC–548–S*, *Cable Assembly CC–358–S*, *Cable Assembly CC–368–S* and *Cable Stub CC–356–S* have been assigned. All Cable WC–548–S used to fabricate the associated assemblies and stub will be identified by five distinct longitudinal ridges located adjacent to each other on the surface of the jacket along the entire length of the cable. All molded connectors used on the cable assemblies and cable stub will have a circular red label molded into the tapered portion of their surface. The label will be approximately 1 inch in diameter and will have a black letter "S" approximately three-fourths inch in height centrally located thereon. In reporting defects in spiral-four cable assemblies, it will be of considerable assistance in determining corrective action necessary, to state whether or not cable is so identified.

ORGANIZATION–OCSIGO

SEVERAL CHANGES in the organization of the Office of the Chief Signal Officer have been instituted as of the beginning of this year. The complete organizational set-up is contained in the chart published on the inside of the back cover of this issue.

The Operational Research Staff, formerly a branch of Plans and Operations Division, has been established as a separate staff group reporting to the Chief Signal Officer.

Engineering and Technical Service has been reorganized as a result of the transfer to the AAF of research and development and maintenance planning of communications and radar equipment peculiar to the AAF. The revised E&T organization includes 5 functional divisions and 12 branches. The Signal Corps Ground Signal Agency organization has been revised because of the transfer of the Eatontown Signal Laboratory and Florida Field Station to the AAF and to include in the chart the Long Branch Signal Laboratory which was established in the fall of 1944.

Procurement and Distribution Service organization has been revised due to the consolidation of the former Procurement and Production Divisions into the Procurement Division, with the exception of the Contract Termination Branch and the functions of the Purchases Branch concerning cost analysis and price adjustment which have been assigned to the Contract Adjustment Division. The Distribution Division has been reorganized due to the transfer of the Stock Control and Issue Branches functions to the Storage and Issue Agency and an Industrial Property Branch has been established to provide staff supervision over the storage of property resulting from contract termination. In the field installation portion of the Procurement and Distribution Service section of the chart, the Signal Sections of 5 ASF Depots (Classification), which were established in the latter part of 1944, have been included.

Army Pictorial Service organization in Washington has been revised to reflect changes in organization which were approved in October 1944, but which were not heretofore published.

SIGNAL CENTER – AFHQ

Increased Traffic Keeps Signalmen on Their Toes—Training Is Important Factor

LIKE ANY major wartime installation, Signal Center, AFHQ, has had to be able to meet the ever changing demands required of it. An endless stream of traffic has placed emphasis on qualities of speed and accuracy. This report deals with the months of September, October, and November, 1944, during which AFHQ moved from Algiers in North Africa to Caserta in Italy. Although it deals with the activities of one theater signal center, as printed in the AFHQ Monthly Bulletin, it could very well apply to any such installation in other theaters of operation.

An all-time peak of 767,000 groups were handled on 12 October 1944. This total topped the record high in Algiers by 10,000 groups. In actual fact, the difference is much greater since more than 100,000 groups a day were handled by the cable section for Navy and Air Force units and which, therefore, did not pass through Signal Center traffic control section (message center).

TWO HUNDRED THOUSAND INCREASE

Further analysis of traffic trends during this period, 20 July 1944, to 15 September 1944, shows an over-all traffic increase from 500,000 to 700,000 groups daily, an average which has been approximated up to the present time. In addition to handling traffic for AFHQ staff sections, almost two-thirds of traffic handled by Signal Center operating sections is relay. This relay traffic received another boost when on 12 November, this section absorbed all traffic to and from Communications Zone, Mediterranean Theater of Operations. This manifested itself by an abrupt increase of 500 relays which continued until 20 November at which time Communications Zone traffic was absorbed by Mediterranean Theater of Operations sections of AFHQ. Thereafter, the only observable increase was in American cipher load, which underwent an expansion of 15 percent in traffic.

Adjustments made necessary to accomplish the above resulted in an additional burden being placed on the teletype means. This traffic has almost tripled that of Algiers; at present this section is averaging 275,000 groups per day.

Another trend is the extended use of tape relay now in operation with major Air Force headquarters and certain weather stations. This has reduced to a minimum message center delay in traffic handling. Tactical operations and diplomatic missions in southern France and the Balkans have added to the number of manual and high speed radio circuits operated by British and American radio. As for the radio-teletype section, little appreciable change was effected since radio-teletype circuits linked the same major headquarters in United States and United Kingdom with AFHQ.

A glance into the immediate future brings into focus the movement of Peninsula Base Section headquarters from Naples to Leghorn, a factor which will affect signal channels appreciably, particularly since the Peninsula Base Signal Center was an important relay station for western Italy and distribution center for the many smaller units in the Naples area.

The emphasis on speed and accuracy referred to above postulates a staff of highly trained communication technicians capable of assuming additional burdens when necessary. In this respect, Signal Center, AFHQ, is continually conducting an on-the-job training program for personnel who, accepted on a trainee status after having completed a formal schooling in *theory* conducted by the 3141st Signal Service Group school, are prepared for assignment here or to the numerous teams for whose personnel composition this section, in part, is responsible.

An insight as to the training program conducted by each section might be in order.

TELETYPE SECTION.—

1. A brief orientation lecture by the trick chief to introduce personnel to the primary technical trends.

2. Personal interview to determine degree of skill, experience, and schooling of student.

3. Preliminary practice in punching tape on *blind perforator* to develop typing practice and test student's accuracy. Perforated tape is then run through printer to enable student to observe his accuracy. After practice student is ready to work line.

4. An experienced operator follows student dur-

INDUSTRIALIST REPORTS

THE Under Secretary of War, Mr. Patterson, recently selected a group of leading manufacturers to visit the European Theater of Operations. Mr. Clarence G. Stoll, president of Western Electric Co., was selected as representative of the communication equipment industry. The following is extracted from Mr. Stoll's report made upon his return:

SIGNAL CORPS.—This is the branch of the Army to which most of Western Electric war production goes. I am glad to report that our war products enjoy a high reputation with the Army in Europe—our field sets, sound power telephones, telephone and telegraph switchboards, spiral-four cable and carrier, field wire, ground and airborne radar, gun directors, tank, artillery, and airplane radio sets are all in active use.

The Signal Corps is responsible for and operates the entire Army communication system in France. Wire communication is preferred to radio wherever possible and the wire teletype system in Paris alone handles 3,500 messages per day. The teletype radio system is preferred to manual radio because of its greater speed and accuracy.

Greater quantities of certain types of field radio sets are required to replace battle losses greater than estimated. Maintenance requirements for these sets are also greater. Battle losses of both Walkie Talkie and Handie Talkie radio sets are greater than expected and greater quantities are required for replacement. More field wire is needed; 78,000 miles of this wire were used in the month of October of last year.

The Signal Corps men in the repair shops and in the crews of the mobile repair units are doing a magnificent job and they are most ingenious in making repairs.

ing this preliminary practice to offer instructions on breaking for switchboard and elements of routing, methods of calling, message heading and receipting for message.

5. Student then handles live traffic under supervision.

6. Tape transmissions are stressed during the training period to conserve time on circuits and produce perfect copies. Reperforators are covered thoroughly.

7. Students are familiarized with Switchboard BD–100 but actual operation is not prolonged.

8. Full duplex operations are introduced but very few students develop fast enough to operate that type of line without experienced supervision.

9. Those students who advance quickly and show promise of efficiency in assignments are sometimes used as regular semi-skilled operators before their training is completed.

TRAFFIC CONTROL, RADIO TELETYPE, A&MDLS SECTIONS.—These three sections will be treated compositely since present practice has been to rotate message center clerk trainees each week to one of these sections in order to provide the student with a more comprehensive picture of his job. In practice, this instruction is developed as follows:

1. Assigned to a job under supervision, the student remains at his assignment for a period of 3 days, at the completion of which he is transferred to another job within the section. In the traffic control section (message center) the student eventually is made acquainted with approximately 12 assignments, this to the end that he may readily understand the various steps in message handling. On a lesser scale, the procedure is identical in radio-teletype and A&MDLS sections.

2. Efficiency reports are compiled weekly on each student with emphasis on attitude and adaptability. Now in its seventh week, the present training program is preparing 31 students for eventual assignment, a large percentage of whom will be made available for assignment throughout the theater.

SIGNS OF THE TIMES

IN ITALY MEN OF THE 3D SIGNAL COMPANY PUT UP SIGNS LIKE THE ONE SHOWN ABOVE TO WARN FRIENDLY TROOPS AWAY FROM THEIR LINE CIRCUITS.

METEOROLOGICAL ASSEMBLIES

Transportable and Mobile, They Have Been Developed for the Air and Ground Forces

THREE SEPARATE types of meteorological stations have been developed for use in tactical operations by Army Air Forces and Army Ground Forces.

It was recognized by the Signal Corps prior to the present war that a meteorological station which could be moved from one spot to another with comparative ease would serve a very useful purpose. However, the full value of this type of station was not fully realized until after war started. Developments which had been progressing over a number of years were expedited and sets designed for use in all theaters were completed.

Meteorological Station AN/TMQ–1( ) consists of all equipment and supplies required to make surface observations, pibal observations and forecasting analyses required of an Army Air Forces fixed weather station, suitably packaged for transportation by any available means. Information has been received indicating that these stations have been carried by plane into territory nominally controlled by the enemy. They are particularly adapted to operations characteristic of the Southwest Pacific where it is desired to operate a weather station for a short period of time and then to move on with the island-hopping forces.

The packing cases themselves are composed of sections which may be reassembled into office furniture and working surfaces. Most of the equipment is standard meteorological issue, but a few items have been redesigned for lighter weight and more practicable handling in the field. These special items include a plastic rain Gage ML–217; a Ceiling Light Set AN/TMQ–2( ) including a hand generator for use where standard power source is not available; and Hydrogen Generator ML–303/TM, a lightweight equipment for generating hydrogen for inflating pilot balloons.

Mobile Meteorological Station SCM–1–( ), while very recently standardized, was procured as early as 1942 in limited quantities for special use in areas of the greatest military activity. This equipment is particularly well adapted for moving in with early invasion waves where meteorological

METEOROLOGICAL STATION AN/TMQ–1 CAN BE CONVENIENTLY ASSEMBLED FOR RAPID TRANSPORTATION WITHIN A SHORT PERIOD OF TIME.

data is required, but time is not available for erecting transportable stations or for moving in permanent equipment. An example of this was its use in the recent invasion of France where these units were sent into recently captured airfields. The standard Mobile Meteorological Station SCM–1–( ) includes meteorological equipment required for surface observation, pibal observations and for forecasting installed within a Truck K–53–( ) in such a manner that operators may move in and operate in almost the same way as can be done in a fixed weather station located in permanent buildings. Here again the equipment is essentially standard equipment with almost the same modifications as indicated for Meteorological Station AN/TMQ–1( ). Some of the earlier models have been equipped for radiosonde observations and teletype and other communication service. Such equipment is not part of the standard model but provision is made for adding them at a later date if required.

Neither of the two meteorological stations described above are suitable for the use of Army Ground Forces which is primarily interested in determining ballistic data for use in gun firing. For this purpose an assembly of meteorological

THE SCM–1 IS A MOBILE WEATHER STATION. SHOWN IN THE REAR VIEW ABOVE IS THE CEILING LIGHT PROJECTOR AND THE WIND EQUIPMENT.

equipment was designed to be packaged and transported by available means, usually by any standard 2½-ton truck. Due to increased requirements for meteorological information, Army Ground Forces requested that complete radiosonde equipment and Radio Set SCR–658–( ), as well as the surface and pibal equipment normally used by artillery units, be assembled and packaged for the use of Field Artillery observation battalions, still with the intention of transporting it by available means. In contrast to Mobile Meteorological Station SCM–1–( ), the equipment for Army Ground Forces consists of:

1. Pibal and surface observation equipment normally required for artillery purposes. This with some of the auxiliary equipment is known as Meteorological Station Set AN/TMQ–4( ).
2. Radio Set SCR–658–( ) with auxiliary radiosonde and radiosonde ground equipment for obtaining radiosonde data and making wind direction and velocity measurements by radio direction finding methods.

Radiosonde AN/AMT–2( ) is to be standardized especially for use with Radio Set SCR–658–( ). In the meantime the current instrument, Radiosonde AN/AMQ–1( ), is being used in combination with Transmitter BC–1253 operating from a common power source, Battery Pack BB–208/AMT.

These three sets of meteorological equipments adequately provide for the requirements of the Army for mobile weather stations. Mobile Meteorological Station SCM–1–( ) includes an integral prime mover and is used by the Army Air Forces under the most fluid conditions of tactical warfare. Meteorological Station AN/TMQ–1( ) is a packaged set of equipment especially suited for temporary Army Air Forces installations. Meteorological Station Set AN/TMQ–4( ) with allied equipment provides the transportable meteorological equipment required by Field Artillery observation battalions of the Army Ground Forces, in their preparation of meteorological data for ballistic corrections.

PAINTING OF REELS

Supply Letter 186, Office of the Chief Signal Officer, 1 September 1943, directed that all Reels DR–4, DR–5 and DR–15, scheduled for overseas shipment, be painted olive drab lusterless. Information recently received from Headquarters, United States Armed Forces, India-Burma Theater, indicates that this treatment was applied locally to 10,500 Reels DR–4, DR–5 and DR–15 which were received finished in a glossy black with high light reflecting qualities. Presumably these reels had been shipped or were in transit to the theater at the time Supply Letter 186 was issued.

PRODUCTION IMPROVEMENTS

Further Equipments That Have Been Modified in the Manufacturing Process (For Details See SCTIL No. 38, January 1945)

Equipment (components)	Change	Reason	Contractor	Order No.	From Serial No.
SCR-284-A (PE-103-A)	Circuit breaker 3-E-3, 20.0 amp, in 6 volt input circuit eliminated. Circuit breaker, Stock #3H900A-22, 0.22 amp, added to plus 500 volt circuit (also identified as 3-E-3). Circuit breaker assembly, three breakers on one bakelite strip, Stock #3H935 eliminated and individual circuit breakers, 3-E-3, Stock #3H900A-22; 3-E-4, Stock #3H900-40; 3-E-5, Stock #3H900-7 substituted.	To provide overload protection for high voltage circuit of power unit.	The Crosley Corporation.	1187-CHI-42	4711.
SCR-284-A (BC-654-A, PE-103-A, GN-45-( )).	Wiring of all connectors which receive Cord CD-501-A changed to bring plus 500 volt lead to pin #8, and relay control lead to pin #3. The following changes were made: Leads to #3 and #8 pins of Connector 1-K-3 on BC-654-A, 3-K-1 on PE-103-A, 5-K-1 on GN-45-( ) interchanged. Units modified as above identified by painting connectors with a yellow arrow.	To reduce insulation breakdown on connectors and on Cord CD-501-A.	do	1187-CHI-42	9500.
SCR-284-A (BC-654-A)	Sockets used for Modulator Tube 1-V-5, 2nd Det. 2-V-5, and output Tube 2-V-6 replaced with molded rubber mounted socket, Stock #2Z8678-4. Diameter of holes in chassis which receive these sockets increased from 1.125" to 1.297".	To reduce microphonics.	do	1187-CHI-42	14000.
SCR-284-A (PE-104-A)	Linen base bakelite material used for all pheonlic parts of vibrator socket.	To reduce breakage of sockets in production.	do	11902-PHILA-43	46652.
SCR-284-A (BC-654-A)	Receiver dial drum replaced with plastic drum ¼" ess in O. D. per Crosley Drawing C-220212. Shadow box replaced and dial lamp placed against the upper half of the dial light mirror. Dial provided with white letters on black background. White finish used on dial pointer. (Dial scale per Crosley Drawing B-220178). Dial pointer replaced with new part per Crosley Drawing MG-2110A-32, modified to have white pointer and to fit new dial drum.	To improve illumination of dial.	do	11902-PHILA-43	24691.
SCR-284-A (PE-103-A)	Metal guard around 6-12 volt switch inside power unit modified to give additional protection to switch wafer when unit is removed from and replaced in case. Modified guard is per Crosley Drawing #B222491, and is interchangeable with old type.	To prevent breakage of switch wafer.	do	11902-PHILA-43	34093.
SCR-284-A (BC-654-A)	Shunt across terminals of antenna ammeter added. Shunt is made of #18 wire formed into one turn coil approximately ½" in diameter per Crosley Drawing #W223963-1.	To reduce burnout of meter.	do	11902-PHILA-43	38013.
SCR-284-A (BC-654-A)	Glyptal added to meter case between glass and front of case.	To provide a better moistureproof seal for the meter.	do	11902-PHILA-43	37900.
SCR-284-A (BC-654-A)	Three holes drilled in shelf as shown on Crosley Drawing C-211112.	To facilitate adjustment of trimmer capacitors on receiver.	do	1187-CHI-42	1500.
SCR-284-A (CD-501-A)	Requirement to Cord CD-501-A added covering sealing of rear face of insert, pins, and soldered connections with Mitchell-Rand Rubber Seal #3. Material of inserts changed from bakelite to Melmac 592.	Moistureproofing of Cord CD-501-A.	do	1187-CHI-42	12000.
SCR-284-A (CD-501-A)	Shield of Cord CD-501-A insulated from male plug. Shield of Cord CD-501-A connected to female plug.	To reduce noise in receiver from GN-45-( ).	do	11902-PHILA-43	
SCR-284-A (BC-654-A)	Thrust collar of neutralizing capacitors 1-C-39, and 1-C-17 pinned to shafts.	To prevent thrust collar from becoming loose.	do	11902-PHILA-43	19000.
SCR-284-A (BC-654-A)	Keying relay modified to include antivibration spring.	To prevent relay from closing due to vibration.	do	1187-CHI-42	12018.
SCR-284-A (BC-654-A)	Antenna Binding Post redesigned (Crosley Part No. MG-214887-37) to include a coil spring to hold assembly of binding post and ceramic bushings at a predetermined pressure.	To prevent breakage of ceramic bushings.	do	1187-CHI-42	3500.
SCR-284-A (BC-654-A)	Resistor 1-R-37, 120 ohm, 2 watts, added across the keying relay coil. Resistor 2-R-27, 1500 ohms, ½ watt added, which is connected across headphone circuit when keying relay is actuated. Terminal strip 2-K-2 added to receiver chassis to facilitate removal of receiver from receiver mounting shelf.	To improve monitoring.	do	1187-CHI-42	3500.

Equipment (components)	Change	Reason	Contractor	Order No.	From Serial No.
SCR-284-A (BC-654-A)	Crystal FT-241-A, Stock No. 2Z3541A-200, and Adapter, Stock No. 2Z262 substituted for Crystal Unit DC-12-A.	To facilitate production of crystals.	The Crosley Corporation.	1187-CHI-42	3500.
SCR-284-A (BC-654-A)	Sprague Type PX-24A, .01 mfd plus or minus 20%, 600-volt, paper capacitors with cardboard insulating sleeve substituted in place of GC-210685-8-13-56, mica capacitors. Circuit symbols in transmitter: 1-C-33, 1-C-36, 1-C-37. Circuit symbols in receiver: 2-C-13, 2-C-14, 2-C-15, 2-C-16, 2-C-20, 2-C-28, 2-C-31, 2-C-47.	To alleviate the shortage of mica capacitors.	do	1187-CHI-42	36847.
SCR-284-A (BC-654-A)	1 megohm plus or minus 10%, ½-watt resistor, Crosley Part #G-39014-61, from a. v. c. return on 1st I. F. added to #8 lug on 2-V-3 socket. 10" of wire from lug #8 of 2-V-3 socket along rear of chassis added to #8 lug on terminal board.	To improve monitoring.	do	11902-PHILA-43	15491.
SCR-284-A (BC-654-A)	One GS-210630-1, 0.1 mfd capacitor 2-C-45 deleted. Replaced with one B-215578-3, 12 mf capacitor to be marked 2-C-45.	R. F. plate bypass to prevent "motorboating."	do	11902-PHILA-43	24734.
SCR-284-A (BC-654-A)	Dial locks provided for both the receiver and transmitter tuning dials.	Requested by using arms.	do	11902-PHILA-43	17691.
SCR-284-A (all units)	All varnished cambric sleeving used in wiring replaced with woven glass sleeving, Crosley Part #39039.	To provide better fungus resistance.	do	11902-PHILA-43	30900.
SCR-284-A (BC-654-A)	Method of fastening thermocouple bracket plate to binding post stud of meter changed from soft soldering to silver soldering. This change was made by Simpson Electric Co.	Soft soldered construction has caused separation of these parts in the field.	do		
SCR-284-A (BC-654-A)	Capacitor 2C43, 100 mfd, 15-volt rewired to connect it directly across the filament circuit instead of from filament to chassis. This is accomplished by connecting positive lead of capacitor to positive filament.	Polarity across this capacitor is reversed under certain conditions of operations.	do	32903-PHILA-43	54100.
SCR-284-( ) (RM-29-A)	Bakelite parts: Laminated bakelite parts vacuum varnish impregnated—Bakelite Varnish XJ180. All bakelite parts further treated with brushed-on coat of Maas and Weldstein Co. #86 Fungicide. Hook-up Cable: Sprayed with Maas and Waldstein Co. #86 Fungicide.	To improve moisture-proofing of RM-29-A.	do	32903-PHILA-43	6427.
SCR-284-( ) (RM-29-A).	Porcelain sealed terminals brought out through metal case.	do	do	32903-PHILA-43	6427.
SCR-284-( ) (RM-29-A).	Linen base bakelite end pieces and separate insulators between ends of coil form and winding replaced with XXX paper base bakelite. Cambric cloth insulation between winding and core replaced with hard rubber tubing. Formvar used for winding, cotton wrap impregnated with GE #1685 varnish with "Dowicide" added.	do	do	32903-PHILA-43	6427.
SCR-284-( ) (RM-29-A).	Westinghouse #7826-1 varnish baked to inside surface of armature. Formvar wire cotton wrap insulation treated with GE #1685 varnish containing Dowicide.	do	do	32903-PHILA-43	6427.
SCR-284-( ) (PE-103-A).	Use of Shock Mount #5150-C made by U. S. Rubber Co., instead of Lord Mounting #150 as specified in Pioneer Gen-E-Motor Drawing A-11663.	To facilitate production.	Pioneer Gen-E Motor Corporation.	20081-PHILA-44	1.
SCR-284-A (PE-104-A)	Copper sulphide rectifier in shunt with filament voltage added. The characteristics of the rectifier are such that its resistance decreases as the voltage across it increases. This effect increases the load across the filament line and acts to improve regulation.	Improves filament voltage regulation when set is operated in vehicle.	The Radiart Corporation.	10180-PHILA-44	(1).
SCR-284-A (PE-103-A)	Circuit breakers replaced with improved type incorporating moisture-proofing features as follows: Breaker 3E3, Sig C Stock #3H900-A22, Manufacturer's type #PAM1510-RSM replaced by Breaker, Sig C Stock #3H900-0.22, Manufacturer's Type PAM1510-RSM. Breaker 3E4, Sig C Stock #3H900-40, Manufacturer's Type #AN1510-RS replaced by Breaker, Sig C Stock #3H900-40-3, Manufacturer's Part #AM1510-RSM, Breaker 3E5, Sig C Stock #3H900-7, Manufacturer's Type #AM1510 replaced by Breaker, Signal C Stock #3H900-7-3, Manufacturer's Type #AM1510-M.	To aid in moisture-proofing of Power Unit PE-103-A. Old type breakers fail due to rusting of integral parts.	Electrolux Corporation.	20082-PHILA-44-M	3500.

[1] The 750 units affected bore this marking: 1.4 VOLT LINE HAS ADDED VOLTAGE REGULATOR. Circuit diagram on back of top cover was revised.

Equipment (components)	Change	Reason	Contractor	Order No.	From Serial No.
SCR-694-C (BC-1306-C)	Resistor (circuit symbol 29) 20,000 ohms, carbon, changed to 47,000 ohms (AWS) plus or minus 10%, ½-watt.	To improve low output characteristics of calibration oscillator.	The Rauland Corporation.	724-MSCPD-44	1-29, 1-49, 51-58, 60-68, 70-88, 91-95, 97-101, 103-115, 119, 127, 130, 131, 133-144, 146-16 , 168, 170, 171, 174, 175, 177-180, 182, 183, 185-188, 190-192, 194-206, 211-216, 218, 220-223, 236, 239, 241, 242, 249, 475.
SCR-694-( )(PE-237-( ))	Transformer, symbol 700-3, connections (3) and (5) to switch, symbol 735-6B, and 735-6C broken. Switch reconnected to terminals (2) and (6) of same transformer.	Reduces input current and voltage to a more desirable level.	do	724-MSCPD-44-08	1001.
SCR-694-C (BG-175)	Bag BG-175 constructed of Type 1, #4 hard texture canvas instead of #6.	No. 6 canvas is not heavy enough to house Generator GN-58 without tearing.	do	724-MSCPD-44-08	1.
SCR-694	Tube Puller TL-201 added to equipment to facilitate removal of miniature tubes. The tube puller may be carried in Bag BG-102.	To facilitate tube removal.	The Crosley Corporation.	22375-PHILA-44	(First 1,500 sets shipped without pullers.)
SCR-694-C (BC-1306)	Capacitor, circuit label symbol #79, changed from 1,000-mmf to 500-mmf plus or minus 10%.	This change is necessary to keep spurious responses within tolerances due to changing characteristics of JAN 3A4 Tube.	The Rauland Corporation.	724-MSCPD-44	3000.
SCR-625-( ) (BC-1141-( )).	Terminal Strip, Stock #2 C447-41D/T5, and flexible leads to floating chassis removed. Cable, Stock #3E4005 connected directly to floating chassis of amplifier.	To prevent breakage of flexible leads.	Horni Signal Mfg. Co.	8603-PHILA-44	1140.
SCR-625-( ) (BC-1141-( )).	do	do	John Meck Industries.	10250-PHILA-44	All sets.
SCR-625-( ) (BC-1141-( )).	do	do	Detrola Corporation.	30794-PHILA-43	Do.
SCR-625-( ) (BC-1141-( )).	do	do	do	9786-PHILA-44	Do.
SCR-625-( ) (BC-1141-( )).	do	do	do	9915-PHILA-44	Do.
SCR-625 (BC-1140)	Hickok meter redesigned as follows: Pivots mounted externally; half-wave rectifier placed on outer side of the base equidistant from and slightly above the two terminals.	Redesigned to expedite production.	Horni Sig Mfg. Corporation.	8603-PHILA-44	3750.
SCR-625-F (BC-1141-F)	B Battery polarizing voltage eliminated from transformers by means of a single pole, single throw switch connected in series with the red positive lead from Battery BA-38.	To reduce field failures of choke and transformers due to electrolysis.	do	21097-PHILA-44-G	1.
SCR-625-C (BC-1141-C)	do	do	Detrola Corporation.	9915-PHILA-44	5629-6220.
SCR-625-C (BC-1141-C)	do	do	do	17170-PHILA-44	All.
SCR-625-C (C-446-C)	Balsa, neoprene covered, search coil replaced by plastic unit (fibre glass discs, bonded on edge with fibre and rosin dipped).	To facilitate production and increase strength of coil.	International Detrola Corporation.	17170-PHILA-44	9043, 9449, 9630, 9795, 9798, 9879, 9880, 9881, 9882, 9888, 9899, 9900, 9902, and up.
SCR-625-F	Equipment moisture and fungi-proofed by manufacturer in accordance with Specification 71-2202-A.		Horni Sig. Mfg. Corporation.	21097-PHILA-44	1035.
SCR-625-C	do		Detrola Corporation.	17170-PHILA-44	All units.

FROM A Signal Corps unit in China comes the report that preventive maintenance was used to good advantage to save equipment. A file system was set up with a card on each piece of equipment. The card called attention to routine and periodical checks to insure fit condition of all parts.

SIGNAL UNITS DECORATED

THE MERITORIOUS Service Unit Plaque has been awarded to the following Signal Corps units in the Mediterranean Theater of Operations:

984th Signal Service Company.—For superior performance of duty in the accomplishment of exceptionally difficult tasks in Italy from 1 March to 11 May 1944. Personnel of this company achieved and maintained a superior standard of discipline, performing duties of an important military nature in connection with preparation for the move of AFHQ from North Africa to Italy. During this period the company engaged in rehabilitation of the local underground cable system, installation and maintenance of additional cable, and rehabilitation of the Italian state cable in cooperation with the British. They installed, maintained, and operated a teletype switchboard, maintained and operated carrier and repeater equipment and the multiple position AFHQ telephone switchboard, installed control lines to the AFHG transmitter and receiver from the radio control center, and operated the long distance fault control office. The 984th was one of the first signal units sent from North Africa to Italy to prepare the signal installations for use of AFHQ.

977th Signal Service Company.—For superior performance of duty in the accomplishment of exceptionally difficult tasks in Italy from 1 July to 31 August 1944. When AFHQ was moved to Italy, this company was charged with the responsibility of installing and operating necessary radio equipment to replace American radio circuits which were discontinued in North Africa. 977th personnel of the remote transmitters, the remote receivers, and radio control operations displayed superior technical ability, energy, and enthusiasm for their work with the result that could only have been achieved by careful planning, installation and operation by well-trained personnel. AFHQ American radio circuits involved in the invasion of Southern France were handled and operated by 977th personnel. Over these radio circuits came the first official news announcing the landings. Subsequent heavy traffic was handled efficiently and expeditiously throughout the first critical days of the campaign.

The Headquarters and Headquarters Company, 3141st Signal Service Group (then Headquarters and Headquarters Company, 2623d Signal Service Regiment), for superior performance of duty in the accomplishment of exceptionally difficult tasks in North Africa and Italy, for the period 1 June to 1 August 1944. During this period, the Signal Service Group was operating both in North Africa and in Italy, and the Headquarters and Headquarters Company was obliged to operate in two echelons, servicing administration and giving technical direction to troops in two widely separated commands. The task of moving signal equipment to the new Allied Force Headquarters in Italy and at the same time dismantling equipment and also maintaining full operation in Africa required extremely exact planning and coordination with Signal tion, Allied Force Headquarters and representatives of Allied Armies and Navies in order to maintain full sig operations during the movement period. The manner performance of all personnel during the period, of operating in centers 750 miles apart, attest to the standing abilities and high caliber of training within unit. The huge volume of administrative and technic work involved was accomplished only through the untiri efforts and outstanding discipline of the personnel of th unit, who contributed so highly to the success of the Allie Armies in the Mediterranean Theater of Operation.

Commendations to the 71st Signal Compan (Special), and the 53d Signal Battalion have als been made in the Mediterranean theater. The Commanding General, Seventh Army, cited the 71st Signal Company (Special), and the Commanding General, Mediterranean Theater of Operations, the 53d Signal Battalion. Commendations follow:

The 71st Signal Company (Special), is commended for meritorious achievement in Italy and Southern France from 15 March 1944 to 4 September 1944. The 71st Signal Company (Special), during the training and planning phase preparatory to the assault on Southern France by the Seventh Army, worked long and difficult hours, without regard for personal hardships, in perfecting proficient amphibious supply techniques. During the early phase of the operation, in spite of many new and difficult problems, the accomplishments of this organization have been greatly in excess of all planned estimates. The determination, ingenuity and outstanding devotion to duty displayed by the officers and men of this organization have made a considerable contribution to the success of the allied operations in Southern France.

The 53d Signal Battalion, for superior performance of duty in the accomplishment of exceptionally difficult tasks in North Africa, Sicily, and Italy from 8 November 1942 to 9 June 1944. This unit was the first American signal battalion to engage in operations against the enemy in the North African Theater of Operations. Landing with the initial forces in North Africa, and despite the most difficult conditions, the battalion not only continuously produced outstanding communications, but also pioneered and developed, from its early battle experiences, many subsequent standard procedures and techniques. Because of the initiative, technical skill, and resourcefulness of its members in making continuous improvements in utilizing its equipment, numerous changes in field signal equipment were officially introduced and disseminated to all theaters of operations, thus providing an outstanding improvement in combat communications and equipment of the Signal Corps of the United States Army.

EQUIPMENT NOTES

SIGNAL CORPS BOARD

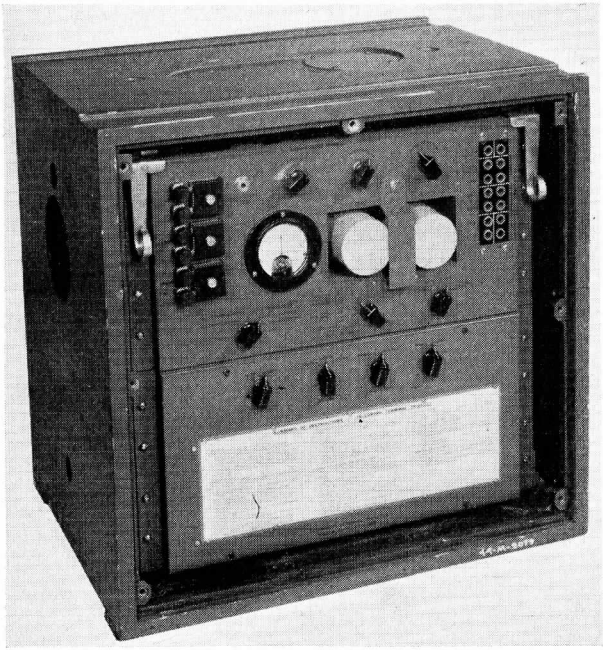
CASE APPROVED BY THE CHIEF SIGNAL OFFICER

Case No. 550—Service Test of Telegraph Terminal Set AN/TCC–1( ) and Filter F–2( )/GG

THE SIGNAL Corps Board in this case was directed to service test Telegraph Terminal Set AN/TCC–1( ) and Filter F–2( )/GG. These items were developed under the direction of the Eatontown Signal Laboratory as an equivalent of the British Speech plus Duplex Equipment which was found particularly useful during the North African campaign.

Telegraph Terminal TH–1( )/TCC–1, the major component of Telegraph Terminal Set AN/TCC–1( ) constitutes the essential equipment for one terminal by means of which a high-grade level compensated carrier telegraph circuit may be superimposed upon a telephone circuit without causing serious impairment to the normal operation or usefulness of the latter. The 1,500- to 2,000-cycle frequency band of the telephone circuit is used for the carrier telegraph circuit, a frequency of 1,680 cycles per second being used in one direction of transmission and 1,860 cycles per second in the other. A reversing switch on the terminal permits its use at either end of the line. Frequencies below 1,500 cycles per second and above 2,000 cycles per second are used for telephone purposes. The terminals do not provide amplification for these frequencies but cause a small bridging loss in addition to a slight deterioration in quality of telephone transmission due to the elimination of the frequencies used for telegraph purposes from the telephone channel. Telephone signaling (ringing) may be accomplished by ringing through the equipment normally with 20 cycles, or by means of an included voice frequency ringer which can be set to operate either at 500/20 or at 1,000/20 cycles. The d-c telegraph legs to which this equipment is adapted are identical with those provided in Telephone Terminal CF–2–( ) (Carrier) and may be operated in the following ways:

1. Half duplex to positive or negative battery.
2. Full duplex to positive or negative battery.
3. Polarential.
4. Two-path polar.

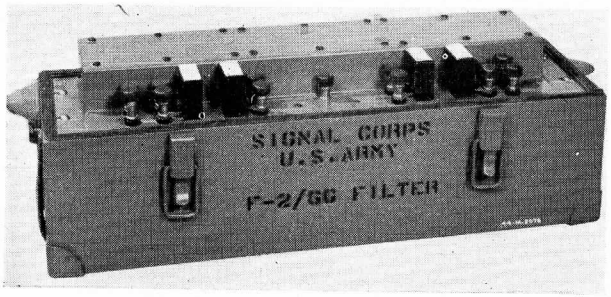


TELEGRAPH TERMINAL TH–1/TCC–1, MAJOR COMPONENT OF THE AN/TCC–1, BY WHICH A HIGH-GRADE LEVEL COMPENSATED CARRIER TELEGRAPH CIRCUIT CAN BE SUPERIMPOSED UPON A TELEPHONE CIRCUIT WITHOUT IMPAIRMENT OF THE LATTER.

The assembly of equipment is mounted on panel units, housed in a portable plywood case 17½ by 21¼ by 22⅛ inches and weighs approximately 170 pounds.

Filter F–2( )/GG is not a part of Telegraph Terminal Set AM/TCC–1( ) but is necessary to provide for bypassing telegraph carrier currents of Telegraph Terminal Sets AN/TCC–1( ) around intermediate telephone switchboards. It may also be used for dropping off the telegraph channel at any intermediate point on the telephone line. This equipment is a small assembly housed in a portable plywood case 7⅛ by 7¼ by 20¾ inches and weighs approximately 30 pounds.

The service test by the Signal Corps Board was composed of four separate parts: Operation between two Telegraph Terminals TH–1( )/TCC–1 with and without intervening switchboards; tandem operation of Telegraph Terminals TH–1( )/TCC–1 using more than two sets; operation of Telegraph Terminals TH–1( )/TCC–1 over radio circuits; a test of Filter F–2( )/GG.



FILTER F–2/GG BYPASSES AN/TCC–1 TELEGRAPH CARRIER CURRENTS AROUND INTERMEDIATE TELEPHONE SWITCHBOARDS.

The tests by the Board indicate that Telegraph Terminal TH–1( )/TCC–1 will provide a good teletypewriter channel on nonloaded metallic open wire, field wire and field cable lines which provide good talking circuits.

Telegraph Terminal TH–1( )/TCC–1 will also make available a good teletypewriter channel when used on telephone circuits of Radio Set AN/TRC–1( ) and AN/TRC–8( ) with or without Telephone Terminal CF–1–( ) (Carrier). An external hybrid coil is necessary when the telegraph terminal is connected directly to the radio equipment. A satisfactory channel is also provided when Telegraph Terminal TH–1( )/TCC–1 is used with two-wire telephone circuits furnished by Radio Set AN/TRC–5( ) and AN/TRC–6( ).

When applied to Radio Set SCR–193–( ) (an amplitude modulated set) it was found that the Telegraph Terminal TH–1( )/TCC–1 provides a good teletypewriter circuit for only a short distance and that the voice channel is unusable.

When used with British Speech Plus Duplex in tandem a good channel is obtained in one direction and only a fair channel in the opposite direction due to inherent differences in the two types of equipment.

The tests of Filter F–2( )/GG indicated that the insertion of this device in a line over which two Telegraph Terminals TH–1( )/TCC–1 are operating does not appreciably affect either the telephone or telegraph circuit.

The board also expressed the opinion that since the accessory items of Telegraph Terminal Set AN/TCC–1( ) are standard equipment, there is no need for the standardization of the Telegraph Terminal Set AN/TCC–1( ) but that only the principle component, Telegraph Terminal TH–1 ( )/TCC–1 should be standardized.

As a result of the service tests it was recommended that Telegraph Terminal TH–1( )/TCC–1 and Filter F–2( )/GG be referred to the Signal Corps Technical Committee for classification after provisions are made for minor improvements; that the military characteristics for Telegraph Terminal Set AN/TCC–1( ) be revised to delete the requirement for four wire operation; and that development be initiated of a satisfactory general purpose voice frequency hybrid coil for use as a four wire terminating set particularly applicable to Telegraph Terminal TH–1( )/TCC–1, Radio Set AN/TRC–1( ) and Radio Set AN/TRC–8( ).

ELECTRONICS EQUIPMENT

REMOTE DATA INDICATOR KIT MC–544

The Remote Data Indicator Kit MC–544 will soon be available for issue to antiaircraft gun batteries using Radio Set SCR–545–( ) or SCR–584–( ).

A number of gun batteries have already received an interim kit consisting of three selsyns and a Technical Bulletin (TB–Sig–38) which contained instructions for fabricating the unit. These instructions proposed that if the standard ordnance cable for use with this equipment was not available, a substitute could be made from field wire W–110.

Reports recently received from the field indicate that the field wire is not satisfactory in all respects. Therefore, standard ordnance cable is being procured for this purpose.

It is recommended that all gun batteries needing the Remote Data Indicator Kit MC–544 (including those that have already received the interim kit) place a requisition for this equipment immediately. In addition, if the standard data cable is not already available in the field, the requisition should include this item.

TEST EQUIPMENT DATA SHEETS

Information is at present being assembled with regard to test equipment used with ground radar sets and their associated IFF equipment. This information, when compiled, will be published in the form of a technical bulletin and will be applicable to ground radar equipment utilized by both the Army Air Forces and the Army Ground Forces. The purpose of this publication is to

provide a readily available list of the test equipment that has been furnished with each radar set when delivered by the manufacturer. This, in practically all cases, constitutes matériel for first and second echelon maintenance.

The bulletin will be cross-indexed in as many combinations as practicable so that even with the most meager information at hand it should be possible to determine practically anything about a particular item. For example, if it is only known that the item about which information is being sought is a signal generator, it will be possible to go to the section marked "Signal Generators," and by running down the list, determine the particular one that is of interest. Once the item is located, there will be no difficulty in determining its Signal Corps stock number, its complete electrical and physical characteristics, the particular radar set it is used with, what other item may be substituted for it, what group of test equipment it may be part of, and possibly what it looks like—for it is intended that pictures of a good many of the items will be included. With all this information, it may not prove to be too difficult to determine who, in the immediate vicinity, may have access to such an item, which may be borrowed if necessary.

It is not anticipated that this technical bulletin will solve all ground radar problems relative to test equipment, but it may help toward that end. It is anticipated that the manuscript will be in the hands of the printer by the first week in February 1945, and distribution made to the field soon thereafter.

COMMUNICATION EQUIPMENT

KEYING THROUGH RM–29–( )

Radio transmitters of a division now in France are keyed remotely from a signal center and incoming messages are received there. This eliminates the time factor between the signal center and the radio set time necessary for a messenger to travel between the command post and the radio set. A field wire line is laid from a radio operating position in the signal center to each radio. In addition to providing remote radiotelegraph and radiotelephone operation, this line provides the operations officer with telephone communication with each radio set. At times, a small switchboard is employed, with a local line to the division switchboard. This is valuable to the operations officer administratively.

When telegraph and teletype communications are good, and the situation is static, radio may be silenced or restricted. When this happens radio operators at the signal center operate telegraph, at the same time being available to take care of any radio traffic at the adjacent radio operating position.

While Remote Control Unit RM–29–( ), as issued, provides a means for remote radiotelephone operation, and for telephone communication between the radio transmitter and the remote operating position, a simple modification, worked out by a technical sergeant in the division, permits keying.

The division's standard operating setup employs a Remote Control Unit RM–29–( ) at the transmitter and a Telephone EE–8 at the remote end. Addition of the following parts permits remote keying:

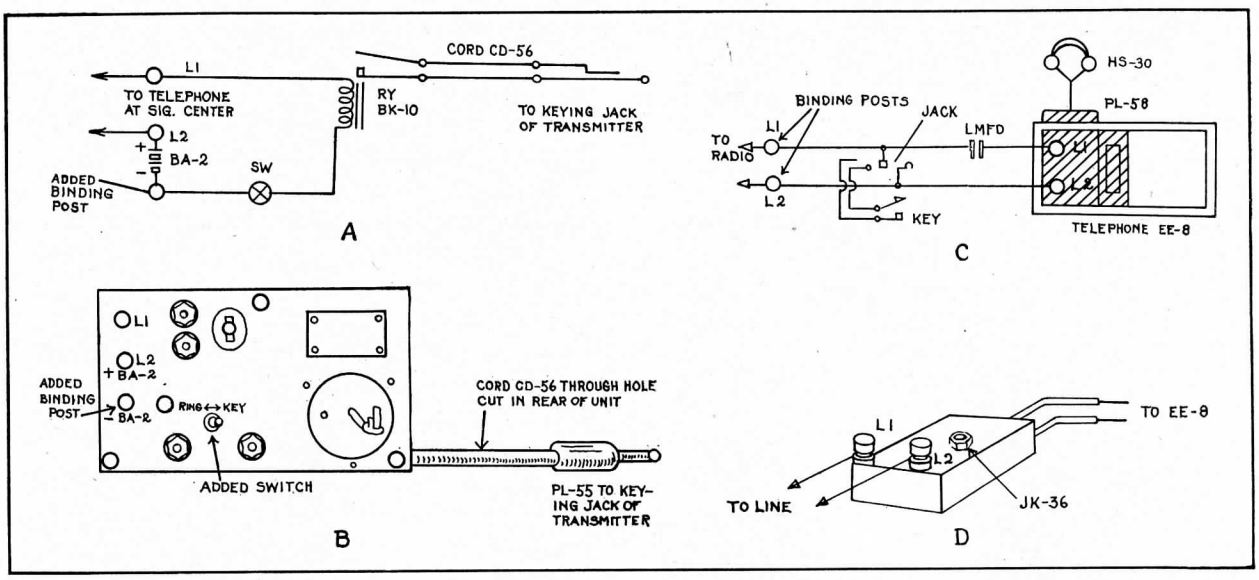
At RM–29–( )	*At Telephone*
1 binding post.	1 mfd. condenser.
1 Relay Unit BK–10.	2 binding posts.
1 Battery BA–2.	1 Jack JK–36.
1 SPST* toggle switch.	1 telegraph key.
1 Cord CD–56 (to transmitter keying jack).	1 Headset HS–30, with Plug PL–58.

*Single Pole—Single Throw

The Relay Unit BK–10, may be mounted inside the Remote Control Unit RM–29–( ). The core of the relay is wired in series with the SPST toggle switch; the purpose of the switch being to open the core of the relay to permit the line to be rung from either end.

A simpler keying method, and one in which the sending operator can hear his sidetone, requires a slight modification of the telephone. A Jack JK–36, is wired in series with the holding coil of the telephone, and mounted on the case of the phone. In this circuit the jack, key, and headset are all that are required at the phone. Also, the operator may monitor his own sending. However, the change makes the telephone unsuited for operation on a common battery switchboard.

In operation, the SPST switch on the remote unit must be closed for keying, and should be open for ringing. A tap of the key by the sending operator signals the operator at the set to turn the transmitter on. Both operators may monitor incoming transmissions.

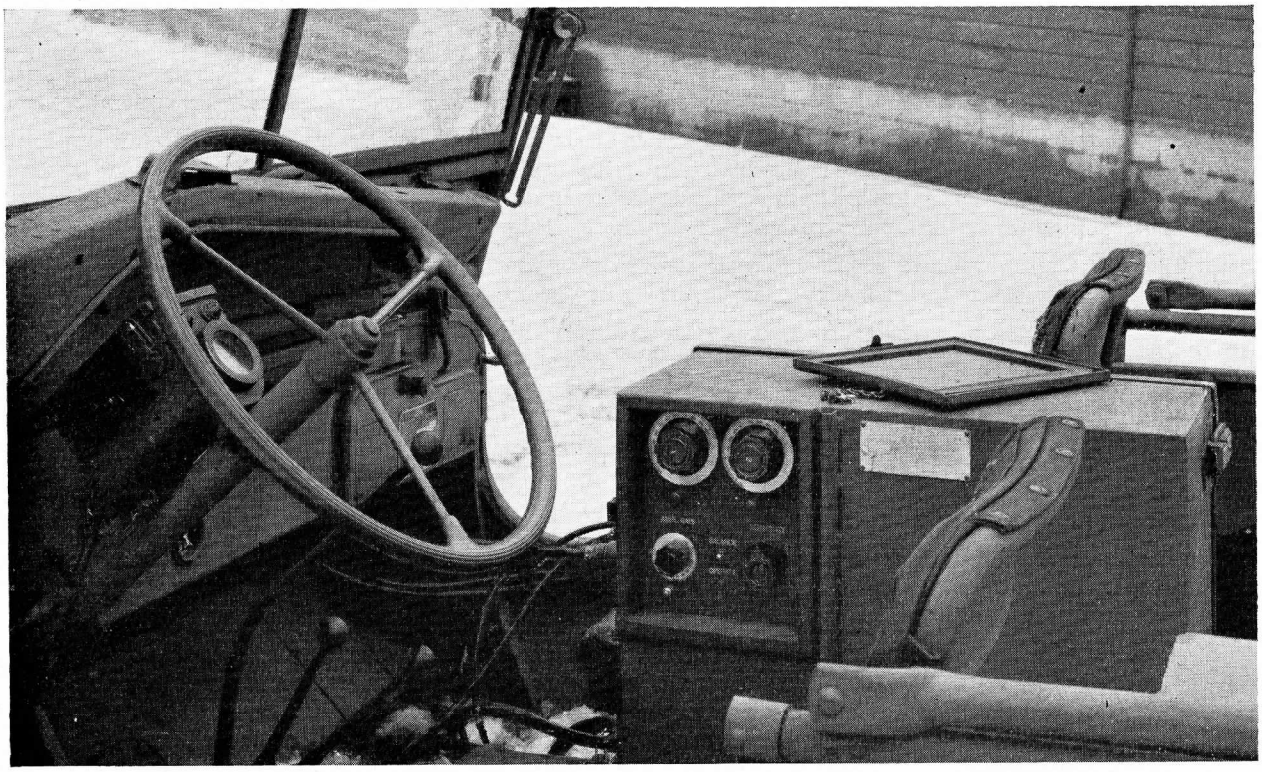


CIRCUIT DIAGRAMS OF RM–29 MODIFICATIONS TO PERMIT KEYING: A—WIRING OF RELAY CIRCUIT. B—FRONT PANEL OF RM–29; SUGGESTED MOUNTING OF PARTS. C—COMPONENTS ADDED AT TELEPHONE. D—SUGGESTED MOUNTING OF PARTS ON SMALL BOX.

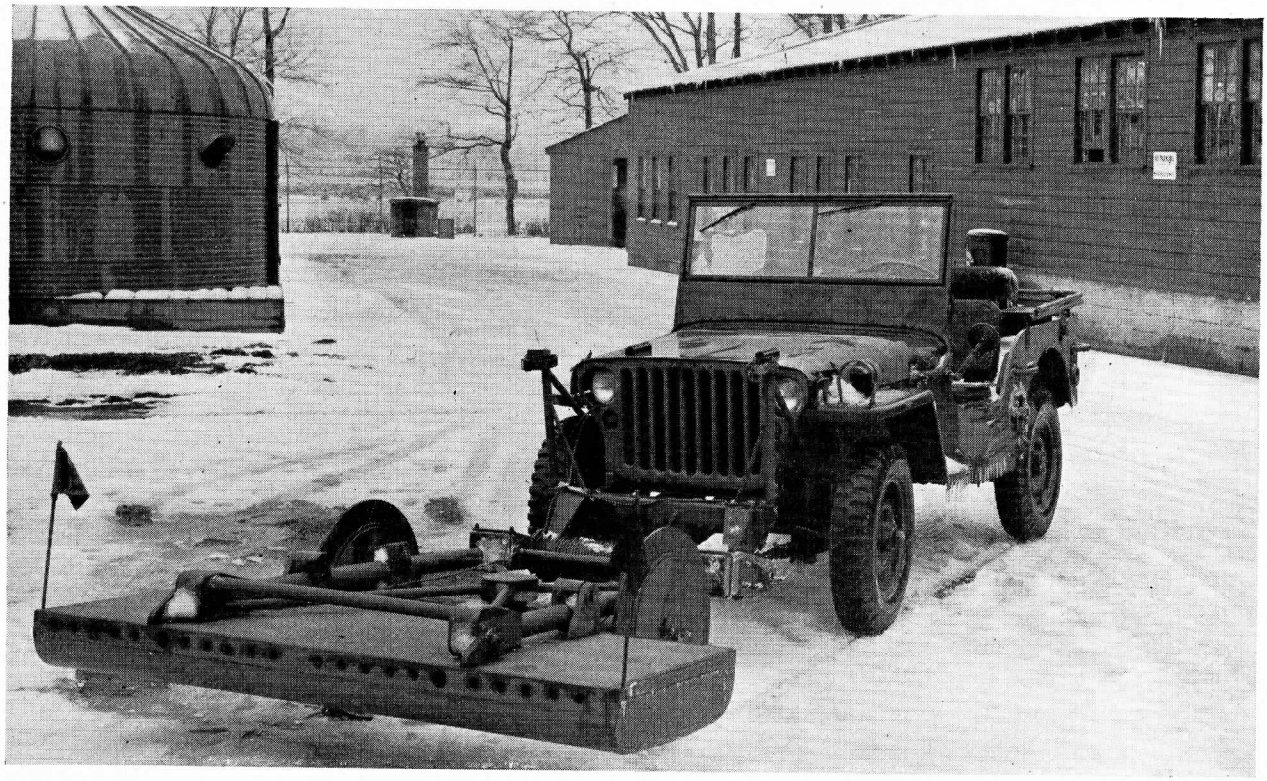
Operation of the remote control unit for radio-telephone or telephone purposes remains unimpaired.

This system has been operated over 3 miles of Wire W–110, on Radio Set SCR–193–( ) and SCR–284–( ). On lines of one-half mile or less, the 12-volt battery of the radio car supplies sufficient relay voltage. Otherwise, one Battery BA–2 per wire mile, is sufficient.

One of the big advantages of this system, is that



AMPLIFIER AND CONTROL BOX OF THE AN/VRS–1 SHOWN INSTALLED IN JEEP. LIGHTS FOR VISUAL INDICATION IS CONTAINED IN CONTROL BOX CLAMPED TO STEERING POST.



BOOM ASSEMBLY OF DETECTOR SET AN/VRS–1 IN OPERATING POSITION. NOTE WOODEN WHEELS OF BOOM AND STANCHIONS ON JEEP FOR SECURING ASSEMBLY IN UPRIGHT POSITION.

it does not require any change in the regular mounting, keeps the set complete at all times, and allows the same set to be kept in the net, even though the radio must suddenly operate on the move.

DETECTOR SET AN/VRS–1( )

Detector Set AN/VRS–1( ), a vehicular-mounted mine detector, is now in limited production. It is built for mounting on a ¼-ton, 4 by 4 vehicle (which is not part of the detector set). It consists of a detecting unit containing search coils carried ahead of the vehicle on a boom, associated electronic equipment mounted below the front seats, and automatic braking and declutching equipment which stops the vehicle when a mine is located. It is capable of detecting an 8-inch mine buried at a depth of 6 inches in reasonably level ground. It detects over a path 6 feet wide and will locate the approximate position of the mine within this path. Power is furnished by the regular storage battery of the vehicle.

The search coil assembly is mounted at the front end of the boom, 7 feet ahead of the front wheels of the vehicle. It consists of a plywood housing inside of which are mounted four large detecting coils in a water-tight box.

The boom consists of a light wooden framework, two wooden wheels (the use of metal near the search coils of course had to be avoided) which hold the front end assembly above the ground, and a steel framework which connects the boom to the vehicle frame. The whole assembly, including wooden wheels, can be elevated to a vertical position when not in use.

The control box, housing the vibrator power supply, oscillator, amplifier and associated control equipment, is installed between the front seats of the vehicle. All cables terminate in sockets in the control box. The vehicle must have a terminal box in front of the seat alongside the driver. This is found in all late vehicles, but was not provided in some early models.

Under the vehicle are mounted the automatic brake and clutch units which disengage the clutch when the control relay closes. These are spring-powered but must be reset manually. A green light mounted on the steering column shows when it is safe to move forward. If this light goes out the operator should stop immediately and investi-

gate. Under no circumstances should the equipment be moved forward when this light is out.

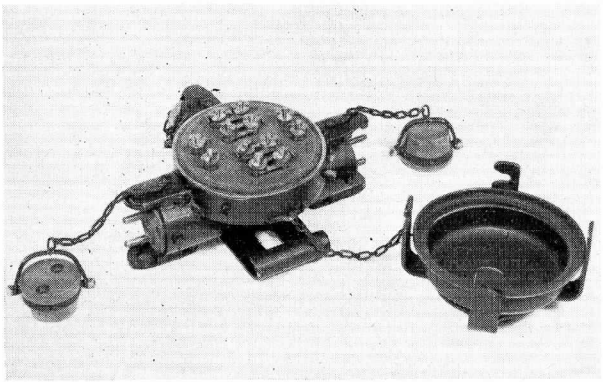
When in use the vehicle must be operated very slowly (5 miles per hour), and special precaution must be taken when turning sharp corners to insure coverage of the wheel tracks by the search coil.

A limited number of these detectors are under procurement. These are allocated to various theaters according to their needs and distribution is to be determined by the theater.

BRIDGING-ACCESS PLUG U–23/G

Bridging-Access Plug U–23/G has been adopted by the Signal Corps for insertion between lengths of spiral-four cable to provide a point for testing and access to the circuit. In addition, it provides a facility for bridging the circuit.

Physically, the device consists of a round metal box approximately 4 inches in diameter with three nonloaded cable connectors attached thereto, making the over-all length approximately 7½ inches. The weight is approximately 4½ pounds. Connections from the sockets and pins of all cable connectors are brought to the face of the plug and terminated on binding posts. The binding posts, the pins and sockets of the connectors, and the wiring between them are set in synthetic rubber. Binding posts of corresponding pins and sockets are indicated by the words "pins" or "sockets" and by arrows molded on the synthetic rubber. There is a raised molding of synthetic rubber around the circumference of the metal box which provides a water seal when the cover is clamped in place. The binding posts on the line circuits are equipped with adjustable metal straps which in their normal position provide circuit continuity and which may be used to short or open desired pairs in the line.



BRIDGING-ACCESS PLUG U–23/G CAN BE INSERTED BETWEEN POINTS OF SPIRAL-FOUR CABLE FOR TESTING AND BRIDGING CIRCUIT. THIS OVER-ALL VIEW SHOWS BINDING POSTS, WATER SEAL, END PLUGS, AND FASTENING PLATE.

When bridging, jumpers are placed from the four bridging binding posts to the four line binding posts. The binding post caps are cut away so that they may be turned more easily and to facilitate attachment of test clips. Three plastic waterproof end caps, similar to the new end caps to be used on spiral-four cable assemblies, but without test terminals, are provided for protecting the connector outlets when not in use. These end caps are made captive to the plug by means of short lengths of chain. A bracket is welded to the back of the body of the plug to provide a means for attaching the plug to a pole, tree, or messenger. Present plans indicate that production of Bridging-Access Plug U–23/G will begin in April 1945.

For distribution to the theaters of operations as a pool item, Bridging-Access Plug U–23/G will be added to the bill of materials of the complete 100-Mile Spiral-Four Carrier System on the basis of 12 per system. Additional issue will be made upon request by the theater commander.

The next published change to T/O & E 11–18, Field Operation Company, Signal Battalion, T/O & E 11–97, Signal Operation Company, Signal Operation Battalion, and Team GP, T/O & E 11–500, Signal Service Organization, will contain this item to be used for testing and maintenance purposes.

SPOOL DR–8–A SEPARATE ITEM

Reel RL–39–A is a lightweight reel assembly designed for hand carrying or for mounting on the chest or back, and is used for laying and recovering Wire W–130–( ). It consists of an empty Spool DR–8–A, and axle with handle and crank together with attachment straps. In addition to being issued as a separate item, Reel RL–39–A is furnished as the major component of Reel Equipment CE–11.

In most instances, Jack JK–26 and Plug PL–54 have been provided for the Resonator M–356–( ) (part of Detector Set SCR–625–( )) but a limited number of early sets are provided with an amphenol cable connector. For the latter, MWO Sig 11–1122–2, dated December 1944, details instructions for changing to Jack JK–26 on the cable and Plug PL–54 on the cord of Resonator

M–356–( ). Most sets now in use require no modification.

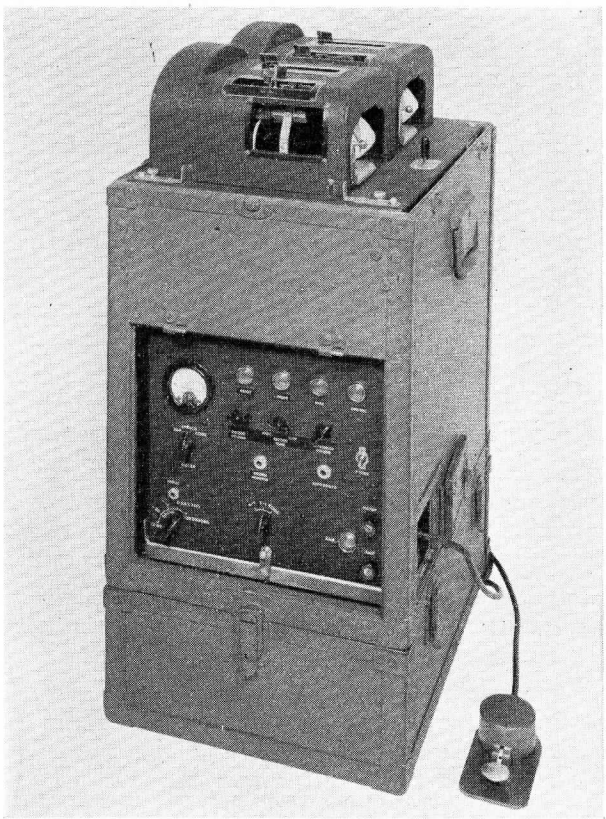
Page 7, Paragraph 4c, of TM 11–1122 for Detector Set SCR–625–( ) states that Headset HS–30–( ) with Cord CD–604 may be used in place of the resonator with amplifiers that are equipped with Jack JK–26. This authorizes using units to requisition Headset HS–30–( ) (Signal Corps Stock No. 2B830) and Cord CD–604 (Signal Corps Stock No. 3E1604) for this purpose. It is recommended that this headset (together with necessary cord) be promptly requisitioned wherever it may be needed.

The parts list of the Detector Set SCR–625–( ) is being changed to delete one of the two Resonator M–356–( ) at present provided and to add one Headset HS–30–( ), which may be used alternatively.

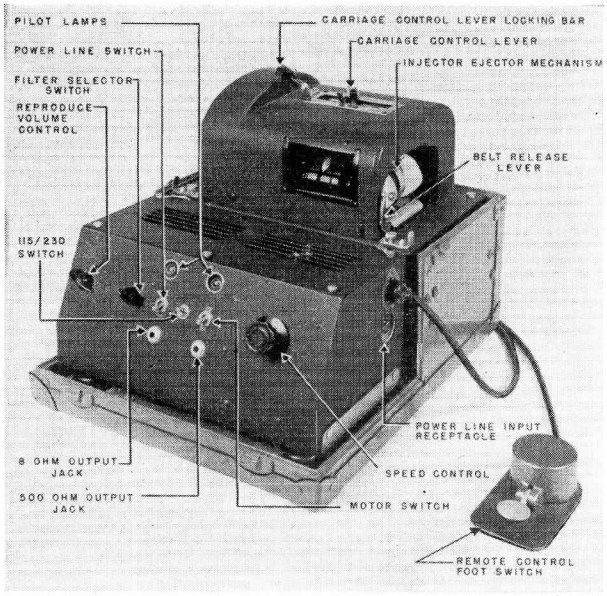
RECORDING EQUIPMENT RC–179–( )

Recording Equipment RC–179–( ) makes a permanent and continuous record of code or voice transmissions received over radio or wire circuits. It consists of a Speech Recorder MC–502–( ) and a Speech Reproducer MC–503–( ), and is intended principally for radio intercept recording applications.

Speech Recorder MC–502–( ) is contained in a single field case 15 inches long, 23 inches deep, and 26 inches high, weighs 110 pounds and is equipped with a removable top cover which can be clamped onto the bottom to raise the unit to a convenient operating height. Its two separate recording heads are interconnected so that the incoming signal is automatically transferred from one to the other as each record becomes full. The recording material is a thin, flexible ethyl cellulose belt 3½ inches wide and 12 inches in circumference, upon which the recording stylus embosses a helical sound track. Two recording speeds provide either 15 or 30 minutes playing time per record. A reproducing head is associated with each recording head, to permit immediate monitoring of the records. Input impedances of 500 and 5,000 ohms are provided.



SPEECH RECORDER MC–502 HAS TWO RECORDING HEADS INTERCONNECTED SO THAT WHEN EACH RECORD IS FINISHED THE SIGNAL IS AUTOMATICALLY TRANSFERRED TO THE OTHER RECORD. IMMEDIATE MONITORING OF EACH RECORD IS POSSIBLE THROUGH A REPRODUCING HEAD ASSOCIATED WITH EACH RECORDING HEAD.



SPEECH REPRODUCER MC–503 HAS A SINGLE REPRODUCING HEAD WHICH TRANSCRIBES SIGNALS FROM BELTS RECORDED BY THE MC–502. RECORDINGS CAN BE SLOWED DOWN IN REPRODUCTION BY AS MUCH AS 15 TO 1 TO FACILITATE TRANSCRIPTION OF HIGH-SPEED CODE SIGNALS.

Speech Reproducer MC–503–( ) is also mounted in a field case, the dimensions of which are 15 inches long, 19 inches deep, and 14½ inches

high. Its total weight is 68 pounds. This device, which has a single reproducing head, is used to transcribe signals from belts recorded by MC–502–( ). A variable speed drive permits recordings to be slowed down, in reproduction, by as much as 15 to 1, in order to facilitate the transcription of high-speed code signals. A series of filters controlled by a selector switch allows reproduced signals to be peaked near the audio frequency resulting from such reduced-speed playback.

Both of the units are shock-mounted in their cases, and are operable from 115- to 230-volt, 50- to 60-cycle power supplies; the audio output of each is available at a jack supplying 2 watts from an impedance of 8 ohms. Remote control foot switches are included with both units, but no loudspeaker or headset is provided. The over-all frequency response of the equipment is flat within plus or minus 5 db over the range of 250 to 4,500 cycles per second.

Issue of Recording Equipment RC–179–( ) to radio intercept organizations is governed by established Tables of Organization and Equipment.

MAINTENANCE

LOCAL BATTERY FOR RINGING

Some telephone users have a tendency to turn the CB-LB switch on Telephone EE–8 to common battery (CB). This causes the generator to turn hard, and the opposite party phone will not ring. Telephones have been sent to field repair units when there was nothing wrong with them, except that the switch was turned to common battery.

Keep this switch turned to local battery (LB) when the telephone is connected on a magneto line.

SHELL CONTAINERS FOR WATERPROOFING

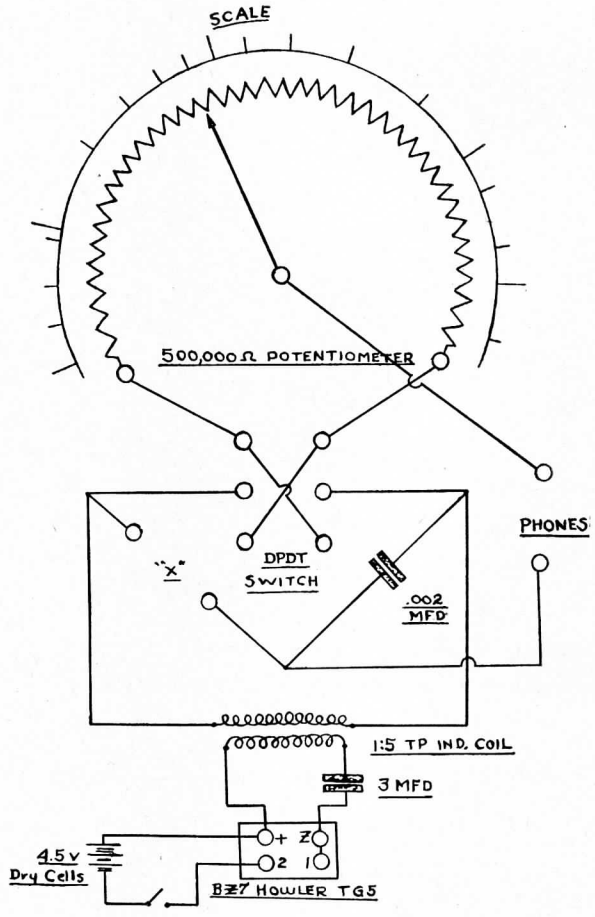
A series of tests were conducted by the Office of the Chief Signal Officer, Headquarters, European Theater of Operations, to determine the possibility of using empty fiber shell cases in the waterproofing of Signal Corps equipment. Certain small items of Signal Corps equipment, notably Radio Set SCR–536–( ), may be enclosed in mortar shell containers. The container, which has been rendered waterproof, is also sufficiently buoyant to support the weight of a man.

CAPACITY BRIDGE

The repair section of a division signal company in the European theater of operations has devised a simple means of measuring an unknown capacitor in the form of a simple capacity bridge.

Both ratio arms of the improvised capacity bridge are formed by a calibrated 500,000-ohm potentiometer. For a standard, a 0.002-mf capacitor was used. A double-pole, double-throw switch was provided to interchange the unknown and the standard capacitors in order to extend the range of instrument and to take advantage of the effect of the taper of the potentiometer in stretching out the scale.

For the oscillator circuit, a howler from a Telegraph Set TG–5–B was used. The note to the bridge was fed through a 1 to 5 telephone induction coil (in this case taken from captured enemy equipment). In order to block d-c a 3-mf capacitor in series with the primary of the induction



CIRCUIT DIAGRAM OF CAPACITY BRIDGE IMPROVISED BY A SIGNAL COMPANY IN THE EUROPEAN THEATER OF OPERATIONS.

coil was used. The value of neither the induction coil nor the capacitor is critical.

To use the device a variety of known capacitors was connected across the X terminals and the potentiometer adjusted for minimum sound in the phones. The point on the scale, thus determined, was marked. As soon as a sufficient number of points was plotted the device was ready to operate.

The appearance of the scale depended upon the standard capacitor used and the taper of the potentiometer. Corresponding to the two settings of the double-pole, double-throw switch there were two scales.

The signal unit that put this device together used it to measure capacitors from 5 mmf to 32 mf. It was found effective especially in putting enemy equipment back into use.

HEADSET CHART

CORRECTION

The Headsets H–20/U and H–24/U which appear on the chart, Headsets, Microphones, and Chest Sets Most Commonly Used by Ground Forces, published in SCTIL No. 38, January 1945, are still in the developmental stage and are not available for issue. Production of these headsets will depend on whether or not they prove satisfactory in service tests and are classified as standard types by the Signal Corps Technical Committee.

OVERLOADING OF VEHICLES

Exceeding Capacities Can Help Speed Supplies, But Precautions Must Be Taken

THE STRAW that broke the camel's back would play hob with a military transport vehicle, too. It would break the frame, axle housing, springs, torque rods, propeller shafts, axle gears, differentials, and axle shafts, in addition to ruining the wheel bearing, tires, clutch, transmission, engine, brakes, and many other parts.

The payload capacities that have been assigned to military vehicles are not arbitrary ratings. They represent definite, safe carrying capacities for cross-country operation, and they have been established by scientific engineering methods. Therefore, it is only logical that loads which exceed these ratings will cause break-downs—unless they are properly handled.

Because the dangers of abused overloading are hidden ones, something-else often gets the blame. Joe says the axle shaft was faulty. It wasn't though, until his truck was overloaded a few times and driven over ground that would rattle the treads off a heavy tank. Taking an overload over severe terrain will wind up an axle shaft like a corkscrew, on the same principle that a wire bent back and forth a few times will wind up and snap.

In addition to bad terrain, which is number one on the list of hidden evils to watch out for, there are other unknown factors that have a bearing on the subject. The speed with which certain phases of operation are made is vitally important, for the heavier the load, the greater the strain on every part when turning or stopping the truck, and excess speed increases this strain even more. The skill of the operator is also important. Proper handling of a vehicle can save untold damage, by preventing jolting, skidding, swaying, etc.

Let's take a typical 2½-ton 6 by 6 over an imaginary trip and see how these factors affect the vehicle * * *.

The specified rating of the truck, 2½ tons, is the weight established for cross-country operation, which allows ample safety factor for practically all conceivable conditions. Actually, in terms of normal operation of vehicles on typical American highways, the truck has a 5-ton capacity. Suppose, then, the truck is loaded to the 5-ton limit for normal operation. The weight of the truck and its load is distributed in the proper ratio, with 5,400 pounds on the front axle and 7,800 pounds on each rear axle. Remember, the safety factor

This article is not intended to condemn the practive of overloading per se. When handled properly, overloading of transport vehicles can be a successful means of stepping up the transportation of material. But it must be done only with a knowledge of the pitfalls it may incur—for the operating techniques of "normal" conditions frequently become abusive techniques when the conditions change. It is this abuse which must be watched for and avoided.

has been used up. Now, suppose the road conditions were not known before the vehicle began its trip. There happens to be a steep hill along the line. This is what happens * * *.

If the grade is steep enough, the front wheels may actually be lifted off the ground during a quick pick-up, and all the weight, 21,000 pounds, will shift to the rear axles! This serves as an example of the fact that, even on lesser grades, when the truck hits an incline, the load is completely redistributed, with no factor of safety to fall back on!

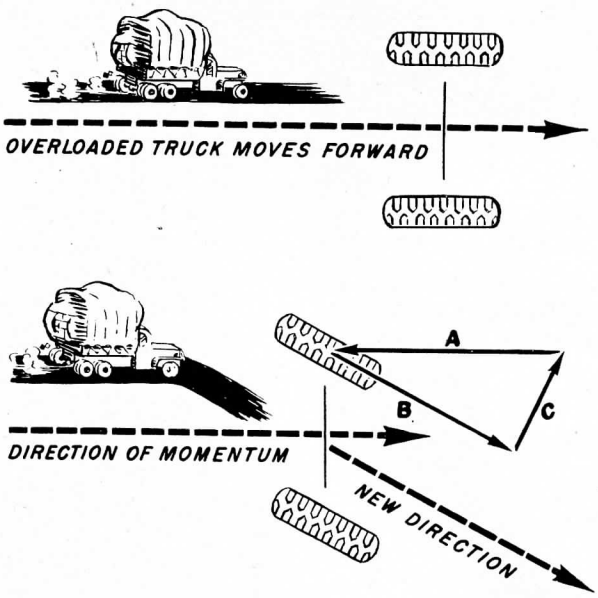
Though the break-down may not occur on this first hill, parts may be weakened, and three or four more such hills during the course of the trip may cause one or more of the weakened parts to break down. On a 4 by 4 in the same situation, the entire vehicle weight and its overload would be transferred to one axle.

Supposing the hill has been crossed without mishap. Now we start running into badly bombed terrain, strewn with debris—rocks and logs and piles of earth. Going over a partially covered log represents a real hazard to the overloaded truck, for at one moment in the maneuver the entire weight of the truck and its load, 21,000 pounds, is shifted to the intermediate axle, with its maximum capacity of approximately 16,000 pounds. With the 5-ton load, there is a sudden thrust of about three times the normal axle load on this axle. The safety factor has been used up—something has to give way.

Suppose a shell hole has to be crossed. Again, the weight shift is a quick one—a jolt—this time on both the front and rear axles. And the intermediate axle won't be able to touch bottom all the way across the hole, so the rear axle takes a double overload during the course of the maneuver.

Next, the driver finds he has to turn off what's left of the road and cross a ditch. Because the ditch is wider than a shell hole and doesn't look so deep, he doesn't slow down. Result—a terrific strain on the vehicle as the weight is shifted rapidly from front to rear—with no safety factor to take the shock.

Any one of these conditions may cause a failure or weaken something to the point where it will give way on the next trip. And the one extra load of matériel that got through will be paid for with a deadlined truck and the consequent delay in shipping other equally vital matériel.



Not the least of the dangers of overloading are the accidents it may cause, especially when the driver fails to reduce his speed and drives as he does with a normal load. A very common plea of drivers who have gone into a ditch when rounding a curve with an overloaded vehicle is, "My brakes locked." The brakes didn't lock, though. This is what happened:

As the overloaded truck moves forward, the wheels rotate easily and naturally. But as the driver attempts to turn, and the front wheels try to guide the truck in a new direction, the momentum of the overloaded truck pushes straight ahead. When the brakes are applied to slow the truck for the turn, the reaction of the road against the front wheels is in the direction of the arrow A, while the reaction of the brakes through the wheels is in the direction of the arrow B. This sets up the force C, which represents the reaction to wheel rotation that is due to the turning angle. The farther the wheels are turned, the more the brake reaction tends to skid the wheels. Were it possible to turn the wheels 90°, they would skid of their own accord, without application of the brakes at all. Since the braking power of the front wheel brakes is in direct ratio to that of the rear wheel brakes, and since the majority of an overload is carried by the rear wheels, the front wheels have a tendency to go into a skid much quicker.

In other words, the front wheels slide sidewise, rotate slower—may stop. Tires drag, steering be-

comes increasingly difficult, as when a truck is standing still on flat tires. The side pressure causes king pins and bushings to bind, front wheels to lock. The vehicle skids.

Slamming on brakes, frequent use of emergency brakes instead of power brakes, with the resultant strain on the front axle, and, in slippery weather, use of chains on rear wheels only, are common causes of accidents which are greatly aggravated by overloads. Unless all conditions of terrain and operation are known, and unless vehicles are handled with a thorough understanding of the effect of an overload under these conditions, overloading is a glaring example of inefficiency and false economy. The temptation to succumb to its promise of getting something done beyond the normal possibilities of the vehicle is a mirage equal to anything the desert has to offer.

TRANSPORTING FILM BY PIGEON

Experiments Show That Birds Can Carry Roll or Pack Negatives Over Long Distances

A SIGNAL photographic company, in collaboration with the Fort Sam Houston pigeon lofts, conducted a series of experiments and tests to ascertain the feasibility of transporting undeveloped films by pigeons. The report of these experiments and tests follows:

Experiment No. 1.—A flock of 50 pigeons was trained to become accustomed to wearing back capsules. After the pigeons were accustomed to the empty capsules, the capsules were loaded with film with the load being gradually increased until the maximum efficiency of the bird was reached. Several different types of capsules were tried for size, lightness, and ease of handling.

Experiment No. 2.—Four pigeons, 2 carrying film, were released at Camp Swift, Tex., to fly an air-line distance of 95 miles to Fort Sam Houston, Tex. One pigeon carried a roll of 35-mm. film in a back capsule, a second bird carried two 4 by 5 film pack negatives in the large back capsule. The third and fourth birds carried neither film nor message. All 4 pigeons were released at 1440. The first bird arrived at the home loft, Fort Sam Houston, Tex., in 2¾ hours, the second bird in 3 hours and 15 minutes, the third bird in 5 hours, and the fourth bird, evidently forced down by nightfall, did not arrive until 0800 the following day. All birds and film arrived in good condition.

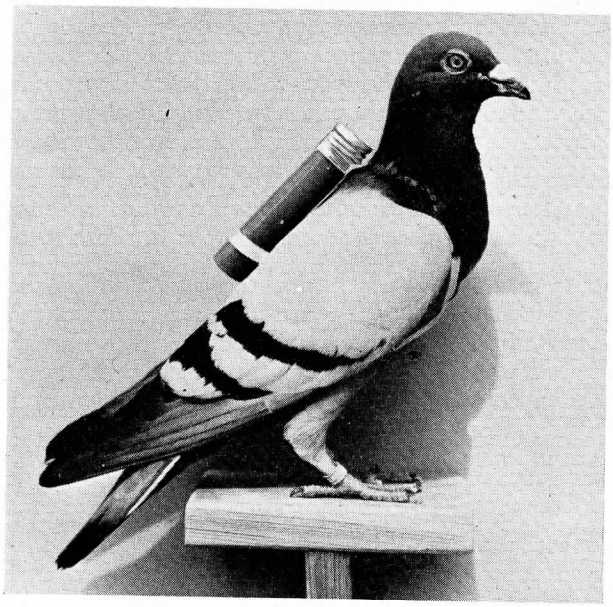
Experiment No. 3.—Four pigeons, 2 of which carried film, were released at Camp Howze, Tex., to fly an air-line distance of 310 miles to the home loft at Fort Sam Houston, Tex. Three birds arrived within 10 hours and the fourth bird arrived on the following morning. One bird carried a 5-inch pack film capsule, one a 35-mm. back capsule, while the other 2 carried leg message capsules only. All birds arrived in good condition.

Experiment No. 4.—One pigeon, carrying a 4 by 5 film pack negative, was released from an airplane cruising at approximately 100 miles per hour. The bird and film arrived in good condition.

Experiment No. 5.—A flock of 55 pigeons was released from a bomber traveling at a speed of 200 miles per hour. The first group of 15 birds was released at an altitude of 8,000 feet, a distance of 22 miles from the home loft; 1 of the birds carried a 35-mm. leg capsule. Forty-five minutes later all of the birds arrived at the home loft in good condition. The second group of 15 birds was released at an altitude of 12,000 feet, 31 miles from the home loft; 2 of the birds carried film, one with leg capsule, the other with 4 by 5 film back cupsule. Fifty-five minutes later all of the birds arrived at the home loft in good condition. The third group of 15 birds was released at an altitude of 19,000 feet, 55 miles from the home loft; 3 of the birds carried back capsules. Eighty minutes later all of the birds arrived at the home loft in good condition. The remaining 10 pigeons were released, at an altitude of 31,000 feet, 80 miles from the home loft; none of these birds, however, carried capsules. One hundred and twenty minutes later all of the birds arrived at the home loft in good condition.

As a result of these experiments, the following observations were noted:

1. Harness and film containers similar to the type used by newspaper agencies were found practical for Army use.
2. A back capsule, approximately 4 inches in length, ¾ inch in diameter and made of aluminum, or a plastic lightproof material, should prove very satisfactory.



PIGEON WEARING BACK CAPSULE AND HARNESS USED IN FLYING FILM OVER LONG DISTANCES.

3. A light and flexible elastic harness, fitting around the neck and rump of the pigeon, is capable of retaining the capsule in proper position on the pigeon's back while in flight. The harness must be capable of fitting large, medium, or small pigeons.

4. Any ordinary-size bird can carry three 4 by 5 pack film negatives, or 20 frames of 35-mm. film a distance of 30 miles in the average time of 45 minutes.

5. Pigeons can be safely released from airplaines at an altitude of 31,000 feet at a speed of 200 miles per hour.

These experiments have definitely indicated that undeveloped films can be transported swiftly and reliably via pigeons and may be used as a means of returning film negatives without involving the use of messenger personnel.

Development of a back capsule, to be known as Film Capsule PG–108( )/CB, is now underway. Military characteristics have been approved by Army Service Forces. It is anticipated that the new film capsule will be available for issue in the near future.

BEARING A BURDEN

BALL AND roller bearings are carrying the war to the enemy on trucks, tanks, tractors, trains, planes, and ships. And bearings are just about number one when it comes to critical items used in the Army.

Constant attention to the care and handling of bearings by all personnel concerned with operation and maintenance of mechanical equipment on which they are used is a vital factor in keeping the Army's mechanical equipment running smoothly and efficiently toward victory.

Three main points in the care and handling of bearings should be kept in mind at all times. First, keep bearings clean! Remember that sand or grit will score a bearing in short order—a few drops of moisture will rust it just as quickly. So keep bearings wrapped at all times when they are not in use, and when installing or removing them always place them on clean surfaces. The dry-cleaning solvents you use to clean them and the lubricants you use to keep them running smoothly must be clean too. For this reason it is important that containers be kept covered as much as possible to prevent dust and grit from settling and blowing into them. Hands, benches, rags, tools—everything that touches bearings—must be clean.

Second, keep bearings adjusted properly. This is especially important in the operation of motor vehicles when removal of front wheels for lubrication is a frequent occurrence. Reinstallation of bearings at times like these, or installation of new bearings when necessary, must be performed carefully so that bearings are neither too tight nor too loose. A bearing that is too tight will overheat quickly and a bearing that is too loose will be subjected to jolting and jarring far in excess of its ability to withstand. Bearings are shock breakers, not shock takers.

Lubrication is the third important maintenance service in the care of bearings. War Department Lubrication Orders for specific items of equipment should be followed so that the right lubricant in the right amount is always applied. Here, again, the cleanliness of lubricants must be emphasized and the practice of keeping lubricant containers covered whenever they are not actually in use must be stressed.

In connection with second, third, and fourth echelon handling and reclamation of bearings, a new technical manual, TM 9–2856, Maintenance of Ball and Roller Bearings, is now in the process of preparation for distribution in the near future.

This manual gives special attention to inspection procedures in connection with determining whether bearings are serviceable or unserviceable. It would be well for personnel responsible for this phase of bearing maintenance, especially, to watch for the appearance of this manual, though of course, everyone who handles bearings will find the manual of interest and help.

It takes just as much, if not more, equipment to win a war as it does to lose one. So the fact that we are winning many victories as the days pass does not mean that we can let up on our efforts to make our equipment last as long as possible and give the utmost in efficient service. Bearings are small in size but they are big in importance. Give them the attention they deserve—keep them clean, keep them adjusted properly, and keep them lubricated—to keep them rolling.

MILITARY TRAINING

TRANSMITTERS AT SQUANKUM

THE EASTERN Signal Corps Unit Training Center at Camp Charles Wood operates a continuous 24-hour zone of communications field problem for units in their final six weeks of unit training.

The fixed radio transmitters used in the problem were formerly located in individual shelters at various locations with control and power lines running to each location. In order to improve control supervision over operating teams, and to give more detailed instruction to personnel not active in the problem, the field radio transmitters were recently installed in one building at Squankum training area.

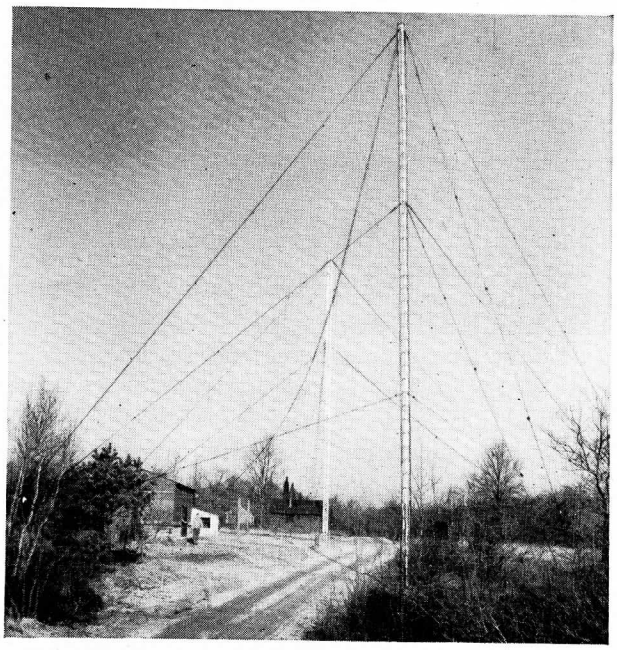
The new transmitter building was constructed by piecing together two House HO–15 prefabricated buildings, making a structure 25′ wide and 30′ long. Cement block walls raised the building so that sufficient height is obtained for the transmitters. Fluorescent light is provided.

Commercial power, 4800-volt, 60 cps, terminates at a transformer pole in the Squankum area. From this point, underground cables carry 220-volt, 60-cycle energy to a power shed. The cable is 4 conductor, No. O, 600–V insulation, "trench-lay." In the power shed a 3-pole, double throw switch changes to the output from a 25 KVA Diesel auxiliary power plant for emergency use.

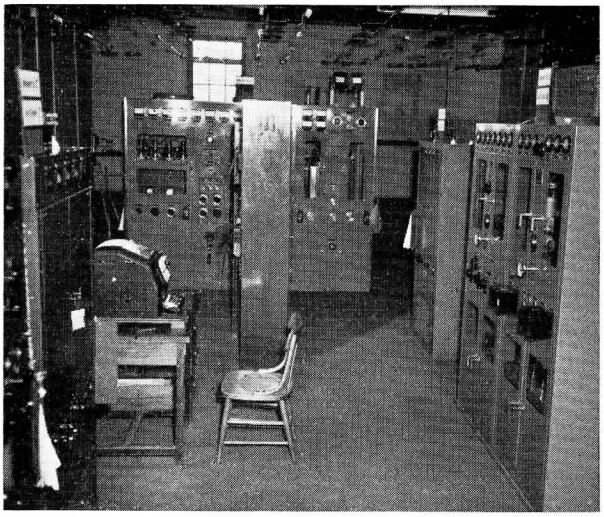
Signal and control lines terminate on a pole 100′ from the building. Underground cable brings these lines into a convenient patching panel in the transmitter room. Keying lines normally need no battery; however, relay systems are installed to get better operations during wet weather.

Transverse lines inside the building near the ceiling allow any transmitter to fire up on any one of the four rhombic antennas. Patching details consist of 45 and 30 calibre shells soldered to the copper braid.

Four transmission lines are constructed to feed the four rhombics. To prevent sharp bends in these lines, poles are set in an arc. A 70′ radius of these lines was judged to be approximately correct for the lowest operating frequency of 4.3 megacycles.. A 12″ separation of No. 6 copperweld was used to obtain, with dissipating resistance, 600-ohm impedance.



TWO 90-FOOT STEEL TOWERS SUPPORT A 4–MC DOUBLET ANTENNA AT SQUANKUM. NOTE TRANSMITTER BUILDING, LEFT FOREGROUND.

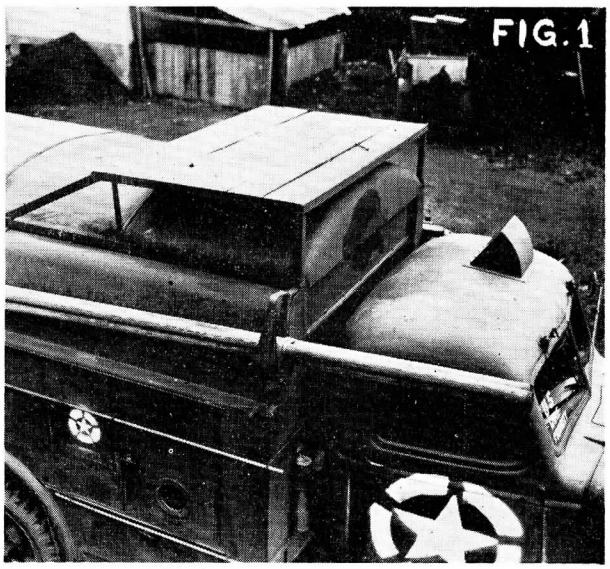


INTERIOR OF TRANSMITTER BUILDING, SHOWING TELETYPEWRITER USED FOR INTERCOMMUNICATION AMONG THE THREE SITES.

Two rhombics on Blaw-Knox steel towers are orientated on Camp Kohler, California, and Fort Lewis, Washington. Two size "C" rhombics are set up for Camp Crowder on wooden poles. The two antennas on steel towers are at present being used only for training purposes.

Two "wind-charger corporation" 90′ steel towers support a 4 mc doublet, used for communication with local stations in the problem. Coaxial cable is run approximately one-third the way up each tower. The conductor of the coaxial cable is then tapped onto the tower, providing two end-grounded "vertical Hertz" radiators, which are also used for local communication.

TRUCK PLATFORM



A MEANS which has proven of value in the placing of spiral-four cable (CC–358) and field wire and in the maintenance of both in overhead wire construction in the Mediterranean Theater of Operations has been through the use of a platform mounted on Truck K–43. Many signal units in this theater have adopted this improvisation. As illustrated in figure 1, the height of the truck is increased only 3 inches. Naturally the use of such platforms is dependent on the type of right-of-way on which the line is constructed.

T–45 AS *SILENT* MIKE

A V-MAIL letter written by a front-line staff sergeant contains an interesting suggestion regarding a new use for Microphone T–45. This microphone is furnished to users of field telephone equipment primarily for use under a gas mask, because of its effectiveness in cancelling the low-frequency reverberations which normally cause a muffled sound when one talks into a closely confined space.

Due to this very characteristic (the cancelling of l-f sounds) the sergeant reports, the T–45 is being used in Germany in forward observation posts for directing operations ". . . where it is valuable because it can be covered to muffle the sound of your voice when Jerry is very close, especially at night." It is assumed that the microphone and lips are covered with cupped palms to confine the sound of the speaker's voice.

Other uses for a *silent* mike should be apparent.

OFFICE OF THE CHIEF SIGNAL OFFICER
ARMY SERVICE FORCES

WASHINGTON, D.C.
1 JANUARY 1945

COMMANDING GENERAL
ARMY SERVICE FORCES

BOARDS & COMMITTEES
COMMUNICATIONS COORDINATION COMMITTEE
SIGNAL CORPS BOARD
SIGNAL CORPS TECHNICAL COMMITTEE

CHIEF SIGNAL OFFICER
ASS'T CHIEF SIGNAL OFFICER
EXECUTIVE

CONTROL DIVISION
ADMINISTRATIVE MANAGEMENT BRANCH
PROGRESS & STATISTICS BRANCH
EVALUATION BRANCH

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  - EASTERN SIGNAL CORPS TRAINING CENTER
  - EASTERN SIGNAL CORPS SCHOOLS
  - EASTERN SIGNAL CORPS UNIT TRAINING CENTER
  - FT. MONMOUTH SIGNAL CORPS PUBLICATIONS AGENCY
- ARMY PIGEON SERVICE AGENCY
- ARMY EXPERIMENTAL STATION PINE CAMP, N.Y.
- SIGNAL UNIT SURVEY GROUPS
  - 1ST & 2ND FT. MONMOUTH
  - 3RD & 4TH CAMP CROWDER
- SIGNAL CORPS GROUND SIGNAL AGENCY
  - QUALITY CONTROL DIVISION — FT. MONMOUTH SIGNAL LABORATORY
  - MAINTENANCE DIVISION — CAMP COLES SIGNAL LABORATORY
  - MATERIEL DIVISION — CAMP EVANS SIGNAL LABORATORY
  - SERVICE DIVISION — LONG BRANCH SIGNAL LABORATORY
  - DETROIT SIGNAL LABORATORY
- SIGNAL CORPS STANDARDS AGENCY
- S.C. COST ANALYSIS AGENCY – PHILADELPHIA
- S.C. COST ANALYSIS AGENCY – CHICAGO
- S.C. COST ANALYSIS AGENCY NEW YORK
- S.C. COST ANALYSIS AGENCY – SAN FRANCISCO
- CHICAGO PRICE ADJ. FIELD OFFICE
- PHILADELPHIA PRICE ADJ. FIELD OFFICE
- SIGNAL CORPS STOCK NUMBERING AGENCY
  - CHICAGO BRANCH
  - DAYTON BRANCH
  - MONMOUTH BRANCH
  - NEW YORK BRANCH
- SIGNAL CORPS PRODUCTION FIELD OFFICES AT CHICAGO LOS ANGELES, NEW YORK, PHILADELPHIA
- EASTERN DEPOT GROUP
  - PHILADELPHIA SIGNAL DEPOT
  - HOLABIRD SIGNAL DEPOT
  - BOSTON SIGNAL DEPOT
  - SIGNAL SECTION BELLE MEAD ASF DEPOT
  - SIGNAL SECTION NEW CUMBERLAND ASF DEPOT
  - SIGNAL SECTION ATLANTA ASF DEPOT
  - SIGNAL SECTION FT. DIX, N.J. ASF DEPOT (CLASSIFICATION)
  - SIGNAL SECTION FT. EUSTIS, VA. ASF DEPOT (CLASSIFICATION)
- WESTERN DEPOT GROUP
  - CHICAGO SIGNAL DEPOT
  - LEXINGTON SIGNAL DEPOT
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  - SIGNAL SECTION CAMP MAAN, CAL. ASF DEPOT (CLASSIFICATION)
  - SIGNAL SECTION CAMP BEALE, CAL. ASF DEPOT (CLASSIFICATION)
  - SIGNAL SECTION FT. LEWIS, WASH. ASF DEPOT (CLASSIFICATION)
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  - PHILA. S.C. INSPEC. ZONE
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- PLANT ENGINEERING AGENCY
  - NORTHEAST SECTOR A.C.S.
  - SOUTHEAST SECTOR A.C.S.
  - NORTHWEST SECTOR A.C.S.
  - SOUTHWEST SECTOR A.C.S.
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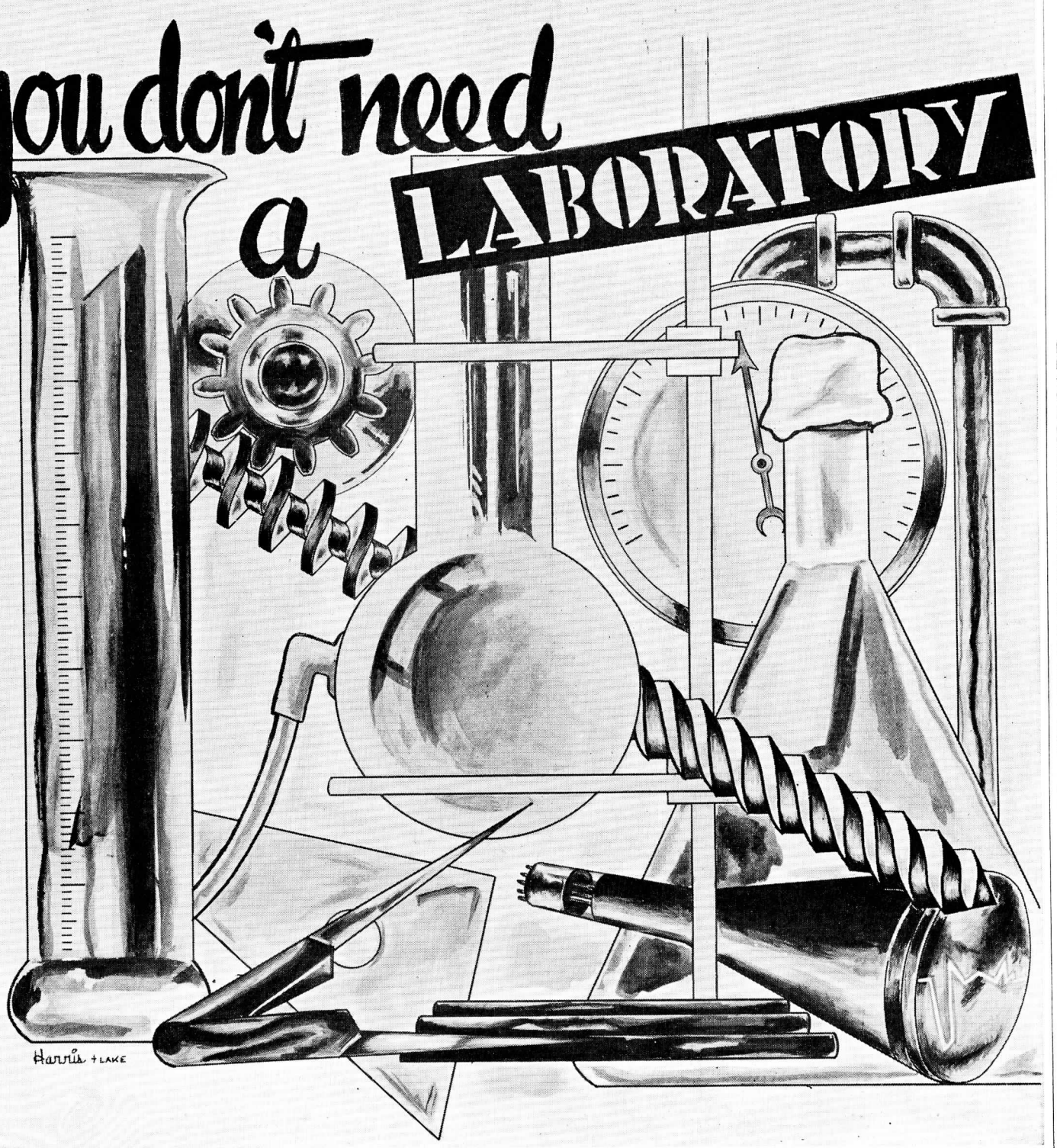
Approved H. C. Ingles
H. C. INGLES
MAJOR GENERAL
CHIEF SIGNAL OFFICER

25-21776-1B



TO CHECK EACH MESSAGE BEFORE TRANSMISSION; YOU DO NEED A SHARP EYE FOR VIOLATIONS OF CRYPTOGRAPHIC SECURITY.

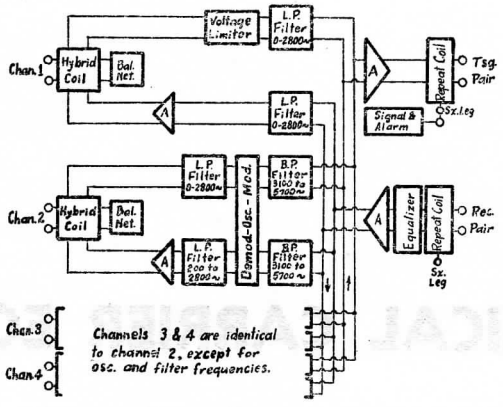
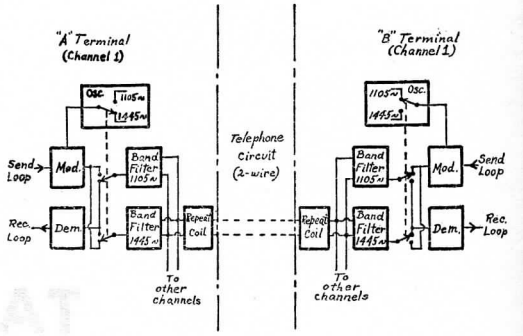
CUT ALONG THIS LINE AND POST ON BULLETIN BOARD

TACTICAL CARRIER EQUIPMENT

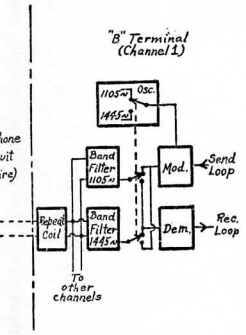
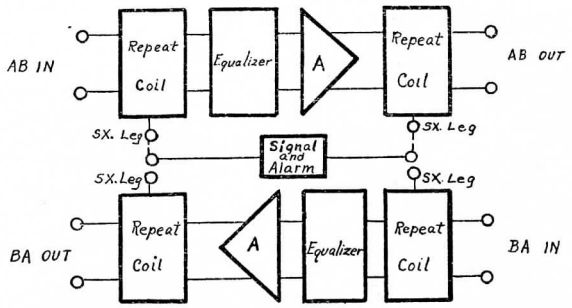
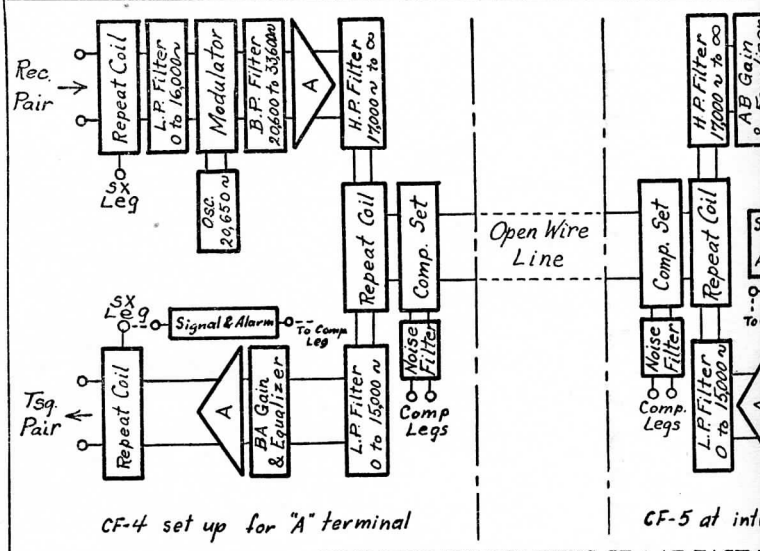
(Comparative Data Sheet)

SPECIAL INSERT

SCTIL NO. 39

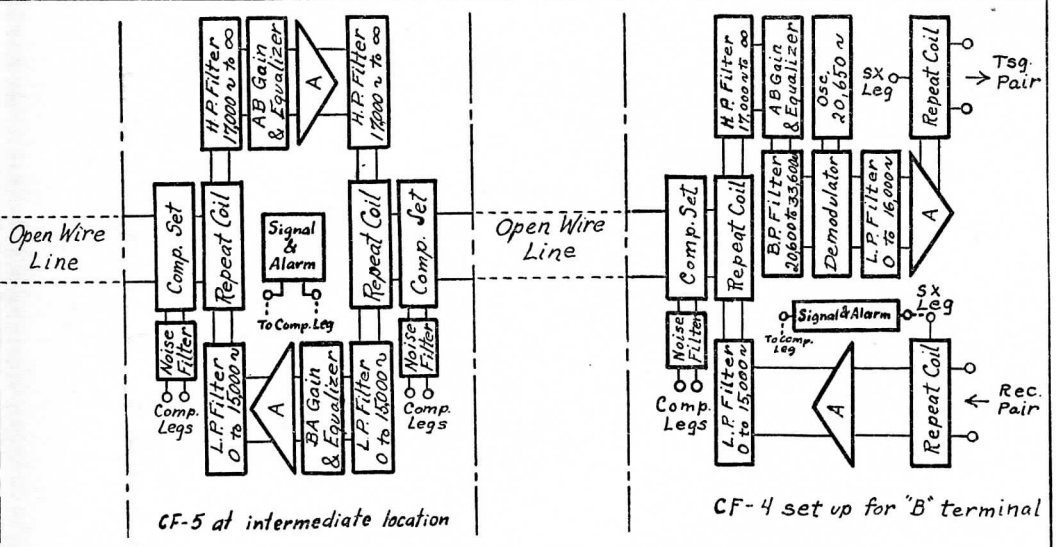
	Telephone Terminal CF-1-A & CF-1-B	Telegraph Terminal CF-2-A & CF-2-B
Part of	Telephone Terminal Set TC-21-( )	Telegraph Terminal Set TC-22-( )
Classification	Standard	Standard
General type	4-channel carrier telephone terminal designed for use on spiral-four cable to provide high quality long distance communication.	4-channel carrier telegraph terminal designed for use on any norm telephone channel.
Functional Diagrams and Distinguishing Features		 Only channel 1 shown at both ends of system. Channels 2, 3, and 4 a equivalent except for osc. and filter frequencies.
Legend A=Amplifier L. P.=Low pass H. P.=High pass B. P.=Band pass B. S.=Band stop B. O.=Building out Tsg.=Transmitting Rec.=Receiving Sx.=Simplex Comp.=Composite Mod.=Modulator Dem.=Demodulator Bal. Net.=Balancing Network V. F.=Voice Frequency Osc.=Oscillator	Provides amplification for v. f. channel No. 1 and generates three carrier frequencies which feed modulators and demodulators to produce superimposed transmission in channels 2, 3, and 4. One pair of the cable is used for transmitting, the other pair for receiving. Lower sidebands only are admitted to the cable (upper sidebands and carriers are suppressed). The four channels occupy the 0-12 kc frequency band. TC-21-( ) is part of Carrier System AN/TCC-2.	Normally employed on Channel No. 3 of CF-1-( ) to obtain a total 3 telephone and 4 two-way teletype channels simultaneously over spiral-four cable. Generates 4 carrier frequencies (tones) which a keyed by "sending" teletypewriters at ends of loops and/or respon to (detects) four other frequencies received from the distant telegra terminal, relaying the detected impulses to "receiving" teletyp writers at ends of loops. Frequency range is 500 to 2,050 cycle TC-22-( ) is part of AN/TCC-2.
Dimensions in inches	66 high, 28 wide, 19 deep	66 high, 27½ wide, 19 deep *(1 bay)
Weight in pounds (unpacked)	475 (CF-1-A); 480 (CF-1-B)	*530 (CF-2-A, per bay); 560 (CF-2-B)
Operating levels	Normal output level is 0 dbm (may be raised to +5 or +10 dbm)	Normally—10 dbm (per channel). May be raised to 0 dbm for speci cases.
Location in system	At terminating ends (S-4 System)	At termination of telephone channel
Range capabilities (max.)	*150 miles (cable on ground or in air). *400 miles (cable buried)	Dependent upon telephone facility; is operable over 25 dbm net lo facility.
Power for which designed	115/230-v., 50-60-cycle or 12-v. bat	115/230-v., 50-60-cycle
Power unit supplied with set	Power Unit PE-75-( )	Gets power from TC-21-( )
Normal A. C. power consumption (watts)	61	425 max. (CF-2-A); 276 max. (CF-2-B)
Standby power, consumption—capacity	2-battery BB-55, 7.5 amp.—20 hours	None provided (AC operation only)
Tube complement	10-6SJ7, 2-6V6	12-6SJ7, 4-6V6, 8-394A (CF-2-A)**
Lightning protection (carbon blocks)	At cable binding posts (also drainage)	At all line and loop binding posts
Running spares	Tubes, protectors, fuses and vibrator	Tubes, protectors, fuses, vib. and relays
Monitoring	EE-8-A (CF-1-A). **Handset (CF-1-B)	Monitoring printer jacks on all chan
Level indication	Dbm meter and ***1,000-cycle tone source	***All measurements covered
Housing	Rack and panels mounted in wood case	Rack and panels mounted in wood case
Technical manual	TM 11-341	TM 11-355 (CF-2-A); TM 11-355-B (CF-2-B)
Signal Corps stock number	4B8361	4A2892A (CF-2-A); 4A2892B (CF-2-B)
Carrier frequencies (cycles)	5,900 (ch. 2), 8,850 (ch. 3), 11,800 (ch. 4)	8 tones (595 to 1955); spaced 170 cycles
Line terminations	4-wire only (600-ohm impedance)	****2-wire or 4-wire telephone line
Drop and loop terminations	2-wire drop (CF-1-A). **2 or 4 (CF-1-B)	*****2-wire or ground return
Signal and alarm circuit	Uses one of simplex circuits	None provided
Tool and test sets required	TE-123 and IE-53 are part of TC-21-( )	Relay adjusting tools part of CF-2-( )
NOTES	*Max. ranges given assume CF-3 repeaters at 25 mile intervals. Range without repeaters is about 45 miles. **CF-1-B differs from CF-1-A in that it includes a built-in handset and the telephone drops may be either 2-wire or 4-wire. ***Built-in signal generator supplies test tone which may be impressed on any channel for line-up purposes.	*CF-2-A constitutes 2 bays (2 ch. ea.). CF-2-B has all 4 channels i single bay. **CF-2-B does not use 6V6; its tube complement is 20-6SJ7 and 4-394A ***Send and receive loop current, send bias, received current, relay tes power supply voltages, audio output level. ****CF-2-A is terminated only for 2-wire telephone lines. See TM 11-2001 for 4-wire field modification. *****The following loop circuits may be accommodated: Full and ha duplex to either positive or negative battery, half-duplex polarenti and full duplex 2-path polar.

TACTICAL CARRIER E

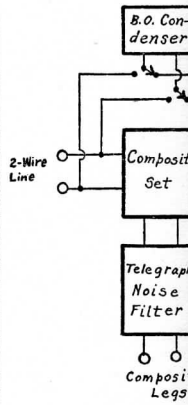
CF-2-A & CF-2-B	Repeater CF-3-A	Converter CF-4
	Repeater Set TC-23-( )	Converter Set TC-33-( )
designed for use on any normal	Standard 4-wire carrier repeater designed for use at intermediate points in a spiral-four cable carrier system.	Standard "Group Modulator" designed for adapting the 4-wire transmission of CF-1-( ) to a 2-wire line.
		
of system. Channels 2, 3, and 4 are er frequencies.		OPEN-WIRE SYSTEM USING CF-4 AT EACH
. 3 of CF-1-( ) to obtain a total of pe channels simultaneously over 1 rrier frequencies (tones) which are ers at ends of loops and/or responds received from the distant telegraph impulses to "receiving" teletype-ency range is 500 to 2,050 cycles.	Amplifies simultaneously all transmission present on the physical pairs of a spiral-four cable when used at intermediate points in a multi-channel carrier system. Contains adjustable equalizers to compensate for the unsymetrical frequency characteristic of the cable. These equalizers are composed of 4 independently adjusted networks: low-frequency, mid-frequency, high-frequency, and flat-gain. The equalizers are identical to those contained in CF-1-( ). TC-23-( ) is part of Carrier System AN/TCC-2.	Provides equivalent 4-wire operation over 1 open-wire pair. B-A direction of transmission remains in 0-12 kc frequency band; A-B transmission is raised to 20.8-32.2 kc band. Contains amplifiers, equalizers, oscillator, modulator, demodulator, directional filters, and composite equipment.
B)	34 high, 28 wide, 14 deep	49 high, 24 wide, 17 deep
	225	300
May be raised to 0 dbm for special	Normal output level is 0 dbm (may be raised to +5 or +10 dbm)	A-B output +18 to −17 dbm (+13 normal); B-A output +15 to −20 dbm (+10 normal)
; is operable over 25 dbm net loss	At intermediate points (S-4 system) Repeaters nominally spaced at 25 mile intervals	*At junction of 4- and 2-wire facilities **Dependent upon characteristics of open-wire facility
	115/230-v., 50-60-cycle 12-v. bat	115/230-v., 50-60 cycle or 12-v. bat
	Power Unit PE-214-( )	*Gets power from TC-21-( ) or TC-23-( )
-B)	31	31
	2-battery BB-55, 3.75 amp.—40 hours	2 battery BB-55, 3.5 amps—43 hours
	2-6SJ7, 2-6V6	3-6SJ7, 3-6V6
	At cable binding posts (also drainage)	At line and cable bind. posts (drainage)
lays	Tubes, protectors, fuses and vibrator	Tubes, protectors, fuses, and vibrator
	Built-in handset (channel 1 only)	Monitor at adjacent CF-1 or CF-3
	*Dbm meter	Dbm meter
ase	Rack and panels mounted in wood case	Rack and panels mounted in wood case
(CF-2-B)	TM 11-341	TM 11-2008
-B)	4B3203	4B4484
es	**Not applicable (sidebands on cable)	20,650 (upper sideband transmitted)
	4-wire only (600 ohms impedance)	4-wire on one side, 2-wire on other side
	Not applicable	Not applicable
	Uses one of simplex circuits	Uses one of composite circuits
( )	TE-123 and IE-53 are part of TC-23-( )	Use those furnished with TC-21 or TC-23
ea.). CF-2-B has all 4 channels in	*Test tone (1,000-cycle) is applied at either end of the system by CF-1-( ). The dbm meter in the repeater measures the level at the output of each amplifier. **Each carrier frequency and its upper sideband are suppressed by CF-1; only the lower sidebands are transmitted over the cable pairs.	*Will normally be operated adjacent to Telephone Terminal CF-1-( ) or Repeater CF-3-( ), but can be separated from them by as much as 1 mile of spiral-four cable. **Example: Range without repeaters for 6 db net loss circuit is 185 mi. (080 copper) or 245 mi. (104 copper). See CF-5 Note.
e complement is 20-6SJ7 and 4-394A end bias, received current, relay test, t level.		
or 2-wire telephone lines. See TM		
nay be accommodated: Full and half ve battery, half-duplex polarential		

ARRIER EQUIPMENT—COMPARATIVE DATA CHART

	Repeater CF-5	Telegraph Terminal CF-6	Carr
	Repeater Set TC-37-( )	End item	End item
nsmission of CF-1-( ) to a 2-wire	Standard Open-wire carrier repeater designed for extending the range of a line on which Converter CF-4 is used.	Standard 2-channel carrier telegraph terminal similar to CF-2-B. Designed primarily to supplement CF-2-( ).	Standard Repeating coil hybrid transmission of CF- limited length.



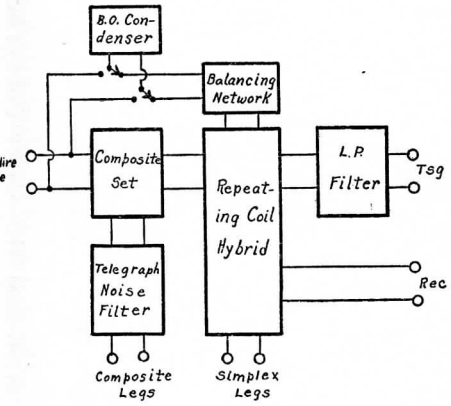
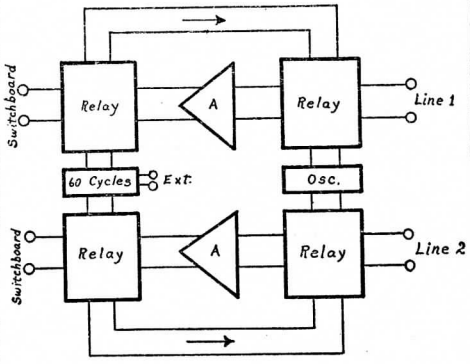
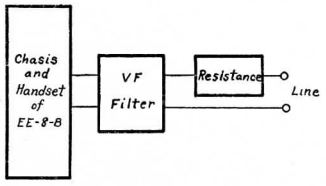
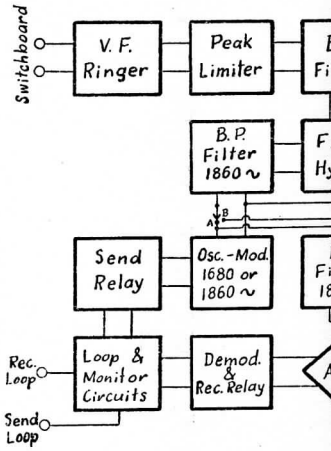
SEE DIAGRAM FOR CF-2-( ). CF-6 IS EQUIVALENT (different oscillator and filter frequencies)

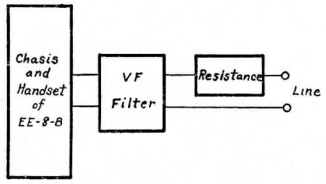
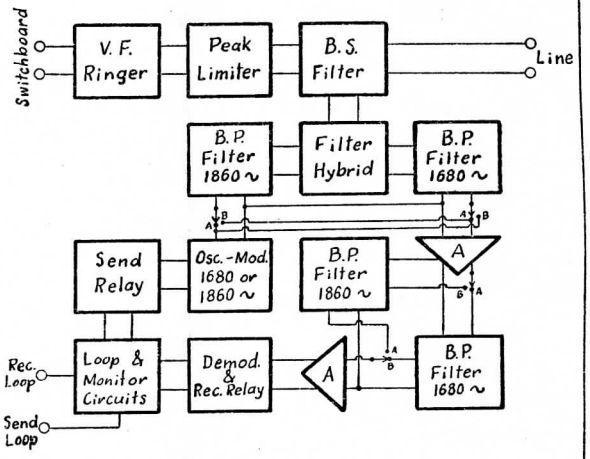
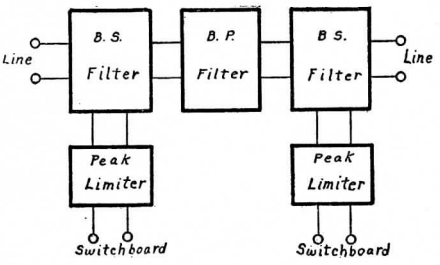


TEM USING CF-4 AT EACH END AND CF-5 AT INTERMEDIATE LOCATION

air. B–A direction of transmission s raised to 20.8–32.2 kc band. Con- dulator, directional filters, and com-	Amplifies simultaneously all transmission present on the physical pair of an open-wire carrier line when used at intermediate points on a line employing Converter CF-4. Contains amplifiers, equalizers, directional filters, and composite equipment.	Provides 2 two-way teletype channels by employing unused frequencies at the bottom, the middle and the top of the frequency band normally employed by CF-2-( ). Total frequency range is 340 to 2,400 cycles. Contains the same type of components as CF-2-B.	Small, portable, inert proof field case. Des length open-wire carr the use of the more e Includes hybrid coil, able building-out cor with noise filter and be used on wire W- 11-2003).
	65 high, 24 wide, 19 deep	50 high, 24 wide, 17 deep	9½ high, 18¾ wide, 7¾
	400	400	48
-15 to −20 dbm (+10 normal)	A–B output normally +13 dbm; B–A output normally +10 dbm	Same as CF-2-( )	Not applicable—adjust
	At intermediate points (CF-4 system)	*At termination of telephone channel	*At junction of 4- and
	*Dependent upon open-wire facility	Dependent upon telephone facility; is operable over 25 dbm net loss facility.	**Dependent upon lin ance (see TM).
	115/230-v, 50-60-cycle or 12-v. bat	115/230-v., 50–60-cycle	Requires no power sou
	Power Unit PE-214-( )	Gets power from TC-21-( )	Not applicable
	46	149 max. (dependent on loop arrangement)	do
	2 battery BB-55, 4.5 amp.—33 hours	None provided (AC operation only)	do
	3–6SJ7, 3–6V6	10–6SJ7, 4–394A	Uses no tubes
	At line binding posts (also drainage)	At all line and loop binding posts	***At line and cable bi
	Tubes, protectors, fuses, and vibrator	Tubes, protectors, fuses, vib. and relays	None
	Built-in handset (channel 1 only)	Monitoring printer jacks on both chan	None—check signal at
	**Dbm meter	Same as CF-2-B	Check for "singing"
	Rack and panels mounted in wood case	Rack and panels mounted in wood case	19" panel in wood case
	TM 11-2008	TM 11-2009	TM 11-2003
	4B3205	4A2892-6	4B1467
	Not applicable (sidebands on line)	425 and 2,125 (ch. 5); 1,275 and 2,295 (ch. 6)	Not applicable
	2-wire only (600 ohm impedance)	2-wire or 4-wire telephone line	4-wire (cable side), 2-w
	Not applicable	2-wire or ground return (same as CF-2)	Not applicable
	Uses one of composite circuits	None provided	Carried through on one
	TE-123 and IE-53 are part of TC-37	Relay adjusting tools part of CF-6	None
al CF-1-( ) or Repeater CF-3-( ), iral-four cable. ircuit is 185 mi. (080 copper) or 245	*Example: Repeater spacing for 6 db net loss circuit using 3 or more repeaters is 130 mi. (080 copper) or 170 mi. (104 copper). **Test tone (1,000-cycle) is applied at either end of the system by CF-1-( ). The dbm meter in the repeater measures the level at the output of each amplifier.	*Normally used as a supplement to CF-2-( ) to provide a 5th and 6th channel, where needed, but may be used independently.	*Normally used adja may be separated from **Example: When us line, operation over c spacings of 35 to 50 mile ***Drainage coils inc side will normally be ac

T

Carrier Hybrid CF-7	*Ringing Equipment EE-101-A	Telephone Unit EE-105	Telegraph Terminal TE
d item	Ringer Set TC-24-( )	End item	*End item
ndard	Standard	Standard	Standard
peating coil hybrid designed for adapting the 4-wire ransmission of CF-1-( ) to 2-wire open-wire lines of mited length.	Voice-frequency ringing equipment designed for converting low frequency ringing signals (20-cycle) to 1000/20 cycle signals and vice versa.	Lineman's portable telephone which can be bridged on carrier telephone lines to permit use of v. f. channel without disturbing carrier channels.	Single-channel carrier telegraph terminal "Speech-Plus-Duplex." Uses small ban within v. f. band.
			
			(Switches in "A" termi
nall, portable, inert apparatus contained in a weather-proof field case. Designed primarily for use on the shorter length open-wire carrier systems which do not necessitate the use of the more elaborate CF-4 and CF-5 apparatus. Includes hybrid coil, adjustable balancing network, variable building-out condenser, d. c. telegraph composite set with noise filter and low pass filter. In emergency, may be used on wire W-143 or 1 pair S-4 Cable. (See TM 11-2003).	Provides ringing facilities for 2 telephone circuits when such circuits involve terminal or repeater equipments which will not normally pass low-frequency ringing signals. Internal 60-cycle source for ringing switchboard; binding posts provided for connecting external 20-cycle source if desired. Designed primarily for a. c. operation, but throw-over to 12-v. storage battery in emergency is automatic. TC-24-( ) is part of Carrier System AN/TCC-2.	Consists essentially of the handset and chassis of Telephone EE-8-B plus a voice-frequency filter, impedance control network, 2 keys and 4 binding posts. These components are mounted in a portable case slightly larger than that of EE-8-B. A 1000/20 cycle whistle is also included to permit the lineman to ring the terminal. May be used as a permanently bridged way station (add v. f. ringer). One key converts circuit to EE-8-B without filter; other key controls impedance.	Provides 2-way v. f. telegraph commun (about 1,500 to 2,000 cycles) of the freque and, at the same time, use of the teleph tion of speech and telegraph is by ba D. C. loops may be neutral, half or fu polar. Includes v. f. ringer (500/20 or 1 adjacent to teletypewriter set.
½ high, 18⅜ wide, 7⅜ deep	11⅝ high, 21¼ wide, 14¾ deep	9⅞ high, 7¾ wide, 5 deep	21¼ high, 22¼ wide, 17½ deep
ot applicable—adjust for best balance	95	16 (with battery)	167
	For less than 20 db line, sensitivity can be reduced 10 db (see range).	*Bridging impedance may be changed by means of 3-position key.	Normal transmitting level is −3 dbm (ma
At junction of 4- and 2-wire facilities	Adjacent to CF-1-( ) in drop circuits	Portable—anywhere on carrier line	At terminations of telegraph circuit
Dependent upon line facility and attendant hybrid balance (see TM).	1,000-cycle receiving branch will operate from 30 db net loss line.	**Operable on any carrier system (with limitations—see TM).	Operable over normal telephone line hav
equires no power source	115/230-v., 50-60-cycle or 12-v. bat	Dry battery operation	115/230-v., 50-60-cycle or 12-v. bat
ot applicable	Gets power from TC-21-( )	Two battery BA-30 (same as EE-8-( ))	Not supplied
do	31	Not applicable	160 max. (dependent on loop arrangeme
do	2 Battery BB-55, 3.2 amps.—45 hours	do	Bat. operation not automatic (12.5 amp.)
ses no tubes	Six 6SJ7, one 6V6	Uses no tubes	Four 2,050, two OC3/VR-105, eleven 6G6
*At line and cable binding posts	None—provide where needed	None—provide where needed	At line, swbd. and loop binding posts
one	Tubes, fuses, vibrator	None	Tubes, protect., fuses, vib. and relays
one—check signal at term. or rep	None	Not applicable	Monitoring printer jacks provided
heck for "singing"	do	*Impedance key marked high, med. and low.	All operational measurements covered
" panel in wood case (carrying strap)	Rack and panels mounted in wood case	Canvas duck case with carrying strap	Hinged rack and panels in wood case
M 11-2003	TM 11-342	TM 11-2014	TM 11-2206
B1467	4F2101	4B8405	4A2895
ot applicable	1,000 (interrupted 19¼ times per sec.)	Not applicable—filters out carrier	1680 and 1860
wire (cable side), 2-wire (line side)	Inserted in 2-wire drop	2-wire (see TM for use on 4-wire line)	2-wire only
ot applicable	See above	Not applicable	2-wire or ground return (same as CF-2)
arried through on one of composite ckts	Not applicable	***Not applicable	**See note
one	Use those furnished with TC-21-( )	Same as for Telephone EE-8-( )	Relay adj. tools part of TH-1/TCC-1
*Normally used adjacent to CF-1-( ) or CF-3-( ), but ay be separated from either by spiral-four cable (see TM). **Example: When used with 80 mil copper-steel open-wire ne, operation over distance of 150 miles with repeater pacings of 35 to 50 miles should be satisfactory. ***Drainage coils included on 2-wire side only since 4-wire de will normally be adjacent to CF-1-( ) or CF-3-( ).	*The first ringing equipments released for field use were 100 EE-100-T1's from a development contract and 208 EE-100-A's which were produced before all production was changed over to EE-101-A. EE-100-T1 and EE-100-A provide single circuit ringing facilities only.	*At "high" position of impedance key 4,000 ohms is in series with line connection; at "med" 1600 ohms; at "low" no series resistance, thus high, med., and low output levels will be the reverse of key markings. **When used on 4-wire system, transmission in one direction and reception in the other is by the "round robin" method (See TM). ***No provision is made for including EE-105 in the d. c. signal and alarm circuit of a carrier system.	*Telegraph Terminal Set AN/TCC-1 TH-1/TCC-1 plus auxiliary apparatus however, standardization was not based and F-2/GG. Auxiliary apparatus, if re separately. **DC signal and alarm circuit not us naling must be used over the portion of 1/TCC-1 is employed (v. f. ringer is part

	Telephone Unit EE-105	Telegraph Terminal TH-1/TCC-1	Filter F-2/GG
	End item	*End item	End item.
	Standard	Standard	Standard.
	Lineman's portable telephone which can be bridged on carrier telephone lines to permit use of v. f. channel without disturbing carrier channels.	Single-channel carrier telegraph terminal similar to British "Apparatus Speech-Plus-Duplex." Uses small band of frequencies taken from within v. f. band.	Transfer filter used for bypassing the telegraph frequencies of TH-1/TCC-1 around switchboards or dropping-off the telegraph channel at intermediate point.
			
		(Switches in "A" terminal position)	
	Consists essentially of the handset and chassis of Telephone EE-8-B plus a voice-frequency filter, impedance control network, 2 keys and 4 binding posts. These components are mounted in a portable case slightly larger than that of EE-8-B. A 1000/20 cycle whistle is also included to permit the lineman to ring the terminal. May be used as a permanently bridged way station (add v. f. ringer). One key converts circuit to EE-8-B without filter; other key controls impedance.	Provides 2-way v. f. telegraph communication by utilizing a portion (about 1,500 to 2,000 cycles) of the frequency range of a telephone circuit and, at the same time, use of the telephone circuit is retained. Separation of speech and telegraph is by band-stop and band-pass filters. D. C. loops may be neutral, half or full-duplex, polarential or 2-path polar. Includes v. f. ringer (500/20 or 1000/20 cycles). Normally used adjacent to teletypewriter set.	**Consists of 2 band stop filters and 1 band pass filter. The band stop filters block the frequencies used for telegraph and permit free passage of remaining voice frequencies. The band pass filter passes the telegraph frequencies and blocks all other frequencies in the voice range. Two peak limiters control the voltage of the telephone currents.
	9⅞ high, 7¾ wide, 5 deep	21¼ high, 22¼ wide, 17½ deep	7¼ high, 22¼ wide, 17½ deep.
	16 (with battery)	167	36½.
	*Bridging impedance may be changed by means of 3-position key.	Normal transmitting level is −3 dbm (may be raised to +4 dbm)	*Band stop filter attenuates telegraph frequencies approximately 75 db.
	Portable—anywhere on carrier line	At terminations of telegraph circuit	At swbd. or intermediate point on line.
	**Operable on any carrier system (with limitations—see TM).	Operable over normal telephone line having attenuation of 50 db	Not applicable.
	Dry battery operation	115/230-v., 50-60-cycle or 12-v. bat	Requires no power source.
	Two battery BA-30 (same as EE-8-( ))	Not supplied	Not applicable.
	Not applicable	160 max. (dependent on loop arrangement)	Do.
	do	Bat. operation not automatic (12.5 amp.)	Do.
	do	Four 2,050, two OC3/VR-105, eleven 6G6G	Uses no tubes.
	Uses no tubes	At line, swbd. and loop binding posts	At all line and swbd. binding posts.
	None—provide where needed	Tubes, protect., fuses, vib. and relays	None.
	None	Monitoring printer jacks provided	Do.
	Not applicable	All operational measurements covered	Do.
	*Impedance key marked high, med. and low.	Hinged rack and panels in wood case	19" panel in wood case (carrying strap).
	Canvas duck case with carrying strap	TM 11-2206	TM 11-2206.
	TM 11-2014	4A2895	3Z1893-10.
	4B8405	1680 and 1860	Not applicable.
	Not applicable—filters out carrier	2-wire only	2-wire only.
	2-wire (see TM for use on 4-wire line)	2-wire or ground return (same as CF-2)	2-wire switchboard drops.
	Not applicable	**See note	Not applicable.
	***Not applicable	Relay adj. tools part of TH-1/TCC-1	None.
	Same as for Telephone EE-8-( )		
	*At "high" position of impedance key 4,000 ohms is in series with line connection; at "med" 1600 ohms; at "low" no series resistance, thus high, med., and low output levels will be the reverse of key markings. **When used on 4-wire system, transmission in one direction and reception in the other is by the "round robin" method (See TM). ***No provision is made for including EE-105 in the d. c. signal and alarm circuit of a carrier system.	*Telegraph Terminal Set AN/TCC-1 was formerly assigned to cover TH-1/TCC-1 plus auxiliary apparatus (power unit, ground rods, etc.); however, standardization was not based on the set—only TH-1/TCC-1 and F-2/GG. Auxiliary apparatus, if required, should be requisitioned separately. **DC signal and alarm circuit not used on this system, but v. f. signaling must be used over the portion of a telephone line on which TH-1/TCC-1 is employed (v. f. ringer is part of TH-1/TCC-1).	*Deterioration of the telephone circuit due to band elimination is in the order of 5 db, that due to filter insertion is about 2 db for each band-stop filter. **Components are same as corresponding items contained integrally in TH-1/TCC-1.