No. 40

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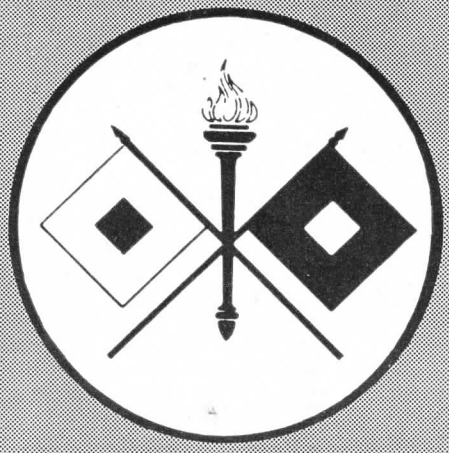
SIGNAL CORPS
Technical Information Letter

MARCH · 1945

ARMY SERVICE FORCES · OFFICE OF THE CHIEF SIGNAL OFFICER



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.

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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.

Correspondence relative to distribution overseas and to all addresses, except AAF units, in the continental United States should be directed through channels to the Chief Signal Officer (SPSAY), Washington 25, D. C. Air Force units in the continental United States should write to the Commanding General, Army Air Forces (AFMPB), Gravelly Point, Virginia, on this subject.

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

CONTENTS

GENTLEMEN OF THE SIGNAL CORPS

The Chief Signal Officer Addresses Graduates of the Officer Candidate School

This article is a composite of several addresses delivered by General Ingles to graduating classes of the Signal Corps Officer Candidate School in recent months. It is presented here in the belief that it will prove helpful and interesting to Signal Corps personnel.

I AM particularly glad on this occasion to welcome to Fort Monmouth the many relatives and friends of the officers who are graduating in this class and who are soon to begin a great adventure.

To every member of this class I offer my sincere congratulations.

You have had a strenuous course. We have made it strenuous intentionally in order that your instructors might determine your ability to meet the rigors of duty in an Army at war. Thus far you have met every test, and I am confident that your recent training, although we all realize it is far from complete, will help you to meet the supreme test to come—the test of combat.

Our Officer Candidate School here is relatively new. Historically, it cannot claim the age, the traditions, or the notable facilities which distinguish many of our civilian universities and military schools. Yet, in the few years since its establishment it has developed and maintained a high standard of study and conduct. It has acquired an acknowledged status, it has generated a splendid esprit de corps and—best of all—its graduates are performing courageous, arduous and competent service on every battlefront.

It seems important for me to recall to you that, upon receiving a commission in the Army, you become a part of one of the oldest institutions of our country, an institution that antedates even the establishment of the United States of America which you are now sworn to defend and preserve. The Army is an institution which has served the Nation honorably and successfully in war and peace and—through the years—it has earned the respect and gratitude of patriotic Americans.

MAJOR GENERAL H. C. INGLES, THE CHIEF SIGNAL OFFICER.

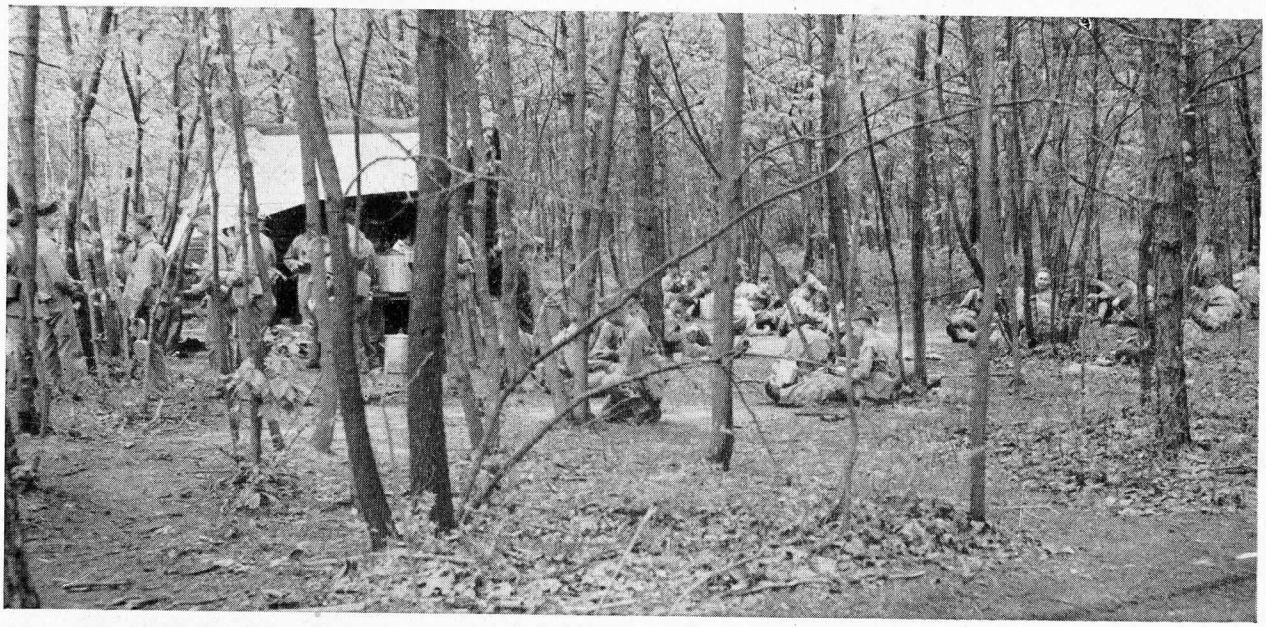
Some of our Army traditions and customs date back to the foundation of the Republic. Modern times have caused us to abandon some of our older customs which were no longer appropriate to the age in which we live. But we cling to those that have proved inspiring or important and, chief among them, is the obligation which rests upon our commissioned personnel to conduct themselves as *officers and gentlemen*—and I mean *gentlemen* in the best sense of the word.

That sense includes honesty, devotion to duty, and those moral qualities which go to make up what we know as *character*.

I have never been a great believer in the effectiveness of advice. I believe that much of our knowledge comes through experience and through our own mistakes. And yet, in the face of this belief, I am going to pass on to you some observations which may be useful.

One of the most important qualifications for a successful commissioned career is a proper attitude toward enlisted men.

Enlisted men are of high caliber. With an Army of more than 7½ million, which is a cross-section of the country, you will find a small percentage of bad actors just as you will find them in a similar cross-section in civil life. You will find



SIGNAL CORPS OFFICER CANDIDATES AT MESS IN THE BIVOUAC AREA AT FORT MONMOUTH

that the men who get into trouble represent considerably less than 1 percent of your command. Bear in mind you are dealing with honest American soldiers, who are doing their best. They don't want you to pal with them. Don't make the mistake of drinking with an enlisted man. They don't want you around. They want to associate with friends in their own ranks. That doesn't mean that you adopt an attitude of snobbishness. You have got to get a balance where you maintain the dignity of your position. Treat enlisted men with fairness and cooperation, but don't try to make pals out of them. You should know that they don't expect it. My own son went through the same cycle you have gone through. He was an enlisted man and finally was fortunate enough to graduate from an officer candidate school, and he has remarked to me several times that his most valuable experience was his experience as an enlisted man. I knew that, myself, long before.

AVOID PARTIALITY

It has been my experience in dealing with enlisted men—and I believe it will be yours—that they don't resent discipline. It is the undisciplined outfit where men are unhappy. They don't resent strict discipline. Men will resent partiality more than anything else. You can have an outfit and have strict discipline, provided it is impartial. When you have men under you, whether it is 3 or 150, if you treat them with impartiality you get along all right. If you have some pets in the outfit you lose your prestige with your men. Avoid that by all means.

Another thing I want to assure you. You can learn a lot from the enlisted men in your outfit. You can learn a lot from the noncoms. Don't miss any opportunity to do so. In my service I think I have learned most from one man—the first sergeant I had when I joined the regiment. You will have noncoms like that. You can learn a great deal from them, and don't be backward about doing it.

Enlisted men are pretty smart individuals. They are hard to fool. An incompetent officer may get away with something for a while. I would give him 2 weeks and that's about all. Bear that in mind! You have got to know your stuff. If it takes 18 hours a day—work the 18 hours. I recall some experiences of my own when I first joined a regiment. I was put in charge of a machine-gun company. I had never seen one. Every man in the company knew more about it than I did. I had to take it home and sleep with it for a month or so until I felt I knew as much about it as any man in the company. Otherwise, I would have had no business commanding the outfit.

I have known of several unfortunate experiences from time to time when young officers got into trouble through debt. Look at your pay check, and believe me it's not very big, but look at it and

cut your living accordingly. Nothing will get you into trouble any quicker than debt. You can live on your pay check, even as small as it is. I lived on a considerably smaller one in the Army for quite a while, and I know it can be done.

Be careful about your personal appearance. There is no excuse for a sloppy officer. You don't need to go out and buy hundreds of dollars worth of uniforms, but it is important that at all times you present the best appearance you can. When you get out in active operations you will live in coveralls and out in the mud. You can't present a good appearance then, and that is recognized. But don't get into sloppy habits. You lose the respect of the men under you and of your brother officers, and I don't know of any better way to maintain self-respect than to be as well groomed as circumstances will permit.

Our whole Army administration is built on the assumption that the commissioned officer will tell the truth. That he will have the plain, old garden variety of honesty. There is no place in the Army for anything else. If you want to prove it, look over some Army Regulations. See how we do business on the officer's certificate. He certifies property, his service check, pay rolls for thousands of dollars for his men, all on his certificate. We have learned to expect that an officer will at all times be honest in his dealings. If you can't believe a commissioned officer, you can't run an army.

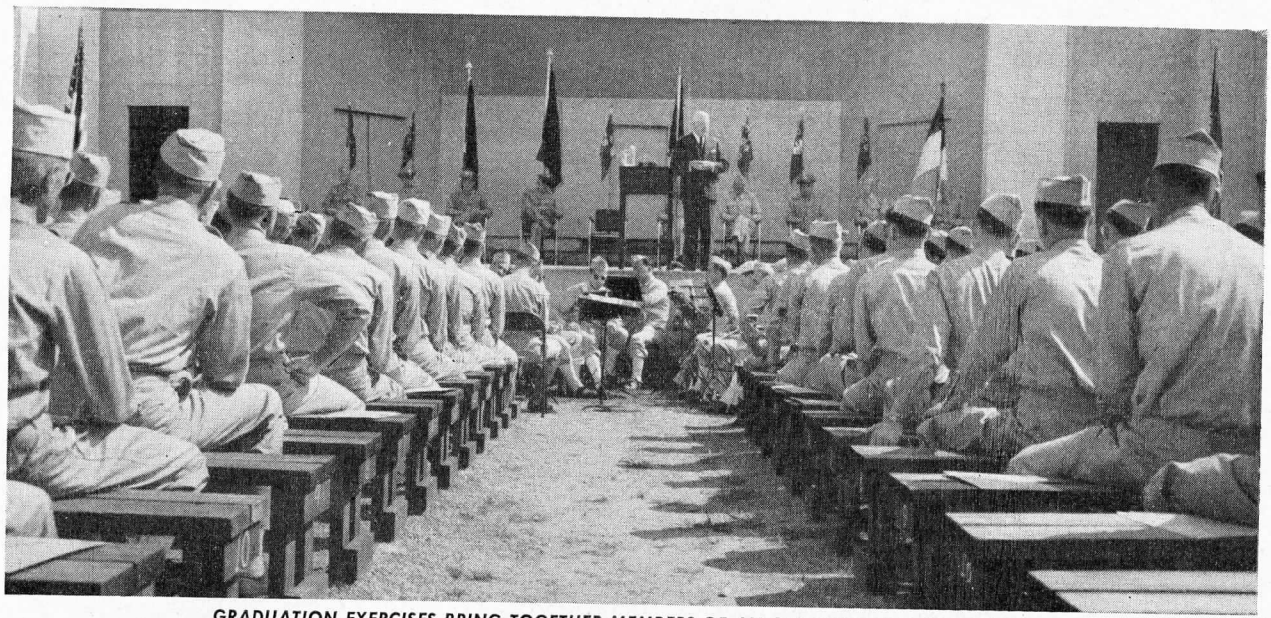
One of the greatest difficulties that we have with young officers after they are first commissioned—it may be due to timidity—is a failure to accept responsibility. You are going to have to accept responsibility for the job assigned to you. Topside can't take that responsibility and do the job.

In the Signal Corps, particularly, we work in small groups with a second lieutenant or a sergeant in charge a great deal more often than a field officer or an officer of captain's grade. Whatever the situation is, you will be entirely responsible for that job being done right. Nobody will be there to tell you what to do and to check up on you. If it doesn't work you may throw out a whole communication system. I have seen terrible consequences of traffic piling up at a signal center. It didn't seem to worry the officer-in-charge, although 6 or 8 hours of traffic were piled up. He didn't feel any responsibility for clearing that traffic. Don't let that occur. If you are in charge of a signal center and have a pile of messages, do not sleep or rest until you get that traffic cleared.

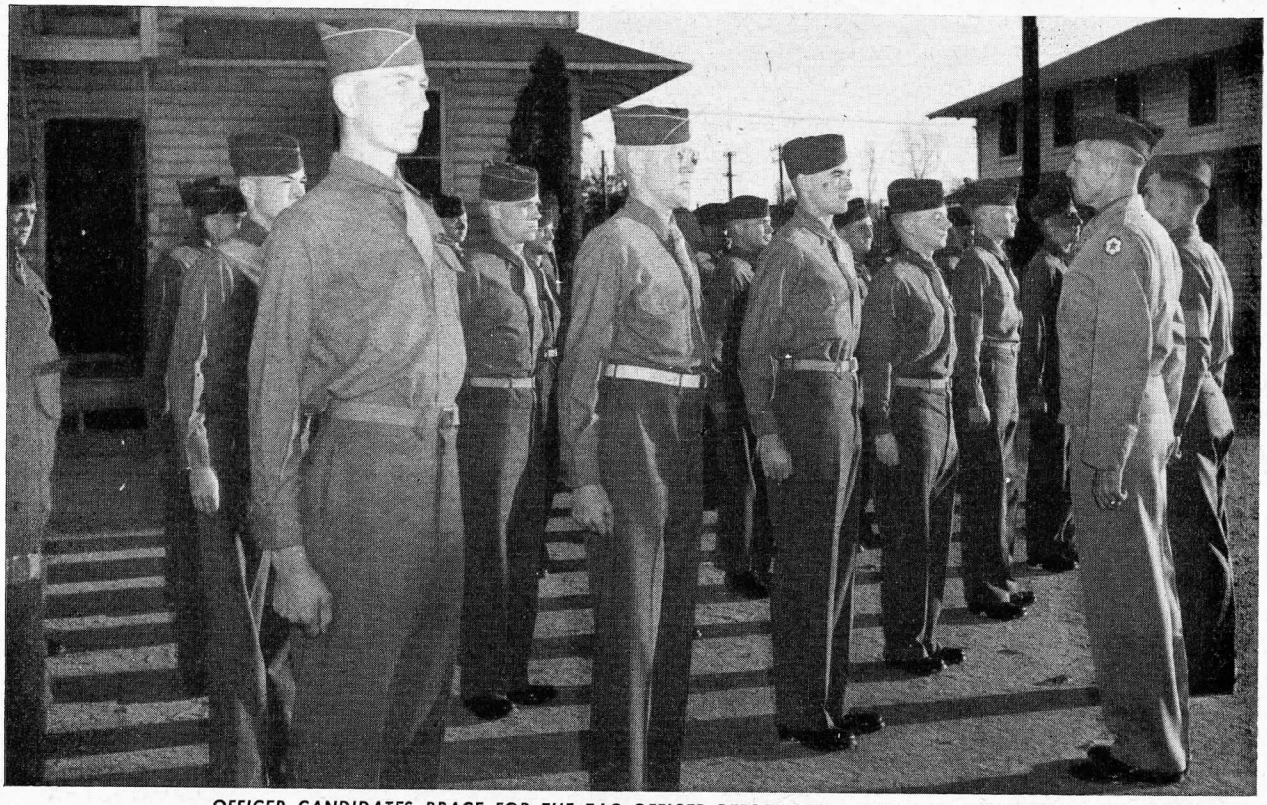
SENSE OF RESPONSIBILITY IMPORTANT

I noticed that lack of responsibility in France, and it caused a partial break-down. I left an officer in France who is very competent in the handling of traffic. He got back a few days ago and made a report and I want to read you a couple of things he said. They are vital and we can't get our job done unless things like this are corrected:

By and large, signal personnel exhibited satisfactory



GRADUATION EXERCISES BRING TOGETHER MEMBERS OF AN OCS CLASS FOR THE LAST TIME



OFFICER CANDIDATES BRACE FOR THE TAC OFFICER BEFORE THEIR BARRACKS BUILDING

technical proficiency in their various specialties. Enlisted men particualrly performed their individual duties in a manner which reflected the greatest credit on their technical training. The responsibility of this group of specialists and the majority of the junior officers did not increase the strength of their organization since they had not acquired a sense of responsibility of their job which is the rapid movement of traffic and the furnishing of reliable means of communication.

That was his observation and it was my own observation. It comes from the lack of a sense of responsibility on the part of a young officer to a considerable extent.

Along the same line, I want to read you another extract from the report:

All possible emergencies cannot be visualized and personnel trained to cope therewith under standing operating procedures.

This is the trouble with training all these people under standing operating procedures. An emergency arises which isn't covered by standing operating procedures and the traffic piles up. That is where we have to use our heads. Nobody can make an SOP that will cover everything you run up against. I venture to say that in the first situation you run up against you are going to say, *They never told me anything about that in OCS.* You will be sure to encounter that.

Again quoting from the report:

The rapidity with which a message center emergency develops passes comprehension. The extent to which it develops before being brought under control is dependent upon the promptness with which it is detected. Again, it is necessary to emphasize the handling of traffic because only personnel indoctrinated with responsibility for handling traffic can detect a slowing up of traffic in time to keep the situation from getting out of control. Some officers were found to be technically well qualified but lacking in a sense of personal responsibility for the expedition of traffic.

I can't emphasize that to you too much, gentlemen: The sense of personal responsibility for moving traffic, if that is the job, is necessary, and you can't get the traffic moved unless you have it. That goes down the line and into supply. You have got to feel personal responsibility to keep supplies moving up. I have seen cases where a lot of equipment gets into a very well run depot and as soon as the officers in that depot get it on shelves their sense of responsibility ends and they overlook the fact that the radio sets don't do anybody any good in the depot. It has to get to the man that is going to use it. We have all got to feel a

personal sense of responsibility for keeping that equipment moving. It is the same proposition that I have been talking to you about except that it happens to be a different commodity.

There is another thing which is very important if you are going to perform your duties well and have personal satisfaction—and that is the only compensation you get, knowing that you have performed your duties well—you must get along with other people. The Army is an organization of people. I don't know of any other type of organization in the world where it is so important to get along with other people above and under you.

We have no place in the Signal Corps for a man who creates dissension. We not only have to get along with ourselves, but with staffs, and with the people of the other arms that we serve.

You must get along with your superiors. I have heard lieutenants say, *I like Captain So and So, and I get along with him fine.* It is the lieutenant's business to do the getting along. That is your business and my business—get along with the person you are working for. Naturally, that is not confined to the Army.

Every once in a while an officer comes to me and says, *I have to get transferred. I am working under Major So and So and I don't get along with him, and I don't like him.* I have known cases where that attitude made an officer's service unsatisfactory. It is silly for anyone in the Army to take that attitude and it is an evidence of weakness.

Bear this in mind. We change a lot in the Army and if you don't like your boss, don't worry about it. He will probably be transferred the day after tomorrow or you will be. I don't ask you to like your boss, but don't let it interfere with your service. Maybe your boss doesn't like you. In any case, go ahead and do your stuff.

MUST LEARN JOB

I have mentioned to you the necessity for knowing your job. We are not deluding ourselves that we have given you a complete education and I don't think we have deluded you. You are just about in the same situation as a young engineer graduating from engineering college—good material for an engineer, but not an engineer, by any means, so don't be afraid of making a mistake. We can forgive mistakes, but we are very backward about forgiving the same mistake twice. But in the Army it is better to make a mistake than to decline to accept responsibility.

Don't be a bit backward about asking questions of your sergeants, and remember a sergeant who has been on that job for some time probably knows a whole lot more than you do. Don't lean on the sergeant, but don't hesitate to check for information anywhere you can find it. In a sense, we have led you up to the water but you are going to have to do the drinking yourself.

The final responsibility always rests with an officer, the responsibility for personnel, for operations, or for the proper storage of signal equipment, or the responsibility for getting the message through. You will have men under you who will perform the technical operations, but the responsibility always rests with an officer.

The leadership you will be able to put out will depend upon your knowledge, upon your interest, and probably more upon good, plain, hard work. We expect you to work as much as it is necessary; if it is 6 hours a day, swell, but if it is 12 or 15 hours a day, which is more probable in wartime, that is what we expect of you. We have no hours and you must turn out all the work that is necessary to get your job done. Those elements all go toward making up leadership—getting the respect of your men, looking after your men. If you are in command of a detachment of men, 2 or 100, and most of you sooner or later will be, remember this: Those men in civilian life were perfectly capable of looking after themselves. When they came into the Army the Government took that away from them and now expects you to look after them. Bear in mind that you have to look after those men, get the best place possible for them to sleep; if it's out in the snow, O. K., but be sure that is the best you can do. You get them food, clothing, and you get them paid. If they were given a free hand and the opportunity they could do it themselves, but they haven't and it is up to the officer to do that. If you don't do that, you won't have leadership in your organization. Don't expect them to do anything you are not willing to do yourself; you will lose their respect.

I very firmly believe that the few suggestions I have given you here are applicable and will help, if you apply them.

In conclusion, I want to repeat to all of you my congratulations on your graduation. We are very glad to have you in the Signal Corps.

TACTICAL USE OF RADIO RELAY

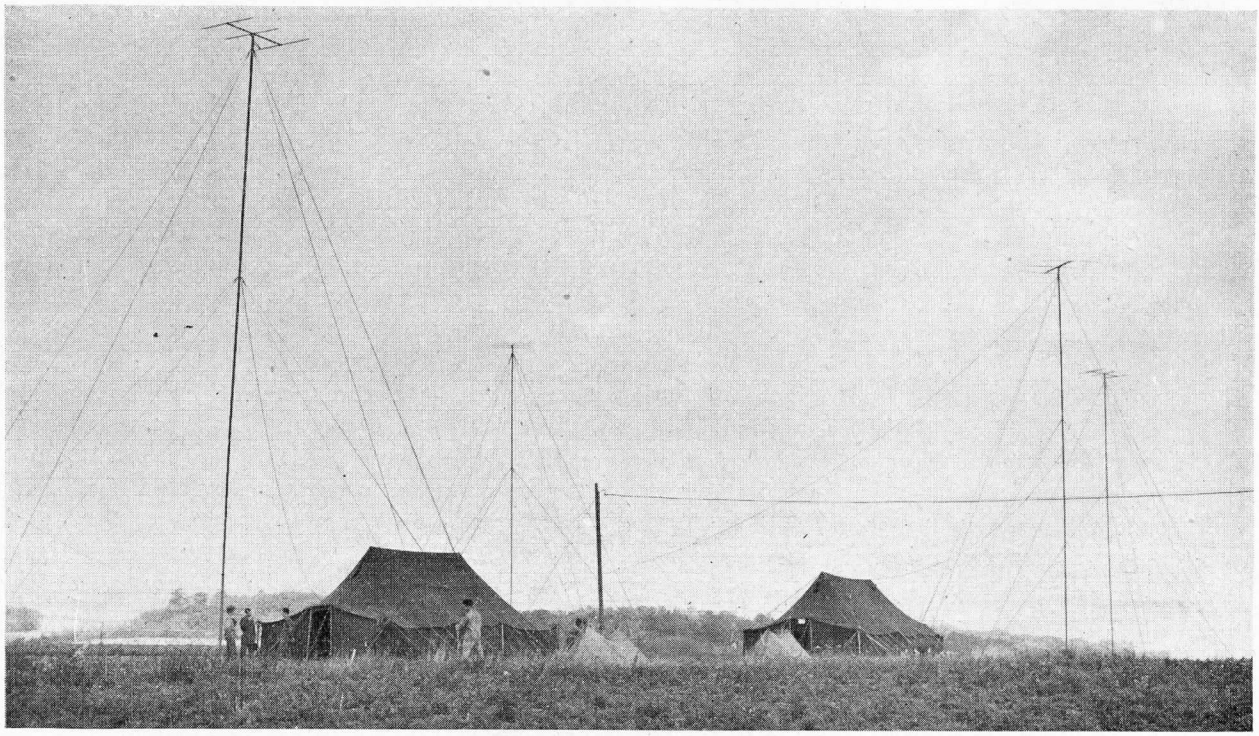
Radio Links to Bridge Wire Gaps Gain in Usage as Systems Meet Combat Requirements

BEFORE THE Winter Technical Meeting of the Institute of Radio Engineers, January 25–27, 1945, a representative of the Signal Corps Ground Signal Agency presented a paper on *Radio Relay Communication Systems in the United States Army.* The paper contained the first complete round-up of the tactical use being made of the radio relay system, the application of which has apparently achieved the long-sought-after integration of Army wire and radio. The article that follows reprints that portion of the paper for the information of all concerned. A description of the multichannel radio relay system was contained in an article published in SCTIL No. 30, May 1944.

North Africa

In December 1942, Allied Force Headquarters, North Africa, placed before the War Department the first specific field requirement for a radio relay communication system. This system was to extend from AFHQ to subordinate headquarters in the forward combat areas providing facilities whereby commanders in these forward areas could maintain reliable and rapid communication with the rear. Drawing upon its experiences in the Carolina maneuvers of 1941, Camp Coles Signal Laboratory was able to establish the major technical characteristics of the proposed North African system and, with the close cooperation of manufacturers, make available commercial v-h-f f-m police type radio equipment.

After a number of weeks of preparation in the North African (now Mediterranean) Theater of Operations, during which techniques for the application of two-tone teletype to the radio equipment were developed and tests conducted to verify the suitability of the equipment for the task at hand, a simplex single channel radio teletype system was placed in operation April 20, 1943, extending from a semifixed 250-watt terminal station in Algiers, through three successive 250-watt radio relay stations into Tunisia (see fig. 1). A mobile 50-watt terminal station was attached to the American combat headquarters, consisting of



A TERMINAL STATION IN FRANCE. NOTE FOUR ANTENNA ARRAYS AND TELEPHONE CABLE COMING IN FROM RIGHT

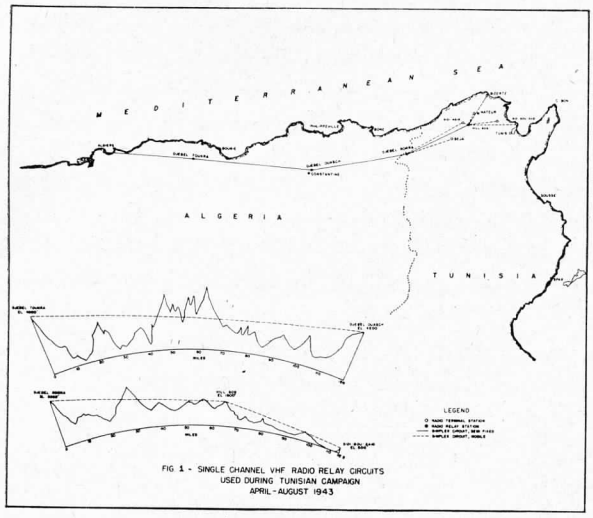
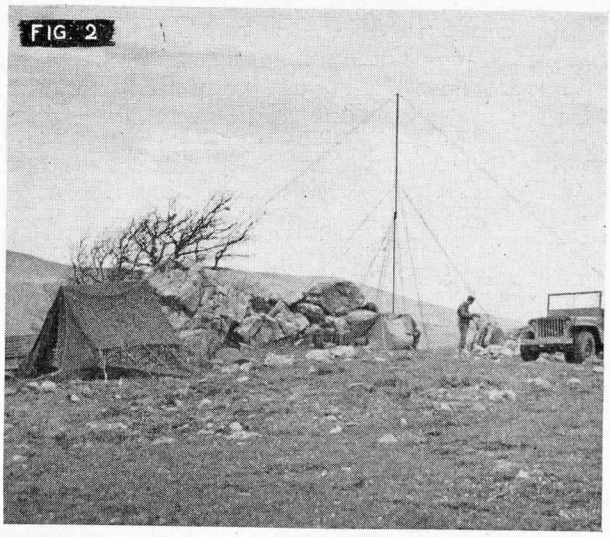


FIG 1 - SINGLE CHANNEL VHF RADIO RELAY CIRCUITS USED DURING TUNISIAN CAMPAIGN APRIL - AUGUST 1943

the II Corps, reinforced, to complete the circuit from Algiers and provide the only direct communication with this headquarters throughout the ensuing phase of the Tunisian Campaign. This circuit carried the bulk of all operational and administrative traffic to and from II Corps. The terminal moved with the corps headquarters from Beja to Sidi Nsir and thence to Mateur, providing communication immediately upon establishment of each position. A fourth relay station was held in readiness during this advance until the famous assault upon Hill 609 permitted its installation upon an adjacent promontory, whereupon it was placed in operation to provide an additional relay section to the mobile terminal as the latter proceeded beyond range of the third relay station. The resulting over-all system length was 379 miles. This operation represented the first employment of radio relay systems and of radio teletype in tactical operations by Allied military forces.

As the campaign progressed, two additional mobile terminal stations were placed in service moving with their respective headquarters to Bizerte and to vicinities about Tunis. The three terminal stations operated alternately with the Algiers terminal and with each other through the relay station near Hill 609. The traffic load reached a maximum of 16,000 word groups per day, 12,000 groups being handled with Algiers, and 4,000 groups between the forward terminals. Pending the establishment of wire lines, a task greatly magnified by the rapidity of movement of the terminal headquarters and by the incidence of enemy action, these radio circuits provided vital



communication facilities at critical moments during and immediately after the campaign, remaining in operation until the middle of August 1943. The total system length during this period reached a maximum of 418 miles over rugged terrain.

Figure 2 shows the transmitter site of one of the relay stations. The radio receivers were located a few hundred yards to the right. A mobile power unit also was located approximately 100 feet from this site serving both receiving and transmitting equipment.

In the installation of this system, some map studies and preliminary reconnaissance of locations were made to predetermine the relay station sites.

Sicily

From the opening of the Sicilian Campaign, July 7, 1943, until August 9, 1943, a duplex radio circuit, shown in Figure 3, was operated between Sidi-bon-Said, near Tunis, and Malta, with relay stations on Cape Bon and Pantelleria, a total distance of 243 miles, all over water. Facilities were made available for the manual relay of traffic from this system to the simplex Algiers-Tunis radio system and also to a wire teletype circuit over a parallel route which, by this time, had been placed in operation.

Although operating teams had been dispatched to Malta and Pantelleria considerably prior to the date of the invasion of Sicily, the necessity for observing radio silence precluded preliminary testing of the circuit other than continuous listening at these points. Consequently, there was no certainty that the circuit would be operable.

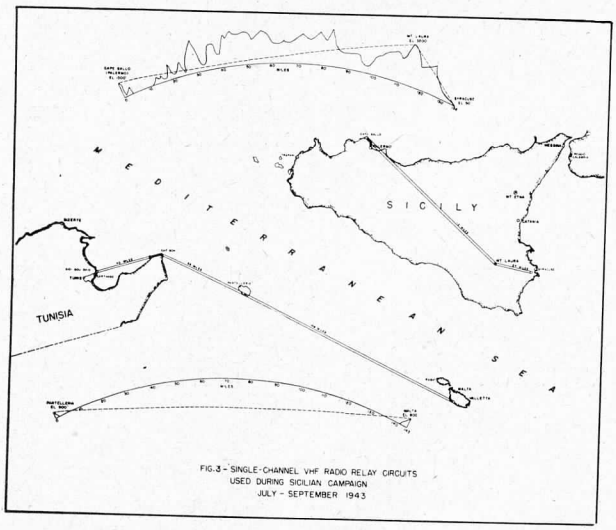


FIG. 3 - SINGLE-CHANNEL VHF RADIO RELAY CIRCUITS USED DURING SICILIAN CAMPAIGN JULY - SEPTEMBER 1943

However, when operations began, signal levels were consistently above marginal limits despite the relatively great distance, 148 miles, between Pantelleria and Malta and the below line-of-sight locations of these stations as indicated in the profile.

Subsequently, a duplex system, also shown in figure 3, was operated on Sicily for a period of approximately one month linking headquarters of the American Seventh Army at Palermo with the Fifteenth Army Group, near Syracuse. One relay station was located atop Mount Laura. There was little or no choice of sites possible, the locations being dictated by tactical necessity. Although the profile indicates a relatively poor transmission path between Mount Laura and Palermo, the circuit operated satisfactorily and provided valuable facilities because of the prior destruction by the enemy of trunk line wire circuits over appreciable distances throughout the island.

Italy

During the Italian Campaign, a variety of missions was executed with this radio relay equipment operating in simplex circuits, generally between Fifteenth Army Group headquarters and the subordinate American Fifth and British Eighth Armies. These circuits provide highly important communication facilities between the headquarters concerned inasmuch as wire lines were subject to frequent disruption by enemy action. One illustration of the very important need of radio relay facilities is illustrated in figure 4, which shows how communication was maintained from the American VI Corps at Anzio beachhead to Fifth Army at Presenzano, thence to the Fifteenth Army Group, which also was linked with the British Eighth Army on the Adriatic side of the peninsula. As the profile indicates, the location of the relay station near Naples routed the radio circuit over favorable terrain between Anzio and Presenzano to avoid the unfavorable terrain in the direct path between these two points. The facility thus provided bridged enemy-held territory in a manner impossible of accomplishment with wire lines and furnished the primary means of communication with Anzio for this vital operation. During this phase, the radio teletype service was extended through the VI Corps teletype switchboard and over wire lines to the combat divisions. This operation illustrates the flexibility and important use of radio relay equipment as a primary means of communication when equivalent wire circuits cannot be made available. Of all the missions accomplished with the radio relay equipment to this time, the Anzio circuit is considered to have been the most valuable. The peak traffic over this circuit reached a maximum of 20,000 word groups per day.

Subsequently, as the campaign progressed northward, these circuits were displaced and new circuits established, extending to the Island of Corsica, the south coast of France and thence northward in the drive toward Germany.

France

Early in 1944, plans for the invasion of the European Continent across the English Channel included the use of the newly developed multichannel Radio Set AN/TRC–1 equipment. Prior to D-Day, the Signal Corps in Great Britain for-

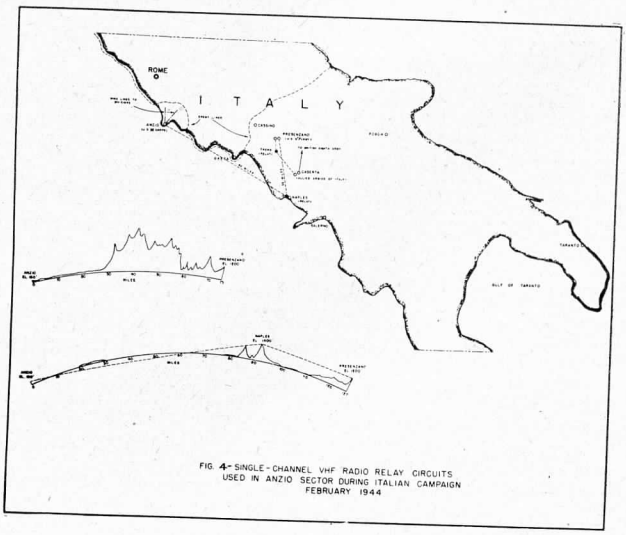
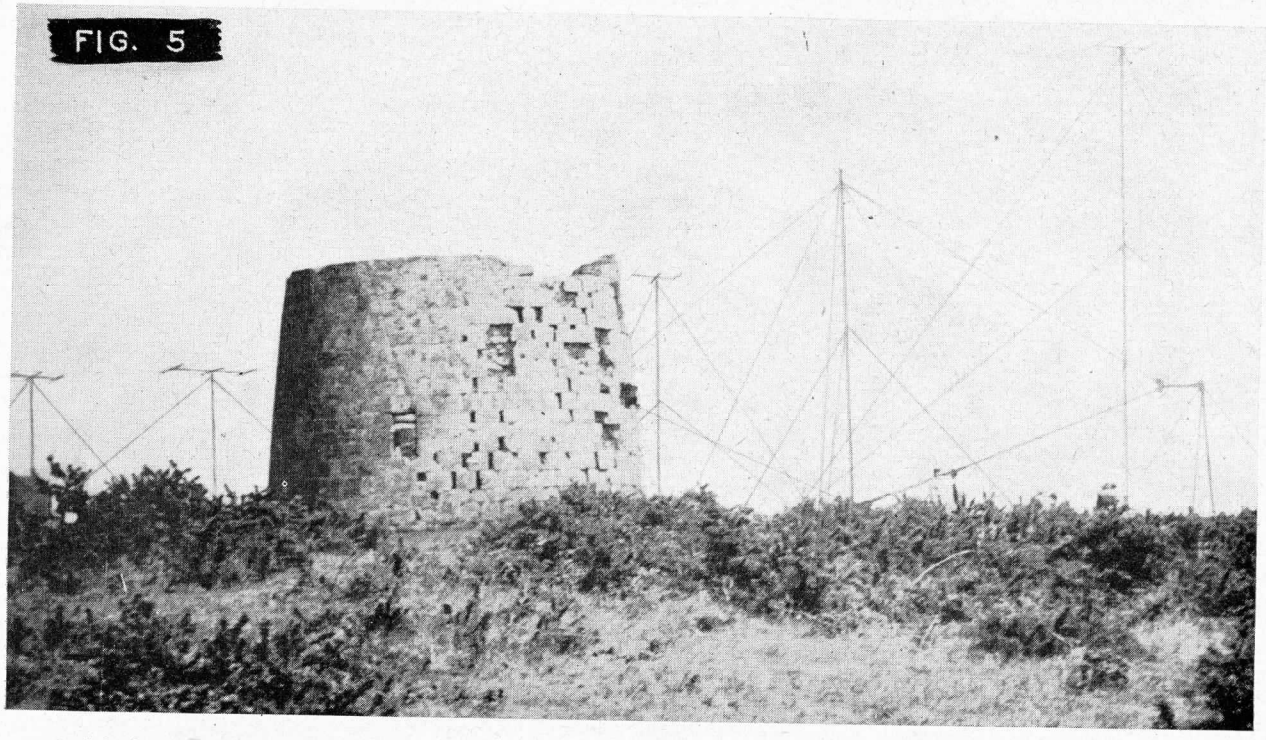


FIG. 4 - SINGLE-CHANNEL VHF RADIO RELAY CIRCUITS USED IN ANZIO SECTOR DURING ITALIAN CAMPAIGN FEBRUARY 1944

FIG. 5



warded information to the War Department concerning the topography of the proposed cross-channel route. A replica of this route was selected along the coast of Maine and an extensive series of tests was performed by Camp Coles Signal Laboratory with models of the new equipment to determine and solve any technical problems of propagation which might be involved in the coming operation. These tests verified the correctness of the choice of frequency band for operation over moderately long distances with reliable signal strengths permitting teletype operation and maximum signal-to-noise ratio consistent with siting requirements which in many cases would preclude the use of true line-of-sight transmission paths. It should be noted that these tests, as well as subsequent operations over water, covered distances considered most optimistic by engineering experts. Accordingly a wide application of the equipment was foreseen by the War Department in establishing extensive plans for integrated multichannel wire and radio circuits.

The dawn of D-Day, June 6, 1944, saw facilities installed in England and ready for the cross-channel operation, and equipment on its way to Normandy following closely behind the first wave of the invasion. Within 2 hours after arrival of the terminal station (at a site on the beachhead) in France, June 8, 1944, the cross-channel circuit began operation. (For the story of this system see SCTIL No. 33, August 1944.)

The site of the channel coast relay station is shown in figure 5. Although the vertical rhombic antennas depicted therein were provided as insurance against weak signals across the channel, the three element horizontal arrays proved to be entirely satisfactory with the normal mast height of 40 feet. In the opposite direction, toward the inland terminal, the three element arrays also were used, but with reduced height to improve security. In this photograph, the antenna wires are retouched for clarity.

As the details of the initial use of radio relay equipment became known, urgent requirements were presented by other combat organizations and services of the armed forces. The First U. S. Army, in accomplishing the initial invasion on the Normandy coast, achieved considerable distinction in this employment by controlling this circuit and having obtained and operated additional equipment to extend facilities in the continent from Army Headquarters to corps, and corps to divisions, and between corps within the Army. Following these outstanding uses, other armies were quick to follow suit as they became operational by equipping their units similarly. Air Force base establishments also availed them-

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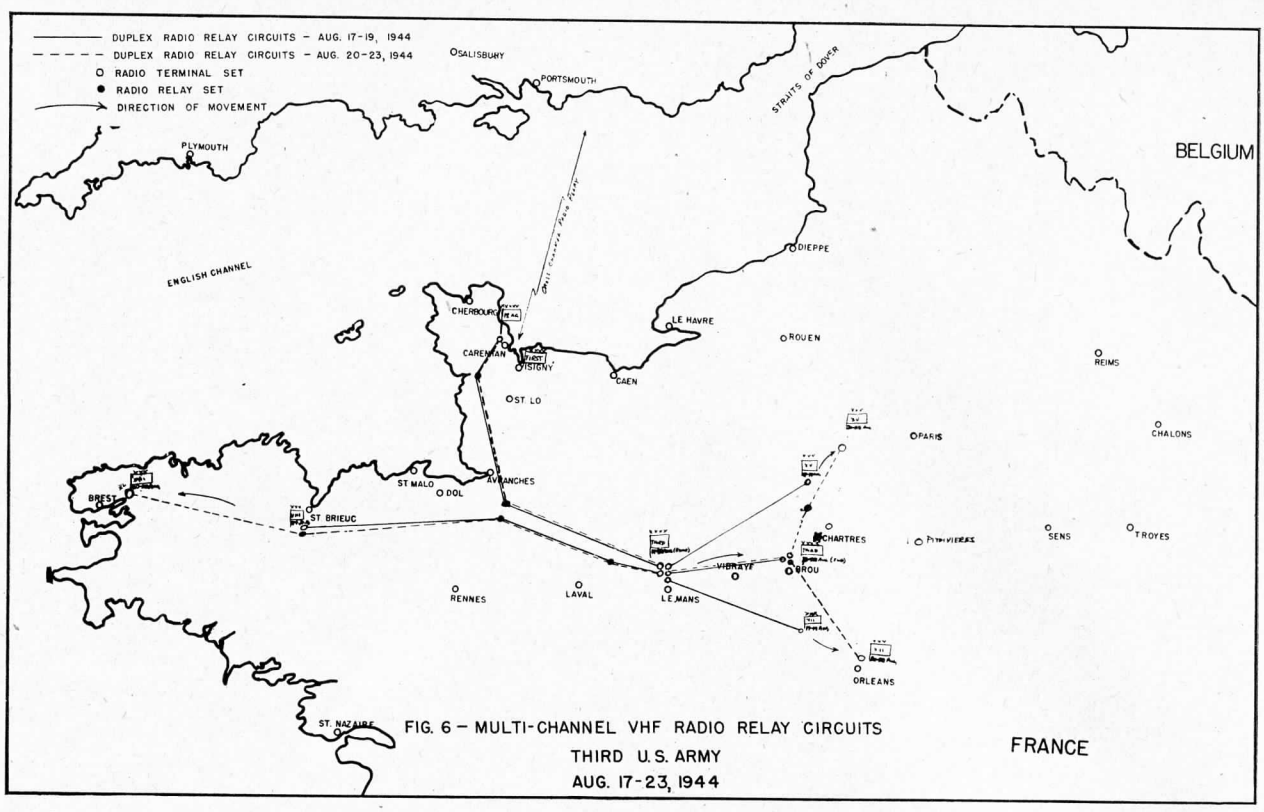


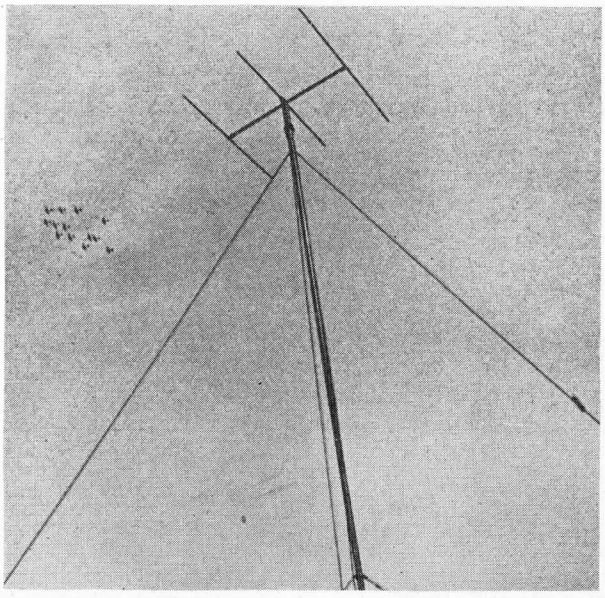
FIG. 6 – MULTI-CHANNEL VHF RADIO RELAY CIRCUITS
THIRD U.S. ARMY
AUG. 17-23, 1944

selves of the opportunities to provide early multi-channel radio circuits pending establishment of equivalent wire facilities.

A typical employment of the radio relay equipment by the Third U. S. Army during General Patton's dash across France is illustrated in figure 6. After the break-through at St. Lo, this Army relied upon these radio circuits for communication back to the 12th Army Group, and forward to its respective corps, and in several instances to its divisions. Initially these circuits composed single sections between the respective terminal headquarters. Then as these elements moved forward, extending their lines of communication, radio relay sets were interposed to extend the lengths of the systems. Later as wire circuits followed through, relay stations became terminals by direct connection to the wire circuits and the rear radio installations then were either removed from service or continued in operation as emergency facilities in the event of failure or overload of the wire facilities.

As the armed forces progressed across France to the Siegfried Line, additional radio relay facilities were established for both tactical requirements in the forward areas and administrative purposes in the communications zone to the rear. Additional cross-channel radio relay systems were installed from Paris to London, other types of radio circuits activated, existing wire lines throughout the occupied area rehabilitated, new wire lines installed, and the whole integrated

AN OFFICER CHECKS A RELAY STATION SET UP UNDER CANVAS SOMEWHERE IN FRANCE. THIS IS ONE OF THE MANY SUCH STATIONS THAT HELPED KEEP COMMUNICATIONS UP WITH OUR ADVANCING ARMIES.



TO THE LEFT OF THIS ANTENNA ARRAY IN FRANCE CAN BE SEEN A FLIGHT OF AMERICAN AIRCRAFT EN ROUTE TO BOMB THE ENEMY DURING THE DECISIVE BATTLE AT ST. LO.

into a comprehensive telephone, teletype, and telegraph network covering an area in Europe equivalent in size to that from New York to Chicago and from Detroit to Atlanta.

Many examples occurred during this campaign to demonstrate the outstanding value of multichannel radio relay communication facilities to military operations both as a primary means to cross territory held by the enemy in situations similar to that at Anzio beachhead, or rendered impassable by enemy action or terrain characteristics; and as a supplementary facility to wire and other radio circuits. River crossings were established under enemy fire which imposed prohibitive losses in men and material during attempted installations of wire circuits. Emergency facilities were provided, when the main French underground cable system failed as a result of combat operations, whereby the Continental Headquarters was furnished direct telephone and teletype communication to England and thence to the United States by interconnection with Trans-Atlantic communication facilities. The importance of this emergency operation is illustrated by the

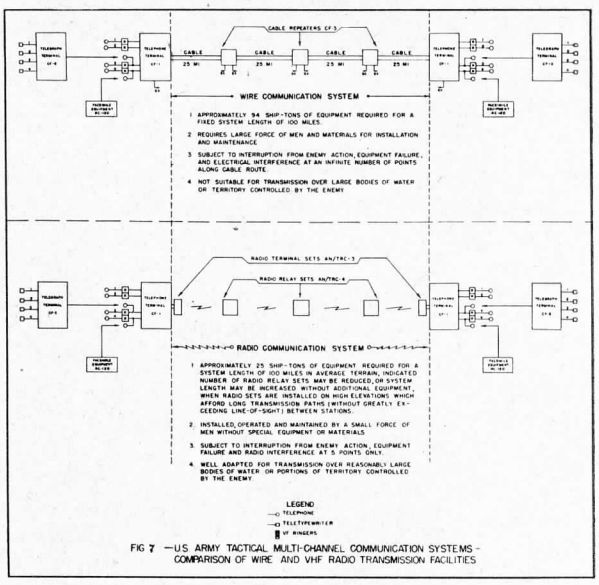


FIG 7 —U.S. ARMY TACTICAL MULTI-CHANNEL COMMUNICATION SYSTEMS - COMPARISON OF WIRE AND VHF RADIO TRANSMISSION FACILITIES

quotation of the Chief Signal Officer, European Theater of Operations, in a Commanding Generals' conference: *In spite of this very serious cable interruption, and I do not think any single trouble could have been worse, we handled 2,709 messages ----------; that is nearly 2 messages per minute throughout the 24 hours.*

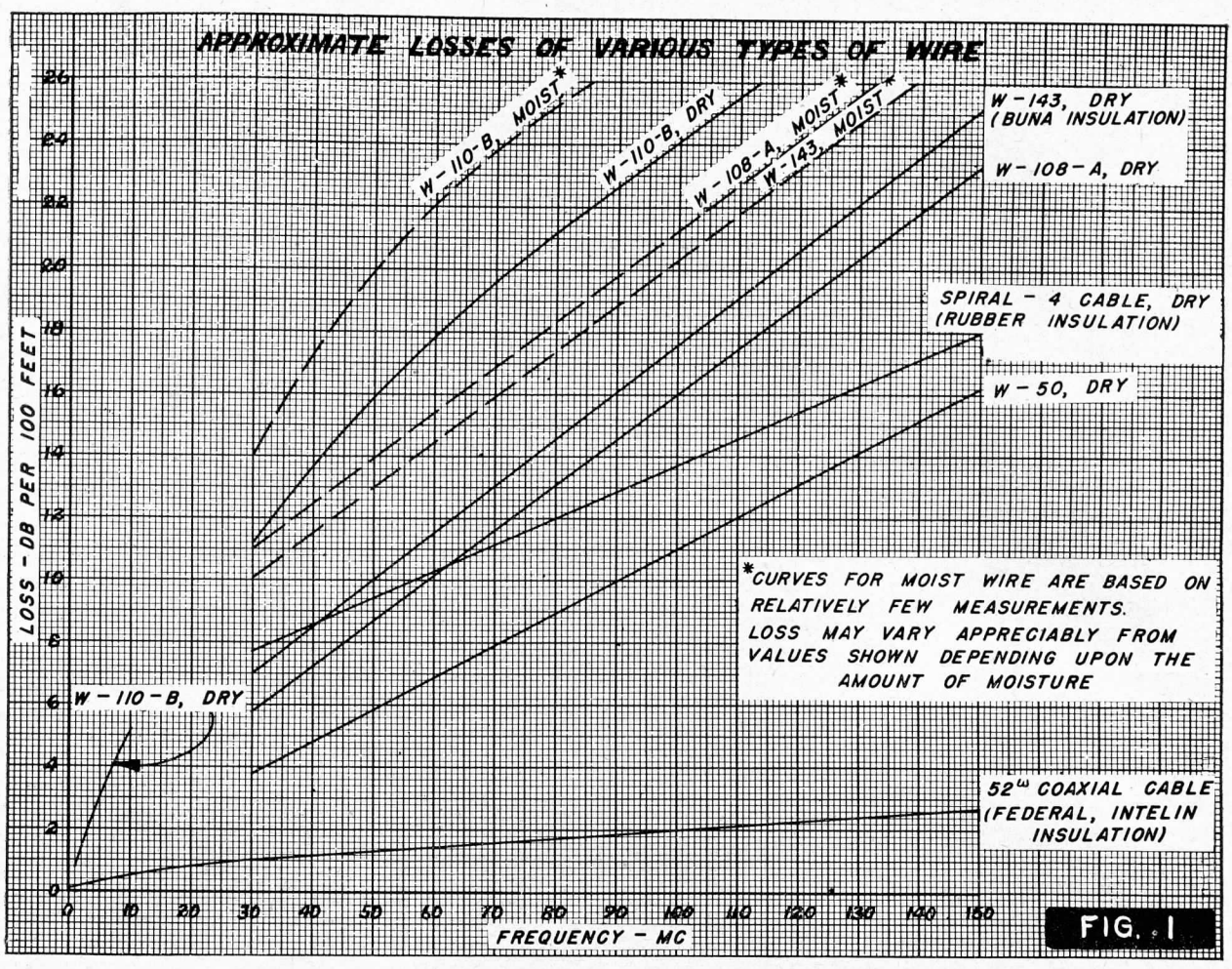
In reporting the employment of the multichannel v-h-f radio relay communication equipment to the War Department, the Chief Signal Officer, European Theater of Operations, stated: *It is believed that this operation marks an important milestone in military radio communication. Tactical field radio equipment has been successfully integrated with wire line and terminal equipment to form a system comparable in reliability and traffic capacity to all-wire systems.*

The favorable reception and praise given to the radio relay systems is due principally to the inherent advantages from a military point of view of such a system. These are briefly summarized in figure 7. Since logistics are of prime importance in military operations, the large saving in shipping space and tonnage as well as installation and maintenance personnel by the use of v-h-f radio relay is a major contribution in relieving the strain on transportation facilities and signal officers' resources.

If it doesn't work, report it. Use AGO Form 468

IMPROVISED VHF ANTENNAS

In an Emergency Field Wire Can Be Used as Transmission Lines, But Care Must Be Taken



THIS ARTICLE provides information on simple v-h-f antennas which can be improvised in the field for emergency use with ground radio receivers or transmitters when standard antennas and feed lines are not available.

Reports received from combat areas have revealed that under these conditions dipole antennas are frequently improvised and used with transmission lines constructed of ordinary field wire. Since v-h-f antennas are usually erected at a considerable height above ground, requiring a rather lengthy transmission line, the use of a single twisted pair of field wire will introduce considerable transmission line losses, particularly at the higher frequencies. In many operations, these losses may become quite important and may represent the difference between success and failure of a mission. For this reason the general use of a single pair of field wire as a transmission line should be avoided.

Tests have been made on the loss characteristics at radio frequencies of 5 types of field wire widely used in theaters of operations. The results of these tests are shown in the accompanying diagram (fig. 1), and reveal losses as high as 25 db per 100 feet of line at frequencies around 100 mc. Even at frequencies as low as 30 mc ordinary field wire, when moist, had losses as high as 15 db per 100 feet.

The use of suitable coaxial cable for the transmission line will reduce these losses to a minimum. However, means have been determined for em-

ploying field wire, when coaxial cable is not available, which will provide a satisfactory arrangement, although with considerably greater losses than obtained with coaxial cable.

Figure 2 shows an improvised antenna which has given satisfactory performance. It consists essentially of a half-wave dipole and an open wire transmission line, with a matching section at each end. It should be noted that the spaced feeders may be constructed of any available type of field wire. However, a single pair of Wire W–110–B of suitable length has been found to be the most satisfactory wire for use as a matching section.

Figure 3 shows the design and constructional details of a typical improvised antenna and transmission line. The antenna proper is shown as a half-wave dipole, which may be formed by separating the two conductors of Wire W–110–B used in the top matching section. The dimension *A* may be calculated from the formula given in figure 3 for single-frequency operation. If the antenna is to be used for reception over a band of frequencies, the dimension *A* should be adjusted for the center frequency of the band. Thus if the antenna is to be used for reception over the band 30 to 40 mc, *A* should be calculated for 35 mc. In general, a single receiving antenna will be satisfactory for use over a frequency range of about 1.5 to 1. For transmission purposes, best results will be obtained by adjusting the dimension *A* for the particular frequency in use.

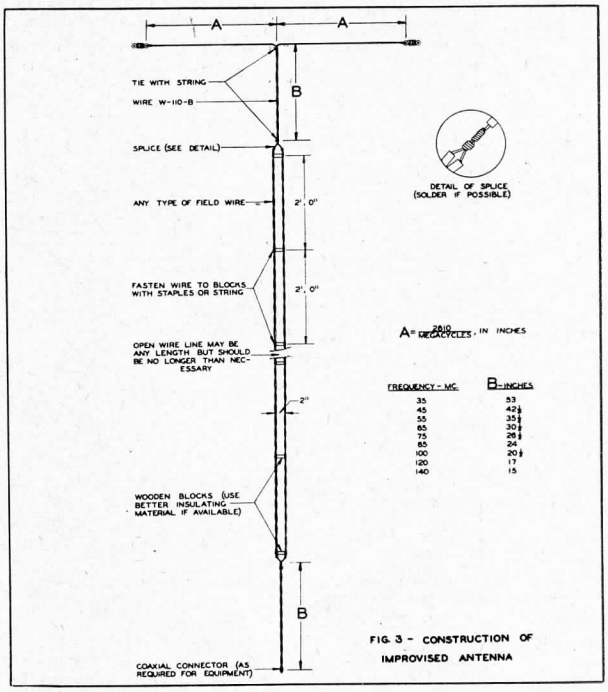


FIG. 3 - CONSTRUCTION OF IMPROVISED ANTENNA

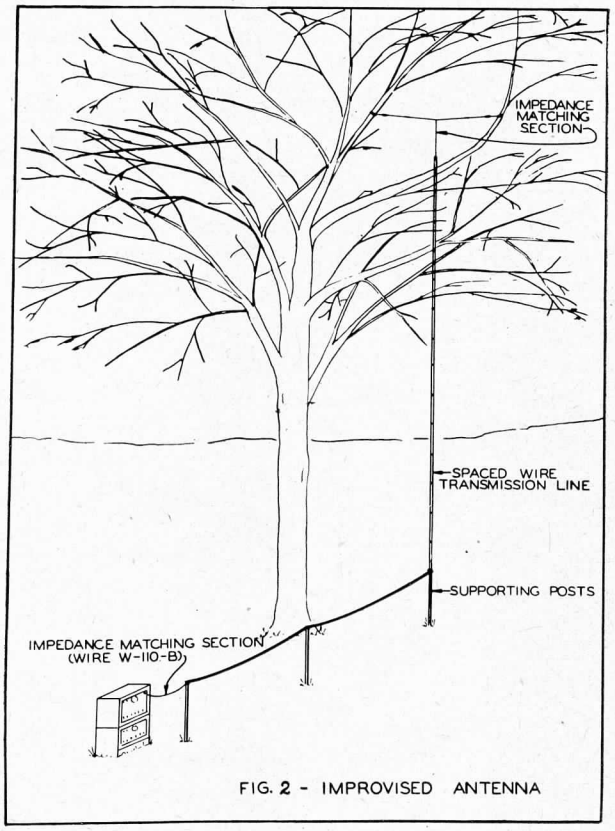
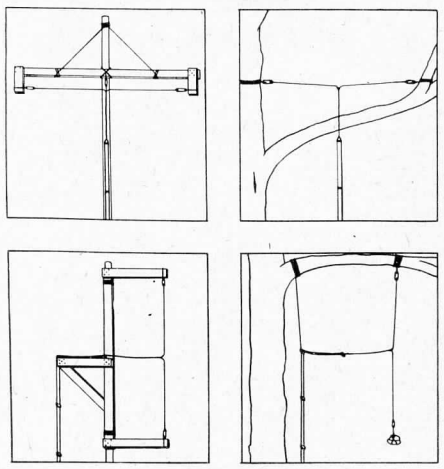


FIG. 2 - IMPROVISED ANTENNA

As shown in figure 3, the transmission line employs two conductors of any available type of insulated wire, separated 2 inches apart by wood blocks at about 2-foot intervals. (If available, a better insulating material than wood should be used.) Paired wire, such as W–110–B, may be used, in which case the two conductors of each pair are connected together and used as one side of the line. The wire may be fastened to the blocks either with staples, tape or string.

The matching sections are made from one pair of W–110–B cut to the dimensions *B* indicated in figure 3. For operation over a band of frequencies (not greater than about 1.5 to 1) the length should be adjusted for the frequency nearest to the center of the band. This may be done for either receiving or transmitting. Deviations from optimum values of the length of the matching section result in standing waves on the open wire portion of the line and change the impedance at the bottom of the line. However, for reasonable deviations, the additional losses caused by the standing waves will be negligible, and the impedance change, small.

FIG. 4 - INSTALLATION OF IMPROVISED ANTENNA



NOTES:
1. USE STANDARD DIPOLE ANTENNA WHEN AVAILABLE.
2. USE ANTENNA POLE WHEN AVAILABLE. OTHERWISE SELECT TREE OR OTHER SUITABLE SUPPORT AND PLACE ANTENNA AS HIGH AS POSSIBLE. CLEAR AWAY ANY FOLIAGE.
3. USE STANDARD INSULATORS WHEN AVAILABLE. ROPE OR STRING CAN BE USED IN PLACE OF INSULATORS WHEN NO OTHER INSULATING MATERIAL IS AVAILABLE.
4. WHEN THE TRANSMITTER IS LOCATED AT SOME DISTANCE FROM THE ANTENNA, THE TRANSMISSION LINE SHOULD BE RUN HORIZONTALLY, SUPPORTED SEVERAL FEET OFF THE GROUND.

The matching section at the antenna end provides an impedance match between the 70-ohm dipole and the 400- to 500-ohm impedance of the open-wire transmission line. The section at the other end provides an input impedance of about 70 ohms to the radio set. When the antenna is used for transmitting this latter section may not be required if the transmitter will load into a 400- to 500-ohm impedance. The length of the lower matching section, if required, can be adjusted to provide the best impedance match for proper transmitter loading.

The antenna shown in figure 2 is designed for horizontal polarization. However, the antenna can also be oriented for vertical polarization. Figure 4 shows several possible methods of erecting the antenna in the field, employing either type of polarization. The orientation of the antenna will naturally depend on the particular application. When used primarily for reception purposes, it should be remembered that a horizontal dipole is directional in the horizontal plane, with maximum pickup obtained in the direction perpendicular to the length of the dipole. On the other hand, a vertical dipole has uniform pickup in all horizontal directions. When vertical polarization is used, the antenna mounting should be such that the down lead is at least one-fourth wave length from the dipole at the lowest frequency employed.

The performance of an improvised antenna constructed from Wire W–110–B when used with Radio Set AN/CRC–3( ) (Galvin FMT–50–BC) and Radio Set AN/TRC–1( ) (Radio Transmitter T–14/TRC–1) transmitters in the frequency ranges 30 to 40 and 70 to 100 mc, respectively, was measured by comparing the receiving field intensity obtained using the improvised antenna with a 100-foot feed line, with the intensity obtained using a half-wave dipole with a 52-ohm flexible coaxial cable of the same length. Tests with the Radio Set AN/TRC–1( ) transmitter revealed that, with matching sections cut for 85 mc, it was possible to load the transmitter to full output at all test frequencies in the range 70 to 100 mc. The radiated field obtained with a dry W–110–B line was 3 to 6 db. less than that obtained with coaxial cable feed to a dipole. With the line wet, the loss increased an additional 1 to 3 db. The antenna proper was adjusted to one-half wave length at each of the test frequencies.

Tests with the FMT–50–B( ) transmitter showed that here, too, the length of the matching section was not critical. Tests were made with matching sections cut for 30, 35, and 40 mc. and it was possible to load the transmitter to full output at all the frequencies tested using any of these matching sections. With a dry line, the radiated field was 2 to 4 db. less than that obtained with a dipole fed with coaxial cable. With the line wet, the loss increased an additional 1 or 2 db. At each test frequency, the antenna was adjusted to one-half wave length.

PASS IT ALONG

From Germany an officer writes: *SCTIL has just reached me. This publication is of great interest to all of us in the field since it provides us with information on new items of equipment and a general resume of what people in other theaters are doing.*

To be effective in all theaters this copy should be passed along.

COMBATTING ENEMY DECEPTION

Require Authentication at All Times and the Enemy Won't Gain Any Information

DURING THE first days of the North African invasion, AFHQ in Gibraltar was sending messages to invasion units on the African coast. Although the messages were receipted for, they were never answered. When answers were requested by AFHQ, the invasion units said they had not received the messages. A D/F bearing taken on the station receipting for them showed it to be an unidentified station, presumably enemy, located in Europe. While authentication systems were being flown to the North African units, the Gibraltar station attempted to get traffic and authentication from the enemy with no success. When authentication between Gibraltar and North Africa was established, the false receipts finally ceased.

An aircraft operating in the Pacific asked for a position fix while returning from a mission. The position was supplied immediately, as well as instructions on the course to be followed. The radio operator, who had received an incorrect authentication from the station furnishing the information, attempted to contact the station again, but got no answer. The navigator became suspicious and asked for another fix. This time a different fix was given with proper authentication, and the aircraft landed safely at its base. Investigation revealed that no Allied unit had sent the first fix. If the aircraft had followed the course suggested, it would have come in directly over one of the enemy airfields in the area.

On opposite sides of the world, in different theaters of war, such incidents occur frequently. They are the result of deliberate enemy attempts to interfere with Allied communications through deception.

There are numerous ways in which deception may be attempted. A message intercepted by the enemy may be sent by them a week later, with a different heading, to the originating station or to a different station. A message may be composed of intercepted and rearranged code text, and then transmitted to an American station.

A favorite Japanese trick is to send a message asking the operator to hold down his key or send *V's* for a few minutes, letting the enemy adjust his receiver to the frequency or get a D/F bearing. (One operator who complied and then asked for identification was answered with the word *JAP.*) The Japanese have proved to be proficient in imitating Allied procedure. They often use Allied call signs, receipt for Allied messages, and attempt voice deception.

The Germans are equally proficient in deception. A D/F station in Italy received a message ordering it to close down for the night, did so, and discovered the next day that the message had not been sent by any Allied station. In the same theater a British troop commander who was moving up to the front received orders, apparently from regiment, to go to a town some points off his course. As the troop advanced, it found that its own regiment was shelling the town. Regiment subsequently denied all knowledge of the misleading orders.

During the siege of Bastogne, American troops reported persistent attempts by the Germans to tap American lines and send false messages; this indicates the need to guard against deception on wire circuits as well as radio.

Combating deception is a matter of following authorized procedure and using initiative. Any transmission of doubtful origin must be regarded with suspicion. When there is any failure to authenticate properly or any deviation from authorized procedure, there is reason to challenge the authenticity of the transmission. Conditions will vary in all theaters, but if personnel are alert and prepared to recognize discrepancies, they will be able to detect the *phonies.*

The newspapers have reported the following two stories.

On Guadalcanal the Japanese captured a Marine radio station and attempted to cancel a request the station had made for help. The Jap message read, *REINFORCEMENTS NO LONGER NEEDED. JAPS HAVE WENT.* Because of the slip in grammar the deception failed, and troops were sent to recapture the position.

A Marine officer on Saipan gave an order over a field telephone and asked if it had been received. *Yes, thank you very much,* was the reply. *No Ma-*

rine in combat would ever say that, the officer exclaimed. *The Japs are on our wire!*

Not all cases of deception are as easily recognized as those above. Attempts at deception are most commonly revealed through their failure; there are probably many instances in which the enemy has practiced deception successfully without detection. Reports from monitors in the field show that failures to authenticate when necessary compose 12 percent of all violations of transmission security. On some occasions, failure to authenticate may have been due to the fact that the message did not originate at an Allied station, in which case the enemy originator would not have been able to authenticate.

One aircraft warning net in Italy received a voice transmission ordering all searchlights in a certain area to be turned on at a specified time. All lights were turned on, and Allied planes were sent up to intercept German planes, in case the message had been faked. No enemy planes appeared, but the message apparently came from the enemy, since an investigation revealed that no Allied station had sent it.

An American station in the Pacific sent a message which was promptly receipted for, and then received a message asking for a repeat of certain groups. Several other service messages of the same type followed. As the original message failed to reach the station for which it was intended, it was assumed that it was intercepted by the Japanese. Following this episode, the American station required authentication regularly. Its suspicion was verified. At no time was any authentication given by the station which had requested the repetitions, although its signal remained strong, and it continued to receipt for messages.

The examples given above illustrate but a few means of deception. If communication personnel and all others who use communication means which are susceptible to interception will follow authorized procedure and remain alert, most enemy deception will fail. Authentication and maintenance of circuit discipline are essential defenses against the enemy. These should be supplemented with a study of the particular situation and with a constant watchfulness for irregularities which might indicate that the enemy is on the circuit.

War Department Training Circular No. 74, *Authentication Systems*, 20 December 1944, should be consulted for information concerning authentication systems and procedure for authenticating.

GUN BATTERY COMMUNICATIONS

FROM AN antiaircraft officer who served in France and Germany from D-Day until the middle of December 1944 comes a description of an improvised communication system put into effect by his platoon and reported in a technical intelligence report, ASF. .

The standard method of establishing communications when a platoon of an antiaircraft battalion assumes a new position is for the battery communications sergeant to start out with a weapons carrier and a long reel of wire, contacting each gun section in turn and then linking all positions up with the platoon switchboard. Since each platoon consists of 6 gun sections or positions, this method usually takes between two and three hours to set up and a similar length of time to break down.

The new system, which was put into effect throughout the entire battalion, consists of giving a small reel with one-half mile of Wire W–130–( ) as well as a telephone to the communications man of each gun section. As soon as the section is placed in position, a guide points out the location of the command post and the section communications man starts walking toward it, unreeling the telephone wire as he walks.

In this manner, all the gun sections can be hooked in with the CP in a matter of from 10 to 15 minutes and can also be ready to move on in the same length of time. An added feature is that much less wire is thus used.

Although not so indicated in the report, it is assumed that the communications men of each gun section are equipped with Reel Equipment CE–11 for unreeling the wire as they proceed to the platoon command post. This equipment is also useful for reeling up such wire when gun positions are changed.

WIRE DISPENSER MX-301( )/G

Wire Coil for High-Speed Laying Now in Production To Meet Theater Requirements

IN SIGNAL Corps Technical Information Letter No. 33, August 1944, the preparation and use of high-speed wire coils, on an experimental basis, was described. Since that time, development has progressed to the point where packaging of assault wire in this form has been initiated to fulfill specific theater requirements.

Wire Dispenser MX–301( )/G is an expendable package 12 inches in diameter and 6 inches long, containing approximately three-fourths mile of Wire W–130–( ), wound in solenoidal fashion to permit dispensing the wire at various speeds such as from a manpack, a moving vehicle and liaison type aircraft without the use of rotating reel equipment. It weighs 25 pounds including the wire. Several wire dispensers may be prespliced end-to-end to facilitate wire laying from vehicles and liaison aircraft. Continuous communication during ground wire laying is possible using Handset TS–10–( ) or Telephone EE–8 or TP–3.

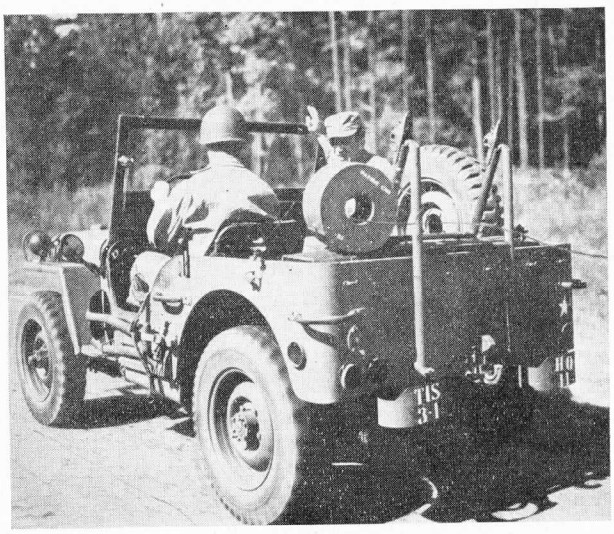
For wire laying from liaison aircraft the Army Air Forces has designed Container, Aerial Wire Delivery, Type A–1 for attachment to the wing struts of an L–5 type aircraft. This container, which is approximately 60 inches long and has an inside diameter of 12¾ inches, holds a maximum of 8 Wire Dispenser MX–301( )/G spliced in tandem. A releasable sheet steel end plate or lid with an attached weight and marker is used to start the payout of the wire when the end plate is released from the cockpit of the aircraft by means of a flexible cable. Container installations are made on both wings as it has been found necessary to have the wings balanced in order to eliminate any undesirable control effects. The wire should be released from both containers at approximately the same time, otherwise excessive control forces will be required to maintain level flight. Tests conducted over the most mountainous terrain in eastern United States indicated that at flying speeds, an average of one snarl or knot may be expected per Wire Dispenser MX–301( )/G. When laid over mountainous terrain, the wire lodges in treetops with the result that long spans are often encountered. One span of Wire W–130–C laid during test was approximately 1,200 feet long.

By laying two circuits simultaneously, assurance is also given that at least one metallic circuit, using one pair for each side, may be obtained even though the existence of snarls and wire tensions due to long spans may cause a short in either or both pairs of wires. Container, Aerial Wire Delivery, Type A–1, and the equipment required to

AN L–5 AIRCRAFT WITH TWO CONTAINERS, AERIAL WIRE DELIVERY, TYPE A–1, ATTACHED. THE CONTAINER AT THE RIGHT ON THE GROUND IS OPEN TO SHOW METHOD OF STOWING EIGHT WIRE DISPENSERS.

634063—45——3

WIRE DISPENSER MX–301( )/G LASHED TO INFANTRY PACKBOARD SHOWING METHOD OF MAINTAINING COMMUNICATION WHILE LAYING WIRE.



WIRE W–130–C BEING LAYED FROM WIRE DISPENSER AT 50 MILES PER HOUR FROM REAR OF JEEP.

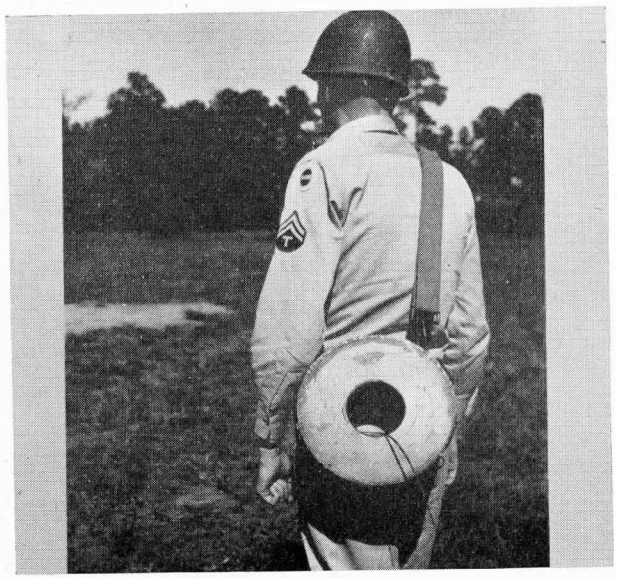
install it on the wing struts of L–5 aircraft, will be issued by the Army Air Forces.

As a result of service tests conducted by the Infantry Board and recommendations by Headquarters, Army Ground Forces, action has been initiated to issue Wire W–130–( ) to Ground Force units in Wire Dispenser MX-301( )/G. Pending combat experience with wire dispensers for laying of assault wire, no action to change, at this time, the allowance of Axle RL–27–( ), Reel RL–39–( ) and Reel Unit RL–31 as shown on current tables of organization and equipment is contemplated. Also, an appreciable time will elapse before the necessary changes can be made in production to permit the packaging of large quantities of assault wire in wire dispensers. However, a limited procurement of 3,000 miles of Wire W–130–C packaged in Wire Dispenser MX–301 ( )/G has been authorized and this wire is now under procurement to meet theater requirements.

Development has been completed and service tests conducted on Wire Dispenser MX–302 ( )/G. This wire dispenser is similar in construction to Wire Dispenser MX–301 ( )/G except it holds approximately one-fourth mile of Wire W–110–B, is 14 inches in diameter, 8 inches long, and weighs approximately 40 pounds complete with one-fourth mile of Wire W–110–B. Although it is intended that Wire Dispenser MX–302 ( )/G be used principally for wire laying from manpack, the Infantry Board in its service tests laid wire with these dispensers at speeds up to 35 miles per hour.

Wire dispensers are at present prepared on Wire Winding Machine MX–304( )/G. This machine was designed primarily for issue to rear echelon signal depots for field preparation of wire dispensers. A limited quantity of these machines are being used by the wire manufacturers to wind the current limited procurement quantities.

Film Bulletin FB–158, *Improved Field Wire Laying With Wire Dispensers* illustrates some of the above methods. Technical Bulletin TB SIG 150, dated 6 January 1945, *Wire Dispenser MX–301/G*, provides operating instructions for the dispenser.



DISPENSER BEING CARRIED BY MEANS OF SIGNAL CORPS CARRYING STRAP ST–19–( )

ANTIAIRCRAFT OPERATIONS ROOM

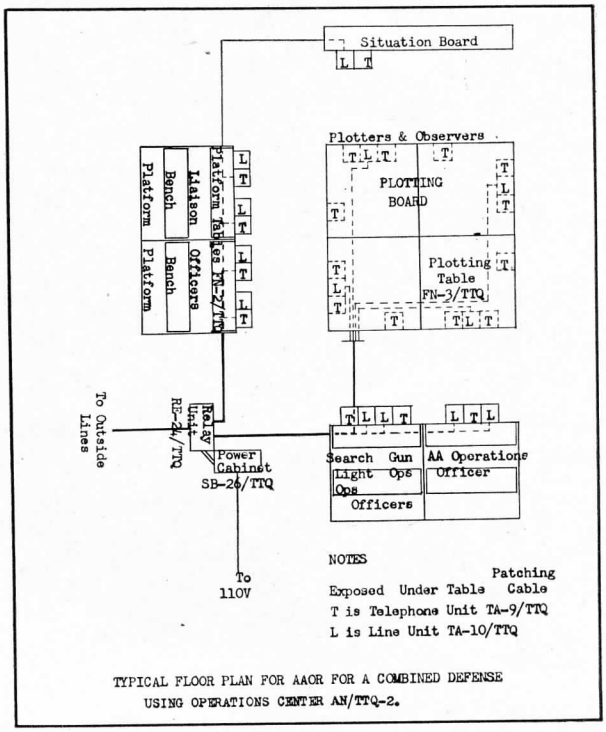
Three Equipments have been Developed for the Proper Functioning of AA Coordinating Centers

THE ANTIAIRCRAFT Operations Room (AAOR) is the central point in an air warning system for coordinating all the AA means available to engage the enemy as effectively as possible. The AAOR has two primary functions: (1) To collect, evaluate, and disseminate intelligence, and (2) to exercise fire direction when and as necessary. The AAOR is used to perform other duties when they do not interfere with its primary functions. Some of these are: (1) To act as a center for liaison and coordination with other arms and services. (2) To provide higher and adjacent headquarters with pertinent information. (3) To perform certain routine functions such as preparation of reports.

To perform the above functions three equipments were developed; Operations Center AN/TTQ–2 ( ), Plotting Equipment AN/TSA–1, and Plotting Equipment AN/TSA–2, each with a different quantity of components, depending on the factilities required. The three equipments are modifications of Operations Center AN/TTQ–1 ( ). Details on the components of the equipments may be had by referring to the article on Operations Center AN/TTQ–1 ( ) in SCTIL No. 31, June 1944.

Operations Center AN/TTQ–2 ( ) is a smaller version of Operations Center AN/TTQ–1 ( ), designed for use by Antiaircraft Operations Room detachments. The reduction does not affect the flexibility of the equipment but rather adapts it to the smaller number of operating positions required by Army Ground Forces at an AAOR. A brief description of the major components together with the newly assigned Signal Corps nomenclature which also applies to the AN/TTQ–1 ( ) follows. The AN/TTQ–2 includes furniture, telephone equipment and control equipment for radio sets but does not include any radio sets.

Plotting Table FN–3/TTQ is a table approximately 4 feet square which may be combined with others to form a plotting surface of the desired size. Information on aircraft flights together with AA information is plotted on maps prepared on the table top so as to be visible to all necessary personnel. Casein paste is provided so that the maps may be painted on the table surface and be

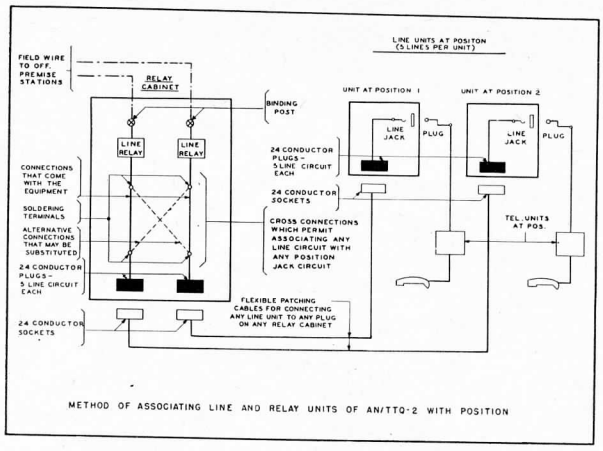


TYPICAL FLOOR PLAN FOR AAOR FOR A COMBINED DEFENSE USING OPERATIONS CENTER AN/TTQ-2.

readily removed. Plotters at the table are provided with telephone equipment connected directly, or in some cases by radio link, to tellers at radar sets.

Telephone Unit TA–9 ( )/TTQ, a universal telephone circuit, for use on land lines or radio circuits with simplex operation on press-to-talk and Line Unit TA–10 ( )/TTQ, a 5-line termination unit, are always used together but in various combinations. Provision is made for mounting these units on the tables by means of a button and hook arrangement. Telephone Unit TA–9-( )/TTQ may be used on only one line at a time but all 5 lines on the TA–10 ( )/TTQ may be used simultaneously.

Platforms to permit the antiaircraft operations officer (AAOO), liaison officers, and other interested personnel to overlook the plotting board are included. Telephone equipment is provided on Platform Table FN–2/TTQ, mounted on the platform to permit the AAOO to direct operations and the liaison officers to contact their headquarters. The platform does not have separate nomenclature



METHOD OF ASSOCIATING LINE AND RELAY UNITS OF AN/TTQ-2 WITH POSITION

but consists of Case CY–283/TTQ with added legs and braces.

A status board is provided for display of necessary information on the state of readiness of the radar sets and similar conditions.

Relay Unit RE–24( )/TTQ furnishes the following:

30 line relay circuits for line and circuit termination.

8 radio channel control circuits.

2 voice amplifiers.

A binding post panel to which field wire may be terminated.

A cross-connection field which permits associating any line or radio channel circuit with any position line unit.

Relay Unit RE–24( )/TTQ is equipped with the same cross-connection pattern when furnished with the AN/TTQ–1( ) or AN/TTQ–2( ) for standardization reasons. It is necessary to remove this pattern and install a new one for the AN/TTQ–2( ). As the pattern will differ according to the tactical requirements at each center, instructions are provided in the instruction manual for making each type of cross connection; land line to telephone circuit in the center, radio channel to telephone circuit, two telephone circuits, parallel connections, etc.

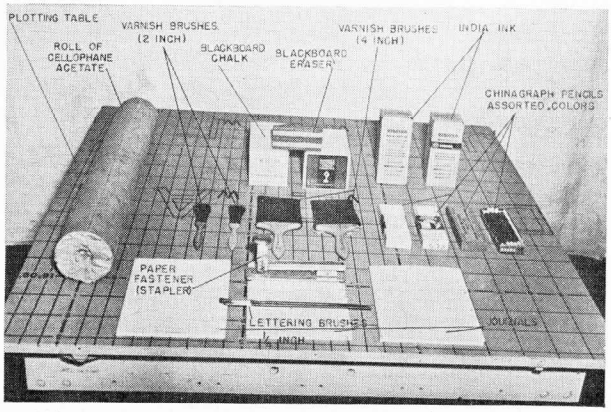
Relay Unit RE–8( )/TTQ provides switching equipment under control of the press-to-talk button on the telephone set to operate a voice amplifier as a two-way amplifier on long land lines. The voice amplifier was originally designed for one-way amplification on radio channels with transmitters that do not have preamplification.

Telephone Power Unit SB–26( )/TTQ includes a 24-volt rectifier and storage battery, a 160-volt rectifier and 6.3-volt filament supply for the amplifiers, Ringer TA–13( )/TTQ a 20-cycle static ringer, control equipment for Timing Indicator ID–110( )/TTQ, and a distribution panel for the power circuits. Two lighting feeder cables, each 60 feet long and provided with 5 duplex receptacles and extension cord assemblies for 110-volt operation are furnished for overhead lighting. Provision is made to use commercial power but two each Power Unit PE–197–( ) are furnished for use as stand-by or when commercial power is not available.

Radio Adapter details are furnished for use at the radio equipment. These details consist of binding posts for connecting field wire cabled to various plugs and sockets for direct connection to standard Signal Corps Radio Set SCR–177–( ), SCR–399–( ) and SCR–543–( ). This permits connection to the radio set without the use of any tools except for terminating the field wire on the binding posts and eliminates the necessity of dismantling the radio and changing soldered connections. Condensers, coils, relays, and switching equipment as required are wired into the adapters.

A complete set of materials needed for the preparation of the maps and for plotting information on the maps is supplied with the center. This includes cans of casein paste in white, blue, and green, varnish and varnish brushes, plastic overlays both clear and with grid markings, chinograph pencils, and india ink in various colors, plastic arrows and symbols. Stands with various marked cards are provided for indicating flight formations and in addition steel sleds with magnetic letters and numbers are provided for the same purpose.

Plotting Equipment AN/TSA–1 is for use by



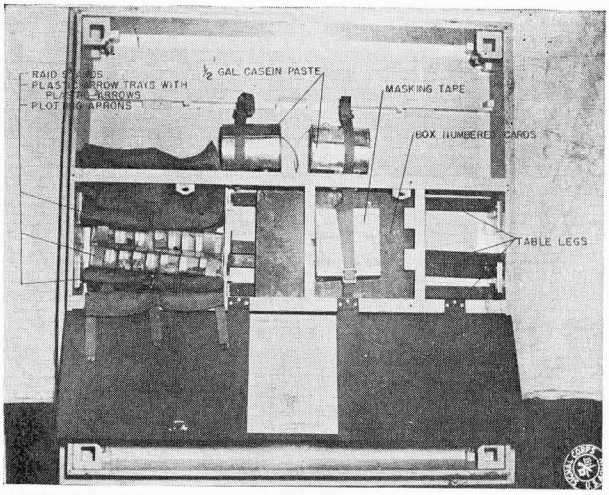
AN OPERATIONS CENTER PLOTTING TABLE WITH MARKING EQUIPMENT ARRAYED ON ITS SURFACE.

AA gun and searchlight battalions as an AAOR in conjunction with telephone and radio equipment issued separately on the T/O & E.

Four plotting tables, a platform and necessary plotting equipment make up the AN/TSA–1. The platform and Platform Table FN–2/TTQ comprising Case CY–283/TTQ are the same as supplied on Operations Center AN/TTQ–2( ). The plotting equipment is packed in the underside of the plotting tables for transportation. The tables are similar to plotting Table FN–8/TSA but due to the difference in the partitions for holding the plotting equipment separate nomenclatures are required. Plotting Table FN–4/TSA and plotting Table FN–8/TSA make up Case CY–327/TSA and two plotting Table FN–9/TSA make up Case CY–394/TSA with the addition of the end pieces which are used as benches during operation.

Similar plotting facilities are provided with the AN/TSA–1 as with the AN/TTQ–2( ). Casein paste in white, blue, and green, and varnish brushes for painting maps directly on the table surface and various colored plastic arrows, raid stands and numbered cards for plotting and designating aircraft flights are provided. The surface may be covered with a clear, plastic covering and plotting may be done in the same manner or with the chinograph pencils provided in various colors. Prepared maps may be inserted under the plastic if desired. A blackboard cloth, chalk, and erasers are included for use as a situation board or status board.

Plotting Equipment AN/TSA–2 is for use by AA automatic weapons battalions for an AAOR. Plotting tables and necessary plotting equipment



BOTTOM VIEW OF PLOTTING TABLE SHOWING HOW EQUIPMENT IS STOWED AWAY ON UNDERSIDE.

are provided but telephone, radio, and power equipment are issued separately.

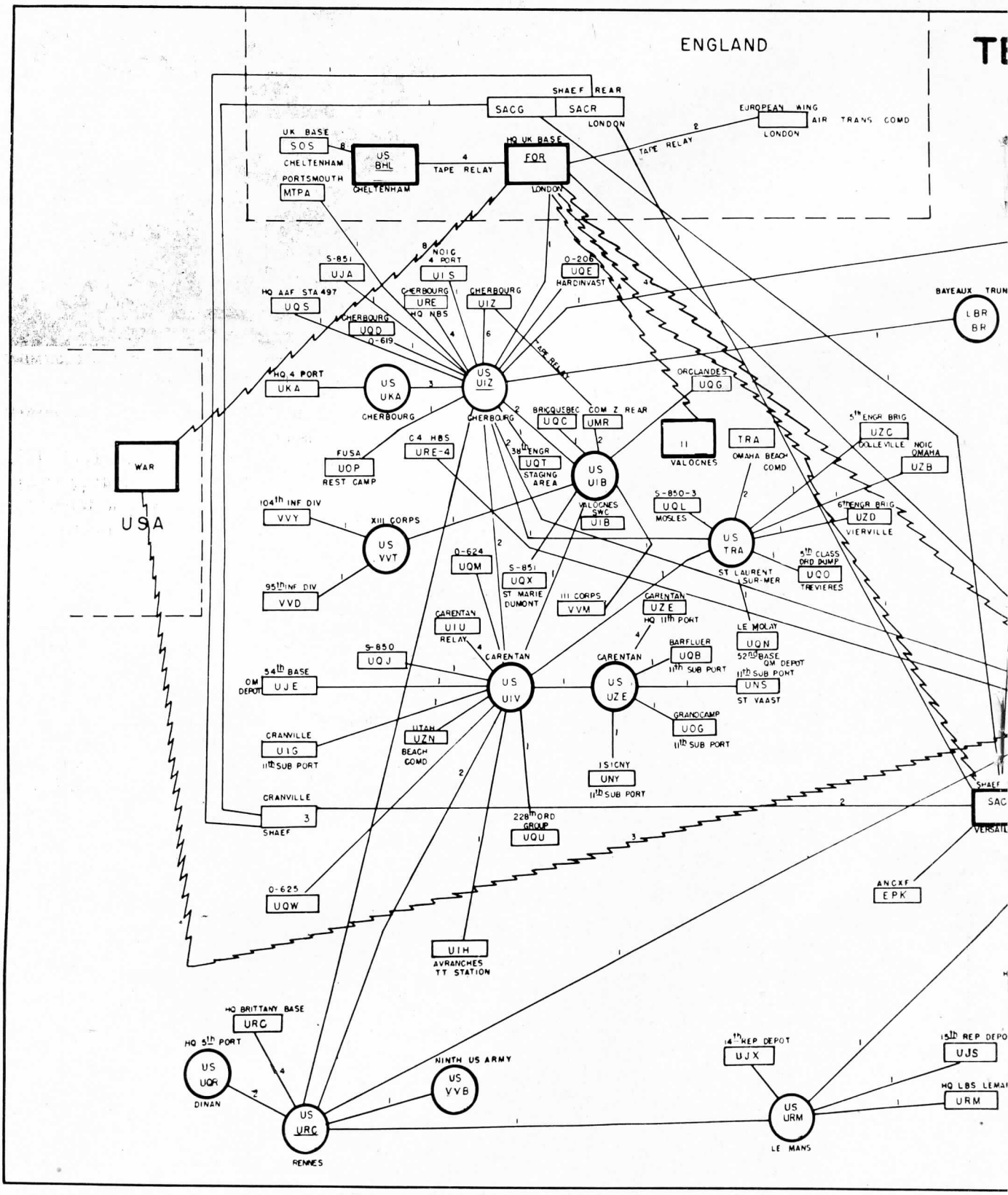
The AN/TSA–1 includes plotting Table FN–10/TSA and FN–11/TSA, with the plotting equipment packed in the underside of the tables for ease in transportation. The two tables with the addition of the end pieces which are used as benches make up one case 4′ x 4′ x 1′, Case CY–395/TSA.

The plotting equipment consists of casein paste in white, green, and blue, and varnish brushes for painting maps on the table surface, a roll of clear, plastic covering to place over the table surface, and chinograph pencils in various colors. Plotting is done by marking on the plastic overlay. Prepared maps may be used under the plastic overlay if desired. A blackboard cloth, chalk, and erasers are included for use as a situation board or status board.

PATROL CONTROL BY TELEPHONE

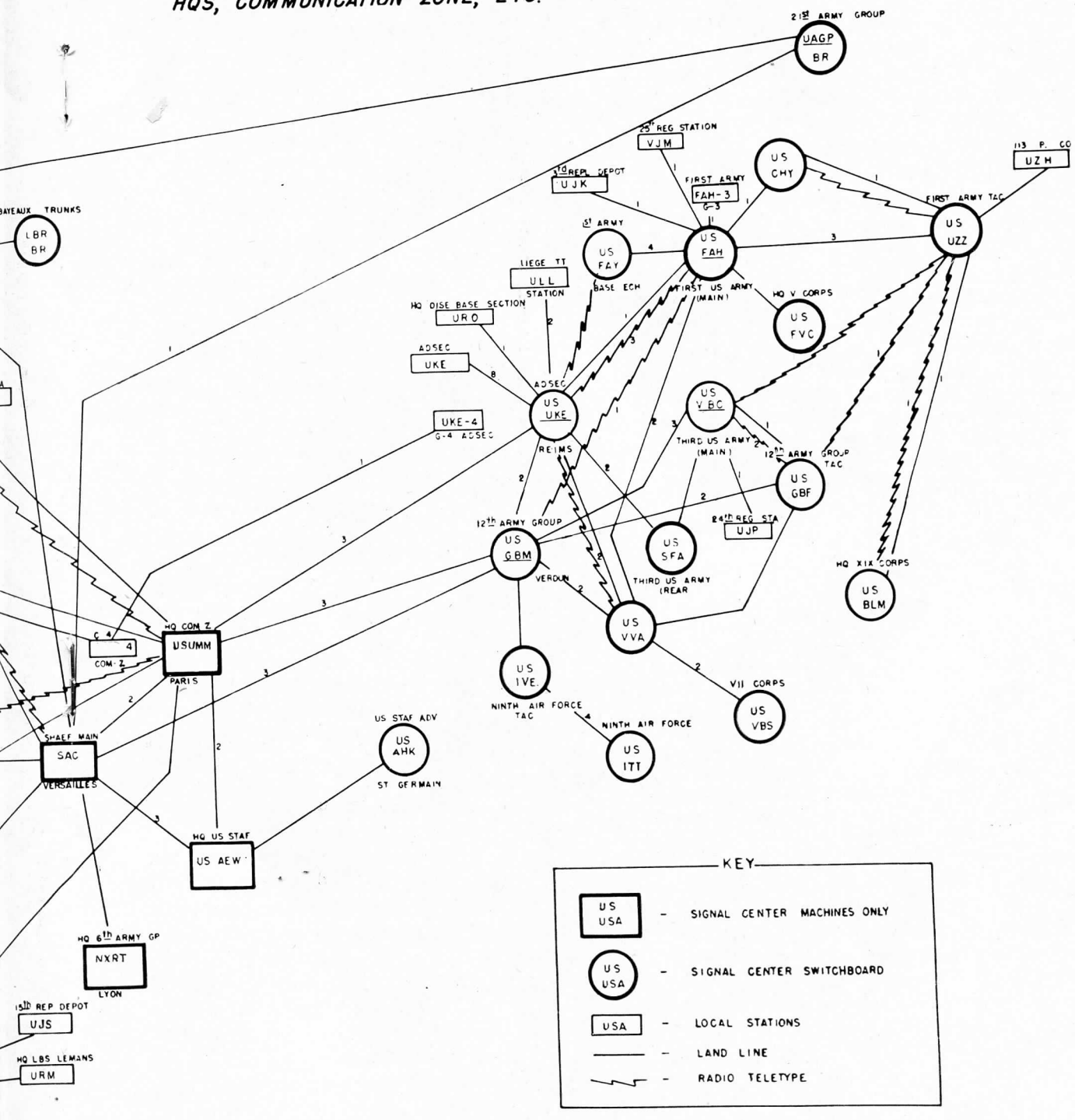
A SYSTEM for telephone control of patrols from battalion headquarters was worked out by a Ranger battalion in Africa and Italy. Communication was provided from each patrol to its parent unit and to other patrols which were operating simultaneously. Field telephones (preferably sound-powered) and light field wire on ½-mile spools were carried by each patrol.

The following example illustrates the method: At dusk each of six patrols would hook into the battalion switchboard and proceed along the prescribed route to the end of the first spool. Each patrol would then check in, using prearranged identification numbers, and receive any further orders. Calls would be made from each successive ½-mile check point. Patrols could talk to each other through the switchboard and sometimes could coordinate their movements to take aggressive action against enemy groups or installations in the area. The coordination afforded by the system tended to increase the confidence of the men and facilitated longer periods of activity by each patrol.


ENGLAND
SHAEF REAR
SACG
SACR
LONDON
EUROPEAN WING
AIR TRANS COMD
LONDON
UK BASE
SOS
CHELTENHAM
PORTSMOUTH
MTPA
US BHL
CHELTENHAM
TAPE RELAY
HQ UK BASE
FOR
LONDON
TAPE RELAY
S-851
UJA
NOIC 4 PORT
UIS
O-208
UQE
HARDINVAST
HQ AAF STA 497
UQS
CHERBOURG
URE
HQ NBS
CHERBOURG
UIZ
CHERBOURG
UQD
O-619
TAPE RELAY
BAYEAUX
LBR
BR
HQ 4 PORT
UKA
US UKA
CHERBOURG
US UIZ
CHERBOURG
ORCLANDES
UQG
BRICQUEBEC
UQC
COM Z REAR
UMR
5th ENGR BRIG
UZC
COLLEVILLE
NOIC OMAHA
UZB
WAR
USA
C4 HBS
URE-4
FUSA
UQP
REST CAMP
38th ENGR
UQT
STAGING AREA
US UIB
VALOGNES SMC
UIB
II
VALOGNES
TRA
OMAHA BEACH COMD
S-850-3
UQL
MOSLES
6th ENGR BRIG
UZD
VIERVILLE
104th INF DIV
VVY
XIII CORPS
US VVT
95th INF DIV
VVD
O-624
UQM
S-851
UQX
ST MARIE DUMONT
US TRA
ST LAURENT SUR-MER
5th CLASS SPLY DUMP
UQO
TREVIERES
III CORPS
VVM
CARENTAN
UZE
HQ 11th PORT
CARENTAN
UIU
RELAY
LE MOLAY
UQN
52nd BASE OM DEPOT
S-830
UQJ
CARENTAN
US UIV
CARENTAN
US UZE
BARFLEUR
UQB
11th SUB PORT
11th SUB PORT
UNS
ST VAAST
54th BASE
OM DEPOT
UJE
GRANDCAMP
UOG
11th SUB PORT
CRANVILLE
UIG
11th SUB PORT
UTAH
UZN
BEACH COMD
ISIGNY
UNY
11th SUB PORT
CRANVILLE
3
SHAEF
228th ORD GROUP
UQU
SHAEF
SAC
VERSAIL
O-625
UQW
ANCXF
EPK
UIH
AVRANCHES
TT STATION
HQ BRITTANY BASE
URC
HQ 5th PORT
US UQR
DINAN
US URC
RENNES
NINTH US ARMY
US VVB
14th REP DEPOT
UJX
15th REP DEPO
UJS
HQ LBS LEMA
URM
US URM
LE MANS

TELEPRINTER TRAFFIC DIAGRAM

HQS, COMMUNICATION ZONE, ETO.



PIGEONS WITH AIRBORNE TROOPS

Operating Procedure Is Suggested for Utilization of Birds in an Airborne Operation

THE FOLLOWING information pertaining to the use of pigeons in airborne operations has been prepared by the Army Pigeon Service Agency in collaboration with the Airborne Training Center. Although limited in application it is believed that this material will be of interest to communication personnel involved in operations of this nature.

The purpose of this procedure is to provide a guide for the use of signal officers, communication officers, and officers of pigeon units involved in an airborne operation.

For purposes of this document, terms are defined as follows:

Airborne Units (troops).—Army Ground Force units (troops) which are specially organized, trained, and equipped to utilize air transportation for entry into combat. Normally such units will include parachute and gliderborne elements of combined arms.

Air-landing Units (troops).—Ground units (troops) transported and landed in powered aircraft. Usually such units are not specially organized, trained, or equipped for entry into combat by air transport; however, airborne units may be airlanded.

Combat Area.—The area including the objectives of airborne forces and the areas contiguous thereto.

Controlling Headquarters.—A headquarters charged with the responsibility of, and having the authority to control all forces participating in an airborne operation.

Departure Area.—An area from which airborne units are transported by air. The area includes all departure bases (airfields).

Gliderborne.—See Airborne.

Parachute Units (troops).—Units (troops) moved by air transport and landed by means of parachutes.

Resupply.—Supply other than that initially carried into combat. The Army Air Forces is responsible for resupplying ground units when supply by air is necessary.

References: FM 11-5, FM 11-10, FM 11-80, FM 100-5, TM 11-410, T/O & E 11-39, T. C. No. 113, 9 October 1943, ASF Catalog, Sig 4-1.

The mission of a pigeon unit is to provide pigeons as a supplemental or emergency means of communication in an airborne operation between airborne troops that have been transported to the combat area and the headquarters controlling their operation in the departure area. Pigeons, when properly employed, are often the most expedient and reliable means of communication, in the absence of wire or radio communication.

Pigeon units will be stationed in one or more of the following locations, as may be deemed practicable: (1) In the departure area at the particular airfield at which the airborne division headquarters is established, provided the distance from the objective to the division headquarters does not exceed 100 miles. (2) In the vicinity of the controlling headquarters of the operation, if the headquarters is to remain stationary throughout the operation and provided the distance from the objective to the controlling headquarters does not exceed 100 miles. (3) In the combat area nearest the objective. Pigeon units supplying pigeon communication to ground combat units in close proximity to the objective will supply pigeons for use by the airborne division or unit. Pigeon messages received at such lofts will be relayed by other means of communication to expedite delivery. The establishment of lofts in close proximity to the objective will shorten the distance of flight, thus expediting delivery of messages from the objective to the loft. When arrangements can be made, this method of employing pigeons with airborne units is considered the most satisfactory.

The degree of success to be obtained from the use of pigeons is controlled by the following: (1) Advance planning and thorough coordination between the signal or communication officers of the airborne division or unit and the commanding officer of the pigeon unit to permit the proper establishment of lofts as indicated above. (2) Receipt of advance information by pigeon personnel to permit proper conditioning and training of pigeons prior to their employment. (3) Careful study of detracting influences, such as terrain over which pigeons must fly or atmospheric conditions.

Pigeon personnel must take full advantage of every opportunity to maintain liaison with communication personnel of the airborne units.

A minimum of 1 officer and 14 enlisted men (2 combat sections of a signal pigeon company) will be required to provide pigeon communication for an operation involving an airborne division.

Standard pigeon supplies and equipment necessary for the maintenance and operation of the combat sections will be in accordance with authorized allowances set forth in T/O & E 11–39 and Army

INITIAL SUPPLY

Unit	Number of pigeons	Equipment	Remarks
Pathfinder Party	12	Pigeon Vest PG–106/CB, Container PG–107/PB	1 Pigeon Vest PG–106/CB and 1 Container PG–107/PB per man.
Prcht Inf Regt.			
Regtl. Hq. Co	4	Parachute Equipment PG–100/CB	1 Parachute Equipment PG–100/CB.
Bn. Hq. Co. (3)	2	Pigeon Vest PG–106/CB, Container PG–107/PB	1 Pigeon Vest PG–106/CB and 1 Container PG–107/PB per man.
Rifle Co. (9)	2	Pigeon Vest PG–106/CB, Container PG–107/PB	1 Pigeon Vest PG–106/CB and 1 Container PG–107/PB per man.
Total Per Prcht. Inf. Regt	28	1 Parachute Equipment PG–100/CB 24 Pigeon Vest PG–106/CB 24 Container PG–107/PB	
Gli. Inf. Regt.			
Regtl. Hq. Co	4	Container PG–107/PB	2 birds per Container PG–107/PB.
Bn. Hq. Co. (2)	2	Container PG–107/PB	2 birds per Container PG–107/PB.
Rifle Co. (6)	2	Container PG–107/PB	2 birds per Container PG–107/PB.
Total per Gli. Inf. Regt	20	10—Container PG–107/PB	
Div. Arty.			
Div. Arty. Hq. Btry	4	Container PG–107/PB	2 birds per Container PG–107/PB.
Prcht F. A. Bn.			
Hq. (Btry	4	Parachute Equipment PG–100/CB	1 Parachute Equipment PG–100/CB.
Firing Btry. (3)	2	Pigeon Vest PG–106/CB, Container PG–107/PB	1 Pigeon Vest PG–106/CB and 1 Container PG–107/PB per man.
Total per Prcht. F. A. Bn	10	1—Parachute Equipment PG–100/CB 6—Pigeon Vest PG–106/CB 6—Containers PG–107/PB	
Gli. F. A. Bn.			
Hq. Btry	4	Container PG–107/PB	2 birds per Container PG–107/PB.
Firing Btry, (2)	2	Container PG–107/PB	2 birds per Container PG–107/PB.
Total Per Gli. F. A. Bn	8	4 Container PG–107/PB	
Gli. AA Bn.			
AW Btry. (3)	2	Container PG–107/PB	2 birds per Container PG–107/PB.
MG Btry. (3)	2	Container PG–107/PB	2 birds per Container PG–107/PB.
Total Per Gli. AA Bn	12	6—Container PG–107/PB	
Engr. Bn.			
Hq. Co	4	Container PG/107/PB	2 birds per Container PG–107/PB.
Prcht. Co	2	Pigeon Vest PG–106/CB Container PG–107/PB	1 Pigeon Vest PG–106/CB and 1 Container PG–107/PB per man.
Gli. Co. (2)	2	Container PG–107/PB	2 birds per Container PG–107/PB.
Total Per Engr. Bn	10	2—Pigeon Vest PG–106/CB 6—Container PG–107/PB	
Signal Co	8	Pigeon Equipment PG–105/CB	2 Pigeon Equipment PG–105/CB.
Grand total	112	2—Parachute Equipment PG–100/CB 2—Pigeon Equipment PG–105/CB 44—Pigeon Vest PG–106/CB 70—Container, PG–107/PB	

Service Forces Catalog Signal 4–1. The major items and their uses are as follows:

Pigeon Vest PG–106/CB.—The pigeon vest is so designed that paratroopers can carry one or two pigeons directly above the reserve parachute or under the arm during descent. Caution must be observed in placing the shoulder strap of the vest under all webbing of the T–5 (parachute harness). The maximum time a pigeon can be held in a vest without stiffness impeding its flight is 6 hours. Therefore, each parachutist carrying pigeons will also carry a Container PG–107/PB which will be used to transport the pigeons upon landing. The latter container is collapsible and can be carried underneath the reserve parachute.

Parachute Equipment PG–100/CB and PG–101/CB, four- and eight-bird containers respectively, will be used to initially supply and resupply units requiring delivery by parachute.

Container PG–107/PB (two-bird, fibre board) will be used by gliderborne and airlanded troops for initial supply and subsequent resupply of pigeons. Parachute troops will use these containers as indicated above.

The initial supply and subsequent resupply will be included in the communication plan drawn up by the signal officer or communication officer for the particular operation. The accompanying initial supply and resupply charts may be used as a guide.

It is the responsibility of the pigeon section to

RESUPPLY				
Means of transportation	Unit	Number of pigeons	Equipment	Remarks
Parachute	Div. Sig. Co	24	6—Parachute Equipment PG–100/CB	Every 12 hours.
Glider	Div. Sig. Co	24	12—Container PG–107/PB	Do.
Airlanded	Div. Sig. Co	24	12—Container PG–107/PB	Do.

see that birds are properly marked for units and transported to the departure airfields in accordance with the plan of the signal or communication officer. To obtain maximum efficiency from the birds, they should be shipped to the various departure airfields so as to arrive just prior to the operation. If the distances are not too great, this can be done with the transportation allotted to the pigeon combat section. Otherwise, it may be necessary to requisition air transportation to get the pigeons to the departure airfields.

The pigeons with the necessary equipment are delivered to the message center of the senior headquarters of the echelon of airborne troops stationed at each departure airfield. Distribution within this echelon will be the responsibility of this message center.

The complex nature of an airborne operation provides many variable factors. Hence, the chances of getting all units to the exact location cannot be assumed; therefore, pigeons may be distributed as far down as company and battery headquarters, depending upon the type of operation. However, such use should be authorized only in cases of emergency. If, after the landing of airborne troops in the combat area, it is determined that no requirement exists for the use of pigeons—as the units become organized, pigeons may be moved to the division headquarters or disposed of in accordance with the communication plan.

SYNTHETIC RUBBER TIRES

IF YOU toss a rock at a window, it will crash through whether the pane is window glass or plate glass. The plate glass may withstand a slightly harder jolt, but it will shatter nevertheless.

That about explains the difference between natural crude rubber tires and synthetic tires. The natural variety may stand a little more abuse than synthetics. But you are not supposed to abuse either of them.

When synthetic tires are operated and maintained properly, they give adequate performance. However, if vehicles are overloaded, tire pressures are not maintained, or trucks are operated at excessive speeds, neither natural rubber tires nor synthetics will give satisfactory mileage. If you are not getting satisfactory mileage from synthetics, the chances are that you would not do much better with natural crude rubber tires. The trouble is due to the kind of person operating and maintaining the vehicle.

Anybody who has ever installed a tube knows that you've got to be careful not to pinch it. If you pinch a natural rubber tube, you've got to repair it. If you pinch a synthetic tube, it shouldn't surprise you to learn that you've got to repair it too. In the case of the synthetic tube, the damage may be a bit greater and more difficult to repair. But in either case, the trouble which occurs later on is not due to the type of material used in reconditioning the tube, but to the type of person whose carelessness made the repair necessary in the first place.

It doesn't make much difference whether a vehicle is equipped with natural crude rubber tires or synthetic tires when operating and maintenance instructions are followed. Long tire life and reasonably trouble-free service will be enjoyed. But if instructions are ignored, tire life will be short and all kinds of difficulties will be encountered no matter what kind of tires are used. The difference in performance of tires is not so much a difference in materials as it is a difference in driving habits and application of 1st and 2nd echelon maintenance by using personnel.

HALF-WAVE, END-FED ANTENNAS

Tests Show Horizontal Antennas Better Sky-Wave Transmission and Reception

SOME INTERESTING facts are available on radio antennas as a result of development and experimental work carried out by the Bell Laboratories in cooperation with the Signal Corps, in the semijungle areas of southern Florida. Results of these findings may have direct application to some Signal Corps tactical radio sets.

Difficulties have been experienced by the various armed forces in the use of tactical radio sets and antennas for transmission over even short distances in jungle area. Ground wave attenuation in the jungles of Panama and New Guinea was found to be very high; and in the design of the antenna for most tactical sets, efficiency in short distance sky-wave transmission has been sacrificed for mobility. As a result difficulties are experienced in transmission over distances of about 50 to 200 miles in open country.

It has been appreciated for some time that the substitution of antennas which radiate well in an upward direction would give much better transmission in jungle, over high mountains, and over medium distances. Tests made were directed toward obtaining quantitative data on the relative performance of various antenna types for sky-wave use in the 2- to 8-megacycle range, and methods for adapting such antennas for use with tactical radio sets.

A solution to the above problem was found in the proper use of half-wave horizontal antennas from 7 to 30 feet above the ground or half-wave sloping wires of the same general heights at a small vertical angle to the ground.

The attenuation of high angle sky-wave through jungles is small since the actual wave path through the jungle is short, being only the distance from the sending antenna to the tree tops and from the tree tops to the receiving antenna.

Horizontal half-wave antennas, or sloping half-wave antennas with a relative low vertical angle of slope, radiate and receive well at high angles. In addition, as receiving antennas they have a marked tendency to discriminate against low angle noises due to atmospheric static and to interference from other radio stations. Likewise, they transmit poorly at low vertical angles and therefore cause little interference in other receivers employing vertical antennas at ground wave distances or a long distance away. These statements apply even to suitably proportioned end-fed antennas, since the combination of down lead and half-wave top receives much less low angle power than the down lead alone. Short vertical antennas and the usual *quarter-wave* inverted L antennas do not have the above properties and are more suitable for ground wave use or for long distances with high power transmitters.

The received sky-wave signal with the horizontal antennas was nearly the same, for given ionosphere conditions, at distances out to 150 miles. Experiments showed no dead spot in the transmission out to 150 miles, which was the greatest distance tested.

Tests confirmed that such antennas provide a means of getting a good signal over a high mountain range.

Transmission tests were made for several days and nights, using half-wave horizontal and end-fed sloping-wire antennas. These antennas were

Sky-wave Transmission between like Antennas—75 miles—3 megacycles

Antenna type	Relative received powers for equal sending powers [1]			Relative transmission power for equal S/N
	Signal	Noise	S/N	
Horizontal half-wave end-fed, 7 feet high	0	0	0	1
Horizontal half-wave end-fed, 30 feet high [2]	+21	+12	+9	0.13
Horizontal half-wave balanced center-fed 30 feet high	+21	+12	+9	.13
Sloping half-wave 5 to 30 feet high (broadside)	+12	+4	+8	.16
Sloping quarter-wave 5 to 20 feet high with counterpoise 2 feet high (broadside)	+1	+6	−5	3.2
SCR–188A Ant. 45-foot top 35-foot down lead, 80-foot counterpoise 5 feet high	−2	+14	−16	40
15-foot tuned whip with crow's-foot counterpoise	−38	−3	−35	3,200

[1] Compare figures within any column. The figures in the first row are merely reference values. Observed signals and noise were corrected to values which would have been obtained if receiver resistance had been matched to antenna resistance with the reactance tuned out.

[2] 150 miles distance.

The above figures give some quantitative comparisons for several different types of antennas tested over a 75-mile course in the semijungle of southern Florida using sky-wave transmission at 3 megacycles. Data for this table were obtained by comparison of pairs of antennas on different nights with cross comparison made in order to reduce the data on all antennas to a common basis. These were not long time tests, but it is thought that the tabulated values are of the right order of magnitude.

BC-654-A TRANSMITTER USED IN SCR-284-A SET

Operating frequency (mc.)	Antenna length (feet)		Approximate transmitter settings for maximum power [2]		
	Top [1]	Lead-in [1]	Antenna selector	Antenna coupler	Antenna tuning
3.8	177	26	1	100	200
4.0	177	26	1	100	290
4.5	177	26	1	100	450
4.5	94	26	1	100	290
4.95	94	26	1	100	420
5.5	94	26	1	100	490
5.5	78	26	1	100	430
5.8	78	26	1	100	480

BC-191-E TRANSMITTER USED IN SCR-177-( ), SCR-188( ), SCR-193-( ) AND AN/VRC-1 SETS

[Place antenna circuit switch "N" on position 1]

Operating frequency (mc.)	Antenna length (feet)		Approximate transmitter settings for maximum power [2]			
	Top [1]	Lead-in [1]	Tuning unit	Antenna coupler "D"	Antenna inductance tuning "M"	Antenna capacitance tuning "O"
2.0	234	47	TU-5A	5	36	35
2.5	234	47	TU-5A	5	13	100
2.5	187	47	TU-5A	5	23	100
3.0	187	47	TU-5A	5	11	80
3.0	156	47	TU-5A or 6A.	5	21	35
3.5	156	47	TU-6A	6	8	50
3.5	117	47	TU-6A	5	23	0
4.0	117	47	TU-6A	6	9	100
4.0	117	26	TU-6A	6	11	100
4.5	117	26	TU-6A	6	12	0
4.5	94	26	TU-6A or 7A.	5	17	0
4.95	94	26	TU-7A	6	13	0
5.5	94	26	TU-7A	5	5	100
5.5	78	26	TU-7A	5	9	50
6.0	78	26	TU-7A	5	6	50
6.5	78	26	TU-8A	6	0	0

BC-653-A TRANSMITTER USED IN SCR-506-A SET

Operating frequency (mc.)	Antenna length (feet)		Approximate transmitter settings for maximum power [2]	
	Top [1]	Lead-in [1]	PA coil	Antenna coupler
2.0	234	47	31	75
2.5	234	47	15	85
2.5	187	47	21	75
3.0	187	47	11	90
3.0	156	47	15	85
3.5	156	47	6	95
3.5	117	47	13	100
4.0	117	47	4	80
4.0	94	47	10	90
4.5	94	47	4	100

[1] For horizontal antenna, lead-in length is length of down-lead plus *zig;* for sloping antennas, lead-in length is *zig* length.
For frequencies between those listed, approximate settings may be estimated by interpolating between values at successive tabulated frequencies which have the same tabulated length of antenna top and lead-in.

[2] Approximate setting for use in loading transmitters when *used* on the *ground* with *end-fed half-wave horizontal* or *sloping antennas* with *lead-ins*. They apply when the sets are used on the ground. The transmitter settings for a given set would be different with the set mounted in a vehicle. Final adjustments should be made for maximum current in antenna meter on indicator, with a plate meter reading within limits specified for the particular transmitter.

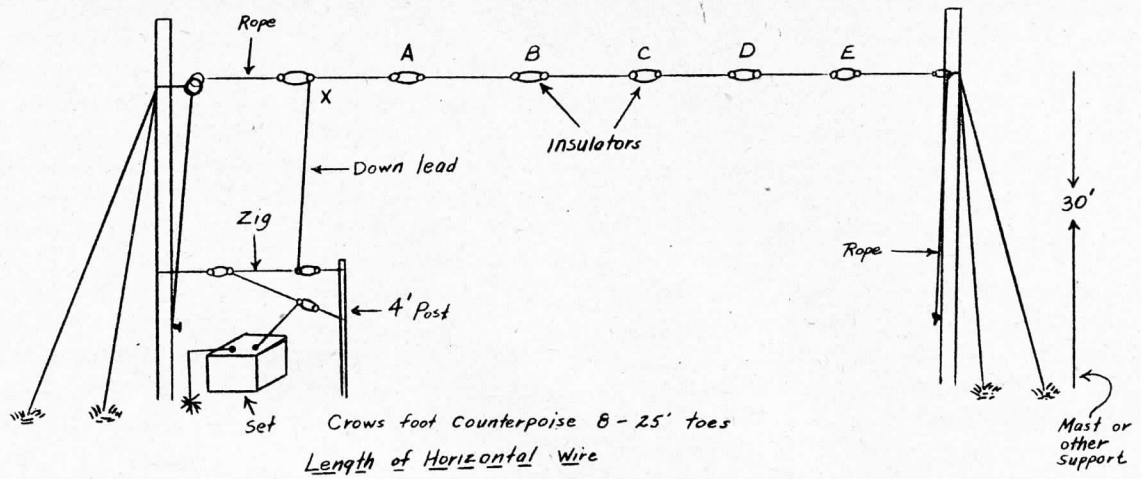
fed by man-pack tactical radio sets rated at 20 watts on c-w. Good voice communication was obtained continuously in the daytime, and fair voice communication for 9 out of 15 nights tested; for the other 6 nights communication was feasible, by using c-w for part of the night and by use of repetitions during part of the c-w transmissions. The distance for most of these tests was 75 miles. Frequencies were chosen with some regard to optimum conditions for sky-wave transmission.

Comparative tests at 75 miles and 3 megacycles indicated that approximately equal signal-to-noise ratios would be received under the following three conditions: (1) Feeding 3 kilowatts into a 15-foot whip with counterpoise. (2) Feeding 1 watt into a half-wave end-fed horizontal 7 feet above the ground. (3) Feeding 1/6 watt into a half-wave sloping wire 5 to 30 feet high.

In each case the sending and receiving antennas were identical. The sloping-wire antennas were broadside to each other.

For receiving, the balanced horizontal center-fed doublet arrangement is the most efficient from the noise rejection standpoint, particularly with regard to local man-made electrical interference and should be employed wherever practical.

Improvised end-fed half-wave horizontal and sloping antennas for use in the frequency range from 2 to 6.0 megacycles are shown in figures 1 and 2. As indicated, the wires are equipped with insulators which may be jumped to give antennas which are half-wave length at 2.0, 2.5, 3.0, 4.0, 5.0, or 6.0 megacycles. The figures also indicate simple down-lead arrangements helpful in loading the antennas when used with radio sets on the ground. In general, a lead-in is employed which is of such length that the antenna-to-ground impedance as seen from the set is comparable with the output impedance of the transmitter. In this case, a lead-in ranging from 26 to 47 feet is employed, the length depending on the transmitter used and the frequency of transmission. With horizontal antennas, the excess of lead-in wire is taken up by a *zig* at the set. With a sloping wire antenna, practically all the lead-in is employed in a *zig*. For tactical sets operated on the ground, the set ground is provided by means of a crow-foot counterpoise consisting of eight 25-foot wires.

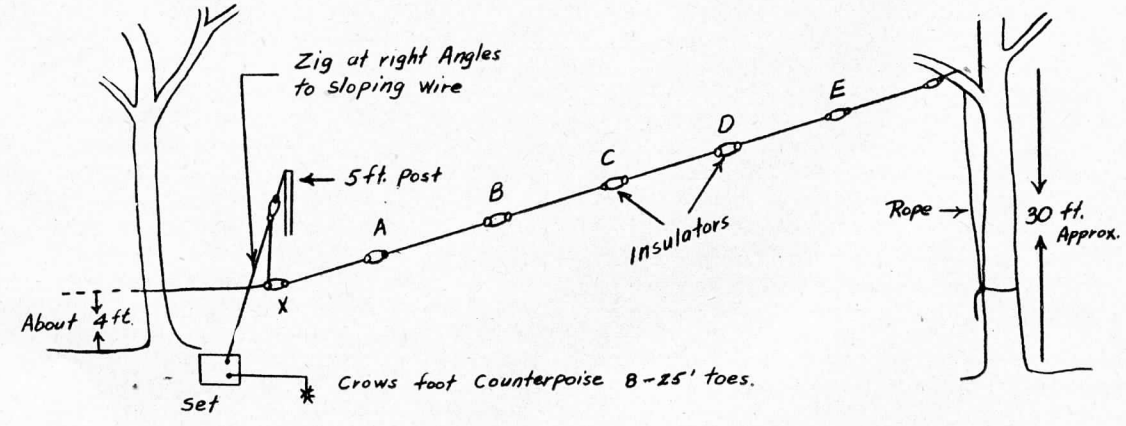


Length of Horizontal Wire

Frequency * MC	Effective length feet	Jumper Insulators
2.0	234	ABCDE
2.5	187	ABCD
3.0	156	ABC
4.0	117	AB
5.0	93.5	A
6.0	78	—

*Frequency at which wire is half-wave length.

FIG. 1 - HORIZONTAL WIRE FOR SKY-WAVE TRANSMISSION



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2.5	187	ABCD
3.0	156	ABC
4.0	117	AB
5.0	93.5	A
6.0	78	—

* Frequency at which Wire is half-Wave length.

FIG. 2 - SLOPING WIRE FOR SKY-WAVE TRANSMISSION

A similar antenna and feeding arrangement may be used with vehicular mounted sets by connecting the lead-in wire to the terminal on the mast base (remainder of mast not used), or directly to the antenna post of the set if a relatively large opening is available in the vehicle. In this case, the ground terminal of the set is connected to the vehicular chassis which serves as a counterpoise.

A mast height of about 30 feet is favorable for good signal-to-noise ratios, using end-fed receiving horizontal half-wave antennas in the range from about 3 to 6 megacycles. The antennas should be placed broadside to each other. If sloping wire antennas are used in the end on position the low ends of the sloping antennas should be pointed toward each other. Approximate transmitter settings and recommended antenna dimensions for certain tactical radio transmitters are given elsewhere. If facilities are not available for erecting the *zig* sections in the field, it may be possible to bring the antenna within the tuning range of the set by inserting one or more coils of insulated wire in series with the antenna. The coil can be made 6 to 8 inches in diameter, bunch wound the turns being held together with tape or short lengths of wire. It will be necessary to determine experimentally the required number of turns.

DRIVING HAZARDS

LIKE THE airplane pilot, who must be able to handle his ship in all kinds of weather, the vehicle driver must know how to handle his vehicle on all kinds of roads. Improper operation of a vehicle, especially where road conditions are unfavorable, can cause serious damage.

Generally speaking, these are the major driving *hazards:*

DUST. Dusty roads are dangerous roads—especially when vehicles are moving in convoys—for visibility is poor and accidents may occur easily. Vehicles should be kept at a safe distance from each other, and speed should be reduced so drivers can stop quickly. Keeping vehicles separated allows dust clouds stirred up by one vehicle to settle before the next vehicle comes along. Aside from the safety angle, this has another important effect on vehicle maintenance; dust clogs air cleaners and other filters, and dust in fuel clogs other vital parts. Extra care must be taken to clean air cleaners and other filters frequently and fuel and lubricant containers must be kept clean, too.

SAND. First cousin to dust, sand has the same effect on filters and fuel whenever it is stirred up by the wind. In addition, operation on sandy terrain may easily cause excess wear and tear on a vehicle. For example, the extra strain put on the engine by driving in sand tends to allow it to overheat readily if coolant is not checked frequently. To avoid getting stuck in sand, it may often be necessary to reduce tire pressures to secure better traction. Vehicle operators should know when this is necessary and how much to reduce pressures. If a vehicle does get stuck, drivers should know how to get it out without damaging the vehicle. If possible, the winch should be used. The clutch pedal must be released slowly to keep wheels from spinning and digging in further. The front axle drive should be engaged to get maximum traction. Attempting to *jump* or *rock* the vehicle out with a quick engagement of the clutch may damage clutch, transmission, transfer case and axles. Racing the engine doesn't help either—it only causes wheels to dig in further.

MUD. As in the case of sand, it may be necessary to lower the tire pressure to get better traction in mud. Traction devices may sometimes be needed, and the winch should be used when necessary. Use of the front-axle drive will help prevent slipping. Spinning the wheels must be avoided, and this can be done only by using the proper gear and the proper speed.

ROCKS AND STUMPS. Here, proper operation is merely a matter of being extremely careful. Speed must be reduced to a minimum, and care must be taken to keep vehicles from *bottoming,* which causes damage to underparts. Correct tire pressure is of maximum importance in this instance.

HIGH TEMPERATURES. There are three things to look out for when operating vehicles in high temperatures. First, overheating of the engine must be avoided. A dirty radiator grill prevents air from circulating properly. A dirty oil pan prevents heat from escaping. So these items must always be kept clean. The temperature gage should be watched and coolant checked frequently to make sure the radiator is full. Here, again, choice of the proper gear ratio for the road conditions must be made. When a vehicle is running slowly, use of a lower gear speeds up the fan and water pump, and so creates greater circulation of air and water needed to keep engine cool. The second factor to be watched in high-temperature operation is the battery. Water in batteries evaporates more quickly in high temperatures; therefore, it must be replenished more frequently than in cool weather. The third item is tires. Tire pressures must be carefully watched because of undue expansion of air. Tires should be inflated in the morning when they are cool and before the air has expanded, and should never be *bled* when they are hot.

MOUNTAINS. There are two main things to watch out for in mountain driving. Both are bad habits easily acquired. There is a high mortality of transmission and transfer cases, caused primarily by the improper use of the gears in shifting down to brake the vehicle. It hardly seems necessary to mention the fact that coasting downhill in mountainous country with a vehicle out of gear is usually fatal to both vehicle and driver—sooner or later.

EQUIPMENT NOTES

ARMY PICTORIAL

COLD-WEATHER PHOTOGRAPHY

PHOTOGRAPHY in cold temperatures presents problems in equipment operation. The following recommendations for operation and winterization are the result of laboratory tests and field experience.

Winterization of still and motion-picture equipment consists primarily of adjusting the equipment, cleaning it of old oils and greases, and lubricating with tested and recommended low-temperature lubricants.

Motion-Picture Cameras

Cameras of the PH–330 series (Eyemo) should be disassembled, cleaned throughout, and checked for tight running parts. Gears which might tend to bind may be loosened by running in with fine emery compound. The camera is then reassembled, the spring housing repacked with fine graphite (one-third normal amount), and the remainder of the camera mechanism lubricated sparingly with OIL PS and GREASE GL (see WDLO 3800 and 3801). Under no conditions should this camera be run with the spring ungraphited. In the case of the PH–330–G, motor and magazine roller bearings should be checked and tolerances increased if necessary. So treated, this camera will run at temperatures down to minus 30° F. at a film speed in excess of 23 frames per second. At lower temperatures, the increased brittleness of film tends to cause breaks in the feed and take-up loops.

The Mitchell standard and NC cameras (PH–274 and 274–A), slow appreciably below freezing temperatures, due to shrinkage of bronze oilless bearings, and are not recommended for cold-weather operation. Properly lubricated, however (with OIL PS and GREASE GL), it will function at temperatures down to plus 15° F. without excessive loss of speed. Enlarging the bearings is not recommended with this camera, as it is designed for silent qualities. (See WDLO 3822 and 3896.)

The High-Speed Mitchell camera (PH–432) operates satisfactorily at temperatures well below zero when properly winterized. Some loss of speed is entailed, but may be compensated for by increasing the battery output from 12 to 16 volts with the motor speed setting to 26 or 27 frames. Or the camera may be handcranked to operating speed. For power-driven operation the motor should be warmed prior to installation.

Camera PH–274 and PH–432 should be cleaned of all previous oil and lubricated with a minimum coating of PS and GL. PH–432, cleaned of all lubricants and run dry, will operate *below* minus 30° F. The oil commercially known as Aero Lubricant (Fiske) has proved satisfactory at temperatures to minus 70° F.

Tripods

The above recommended winterization procedures apply equally to the Akeley tripod (part of PH–270) and Mitchell *Free Head* tripod (used with PH–274). The former will operate to minus 25° F. when winterized and after removal of two friction discs from either side of the friction tilt.

Storage Batteries

Batteries require special care at low temperatures. They should be kept highly charged at all times in order to increase output and avoid freezing of dilute acids. For the same reason additional solution should never be added while the battery is cold. Where possible, additional battery capacity should be provided to maintain output as against low-temperature loss.

Storage

Motion picture cameras and film should be stored in an unheated place to avoid condensation of moisture on the mechanism or film. This will also avoid danger of lenses coming uncemented due to extreme changes of temperature.

Still Cameras

The shutters of still cameras tend to slow or jam completely at low temperatures. Winterization procedures for the Speed Graphic (PH–47–E) may be taken as typical: Remove all lubrication from the front shutter including paraffin from the shutter blades. Clean focal plane parts with Solvent, dry cleaning. Clean shutter spindle springs, and apply a minimum of flake graphite. (See WDLO 3814.) Treat the bellows with neat's foot oil against cracking. It may be necessary to sand the lensboard to compensate for contraction of the plastic lens standard. If the rangefinder

tends to jam, clean throughout of all lubricant, loosen reflector and mirror pivots, and *very lightly* graphite lower reflector bearing. Resynchronize the flash gun to one twenty-fifth second to allow for increased battery time lag.

Inspection

In all cases, inspection of winterized equipment should be more frequent because of increased wear resulting from reduced lubrication.

Exposures

Exposure will be complicated by several factors, including loss of film speed, deceptive light conditions, excessive contrast and faulty shutter operation. Since the operation of exposure meters is erratic at low temperatures (tending toward overly high readings), exposure should be made by experience or reference to the American War Standards exposure computer (PH–504/PF). Due allowance should be made for loss of film speed (see fig. 1), although this factor may be compensated for by automatically lower operating speeds of shutter. A deep yellow filter, such as Wratten 15 G, will be found useful for correcting contrasty glarelight.

Processing

In removal of film from a cold to a warm place for development the container should be tightly closed and taped during the warming period to avoid condensation. Processing should take place as nearly as possible at recommended temperatures; otherwise compensation must be made for lowered activity of the processing chemicals (reduced by half for each decrease of 18° F.).

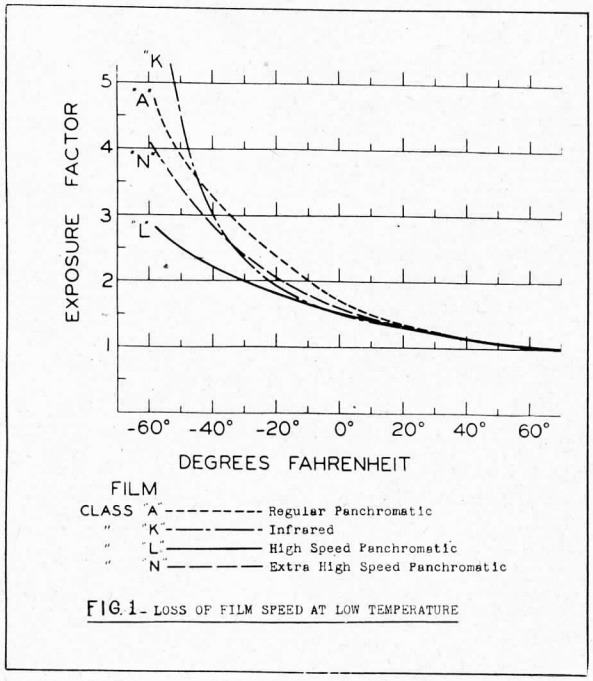
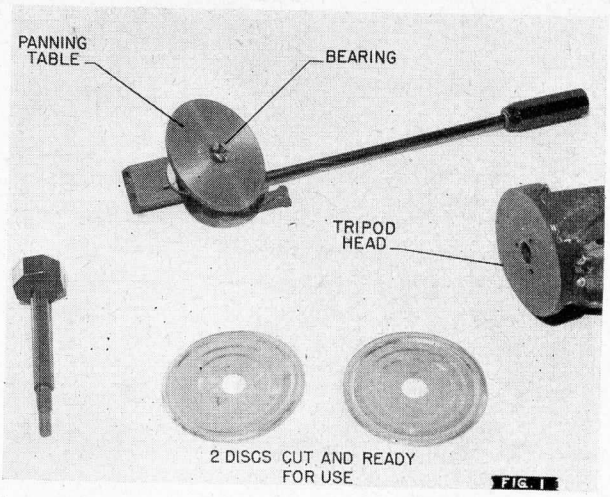


FIG. 1 – LOSS OF FILM SPEED AT LOW TEMPERATURE



REPAIR OF SPECIAL TRIPOD

On the basis of information contained in field reports mentioning certain difficulties encountered with the Ciné Kodak Special Tripod, investigations were conducted by Pictorial Engineering and Research Laboratory Division to remedy the difficulties. It was learned from these reports that the excessive heat of the tropics softens the rubber friction pad found on some models of the tripod to such an extent that the panning table and tripod head bind, making panning impossible. The expedient procedure outlined below was devised as a solution to the problem.

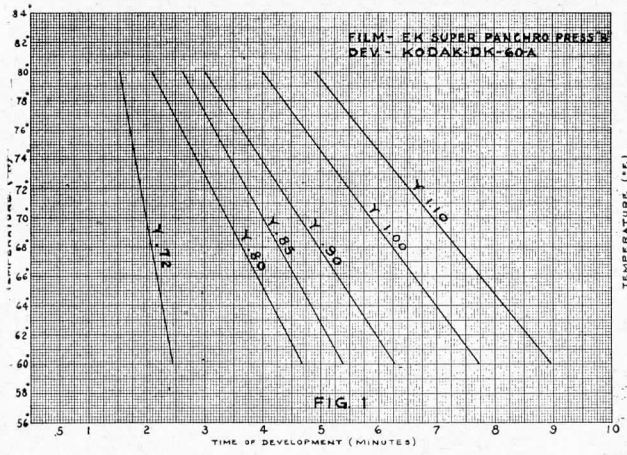


FIG. 1

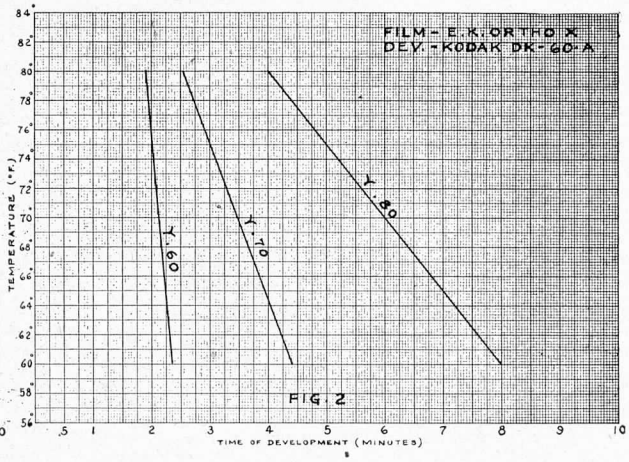


FIG. 2

1. Cut two metal discs of the same size or slightly larger than the tripod head from the bottom of ordinary tin cans.

2. Cut a hole into the center of each disc so that it will fit over the bearing shown in figure 1.

3. Lubricate the mating surfaces of the two discs and the bearing surfaces of the tripod with graphite before assembling.

4. To assemble the tripod, place one disc over the bearing on the panning table with the outer edges facing away from the table. The other disc is then also fitted over the bearing with its outer edges, facing the panning table. Reassemble the panning table and discs to the tripod head and tighten until the desired degree of panning friction is reached.

Figure 2 illustrates a Ciné Kodak Special Tripod with discs as described above substituted for the regular friction plate.

DEVELOPMENT CHARACTERISTICS OF DK–60–A

To extend the application of Developer DK–60–A to the majority of films issued to Army Ground Forces, *Time, Temperature and Gamma Development Charts* were prepared by Pictorial Engineering and Research Laboratory Division. Development characteristics were determined for the following films: EK Super Panchro Press *B*, EK Ortho X, Ansco Superpan Press, Ansco Tri S Ortho, and Defender Arrow Pan Press. The development charts, figures 1 through 5, show the relation between the time of development and the processing temperature for selected contrasts (gamma).

The recommended development time, at a given temperature, to attain a specific gamma, may be found by the steps outlined below:

1. Locate the temperature at which the processing is to be done on the *Temperature* scale at the left side of the chart.

2. Follow this line to the right until the desired *Gamma* line is intersected.

3. Follow the vertical line that passes through this intersection to the *Time* line at the bottom of the chart, and read the number of minutes.

For example: If the film to be developed is

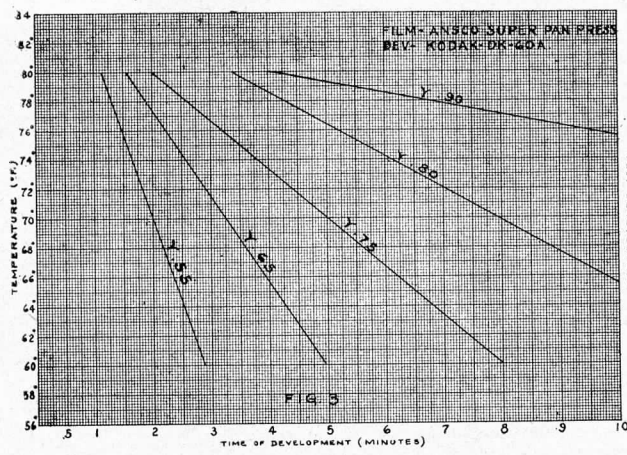


FIG. 3

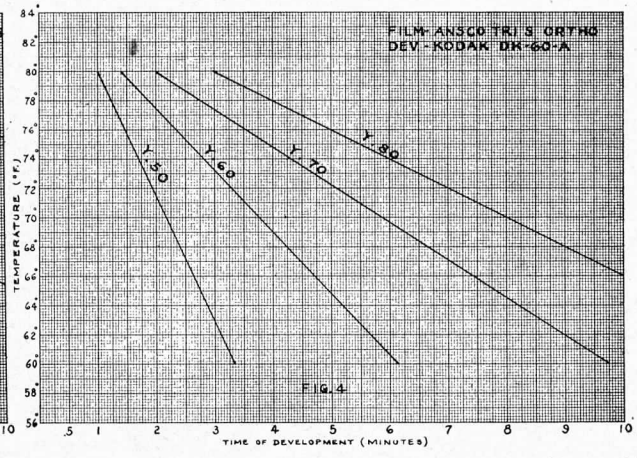
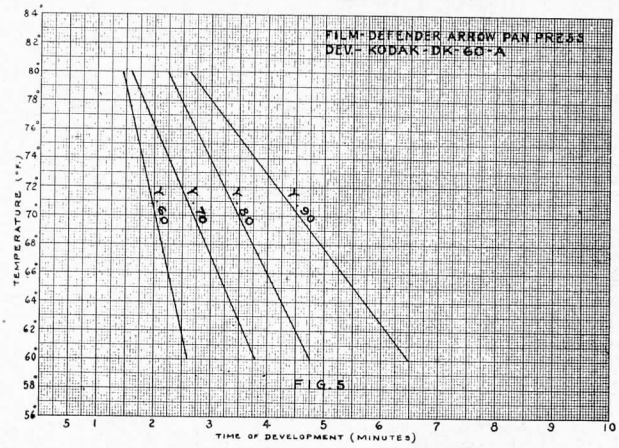


FIG. 4



Ansco Superpan Press, refer to the chart on this film. Assume that the temperature at which the film is to be processed is 70°, and a Gamma of 0.75 is desired. Following the procedure outlined in the preceding paragraph the development time is found to be 5 minutes.

When Replenisher DK–60–ATR is used to maintain Developer DK–60–A, the development characteristics will not change over the useful life of the developer, and the chart on DK–60–A should be followed.

ELECTRONIC EQUIPMENT

NEW POWER UNITS

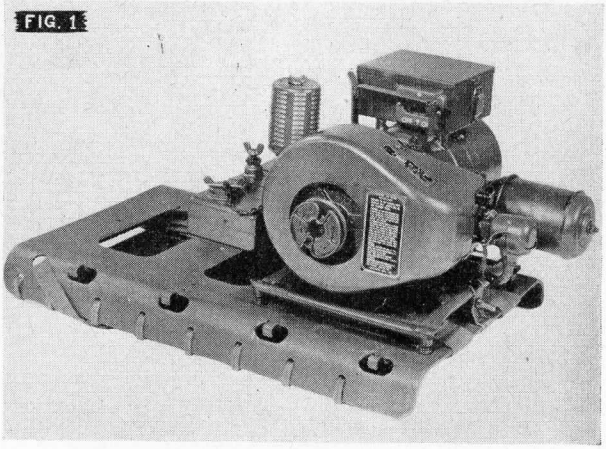
Two new power units have recently been standardized and should be available to the field within the near future.

Power Unit PE–162–( )

Power Unit PE–162–( ) is a dual voltage direct-current unit delivering 200 watts at 500 volts and 50 watts at 70 volts. Voltage regulation is accomplished by an electric speed governor installed on Engine GE–12–C. Engine GE–12–A has an air wave governor. It is a lightweight portable unit capable of reliable operation under extreme conditions of dust, shock, temperature, and humidity. It weighs approximately 80 pounds when cased and is 16″ x 19″ x 11″ in over-all size.

The PE–162 was developed to supply power for Radio Set SCR–694–( ). However, the filter box was later modified to provide two outlets so that it can also be used to supply power for Radio Set SCR–284–( ).

The PE–162 utilizes the Jacobsen 2-cycle single-cylinder air-cooled engine, Model J–100, with the



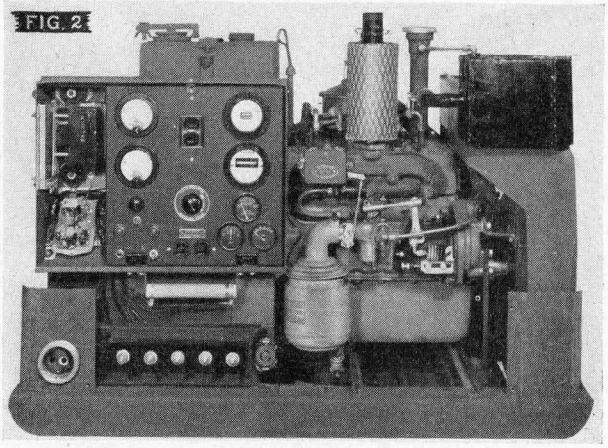
electrical generators spine-coupled directly on the engine crankshaft. The engine develops approximately 1 horsepower at 3,000 revolutions per minute. The engine generator assembly is mounted on a light metal frame that permits operation while on the ground or while mounted on a pack board (see fig. 1).

The electrical characteristics of the PE–162 are similar to those of the hand-operated Generator GN–45–( ), GN–57–( ), and GN–58–( ), which are also used to supply power for Radio Set SCR–694 and 284. Under circumstances when continuous operation of the radio set is warranted, the PE–162 can be substituted for the hand generator.

Power Unit PE–162 is also on the parts list for Radio Set AN/TRC–2–( ).

Power Unit PE–197–( )

Power Unit PE–197–( ) (see fig. 2) consists of a Hercules Model ZXB engine directly coupled to an electrical alternator, a control cabinet, and a tool and spare-parts box mounted together on a



skid base. The whole assembly is incased in a metal housing forming an integral unit.

It is manually started by a hand crank; however, an electric starter Kit AN/GSA–3 can be installed on the unit for remote control if desired.

The over-all dimensions of the unit is 44″ x 22¼″ x 30″ and it weighs approximately 700 pounds without starting equipment and approximately 770 pounds with such equipment installed. It is rated 5 kilowatts at 120 volts 60-cycle single phase at 1,800 revolutions per minute.

The unit is sufficiently rugged to withstand shock and vibration incident to transportation by truck or trailer over rough terrain or skidding short distances behind a truck or tractor.

The Hercules Model ZXB is a 4-cylinder, 4-cycle, liquid-cooled engine designed to operate on gasoline and equipped with a speed governor for holding the engine speed between predetermined revolutions per minute in accordance with the electrical generator output requirements. This model equipment is also used as the prime mover for Signal Corps Power Unit PU–21–( )/U, PU–31–( )/C, PU–32–( )/C, PU–35–( )/U, and PU–51–( )/TPS–1b. This arrangement greatly reduces the maintenance and spare parts problems from the prime mover standpoint.

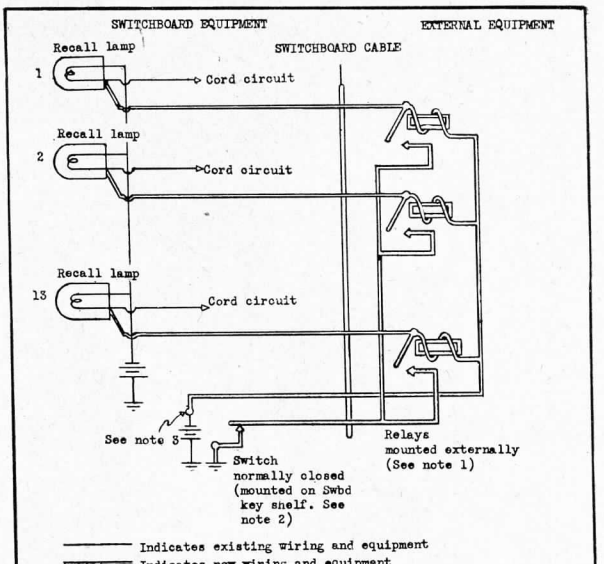
COMMUNICATION EQUIPMENT

MODIFICATION OF BD–89 CIRCUIT

A signal company depot (avn) in the Mediterranean Theater of Operations has modified the cord circuit of a Switchboard BD–89 to provide locking recall and disconnect on magneto lines. The accompanying diagram shows the method used in accomplishing this modification.

Since there is no space to mount additional relays in a BD–89 switchboard, a metal rack was built and placed just behind and outside of the switchboard itself. The relays are connected to the switchboard by a short piece of switchboard cable.

The recall lamp lights and the relay closes when ringing current is received. The lamp remains lighted and is extinguished by the use of a common ground release button. This button is mounted at the side of the key shelf within easy reach of the operator. One button is used for each position of a BD–89. This button, when operated, disconnects all relays and extinguishes all recall lamps on the associated board.



NOTES: 1. Relays must be 24 volts with D.C. resistance of 2000 ohms or more with one "Make" contact. 13 relays required.

2. Switch should be push button, normally closed, non-locking. 1 switch required.

3. Battery connection should be made at posts no. 11 or 12 of the Night Alarm, fuse alarm, battery, and ground circuit terminal strip. See Fig. 28, TM-11-340.

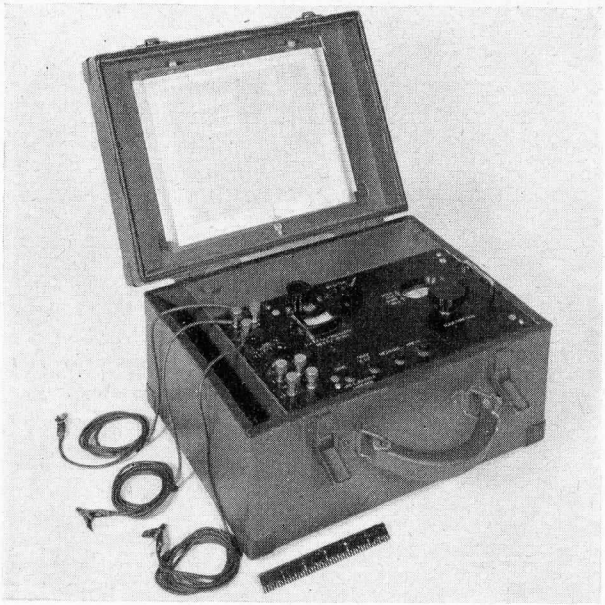
MODIFICATION OF BD-89 SWITCHBOARD CORD CIRCUIT To Give Locking Recall and Disconnect Signal

Operating practice has been changed only to the extent of employing the button to extinguish recall lamps.

It is considered that while this modification provides for increased efficiency in operation, its field of application will be limited by the resulting decrease in compactness and portability which are factors of primary importance in any tactical switchboard. Use of this modification where the necessary equipment is available is practicable if traffic so warrants.

TEST SET TS–27/TSM

Test Set TS–27/TSM (Stock No. 3F4325–27) is primarily a capacitance and resistance bridge. It is a new test set designed for analyzing and locating faults on line facilities. It may be used for direct measurement of conductor and insulation resistance and for the location of grounds, crosses and shorts. It may also be used for the measurement of capacitance and for location of opens in wire lines. This test set is normally used at central



TEST SET TS–27/TSM IS USED FOR LINE TESTING WIRE AND CABLE LINES. THIS VIEW SHOWS THE PANEL ARRANGEMENT AND TABULATED DATA CHART INSIDE THE COVER.

offices, repeater locations or at line terminations in conjunction with Test Set TS–26/TSM (lineman's portable volt-ohmmeter), the latter being carried out on the line to assist in final location of the fault. Test Set TS–27/TSM, including dry batteries and test cords, is contained in a portable, weatherproof field case equipped with carrying handle. It is approximately 15½ inches long, 12¼ inches wide and 8 13/16 inches high and weighs approximately 32 pounds. Tabulated data to aid in rapid location of line trouble appear on charts contained on the inside of the test set cover.

Direct current from batteries is used to obtain bridge readings for measuring conductor and insulation resistance and for locating grounds, crosses and shorts. Twenty-cycle alternating current supplied by a vacuum tube oscillator is used to measure capacitance and locate opens. Two Battery BA–59 in series supply 90 volts to energize the bridge when making d-c measurements. These batteries also furnish plate current to the oscillator and amplifier tubes. The 1½-volt filament current for the tubes is supplied by one Battery BA–15, or two Battery BA–30 in parallel. Two pairs of binding posts are included for connecting to two pairs of wires (lines under test) simultaneously. One pair of binding posts is included for connecting to a telephone (not part of test set).

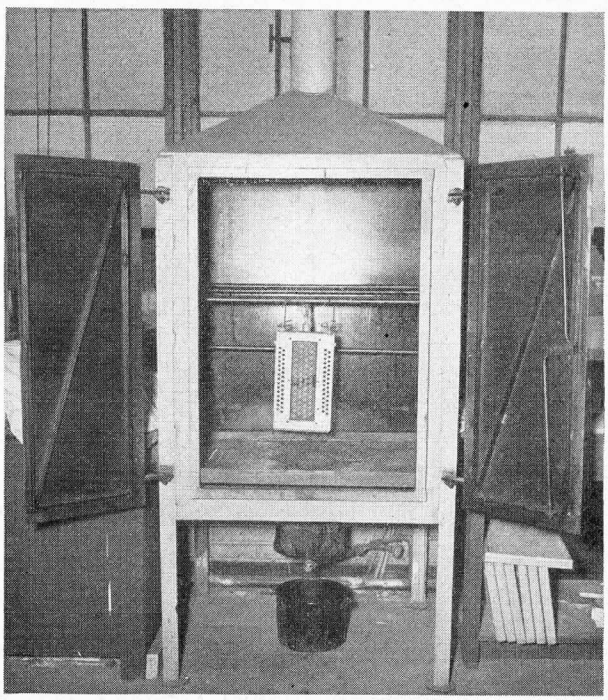
TS-27/TSM is in production and deliveries are being made. Issue will be in accordance with T/O and E's. A detailed description, together with operation and maintenance information and circuit diagrams, is published in Technical Manual TM 11-2057.

MAINTENANCE

OVEN FOR MELTING CHATTERTON COMPOUND

Some difficulty has been reported in removing the Chatterton compound from cable terminals and fuse chambers. The old method of using a gasoline torch to remove the compound resulted in the damaging of 60 percent of the porcelain faces. Also fumes from the torch were a health menace to nearby workers.

A method of accomplishing the removal of this compound without damaging the equipment or causing a health hazard, has been based on an employee suggestion, put into effect at the Philadelphia Signal Depot. This method consists of an oven which preserves the porcelain face plates through the maintenance of the proper degree of heat. A chimney diverts the smoke and fumes from the building. From 40 to 50 terminals, depending on size, can be put through the compound removal process in the same time required formerly to treat one by the old method. The oven



OVEN IMPROVISED FOR MELTING CHATTERTON COMPOUND FROM CABLE TERMINALS AND FUSE CHAMBERS WITHOUT DAMAGE TO PORCELAIN FACES AND WITHOUT CAUSING A HEALTH HAZARD.

CORRECTION

The following two items were combined in SCTIL No. 39, February 1945, beginning on page 36, and several paragraphs omitted. The corrected version is reprinted below:

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, an 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.

Reports from theaters have stated that the empty Spool DR–8–A is not required as a component of Reel RL–39–A, since this spool is also being received filled with Wire W–130–( )for use with this reel. Therefore, nomenclature *Reel RL–39–A* has been revised to *Reel RL–39–*( ) and *Reel RL–39–B* has been assigned to designate Reel RL–39–( ) without Spool DR–8–A. Reel RL–39–B will be issued for all RL–39–( ) requirements. Spool DR–8–A has been standardized as a separate item under the nomenclature *Spool DR–8–*( ). A separate basis of issue is being established for the empty Spool DR–8–( ) in order to authorize its issue as a separate item where required. Organizations requiring Reel RL–39–( ) with the empty spool should requisition both of these items.

The use of Reel RL–39–( ) and Spool DR–8–( ) is described in TM 11–2250.

HEADSET HS–30–( ) FOR DETECTOR SET SCR–625–( )

Recommendation has been received from the field that Headset HS–30–( ) be included as a regular assessory for Detector Set SCR–625–( ). Extensive field trials conducted in several Engineer and Infantry units have definitely indicated the value of using this headset, especially in forward areas. The elimination of unnecessary sound, increased sensitivity and improved operation resulting from the use of the headset are reported to have substantially increased audio sensitivity without affecting the visual meter indicator operation.

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 the 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.

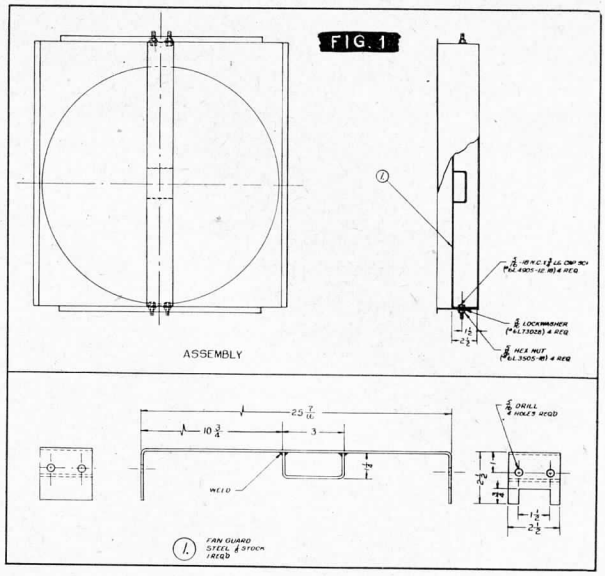
also eliminates danger of burning the operator by spilled, heated compound.

The oven is constructed from sheet metal and angle iron, and heated by a 5-inch gas element. The inside dimensions are 36 inches square by 40 inches in height. It stands on legs 25 inches from the floor. Two tight fitting steel doors provide entrance. Steel grates over the burner and a flat steel pan tapered to funnel at bottom, drains off the melted compound. Removal racks of one-half inch pipe accommodate cable terminals, from 22 to 40 inches in length. A 6-inch chimney pipe, with

damper for checking heat and which allows fumes to escape, leads to a flue outside of the building.

WATER PUMP ASSEMBLY DAMAGE

Reports have been received in the Office of the Chief Signal Officer of the failure of the water pump assembly of Power Unit PE–74, 84 and 137. The failure of this part (water pump assembly Le Roi Part No. 1A13–360–1) is usually caused by the breakage of the impeller shaft while the units are operating. The fan which is attached to the shaft is driven into the radiator and causes considerable damage. MWO SIG 9, dated 1 July 1944, calls for replacement of water pump assembly in all Power Unit PE–74, 84 and 137. Although the field application of the recommendations of MWO SIG 9 will eventually eliminate the cause of damage to the radiator, it is believed that considerable time will elapse until all units in the field have been modified. Therefore, it is suggested that radiator guards be fabricated from materials available in the field. Figure 1 outlines a suggested procedure for making and installing a radiator guard for the power unit concerned.



USMC SIGNAL CATALOG

ALL NAVY and commercial signal equipment and maintenance parts used by the Marine Corps will be stock numbered by the Signal Corps Stock Numbering Agency and shown in future editions of the *Sig 5* series of ASF Catalogs.

The Marine Corps is going to completely revise its present signal catalog to include the following features: a descriptive section similar in composition to *Sig 3*, in which all T/A articles will be described, and a stock section which will be essentially a stock list with brief descriptions of all parts stocked by Marine signal supply organizations. A spare parts section will also be published. This section will not be bound with the descriptive and stock sections, but will comprise a series of pamphlets the same size as those published in *Sig 7* and *8*, and will give spare parts allowances for all Navy and commercial equipment used by the Marine Corps.

Signal property accounts gradually will be converted to the stock number and item name as shown in *Sig 5*. Conversion of bin marking will be accomplished by the distribution of a stock identification card which will contain the same information appearing in the stock section of the catalog.

SPARE PARTS CATALOG INDEX

THE TABLE on the opposite page lists the equipments for which pamphlets have been issued under Army Service Forces Signal Supply Catalog Sections SIG 7 and 8. These items are supplemental to the list published in SCTIL No. 38, January 1945, and cover the period 1 December 1944 to 10 February 1945.

Correction to list in SCTIL No. 38: Under the list of SIG 7's in this issue DV–2 should be changed to read CV–2.

SIG 7

AN/GFQ-2
AN/GSC-T1
AN/MPN-1
AN/PRN-1
AN/PPN-1A
AN/PRC-1
AN/TIQ-3
AN/TPL-1
AN/TPS-3
AN/TRA-1A/1B
AN/TVQ-1
AN/TXC-1
AN/VRC-3
AN/UIQ-1

BC-191
BC-342 (Rev)
BC-314 (Rev)
BC-344 (Rev)
BC-725-A
BC-726-A
BC-1060-A

CF-1 (Rev)
CF-2 (Rev)
CF-3 (Rev)
CV-4
CF-7 (Rev)
CV-2
CV-2/TX (Rev)

EE-80 (Rev)

GE-12
GR-3-C

H-19/U
HS-30

I-151-A
I-167
I-178-A
I-189-A
I-222-A
I-223-A
IE-9-C

MC-123
ML-2
ML-3
ML-47-C thru R
ML-110
ML-121
ML-185
ML-224
MX-155/G1

PA-2-A, B
PE-49
PE-84-A, C, D
PE-95 (Rev)
PE-97
PE-99
PE-127-A
PE-145-A
PE-185-A or B
PE-198
PE-210
PE-214
PH-6-A
PH-13-A
PH-14

PH-29-B
PH-37
PH-47-D
PH-47-E
PH-47-F
PH-51-B
PH-67
PH-75
PH-77-E
PH-83-D
PH-87
PH-91-A
PH-95-A
PH-104
PH-125
PH-129-A
PH-131-A to G
PH-146
PH-149
PH-151-A
PH-179
PH-186
PH-192
PH-205
PH-206-A
PH-208
PH-219
PH-245-A
PH-261
PH-271
PH-274
PH-274-A
PH-275
PH-275-A
PH-279
PH-281
PH-283

PH-284
PH-285
PH-286-A
PH-298
PH-299
PH-314
PH-319
PH-324
PH-330-H
PH-346
PH-346-B
PH-382
PH-385
PH-390
PH-391
PH-392
PH-395
PH-398-A
PH-399
PH-402
PH-406
PH-408
PH-413-A
PH-501/PF
PH-503/PF
PH-507/PF
PH-508/PF
PH-509/PF
PH-511/GF
PH-512/GF
PH-516/GF
PH-520/U
PH-530/PF
PH-542/UF
PH-543/UF
PH-544/UF
PH-545/PF

PH-550/GF
PU-8/TTQ-1
PU-9/TPS-1

RC-120 (Rev)
RC-163
RC-188
RC-207
RC-246-A
RC-261
RC-289
RC-291
RC-298
RL-31 (Rev)

SCM-20-A
SCR-193
SCR-197
SCR-206
SCR-244 (Rev)
SCR-255
SCR-284
SCR-299
SCR-399
SCR-499
SCR-502
SCR-503 (Rev)
SCR-506
SCR-508, 528
SCR-510
SCR-538
SCR-545
SCR-547
SCR-551 (Rev)

SCR-556
SCR-593
SCR-607 (Rev)
SCR-608
SCR-609 (Rev)
SCR-610
SCR-615
SCR-627-A
SCR-704
SCR-808 (Rev)
SCR-828 (Rev)

TC-3
TC-12 (Rev)
TC-18
TC-18 (Rev)
TC-19 (Rev)
TC-21 (Rev)
TC-22 (Rev)
TC-23 (Rev)
TC-24 (Rev)
TC-29
TC-33
TC-37
TG-26
TS-92/AP
TS-106/TPM-1
TS-196/CPM-4
TS-197/CPM-4
TT15PP

SIG 8

AB-7/CRC-2
AM-8/TRA-1
AN-106
AN/CRC-2
AN/GFQ-2
AN/MPN-1
AN/MRQ-2
AN/PPN-1A
AN/PPN-2
AN/TIQ-3
AN/TPL-1
AN/TPS-3
AN/TRA-1 (Rev)
AN/TRC-2
AN/TRC-4 (Rev)
AN/TTQ-1
AN/TVQ-1
AN/TXC-1
AN/VV-X1, 1X
AS-19/TRC-1
AS-51/MRQ-2
AS-93/MRQ-2

BC-312 (Rev)
BC-314 (Rev)
BC-342 (Rev)
BC-344 (Rev)
BC-603 (Rev)
BC-604 (Rev)
BC-606 (Rev)
BC-640
BC-653 (Rev)
BC-659 (Rev)
BC-669 (Rev)
BC-726-A
BC-904 (Rev)
BC-976 (Rev)
BC-978 (Rev)
BC-1000 (Rev)
BC-1003
BC-1006
BC-1016 (Rev)
BC-1060-A
BC-1136
BC-1209
BC-1292
BC-1380
BD-77 (Rev)
BD-129 (Rev)
BE-77 (Rev)
BE-84

C-65/CRC-2
C-98/GR
C-103/TRQ-1
C-110/MRQ-2
CF-1 (Rev)
CF-5
CF-7 (Rev)

DEL-1530
DM-34 (Rev)

EE-96
EE-101 (Rev)
EE-105

FL-41
FT-253
FT-253 (Rev)

GN-44 (Rev)
GN-45 (Rev)
GN-47
GN-53
GN-57

HD-1
HO-17
HO-23
HO-27
HS-25 (Rev)
HS-30 (Rev)

I-83
I-114
I-115
I-126-A
I-151-A
I-167
I-178-A
I-179
I-181 (Rev)
I-189
I-223-A
I-224-A
IE-53 (Rev)

MC-364
MC-509
MC-516
MC-517
MC-611
ML-185 (Rev)
ML-277
ML-313
MP-48 (Rev)
MT-344/TTC-2
MX-155/GT
MX-194/TVQ-1
MX-333/GG

PE-74
PE-99-A, B, C, D, E, F, G (Rev)
PE-100
PE-117-C (Rev)
PE-120
PE-137
PE-140 (Rev)
PE-155
PE-156
PE-162 (Rev)
PE-182
PE-183
PE-210
PE-214 (Rev)
PE-245
PH-6
PH-6-A
PH-8
PH-9
PH-14
PH-32
PH-37
PH-47-D
PH-47-E
PH-47-F
PH-51-B
PH-67
PH-75
PH-77-E
PH-81
PH-83-D
PH-87
PH-87-A
PH-92
PH-95-A
PH-103
PH-104
PH-120-A
PH-120-B
PH-125
PH-129-A
PH-131-A to G
PH-132-B
PH-146
PH-151-A
PH-186
PH-191-A
PH-193
PH-205
PH-208

PH-218
PH-219
PH-220
PH-222
PH-224-A
PH-242
PH-253-C
PH-254
PH-256-A
PH-261
PH-270
PH-271
PH-274
PH-275
PH-275-B
PH-279
PH-281
PH-283
PH-284
PH-285
PH-286
PH-286-A
PH-288
PH-288 (Rev)
PH-299
PH-314
PH-319
PH-322
PH-324
PH-330
PH-330-G
PH-330-H
PH-346
PH-355-A
PH-385
PH-390
PH-391
PH-392
PH-395
PH-398
PH-398-A
PH-399
PH-402
PH-405
PH-406
PH-408
PH-413
PH-413-A
PH-420
PH-426
PH-430-A
PH-431
PH-431-A
PH-501/PF

PH-503/PF
PH-507/PF
PH-508/PF
PH-509/PF
PH-511/GF
PH-512/GF
PH-520/U
PH-523/GF
PH-524/PF
PH-542/UF
PH-543/UF
PH-544/UF
PH-545/PF
PN-21 (Rev)
PP-68/U
PP-86/TXC-1
PU-9/TPS-2
PU-33/C

RA-61 (Rev)
RA-87 (Rev)
RC-82
RC-83
RC-188
RC-207
RC-213
RC-215
RC-246-A
RC-256
RC-257
RC-258
RC-259
RC-261
RC-350
RC-351
RL-31 (Rev)
RL-31-B, C
RL-106
RM-18
RM-21 (Rev)
RM-23
RM-24
RM-25
RM-26
RM-27
RM-28
RM-29 (Rev)
RM-42

SB-5/PT
SB-6/GG
SB-18/GT
SCR-298
SCR-300 (Rev)

SCR-506 (Rev)
SCR-511 (Rev)
SCR-545
SCR-547
SCR-551 (Rev)
SCR-556
SCR-561
SCR-562
SCR-563
SCR-564
SCR-565
SCR-572
SCR-573
SCR-574
SCR-575
SCR-584-A
SCR-607-A, B (Rev)
SCR-609 (Rev)
SCR-610
SCR-615
SCR-627-A
SCR-632
SCR-633
SCR-634
SCR-642
SCR-643
SCR-644
SCR-645
SCR-694-AW, BW

T-17
T-39 (Rev)
T-55/MRQ-2
TC-2 (Rev)
TC-21 (Rev)
TC-22 (Rev)
TC-23 (Rev)
TC-24 (Rev)
TG-10
TG-30
TS-26
TS-32/TRC-1 (Rev)
TS-196/CPM-4
TS-197/CPM-4
TS-200/CPM-4
TS-291/U
TS-294A/U
TS-298/U
TS-317/U
TU-3 (Rev)
TU-61
TU-62

VO-3

MILITARY PERSONNEL

TECHNICAL SERVICE UNITS

OVERHEAD installations receiving authorizations of personnel from the Chief Signal Officer have been organized into numbered *Technical Service Units* (TSU), in conformity with a new policy effective 1 February 1945 establishing a uniform numbering system for designating and reporting Army Service Forces units not organized on a Table of Organization basis.

For some time a numbering system has been in effect in service commands. Four-digit numbers have been employed for the purpose of identifying small detachments of overhead personnel (service

Technical Service Units—Signal Corps

PERSONNEL AND TRAINING SERVICE—9400–9419

9400 ESCTC Inside U. S., Outside U. S.
9401 Not used.
9402 Army Experimental Station.
9403 Army Pigeon Service Agency.
9404 Signal Unit Survey Groups.
9405 AETC.

ARMY COMMUNICATIONS SERVICE—9420–9439

9420 Sig Sec Agy, MDW, Inside U. S., Outside U. S.
9421 Not used.
9422 Not used.
9423 WD Sig Center (Traffic Operations Branch).
9424 Army Communications Commercial Agency.
9425 PEA Inside U. S., Outside U. S.
9426 Not used.
9427 Alaska Communications System Outside U. S.

ARMY PICTORIAL SERVICE—9440–9449

9440 Sig C Photo Center Inside U. S., Outside U. S.
9441 Not used.
9442 Sig C Photo Lab., Army War College.

ENGINEERING AND TECHNICAL SERVICE—9450–9459

9450 Sig C Ground Sig Agency, Inside U. S., Outside U. S.
9451 Not used.
9452 Sig C Standards Agency.
9453 Army Sec, Combined Research Group, Naval Research Laboratory, MDW.

MISCELLANEOUS—9460–9479

9460 Legal Division Inside U. S., Outside U. S.
9461 Not used.
9462 Sig C Historical Section, New York.
9463 Radio Propagation Unit.

PROCUREMENT AND DISTRIBUTION SERVICE—9500–9569

Sig C Depots, Army Service Forces Depots, Classification Depots—9500–9529

9500 Boston Signal Depot.
9501 Chicago Signal Depot.
9502 Dayton Signal Depot.
9503 Holabird Signal Depot.
9504 Lexington Signal Depot.
9505 Los Angeles Signal Depot.
9506 Philadelphia Signal Depot.
9507 Sacramento Signal Depot.
9508 Seattle Signal Depot.
9509 Atlanta ASF Depot.
9510 Belle Mead ASF Depot.
9511 New Cumberland ASF Depot.
9512 San Antonio ASF Depot.
9513 Utah ASF Depot.
9514 Camp Beale ASF Depot (Classification).
9515 Camp Haan ASF Depot (Classification).
9516 Fort Dix ASF Depot (Classification).
9517 Fort Eustis ASF Depot (Classification).
9518 Fort Lewis ASF Depot (Classification).
9519 Dayton Signal Meteorological Depot.

Procurement Districts, Cost Analysis Agencies, Price Adjustment Field Offices, Production Field Offices—9530–9549

9530 Dayton Proc Dist (Proc activity).
9531 Dayton Proc Dist (Cont term & prop disp activity).
9532 Monmouth Proc Dist (Proc activity).
9533 Mon Proc Dist (Cont term & prop disp activity).
9534 Phila Proc Dist (Proc activity).
9535 Phila Proc Dist (Cont term & prop disp activity).
9536 Chicago Cost Analysis Agency.
9537 Los Angeles Cost Analysis Agency.
9538 New York Cost Analysis Agency.
9539 Phila Cost Analysis Agency.
9540 San Francisco Cost Analysis Agency.
9541 Chicago Price Adjustment Field Office.
9542 Phila Price Adjustment Field Office.
9543 Chicago Production Field Office.
9544 Los Angeles Production Field Office.
9545 New York Production Field Office.
9546 Phila Production Field Office.

Other Procurement and Distribution Service Activities—9550–9569

9550 Dayton Shipments Control Division.
9551 Dayton Signal Corps Supply Agency (Hq)
9552 Sig C Inspection Agy (Excl cont term).
9553 Sig C Inspection Agy (Cont term & prop disp).
9554 Sig C Stock Numbering Agency.
9555 Storage and Issue Agency.

SIGNAL CORPS OFFICER REPLACEMENT POOL—9600

9600 Det A Abolished.
9600 Det B ASFTC, Camp Crowder, Mo.
9600 Det C ESCTC, Fort Monmouth, N. J.
9600 Det D Holabird Sig Depot, Baltimore, Md.
9600 Det E Sig C Adv Radio Com Sch, Arlington, Va.
9600 Det F Sig C Photo Cent, LIC, N. Y.

OCSIGO

9699

command units) authorized in the form of bulk allotments. Commanding generals of theaters of operations have likewise employed this procedure to distinguish provisional units organized within allotments of personnel for operation and maintenance of overhead functions and installations.

At various times difficulty has been experienced in the proper identification of reported strength for detachments of Signal Corps overhead units stationed at different geographical locations from the installation to which they were assigned. A proposal was made that a numbering system be developed applying to overhead under the jurisdiction of the technical services which would accomplish the purpose of proper identification of such overhead units. The proposal materialized with the publishing of Army Service Forces Circular No. 13, 11 January 1945, which is applicable to the Signal Corps as follows:

1. A Technical Service Unit number has been assigned to each installation receiving an authorization of personnel from the Chief Signal Officer, and all personnel at that installation engaged in activities for which the Chief Signal Officer is responsible have been organized as part of the Technical Service Unit and will be designated as *No. TSU-Sig C, Name of Installation, Station Location.*

2. Separately located sub-installations are being organized as lettered detachments of the parent installation or activity and will be designated as *No. TSU-Sig C, Detachment (Letter) Name of Subordinate Activity, Name of Installation, Station Location.*

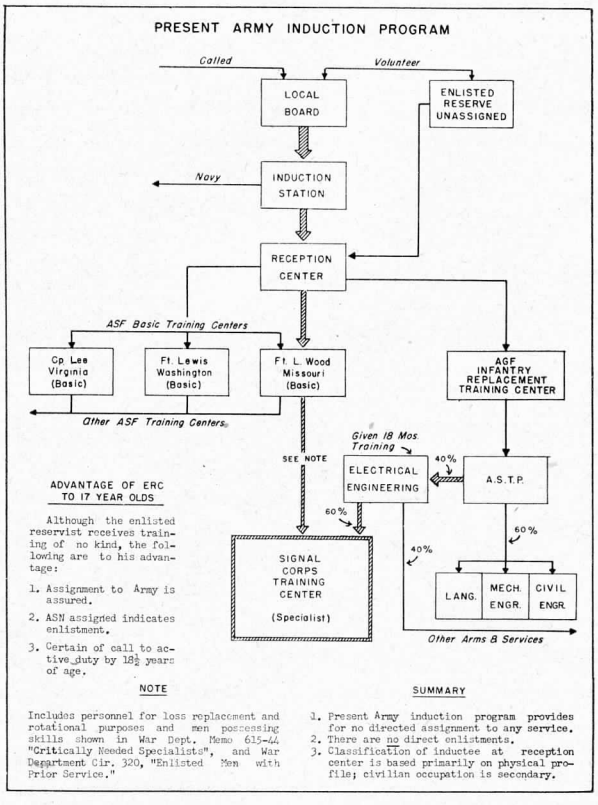
The new procedure will greatly facilitate the proper recording of strength, inasmuch as individual reports received by The Adjutant General from different reporting areas may be readily associated when consolidated strength reports are made.

The numbers to be used in establishing the new policy were designated in Change 7 to Mobilization Regulation 3–1. Blocks of numerals were allotted to the commanding generals of service commands, theaters of operations, defense and base commands, departments, and chiefs of technical services for use by them in identifying the overhead installations and units which they might organize. The numbers 9400 to 9699 were allotted to the Chief Signal Officer, and have been assigned as shown in the accompanying table to overhead installations receiving authorizations of personnel.

REVISED INDUCTION PROCEDURES

Up to the present time personnel at reception centers possessing skills useful to the Signal Corps as shown in War Department Memorandum 615–44 *Critically Needed Specialists* or qualifying for the Signal Corps under War Department Circular 320 *Enlisted Men with Prior Service* were sent direct to the Army Service Forces Training Center at Camp Crowder, Mo. Here they received basic military training before being given technical training in some Signal Corps specialty. A total of sixteen training centers for all services under the jurisdiction of the Army Service Forces were maintaining facilities for furnishing basic military training to this type personnel.

With the steady decrease of intake from reception centers, a new program was instituted in connection with the handling of such personnel. Beginning 1 February 1945, all basic military training for reception center personnel received by the Army Service Forces will be conducted at only three training centers: Fort Lewis, Wash., Fort



Leonard Wood, Mo., and Camp Lee, Va. Upon completion of basic military training at one of these training centers, personnel will either receive technical training at the same center or be sent to another training center for technical training.

The accompanying chart traces the channels through which personnel go from the time they are called or volunteer until they reach the Signal Corps training center. Personnel earmarked for the Signal Corps at reception centers will now be sent to Fort Leonard Wood for basic military training before proceeding to Camp Crowder for technical training at the Army Service Forces Training Center and the Signal Corps School. The three weeks basic refresher course will still be given at Camp Crowder to personnel received from sources other than a reception center.

Facilities for technical and specialist training at Army Service Forces training centers also have been combined. The training center at Camp Crowder, previously used exclusively for the training of Signal Corps personnel, will now in addition be used for training medical personnel. Facilities of other services have likewise been combined to reduce the number of Army Service Forces training centers from 16 to 12.

MILITARY TRAINING

MULTI-TONE KEYER

THE MULTI-TONE Keyer is an electronic device developed and built by an instructor in the Code and Traffic Section of the Radio Division, Enlisted Men's School, Eastern Signal Corps Training Center, Fort Monmouth. It has been in daily use since 1 November 1944, has proved entirely satisfactory in its operation, and has accomplished its purpose with a considerable saving in critical material and equipment.

The keyer enables one sound recorder to do the work of four, thereby multiplying fourfold the usefulness of recording units such as are used in the Code and Traffic Section of the Enlisted Men's School.

The underlying principle of the device is the generation of several different audio frequencies which are individually keyed but simultaneously recorded by a single machine on one record. On playback, the various frequencies on the record are electrically separated by filters and individually control or key an audio tone which is fed to the original keying positions for recopying.

This means that four students, instead of one, can at the same time take a code test, using only one machine and one record. This saves three machines and three records at each operation.

Specifically, when the multi-tone keyer *playback-record* switch (fig. 1) is in the *record* position, each of four type 6SC7 twin triode tubes is connected in a form of cascaded oscillatory circuit with a parallel resonant circuit as the grid impedance in the first triode section of each tube. Each circuit thereby generates one frequency or channel. The frequencies are 1,250, 1,750, 2,250, and 2,750 cycles per second, each frequency being keyed by grounding the cathode of its oscillator tube.

These four generated frequencies are tapped off by high resistances connected to the plate of the second triode section of each 6SC7. At their other end, the resistors are connected to a potentiometer through a blocking capacitor. In this way the four frequencies are mixed into a common output which is recorded. The blocking capacitor is used to keep the plate supply voltage from grounding through the resistors and the potentiometer. An audio transformer, 3 to 1 stepdown, is used after the potentiometer to offer a low direct current resistance to the recorder input.

It can readily be seen now, that there must be some way of monitoring the oscillations so that the students can hear their own sending. Because of the fact that the generated frequencies are high and difficult to hear, an auxiliary 850-cycle tone, supplied from an external source, is used for this purpose. This tone is applied through a volume control into an audio 3 to 1 step-up transformer, and from there to the grids of the four sections of two additional twin-triodes, 6F8G tubes in this case.

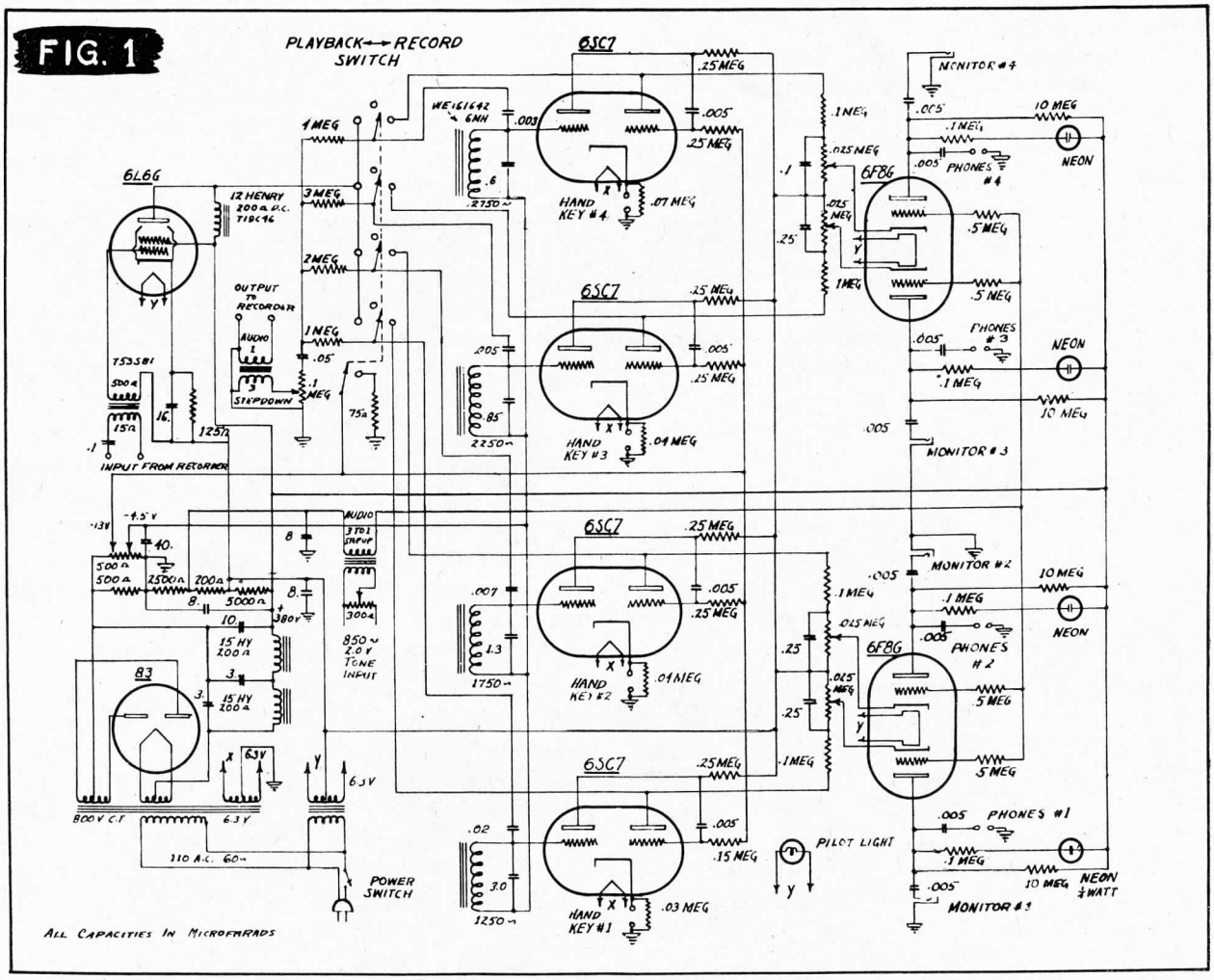
The plate current of each of the four preceding 6SC7 second triode sections is caused to flow through the cathode potentiometer of a corre-

sponding 6F8G triode section in such a way that it will drop the bias of the 6F8G section and cause the 850-cycle tone on the grid to be heard in the headsets which are capacitively coupled to the plate. However, when the preceding 6SC7 is not drawing current, that is when it is not oscillating, there is negligible voltage drop across the cathode potentiometer of the corresponding 6F8G section, and the bias on the grid is a high negative value which cuts off the plate current of this section and does not allow the 850-cycle tone to be heard. In this manner, the 850-cycle tone in the plate circuit of the 6F8G monitoring tubes follows accurately the generation of the higher frequencies which are actually recorded, and affords a pleasing monitoring note which is easy to copy.

Besides the capacitively coupled headsets, an auxiliary jack is capacitively connected to each of the four 6F8G sections for external monitoring by the instructor, and a ¼-watt neon bulb is in series with each monitor plate to provide visual monitoring means. A 10-megohm leakage resistor connected across each neon lamp prevents random flickering at times when the bias of the monitoring tube sections is at cut-off value.

The cathode potentiometers in the cathode circuit of the 6F8G sections are experimental, and can be replaced by plain resistors of equivalent value with the cathode lead tied to the junction of the cathode resistor and the 100,000-ohm 6SC7 plate resistor. The bypass capacitor across each cathode potentiometer bypasses the alternating component of the 6SC7 plate current and keeps it from modulating the 850-cycle monitoring tone.

After the recording has been made, it is played back after the *playback-record* switch on the keyer



is turned to the *playback* position. In this position the 6SC7 tubes are now connected as 2-stage tuned voltage amplifiers with the tuned parallel resonant circuits still across the grids of the first sections of these tubes. Each resonant circuit now selects its own frequency, that is, the one it previously generated, and passes it on to its own 6SC7.

The second triode section of each 6SC7 now functions as the second stage of the 2-stage amplifier, and its plate current passes through the corresponding 6F8G section cathode potentiometer just as it did before. This causes the 6F8G monitoring section to function exactly as it did during the *record* connection so that it is now monitoring the signal which is coming in from the recorder. In this way, the 850-cycle tone follows accurately the keying of the particular channel as it was recorded.

The 6L6G tube in the circuit is used to boost the output of the recorder during the *playback* period. It is idle during the *record* period, drawing plate current but being disconnected otherwise.

Care must be exercised during the recording period to see that the safe input level of the particular recorder used with this device is not exceeded. The voltage can be adjusted to a safe value by the use of the output potentiometer on the keyer.

Code Transmitter and Recorder TG–8–B presently used with the keyer has given satisfactory results with all the controls at maximum and the mandrel rotating at 95 revolutions per minute. The voltage impressed across the cutting head was 5.8 volts with all the keys down. On playback the output voltage from the recorder was about 3.2 volts.

The two bias voltages supplied from the 500-ohm bleeder section in the power supply are fairly critical and must be adjusted when the keyer is first put into operation. The lower voltage, which is the bias for the first sections of the 6SC7 tubes, ranges between 3 to 4½ volts. It must be as high as possible without preventing oscillation on *record*, and not low enough to allow interference from the other frequencies on *playback*. The higher voltage, which is the bias for the second sections of the 6SC7 tubes, is about 13 volts, and it must be as high as possible without resulting in slow starting when keying. Once set for the particular keyer, these voltages will not require any more adjustment.

Either automatic or hand keys may be used with the keyer, since it will follow any speed, the only precaution to be taken is to see that the students close their keys during the playback period so that the cathode to ground circuit of each 6SC7 tube is completed.

As stated before, the cathode potentiometer controls were experimental and need not be included provided resistors are substituted, in which case only three controls will be necessary, the *playback-record* switch, the *tone input*, and *output level* potentiometers. These, too, are set only once, and the only further manipulation required is that of the *playback-record* switch and whatever must be done to the recorder to make it play back the record which it cut.

Ordinary, inexpensive receiver-type components are used throughout, with the exception of the inductive portion of the tuned circuits which are iron-dust core loading coils used in telephone work. The ones in this keyer are WE161642, 6 millihenry loading coils removed from salvaged spiral-four connectors, which give the tuned circuits a Q of about 30, thereby affording sufficient band width to allow for considerable motor speed variation in the recorder before affecting the keying.

Also incorporated in the design is an automatic limiting action which allows considerable voltage fluctuation in the recorder output before the keying begins to suffer. These two characteristics make the device quite stable.

A width of only 1,500 cycles is used in the 4-channel multi-tone keyer. Since the recorders can handle a considerably wider band, an 8- or 10-channel keyer is entirely feasible, resulting in an eightfold or tenfold saving of equipment in subsequent models of the keyer. The greater utilization of existing equipment which is possible through the use of the multi-tone keyer permits the devising of new teaching procedures wherein a student may copy his sending for an entire period instead of just for a few minutes, resulting in a greater awareness of his errors and a consequent stimulation for correcting them.

The multitone keyer might possibly find use in other applications where it is desired to record and playback several code signals, such as in radio intercept units, or for furnishing code signals at several different speeds simultaneously from a single machine for instructional purposes.

U. S. GOVERNMENT PRINTING OFFICE: 1945


LONG MESSAGES
TAKE Longer TO WRITE
Longer TO SEND
Longer TO READ
Be Brief!
ARMY COMMUNICATIONS SERVICE

Extract from letter written by **GENERAL EISENHOWER** to the **CHIEF SIGNAL OFFICER**

Supreme Headquarters
ALLIED EXPEDITIONARY FORCE
Office of the Supreme Commander

13 March, 1945

Dear Ingles:

* * * * *

I am also highly appreciative of the great efforts which you and your organization have exerted in providing us with adequate and modern communication equipment.

Sincerely,

Dwight D. Eisenhower

Major General H. C. Ingles
Chief Signal Officer
War Department
Washington, D. C.