

# PORTABLE CARRIER TELEPHONE



U. D. 252

**Union Switch & Signal Co.**

Swissvale, Pa.



# Union Switch & Signal Company

SWISSVALE, PA.



Subject: PORTABLE CARRIER TELEPHONE

## UNION DEVELOPMENT

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4 Sheets

### HISTORY

The device herein described was developed as an answer to a communication problem encountered in the installation and testing of Centralized Traffic Control installations. That it has other applications in the general maintenance work of railway signal departments will be immediately apparent, and that it may have a much wider field of application as a temporary, supplementary, or emergency railroad communication facility appears probable.

The Portable Carrier Telephone is a simple device which may be employed on railroads in a variety of special purpose auxiliary telephone circuits. It would ordinarily not become a part of the usual working circuits used for operation or general administration of the property.

Originally the device was developed to make a testing circuit available between the control office of a C.T.C. installation and field locations during construction. The need for such a circuit, to be used for extended periods by construction forces, was accentuated by the lack of circuit time, which could be given up from other communication services, for this work. Construction of temporary physical lines would have been extremely costly and impractical. With development of this simple portable carrier device, it was possible to link two or more points in the construction zone by telephone, without encroaching on other railroad circuits, except perhaps by calling to advise a man that he was wanted on the testing circuit.

The Portable Carrier Telephone as developed by the Union Switch and Signal Company is essentially intended for the installation, testing, and maintenance of signal systems. Railroad communications officers, who have observed it in operation, have pointed out that it has a possible field of application far beyond anything intended by its developers. Such enthusiastic interest has been evidenced

that the Union Switch and Signal Company has decided to make the equipment available for general railroad use on the same basis as it supplies many users with the well-known Gill Selector, that is to say, as a unit of equipment.

#### POSSIBLE USES OF PORTABLE CARRIER TELEPHONE

In addition to its basically intended use as a temporary low-cost carrier telephone circuit for testing signal installations, the device has recently been used to establish temporary blocking and dispatching facilities at a time when all wire lines were down on a section of railroad. This was accomplished by quick distribution of a number of portable units on an operating district at strategic points. The resultant dispatcher's line lacked calling facilities, but was able to function remarkably well during the period of the emergency -- without these portable carrier telephones, there would have been no communication facilities whatever. In this instance the communication circuit was over the entire line with ground return. Some wires were broken, some were twisted with others and some poles were broken.

In another case, the same railroad contemplates use of one unit in a Superintendent's office and another in the Assistant Superintendent's office at a sub-division point about 100 miles distant. This will provide a private line between these offices which will take some load from other communication circuits. Of course, effective use of the circuit will depend upon a pre-arranged schedule for conversational time, or upon the call being set up by use of another line. This use between two fixed points suggests any number of possibilities for establishment of independent lines between two or more offices of the same department at widely separated points on the line, to relieve the load on general use circuits.

The establishment of a non-interfering circuit between the point of a wreck and the Superintendent's office is another possibility, as is the use of the device to maintain contact between any fixed office and some point on the line of road -- for example a unit may be permanently located in an office and a companion portable unit carried by a field man who could establish direct contact with the office from any point on the Division.

Limitations as to effective use of the device for general purposes arise first from the fact that no inherent calling facilities are within the circuit itself -- therefore use must depend on keeping the circuit constantly open, operating it on a predetermined schedule, or calling by means of some other circuit by telephone or



telegraph. Secondly, it would be impractical to use the Portable Carrier Telephone for more than one purpose in the same general area without having a separate frequency for each use. This second limitation can be overcome in most cases by use of a second frequency for the additional use. When it is determined by the railroad what carrier frequencies can be used on its lines without interference, it would be possible to secure the units for such specific carrier frequencies.

In general, it is the experience of signal construction forces who have used the device, that an extremely good quality voice channel is obtainable up to about 200 miles where normal wire conditions obtained. In the case of a single wire and ground connection, acceptable results have been obtained over a distance of 200 miles.

#### DESCRIPTION OF APPARATUS AND APPLICATION

The standard portable carrier telephone is designed to operate from any 110 volt alternating current source, 60 or 100 cycle. It can be connected to any ordinary outlet of such power. If it is desired to employ the unit at points where alternating current is not directly available, the unit can be supplied in combination with a regular tuned alternator capable of providing the a-c. power from any ordinary signal battery source. Power consumption is approximately 30 watts.

The basic unit is a compact integral unit containing only those essentials consistent with supplying good voice communication. The apparatus is of the push-to-talk type, without a calling device, and is ready for use when connected to a power source, as described above, and to a pair of wires on the pole line or to one wire and to ground. This all complete unit weighs only 13 pounds, is approximately 9 inches long, 4-3/4 inches wide and 12 inches high.

Most railroad communication lines are suitable for reception and transmission on the 35 kilocycle carrier frequency emitted by the unit. The practical range will vary depending on many factors, such as the amount of cable in the line, the attenuating character of other devices on the line and other factors involved in carrier telephony. In extreme cases where a large percentage of the line circuit is in cable, it may be necessary to insert matching transformers (similar to Western Electric CS-120) between the line and the portable carrier telephones. Units can be supplied at other than the 35 kilocycle frequency if required.

The maximum number of units which may be effectively combined in a circuit has not been determined as no tests have been made to determine this and other telephonic characteristics beyond those of practical usages already made of the equipment. In a previously described case, six units were associated in the establishment of a temporary dispatcher's line. There appears to be no reason why this number could not be increased substantially.

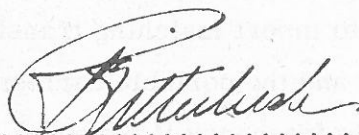
The telephone unit offers a high impedance to the line in the receiving condition and something in the order of 300 ohms in the transmitting condition. The maximum power is about 0.4 watts into loads varying from 125 to 700 ohms.

### OPERATION

To operate the telephone units the cord marked "Line" should be connected directly to the line to be used for communication. The other cord is plugged into the 110 volt line and the toggle switch operated to the "ON" position. After a warm-up period of about 15 seconds the unit is ready for operation.

The push-to-talk button on the handset operates a relay within the unit to transfer the circuits from a receiving condition to a transmitting condition. Thus when one wishes to talk, the push-to-talk button must be operated before commencing to talk. Conversely, the push button must be released immediately after talking in order to permit the reception of the transmission from another station. It facilitates the operation of the push-to-talk system if the word "OVER" is used by the speaker to indicate to the listener that a particular phase of his conversation is completed and that he will return his set to the listening condition.

The dials marked "TRANS" and "REC" control the amount of power delivered to the line by the transmitter and the sensitivity of the receiver respectively. These may both be set at 100 until contact between two stations is established after which the receiver sensitivity can be reduced as desired. In general, the receiver sensitivity dial should be advanced as far as is practicable in keeping with the line noises. The transmitter should be operated at as low a level as is practical.



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Vice President