

**ENGINEERING AND OPERATING CONSIDERATIONS INVOLVED
IN FURNISHING CIRCUITS
TO THE WESTERN UNION TELEGRAPH COMPANY UNDER SPECIAL CONTRACT**

- 1.001 This addendum supplements Section 312-100-000.
- 1.002 Single wire grounded services have become a serious source of noise in the telephone plant. To aid the telephone company in reducing this problem The Western Union Telegraph Company in New York and Oakland have agreed in the future not to order circuits using single wire configurations.
- 1.003 This addendum is issued to show necessary changes in the text and figures of Section 312-100-000 due to the new agreement.

2. TELEGRAPH AND DATA FACILITIES

The following changes apply to Part 2 of the Section:

- (a) 2.03 - omitted
 - (b) 2.04 and 2.05 - revised
- 2.03 Delete entire paragraph. Figure 5B is no longer offered.
- 2.04 Fully operative circuit sections are sometimes terminated at the office of the Telegraph Company, or at premises of its customer, in 130-type subscriber sets. There are three types of 130 sets which may be encountered: the 130 B1, 130 B2, and 130 C1. The following tabulation gives reference information for interconnecting from such sets to the Telegraph Company's plant:

TYPE OF SUB SET	TYPE OF SERVICE	TYPE OF LOOP	DRAWING REFERENCE
130 B1	HALF DUPLEX	2-WIRE	SD-70679-01 FIG. 2
	FULL DUPLEX	2-WIRE	SD-70679-01 FIG. 4
130 B2	HALF DUPLEX	2-WIRE	SD-70848-01 FIG. 1
OR			
130 C1	FULL DUPLEX	2-WIRE	SD-70848-01 FIG. 3

The resistance external to the 130-type set must be in accordance with the attached "Engineering Notes."

- 2.05 The loop potentiometers and loop current adjustments of 43A1 carrier telegraph terminals used in connection with Western Union service should be made in accordance

with instructions in the appropriate series of practices. Where TLT or other jacks are not provided in the loop circuits, milliammeters or other equipment used for testing should be connected into the circuit in the same electrical relation to the rest of the equipment as outlined in the appropriate sections of practices.

**ENGINEERING NOTES -
SECTION III - TELEGRAPH AND DATA FACILITIES**

The following changes apply to ENGINEERING NOTES, Section III:

- (a) 3.19 through 3.21 - revised
- (b) 3.22 - omitted
- (c) 3.23 and 3.24 - revised
- (d) 3.28 through 3.30 - revised
- (e) 3.32 - revised
- (f) 3.33(b) - revised
- (g) 3.35 - revised
- (h) Figs. 2B, 2C, 3B, 3C, 4A, 4B, 4C, 5B, 5C, 5D, 7C, and 7D - omitted (Not recommended for use in Pacific Company and will not be ordered by Western Union)
- (i) Fig. 6B - omitted (Not standard in Pacific Company)
- (j) Figs. 5E, 6A, 7A, and 7B - revised

3.19 Figs. 2A to 7B, inclusive, indicate typical arrangements to be followed for connection of fully operative sections to, or at, the Telegraph Company's office or patron's office. As indicated on the figures, the normal operating loop current values will be between .060 and .065 amps. The loops may be operated as pairs of wires terminating at one end in the Telephone Company's office and at the other end in the Telegraph Company's or patron's office. The wiring and equipment of the Telephone Company will be separated from that of the Telegraph Company by a terminal strip or block known as a demarcation strip. The figures show such a demarcation strip for those cases where teletypewriter subscriber

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sets are involved. The cable terminal should not serve as a demarcation strip.

3.20 All of the arrangements shown on the figures are not always available. The types of loop arrangements available will depend upon the method which the Telephone Company uses to provide the line facility. The most common types of loop circuits in the Telephone Company's plant are the balanced loop shown on Fig. 3A and the electronic loop shown on Fig. 5A. Of less frequent occurrence are the open and close type of loop shown on Fig. 2A. For outlying point operation where the service point is at some distance from a major toll office, it may be desirable as previously discussed to employ 128B2 or 130B1 subscriber sets as indicated on modified Figs. 6A to 7B. One type of loop circuit may fit the Telegraph Company's equipment better than another. Since the selection of the type of line facilities, subscriber sets, repeaters, etc., influences the drop or loop side, those to be used should be selected, where practicable, so that the drop or loop will best meet the Telegraph Company's requirements. Discussions of the available options between the representatives of the Telephone Company and the Telegraph Company in the early stages of planning circuit additions and changes should be helpful.

3.21 Balanced loops (Fig. 3A) are employed where the Telephone Company's circuit section utilizes direct current, line-type terminal telegraph repeaters. The balanced loop employs + and - 130-volt potentials, and in general, must terminate in a potential equal to and of the same polarity as the spacing potential sent to the loop by the telegraph terminal. Electronic loops (Fig. 5A) are employed where 43A1 carrier telegraph sections are used, or where No. 2 or 9B service boards are employed in the Telephone Company's office. With electronic loops the signals are formed at the central office by the action of electronic tubes, and the permissible variation of battery potentials and polarities is limited. In general, balanced and electronic loops are the rule in the larger toll offices. Electronic loops, however, may also be found in the smallest offices. Open and close loops (Fig. 2A) are rather rare. They may be encountered in small outlying offices, where single line telegraph repeaters are used in connection with extending loops which are too long for operation without some type of repeater.

3.22 Delete entire paragraph. The 128C type set is non-standard for use in the Pacific Company.

3.23 The 128B2 set provides half duplex transmission on open wire lines only. It has an optional loop connection providing for either single-loop, two-loop neutral receiving or two-loop polar receiving. The single-loop option permits the extension of the loop to a maximum of about 12 miles of 19 gauge cable. The loop of the 128B2 set may be extended to a distant teletypewriter where transmission conditions permit. The resistance should be adjustable to provide .060 to .065 ampere loop current.

3.24 The 130-type set may be arranged to extend the loop circuit on either a half duplex or full duplex two-loop basis, to a maximum of 800 ohms, including the teletypewriter, if only one polarity of 130-volt loop battery is employed. Each loop circuit shall be a two-wire loop.

3.28 Circuit sections suitable for direct current telegraph using exclusively a pair of wires in cable or an open wire (a single wire of an open wire line) in general will be used in cases where the section lengths are short. These sections will be connected at the Telegraph Company's office to telegraph repeaters, teletypewriters, Morse sets, other equipment or other circuit facilities. As described in Paragraph 2.02 of Section II, the Telegraph Company may use any circuit section furnished under Contract No. 2 for purposes other than printing telegraph service. It is possible, therefore, that where the facilities are suitable, the Telegraph Company may use such sections for facsimile, data, etc. However, Contract No. 2 makes no provision for furnishing repeaters to connect to such section; it states that, "A two-point circuit section furnished pursuant to this item (d) shall be furnished on a nonoperative basis, i.e., without repeaters, battery, etc."

3.29 Contract No. 2 specifies that circuit sections suitable for voice-frequency transmission, also referred to as type (a) (1) circuits, "shall be suitable for a minimum of 12 telegraph carrier channels in each direction such as are provided by the Bell System type 43 carrier system." The contract further specifies that "no additional charge will be made in cases where the lessor furnishes at its option circuit sections suitable for not more than 17 such type 43 carrier telegraph channels." In certain cases, such circuit sections will be suitable for data, facsimile, or some service other than carrier telegraph and may be so used. (See Paragraph 3.09.)

3.30 The Telegraph Company has the right to create additional communication channels within the voice-frequency range

(200-3000 hertz) from circuits it leases from the Telephone Company, by subdivision of the frequency band or by time subdivision. The above statement is not intended to imply that the usable frequency range of voice-frequency circuits leased from the Telephone Company will necessarily have lower and upper limits of 200 and 3000 hertz, respectively.

3.32 Circuit sections intended for the application of voice-frequency carrier telegraph systems by the Telegraph Company should be assigned to circuit facilities of the type normally provided for the operation of the Bell System 43 voice-frequency telegraph carrier system. Circuits having the same characteristics are usually provided for the Bell System 43A1 system when used for the office-to-office operation of complete systems. Considerations involved in engineering the circuit layout for voice-frequency carrier telegraph systems are discussed in other literature and should be followed by the Telephone Companies, where applicable. There is a transmission advantage in avoiding the use of compandors. If local practice provides noncompandored channels for Telephone Company VF systems, then the sections furnished for the Telegraph Company should be treated accordingly. When the removal of compandors is requested by the Telegraph Company charges as specified in Schedule A shall apply.

3.33 (b) Narrow-band systems having channels spaced 150 hertz apart are known as types 20, 30, 40, and 60. These channels are in widespread use and each provides two groups of eight or ten channels each. The over-all spectrum required for two 10-channel

groups is 340 to 3,260 hertz. The chief difference between the type 20 and the 30's, 40's, and 60's is that the latter three employ a relay for the receiving branch which simplifies the requirement for interconnecting repeaters. The loop circuit of the type 20 is of the electronic type similar to that of the 43A1 systems. Where it is desired to interconnect a type 20 channel and a 43A1 channel it is usually necessary to use an interconnecting dc repeater as shown in Fig. 5E (modified for two pairs).

Other FSK systems used by Telegraph Company for data provide for transmission at 300, 600, 1200 and 2400 bauds.

3.25 The net loss frequency characteristic of the interexchange circuit sections furnished to the Telegraph Company should be comparable to those provided for 43 systems. The net loss frequency requirements are as follows:

FREQUENCY (Hz)	ALLOWABLE DEVIATION FROM REFERENCE LOSS (DB)
1000	REF.
425	-4,5 to +4,5
500	-4,0 to +4,0
1000	-0,5 to +0,5
1900	-3,4 to +3,4
2500	-4,5 to +4,5

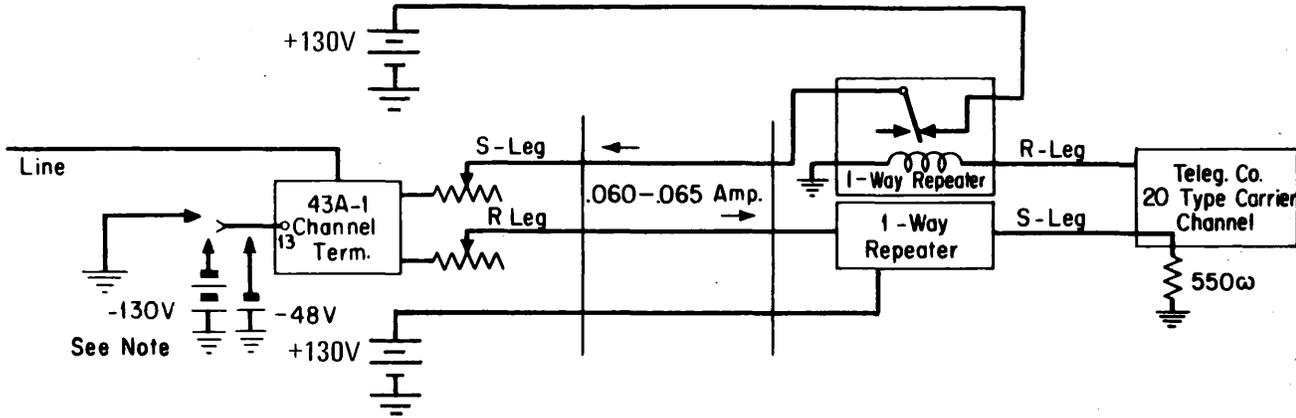
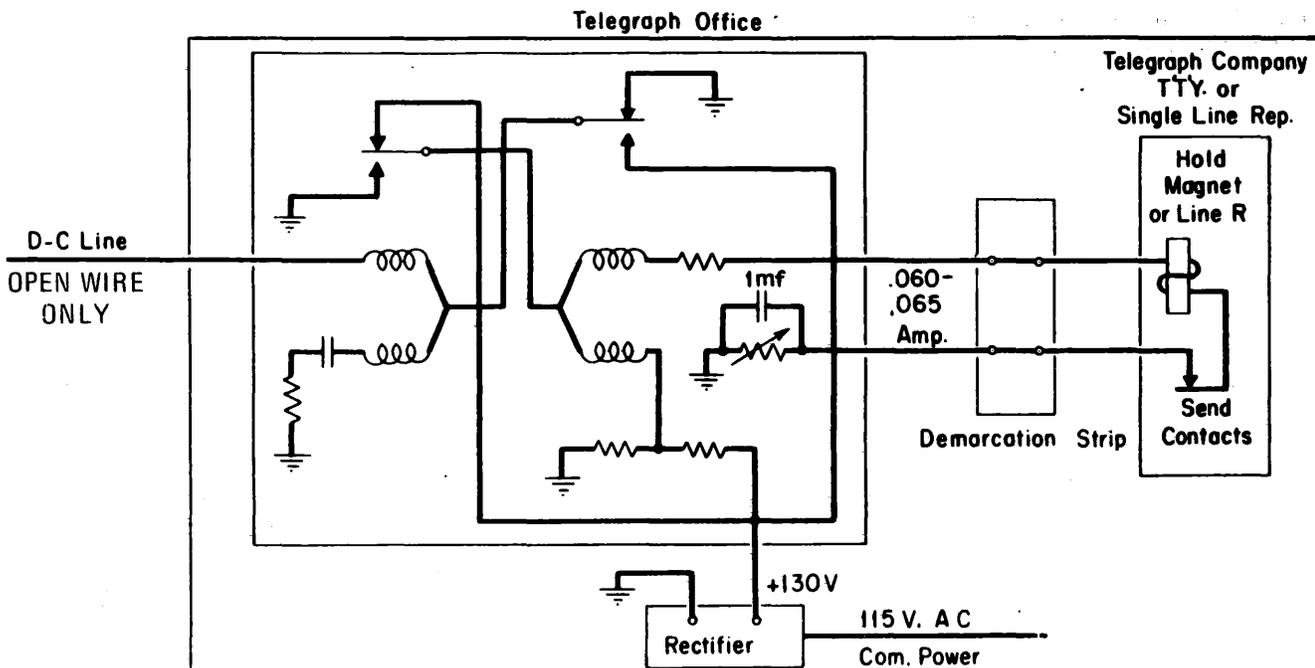


Fig. 5E – 43A1 Channel Term. at Telephone Office — Teleg. Co. 20 Type Carrier Term. at Telegraph Office — Full Duplex

Note: Negative 130V battery may not always be available at the Telephone Company office. If ground is furnished at either office the loop resistance including terminal equipment is limited to 800ω with 130V battery or less with a lower voltage, (as may be furnished by Telegraph Co.) If both polarities of 130 volt battery are used, the limiting value of loop resistance (including terminal equipment) is 2880 ohms.

**FULLY OPERATIVE CIRCUIT SECTIONS
TYPICAL METHODS OF CONNECTING TO TELEPHONE COMPANY OFFICES**

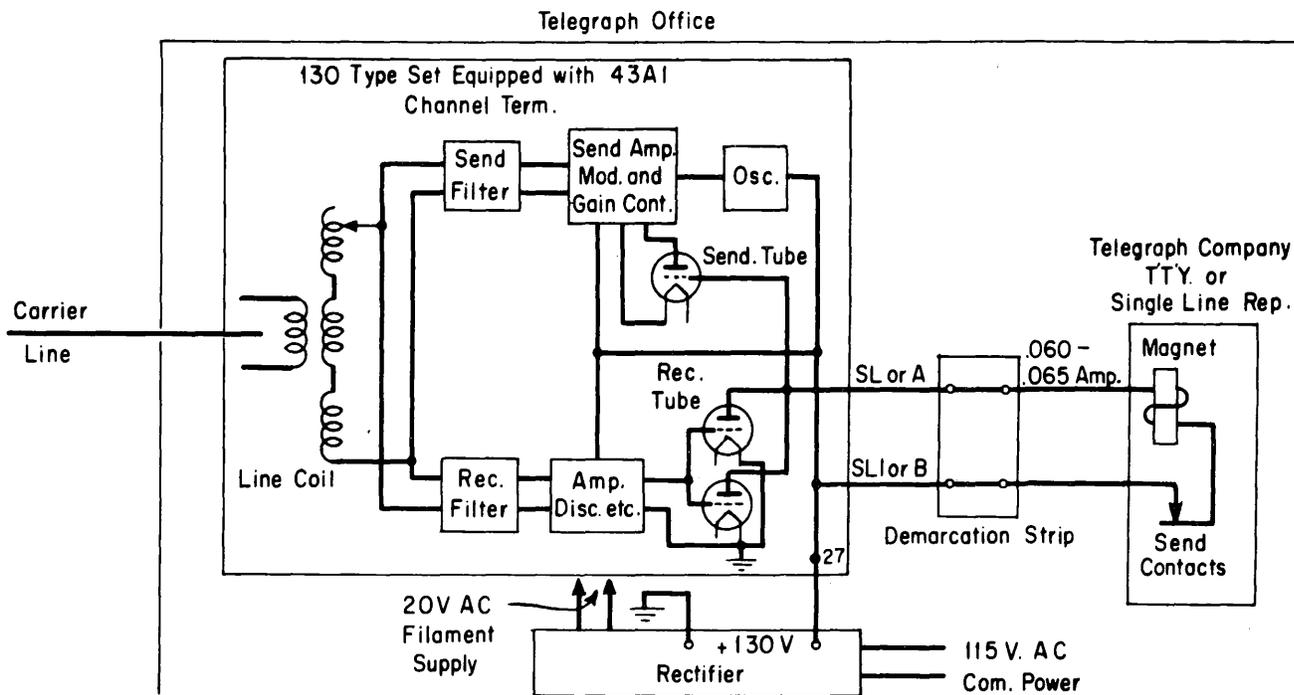
**Applicable Where Telephone Company Line Facility Terminates
in 128-Type TTY Subscriber Sets**



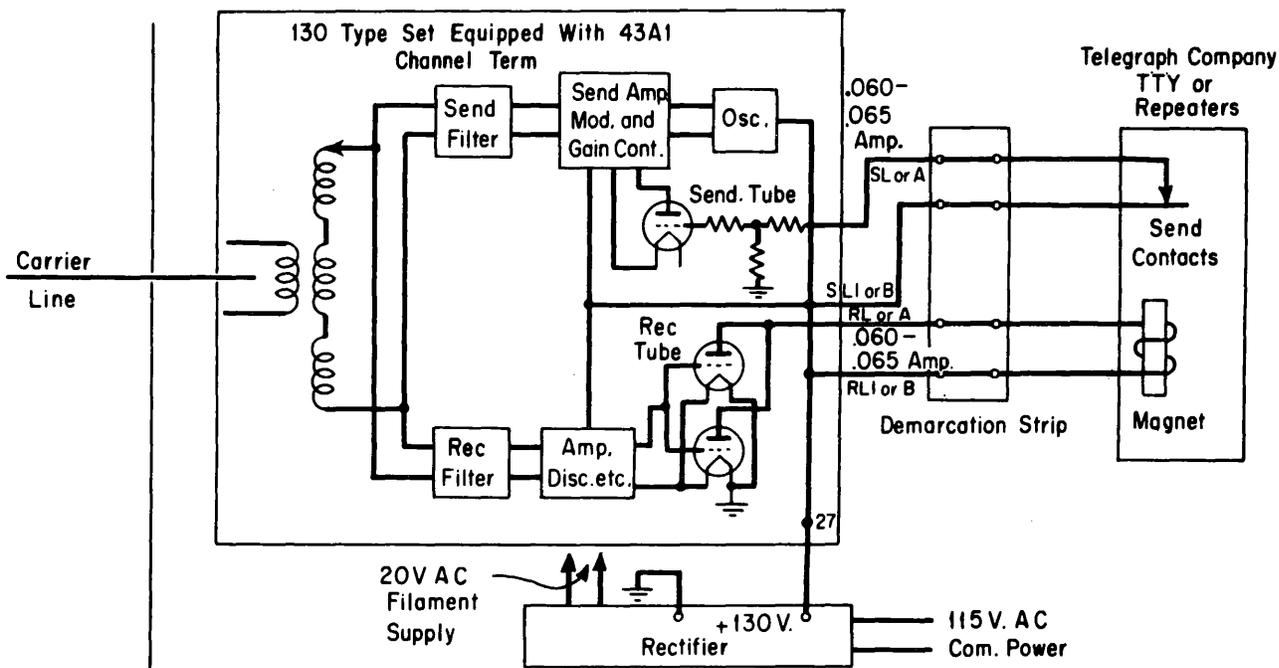
**Fig. 6A – Telephone Company 128B2 Set at Telegraph Company Office
Half Duplex Only — Single-Loop Operation
(Limited Availability)**

**FULLY OPERATIVE CIRCUIT SECTIONS
TYPICAL METHODS OF CONNECTING TO TELEPHONE COMPANY OFFICES**

**Applicable Where Telephone Company Line Facility Terminates
in 130-Type Subscriber Set**



**Fig. 7A - Telephone Company 130-Type Set at Telegraph Company Office
Half Duplex Operation - Single Loop**



**Fig. 7B - Telephone Company 130-Type Set at Telegraph Company Office
Full Duplex Operation - Two Loops**