COMMON SYSTEMS
COMPOSITE SIGNALING CIRCUIT TYPE B
WITH TYPE D CX SET AND REPEATING COILS
ARRANGED FOR PHANTOM GROUP OR
SINGLE PHYSICAL CIRCUIT
2 WAY SIGNALING 2 WAY DIALING
OVER SHORT HAUL CABLE AND
OPEN WIRE NON-REPEATERED CIRCUITS

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.01 Prior to Issue 13-D the title of this circuit drawing read as ff:

COMMON SYSTEMS
COMPOSITE SIGNALING CIRCUIT TYPE B
WITH TYPE D CX SET AND
PHANTOM COIL GROUP
2 WAY SIGNALING 2 WAY DIALING
OVER SHORT HAUL CABLE AND OPEN WIRE CIRCUITS
FOR CIRCUITS NOT EQUIPPED WITH TEL. REP'TS.

D.02 Options ZV and ZW are added to Fig. 12 and to Note 115.

D.03 "Fig. 12" added to connecting information for leads T1 and R1 of Fig. 10.

D.04 Note 116 formerly read "Furnish "K" wiring when earth potential compensation is required for Figs. 1, 3 and 4 as a phantom group. Furnish "L" wiring and apparatus when earth potential compensation is not required and one leg connects to a telegraph or similar channel. Furnish "H" wiring when earth potential compensation is not required and Fig. 12 is furnished as a fourth signaling ckt."

D.05 Cross connection Figs. 53 and 54 are added.

D.06 Note 122 formerly read "The 149M retardation coils in the side circuits of a quad shall have the same code letter".

D.07 Connecting circuit information for leads M, E, N, and F of Figs. 1, 3 and 4 formerly read "To Trk. Ckt., Aux. Pulse Link Ckt., or CX Sig. Aux. Sig. Ckt."

D.08 Note 109 formerly specified "when associated ckt. is a Composite Signaling Auxiliary Signaling Ckt."

D.09 Connecting circuit information for leads T and R of Figs. 2, 8 and 9 formerly read "To Trk. Ckt., CX Sig. Aux. Sig. Ckt., Rep. Coil Ckt. or Rep. Coil of similar CX Sig. Ckt."

D.10 Note 105 formerly read:-
"High voltage breakdown condensers shall be used for condensers (A) (B) (D) (T) and (R) of Figs. 10 and 11 when required by line conditions."

All other headings under Changes, no change.

1. PURPOSE OF CIRCUIT

1.1 This circuit provides a means for compositing and terminating trunks not equipped with terminal repeaters.

1.2 This circuit also provides a two-way, duplex signaling circuit for composite signaling and dialing.

2. WORKING LIMITS

2.1 The limits of this circuit are stated on the schematic drawing.

3. FUNCTIONS

Note: In stating the functions below, it is assumed that there are two composite signaling circuits, one at each end of the trunk; and in the following listing of the functions one will be called the "east" end and the other the "west" end. The composite signaling circuits at the two ends may be exactly alike or one may be per SD-95029-01, or SD-95048-01.

3.1 To transmit a current pulsation from "east" to "west" operating, for the duration of the pulsation, a receiving relay (CX) at the "west" end of the circuit.

3.2 To transmit a current pulsation from "west" to "east" operating for the duration of the pulsation a receiving relay (CX) at the "east" end of the circuit.

3.3 To transmit simultaneously current pulsations from "east" to "west" and from "west" to "east" operating the receiving relays (CX) at both ends.

3.4 To prevent a receiving relay (CX) from responding to pulsations originated at that end of the circuit where it is located.

3.5 Provides means for readjustment of one receiving relay (CX) without

impairing the other two signaling channels.

3.6 Provides means for making the distant office trunk test busy during the testing of a (CX) relay.

3.7 Provides means for obtaining a phantom circuit from two side circuits.

3.8 Provides means for matching the impedance of the line approximately to that of the office.

3.9 Provides means for using the line or trunk simultaneously for telephone communication and for composite signaling, dialing and telegraph operation.

4. CONNECTING CIRCUITS

When this circuit is listed on a keysheet, the connecting information thereon is to be followed.

4.1 Two-way Trunk To Operator Office SD-32190-01 (Typical)

4.2 Incoming Trunk Circuit SD-31887-01

4.3 H1 Carrier Terminal Circuit SD-64081-01

4.4 CX Signaling Converter Circuit SD-64698-01 (Typical)

4.5 Auxiliary Pulse Link Circuit SD-95043-01 (Typical)

4.6 AC Earth Potential Filter Circuit SD-95073-01

4.7 Telegraph or Teletype Circuit SD-70054-01 (Typical)

DESCRIPTION OF OPERATION

5. CX SET - FIGS 10 AND 11

The CX sets which are shown as Figs. 10 and 11 act as filters and separate the direct current and low frequency alternating current components of the d-c signaling or dial pulsing from the voice frequency alternating currents. The direct current and low frequency components of the dial pulses readily pass through the windings of the retardation coil in the composite set to the signaling legs, while the voice currents are prevented from entering the signaling circuit by the high inductance of the windings in the same retardation coil. On the other hand, voice currents pass readily through the series line condensers (T) and (R) to the repeating coil, while the direct current of the dial pulses is prevented from entering the repeating coil group by the same condensers. Condenser (D) is provided only when telegraph is used on one leg of the circuit, for the purpose of reducing the telegraph thump.

5.1 Repeating Coils Figs. 2, 8 and 9

The (S1), (S2) and (PH) repeating coils form a repeating coil group arranged for phantom group operation but (S1) and (S2) may be used individually on single physical circuits. The repeating coils may be selected according to Table A to match the impedance of the line to that of the office.

The condensers (S1), (S2) and (PH) of Figure 5 are required, to prevent the drop windings of the repeating coils from forming a direct current short on associated drop equipment. Figure 13 is required when a repeating coil of this circuit connects to another repeating coil in which case blocking condensers are not required. Ground on the "C" terminals of the repeating coils is required for the purpose of reducing crossfire from one (CX) signaling or dialing circuit to an adjacent (CX) circuit. It also reduces the effect of the inductance unbalance of retardation coils A and B which might otherwise cause the phantom circuit to be noisy.

5.2 CX Signaling Circuit - Figs. 1, 3, 4, 6, 7, & 12

When a signaling circuit is in the normal released condition, ground is connected to lead "M" at both ends of the circuit. The relays are held in their released condition due to the flow of current through the (S1) windings. When battery is applied at one end of a channel, the current through winding (S1) of the (CX) relays at that end is reversed and tends to operate that relay, but is opposed by the current through the (S2) winding, which is of a magnitude sufficient to hold the (CX) relay released. However, the current through the (S2) winding flows over the line conductor and through the (S2) winding of the (CX) relay at the distant end and is of a magnitude sufficient to overcome the current in the (S1) winding and therefore operates that relay. When battery is applied to the "M" lead at both ends of the circuit at the same time, little or no current flows through the (S2) windings and as the currents through the (S1) windings are reversed, both (CX) relays operate. The (P) winding is provided only as an earth potential neutralizing leg. The retard coil (T) is used for the purpose of reducing the thump produced by the dial pulses. When the signaling and dialing circuit is required for single circuits only, Figs. 1 or 3 with "M" wiring or Fig. 12

may be provided. The operation of the circuit remains the same as described above. Figure 6 is provided for the purpose of making the distant office end test busy if the associated trunk circuit at the distant end is other than an intertoll trunk circuit or to hold the distant end in a normal idle condition when the circuit at the distant end is an intertoll trunk circuit, when readjusting a (CX) relay. It should be connected to that leg of the (CX) set which is connected to the operating winding (S2) of the (CX) relay under test.

Figure 7 is provided for the purpose of closing through the earth potential leg when readjusting a (CX) relay. It should be connected as specified in the circuit requirements table.

To facilitate maintenance the leads required for testing this circuit are brought out to the terminal strip and strapped as shown on the schematic.

5.3 The "E" option connects the T lead of side No. 2 to the signaling circuit associated with side No. 2 and connects the R lead of side No. 2 to the signaling circuit associated with the phantom. This connection is the reverse of the connection for the "Q" option. When new circuits are installed or when changes are made on existing circuits to provide the "E" option, it will be necessary to provide the circuits at the distant end of the line with the equivalent wiring so that the distant office circuits are wired with the side No. 2 signaling circuit on the T lead and the phantom signaling circuit on the R lead of side No. 2

When the phantom circuit is not provided and the signaling circuits are wired in accordance with the "E" option, the wiring of side No. 1 is the same as the wiring of side No. 2 and side No. 1 in one office can be connected over a line to side No. 2 in another office.

5.4 The longitudinal retardation coil (F) of Fig. 15 is provided for suppression of interference under conditions where the shunt type resonant filter, used for the suppression of 60 cycle interference is not applicable or not sufficiently effective. Since the longitudinal voltages induced in the line wires of a quad are equal, and are applied to the windings of the retardation coil in the same phase, each encounters the same high reactance as if it were connected to the primary winding of a transformer with open circuit secondary windings. The effect of these induced voltages on the signaling circuit is thereby greatly reduced. During pulse transmission through any winding, however, the other windings, to which no equivalent signal is then being applied, act as parallel connected transformer secondary windings closed through the comparatively low resistance of the line and ground return paths. The reactance of the winding through which the signal is passing is consequently low, and the desired transmission of signaling pulses is not appreciably impaired by the presence of the coil.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 2342-SBC-FSE-KK