# COMMON SYSTEMS
# TYPE N CARRIER TELEPHONE
# SIGNALING
# ORDER WIRE AND ALARMS
# LINE BRIDGING, CUTOFF RELAY
# AND POWER SUPPLY ARRANGEMENTS

## SECTION I - GENERAL DESCRIPTION

1. PURPOSE OF CIRCUIT

1.1 To establish proper order wire and alarm circuit connections between offices for use in maintaining N carrier systems.

1.2 To supply power for the repeater switching set.

## SECTION II - DETAILED DESCRIPTION

1. GENERAL

1.01 Line Bridging Repeating Coil Circuit for Power Supply Points, Fig. 1

1.011 Voice-frequency currents from the line circuit enter the windings "1-2", "3-4" of the repeating coil (A) and are transformed down by the 4 to 1 impedance ratio. Resistor (R1) serves to build out the circuit impedance as viewed from windings "5-6", "7-8" (connected in parallel). It also aids to raise the impedance bridged across the voice-frequency line circuit. A simplex tap is derived from the line windings which when connected to a 130-volt battery source allows this voltage to be transmitted to the line pair.

1.02 Line Bridging Circuit for Auxiliary Repeater Points, Fig. 2 ( Mfr Disc. )

1.021 Voltage taps taken off the order-wire pair and the alarm pair serve to supply +130 volts and -130 volts, respectively, from the pairs to the socket (TST PWR) for power to operate a plugged-in repeater switching set. Variable resistor (R4) and resistors (R1) to (R3) provide means for adjusting the received line voltage. The ground connection to the socket (TST PWR) supplies an ac ground to the repeater switching set. A pair of terminals (TLK) are provided for quickly connecting the high-impedance bridging 84A cableman test set for talking and monitoring on the order wire.

1.03 Telephone Set Circuit for Bridging Points, Fig. 3 ( Mfr Disc. )

1.031 This circuit is arranged for 24-, 48-, 130-, or 152-volt battery. Connection is made to the order-wire pair via the repeating coil circuit of Fig. 1. Normally this connection is open until the operator set is plugged into the jacks (TEL SET).

1.04 Cutoff Relay Circuit for 1900-cycle Signaling, Fig. 4

1.041 This circuit provides means for connecting to a 1900-cycle signaling oscillator and a 1900-cycle signaling receiver circuit. Normally the relay (CO) is released to allow signaling or voice currents to flow through the leads "T" and "R" and to short the hot 1900-cycle oscillator leads. If a signaling tone enters Fig. 4 from Fig. 1 or an associated connecting circuit, a portion flows through (T) and (R) bridging impedance building-out resistors to the input of a voice-frequency amplifier circuit. Upon operating the ringing key in the associated ringdown signaling circuit, battery from the associated signaling receiver delay circuit is placed on the lead "A" thus operating the relay (CO). The relay (CO) operated places a short on the input of the associated voice-frequency amplifier, and tone from the 1900-cycle oscillator flows out into the line-bridging repeating coil circuit, Fig. 1, or another associated circuit.

1.05 Line Balancing for 1900-cycle Signaling Circuit, Fig. 5

1.051 This circuit, which bridges the telephone set balancing network of the associated compromise and balancing networks, balances the effect of the bridge formed by resistors (T) and (R) of the cutoff relay in series with the input of the voice-frequency amplifier associated with a 1900-cycle signaling receiver circuit.

1.06 Jack Circuit, Fig. 6

1.061 Supplies suitable test points for tones on the alarm circuit.

1.07 Repeating Coil Termination, Fig. 7

1.071 Supplies an approximate 600-ohm termination to the drop side of a repeating coil terminating the order-wire line of the alarm line at points not sending or receiving an alarm but which may be required to send power over the simplex of the alarm pair.

1.08 Adjustable Resistance Hybrid Circuit, Fig. 8

1.081 This circuit is a simple unbalanced-to ground resistance hybrid with adjustable (potentiometer) ratio arms. The two potentiometers (BAL) are geared together and controlled by a single shaft. For any setting, the value of resistance introduced by each potentiometer into the hybrid circuit is such that the product of their resistance values in ohms is equal to 600 by 600 approximately. If leads "A", "B", and "C" are terminated in 600 ohms and these are labeled (A), (B), and (C), respectively, the transmission losses are as follows:

(a) With potentiometer assembly in approximately midposition, the loss (C) to (A) and (B) to (A) are both equal to about 6 db. (The resistance introduced into the hybrid circuit by each potentiometer is then approximately 600 ohms.)

(b) With potentiometer assembly in JUST MAKE, approximately 35 degrees off extreme clockwise setting, the loss (C) to (A) is about 0.5 db and the loss (B) to (A) is about 24.5 db.

Caution: The circuit will become open in the (B) to (A) direction if the potentiometer assembly is set within approximately 35 degrees of the extreme clockwise position.

(c) With potentiometer assembly in the extreme counterclockwise position, the loss (C) to (A) is about 24.5 db, and the loss (B) to (A) is approximately 0.5 db.

(d) For any working position of the potentiometer assembly, the impedance looking from any termination is approximately 600 ohms when the other terminations are 600 ohms.

1.09 +152 Volt or +130 Volt Supply and Lamp Circuit, Fig. 9

1.091 Supplies fusing for the power leads associated with order-wire and alarm equipment, socket (PWR), and to the simpex circuits. The resistance lamps, (A), (L1), or (L3), and (B) or (L2) furnish protection in the case of grounds occurring on the order wire simplex circuits.

1.10 -130 Volt Supply and Lamp Circuit, Fig. 10

1.101 Supplies fusing for power leads. The lamps (A), (L1), or (L3) and (B) or (L2) provide protection in the case of grounds occurring on the alarm simplex circuit.

1.11 -24 Volt or -48 Volt Supply, Fig. 11

1.111 Supplies fusing for 24 volts or 48 volts for the telephone set circuit.

1.12 ±130 Volt or +152 Volt Alarm Lamp and -24 Volt and -48 Volt Lamp Circuits, Fig. 12 to 15

1.121 Provides fuse alarm lamps as follows:

For +130 volts or +152 volts, Fig. 12
-130 volts, Fig. 13
-48 volts, Fig. 14
-24 volts, Fig. 15

1.13 Fuse Alarm Relay Circuit, Fig. 16

1.131 This circuit provides a multiwinding relay (K1) for the telephone set which requires power supplies of +130, +152, -130, and either -48 or -24 volts as specified.

1.14 Upon the blowing of a fuse in Fig. 9 to 11, the associated fuse lamp in Fig. 12 to 15 will light and the relay (K1), Fig. 16, will operate to cause the office alarms to function off its operated contacts.

1.15 +130 Volt or +152 Volt Supply, Fig. 17

1.151 Supplies fusing for the power leads associated with the order-wire and alarm equipment.

1.16 Line Bridging Circuit for Auxiliary Repeater Points to Take Power from a Cable, Fig. 18

1.161 Voltage taps taken off the order-wire pair and alarm pair serve to supply +130 volts or +152 volts and -130 volts, respectively, from the pairs to the socket (TST PWR) for power to operate a plugged-in repeater switching set and associated alternate repeater. The variable rheostat (ADJ V) provides means for adjusting the voltage applied to the repeater switching set used with electron tube repeaters, or the one used with transistorized repeaters. Option "S" is omitted from the unit which mounts within an office, while option "S" is furnished in the unit which mounts inside a pole cabinet and apparatus case, respectively. Capacitors (T) and (R) serve to insulate the binding posts (TLK) from ±130 volts dc, and the 0.51-megohm resistors (T) and (R) prevent capacitor charging clicks from entering a connected telephone set circuit.

1.17 Provides a bell for an audible signal and also provides, on an optional basis, means for operating the bell on +130 volt supply.

1.18 Provides means for a second order-wire pair to run through an N1 pole-mounted cabinet. No power is required on this pair. Capacitors (T) and (R) serve to insulate the binding posts (TLK) from dc voltage or line surges. The 0.51-megohm resistors (T) and (R) prevent capacitor clicks from entering a connected telephone set circuit.

1.19 Signal Sending and Receiving Circuit, Jack Circuit, and Signaling Key Circuit for use with 1000-cycle or 1900-cycle Signaling, Fig. 24 to 27, ( Mfr Disc. )

1.191 Incoming signals cause the 1900-cycle delay circuit or the 1000-cycle signal receive circuit to apply battery to lead "SG1" or "SG2" which causes relay (A) to operate on its primary winding. Relay (A) locks up to ground through its secondary winding over lead "J" through Fig. 26 and 27 when no multiple appearances of the order wire are required, or through Fig. 26 and associated figures on the 1000-cycle ringdown signal circuit when multiple appearances are required. The operation of relay (A) also causes lamp (ORDER WIRE), in Fig. 26, to light. When the call is answered, the continuity of lead "J" is broken which releases relay (A), extinguishing the lamp. For a recall, signal relay (A) will operate and light the lamp (ORDER WIRE) for the duration of the incoming signal, but will not lockup because the continuity of lead "J" has been broken. Fig. 26 also connects to a line terminating circuit through leads "T3", "R3", "BR", and "G". When a telephone set is plugged into jacks (ORDER WIRE), in Fig. 26, this termination is removed and the order wire is prepared for signaling or talking. Outgoing signals are transmitted by connecting ground to lead "SS1" or "SS2", in Fig. 24, by operating the key (RING), in Fig. 25. This operates relay (R), in Fig. 24, to connect battery to lead "SG1" or "SG2" to operate the 1000-cycle or 1900-cycle cutoff relay circuit and send out the corresponding signal.

1.20 Cutoff Relay Circuit for 1000-cycle Signal Send and 1900-cycle Signal Receive, Fig. 28, ( Mfr Disc. )

1.201 This circuit operates similar to Fig. 4, as described in 1.04 except that leads "T", "R", and "B" connect to a 1000-cycle signaling oscillator.

## SECTION-III - REFERENCE DATA

### 1. WORKING LIMITS

1.1 The working limits for the alarm and order wire circuits are in general the same as for commercial voice-frequency and signaling circuits (see the existing literature ).

### 2. FUNCTIONS

2.01 Provides a telephone drop on the order-wire pair at intermediate bridging points.

2.02 Provides means for connecting an alarm sending or receiving circuit to the alarm pair.

2.03 Provides means for supplying at a power supply point over the two simplexes of a quadruple:

(a) +130 volts (on the order-wire pair)

(b) -130 volts (on the alarm pair)

2.04 Provides means for receiving the ±130 volts transmitted over the quadruple into a repeater switching set at a nonpower supply point.

2.05 Provides means for fusing the talking, heater, and plate circuits associated with the order-wire and alarm equipment.

2.06 Provides means for the fusing and the protection of the ±130 volts supplied to the two simplexes of a quadruple.

2.07 Provides fuse alarm lamps and a multifuse alarm relay.

2.08 Provides means for equalizing:

(a) The alarm-tone level applied to the line at a power supply point with the level of the through incoming alarm tones.

(b) The receiving alarm levels from two directions at the input to an alarm receiving circuit.

2.09 Provides means for terminating the drop side of the repeating coil employed to terminate the cable pair when no alarms are sent or received, but power may be supplied to the simplex of the pair.

2.10 Provides jacks for the alarm receiving circuit.

### 3. CONNECTING CIRCUITS

When this circuit is listed on a key sheet, the connection information thereon is to be followed.

3.01 VF Alarm and Order wire Signaling Ckt for Type "N" Carrier Systems - SD-95143-01

3.02 "V3" Telephone Repeater Line and Balancing Application Schematic - SD-95144-01

3.03 "V3" Telephone Repeater Battery Supply and Connecting Circuit - SD-95113-01

3.04 Regulating Network and Transfer Circuit - SD-64937-01

3.05 Regulating Network and Transfer Circuit - SD-64937-02

3.06 Sig Order Wire Application Schematic - SD-55385-01

3.07 1000-cycle Ringdown Sig Ckt - SD-55574-01

3.08 Tel Order Wire Brdg - SD-59046-01

3.09 1000-cycle CO Relay Ckt - SD-55393-01

3.10 Comprise and Balancing Networks - SD-90517-01

3.11 Annunciator Ckt - SD-91202-01

3.12 Aud Alm & Pilot Lamp Ckt - SD-90614-01

3.13 Aud & Visual Alm Ckt - SD-96188-01

3.14 Aud & Visual Alm Ckt - SD-95063-01

3.15 Telephone Set Ckt - SD-56073-01

3.16 Pulse Repr Test Set Bat Jk - SD-56137-01

3.17 Aux Sig & Night Alarm Ckt - SD-55039-01

3.18 1000-cycle Signaling Receiving Ckt - SD-55392-01

3.19 SXS - 355A - Misc Alarm Circuit - SD-32192-01

3.20 SXS - No.1 - Pilot Lamp Circuit - ES-30437-01

3.21 N1 Carrier Tel - High Frequency Cross-Connecting And Line Building Out Circuit - SD-97030-01

SECTION IV - REASONS FOR REISSUE

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Fig. 24 to 28 and 74 are rated "Mfr Disc."

D.2 Notes 112 and 113 are rated "Mfr Disc."

D.3 Connecting Circuits 3.19, 3.20 and 3.21 are added.

D.4 Note 104 and Table 1 are changed to show lead designations to Connecting Circuits 3.19 and 3.20.

D.5 Note 203 was added.

All other headings under Changes, no change.

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