CIRCUIT DESCRIPTION

CD-95121-01
Issue 8D
Appendix 4B
Dwg Issue 23B

COMMON SYSTEMS "N1" CARRIER TELEPHONE APPLICATION SCHEMATIC FOR TERMINAL

CHANGES

D. Description of Changes

D.1 In Fig. 12, the AM option, "KS-15875" formerly read "ROTRON MFG. CO. DRFC-1 TYPE KS-505."

D.2 In Fig. 12, the AM option "S 1-1/8 FUSTAT" formerly read "S 8/10 FUSTAT."

D.3 In Fig. 12, the AB option "SRU" formerly read "SGU."

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2161-JTP-LP

COMMON SYSTEMS "N1" CARRIER TELEPHONE APPLICATION SCHEMATIC FOR TERMINAL

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 Options were added to provide for the powering of the 240-type amplifier using existing power.

D. DESCRIPTION OF CHANGES

D.1 Option "JM" was added in Fig. 1 to provide for +130 volt supply, and "JN" was added in Fig. 1 to provide for -130 volt supply to the 240-type amplifiers.

D.2 Connection was added from pin 19 on J13, Fig. 1, to pin 5, Fig. 17, to provide power bypass when a noise control unit is used in conjunction with the 240-type amplifier.

D.3 Connection was added to X CONN, Fig. 65.

D.4 Additional power options were added to Note 102 to provide power to the 240-type amplifiers.

D.5 Fig. 6, 10, 11, 15, and 16 were rated "Mfr Disc." and replaced by Fig. 15, 13, 14, 11, and 12, respectively, on SD-95224-01.

D.6 Notes 129 and 130 were added.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2169-JRB-DDS

COMMON SYSTEMS "N1" CARRIER TELEPHONE APPLICATION SCHEMATIC FOR TERMINAL

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Option (ZV) for "N1" carrier remote alarm release circuit is added to Fig. 1, Fig. 3, and Fig. 51. Option (ZT) was also added to Fig. 3 and Fig. 51.

D.2 Option (AI) was extended to GRD lead in Fig. 12.

D.3 Note 128 was added to explain options (ZT) and (ZV).

D.4 Note 210 was clarified.

4. CONNECTING CIRCUITS

4.78 N1 Carrier Remote Alarm Release Circuit, SD-56464-01.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT 2161-JJL-LP

COMMON SYSTEMS "N1" CARRIER TELEPHONE APPLICATION SCHEMATIC FOR TERMINAL

CHANGES

A. CHANGED AND ADDED FUNCTIONS

A.1 Optional apparatus is specified for use in this circuit so that longitudinal noise coming from cable may be suppressed when the N1 terminal is used with a Data Transmission System.

B. CHANGES IN APPARATUS

B.1 Added (optionally) as Fig. 17, noise control unit:
- 2 - Capacitors (C103)(C104) KS14138, L1 .001 uf
- 1 - Capacitor (C105) KS13814, L10 0.1 uf
- 1 - Inductor (L2) F1D4 4.5 mh
- 1 - Transformer (T43) 2507P 135 ohms: 135 ohms

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Fig. 17 added.

D.2 "FF" and "GG" options added to cover B.1 above.

D.3 "FF" and "GG" options and reference to Fig. 17 added to table of Note 110.

D.4 Note 210 revised.

D.5 Fig. 65 added to show cross connections for Fig. 17.

D.6 Fig. 51, 58, 60 and 61 revised to include connection to Fig. 65.

D.7 Fig. 1 revised to include listing of transmission channel unit SD95252-01 in J1, and to include connecting information for Fig. 17.

D.8 Reference to equipment information brought up to date.

3. FUNCTIONS

3.11 Provides a means for draining off longitudinal impulse noise that has been coupled to the N terminal pair on the receiving side of the terminal.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INCORPORATED

DEPT. 2161-BAM-LP

COMMON SYSTEMS "N1" CARRIER TELEPHONE APPLICATION SCHEMATIC FOR TERMINAL

CHANGES

B. CHANGES IN APPARATUS

B.1 Superseded / Superseded by

Superseded	Superseded by
1 - Relay (St. Rel) Struthers-Dunn RSX777B	1 - Relay (St. Rel) Struthers-Dunn RSX777C
1 - Relay (St. Rel) Struthers-Dunn RSX777C	1 - Relay (St. Rel) Struthers-Dunn RSX1265
1 - Motor (M1) KS-15553 with S 1-6/10 Fustat	1 - Motor (M1) Rotron Mfg. Co. DRFC-1 Type KS-505 with S 8/10 Fustat

B.2 Optional

1 - Cap. (C6) KS-13917 100 µf	1 - Cap. (C6) KS-14202 2-100 µf

C. CHANGES IN CIRCUIT REQUIREMENTS OTHER THAN THOSE APPLYING TO ADDED OR REMOVED APPARATUS

C.1 Notes 6 and 7 were added to Circuit Requirements.

D. DESCRIPTION OF CIRCUIT CHANGES

D.01 "AH", "BB", "CC", "DD", and "EE" options were added to Fig. 1.

D.02 Special Services Channel Unit was added to list of equipment which plugs into (J1) of Fig. 1.

D.03 In Fig. 1, "AY" wiring at resistor (R9) was previously shown as "AX" wiring in error.

D.04 "AK" apparatus was added to Fig. 5.

D.05 In Figs. 10, 11 and 16, "BB" and "CC" option designations were added and X Conn. information expanded to include Figs. 51 and 64.

D.06 In Fig. 12, "B" apparatus was changed to a Struthers-Dunn RSX777C relay and rated M.D. Option "BA" was added.

D.07 In Fig. 12, "AM" apparatus was added and "AL" rated M.D.

D.08 In Fig. 12, (SW1) was previously shown as a Fenwal 1700 thermoswitch in error.

D.09 Equipment information was revised.

D.10 +130 volt battery was changed to Sig. Battery.

D.11 Note 116 was rated Mfr. Disc.

D.12 Note 110 was revised.

D.13 Note 105 was revised to specify 38.5 V ± 0.5 V instead of 40 V ± 0.5 V.

D.14 Notes 124, 125, 126 were added.

D.15 Note 204 was revised.

D.16 Table 1 was revised.

D.17 Fig. 64 was added.

D.18 Figs. 51, 52, 53, 56, 57, 58, 59, 60, and 62 were revised.

All other headings under Changes, No change.

1. PURPOSE OF CIRCUIT

1.1 This circuit shows the components required for a type N terminal installation and the interconnection between them. Included are the mounting jacks for the channel units and the transmitting and receiving group units, test jacks for the group units, span adjustment pads, and power supplies and alarm arrangements.

2. WORKING LIMITS

2.1 None.

3. FUNCTIONS

3.01 Provides connections between the channel units and the voice frequency circuits with their signalling arrangements.

3.02 Provides connections between the channel units and the group units, through pads in the transmitting

direction which improve crosstalk separation between the different channels.

3.03 Provides connections between the group units and the outside cable pairs.

3.04 Provides for group unit testing and maintenance by means of switching jacks.

3.05 Provides means of building out any particular line loss to a prescribed value.

3.06 Provides for power supply to the channel and group units and to testing circuits from local sources. Also, provides for the transmission of power from local source to an adjacent repeater station.

3.07 Provides an alarm in case of carrier transmission failure.

3.08 Provides an alarm in case of failure of the signalling 3700-cycle oscillator.

3.09 Provides alarms in case of fuse failure.

3.10 Provides cooling circuit.

4. CONNECTING CIRCUITS

4.1 Channel Unit Circuit - SD-95118-01, SD-95118-02.

4.2 High Group Transmitting Circuit - SD-95119-01.

4.3 Low Group Receiving Circuit - SD-95120-01.

4.4 Low Group Transmitting Circuit - SD-95129-01.

4.5 High Group Receiving Circuit - SD-95130-01.

4.6 Various VF and signalling circuits. Typical circuits are listed in Table I on the drawing. Otherwise, see Key Sheet.

4.7 Various Alarm Circuits, such as

4.71 Annunciator Ckt. - SD-90202-01.

4.72 Audible Alarm & pilot Lamp Ckt.,-SD-90614-01.

4.73 Audible & Visual Alarm Ckt.,-SD-95063-01.

4.74 VF Alarm System - SD-95143-01.

4.75 SXS-355A Misc. Alarm Ckt.,-SD-32192-01.

4.76 SXS-No. 1 (A&M only) Pilot Lamp Ckt.,-SD-96138-01.

4.77 No. 350A Pilot Lamp & Power Alarm Ckt.,-SD-31573-01.

4.8 Discharge voltage control ckt.,-SD-95166-01.

4.9 Thru Channel Ckt.,-SD-95191-01.

4.10 "E" Lead Grounding Ckt.,-SD-95190-01.

DESCRIPTION OF OPERATION

5. TRANSMISSION (FIGS. 1, 6, 8, 10, 11, 15 and 16)

The associated VF circuits either 2-wire or 4-wire with their signalling "E" and "M" leads are connected to the channel unit (J1) to (J12). These jacks are connected to the Transmitting Group Unit (TRSG) jacks through switching jack (J16) which is multipled to switching jack (J15). Resistances (R51), (R53) (R55), (R57), (R59), (R61), (R63), (R65), (R67), (R69), (R71) & (R73) together with a potentiometer mounted on each channel unit constitute crosstalk separation pads to prevent intermodulation between the different channels. (The various channels are multipled at the output of the pads.) In the receiving direction the channel jacks are directly multipled together and connected to the Receiving Group Unit (REC) jack through switching jack (J14) which is miltipled to switching jack (J13). The transmitting Group Unit (TRSG) jack is connected to the outgoing outside cable pair through the switching jacks (J16) and (J15) already mentioned. The Receiving Group Unit (REC) jack receives the signals from the incoming cable pair through switching jacks (J14) and (J13).

A span adjusting pad (Fig. 6) and/or a 1, 2, or 4 mile artificial line (Figs. 10, 11, or 16) or a combined span adjusting pad and 2 mile artificial line (Fig. 15) may be used on the cable side of the switching jacks (J13), (J14), (J15) and (J16) to adjust carrier levels in the transmitting direction for level coordination and in the receiving direction to make up for short repeater section lengths. A span adjusting pad (Fig. 6) consists of resistors (R1), (R2), (R3), (R4), and (R5). Capacitor (C1) presents an open to the cable pair for d-c testing purposes. The one mile artificial line (Fig. 16) consists of resistors (R107) through (R112) and capacitor (C102). Capacitor (C101) blocks d-c during cable

testing. A two mile artificial line (Fig. 10) consists of resistors (R81) through (R85) and capacitors (C82) and (C83). Capacitor (C81) blocks d-c during cable testing. A four mile artificial line (Fig. 11) consists of resistors (R91) through (R98) and capacitors (C92), (C93), (C95) and (C96). Capacitors (C91) and (C94) provide d-c blocking for cable testing. A combined span adjusting pad and two mile artificial line (Fig. 15) consists of resistors (R99) through (R106) and capacitors (C98) and (C99). Capacitors (C97) and (C100) provide d-c blocking for cable testing purposes.

Suitably strapped connectors (Fig. 8) must always be inserted in switching jacks (J16) and (J14) for normal transmission. Connectors are also inserted in switching jacks (J15) and (13) providing parallel contacts.

The 3700-cycle signal tone required for the channel units is generated in an oscillator which is a part of either the low group transmitting or receiving units. The tone is transmitted from either the (TRSG) or (REC) jacks to the channel unit jacks (J1) to (J12) through switching jacks (J16), (J15), (J14) and (J13). The corresponding 3700- cycle alarm control which is also obtained from the same group units reaches the alarm relay circuit (Fig. 3) from (TRSG) and (REC) jacks through the switching jack (J16) to (J13) as above.

When it is desired to use ringdown signalling on channels supply by N carrier, -40V battery is connected to the "M" lead by means of a strap at the IDF which permanently holds the transmitting signalling circuit in the condition for no transmission of the 3700-cycle signalling tone.

In addition, a carrier transmission failure alarm signal originating in the Receiving group unit reaches the alarm circuit in the same manner from the (REC) jack.

6. MAINTENANCE

Normal transmission is obtained by insertion of suitably strapped connecting plugs in switching jacks (J15) and (J15), (J14) and (J13). For maintenance purpose of the Transmitting group unit the strapped connector inserted in jack (J15) is removed and the jack is used for connecting to a switching circuit in which a spare group unit is plugged. The connector in jack (J16) is then removed and transmission is transferred to the switching circuit so that it can be switched from the regular to the spare unit. The same switching circuit can be used for maintenance of the Receiving Group Unit in a similar manner.

7. POWER SUPPLY

7.1 Filament Supply (Fig. 4)

The filament supply for the channel and group units is obtained from a 48-volt office battery through a resistance circuit dropping the voltage to 40 volts. This consists of Rheostat (R10) and Resistances (R11) to (R20) which are strapped to provide the desired voltage depending on the battery voltage and the load.

Condenser (C8) to ground from the filament supply lead for the group units is provided to improve the singing margin of these units.

7.2 Plate Supply (Figs. 5 and 9)

7.21 With "E" option (Mfr. Disc.)

The 130-volt supply (Fig. 5) is filtered by means of retard coil (L1) and condensers (C6) and (C7), the latter providing filtering in the high frequency region where the electrolytic condenser (C6) presents a relatively high impedance. Resistance (R6) is normally shorted through the contacts of (CHG) key. Operation of the non-locking key places the resistance in series with (C6) to limit the charging current at the time of fuse replacement. Fig. 9 provides the necessary +130-volt plate battery for (Fig. 5) and the -130-volt and +130-volt battery for the repeater in Fig. 1.

7.22 With "F" option.

Where the "F" option has been provided the function of the circuit is the same as described in paragraph 7.21 except that the (CHG) key (R6) resistor and (C7) condenser have been omitted.

7.3 Power Transmission Over the Line

When power is to be transmitted to an adjacent repeater station a +130-volt lead is connected to the (TRSG) jack through resistance (R9) and multipled to switching jacks (J16) and (J15) in order to provide power transmission when a spare group unit is used. -130-volt power is similarly supplied through resistance (R7) and rheostat (R8) to the (REC) jack and switching jacks (J14) and (J13). The rheostat is adjusted to compensate for different line lengths so that the required 140 volts is obtained at the distant stations.

Power surge protection for the +130 and -130 volt power supplies is provided by the condensers (C9) and (C10), figures 13 and 14. Condenser (C9) is applied to the +130 volt power lead between resistor (R9) and terminal punching 25 on the Term. Mtg. condenser (C10) is applied to the -130 volt power lead between resistor (R10) and terminal punching 57 on the Term. Mtg.

7.4 Testing Circuit Power Supply (Fig. 7).

A -40 volt lead from Fig. 4 and +130 volt lead from Fig. 5 are connected to (TEST PWR) jack. This permits power to be connected when necessary to the group unit switching circuit. Test jacks (+130), (-40V) and (GRD) provide means of measuring the plate and filament supply voltages.

The ZK option shows resistors (R25) and (R26) which limits the current in order to protect the fuses in cases of an accidental ground at the test jacks.

8. ALARM CIRCUIT (Fig. 3)

8.1 Fuse Alarms

The operation of a fuse on the +130 volt fuse panel will supply battery through resistance (R31) to the (T) winding of relay (K1). Lamp (+130V) is in parallel with the 920-ohm section of resistance (R31) to provide a visual indication of the fuse panel involved. The operation of relay (K1) places ground on leads "1" and "2" to the office alarm circuit.

Alarm in the case of failure of a -130 volt fuse is provided in similar manner through resistance (R32) and the (S) winding of the same relay.

The operation of a fuse on the -40 fuse panel will supply battery through resistance (R33) to the (P) winding of the same relay (K1) and to the (-40V) lamp. The latter gives visual indication while the operation of the relay places ground on the two leads to the office alarm circuit.

8.2 3700-Cycle Oscillator Alarm

8.21 With "AC" option (Mfr. Disc.).

The rectified signal obtained from the output of the 3700-cycle oscillator in either the Low-Group Transmitting or Low Group Receiving Unit reaches the winding of the (K4) relay from switching jack (J14), so that the relay is normally operated. With a failure of the oscillator, the release of relay (K4) places +130 volt on the (T) winding of the (K1) relay, the operation of which connects ground to office alarm leads "1" and "2" as before. Visual indication is provided by lamp 3700~ shunted across the 920-ohm section of Resistance (R34).

8.22 With "AD" option

The "AD" option provides a (3700~) alarm cut off key. With the (K4) relay released and the (K1) relay operated, as described in paragraph 8.21, operating the (3700~) key removes the +130 volts from the "T" winding of the (K1) relay. This releases the (K1) relay and removes grounds from the office alarm leads "1" and "2" thus cutting off the audible alarm and extinguishing the aisle alarm light. The operation of the (3700~) key also provides ground for the (3700~) lamp which remains lighted, through resistor (R35).

8.3 Carrier Transmission Alarm

The rectified signal obtained from the output of the Receiving group unit reaches the winding of the (K2) relay from switching jack (J14) keeping the relay normally operated. Failure of the system transmission causes the release of relay (K2) which applies ground to the winding of relay (K3) through thermistor (RT1) leading to slow operation of the relay so that failures of short duration do not result in an alarm. Once operated, the relay is locked in the operated position until released manually by means of the (B ALM RLS) nonlocking key. This feature is required to prevent clearance of the alarm because of the automatic regulation feature of the system without assurance that the trouble condition which originated the alarm has disappeared or been remedied. Operation of relay (K3) places ground on the office alarm leads "1" and "2", through contact on the (A ALM RLS) key and provides visual indication by means of lamp (CARR). At the same time ground is removed from leads "G1" to "G6", thus disabling the receiving signalling circuit in the channel units to prevent false operation (seizure of sender circuits). Operation of the (A ALM RLS) key removes ground from the office alarm leads "1" and "2" so as to cut off the audible alarm and extinguish the aisle alarm light. The (A & B ALM RLS) keys are interlocked so that operation of the (B) key will not release the relay until the (A) key has been turned back to normal, restoring the office alarm connection.

8.4 Blower Motor Ckt.

This is a thermostatically controlled blower circuit which operates to cool the equipment when the temperature at the thermostat rises to 110°F. At this temperature, the Fenwal thermo switch (SW1) operates to close the operating path through the Struthers-Dunn relay (ST. REL), the contacts of which then close the power circuit to the blower motor (M1).

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