

COMMON SYSTEMS
"N1" CARRIER TELEPHONE
HIGH GROUP RECEIVING CKT.

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Leads of (RT1) Thermistor were reversed
to agree with the equipment drawings.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 2123-AK-WAD-IT

CIRCUIT DESCRIPTION
TRANSMISSION SYSTEMS DEVELOPMENT DEPARTMENT

CD-95130-01
Issue 1
Appendix 6-D
Dwg. Issue 7-D

COMMON SYSTEMS
"N1" CARRIER TELEPHONE
HIGH GROUP RECEIVING CKT.

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

- D.1 The rating was changed from
"A.T.&T.Co. Provisional" to
"A.T.&T.Co. Standard".

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 2210-DNR-PGE-IS

TO BE USED AS AN ORIGINAL
BY THE HAYTHORNE PRINT SHOP

CIRCUIT DESCRIPTION
TRANSMISSION SYSTEMS DEVELOPMENT DEPARTMENT

CD-95130-01
Issue 1
Appendix 5-AR
Dwg. Issue 6-AR

COMMON SYSTEMS
"N1" CARRIER TELEPHONE
HIGH GROUP RECEIVING CKT.

CHANGES

B. CHANGES IN APPARATUS

B.1 Added

- 1 - Res. (R1) 200 ohm KS-13490, L1
- 1 - Cond. (C4) 470 MMF KS-13365, L1

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 2540-ACV-PGE-GX

TO BE USED AS AN ORIGINAL
BY THE HAWTHORNE PRINT SHOP

CIRCUIT DESCRIPTION
TRANSMISSION SYSTEMS DEVELOPMENT DEPARTMENT

CD-95130-01
Issue 1
Appendix 4-B
Dwg. Issue 5-B

COMMON SYSTEMS
"N1" CARRIER TELEPHONE
HIGH GROUP RECEIVING CKT.

CHANGES

B. CHANGES IN APPARATUS

B.1 Superseded Superseded By
1-Filter (FL2) 1-Filter (FL2)
167B 167U

D.2 Circuit Note Change

To clarify note 104 the following was added, "To increase gain first remove strap across R10, for additional gain remove both straps."

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 "A" and "B" option are added.
"A" option only was previously shown and not rated "Mfr. Disc."

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 2540-ACV-PGE-NM

TO BE USED AS AN ORIGINAL
BY THE HAWTHORNE PRINT SHOP

COMMON SYSTEMS
"N1" CARRIER TELEPHONE
HIGH GROUP RECEIVING CKT.

CHANGES

B. CHANGES IN APPARATUS

B.1 Removed	Replaced by
1 - Cond. (C8) 100 μ pf KS-13565, L1	1 - Cond. (C8) .001 pf KS-14138, L1
1 - Cond. (C11) .01 pf KS-14141, L2	1 - Cond. (C11) 0.1 pf KS-14144, L2

B.2 Added

1 - Cond. (C3), 0.1 pf, KS-13814,
L10

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 The value of resistance (R32) has
been corrected to the preferred
figure of 90.9 ohms instead of 90.3.

The inductance of the (L3) retard is
now given as 25.3 μ h (instead of 24)
and of the (L1) retard as 4.5 μ h (in-
stead of 4)

D.2 Terminals 1 and 2 on the (RT1)
thermistor were interchanged.

D.3 Note 103 previously read:

"Normally furnish "X" wiring.
Provide "Y" wiring when circuit is
used in switching circuit and for cir-
cuit maintenance."

D.4 A-c grounding of the longitudinal
power supply lead is provided by
means of added condenser (C3).

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 2540-ACV-PGE-GJ

TO BE USED AS AN ORIGINAL
BY THE HAWTHORNE PRINT SHOP

COMMON SYSTEMS
"M1" CARRIER TELEPHONE
HIGH GROUP RECEIVING CKT.

CHANGES

B. CHANGES IN APPARATUS

Removed	Replaced By
213B Rep. Coil (T1)	213D Rep. Coil (T1)

(R 9) was 260 ohms
 (R13) " 650 "
 (R17) " 136 "
 (R21) " 4000 "
 (R32) " 90 "

D.3 Value of resistance (R15) was corrected to 43.2 from 4.3 shown on previous issue.

D. DESCRIPTION OF CIRCUIT CHANGES

D.1 Terminal numbers on (T3), (T4) and (T5) transformers were made as follows:

On (T3) & (T5)	3	was shown as	2
	4		3
	6		4
On (T4)	3		2
	4		3
	5		4
	6		5

D.4 Code KS-14274, L1 of (SLOPE ADJ) switch (S1) has been added.

D.5 Note 105 was modified. It previously read: Use "S" wiring for normal amplifier operation. Installer shall run "T" wiring when customer requires excess amplifier gain.

D.6 Reference to "200 type terminal", was removed from resistances (R28) and (R29).

D.2 A number of resistance values were changed to agree with RMA standards.

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3540-ACV-PGE-CF

TO BE USED AS AN ORIGINAL
BY THE HAWTHORNE PRINT SHOP

COMMON SYSTEMS
"N1" CARRIER TELEPHONE
HIGH GROUP RECEIVING CKT.

CHANGES

B. CHANGES IN APPARATUS

B.1 Removed

8850 ohm 145A Res.	(R22)
5000 " " "	(R21)
4.5 " " "	(R16)
10 " " "	(R15)
500 " " "	(R13)
500 " " "	(R12)

Replaced by

20000 ohm 145A Res.	(R22)
4000 " " "	(R21)
15 " " "	(R16)
43 " " "	(R15)
180 " " "	(R12)
180 " " "	(R14)

B.2 Added

650 ohm 145A Res. (R13)

D. DESCRIPTION OF CIRCUIT CHANGES

- D.01 Location of resistance (R23) changed.
- D.02 Inductance value of (L2) retard was 32 MH.
- D.03 Terminal numbering on (T4) output transformer changed.
- D.04 "X" and "Y" wiring simplified.
- D.05 Chassis grounds E1, E2, and E3 added.

D.06 (L3) retard coil coded.

D.07 (FIL ACT) test jack designated (J1).

D.08 (S1) switch designation was (SLOPE).

D.09 Note 103 read:

Use "S" wiring for normal amplifier operation. Use "T" wiring where 6 db excess repeater gain is required.

D.10 Note 202 added.

D.11 The field gain adjustment formerly provided by (R12) and (R13) is now obtained from (R12) and (R14).

All other headings, no change.

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3540-RAL-PGE-BP

TO BE USED AS AN ORIGINAL
BY THE HAWTHORNE PRINT SHOP

COMMON SYSTEMS
"N1" CARRIER TELEPHONE
HIGH GROUP RECEIVING CKT.

1. PURPOSE OF CIRCUIT

1.1 This circuit provides amplification of the high group frequency band (164-260 kc) received from the cable. After amplification the signals pass to the channel units. A part of the output signal is amplified by a supplementary amplifier, then rectified to furnish the operating current for an external carrier alarm relay circuit.

2. WORKING LIMITS

2.1 None.

3. FUNCTIONS

3.01 Amplifies the high group frequency band received from the input cable for transmission to the associated channel units.

3.02 When required, provides flat gain regulation by means of a thermistor in the feedback path of the receiving amplifier.

3.03 Provides means of obtaining a 6 db excess gain in the receiving amplifier when required.

3.04 Provides means of selecting, in the receiving amplifier one of three different values for the equalizing slope of the repeater characteristic in order to compensate for the line residual slope.

3.05 Introduces a fixed equalization (-7 db).

3.06 Amplifies and rectifies a part of the receiving amplifier output by means of a supplementary amplifier and rectifier to supply d-c current to an external carrier alarm relay circuit.

3.07 Provides means of supplying negative voltage to an adjacent repeater station when required. The positive voltage is supplied through the associated low group transmitting circuit.

3.08 Provides means of measuring tube space currents.

4. CONNECTING CIRCUITS

4.1 Channel Unit Circuit - SD-95118-01

4.2 Application Schematic for Terminal - SD-95121-01

4.3 Low Group Transmitting Circuit - SD-95129-01

DESCRIPTION OF OPERATION

5. GENERAL

The High Group Receiving circuit consists of a band-pass filter, equalizer, receiving amplifier, and carrier alarm amplifier-rectifier. With an associated Low Group Transmitting circuit it constitutes the terminal group equipment.

6. RECEIVING CIRCUIT - BAND-PASS FILTER AND EQUALIZER

Signals received from the cable pass through the step-up repeating coil (T1). The mid-point of the primary of this coil is simplexed to transmit power over the line. Longitudinal voltages are suppressed by the retardation coil (L1). An impedance improving condenser (C1) is shunted across the secondary of coil (T1). Following the coil the band-pass filter combination (FL1) and (FL2) passes the desired frequencies required in the high group band to equalizers (EQ1) and (EQ2), which insert a fixed amount (-7 db) of equalization, either to partially compensate for the pre-equalization introduced at the distant transmitting terminal when the total number of repeater sections is even, or to complete the basic equalization for an odd repeater section. From the equalizer the signals pass to the primary winding of the amplifier input transformer (T3).

7. RECEIVING AMPLIFIER CIRCUIT

The amplifier circuit is essentially like that of the low-high repeater except for the slope adjustment network. The signal received from the equalizers (EQ1) and (EQ2) of the input circuit is stepped up by input transformer (T3). Resistance (R6) provides a suitable termination for the coil. The high winding of the transformer is connected directly to the control grid of tube (V1) and through resistances (R7) and (R8) to the cathode of the tube. Resistance (R8), by-passed by condenser (C6), is the cathode bias resistance for tube (V1). Resistance (R7) provides a d-c path for the grid bias of high enough impedance

so as not to affect the input series feedback across which it is shunted. The first stage or vacuum tube (V1) is impedance coupled to the second tube (V2) by means of retard coil (L2), condenser (C8), and grid leak resistance (R19). The plate of the second tube (V2) delivers the amplified signals to the channel units through output transformer (T4). The hybrid coil arrangement of the output transformer (T4) with resistance (R21) provides the feedback at the output which is connected to the input series feedback circuit through the "Beta" circuit. D-c insulation is provided by condensers (C5) and (C9). This "Beta" circuit controls the gain characteristic of the repeater and includes:

(a) Thermistor (RT1) or resistance (R22) which controls the basic gain of the amplifier. When regulation is required the thermistor is used. Its resistance varies over a wide range with small changes in amplifier output level so that the amplifier output is substantially constant for relatively large changes in amplifier input level. Condenser (C11) provides d-c insulation to prevent excessive voltage between the thermistor element and its heater.

(b) The inductance, condenser, resistance parallel combination (L3), (C2) and (C10), (R15), or (R16) and (R17), (R31), or (R32) which determines the frequency characteristic of the amplifier. The (SLOPE) switch selects the suitable element combination to provide three different slopes (A), (B) or (C) of the characteristic to correct for residual line slope.

(c) Resistances (R9) and (R10), (R12) and (R13) which provide a voltage division setting the feedback voltage inserted in series between the cathode and the grid of tube (V1) thus determining the gain of the amplifier. (R9) and (R10) provide factory gain adjustment, and (R12) and (R13) field adjustment.

The plate power supply is introduced through resistance (R23) with filtering condenser (C12) across the supply. The plate and screen current for the first stage is supplied through resistance (R18). Condenser (C7) provides a screen by-pass, the plate being fed through retard coil (L2). The plate and screen supply for the second stage passes through retard coil (L4), the screen being supplied through resistance (R21) with condenser (C9) providing screen-to-cathode by-pass, and the plate being fed through output transformer (T4).

Retard coil (L4) prevents an a-c short across the feedback path through condenser (C12). Resistance (R20) is the cathode bias resistance for tube (V2). The space current of the first stage can be determined from measurements between test jacks (FIL ACT 5 and 6) and for the second stage between test jacks (3 and 4).

8. CARRIER ALARM AMPLIFIER AND RECTIFIER

This amplifier-rectifier circuit supplies d-c operating current to an external carrier alarm relay to provide an indication of system failure in the event that the transmission path is interrupted. Signals received from the secondary of output transformer (T4) are applied to the control grid of tube (V3) through grid limiting resistance (R24) and to the cathode through resistance (R25). Resistance (R25), by-passed by condenser (C13), is the cathode bias resistance for tube (V3). The plate of tube (V3) delivers the amplified signal to the primary of repeating coil (T5). The plate and screen supply is furnished through resistance (R26) with condenser (C14) filtering this supply and providing screen and plate circuit by-pass to cathode. The screen is fed direct and the plate through the primary of repeating coil (T5). Signals from the secondary of repeating coil (T5) are rectified by the full-wave rectifier (CR2), made up of four germanium varistors, to a d-c current sufficient to hold operated an external relay in the carrier alarm lead circuit. Condenser (C15) serves to filter from the carrier alarm lead, any a-c currents passing the rectifier (CR2), and also charges to the peak voltage of the output of the rectifier to hold its output voltage constant. Should a failure occur in the transmission path, the output of tube (V3) will become negligible and no current will be rectified by (CR2) removing the d-c from the carrier alarm lead. This will cause the external carrier alarm relay to release and provide indication of system failure. The space current for tube (V3) can be determined from measuring between test jacks (FIL ACT 4 and 2).

9. FILAMENT CIRCUIT

The filament supply is obtained from an office 48-volt battery through a resistance, external to this circuit, dropping the voltage to approximately 40 volts. The heaters of tubes (V1), (V2), and (V3), paralleled, are in series with resistance (R30) which is shunted by the series combination of rheostat (R27) and resistances (R28)

and (R29). The drop across the latter provides the heater voltage for thermistor (RT1) when used. Rheostat (R27) provides the required current adjustment.

The grounded end, mid-point, and negative end of the filament string are

externally connected to test jacks (FIL ACT 1, 2 and 3) on the associated Low Group Transmitting circuit. The reduction in heater current for filament activity tests is obtained by bridging a suitable resistance across test jacks (FIL ACT 2 and 3).

BELL TELEPHONE LABORATORIES, INC.

DEPT. 3540-CBH-PGE-GJ