SD-3C220-01

SHEET INDEX

CONTENTS	SHEET NO.	ISSUE NO. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	SHEET NO.
SHEET INDEX	A1	1	2	3	4																																															A1
SUPPORTING INFORMATION																																																				
FS1 TRANSMITTER AMPLIFIER	B1	1	2	3	4																																														B1
FS2 RECEIVER AMPLIFIER	B2	1	2	2	2																																													B2
FS3 SIGNALING CIRCUIT	B3	1	2	2	2																																													B3
APP FIG. 1	C1	1	2	3	3																																												C1
CIRCUIT NOTES	D1	1	2	2	4																																												D1
EQUIPMENT NOTES	D2	1	1	1	1																																												D2
INFORMATION NOTES																																																	

SUPPORTING INFORMATION

CATEGORY	NO.
EQUIPMENT DRAWING	J98718SE
EQUIPMENT DESIGN REQUIREMENTS	J98718 (801-505-153)

SHEET INDEX NOTES

1. WHEN CHANGES ARE MADE IN THIS DRAWING, ONLY THOSE SHEETS AFFECTED WILL BE REISSUED.
2. THIS SHEET INDEX WILL BE REISSUED AND BROUGHT UP TO DATE EACH TIME ANY SHEET OF THE DRAWING IS REISSUED, OR A NEW SHEET IS ADDED.
3. THE ISSUE NUMBER ASSIGNED TO A CHANGED OR NEW SHEET WILL BE THE SAME ISSUE NUMBER AS THAT OF THE SHEET INDEX.
4. SHEETS THAT ARE NOT CHANGED WILL RETAIN THEIR EXISTING ISSUE NUMBER.
5. THE LAST ISSUE NUMBER OF THE SHEET INDEX IS RECOGNIZED AS THE LATEST ISSUE NUMBER OF THE DRAWING AS A WHOLE.

DRWG ISSUE	CD ISSUE	DATE ISSUED
1	1	2-4-75
2A	1 APP 1A	12-26
3A	1 APP 2A	8-25-76
4A	1 APP 3A	2-7-77

SD- 3C220-01 IN22

COMMON SYSTEM SIGNALING

TYPE D3, 24-CHANNEL PULSE CODE MODULATION BANK 4-WIRE DUPLEX CHANNEL UNIT CIRCUIT

AT&TCO STANDARD

SD-3C220-01-A1

7 SHEETS

BELL TELEPHONE LABORATORIES INCORPORATED

6S

SD-3C220-01-A1

FS 1
TRANSMITTER AMPLIFIER

P/O CP1
EXCEPT AS OTHERWISE INDICATED

T J1 (-9 TO +0.5dB TLP) XMT → TO TRUNK CKT
R J2

P/O P1 — T(IN) 4 — E1
P/O P1 — R(IN) 29 — E2

S1: 6 OPEN; 7 1200; 8 600; 9 150; 10
3C1: A
S2: 5 OPEN; 4 1200; 3 600; 2 150; 1

T1: 7, 8, 10, 6, 5, 4, 3, 2, 9, 11, 1

CR7

LF SCR SW

C25 SCR SW, C.5 SCR SW, C1 SCR SW, C2 SCR SW

P/O C1: 11 F .5 — 6; 12 E .25 — 5; 13 D .5 — 4; 14 C 1.0 — 3; 15 B 1.0 — 2; 16 A 1.0 — 1

CW
R1 5K RLF — 2, 3, 1
E3, E4

CW
R2 5K RHF — 3, 2, 1
E5, E6

R3 51.1; R4 51.1; R7 1690; R8 681; R11 51.1; R12 51.1

P/O C1: 7 H .25 — 10; 8 G .25 — 9
L1 5.74 mH — 4, 1
HF SCR SW

C2 .499; C5 .499

P/O CM1
R5 10K; R13 10K
R6 77.7K (SEE NOTE N7)
R36 77.7K — 12G
R9 619
IC1-C — 6, 7, 9, 10
-12: C3 .01 — 12G
+12: C4 .01 — 12G

R10 600

AT1: 1, 2, 3 — 12G
1dB, 2dB, 4dB, 8dB

AT2: 1, 2, 3 — 12G
.1dB, .2dB, .4dB, .8dB

E7

P/O J3 XMT — 11, 10, 9, 8
-7.5dB TLP — 7

E8

E14 — 12G

NC: 4, 6, 9, 12, 13, 20, 21, 23, 24, 26, 28, 32, 33

IC2 TRANSMIT ACTIVE FILTER 525F — 7, 5, 18, 19, 22, 34, 31, 25, 30, 14, 15, 17, 27, 2, 29, 1, 3, 8, 10, 11, 16

C6 .01 — +12, 12G
C7 .01 — 12G, -12

Z1 TRANSMIT GATE CIRCUIT ED-3C414-30
P/O P1 — 7, 47 TPAM
XMT → TO XMT UNIT CKT
2.15; 2K
PULSE AMP — 1, 6, 46 TPAMG
C8 1000PF — 5
C9 2.2 — 2, +12, -12
4 — 12G
12 — 3G7
43 TO XMSN MON UNIT CKT

P/O P1 — 32 5G; 33 -48SP; 8 FG; 7 -48F; 26 FRG; 23 -12; 22 12G; 24 +12; 48 4G; 50 +4

UNIT FACE PLATE
R37 27.1
R38 18

TO TPU CKT
TO FUSE ALARM & FLT CKT
TO FRAME GRD
TO POWER CONVERTER UNIT CKT

BELL SYSTEM PROPRIETARY INFORMATION
NOT FOR PUBLICATION OR
OUTSIDE DISTRIBUTION

SD-3C220-01-BI

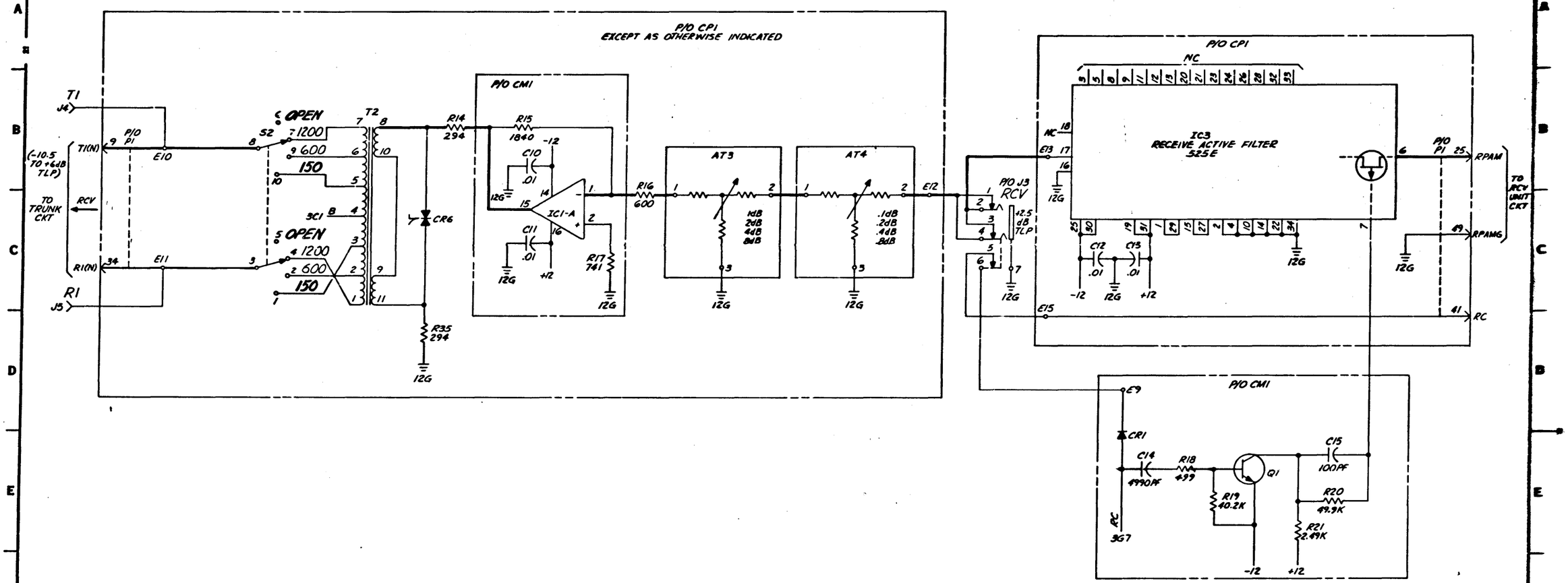
SHEET 4A

4-WIRE DUPLEX CHANNEL UNIT

BELL TELEPHONE LABORATORIES INCORPORATED — SIZE 6S

SD-3C220-01-BI

FS 2
RECEIVER AMPLIFIER



BELL SYSTEM PROPRIETARY INFORMATION
NOT FOR PUBLICATION OR
OUTSIDE DISTRIBUTION

SD-3C220-01-B2

	4-WIRE DUPLEX CHANNEL UNIT	SD-3C220-01-B2
BELL TELEPHONE LABORATORIES INCORPORATED	6S	2A

FS 2
RECEIVER AMPLIFIER

P/O CP1
EXCEPT AS OTHERWISE INDICATED

T1
J4
P/O P1
T1(N)
(-10.5 TO +6dB TLP)
TO TRUNK CKT
RCV
R1(N)
R1
J5
E10
E11
S2
OPEN
1200
600
150
OPEN
1200
600
150
3C1
T2
CR6
R35 294
12G
P/O CM1
R14 294
R15 1840
C10 .01
C11 .01
IC1-A
R16 600
R17 741
-12
+12
12G
AT3
AT4
1dB 2dB 4dB 8dB
.1dB .2dB .4dB .8dB
E12
P/O J3
RCV
+2.5 dB TLP
P/O CP1
NC
IC3
RECEIVE ACTIVE FILTER
525E
E13
E15
C12 .01
C13 .01
P/O P1
RPAM
RPAMG
TO RCV UNIT CKT
RC
12G

P/O CM1
E9
CR1
C14 4990PF
R18 499
R19 40.2K
Q1
C15 100PF
R20 49.9K
R21 2.49K
RC
3G7
-12
+12

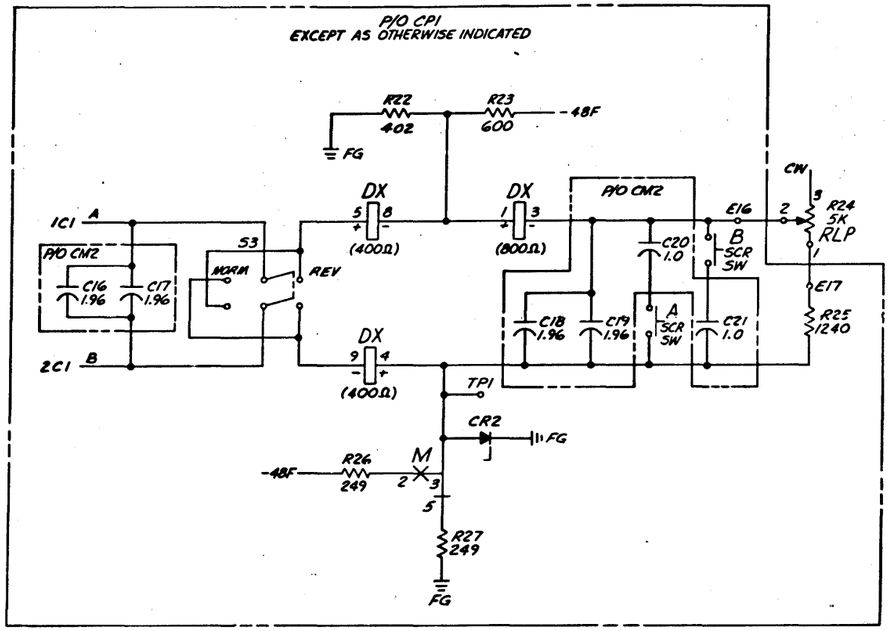
4-WIRE DUPLEX
CHANNEL UNIT

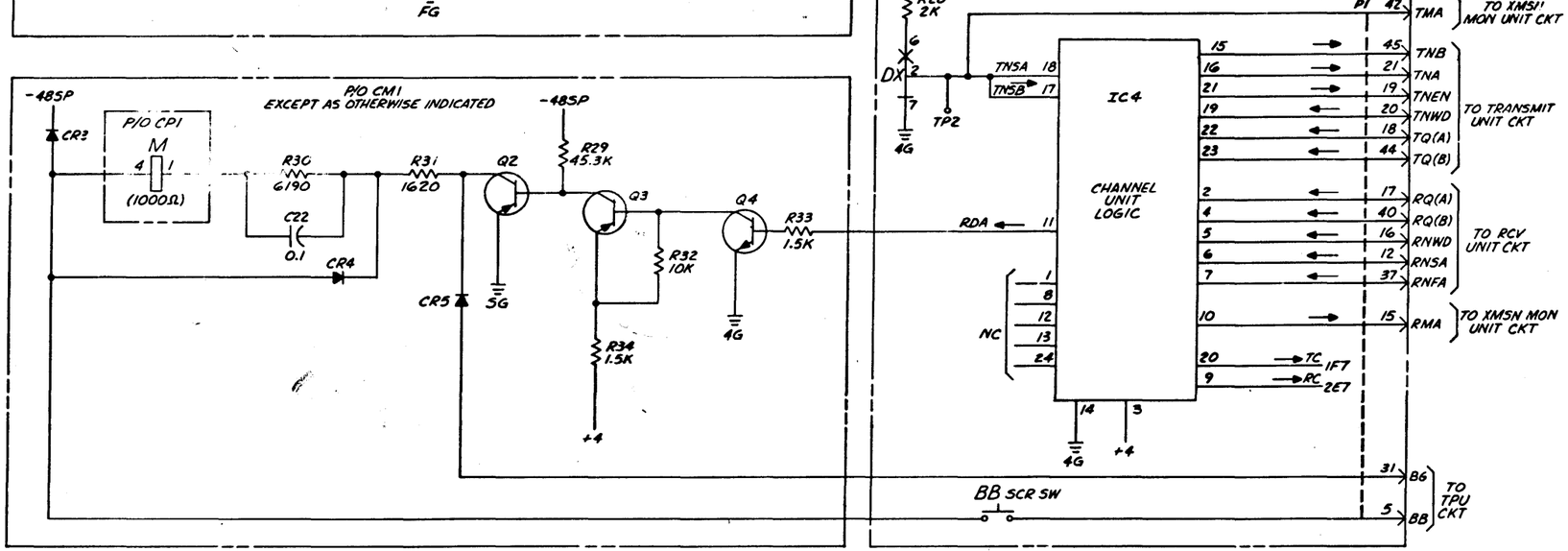
BELL TEL HONE LABORATORIES INCORPORATED

6S

SD-3C220-01-B2

FS 3
SIGNALING CIRCUIT





4-WIRE DUPLEX CHANNEL UNIT	SD-3C220-01-B3
BELL TELEPHONE LABORATORIES INCORPORATED	SHEET 6S

SHEET 2A

SD-3C220-01-B3

APP FIG. 1

CONNECTOR

DESIG	LOC	CODE
T(J1)	1B0	KS-20667,L9
R(J2)	1C0	KS-20667,L13
[1] RCV(J3)	2C6	601AM
[1] XMT(J3)	1C9	
T1(J4)	2B0	KS-20667,L9
R1(J5)	2C0	KS-20667,L13

JACK

SEE CONNECTOR

POTENTIOMETER

DESIG	LOC	CODE
R1	1A2	KS-21423,L3
R2	1A5	KS-21423,L4
R24	3C4	KS-21423,L4

CIRCUIT PACK

DESIG	LOC	CODE
CP1	1B4,2B4, 3B3,3D6	ED-3C482-( )

E/W

RELAY

DX 338A

3E5

3B2

3B3

3C2

M 326A

3D3

3E1

ATTENUATOR

DESIG	LOC	CODE
AT1	1C8	50E
AT2	1C8	50C
AT3	2B4	50E
AT4	2B5	50C

CAPACITOR

DESIG	LOC	CODE
[1] C1,A-H	1C3,1C5	734F,CAP PAK
C2	1B6	535JS,.499
C5	1C6	535JS,.499
C6	1F5	KS-19774,L1,.01
C7	1F6	KS-19774,L1,.01
C8	1F7	KS-16742,L32,1000PF
C9	1F8	KS-20736,L8,2.2
C12	2C7	KS-19774,L1,.01
C13	2C7	KS-19774,L1,.01

DIODE

DESIG	LOC	CODE
CR2	3D3	426AH
CR6	2C2	5218
CR7	1C2	5218

INDUCTOR

DESIG	LOC	CODE
L1	1C5	1622BS,5.74mH

CIRCUIT PACK (CONT)

INTEGRATED CIRCUIT

DESIG	LOC	CODE
IC2	1E6	525F
IC3	2B7	525E
IC4	3E6	1290

NETWORK

DESIG	LOC	CODE
Z1	1E8	30-3C414-30

RESISTOR

DESIG	LOC	CODE
R3	1B4	KS-20810,L1A,51.1
R4	1B4	KS-20810,L1A,51.1
R7	1C4	KS-20810,L1A,1690
R8	1C5	KS-20810,L1A,681
R9	1C6	KS-20810,L1A,619
R10	1C7	KS-20810,L1A,600
R11	1D4	KS-20810,L1A,51.1
R12	1D4	KS-20810,L1A,51.1
R14	2B2	KS-20810,L1A,294
R16	2C4	KS-20810,L1A,600
R22	3B2	KS-8512,L66C,402
R23	3B3	KS-8512,L66C,600
R25	3C4	KS-20810,L1A,1240
R26	3D2	KS-8512,L66C,249
R27	3D3	KS-8512,L66C,249
R28	3E4	KS-20810,L1A,2K
R35	2D2	KS-20810,L1A,294
R37	1G2	KS-20810,L1A,27.1
R38	1G2	KS-20810,L1A,18

SELECTOR BLOCK

DESIG	LOC	CODE
LF	1C2	
C.25	1C3	
C.5	1C3	
[1] C1	1C4	851587785
C2	1C4	
HF	1C5	
[1] A	3C4	840952451
[1] B	3C4	
BB	3H5	P-44P303

SWITCH

DESIG	LOC	CODE
S1	1B1	KS-19104,L18
S2	2B1	KS-19104,L18
S3	3C2	KS-20400,L2

TRANSFORMER

DESIG	LOC	CODE
T1	1B1	257BB1
T2	2B2	257BB1

CIRCUIT MODULE

DESIG	LOC	CODE
CM1	2B3,3E2, 2D8	ED-3C481-( )

E/W

CAPACITOR

DESIG	LOC	CODE
C3	1C7	KS-19774,L2,.01
C4	1D7	KS-19774,L2,.01
C10	2B3	KS-19774,L2,.01
C11	2C3	KS-19774,L2,.01
C14	2E7	KS-16742,L32,4990PF
C15	2E8	KS-16958,L31,100PF
C22	3F2	594C,0.1

DIODE

DESIG	LOC	CODE
CR1	2E7	458C
CR3	3E1	458A
CR4	3F2	458A
CR5	3F3	458A

INTEGRATED CIRCUIT

DESIG	LOC	CODE
[1] IC1-A	2C3	559A
[1] IC1-B	SPARE	
[1] IC1-C	1C6	

RESISTOR

DESIG	LOC	CODE
R5	1B6	KS-20810,L1A,10K
R6	1B7	KS-20810,L1A,79.6K
R13	1C6	KS-20810,L1A,10K
R15	2B3	KS-20810,L1A,1840
R17	2C3	KS-20810,L1A,741
R18	2E7	257A,499
R19	2E8	257A,40.2K
R20	2E8	257A,49.9K
R21	2E8	257A,2.49K
R29	3E3	257A,45.3K
R30	3F2	257A,6190
R31	3F3	257A,1620
R32	3F4	257A,10K
R33	3F4	257A,1.5K
R34	3G3	257A,1.5K
R36	1D7	KS-20810,L1A,77.7K

TRANSISTOR

DESIG	LOC	CODE
Q1	2E8	66J
Q2	3F3	51B
Q3	3F3	51A
Q4	3F4	66G

CIRCUIT MODULE

DESIG	LOC	CODE
CM2	3C1,3B3	ED-3C486-( )

E/W

CAPACITOR

DESIG	LOC	CODE
C16	3C1	596C,1.96
C17	3C1	596C,1.96
C18	3C3	596C,1.96
C19	3C3	596C,1.96
C20	3C4	596C,1.0
C21	3C4	596C,1.0

4-WIRE DUPLEX
CHANNEL UNIT

SD-3C220-01-C1

BELL TELEPHONE LABORATORIES
INCORPORATED

6S

CIRCUIT NOTES:

101.

DESIG	FUSE AMP	POTENTIAL	ONE PER
BATTERY SYMBOL			VOLTAGE RANGE

102.

FEATURE OR OPTION	PROVIDE		
	APP FIG	APP OR WRG	QUANTITY

103.

RECORD OF FIGURES, WIRING AND APPARATUS CHANGES						
CHANGED ON ISSUE	IF JOB RECORDS DO NOT SPECIFY	THIS OPTION WAS FURN	SEE NOTE	USE IN CIRCUIT		
				STD	A & M	MD

CIRCUIT NOTES: (CONT)

104. SCREW SWITCH "BB" SHALL BE CLOSED TO ENABLE CARRIER FAILURE ALARM CIRCUITRY.

105. SCREW SWITCH "A" SHALL BE CLOSED FOR SUBSCRIBER LOOP LENGTHS OVER 30 KFT. SCREW SWITCH "B" SHALL BE CLOSED FOR SUBSCRIBER LOOPS OVER 90 KFT.

106. TALK BATTERY AND GROUND MUST NOT BE CONNECTED TO TERMINALS 25 AND 26.

107. IF GAIN REQUIREMENTS ARE NOT ACHIEVED PER X-79000 (SEC 2, SHEET 4) SPECIFICATION, R6 SHALL BE CHANGED TO ONE OF THE FOLLOWING VALUES AS REQUIRED: 75.0K, 75.9K, 78.7K OR 79.6K.

EQUIPMENT NOTES:

201. "P1" INDICATES CONNECTOR FINGERS OF PWB PLUG END AND MATES WITH A 9028 CONNECTOR.

202. DESIGNATIONS SHOWN IN BOLD CHARACTERS IN B SECTION ARE MARKED ON UNIT.

203. TO CLOSE A SCREW SWITCH, THE SCREW SHALL BE TIGHTENED SUFFICIENTLY TO INSURE CONTACT BETWEEN TERMINALS AND UNDERSIDE OF SCREW HEAD. CAUTION IN TIGHTENING SCREW IS RECOMMENDED TO AVOID SHEARING OF SCREW. TO OPEN A SCREW SWITCH, THE SCREW SHALL BE LOOSENED APPROXIMATELY TWO COMPLETE TURNS UNIT IS NORMALLY FURNISHED WITH SCREWS CLOSED.

INFORMATION NOTES:

301. UNLESS OTHERWISE SPECIFIED:
RESISTANCE VALUES ARE IN OHMS
CAPACITANCE VALUES ARE IN MICROFARADS
VALUES PRECEDED BY THE SYMBOL (+) PLUS OR (-) MINUS ARE IN VOLTS.

SD-3C220-01-D1

SHEET 4A

4-WIRE DUPLEX CHANNEL UNIT

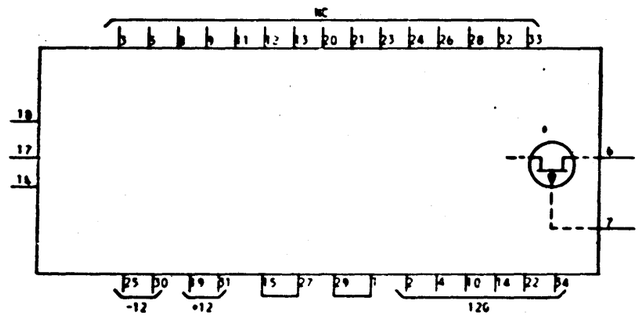
BELL TELEPHONE LABORATORIES INCORPORATED

SYS DES 6S

SD-3C220-01-D1

INFORMATION NOTES (CONT)
502. IC DEVICE CIRCUIT ELEMENTS

(A) **525E** RECEIVE ACTIVE FILTER



INPUT/OUTPUT INFORMATION

PIN 6 IS THE PRIMARY CHANNEL INPUT FOR THE RECEIVE PULSE AMPLITUDE MODULATED SIGNAL.

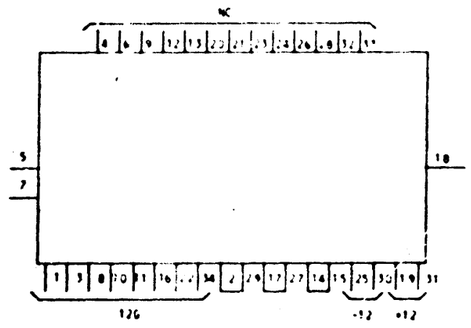
PIN 7 IS THE TIMING INPUT REQUIRED TO SAMPLE THE INDIVIDUAL CHANNEL

PIN 17 IS THE PRIMARY CHANNEL OUTPUT FOR THE RECONSTRUCTED VOICE FREQUENCY SIGNAL.

CIRCUIT DESCRIPTION

THE RECEIVING ACTIVE FILTER RE-CONSTRUCTS THE TRANSMITTED WAVEFORM FROM THE RECEIVED SAMPLES. IT EFFECTIVELY HAS A LOW-PASS CHARACTERISTIC WHICH SUPPRESSES FREQUENCY COMPONENTS IN THE INPUT ABOVE 4 kHz.

(B) **525F** TRANSMIT ACTIVE FILTER



INPUT/OUTPUT INFORMATION

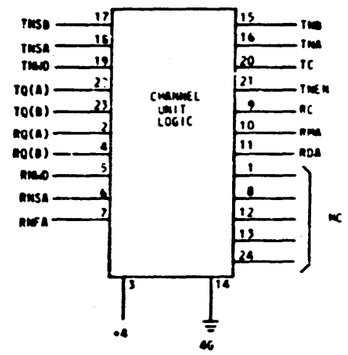
PIN 5 IS THE PRIMARY VOICE FREQUENCY SIGNAL INPUT

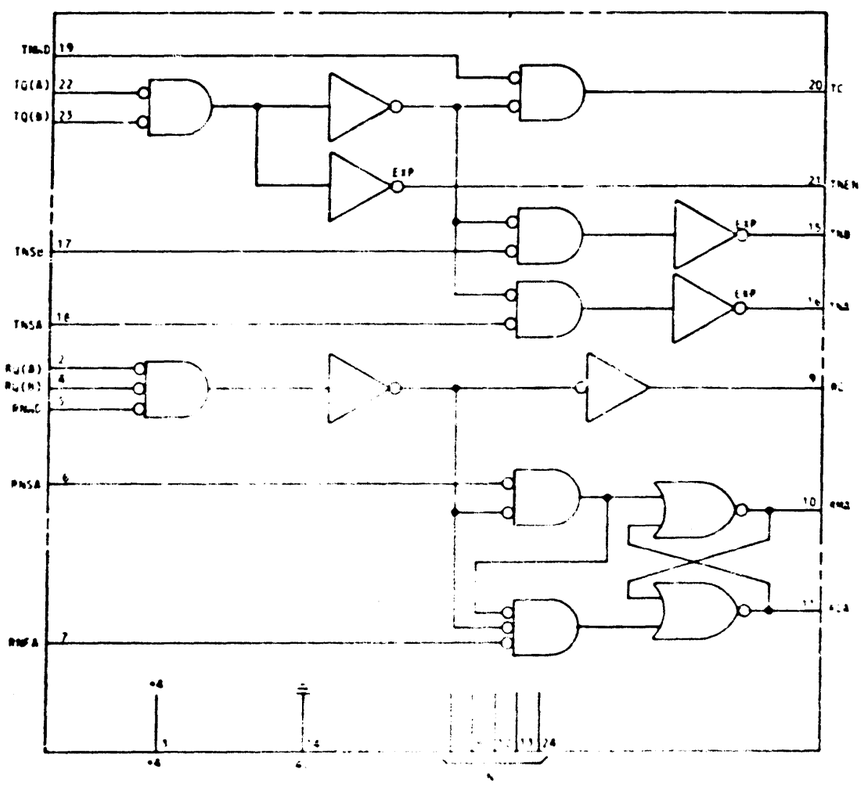
PIN 18 IS THE FILTERED VOICE FREQUENCY OUTPUT

CIRCUIT DESCRIPTION

THE TRANSMIT ACTIVE FILTER IS A LOW-PASS FILTER WHICH EFFECTIVELY SUPPRESSES FREQUENCIES ABOVE 4 kHz. THESE FREQUENCIES WOULD PRODUCE MODULATION PRODUCTS BELOW 4 kHz IF THEY WERE NOT SUPPRESSED.

(C) **129D** CHANNEL UNIT LOGIC

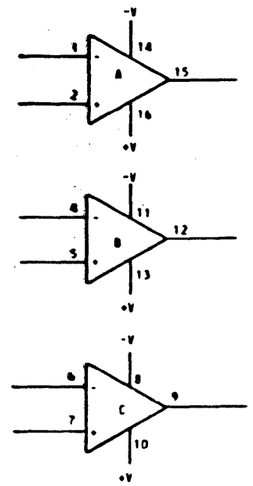




INPUT/OUTPUT INFORMATION

CIRCUIT DESCRIPTION

(D) **559A** HYBRID INTEGRATED CIRCUIT TRIPLE OPERATIONAL AMPLIFIER



INPUT/OUTPUT INFORMATION

CIRCUIT DESCRIPTION