SHEET INDEX

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APPARATUS INDEX

DESIG	LOCATION FS	LOCATION APP FIG.	LOCATION EQUIP.
CIRCUIT PACKAGES			
CPS 1	1C1	1	
CPS 2	1C3	1	
CPS 3A	1A4	1	
CPS 3B	1C4	1	
CPS 3C	1F4	1	
CPS 3D	1G4	1	
CPS 4	1G4	1	
CPS 5	1D6	1	
CPS 6	1D7	1	
CONNECTORS			
F	SEE APP FIG.	1	
F		2	
DIODES			
CR1	1E6	1	

DESIG	LOCATION FS	LOCATION APP FIG.	LOCATION EQUIP.
FILTERS			
BEF	1C2	1	

SUPPORTING INFORMATION

CATEGORY	NO.
EQUIP. DESIGN SPEC	J99289

OPTION INDEX

APP OR WRG	LOCATION
Z	APP FIG. 1
Y	APP FIG. 1
X	APP FIG. 1
W	APP FIG. 1

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.

ISSUE	ISSUE	ISSUED		
1	1	9-28-62	RWR HTS	LCJR EGS FC
2D	1 APP 1D	1-10-63	RT MR	LCJR EGS TEB
3A	2A	8-5-63	JDS MS	LCJR EGS TEB
4B	2A APP 1B	2-1-65	SWD GWW	FWF EGS MEJ
5B	2A APP 2B	6-22-65	MR —	GTK EGS JJM
6D	2A APP 3D	7/15/66	SUM JTF	RM EGS WFO
7B	2A APP 4B	7-15-66	SUM JTF	RN EGS WFO
8D	2A APP 5D	10-24-67	JMC —	GTK [illegible] WFO
9B	3B	5-21-68	JMC ADG	GTK EGS WFO
10B	3B APP 1B	3-12-70	BAH CAS	MS RCC WFO
11B	3B APP 2B	10-20-70	VB CAS	MS RCC WFO
12D	3B APP 3D	4-15-71	ATL GB	MS RCC WFO

REPLACES BUT NOT INTERCHANGABLE WITH SD-95287-01

12

SD-98148-01 IN99

AT&TCO STANDARD

COMMON SYSTEMS
"TOUCH-TONE" CALLING
RECEIVING CIRCUIT
TYPE A3

SD-98148-01-A1
11 SHEETS

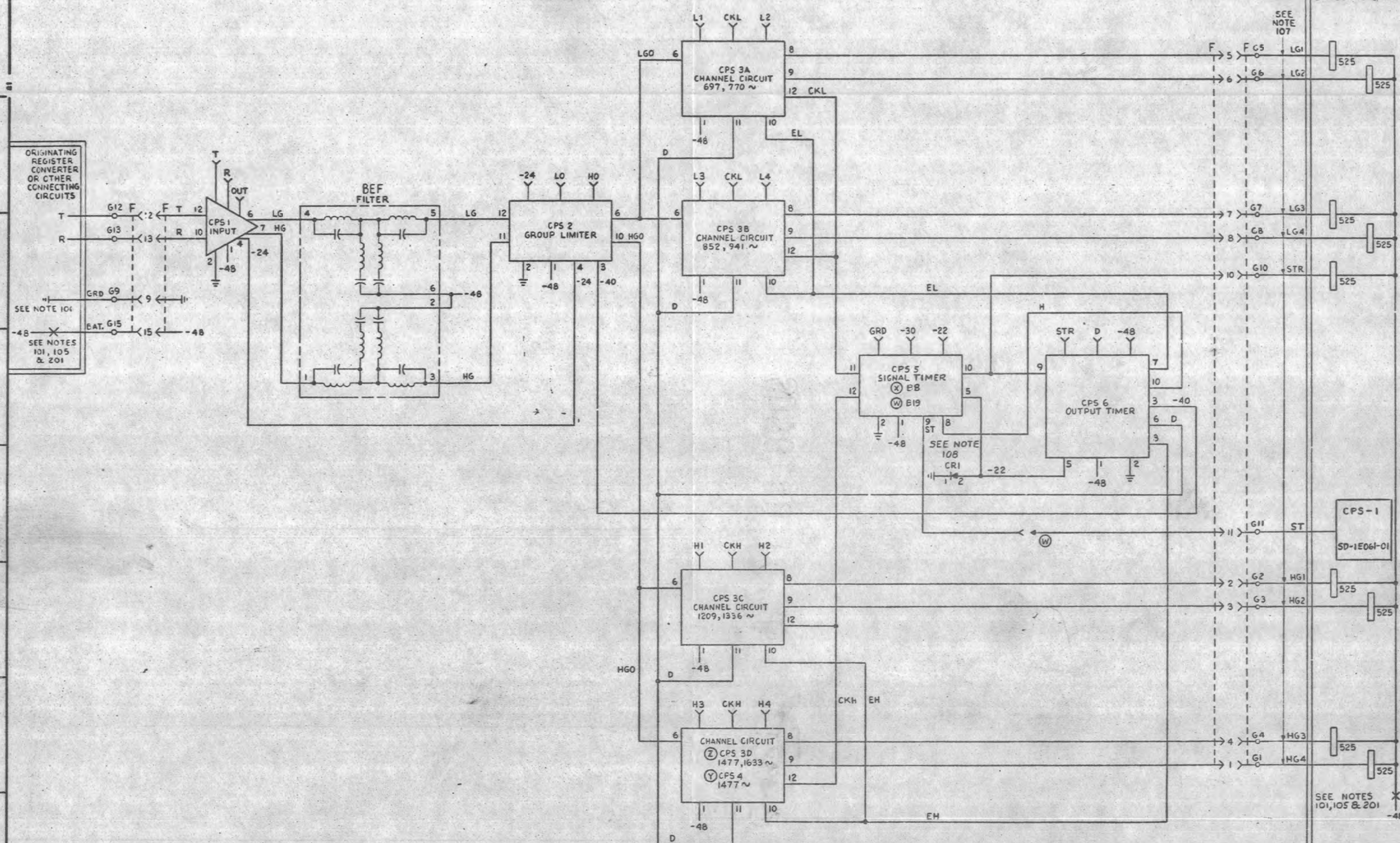
BELL TELEPHONE LABORATORIES INCORPORATED 6S

SD-98148-01-A1

E-7395 (1-61)

FS 1

"TOUCH-TONE" CALLING RECEIVING CIRCUIT



ISSUE
1
2D
4B
5B
6D
12D

12

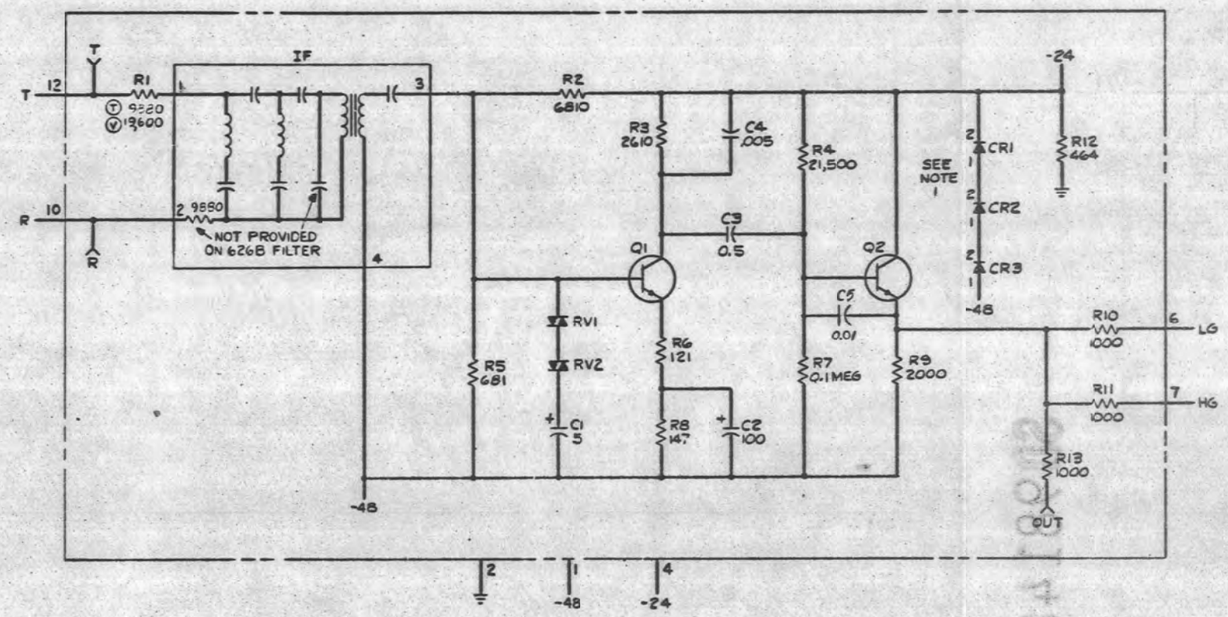
"TOUCH-TONE" CALLING RECEIVING CIRCUIT TYPE A3

BELL TELEPHONE LABORATORIES INCORPORATED

SD-98148-01-B1

6S

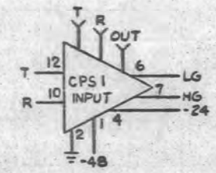
CPS 1
INPUT AMPLIFIER
B1



SUPPORTING INFORMATION

CATEGORY	NO.
CIRCUIT PACK CODE	B1
ASSEMBLY DRAWING	A154777
CONNECTOR ON FRAME	909A

SYMBOL



COMPONENT LIST

CAPACITOR

DESIG	CODE
C1	601A
C2	602B
C3	542A
C4	KS-13814,L8, .005
C5	(N) KS-16048,L4, .01

DIODE

DESIG	CODE
CR1	(S) 420M (R) 446C
CR2	(S) 420M (R) 446C
CR3	(S) 420M (R) 446C

FILTER

DESIG	CODE
IF	(V) 626B
	(T) 626C

RESISTOR

DESIG	CODE
R1	(T) 221A, 9880
	(V) 221A, 19,600
R2	221A, 6810
R3	221A, 2610
R4	221A, 21,500
R5	221A, 681
R6	221A, 121
R7	221A, .1 MEG
R8	221A, 147
R9	KS-13491,L1, 2000
R10	221A, 1000
R11	221AH 1000

RESISTOR (CONT)

DESIG	CODE
R12	(ZE) KS-14603,L1A, 464
	(ZF) KS-20289,L1A, 464
R13	KS-13490,L1, 1000

TRANSISTOR

DESIG	CODE
Q1	(ZC) 16F (ZD) 66F
Q2	(ZC) 16F (ZD) 66F

VARISTOR

DESIG	CODE
RV1	100A
RV2	100A

DESCRIPTION:

THE CPS 1 INPUT AMPLIFIER MATCHES FROM A HIGH IMPEDANCE, REQUIRED AT THE TOUCH-TONE RECEIVER INPUT, TO THE IMPEDANCE OF THE 632A BAND ELIMINATION FILTER, WITH A SLIGHT VOLTAGE GAIN, AND INCLUDES A HIGH PASS FILTER (IF) TO SUPPRESS AC INDUCTION NOISE, THE PRINCIPAL COMPONENTS OF PRECISION DIAL TONE AND OTHER LOW FREQUENCY TRANSIENTS. THE (IF) FILTER CUTS OFF AT ABOUT 600 CPS AND HAS AN INPUT IMPEDANCE OF 20,000 OHMS AND OUTPUT IMPEDANCE OF 600 OHMS. (R1) PROVIDES HIGH INPUT IMPEDANCE AT LOW FREQUENCIES AND WHEN OPTION V IS PROVIDED, ACTS AS A SOURCE IMPEDANCE TO THE (IF) FILTER IMPEDANCE. WHEN OPTION T IS PROVIDED R1 IS REDUCED BECAUSE PART OF THE SOURCE IMPEDANCE IS CONTAINED WITHIN THE FILTER. THIS BALANCES THE RECEIVER INPUT AND IMPROVES THE REJECTION OF LONGITUDINAL NOISE. INPUTS ON TERMINALS 10 AND 12 IN EXCESS OF 2 VOLTS PEAK-TO-PEAK ARE SUPPRESSED BY VARISTORS (RV1), (RV2) AND CAPACITOR (C1) IN ORDER TO PROTECT (Q1) AND REDUCE OUTPUT TRANSIENTS. (Q1) ACTS AS A VOLTAGE AMPLIFIER PROVIDING ABOUT 24 DB GAIN. (R2) AND (R5) BIAS THE BASE OF (Q1) AT ABOUT +2 VOLTS AND PROVIDE A 600 OHM TERMINATION FOR THE (IF) FILTER. (R6) PROVIDES DEGENERATIVE FEEDBACK TO STABILIZE GAIN. (Q2) ACTS AS AN EMITTER FOLLOWER TO PROVIDE A LOW (ABOUT 100 OHMS) OUTPUT IMPEDANCE. IT IS BIASED BY (R4) AND (R7) SUCH THAT THE EMITTER CURRENT THROUGH (R9) IS ABOUT 8 MA. (R10) AND (R11) PROVIDE A NOMINAL CONSTANT OUTPUT IMPEDENCE OF 1000 OHMS AT TERMINALS 6 AND 7. CAPACITOR (C4) PROVIDES ROLL-OFF IN THE AMPLIFIER GAIN ABOVE THE AUDIO FREQUENCY RANGE. CAPACITOR (C5) DEGRADES THE HIGH FREQUENCY RESPONSE OF TRANSISTOR (Q2) THIS PREVENTS THE DEVELOPMENT OF UNWANTED HIGH FREQUENCY OSCILLATIONS BY TRANSISTOR (Q2). REGULATED -24 V DC SUPPLY FOR THE INPUT AMPLIFIER AND CPS 2 GROUP LIMITER (VIA TERMINAL 4) IS DERIVED FROM ZENER DIODES (CR1), (CR2), AND (CR3), WITH BLEEDER CURRENT SUPPLIED BY (R12) CAPACITOR (C4) INSURES HIGH FREQUENCY STABILITY. TEST POST ARE PROVIDED AT TIP, RING INPUT AND OUTPUT.

SHEET NOTES:

1. ZENER DIODE NOMINAL BREAKDOWN VOLTAGE.
   (CR1)- 8.2 VDC
   (CR2)- 8.2 VDC
   (CR3)- 8.2 VDC

ISSUE	
1	
4B	
5B	
7B	
8D	
9B	
12D	

12

"TOUCH-TONE" CALLING
RECEIVING CIRCUIT
TYPE A3

SD-98148-01-B11

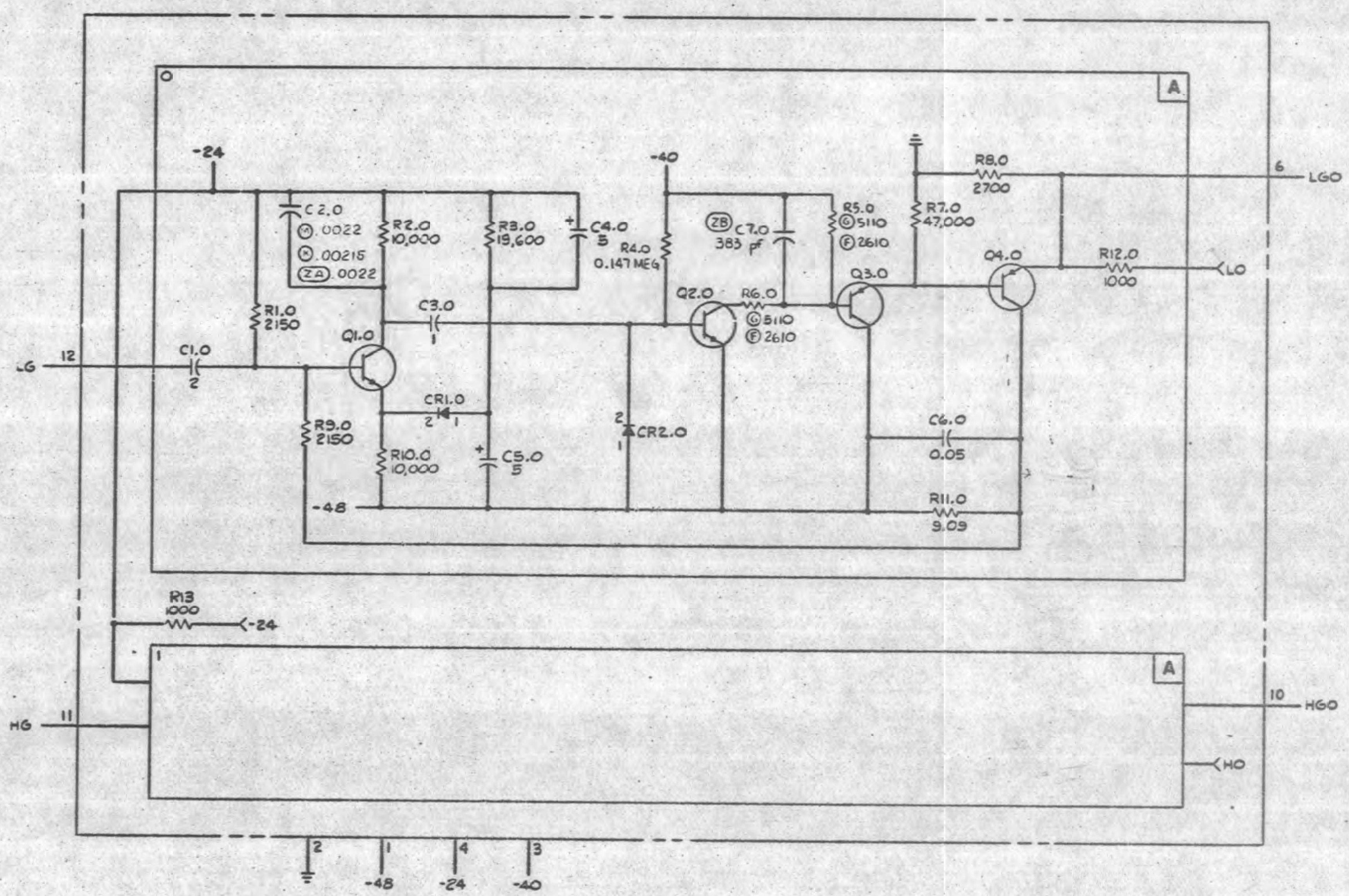
BELL TELEPHONE LABORATORIES INCORPORATED 6S

SD-98148-01-B11

EAGLE E1

CPS 2

GROUP LIMITER
B2

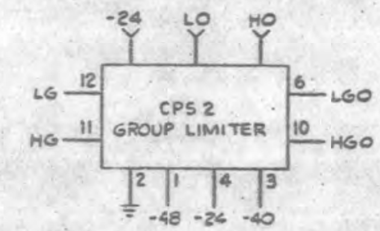


SUPPORTING INFORMATION

CATEGORY	NO.
CIRCUIT PACK CODE	B2
ASSEMBLY DRAWING	A154778
CONNECTOR ON FRAME	909A

ISSUE	
1	
4B	
5B	MR
8D	
9B	
10B	
11B	
12D	

SYMBOL



DESCRIPTION:

THIS PACKAGE CONTAINS TWO LIMITER CIRCUITS, ONE FOR EACH OF THE TWO GROUPS OF "TOUCH-TONE" SIGNALING FREQUENCIES TO PROVIDE AN ESSENTIALLY SQUARE WAVE OUTPUT WHOSE TRANSITIONS OCCUR AT THE ZERO VOLTAGE AXIS CROSSINGS OF THE INPUT SIGNAL. EACH LIMITER CIRCUIT CONSISTS OF TWO LIMITER STAGES FOLLOWED BY TWO CASCADED EMITTER FOLLOWERS TO PROVIDE A LOW OUTPUT IMPEDANCE FOR DRIVING THE CPS 3, 4 CHANNEL CIRCUITS. POWER IS SUPPLIED AT TERMINAL 4 (-24 VOLTS FROM CPS 1), TERMINAL 3 (-40 VOLTS FROM CPS 6) TERMINAL 2 (GROUND) AND TERMINAL 1 (-43 VOLTS). THE LIMITER CIRCUIT WITH COMPONENT POSTSCRIPTS .0 IS INTENDED FOR THE LOW GROUP FREQUENCIES AND THE ONE WITH POSTSCRIPTS .1 FOR THE HIGH GROUP. (R1) AND (R9) BIAS THE BASE OF (Q1) HALFWAY BETWEEN -48 AND -24 VOLTS AND PROVIDE A 1000 OHM INPUT TERMINATION. (R11) PROVIDES NEGATIVE FEEDBACK FROM THE COLLECTOR OF (Q4). THE VOLTAGE DROP ACROSS (R3) AND (R10) IS EQUAL DUE TO THE BASE BIAS AND SINCE (R3) = 2(R10), (Q1) MUST SUPPLY TO (R10) THE OTHER HALF OF THE CURRENT IT NEEDS TO PRODUCE THE REQUIRED VOLTAGE DROP. CURRENT FROM (Q1) FLOWS THROUGH (R2) TO FIX THE COLLECTOR VOLTAGE OF (Q1) HALF WAY BETWEEN ITS EMITTER AND -24 VOLTS. WHEN AN AC SIGNAL IS APPLIED AT THE INPUT, THE POSITIVE HALF CYCLE CAUSES (CR1) TO BE BACK BIASED AND (Q1) SATURATES, AS ITS COLLECTOR CURRENT DOUBLES. THE NEGATIVE HALF CYCLE CUTS (Q1) OFF. HENCE THE COLLECTOR CURRENT OF (Q1) IS A SYMMETRICAL SQUARE WAVE. (Q2) ACTS AS A TRANSISTOR SWITCH. WITH (CR2) THE SWITCH INPUT IMPEDANCE IS ESSENTIALLY EQUAL FOR BOTH POSITIVE AND NEGATIVE INPUT SWINGS. THIS RESULTS IN POSITIVE HALF CYCLE SWINGS ON THE COLLECTOR OF (Q1) DRIVING BASE CURRENT INTO (Q2) EQUAL AND OPPOSITE TO THE CURRENT IN (CR2) ON NEGATIVE HALF CYCLES. HENCE THE BASE CURRENT IN (Q2) IS ESSENTIALLY EQUAL TO THE NEGATIVE HALF CYCLE COLLECTOR CURRENT SWING ON (Q1) AND A SQUARE WAVE OF VOLTAGE IS DEVELOPED AT THE COLLECTOR OF (Q2). THE AMPLITUDE OF THIS SWING IS ESSENTIALLY EQUAL TO THE DIFFERENCE BETWEEN THE -40 VOLT SUPPLY AND THE -48 VOLT SUPPLY. THE -40 VOLT SUPPLY IS ALSO USED TO SET THE THRESHOLD OF THE CPS3, 4 CHANNEL CIRCUIT DETECTORS; HENCE CHANGES IN SUPPLY ARE SELF COMPENSATING. (R5) AND (R6) ACT AS A VOLTAGE DIVIDER TO SUPPLY HALF OF THE COLLECTOR SQUARE WAVE VOLTAGE OF (Q2) TO (Q3) AND BIAS ITS BASE ABOUT 4 VOLTS ABOVE THE 48 VOLT SUPPLY. (Q3) AND (Q4) ACT AS CASCADED EMITTER FOLLOWERS TO PRODUCE A 4 VOLT P/P SQUARE WAVE OUTPUT WITH A LOW (ABOUT 10 OHMS) OUTPUT IMPEDANCE. RESISTOR (R11) WHICH PROVIDES NEGATIVE FEEDBACK SETS AND STABILIZES LIMITER SENSITIVITY AND, IN CONJUNCTION WITH THE CPS3, 4 CHANNEL CIRCUITS WHOSE INPUT IMPEDANCES ARE MINIMUM AT TOUCH-TONE SIGNALING FREQUENCIES, PROVIDES EQUALIZATION OF LIMITER SENSITIVITY. THIS RESULTS IN LOWER SENSITIVITY AT THE SIGNALING FREQUENCIES AND HENCE PROVIDES PROTECTION AGAINST SPEECH INPUTS SIMULATING SIGNALING FREQUENCY OUTPUTS BY EMPHASIZING OUT OF BAND FREQUENCIES. CAPACITORS (C2) AND (C6) INSURE HIGH FREQUENCY STABILITY. TEST POSTS ARE PROVIDED AT EACH LIMITER OUTPUT AND ON THE -24 VOLT SUPPLY.

COMPONENT LIST

CAPACITOR

DESIG	CODE
C1	542F
C2	(M) KS-14138, L1, .0022
	(K) 594G .00215
	(ZA) KS-20300 L5, .0022 OR 594G, .00215
C3	542N
C4	601A
C5	601A
C6	KS-13814 L1, .05
(ZB) C7	570DK, 383pf

DIODE

DESIG	CODE
CR1	(S) 420G (R) 458C
CR2	(S) 420G (R) 458C

RESISTOR

DESIG	CODE
R1	221A, 2150
R2	221A, 10,000
R3	221A, 19,600
R4	221A, .147 MEG.
R5	221A (G) 5110 (F) 2610
R6	221A (G) 5110 (F) 2610
R7	KS-13490, L1, 47,000
R8	KS-13492, L1, 2700
R9	221A, 2150
R10	221A, 10,000
R11	221A, 9.09
R12	KS-13490, L1, 1000
R13	KS-13490, L1, 1000

TRANSISTOR

DESIG	CODE
Q1	(ZC) 16F (ZD) 66F
Q2	(ZC) 16F (ZD) 66F
Q3	12D
Q4	12D

12

COMMON SYSTEMS
"TOUCH-TONE" CALLING
RECEIVING CIRCUIT
TYPE A3

(2) SD-98148-01-B12

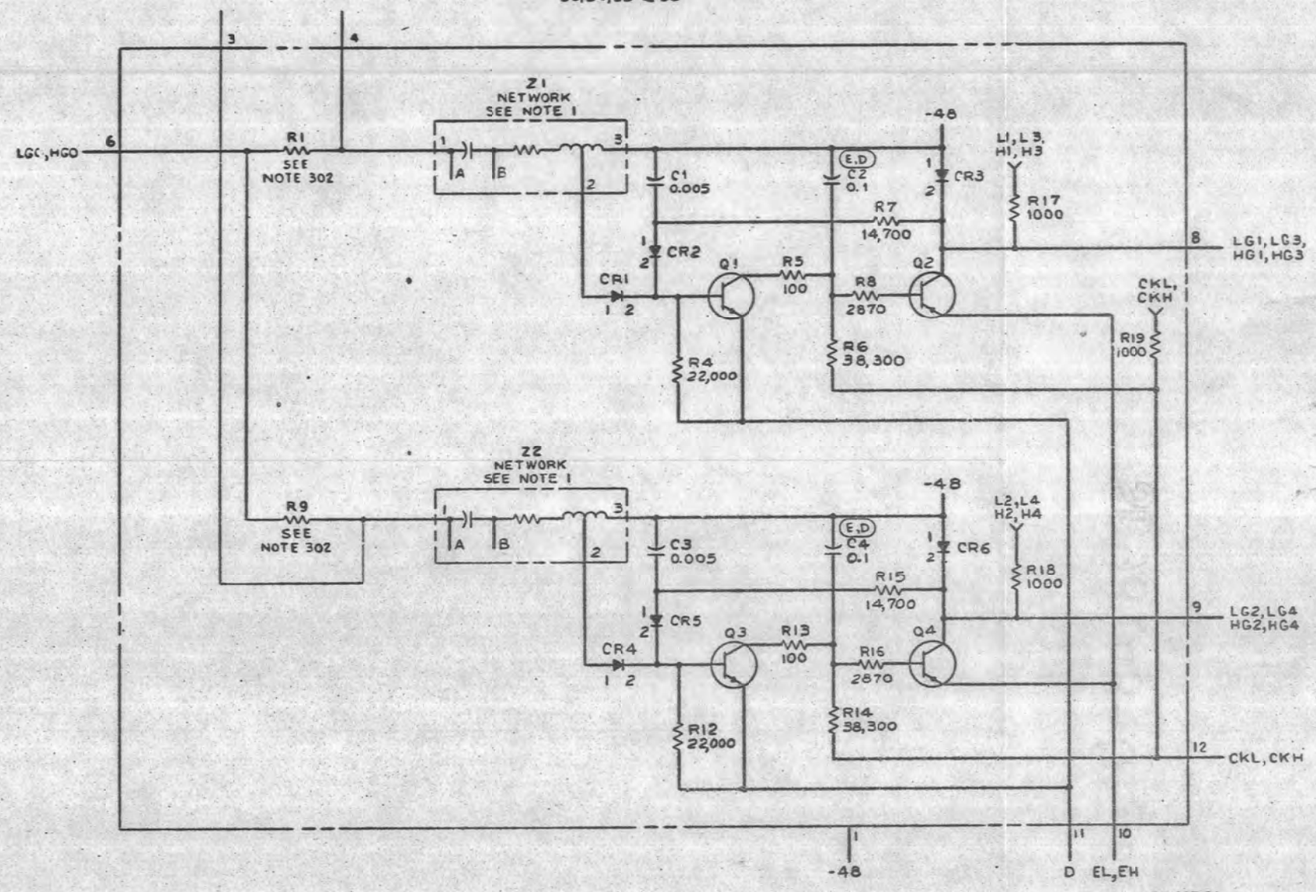
BELL TELEPHONE LABORATORIES
INCORPORATED

6S

SD-98148-01-B12

CPS 3A,3B,3C & 3D

CHANNEL CIRCUIT
B3,B4,B5 & B6



SUPPORTING INFORMATION

CATEGORY	NO.
CIRCUIT PACK CODE ASSEMBLY DRAWING CONNECTOR ON FRAME	B3,B4,B5 & B6 4154779 909A

DESCRIPTION:

EACH CHANNEL CIRCUIT CONSISTS OF TWO CIRCUITS FOR THE RECOGNITION AND DETECTION OF A SPECIFIC "TOUCH-TONE" SIGNALING FREQUENCY AND FOR LOCKING IN A DETECTED SIGNAL WHILE AN OUTPUT IS BEING DELIVERED TO THE ASSOCIATED CONNECTING CIRCUIT. THE CIRCUIT IS MEANT TO BE DRIVEN BY THE CPS 2 LIMITER WITH THE LOW LIMITER DRIVING THE TWO LOW GROUP CHANNEL CIRCUITS AND THE HIGH LIMITER DRIVING THE TWO HIGH GROUP CHANNEL CIRCUITS AT TERMINAL 6. CONTROL VOLTAGES ARE SUPPLIED BY CPS 6 AT TERMINALS 10 AND 11, OUTPUT LEADS, TERMINALS 8 AND 9 SHOULD RETURN TO -48 VOLTS THROUGH THE ASSOCIATED CONNECTING CIRCUITS DIGIT RELAYS. OUTPUT TERMINAL 12 IS RETURNED TO ABOUT -7 VOLTS THROUGH 13300 OHMS IN CPS 105. ONLY THE TOP HALF OF THE CHANNEL CIRCUIT WILL BE DESCRIBED AS THE OTHER HALF OPERATES IN AN IDENTICAL MANNER EXCEPT AT A DIFFERENT INPUT FREQUENCY. RESISTOR (R1) IS PROVIDED IN SERIES WITH THE TUNED CIRCUIT (Z1). TO ADJUST ITS EFFECTIVE Q AND CHANNEL BANDWIDTH. THE LIMITER DRIVES THE TUNED CIRCUIT WITH A SQUARE WAVE OF ABOUT 4 VOLTS P/P. AT RESONANCE THE FUNDAMENTAL FREQUENCY COMPONENT DEVELOPED ACROSS THE SERIES INDUCTANCE IS QUITE LARGE AND PROPORTIONAL TO Q. WITH Q ADJUSTED TO ABOUT 14, A SINUSOIDAL TAP VOLTAGE OF ABOUT 12 VOLTS PEAK IS DEVELOPED. THE EMITTER OF (Q1) IS NORMALLY BIASED ABOUT 8 VOLTS ABOVE THE -48 VOLT TUNED CIRCUIT RETURN, HENCE POSITIVE HALF CYCLES OF THE TAP VOLTAGE IN EXCESS OF 8 VOLTS PLUS THE BASE - EMITTER DROP OF (Q1) PLUS THE DROP ACROSS (CR1) DRIVE (Q1) ON. HENCE A DETECTOR THRESHOLD OF ABOUT 9.5 VOLTS OR ABOUT 2db BELOW THE +12 VOLT PEAK POSITIVE OUTPUT OF THE TUNED CIRCUITS, IS SET. THIS THRESHOLD INSURES THAT ONLY ONE CHANNEL CIRCUIT DETECTOR WILL BE ENERGIZED BY A GIVEN LIMITER AT A TIME, AND SETS DETECTOR BANDWIDTH TO ABOUT 5% OF THE RESONANT FREQUENCY, DEPENDING ON THE EXACT VALUE OF Q. WHEN A SIGNALING FREQUENCY CAUSES THE TUNED CIRCUIT VOLTAGE TO DRIVE (Q1) ON, (Q1) RAPIDLY DISCHARGES (C2) AND CAUSES A DROP IN VOLTAGE AT TERMINAL 12. THIS INDICATES A SIGNAL CHECK TO CPS 5. AT THE COMPLETION OF THE POSITIVE HALF CYCLE (Q1) TURNS OFF AND (C2) CHARGES WITH A TIME CONSTANT DETERMINED BY (R6), (C2) AND CPS 5. SHOULD THE INPUT SIGNAL STOP AT THIS POINT THE VOLTAGE AT TERMINAL 12 WILL RISE SUFFICIENTLY TO NO LONGER INDICATE A SIGNAL CHECK TO CPS 5, IN ABOUT 4 MILLISECONDS. HOWEVER, AS LONG AS THE INPUT PERSISTS THE COLLECTOR VOLTAGE OF (Q1) WILL BE LESS THAN 16 VOLTS ABOVE THE -48 VOLT SUPPLY. THE OUTPUT TRANSISTOR (Q2) IS NOT ACTIVATED BY CPS 6 VIA TERMINAL 10, UNTIL A VALID SIGNAL HAS PERSISTED LONG ENOUGH FOR THE CPS 5 SIGNAL TIMER TO RUN OUT. AT THIS TIME CPS 6 IS TRIGGERED AND -22 VOLTS IS APPLIED TO TERMINAL 10 AND A 750 OHM RESISTOR IS INSERTED IN SERIES WITH THE -48 VOLT SUPPLY TO TERMINAL 11. IF (Q1) IS OPERATED AT THIS TIME ITS COLLECTOR VOLTAGE IS SUFFICIENTLY NEGATIVE AS TO TURN ON (Q2) THROUGH (R8) CAUSING COLLECTOR CURRENT TO FLOW THROUGH (R7), (CR2) TO THE BASE OF (Q1) LOCKING (Q1) AND (Q2) ON. THE COLLECTOR VOLTAGE OF (Q2) DROPS TO -22 VOLTS CAUSING CURRENT TO FLOW IN THE ASSOCIATED CONNECTING CIRCUIT RELAY VIA TERMINAL 8 AND OPERATING THE RELAY. EMITTER CURRENT FROM (Q1) FLOWS THROUGH THE 750 OHM RESISTOR INSERTED IN SERIES BY CPS 6 CAUSING THE EMITTER VOLTAGE OF (Q1) TO RISE TO A POINT WHERE IT IS IMPOSSIBLE TO OPERATE A DETECTOR FROM A TUNED CIRCUIT OUTPUT. THIS PRECLUDES THE POSSIBILITY OF FALSE DETECTOR OPERATION DURING THE READ OUT INTERVAL. (Q1) AND (Q2) REMAIN LOCKED UNTIL CPS 6 RETURNS TO NORMAL AND REMOVES THE -22 VOLT BIAS FROM TERMINAL 10. IF THE INPUT SIGNAL IS STILL PRESENT AT THIS TIME (Q1) REMAINS OPERATED AS IT WAS INITIALLY AND (Q2) TURNS OFF, RELEASING THE CONNECTING CIRCUIT DIGIT RELAY. (R5) LIMITS THE COLLECTOR CURRENT IN (Q1) WHEN (C2) IS DISCHARGED. CAPACITOR (C1) REDUCES SWITCHING TRANSIENTS. (CR3) PREVENTS NEGATIVE INDUCTIVE SURGES FROM THE DIGIT RELAY WHEN (Q2) TURNS OFF. TEST POINTS ARE PROVIDED AT THE DIGIT RELAY OUTPUTS AND THE CHECK OUTPUT TO CPS 5. TERMINALS 3 AND 4 ARE PROVIDED FOR MANUFACTURING TESTING ONLY.

COMPONENT LIST

CAPACITOR

DESIG	CODE
C1	KS-13814,L8, .005
C2	(E) 542L, (U) 722C
C3	KS-13814,L8, .005
C4	(E) 542L, (U) 722C

DIODE

DESIG	CODE
CR1	(S) 420G (R) 458C
CR2	(S) 420G (R) 458C
CR3	441J
CR4	(S) 420G (R) 458C
CR5	(S) 420G (R) 458C
CR6	441J

NETWORK

DESIG	CODE
Z1	SEE NOTE 1
Z2	SEE NOTE 1

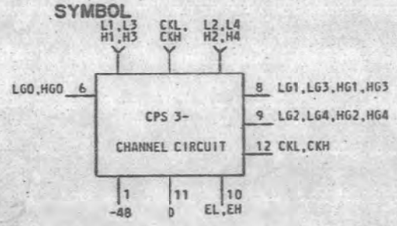
RESISTOR

DESIG	CODE
R1	221A; SEE NOTE 302
R4	KS-13490,L1, 22,000
R5	KS-13490,L1, 100
R6	221A, 38,300
R7	221A, 14,700
R8	221A, 2870
R9	221A, SEE NOTE 302
R12	KS-13490,L1 22,000
R13	KS-13490,L1, 100
R14	221A, 38,300
R15	221A, 14,700
R16	221A, 2870
R17	KS-13490,L1, 1000
R18	KS-13490,L1, 1000
R19	KS-13490,L1, 1000

TRANSISTOR

DESIG	CODE
Q1	(ZC) 16F (ZD) 66F
Q2	12N
Q3	(ZC) 16F (ZD) 66F
Q4	12N

SYMBOL



SHEET NOTES:

1

CPS	CODE	FREQUENCY	Z1	Z2
3A	B3	697,770~	4053A	4053B
3B	B4	852,941~	4053C	4053D
3C	B5	1209,1336~	4053E	4053F
3D	B6	1477,1633~	4053G	4053H

ISSUE

1		
2D	RT MR ICB	
4B	BMB LWW WJ	
5B	MR - WM	
8D		
10B		
12D		

12

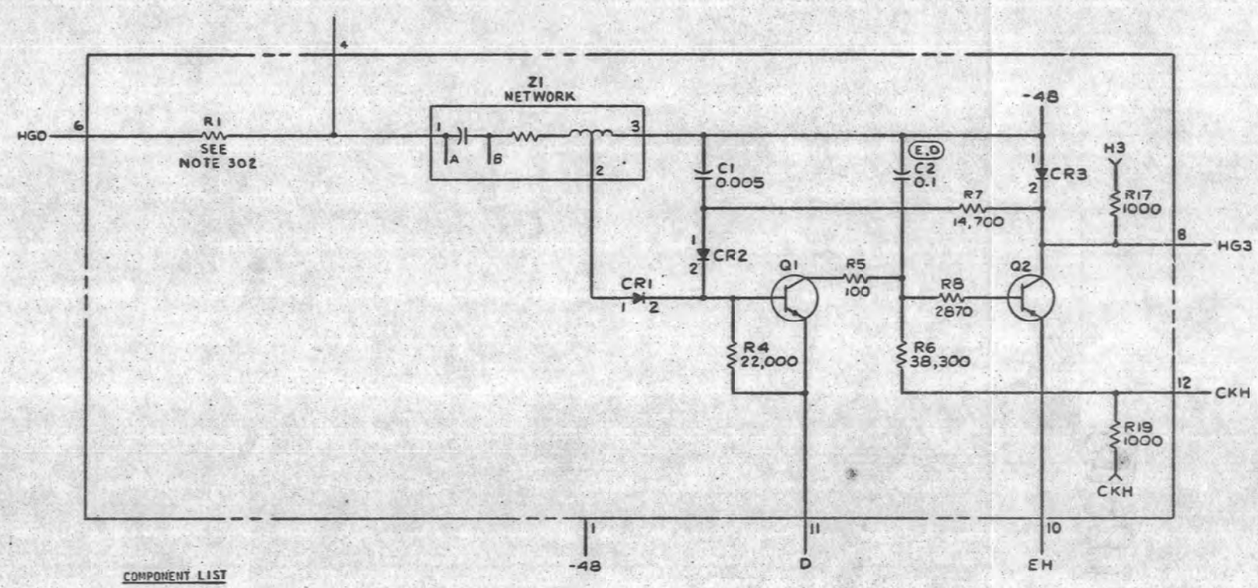
COMMON SYSTEMS
"TOUCH-TONE" CALLING
RECEIVING CIRCUIT
TYPE A3
(2)

SD-98148-01-B13

BELL TELEPHONE LABORATORIES
INCORPORATED
SIZE 6S

SD98148-01-B13

CPS 4
CHANNEL CIRCUIT
B7



COMPONENT LIST

CAPACITOR

DESIG	CODE
C1	KS-13814,L8, .005
C2	(E) 542L, (D) 722C

TRANSISTOR

DESIG	CODE
Q1	(ZC) 16F (ZD) 66F
Q2	12N

DIODE

DESIG	CODE
CR1	(S) 420G (R) 458C
CR2	(S) 420G (R) 458C
CR3	441J

NETWORK

DESIG	CODE
Z1	4053G

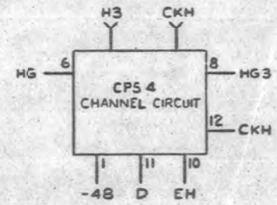
RESISTOR

DESIG	CODE
R1	221A, SEE NOTE 302
R4	KS-13490,L1,22,000
R5	KS-13490,L1,100
R6	221A,38,300
R7	221A,14,700
R8	221A,2870
R17	KS-13490,L1,1000
R19	KS-13490,L1,1000

SUPPORTING INFORMATION

CATEGORY	NO.
CIRCUIT PACK CODE	B7
ASSEMBLY DRAWING	A154780
CONNECTOR ON FRAME	909A

SYMBOL



DESCRIPTION:

THE CPS 4 CHANNEL CIRCUIT OPERATES IN A MANNER IDENTICAL WITH THE CPS 3 CHANNEL CIRCUITS EXCEPT ONLY ONE FREQUENCY CHANNEL (1477 CPS) IS PROVIDED.

ISSUE
1
2D
3A
4B
5B
8D
10B
12D

12

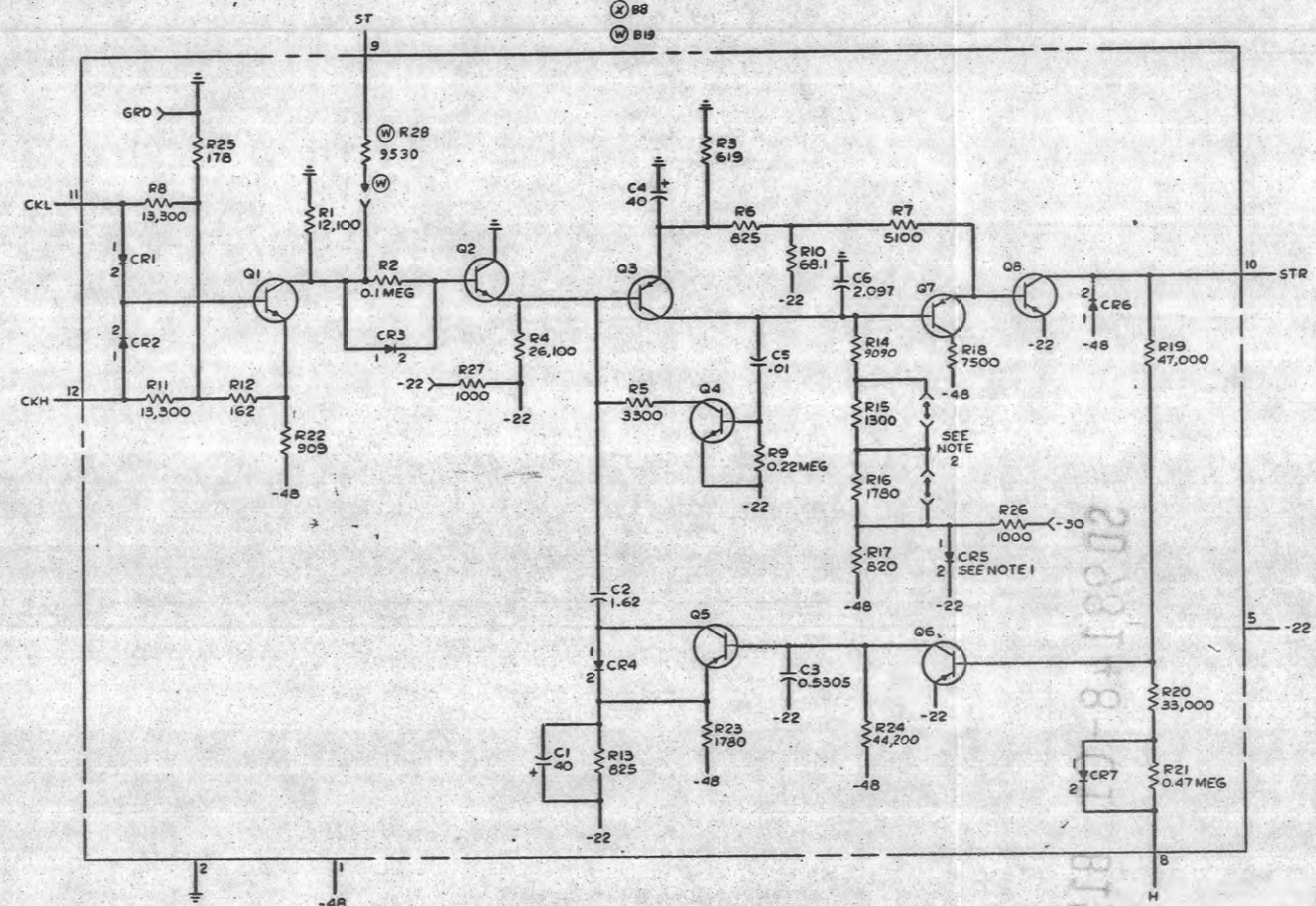
COMMON SYSTEMS
"TOUCH-TONE" CALLING
RECEIVING CIRCUIT
TYPE A3
(2)

SD-98148-01-B14

BELL TELEPHONE LABORATORIES
INCORPORATED
65

SD-98148-01-B14

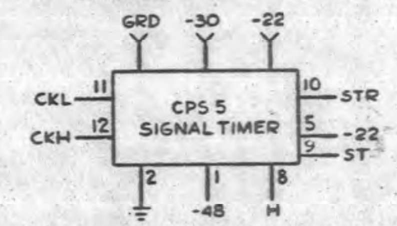
CPS 5
SIGNAL TIMER
(X) B8
(W) B19



SUPPORTING INFORMATION

CATEGORY	NO.
CIRCUIT PACK CODE	(X) B8, (W) B19
ASSEMBLY DRAWING	A154781
CONNECTOR ON FRAME	909A

SYMBOL



DESCRIPTION:

THE SIGNAL TIMER IS MEANT TO CHECK AND TIME THE CPS3, 4 CHANNEL CIRCUIT CHECK SIGNALS AND ENERGIZE A STEERING RELAY AS LONG AS A VALID SIGNAL PERSISTS. A TRIGGER VOLTAGE IS ALSO SUPPLIED TO CPS 6 VIA TERMINAL 10. CONTROL VOLTAGE IS FEDBACK TO CPS 5 FROM CPS 6 VIA TERMINAL 8. IT HAS TWO INPUTS TERMINALS 11 AND 12, ONE FOR THE LOW GROUP CHANNEL CIRCUITS AND ONE FOR THE HIGH GROUP. (CR1), (CR2) AND (Q1) COMPRISE AN "AND" GATE THIS GATE OPENS WHEN ONE DETECTION IN BOTH THE HIGH AND LOW GROUP CHANNEL CIRCUITS (CPS 3, 4) OPERATES CAUSING A DROP IN VOLTAGE AT TERMINALS 11 AND 12. (R12), (R22) AND (R25) HOLD THE EMITTER OF (Q1) AT ABOUT -13 VOLTS. WHEN A VALID SIGNAL IS PRESENT AT THE INPUTS AND (Q1) TURNS OFF, ITS COLLECTOR VOLTAGE RISES AND CURRENT FLOWS THROUGH (R1) AND (CR3) TURNING (Q2) ON. WHEN THE ST LEAD (OPTION W) IS PROVIDED, AN OUTPUT, UNDER THE CONTROL OF (Q1) IS AVAILABLE AT THIS TIME. (R2) ABSORBS LEAKAGE CURRENT FROM (Q2) WHEN IT IS OFF. WHEN (Q2) TURNS ON ITS EMITTER VOLTAGE RISES TO ALMOST GROUND POTENTIAL AND (C2) IS CHARGED THROUGH (CR4), AND (Q3) TURNS OFF. THIS PERMITS (C6) TO CHARGE EXPODENTIALLY THROUGH (R14), (R15), (R16) FROM THE REGULATED -30 VOLT SUPPLY CONTROLLED BY (CR5). TERMINAL 5 SHOULD BE CONNECTED TO THE ANODE OF A 22 VOLT ZENER DIODE WITH ITS CATHODE RETURNED TO GROUND. THIS PROVIDES A REGULATED -22 VOLTS AT TERMINAL 5 AND -30 VOLTS AT THE ANODE OF (CR5). (C6) CHARGES SUFFICIENTLY TO TURN (Q7) ON IN ABOUT 21.5 MILLISECONDS. WHEN (Q7) TURNS ON CURRENT FLOWS THROUGH (R18) AND (Q7) TURNING (Q8) ON. TERMINAL 10 SHOULD BE RETURNED TO -48 VOLTS THROUGH THE STEERING RELAY IN THE ASSOCIATED CONNECTING CIRCUIT. TURN ON OF (Q8) RESULTS IN OPERATION OF THIS RELAY AND A POSITIVE VOLTAGE EXCURSION AT TERMINAL 10 WHICH IS USED TO TIRGGER CPS 6. THE -48 VOLTS NORMALLY ON TERMINAL 10 HOLDS (Q6) ON THROUGH (R19). THE TURN ON OF (Q8) PERMITS (Q6) TO TURN OFF, HOWEVER TERMINAL 8 IS NORMALLY HELD AT ABOUT -13 VOLTS BY CPS 6 BUT WHEN (Q8) TURNS ON AND CPS 6 IS TRIGGERED THE VOLTAGE AS TERMINAL 8 CHANGES TO ABOUT -30 VOLTS HOLDING (Q6) ON THROUGH (R20) AND (CR7). WHEN CPS 6 RETURNS TO NORMAL (Q6) IS TURNED OFF WITH (R21) HOLDING ITS BASE VOLTAGE SLIGHTLY ABOVE THE -22 VOLT SUPPLY. WHEN (Q6) TURNS OFF ITS COLLECTOR VOLTAGE RISES WITH A TIME CONSTANT DETERMINED BY (C3) AND (R24), AND REACHES THE TURN ON VOLTAGE OF (Q5) IN ABOUT 10 MILLISECONDS. WHEN (Q5) TURNS ON THE BOTTOM OF (C2) IS CLAMPED TO THE EMITTER VOLTAGE OF (Q5), DETERMINED BY VOLTAGE DIVIDER (R13), (R23) (ABOUT -30 VOLTS). SHOULD THE INPUT SIGNAL CHECK STOP AT THIS TIME (Q1) WOULD TURN ON AND (Q2) TURN OFF, HOWEVER ITS EMITTER VOLTAGE WOULD DROP WITH A TIME CONSTANT DETERMINED BY (C2) AND (R4). THE EMITTER VOLTAGE OF (Q2) WILL REACH THE TURN ON VOLTAGE OF (Q3) IN ABOUT 20 MILLISECONDS. TURN ON OF (Q3) WILL DISCHARGE (C6) AND TURN OFF (Q7) AND (Q8), HENCE, TURNING ON (Q6) AND TURNING OFF (Q5), THUS RESTORING THE CIRCUIT TO NORMAL. IF HOWEVER THE INPUT SIGNAL CHECK STOPS BEFORE (Q6) TURNS OFF AND (Q5) ON, (C2) WILL NOT BE CLAMPED AND THE EMITTER VOLTAGE OF (Q2) WILL DROP INSTANTLY, CAUSING THE CIRCUIT TO RESET ALMOST INSTANTLY.

DESCRIPTION: (CONTINUED)

WHEN (Q3) TURNS ON AND ITS COLLECTOR VOLTAGE STARTS TO RISE, CURRENT FLOWS THROUGH (C5) INTO THE BASE OF (Q4) TURNING IT ON AND INCREASING THE BASE CURRENT TO (Q3) THROUGH (R5) AND THE COLLECTOR OF (Q4). THIS SPEEDS UP THE RESET OF THE SIGNAL TIMER. CAPACITOR (C1) ABSORBS THE CURRENT SURGE WHEN (C2) IS CHARGED AND (C4) ABSORBS THE CURRENT SURGE WHEN (C6) IS CHARGED. (CR6) PROTECTS (Q8) FROM INDUCTIVE SURGES WHEN (Q8) TURNS OFF AND THE STEERING RELAY IS RELEASED. TEST POSTS ARE PROVIDED AT GROUND AND THE -22 AND -30 VOLT SUPPLY POINTS.

SHEET NOTES:

1. ZENER DIODE NOMINAL BREAKDOWN VOLTAGE (CR5) -8.2 VDC
2. RESISTOR (R16) SHALL NORMALLY BE STRAPPED OUT. IF SIGNAL TIMER INTERVAL IS SHORTER THAN REQUIRED, REMOVE STRAP FROM (R16). IF SIGNAL TIMER INTERVAL IS LONGER THAN REQUIRED, STRAP OUT (R16) AND (R15).

COMPONENT LIST

CAPACITOR

DESIG	CODE
C1	602A
C2	535DL
C3	535M
C4	602A
C5	KS-16048,L4,.01
C6	535J

DIODE

DESIG	CODE
CR1	(S) 420G (R) 458C
CR2	(S) 420G (R) 458C
CR3	441J
CR4	441J
CR5	(S) 420M (R) 446T
CR6	441J
CR7	441J

RESISTOR

DESIG	CODE
R1	221A,12,100
R2	KS-13490,L1,.1 MEG
R3	221A,619
R4	221A,26,100
R5	KS-13490,L1,3300
R6	221A,825
R7	KS-13490,L1,5100
R8	221A,13,300
R9	KS-13490,L1,.22 MEG
R10	221A,68.1
R11	221A,13,300
R12	221A,162
R13	221A,825
R14	221A,9090
R15	221A,1300
R16	221A,1780

RESISTOR (CONT)

DESIG	CODE
R17	KS-13492,L1,820
R18	221A,7500
R19	KS-13490,L1,47,000
R20	KS-13490,L1,33,000
R21	KS-13490,L1,.47 MEG
R22	(ZG) KS-14603,L3C,909
	(ZH) KS-20289,L3C, 909
R23	221A, 1780
R24	221A, 44,200
R25	221A, 178
R26	KS-13490,L1,1000
R27	KS-13490,L1,1000
(W) R28	238A,9530

TRANSISTOR

DESIG	CODE
Q1	(ZC) 16F (ZD) 66F
Q2	(ZC) 16F (ZD) 66F
Q3	12D
Q4	(ZC) 16F (ZD) 66F
Q5	12D
Q6	12D
Q7	12D
Q8	12D

ISSUE	
1	
2D	RT MR
3A	
4B	
5B	MR
8D	
9B	
12D	

COMMON SYSTEMS
"TOUCH-TONE" CALLING
RECEIVING CIRCUIT
TYPE A3

SD-98148-01-B15

ISSUE 2

BELL TELEPHONE LABORATORIES INCORPORATED

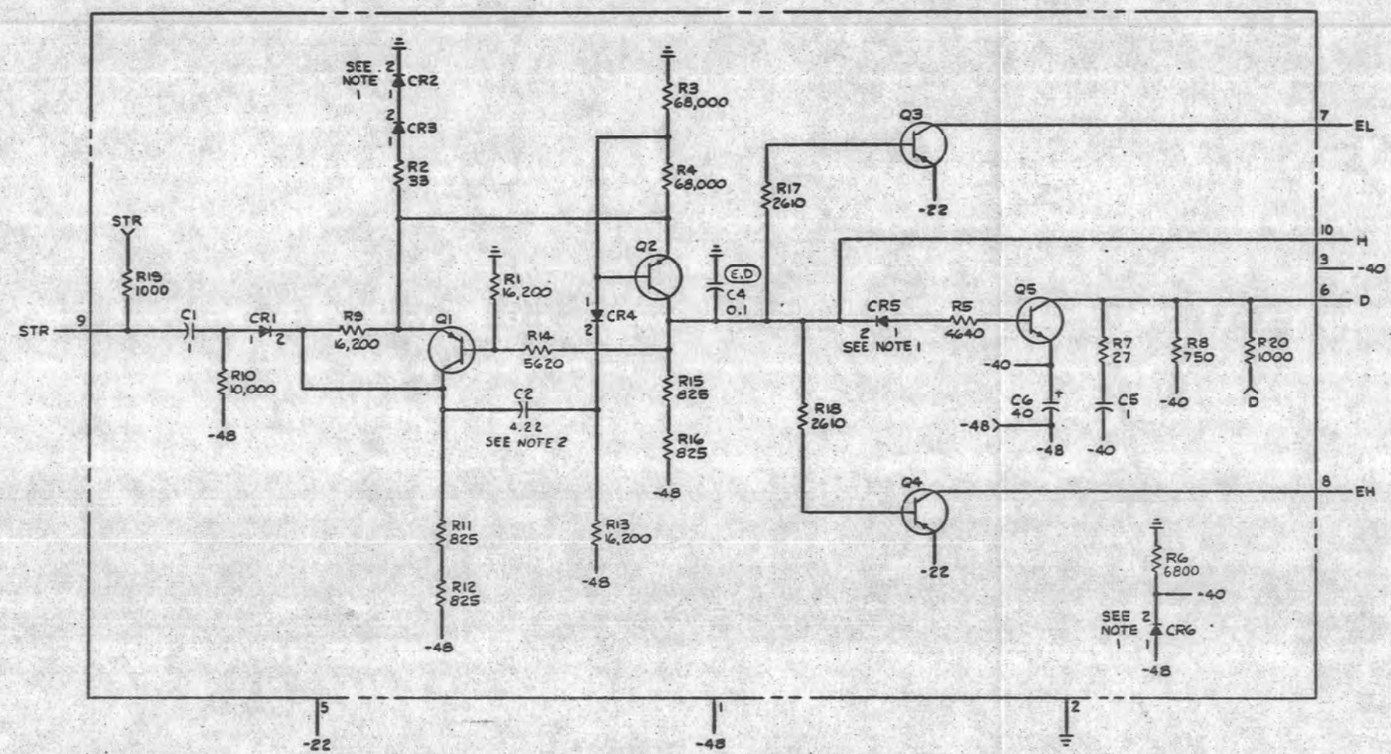
6S

12

SD-98148-01-B15

EI-EAGLE

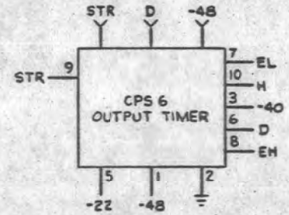
CPS 6
OUTPUT TIMER
89



SUPPORTING INFORMATION

CATEGORY	NO.
CIRCUIT PACK CODE	89
ASSEMBLY DRAWING	A154782
CONNECTOR ON FRAME	909A

SYMBOL



DESCRIPTION:

THE OUTPUT TIMER CONSISTS OF A MONOPULSER FOR TIMING THE DURATION OF CONTROL SIGNALS FEED BACK TO OTHER CPS UNITS. NORMALLY THE FOLLOWING VOLTAGES ARE FEED BACK: TERMINAL 3, ABOUT -40 VOLTS; TERMINAL 10, ABOUT -13 VOLTS, TERMINALS 7 AND 8 OPEN CIRCUIT. WHEN THE TIMER IS TRIGGERED TERMINAL 6 IS RETURNED TO -40 VOLTS THROUGH (R8), TERMINAL 10 GOES TO -30 VOLTS AND TERMINALS 7 AND 8 ARE CONNECTED TO -22 VOLTS. TERMINALS 6,7 AND 8 FEED THE CPS3, 4 CHANNEL CIRCUITS. TERMINAL 10 SUPPLIES THE CPS 5 SIGNAL TIMER AND TERMINAL 3 SUPPLIES A CONSTANT -40 VOLTS TO CPS 2. NEGATIVE 22 VOLTS IS SUPPLIED TO CPS 6 BY CPS 5. THE MONOPULSER CIRCUIT CONSISTS OF (J1) AND (J2) AND THEIR ASSOCIATED CIRCUITRY. ZENER DIODES (CR2) AND (CR3) AND (R2) PROVIDE AN EMITTER BIAS OF ABOUT -14 VOLTS. (J2) IS NORMALLY HELD ON THROUGH (CR4) AND (R13) AND (J1) OFF THROUGH (R14) AND (R1). A POSITIVE GOING VOLTAGE ON TERMINAL 9 FROM CPS 5 IS DIFFERENTIATED BY (C1) AND (R10) AND A PULSE OF CURRENT IS APPLIED TO THE COLLECTOR OF (J1) THROUGH (CR1). THIS PULSE IS COUPLED THROUGH (C2) TO THE BASE OF (J2) TURNING IT OFF. THE ACCOMPANYING RISE IN THE COLLECTOR VOLTAGE OF (J2) DRIVES (J1) ON THROUGH (R14) AND THE COLLECTOR VOLTAGE OF (J1) RISES, SIMILARLY THE BASE VOLTAGE OF (J2), THUS HOLDING (J2) OFF AND (J1) ON. AT THIS POINT THE VOLTAGE AT THE INTERSECTION OF (C2) AND (R13) IS DRIVEN ABOUT 30 VOLTS ABOVE THE EMITTER VOLTAGE OF (J2) AND ITS STARTS TO DROP EXPONENTIALLY WITH A TIME CONSTANT DETERMINED BY (R13) AND (C2). IN ABOUT 45 MILLISECONDS THIS VOLTAGE HAS DROPPED SUFFICIENTLY TO CAUSE (CR4) TO CONDUCT AND (J2) TURNS ON TURNING (J1) OFF AND THE CIRCUIT RESTORES TO NORMAL, WITH THE COLLECTOR VOLTAGE OF (J1) DROPPING TO -45 VOLTS WITH A TIME CONSTANT DETERMINED BY (R9), (R11), (R12) AND (C2). CAPACITOR (C4) PREVENTS FALSE TRIGGERING BY POWER SUPPLY TRANSIENTS. ZENER DIODE (CR6) IN CONBINATION WITH (R6) ACTS A VOLTAGE REGULATOR TO HOLD TERMINAL 3 ABOUT 3 VOLTS ABOVE THE -48 VOLT SUPPLY. IN THE NORMAL STATE WITH (J2) ON, ZENER DIODE (CR5) CONDUCTS IN THE REVERSE DIRECTION AND HOLDS (J5) ON THROUGH (R5). THIS CLAMPS TERMINAL 6 TO THE -40 VOLT SUPPLY. (J3) AND (J4) ARE BOTH HELD OFF AT THIS TIME. WHEN THE CIRCUIT IS TRIGGERED AND (J2) TURNS OFF ITS COLLECTOR VOLTAGE DROPS TO ABOUT -30 VOLTS CAUSING CONDUCTION TO STOP IN (CR5) AND (J5) TURNS OFF, THUS INSERTING (750 OHMS) (R8) IN SERIES WITH THE -40 VOLT SUPPLY TO TERMINAL 6. (R7) AND (C5) REDUCE SWITCHING TRANSIENTS ON TERMINAL 6. AT THIS TIME (Q3) AND (Q4) ARE TURNED ON THROUGH (R17) AND (R18) AND TERMINALS 7 AND 8 ARE CLAMPED TO -22 VOLTS. AT THE END OF THE MONOPULSER TIMING PERIOD (Q3), (Q4) AND (Q5) RETURN TO THEIR NORMAL STATE AS THE COLLECTOR POTENTIAL OF (Q2) RISES TO -14 VOLTS. (R3) AND (R4) ABSORB LEAKAGE CURRENT FROM (J2) WHEN IT IS OFF. TEST POINTS ARE PROVIDED AT THE TRIGGERING INPUT (STR), TERMINAL 6 CONTROL OUTPUT AND -48 VOLTS.

COMPONENT LIST

CAPACITOR

DESIG	CODE
C1	542N
C2	SEE NOTE 2
C4	(E) 542L, (D) 722C
C5	542N
C6	602A

DIODE

DESIG	CODE
CR1	441J
CR2	(S) 420A (R) 446B
CR3	(S) 420A (R) 446B
CR4	(S) 420G (R) 458A
CR5	(S) 420N (R) 446M
CR6	(S) 420S (R) 446T

RESISTOR

DESIG	CODE
R1	221A, 16,200
R2	KS-13490,L1,33
R3	KS-13490,L1, 68,000
R4	KS-13490,L1, 68,000
R5	221A, 4640
R6	KS-13490,L1, 6800
R7	KS-13490,L1, 27
R8	221A, 750
R9	221A, 16,200
R10	KS-13490,L1, 10,000

RESISTOR (CONTINUED)

DESIG	CODE
R11	221A, 825
R12	221A, 825
R13	221A, 16,200
R14	221A, 5620
R15	221A, 825
R16	221A, 825
R17	221A, 2610
R18	221A, 2610
R19	KS-13489,L1, 1000
R20	KS-13490,L1, 1000

TRANSISTOR

DESIG	CODE
Q1	12D
Q2	12D
Q3	12D
Q4	12D
Q5	(ZC) 16F (ZD) 66F

NOTES:

1. ZENER DIODE NOMINAL BREAKDOWN VOLTAGE
   (CR2) - 6 VDC
   (CR3) - 6 VDC
   (CR5) - 15 VDC
   (CR6) - 8.2 VDC
2. THE REQUIRED CAPACITANCE OF 4.22 UF MAY BE OBTAINED BY ONE 535GA CAPACITOR DESIGNATED (C2) OR TWO 535J CAPACITORS WIRED IN PARALLEL AND DESIGNATED (C2A) AND (C2B) RESPECTIVELY.

DRAWING ISSUE

1	
2D	
3A	
4B	
5B	
8D	
10B	
12D	

12

COMMON SYSTEMS
"TOUCH-TONE" CALLING
RECEIVING CIRCUIT
TYPE A3

SD-98148-01-B16

BELL TELEPHONE LABORATORIES INCORPORATED

SIZE 6S

SD-98148-01-B16

APP FIG. 1

CIRCUIT PACKAGES

DESIG	LOC	CODE
CPS 1	1C1	B1
CPS 2	1C3	B2
CPS 3A	1A4	B3
CPS 3B	1C4	B4
CPS 3C	1F4	B5
(Z) CPS 3D	1G4	B6
(Y) CPS 4	1G4	B7
(X) CPS 5	1D6	B8
(W) CPS 5	1D6	B19
CPS 6	1D7	B9

CONNECTOR

●1	●2	●3
●4	●5	●6
●7	●8	●9
●10	●11	●12
●13	●14	●15
●16	●17	●18
●19	●20	●21

DESIG	F
CODE	(B) KS-14671 L1 (A) KS-14671 L3 MALE
OPTION	LOC
1	1G8
2	1F8
3	1F8
4	1G8
5	1A8
6	1A8
7	1C8
8	1C8
9	1C0
10	1C8
11	1E8
12	1C0
13	1C0
14	
15	1D0
16	
17	
18	
19	
20	
21	

DIODE

DESIG	LOC	CODE
CR1	1E6	(J) 425H (H) 485H

FILTER

DESIG	LOC	CODE
BEF	1C2	632A

APP FIG. 2

CONNECTOR

03	02	01
06	05	04
09	08	07
012	011	010
015	014	013
018	017	016
021	020	019

DESIG	F
CODE	(E) KS-14672 L1 (R) KS-14672 L3 FEMALE
OPTION	LOC
1	1G8
2	1F8
3	1F8
4	1G8
5	1A8
6	1A8
7	1C8
8	1C8
9	1C0
10	1C8
11	1E8
12	1C0
13	1C0
14	
15	1D0
16	
17	
18	
19	
20	
21	

DRAWING ISSUE

1	
3A	
4B	
9B	
6D	
9B	
10B	

10

"TOUCH-TONE" CALLING
RECEIVING CIRCUIT
TYPE A3

(2)

SD-98148-01-CI

BELL TELEPHONE LABORATORIES
INCORPORATED

6S

SD-98148-10-CI

CIRCUIT NOTES:

101.

DESIG	FUSE AMP	POTENTIAL	ONE PER
	1-1/3	-48V	RECEIVING CKT SEE NOTE 105
BATTERY SYMBOL		VOLTAGE RANGE	
-48		45-52.5V	

102.

FEATURE OR OPTION	PROVIDE		
	FIG.	APP OR WRG	QUANTITY
"TOUCH-TONE" CALLING RECEIVING CKT, EQUIPPED FOR 7 CHANNELS	1	Y	1
"TOUCH-TONE" CALLING RECEIVING CKT, EQUIPPED FOR 8 CHANNELS	1	Z	1
"TOUCH-TONE" CALLING RECEIVER MOUNTING SHELF; ONE PER TWO RECEIVING CIRCUITS	(2)		TWO PER SHELF

103.

NETWORK VALUES		
NETWORK NO.	RESISTANCE IN OHMS	CAPACITANCE IN UF

104.

RECORD OF FIGURES, WIRING AND APPARATUS CHANGES							
CHANGED ON ISS	IF JOB RECORDS DO NOT SPECIFY	THIS OPTION WAS FURN	SEE NOTE	USE IN CIRCUIT			
				STD	A&M	MD	
3A	APP FIG. 2	NONE	102	APP FIG. 2			
5B	X OR W	X		W		X	
7B	T OR V	V		T		V	
8D	R OR S	S		R		S	
9B	N	NONE		N			
9B	M OR K	M		K		M	
9B	J OR H	J		H		J	
10B	F OR G	G		F		G	
10B	D OR E	E		D		E	
10B	A OR B	B		A		B	
10B	ZA	M OR K		ZA		M,K	
11B	ZB	NONE		ZB			
12D	ZD OR ZC	ZC		ZD		ZC	
	ZF OR ZE	ZE		ZF		ZE	
	ZH OR ZG	ZG		ZH		ZG	

105. THE OFF NORMAL BATTERY -48 VOLTS TO THE RECEIVING CIRCUIT SHALL ORIGINATE FROM A CONTACT IN THE ASSOCIATED CONNECTING CIRCUIT. ALL RELAYS IN THE SAME CONNECTING CIRCUIT WHICH OPERATE ON SIGNALS FROM THE RECEIVING CIRCUIT SHALL ALSO RECEIVE OFF NORMAL -48 VOLTS FROM THE SAME CONTACT.

106. THE LEAD FROM GROUND BUS BAR TO THE RECEIVING CIRCUIT SHALL SUPPLY GROUND TO NO OTHER CIRCUIT.

107. ALL UNUSED CHANNELS WHICH ARE EQUIPPED IN THE RECEIVER, INCLUDING THE STR LEAD, MUST BE TERMINATED IN THE CONNECTING CIRCUIT WITH A 2400 OHM ±5% 2 WATT RESISTOR. ONE SIDE OF THIS RESISTOR SHOULD BE ATTACHED TO THE SAME BATTERY LEAD THAT SUPPLIES THE CHANNEL RELAYS AND THE OTHER SIDE TO THE UNUSED LG, HG OR STR LEADS.

108. THE CIRCUIT CONNECTED TO THE ST LEAD SHALL BE EQUIVALENT TO A RESISTANCE IN SERIES WITH A BATTERY WHOSE POSITIVE TERMINAL IS GROUNDED. THE EQUIVALENT SERIES RESISTOR SHALL BE GREATER THAN 5000 OHMS. THE CURRENT WHICH THE EQUIVALENT CIRCUIT CAN DELIVER WHEN ITS TERMINALS ARE SHORT CIRCUITED SHALL BE LESS THAN 200 MICRO-AMPERES.

EQUIPMENT NOTES:

201. THE RESISTANCE OF THE LEADS FROM THE -48 VOLT FUSE PANEL TO THE RECEIVING CIRCUIT AND FROM THE GROUND BUS BAR TO THE RECEIVING CIRCUIT SHALL NOT EXCEED 0.62 OHMS EACH.

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.

302. THE VALUE OF THE (R1) & (R9) RESISTORS OF CPS 3 & CPS 4 SHOULD BE SELECTED FROM THE FOLLOWING LIST TO PROVIDE THE REQUIRED CHANNEL CIRCUIT BANDWIDTH.

VALUES

0	30.1	60.4	90.9
5.11	34.8	64.9	95.3
10.0	40.2	70.6	100
14.7	45.3	75.0	105
20.5	49.9	80.6	
24.9	54.9	85.6	

303. ASSOCIATED SIGNALING FREQUENCIES AND CIRCUIT DESIGNATIONS

"TOUCH-TONE" SIGNALING FREQUENCY	CIRCUIT PACK	EQUIPMENT CODE	OUTPUT LEAD
697	CPS 3A	B3	LG1
770	CPS 3A	B3	LG2
852	CPS 3B	B4	LG3
941	CPS 3B	B4	LG4
1209	CPS 3C	B5	HG1
1336	CPS 3C	B5	HG2
1477	(Z) CPS 3D	B6	HG3
	(Y) CPS 4	B7	HG3
1633	(Z) CPS 3D	B6	HG4

"TOUCH-TONE" SIGNALING CODE:
EACH DIGIT CONSISTS OF 1 OUT OF 4 LOW GROUP FREQUENCIES PLUS 1 OUT OF 4 HIGH GROUP FREQUENCIES.

	HG1 1209	HG2 1336	HG3 1477	HG4 1633
LG1 697	1	2	3	SPARE
LG2 770	4	5	6	SPARE
LG3 852	7	8	9	SPARE
LG4 941	*	0	#	SPARE

DRAWING ISSUE	
1	RWR WJS FC
2D	RT MR TEB
3A	JoS MS TEP
4B	BWD GWW MEJ
5B	MR - JJM
6D	SWM JTF WFG
7B	SWM JTF WFG
8D	
9B	
10B	
11B	
12D	

12

"TOUCH-TONE" CALLING RECEIVING CIRCUIT TYPE A3

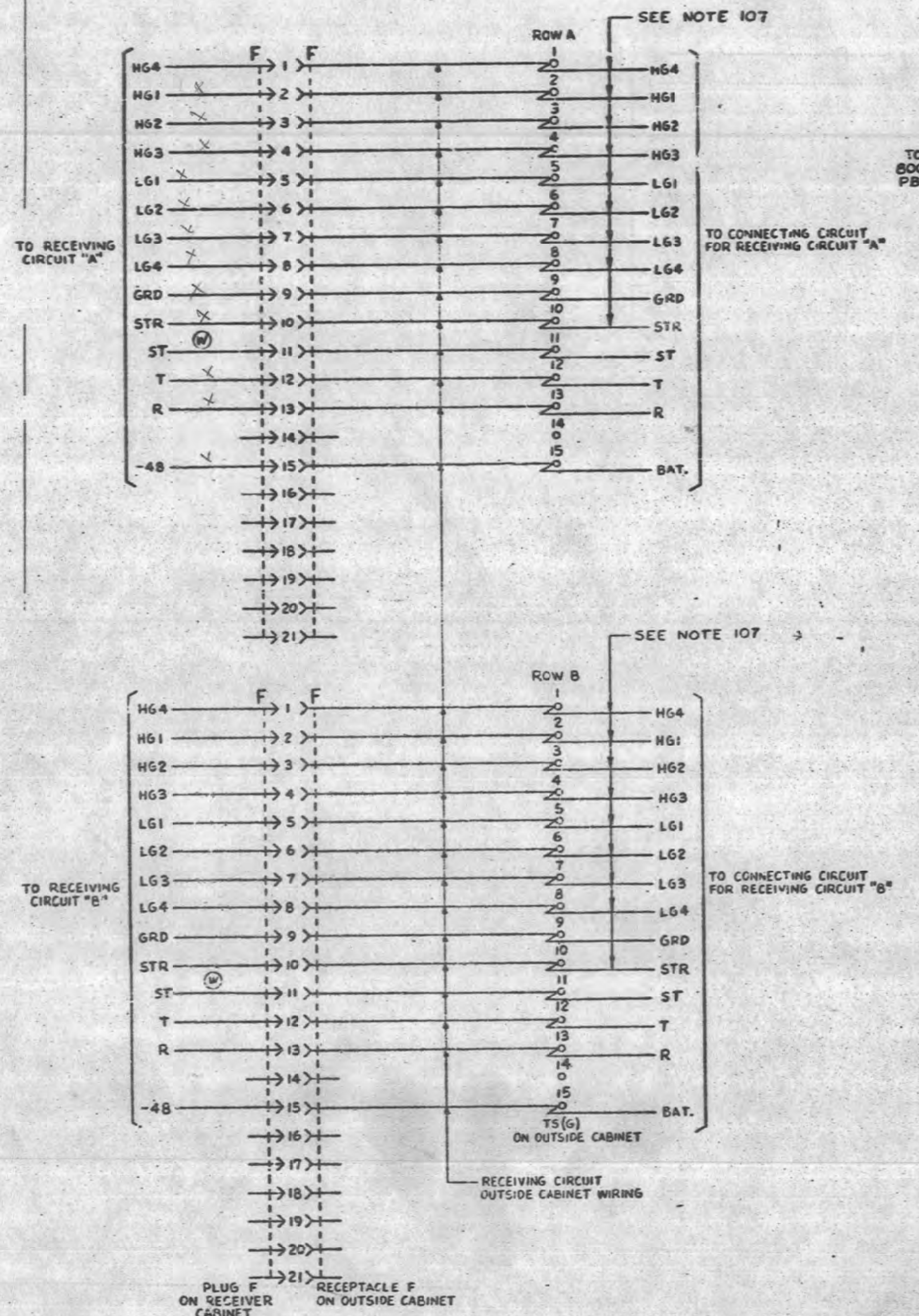
(2) SD-98148-01-D1

BELL TELEPHONE LABORATORIES INCORPORATED

6S

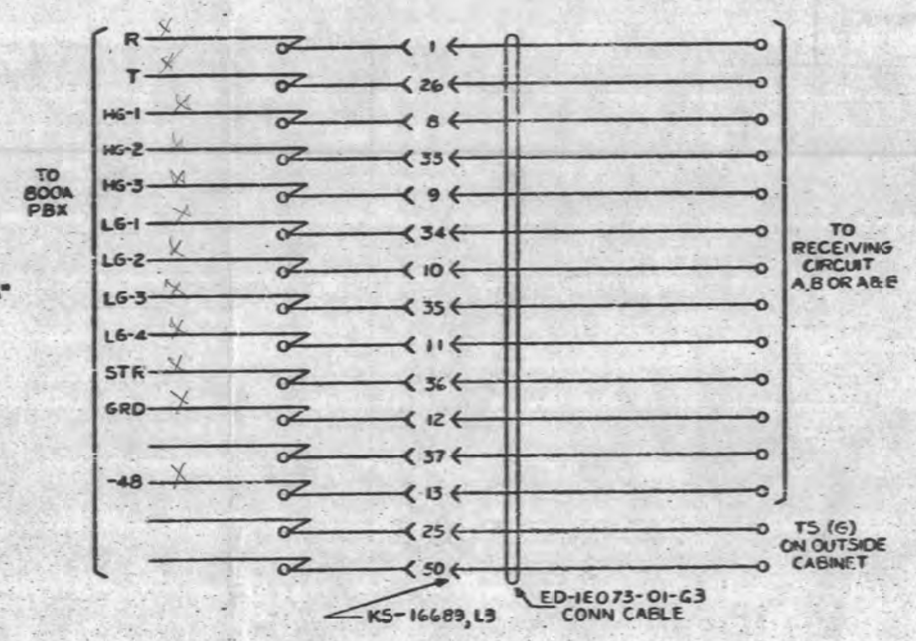
SD-98148-01-D1

CAD. 1



CAD. 2

FOR 800A PBX APPLICATION
ROW A, ROW B OR ROW A & B



ISSUE	
1	
2D	
4B	
5B	
7B	

7

"TOUCH-TONE CALLING RECEIVING CIRCUIT TYPE A3

BELL TELEPHONE LABORATORIES INCORPORATED

6S

SD-98148-01-G1

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