SHEET INDEX

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FS 2 CO OR PBX LINE CKT 400C KEY TEL UNIT (MD)	B2	2	3	3	3	3	3	3	3	3	3	3	3	3	3						
FS 3 CO OR PBX LINE CKT 400D KEY TEL UNIT	B3		3	4	4	6	7	8	9	10	11	12	12	14	15						
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APP FIG. 1 400A KEY TEL UNIT (MD)	C1	2	2	2	2	2	2	2	2	2	2	2	2	2	2						
APP FIG. 2 400B KEY TEL UNIT (MD)	C2	2	3	3	3	3	3	3	3	3	3	3	3	3	3						
APP FIG. 3 400C KEY TEL UNIT (MD)	C3	2	3	3	3	3	3	3	3	3	3	3	3	3	3						
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CIRCUIT NOTES	D1	2	3	3	3	6	6	3	9	10	11	12	13	13	15						
INFORMATION NOTES WORKING LIMITS	D2		3	3	3	6	7	7	9	10	11	12	12	12	15						
CIRCUIT REQUIREMENTS *SHEET CANCELLED ON DWG ISS 15B*	F1																				

DWG ISS	CD ISS	DWG ISS	CD ISS	DWG ISS	CD ISS
1	1				

DWG ISSUE	CD ISSUE	DATE ISSUED	DWN	APPD
2D	2D	6-8-64	EFS DHC	MHE LAH ARM
3D	3D	9-1-65	MPK DHC	REB LAH ARM
4A	3D APP-1A	9-3-65	EFS DHC	REB LAH ARM
5A	4A	3-11-66	HBW KB	REB LAH DLV
6B	4A APP 1B	3-11-66	HBW KB	REB LAH DLV
7D	4A APP 2D	4-22-66	– DHC	REB LAH DLV
8B	4A APP 3B	4-1268	DSC DHC	AL GES ARH
9B	5B	2-16-70	RJB RJB	ADL HDK WPS
10B	5B APP 1B	2-16-70	RJB RJB	ADL HDK WPS
11B	5B APP 2B	8-31-71	HBW –	ADL GES AFR
12B	5B APP 3B	8-31-71	HBW –	ADL GES AFR
13B	5B APP 4B	8-31-71	HBW –	ADL GES AFR
14A	5B APP 5A	1-11-73	GDI HBW	JPS RGP AFR
15B	6B	1-11-73	GDI HBW	DLM RGP AFR

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.

SUPPORTING INFORMATION

CATEGORY	NO.

SD- 69513-01 iK03

STATION SYSTEMS

KEY TELEPHONE SYSTEM NO. 1A2
CO OR PBX LINE CIRCUIT

AT&TCo STANDARD

SD-69513-01-A1
13 SHEETS

BELL TELEPHONE LABORATORIES INCORPORATED

DRAWING SIZE 3S

PRINTED IN U.S.A.

OPTION INDEX

APP OR WRG	LOCATION
Z	1D4,2D4,3E2
Y	1E2,2E2,3F6
X	1F2,2F2,3F6
W	1G3,2G3,3A5
V	1G3,2G3,3B6
T	1G3,2G3,3B6
S	1G3,2G3,3A5
R	APP FIG. 4, 3E3,3F3
Q	APP FIG. 4, 3E3,3F3
N	APP FIG. 4, 3E2
M	APP FIG. 4, 3E2
K	APP FIG. 4
J	APP FIG. 4
G	APP FIG. 4
F	APP FIG. 4
E	APP FIG. 4
D	APP FIG. 4
B	APP FIG. 4
A	APP FIG. 4
ZA	APP FIG.4,3B3
ZB	APP FIG.4,3E3,3F3,3F4
ZC	APP FIG.4,3E4
ZD	APP FIG.4,3E3
ZE	APP FIG.4
ZF	APP FIG. 4,3E3,3G3
ZG	APP FIG. 4,3E3,3G4
ZH	APP FIG. 4,3E5
ZJ	APP FIG. 4,3E3
ZI	APP FIG.4,3E3,3F3, 3F4,3G4

DRAWING ISSUE

2D	EFS DAC ARR
3D	APP DAC ARR WRG KEY DLY
6B	
8B	
9B	
10B	
11B	
12B	
15B	

CO OR PBX LINE CIRCUIT

SD-69513-01-A2

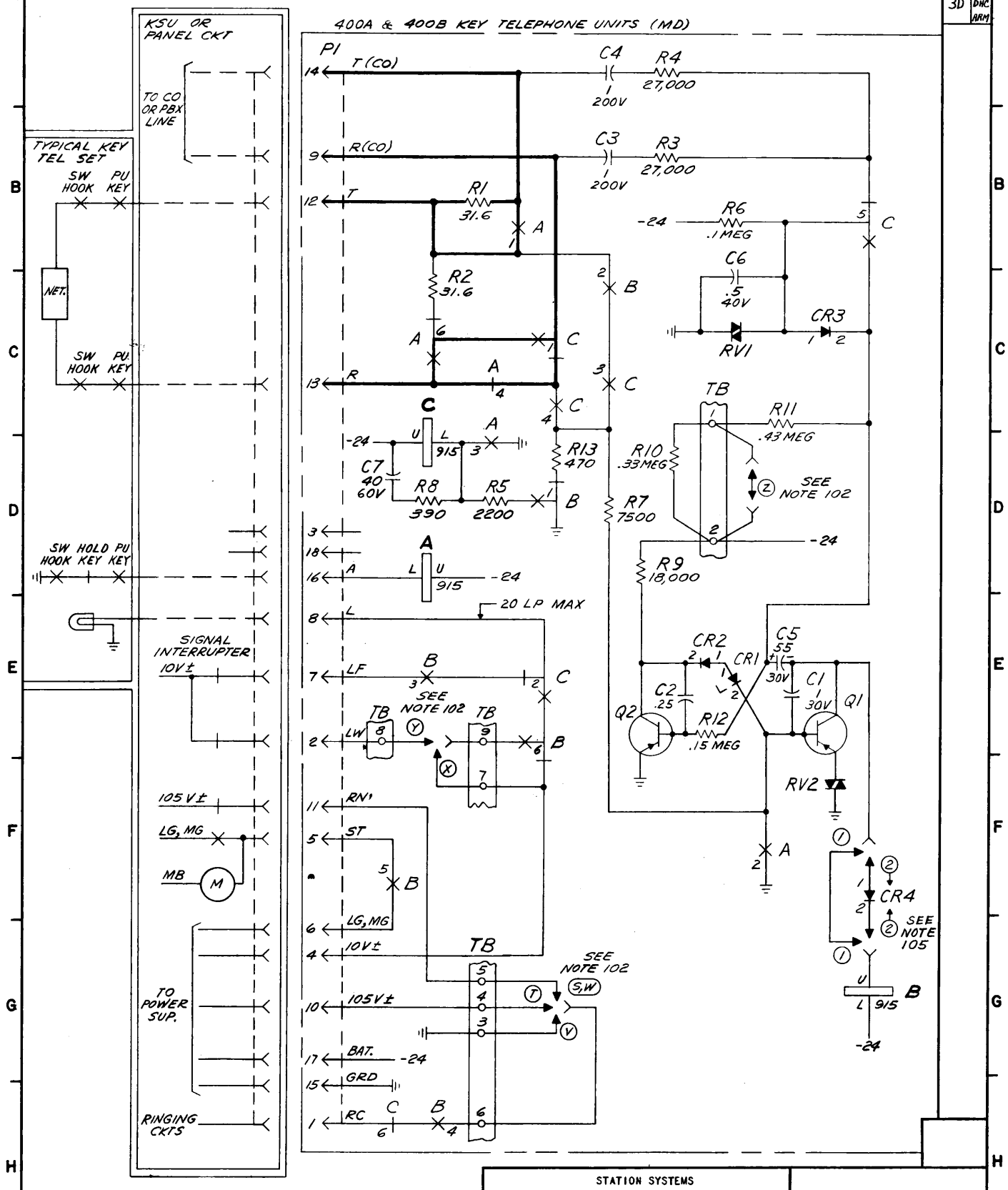
BELL TELEPHONE LABORATORIES INCORPORATED

SIZE CODE 3S

PRINTED IN U.S.A.

FS1

CO OR PBX LINE CKT



DRAWING ISSUE	
2D	DHC ARM
3D	EFS DHC ARM

STATION SYSTEMS

KEY TELEPHONE SYSTEM NO. 1A2
CO OR PBX LINE CIRCUIT

SD-69513-01-B1

BELL TELEPHONE LABORATORIES INCORPORATED

DWG SIZE 3S

PRINTED IN U.S.A.

FS2
CO OR PBX LINE CKT

DRAWING ISSUE
2D
3D

KSU OR PANEL CKT

TO CO OR PBX LINE

TYPICAL KEY TEL SET

SW HOOK PU KEY

NET.

SW PU HOOK KEY

SW HOLD PU HOOK KEY KEY

SIGNAL INTERRUPTER

10V±

105V±

LG, MG

MB

M

TO POWER SUP.

RINGING CKTS

400C KEY TELEPHONE UNIT (MD)

P1

T(CO)

R(CO)

T

R

RC

RN

ST

LG, MG

10V±

105V±

BAT. -24

GRD

LF

LW

20 LP MAX

SEE NOTE 102

R1 31.6

R2 31.6

R3 19,600

R4 19,600

C3 1/200V

C4 1/200V

R5 2200

R6 .1MEG

R7 7500

R8 390

R9 18,000

R10 .33MEG

R11 .43MEG

R12 .15 MEG

R13 470

R14 680

R15 680

R16 .1 MEG

RV1

RV2

RV3

RV4

RV5

RV6

C1 1 30V

C2 .25

C5 55 30V

C6 .01

C7 40 60V

CR1

CR2

CR3

CR4

Q1

Q2

Q3

Q4

TB

SW

915

-24

STATION SYSTEMS

KEY TELEPHONE SYSTEM NO. 1A2
CO OR PBX LINE CIRCUIT

SD-69513-01-B2

BELL TELEPHONE LABORATORIES INCORPORATED

3S

FS 3(MFR DISC)

CO OR PBX LINE CKT

400D KEY TELEPHONE UNIT

KSU OR PANEL CKT

TO CO OR PBX LINE

TB

S,W

T

V

5 RN → 11

4 ±105V → 10

-24 BAT. → 17

GRD → 15

B C RC → 1

2 3

R → 13

9 R

ZA RV1 3 A

L 1 3 P-55 6 4 S-755 2

C

C2 .511 200V

R18 K 22,000 J 18,000

R17 K 22,000 J 18,000

R2 6800

C3 1 200V

C5 .511 200V

B

B,A,ZB R1 120

14 T → 12 T

R15 1500

RT1 N .47 MEG M .39 MEG

R6 1000

RT2 .75MEG

CT K 75 30V J 55 30V

R14 4700

TB

ZJ 511

ZC 5

ZD 1

C7

ZF ZG CR2

C1 -24 ZF .511

R5 82,000

R7 R 5600 Q 5100

ZF,ZG,ZJ Q2

RQ CR7

ZF,ZG,ZI Q3

R4 36,000

ZF,ZG,ZI Q1

B B,A

R16 .22MEG

R12 6800

R13 1800

R9 R 12,000 Q 3300

C4 .147 ZE

B L 750 U B,A,ZB

CR3

ZH,E,D R11 1560

C L 750 U B,A,ZB

ZH C8 .511

-24

TB

10 LW → 2

B 5 LF → 7

C 1 L → 8 20 LP MAX

A 1

±10V → 4

LG,MG → 6

B 4

ST → 5

A → 16

R10 K 22,000 J 32,000

C6 .511

R3 1000

G,F CR6

G,F CR5

ZF R8 16,000

ZG, ZI

B,A,ZB CR8

G,F CR4

-24

-24

B,A,ZB A U L 915

CR1

KSU OR PANEL CKT

±105V

TO POWER SUPPLY

RINGING CKTS

TYPICAL TEL SET

PU KEY SW HOOK

NET.

PU KEY

±10V

TO POWER SUPPLY

M MB

LG,MG

PU KEY HOLD KEY SW HOOK

DRAWING ISSUE

3D	HBU DNC ARM
4A	EFS DNC ARM
6B	HBU KA DLY
7D	- DNC DLY
8B	
9B	
10B	
11B	
12B	
14A	
15B	

CO OR PBX LINE CIRCUIT

SD-69513-01-B3

BELL TELEPHONE LABORATORIES INCORPORATED

DWG SIZE 6S

PRINTED IN U.S.A.

FS 4

CO OR PBX LINE CKT

400D KEY TELEPHONE UNIT

KSU OR PANEL CKT

TO CO OR PBX LINE

R 9 — R 13

T 14 — T 12

A 3

L 1 3 6

6 4 C 2

C

R2 6.8K

C1 1

3 B

R1 120

CR1

R14 1.5K

RT1 .39M

RT2 .75M

R6 1K

CT 55 30V

B 1

C 5

R11 4.7K

CR4 -24

3 ZC 5 ZJ .511 C4

1 Z

2

R5 82K

R7 5.1K

CR3

L U 750 B

U 750 L C

R9 1.56K

A 4

C3 .511

-24

C2 .511

Q2

Q1

Q3

CR6 L

R15 10K

4 C

R4 36K

2 L 5

R3 3.3K

R12 6.8K

R13 1.8K

R8 3.3K

R10 .22M

CR5

A U L 915

CR2

RN 11

±105 10

5 6 4 8 10 7 9

T S.W V Y X

B 2 C 3 RC 1

LW 2

B 5 LF 7

C 1 L 8

A ±10 4

MG 6

4 ST 5

A 16

BAT 17

GND 15

KSU OR PANEL CKT

TYPICAL TEL SET

PU KEY

SH HOOK

NET.

PU KEY

±105V

TO POWER SUPPLY

RINGING CKTS

±10V

TO POWER SUPPLY

M MB

LG, MG

PU KEY

HOLD KEY

SW HOOK

TO POWER SUPPLY

CO OR PBX LINE CIRCUIT

SD-69513-01-B4

BELL TELEPHONE LABORATORIES INCORPORATED

DWG SIZE 6S

PRINTED IN U.S.A.

APP FIG. 1 (MD)

400A KEY TELEPHONE UNIT

DRAWING ISSUE	
2D	EFS PHC ARM

RELAY

DESIG	A		B		C					
CODE	MB6		MB2		MB3					
OPTION										
X	CONT ARR	LOC	CONT ARR	LOC	CONT ARR	LOC	CONT ARR	LOC	CONT ARR	LOC
6	EMB	1C2	EBM	1E3	B	1H2				
5			M	1F2	EBM	1B5				
4	EB	1C3	M	1H2	M	1C3				
3	M	1C3	M	1E2	M	1C3				
2	M	1E4	M	1C3	EBM	1E3				
1	EMB	1B3	EBM	1D3	EMB	1C3				
COIL		1B2		1G5		1C2				

CAPACITOR

DESIG	LOC	CODE
C1	1E4	542N
C2	1C4	542C
C3	1B3	542N
C4	1A3	
C5	1E4	KS-16390 L17
C6	1B4	542M
C7	1D3	KS-16390 L8

CONNECTOR

DESIG	LOC	CODE
P1	1A2	906C

DIODE

DESIG	LOC	CODE
CR1	1E4	420A
CR2	1E4	400J
CR3	1C5	420D

RESISTOR

DESIG	LOC	CODE
R1	1B2	KS-14603 L1A, 31.6
R2	1C2	
R3	1B4	KS-13490 L1, 27,000
R4	1A4	
R5	1D3	KS-13490 L2, 3200
R6	1B4	KS-13490 L2, .1 MEG
R7	1D3	KS-13490 L2, 7500
R8	1D3	KS-13490 L2, 390
R9	1D4	KS-13490 L1, 18,000
R10	1D4	KS-13490 L1, .33 MEG
R11	1C4	KS-13490 L1, .43 MEG
R12	1C4	KS-13490 L1, .15 MEG
R13	1D3	KS-13490 L2, 470

TERMINAL BOARD

DESIG	TB
CODE	P-15C931
OPTION	
X	LOC
9	1E3
8	1E2
7	1E3
6	1G3
5	1G3
4	1G3
3	1G3
2	1C4
1	1C4

TRANSISTOR

DESIG	LOC	CODE
Q1	1E5	12H
Q2	1E4	12G

VARISTOR

DESIG	LOC	CODE
RV1	1C4	312C
RV2	1F5	100A

STATION SYSTEMS

KEY TELEPHONE SYSTEM NO. 1A2
CO OR PBX LINE CIRCUIT

SD-69513-01-CI

BELL TELEPHONE LABORATORIES
INCORPORATED

DWG SIZE 3S

PRINTED IN U.S.A.

APP FIG. 2 (MFR DISC.)

400B KEY TELEPHONE UNIT

DRAWING ISSUE	
2D	EFS DNC ARM
3D	EFS DNC ARM

RELAY

DESIG	A		B		C					
CODE	MB6		MB2		MB3					
OPTION										
X	CONT ARR	LOC	CONT ARR	LOC	CONT ARR	LOC	CONT ARR	LOC	CONT ARR	LOC
6	EMB	1C2	EBM	1E3	B	1H2				
5			M	1F2	EBM	1B5				
4	EB	1C3	M	1H2	M	1C3				
3	M	1C3	M	1E2	M	1C3				
2	M	1F4	M	1C3	EBM	1E3				
1	EMB	1B3	EBM	1D3	EMB	1C3				
COIL	X	1D2	X	1G5	X	1C2	X		X	

CAPACITOR

DESIG	LOC	CODE
C1	1E4	542N
C2	1E4	542C
C3	1B3	542N
C4	1A3	
C5	1E4	KS-16390 L17
C6	1B4	542M
C7	1D2	KS-16390 L8

CONNECTOR

DESIG	LOC	CODE
P1	1A2	906C

DIODE

DESIG	LOC	CODE
CR1	1E4	420A
CR2	1E4	441J
CR3	1C5	420D
CR4	1F5	420G

RESISTOR

DESIG	LOC	CODE
R1	1B2	KS-14603 L1A, 31.6
R2	1C2	
R3	1B4	KS-13490 L1, 27,000
R4	1A4	
R5	1D3	KS-13490 L2, 2200
R6	1B4	KS-13490 L2, 0.1 MEG
R7	1D3	KS-13490 L2, 7500
R8	1D2	KS-13490 L2, 390
R9	1D4	KS-13490 L1, 18,000
R10	1D4	KS-13490 L1, 0.33 MEG
R11	1C4	KS-13490 L1, 0.43 MEG
R12	1E4	KS-13490 L1, 0.15 MEG
R13	1D3	KS-13490 L2, 470

TERMINAL BOARD

DESIG	TB
CODE	P-15C931
OPTION	
X	LOC
9	1E3
8	1E2
7	1E3
6	1G3
5	1G3
4	1G3
3	1G3
2	1C4
1	1C4

TRANSISTOR

DESIG	LOC	CODE
Q1	1E5	12H
Q2	1E4	12G

VARISTOR

DESIG	LOC	CODE
RV1	1C4	312C
RV2	1F5	100A

STATION SYSTEMS

KEY TELEPHONE SYSTEM NO. 1A2
CO OR PBX LINE CIRCUIT

SD-69513-01-C2

BELL TELEPHONE LABORATORIES INCORPORATED

DWG SIZE 3S

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APP FIG. 3 (MFR DISC.)

400C KEY TELEPHONE UNIT

DRAWING ISSUE	
2D	EFS DHC ARM
3D	EFS DHC ARM

RELAY

DESIG	A		B		C					
CODE	MB6		MB2		MB3					
OPTION										
	CONT ARR	LOC	CONT ARR	LOC	CONT ARR	LOC	CONT ARR	LOC	CONT ARR	LOC
6	EMB	2C2	EBM	2E3	B	2H2				
5			M	2F2	EBM	2C5				
4	EB	2C3	M	2H2	M	2C3				
3	M	2C3	M	2E2	M	2C3				
2	M	2F4	M	2C3	EBM	2E3				
1	EMB	2B3	EBM	2D3	EMB	2C3				
COIL		2D2		2F5		2C2				

CAPACITOR

DESIG	LOC	CODE
C1	2E5	542N
C2	2E4	542C
C3	2B4	542N
C4	2A4	
C5	2E4	KS-16390 L17
C6	2B4	570DR
C7	2D2	KS-16390 L8

CONNECTOR

DESIG	LOC	CODE
P1	2A2	906C

DIODE

DESIG	LOC	CODE
CR1	2E4	420A
CR2	2E4	441J
CR3	2C5	420D
CR4	2F5	420G

RESISTOR

DESIG	LOC	CODE
R1	2B2	KS-14603 L1A, 31.6
R2	2C2	
R3	2B3	221A, 19 600
R4	2A3	
R5	2D3	KS-13490 L2, 2200
R6	2A4	KS-13490 L2, 0.1 MEG
R7	2D3	KS-13490 L2, 7500
R8	2D2	KS-13490 L2, 390
R9	2D4	KS-13490 L1, 18,000
R10	2D4	KS-13490 L1, 0.33 MEG
R11	2D4	KS-13490 L1, 0.43 MEG
R12	2E4	KS-13490 L1, 0.15 MEG
R13	2D3	KS-13490 L2, 470
R14	2B5	KS-13490 L1, 680
R15	2B4	
R16	2C4	KS-13490 L2, 0.1 MEG

TERMINAL BOARD

DESIG	TB
CODE	P-15C931
OPTION	
	LOC
9	2E3
8	2E2
7	2E3
6	2G3
5	2G3
4	2G3
3	2G3
2	2C4
1	2C4

TRANSISTOR

DESIG	LOC	CODE
Q1	2E5	12H
Q2	2E4	12G
Q3	2C4	12H
Q4	2C5	

VARISTOR

DESIG	LOC	CODE
RV1	2A5	317D
RV2	2F5	100A
RV3	2B5	100D
RV4	2B4	
RV5	2C5	
RV6	2C4	

STATION SYSTEMS

KEY TELEPHONE SYSTEM NO. 1A2
CO OR PBX LINE CIRCUIT

SD-69513-01-C3

BELL TELEPHONE LABORATORIES INCORPORATED

DWG SIZE 3S

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APP FIG. 4 (MFR DISC)

4000 KEY TELEPHONE UNIT

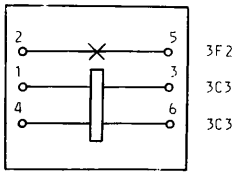
RELAY

DESIG	A				B						C			
CODE	MA19		MA20		MB16		MB22		MB24		MB17		MB23	
OPTION	B		A		B		A		ZB		B		A	
	CONT ARR	LOC	CONT ARR	LOC	CONT ARR	LOC	CONT ARR	LOC	CONT ARR	LOC	CONT ARR	LOC	CONT ARR	LOC
6					EBM	3F3	M	3F3			EMB	3C4	EMB	3C4
5					M	3E7	M	3E7	M	3E7	EBM	3F2	EBM	3F2
4	EMB	3E5	EMB	3E5	M	3C6	M	3G6	M	3G6	EBM	3G1	EBM	3G1
3	M	3B4	M	3B4	M	3C4	M	3C4	M	3C4	EBM	3B6	EB	3B6
2	M				M	3B6	M	3B6	M	3B6	EBM	3C4	EBM	3C4
1	EBM	3F6	EBM	3F6	EBM	3F1	EBM	3F1	EBM	3F1	EMB	3E6	EMB	3E6
COIL		3G5		3G5		3E4		3E4		3E4		3E5		3E5

RELAY

L

327A (SEE NOTE 201)



CAPACITOR

DESIG	LOC	CODE
C1	3E3	(ZF) 575B
C2	[illegible]	575B
C3	3D3	575C
C4	3F4	(ZE) 594G
C5	3D3	597B
C6	3G2	575B
CT	3F1	(X) KS-16390 L12
		(J) KS-16390 L17
C7	3E3	(ZC) 601A OR EQUIV
		(ZD) 575C OR EQUIV
		(ZJ) 575B OR EQUIV
C8	3E5	(ZH) 575B

TERMINAL BOARD

DESIG	TB
CODE	P-15C931
OPTION	
	LOC
10	3E6
9	3E6
8	3A6
7	3E6
6	3A6
5	3A6
4	3A6
3	3E2
2	3E2
1	3E2

DIODE

DESIG	LOC	CODE
CR1	3H5	
CR2	(ZF) 3E3	441J
CR3	3E5	
CR4	3G2	(F) 459A
CR5	3G3	(G) 420G
CR6	3G2	
(R) CR7	3F3	(R) 446C
(Q) CR7	3F3	(Q) 459E
CR8	3G1	(A) 459AF
		(B) 420K
		(ZB) 459AF

TRANSISTOR

DESIG	LOC	CODE
Q1	3F3	(ZF) 16G
Q2	3F3	(ZG) 66G
		(ZI) 66G
Q3	3F4	(ZF) 16G
		(ZG) 66G
		(ZI) 16G

RESISTOR

DESIG	LOC	CODE
R1	3D4	(A) KS-20289 L4,120
		(B) KS-14603 L1A,120
		(ZB) KS-20289 L4A,120
R2	3C3	KS-13490,L2,6800
R3	3G2	KS-13490,L2,1000
R4	3F2	KS-13490,L1,36,000
R5	[illegible]	KS-13490 L2,[illegible]
R6	3E1	KS-13490 L2,1000
R7	3E3	(Q) KS-13490,L1,5100
		(R) KS-13490,L2,5600
R8	3G4	(ZF) KS-13490,L1,16,000
R9	3F3	(R) KS-13490 L2, [illegible]
		(Q) KS-13490 L2, [illegible]
R10	3C1	(J) KS-13490 L2, 39,000
		(K) KS-13490 L2, [illegible]
R11	3E5	(E) 223A, 1560
		(D) 221A, 1560
		(ZH) KS-16312,L3A,1560
R12	3F3	KS-13490,L1,6800
R13	3F3	KS-13490,L1,1800
R14	3F1	KS-13490,L1,4700
R15	3E1	KS-13490,L1,1500
R16	3F2	KS-13490,L2,.22 MEG
R17	3D3	(J) KS-13490,L2,18,000
R18	3C3	(K) KS-13490,L2,22,000
RT1	3E2	(N) KS-13490,L1,.47 MEG
		(M) KS-13490,L1,.39 MEG
RT2	3E2	KS-13490,L1,.75 MEG

VARISTOR

DESIG	LOC	CODE
(ZA) RV1	3B3	317B

DRAWING ISSUE

3D	MPK DHC ARM
4A	EFS DHC ARM
5A	HBM KB DLY
6B	HBM KB DLY
7D	- DRC DLY
8B	
9B	
10B	
11B	
12B	
13B	
14A	
15B	

CO OR PBX LINE CIRCUIT

SD-69513-01-C4

BELL TELEPHONE LABORATORIES INCORPORATED

DWG SIZE 3S

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APP FIG. 5
400D KEY TELEPHONE UNIT

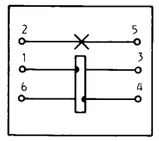
RELAY

FUNC DESIG	A		B		C	
REF DESIG						
CODE	MA28		MB24		MB23	
OPTION						
X	CONT ARR	LOC	CONT ARR	LOC	CONT ARR	LOC
6					EMB	4B4
5			M	4E6	EBM	4E2
4	EBM	4E5	M	4F6	EBM	4E2
3	M	4A4	M	4C4	EB	4E6
2			M	4E6	EBM	4B4
1	EBM	4F6	EBM	4E1	EMB	4F6
COIL	X	4G5	X	4D4	X	4D5

RELAY

L (SEE NOTE 201)

327 A



LOC
4F2
4B3
4B3

CAPACITOR

DESIG	LOC	CODE
C1	4C3	575C
C2	4E3	575B
C3	4F5	575A
C4	4D3	(ZC) 601A OR EQUIV
		(ZJ) 575B OR EQUIV
CT	4E1	KS-16390,L17,55

TRANSISTOR

DESIG	LOC	CODE
Q1	4E3	66G
Q2	4E3	66G
Q3	4E4	16G

DIODE

DESIG	LOC	CODE
CR1	4D2	456F
CR2	4G5	456F
CR3	4D4	456F
CR4	4G1	456F
CR5	4G3	456F
CR6	4E4	459E

RESISTOR

DESIG	LOC	CODE
R1	4C4	KS-20289,L4A,120
R2	4B3	KS-13490,L2,6800
R3	4F2	KS-13490,L2,3300
R4	4F2	KS-13490,L1,3E,000
R5	4D3	KS-13490,L2,82,000
R6	4E1	KS-13490,L2,1000
R7	4D3	KS-13490,L1,5100
R8	4F4	KS-13490,L2,3300
R9	4F4	KS-20810,L1A,1560
R10	4G2	KS-13490,L2,.22 MEG
R11	4F1	,L1,4700
R12	4F3	,L1,6800
R13	4F3	,L1,1800
R14	4D1	,L1,1500
R15	4E2	,L1,10,000
RT1	4D2	,L1,.39 MEG
RT2	4E2	KS-13490,L1,.75 MEG

APP FIG. 5

CO OR PBX LINE CIRCUIT

SD-69513-01-C5

BELL TELEPHONE LABORATORIES INCORPORATED

DWG SIZE 6S

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CIRCUIT NOTES:

101.

DESIG	FUSE AMP	POTENTIAL	ONE PER
		-24 SIG	FUSE PROVIDED ON ASSOC KSU OR PANEL CKT

BATTERY SYMBOL	VOLTAGE RANGE
-24	20-26V

102.

FEATURE OR OPTION				PROVIDE APP FIG.	APP OR WRG	QUANTITY
INDUCED VOLTAGE ON TIP AND RING	12V AC RMS MAX	TIME-OUT CONT	LONG TIME DELAY	2	*	1 PER LINE
			SHORT TIME DELAY		Z	
		VISUAL HOLD CKT	LAMP WINK		Y	
			LAMP STEADY		X	
		AUDIBLE SIG	INTERRUPTED RING		W	
			STEADY RING		T	
			COMMON WITH RELAY CONT		V	
			COMMON WITH DIODE MATRIX CONT		S	
	GREATER THAN 12V AC RMS SEE NOTE 302	TIME-OUT CONT	LONG TIME DELAY	3	*	1 PER LINE
			SHORT TIME DELAY		Z	
		VISUAL HOLD CKT	LAMP WINK		Y	
			LAMP STEADY		X	
		AUDIBLE SIG	INTERRUPTED RING		W	
			STEADY RING		T	
			COMMON WITH RELAY CONT		V	
			COMMON WITH DIODE MATRIX CONT		S	
TIME-OUT CONT			LONG-TIME DELAY	4	*	1 PER LINE
			SHORT-TIME DELAY		Z	
VISUAL HOLD CKT			LAMP WINK		Y	
			LAMP STEADY		X	
AUDIBLE SIG			INTERRUPTED RING		W	
			STEADY RING		T	
			COM WITH REL CONT		V	
			COM WITH DIODE MATRIX CONT		S	
DELAYED HOLD CKT RELEASE SEE NOTES 106,109 AND 306	SEE NOTES 303 & 308		NO.1 ESS	4	ZC	1 PER LINE
	SEE NOTES 303 & 307		NO. 5 X-BAR CENTREX 800A PBX (REPLACED BY OPTION ZJ)		ZD	
	SEE NOTES 303 AND 307		NO.5 X-BAR CENTREX, 800A PBX		ZJ	
DELAYED HOLD CKT RELEASE SEE NOTES 106,109 AND 306	SEE NOTES 303 & 308		NO. 1 ESS	5	ZC	1 PER LINE
	SEE NOTES 303 AND 307		NO.5 X-BAR CENTREX, 800A PBX (REPLACED BY OPTION ZJ)		ZD	
	SEE NOTES 303 AND 307		NO.5 X-BAR CENTREX, 800A PBX		ZJ	

* LONG TIME DELAY IS A FUNCTION OF THE PRINTED WIRING AND IS EFFECTIVE ONLY WHEN Z OPTION STRAP IS REMOVED.

103.

NETWORK VALUES			
NETWORK		RESISTANCE IN OHMS	CAPACITANCE IN UF
NO.	CODE		

CIRCUIT NOTES: (CONT)

104. RECORD OF APPARATUS 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	
2D				FIG. 2		FIG. 1	
3D				FIG. 4		FIG. 2 & 3	
6B	R,Q	R		Q		R	
	N/M	N		M		N	
8B	A OR B	A		A		B	
	D OR E	D		D		E	
	F OR G	F		F		G	
	J OR K	J		J		K	
9B	ZA		305			ZA	
10B	ZB OR A	ZB		ZB		A	
	ZE		305			ZE	
11B	ZF OR ZG	ZG		ZG		ZF	
12B		ZH	305	ZH			
14A	ZG OR ZI	ZI		ZI		ZG	
15B				FIG.5		FIG.4	

105. (CR4) DIODE CONNECTED FOR 400B LINE CIRCUIT. SHORT CONNECTED FOR 400A.

106. WHEN Z OPTION IS TO BE PROVIDED WITH ZC,ZD OR ZJ OPTIONS THE STRAP ON TERMINALS 1 AND 2 IS TO BE REPLACED BY THE CAPACITOR LEAD.

107. TOTAL LOOP RESISTANCE OF THE A LEAD TO THE B GROUND THROUGH THE A1 LEAD SHALL NOT EXCEED 50Ω.

108. STATION LAMP LOOP SHALL NOT EXCEED 50Ω.

109. THE CAPACITOR VALUES ASSOCIATED WITH OPTIONS ZC,ZD, AND ZJ WERE SELECTED TO PROVIDE THE NECESSARY DELAY INTERVALS IN COMBINATION WITH OPTION Z (SHORT TIMEOUT). THE DELAY OPTIONS ARE NOT RECOMMENDED FOR USE WITH THE LONG TIMEOUT ARRANGEMENT. HOWEVER, SIMILAR TIME DELAYS CAN BE PROVIDED BY CHANGING THE CAPACITOR VALUES AS FOLLOWS:
OPTION ZC FROM 5uf TO 1.62uf (701G OR EQUIVALENT)
OPTION ZJ FROM 0.5uf TO 0.162uf (594G OR EQUIVALENT)

EQUIPMENT NOTES:

201. THE SILICON PLOTTING COMPOUND HAS BEEN REPLACED TO ELIMINATE SILICON OIL CONTACT CONTAMINATION. THE NEW RELAY SHALL BE IDENTIFIED BY AN INVERTED DELTA SYMBOL (∇) FOLLOWING THE 327A DESIGNATION.

DRAWING ISSUE	
2D	EFS DHC ARM
3D	WPH DHC ARM
6B	HBH KB DLY
8B	
9B	
10B	
11B	
12B	
13B	
15B	

CO OR PBX LINE CIRCUIT

SD-69513-01-D1

BELL TELEPHONE LABORATORIES INCORPORATED
DWG SIZE 3S
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INFORMATION NOTES:

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

302. TRANSVERSE VOLTAGE UP TO APPROXIMATELY 24V RMS OR LONGITUDINAL VOLTAGE UP TO APPROXIMATELY 90V RMS

303. THE TIMEOUT INTERVAL CAN BE REDUCED BY SHUNTING A RESISTOR OF PROPER VALUE ACROSS RESISTOR RT1 WHICH CAN BE ACCOMPLISHED AS FOLLOWS:

1. REMOVE OPTION STRAP Z FROM TERMINALS 1 AND 2.
2. REPLACE OPTION Z BY CONNECTING ONE LEAD OF SHUNTING RESISTOR BETWEEN TERMINALS 1 AND 2.
3. CONNECT THE OTHER LEAD OF THE SHUNTING RESISTOR TO TERMINAL 3.
4. USE THE TABLE BELOW TO APPROXIMATE THE RESISTOR VALUE REQUIRED FOR DESIRED TIMEOUT INTERVAL.

DESIRED TIME	TIME IN SECONDS FOR NOMINAL 10 SEC TO	R * MEG Ω	EFFECT ON DELAYED HOLD RELEASE OPTIONS	
			ZC	ZJ
3/4 TO	7.5 SEC	1.20	NONE	NONE
2/3 TO	6.7 SEC	.75	NOT RECOMMENDED SEE NOTE 308	NONE
1/2 TO	5.0 SEC	.39		NONE
1/3 TO	3.4 SEC	.20		NONE

* KS-13490-L1 OR EQUIVALENT

REDUCING THE TIMEOUT BELOW 4 SEC IS NOT RECOMMENDED

NOTE:
WHERE THE DURATION OF MACHINE RINGING IS 1 SECOND, TIMEOUT SHALL NOT BE REDUCED BELOW 50% OF ORIGINAL TIMEOUT.

304. THE 400D LINE CIRCUIT SHALL BE USED WITH THE 235A AND 236A STATION LINE CONCENTRATORS, ONLY WHEN THE CONCENTRATORS HAVE BEEN MODIFIED AS SHOWN ON THE APPLICABLE ISSUES OF SD-69387-01, SD-69498-01, AND SD-69499-01.

305. WHEN LETTERED OPTION APPEARS COMPONENT IS PROVIDED ON CIRCUIT BOARD. WHEN NO LETTERED OPTION APPEARS COMPONENT IS REMOVED FROM CIRCUIT BOARD.

306. OPTIONS ZC, ZD, AND ZJ ARE INSTALLER PROVIDED OPTIONS THAT DELAY THE RELEASE OF THE LOCAL HOLD CIRCUIT WHEN THE TELEPHONE LINE IS OPENED FOR SHORT INTERVALS. THESE LINE OPENS USUALLY OCCUR WHEN THE SWITCHING MACHINE RESWITCHES THE LINE AFTER THE TRANSMISSION PATH HAS BEEN ESTABLISHED. THE DELAY INTERVAL PREVENTS FALSE RELEASE OF HOLD DURING THESE ACTIONS.

307. OPTION ZD IS ESSENTIALLY REPLACED BY OPTION ZJ. HOWEVER, IT IS NOT NECESSARY TO UPDATE CIRCUITS PREVIOUSLY MODIFIED WITH OPTION ZD.

308. THE NO. 1 ESS SPECIAL LINE APPLIQUE CIRCUIT (SD-1A297) SHOULD BE USED IN APPLICATIONS WHERE OPTION ZC CANNOT BE APPLIED.

WORKING LIMITS

RINGING RANGES:

APP FIG.	MINIMUM RINGING VOLTAGE	MINIMUM LEAKAGE RESISTANCE	MAXIMUM NO. RINGERS			
			0	1	2	3
			MAXIMUM RINGING RANGE (OHMS)			
2	72V RMS	15K	4446	1788	1119	814
	80V RMS	15K	6062	2438	1526	1110
	84V RMS	15K	6871	2763	1729	1258
	84V RMS	10K	5140	2434	1594	1185
3	72V RMS	15K	4060	1722	1093	800
	80V RMS	15K	5537	2349	1490	1091
	84V RMS	15K	6275	2662	1689	1237
	84V RMS	10K	4799	2354	1560	1166
4	72V RMS	15K	2408	1334	922	705
	80V RMS	15K	3284	1819	1258	961
	84V RMS	15K	3722	2062	1426	1090
	84V RMS	10K	3148	1873	1333	1034

FOR APP FIG. 4, NO LIMITATIONS FOR LONGITUDINAL VOLTAGES EXCEPT FOR FOLLOWING CONDITION: WHEN DIALING FROM A NON "A" LEAD STATION CONNECTED ACROSS THE T AND R, LONGITUDINAL VOLTAGE UP TO 35V RMS.

DRAWING ISSUE

3D	EFS DHC ARN
6B	HBW KB DLY
7D	- DHC DLY
9B	
10B	
11B	
12B	
15B	

CO OR PBX LINE CIRCUIT

SD-69513-01-D2

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DWG SIZE 3S

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