

**BELL SYSTEM PRACTICES**  
**Installation and Maintenance**

**SECTION C53.154**  
**Issue 3, Nov., 1954**  
**AT&T Co Provisional**

## **KEY TELEPHONE SYSTEM 1A**

### **MAINTENANCE**

#### **1. GENERAL**

1.01 This section provides certain information (including an index and drawings) to assist in the maintenance of **key telephone units**, as they are more commonly employed in providing the various service features at 1A key telephone system installations.

1.02 Maintenance of telephone sets, keys, buzzers, power equipment, etc., used in this system is covered by other C sections pertaining directly to these various apparatus items.

1.03 Due to extensive revision, arrows indicating changes have been omitted.

#### **2. TESTING AND ADJUSTMENT OF RELAYS**

2.01 Relays shall be tested and adjusted in accordance with information contained in B460 sections to meet the readjust values given in the circuit requirement tables contained in the various SD drawings covering this system.

#### **3. MODIFICATIONS**

##### **Thermistors and Varistors Used in Ringing Circuits**

3.01 At the time thermistors and varistors are in a low resistance condition due to application of ringing current, high voltage surges may occur, severely damaging these devices. When this condition is found on **any** line in a system, **each** line in the system should be equipped with a 317A varistor, connected as shown in the various drawings included in this section or as shown on appropriate SD drawings. 317A varistors may be added to 50-type KTUs or, if system employs bent angle-type KTUs, 15A, B, or C KTUs may be replaced by 15D KTUs which are equipped with a 317A varistor.

## Noise Suppression

3.02 At certain installations, objectionable noise (sometimes referred to as longitudinal noise) may be heard immediately upon answering an incoming call. Generally, this is a temporary line unbalance to ground situation, and applicable procedures for correcting this condition are authorized on page 29 of this section.

3.03 Battery feed filtering (or suppression) of objectionable noise on talking paths of intercom line circuits is discussed on page 9 and subject matter cross referenced and noted in the index below.

## 4. DRAWINGS

4.01 The drawings included in this section will assist in testing the more commonly found circuit arrangements of the 1A key telephone system. They should be used as a supplement to standard drawings and are not intended to replace them. Wherever practicable, individual service features are shown completely; and for the purpose of clarity, each circuit feature per illustration is shown in heavy black lines. Talking circuits are shown in their entirety by broad, dark gray lines.

4.02 All factual information unique to each particular drawing is found on the same page with the drawing.

## 5. INDEX

5.01 The index on pages 3, 4, 5, and 6 lists standard line circuit drawings used in the 1A key telephone system. Those drawings covering wiring and connecting of key boxes and key button telephone sets are **not** listed. Only those arrangements listed in **bold face** print are covered in this section.

# INDEX

## CENTRAL OFFICE AND PBX LINE CIRCUITS

Feature		Key Telephone Units Used	Circuit or Drawing Title		Figure Number	Page Number	Schematic Drawing Reference
Holding		1A	Operate Path Bridging Path Release Path		1A 1C 1D	7 7 7	SD-69091-01, Fig. 8
		1B	Operate Path Bridging Path Release Path		2A 2C 2D	8 8 8	SD-69091-01, Fig. 38
		5A	Auxiliary Hold		—	—	SD-69091-01, Fig. 9
		51A or 52A	Operate Path Bridging Path Release Path		22A 22C 22D	24 24 24	SD-69136-01, Figs. 1, 51, 52
		641B or 642B Subset	Holding Ckt		—	—	SD-69165-01, Fig. 2
Hold- ing	With Wink	1A or 1B	Holding Ckt	For Systems Using Bent Angle-type KTUs	—	—	SD-69091-01, Fig. 49
		51A or 52A		For Systems Using 50-type KTUs	—	—	SD-69136-01, Fig. 1 Modified per SD-69242-01
Busy Lamps Only		6A	Line Busy Lamp		—	—	SD-69091-01, Fig. 6
		6B or C	Line Busy Lamp		9	11	SD-69091-01, Fig. 22
Line Lamps Only		9A	Line Lamp		—	—	SD-69091-01, Fig. 5
		6B or C, 14A, 17A or B, 30A	Line Lamp, Com Aud Sig, and Time-out		—	—	SD-69091-01, Figs. 42, 45
		15A, B, C, or D	Ringing and Com Aud Sig		8	10	SD-69091-01, Fig. 22
		15C or D, 16A, 18D or E, 30A	Line Lamp, Com Aud Sig, and Time-out		—	—	SD-69091-01, Figs. 41, 45
		21A or B Indicator	Line (Lamp) Indicator		—	—	SD-69091-01, Fig. 17

## CENTRAL OFFICE AND PBX LINE CIRCUITS (Contd)

Feature		Key Telephone Units Used	Circuit or Drawing Title		Figure Number	Page Number	Schematic Drawing Reference
Separate Line and Busy Lamps		6A, 9A	Separate Line and Busy Lamps and Com Aud Sig		—	—	SD-69091-01, Figs. 5, 6
		6B or C, 14A	Separate Line and Busy Lamps and Com Aud Sig		—	—	SD-69091-01, Fig. 22
		6B or C, 14A, 20A	Separate Line and Busy Lamps and Com Aud Sig		—	—	SD-69091-01, Fig. 24
		<b>6B or C, 15A, B, C, or D</b>	<b>Ringling and Com Aud Sig Separate Line and Busy Lamps</b>		<b>8 9</b>	<b>10 11</b>	SD-69091-01, Fig. 22
		6B or C, 15A, or B, 16A	Separate Line and Busy Lamps and Com Aud Sig		—	—	SD-69091-01, Fig. 23
Combined Line and Busy Lamps		6B or C, 14A, 17A, 19A or B, 20A	Combined Line and Busy Lamps, Com Aud Sig, and Time-out		—	—	SD-69091-01, Fig. 26
		14A, 17A or B, 18D or E, 19A or B, 30A	Combined Line and Busy Lamps, Com Aud Sig, and Time-out		—	—	SD-69091-01, Figs. 44, 45, 46
		<b>15A or B, 16A, 18A, B, or C, 19A or B</b>	<b>Ringling and Com Aud Sig Combined Line and Busy Lamps Flashing Relays</b>		<b>10 11 12</b>	<b>12 13 14</b>	SD-69091-01, Fig. 25
		15A or B, 16A, 18B or C, 19A or B, 30A	Combined Line and Busy Lamps, Com Aud Sig, and Time-out		—	—	SD-69091-01, Fig. 40
		<b>15C or D, 16A, 18D or E, 19A or B, 30A</b>	<b>Ringling and Com Aud Sig Combined Line and Busy Lamps Flashing Relays Time-out</b>		<b>13 14 15 16</b>	<b>15 16 17 18</b>	SD-69091-01, Figs. 43, 45, 46
		<b>51A</b>	<b>Ringling and Com Aud Sig Combined Line and Busy Lamps Flashing Relays Time-out</b>		<b>17 18 19 20</b>	<b>19 20 21 22</b>	SD-69136-01, Figs. 1, 6, 7, 17, 51
		<b>52A</b>	<b>Ringling and Com Aud Sig Combined Line and Busy Lamps Flashing Relays Time-out</b>		<b>23 24 25 26</b>	<b>25 26 27 28</b>	SD-69136-01, Figs. 1, 6, 7, 17, 51, 52



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## CENTRAL OFFICE AND PBX LINE CIRCUITS (Contd)

Feature	Key Telephone Units Used	Circuit or Drawing Title		Figure Number	Page Number	Schematic Drawing Reference
Combined Line and Busy Lamps (Contd)	213A	CO or PBX line ckt for joint use with stations of other systems or equipments		—	—	SD-69230-01, Figs. 1, 51
Wink With Combined Line and Busy Signal and Holding	1A or B, 15C or D, 16A, 17B, 18D or E, 19A or B, 30A, 33A	Wink, Combined Line and Busy Signal, Com Aud Sig, Time-out, and Holding		—	—	SD-69091-01, Figs. 45, 46, 49, 50, 51
	17B, 18D, 33A, 51A or 52A	Wink, Combined Line and Busy Signal, Com Aud Sig, Time-out, and Holding		—	—	SD-69136-01, Figs. 1, 6, 7, 17 Modified per SD-69242-01
Automatic Cutoff	25A or B, 26A or B	Automatic Cutoff and Control Ckt	For Systems Using Bent Angle-type KTUs	—	—	SD-69091-01, Figs. 36, 39
			For Systems Using 50-type KTUs	—	—	SD-69136-01, Figs. 21, 22
Automatic Exclusion	10A	Automatic Exclusion		—	—	SD-69140-01, Fig. 1
Listening-in	5A Varistor	Listening-in Line Ckt		—	—	SD-69091-01, Fig. 16
	See Dwg	Listening-in Line Ckts		—	—	SD-69155-01
Noise Suppression	17B	Modification of 51A KTU		27	29	—
		Modification of 52A KTU		28	29	—

## INTERCOMMUNICATING LINE AND SIGNALING CIRCUITS

Type of Circuit	Key Telephone Units Used	Circuit or Drawing Title		Figure Number	Page Number	Schematic Dwg and/or BSP Sect Reference
Dial Selective	57A	Dialing and Line Busy Lamp Audible Signaling Release		29 30 31	30 31 32	SD-69199-01, Figs. 1, 51
	57A	25B, 26B	Line, Busy Lamp, and Cutoff	—	—	SD-69199-01, Figs. 1, 4, 5, 6, 51
		6C, 29A	Line and Combined Line and Busy Lamp	—	—	SD-69199-01, Figs. 1, 7, 51
		25B, 26B, 6C, 29A	Line, Combined and Busy Lamp, and Cutoff	—	—	SD-69199-01, Figs. 1, 4, 5, 6, 51
Line and Signaling	2A	Battery Feed Coil		3	9	SD-69091-01, Fig. 11
	3A	Selective and Code Signaling	For Systems Using Bent Angle-type KTUs	—	—	SD-69091-01, Figs. 10, 21
			For Systems Using 50-type KTUs	—	—	SD-69136-01, Figs. 10, 11
	4A	Automatic Signaling		—	—	SD-69091-01, Fig. 12
	12A	Battery Feed Coil		4	9	SD-69091-01, Fig. 19
	13A	Battery Feed Relay and 2-way Automatic Signaling		—	—	SD-69091-01, Fig. 20
	13B	Battery Feed Relay, 2-way Automatic Sig, and Line Busy Lamp		—	—	SD-69091-01, Fig. 29
	13B, 17A or B, 19A or B	Battery Feed Relay, 2-way Automatic Sig and Comb Line and Busy Lamp		—	—	SD-69091-01, Figs. 32, 46
	31A	Battery Feed Relay and Line Busy Lamp		5	9	SD-69091-01, Fig. 47
	51A	Battery Feed Relay and Line Busy Lamp		21	23	SD-69136-01, Figs. 1, 5, 17, 51



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## INTERCOMMUNICATING LINE AND SIGNALING CIRCUITS (Contd)

Type of Circuit	Key Telephone Units Used	Circuit or Drawing Title		Figure Number	Page Number	Schematic Dwg and/or BSP Sect Reference
Line and Signaling (Contd)	641B or 642B Subset	Battery Feed Coil		—	—	SD-69165-01, Fig. 3
	J86205A, L1 Rectifier	Battery Supply and Feed		6	9	SD-80555-03, C53.513
	J86205H, L1 Rectifier	Battery Supply and Feed		7	9	SD-80672-01, C53.513
Noise Suppression	23A	Noise Suppression for Battery Supply	For Systems Using Bent Angle-type KTUs	—	—	SD-69091-01, Fig. 34, C53.513
		Noise Suppression for Battery Supply	For Systems Using 50-type KTUs	—	—	SD-69136-01, Fig. 23, C53.513
	KS-14136 Condenser	Noise Suppression for Battery Supply		—	—	SD-69136-01, Fig. 24, C53.513
	KS-8056 Condenser	Noise Suppression for Battery Supply		—	—	C53.513

## PRIVATE LINE, TIE LINE, STATION LINE, ETC., CIRCUITS

Type of Line	Key Telephone Units Used	Circuit or Drawing Title		Figure Number	Page Number	Schematic Drawing Reference
Private Lines	7A	Private Line Ckt		—	—	SD-69091-01, Fig. 7
	7A, 15C or D, 16A, 19A or B, 30A, 31A	Private Line Signaling and Battery Feed Relay Ckt		—	—	SD-69091-01, Figs. 45, 46, 48
	56A	Private Line Ckt		—	—	SD-69105-01, Figs. 1, 51

## PRIVATE LINE, TIE LINE, STATION LINE, ETC., CIRCUITS (Contd)

Type of Line	Key Telephone Units Used	Circuit or Drawing Title	Figure Number	Page Number	Schematic Drawing Reference
Tie Lines	53A	Automatic Tie Line Ckt	—	—	SD-69136-01, Figs. 2, 6, 7, 14, 17, 53
	54A	Ringdown Tie Line Ckt	—	—	SD-69136-01, Figs. 3, 6, 7, 14, 17, 54
Station Line	55A	Station Line Ckt	—	—	SD-69136-01, Figs. 4, 6, 7, 14, 17, 55

## MISCELLANEOUS

Item	Code	Circuit or Use		Schematic Dwg and/or BSP Sect Reference
Bent Angle-type KTUs	1-type thru 33-type KTUs	Schematic Wiring Dwgs showing Individual KTUs		SD-69243-01
Buzzers	4-type Buzzers	Common Audible Signal		Connections C65.826
				Maintenance B438.003
	7-type Bells and Buzzers	Common Audible Signal	For Systems Using Bent Angle-type KTUs	Connections SD-69091-01, Fig. 15
				Maintenance C54.352
		Common Audible Signal	For Systems Using 50-type KTUs	Connections SD-69136-01, Fig. 13
				Maintenance C54.352
		Inter-com Signal	For Systems Using Bent Angle-type KTUs	Connections SD-69091-01, Fig. 15
				Maintenance C54.352
			For Systems Using 50-type KTUs	Connections SD-69136-01, Fig. 12
				Maintenance C54.352
		Inter-com Signal	For Dial Selective Intercom Station Sig	Connections SD-69199-01, Fig. 2
				Maintenance C54.352

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## MISCELLANEOUS (Contd)

Item	Code	Circuit or Use		Schematic Dwg and/or BSP Sect Reference
Lamps	A3, B2, G2, K2, 51A Lamp	Line Lamp, Busy Lamp, Comb Line and Busy Lamp or Sig Lamp	For Systems Using Bent Angle-type KTUs	SD-69091-01, Fig. 28
			For Systems Using 50-type KTUs	SD-69136-01, Fig. 15
			For Dial Selective Intercom Line	SD-69199-01, Fig. 9
	22-type KTU	Lamp Resistance Ckt	For Systems Using Bent Angle-type KTUs	SD-69091-01, Fig. 33
			For Systems Using 50-type KTUs	SD-69136-01, Fig. 20
			For Dial Selective Intercom Line Ckt	SD-69199-01, Fig. 10
	ED-91929-01, G5 Equipment Unit	Lamp Resistance Ckt	For Dial Selective Intercom Line Ckt	SD-69199-01, Fig. 11
Power	11A KTU	Ringing Feeder Lamp Ckt	For Systems Using Bent Angle-type KTUs	SD-69091-01, Fig. 18
			For Systems Using 50-type KTUs	SD-69136-01, Fig. 8
	16A KTU	Used with Dial Selective Intercom Line Ckt		SD-69199-01, Fig. 15
	17B KTU	Used with Dial Selective Intercom Line Ckt		SD-69199-01, Fig. 14
	393A or B Transformer	For Systems Using Bent Angle-type KTUs		SD-69091-01, Fig. 31
		For Systems Using 50-type KTUs		SD-69136-01, Fig. 19
	KS-5714, L1, 2, or 3 Transformer	For Systems Using Bent Angle-type KTUs		SD-69091-01, Fig. 30
		For Systems Using 50-type KTUs		SD-69136-01, Fig. 18

## MISCELLANEOUS (Contd)

Item	Code	Circuit or Use		Schematic Dwg and/or BSP Sect Reference
Ringer (External to Set)	531A or 584DE Subset	Common Ringer	For Systems Using Bent Angle-type KTUs	SD-69091-01, Fig. 4
			For Systems Using 50-type KTUs	SD-69136-01, Fig. 16
			For Dial Selective Intercom Station Ringer	SD-69199-01, Fig. 3
		Line Ringer	For Systems Using Bent Angle-type or 50-type KTUs When 10A KTU is used (Auto Excl)	SD-69091-01, Fig. 3 SD-69140-01, Fig. 2
Signaling Keys	551A, 549A, B, C, or D Keys	Signaling Key Ckt		SD-69091-01, Fig. 14
Switching Relay	17A or B KTU	Switching Relay Ckt		SD-69091-01, Fig. 27
Range Charts	—	Range Charts for Systems Connected to PBXs		SD-69200-01