



No. 1A Key Telephone System

.....*Western Electric*.....

Western Electric

1A Key Telephone System

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GENERAL DESCRIPTION

The 1A Key Telephone System provides station switching facilities to be operated by the subscriber on individual common battery Central Office or PBX lines without the assistance of an attendant or operator. With this system the subscriber may perform the following services.

- a. Answer and originate calls on from one to six central office, PBX, intercommunicating or private lines.
- b. Hold calls on from one to five central office or PBX lines.
- c. Cut off extension stations, extension ringers or the ringer in the set, or disconnect the ringer in the set and connect a distant extension station or ringer.
- d. Signal on intercommunicating or private lines.

The switching features are provided by means of keys located in the base of the telephone set. The keys are available in a variety of types and provide for combinations of the general features referred to above. The maximum number of keys is six, and where holding, signaling or cutoff keys are included, the number of line keys is correspondingly reduced.

This system replaces station wiring plans, some of the key equipments and also provides other services not covered by such plans.

The key telephone sets equipped with switching keys used in this system have recently been made available with clear plastic key buttons which can be illuminated by lamps. The system is arranged so that the individual requirements for each station in a particular installation may be provided on a feature basis by selecting the proper key telephone set and interconnecting selected key telephone units for the common equipment. Wired and assembled units are also available for providing a group of operating features for two, three and four Central Office or PBX lines.

Station Apparatus

The key telephone sets are combined telephone sets similar in appearance to the standard keyless combined telephone sets. These sets include in a single housing the switching keys, line and busy lamps, if desired, subscriber set apparatus, ringer and the additional cord conductors which are required for the keys and lamps. Where more than one line terminates in a set the ringer may be connected to any one of the lines, externally mounted ringers being used for the balance of the lines. If desired this ringer may also be used as an audible signal common to all of the lines. The keys serve to switch the talking circuit to any line. On sets having 4 or 6 button keys, the keys are equipped with a latch which is associated with two of the pickup positions and arranged so that the buttons of the two positions cannot be locked simultaneously when depressed. On sets having a combined turn and push button key, the key is located in the telephone set housing just below and to the left of the dial. It has a small black key button with a white line engraved in its top to indicate the position of the key. The key is furnished with two sets of transfer contacts operated by turning the button and a set of make contacts operated by pushing it downward.

A magnetic shield around the induction coil and a balanced talking and ringing condenser unit are provided in the telephone sets to avoid undesirable crosstalk between two lines when the ringer is on one of them and the set circuit is on the other. In order to provide this balance the condenser cover is connected to the ring side of the line. As a further precaution against undesirable crosstalk, the cords are constructed in spiral pairs and fours so as to minimize any unbalance between cord conductors. The feature combination furnished by a given set may be varied to some extent by making suitable changes in the connection of the spade tipped leads in the set as, for example, to associate a cutoff key with any one of the lines appearing in the set.

The key telephone sets and the features provided by the various code numbers for manual and dial service with and without illuminated key buttons are identified on the next two succeeding pages. This tabulation also indicates the key and telephone set circuit drawing applicable to each.

Feature Combinations Provided and Corresponding Codes of Telephone Sets and Cords

FOUR BUTTON SETS

Telephone Set Non-Illuminated Key Buttons

Types of Keys and Features Provided	Code No. Manual Service	Code No. Dial (A) Service	Code No. Cord (B)	Key and Telephone Set Circuit
<div>561A</div> <div>(P) (P) (P) (P)</div>	440AAW-3	440ACW-3	D10D-9	Fig. 1
<div>561B</div> <div>(P) (P) (P) (S)</div>	440BAW-3	440BCW-3	D10D-9	Fig. 1
<div>561E</div> <div>(H) (P) (P) (P)</div>	440EAW-3	440ECW-3	D14A-9	Fig. 5
<div>561F</div> <div>(H) (P) (P) (S)</div>	440FAW-3	440FCW-3	D12A-9	Fig. 5
<div>561G</div> <div>(H) (P) (P) (C)</div>	440GAW-3	440GCW-3	D12A-9	Fig. 5

H = Hold
P = Pickup
S = Signal
C = Cutoff

SIX BUTTON SETS

Telephone Set Non-Illuminated Key Buttons

Types of Keys and Features Provided	Code No. Manual Service	Code No. Dial (A) Service	Code No. Cord (B)	Key and Telephone Set Circuit
<div>562A</div> <div>(P) (P) (P) (P) (P) (P)</div>	460AAW-3	460ACW-3	D14A-9	Fig. 1
<div>562G</div> <div>(H) (P) (P) (P) (P) (P)</div>	460GAW-3	460GCW-3	D22B	Fig. 5
<div>562H</div> <div>(H) (P) (P) (P) (P) (S)</div>	460HAW-3	460HCW-3	D20B	Fig. 5
<div>562K</div> <div>(H) (P) (P) (P) (P) (C)</div>	460KAW-3	460KCW-3	D20B	Fig. 5
<div>562L</div> <div>(H) (P) (P) (P) (S) (C)</div>	460LAW-3	460LCW-3	D18C	Fig. 5
<div>562M</div> <div>(H) (P) (P) (P) (S) (S)</div>	460MAW-3	460MCW-3	D18C	Fig. 5
<div>562N</div> <div>(H) (P) (P) (S) (S) (S)</div>	460NAW-3	460NCW-3	D14A-9	Fig. 5

H = Hold
P = Pickup
S = Signal
C = Cutoff

COMBINED TURN AND PUSH BUTTON TYPE KEY TELEPHONE SETS

410AAW-3	410ACW-3	D4AH-9	Fig. 4
410BAW-3	410BCW-3	D6P-9	Fig. 4
410CAW-3	410CCW-3	D8M-9	Fig. 4

Telephone Set Illuminated Key Buttons

Code No. Manual Service	Code No. Dial (A) Service	Code No. Cord (B)	Lamp, Key & Tele- phone Set Circuit
444AAW	444ACW	D16B	Fig. 3
*	*		
444EAW	444ECW	D18C	Fig. 2
444FAW	444FCW	D16B	Fig. 2
*	*		



Telephone Set Illuminated Key Buttons

Code No. Manual Service	Code No. Dial (A) Service	Code No. Cord (B)	Lamp, Key & Tele- phone Set Circuit
*	*		
464GAW	464GCW	D29A	Fig. 2
464HAW	464HCW	D26B	Fig. 2
*	*		
*	*		
464MAW	464MCW	D22B	Fig. 2
*	*		



- * No set coded to provide these features.
 (A) Key Telephone Sets include No. 5HB Dial.
 (B) Manual and Dial Key Telephone Sets include cords as identified.
 Code numbers of keys are shown on key top diagrams.

KEY TELEPHONE SYSTEM NO. 1A KEY AND TELEPHONE CIRCUIT ARRANGED FOR PICK-UP, AND SIGNALING

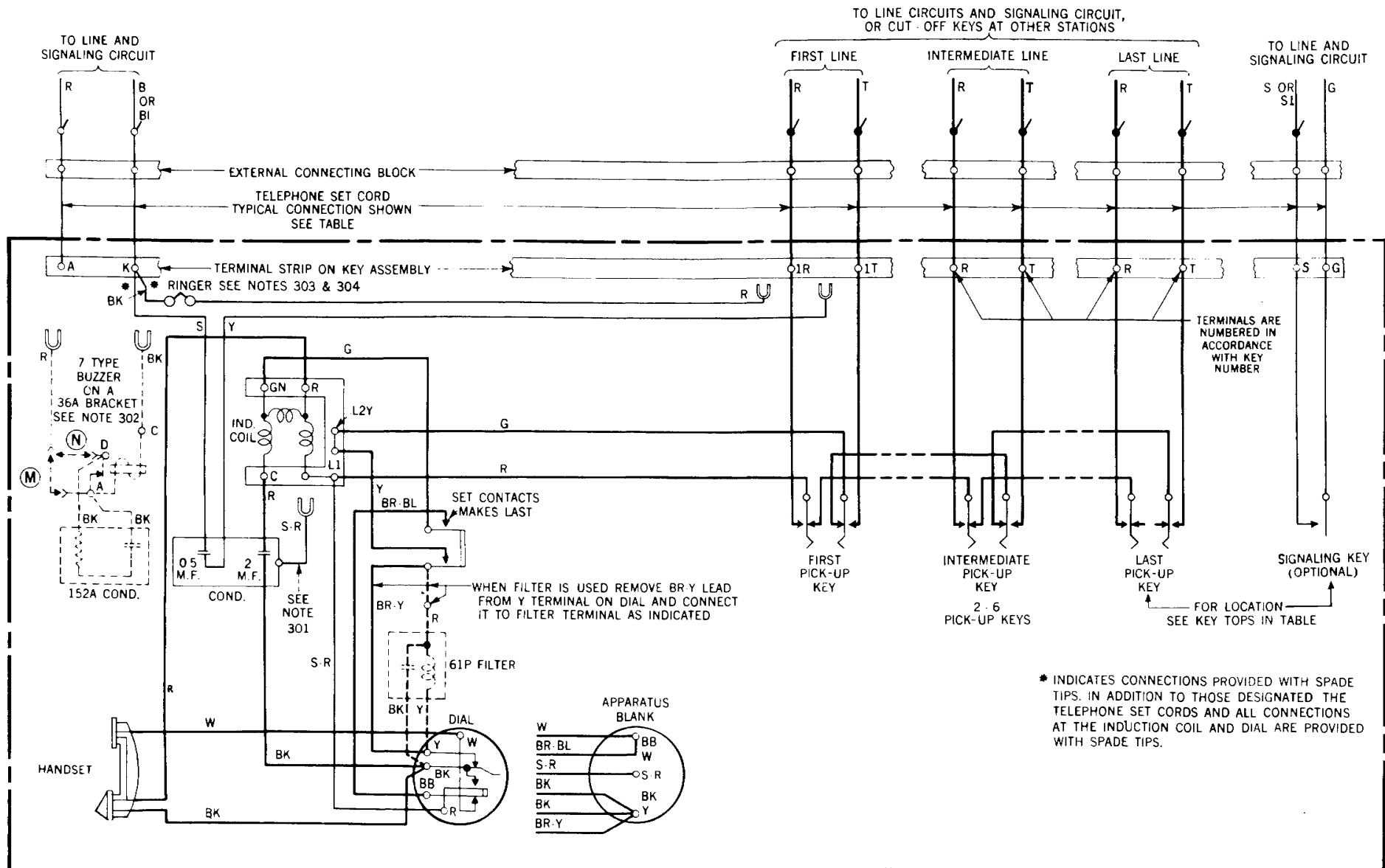


FIGURE 1

CIRCUIT NOTES:

101. PROVIDE THE KEY TELEPHONE SET IN ACCORDANCE WITH REQUIREMENTS AS INDICATED IN THE FOLLOWING TABLE.
THE CORD CONDUCTOR COLORS ARE SHOWN UNDER THE DESIGNATIONS OF THE TERMINALS IN THE SET.

NUMBER OF LINES AND FEATURES PROVIDED FOR BY KEYS	CODE			CORD CONDUCTOR COLORS	TO LINE 1		TO LINE 2		TO LINE 3		TO LINE 4		TO LINE 5		TO LINE 6		BUZZER SIGNALLING		TO LINE AND SIGNAL CKT.		
	KEY TEL. SET		TEL. SET CORD		RING	TIP	RING	TIP	RING	TIP	RING	TIP	RING	TIP	RING	TIP	GND	BUZZ I	R	B	
	MANUAL	5HB DIAL	CODE		DESIGNATIONS OF TERMINALS IN THE SET (SEE NOTES 303 AND 304)																*
					1R	1T	2R	2T	3R	3T	4R	4T	5R	5T	6R	6T	G	S	A	A	
<div>P P P P</div>	440AAW-3	440ACW-3	D10D	R	G	Y	BK	BL	W	R-R	G-G							Y-Y	BK-BK		
<div>P P P P S</div>	440BAW-3	440BCW-3	D10D	R	G	Y	BK	BL	W							G-G	R-R	Y-Y	BK-BK		
<div>P P P P P P</div>	460AAW-3	460ACW-3	D14A	R	G	Y	BK	BL	W	BR-R	BR-G	BR-Y	BR-BK	BR-BL	BR-W			R-G	R-Y		

301. CONNECTIONS OF S-R CONDENSER LEAD

	BUZZER OR SET RINGER USED FOR	CONNECT S-R CONDENSER LEAD TO TERM.	DISPOSAL OF CORD CONDUCTORS SHOWN IN NOTE 101 ON TERMS.	
			A	*A
SETS DATED 4-1-41 WITH DOT BESIDE DATE AND DATED LATER WITHOUT DOT	COMMON RINGER OR BUZZER	LI	A	K
	LINE RINGER	R HAVING RED RINGER LEAD	A	A

304. MAKE RINGER AND BUZZER CONNECTIONS AS FOLLOWS:

	RINGER AND CONDENSER CONNECTIONS	TERMINALS IN SET	R	Y
COLOR OF WIRES IN SET			R	Y
SET RINGER USED AS INDIVIDUAL LINE RINGER ON T AND R OF ANY LINE, EXCEPT PRIVATE LINES.			R	T
SET RINGER USED FOR PRIVATE LINE OR AS COMMON RINGER, OR BUZZER USED AS COMMON OR INTERCOMMUNICATING SIGNAL.			A	K
RINGER IN SET NOT USED			A	A

302. PROVIDE "M" WIRING WHEN THE BUZZER IS TO OPERATE ON 60 CYCLE A-C AND PROVIDE "N" WIRING WHEN THE BUZZER IS TO OPERATE ON D-C.

303. SETS ARE WIRED IN THE SHOP WITH RED RINGER AND YELLOW CONDENSER LEADS CONNECTED TO "1R" AND "1T" TERMINALS, RESPECTIVELY, FOR SET RINGER TO BE USED AS A LINE RINGER ON LINE 1. THEY MAY BE CONNECTED BY THE INSTALLER TO OTHER "R" AND "T" TERMINALS. WHEN THE RINGER IS USED FOR A PRIVATE LINE OR AS A COMMON RINGER OR WHEN A BUZZER IS USED, CHANGE THE CORD CONDUCTOR SHOWN CONNECTED TO TERMINAL "A" IN THE COLUMN UNDER THE ASTERISK IN THE TABLE OF NOTE 101 TO TERMINAL "K" INSTEAD.

FIGURE 1A

KEY TELEPHONE SYSTEM NO. 1A LAMP, KEY AND TELEPHONE CIRCUIT WITH LAMPS IN TELEPHONE SET ARRANGED FOR PICK-UP, HOLDING AND SIGNALING

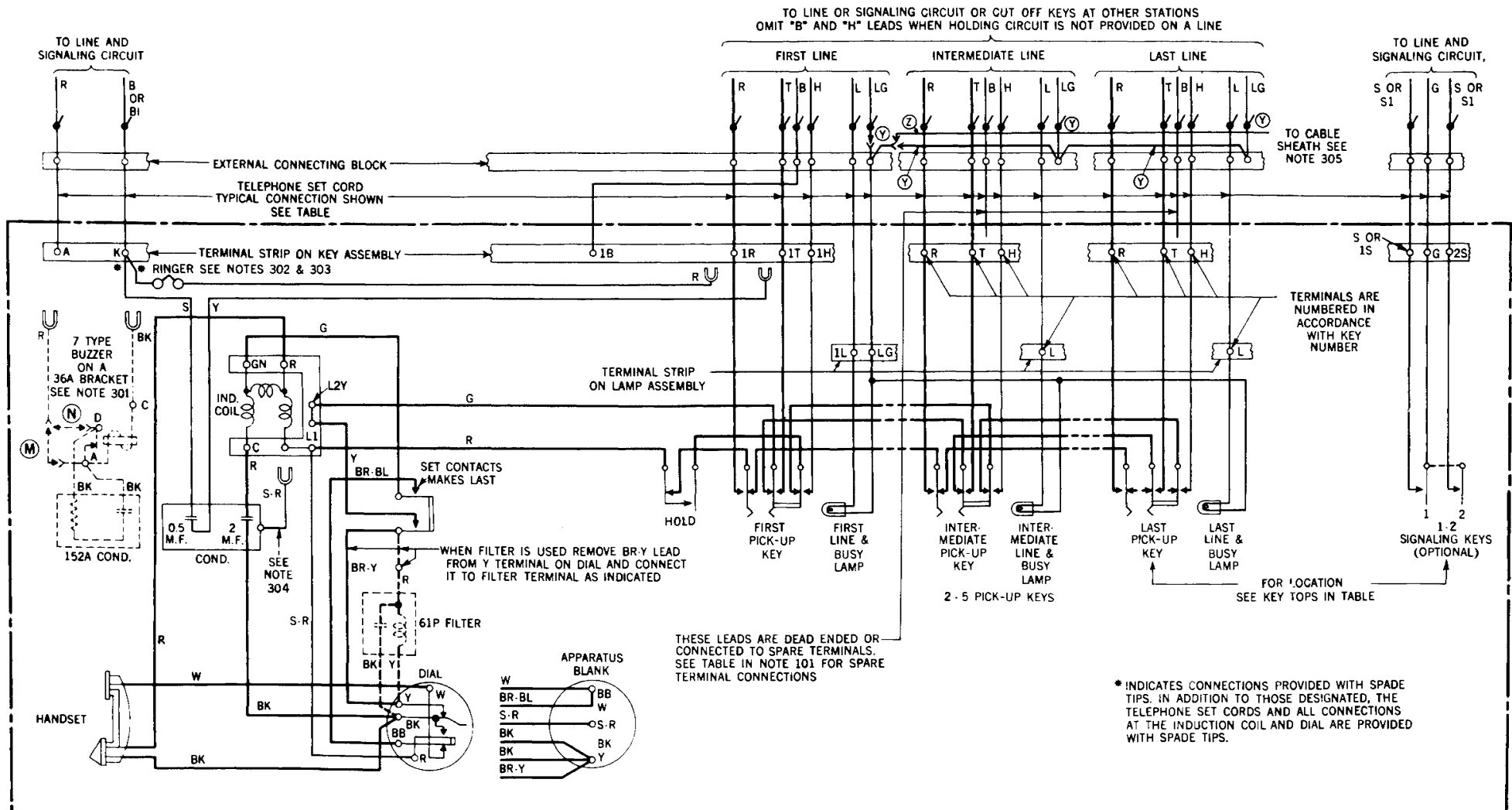


FIGURE 2

CIRCUIT NOTES:

101. PROVIDE THE KEY TELEPHONE SET IN ACCORDANCE WITH REQUIREMENTS AS INDICATED IN THE FOLLOWING TABLE. THE CORD CONDUCTOR COLORS ARE SHOWN UNDER THE DESIGNATIONS OF THE TERMINALS IN THE SET EXCEPT WHERE "0" APPEARS WHICH INDICATES THAT THE CONDUCTOR IS DEAD-ENDED IN THE SET.

NUMBER OF LINES AND FEATURES PROVIDED FOR BY KEYS	CODE		TO LINE 1		TO LINE 2				TO LINE 3				TO LINE 4				TO LINE 5				BUZZER SIGNALING		TO LINE AND SIGNAL CKT.		LINE AND BUSY LAMPS					SPARE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
	KEY TEL. SET	TEL SET CORD	RING	TIP	BAL	HOLD	RING	TIP	BAL.		HOLD	RING	TIP	BAL.		HOLD	RING	TIP	BAL.		HOLD	RING	TIP	BAL	HOLD	GND	BUZZ 1	BUZZ 2	R	B	LAMP GRD.	LAMP 1	LAMP 2	LAMP 3	LAMP 4	LAMP 5																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
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			IR	IT	IB	IH	2R	2T	E2	D	2B	2H	3R	3T	E1	D	3B	3H	4R	4T	E4	D	4H	5R	5T	E1	5H	G	S	1S	2S	A	A	LG	1L	2L	3L	4L	5L	X	E1	E3	E4																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
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	444FAW	444FCW	D16B	R	G	Y	BK	BL	W			BR-R	BR-R	BR-R	BR-R												R-Y	R-G		R-BK	R-BL	BR-R	Y	BR-BL	BR-W						BR-BK																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
	464GAW	464GCW	D29A	R	G	Y	BK	BL	W			BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R	BR-R

INFORMATION NOTES:

301. PROVIDE "M" WIRING WHEN THE BUZZER IS TO OPERATE ON 60 CYCLE A-C, AND PROVIDE "N" WIRING WHEN THE BUZZER IS TO OPERATE ON D-C.

302. SETS ARE WIRED IN THE SHOP WITH RED RINGER AND YELLOW CONDENSER LEADS CONNECTED TO "IR" AND "IT" TERMINALS, RESPECTIVELY, FOR SET RINGER TO BE USED AS A LINE RINGER ON LINE 1. THEY MAY BE CONNECTED BY THE INSTALLER TO OTHER "R" AND "T" TERMINALS. WHEN THE RINGER IS USED FOR A PRIVATE LINE OR AS A COMMON RINGER OR WHEN A BUZZER IS USED CHANGE THE CORD CONDUCTOR SHOWN CONNECTED TO TERMINAL "A" IN THE COLUMN UNDER THE ASTERISK IN THE TABLE OF NOTE 101 TO TERMINAL "K" INSTEAD.

303. MAKE RINGER AND BUZZER CONNECTIONS AS FOLLOWS:

COLOR OF WIRES IN SET		RINGER AND CONDENSER CONNECTIONS	
SET RINGER USED AS INDIVIDUAL LINE RINGER ON T AND R OF ANY LINE, EXCEPT PRIVATE LINES.		R	Y
SET RINGER USED FOR A PRIVATE LINE OR AS COMMON RINGER OR BUZZER USED AS COMMON OR INTERCOMMUNICATING SIG.		R	T
RINGER IN SET NOT USED.		A	K
		A	A

304. CONNECT S-R CONDENSER LEAD AS FOLLOWS:

WHEN SET RINGER IS USED FOR A COMMON RINGER OR WHEN A BUZZER IS USED, CONNECT S-R CONDENSER LEAD TO TERMINAL "LI".

WHEN SET RINGER IS USED FOR A LINE RINGER CONNECT S-R CONDENSER LEAD TO "R" TERMINAL OF LINE WITH WHICH THE RINGER IS ASSOCIATED.

305. PROVIDE "Y" WIRING FOR METALLIC RETURN. (METALLIC RETURN SHALL ALWAYS BE PROVIDED WHEN THE BATTERY IS NOT LOCATED IN THE SAME BUILDING AS THE KEY TEL. SYSTEM OR WHEN IT IS LOCATED IN THE SAME BUILDING AND IT IS CHARGED OVER METALLIC RETURN FEEDERS. METALLIC RETURN SHALL ALSO BE USED ON A-C SUPPLY.)

PROVIDE "Z" WIRING FOR CABLE SHEATH RETURN. (CABLE SHEATH RETURN SHALL ONLY BE USED WHEN THE BATTERY IS LOCALLY GROUNDED AND LOCATED IN THE SAME BUILDING AS KEY TEL. SYSTEM.)

FIGURE 2A

KEY TELEPHONE SYSTEM NO. 1A LAMP, KEY AND TELEPHONE CIRCUIT WITH LAMPS IN TELEPHONE SET ARRANGED FOR PICK-UP.

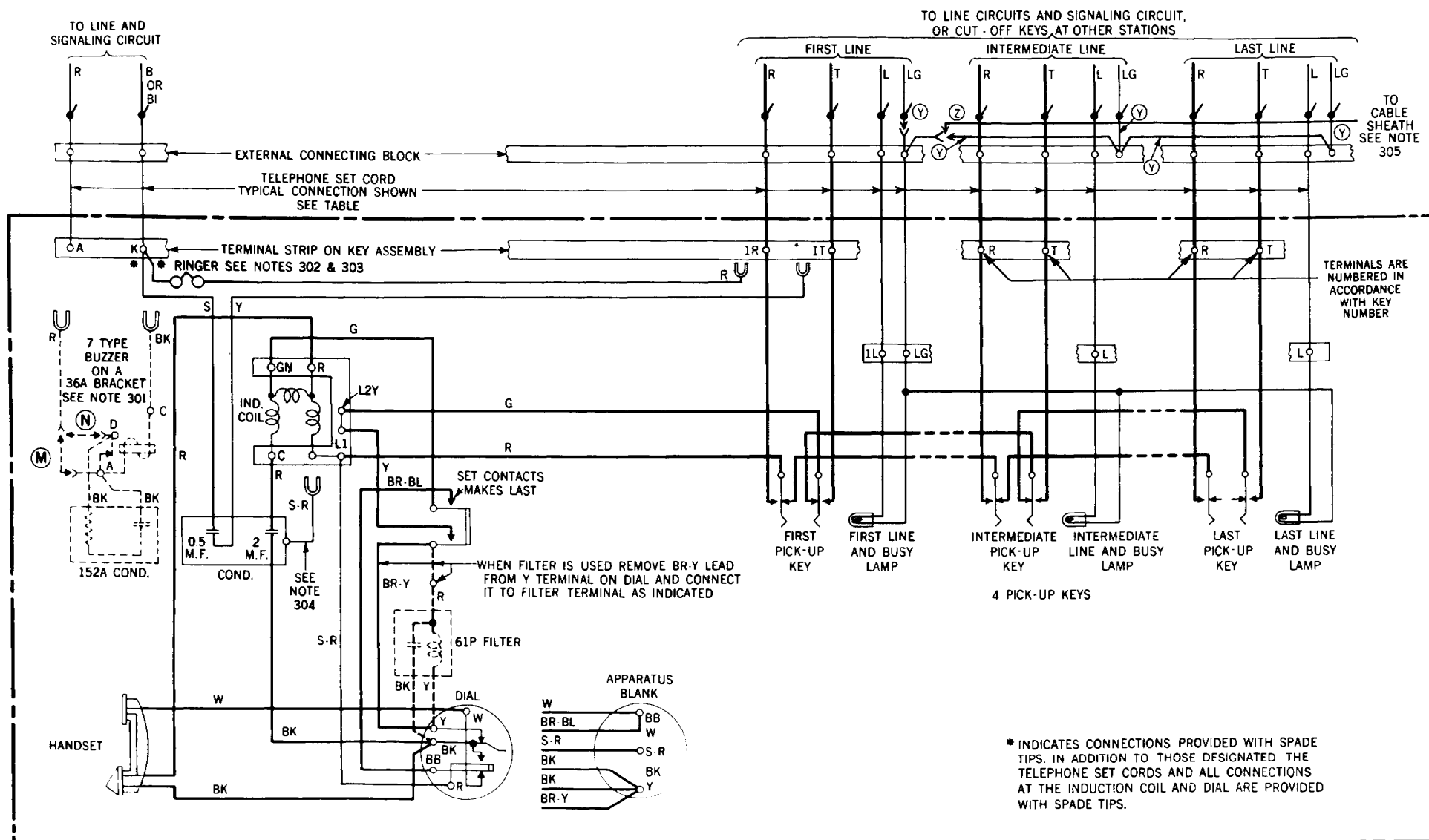


FIGURE 3

CIRCUIT NOTES:

101. PROVIDE THE KEY TELEPHONE SET IN ACCORDANCE WITH REQUIREMENTS AS INDICATED IN THE FOLLOWING TABLE. THE CORD CONDUCTOR COLORS ARE SHOWN UNDER THE DESIGNATIONS OF THE TERMINALS IN THE SET.

NUMBER OF LINES AND FEATURES PROVIDED FOR BY KEYS	CODES		TO LINE 1		TO LINE 2		TO LINE 3		TO LINE 4		TO LINE AND SIGNAL CKT.		LINE AND BUSY LAMPS					SPARE		
	KEY TEL. SET		TEL. SET CORD	RING	TIP	RING	TIP	RING	TIP	RING	TIP	R	B	LAMP GND	LINE 1	LINE 2	LINE 3	LINE 4		
	MANUAL	DIAL (5HB)		DESIGNATIONS OF THE TERMINALS IN THE SET										*	(SEE NOTES 302 AND 303)					
				IR	IT	2R	2T	3R	3T	4R	4T	A	A	LG	IL	2L	3L	4L	EI	
														A	A	LG	IL	2L	3L	4L
<div>P O P O</div>	444AAW	444ACW	D16B	R	G	Y	BK	BL	W	PR-R	BR-G	R-BK	R-BL	BR-Y	BR-BK	BR-BL	BR-W	R-G	R-Y	
CORD CONDUCTOR COLORS																				

INFORMATION NOTES:

301. PROVIDE "M" WIRING WHEN THE BUZZER IS TO OPERATE ON 60 CYCLE A-C AND PROVIDE "N" WIRING WHEN THE BUZZER IS TO OPERATE ON D-C.
302. SETS ARE WIRED IN THE SHOP WITH RED RINGER AND YELLOW CONDENSER LEADS CONNECTED TO "IR" AND "IT" TERMINALS, RESPECTIVELY, FOR SET RINGER TO BE USED AS A LINE RINGER ON LINE 1. THEY MAY BE CONNECTED BY THE INSTALLER TO OTHER "R" AND "T" TERMINALS. WHEN THE RINGER IS USED FOR A PRIVATE LINE OR AS A COMMON RINGER OR WHEN A BUZZER IS USED, CHANGE THE CORD CONDUCTOR SHOWN CONNECTED TO TERMINAL "A" IN THE COLUMN UNDER THE ASTERISK IN THE TABLE OF NOTE 101 TO TERMINAL "K" INSTEAD.
303. MAKE RINGER AND BUZZER CONNECTIONS AS FOLLOWS:

		RINGER AND CONDENSER CONNECTIONS	
COLOR OF WIRES IN SET		R	Y
SET RINGER USED AS INDIVIDUAL LINE RINGER ON T AND R OF ANY LINE, EXCEPT PRIVATE LINES. SET RINGER USED FOR A PRIVATE LINE OR AS COMMON RINGER, OR BUZZER USED AS COMMON OR INTERCOMMUNICATING SIGNAL. RINGER IN SET NOT USED.	TERMINALS IN SET	R	T
		A	K
		A	A

304. CONNECT S-R CONDENSER LEADS AS FOLLOWS:

WHEN SET RINGER IS USED FOR A COMMON RINGER OR WHEN A BUZZER IS USED, CONNECT S-R CONDENSER LEAD TO TERMINAL "LI".
WHEN SET RINGER IS USED FOR A LINE RINGER CONNECT S-R CONDENSER LEAD TO "R" TERMINAL OF LINE WITH WHICH THE RINGER IS ASSOCIATED.

305. PROVIDE "Y" WIRING FOR METALLIC RETURN (METALLIC RETURN SHALL ALWAYS BE PROVIDED WHEN THE BATTERY IS NOT LOCATED IN THE SAME BUILDING AS THE KEY TEL. SYSTEM OR WHEN IT IS LOCATED IN THE SAME BUILDING AND IT IS CHARGED OVER METALLIC RETURN FEEDERS. METALLIC RETURN SHALL ALSO BE USED ON A-C SUPPLY).

PROVIDE "Z" WIRING FOR CABLE SHEATH RETURN (CABLE SHEATH RETURN SHALL ONLY BE USED WHEN THE BATTERY IS LOCALLY GROUNDED AND LOCATED IN THE SAME BUILDING AS THE KEY TEL. SYSTEM).

FIGURE 3A

KEY TELEPHONE SYSTEM NO. 1A KEY AND TELEPHONE CIRCUIT FOR COMBINED TURN AND PUSH BUTTON KEY TELEPHONE SETS

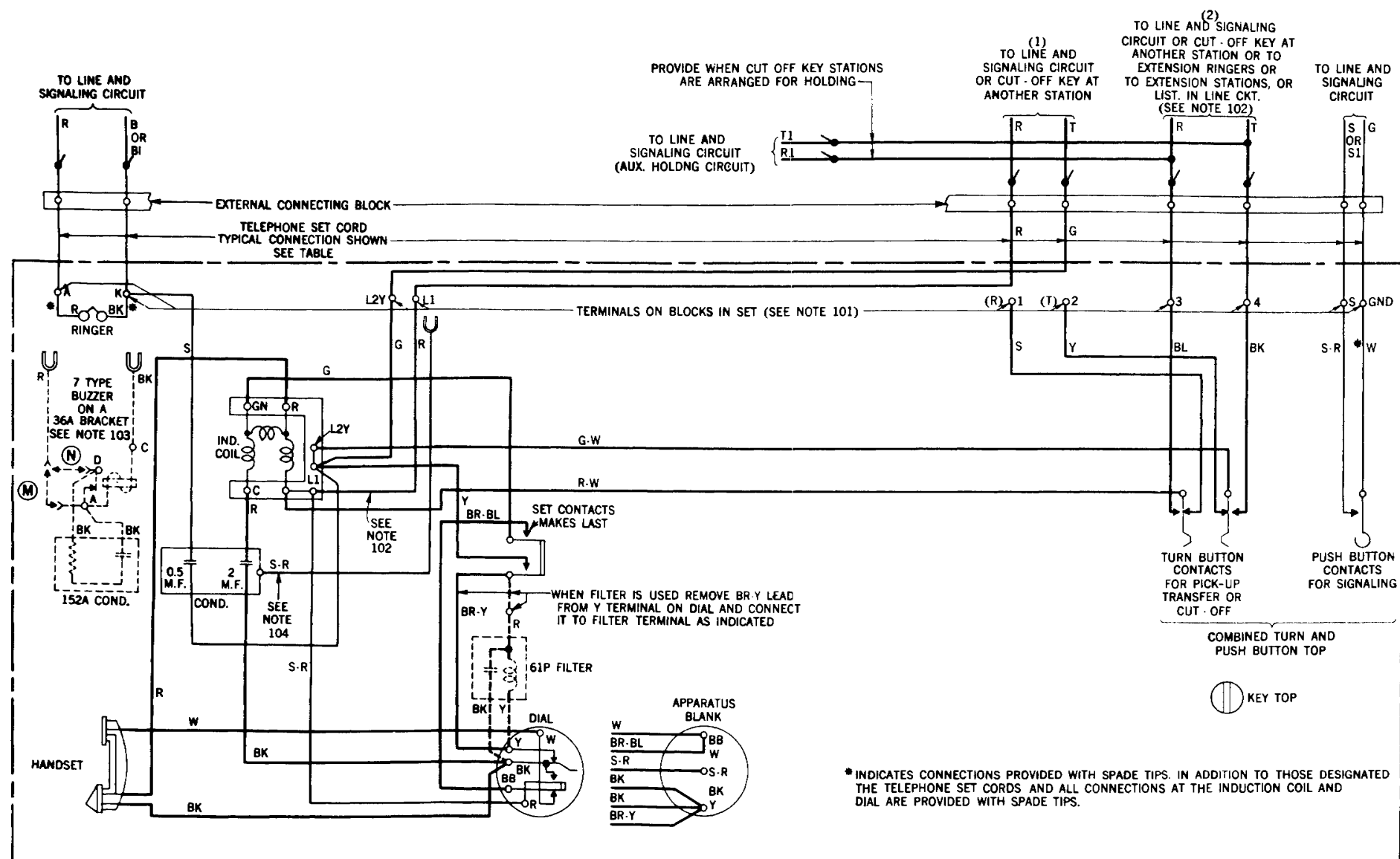


FIGURE 4

BASIC FEATURES	WITH SIGNALING	WITH INDIVIDUAL RINGER	WITH COMMON RINGER OR FOR PRIVATE LINE	CODES			TO LINE 1		TO LINE 2		TO EXT. STA. OR RINGER OR LISTENING IN HEAD SET		TO SIGNALING CIRCUIT		TO COMMON RINGER RELAY OR PRIVATE LINE CIRCUIT				RINGER AND CONDENSER CONNECTIONS		
				KEY TELEPHONE SET		TEL. SET CORD	RING	TIP	RING	TIP	RING	TIP	BUZZ.	GND.	R LEAD	B LEAD	SET WIRING				
				MANUAL	5H8 DIAL																
CORD COLORS																					
R	GN	Y	BK	Y	BK	Y	BL	BK	W	R-R	BL	G-G	W	R	Y	S					
SINGLE LINE RINGER CUT-OFF (RINGER IN SET)	YES	YES	NO	410AAW-3	410ACW-3	D4AH	LI	L2Y				(S)	(GND)					(3)	(4)	K	
SINGLE LINE EXTENSION CUT-OFF WITH RINGER TRANSFER	YES	YES	NO	410BAW-3	410BCW-3	D6P	LI	L2Y			3	4		S	GND			(1)	(2)	K	
	NO	YES	NO	410AAW-3	410ACW-3	D4AH	LI	L2Y			3	4						(1)	(2)	K	
SINGLE LINE EXTENSION CUT-OFF (EXTERNAL RINGER) OR HEAD SET CONTROL	YES	YES	NO	410BAW-3	410BCW-3	D6P	LI	L2Y			3	4		S	GND			LI**	L2Y**	K	
	NO	YES	NO	410AAW-3	410ACW-3	D4AH	LI	L2Y			3	4						LI**	L2Y**	K	
TWO LINE PICK UP	YES	YES	NO	410BAW-3	410BCW-3	D6P	(1)	(2)	3	4				S	GND			(1)*	(2)*	K	
		NO	YES	410CAW-3	410CCW-3	D8M	1	2	3	4				S	GND	A		K	A	L2Y**	(L2Y)
	NO	YES	NO	410AAW-3	410ACW-3	D4AH	(1)	(2)	3	4								(1)*	(2)*	K	
		NO	YES	410BAW-3	410BCW-3	D6P	(1)	(2)	3	4						(A)		(K)	(A)	L2Y**	(L2Y)

CIRCUIT NOTES:

101. PROVIDE THE KEY TELEPHONE SET IN ACCORDANCE WITH REQUIREMENTS AS INDICATED IN THE TABLE ABOVE. THE DESIGNATIONS SHOWN UNDER THE CORD CONDUCTOR COLORS ARE THE DESIGNATIONS OF THE TERMINALS IN THE SET.
102. WHEN HEAD RECEIVERS ARE USED AS LISTENING IN SETS, CONNECT "T" AND "R" LEADS TO VARISTOR. THE "G-W" AND "R-W" WIRES FROM THE TURN BUTTON KEY SHOULD BE CHANGED FROM "L2Y" AND "LI" TERMINALS TO THE "GN" AND "R" TERMINALS, RESPECTIVELY, OF THE INDUCTION COIL.
103. PROVIDE "M" WIRING WHEN THE BUZZER IS TO OPERATE ON 60 CYCLE A-C, AND PROVIDE "N" WIRING WHEN BUZZER IS TO OPERATE ON D-C. THE BUZZER MUST BE INSTALLED WITHOUT ITS COVER.

104. CONNECTIONS OF S-R CONDENSER LEAD.

	NO. OF LINES PICKED UP	BUZZER OR SET RINGER USED FOR	CONNECT S-R COND. LEAD TO TERM. ON TERM. BLOCK
SETS DATED 4-1-41 WITH DOT BESIDE DATE AND DATED LATER WITHOUT DOT	1	COMMON SIG. OR LINE RINGER	1
	2	COMMON SIG.	1
		LINE RINGER	1 OR 3 HAVING RED RINGER LEAD

* THE CONNECTIONS SHOWN PROVIDE FOR RINGING ON LINE ONE. IF RINGING ON LINE TWO IS REQUIRED, CONNECT THE RED RINGER LEAD AND YELLOW CONDENSER LEAD TO TERMINALS 3 AND 4, RESPECTIVELY.

** INDICATES TERMINALS ON INDUCTION COIL. OTHER TERMINALS IN TABLE ARE ON CONNECTING BLOCK.

○ CIRCLE INDICATES LEADS TO TERMINALS THAT MUST BE CHANGED FROM CONNECTIONS AS PROVIDED IN SHOP.

FIGURE 4A

TO LINE OR SIGNALING CIRCUIT OR CUT-OFF KEYS AT
OTHER STATIONS OMIT "B" AND "H" LEADS WHEN
HOLDING CIRCUIT IS NOT PROVIDED ON A LINE



CIRCUIT NOTES:

101. PROVIDE THE KEY TELEPHONE SET IN ACCORDANCE WITH REQUIREMENTS AS INDICATED IN THE FOLLOWING TABLE. THE CORD CONDUCTOR COLORS ARE SHOWN UNDER THE DESIGNATIONS OF THE TERMINALS IN THE SET.

NUMBER OF LINES AND FEATURES PROVIDED FOR BY KEYS	CODE			TO LINE 1		TO LINE 2				TO LINE 3				TO LINE 4				TO LINE 5				BUZZER SIGNALING					EXTENSION OR HEADSET CUT-OFF		TO LINE & SIGNAL CKT.		SPARE SEE NOTE 302																															
	KEY TEL. SET		TEL. SET CORD	RING	TIP	BAL.	HOLD	RING	TIP	BAL.	HOLD	RING	TIP	BAL.	HOLD	RING	TIP	BAL.	HOLD	GND	BUZZ 1	BUZZ 2	BUZZ 3	RING	TIP	R	B																																			
	DESIGNATIONS OF THE TERMINALS IN THE SET (SEE NOTES 301, 305 & 306)																												*																																	
	IR	IT	IB	IH	2R	2T	E2	E3	E4	2B	2H	3R	3T	E1	E4	3B	3H	4R	4T	E4	4H	5R	5T	E2	5H	G	S	1S	2S	3S		CR	CT	A	A	X																										
	440EAW-3	440ECW-3	D14A	R	G	Y	BK	BL	W		BR-R	BR-G	BR-Y	BR-BK		BR-BL	BR-W																R-G	R-Y																												
	440FAW-3	440FCW-3	D12A	R	G	Y	BK	BL	W		BR-R	BR-G														BR-BK	BR-Y					BR-BL	BR-W																													
	440GAW-3	440GCW-3	D12A	R	G	Y	BK	BL	W		BR-R	BR-G																			BR-Y	BR-BK	BR-BL	BR-W																												
	460GAW-3	460GCW-3	D22B	R	G	Y	BK	BL	W		BR-R	BR-G	BR-Y	BR-BK	BR-BL		BR-W	R-G	R-Y	R-BK	R-BL	R-W	G-Y	G-BK	G-BL							G-W	Y-BK																													
	460HAW-3	460HCW-3	D20B	R	G	Y	BK	BL	W	BR-R		BR-G	BR-Y	BR-BK	BR-BL		BR-W	R-G	R-Y	R-BK	R-BL			G-Y	R-W							G-BK	G-BL																													
	460KAW-3	460KCW-3	D20B	R	G	Y	BK	BL	W	BR-R		BR-G	BR-Y	BR-BK	BR-BL		BR-W	R-G	R-Y	R-BK	R-BL									R-W	G-Y	G-BK	G-BL																													
	460LAW-3	460LCW-3	D18C	R	G	Y	BK	BL	W	BR-R		BR-G	BR-Y	BR-BK	BR-BL	BR-W								R-Y	R-G				R-BK	R-BL	R-W	G-Y																														
	460MAW-3	460MCW-3	D18C	R	G	Y	BK	BL	W	BR-R		BR-G	BR-Y	BR-BK	BR-BL	BR-W								R-Y		R-G	R-BK				R-W	G-Y	R-BL																													
	460NAW-3	460NCW-3	D14A	R	G	Y	BK	BL	W		BR-R	BR-G														BR-BK	BR-Y	BR-BL	BR-W			R-G	R-Y																													

FIGURE 5A

INFORMATION NOTES:

301. MAKE RINGER, BUZZER AND CUT-OFF CONNECTION AS FOLLOWS:

COLOR OF WIRES IN SET	RINGER AND CONDENSER CONNECTIONS		CUT-OFF CONNECTIONS		
	R	Y	BK-W	G-W	R-W
SET RINGER USED AS INDIVIDUAL LINE RINGER ON T AND R OF ANY LINE, EXCEPT PRIVATE LINES.	R	T			
SET RINGER USED FOR A PRIVATE LINE OR AS A COMMON RINGER OR BUZZER USED AS COMMON OR INTERCOMMUNICATING SIG.	A	K			
SET RINGER USED AS A LINE RINGER WHEN CUT-OFF KEY IS OPERATED TO SUBSTITUTE SET RINGER FOR EXTERNAL STATION OR RINGER. CONNECT S-R COND. LEAD TO R OF LINE.	X	T	X	R	T
CUT-OFF KEY ON T AND R OF ANY LINE.			X	T	R
HEAD RECEIVERS USED AS LISTENING IN SETS.			X	GN	R
CUT-OFF SET RINGER OR BUZZER WHEN USED AS A PRIVATE LINE, COMMON OR INTERCOMMUNICATING SIGNAL.	CT	K	X	A	CR
CUT-OFF SET RINGER WHEN USED AS A LINE RINGER.	CR	CT	X	T	R
RINGER IN SET NOT USED.	A	A			

302. AT EXTERNAL CONNECTING BLOCK, THE SPARE CONDUCTOR SHALL BE CONNECTED TO A SPARE TERMINAL OR TAPED.

303. CONNECTIONS OF S-R CONDENSER LEAD

	BUZZER OR SET RINGER USED FOR	CONN. S-R COND. LEAD TO TERM.	DISPOSAL OF CORD CONDUCTORS SHOWN IN NOTE 101 ON TERMS.	
			A	*A
SETS DATED 4-1-41 WITH DOT BESIDE DATE AND DATED LATER WITHOUT DOT	COM. RINGER OR BUZZER	LI	A	K
	LINE RINGER	R HAVING RED RING. LEAD	A	A

304. PROVIDE "M" WIRING WHEN THE BUZZER IS TO OPERATE ON 60 CYCLE A-C, AND PROVIDE "N" WIRING WHEN THE BUZZER IS TO OPERATE ON D-C.

305. SETS ARE WIRED IN THE SHOP WITH RED RINGER AND YELLOW CONDENSER LEADS CONNECTED TO "IR" AND "IT" TERMINALS, RESPECTIVELY, FOR SET RINGER TO BE USED AS A LINE RINGER ON LINE 1. THEY MAY BE CONNECTED BY THE INSTALLER TO OTHER "R" AND "T" TERMINALS. WHEN THE RINGER IS USED FOR A PRIVATE LINE OR AS A COMMON RINGER OR WHEN A BUZZER IS USED CHANGE THE CORD CONDUCTOR SHOWN CONNECTED TO TERMINAL "A" IN THE COLUMN UNDER THE ASTERISK IN THE TABLE OF NOTE 101 TO TERMINAL "K" INSTEAD.

306. SETS ARE WIRED IN THE SHOP WITH THE G-W AND R-W LEADS FROM THE CUT-OFF KEY CONNECTED TO TERMINALS "2T" AND "2R", RESPECTIVELY, TO CUT-OFF EXTENSION STATIONS FROM LINE 2. THESE LEADS MAY BE CONNECTED BY THE INSTALLER TO OTHER "R" AND "T" TERMINALS.

FIGURE 5B

Audible Signal Common to Two or More Central Office or PBX Lines

In the description of key telephone sets it is stated these sets are furnished with a ringer which may be connected to any one of the lines terminating in a set or it may be used as an audible signal common to all of the lines. To provide a common audible signal it is necessary to use ring-up relays such as included in the Nos. 14A, 15B and 50 type Key Telephone Units. The ringing current applied to the central office lines operates this relay and a ringing current (105 volt 20 cycle a-c) supply from the central office or PBX is required to operate the ringers. Where this ringing current cannot be supplied economically, d-c or 50-60 cycle a-c operated No. 7 type Bells or Buzzers may be substituted for the ringers.

A No. 7 type Buzzer may be mounted in any of the key telephone sets in place of the ringer, when desired, by employing a No. 36A Bracket. The buzzer may be used as an intercommunicating signaling buzzer or as a common line signal. In the No. 410 type sets, the buzzer must be installed with the cover removed because of the small space available, but in the Nos. 440, 444, 460 and 464 type sets it may be installed with or without the cover, depending on the volume required. The No. 36A Bracket is also arranged to mount the No. 152A Condenser which should be used when radio frequency suppression is required for the buzzer.

When additional individual ringers are required, a separately mounted ringer such as the No. 531AW Subscriber Set may be employed. This set without the associated condenser may be used as a common ringer.

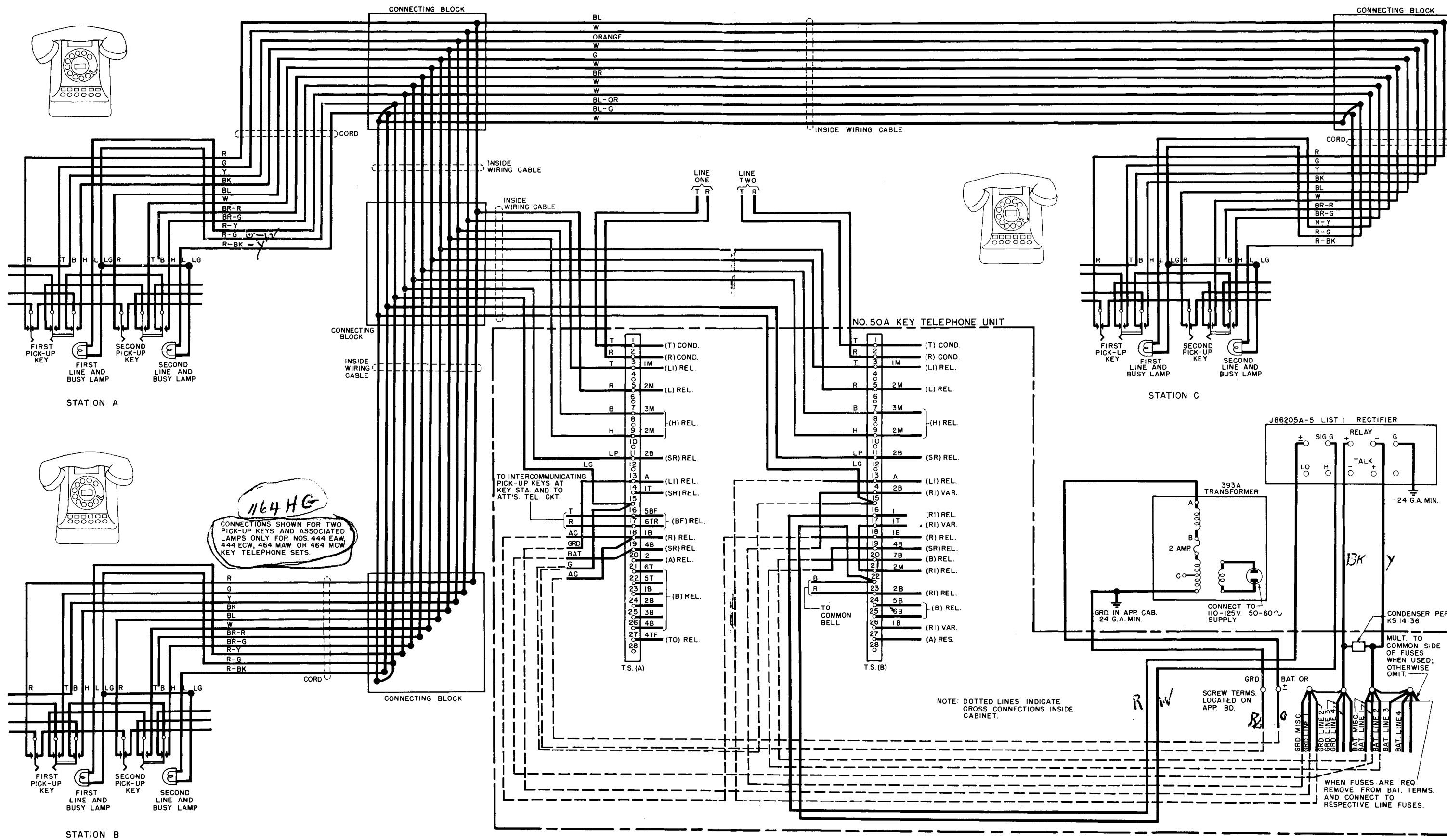


Three No. 44A Connecting Blocks
and No. 101C-4 Cover



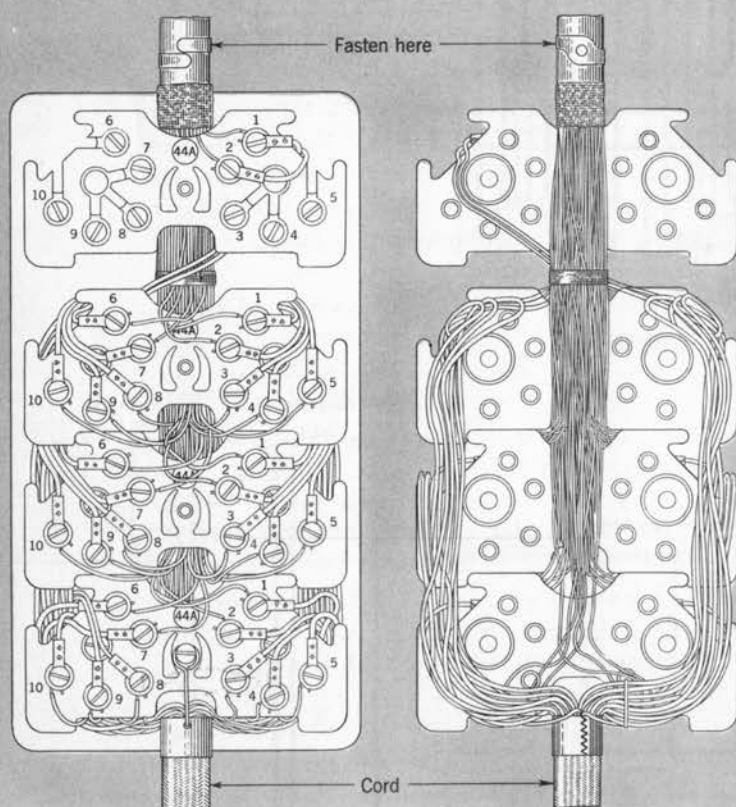
One No. 44A Connecting Block
and No. 101A-4 Cover

A ten terminal connecting block No. 44A is used to terminate key telephone set cords having more than four conductors. This block may be used individually or in a multiple arrangement of up to four blocks as illustrated. The following table indicates the terminals to which the various pairs of inside wiring cable and key telephone set cord conductors are terminated on No. 44A Connecting Blocks. The first box is for the first connecting block (one nearest butt of cable) and the second, third and fourth boxes are for the second, third and fourth connecting blocks respectively. The cord attaches to the last block on the side opposite to where the cable enters.



NO. 1A KEY TELEPHONE SYSTEM. WIRING FOR TWO PICK-UP KEYS AND LAMPS ONLY, THREE STATIONS WITH HOLDING AND NO. 50A KEY TELEPHONE UNIT, WITH RECTIFIER AND TRANSFORMER.

T 2623



Four No. 44A Connecting Blocks. One
Nos. 101A and 101C Covers Required

Connecting Block Terminals

Cable Pairs

1	Blue
2	Mate
4	Orange
5	Mate
6	Green
7	Mate
9	Brown
10	Mate
3	Slate
8	Mate

1	Blue-White
2	Mate
4	Blue-Orange
5	Mate
6	Blue-Green
7	Mate
9	Blue-Brown
10	Mate
3	Blue-Slate
8	Mate

1	Orange-White
2	Mate
4	Orange-Green
5	Mate
6	Orange-Brown
7	Mate
9	Orange-Slate
10	Mate
3	Green-White
8	Mate

1	Green-Brown
2	Mate
4	Green-Slate
5	Mate
6	Brown-White
7	Mate
9	Brown-Slate
10	Mate
3	Slate-White
8	Mate

* Double red, double green, double yellow and double black in cords with rubber insulated conductors. These conductors have ribs to distinguish them from the others in the cord.

Cord Conductors

Red
Green
Yellow
Black
Blue
White
*Brown-Red
*Brown-Green
*Brown-Yellow
*Brown-Black

Brown-Blue
Brown-White
Red-Green
Red-Yellow
Red-Black
Red-Blue
Red-White
Green-Yellow
Green-Black
Green-Blue

Green-White
Yellow-Black
Yellow-Blue
Yellow-White
Black-White
Blue-White
Black-Blue
Slate
Brown-Slate
Red-Slate

Green-Slate
Yellow-Slate
None
None
None
None
None
None
None
None

The Nos. 101A-4 (Ivory) or 101A-9 (Brown) covers are used with a single No. 44A Connecting Block and two or three No. 44A Connecting Blocks may be mounted under the No. 101C-4 (Ivory) or 101C-9 (Brown) covers. The Nos. 168A-4 (Ivory) or 168A-9 (Brown) Backboards are arranged for mounting one No. 44A Connecting Block and the Nos. 168B-4 (Ivory) or 168B-9 (Brown) Backboards are arranged for mounting two or three No. 44A Connecting Blocks. The Nos. 168C-4 (Ivory) or 168C-9 (Brown) Backboards are arranged for mounting four No. 44A Connecting Blocks.

The No. 51A Lamp is used in the illuminated button key telephone sets. This is a 10-volt lamp and is similar to the switchboard type lamp such as the B2 except that it is shorter, its length being $\frac{7}{8}$ inches. For installations requiring line or busy lamps, the illuminated button sets may be used to provide the following service features.

- (a) Locking or non-locking line lamp.
- (b) Busy lamp.
- (c) Combined line and busy lamp in which the lamp flashes on incoming calls, and the same lamps are arranged to light steadily on originated, answered or held calls.

The same service features may be provided using sets not equipped with illuminated buttons together with suitable standard lamp indicators when desired by the customer. The Nos. 14B-3 or 18B-3 Indicators are intended for use as visual indicators of line or busy signals or both line and busy signals for three lines. The No. 17 type Indicators provide for two lines and the No. 20B-3 Indicator provides for four signals or four lines.

Where both key telephone sets with illuminated key buttons and lamp indicators are used in the same system the 51A Lamps normally used to illuminate the key buttons are also used in the lamp indicators in place of B2 or A1 Lamps. Lamp base assembly P-471885 is placed under the 51A Lamp before inserting it in the lamp indicator so that overall length of the combination is about the same as that of the B2 Lamp.

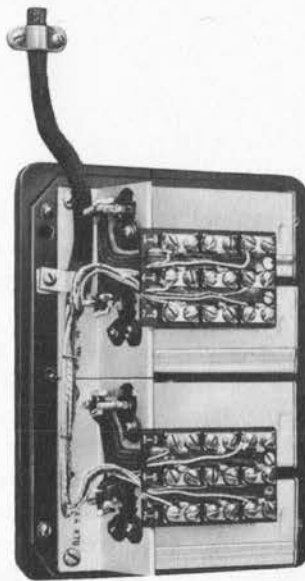
Common Equipment

When line and signaling equipment common to an installation is required, it is provided in the form of key telephone units. The individual feature units are small equipment units assembled and wired on individual mounting plates and the multifeature units consist of completely wired and assembled units mounted in 4-plate metal apparatus cabinets.

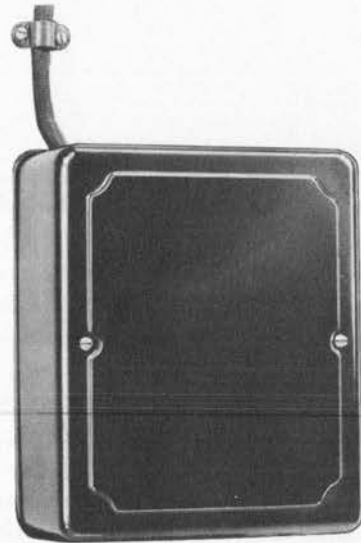
COMMON EQUIPMENT INDIVIDUAL FEATURE KEY TELEPHONE UNITS

Application	K.T.U. Code	Mounting Spaces	Function	Description (See Para- graph)
LINE AND BUSY LAMPS AND COMMON BUZZER OR RINGER	6B	1	Busy Lamp (BL) and Line Lamp (LL) release	(A)
	14A	1	Ring-up relay (manual)	(B)
	15B	2	Ring-up relay (dial)	(B)
	16A*	1	Common Audible Signal (dial)	(C)
	18A	2	BL and LL release, dial, com- bined line and busy lamp (CLB)	(D)
	19B*	2	Flashing relay for combined line and busy lamp	(E)
	20A*	1	Common Audible Signal (manual)	(F)
HOLDING	1A	2	Holding	(G)
	5A	1	Auxiliary Hold	(H)
INTERCOM. SIGNALING	3A*	1	Code and selective signaling	(I)
	13B	2	Intercom. with 2-way automatic signaling	(J)
PRIVATE LINE	7A	2	Private line with ring-down sig- naling	(K)
AUTOMATIC EXCLUSION	10A	2	Automatic exclusion	(L)
MISCELLANEOUS	8B*	1	Interconnecting	
	17A*	1	Switching relay	
BATTERY SUPPLY	2A	1	Battery Feed for Intercom., 12-26 volts	
	12A	1	Dry Cell Battery Feed for Inter- com., 4½ volts	
	21A*	2	Fusing Unit for C.O., PBX or Bldg. Batt. Supply	
	22A*	1	Lamp resistance circuit for lamps in key telephone sets (8 cell battery supply)	
	22B*	1	Lamp resistance circuit for lamps in key telephone sets (9 cell battery supply)	
	22C*	1	Lamp resistance circuit for lamps in key telephone sets (10 cell battery supply)	
	22D*	1	Lamp resistance circuit for lamps in key telephone sets (11, 12 or 13 cell battery supply)	
	22E*	1	Lamp resistance circuit for lamps in key telephone sets (23 or 24 cell battery supply)	
	11A*	1	Lamp Unit for generator supply feeder	

* These Key Telephone Units are not provided on a "per line" basis. All other Key Telephone Units are provided one per line as required.



Two Holding Relay Units Mounted on 105AW Apparatus Box Base and Insulating Sub-base



No. 105AW Apparatus Box

KEY TELEPHONE UNITS

The individual feature key telephone units are small wired units assembled and wired on individual mounting plates. Each unit includes a terminal panel having screw terminals for external connections and soldered terminals for the wiring within the unit. Any feature such as holding, line lamp, busy lamp, etc., can therefore be furnished separately or a combination of features can be furnished by assembling and interconnecting these units. They are arranged to be grouped together at a common point in one or more No. 105AW Apparatus Boxes or in metal cabinets.

(A) No. 6B Key Telephone Unit. This unit consists of a series supervisory type relay which is arranged to light from 1 to 12 busy lamps depending upon the number of stations at which the busy lamp appears.

(B) Nos. 14A and 15B Key Telephone Units. These units are arranged to provide line lamp and buzzer signals locking or non-locking in connection with incoming telephone calls.

(C) No. 16A Key Telephone Unit. This unit is arranged to control a common audible signal such as a ringer or buzzer which will operate only while ringing current is on the line. It is intended for use in connection with the locked-in line lamp feature where a continuous audible signal is not desired.

(D) No. 18A Key Telephone Unit. This unit is arranged for lighting busy lamps and releasing locked-in line signals. It is recommended for dial areas since it is designed to prevent undesirable flashing of the busy lamps while any of the stations are dialing. This is of particular importance where combined line and busy lamps are provided.

(E) No. 19B Key Telephone Unit. This unit is designed to be used in conjunction with the ring-up relay units to provide for flashing line lamps. The flashing line lamp feature makes it possible to use one lamp to indicate an incoming call and a busy condition.

(F) No. 20A Key Telephone Unit. This unit is designed to provide a common audible signal such as a ringer or buzzer which operates continuously whenever there is a call on the line.

(G) No. 1A Key Telephone Unit. This unit is designed to provide a holding bridge across the line. The operation of the common holding key with the hand set removed will disconnect the set from the line and connect a holding bridge across the line. The holding bridge remains on the line until it is picked up again by the same or another station.

(H) No. 5A Key Telephone Unit. This unit is required to control the balance and hold leads when a cutoff key is used to cut off stations arranged for holding. It is used in conjunction with the 1A Key Telephone Unit. When an externally mounted cutoff key is used such as the No. 6017J Key which is provided with four break contacts, the No. 5A Key Telephone Unit is not required.

(I) No. 3A Key Telephone Unit. This unit consists of a relay which is arranged to energize a number of buzzers simultaneously when the relay is operated by means of a code signaling key. No auxiliary equipment is required for buzzer signaling when all of the buzzers are operated either selectively or on a code ringing basis, but when some of the signaling keys are used for selective buzzer operation and others are employed to operate the same buzzers on a code signaling basis, the No. 3A Key Telephone Unit will be required as a part of the common equipment.

(J) No. 13B Key Telephone Unit. This unit is designed to provide an automatic two-way intercommunicating signaling circuit between two stations which are usually on the same premises. When the pick up key associated with the intercommunicating line is operated at either station and the hand set at that station is removed from the mounting, the signal at the other station will operate and continue to operate until the hand set at the called station is removed from the mounting or the hand set at the calling station is replaced on its mounting if the called station fails to answer.

(K) No. 7A Key Telephone Unit. This unit includes a ring-up relay which may be operated by a signaling button to place ringing current on a private line. A similar unit may be employed at the distant end of the line or the distant end may terminate in any suitable station arrangement having a local battery supply for talking and a means for ringing on the line.

(L) No. 10A Key Telephone Unit. This unit consists of two relays arranged so that the principal station will automatically cut off all secondary stations whenever the principal station connects to the line regardless of whether the line is in use at any of the secondary stations.

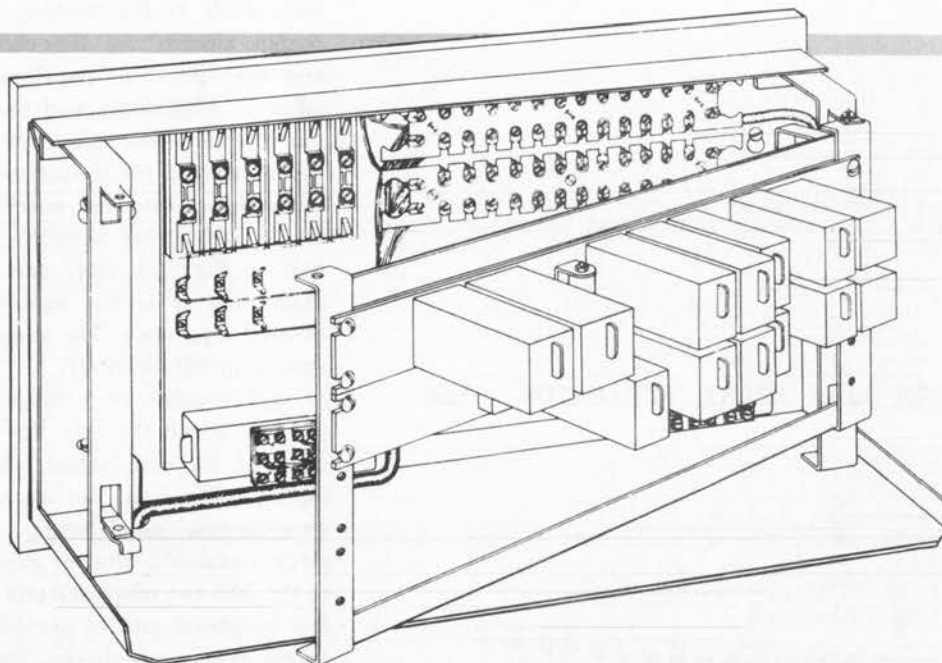
The Key Telephone Units for line and busy lamp and common buzzer or ringer features are employed in the combinations shown in the following table.

Combination of Features							
Dial or Manual	Busy Lamp (BL)	Line Lamp (LL)	Locked in Line Lamp (LKLL)	Combined Line & Busy Lamp (CLB)	Common Buzzer or Common Bell (CZ or CB)	Audible Signal Int. Steady	Combination of Key Telephone Units
DIAL	X						6B
	X	X			X	X	6B, 15B
	X		X		X	X	6B, 15B
	X		X		X	X	6B, 15B, 16A*
				X	X	X(1)	15B, 18A, 19B*
				X	X	X	15B, 18A, 19B*, 16A*
MANUAL	X						6B
	X	X			X	X	6B, 14A
	X		X		X	X	6B, 14A, 20A*
				X	X	X(1)	6B, 14A, 19B*
				X	X	X(2)	6B, 14A, 19B*, 20A*
* Only one of these key telephone units provided per installation. Other key telephone units provided one per line.							
(1) d-c operation only.							
(2) a-c operation only.							

The number of No. 105AW Apparatus Boxes required can be obtained by totaling the mounting spaces for the key telephone units as indicated on the tabulation on Page 22 and dividing by four. If more than three No. 105AW Apparatus Boxes are required (12 mounting spaces) consideration should be given to the use of an apparatus cabinet per ED-91472-70 or if the total mounting spaces required exceeds 24 (the limit of cabinet per ED-91472-70) consideration should be given to the use of the 11 or 18 plate apparatus cabinet ED-91194-70 and ED-91180-70 respectively.

The key telephone units are mounted in the cabinets by means of bent mounting bars per ED-69143-70 Group 1 for 19 inch mounting plates and Group 2 for 23 inch mounting plates. The bent bars, furnished in pairs, are designed to occupy the space of one mounting plate and provide for mounting three single space key telephone units on both front and back, thereby giving a capacity of six single space key telephone units per mounting plate space. They are not furnished with the apparatus cabinets and must be ordered separately. Units which occupy two spaces will require two mounting bar assemblies. Where two or more mounting bar assemblies are mounted adjacent to each other single and double units can be mingled. Key telephone units are omitted from the back of the top mounting bar assembly in the 11 and 18-plate cabinets to provide space for the incoming cable. The 4-plate cabinet uses bent mounting bars 19 inches long per Group 1, drawing ED-69143-70 and the 11 and 18 plate cabinets use bent mounting bars 19 inches or 23 inches long as required.

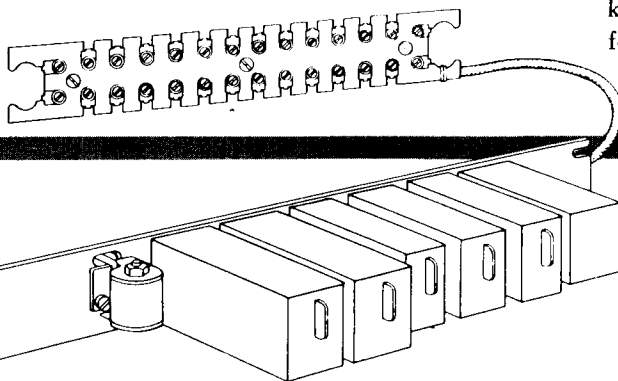
MULTI-FEATURE UNITS



50A-26 Key Telephone Unit, cover removed showing 51A Key Telephone Unit consisting of two 19" mounting plates on which are mounted the common equipment such as flashing, common audible signal, automatic battery cutoff and intercommunicating circuits for the entire installation and also the per line equipment for two central office or PBX lines.

MULTI-FEATURE KEY TELEPHONE UNITS

Application	K.T.U. Code	Function
COMMON AND LINE CIRCUITS FOR 2 CENTRAL OFFICE OR PBX LINES MOUNTED IN METAL CABINET	50A-26	This unit consists of the No. 51A Key Telephone Unit (described below) mounted in metal cabinet with olive green finish.
	50A-27	This unit consists of the No. 51A Key Telephone Unit (described below) mounted in metal cabinet with walnut finish.
COMMON AND LINE CIRCUITS FOR 3 CENTRAL OFFICE OR PBX LINES MOUNTED IN METAL CABINET	50B-26	This unit consists of the Nos. 51A and 52A Key Telephone Units (described below) mounted in metal cabinet with olive green finish.
	50B-27	This unit consists of the Nos. 51A and 52A Key Telephone Units (described below) mounted in metal cabinets with walnut finish.
COMMON AND LINE CIRCUITS FOR 4 CENTRAL OFFICE OR PBX LINES MOUNTED IN METAL CABINET	50C-26	This unit consists of the No. 51A and 2 No. 52A Key Telephone Units (described below) mounted in metal cabinet with olive green finish.
	50C-27	This unit consists of the No. 51A and 2 No. 52A Key Telephone Units (described below) mounted in metal cabinet with walnut finish.
BASIC TWO CIRCUIT CENTRAL OFFICE UNIT	51A	This unit consists of two 19-inch relay mounting plates on which are mounted the common equipment such as the flashing, audible signal and timing circuits for the entire installation and also the "per line" equipment for two central office or PBX lines, and the battery supply for one intercommunicating line. Pigtail cables from the apparatus on the mounting plates are terminated on terminal panels having combined solder and screw terminals. This is the basic unit in the 50A, 50B and 50C key telephone units, and it is not expected that it will be ordered separately. The circuit arrangements are shown on SD-69136-01.
PER LINE RELAY APPARATUS	52A	This unit consists of a single 19-inch mounting plate on which the "per line" relay apparatus is mounted for one central office or PBX line. A pigtail cable from the apparatus is terminated on a terminal panel having combined solder and screw terminals. One of these units is provided in the 50B key telephone unit and two in the 50C key telephone unit to provide for the third and fourth lines, respectively. This unit can be used



No. 52A Key Telephone Unit

Application	K.T.U. Code	Function
ONE AUTOMATIC TIE LINE	53A	<p>advantageously by the Telephone Companies where it is desired to add an additional central office or PBX line to an existing installation in the field. The circuit arrangements are shown on SD-69136-01.</p> <p>This unit consists of a single 19-inch mounting plate on which the "per line" relay apparatus is mounted for one automatic tie line. A pigtail cable from the apparatus on the mounting plate is terminated on a terminal panel having combined solder and screw terminals. This unit when required can be installed locally in either the 50A or 50B key telephone units. The circuit arrangements are shown on SD-69136-01.</p>
ONE RINGDOWN TIE LINE	54A	<p>This unit consists of a single 19-inch mounting plate on which the "per line" relay apparatus is mounted for one ringdown tie line. A pigtail cable from the apparatus on the mounting plate is terminated on a terminal panel having combined solder and screw terminals. This unit when required can be installed locally in either the 50A or 50B key telephone units. The circuit arrangements are shown on SD-69136-01.</p>
ONE STATION LINE CIRCUIT	55A	<p>This unit consists of a single 19-inch mounting plate on which the "per line" relay apparatus is mounted for one station line circuit. A pigtail cable from the apparatus on the mounting plate is terminated on a terminal panel having combined solder and screw terminals. This unit when required can be installed locally in either the 50A or 50B key telephone units. The circuit arrangements are shown on SD-69136-01.</p>
OFF-PREMISE EXTENSION UNIT	56A	<p>This circuit is used where an off-premise extension is required in connection with a main station and where central office as well as private line service is required. A particular application is where a doctor has his main telephone at his office and an extension at his home. The apparatus is mounted on two 19-inch mounting plates and is located at the main station housed in a small 4-plate apparatus cabinet.</p>

Operation

The key telephone sets provide for picking up central office, PBX, private or intercommunicating lines. Incoming calls on central office, PBX or ringdown private lines are indicated by the usual station ringers or by lamps and buzzers operated in a local circuit to indicate which line to pick up in answering an incoming call. To originate a call on any line the push button corresponding to the desired line is pressed down and the hand set lifted from the mounting. In the 410 type set, the turn button feature may be used to pick up two lines and in the 440, 444, 460 and 464 type sets, separate pickup keys are provided to pick up as many as six lines. In these latter sets, the provision of a holding key, cutoff key or one or more signaling keys will correspondingly reduce the number of pickup keys which may be furnished in the 4-button or 6-button units.

A holding feature is provided for use by the subscriber in transferring incoming calls to another person on the same line, holding the central office line while calling out for information on another line and similar uses. The holding feature requires a holding circuit (1A, 51A or 52A Key Telephone Units) for each line arranged for holding, and a holding key in each set arranged for holding which is common to all of the associated pickup keys. The holding key is available in certain of the key combinations of the 440, 444, 460 and 464 type sets.

When the subscriber desires to hold the line for the purpose of obtaining information over another line, transferring an incoming call, etc., the common hold key in the combined telephone set is pressed. This places a relay holding bridge across the line and maintains the lamp associated with the line under a lighted condition so that other stations will know that the line is still in use. When the subscriber (or the station to which the call has been transferred) desires to go in on the line again, the pickup key associated with that line is pressed and if the hand set is off the cradle, the hold automatically releases and permits the subscriber to converse on the line.

The intercommunicating line consists of a pair of wires appearing at any desired number of stations and is used for local telephone conversation between stations associated with a system. One or more intercommunicating lines may be provided. Each intercommunicating line requires a separate battery feed coil (2A Key Telephone Unit or a 12A Key Telephone Unit) or a talking battery supply from a rectifier equipped with a feed coil, except where the 50 type key telephone units are employed. The signaling arrangements for intercommunicating lines consist of a push button and buzzer arrangement which is used to summon a desired station to the intercommunicating line for the purpose of obtaining information, transferring calls, etc. The push button feature of the No. 410 type Key Telephone Sets, or signaling buttons in the No. 440, 444, 460 and 464 type sets, or in the separate keys, may be employed to operate buzzers for intercommunicating signaling or to control the ringing relay in a private line circuit. When more signaling keys are required at a station than are available in any suitable key telephone set, the Nos. 549 type or 551A Keys made be employed.

For those installations which require a system providing a common audible signal, flashing line lamps, steady busy lamps and intercommunication in addition to the pickup and hold features for two, three or four central office lines, the No. 50 type multi-feature units are recommended. Two line units have mounting space for two No. 52A Key Telephone units thereby providing for the growth of two lines, and the three line units have mounting space for the addition of one line at a later date. Engineering and installation costs are reduced through the use of completely equipped and wired apparatus cabinets which make assembly of units on the job unnecessary. Also when the equipment is removed on disconnections, maximum salvage value is obtained from the use of standardized equipment assemblies which can be reused in the same application.

The No. 50 type units are equipped with an automatic battery cutoff to prevent the line lamps from locking in for long periods when calls might remain unanswered. If the call is not answered after approximately 30 seconds during periods when the system is not in use, a thermal type relay operates and extinguishes the locked-in line lamp. This is intended to keep line lamps and buzzers from operating for long periods such as overnight or entire weekends when offices are closed. However the

thermal relay will not normally be effective during working hours as the circuit is arranged to disconnect the thermal elements whenever calls are being answered or originated.

Hypothetical Installation -INDIVIDUAL FEATURE UNITS

A hypothetical installation of a 1A Key System for two dial operated central office lines and five stations follows. The key telephone sets, key units and other apparatus required are listed first assuming the use of individual feature units and thereafter on the basis of using the No. 50 type units. FROM THESE EXAMPLES ONE MAY READILY DETERMINE THE ADVANTAGE AFFORDED BY THE USE OF THE MULTI-FEATURE UNITS WHEN ALL OF THE FEATURES ARE REQUIRED.

2 Dial Operated Central Office Lines

1 Intercommunicating Line

5 Stations equipped with key telephone sets having illuminated key buttons for flashing line lamps and steady busy lamps.

Bell or buzzer to respond to central office ringing as a separate cable pair, for central office ringing current will not be provided at this installation.

Buzzer signals for intercommunicating line.

Externally mounted cutoff key at one station for each line.

Quantity	Description	Function
5	No. 464MCW Telephone Sets less Ringers	Circuit Drawing Fig. 2.
5	No. 36A Brackets	
5	No. 7AW Buzzers.	A-C or d-c operated signals for intercommunication.
	No. 7AW Buzzers or 7DW Bells	A-C or d-c operated signals (as required) to operate on incoming calls. (C)
2	No. 6017J Key	For use as cutoff key at station arranged for cutoff.
5	No. 168B-9 Backboards	For mounting 3 No. 44A Connecting Blocks providing for 30 terminals. (Each backboard)
15	No. 44A Connecting Blocks	To terminate key telephone set cords.
5	No. 101C-9 Covers	To cover 3 No. 44A Connecting Blocks arranged in multiple.
2	No. 1A Key Telephone Units	One holding unit required for each central office line.
1	No. 2A Key Telephone Unit (A)	Battery feed coil for intercommunicating line.
2	No. 15B Key Telephone Units (B)	Ring up relay dial areas.
1	No. 16A Key Telephone Unit	Common Audible signal dial areas.
2	No. 18A Key Telephone Units	Busy lamp and line lamp release dial lines.
1	No. 19B Key Telephone Unit	Flashing.
5	No. 105AW Apparatus Boxes	For mounting key telephone units.
1	No. 393A Transformer	To provide 10 volts for 51A Lamps in key telephone sets from a-c source.
1	J-86205A List 2 Rectifier	D-C supply for relays 18v at 0.5 ampere; d-c supply for talking (one line only) 3v at 0.1 ampere; 33v at no load; a-c supply for bells, buzzers and lamps (except No. 51A Lamp) 16v at 1 ampere.

(A) This unit is not required when rectifier per List 2 J-86205A is used.

(B) The maximum number of common audible signals to be multiplied to the (R) relay contacts in this unit are ten No. 7AW Buzzers, four No. 7EW Buzzers or twelve high impedance ringers.

(C) Where 105 volt 20 cycle a-c ringing current is available the key telephone sets should be ordered equipped with ringers, or the No. 531AW-3 Subscriber Set may be used.

MULTI-FEATURE UNIT

The following editing information is furnished for the same hypothetical installation using the No. 50A-26 Key Telephone Unit. With this unit the relays are mounted and wired in a four-plate metal apparatus cabinet and the automatic battery cutoff feature is included. This feature extinguishes the locked-in line lamp if the call is not answered after approximately 30 seconds during periods when the system is not in use.

2 Dial Operated Central Office Lines

1 Intercommunicating Line

5 Stations equipped with key telephone sets having illuminated key buttons for flashing line lamps and steady busy lamps.

Bell or buzzer to respond to central office ringing, as a separate cable pair for central office ringing current will not be provided at this installation.

Buzzer signals for intercommunicating line.

Externally mounted cutoff key at one station for each line.

Quantity	Description	Function
5	No. 464MCW Telephone Sets less Ringers	Circuit Drawing Fig. 2.
5	No. 36A Brackets	
5	No. 7AW Buzzers	A-C or d-c operated signals for intercommunication.
	No. 7AW Buzzers or 7DW Bells	A-C or d-c operated signals (as required) to operate on incoming calls. (B)
2	No. 6017J Key	For use as cutoff key at station arranged for cutoff.
5	No. 168B-9 Backboards	For mounting 3 No. 44A Connecting Blocks providing for 30 terminals. (Each backboard)
15	No. 44A Connecting Blocks	To terminate key telephone set cords.
5	No. 101C-9 Covers	To cover 3 No. 44A Connecting Blocks arranged in multiple.
1	No. 50A-26 Key Telephone Unit	Common and line units for two central office or PBX lines. (Circuit drawing pages 18 and 19)
1	No. 393A Transformer	To provide 10 volts for 51A Lamps in key telephone sets from a-c source.
1	J-86205A List 1 Rectifier	D-C supply for relays 18v at 0.5 ampere; d-c supply for talking (one line only) 3v at 0.1 ampere 33v at no load; a-c supply for bells, buzzers and lamps (except No. 51A Lamp) 16v at 1 ampere.

(B) Where 105 volt 20 cycle a-c ringing current is available the key telephone sets should be ordered equipped with ringers, or the No. 531AW-3 Subscriber Set may be used.

The key telephone sets, key telephone units and other apparatus required to provide service without visual signals and equivalent to some of the simpler wiring plans are identified on the succeeding pages. These arrangements include:

PICKUP AND HOLD ON TWO LINES

This is a hypothetical installation in which two single party Central Office or PBX lines are terminated in the same room and the individuals at each telephone wish to pick up and hold calls on his own line in addition to the second line during the absence of the individual normally stationed at the second line. The ringers in each telephone set are permanently connected to different lines and no provision is made for visual signals.

The following apparatus is recommended.

Quantity	Description	Function
2	No. 440EAW-3 Key Telephone Sets or	For manual service.
2	No. 440ECW-3 Key Telephone Sets	For dial service.
2	No. 168B-9 Backboards (Color Brown)	Each backboard will mount 2 No. 44A Connecting Blocks.
4	No. 44A Connecting Blocks	For terminating telephone set cords.
2	No. 101C-9 Covers (Color Brown)	Each cover for 2 No. 44A Connecting Blocks mounted in multiple
1	No. 105AW Apparatus Box	For mounting No. 1A Key Telephone units.
2	No. 1A Key Telephone Units	Holding Unit required for each line.

A copy of drawing SD-69091-01 showing the wiring diagram for the 1A Key Telephone Units is furnished with these units, and Figure 5 covering the key and telephone set circuit is shown on page 14.

The Nos. 440EAW-3 and 440ECW-3 Key Telephone Sets are each equipped with one hold key and three pickup keys. One pickup key will be unused for the initial installation and may be blocked in the non-operated position by means of the P-339942 key blocking device, one of which is furnished with each of these sets. A third line may be added to this installation at a later date and connected to the unused pickup key.



Notes: 1—Numbers beside leads indicate number of conductors.

2—Key Telephone Set cord—8 conductors used.

PICKUP AND HOLD ON FOUR LINES

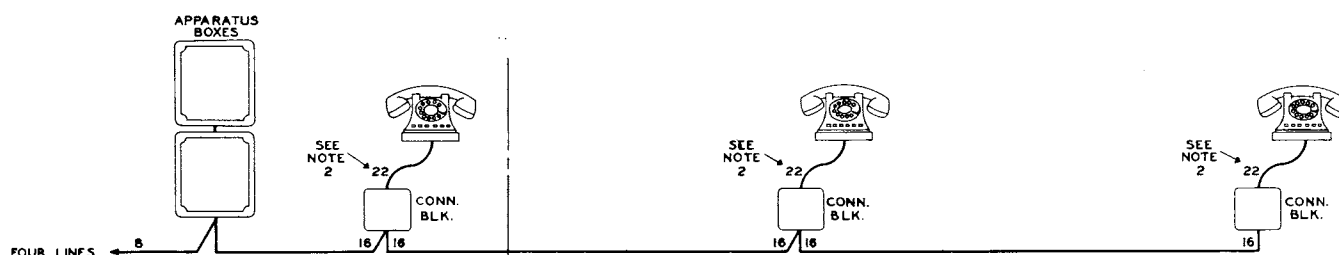
This is a hypothetical installation similar to the preceding except involving four central office single party or PBX lines and four stations. The individuals on each line or at each telephone wish to have the facilities for picking up and holding calls on each of the other three lines in addition to those on his own line. The ringers in the telephone sets are permanently connected to different lines and no provision is made for visual signals.

The following apparatus is recommended.

Quantity	Description	Function
4	No. 460GAW-3 Key Telephone Sets or	For manual service.
4	No. 460GCW-3 Key Telephone Sets	For dial service.
4	No. 168B-9 Backboards (Color Brown)	Each backboard will mount 3 No. 44A Connecting Blocks.
12	No. 44A Connecting Blocks	For terminating telephone set cords.
4	No. 101C-9 Cover (Color Brown)	Each cover for 3 No. 44A Connecting blocks mounted in multiple.
2	No. 105AW Apparatus Boxes	For mounting 1A Key Telephone Unit.
4	No. 1A Key Telephone Units	Holding Unit required for each line.

The Nos. 460GAW-3 and 460GCW-3 Key Telephone Sets are each equipped with one hold key and five pickup keys. One pickup key will be unused in the initial installation and may be blocked in the non-operated position by means of the P-339942 key blocking device, one of which is furnished with each of these sets. A fifth line may be added to this installation at a later date and connected to the unused pickup key.

A copy of drawing SD-69091-01 showing the wiring diagram for the IA Key Telephone Units is furnished with these units, and Figure 5 covering the key and telephone set circuit is shown on page 14.



Notes: 1—Numbers beside leads indicate number of conductors.

2—Key Telephone Set cord—16 conductors used.

KEY TELEPHONE SET EQUIPPED WITH COMBINED TURN AND PUSH BUTTON KEY

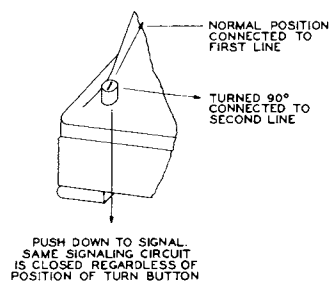
The circuit for the turn and push button type of key is shown in Figure 4.

This circuit provides for

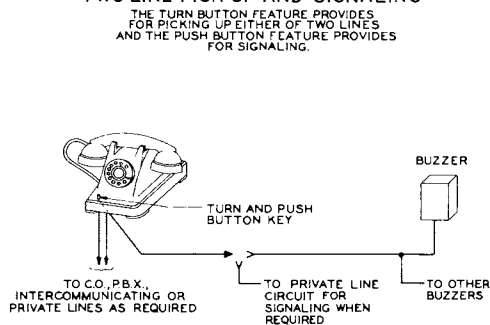
- (1) Picking up either of two lines and signaling.
- (2) Cutting off an extension station or extension ringer and signaling.
- (3) Disconnecting a ringer in the set and connecting an extension station and signaling.
- (4) Controlling a listening-in set and signaling.

These features are illustrated as follows:

FEATURES OF COMBINED TURN AND PUSH BUTTON AS APPLIED TO 2-LINE PICK UP

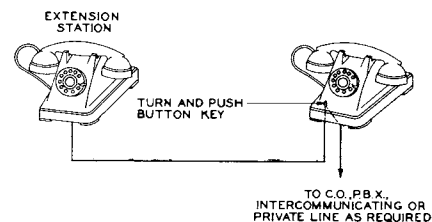


TWO LINE PICK UP AND SIGNALING



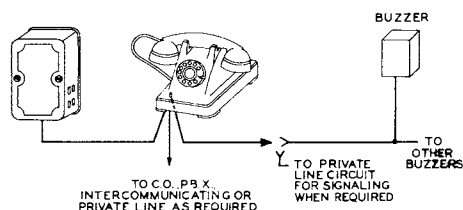
EXTENSION STATION CUT-OFF

OPERATION OF KEY CUTS OFF EXTENSION STATION. EXTENSION STATION MAY INCLUDE A RINGER OR NOT, AS REQUIRED



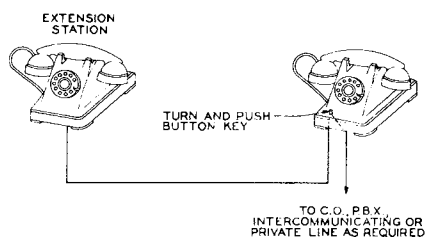
RINGER CUT-OFF

TURN-BUTTON KEY CUTS OFF RINGER WHICH MAY BE IN SET OR SEPARATE AS REQUIRED (AT LEAST ONE RINGER INDIVIDUAL OR COMMON MUST BE PERMANENTLY ASSOCIATED WITH EACH LINE.)



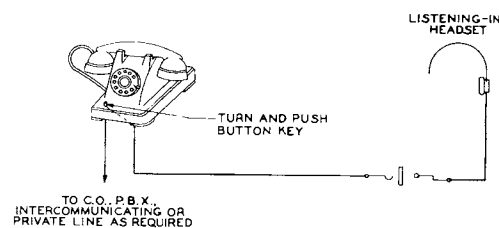
TRANSFER-RINGER TO EXTENSION STATION

KEY DISCONNECTS RINGER IN SET AND CONNECTS EXTENSION STATION OR EXTENSION RINGER



LISTENING-IN SET

OPERATION OF KEY CUTS IN HEADSET FOR SECRETARIAL WORK



Limitations

It is desirable to have the system arranged so that the number of stations that can be connected to one line is limited so as to reduce the possibility of interference particularly with dial pulsing on dial lines, and the possibility of poor transmission being experienced due to the use of a line simultaneously by several stations for listening-in or conference purposes. In general, not more than six stations should be connected directly or by key operation to one central office line and not more than seven stations to the intercommunicating line where visual line and busy signals are not provided. Where, however, common audible signals and visual line and busy signals, necessary for the proper operation of the system, are installed, a greater number of stations may be connected to a line, particularly if it is contemplated that not more than two stations will be used simultaneously on one line and where the use of the telephone is such that little interference is anticipated. The lamp appearances on one line should not exceed twelve.

The conductor loop resistance limitations for key telephone systems are determined by the range of the central office with which a system is associated.

When lines of the No. 1A Key Telephone System are connected to 555 PBX's, the following procedures must be followed:

- (a) Maintain a minimum of 34 volts at the PBX or
- (b) Provide long line circuits or
- (c) In the case of angle bracket mounted units (Individual feature telephone units) provide Nos. 1B, 6C and 18C Key Telephone Units instead of Nos. 1A, 6B and 18A or B Key Telephone Units respectively.

Where there is any question that the loop limits may be exceeded, a check may be made as follows:

The maximum conductor loop resistance from the relay equipment to the central office should be such that (with the holding bridge across the line) not less than the test current values shown in circuit requirement tables on the circuit drawing will flow through the winding of the supervisory relay when the receiver or hand set is removed from its mounting at the most remote station.

Power Supply

The relays, talking circuits and d-c buzzers or bells used in the 1A Key Telephone System are designed for operation on a 14 to 26 volt power supply. An a-c power supply, such as that obtainable from the copper oxide rectifier units or the bell ringing transformer may also be used for the operation of buzzers, bells or lamps on alternating current. For some purposes, a local battery made up of dry cells or "B" batteries may be employed. A battery supply for talking circuits only is furnished in some of the rectifiers described below.

The various sources of power supply available and the services for which each may be used are as follows:

(a) Direct battery feed over cable pairs from the central office or from a PBX, centralized building battery or from a local battery storage plant. This supply may be employed to operate relays, d-c buzzers and bells and line and busy lamps except the 51A Lamps (for illuminating button sets) as well as to furnish a talking supply for intercommunicating or private lines. When used for the latter purpose, a battery feed coil (2A Key Telephone Unit) will be required for each talking circuit.

(b) Copper oxide rectifier per J86205A operates on 105-125v, 50-60 cycle service and provides the supplies directly to a station system without a local battery. Nominal voltages for the J86205A Rectifier at the rated amperage are given below. The voltages are nominal only and will vary considerably with the load on any of the taps.

- | | |
|---|-----------------------------------|
| D-C supply for relays | — 18v at 0.5 ampere |
| D-C supply for talking (one line only) | — 3v at 0.1 ampere 33v at no load |
| A-C supply for bells, buzzers and lamps (except No. 51A Lamp) | — 16v at 1 ampere |

List 1 of J86205A is used for transmitter supply in circuits having a retard coil in the intercommunicating battery supply.

List 2 of J86205A is used for transmitter supply in circuits not having a retard coil in the intercommunicating battery supply. List 2 is the same as List 1 except that it includes a retard coil.

(c) Copper oxide rectifier per J86205H List 1 operates on 105-125v, 60 cycle service and supplies d-c for intercommunicating talking (one line only) and 24v, 0.2A a-c for bells, buzzers or lamps (except No. 51A Lamp) over a 25 ohm loop as follows:

60 Cycle Service Voltage	60 Cycles Output		7EW Bells	Operates 7AW Buzzers	A1 Lamps
	Volts	Amperes			
125	24.2	* .26	4	12	7
120	23.2	.23	4	11	6
115	22.5	.20	3	10	5
110	21.6	.16	3	9	4
105	21.0	.13	2	7	3

* May be increased to 0.4 ampere if talking circuit is not in use.

Rectifier per J86205H List 1 does not include a direct current supply for the operation of relays, line and busy lamps or direct current buzzers or bells.

(d) A local battery made up of 15 No. 6 dry cells connected in series and housed in two 2B battery cabinets. This power supply is satisfactory for the operation of d-c buzzers and bells and for use with talking circuits when employed with the 2A Key Telephone Unit.

(e) Three 22½ volt B batteries connected in parallel and housed in a 2A battery cabinet. This supply is intended for use where signaling battery only is required to operate d-c buzzers or bells.

(f) Low voltage from Jefferson Electric Company transformers No. 231-001-027 or 231-001-039 or equivalent. This supply is suitable for the operation of a-c buzzers or bells and lamps except the 51A. The no load output voltage of these transformers is 24 volts. The first delivers one ampere at 15 volts and the second 2 amperes at 15 volts.

(g) A ringing current supply over feeder pairs from a central office or a PBX. This supply will be required for ringing on private lines, and for the operation of common ringers employed with the 14A or 15A Key Telephone Units. The ringing lamp furnished in the 10A Key Telephone Unit will be required in connection with the ringing supply.

(h) Where telephone sets with illuminated key buttons or lamp indicators with 51A Lamps are employed, the voltages impressed on the lamps should be limited to approximately 10 volts. Where 110-125 volt a-c power supply is available the 393A transformer is used to supply power for the lamps. Where a-c power supply is not available, battery power supply either from the system or building power plant or supplied over cable pairs from the central office will be used, and 19-type resistances connected in the leads to the lamps to limit the voltage at the lamps. Where a-c supply from the transformer is employed the conductor loop resistance of the leads between the apparatus cabinet or box and the individual lamp in the key telephone set or lamp indicator should not exceed 25 ohms. Where separate leads are not run to each lamp, i.e., where it is desired to supply more than one lamp associated with the same line over a single pair of wires or cable conductors, this 25-ohm limit should be divided by the number of lamps connected to the lamp leads. For satisfactory operation the maximum conductor loop resistance of the wire between the transformer and the terminals in the apparatus box or cabinet at which key button lamp leads are terminated should be determined by the following formula:

$$\text{Maximum Conductor Loop Resistance in Ohms} = \frac{33}{\text{Number of Lamps supplied by Transformer}}$$

Where more than 36 lamps are to be supplied a second transformer should be installed.

When a common source of direct current power is employed to operate the buzzers or bells and for talking circuits, the 500 mf. condenser per KS14136 may be bridged across the signaling supply leads where necessary to avoid introducing objectionable noise on the talking circuits.

Fusing: Individual circuit fuses are not required in the 1A Key Telephone System except where the central office (or building) battery is not always covered by a maintenance man for the replacement of fuses. It may also be used where, for other reasons individual circuit fuses are desired. The reason for this is that a large percentage of the installations will be fed over battery feed pairs from a central office (or building) battery which is readily accessible for prompt replacement of fuses. In these installations, a trouble ground at the station will operate the 2-ampere alarm type fuse at the central office (or building) battery bringing in an alarm, and the fuse will be replaced within a short time by the maintenance man. During this trouble condition, the battery supply to the key equipment will be interrupted while the fuse is being replaced and although the reception of incoming calls will be halted for this brief period on key telephone units, such as the 51A and 52A for instance, the placing of outgoing calls may be carried on as usual on the central office or PBX lines. The recommended fusing arrangement is similar to that used on 551 type PBX's and is shown on SD-69136-013. For the purpose of computing the number of fuses required, it may be assumed that a single 2-ampere fuse at the central office (or building) battery has a continuous current rating of 1.6 amperes.

For further information regarding the No. 1A Key Telephone System, you are invited to address the Western Electric distributor whose name is listed below.

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