ECON-O-KEY 100™

Installation Manual

TIE-919 KEY SERVICE UNIT

THIS ISSUE SUPERCEDES ALL PREVIOUS ISSUES

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INTRODUCTION

THE PURPOSE OF THIS MANUAL IS TO PROVIDE THE DESCRIPTIVE AND PROCEDURAL INFORMATION NECESSARY TO INSTALL AND MAINTAIN THE TIE-919 KSU. IT IS ASSUMED THAT THE INSTALLER HAS A BASIC KNOWLEDGE OF KEY SYSTEM THEORY AND OPERATION. WITH THAT KNOWLEDGE AND THIS MANUAL, THE INSTALLER WILL BE ABLE TO INSTALL, MAINTAIN, AND TROUBLESHOOT THE KSU.

THE TIE-919 KSU, IN CONJUNCTION WITH THE TIE-919 EU (EXPANSION UNIT) AND E-100-B KEY TELEPHONE SETS MAKE UP THE TIE-919 KEY TELEPHONE SYSTEM. INFORMATION ON INSTALLATION, CONNECTIONS, AND STRAPPING FOR THE E-100-B KEY TELEPHONE SETS IS ALSO PROVIDED IN THIS MANUAL.

IT IS RECOMMENDED THAT THE INSTALLER THOROUGHLY FAMILIARIZE HIMSELF WITH THE INFORMATION CONTAINED IN THIS MANUAL PRIOR TO INITIATING INSTALLATION OF THE TIE-919 KSU.

IF, DURING INSTALLATION, PROBLEMS OR QUESTIONS ARISE THAT CANNOT BE RESOLVED BY MEANS OF THE INFORMATION CONTAINED IN THIS AND RELATED MANUALS, ASSISTANCE IS AVAILABLE FROM THE TIE TECHNICAL SERVICE DEPARTMENT, MONDAY THROUGH FRIDAY BETWEEN 9:00 AM AND 5:00 PM (EASTERN TIME) USING THE FOLLOWING TELEPHONE NUMBER:

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TIE-919 KEY SERVICE UNIT INSTALLATION

1.00 SYSTEM DESCRIPTION

1.01 General

1.02 The TIE-919 Key Service Unit (KSU) is a versatile compact unit. The KSU is prewired to accommodate a combination of 400 type plug-in card arrangements to give maximum flexibility.

1.03 Apparatus Mounting Assembly

1.04 The apparatus mounting assembly (including the cover) is 13-3/4 inches (34.9 cm) wide, 19-27/32 inches (50.4 cm) high, and 9-3/16 inches (23.3 cm) deep.

1.05 It is used to house the components of the KSU. The mounting assembly has a swing-out gate which allows access to KSU wiring and connecting blocks. The assembly is enclosed by a removable cover which protects the equipment from dirt, dust, and excessive moisture.

1.06 The complete assembly is fastened to a suitable mounting surface with mounting hardware placed through four keyhole type mounting holes provided in the rear panel of the KSU. The prewired swing-out gate is hinged at the right.

1.07 Gate Assembly

1 08 A double-wide panel across the top of the apparatus mounting assembly swing-out gate contains eight 20-pin card connectors (J1-J6 and J9-J10), and four 40-pin connectors (J7-J8 and J11-J12). A 21-pin connector (J15) is mounted immediately below card connectors J8-J10. The 20-pin connectors accept either 18 or 20 contact, 4-inch wide, plug-in printed circuit cards. The 40-pin card connectors accept 18, 20, or 40-contact, 4-inch wide, plug-in circuit cards. In-line card connectors J7-J8 will accept an 80-contact, 8-inch wide, plug-in circuit card.

1.09 The 21-pin connector (J15) accepts the interrupter which is supplied with the KSU. The panel card connectors are factory wired to the connecting blocks and fuse panel.

1.10 Fuse Panel

1.11 The fuse panel, mounted to the apparatus mounting assembly swing-out gate, contains 14 non-alarm-type fuses. Fuse ratings and use are shown in Table 1. The fuse panel is factory wired.

Table 1 - KSU Fuse Distribution

FUSE NO.	RATING (Amperes)	DESIGNATION	CONNECTIONS SERVED
F1	2	FLB 1	J1-J3
F2	2	FLB 2	J4-J6
F3	2	FLB 3	INT., J11-J12
F4	2	FLB 4	J8-J10
F5	2	FLF 1	J1-J3
F6	2	FLF 2	J4-J6
F7	2	FLF 3	J11-J12
F8	2	FLF 4	J8-J10
F9	2	FLW 1	J1-J3
F10	2	FLW 2	J4-J6
F11	2	FLW 3	J11-J12
F12	2	FLW 4	J8-J10
F13	-	Not Used	-
F14	1/2	BB 3	ALL STATIONS

1.12 Power Supply

1.13 The TIE-919 KSU is supplied with a fused power supply which provides all voltages necessary for a fully equipped KSU. This unit measures 9-1/4 inches (23.5 cm) wide, 7-1/8 inches (18.1 cm) high, 5-3/8 inches (13.7 cm) deep, and is mounted to the apparatus mounting assembly swing-out gate.

WARNING

Malfunction of a power supply can be a hazard to telephone personnel, if the power supply and KSU are incorrectly grounded. It is recommended that AC service outlet used be the 3-wire parallel ground type. A 3-wire-to-duplex adapter should be avoided unless a separate ground is provided for the KSU frame.

An additional ground must be provided as a reference for the power supply secondary. This ground is connected from a metallic cold-water pipe to the ground terminal on the front of the supply. This grounding wire should be as short as possible and made of No 14 (or larger) copper wire.

1.14 The power supply is equipped with a 6-foot, 3-wire power cord. The input to the power supply has 3 taps to accommodate voltage variations of the local power companies. The power supply is factory wired to the 117 ±6 volts tap. Taps are also provided for 111 and 123 volts and may be used as local conditions dictate to maintain proper voltage to the circuit cards.

WARNING

Be sure the power supply is unplugged before changing the wiring to these taps.

1.15 The power supply contains five non-alarm type cartridge fuses. Fuse ratings and use are shown in Table 2. The power supply outputs are as follows:

(a) A BAT (talk) negative, 18 to 28 volts DC, filtered, at 1 ampere.

(b) B BAT (signalling) negative, 20 to 28 volts DC, unfiltered, at 2 amperes.

(c) Lamp supply, 9 to 11 volts, 60-Hz at 8 amperes.

(d) AC signalling supply, 18 to 22 volts, 60-Hz at 2 Amperes (used for buzzer signalling only).

Table 2 - Power Supply Fuse Distribution

FUSE NO.	RATING (Amperes)	DESIGNATION	USE
F1	5	LINE	POWER SUPPLY INPUT
F2	2	TALK	A BAT -18 TO -28 VDC
F3	5	SIG	B BAT -20 TO -28 VDC
F4	10	10V	LAMP SUPPLY 9 TO 11 VAC
F5	2	20V	AUDIBLE SIGNAL 18 TO 22 VAC

1.16 TIE-919 EU Expansion Unit (Optional)

1.17 Addition of the Expansion Unit to the KSU expands the system capacity from 10 to 19 key telephone stations. In installations where 2 groups of key telephone stations exist, the Expansion Unit can be mounted near one group of stations and used as a distribution frame. The Expansion Unit can then be connected to the KSU by a plug-ended, 50-pair house cable (customer supplied).

1.18 The Expansion Unit overall dimensions (including cover) are 13-3/4 inches (34.9 cm) wide, 19-27/32 inches (50.4 cm) high, and 9-3/16 inches (23.3 cm) deep. It contains two 8 x 50 quick-connect blocks and is factory wired to 2 50-contact (amphenol 57-series type) plug-in connectors for mating to the TIE-919 KSU.

1.19 Wiring Terminations

1.20 Card connectors J1-J12 are factory wired to the appropriate terminals of the KSU quick-connect blocks B1, B2, B3, and B4.

1.21 All wiring to and from the fuse panel is factory terminated. Power distribution terminations are made by the factory to connecting block B2. Power supply wiring to the fuse panel is also made by the factory.

1.22 All station terminations, CO or PBX line terminations, intercom signalling connections, etc., are made by the installer at the KSU (and Expansion Unit) in accordance with the system arrangement. Refer to "CONNECTIONS" for installers station terminations.

1.23 Plug-In KTU's

1.24 The number of plug-in KTU's (ordered separately) available for use with the TIE-919 KSU offers a wide variety of system arrangements. Plug-in KTU's may be used in card connectors as shown in Table 3. Circuit card functions and descriptions are as follows:

(a) 400E Line Card.

The line card is a 4-inch, 18-contact, plug-in card that provides line pick-up and hold for one central office or PBX line, audible signal control of incoming calls, control of visual signals for line status indication, and access to the music-on-hold (with optional buffer circuit).

(b) 401A Manual Intercom Card

The manual intercom card is a 4-inch, 18-contact, plug-in unit that provides busy lamp indication and common-talking battery for intercommunication between stations within the TIE-919 system. An external signalling arrangement may be used for station signalling

Table 3 - KSU Connector Positions and KTU Card Assignment

CONNECTOR POSITION	KTU	FUNCTION
J1-J6	400E	LINE CARD
J7	424A	PART OF DIAL-SELECTIVE INTERCOM (CONN A)
J8	424A 400E	PART OF DIAL-SELECTIVE INTERCOM (CONN B) LINE CARD
J9	401A/401AP 400E	MANUAL INTERCOM/PAGING ADAPTER(KEY ACCESS) LINE CARD
J10	401AP 400E	PAGING ADAPTER (KEY ACCESS) LINE CARD
J11	456TA 400E	INTERCOM AMPLIFIER LINE CARD
J12	401AP 403A 400E	PAGING ADAPTER (DIAL ACCESS) MUSIC-ON-HOLD BUFFER LINE CARD

(c) 401AP Paging Adapter Card

The paging adapter card is a 4-inch, 18-contact, plug-in unit that provides (key or dial) access to an external paging system, busy lamp indication, and talking battery for the station equipment.

(d) 403 Music-On-Hold Buffer Card

The music-on-hold buffer card is a 4-inch, 18-contact, plug-in unit that provides the interface to connect music from an external source to the line card when a CO/PBX line is placed on hold.

(e) 424 Dial Selector Circuit

The dial selector circuit cards are 8-inch, 80-contact, plug-in units that provide talking battery to intercom stations by way of a common talking path. Visual busy indication and station selection of up to 19 codes are standard features.

(f) 456T Call-Announcing Card

The call-announcing card is a 4-inch, 18-contact, plug-in unit that provides the amplifier circuitry necessary to drive the intercom speaker at the intercom stations. Intercom lamp control and intercom answer detection are also provided.

2.00 E-100-SERIES TELEPHONE SET

2.01 The E-100-series Key Telephone Sets are recommended for use with the TIE-919 KSU. The telephone sets provide nine (clear) line keys and a (red) hold key. A single, 25-pair line cord is provided to connect the telephone set to the KSU.

2.02 Information contained in this manual is based on the use of the E-100-series telephone sets. Use of other instruments is possible, however, KSU and instrument wiring may be affected.

2.03 For details of both the E-100-B and the E-100-C and their installation in a TIE-919 Key Telephone System, refer to Sections 2 or 3 of this manual.

3.00 INSTALLATION

It is recommended that the installer be familiar with the information contained in this section before attempting to install the TIE-919 KSU. Special tools and test equipment ARE NOT required for installation.

3.01 Equipment Location

3.02 The practical objective of equipment location is to minimize cable runs. Considering the factors listed below, select a suitable KSU installation site.

(a) Availability of 105 to 125-volt, 60-Hz, single-phase 3-wire power outlet.

(b) Location of CO/PBX terminations.

(c) Location of the majority of local stations.

(d) Location of telephone ducts or conduit, if provided.

(e) Availability of space to allow equipment gates to swing fully open for access to wiring and for servicing without contacting any equipment, walls, furniture, etc.

(f) A well-ventilated area having a temperature range of from 32 degrees (0C) to 95 degrees (+35C) Fahrenheit is recommended.

(g) A good earth ground must be provided using 14-gauge or larger wire. A cold-water pipe with joints and meters by-passed by 14-gauge or larger straps will

provide a suitable ground.

3.03 KSU Mounting

3.04 The TIE-919 KSU is configured for wall-mounting only. When a concrete, masonry, or damp surface is selected for the mounting site, the KSU should be mounted on a backboard (customer provided).

3.05 On the surface to which the KSU is to be mounted, locate four mounting points with the wall-mounting template supplied. These holes correspond with the key-type mounting holes in the back panel of the KSU assembly which are 8 inches (20.3 cm) apart and the top holes are 15 3/8 inches (39.1 cm) above the bottom holes.

3.06 The method of fastening the assembly is determined by the surface material to which it is to be mounted. Using suitable fasteners, secure the assembly to the mounting surface.

3.07 Expansion Unit (EU) Mounting

3.08 The TIE-919 Expansion Unit (EU) is configured for use with the TIE-919 KSU. The EU expands the number of telephone stations in the system from a maximum of 10 to a maximum of 19. To mount and interconnect the EU to the KSU, proceed as follows:

(a) Select a mounting location to the immediate left of the KSU. Ensure the cable assembly from the KSU will reach and mate with the cable assembly from the EU. If the KSU and EU cannot be mounted in close proximity, the 2 units may be interconnected with a 50-pair jumper cable of suitable length (one end male connectors, the other end female connectors).

(b) Using the procedures outlined in paragraphs 3.05 and 3.06, mount the Expansion Unit.

(c) Make station terminations in accordance with local requirements using the CONNECTIONS section of this practice as a guide.

(d) On completion of station connections, connect the EU to the KSU by means of the plug-ended cables provided, being certain the proper connectors are plugged together (C1 to C1 and C2 to C2).

4.00 CONNECTIONS

4.01 General

4.02 The connection instructions provided in the following paragraphs have been divided into a sequence recommended for installing a typical TIE-919 KSU.

4.03 Installer connections are made on quick-connect blocks designed for use with plastic insulated wire (20 to 26 gauge). Insulated conductors (unskinned) are terminated on the connecting blocks by means of a 714-B type tool.

4.04 The station cables are terminated on quick-connect blocks B3 and B4 (one 25-pair cable per station). CO/PBX lines are terminated on block B1. Strapping options are performed on blocks B2 and B3.

4.05 Station Connections

4.06 Terminate key telephone cables (one per station) on connecting blocks B3 and B4 of the KSU or EU. Figure 1 shows sample station cable connections for a typical installation. Refer to Tables 4, 10 and 11 for station lead designations and connecting block termination points.

Problems may result if E-100-B & E-100-C sets are mixed in the same system. For this reason, it is recommended that E-100-C's be "converted" (by converting the FLASH key) when they are to be used in systems with E-100-B sets. This is done to make the key functions of both type sets the same. Refer to Section 3 of this manual.

4.07 BL Leads: The BL lead provides an off-hook (hook-switch) ground for various control lead options which may be required on a per station basis. These leads are terminated on separate clips on KSU or EU block B3. Table 5 shows the location for terminating each station BL lead. BL lead clips in the EU are indicated with an asterisk (*).

4.08 BZ1 leads: The cut-down of the YL-SL station leads (BZ1) will depend on the signalling options at the stations.

Table 4 - Station Cable Connections
(See Figure 1)

FROM STATION CABLE			TO KSU BLOCKS**		
			E-100-B*	NOTES	E-100-C*
LEAD DESIG	PLUG PIN	CABLE COLOR	CLIP	SEE PARA	CLIP
1T 1R	26 1	WH-BL BL-WH	1 2		1 2
1A SG(A1)	27 2	WH-OR OR-WH	3 4		3 4
1LG 1L	28 3	WH-GN GN-WH	5 6		5 6
2T 2R	29 4	WH-BR BR-WH	7 8		7 8
2A 9A	30 5	WH-SL SL-WH	9 10	←4.12	9 -
2LG 2L	31 6	RD-BL BL-RD	11 12		11 12
3T 3R	32 7	RD-OR OR-RD	13 14		13 14
3A 8A	33 8	RD-GN GN-RD	15 16	4.12→	15 10
3LG 3L	34 9	RD-BR BR-RD	17 18		17 18
4T 4R	35 10	RD-SL SL-RD	19 20		19 20
4A 7A	36 11	BK-BL BL-BK	21 22		21 16
4LG 4L	37 12	BK-OR OR-BK	23 24		23 24
5T 5R	38 13	BK-GN GN-BK	25 26		25 26
5A 6A	39 14	BK-BR BR-BK	27 28		27 28
5LG 5L	40 15	BK-SL SL-BK	29 30		29 30
6T 6R	41 16	YL-BL BL-YL	31 32		31 32
BL RB	42 17	YL-OR OR-YL	- 34	4.07	- 34
6LG 6L	43 18	YL-GN GN-YL	35 36		35 39
7T 7R	44 19	YL-BR BR-YL	37 38		43 44
BZ1 BZ2	45 20	YL-SL SL-YL	- -	4.08 4.11	- -
7LG 7L	46 21	VI-BL BL-VI	41 42		47 48
8T 8R	47 22	VI-OR OR-VI	43 44		49 50
9LG 9L	48 23	VI-GN GN-VI	45 46		- -
8LG 8L	49 24	VI-BR BR-VI	47 48		45 46
9T 9R	50 25	VI-SL SL-VI	49 50		- -

* Use E-100-B column for E-100-C sets with flash key converted for ICM use.

** KSU block B3 - Rows E through G
KSU block B4 - Rows A through G

- For stations with call-announcing, connect the YL-SL leads to block B3 or B4 clip 39.

- For stations to receive CO audible tone signals (usually the attendant stations) connect the YL-SL station leads to block B3, as shown in Table 6 (refer to instructions in Sections 2 or 3 for CO audible strapping options in the telephone.

4.09 The RC signalling leads for the 1st eight lines are strapped together at the factory. With this wiring, the installer may connect the BZ1 lead of the attendants station to any of these lines and that station will be signalled by an incoming call on any of these lines. This may be restrapped by the installer to have different groups of lines signal different stations. Furthermore, because a DC ground is used to signal the station, diodes may be used to provide a variety of flexible signalling arrangements such as shown in Figure 2.

READ The example shown in Figure 2 may NOT be employed if BUZZERS are used at stations for signalling.

4.10 In the example shown in Figure 2, incoming calls on lines 1, 2, or 3 will signal only the attendant. Calls on line 4 will signal the attendant AND the individual station

4.11 BZ2 Leads: The SL-YL station lead (BZ2) is used for intercom signalling (tone or call - announcing) to each station in the system. The connection of a station BZ2 lead at block B3 assigns the intercom number (dial-code) for each station. When using a dial-selective intercom card (424 type) in the system, connect the SL-YL lead of each station to block B3 as shown in Table 7. (Refer to Section 2 of this manual for intercom audible signal strapping in the telephone).

4.11A When buzzers are used at the stations, wire the BZ2 lead of the stations to receive ICM signals as described in paragraph 4.11. For stations to receive CO audible signals, wire the BZ2 (SL-YL) station lead to clip 39 of B3 or B4 and strap the ICM code for this station to the CO audible common strapping on B3. Refer to Figure 2A.

See READ paragraph at top of page 7.

Table 5
Station BL Lead Termination Location

FROM STATION CABLE		TO KSU B3
STATION	CABLE COLOR	CLIP
1	YL-OR	32B
2		33B
3		34B
4		35B
5		36B
6		37B
7		38B
8		39B
9		40B
10		41B
11		32B*
12		33B*
13		34B*
14		35B*
15		36B*
16		37B*
17		38B*
18		38B*
19		40B*

* Clips located in Expansion Unit

Only one (1) station may be wired to receive CO audible signals from a line or group of lines.

4.12 DO NOT connect station leads to clip 10 if telephones are equipped with automatic exclusion and dial intercom is provided.

4.13 The termination points in Table 7 correspond to KSU block B3 AND EU block B3. Connect the SL-YL station leads to KSU block B3 or EU block B3 as application dictates to assign station codes.

4.14 If the system uses a 19-station dial selector (424), dial code 1 cannot be assigned to a station. Dial code 1 is factory wired as the transfer digit for two-digit intercom numbers.

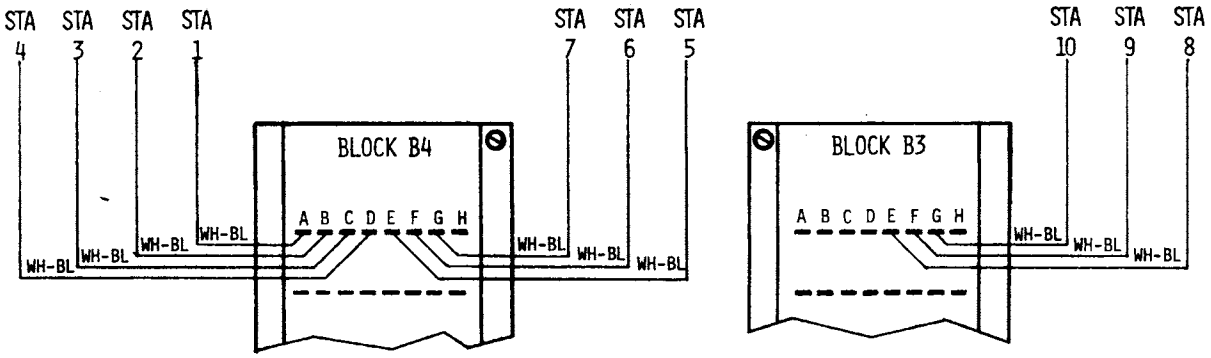


Figure 1 - Station Cable Arrangement (Tip lead shown for stations 1 through 10)

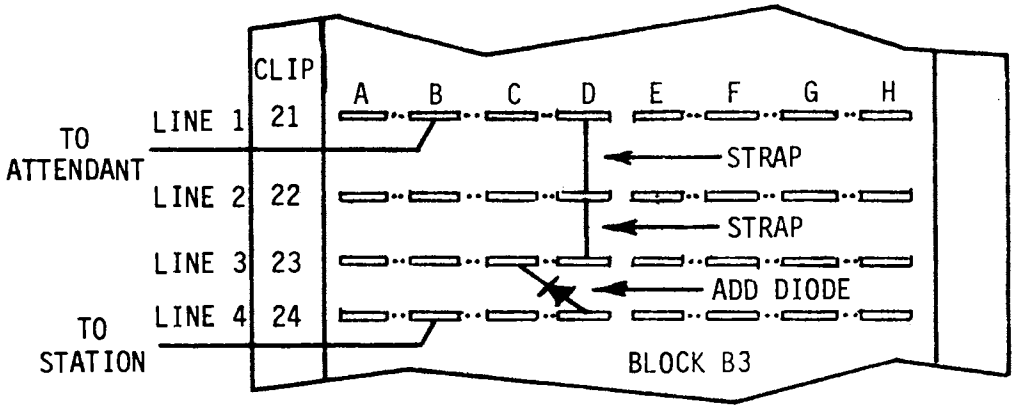


Figure 2 - CO Audible Signal Arrangement (example)

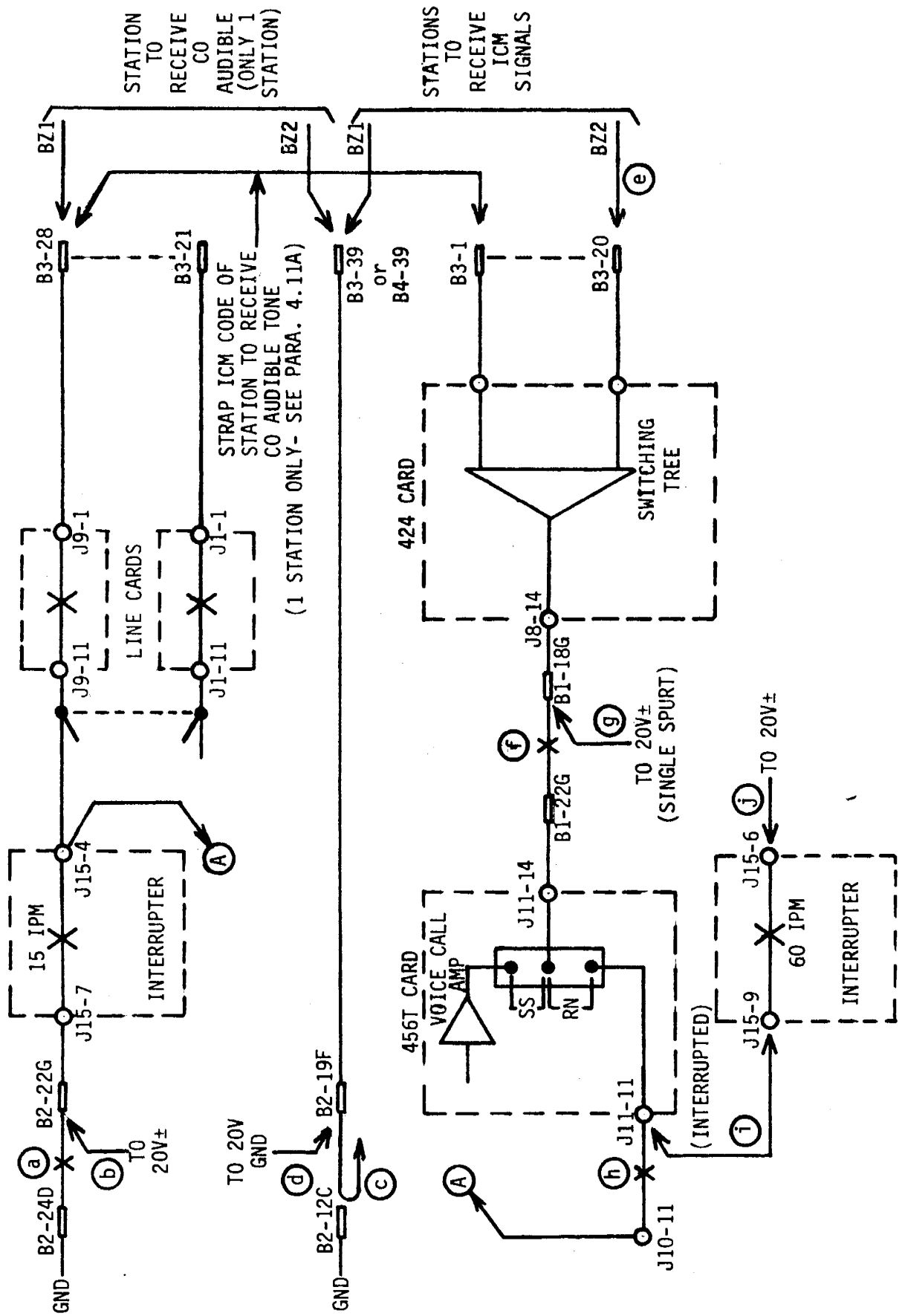


FIGURE 2A - Installer Wiring - Station Signalling With Buzzers

Refer to paragraphs 4.11A, 4.44, 4.47 and 4.51A

Table 6 - Station Connections For CO Audible Signal

FROM STATION REQUIRING CO AUDIBLE		TO KSU BLOCK B3	LINE CARD - RC LEAD ASSOCIATION		
LEAD DESIG	CABLE COLOR	CLIP (ROW B-D)	LINE CARD CONNECTOR	KSU LEAD DESIG	NOTE
BZ1	YL-SL	21B	J1	RC1	SEE PARA 4.08
		22B	J2	RC2	
		23B	J3	RC3	
		24B *	J4	RC4	
		25B	J5	RC5	
		26B	J6	RC6	
		27B	J10	RC7	
		28B	J9	RC8	
		29B	J8	RC9	
		30B	J12	RC10	
		31B	J11	RC11	

* The RC leads of the 1st 8 line cards are strapped together at the factory. Refer to paragraph 4.09 for instructions on connections for individual line CO audible signalling at individual stations.

Table 7
Station ICM Audible Signal Connections

FROM STATION CABLE		TO KSU B3	REFER TO
ASSIGNED DIAL CODE	CABLE COLOR	CLIP (ROW B-D)	4.13
0	SL-YL	1B	
1		2B →	4.14
2		3B	
3		4B	
4		5B	
5		6B	
6		7B	
7		8B	
8		9B	
9		10B	
10		11B	
11		12B	
12		13B	
13		14B	
14		15B	
15		16B	
16		17B	
17		18B	
18		19B	
19		20B	

4.15 CO/PBX Connections

4.16 CO/PBX line connections are installer provided on KSU connecting block B1 as application dictates.

4.17 Preliminary considerations: Since the E-100 key telephone is arranged for multi-line conferencing, the polarity of all station lines MUST be the same. If no interconnect device is used, and the CO/PBX provides reverse polarity answer supervision, a diode bridge must be added to terminal block B1 for each CO/PBX line as shown in Figure 3.

4.18 Wiring terminations: To connect CO/PBX lines to the TIE-919 system (with or without diode bridge), refer to Table 8.

4.19 Plug-In Card Connections

4.20 Wiring and strapping options required for plug-in KTU's used in the TIE-919 KSU are described in the fol-

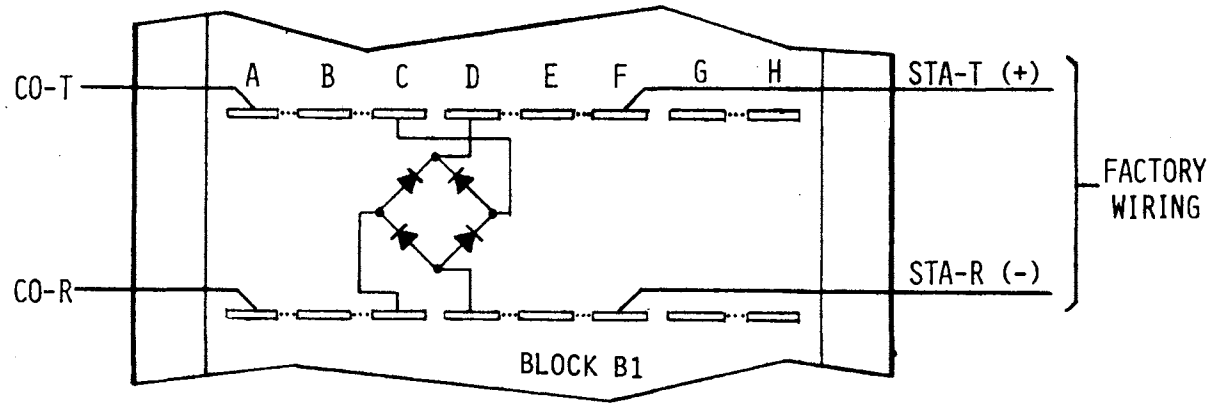


Figure 3 - Typical Diode Bridge Connection

lowing paragraphs. In most cases, standard factory wired options on the plug-in cards are required by the system and need not be altered. Installer wiring options in the KSU are accomplished on blocks B2 and B3 as application dictates.

4.21 400E Line Card

4.22 The 400E line card may be installed in connector positions J1 thru J6, and J8 thru J12 in accordance with system requirements. All connector positions referenced above are prewired to line keys at the stations except for connectors J11 and J12. Connectors J11 and J12 are not normally used for line cards but may be wired in the field to selected line keys if desired.

4.23 When an STC interconnect device is used with the system, ensure the BR wiring strap on each line card is cut. Cutting the BR strap provides an operate path for the RU lead to the interconnect device. Location of the BR strap is shown in Figure 4. This strap should not be cut on cards connected to STP interface devices or connected directly to the CO/PBX line.

4.24 Music-on-hold can be used with lines served by connector positions J1 through J6. Factory wiring provides for a MOH buffer card (403) in connector position J12 (refer to paragraph 4.33). When supplying music-on-hold, ensure pins 3 and 18 of each card are strapped for this feature as shown in Figure 4.

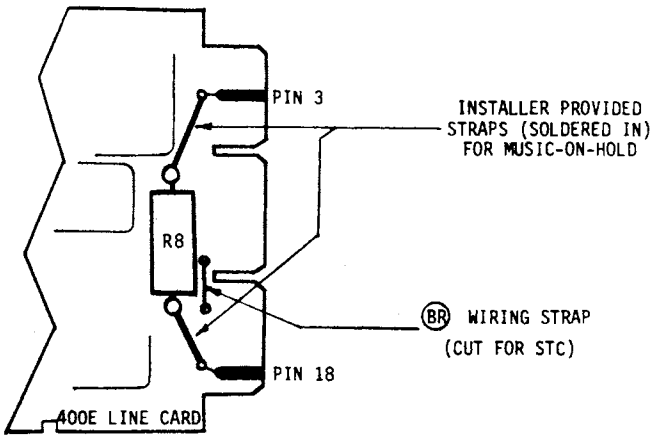


Figure 4
400E Line Card, Strap Locations

4.25 When using a 400 type line card in positions J8 through J12, the installer must change some strapping in the KSU. If line cards, such as the 400E, with music-on-hold wired to pins 3 and 18 are used, the "A" battery and ground connections for the appropriate card must be removed from the B2 connecting block. Following is a list of wiring changes by card position:

a) Position J8

Remove straps from

B2-9G to B2-16E
B2-10G to B2-17E
B2-14E to B2-7G
B1-18G to B1-22G

Table 8 - CO/PBX Connections

FROM CO/PBX	TO KSU BLOCK B1		ASSOCIATED POSITIONS	
	WITH DIODE BRIDGE	WITHOUT DIODE BRIDGE	CARD CONNECTOR	STATION LINE KEY
T1	1A	1D	J1	LK1
R1	2A	2D		
1RU*	-	2G		
T2	3A	3D	J2	LK2
R2	4A	4D		
2RU*	-	4G		
T3	5A	5D	J3	LK3
R3	6A	6D		
3RU*	-	6G		
T4	7A	7D	J4	LK4
R4	8A	8D		
4RU*	-	8G		
T5	9A	9D	J5	LK5
R5	10A	10D		
5RU*	-	10G		
T6	11A	11D	J6	LK6
R6	12A	12D		
6RU*	-	12G		
T7	13A	13D	J10	LK7
R7	14A	14D		
7RU	-	14G		
T8	15A	15D	J9	LK8
R8	16A	16D		
8RU*	-	16G		
T9	17A	17D	J8	LK9
R9	18A	18D		
9RU*	-	18G		
T10	19A	19D	J12	-
R10	20A	20D		
10RU*	-	20G		
T11	21A	21D	J11	-
R11	22A	22D		
11RU*	-	22G		

* This connection required only if STC type interface is used.

Remove "A" ground from B2-9B (if required)

Remove "A" battery from B2-9E (if required)

Connect a strap from B2-6G to B2-7G

b) Position J9

Remove "A" ground from B2-8B (if required)

Remove "A" battery from B2-8E (if required)

c) Position J10

Remove "A" ground from B2-7B (if required)

Remove "A" battery from B2-7E (if required)

d) Position J11

Remove straps from

B2-14E to B2-7G
B2-16E to B2-9G
B2-17E to B2-10G
B2-18E to B2-11G
B1-22E to B2-15G
B1-18G to B1-22G

Remove "A" ground from B2-11B (if required)

Remove "A" battery from B2-11E (if required)

This card position is not prewired to the stations. Stations to answer this line must be wired to quick-connect block B3 as follows:

T lead wire to B3-47 B thru D
R lead wire to B3-48 B thru D
A lead wire to B3-49 B thru D
L lead wire to B3-46 B thru D

e) Position J12

No wiring changes required.

This card position is not prewired to the stations. Stations to answer this line must be wired to quick-connect block B3 as follows:

T lead wire to B3-43 B thru D
R lead wire to B3-44 B thru D
A lead wire to B3-45 B thru D
L lead wire to B3-42 B thru D

After making the above connections, strap the RC lead of the line(s) to the station to receive CO audible signals as described in paragraph 4.09 and in Table 6. Connect the CO/PBX leads for each line as described in paragraph 4.15 and in Table 8.

4.26 401A Manual Intercom Card

4.27 The 401A manual intercom card is normally installed in connector position J9 to provide 'meet-me' conference, hot line, or paging answer on station line key 8. No installer connections (other than station connections) are required. When using the manual intercom card in connector position J9, ensure that there are no installer connections on block B1-16D or E, B1-15D or E, B1-16G, and B2-21D or E. Any signalling capability associated with the manual intercom card must be provided on a local basis in accordance with the cards application.

4.28 401AP Paging Adapter Card

4.29 The 401AP Paging Adapter card provides an interface between the KSU and an external paging system. The paging adapter may be provided with either key access (direct access by pushing the associated key at the stations) or dial access (access to paging by pushing the dial intercom key and dialling the assigned number).

4.30 The audio output lead connections from the KSU to the external paging equipment should be made with a shielded cable. If the paging equipment requires a control lead, provide Ⓒ or Ⓖ wiring on the 401AP card as shown in the condensed schematic on Figure 9.

The E-100 telephones are factory-wired for multi-line conferencing. This conferencing capability MUST be removed from the key used for paging access to prevent coupling of outside lines into the paging

system. Refer to section 2 or 3 of this manual for modification instructions.

4.31 Installation for Key Access to Paging Using E-100-B or Converted E-100-C Telephones

The 401AP card is plugged into position J10 to provide paging access on LK7 at the stations. Make the following connections:

a) Using SHIELDED CABLE, connect paging amplifier 1 to B1-14E and paging amplifier 2 to B1-14G.

b) Connect paging amplifier control to B2-21B.

c) Remove strap from B3-27D (CO audible strap).

d) Provide Ⓒ or Ⓖ wiring on 401AP card as required.

4.32 Installation for Key Access to Paging Using E-100-C Telephones

Key LK7 in the station is normally used for manual intercom. This may be changed to key access to paging by plugging the 401AP card into J9 and making the following changes:

a) Using SHIELDED CABLE, connect paging amplifier 1 to B1-16E and paging amplifier 2 to B1-16G.

b) Connect the paging amplifier control lead to B2-21E.

c) Remove strap from B3-28D (CO audible strap).

d) Provide Ⓒ or Ⓖ wiring on 401AP as required.

4.33 Key LK6 may be used for key access to paging by plugging the 401AP card into position J6 and making the following connections:

a) Using SHIELDED CABLE, connect paging amplifier 1 to B1-12E and paging amplifier 2 to B1-12G.

b) Remove strap from B3-23D (CO audible strap).

c) Connect amplifier control lead to B3-23D.

d) Provide Ⓒ or Ⓖ wiring on 401AP as required.

e) Remove and store the lead from B2-6B.

f) Strap B2-6C to B2-7C.

g) Remove and store the lead from B2-6E.

h) Strap B2-6D to B2-7D.

4.34 Installation of Dial Access to Paging With E-100-B/C Telephones

To provide dial access to paging, the 401AP card is plugged into J12. When dial access is provided, the music-on-hold option cannot be provided.

4.35 The access code used for paging depends on the type of intercom signalling to the stations. With call-announcing, codes 2, 3, or 4 may be used For ICM tone signalling (single spurt or interrupted), 2 must be used for the access code. Make the following connections to KSU blocks B1 and B2:

(a) Strap B2-16C to B2-16D (ICM R).
Strap B2-17C to B2-17D (ICM T).

(b) Strap ONE of the following:

Call Announ.
- B2-18C to B2-12G (Dial code 2)
- B2-18C to B2-13G (Dial code 3)
- B2-18C to B2-14G (Dial code 4)

Tone sig-B2-18C to B2-8G (Dial code 2)

(c) Using SHIELDED CABLE, connect paging amplifier 1 to B1-20E paging amplifier 2 to B1-20G.

(d) Connect paging amplifier control to B2-14B, if required.

(e) Provide Ⓒ or Ⓖ wiring on card as required.

4.36 In addition to the above, make the following connections ONLY when single spurt tone signalling is used. It will provide a path to hold the register until the paging party releases.

Remove B2-15G to B1-22E and

connect a diode from B2-21H to B2-20H

Strap B2-21G to B2-18B

Strap B2-20G to B2-15G

4.36A When single spurt signalling is used for ICM calls, the 456T card is not equipped and position J11 may be used for dial access to paging. To accomplish this, make the following changes:

Remove strap from B1-18G to B1-22G

Remove green "A" battery strap from B2-11E

Remove green "A" ground strap from B2-11B

Move strap on B2-11C to B2-9C

Move strap on B2-11D to B2-9D

Remove strap from B2-18E to B2-11G

Remove strap from B2-15G to B1-22E

Remove strap from B2-14E to B2-7G

Add strap from B2-18E to B2-8G

Connect a diode from B2-21H to B2-20H

Strap B2-21G to B2-18D

Strap B2-20G to B2-15G

Using SHIELDED CABLE, connect the paging amplifier leads as follows:

Paging amplifier 1 to B1-22E

Paging amplifier 2 to B1-22G

Connect paging amplifier control lead to B2-14E, if required.

4.37 403 Music-On-Hold Buffer Card

4.38 The 403 music-on-hold buffer card provides the interface necessary to connect a 500-ohm or 8,000-ohm music source to line cards in connector positions J1 through J6 when any of these cards are placed on HOLD. See Figure 11.

The music-on-hold card must be reverse mounted (component-side to the left) in connector position J12.

NOTE

In order to reverse mount the card, the 2 key guides in connector position J12 must be removed (break out carefully). This may be done with needle-nose pliers. Exercise CAUTION to avoid breaking the adjacent ribbing in the connector.

4.39 Connect the music source to the KSU block B2 as follows:

(a) Using SHIELDED CABLE, connect

MUS1 to B2-1G.

MUS2 to B2-2G.

(b) Strap the card for 500-ohm or 8000-ohm input impedance in accordance with the music source used. Refer to the condensed schematic on the music-on-hold buffer card for strapping options.

(c) Ensure the line cards for the 1st 6 lines (J1-J6) are strapped for music-on-hold as shown on Figure 4.

4.40 After the system is operational, adjust the music source and/or the variable resistor on the music-on-hold card for proper music level.

4.41 424 Dial-Selective Intercom Card

4.42 The 424 card is a 19 station dial-selective intercom. It is a double size card that is installed in in-line connectors J7 and J8. Its function is to provide 'talking' battery for a common talking path, receive and store dialled information, establish a signal path to the dialled station, and perform a variety of timing functions to recognize dial-pulses, end of dialling, release, etc.

4.43 Station numbers may be 1 or 2 digit numbers. The digits 0 and 2 through 19 may be used as station numbers. The digit 1 is used as a transfer digit (the 1st digit of a 2 digit number) and may NOT be used as a station number. Each station's number (dial code) is determined by the wiring of the BZ2 lead on the B3 block as described in paragraph 4.11.

4.44 The KSU is wired for use with telephones equipped with a tone oscillator (E-OSC-A) to provide tone signals (CO audible or ICM). If AC buzzers are used in the telephones, the following KSU wiring changes are required:

Refer to Figure 2A

(a) Remove strap - B2-24D to B2-22G.

(b) Add strap from B2-22G to 20V± terminal on the power supply.

(c) Carefully remove the YL-SL loop from B2-12C. Make sure that the loop does not break. Store adjacent to the block.

(d) Add strap from B2-19E to 20V Gnd terminal on the power supply.

(e) In addition to the above KSU wiring changes, be sure that the station has been changed as described in paragraph 4.11A.

4.45 The intercom may be arranged to provide one of three types of signalling to the station. Two of these (call-announcing and interrupted tone signalling) require the addition of a 456T Call-announcing card and are described under paragraph 4.48.

4.46 If the 456T Call-announcing card is not equipped, single-spurt signalling may be provided. This will provide ONE short signal to the called station at the end of dialling. The duration of this signal is set at about 1½ seconds, but may be changed by adjusting potentiometer R4 on the 424 card.

4.47 To provide single-spurt signalling make the following connections:

a) Remove strap B1-18G to B1-22G (f)

b) Strap J7-4 to J11-4

c) When E-OSC-A is used, strap B1-18G to B1-24C

d) When buzzers are used, strap B1-18G to 20V± on power supply. (g)

e) In addition to the above, be sure that the station cutdown has been made in accordance with paragraph 4.11A.

4.48 Ensure that the proper station signalling options are provided at each telephone set in accordance with the instructions provided in sections 2 or 3 of this manual.

4.49 456T Call-announcing Card

4.50 The 456T Call-announcing card is mounted in connector position J11 and is used in conjunction with the dial selective intercom to provide call announcing or interrupted tone signalling. The call-announcing card also provides intercom lamp control (flashing lamp for unanswered calls or steady lamp for answered calls), answer detection (to turn off the amplifier, change the lamp signal, and remove the tone signal), and an amplifier to drive the paging speakers at the stations (only one speaker may be selected and driven at a time).

4.51 Depending on the system arrangement, one of two wiring options must be made on the 456T card.

- If voice paging is desired, provide (SS) wiring.
- If interrupted tone signalling is used, provide (RN) wiring.
- Refer to the 456T call-announcing card condensed schematic in Figure 13 for implementation of these options.

4.51A When buzzers are used for signalling at the stations and the above wiring for interrupted signalling is implemented, the CO and ICM signals will be the same (15 IPM). The following wiring changes may be made to provide a fast (60 IPM) interrupted buzzer signal for ICM calls:

(Refer to Figure 2A)

(h) Remove strap from J10-11 to J11-11 to J12-11

(i) Add strap from J15-9 to J11-11

(j) Add strap from J15-6 to 20V± terminal of the power supply

4.52 Potentiometer R2, located at the front of the 456T card, may be adjusted to change the level of the call-announcing amplifier output. Another small potentiometer is provided on the card to adjust the answer-detection level. This potentiometer is preset at the factory and SHOULD NOT be adjusted in the field.

4.53 Expansion Unit (EU) Connections

4.54 When the system is expanded to more than 10 stations, an expansion unit (EU) is used as a termination point for stations 11 through 19. Make connections for stations 11 through 19 on EU blocks B3 and B4 as shown in Tables 4, 5, 6, and 7. Station cables should be assigned to rows on blocks B3 abd B4 as follows:

(a) Station cables 11, 12, and 13 on block B4, rows A, B and C.

(b) Station cables 14, 15, and 16 on block B4, rows E, F and G.

(c) Station cables 17, 18, and 19 on block B3, rows E, F and G.

5.00 MAINTENANCE

5.01 General

5.02 These instructions are provided for the information and guidance required by personnel responsible for the maintenance of the TIE-919 Key Service Unit.

5.03 Verify that installation wiring is correct by testing each line circuit, each intercom and paging circuit. A check should also be made that the dial-selective and manual intercom station assignments are in accordance with customer requirements. Following is a list of suggested operational checks to be made before turn-over of the system.

Each line card-

- Seizure (in and out)
- Proper lamp indications
- CO audible tones
- Answer
- Release
- Hold
- Music-on-hold (if provided)
- Release from hold (by answer and by CO release)
- Time-out (after ring-up)

Dial-selective intercom with call-announcing card

- Seizure
- Proper lamp indications
- Dialing
- Announcing (if provided)
- Answer detection (if provided)
- Release

Manual Intercom

- Seizure
- Lamp indication
- Release

Paging Adapter

- Seizure
- Lamp indication
- Paging volume
- Release

5.04 After installation, a system malfunction is normally found during a routine check or when trouble is reported. When a malfunction is reported, proceed as outlined in paragraph 5.08.

5.05 Routine Preventive Maintenance

5.06 Routine preventive maintenance is a systematic check of the system to locate equipment faults before service is interrupted. This is done by periodic inspection, the frequency being determined by local environmental conditions and equipment location on the subscribers premises. Although a minor defect may not interfere with equipment performance, early repairs can prevent a major breakdown and save valuable time and effort. Routine checks should be made as follows:

(a) Remove any accumulated dust or dirt using a small portable vacuum cleaner. If area is subject to heavy dust accumulation, be certain that the KSU and/or EU cover is in place at all times.

(b) Inspect power supply and fuse panel for blown fuses.

(c) Ensure that interrupter holding screws are not loose.

(d) Inspect the KSU to determine if all circuit cards are secure in their sockets.

(e) Periodically record all AC and DC voltages to assure there is no steady change. This will be be helpful in noting if there is a change in the local power company's input AC service.

5.07 Trouble Report

5.08 A malfunction in the system will be indicated as a result of a routine check or a trouble report. When a trouble report is received, obtain as much data as possible about the malfunction. For example: the number of lines involved, whether the complaint involves the intercom circuits, line circuits, or the entire system; whether one station or many, the type of malfunction, and the frequency of the problem. When all information about the malfunction is received, proceed with troubleshooting.

5.09 Troubleshooting

5.10 The use of plug-in type circuit cards facilitates fast replacement and reduces downtime to a minimum. To further reduce system downtime, an adequate supply of circuit cards should be available at all times. Usually an analysis of the trouble report or a brief operational check is enough to localize the malfunction to the telephone station, system power supply, line circuits, intercom circuits, feature cards, or the CO or PBX.

(a) System Power Supply

Power supply malfunctions can, in most cases, be attributed to a short in external circuitry, improper AC input voltage, or a defective component in the power unit.

Before replacing blown fuses, check for shorts in the affected external circuits. Improper 'A' and 'B' battery outputs can cause malfunctions to occur in external equipment. Full load 'A' battery voltage should not drop below 18 volts DC and full load 'B' battery should not drop below 20 volts DC. Ensure that the AC input source to the power supply is not over-loaded and that the AC INPUT tap on the power supply has been connected as described in paragraph 1.14. If the malfunction can be attributed to a defective power supply, replace the supply.

(b) Circuit Cards

Troubleshooting the plug-in circuit cards is best done by exchanging a suspected card with a known good card to isolate the fault to the card or external circuitry. Ensure wiring options on the replacement card are the same as the options on the suspect card. When a circuit card is found to be defective, remove the faulty card and replace with a new one from stock. When authorized, return defective circuit card to the supplier for replacement or repair.

(c) System Wiring

If a wiring malfunction is suspected (i.e. cable or lead break, termination disconnection, etc.), refer to the appropriate wiring diagrams and tables in this section and troubleshoot as necessary.

6.00 PARTS IDENTIFICATION

6.01 Individual parts for the basic TIE-919 KSU can be identified using the following procedure:

(a) Using Figure 5, locate the part item identification number.

(b) Refer to Table 9 and locate the item identification number and obtain the description.

6.02 Individual parts for the TIE-919 Expansion Unit (EU).

(a) Cabinet (basic, less parts)

(b) Terminal block B3 (8 x 50)

(c) Terminal block B4 (8 x 50)

(d) Cover

7.00 CONDENSED SCHEMATICS AND EQUIPMENT WIRING DIAGRAMS

7.01 Condensed Schematics

7.02 The condensed schematics in this section may be used by the installer as an aid in understanding the overall system operation and functions.

7.03 All functional leads relating to the operation of the TIE-919 Key Telephone System are shown and designated on the condensed schematics. Leads which are wired in the system but perform no function are shown but have no reference designation. These leads may be used to perform special functions in accordance with local application and are shown for reference only.

7.04 Equipment Wiring Diagrams

7.05 The wiring diagrams in this section provide the installer with point-to-point wiring terminations supplied by by the factory. Notes and installer-modified wiring may be added to these diagrams as application dictates.

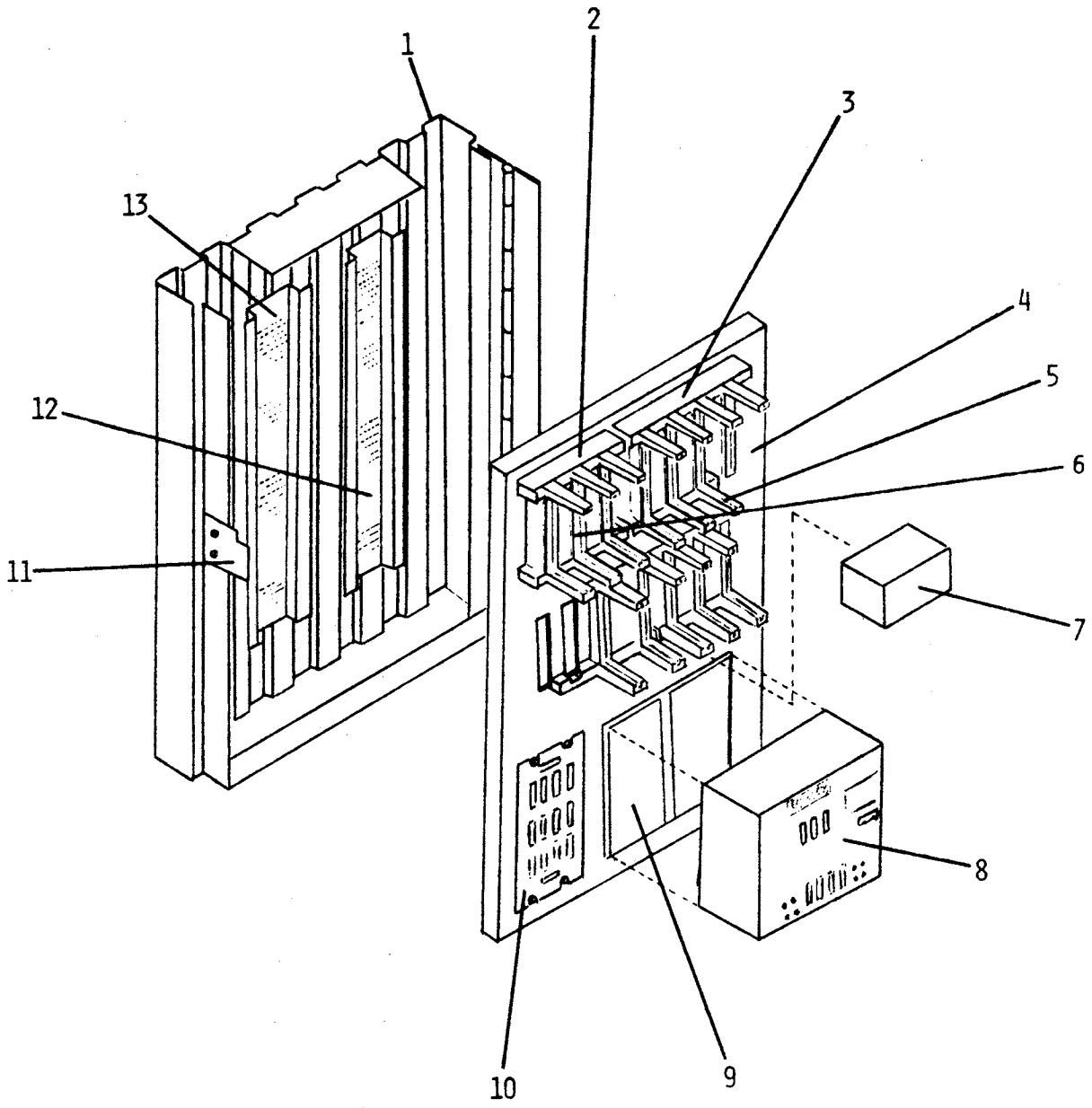


Figure 5 - TIE-919 Parts Identification Numbers

Table 9 - TIE-919 Parts List

ITEM NO	DESCRIPTION	TIE NO	ITEM NO	DESCRIPTION	TIE NO
1	Cabinet	91900	8	Power Supply	91917
2	Bracket (3-wide)	91919	9	Terminal Block (8x24)(qty 2)	91925
3	Bracket (4-wide)	91920	10	Fuse Panel	91926
4	Gate Assembly	91921	11	Latch	91927
5	Card Guide (qty 22)	91922	12	Terminal Block B3 (8x50)	91928
6	Card Connector (qty 12)	91923	13	Terminal Block B4 (8x50)	91932
7	Interrupter Timer	91924	14	Cover (not shown)	91929

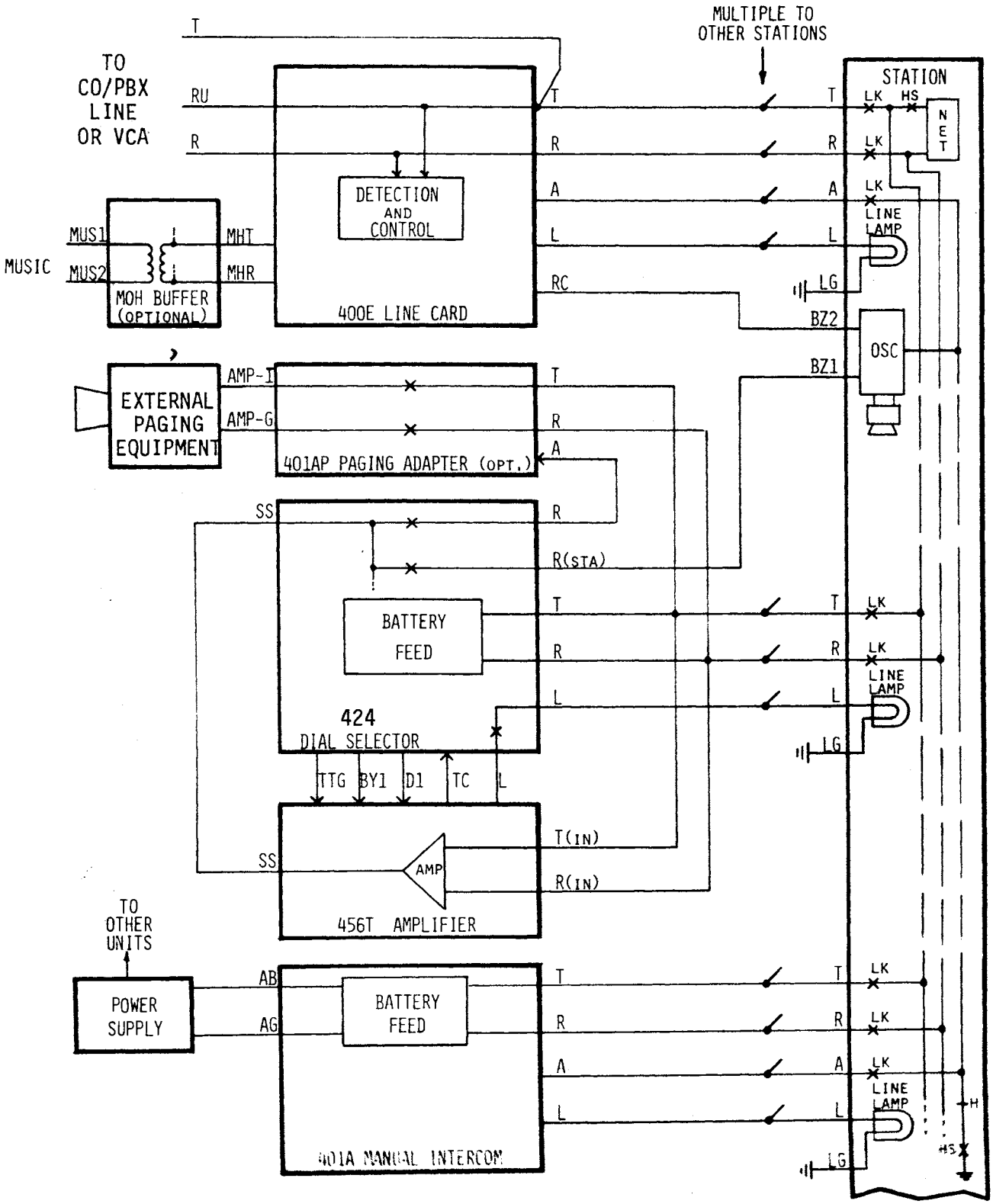


Figure 6 - Typical TIE-919 Key Telephone System - Condensed Schematic

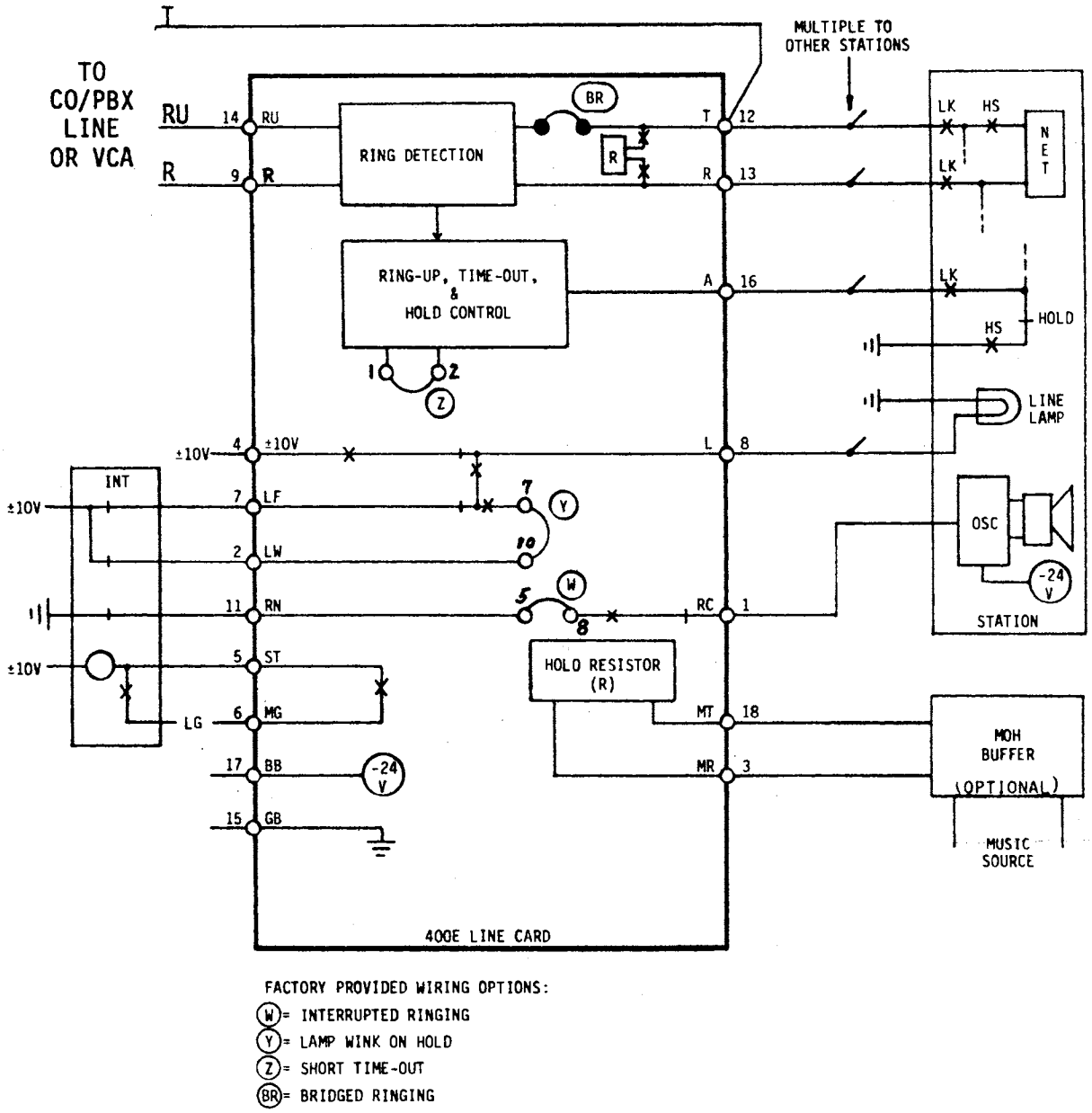


Figure 7 - 400E Line Card - Condensed Schematic
(Refer to paragraph 4.21)

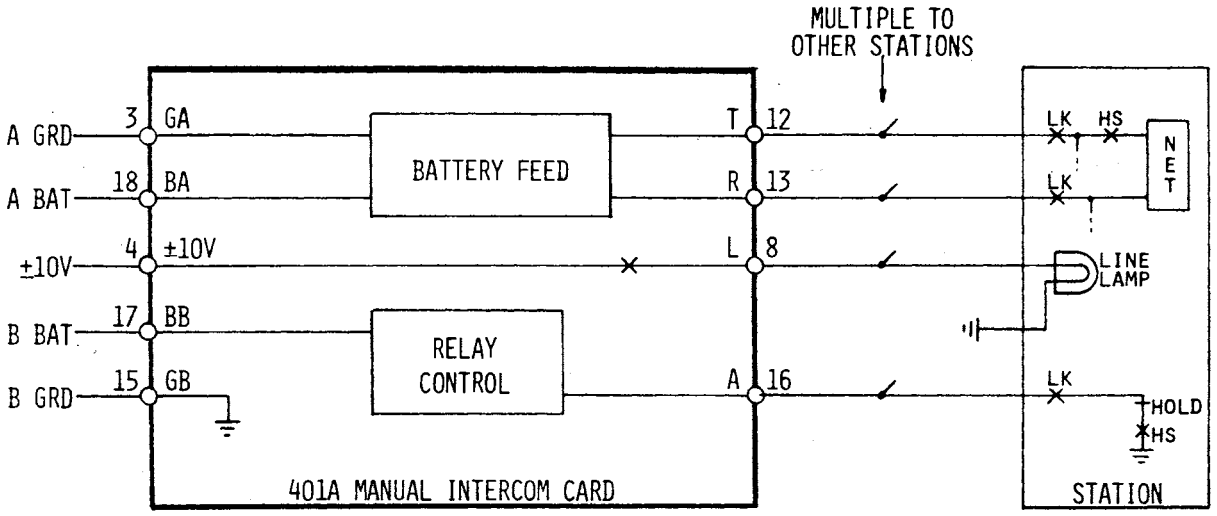
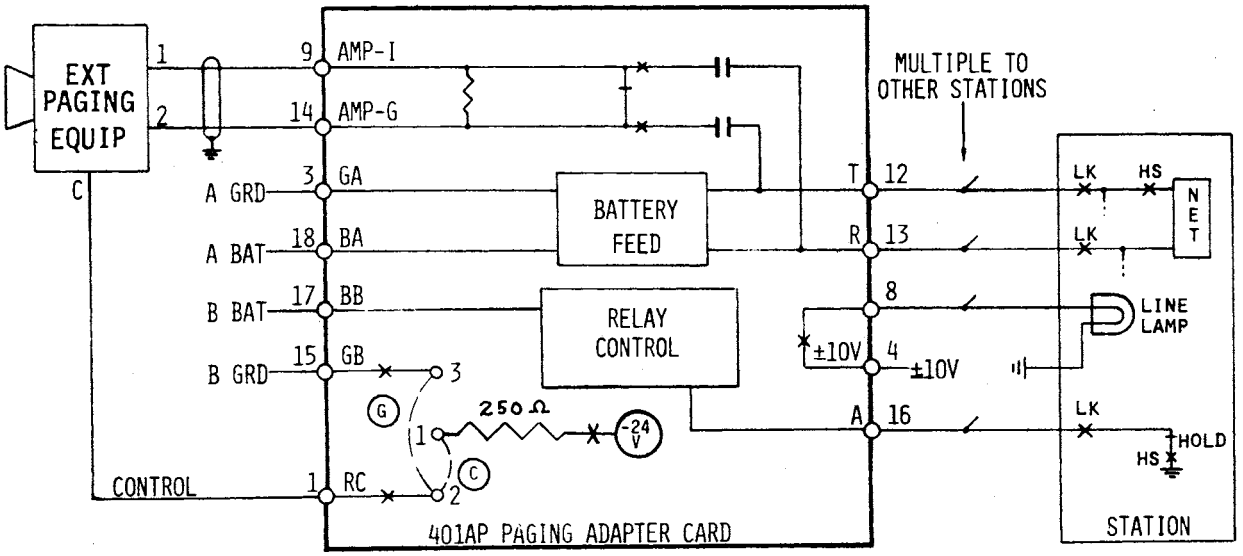
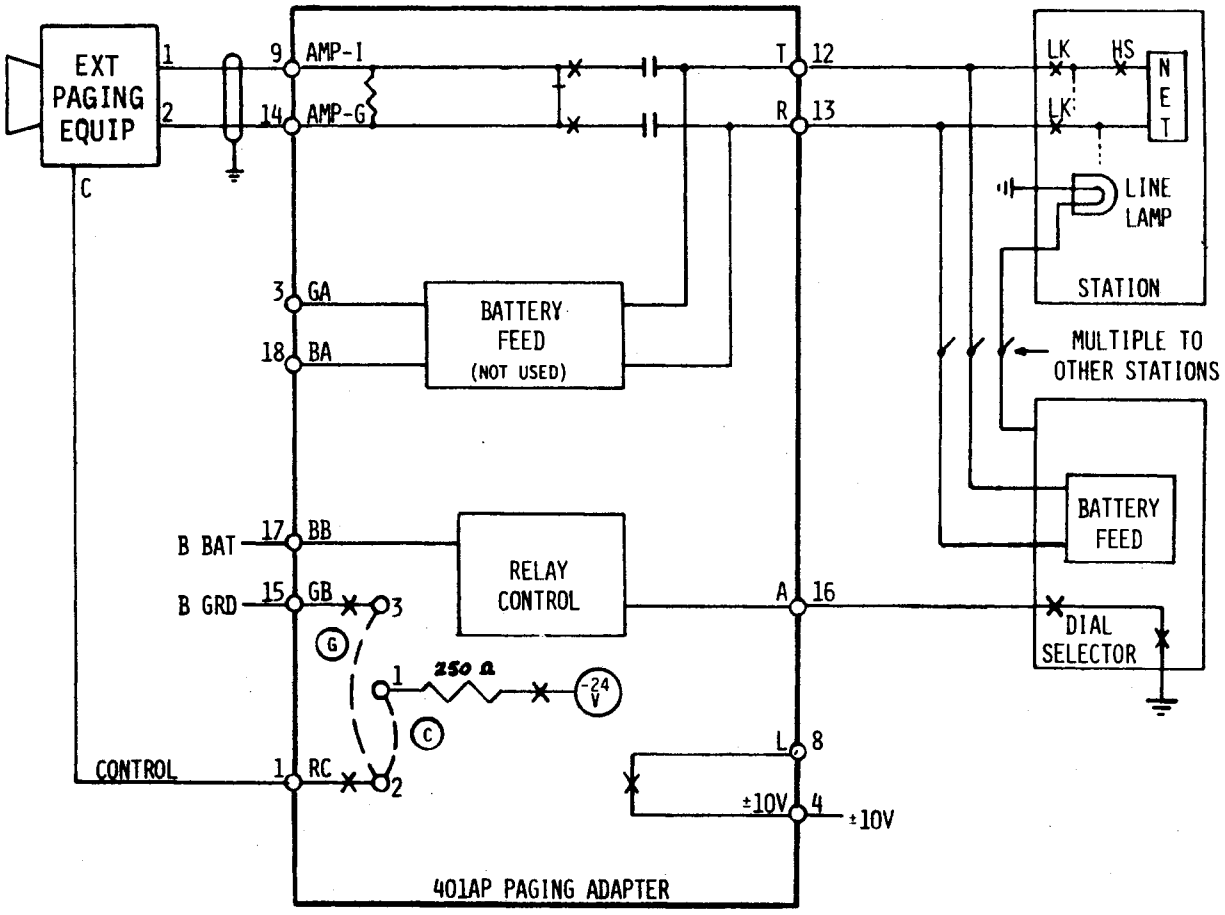


Figure 8 - 401A Manual Intercom Card - Condensed Schematic
(Refer to paragraph 4.26)



PAGING EQUIPMENT CONTROL:
FOR GROUND START, PROVIDE (G) WIRING.
FOR BATTERY START, PROVIDE (C) WIRING.

Figure 9 - 401AP Paging Adapter Card, Line Key Access - Condensed Schematic
(Refer to paragraphs 4.31 and 4.32)



NOTES: 1. FOR PAGING EQUIPMENT CONTROL:
a. STRAP (G) WIRING FOR GROUND START.
b. STRAP (C) WIRING FOR BATTERY START.
2. THIS CARD SHOULD BE USED IN CONNECTOR J12 FOR DIAL-ACCESS PAGING.

Figure 10 - 401AP Paging Adapter Card, Dial Access - Condensed Schematic
(Refer to paragraph 4.34)

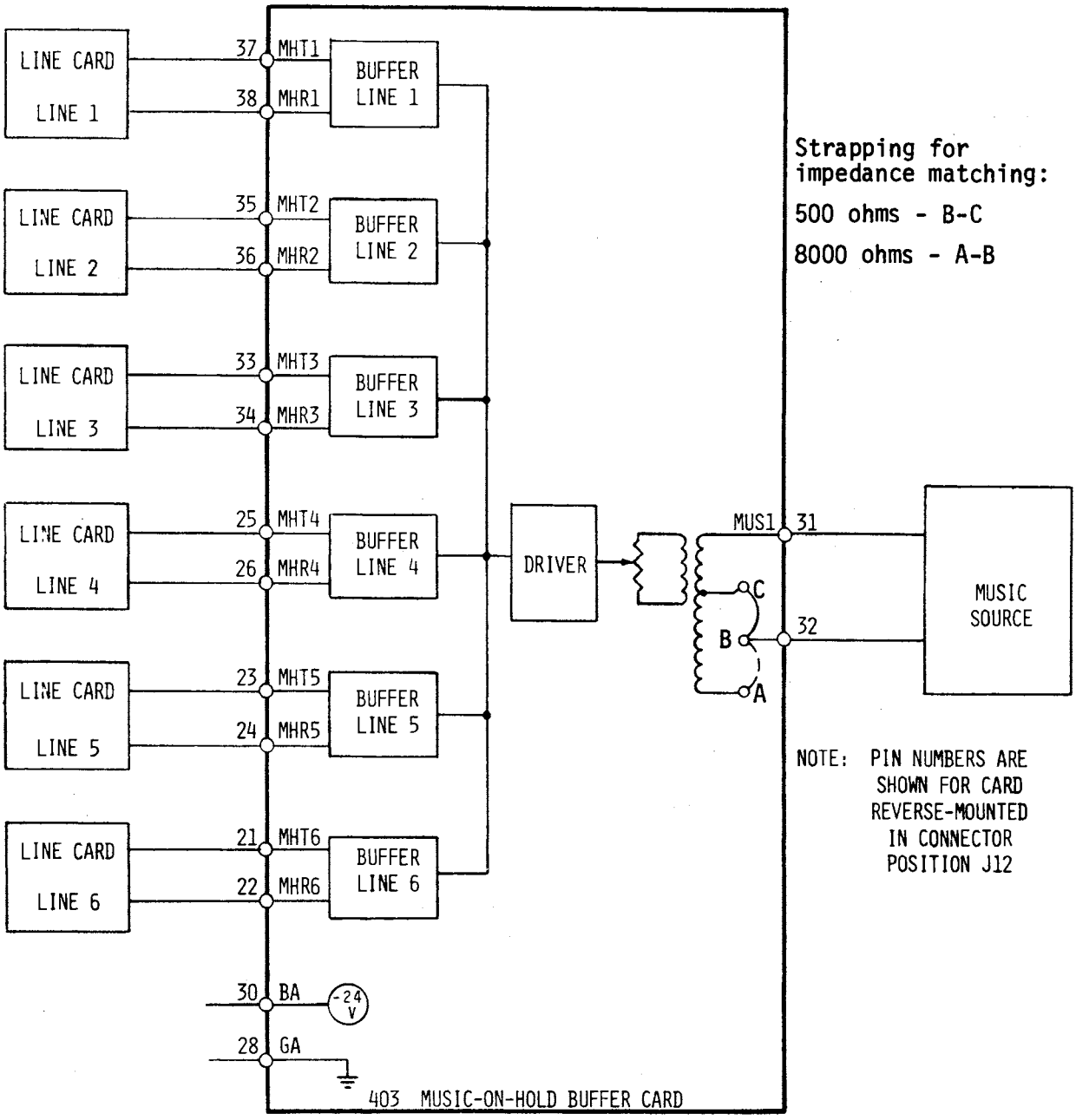


Figure 11 - 403 Music-On-Hold Buffer Card - Condensed Schematic
(Refer to paragraph 4.37)

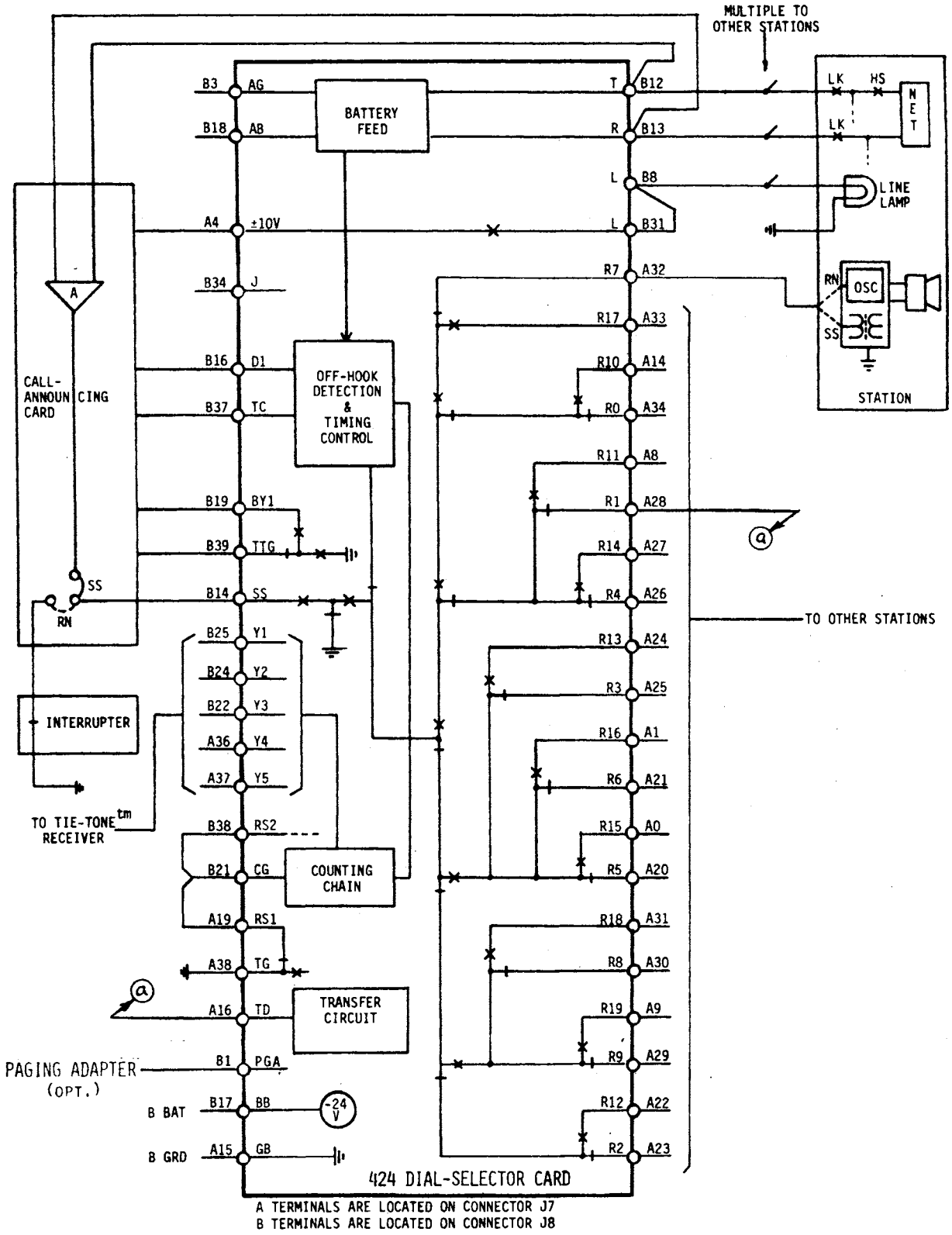
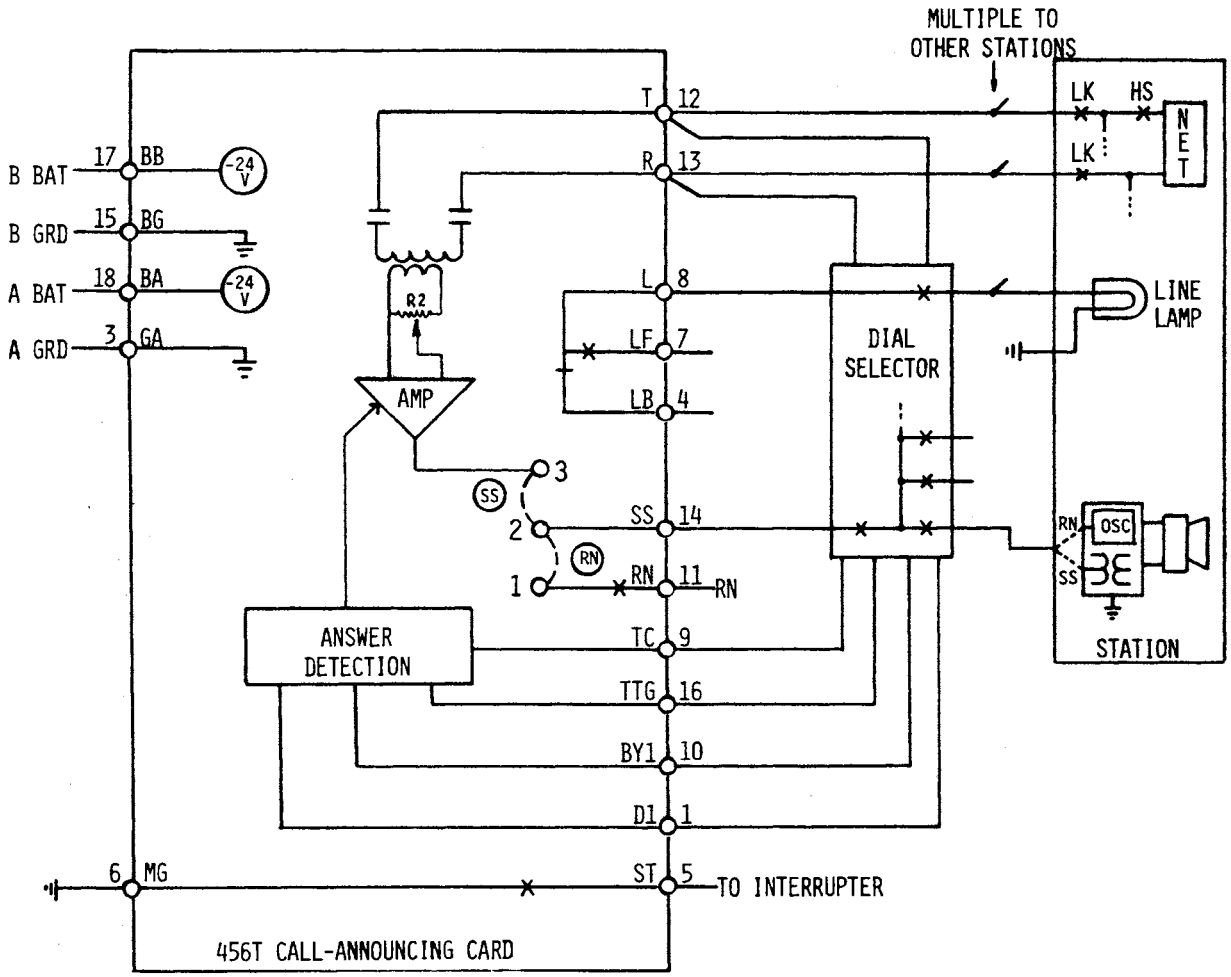
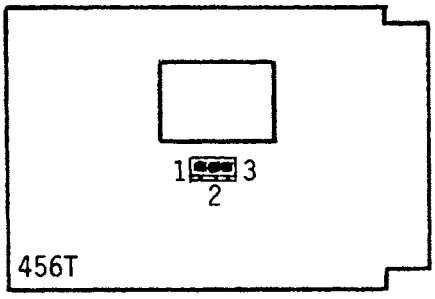


Figure 12 - 424 Dial-Selective Intercom Card - Condensed Schematic
(Refer to paragraph 4.41)



NOTES:
1. STRAP (SS) WIRING FOR CALL-ANNOUNCING TO STATION.
2. STRAP (RN) WIRING FOR INTERRUPTED RINGING TO STATION.
3. THIS CARD IS NORMALLY USED IN CONNECTOR POSITION J11.



1-2 (RN)
2-3 (SS)

Figure 13 - 456T Call-Announcing Card
Condensed Schematic and Option Terminal Layout
(Refer to paragraph 4.49)

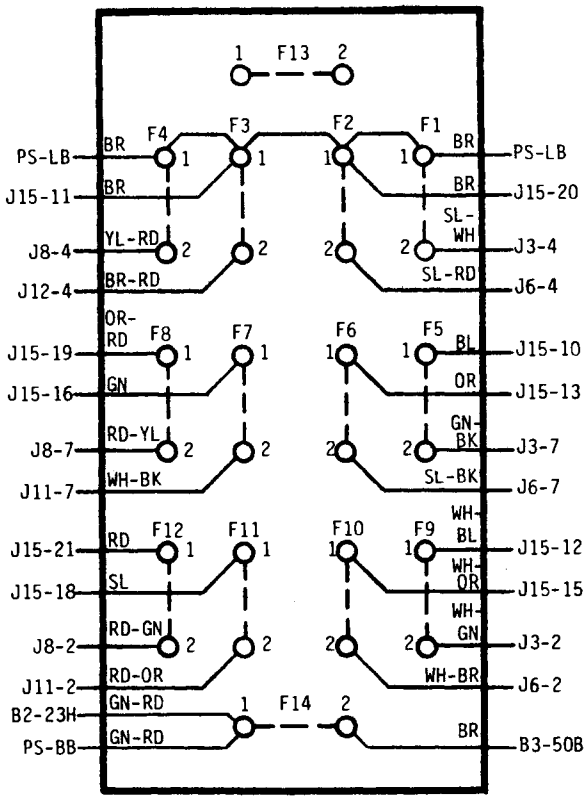


Figure 14 - Fuse Panel Wiring

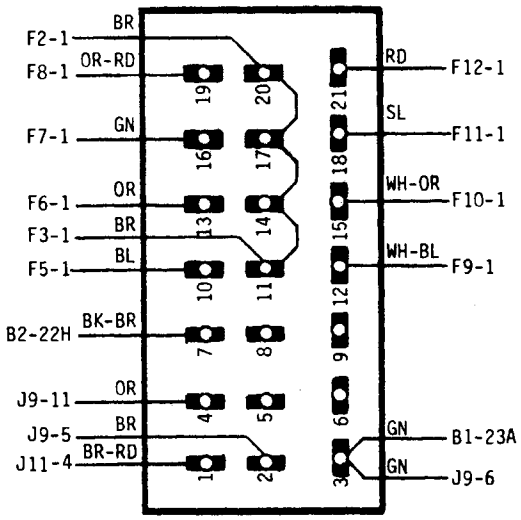


Figure 15 - Interrupter Socket Wiring

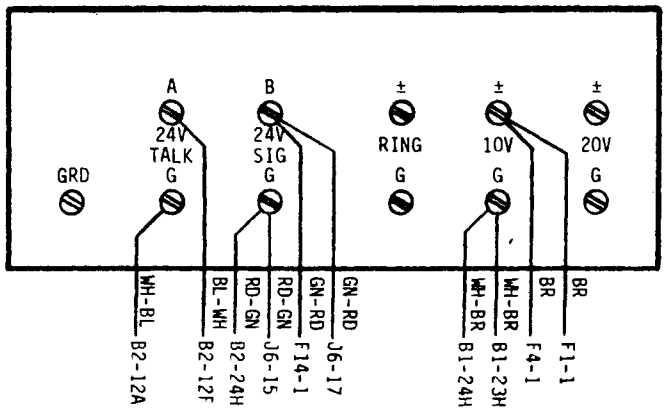


Figure 16 - Power Supply Panel Wiring

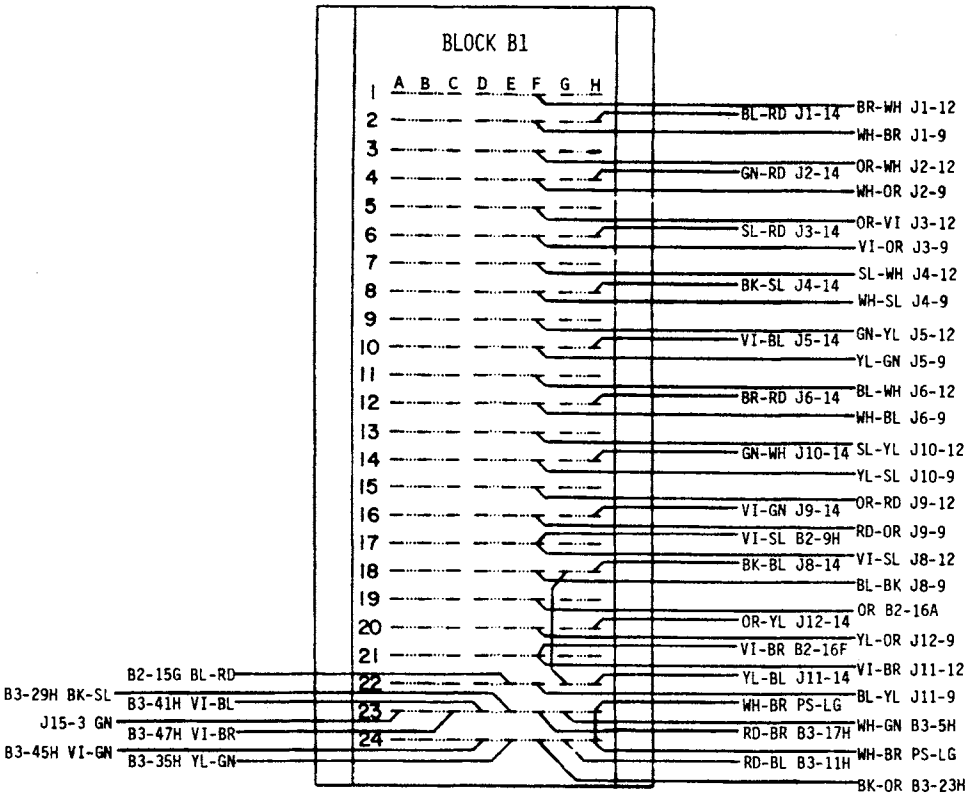


Figure 17 - Quick-Connect Block B1 - Wiring

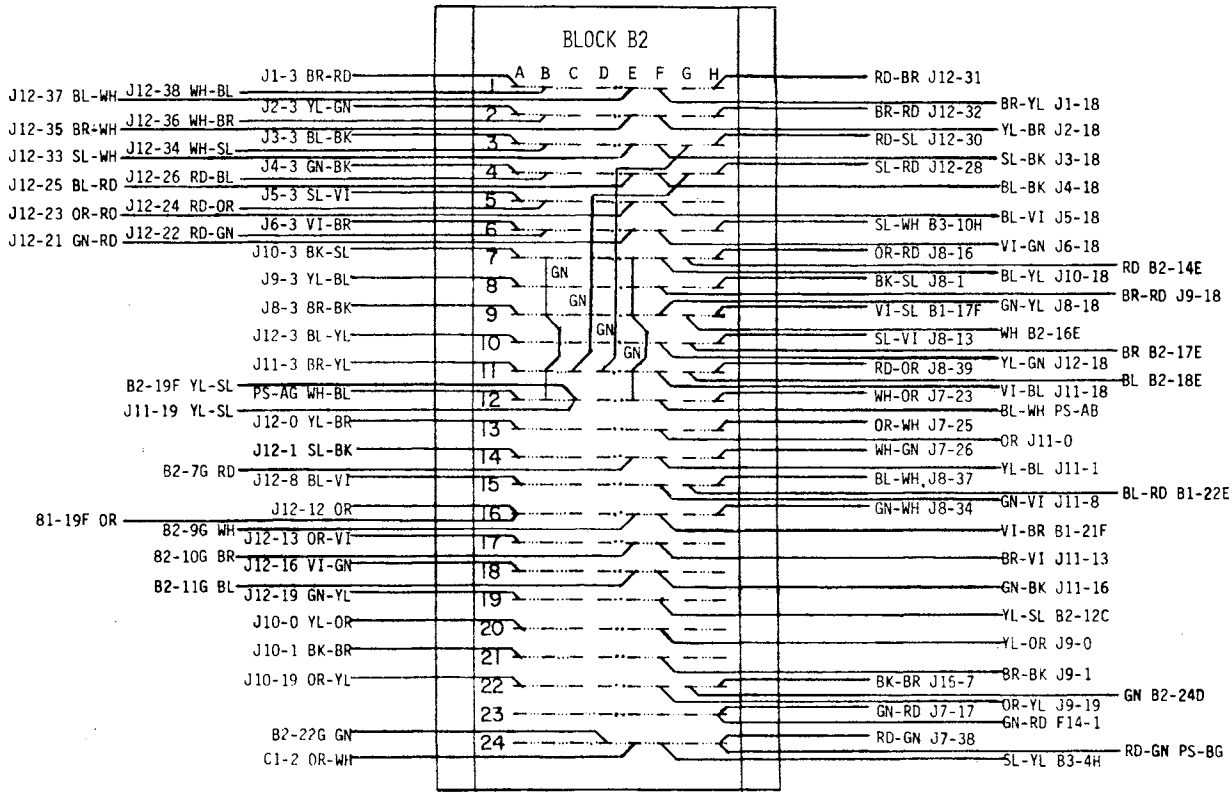


Figure 18 - Quick-Connect Block B2 - Wiring

INTERNAL KSU WIRING		CONNECTING BLOCK B3									E-100-B* STATION CABLE		E-100-C STATION CABLE	
LEAD DESIG	LEAD COLOR	A	B	C	D	E	F	G	H	CLIP	LEAD DESIG	CABLE COLOR	LEAD DESIG	CABLE COLOR
R0	WH-BL	INTERNAL WIRING TO KSU AND CONNECTOR C2	LEAD FROM STATION CABLE FOR ICM SIGNALLING			TERMINATE STATION CABLE	TERMINATE STATION CABLE	TERMINATE STATION CABLE	INTERNAL WIRING TO KSU AND CONNECTOR C1	1	1T	WH-BL	1T	WH-BL
R1	BL-WH									2	1R	BL-WH	1R	BL-WH
R2	WH-OR									3	1A	WH-OR	1A	WH-OR
R3	OR-WH									4	SG	OR-WH	SG	OR-WH
R4	WH-GN									5	1LG	WH-GN	1LG	WH-GN
R5	GN-WH									6	1L	GN-WH	1L	GN-WH
R6	WH-BR									7	2T	WH-BR	2T	WH-BR
R7	BR-WH									8	2R	BR-WH	2R	BR-WH
R8	WH-SL									9	2A	WH-SL	2A	WH-SL
R9	SL-WH									10	9A	SL-WH	8A	GN-RD
R10	RD-BL									11	2LG	RD-BL	2LG	RD-BL
R11	BL-RD									12	2L	BL-RD	2L	BL-RD
R12	RD-OR									13	3T	RD-OR	3T	RD-OR
R13	OR-RD									14	3R	OR-RD	3R	OR-RD
R14	RD-GN									15	3A	RD-GN	3A	RD-GN
R15	GN-RD									16	8A	GN-RD	7A	BL-BK
R16	RD-BR									17	3LG	RD-BR	3LG	RD-BR
R17	BR-RD									18	3L	BR-RD	3L	BR-RD
R18	RD-SL									19	4T	RD-SL	4T	RD-SL
R19	SL-RD									20	4R	SL-RD	4R	SL-RD
RC1	BK-BL		LEAD FROM STATION FOR CO AUDIBLE		STRAPPED TOGETHER AT FACTORY					21	4A	BK-BL	4A	BK-BL
RC2	BL-BK									22	7A	BL-BK	--	--
RC3	BK-OR									23	4LG	BK-OR	4LG	BK-OR
RC4	OR-BK									24	4L	OR-BK	4L	OR-BK
RC5	BK-GN									25	5T	BK-GN	5T	BK-GN
RC6	GN-BK									26	5R	GN-BK	5R	GN-BK
RC7	BK-BR									27	5A	BK-BR	5A	BK-BR
RC8	BR-BK									28	6A	BR-BK	6A	BR-BK
RC9	BK-SL									29	5LG	BK-SL	5LG	BK-SL
RC10	SL-BK									30	5L	SL-BK	5L	SL-BK
RC11	YL-BL									31	6T	YL-BL	6T	YL-BL
										32	6R	BL-YL	6R	BL-YL
										33	--	--	--	--
										34	RB	OR-YL	RB	OR-YL
										35	6LG	YL-GN	6LG	YL-GN
										36	6L	GN-YL	6L	GN-YL
										37	7T	YL-BR	--	--
										38	7R	BR-YL	--	--
										39	BZ1	YL-SL	BZ1	YL-SL
										40	--	--	--	--
10L	BL-VI									41	7LG	VI-BL	--	--
10T	VI-OR									42	7L	BL-VI	--	--
10R	OR-VI									43	8T	VI-OR	7T	YL-BR
10A	VI-GN									44	8R	OR-VI	7R	BR-YL
11L	GN-VI									45	9LG	VI-GN	8LG	VI-BR
11T	VI-BR									46	9L	GN-VI	8L	BR-VI
11R	BR-VI									47	8LG	VI-BR	7LG	VI-BL
11A	VI-SL									48	8L	BR-VI	7L	BL-VI
BB	SL-VI									49	9T	VI-SL	8T	VI-OR
										50	9R	SL-VI	8R	OR-VI

INTERCOM DIAL CODES

CO AUDIBLE LEADS

SPARE FOR BLF OR ACCESS TO EXPANSION UNIT

LINE 10 (J12)

LINE 11 (J11)

BATTERY

CABLES ON RIGHT

* or converted E-100-C

Table 10 - Quick-Connect Block B3 - Lead Layout

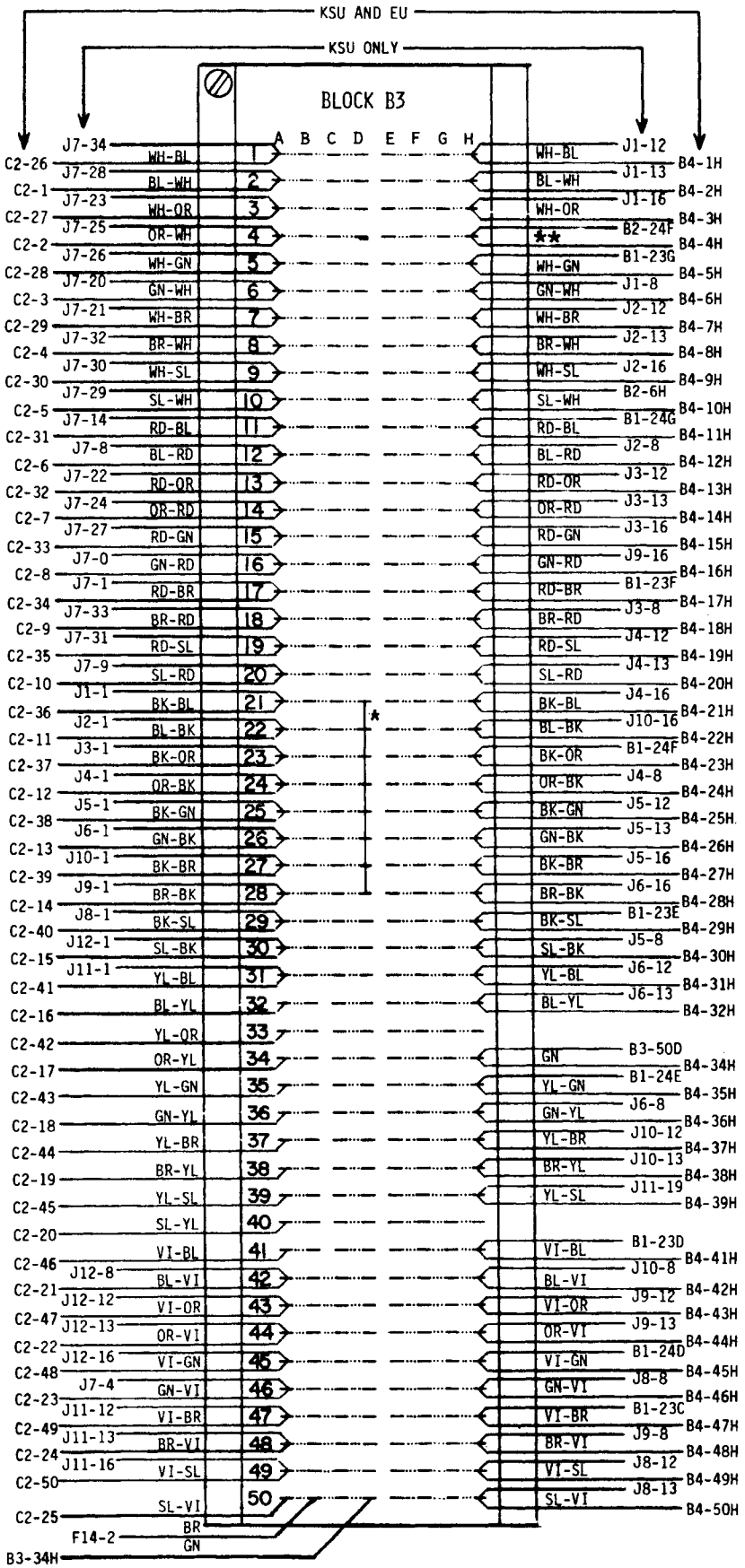


Figure 19 - Quick-Connect Block B3 - Wiring

E-100-C STATION CABLE		E-100-B* STATION CABLE		CONNECTING BLOCK B4								
LEAD DESIG	CABLE COLOR	LEAD DESIG	CABLE COLOR	CLIP	A	B	C	D	E	F	G	H
1T 1R	WH-BL BL-WH	1T 1R	WH-BL BL-WH	1 2	TERMINATE STATION CABLE	TERMINATE STATION CABLE	TERMINATE STATION CABLE	TERMINATE STATION CABLE	TERMINATE STATION CABLE	TERMINATE STATION CABLE	TERMINATE STATION CABLE	INTERNAL WIRING TO KSU AND CONNECTOR C1
1A SG	WH-OR OR-WH	1A SG	WH-OR OR-WH	3 4								
1LG 1L	WH-GN GN-WH	1LG 1L	WH-GN GN-WH	5 6								
2T 2R	WH-BR BR-WH	2T 2R	WH-BR BR-WH	7 8								
2A 8A	WH-SL GN-RD	2A 9A	WH-SL SL-WH	9 10								
2LG 2L	RD-BL BL-RD	2LG 2L	RD-BL BL-RD	11 12								
3T 3R	RD-OR OR-RD	3T 3R	RD-OR OR-RD	13 14								
3A 7A	RD-GN BL-BK	3A 8A	RD-GN GN-RD	15 16								
3LG 3L	RD-BR BR-RD	3LG 3L	RD-BR BR-RD	17 18								
4T 4R	RD-SL SL-RD	4T 4R	RD-SL SL-RD	19 20								
4A --	BK-BL --	4A 7A	BK-BL BL-BK	21 22								
4LG 4L	BK-OR OR-BK	4LG 4L	BK-OR OR-BK	23 24								
5T 5R	BK-GN GN-BK	5T 5R	BK-GN GN-BK	25 26								
5A 6A	BK-BR BR-BK	5A 6A	BK-BR BR-BK	27 28								
5LG 5L	BK-SL SL-BK	5LG 5L	BK-SL SL-BK	29 30								
6T 6R	YL-BL BL-YL	6T 6R	YL-BL BL-YL	31 32								
-- RB	-- OR-YL	-- RB	-- OR-YL	33 34								
6LG 6L	YL-GN GN-YL	6LG 6L	YL-GN GN-YL	35 36								
-- --	-- --	7T 7R	YL-BR BR-YL	37 38								
BZ1 --	YL-SL --	BZ1 --	YL-SL --	39 40								
-- --	-- --	7LG 7L	VI-BL BL-VI	41 42								
7T 7R	YL-BR BR-YL	8T 8R	VI-OR OR-VI	43 44								
8LG 8L	VI-BR BR-VI	9LG 9L	VI-GN GN-VI	45 46								
7LG 7L	VI-BL BL-VI	8LG 8L	VI-BR BR-VI	47 48								
8T 8R	VI-OR OR-VI	9T 9R	VI-SL SL-VI	49 50								
					CABLES ON LEFT				CABLES ON RIGHT			

* or converted E-100-C

Table 11 - Quick-Connect Block B4 - Lead Layout

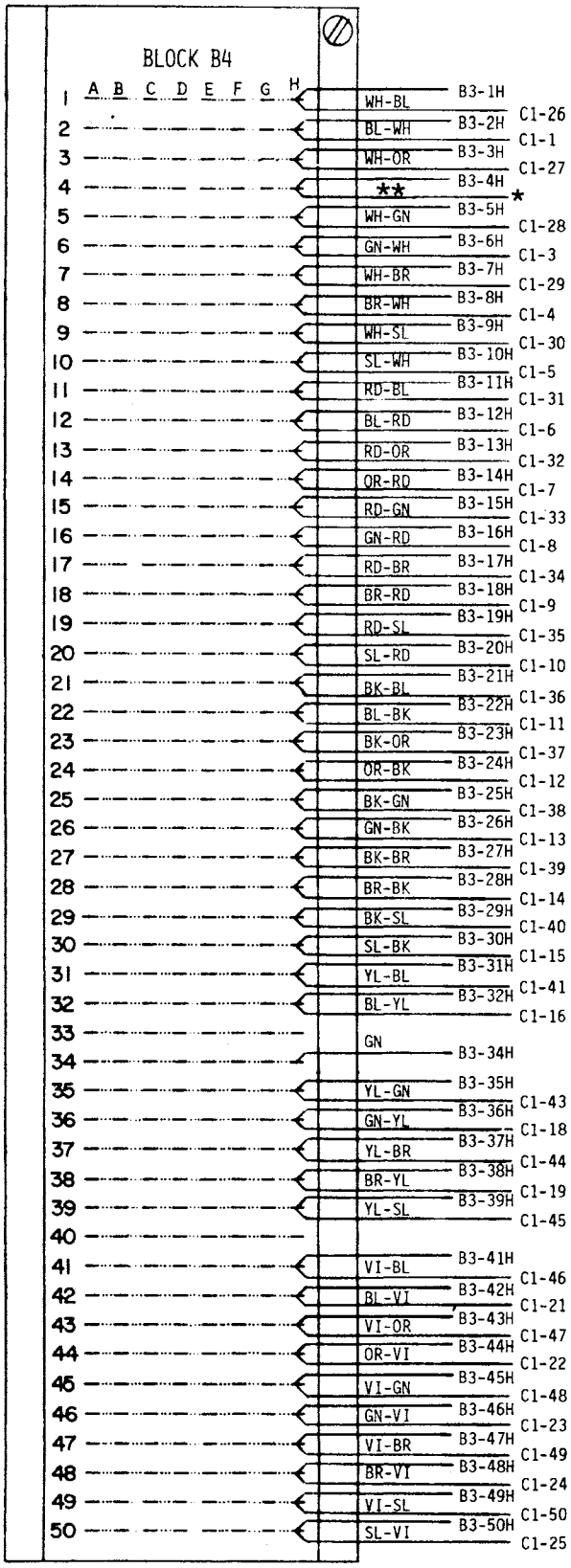
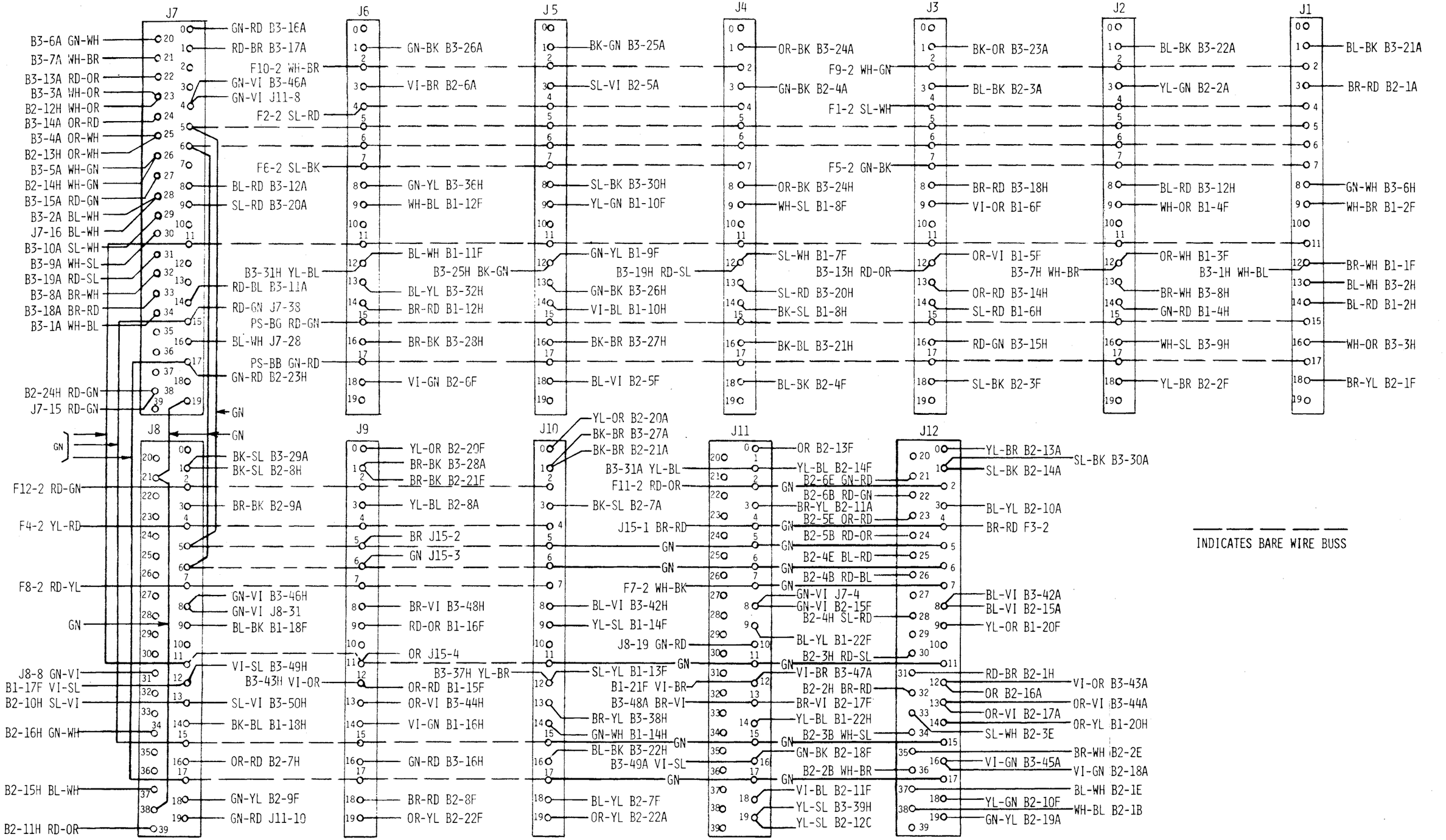


Figure 20 - Quick-Connect Block B4 - Wiring

Table 12 - Connectors C1 and C2 - Wiring

PLUG PIN	LEAD COLOR	CONNECTOR	
		C1	C2
26 1	WH-BL BL-WH	B4-1H B4-2H	B3-1A B3-2A
27 2	WH-OR OR-WH	B4-3H B2-24E	B3-3A B3-4A
28 3	WH-GN GN-WH	B4-5H B4-6H	B3-5A B3-6A
29 4	WH-BR BR-WH	B4-7H B4-8H	B3-7A B3-8A
30 5	WH-SL SL-WH	B4-9H B4-10H	B3-9A B3-10A
31 6	RD-BL BL-RD	B4-11H B4-12H	B3-11A B3-12A
32 7	RD-OR OR-RD	B4-13H B4-14H	B3-13A B3-14A
33 8	RD-GN GN-RD	B4-15H B4-16H	B3-15A B3-16A
34 9	RD-BR BR-RD	B4-17H B4-18H	B3-17A B3-18A
35 10	RD-SL SL-RD	B4-19H B4-20H	B3-19A B3-20A
36 11	BK-BL BL-BK	B4-21H B4-22H	B3-21A B3-22A
37 12	BK-OR OR-BK	B4-23H B4-24H	B3-23A B3-24A
38 13	BK-GN GN-BK	B4-25H B4-26H	B3-25A B3-26A
39 14	BK-BR BR-BK	B4-27H B4-28H	B3-27A B3-28A
40 15	BK-SL SL-BK	B4-29H B4-30H	B3-29A B3-30A
41 16	YL-BL BL-YL	B4-31H B4-32H	B3-31A B3-32A
42 17	YL-OR OR-YL	- -	B3-33A B3-34A
43 18	YL-GN GN-YL	B4-35H B4-36H	B3-35A B3-36A
44 19	YL-BR BR-YL	B4-37H B4-38H	B3-37A B3-38A
45 20	YL-SL SL-YL	B4-39H -	B3-39A B3-40A
46 21	VI-BL BL-VI	B4-41H B4-42H	B3-41A B3-42A
47 22	VI-OR OR-VI	B4-43H B4-44H	B3-43A B3-44A
48 23	VI-GN GN-VI	B4-45H B4-46H	B3-45A B3-46A
49 24	VI-BR BR-VI	B4-47H B4-48H	B3-47A B3-48A
50 25	VI-SL SL-VI	B4-49H B4-50H	B3-49A B3-50A



INDICATES BARE WIRE BUSS

Figure 21 - Card Connector Wiring

E-100-B KEY TELEPHONE SET

1.00 INTRODUCTION

1.01 This section contains information for installing and strapping the TIE E-100-B Key Telephone Set for use with the TIE-919 Key Telephone System.

2.00 E-100-B DESCRIPTION

2.01 The E-100-B Key Telephone Set is designed for application in small key telephone systems served by a PBX or CO lines. The E-100-B is a 10 button key telephone having a 25-pair cable terminating on an amphenol type plug.

2.02 The E-100-B key telephone is available in 3 different models equipped with a rotary, TIE-Tone^{tm}, or Outpulse^{tm} dial. These 3 models can be specified using the following codes:

E-100-B__

R = Rotary dial
T = TIE-Tone^{tm} dial
O = Outpulse^{tm} dial

2.03 The E-100-B key telephone provides the following features when used in conjunction with the TIE-919 or other standard 1A2 type key service units.

(a) Pickup and hold of up to 9 CO/PBX lines.

(b) Line status indicated by small, 10-volt, lamps located under the pickup keys.

(c) Automatic pickup key restoration when the handset is returned to the cradle.

(d) Equipped to permit call announcing when used with a KSU arranged to provide this feature.

(e) Two-pitch electronic buzzer. One tone for CO audible and the other for ICM calls if call-announcing is not provided.

(f) Volume control to permit adjustment of speaker signal level.

(g) Optional wiring for signal cut-off when off-hook.

(h) Industry standard handset and dial.

(i) Interchangable face mats are available for color coordination with surrounding decor.

(j) 500 type network.

(k) Wired for busy lamp control.

(l) Multi-line conferencing by depressing more than 1 pickup key.

(M) 3 types of dials available; rotary, TIE-Tone, or Outpulse.

(n) May be converted to wall mounted set (optional kit required).

(p) Optional station restriction on CO lines (all lines restricted).

(q) Optional automatic exclusion circuit (CO lines only) may be added. (kit required)

2.04 The E-100-B telephone set is equipped with 10 keys. The key functions are shown in Figure 2.1.

LK1 CO	LK2 CO	LK3 CO	LK4 CO	LK5 CO
HOLD & PR RL	LK9 ICM/CO	LK8 ICM/CO	LK7 CO	LK6 CO

Figure 2.1 - Key Functions

3.00 INSTALLATION

3.01 Running Cable Resistance

3.02 Each telephone must be within 25-ohms conductor resistance (50-ohm loop resistance) of the key service unit. Refer to Table 3.3 on page 10 for details of permissible cable length.

3.02 Refer to Table 3.1 for cable conductor assignments for the E-100-B key telephone set.

3.03 Audible Signals

3.04 The E-100-B may be arranged to provide 3 types of audible signals:

(a) Voice paging for call announcing and short ICM messages.

(b) A high-tone signal usually used for CO audible.

(c) A low-tone for ICM calls when voice paging is not used.

3.05 The telephone set may be arranged to cut-off certain types of signals if the handset is off-hook. The telephone as received from the factory is wired to receive voice paging only and does not have signal cut-off. Refer to Table 3.2 for the wiring of the various signalling options.

3.06 In addition to strapping the telephone to receive the desired audible signals, it may be necessary to alter the strapping of the Key Service Unit. Refer to Section 1 for KSU wiring to provide the the desired signalling.

3.07 Exclusion

3.08 An optional exclusion circuit may be added to the telephone to provide privacy on all CO lines.

3.09 The "A" lead for the line key used for the dial selective intercom must NOT be connected at the KSU to permit handset answering of ICM calls.

Table 3.1

STATION CABLE CONDUCTOR ASSIGNMENTS			
CIRCUIT	LEAD DESIG	PLUG PIN	CABLE COLOR
LK 1	1T	26	WH-BL
	1R	1	BL-WH
COMMON	1A	27	WH-OR
	SG(A1)	2	OR-WH
LK 1	1LG	28	WH-GN
	1L	3	GN-WH
LK 2	2T	29	WH-BR
	2R	4	BR-WH
LK 9	2A	30	WH-SL
	9A	5	SL-WH
LK 2	2LG	31	RD-BL
	2L	6	BL-RD
LK 3	3T	32	RD-OR
	3R	7	OR-RD
LK 8	3A	33	RD-GN
	8A	8	GN-RD
LK 3	3LG	34	RD-BR
	3L	9	BR-RD
LK 4	4T	35	RD-SL
	4R	10	SL-RD
LK 7	4A	36	BK-BL
	7A	11	BL-BK
LK 4	4LG	37	BK-OR
	4L	12	OR-BK
LK 5	5T	38	BK-GN
	5R	13	GN-BK
LK 6	5A	39	BK-BR
	6A	14	BR-BK
LK 5	5LG	40	BK-SL
	5L	15	SL-BK
LK 6	6T	41	YL-BL
	6R	16	BL-YL
COMMON	BL	42	YL-OR
	RB	17	OR-YL
LK 6	6LG	43	YL-GN
	6L	18	GN-YL
LK 7	7T	44	YL-BR
	7R	19	BR-YL
COMMOM	BZ1	45	YL-SL
	BZ2	20	SL-YL
LK 7	7LG	46	VI-BL
	7L	21	BL-VI
LK 8	8T	47	VI-OR
	8R	22	OR-VI
LK 9	9LG	48	VI-GN
	9L	23	GN-VI
LK 8	8LG	49	VI-BR
	8L	24	BR-VI
LK 9	9T	50	VI-SL
	9R	25	SL-VI

Table 3.2 - Signalling Options and Cut-off Control

SIGNALLING MODE	OPTIONS	TELEPHONE SET STRAPPING						KSU WIRING	
		RD	BL-WH	BL	GN	PK	WH	BZ1	BZ2
Stations With Voice Paging Only	Without Cut-off	OH1	BC1	BC2	PG1	PG2	OH2	Wire To Paging Common	Wire To Terminal Of Assigned Dial Code
	With Cut-off	OH2	BC1	BC2	PG1	PG2	OH1		
Stations With Voice Paging and CO Audible	Without Cut-Off	OH1	PG1	BC2	PG3	PG2	OH2	Wire to Terminals Of Lines On Which CO Audible Signals Are To Be Received	
	CO Cut-off	PG1	OH1	BC2	PG3	PG2	OH2		
	ICM Cut-off	PG3	PG1	BC2	OH1	PG2	OH2		
	All Signals Cut-off	OH2	PG1	BC2	PG3	PG2	OH1		
Stations With CO Audible & ICM Audible Tones	Without Cut-off	OH1	PG1	PG2	BC1	BC2	OH2		Wire To Terminal Of Assigned Dial Code & Strap 456TA Card For Tone Signalling Or Ground SS Lead To ICM Card
	CO Cut-off	PG1	OH1	PG2	BC1	BC2	OH2		
	ICM Cut-off	PG2	PG1	OH1	BC1	BC2	OH2		
	All Signals Cut-off	OH2	PG1	PG2	BC1	BC2	OH1		

Shaded area indicates factory wiring.

3.10 When exclusion is provided, the HOLD key is used as a PRivacy ReLease key, (PR RL), by partially depressing the key. A lamp beneath the key will indicate when the key has been depressed sufficiently to release the exclusion circuit.

CAUTION

If the key is depressed too far the line will be placed on HOLD and the party could be excluded from the call.

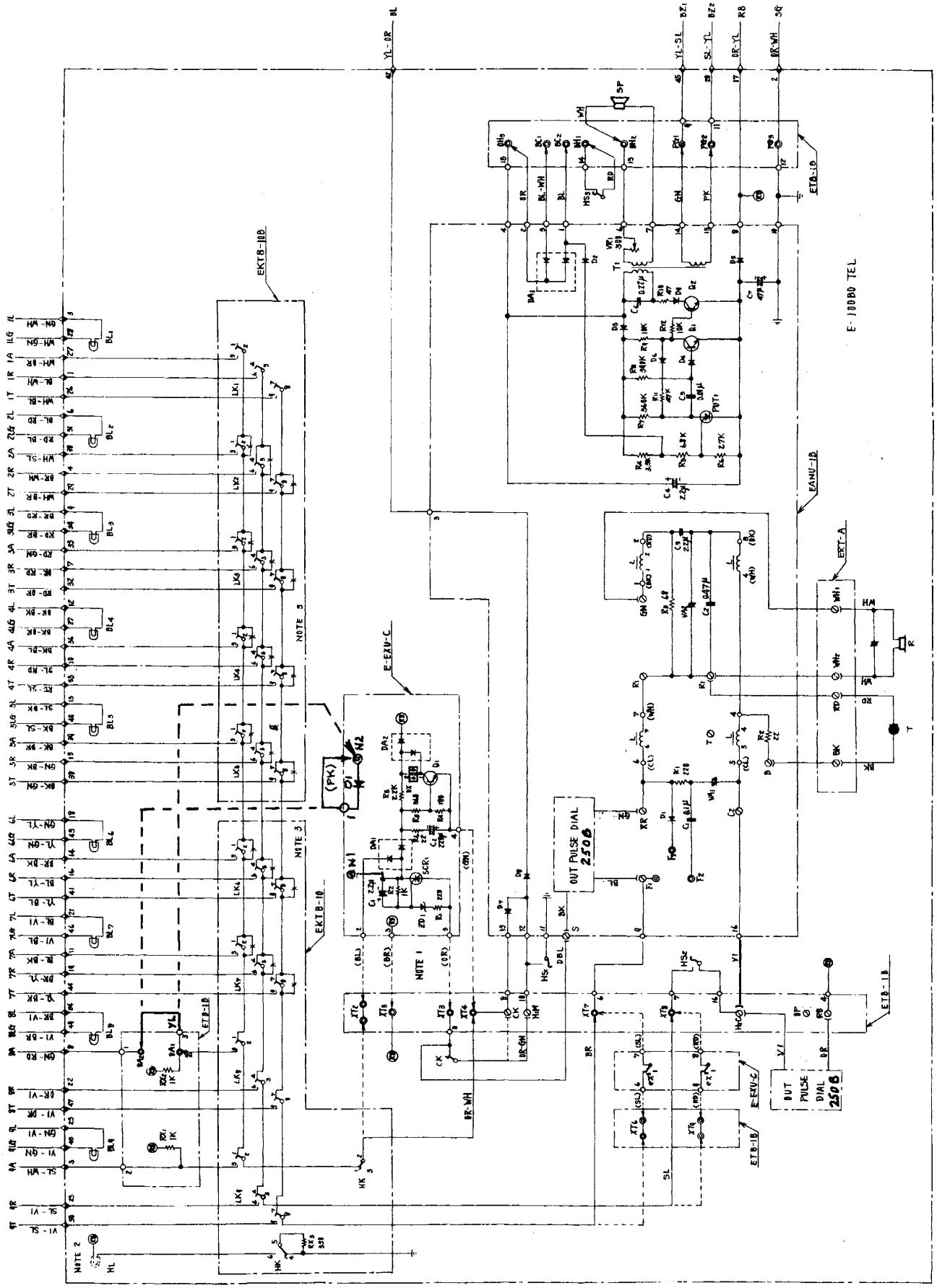
read The PR RL lamp must be added by the installer beneath the HOLD key.

3.11 Exclusion Circuit Installation

3.12 The EXclusion Unit, E-EXU-C, is installed in the front, right hand side of the telephone base with 2 screws and stand-off insulators. The circuit is then connected to the pintip terminals on the ETB-1B circuit board as shown in the schematic in Figure 3.1.

3.13 Mechanical installation details are illustrated in Figure 3.3. Care should be taken when dressing the telephone wiring harness to avoid broken leads.

3.14 After installation of the E-EXU-C, connect the unit in the following order:



NOTES:
1. When Exclusion Unit, E-EXU-C, is equipped, the wiring with dotted lines should be used
2. The HL lamp should be installed when PRivacy ReLease indication is required.
3. When multi-line conferencing is not required, cut straps marked —✕—.

Figure 3.1 - Schematic - E-100-BO Key Telephone Set

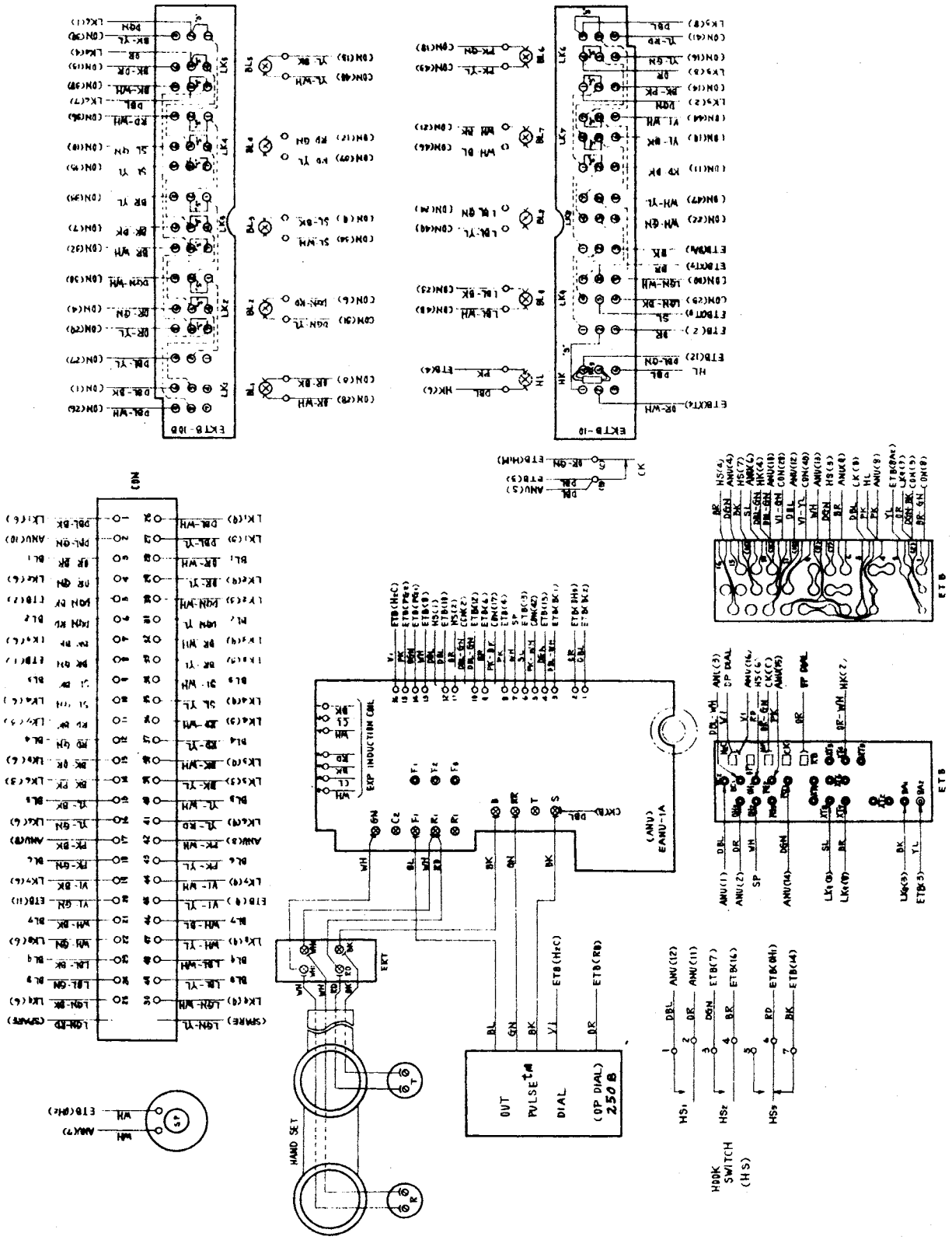
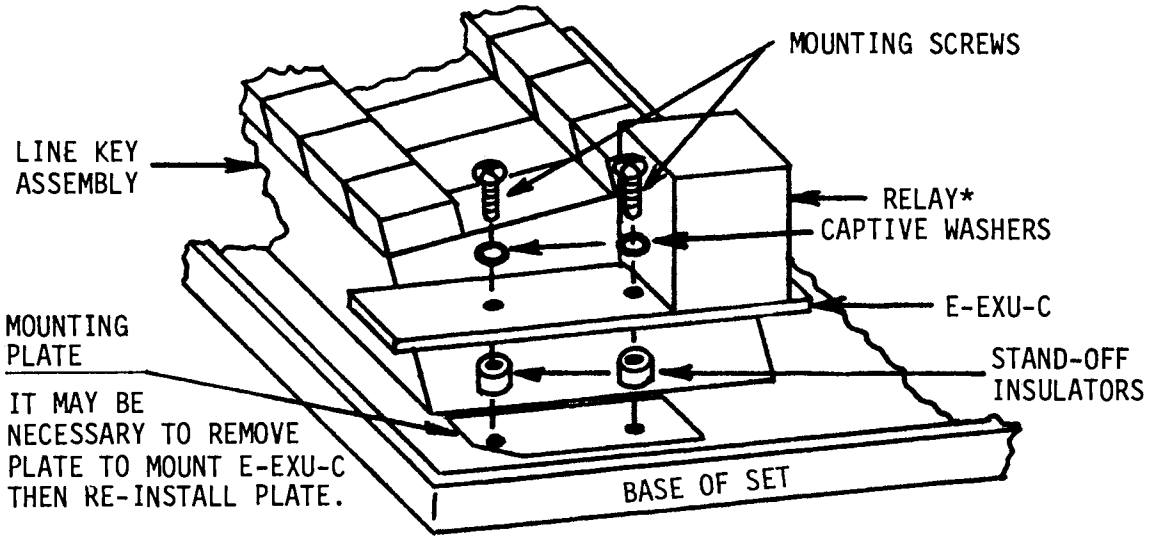


Figure 3.2 - Wiring - E-100-B0 Key Telephone Set



* Dress line key assembly wiring harness around the outside of relay.

Figure 3.3 - E-EXU-C Mounting Detail

ON THE ETB-1B TERMINAL BOARD-

(a) move BR lead from XT7 to XT6

(b) move SL lead from XT8 to XT9

(c) move OR-WH lead from XT4 to XT2

(d) move OR-GN lead from H1M to CK

FROM THE E-EXU-C-

(e) connect BL lead to ETB-1B XT2

(f) connect OR lead to ETB-1B XT3

(g) connect GN lead to ETB-1B XT4

(h) connect BR lead to ETB-1B XT5

(i) connect an SL lead to ETB-1B XT6

(j) connect an SL lead to ETB-1B XT7

(k) connect a RD lead to ETB-1B XT8

(l) connect a RD lead to ETB-1B XT9

WHEN LK8 IS USED FOR MANUAL INTERCOM

(m) move YL lead from 8A2 on ETB-1B to N2 on E-EXU-C

(n) move PK lead from N2 on E-EXU-C to 8A2 on ETB-1B

3.15 Multi-line Conference

3.16 The telephone is factory-strapped for multi-line conferencing on lines associated with line keys LK1 thru LK7. Any two lines wired for this feature may be conferenced by merely depressing the two associated pickup keys.

3.17 This feature may be disabled from some or all of the lines at individual stations by cutting three (3) straps for each key. Refer to the wiring diagram in Figure 3.2. Straps are marked (S) on the drawing.

3.18 If keys LK8 or LK9 are used for CO line access, straps may be added from terminals 1 to 2, 4 to 5 and 7 to 8 of the appropriate key to permit conferencing on these lines. Refer to wiring diagram in Figure 3.2.

3.19 Key Access of External Paging

If key access to an external paging system is provided, it is recommended that LK7 be used for this purpose. The straps shorting contacts on LK7 should be removed. Refer to the wiring diagram in Figure 3.2.

3.20 Restriction of Outward Dialling

The E-100-B telephone set is wired at the factory for multi-line conferencing. Therefore, the polarity of all CO lines must be the same. This is necessary to prevent transmission disruption and possible circuit latch-up. If the set is strapped for dial restriction, it will be unable to dial on ALL CO lines.

3.21 For restriction when a rotary type dial is used, a triple-ended pin-tip jumper is required to strap pins F1, F2, and F3 on the E-ANU board. Pintip jumpers are available from TIE.

3.22 On the ETB-1B board reverse the leads on terminals XT7 and XT8. The color of these leads will depend on whether the telephone is equipped with an E-EXU-C circuit board. Refer to Figure 3.1.

3.23 The ICM T and R leads from the restricted station to the dial selective intercom must be reversed at the KSU to permit the station to dial on the intercom.

3.24 For restriction of a TIE-TONE dial, reverse the leads on terminals XT7 and XT8 of the ETB-1B board. Refer to Figure 3.1. Then reverse the ICM T and R leads of the restricted station for the dial selective intercom at the KSU.

3.25 Dial restriction of an Outpulse dial is not possible without modification of the dial circiut which IS NOT recommended.

3.26 Dial Installation

3.27 Three types of dials may be used in the E-100-B; rotary, TIE-TONE, or Outpulse. Direct replacement of any one of the 3 types requires only that the dial mounting screws be loosened or removed and the new dial installed in reverse manner. Care should be taken to connect the leads from the new dial to the same terminals used by the dial being replaced.

3.28 To install a T-59 rotary dial procede as follows: Refer to Fig. 3.4.

(a) If the set has had a TIE-TONE^{tm}

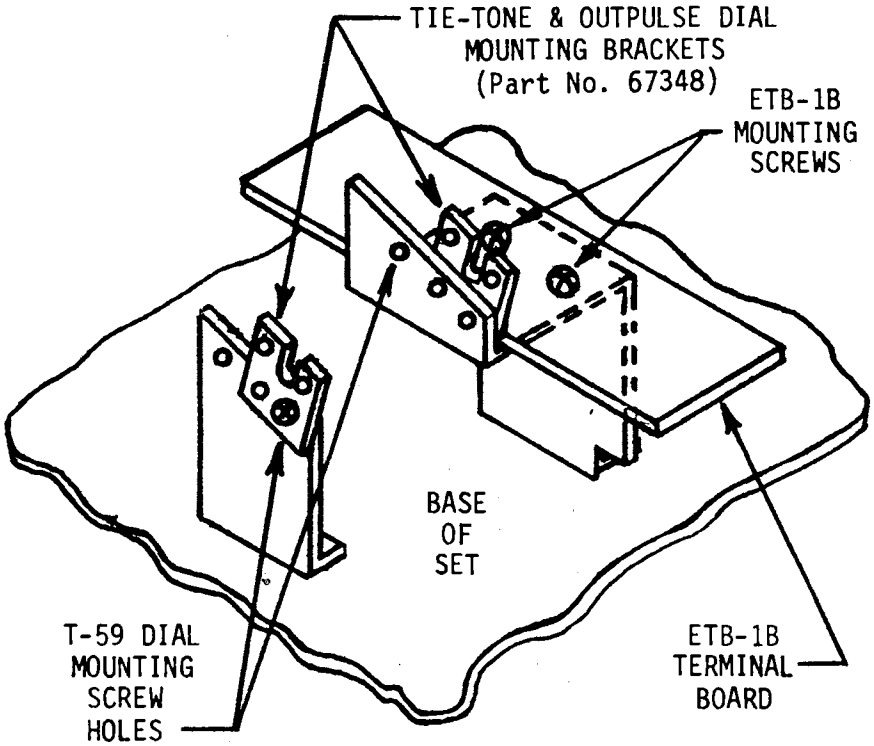


Figure 3.4 - Dial Bracket Mounting Detail

or outpulse dial previously, remove the mounting brackets for the previous dial. This requires dismounting the ETB-1B terminal board temporarily for screwdriver access to the mounting bracket screw on the right side.

(b) Install the T-59 dial, using the screws from the removed brackets. NOTE that the dial mounts so that the left screw goes in the hole toward the front of the set and the right screw goes in the hole toward the rear of the set.

(c) Remount the ETB-1B board. Make sure that the stand-off insulators are between the ETB-1B and the dial mounting bracket.

(d) Connect the dial in accordance with Figure 3.5.

3.29 To install a TIE-TONE dial, dial mounting brackets are required. If the brackets (TIE Part No 67348) are not in place they must be installed. Installation requires temporary removal of the ETB-1B terminal board. Refer to Figure 3.4. Proceed as follows:

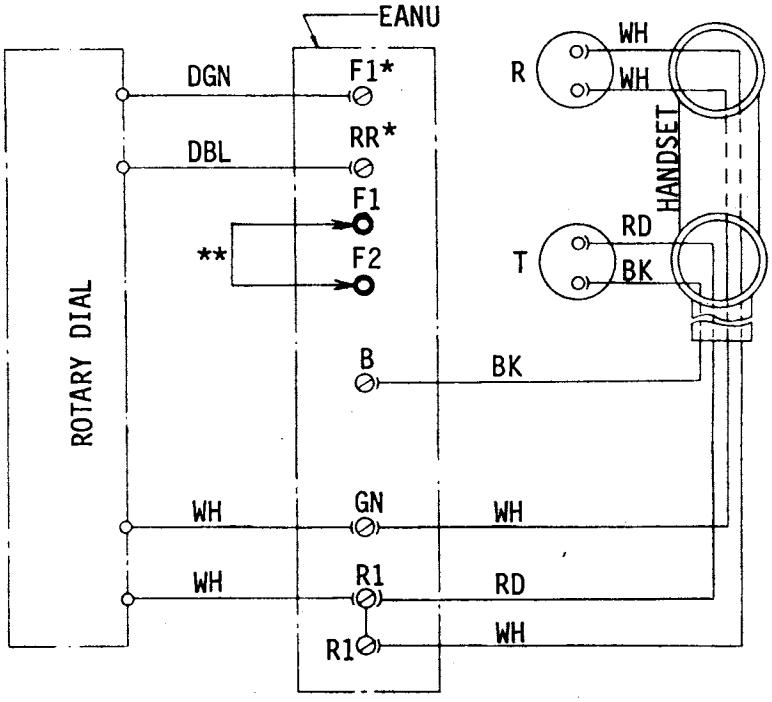
(a) Remove ETB-1B terminal board.

(b) Mount the brackets. The mounting screws use the holes toward the front of the set.

(c) Remount the ETB-1B board. Make sure that the stand-off insulators are between the ETB-1B and the dial mounting bracket.

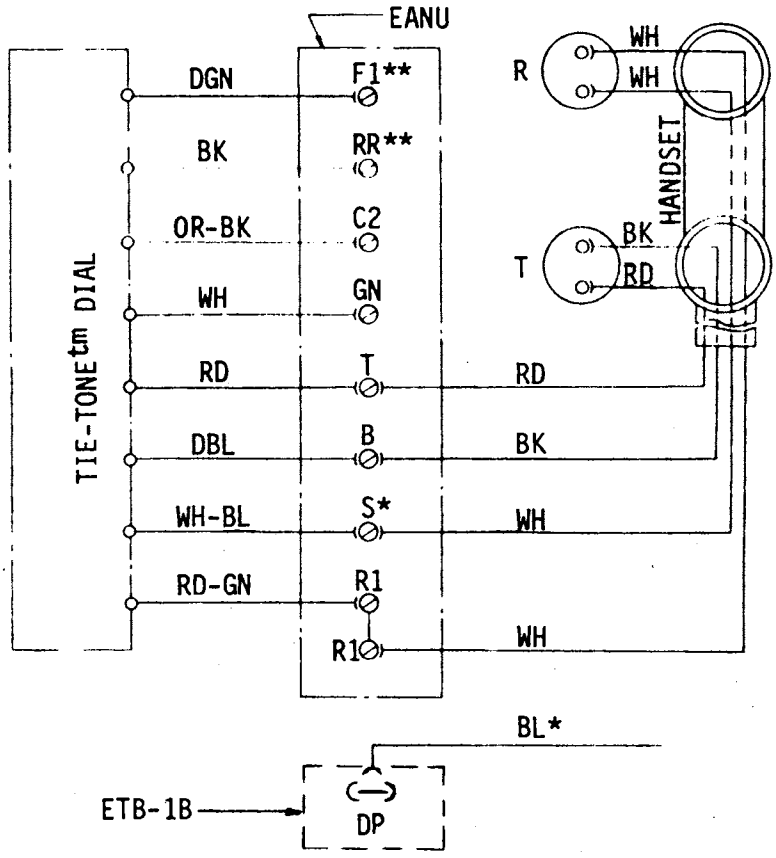
(d) Connect the dial in accordance with Figure 3.6.

3.30 To install an Outpulse^{tm} dial, dial mounting brackets are required. If



* Remove strap from F1 to RR if present.
** Add pintip jumper from F1 to F2.

Figure 3.5 - Rotary Dial Installation



* Move BL lead connected to terminal S to terminal DP on the ETB-1B board.

** Remove strap from F1 to RR and pintip jumper from F1 to F2 if present.

Figure 3.6 - TIE-TONE^{tm} DIAL INSTALLATION

the brackets (TIE Part No 67348) are not in place they must be installed. Installation requires temporary removal of the ETB-1B terminal board. Refer to Figure 3.4. Proceed as follows:

(a) Remove ETB-1B terminal board.

(b) Mount the brackets. The mounting screws use the holes toward the front of the set.

(c) Remount the ETB-1B board. Make sure that the stand-off insulators are between the ETB-1B and the dial mounting bracket.

(d) Connect the 250B dial in accordance with Figure 3.1 or Figure 3.7 for the 350/C3B dial.

3.31 Wall Mounting

3.32 When the E-100-B set is to be wall-mounted, a wall-mounting kit (TIE Part No. 67304, for rotary dial sets, or TIE Part No. 67305 for TIE-TONE^{tm} or Outpulse^{tm} dial sets) is required. Install the set as follows:

(a) Secure the wall-mount bracket with the pointed-end down using suitable hardware for the location of the telephone. 3 holes

are provided for this purpose.

(b) Remove the face-plate, face-mat, and housing from the set.

(c) Mount the telephone set on the wall-mount bracket via the two square holes in the base of the set. The keystrip is now at the top of the set. The lower tang of the wall-mount bracket fits into a slot, through the bottom rear of the set. Secure the set with one of the screws, provided in the kit, through a hole in the bottom (center) of the housing.

(d) Dismount the dial.

(e) Unplug the handset leads from the ERT terminal block and remove the handset.

(f) Remove the black rubber filler from the slot (bottom, right of center) and move to new position where handset cord was initially.

(g) Remove the four spade-tipped conductors (from the ERT block) terminated on EANU terminals R1, B, and GN and connect to RD, BK, WH1, and WH2 on the ERT block.

(h) Reconnect the handset to the EANU board as follows:

1. The RD and a WH lead to R1.
2. The remaining WH lead to GN.
3. The BK lead to B.

(i) Secure handset via its strain-relief into the slot in the bottom of the set.

(j) Remove the handset cradle by removing 2 screws accessed through the right side of the base-plate.

(k) Secure new handset hanger (supplied in kit) with a screw into the tapped hole located at the end of the hook-switch contacts.

(l) Remove the red HOLD button and turn the designation plate (HOLD) over.

(m) Insert the rubber plug, supplied in the kit, into the lower vacant slot in the right side of the set.

(n) Remount the dial.

(o) Make audible signal option connections, as required, on the ETB terminal board.

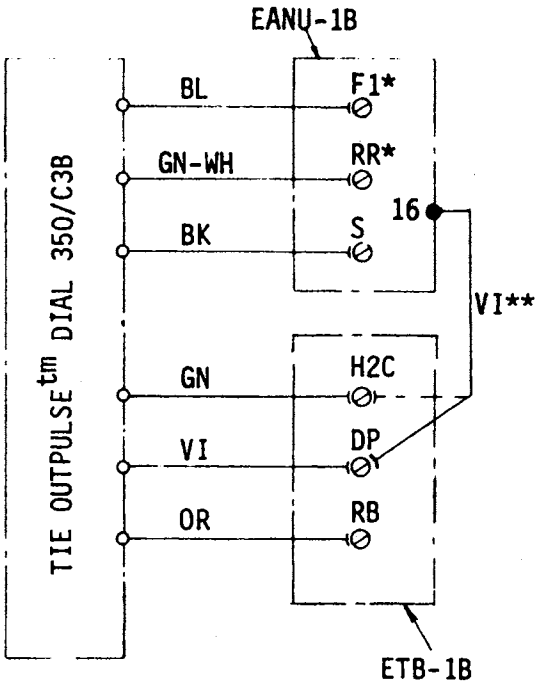
(p) Secure the housing with the screw at the lower center of the set.

(q) Mount the new face-plate and mat.

(r) Designate line keys, as required.

Table 3.3 - Running Cable Resistance

GAUGE	FEET/OHM	MAXIMUM LENGTH
22	61.95	1549 feet
24	38.96	975 feet
26	24.50	612 feet



* Remove strap from F1 to RR and pintip jumper from F1 to F2 if present.
** Move VI lead from H2C to DP on the ETB-1B board.

Figure 3.7 - TIE Outpulse^{tm} Dial 350/C3B - Installation

E-100-C KEY TELEPHONE SET

1.00 INTRODUCTION

1.01 This section contains information for installation and strapping of the TIE E-100-C Key Telephone Set for use with the TIE-919 Key Telephone System.

2.00 DESCRIPTION AND FEATURES

2.01 The E-100-C Key Telephone Set is designed for application in small key telephone systems served by a PBX or CO lines. The E-100-C is a 10-button key telephone (refer to Figure 2.1 for key layout and functions) having a 25-pair line cord terminated on an amphenol type plug.

2.02 The E-100-C key telephone incorporates a new modular design concept in which all the component assemblies "plug" together as follows:

a) The EANU-1C board mounts to the base of the set and other assemblies plug into it. Refer to Figure 2.2 for the location of the connectors on the EANU-1C board.

b) The line key assembly mounts to the base of the set and plugs into the EANU-1C board (connector K).

c) The 25-pair line cord has 4 connectors. Each connector is coded with a colored dot and plugs into the correspondingly coded connector in the telephone set (3 connect to the key assembly and 1 connects to the EANU-1C, connector C).

d) The hookswitch assembly mounts on the base of the set and plugs into the EANU-1C board (connector H).

e) The speaker assembly mounts on the base and plugs into the EANU-1C board (connector S).

f) The handset leads (with spade-tipped terminals) plug into the key assembly. These terminals are so located that they may be used for both a desk or wall telephone set.

g) The dial kit (consisting of a dial prewired to a single connector, the DTB board) plugs into the EANU-1C board (connector T). This simplifies dial changes and dial installation in the field. No tools are required and no fumbling with individual leads - no wiring errors.

h) The optional exclusion circuit card, E-EXU-D, plugs directly into the EANU-1C board (connector X).

j) The optional station signalling tone oscillator circuit, E-OSC-A, plugs into the EANU-1C board (connector B) to provide CO audible and/or intercom tone signals to the station.

2.03 The E-100-C telephone provides the following features:

a) Pickup and hold on up to 8 CO/PBX lines.

b) Line status indication by small 10 volt lamps located under the pickup keys.

c) Automatic pickup-key restoration when the handset is returned to the cradle.

d) Set is equipped to permit call-announcing when used with a KSU arranged to provide this feature.

LK1 CO	LK2 CO	LK3 CO	LK4 CO	LK5 CO
HOLD	LK9 FLASH/ ICM	LK8 ICM/CO	LK7 ICM/CO	LK6 CO

Figure 2.1 - Key Functions

e) Optional plug-in 'two-pitch' electronic buzzer, one tone for CO audible and the other for ICM audible if call-announcing is not provided.

f) Volume control to permit adjustment of speaker signal level.

g) Optional strapping for signal cut-off when station is off-hook.

h) Industry standard handset and dial.

i) Optional interchangable face mats are available for color coordination with surrounding decor.

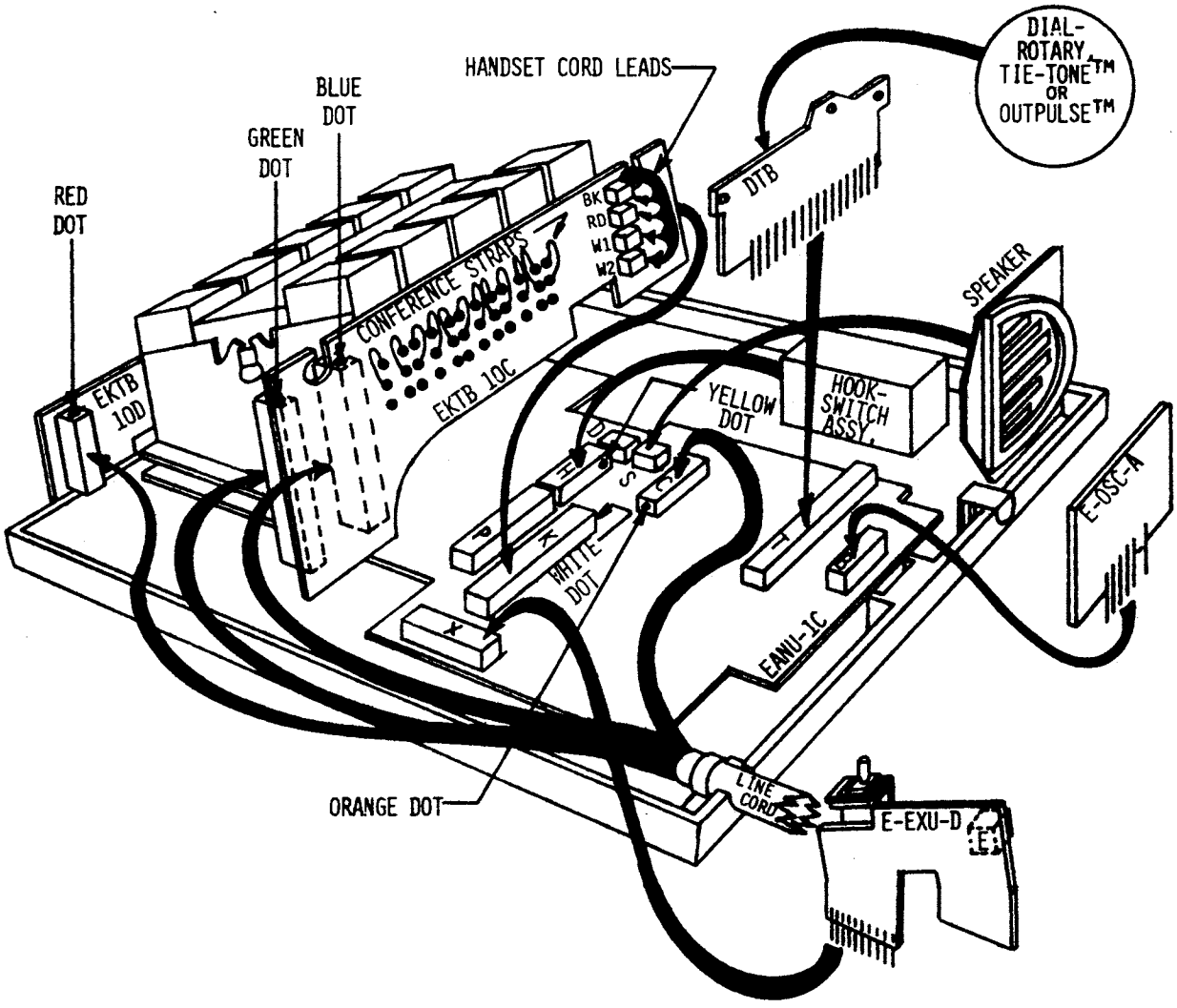


Figure 2.2 - E-100-C Key Telephone Set, Internal Layout

j) Handset has longer (6-foot) coil cord.

k) 500 type network.

l) Wired for busy lamp control.

m) Multi-line conferencing by depressing more than 1 pickup key.

n) 3 types of dials available: rotary, TIE-TONE™ or OUTPULSE™.

p) May be converted to wall-mounted set (optional kit required).

q) Optional station restriction on CO lines

r) Optional automatic exclusion circuit (for CO lines only) may be added (kit required).

3.00 ORDERING INFORMATION

3.01 The following information is provided to assist with ordering E-100-C Key Telephone Sets and accessories:

a) E-100-C 10 Button Key Telephone Set

The modular construction of the E-100-C makes it no longer necessary to stock a variety of telephones (different colors, different dials, etc.). The standard E-100-C Key Telephone Set is packaged less dial and face plate. The dial and any optional circuits required can easily be plugged into the telephone at the installation site.

b) Dial Kits

Three types of dial kits are available - rotary, TIE-TONE™, or OUTPULSE™. Each kit contains a dial assembled with 'snap-in' mounting brackets and is terminated on a DTB (Dial Terminal Board) ready to plug into the telephone set.

RDK - Rotary - Type TAP-511

TDK - TIE-TONE - Type 350/A1

ODK - OUTPULSE - Type 250B

c) Face Plate Kit

Each face plate kit contains a metal face plate, plastic face panel, key designation sheet, & a woodgrain face mat. The following kits are available and may be ordered as required:

FPK-100-CR For E-100-C equipped with a rotary dial (not wall-mounted.

FPK-100-CT For E-100-C equipped with TIE-TONE or OUTPULSE dials.

FPK-100-CRW For E-100-C equipped with a rotary dial and wall-mounted.

FPK-100-CR (EX) For E-100-C equipped with a rotary dial and exclusion unit (not wall-mounted).

FPK-100-CT (EX) For E-100-C equipped with a TIE-TONE or OUTPULSE dial and exclusion unit.

FPK-100-CRW (EX) For E-100-C equipped with a rotary dial, exclusion unit, and wall-mounted.

d) Colored Face Mats

Packets of colored face mats (10 mats per packet, all 1 color) are available in six colors (white, blue, green, yellow, orange and red) for coordinating the telephone color with the surrounding decor. Each face mat has a round die-cut punch-out that can be removed when the face mat is used in a set equipped with an

exclusion unit. Be sure to specify color when ordering.

FM-100-CR For E-100-C equipped with a rotary dial, not wall-mounted.

FM-100-CT For E-100-C equipped with TIE-TONE or OUTPULSE dials.

FM-100-CRW For E-100-C equipped with a rotary dial & wall-mounted.

e) E-EXU-D Exclusion Unit

A printed circuit board with a privacy release (PR RL) switch mounted on the board and plugs directly into the E-100-C telephone set to provide exclusion on CO lines.

f) E-OSC-A Oscillator Unit

Two-tone buzzer (oscillator) must be added to the station to receive CO audible or other tone (not voice) signals. It is a single printed circuit board that plugs directly into the E-100-C telephone set.

g) Wall-mounting Kit (Econ-O-Phone)

Includes a wall-mounting bracket and wall-type cradle with rubber filler plug. The face plate kit and/or mats should be ordered separately.

4.00 INSTALLATION

4.01 Cable Installation

4.02 Cables (25-pair) are run from the KSU to a point close to where the telephone set is to be installed. For proper operation of the system, the length of the cable must be such that the conductor resistance is less than 25 ohms (loop resistance less than 50 ohms). Refer to Table 4.1 for details of permissible cable length.

Table 4.1 - Cable Length Limitations

WIRE GAUGE	FEET/OHM	MAXIMUM LENGTH
22	61.95	1549 FEET
24	38.96	975 FEET
26	25.50	612 FEET

4.03 Refer to Table 4.2 for cable conductor assignment for the E-100-C Key Telephone Set.

The E-100-C set should NOT be plugged into a system that has been wired for earlier E-100 type telephones. The E-100-C and E-100-B sets are pin-to-pin compatible but the key functions are NOT the same. (Refer to Figure 2.1.) By converting LK9 from flashing to an ICM key, the E-100-C becomes key compatible with the E-100-B key set (see paragraph 4.39).

4.04 Audible Signalling Options

4.05 The E-100-C telephone set is factory wired for call-announcing. This permits short announcements to be made to a station via the speaker in the telephone set.

4.06 The E-100-C may be arranged to receive tone signals by adding an optional E-OSC-A circuit card.

4.07 The E-OSC-A oscillator card is installed in the telephone in connector 'B' on the EANU-1C board. The card is plugged-in with the component side toward the rear of the set. The connector is keyed for proper alignment of the card (see Figure 4.1).

4.08 With the E-OSC-A card installed, the telephone may be strapped to provide the following signalling options:

a) Call-announcing only

b) Call-announcing and CO audible tone

c) CO audible and ICM tones

d) ICM tone only

Furthermore, the station may be arranged to cut off audible signals when the handset is off-hook.

NOTE: The E-100-C is wired to cut-off all signals when an ICM line is seized.

4.09 For strapping of connector 'P' to provide the various signalling options, refer to Table 4.3.

The KSU must also be wired to provide the proper signal options to the telephone sets. Refer to Section 1 of this manual.

4.10 An AC buzzer may be installed in the telephone to provide signalling in a system which does not have call-announcing. Buzzers may NOT be mixed with other types of signalling. The buzzer is installed to the left of the line key assembly as shown in Figure 4.2. The buzzer leads are connected to terminals AG and K1 of the DTB board after removing the strap ② from K1 to K2. Strap connector 'P' as shown in Table 4.3.

The TIE-919 KSU must be strapped to provide 18VAC for buzzer signalling.

4.11 Dial Installation

4.12 The E-100-C telephone set is packaged without a dial. Three types of dial kits are available for installation in the E-100-C (refer to par. 3.01b). The dial kit contains a dial wired to a DTB board.

4.13 Before installing the dial, strap the 'D' connector (see Figure 4.1) on the EANU-1C, if required. This connector is strapped at the factory for rotary dial use. Remove the shorting clip from pins 1-2 when TIE-TONE dials are used. The diode strap in position 3-4 may be used to provide dial restriction (see paragraph 4.31).

Table 4.2

STATION CABLE CONDUCTOR ASSIGNMENTS *			
KEY* NUMBER	LEAD DESIG	PLUG PIN	CABLE COLOR
LK 1	1T 1R	26 1	WH-BL BL-WH
COMMON	1A SG(A1)	27 2	WH-OR OR-WH G
LK 1	1LG 1L	28 3	WH-GN GN-WH
LK 2	2T 2R	29 4	WH-BR BR-WH
LK 9	2A 9A	30 5	WH-SL SL-WH
LK 2	2LG 2L	31 6	RD-BL BL-RD
LK 3	3T 3R	32 7	RD-OR OR-RD
LK 8	3A 8A	33 8	RD-GN GN-RD
LK 3	3LG 3L	34 9	RD-BR BR-RD
LK 4	4T 4R	35 10	RD-SL SL-RD
LK 7	4A 7A	36 11	BK-BL BL-BK
LK 4	4LG 4L	37 12	BK-OR OR-BK
LK 5	5T 5R	38 13	BK-GN GN-BK
LK 6	5A 6A	39 14	BK-BR BR-BK ST
LK 5	5LG 5L	40 15	BK-SL SL-BK
LK 6	6T 6R	41 16	YL-BL T-T BL-YL T-R
COMMON	BL RB	42 17	YL-OR H OR-YL
LK 6	6LG 6L	43 18	YL-GN LG GN-YL LP
LK 7	7T 7R	44 19	YL-BR BR-YL
COMMOM	BZ1 BZ2	45 20	YL-SL SL-YL
LK 7	7LG 7L	46 21	VI-BL BL-VI
LK 8	8T 8R	47 22	VI-OR OR-VI
LK 9	9LG 9L	48 23	VI-GN GN-VI
LK 8	8LG 8L	49 24	VI-BR BR-VI
LK 9	9T 9R	50 25	VI-SL SL-VI

* See Figure 2.1 for key functions

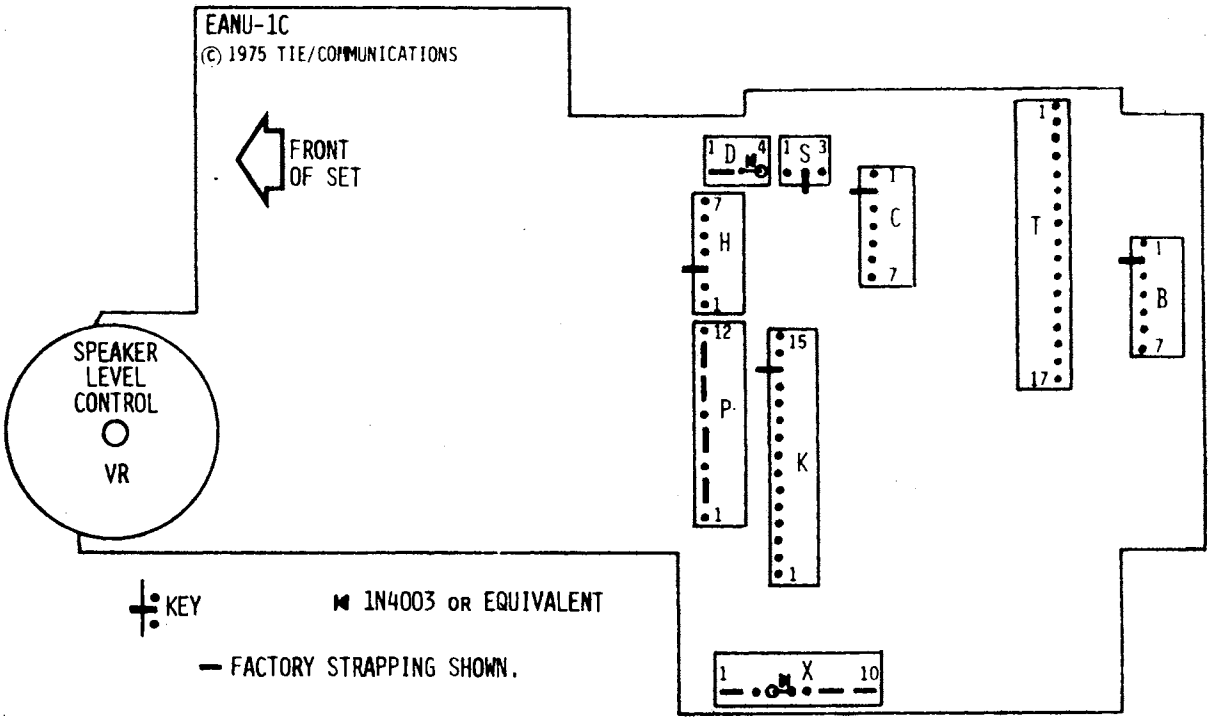


Figure 4.1 - EANU-1C Connector Layout and Pin Numbering

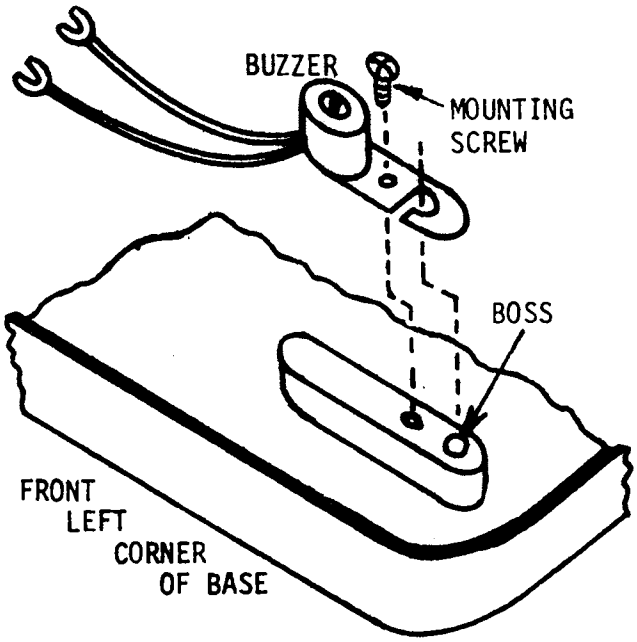


Figure 4.2
AC Buzzer Mounting Arrangement

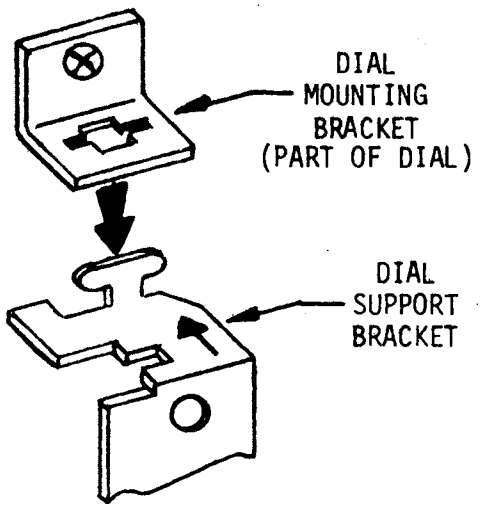


Figure 4.3
Dial Mounting Arrangement

Table 4.3 - Audible Signal Strapping Options

SIGNALLING OPTION	TERMINALS ON 'P' CONNECTOR
Call-announcing Only (Factory wiring)	1 2 3 4 5 6 7 8 9 10 11 12
Call-announcing Only With cut-off	1 2 3 4 5 6 7 8 9 10 11 12
Call-announcing and CO audible Without cut-off	1 2 3 4 5 6 7 8 9 10 11 12
Call-announcing and CO audible With cut-off of all signals	1 2 3 4 5 6 7 8 9 10 11 12
CO audible and ICM tone Without cut-off	1 2 3 4 5 6 7 8 9 10 11 12
CO audible and ICM tone With cut-off of all signals	1 2 3 4 5 6 7 8 9 10 11 12
ICM tone Only Without cut-off	1 2 3 4 5 6 7 8 9 10 11 12
ICM tone Only With cut-off	1 2 3 4 5 6 7 8 9 10 11 12
Buzzer	1 2 3 4 5 6 7 8 9 10 11 12

FRONT OF TELEPHONE SET

4.14 To install the dial, plug the DTB board into connector 'T' on the EANU-1C board. Plug the DTB board in with the terminals toward the front of the telephone set (refer to Figure 2.2). The dial is then mounted by placing the slots of the dial mounting brackets over the tabs of the support brackets and sliding the complete dial assemble to the left (in the direction of the arrow on the support bracket). Refer to Figure 4.3.

Be sure that the DTB board is properly aligned with the 'T' connector when plugging them together.

4.15 After the dial is installed, install the proper face plate kit and face mat (refer to paragraphs 3.01c and 3.01d).

4.16 Dial Conversion

4.17 The easiest way to change a dial in the E-100-C is to replace it with a dial kit from TIE. However, any standard dial (WE 8 type) with leads terminated on spade-tipped terminals may be installed in the E-100-C telephone. This is done by removing the old dial and unplugging the DTB board. Remove the leads from the DTB board. Connect the new dial leads to the DTB board as

Table 4.4 - Dial Connections for E-100-C Key Telephone Sets

E-DTB TERM. BOARD	DIAL - TYPE		
	ROTARY	TIE-TONE™	OUTPULSE™ TYPE 250 B
P3	YL		
P4	YL		
RB			OR
SG			
L1			
C		OR-BK	VI
B		DBL	
T		RD	
K1			
OG			BK
AG			
LK			
GN	WH	WH	
R	WH	RD-GN	
RR	BL	BK	GN
S		WH-BL	
K2			
F **	GN	DGN	BL
R1 **			
T1			
X1			
X2			
X3			
CONN D	STRAP 1-2		STRAP 1-2

① ② ③ ④ 3 inch jumper between designated terminals.

* Factory installed in the dial kit.
Not required for E-100-C operation.

** See Dial Restriction (para. 4.31)

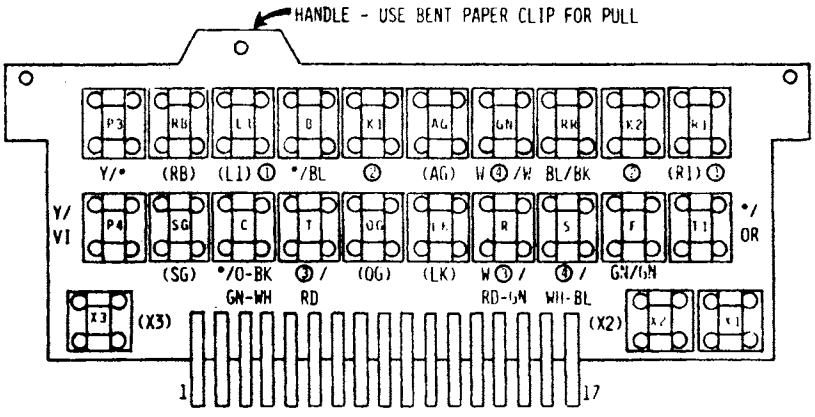


Figure 4.4 - DTB Dial Terminal Board Layout

shown in Table 4.4. Refer to Figure 4.4 for location of the terminals on the DTB.

4.18 Remove the dial mounting brackets from the old dial & remount on the new dial. Before installing the dial in the telephone, strap the 'D' connector as required (see paragraph 4.13).

4.19 When the dial is in position in the telephone, install the proper face plate kit and the proper face mat (see paragraph 3.01c and 3.01d).

4.20 Automatic Exclusion

4.21 The E-100-C telephone set may be arranged to provide automatic exclusion on CO lines by adding an optional exclusion kit (E-EXU-D). With this exclusion kit installed, the station set is denied access to (excluded from) busy CO lines.

4.22 To install the exclusion unit:

a) Remove the face plate, face mat and housing from the set.

b) Remove the shorting clips from connector 'X' (see Figure 4.1) that were installed at the factory.

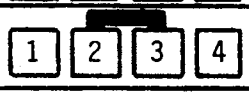
c) The exclusion circuit card is installed over the right station dial support bracket (using the notch in the bracket as a card guide) and plugged into the 'X' connector on the EANU-1C board (see Figure 2.2 for reference).

d) A connector ('E') located on the E-EXU-D board is strapped to provide or block exclusion on LK8 depending on the assigned function of that key. The E-EXU-D is factory-wired for dial intercom on LK8. Refer to Table 4.5 for the strapping options and strap the 'E' connector as required.

4.23 A privacy release (PR RL) switch is mounted on the E-EXU-D and is arranged to extend above the face plate. Therefore, the face plate used must have a hole for the PR RL button. Refer to paragraph 3.01c for face plate kit descriptions.

4.24 If an exclusion unit (E-EXU-D) is to be removed from an E-100-C telephone set, connector 'X' must be restrapped. Refer to Figure 4.1 for the required strapping.

Table 4.5
E-EXU-D Connector 'E' Strapping

FUNCTION OF LK8	'E' CONNECTOR
Dial Intercom (Factory Wiring)	
CO Line or Manual Intercom	

4.25 Multi-line Conferencing

4.26 The E-100-C telephone set is factory strapped to provide multi-line conferencing on lines associated with keys LK1 through LK6. Any two lines wired for this feature may be conferenced merely by depressing the two associated pickup keys.

4.27 This conferencing arrangement is passive and, because of the increased transmission loss each time a line is conferenced to another line, it is recommended that NOT more than 2 lines be conferenced at any one time.

The polarity of all lines with conferencing MUST be the same. Conferencing two lines that have different polarity will result in loss of transmission at the station and make the conference useless.

4.28 Intercom and CO lines may NOT be conferenced together. Keys LK7 and LK8 are factory-wired as ICM lines and no conference straps have been wired in the telephone.

4.29 If keys LK7 and LK8 are to be used for CO line access, straps may be added from terminals 1 to 2, 4 to 5, and 7 to 8 on the appropriate line key(s). Refer to Figure 4.5 for conference strapping.

4.30 The multi-line conferencing capability may be removed from all or a portion of the lines at a station by removing the conference straps for the appropriate key. Lines on which conferencing is denied should be grouped together on the highest numbered keys.

4.31 Restriction of Outward Dialling With Multi-line Conferencing

4.32 The E-100-C telephone is factory-wired for multi-line conferencing and the polarity of all lines must be the same, as mentioned previously. Therefore, if the telephone set is to be arranged for dial restriction, ALL CO lines must be dial restricted.

4.33 To provide dial restriction with rotary or OUTPULSE dials:

a) Reverse the intercom T and R leads from the restricted station at the KSU or EU (B3 or B4 clips 49 and 50).

b) Reverse the diode in the 'D' connector on the EANU-1C board at each station (see Figure 4.6).

4.34 To provide dial restriction with TIE-TONE^{tm} dials:

a) Reverse the intercom T and R leads from the restricted station at the KSU or EU (B3 or B4 clips 49 and 50).

b) On the DTB board, at the station, reverse the dial wiring to terminals F and R1 (DGN lead from dial to R1 and strap ① to F). See Table 4.4.

4.35 Restriction of Outward Dialling Without Multi-line Conferencing

4.36 Remove the multi-line-conferencing straps on the line key assembly (see Figures 2.2 and 4.1) and reverse the T and R leads of the CO lines to be dial restricted at the KSU or EU, and strap connector 'D' as shown in Table 4.6.

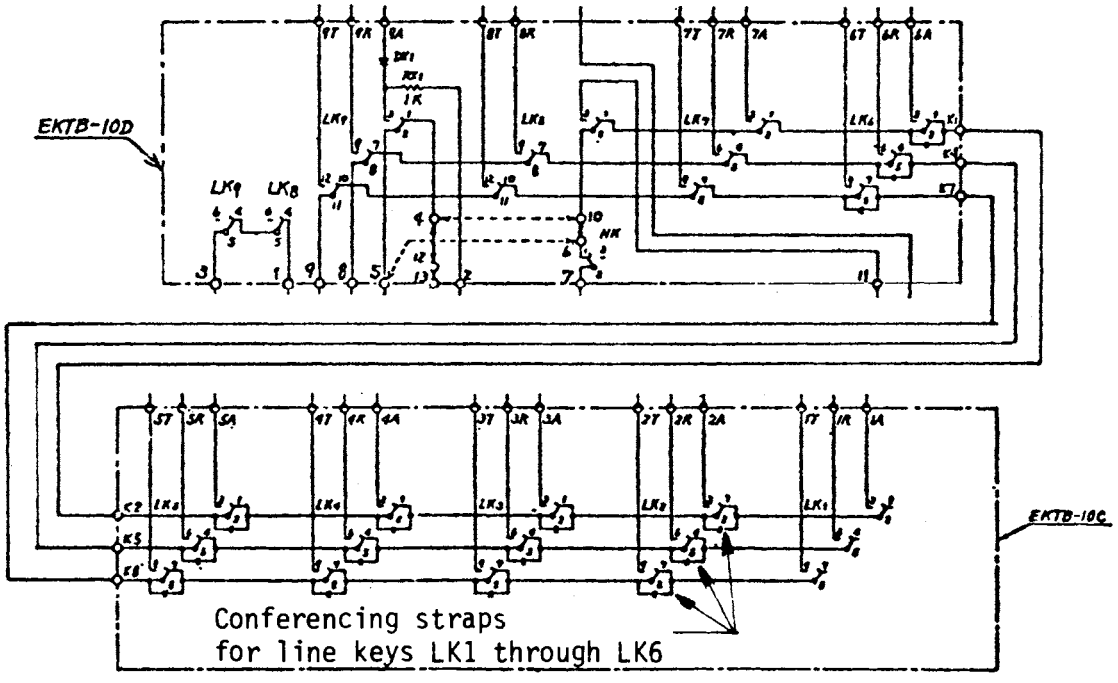
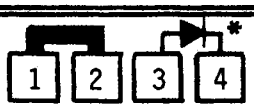
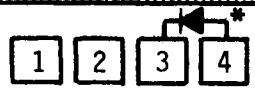
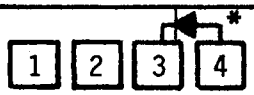


Figure 4.5 - E-100-C Conference Strapping

Table 4.6 - E-100-C Dial Restriction Options

DIAL TYPE	EANU CONNECTOR'D'	
	w/o REST-w/ CONF w/ REST-w/o CONF	w/ REST-w/ CONF
Rotary or OUTPULSE		
TIE-TONE		

*1N4003 or equivalent.
Shaded area denotes factory-wiring.

4.37 Wall-Mounting

4.38 When the E-100-C telephone is to be wall-mounted, order a Wall-mounting Kit - Econ-O-Phone for each set. If the telephone has a rotary dial, a face plate kit must also be ordered [either FPK-100-CRW or FPK-100-CRW(EX)]. Install these on the telephone as follows:

(a) Secure the wall-mount bracket with the pointed-end down using suitable hardware for the location of the telephone. 3 holes are required for this purpose.

(b) Remove the face plate, face mat, and the housing from the set.

(c) Mount the telephone set on the wall-mount bracket via the two square holes in the base of the set. The keystrip is now at the top of the set. The lower tang of the wall-mount bracket fits into a slot, through the bottom rear of the set. Secure the set with one of the screws, provided in the kit, through a hole in the bottom (center) of the housing.

(d) Remove the handset cord from the slot at the top of the set.

(e) Remove the black rubber filler from the slot (bottom, right of center) and move to new position where the handset cord was initially.

(f) Secure the handset via its strain-relief into the slot in the bottom of the set.

(g) Remove the handset cradle by removing 2 screws accessed thru the right side of the base-plate.

(h) Secure new handset hanger (supplied in kit) with a screw into the tapped hole located at the end of the hookswitch contacts.

(i) Remove the red HOLD button and turn the designation plate (HOLD) over.

(j) Insert the rubber plug, supplied in the kit, into the lower vacant slot in the right side of the set.

(k) Unsnap the dial. Turn the dial over (180°) and snap in place.

(l) Make strapping changes and install optional assemblies as required.

(m) Secure the housing with the screw at the lower center of the set.

(n) Mount the appropriate face mat and face plate.

4.39 Converting Key Function

4.40 The E-100-C telephone comes from the factory with the key in position LK9 arranged for flashing. This may be used for operator recall or the recovery of dial tone without releasing the line. The flashing key may be converted to an ICM pickup key and thereby free another key for access to an additional CO/PBX line.

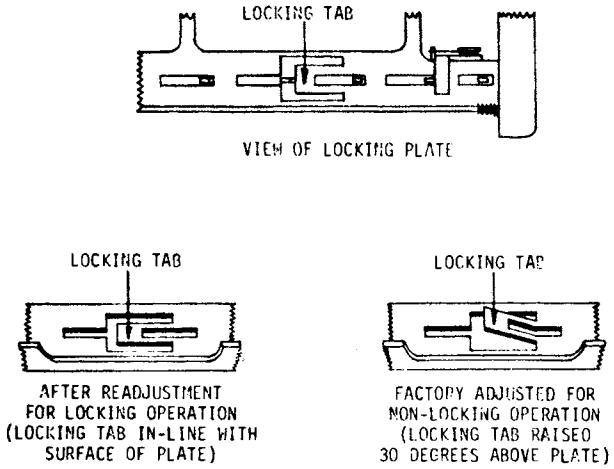


Figure 4.6
Mechanical Conversion of Pickup Key

4.41 To convert LK9 for use as a pick-up key, the locking tab must 1st be adjusted for locking operation. This is accomplished as follows:

a) Remove the face plate and housing.

b) Remove the 2 screws holding the key assembly. Lift the key assembly straight up until it has cleared the card guide on the right side. Turn the assembly over exposing the underside.

c) Bend the locking tab directly beneath the flashing key until it is flush with the locking plate (refer to Figure 4.6).

d) Test for proper interlocking operation with the other pickup keys.

e) Test for proper release when the hold key is pressed and released.

f) Reinstall the key assembly to the base of the set and test the release of the converted key when the hookswitch is operated.

4.42 The wire connections to the left side of the key assembly EKTB-10D board must be changed. A soldering iron will be required for this task. Refer to Table 4.7 for the necessary wiring changes.

Table 4.7
Key Assembly Wiring Connections

KEY ASSEMBLY CONTACT	LK9 FUNCTION	
	FLASHING	ICM PICKUP
1	BL	BL
2	SL	SL
3	OR	OR
4		
5	GN	
6		
7	RD	RD
8	YL	YL
9	BK	BK
10		
11	BR	BR
12		GN
13	LGN	LGN

Shaded area denotes factory wiring

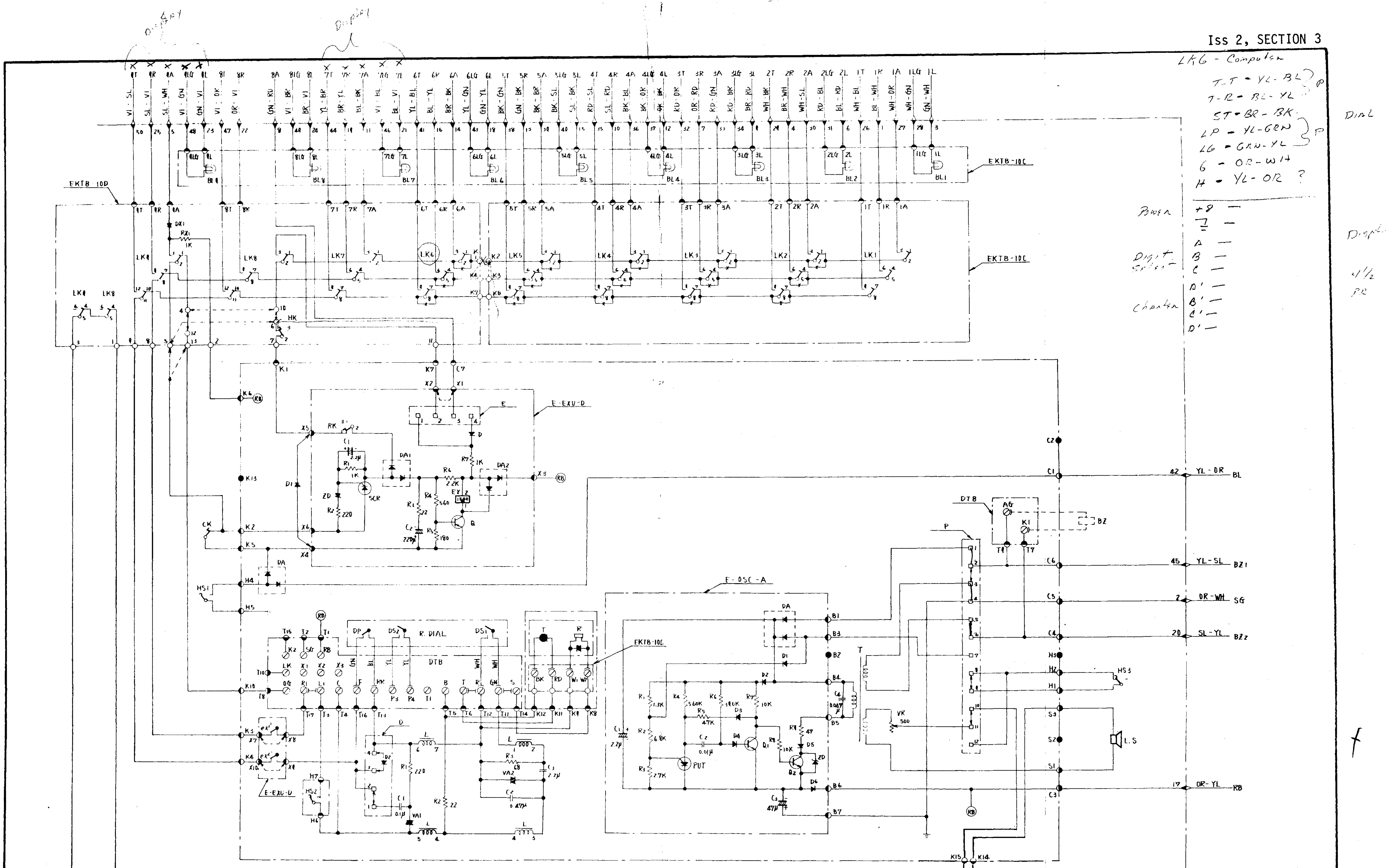


Figure 4.7

TITLE: E-100-CR Key Telephone - Schematic

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