SERVICE

400-SERIES KEY TELEPHONE UNITS

FOR INTERCOM SERVICES

1. GENERAL

1.01 This section provides schematic information for the 400-series key telephone units (KTUs) which provide talking circuits and control and signaling functions between telephone sets in a 1A2 Key Telephone System (KTS) (Fig. 1 and 2).

1.02 This section is reissued to add information on:

- 444-type KTU
- 454-Type KTU
- 460-Type KTU
- 626A modular panel.

1.03 The following KTUs and their functions are covered in this section:

- 401A—Manual Intercom Line Circuit
- 407 Type—Dial Intercom, 10-Code Selector Circuit
- 420A—Long Line Circuit
- 421A—Direct Station Selection (DSS) Circuit or Preset Conference
- 422B—Station Busy Selector Circuit
- 423A—Dial Tone, Busy Tone, and Audible Ringback Tone Circuit for nonmodular panel installations
- 424 Type—Dial Intercom, 19-Code Selector Circuit
- 425 Type—Flashing Lamp Circuit
- 426A—Amplifier, Band Separation, and Limiter Circuit
- 427 Type—Frequency Recognition and Translation Circuit
- 440A (MD)—TOUCH-TONE® Adapter Circuit
- ◗444 Type—Selector Extender Circuit
- 454 Type—3-Path Access Circuit
- 460 Type—2-Path Access Circuit◖
- 476A—Dial Tone, Busy Tone, and Audible Ringback Tone Circuit for modular panel installations
- 478B—TOUCH-TONE Adapter Circuit
- 494A—TOUCH-TONE Selector Circuit.

1.04 ◗Detailed information on the 626A modular panel (Fig. 3) and its associated KTUs may be found in Section 518-215-421.

The 401A, 407-type, 424-type, and 494A KTUs must not be used for multiline conferencing to CO/PBX lines using simultaneous depression of pickup buttons (mashdown conferencing). This can cause damage to the KTUs and violates the Federal Communications Commission (FCC) registration requirements. Add-on conferencing to CO/PBX lines using the 417A KTU is allowed. This restriction does not apply in COM KEY* systems and for 2- and 3-path intercom arrangements (options FW and S) in the 626A modular panel.◖

*Trademark of AT&T.

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Bell System except under written agreement

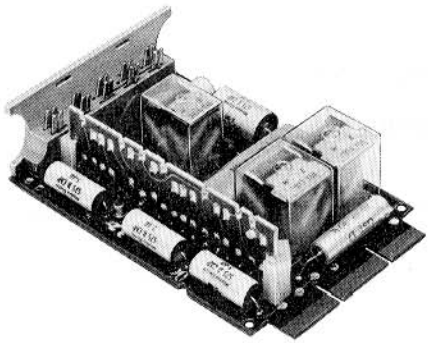


Fig. 1—Typical 4-Inch Key Telephone Unit

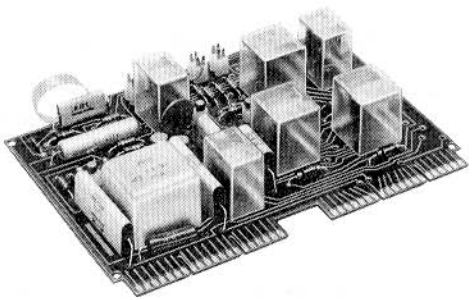


Fig. 2—Typical 8-Inch Key Telephone Unit

1.05 ▶After January 1, 1980, the 454C and 460C KTUs must be used when providing their related services. Earlier vintage KTUs may be used for additions and maintenance at grandfathered installations for the life of the units, provided they are not modified.◀

1.06 Information on line services is covered in Section 518-215-400; auxiliary circuits, Section 518-215-401; and all control circuits including audible signals, Section 518-215-403.

A. Mechanical

1.07 All circuit components on these KTUs are mounted in a plug-in printed wiring board, one end of which is equipped with contacts. A 4-inch board may have 18, 20, or 40 contacts; an 8-inch board will have 80 contacts (requiring two vertical 40-pin connectors). The circuit boards plug into mating connectors in key service units, panels, or apparatus mountings. Wiring from the connectors will be dedicated or nondedicated leads. Dedicated leads are those that normally appear on the same contacts of all KTUs, such as supply voltages and grounds, and are normally factory wired. Nondedicated leads are those whose designation and function vary and are made available for installer connections. Typical 4- and 8-inch KTUs are shown in Fig. 1 and 2.

B. Electrical

1.08 Functional schematics (Fig. 4 through 21) cover the basic circuitry of each KTU, contacts used, and its relationship to telephone sets, other KTUs, power supplies, and apparatus. Dashed lines are used to simplify the schematics and to indicate intermediate circuitry. If full schematics are required, refer to the SDs listed in paragraph 1.11.

1.09 Voltages required for operation of the KTU, or provided to associated apparatus by the KTU, are shown with their connector pins. Other voltages may appear on the contacts of the mating connector, depending on the mounting arrangement, but not on the KTU.

1.10 The KTUs may require the following power supply voltages and their associated grounds:

- -24 volts (B battery) for control
- ±10 volts for visual and audible signals
- ±105 volts for audible signals.

1.11 This issue of the section is based on the following drawings:

SD-69475-01, Issue 6—401A KTU

SD-69567-01, Issue 15—407B (MD) and C, 420A, 422B, 423A and B, 424A (MD), B (MD), and C, 425A (MD) and B, 476A, and 494A KTUs

SD-69590-01, Issue 3—421A KTU

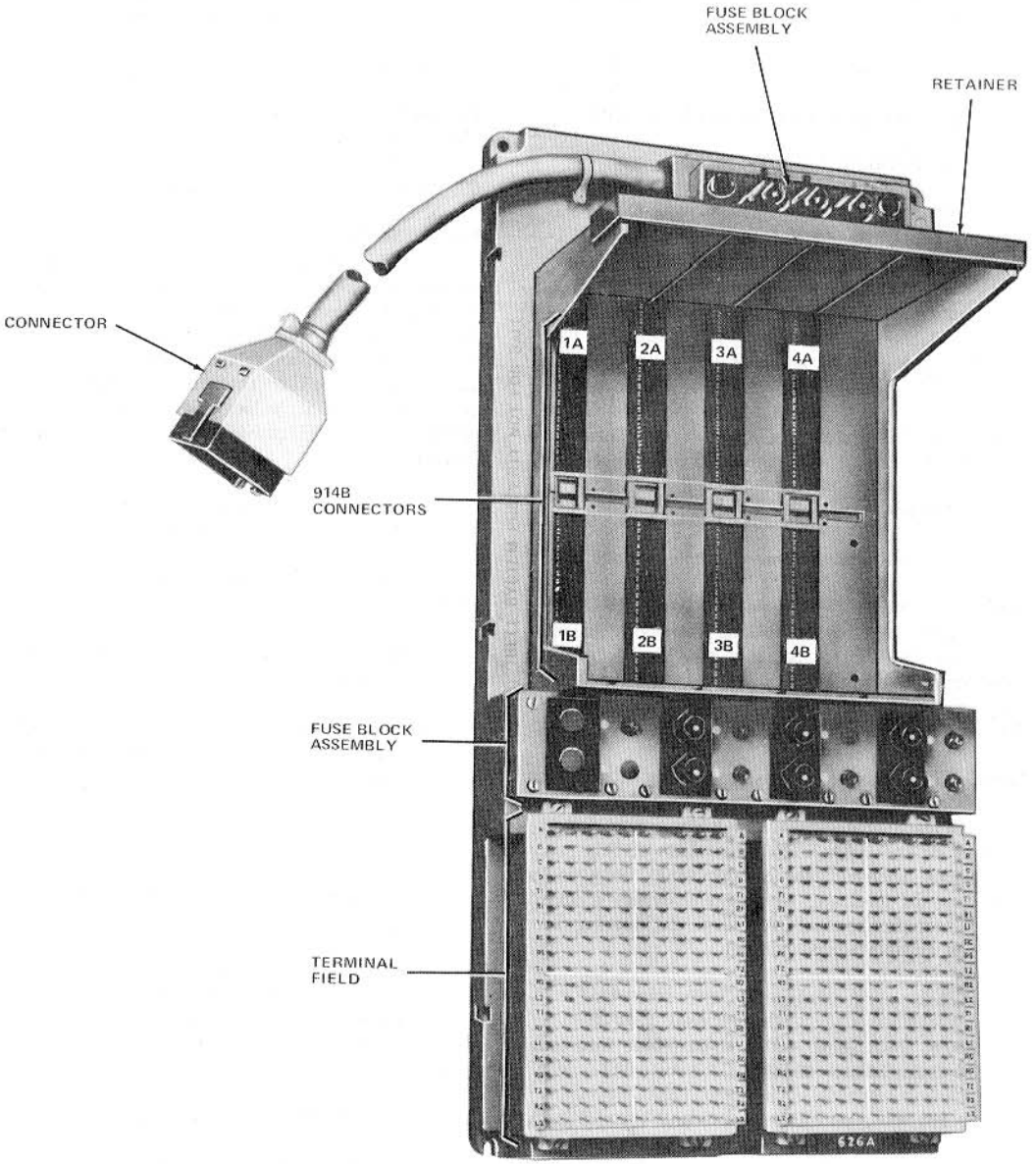


Fig. 3—◗626A Modular Panel◖

SD-69595-01, Issue 7—426A, 427B, and C KTUs

SD-69906-01, Issue 1—440A (MD) KTU

SD-69653-01, Issue 2—444-Type KTU

SD-69930-01, Issue 1—454-Type KTU

SD-69652-01, Issue 3—460-Type KTU

SD-69931-01, Issue 1—478B KTU

SD-69658-01, Issue 4—626A Modular Panel.

If this section is to be used with equipment or apparatus reflecting later issues of the drawings, reference should be made to the CDs and SDs to determine the extent of the changes and the manner in which the section may be affected.

2. IDENTIFICATION

A. 401A KTU (Manual Intercom Line Circuit)

2.01 The 401A KTU (Fig. 4) is a 4-inch, 18-contact unit that provides talking battery for manual intercom and control for line busy lamp feature. Audible signaling between stations is accomplished by means of separately furnished pushbuttons, buzzers, or bells.

2.02 The A lead of a station associated with the manual intercom circuit provides ground through the operated switchhook contacts to operate a relay on the 401A KTU. Operation of this relay completes a circuit for the optional busy lamp feature. In addition, the relay provides a spare set of transfer contacts for local engineering use, such as audible signal control.

B. 407B (MD) and 407C KTUs (Dial Intercom, 10-Code Selector Circuit)

2.03 The 407-type KTUs (Fig. 5 and 6) are 8-inch, 80-contact units for use with the dial selective intercom circuits. They provide the following basic operating features:

- Maximum of 10 station codes (0-9)
- Busy lamp at all stations
- Adjustable single spurt signaling (0.5 to 2.5 seconds) by adjusting timing resistor
- Rotary dial selection.

The 407C KTU replaces the 407B KTU (MD) on a plug-compatible basis.

C. 420A KTU (Long Line Circuit)

2.04 The 420A KTU (Fig. 7) is a 4-inch, 18-contact unit that provides a circuit for use with off-premise (long line) stations connected to the dial selective intercom line circuit. This KTU extends the loop resistance of the basic selector to 500 ohms. No provision is made for busy lamps at stations connected to this circuit. Mutilation of other station dial pulses is prevented by relay operation. The KTU provides the following operating features:

- Signaling and talking over single pair from off-premise (long line) stations
- Any code may be assigned to off-premise stations
- Ringing can be tripped only during silent intervals

Note: If handset pickup occurs during ringing cycle, ring will be heard in handset receiver.

- Used with rotary or TOUCH-TONE telephone set
- When associated with TOUCH-TONE adapter circuit [426A with 427B or C KTUs, 440A (MD), or 478B KTU] or TOUCH-TONE Selector Circuit (494A KTU), maximum nonrepeatered station conductor loop is 500 ohms or 4-dB insertion loss at 1000 Hz, whichever is limiting.

D. 421A KTU (DSS Circuit or Preset Conference)

2.05 The 421A KTU (Fig. 8 and 9) is a 4-inch, 40-contact unit that can be used as a DSS circuit or a preset conference circuit. The KTU has the following operating features:

- Used with common audible matrix

NOTE:
1. REQUIRES A MOUNTING FACILITY EQUIPPED WITH AN 18-, 20-, OR 40-PIN CONNECTOR.

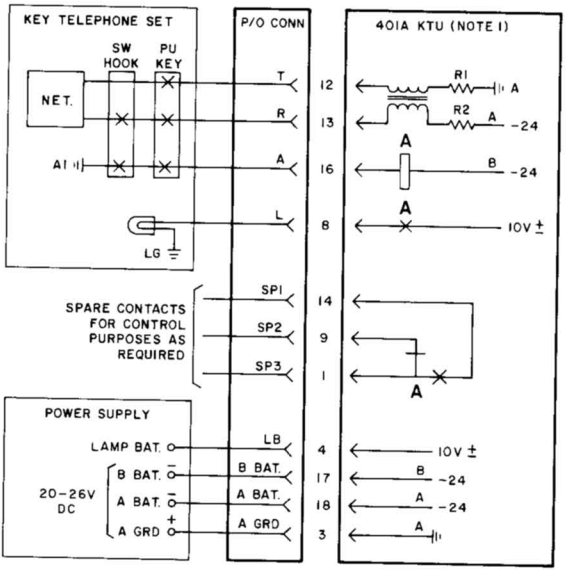


Fig. 4—Condensed Functional Schematic of 401A KTU (Manual Intercom Line Circuit)

- Option strapping when used for a preset conference circuit
- Maximum external circuit loop resistance is 120 ohms
- Used to provide DSS in conjunction with 407- or 424-type KTUs.
- Allows line lamps to flash but prevents audible signal at called station when called station is busy on other line
- If the calling station maintains connection and the called station goes from busy to on-hook, the busy signal to the calling station stops and the audible signal (with flashing line lamp) begins at the called station.

E. 422B KTU (Station Busy Selector Circuit)

2.06 The 422B KTU (Fig. 10) is a 4-inch, 40-contact unit that provides control of station busy tone for the dial selective intercom line circuit. It also provides control circuits for 10 station codes. When a system consists of 19 station codes, two KTUs are required—one for the units group (single-digit codes, 0-9) and one for the tens group (2-digit codes, X0-X9). This KTU provides the following operating features:

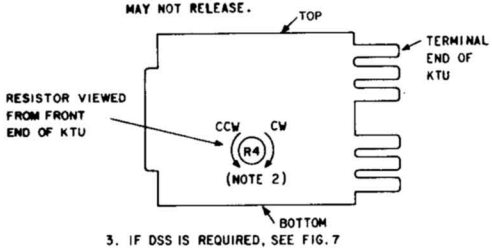
- Determines if called station is off-hook or busy on other line

F. 423A KTU (Dial Tone, Busy Tone, and Audible Ringback Tone Circuit)

2.07 The 423A KTU (Fig. 11) is a 4-inch, 20-contact unit that provides a variable rate multivibrator to produce dial tone, station busy tone, or audible ringback tone for the dial selective intercom line circuit. To provide busy tone and audible ringback tone, the multivibrator of the 423A KTU is under control of an associated interrupter (ground). For all tone signals, the output of the multivibrator is returned to the originating station over the tip side of the intercom line.

NOTES:

1. REQUIRES A MOUNTING FACILITY EQUIPPED WITH TWO 914A (40-PIN) CONNECTORS MOUNTED IN A VERTICAL PLANE.
2. RESISTOR R4 CAN BE ADJUSTED TO PROVIDE A VARIABLE TIMING CYCLE FOR THE RELEASE OF RELAY B (SET AT 1.5 SECONDS AT FACTORY). TURN KNURLED WHEEL FULL COUNTERCLOCKWISE FOR 0.5 SECOND TIMEOUT. TURN CLOCKWISE TO MAKE INTERVAL LONGER. AT THE FULL CLOCKWISE POSITION TIMING MAY BE SO LONG THAT B RELAY MAY NOT RELEASE.



3. IF DSS IS REQUIRED, SEE FIG. 7

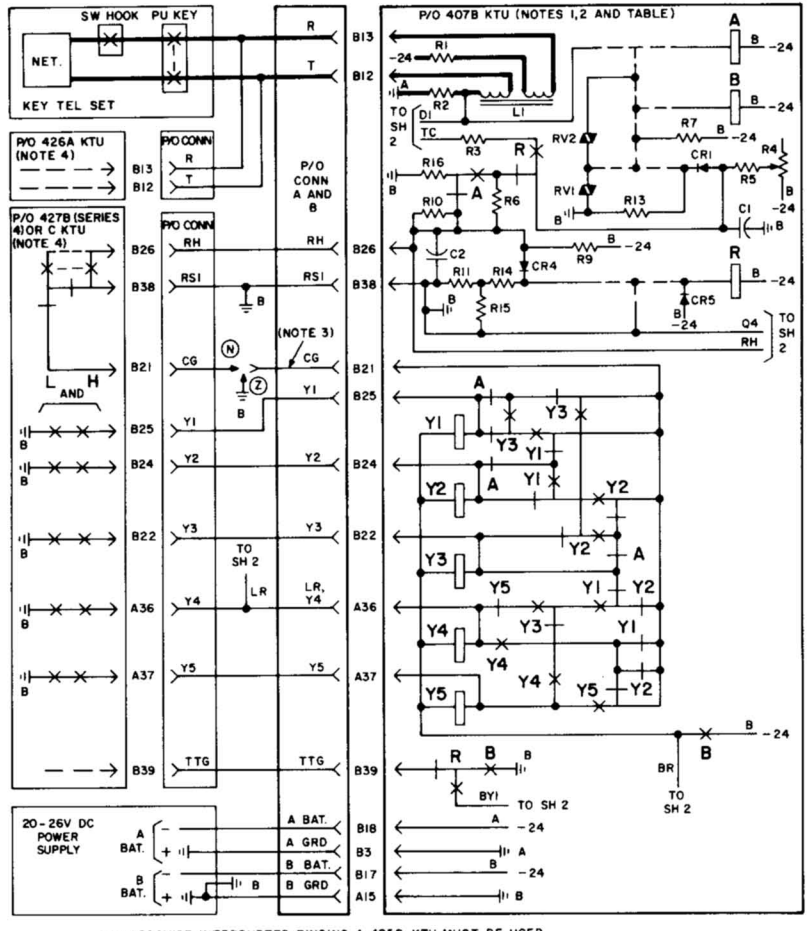
TABLE:

DIGIT DIALED	COUNTER RELAYS OPERATED AT END OF DIAL PULSE				
	Y1	Y2	Y3	Y4	Y5
1		●			
2	●				
3			●	●	
4		●		●	
5	●			●	●
6			●	●	●
7		●		●	●
8	●				●
9			●		●
0		●			●

4. 440A(MD) OR 478B KTU MAY BE USED TO PROVIDE "TOUCH-TONE" DIALING IN PLACE OF 426A WITH 427B (SERIES 4) OR C KTUS.

OPTIONS:

Z	WITHOUT		"TOUCH-TONE" DIALING
N	WITH		
E	INTERRUPTED	10V AC BUZZER	AUDIBLE SIGNALS
X	*	105V 30HZ RINGER	
@	SINGLE SPURT †	10V AC BUZZER	
J		18V AC BUZZER	
K		DC BUZZER	
M		105V 30HZ RINGER	
W	STEADY		LINE LAMPS
H	FLASHING		
R	INTERRUPTED RING WITH STATION BUSY TONE X		USING 423A KTU



* TO PROVIDE INTERRUPTED RINGING A 425B KTU MUST BE USED.

† STATION BUSY TONE IS NOT RECOMMENDED FOR USE WITH SINGLE SPURT RINGING

Fig. 5—Condensed Functional Schematic of 407B KTU (MD) (Dial Intercom, 10-Code Selector Circuit) (Sheet 1 of 2)

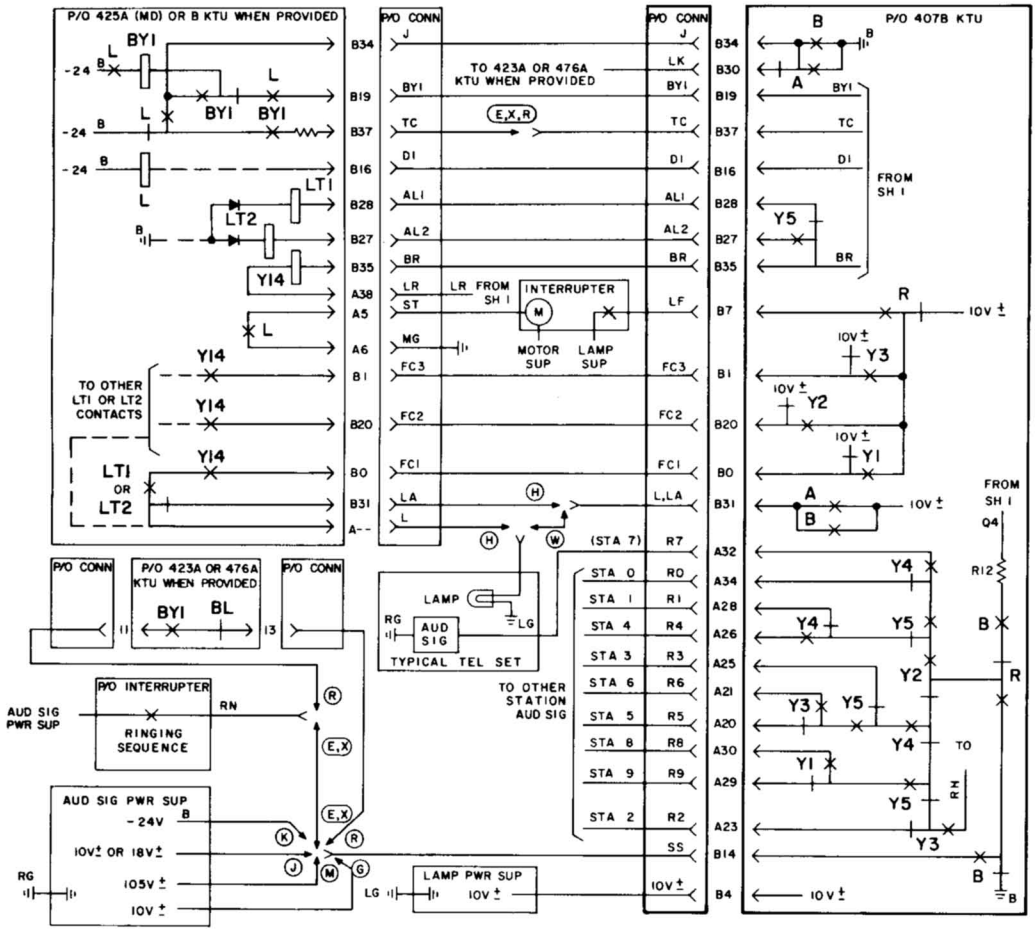
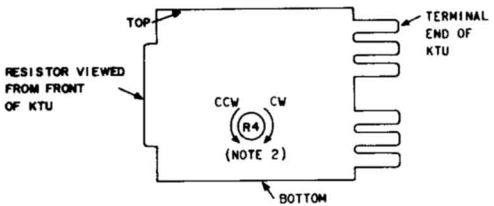


Fig. 5—Condensed Functional Schematic of 407B KTU (MD) (Dial Intercom, 10-Code Selector Circuit) (Sheet 2 of 2)

NOTES:

1. REQUIRES A MOUNTING FACILITY EQUIPPED WITH TWO 914A (40-PIN) CONNECTORS MOUNTED IN A VERTICAL PLANE.
2. RESISTOR R4 CAN BE ADJUSTED TO PROVIDE A VARIABLE TIMING CYCLE FOR THE RELEASE OF RELAY B. A TIMING CYCLE OF 1.5 SEC IS PROVIDED BY THE FACTORY. THE ADJUSTMENT OF R4 IS REVERSED FROM THE 424B KTU. TURN KNURLED WHEEL TO FULL CLOCKWISE POSITION FOR 0.5 SEC TIMEOUT. TURN COUNTERCLOCKWISE FOR TIMEOUT INTERVAL LONGER THAN 1.5 SECONDS.



3. IF DSS IS REQUIRED, SEE FIG. 7

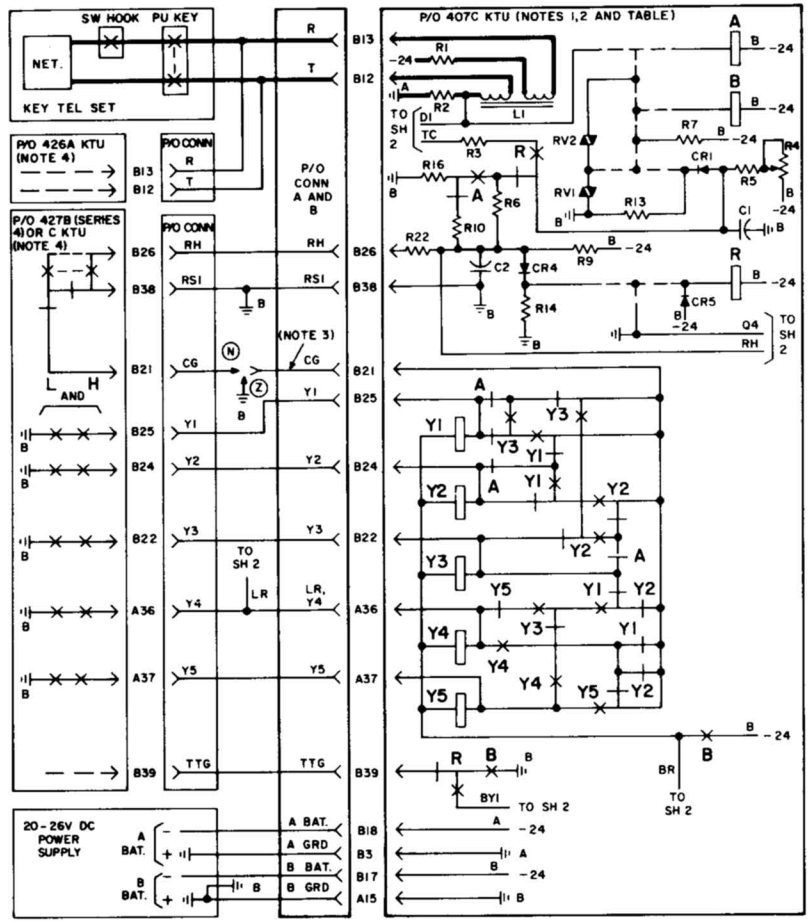
TABLE:

DIGIT DIALED	COUNTER RELAYS OPERATED AT END OF DIAL PULSE				
	Y1	Y2	Y3	Y4	Y5
1		●			
2	●				
3			●	●	
4		●		●	
5	●			●	●
6			●	●	●
7		●		●	●
8	●				●
9			●		●
0		●			●

4. 440A(MD) OR 478B KTU MAY BE USED TO PROVIDE "TOUCH-TONE" DIALING IN PLACE OF 426A WITH 427B (SERIES 4) OR C KTUS.

OPTIONS:

Z	WITHOUT		"TOUCH-TONE" DIALING
N	WITH		
E	INTERRUPTED *	10V AC BUZZER	AUDIBLE SIGNALS
X		105V 30HZ RINGER	
G	SINGLE SPURT †	10V AC BUZZER	
J		18V AC BUZZER	
K		DC BUZZER	
M		105V 30HZ RINGER	
W	STEADY		LINE LAMPS
H	FLASHING		
R	INTERRUPTED RING WITH * STATION BUSY TONE		USING 423A KTU



* TO PROVIDE INTERRUPTED RINGING A 425B KTU MUST BE USED

† STATION BUSY TONE IS NOT RECOMMENDED FOR USE WITH SINGLE SPURT RINGING

Fig. 6—Condensed Functional Schematic of 407C KTU (Dial Intercom, 10-Code Selector Circuit) (Sheet 1 of 2)

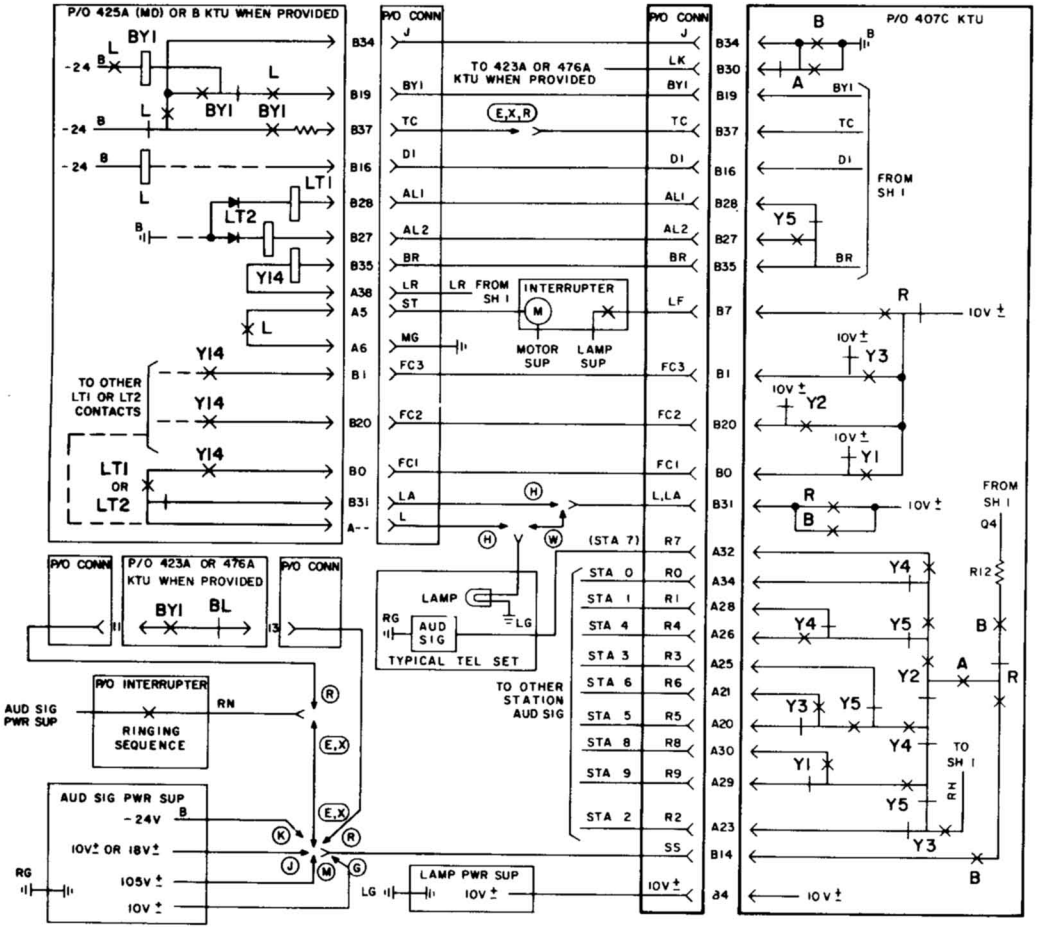


Fig. 6—Condensed Functional Schematic of 407C KTU (Dial Intercom, 10-Code Selector Circuit) (Sheet 2 of 2)

NOTES:

1. REQUIRES A MOUNTING FACILITY EQUIPPED WITH AN 18-,20-, OR 40-PIN CONNECTOR.
2. WHEN INTERCOMMUNICATING SYSTEM IS EQUIPPED WITH THE "TOUCH-TONE" ADAPTER (440A[MD] OR 478B OR 426A WITH 427B [SERIES 4] OR C KTUS) PROVIDE A 400J DIODE FOR EACH 420A KTU INSTALLED.
3. MAXIMUM STATION CONDUCTOR LOOP IS 500 OHMS. OFF-PREMISE (LONG LINE) TELEPHONE SET MAY BE EQUIPPED WITH A "TOUCH-TONE" DIAL PROVIDED THE INTERCOMMUNICATING SYSTEM IS SO EQUIPPED.
4. ANY DIGIT MAY BE ASSIGNED TO OFF-PREMISE (LONG LINE) STATION.

OPTIONS:

M	105V±	USED TO OPERATE AUD SIG OF INTERCOM SYSTEM
J	18V±	
K	-24V DC	

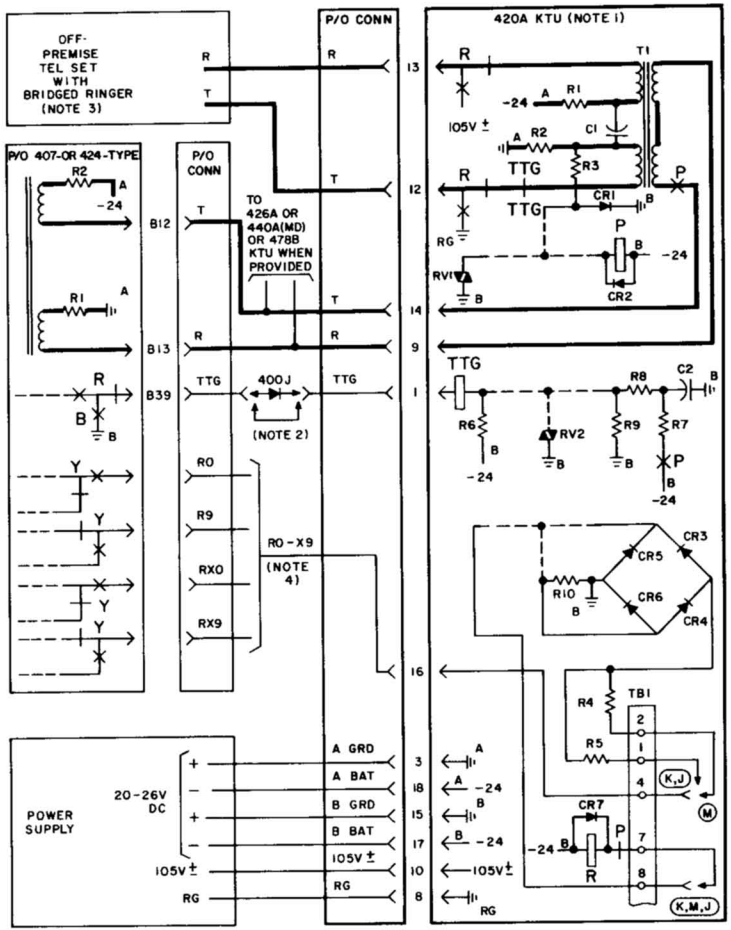


Fig. 7—Condensed Functional Schematic of 420A KTU (Long Line Circuit)

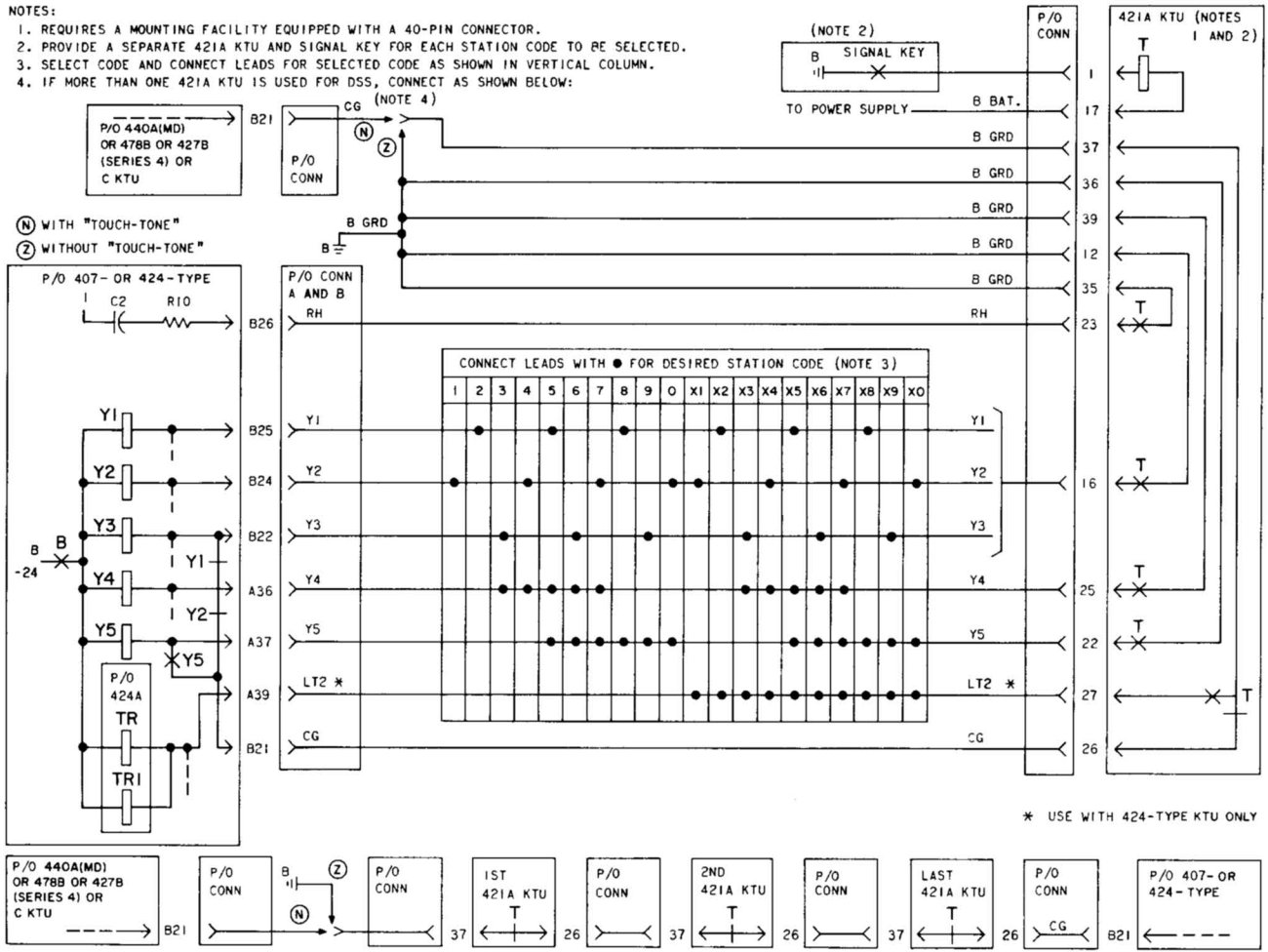


Fig. 8—Condensed Functional Schematic of 421A KTU (Wired for DSS)

NOTES:

1. THE 421A KTU REQUIRES A MOUNTING FACILITY EQUIPPED WITH A 40-PIN CONNECTOR.
2. THE 413A KTU REQUIRES A MOUNTING FACILITY EQUIPPED WITH AN 18-, 20-, OR 40-PIN CONNECTOR.
3. PROVIDE THE 413A KTU ONLY WHEN ACCESS TO THE PRESET CONFERENCE IS BY DIAL CODE OR BY DIAL CODE AND DSS. DO NOT PROVIDE THE 413A KTU WHEN ACCESS TO THE PRESET CONFERENCE IS LIMITED TO DSS.
4. REMOVE RINGER CAPACITORS FROM CIRCUIT.
5. WHEN THIS CIRCUIT IS PROVIDED, RINGING VOLTAGE (105V±) MUST BE USED TO OPERATE THE AUDIBLE SIGNALS CONNECTED TO THE DIAL INTERCOM LINE.
6. PROVIDE (W) OPTION AS SHOWN.

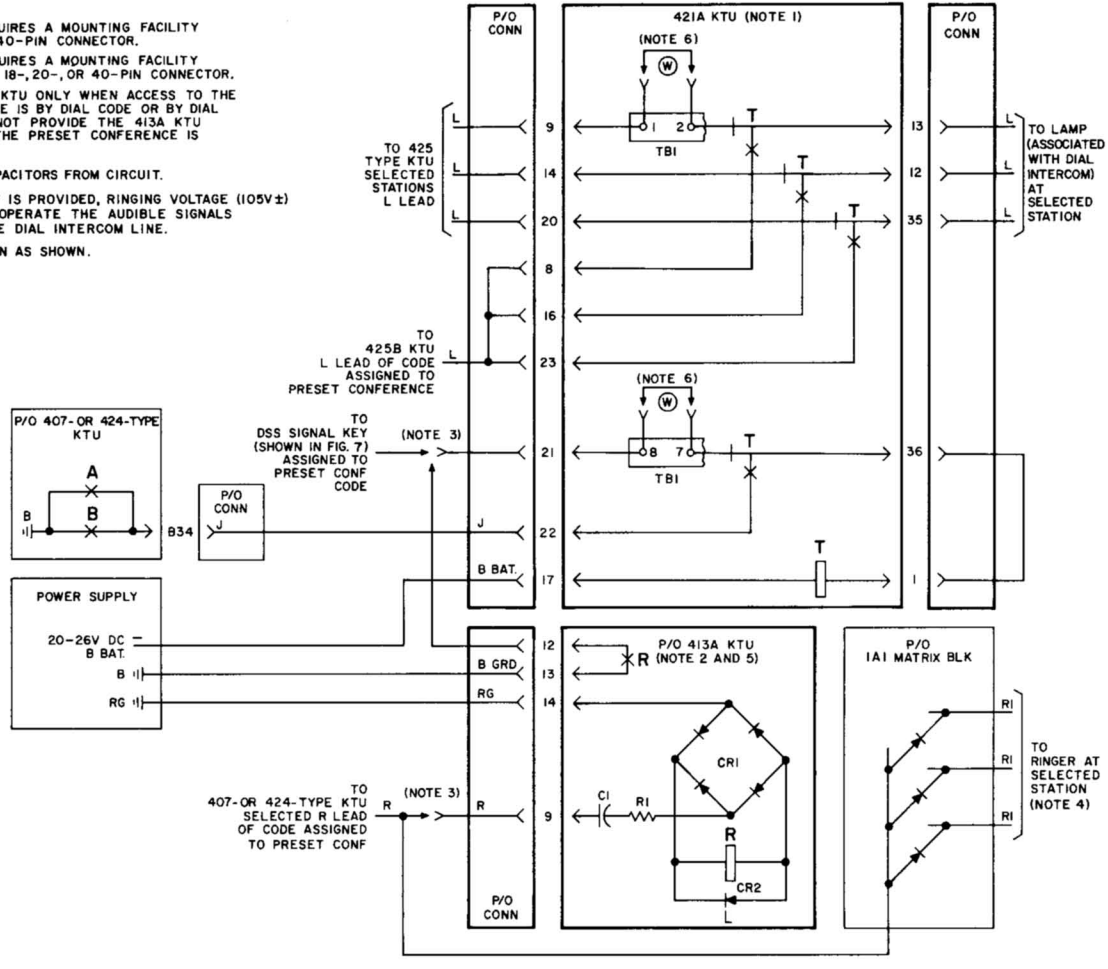


Fig. 9—Condensed Functional Schematic of 421A KTU (Wired for Preset Conference)

NOTES:

1. REQUIRES A MOUNTING FACILITY EQUIPPED WITH A 40-PIN CONNECTOR.
2. PROVIDE A SEPARATE 422B KTU FOR UNITS GROUP (1-0, SINGLE DIGIT NOS.) AND FOR THE TENS GROUP (X1-X0, TWO-DIGIT NOS.)
3. PROVIDE AND INSTALL A KS-15724,L1 DIODE IN THE TELEPHONE SET. FOR CONNECTION, USE THE STATION BUSY OPTION AS SHOWN IN THE CONNECTION SECTION OF THE TEL SET USED.
4. CONNECT TO J GROUND IF 407-TYPE KTU IS PROVIDED. CONNECT TO LT1 IF ASSOCIATED WITH UNITS GROUP OR TO LT2 IF ASSOCIATED WITH TENS GROUP.
5. REMOVE STRAP AND INSTALL 441J DIODE, PROCURE DIODE LOCALLY.

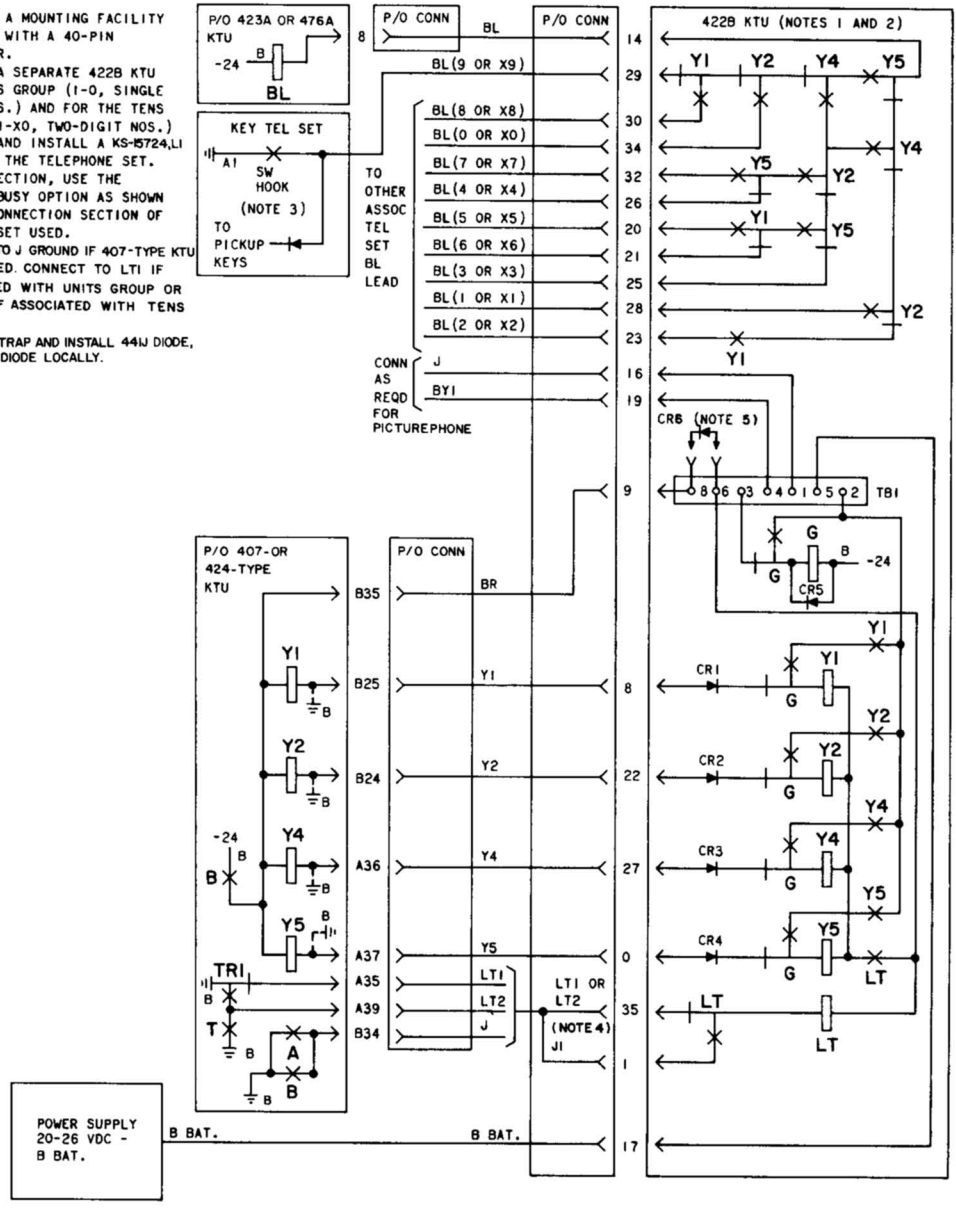
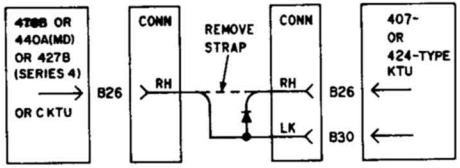


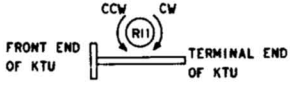
Fig. 10—Condensed Functional Schematic of 422B KTU (Station Busy Selector Circuit)

NOTES:

1. REQUIRES A MOUNTING FACILITY EQUIPPED WITH A 20- OR 40-PIN CONNECTOR.
2. WHEN ADDING DIAL TONE (T OPTION) TO A SYSTEM EQUIPPED FOR "TOUCH-TONE" (440A [MD] OR 478B OR 426A WITH 427B [SERIES 4] OR C KTUS) A 400J DIODE MUST BE INSERTED BETWEEN THE "RH" AND "LK" LEADS ON THE 407- OR 424-TYPE KTU. REWIRE AS FOLLOWS:



3. TURN KNURLED WHEEL TO FULL CLOCKWISE POSITION FOR MINIMUM DIAL TONE VOLUME AND TO FULL COUNTERCLOCKWISE POSITION FOR MAXIMUM DIAL TONE VOLUME.



OPTIONS:

R *	STATION BUSY TONE WITH INTERRUPTED AUDIBLE SIGNAL
S	AUDIBLE RINGBACK
T	DIAL TONE

*-FACTORY PROVIDED

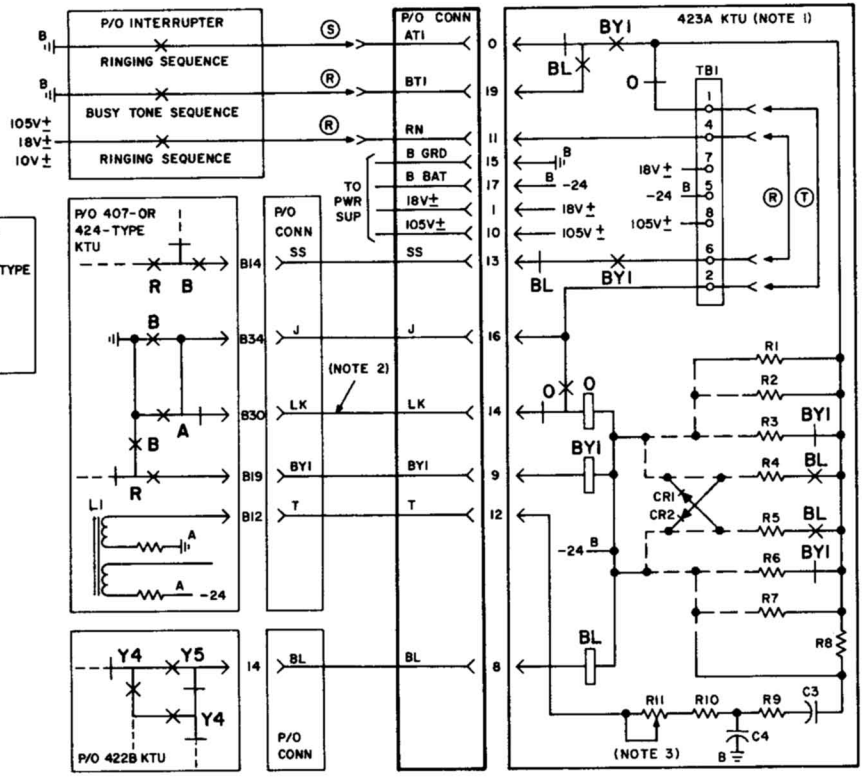


Fig. 11—Condensed Functional Schematic of 423A KTU (Dial Tone, Busy Tone, and Audible Ringback Tone)

2.08 The 423A KTU has been rerated from MD to AT&T Standard for use in nonmodular panel installations.

Note: The 423B KTU has been recoded to 476A KTU for use in modular panel installations only.

G. 424A (MD), 424B (MD), and 424C KTUs (Dial Intercom, 19-Code Selector Circuit)

2.09 The 424-type KTUs (Fig. 12) are 8-inch, 80-contact units providing the same basic features as the 407C KTU but have a capacity of 19 station codes. These KTUs provide the following:

- Rotary dial selection
- Nineteen dial codes (nine single digit and ten 2-digit).

Note: The first digit of a 2-digit code is not available as a station code.

A 424A (MD), B (MD), or C KTU can be used in a 1A2 KTS, but a 424A KTU (MD) is not to be used in place of a 424B (MD) or C KTU in the 7A or 14A Communication System. Of the 424-type KTUs, only the 424C KTU can be used with the 21A System. The 424C KTU provides a number of circuit improvements over the 424A KTU (MD) and 424B KTU (MD), such as greater tolerance to rapid TOUCH-TONE dialing and elimination of speaker clicks in COM KEY installations. Replace earlier 424-type KTUs with a 424C KTU only when customer complaints warrant.

H. 425A (MD) and 425B KTUs (Flashing Lamp Circuit)

2.10 The 425-type KTUs (Fig. 13) are 8-inch, 80-contact units that provide the control circuits for flashing lamps for up to 19 station codes in the dial selective intercom circuit. These KTUs provide the following operating features:

- Incoming call flashing lamp signal to called station
- Busy lamp signals to all other stations
- Optional interrupted ringing
- Detects when called station answers; stops interrupted ringing and flashing lamp signal
- Provides a separate switching ground for use with PICTUREPHONE® intercom (425B only).

I. 426A KTU (Amplifier, Band Separation, and Limiter Circuit)

2.11 The 426A KTU (Fig. 14) is an 8-inch, 80-contact unit comprising half of the TOUCH-TONE adapter circuit. It is used in conjunction with a 427-type KTU for TOUCH-TONE dial station selection in the 1A2 KTS dial selective intercommunicating circuit. The 426A amplifies and separates TOUCH-TONE signals into high and low frequencies for use as inputs for the 427-type KTUs. It also provides protection against false operation caused by speech or noise frequency components.

J. 427B (Series 4) and 427C KTUs (Frequency Recognition and Translation Circuit)

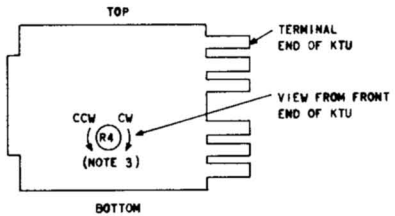
2.12 The 427B (Series 4) and 427C KTUs (Fig. 14) are 8-inch, 80-contact units comprising half of the TOUCH-TONE adapter circuit. These KTUs receive separated TOUCH-TONE frequencies from the 426A KTU and translate them into relay operations. The relay operations, in turn, energize relays in the basic selector circuit to signal the selected station.

K. 440A KTU (MD) (TOUCH-TONE Adapter Circuit)

2.13 The 440A KTU (MD) (Fig. 15) is an 8-inch, 80-contact unit consisting of two printed circuit boards permanently fastened together and requiring a single upper and lower connector. The circuitry and function are the same as that of the 426A and 427C KTUs, but are not electrically interchangeable in some mounting arrangements since the 426A and 427C KTUs each require an

NOTES:

1. REQUIRES A MOUNTING FACILITY EQUIPPED WITH TWO 914A (40-PIN) CONNECTORS MOUNTED IN A VERTICAL PLANE.
2. ANY SELECTED R LEAD (R1-R0) MAY BE ASSIGNED AS THE INITIAL DIGIT OF A 2-DIGIT CODE. THE R LEAD SO ASSIGNED MAY NOT BE USED FOR A STATION CODE.
3. RESISTOR R4 CAN BE ADJUSTED TO VARY THE RELEASE TIME OF RELAY B (FACTORY SET AT 1.5 SECONDS ON ALL CODES) AS FOLLOWS:
   424A AND 424B-TURN KNURLED WHEEL FULL COUNTERCLOCKWISE (CCW) FOR 0.5 SECOND TIMEOUT. TURN CLOCKWISE (CW) FOR INTERVAL LONGER THAN 1.5 SECONDS. AT FULL CW POSITION CYCLE MAY BE VERY LONG AND B RELAY MAY NOT RELEASE.
   424C-ADJUSTMENT OF R4 IS REVERSED ON 424C FROM 424A/B. TURN WHEEL FULL CW FOR 0.5 SECOND TIMEOUT. TURN CCW FOR TIMING LONGER THAN 1.5 SECONDS.

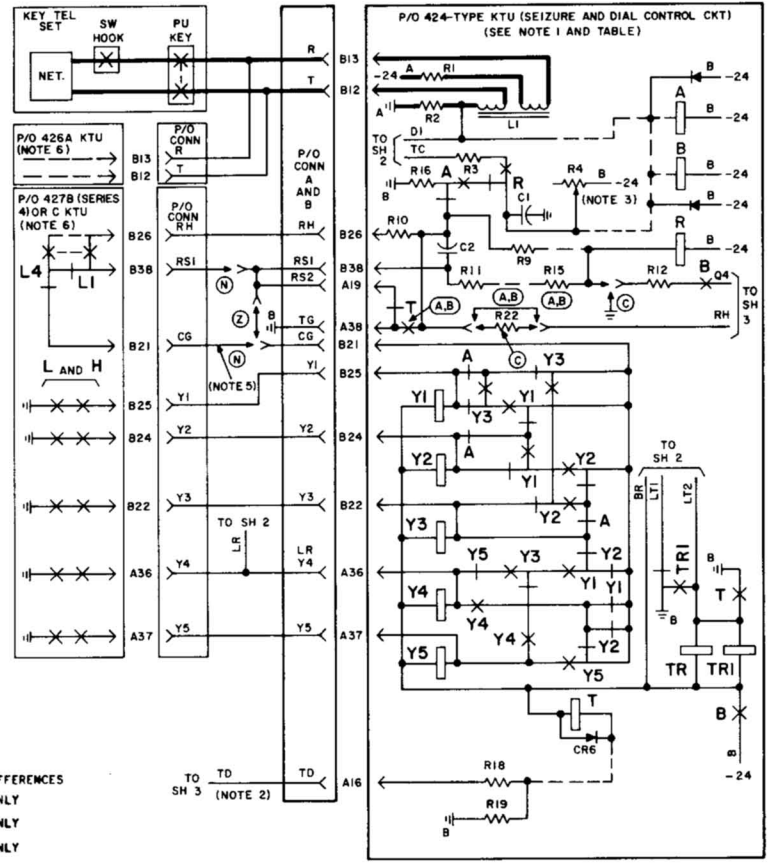


4. CONNECT LT1 TO 422B KTU ASSOCIATED WITH UNITS GROUP AND CONNECT LT2 TO 422B KTU ASSOCIATED WITH TENS GROUP.
5. IF DSS IS REQUIRED, SEE FIG. 7.
6. 440A(MD) OR 478B KTU MAY BE USED TO PROVIDE TOUCH DIALING IN PLACE OF 426A WITH 427B (SERIES 4) OR C KTUS.

OPTIONS:

Z	WITHOUT		"TOUCH-TONE" DIALING
N	WITH		
E	INTERRUPTED *	10V AC BUZZER	AUDIBLE SIGNALS
X		105V 30 HZ RINGER	
R	INTERRUPTED RING WITH STATION BUSY TONE †		USING 423A KTU
G	SINGLE SPURT †	10V AC BUZZER	
J		18V AC BUZZER	
K		DC BUZZER	
M		105V 30 HZ RINGER	
W	STEADY		LINE LAMPS
V	FLASHING		

* TO PROVIDE INTERRUPTED RINGING A 425B KTU MUST BE USED.
† STATION BUSY TONE IS NOT RECOMMENDED FOR USE WITH SINGLE SPURT RINGING.



WIRING DIFFERENCES
(A) 424A ONLY
(B) 424B ONLY
(C) 424C ONLY

Fig. 12—Condensed Functional Schematic of 424-Type KTU (Dial Intercom, 19-Code Selector Circuit) (Sheet 1 of 3)

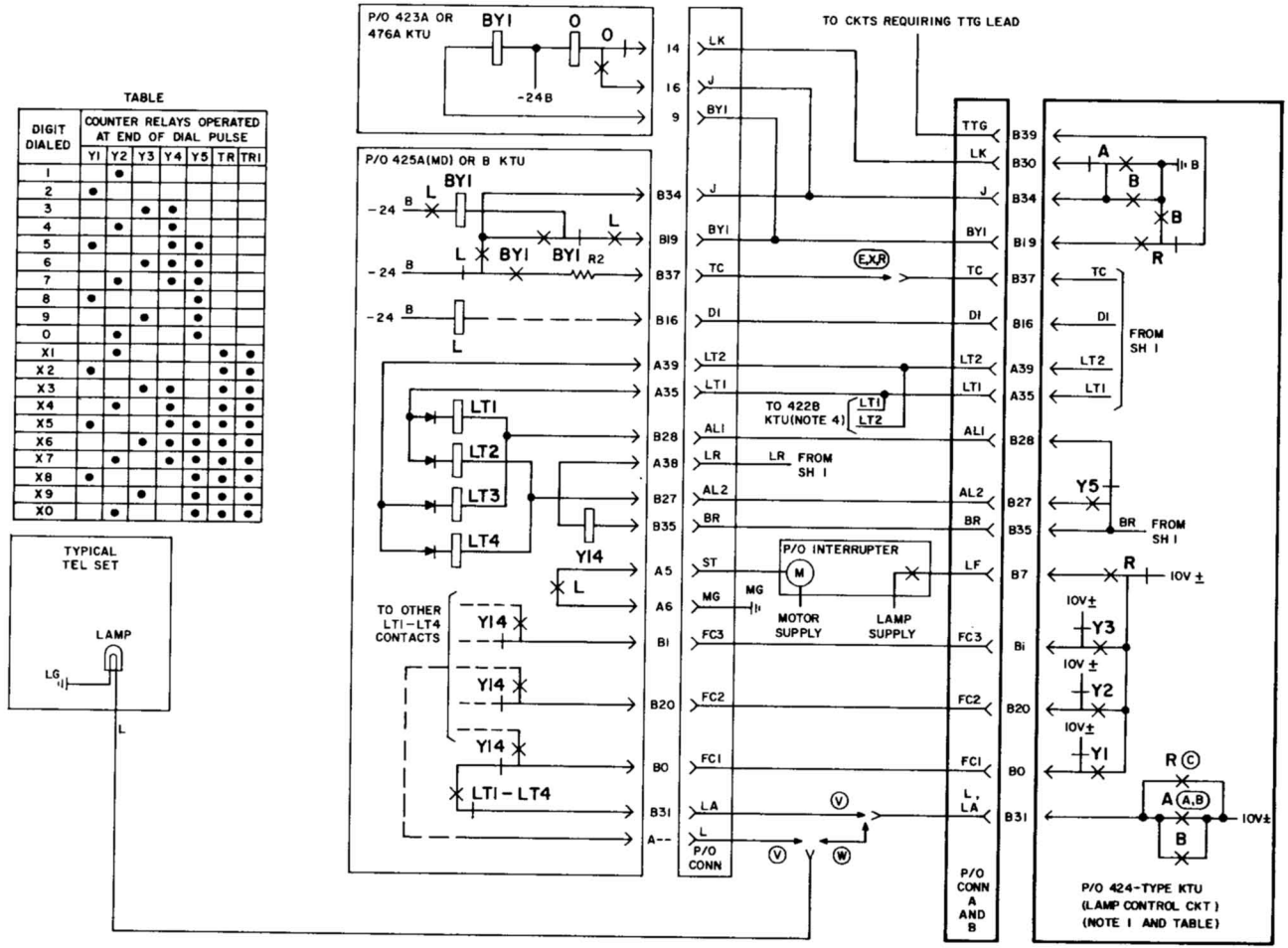


Fig. 12—Condensed Functional Schematic of 424-Type KTU (Dial Intercom, 19-Code Selector Circuit) (Sheet 2 of 3)

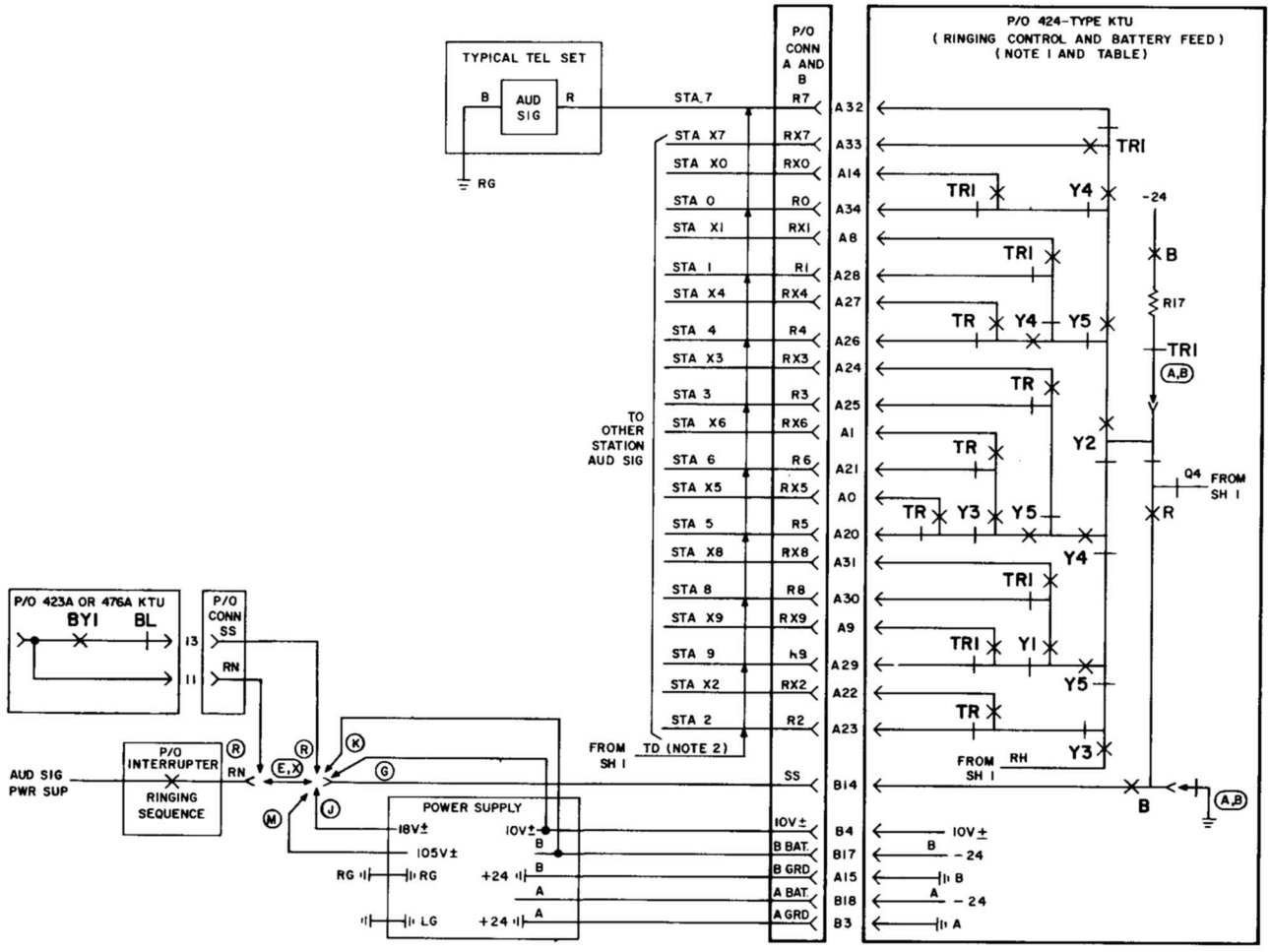


Fig. 12—Condensed Functional Schematic of 424-Type KTU (Dial Intercom, 19-Code Selector Circuit) (Sheet 3 of 3)

NOTES:
1. REQUIRES A MOUNTING FACILITY EQUIPPED WITH TWO 914A (40-PIN) CONNECTORS MOUNTED IN A VERTICAL PLANE.
2. THE 425A (MD) AND B KTUS ARE THE ONLY KTUS TO PROVIDE INTERRUPTER START CONTROL FOR ALL FUNCTIONS OF THE 1A2 DIAL INTERCOMMUNICATING SYSTEM.

OPTIONS:

X	INTERRUPTED 105V AC RINGER	
V	FLASHING LAMPS	USING 424-TYPE KTU
H		USING 407-TYPE KTU
R	INTERRUPTED RING WITH STATION BUSY TONE	USING 423A KTU

TABLE:

STA LAMP LEAD*	RELAYS OPERATED AT END OF PULSE TRAIN									
	407 OR 424					425A OR B				
	Y1	Y2	Y3	Y4	Y5	LT1	LT2	LT3	LT4	Y14
L1		●				●				
L2	●					●				
L3			●	●		●				●
L4		●		●		●				●
L5	●			●	●		●			●
L6			●	●	●		●			●
L7		●		●	●		●			●
L8	●				●		●			
L9			●		●		●			
L0		●			●		●			
LX1		●						●		
LX2	●							●		
LX3			●	●				●		●
LX4		●		●				●		●
LX5	●			●	●				●	●
LX6			●	●	●				●	●
LX7		●		●	●				●	●
LX8	●				●				●	
LX9			●		●				●	
LX0		●			●				●	

407-TYPE

424-TYPE

* NUMBER DESIGNATES STATION ASSIGNMENT. X IS FIRST DIGIT OF TWO-DIGIT CODE, WHICH CAN BE ANY DIGIT 1-0. DIGIT SO ASSIGNED, CANNOT BE A SINGLE DIGIT STATION CODE.

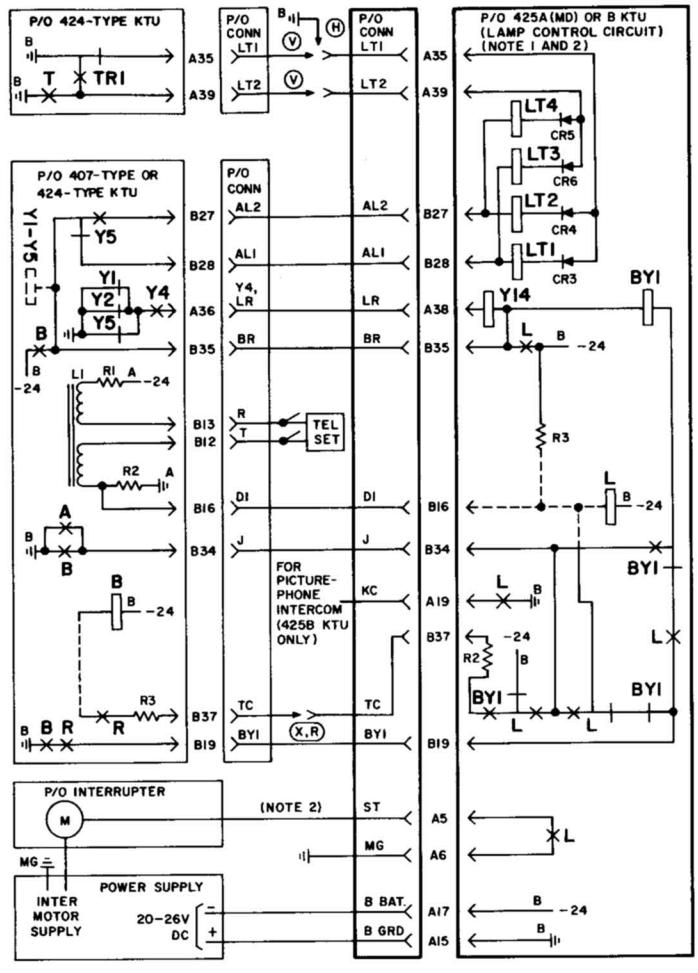


Fig. 13—Condensed Functional Schematic of 425A (MD) and 425B KTUs (Flashing Lamp Circuit) (Sheet 1 of 2)

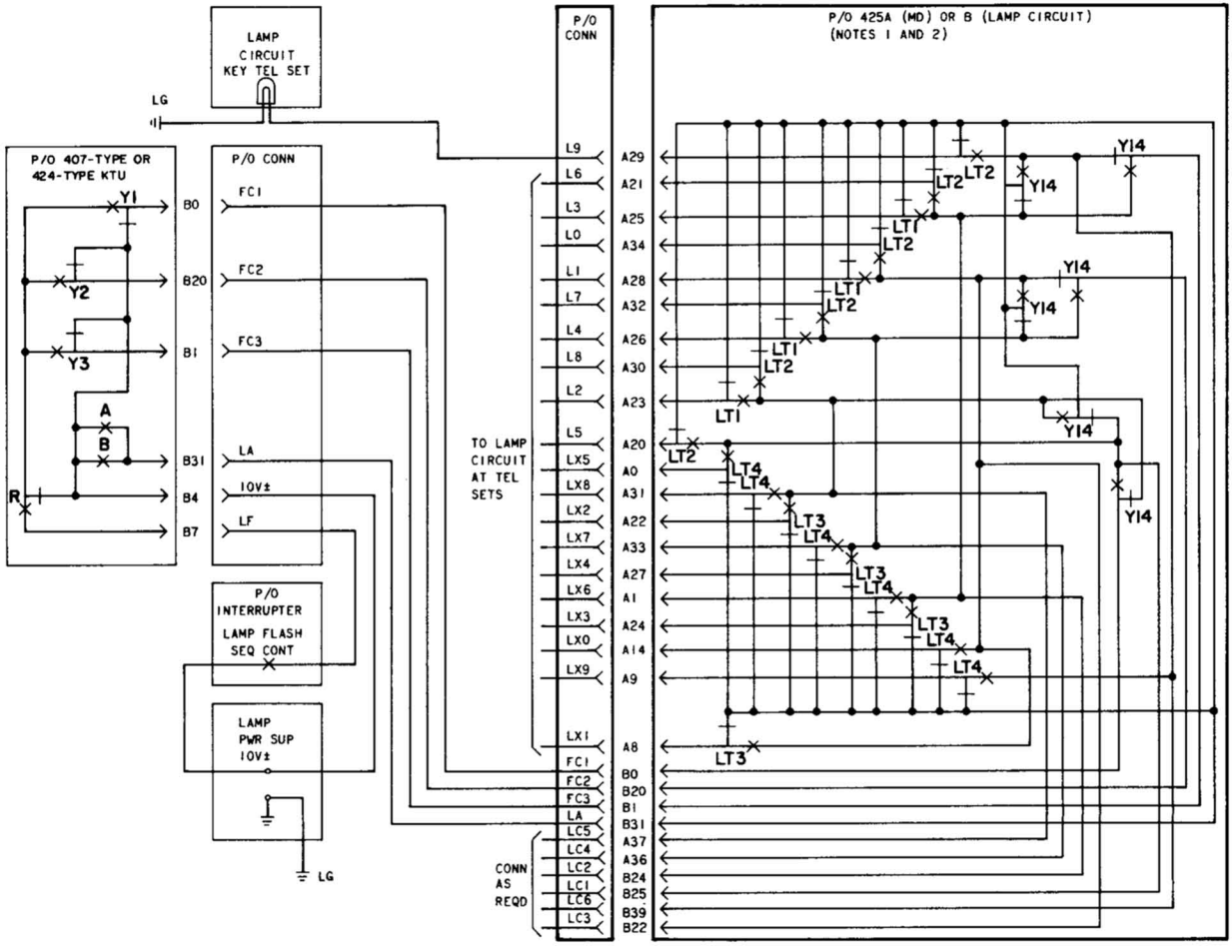


Fig. 13—Condensed Functional Schematic of 425A (MD) and 425B KTUs (Flashing Lamp Circuit) (Sheet 2 of 2)

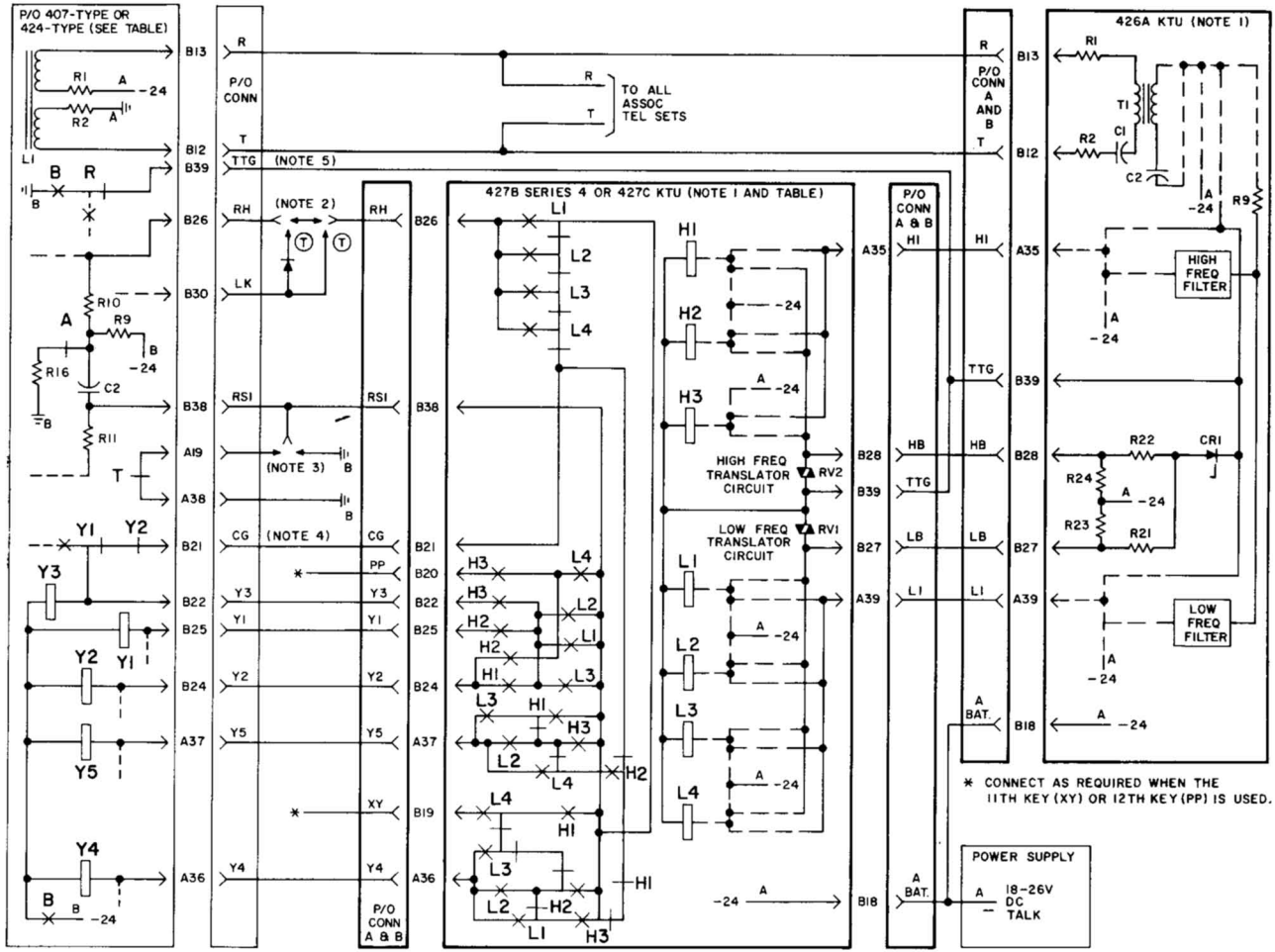


Fig. 14—Condensed Functional Schematic of 426A KTU (Amplifier, Band Separation, and Limiter Circuit) and 427B (Series 4) or 427C KTU (Frequency Recognition and Translation Circuit) (Sheet 1 of 2)

DIGIT DIALED †	1	2	3	4	5	6	7	8	9	0
HIGH AND LOW FREQ GENERATED BY TT DIAL	1209 697	1336 697	1477 697	1209 770	1336 770	1477 770	1209 852	1336 852	1447 852	1336 941
RELAYS OPERATED IN 427B, SERIES 4 OR 427C KTU	H1,L1	H2,L1	H3,L1	H1,L2	H2,L2	H3,L2	H1,L3	H2,L3	H3,L3	H2,L4
CTR RELAYS OPRD IN 407-TYPE OR 424-TYPE	Y2	Y1	Y3,Y4	Y2,Y4	Y1,Y4,Y5	Y3,Y4,Y5	Y2,Y4,Y5	Y1,Y5	Y3,Y5	Y2,Y5

NOTES:

1. EACH 426A AND 427B, SERIES 4 OR 427C KTU REQUIRES TWO 914A (40-PIN) CONNECTORS MOUNTED IN A VERTICAL PLANE.
2. T WIRING MUST BE FURNISHED ON A SYSTEM EQUIPPED WITH DIAL TONE USING A 423A KTU. DIODE IS A 400J AND MUST BE PROVIDED LOCALLY. DIODE IS NOT REQUIRED IF DIAL TONE IS PROVIDED BY A 423B KTU.
3. GROUND IS PROVIDED DIRECTLY TO THE RSI LEAD WHEN THE 407-TYPE KTU IS USED AND THROUGH A T RELAY CONTACT WHEN THE 424-TYPE KTU IS USED.
4. WHEN THE 427B, SERIES 4 OR 427C IS ADDED TO AN EXISTING SYSTEM REMOVE GROUND FROM B21 OF THE 407B KTU OR REMOVE STRAP FROM B21 TO A19 OF THE 424A KTU.
5. WHEN ADDING THE 426A AND 427B, SERIES 4 OR 427C KTU'S TO AN EXISTING SYSTEM EQUIPPED WITH A 420A KTU, A DIODE MUST BE INSTALLED IN THE TTG LEAD CONNECTING TO THE 420A KTU. SEE FIGURE 6.
6. IF DSS IS REQUIRED, SEE FIG. 7.

† SINGLE-DIGIT CODE OR 1ST OR 2ND DIGIT OF TWO-DIGIT CODE.

Fig. 14—Condensed Functional Schematic of 426A KTU (Amplifier, Band Separation, and Limiter Circuit) and 427B (Series 4) or 427C KTU (Frequency Recognition and Translation Circuit) (Sheet 2 of 2)

upper and lower connector. The 440A KTU (MD) is replaced by the 478B KTU.

L. ▶444-Type KTU (Selector Extender Circuit)

2.14 The 444-type KTU (Fig. 16) is an 8-inch, 80-contact unit which expands the 19 codes of the 424-type KTU (19-code selector circuit) to a total of 37 codes. The 444B KTU is the same as the 444A except two option plugs have been added which have application only in the 21A Communication System. In other systems, the 444B KTU should be used as supplied from the factory, ie, with the option plugs in positions 2-3 and 5-6. When using the 444-type KTU, two more transfer digits are factory assigned and these digits may not be used as station codes. Digits 2 and 3 are used as the second and third transfer digits.

M. 454-Type KTU (3-Path Intercom Access Circuit)

2.15 The 454-type KTU (Fig. 17) is an 8-inch unit that contains three separate intercom paths. Path selection is based on operation of an associated intercom button on the key telephone sets. The 454-type KTU also provides dial tone, seizes the code selector, and provides flashing lamp signal during selection and steady lamp during busy mode.

N. 460-Type KTU (2-Path Intercom Access Circuit)

2.16 The 460-type KTU (Fig. 18) is an 8-inch unit that contains two separate intercom paths. Path selection is based on operation of the associated intercom button on the key telephone sets. The unit also provides dial tone, seizes the selector, and provides a flashing lamp signal during selection and a steady lamp during the busy mode. Control circuitry permits only one intercom path to seize the selector at a time.◀

O. 476A KTU (Dial Tone, Busy Tone, and Audible Ringback Tone Circuit)

2.17 The 476A KTU (Fig. 19) is a 4-inch, 20-contact unit that provides a variable rate multivibrator to produce dial tone, station busy tone, or audible ringback tone for the dial selective intercom line circuit in modular panel installations. To provide busy tone and audible ringback tone, the multivibrator is controlled by the RN and lamp flash leads. For all tone signals, the output of the multivibrator is returned to the originating station over the tip side of the intercom line.

2.18 The 476A KTU provides the following features:

- Eliminates externally wired interrupter or relay
- Uses existing RN and LF leads for control.

The 476A KTU should be used in modular panel installation only.

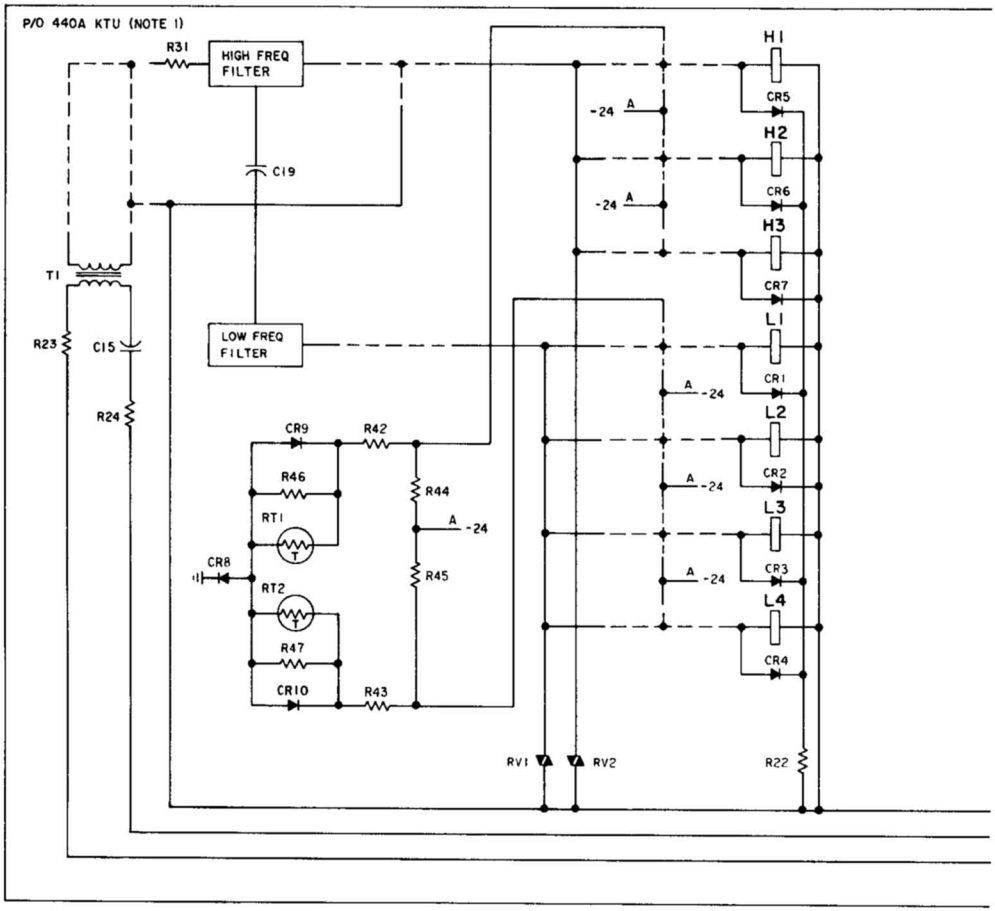
P. 478B KTU (TOUCH-TONE Adapter Circuit)

2.19 The 478B KTU (Fig. 20) is an 8-inch, 80-contact solid state unit which provides the same functions as the 440A KTU (MD). It will work with all 407- and 424-type selector circuits. The 478B KTU requires both A and B grounds; provisions are made by means of either a wiring kit or an option plug for installing the necessary grounds when they are not present in the mounting arrangement. The 478B KTU is directly interchangeable with the 440A KTU (MD) when the connectors have A and B grounds.

Q. 494A KTU (TOUCH-TONE Selector Circuit)

2.20 The 494A KTU (Fig. 21) provides basic TOUCH-TONE intercom features in a single 8-inch, 80-contact, solid-state unit. It utilizes the same mounting slot in 1A2 key service units and panels as 407- and 424-type KTUs, or the 702B KTU panel only in COM KEY 2152. The 494A KTU provides:

- TOUCH-TONE dial selection of up to 19 station codes, including 0, 2 through 9, and 10 through 19.
- Single-spurt signaling using 10-volts ac buzzers or -24 volts dc signaling devices. Signaling duration is nonadjustable and preset at nominal 1.5 seconds duration.
- Control for intercom line busy lamps.
- Capability for expansion to 37 codes, 55 codes, and multipath intercom (COM KEY ▶and 626A modular panel)◀ arrangements with the 444-, 454-, and 460-type KTUs.



DIGIT DIALED *	1	2	3	4	5	6	7	8	9	0
HIGH AND LOW FREQ GENERATED BY TT DIAL	1209 697	1336 697	1477 697	1209 770	1336 770	1477 770	1209 852	1336 852	1477 852	1336 941
RELAYS OPRD IN 440 A KTU	H1,L1	H2,L1	H3,L1	H1,L2	H2,L2	H3,L2	H1,L3	H2,L3	H3,L3	H2,L4
CTR RELAYS OPRD IN 407B OR 424A	Y2	Y1	Y3,Y4	Y2,Y4	Y1,Y4,Y5	Y3,Y4,Y5	Y2,Y4,Y5	Y1,Y5	Y3,Y5	Y2,Y5

NOTES:
1. REQUIRES A MOUNTING FACILITY EQUIPPED WITH A 80-PIN CONNECTOR.
2. WHEN THE 440A KTU IS ADDED TO AN EXISTING SYSTEM REMOVE GROUND FROM B21 OF THE 407-TYPE KTU OR REMOVE STRAP FROM B21 TO A19 OF THE 424-TYPE KTU.
3. GROUND IS PROVIDED DIRECTLY TO THE RS1 LEAD WHEN THE 407B-TYPE KTU IS USED AND THROUGH A T RELAY CONTACT WHEN THE 424A-TYPE KTU IS USED.
4. T WIRING MUST BE FURNISHED ON A SYSTEM EQUIPPED WITH DIAL TONE. DIODE IS A 400J AND MUST BE PROVIDED LOCALLY.
5. WHEN ADDING THE 440A KTU TO AN EXISTING SYSTEM EQUIPPED WITH A 420A KTU, A DIODE MUST BE INSTALLED IN THE TTG LEAD CONNECTING TO THE 420A KTU. SEE FIGURE 7.

* SINGLE-DIGIT CODE OR 1ST OR 2ND DIGIT OF TWO-DIGIT CODE.

Fig. 15—Condensed Functional Schematic of 440A KTU (MD) (TOUCH-TONE Adapter Circuit) (Sheet 1 of 2)

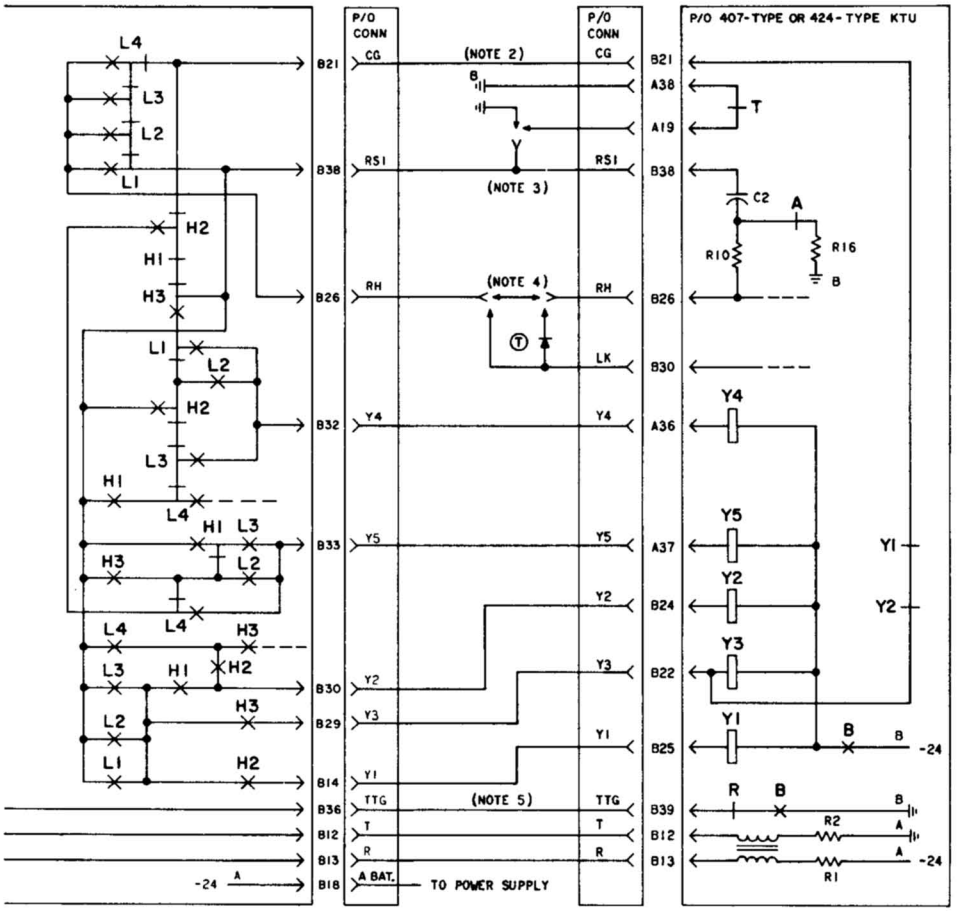


Fig. 15—Condensed Functional Schematic of 440A KTU (MD) (TOUCH-TONE Adapter Circuit) (Sheet 2 of 2)

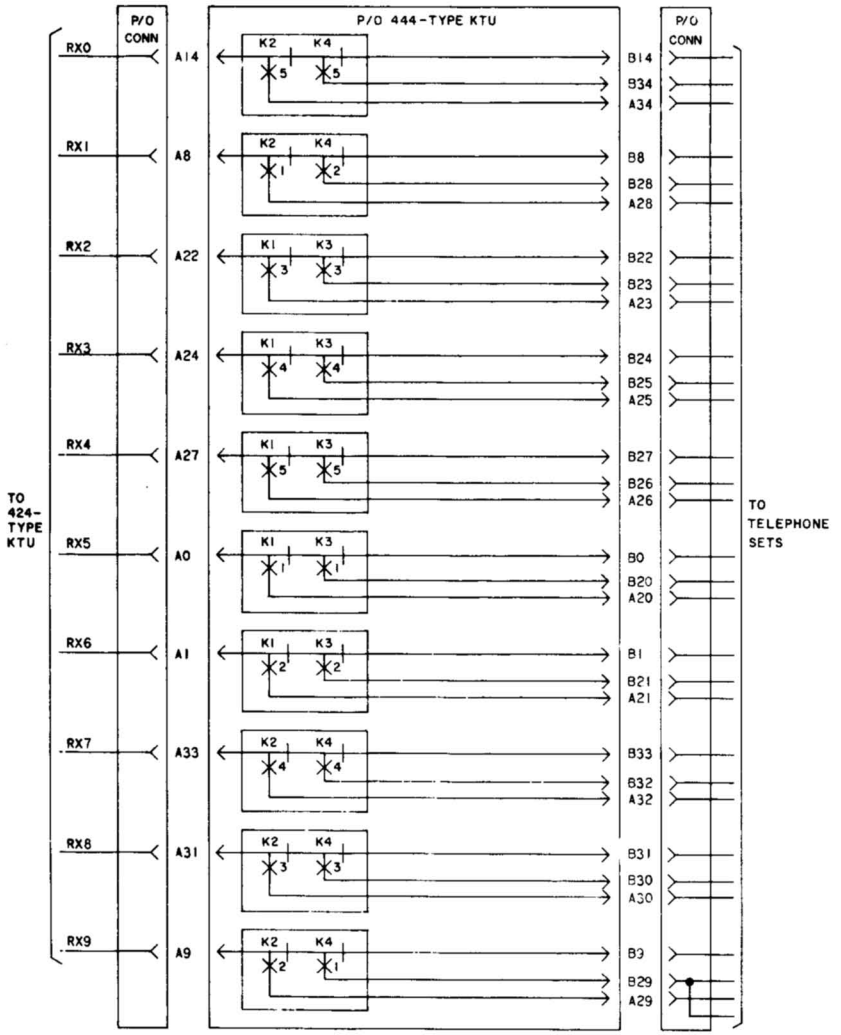


Fig. 16—Condensed Functional Schematic of 444-Type KTU (Selector Extender Circuit) (Sheet 1 of 2)

Deluxe intercom features, including flashing lamps at called stations, audible ringback and busy tone, cannot be provided.

2.21 Lead connections are the same as for the 424C KTU except that an additional pair of tip and ring contacts are available for use in COM KEY 2152.

2.22 The initial digit 1 is always treated as the first digit of a 2-digit code; therefore, no strapping of a transfer digit is required for basic 19-code selector operation. Digits 2, 3, 4, and/or 5 may be used as transfer digits when operation

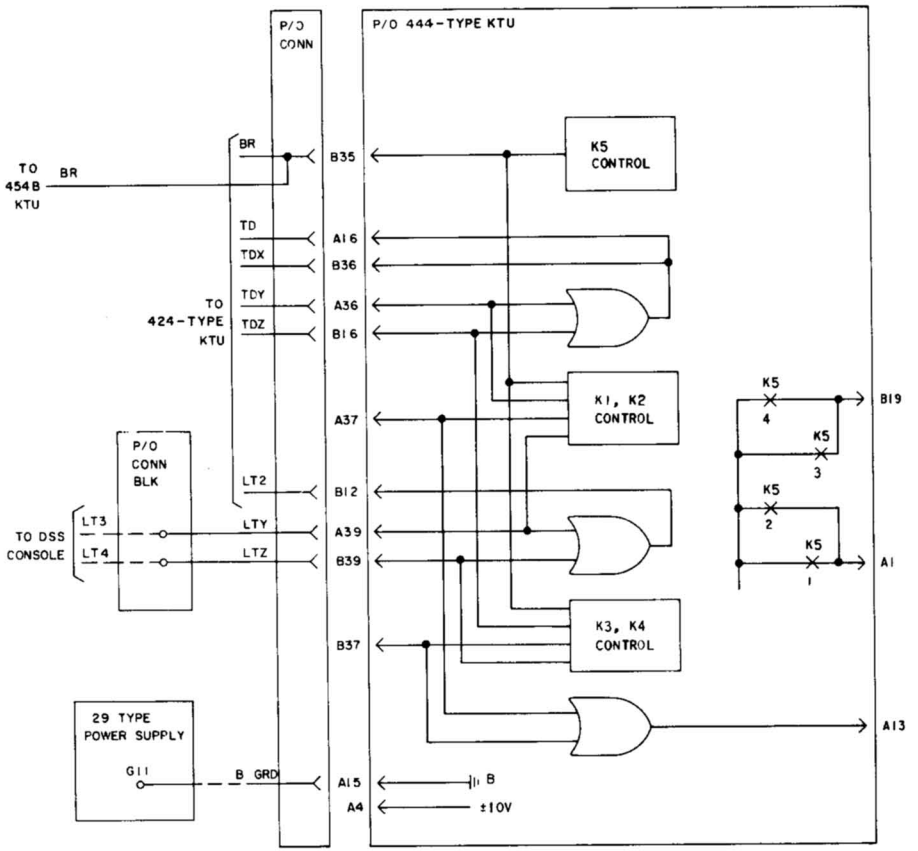


Fig. 16—Condensed Functional Schematic of 444-Type KTU (Selector Extender Circuit) (Sheet 2 of 2)

is extended to 37 or 55 codes using the 444-type KTU (selector extender).

Note: Once selected, the first digit of a 2-digit code is not available as a single-digit station code.

2.23 Screw switches S1 and S2 must be in the open position to disconnect the internal battery feed circuit for button-per-path intercom arrangements, eg, COM KEY, or 626A modular panel (option FW or S). Single path 1A2 intercoms require S1 and S2 switches be closed.

Warning: Failure to open S1 and S2 switches in button-per-path arrangements may cause damage to 494A CP.

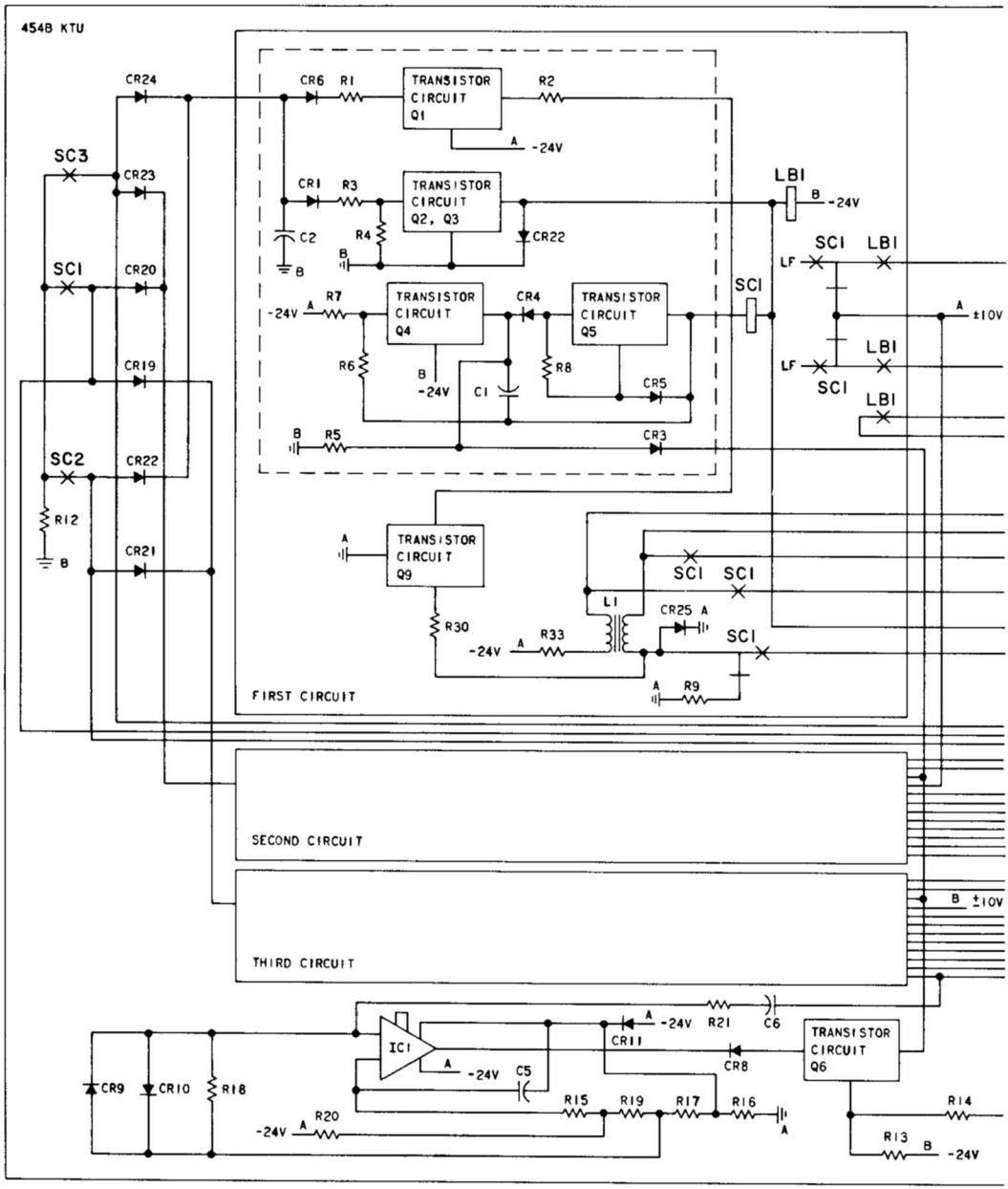


Fig. 17—Condensed Functional Schematic of 454-Type KTU (3-Path Intercom Access Circuit) (Sheet 1 of 2)

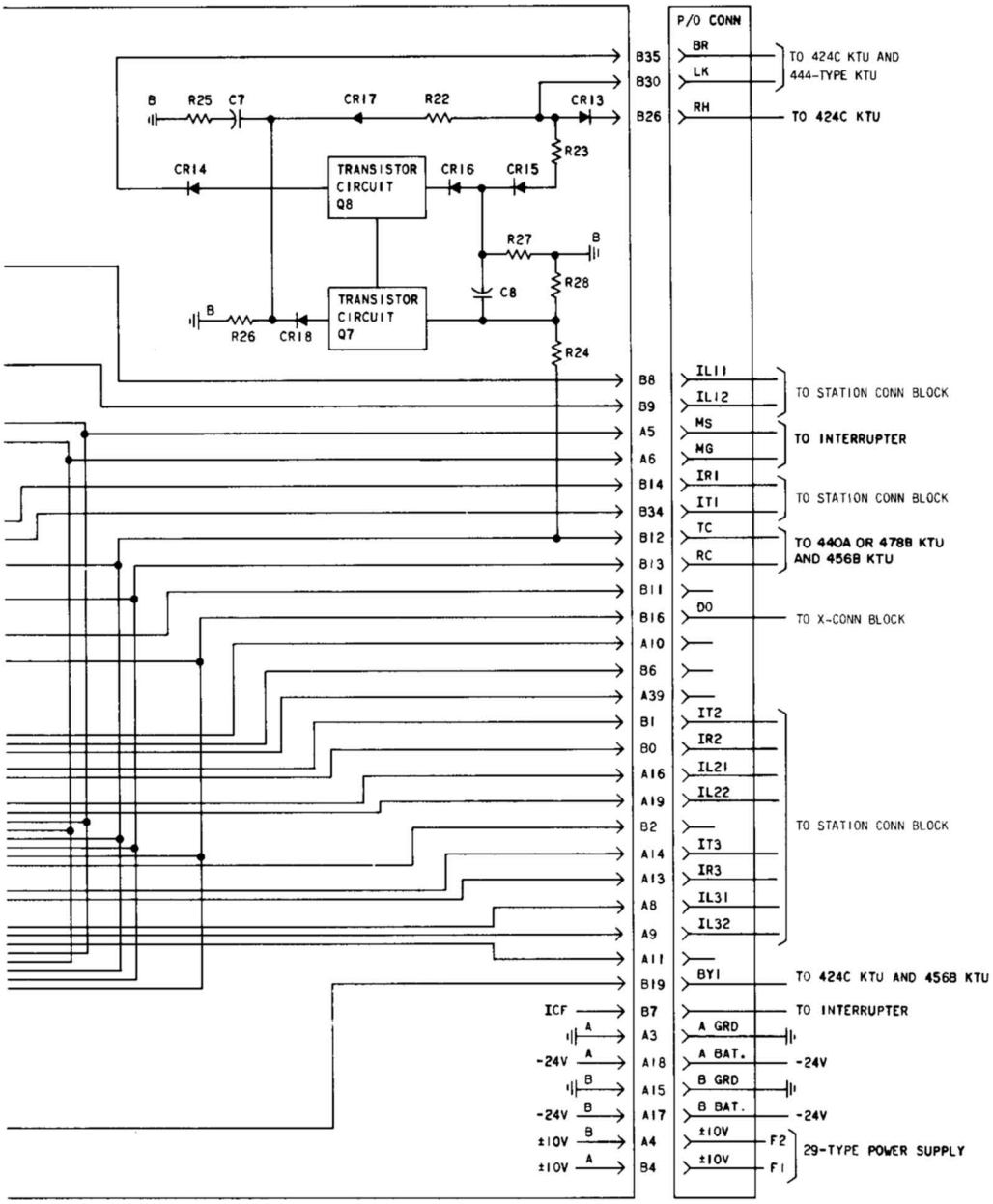


Fig. 17—Condensed Functional Schematic of 454-Type KTU (3-Path Intercom Access Circuit) (Sheet 2 of 2)

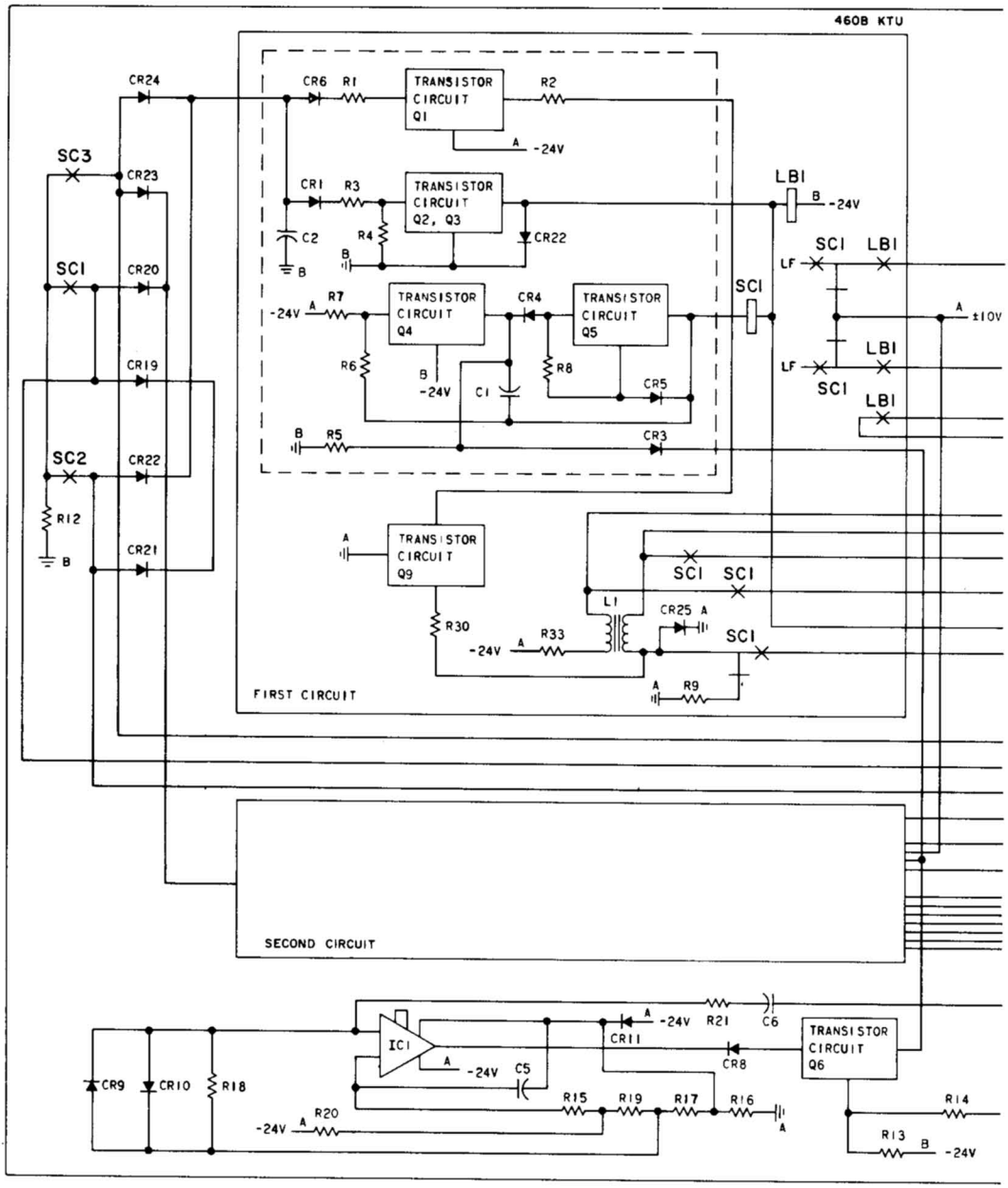


Fig. 18—Condensed Functional Schematic of 460-Type KTU (2-Path Intercom Access Circuit) (Sheet 1 of 2)

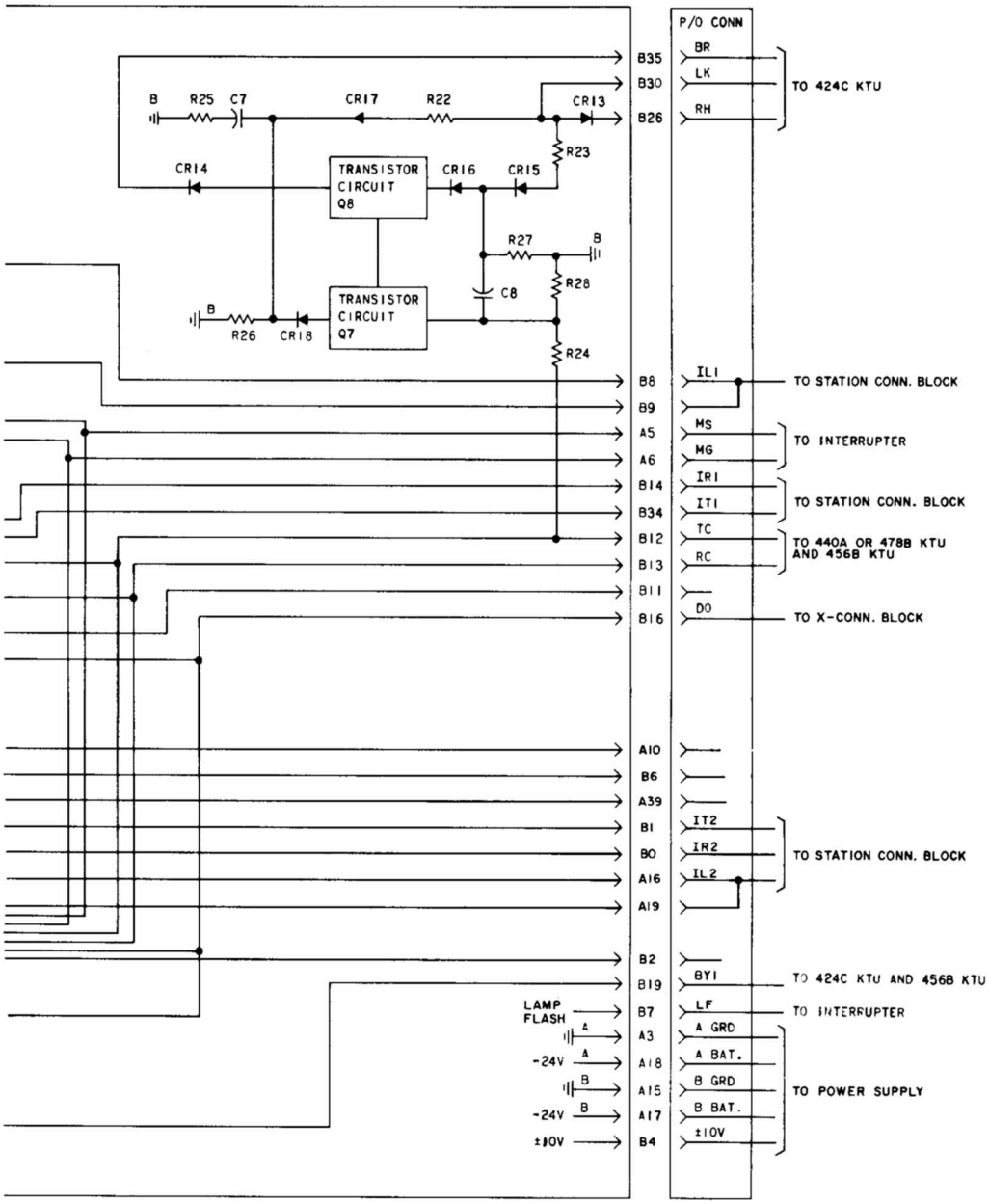
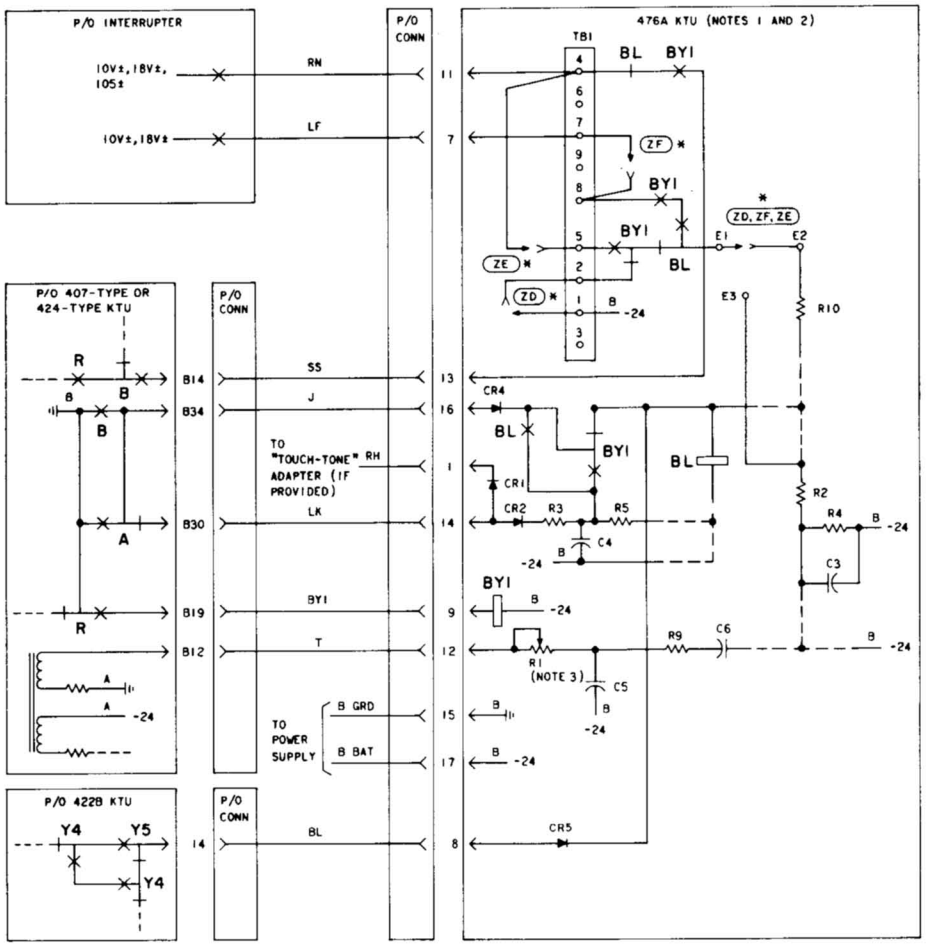
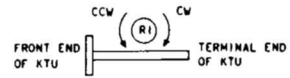


Fig. 18—Condensed Functional Schematic of 460-Type KTU (2-Path Intercom Access Circuit) (Sheet 2 of 2)



NOTES:

1. REQUIRES A MOUNTING FACILITY EQUIPPED WITH 20 OR 40 PINS.
2. THE 476A KTU CAN ONLY BE USED IN MODULAR PANEL INSTALLATIONS.
3. TURN KNURLED WHEEL TO FULL CLOCKWISE POSITION FOR MINIMUM DIAL TONE VOLUME AND TO FULL COUNTERCLOCKWISE POSITION FOR MAXIMUM DIAL TONE VOLUME.



OPTIONS:

APPLICATION	"E" TERMINAL STRAPPING	OPTION	
AC OR NEGATIVE VOLTAGE CONTROL	E1 TO E2 *	DIAL TONE	ZD *
		STATION BUSY TONE	ZF *
		AUDIBLE RINGBACK	ZE *

* FACTORY PROVIDED STRAPPING

Fig. 19—Condensed Functional Schematic of 476A KTU (Dial Tone, Busy Tone, and Audible Ringback Tone)

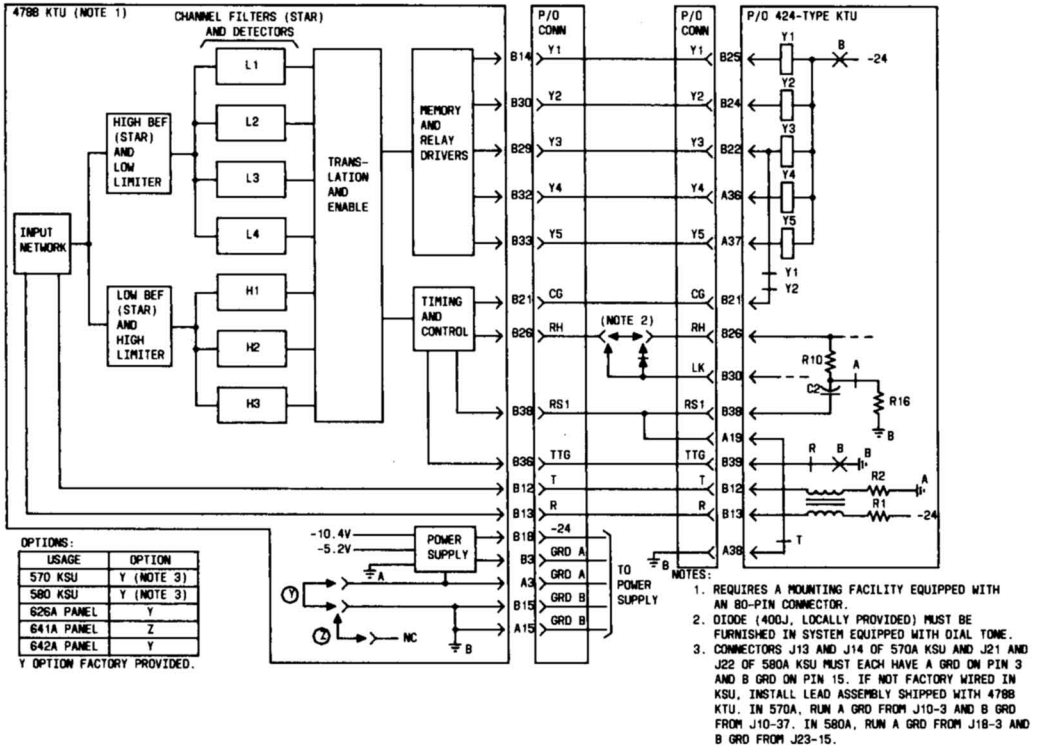
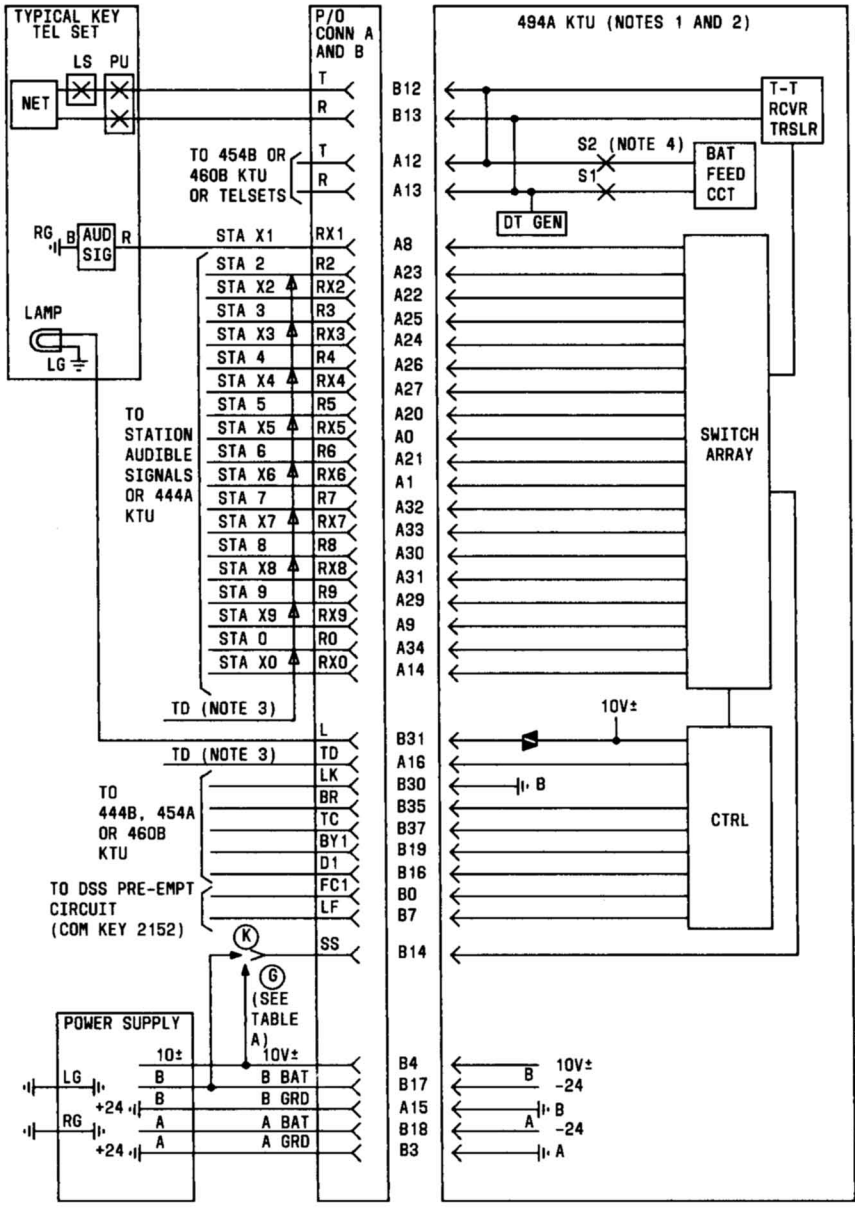


Fig. 20—Condensed Functional Schematic of 478B KTU (TOUCH-TONE Adapter Circuit)

2.24 ▶The 626A panel measures 8-1/2 inches wide, 18-1/2 inches high, and 6 inches deep. It is equipped with eight 914B connectors paired vertically to accept 4- or 8-inch KTUs. The 626A panel is designed for use with the 1A2 KTS. It serves as a means for providing a number of button-per-path type dial intercoms. The 626A panel can accommodate intercom configurations of 1, 2, or 3 paths with capacities of 19 or 37 stations. Intercom paths are selected by operation of the associated button on KTSs. Rotary and/or TOUCH-TONE dialing can be provided. Lead terminations are provided in a quick-connect field to facilitate connecting optional features and for connecting to station blocks of a 1A2 KTS cross-connect field.◀



NOTES:

1. REQUIRES A MOUNTING FACILITY EQUIPPED WITH TWO 914A (40-PIN) CONNECTORS MOUNTED IN A VERTICAL PLANE.
2. SINGLE-SPURT SIGNAL IS NON-ADJUSTABLE AND PRESET AT NOMINAL 1.5 SECONDS DURATION.
3. DIGIT 1 ALWAYS FIRST DIGIT OF 2-DIGIT CODE; THEREFORE, NO STRAPPING FOR TD REQUIRED IN 19-CODE SYSTEM. DIGITS 2, 3, 4, AND/OR 5 MAY BE ASSIGNED AS INITIAL DIGIT OF 2-DIGIT CODE VIA TD STRAPPING. ONCE SELECTED, TD-CODE MAY NOT BE USED AS SINGLE DIGIT CODE.
4. SET SCREW SWITCHES S1 AND S2 AS FOLLOWS:
   - SINGLE-PATH INTERCOM -CLOSED (FULL CW)
   - COM KEY OR MULTIPATH INTERCOM -OPEN (CCW)

TABLE A

OPTION	AUD. SIG. REQUIREMENTS
G	10 VAC
K	-24 VDC

Fig. 21—Condensed Functional Schematic of 494A KTU (TOUCH-TONE Selector Circuit) (Sheet 1 of 2)

TABLE B
494A KTU USABILITY

MOUNTING APPARATUS OR PANEL				
COM	718 (7A)			*
	1434 (14A)			*
KEY	2152 (21A)	PANEL 702	A	NO
			B	YES
APPARATUS MOUNTING	69G			YES
	110A			YES
KEY SERVICE UNIT	513-,515-			YES
PANEL	601A			YES
	602A			NO
MODULAR PANEL	626A			YES
	641A			YES

* 478B KTU RECOMMENDED IN THESE SYSTEMS

Fig. 21—Condensed Functional Schematic of 494A KTU (TOUCH-TONE Selector Circuit) (Sheet 2 of 2)