KEY TELEPHONE SYSTEMS

ITT K-347 ( ) 962 KEY TELEPHONE UNIT INSTALLATION AND CONNECTIONS

1. GENERAL

1.01 This practice provides the application, description, installation and maintenance procedures for the ITT-Telecommunications Type K-347 B and C Key Telephone Units. The K-347 B and C KTU's are used in 1A1 and 1A2 Key Telephone Systems to provide touch-tone dial selective intercom. See Figures 1 and 2.

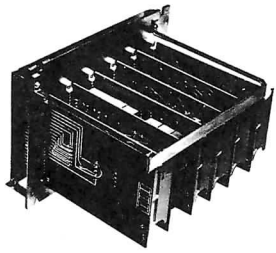


FIGURE 1. K-347 (C) 962 Key Telephone Unit, Front View Shown with K-316 (A) 962 installed.

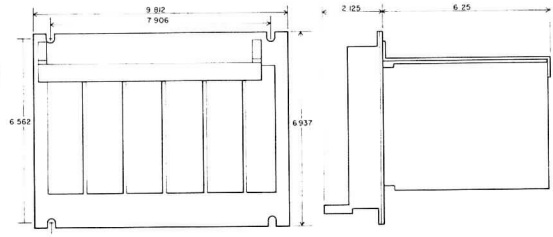


FIGURE 2. K-347 (C) Dimensions.

1.02 The KTU's are identified by a code number stamped on the mounting panel. Approximate dimensions are 9-1/4 inches long by 7 inches high by 8-1/2 inches deep. The units mount on standard KSU frames. See Table C for ordering information.

a. K-347(B)962–Consists of a mounting panel, four plug-in cards (A1, A2, A3 and A4 positions), a card retaining bracket and associated hardware.

b. K-347(C)962–Same as K-347(B)962 except five plug-in cards (A00, A1, A2, A3 and A4 positions).

2. APPLICATIONS

2.01 The K-347(B)962 is designed for use in conjunction with a 207C KTU dial selective intercom circuit to provide a maximum of nine rotary dial or touch-tone stations. The intercom system may be expanded to 18 stations by adding a 216A transfer circuit and a 180255 auxiliary card which plugs into the A3 card of the K-347(B).

2.02 The K-347(C)962 is designed for use in a touch-tone installation to provide a maximum of ten touch-tone intercom stations. The intercom system may be expanded to 19 stations by adding the 316(A)962 transfer circuit. The K-347(C) normally mounts in the same position as a 207C KTU and 216A transfer circuit in the Key Service Unit.

3. DESCRIPTION

3.01 The K-347(C) KTU permits the use of touch-tone (pushbutton dial) telephone instruments with a 1A1 or 1A2 Key Telephone System for dial selective intercom. Pairs of voice frequency tones generated by the pushbutton dial are used for transmitting digital information from the subset to the KTU. The K-347(C) receives the dual frequency signals and converts them into relay operations which select and signal the dialed station.

3.02 The basic K-347(C) KTU (for 10 stations) is made up of 5 plug-in printed circuit cards, coded as follows: A00, A1, A2, A3 and A4.

a. A00 CARD: Provides battery feed (talking battery) to the telephone subset and transmits the dual frequencies generated by the dial to the A1 card.

b. A1 CARD: Provides multiple functions:

(1) The input circuit receives the dial signals and isolates them from the DC talking circuit.

(2) The input amplifier adjusts all tones received to the same amplitude.

(3) The high band filter and limiter and the low band filter and limiter separate the dual frequencies into their respective bands. (Each dual frequency signal consists of a high band frequency and a low band frequency. See Figure 3.)

(4) The filter and trigger circuits, (one circuit for each of the seven frequencies which can be generated by the pushbutton dial). Channel each frequency into its proper function.

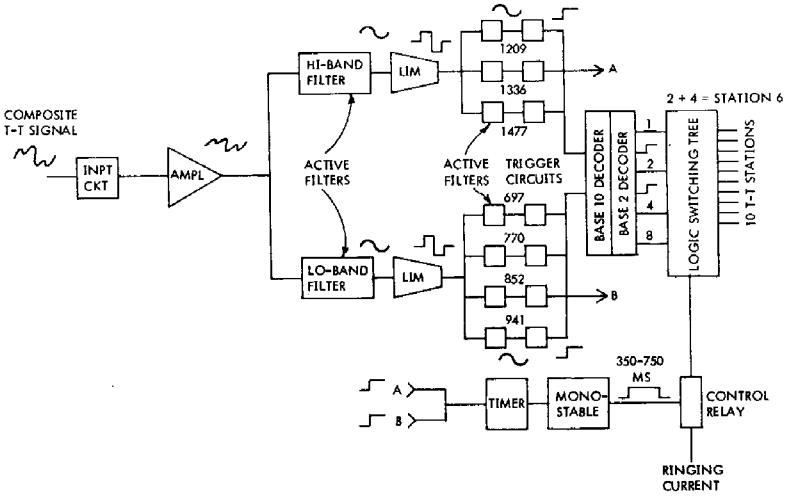


FIGURE 3. Block Diagram Illustrating General Operations.

c. A2 CARD: Provides base 10 and base 2 decoding functions. The combination decodes the high and low combination T.T. frequencies to base 2 digits to be accepted by the A4 card (Logic Switching Tree).

d. A3 CARD: Provides timing functions. It checks the duration of the input signal and controls the duration of audible signaling current to the A4 card (Logic Switching Tree). The duration of the audible signal is factory strapped for 750 milliseconds. To change the duration to 350 milliseconds, remove strap from between C3 and C5 on the A3 card.

e. A4 CARD: A transistor driven relay switching tree which passes the audible signaling current to the selected station.

3.03 The K-347(C) KTU for use with 19 stations requires the addition of the A3 AUX and the A5 cards. The A3 AUX card plugs into the A3 card and provides a transfer circuit for the operation of the A5 card. The A5 card is a relay switching tree which passes the audible signaling current to the selected station assigned in the 21 thru 20 digit group.

3.04 The working limits of the K-347(C) KTU are as follows:
20 to 26 volts DC: 90-105 volts 30 Hz for ringers, or
9-11 volts 60 Hz for buzzers.

3.05 Input signal requirements are as follows:

FREQUENCY:

DIGIT	TONE PAIR (HZ)
1	697 + 1209
2	697 + 1336
3	697 + 1477
4	770 + 1209
5	770 + 1336
6	770 + 1477
7	852 + 1209
8	852 + 1336
9	852 + 1477
0	941 + 1336
*	941 + 1209
#	941 + 1477

Frequency Bandwidth:	±2½% about center frequency
Input Level:	-22 to +5 dbV per frequency with a maximum difference in amplitude of 10 db between the two tones comprising a tone pair.
Signal Duration:	40 milliseconds, minimum
Interdigital Interval:	40 milliseconds, minimum
Input Impedance:	Approximately 40,000Ω
Power Supply:	-20 volts DC to -28 volts DC
Temperature Range:	0°C to 55°C operating and -25°C to 85°C non-operating

Minimum Digit recognition time – 40 milliseconds

4. INSTALLATION

4.01 If mounting the unit in a wall cabinet, install it behind the mounting frame using the four 1-1/4 inch machine screws and spacers provided. If mounting in a floorstand cabinet, use the 3/8 inch machine screws provided and mount the unit in the normal manner. In the 501 KSU type wall cabinet, it may be necessary to move the connecting blocks to the higher position. In the 511 KSU type wall cabinet, remove the acoustic padding from inside the cover to allow clearance for the K-347 KTU.

4.02 If the unit is to be used in an all touch-tone system, remove the 207 C KTU and 216A transfer circuit if present and install the K-347 in their place. If the unit is to be used in a mixed touch-tone and rotary dial system, space must be provided near the 207C.

4.03 Connecting the K-347(B) or (C)962 Key Telephone Unit is accomplished as follows:

CAUTION: When connecting, be sure that A Battery and A Ground leads are terminated on terminals 9B and 10B respectively. Otherwise *damage to the printed cards may result.*

a. For an all touch-tone system (see Figures 4 and 5), on terminal block B of the 501 Key Service Unit:

(1) Strap from 17 to 37.

(2) Connect one end of a 4 foot wire, any color, to terminal 38, spudger into main cable arm and bring out in long sub-arm in group of conductors for termination on the K-347. For 10 stations, terminate the 4 foot wire on terminal 11A of the K-347; for 19 stations, terminate the wire on terminal 1A.

(3) Terminate other conductors as shown in Figures 4 and 8 for 10 stations or in Figure 5 for 19 stations.

(4) Plug A00, A1, A2, A3 and A4 cards, *with printed circuit side to the left,* into designated connectors. For 19 stations, also plug in the A5 card and install the A3 Auxiliary card on the A3 card.

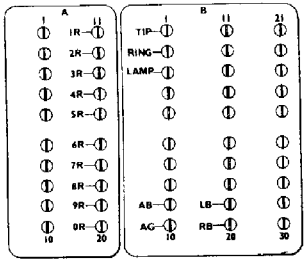


FIGURE 4. Connections for 10 Touch Tone Stations.

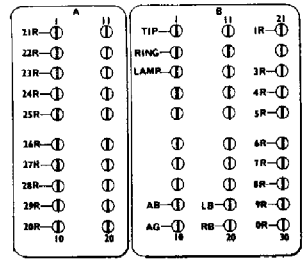


FIGURE 5. Connections for 19 Touch Tone Stations.

b. For mixed touch-tone and rotary dial stations (see Table A), connections are accomplished as follows:

(1) Install the 207C KTU in the normal manner for rotary dial intercom. For 18 stations, install the 216A transfer circuit in the normal manner also.

(2) Mount the 347(B) near the 207C and strap between the two units as shown in Table A. For 18 stations strap between the 347(B) and the 207C and the 216A as shown in Table A. Note diodes.

(3) Plug A1, A2, A3 and A4 cards into their designated connectors. For 18 stations, install the A3 Auxiliary card on the A3 card.

TABLE A. Connecting K-347(B) to 207C KTU and 216A Transfer Circuit.

207 C	K-347 B	216 A
12A	12A	
13A	13A	
14A	14A	
15A	15A	
16A	16A	
17A	17A	
18A	18A	Diodes
19A	19A	(1N2070 or any diode rated 750 ma, 600 v peak reverse voltage)
20A	20A	
1B	4B	
2B	2B	
"A Bat"	9B	
"A Ground"	10B	
"Sig Bat"	20B	
	6B	33
		32

NOTE: If shorter signal is desired, remove strap from terminals C3 and C5 on A3 Card.

4.04 *Intercom Station Digit Assignment*—Since the wiring of the 501 KSU has been revised to accommodate the use of the K-347(C) KTU, revised station digit assignment is also necessary. Terminate Station Audible Signal conductors according to Figures 6 and 7.

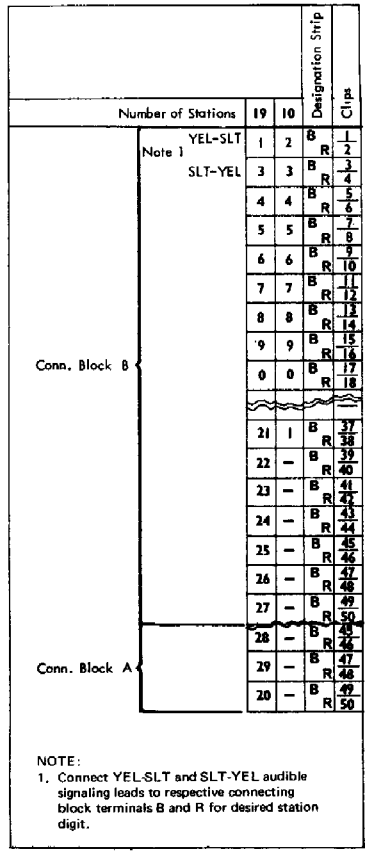
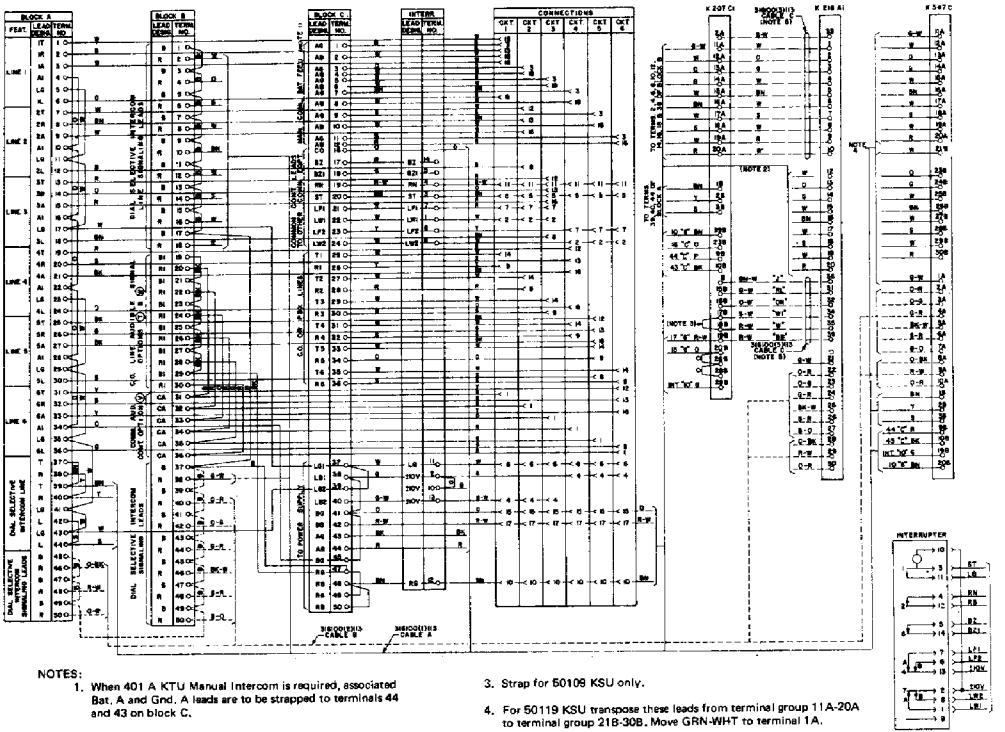


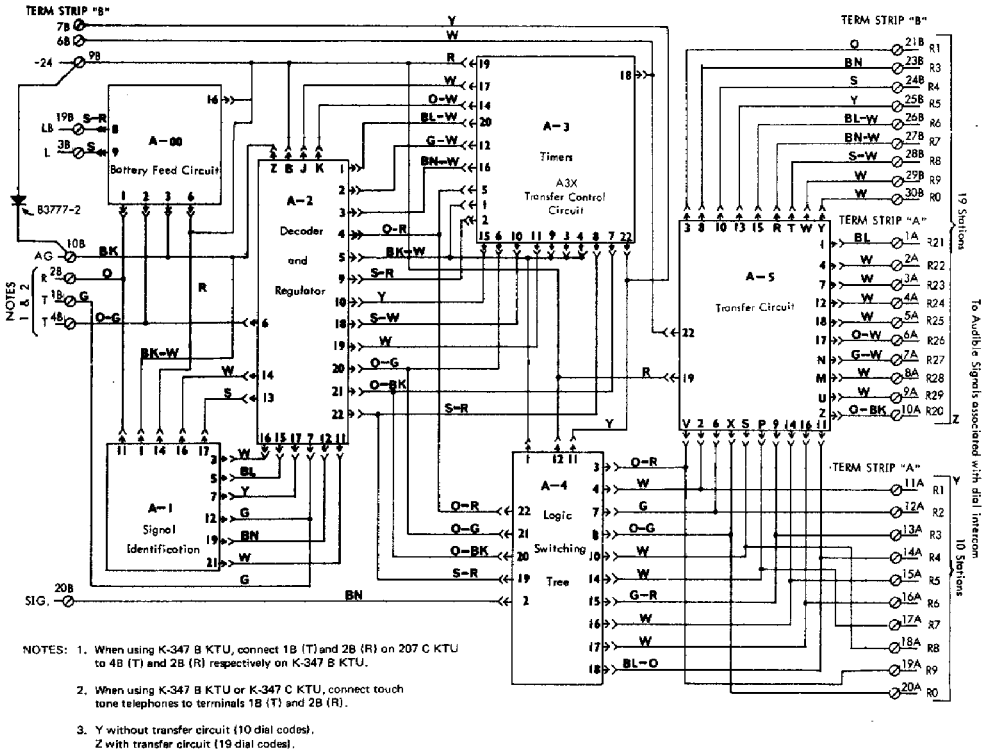
FIGURE 6. Intercom Station Digit Assignment.



NOTES:

1. When 401 A KTU Manual Intercom is required, associated Bat, A and Gnd. A leads are to be strapped to terminals 44 and 43 on block C.
2. For 50118 KSU transpose these leads from 207 C to 216 A.
3. Strap for 50109 KSU only.
4. For 50119 KSU transpose these leads from terminal group 11A-20A to terminal group 21B-30B. Move GRN-WHT to terminal 1A.
5. Cable "C" is used only on K 50118 KSU.

FIGURE 7. K-501 Key Service Unit Schematic.



NOTES:
1. When using K-347 B KTU, connect 1B (T) and 2B (R) on 207 C KTU to 4B (T) and 2B (R) respectively on K-347 B KTU.
2. When using K-347 B KTU or K-347 C KTU, connect touch tone telephones to terminals 1B (T) and 2B (R).
3. Y without transfer circuit (10 dial codes).
Z with transfer circuit (19 dial codes).

FIGURE 8. Block Diagram Showing System Connections.

5. MAINTENANCE

5.01 Maintenance of the K-347 KTU is limited to replacing printed circuit cards as indicated in Troubleshooting Procedure below.

5.02 Troubleshooting consists generally of checking for correct installation and for proper relay operation. Table B gives test procedure and relay operation. Figure 9 shows location of relays on the A4 card.

5.03 Troubleshooting Procedure is accomplished as follows:

CAUTION: Always disconnect 110 volts AC power source before installing or removing cards, tracing wiring or making corrections in system.

a. Disconnect 110 volts AC power source.

b. Check power supply fuses.

c. Check that the A battery lead is terminated on 9B and that A ground is terminated on 10B of K-347.

d. Visually inspect for loose connection.

e. Be sure all printed circuit cards are plugged in properly and securely. Codes A00, A1, A2, A3, A4 and A5 are shown on each respective card and under each respective connector. *The printed circuit side of each card should be on the left.* If trouble shooting a 19 station system, be sure the A-3X card is plugged into the A3 card securely.

f. Connect power source.

g. Use a connected telephone which is near the key service unit to perform tests indicated in Table B and observe relays and audible signaling. Replace printed circuit cards as indicated. If replacing the card which apparently failed does not correct malfunction, isolate trouble as follows:

(1) Disconnect power.

(2) Remove all printed circuit cards except the A00 and the A2.

(3) Connect power and perform on-hook, off-hook procedure:

(a) Relay on both cards operate: go to step (4).

(b) Relay on A00 operates, relay on A2 fails: replace A2 card and repeat on-hook, off-hook cycle. If relay still fails, return K-347 KTU to the factory for repair.

(c) Relays on A00 and on A2 fail: replace A00 card and repeat on-hook, off-hook cycle. If relay on A00 operates and relay on A2 fails, see (b), above. If both relays fail, return K-347 KTU to the factory for repair.

(4) Plug in all cards and perform the tests indicated in Table B.

(a) Relays operate properly and audible signals operate at the dialed stations: end troubleshooting.

(b) Relays operate properly but audible signals do not: check for incorrect audible signal connections.

(c) Relays on A00 and A2 operate, but relays 1, 2, 4, or 8 on A4 fails, replace the A4 card. Repeat test. If new A4 card fails, return K-347 KTU to the factory for repair.

(d) Relays on A00 and A2 operate; relays 1, 2, 4 and 8 on A4 operate as indicated in Table B; relay G on A4 fails to operate for 350 milliseconds or 750 milliseconds: replace A3 card. Repeat test. If G relay still fails, replace A4 card. If G relay still fails, return K-347 KTU to the factory for repair.

(e) If troubleshooting a 19 station system, and relays on A5 fail, replace A-3X card (mounted on A3) and repeat test. If A5 relays still fail, replace the A3 card. If A5 relays still fail, replace the A5 card. If A5 relays still fail, return K-347 KTU to the factory for repair.

TABLE B. RELAY OPERATION X indicates operated relay

TEST PROCEDURE	A-00 CARD	A-2 CARD	A-4 CARD (1)	A-5 CARD (2)
On-hook, off-hook	X	X	–	–
Dial number 1 (3)	X	X	1 and G	–
2	X	X	2 and G (4)	BOTH
3	X	X	1, 2 and G	–
4	X	X	4 and G	–
5	X	X	1, 4 and G	–
6	X	X	2, 4 and G	–
7	X	X	1, 2, 4 and G	–
8	X	X	8 and G	–
9	X	X	1, 8 and G	–
0	X	X	2, 8 and G	–
21	X	X	1 and G	BOTH
22	X	X	2 and G	BOTH
23	X	X	1, 2 and G	BOTH
24	X	X	4 and G	BOTH
25	X	X	1, 4 and G	BOTH
26	X	X	2, 6 and G	BOTH
27	X	X	1, 2, 4 and G	BOTH
28	X	X	8 and G	BOTH
29	X	X	1, 8 and G	BOTH
20	X	X	2, 8 and G	BOTH

NOTES:

(1) Relays 1, 2, 4 and 8 on the A-4 card should operate as long as dial button is depressed, Relay G should operate for 350 or 750 milliseconds.

(2) 19-station system only.

(3) Perform "on-hook, off-hook" cycle before dialing each number.

(4) 10-station system only.

(5) If three digits fail, test dial may be at fault. Connect a phone known to have correct dial frequency output and repeat tests before replacing components in K-347 KTU.

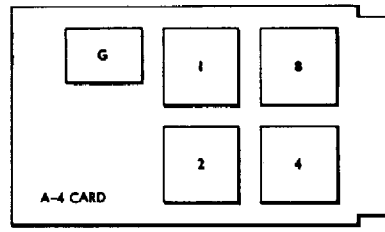


FIGURE 9. Location of G, 1, 2, 4 and 8 Relays.

6. ORDERING INFORMATION

6.01 The K-347(C) KTU can be provided factory wired as a part of the 501 type KSU. When this combination is required, order according to the coding scheme:

501KSU ** (***) 963

Basic Unit for 6-CO or PBX Lines

Number of Intercom Stations
10
19

Mounting & Power

FP-Floor Mounting with Power Supply for Buzzer *only* Audible Signals

FPG-Floor Mounting with Power Supply for Buzzer or Ringer Audible Signals

Family Group Code

Installation instructions for the 501 KSU are covered in instruction sheet number 180514 which is packed with each 501 KSU.

NOTE: Terminate lamp ground leads from telephones to LG of connecting block A of the KSU.

6.02 Replacement parts may be ordered using the nomenclature and part numbers shown below and in Table C:

a. 180288 - Card Mtg. Assy. (Panel) includes Mtg. Hardware.

b. 180299 - A00 PC card.

c. 180252 - A1 PC card..

d. 180253 - A2 PC card.

e. 180254 - A3 PC card.

f. 180255 - A3X Aux. PC card.

g. 180256 - A4 PC card.

h. 180275 - A5 PC card.

i. 180538 - Mounting Kit (included with 180288 card mounting assy.) Consists of 4 each 3/4 inch spacers and 1-1/4 inch machine screws.

TABLE C. ORDERING INFORMATION

CODE	DESCRIPTION	SUPERIOR SALES CATALOGUE NUMBER
K-347 (B) 962	KTU, T-T Adapter, K-1A2	
K-347 (C) 962	KTU, T-T Intercom Circuit K-1A2	032-3490
K-316 (A) 962	KTU, Transfer Circuit	
K-316100 (2) 113	Cable Assembly for K-316A	032-3491
180255	PC Card, A-3X, Auxiliary Decoder	

NOTE: All printed circuit cards are individually packed and should not be plugged in until all external wiring has been thoroughly checked.