VOICE CONNECTING ARRANGEMENTS CAU, SU3, SU4, SU6, AND SU7

1. GENERAL

1.01 This section contains information on identification, installation, operation, maintenance, and connections for the KS-20445, List 1; KS-20445, List 2; KS-20445, List 1 (2W); KS-20445, List 2 (2W); and KS-20445, List 1 (RD) control units, when used in Voice Connecting Arrangements (VCA), CAU, SU3, SU4, SU6, and SU7. (SU7 was an interim arrangement and has been replaced by SU7QW.)

1.02 This section is reissued to:

- Add ordering information for VCA SU4
- Revise Fig. 3, 5, and 6
- Revise 3.03(b) to clarify connections.

1.03 The customer must be informed by the supplier or manufacturer of the equipment of the proper use and operation of that equipment with Voice Connecting Arrangements CAU, SU3, SU4, SU6, and SU7.

1.04 If the customer wants a copy of the Technical Reference which covers these interface specifications, the customer should contact the local Telephone Company Business Office or the Marketing Representative.

1.05 The KS-20445, List 1 control unit is an exact replacement for the KS-20008 alarm coupler.

1.06 This issue of the section is based on the following drawing:

SD-69600-01 Issue 3D—KS-20445 Control Unit

If this section is to be used with equipment or apparatus reflecting a later issue(s) of the drawing, reference should be made to the SD to determine the extent of the changes and the manner in which the section may be affected.

2. IDENTIFICATION

2.01 *Purpose:*

- Voice Connecting Arrangement CAU provides for one-way voice transmission when customer-provided (CP) alarm systems are connected to the telecommunications network. This arrangement can be provided by the KS-20445, List 1 control unit. If KS-20445, List 2 control unit only is available, it may be used if List 3 circuit board is removed.
- Voice Connecting Arrangement SU3 provides for control and testing by the customer of the customer-provided equipment (CPE) from a remote telephone set equipped with an appropriate tone signaling device. SU3 cannot be used alone; it is only used with CAU or SU6.
- Voice Connecting Arrangement SU4 (CAU plus SU3) provides the remote testing feature for CP alarm systems.
- Voice Connecting Arrangement SU6 provides for the use of the control unit with CPE where 2-way voice transmission is required. In this arrangement, the CPE requires automatic originating or automatic receiving capabilities. This arrangement requires a Distributing House modification. This arrangement is ***not*** intended for recording a 2-way conversation. Voice Connecting Arrangement SU3 may be used in this application as an option.
- Voice Connecting Arrangement SU7 provides for the use of the control unit with a CP repertory dialer (dial pulse) that requires no voice transmission path to the network. This arrangement requires a Distributing House modification of the control unit. Voice Connecting Arrangement SU3 is not used in this application (SU7 has been replaced by SU7QW).

2.02 ***Application:*** For use on individual lines (not semipublic or coin lines) as an adjunct to a main or extension telephone set.

2.03 ***Ordering Guide:***

- Unit, Control, KS-20445, List 1 (for one-way transmission, CAU)
- Unit, Control, KS-20445, List 2 (for one-way transmission, SU4) consists of CAU and SU3 signal unit
- Unit, Signaling, KS-20445, List 3 (signal unit SU3), used only with CAU or SU6
- Unit, Control, KS-20445, L1 "2W" (modified for 2-way transmission, SU6 without List 3 signal unit SU3)
- Unit, Control, KS-20445, List 2 "2W" (modified for 2-way transmission SU6 with SU3 signal unit)
- Unit, Control, KS-20445, List 1 "RD" (modified for repertory [dial pulse] dialers, SU7). SU7 was an interim arrangement. It has been replaced by SU7QW—KS-20721, List 1 station coupler.

Note: The combination CAU plus SU3 is identified by USOC SU4. The combination SU6 plus SU3 is not identified by a single USOC code.

2.04 ***Color:*** Light olive-gray.

2.05 ***Design Features:***

KS-20445, List 1 Control Unit, CAU, (Fig. 1)

- Provides a means of connecting the speech, pulsing, and power supply leads from CPE.
- Has screw terminals for terminating telephone line, associated telephone set, and A and A1 leads.
- Enables the customer to ***monitor*** the progress of an alarm call.
- Equipped with test leads packaged with the unit for operation test of the KS-20445 unit.

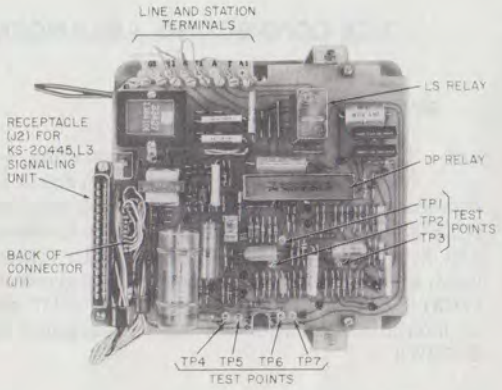


Fig. 1—KS-20445, List 1 Control Unit, CAU, Cover Removed, Test Points

- Provides a plug-in arrangement for converting to List 2 unit.
- Designed for wall mounting.
- Unit is 6-7/8 inches wide, 7-3/8 inches high, and 3-3/8 inches deep.
- Unit weighs 4 pounds.

KS-20445, List 2 Control Unit, SU4 (CAU and SU3, Fig. 2)

- Consists of a KS-20445, List 1 control unit and a KS-20445, List 3 signaling unit.
- Permits the customer ***to test*** and ***control*** the operation of his alarm system from a remote telephone set when the remote telephone set has a TOUCH-TONE® dial, or is equipped with a 62A control unit or a J1A handset, to provide a 1475-Hz control tone.
- Provides a means for resetting the customer's alarm system.
- Has a 20-second time-out circuit causing the control unit to disconnect after ring-up, if a 1475-Hz tone is not received from distant party.

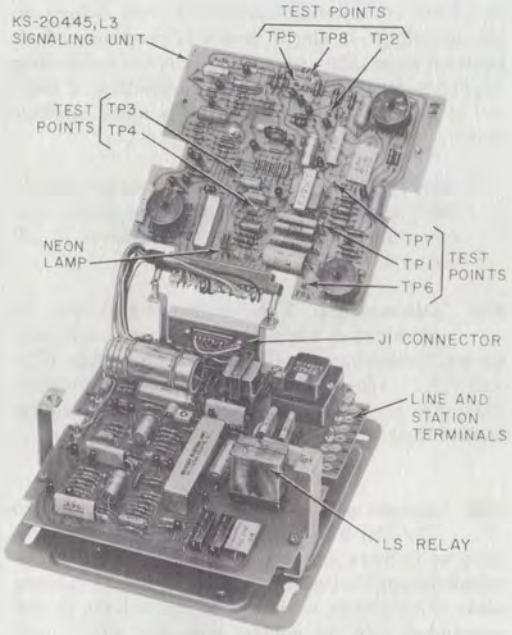


Fig. 2—KS-20445, List 2 Control Unit, Test Points on List 3 Signaling Unit

- Provides a continuous 2125-Hz acknowledgment tone to distant party.
- Unit weighs 4-1/2 pounds.

KS-20445, List 1 (2W) Control Unit, SU6

- Same as KS-20445, List 1 except modified to provide 2-way transmission.

KS-20445, List 2 (2W), Control Unit SU6 and SU3

- Same as KS-20445, List 2 except modified for 2-way transmission.

KS-20445, List 1 (RD) Control Unit, SU7

- Provides a means of connecting pulsing, power supply, and off-normal muting leads from CP repertory dialer.
- Has screw terminals for terminating telephone line, associated telephone set, ON1 and ON2 leads.
- Enables dialing from CPE.
- Designed for wall mounting.
- Unit is 6-7/8 inches wide, 7-3/8 inches high, and 3-3/8 inches deep.
- Unit weighs approximately 4 pounds.

3. INSTALLATION

PLANNING

3.01 The customer must provide a Cinch Mfg. Co. or ITT Cannon Electric Co. DA-19603-403 plug with DA-51225-1 hood (or equivalent) and a connecting cable as a part of the customer's device.

3.02 The customer must provide dc power for normal operation. Power requirements are:

- Voltage: 18 $\pm$3 volts dc, peak voltage (including ripple) shall ***not exceed*** 25 volts.
- Current requirements for the KS-20445 unit are shown in Table A.

TABLE A

KS-20445 UNIT CURRENT REQUIREMENTS		mA DC (APPROX.)	
		LIST 1	LIST 2
18-Volt Supply	Standby	2.5	10.
	Initial Surge	(1000 max)	(1000 max)
	Operating	50	70

INSTALLING

Do not install in hazardous locations, near excessive heat, moisture, or cold temperatures.

3.03 Sufficient wall space should be available. Install as follows:

(a) Remove cover and secure unit to wall with appropriate fasteners. Use backboard only where required.

(b) ▶Connect the telephone line, associated telephone sets and key equipment, where required, to the screw terminals on the printed wiring board according to the arrangement desired (Fig. 3 through 6). All Telephone Company-provided telephone sets must be connected to the T1 and R1 terminals. Do not bridge directly to the line.◀

Make certain that the dc power from the customer's device is of proper polarity. Improper polarity will not damage unit because it contains a polarity guard. However, the unit will not operate if the polarity is reversed.

(c) Perform operating tests to determine if the KS-20445 unit is operating properly (Part 5).

(d) Replace cover.

(e) Attach plug from customer's device into receptacle (J1) at the bottom of the unit (Fig. 2).

4. OPERATION

4.01 ***Outgoing Call:*** When the CP alarm unit goes off-hook and provides a contact closure between leads OH1 and OH2, the control unit will seize the line and dial tone is returned to the CP alarm unit. The CP alarm unit outpulses by opening and closing the contact between leads OH1 and OH2. After dialing is completed, the control unit provides a transmission path from leads TT and TR (CP alarm unit) to the telephone line. When the signaling unit is not provided, the CP alarm unit must provide an announcement or other means of delaying the main message to permit the called party to respond to ringing and answer the call. If the signaling unit is provided, the CP alarm unit may close lead SRU to lead COM to transmit a 2125-Hz tone to the called party. During operation of the control unit, the associated telephone set is placed in a monitor condition (by opening the dc path). The customer may check the progress of an alarm call by monitoring on the associated telephone set without interfering with dialing or transmission. If alarm device is programmed to transmit more than one calling cycle, the monitoring telephone must go on-hook at completion of each call to prevent interference with the alarm sending device.

> ***Note:*** If the associated telephone set uses a G6-type amplifier handset, it will be inoperative when the coupler operates and removes TALK battery.

4.02 ***Disconnect:*** The automatic call cycle is terminated when the CP alarm unit goes on-hook removing the closure between leads OH1 and OH2. When the signaling unit is provided, the called party may terminate the alarm cycle by transmitting a 1475-Hz tone to the control unit.

4.03 ***Incoming Call (KS-20445, List 2 Only):*** The List 3 signaling unit enables the control unit to receive incoming calls from a remote telephone set for test purposes. When the customer dials the number assigned to the telephone set associated with the control unit, the control unit detects the 20-Hz ringing and seizes the telephone line. The control unit answers the calling party by transmitting a pulsed 2125-Hz tone while waiting for a 1475-Hz control tone from the calling party. A 20-second timeout circuit will cause the control unit to disconnect automatically if the 1475-Hz control tone is not received. After the 1475-Hz tone is detected, a continuous 2125-Hz tone is transmitted to the calling party to acknowledge receipt of the 1475-Hz tone; and a contact closure is provided between leads TD1 and TD2 to start the CP alarm unit. The CP alarm unit closes leads OH1 to OH2 to start the alarm reporting cycle and closes lead RTD to COM to stop the 2125-Hz tone. The control unit removes the closure between leads TD1 and TD2. If the CPE opens lead ETD from COM during the announcement, the calling party may signal the control unit with a second 1475-Hz tone. This second tone will cause the control unit to close leads TD1 and TD2 to reset the CP alarm unit. After the announcement is completed, the CP alarm unit may open lead RTD from COM to start the 2125-Hz pulsing tone and the 20-second disconnect. The calling party may signal with a 1475-Hz tone to reset the CP alarm unit. If the 1475-Hz tone is not received, the control unit will disconnect in approximately 20 seconds.

5. MAINTENANCE

5.01 When trouble is reported verify that:

- Customer connector plug is secure in control unit.
- Power of correct polarity is present at control unit.
- CO pair is good.
- Leads to CO line and associated telephone set are secure.

If trouble still exists, perform the following tests.

5.02 ***Lettered Steps:*** The letter "a" added to a step number in 5.05 indicates an action required when the List 3 signaling unit is provided. Where the List 3 signaling is not provided, all steps designated by the letter "a" should be omitted.

5.03 ***Apparatus Required:***

Tests A and B

- One KS-7105 battery (22-1/2 volts), or equivalent.
- Test leads for connecting battery to pins 9 and 11 on J1 (supplied with unit).
- On 1013A or equivalent hand test set. (If the associated telephone set has a G6-type amplifier handset, use a second 1013A hand test set connected across T1 and R1 for monitoring.)
- A separate test lead consisting of a piece of insulated wire approximately 6 to 8 inches long with ends stripped and tinned approximately 1/4 inch.
- One KS-14510, volt-ohm-milliammeter (VOM) equipped with KS-14510, List 2 leads with test prods, or equivalent (used to make tests on the KS-20445, List 3 signaling unit, when provided).

5.04 ***Preparation:***

Tests A and B

Make all tests with CPE disconnected.

Note: To perform operating test on the List 3 signaling unit, have a test call placed to the control unit from the local test desk. A TOUCH-TONE® dial, a 62A control unit, or a J1A handset, or equivalent, may be employed at the test desk to provide 1475-Hz control tone. Where the List 3 signaling unit is not provided, all steps designated by the letter "a" should be omitted.

STEP	ACTION	VERIFICATION
1	Disconnect customer plug (see Fig. 2).	
2	Remove unit cover.	
3	Connect power supply to pins 9 (+) and 11(−) on unit using test leads provided. Connect red lead to pin 9(+) and black lead to pin 11(−).	
4a	If List 3 signaling unit is provided— Loosen the two retaining screws and swing signaling unit on its hinge in order to view LS relay (Fig. 2).	
5	Connect one 1013A hand test set, or equivalent (with switch in MON position), cord clip across TP4 and TP5, and the other clip across TP6 and TP7 (Fig. 1). ***Caution: High room noise may cause transmission of dial pulses in TALK position.***	
6	Operate hand test set switch to TALK position.	LS relay operated. (Relay operation can be seen through clear plastic cover of LS relay, Fig. 1. Also, the momentary "click" of the relay when operating is audible.)

5.05 ***Test A—CAU, SU3, SU4, and SU6:***

STEP	ACTION	VERIFICATION
7	Listen for dial tone on associated telephone set (connected to terminals T1 and R1—Fig. 3).	Dial tone is heard. (Since dc is blocked by the control unit, the associated telephone set can be used only for monitoring when LS relay is operated—Fig. 3).

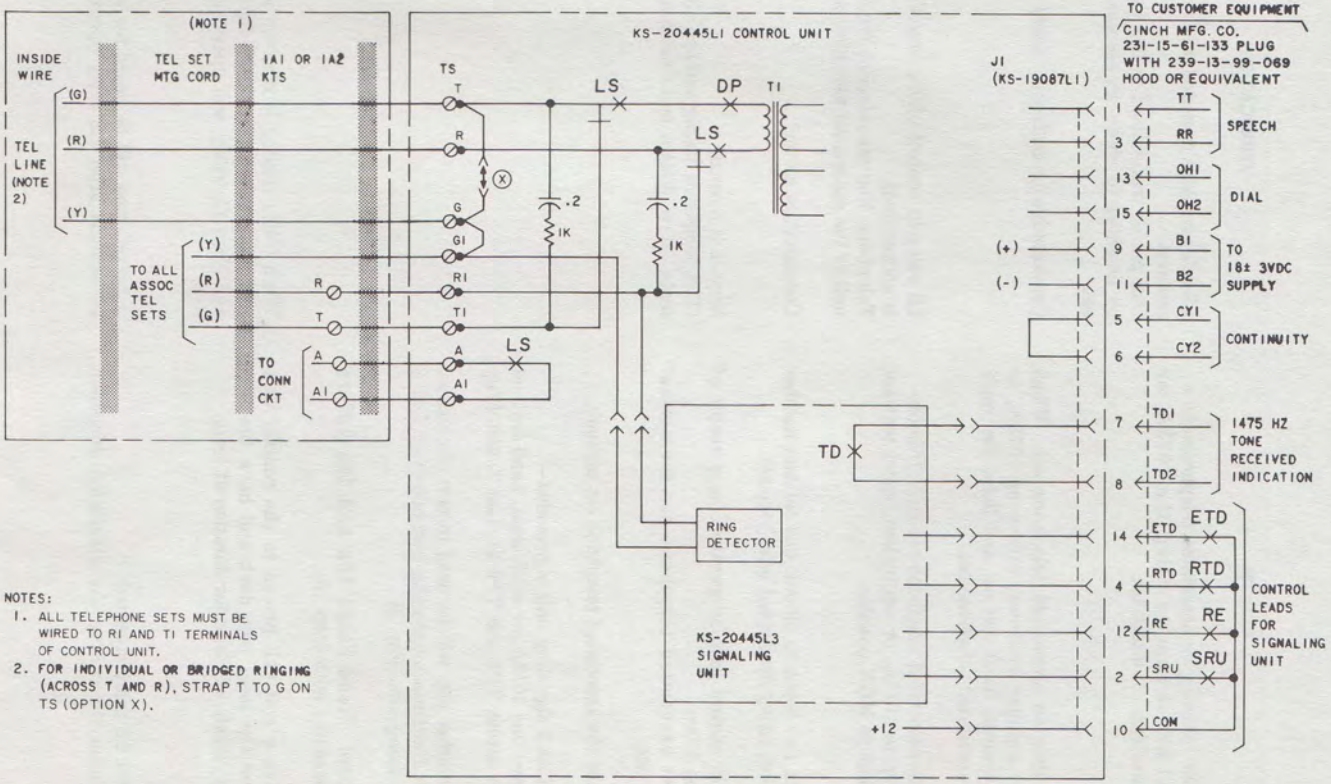


Fig. 3—Typical Connections for KS-20445, List 1 or List 2 Control Unit and Single Line Telephone Set

STEP	ACTION	VERIFICATION
8	While listening on associated telephone set— Dial a test number using the 1013A, or equivalent, hand test set.	LS relay remains operated (due to slow release feature). Dial pulses transmitted to line can be verified by listening to clicks on associated telephone set.
9	Monitor on associated telephone set. When test number answers, talk over 1013A, or equivalent, hand test set and listen for reply on associated telephone set.	Conversation (on both ends) heard satisfactorily.
10	With associated telephone set still off-hook— Operate 1013A, or equivalent, hand test set switch to MON position.	LS relay in control unit released (control unit is unoperated). Telephone line transferred from the control unit to the associated telephone set.
11	Talk and listen to distant end (of test number called) using associated telephone set.	Conversation normal.
12	With control unit unoperated (as a result of Step 10)— Test associated telephone set for normal service.	Service is normal. (This completes dialing and speech transmission tests. Have distant end disconnect.)
13	Place the associated telephone set on-hook.	
14a	If List 3 signaling unit is provided— Leave one 1013A, or equivalent, hand test set clip across TP4 and TP5 on List 1 unit (Fig. 1). The other clip will be used to test the control unit functions by probing test points on List 3 signaling unit (Fig. 2). ***Note:*** Read Steps 15a and 16a before proceeding with Step 15a.	
15a	Have a test call placed to the control unit from the local test desk and have the test call remain off-hook for duration of tests.	When 20-Hz ringing is received at the control unit, the neon lamp (Fig. 2) will flash momentarily and then LS relay will operate to seize the line.
16a	After LS relay operated— Monitor the call on the associated telephone	A pulsed tone will be heard for approximately 20 seconds after LS relay operated; then LS

STEP	ACTION	VERIFICATION
	set.	relay will release to disconnect the control unit.
17a	Leave the associated telephone set off-hook for remaining tests. Operate 1013A, or equivalent, hand test set switch to TALK position.	
18a	On the List 3 signaling unit— Momentarily ***touch*** the free 1013A, or equivalent, hand test set clip (mentioned in 14a), to TP3 and then ***connect*** to TP5 on List 3 signaling unit.	LS relay should operate and remain operated as long as the clip is connected to TP5.
19a	Leave the hand test set clip connected to TP5 on List 3 signaling unit.	
20a	While monitoring on associated telephone set— Use a separate test lead to connect TP7 to TP2 on List 3 signaling unit (Fig. 2) for approximately 1 second. Remove test lead.	A continuous 2125-Hz tone should be heard in associated telephone set receiver.
21a	Use KS-14510 VOM, or equivalent, with test prods to check for continuity between pins 7 and 8 on J1 on unit (verify that TD relay operated).	Continuity present.
22a	Continue to leave hand test set clip connected to TP5 on List 3 signaling unit.	
23a	Listen, using associated telephone set receiver. Use test lead to connect TP5 to TP6 on List 3 signaling unit (Fig. 2) for approximately 1 second. Remove test lead.	2125-Hz tone will stop.
24a	Use KS-14510 VOM, or equivalent, with test prods to check for open circuit between pins 7 and 8 on connector J1 to verify that relay TD released (Fig. 3).	Open circuit.
	Note: Read ***all*** of Step 25a before proceeding.	
25a	Listen, using associated telephone set receiver. Disconnect 1013A, or equivalent, hand test set clip from TP5 on List 3 signaling unit for 5 to 10 seconds and then momentarily touch clip to TP4.	A pulsed tone will be heard until TP4 is touched; then the control unit will disconnect.
26a	Instruct the party at the test location to send a tone signal by pressing the "3" button on	After TP3 is touched, relay LS operates and the 2125-Hz beep tone is heard. When the

STEP	ACTION	VERIFICATION
	TOUCH-TONE dial, or equivalent, for approximately 1 second after the 2125-Hz beep tone from the control unit is heard. Then, touch the 1013A, or equivalent, hand test set clip to TP3 on List 3 signaling unit.	test party sends the TOUCH-TONE signal, the control unit stops pulsing and sends back a continuous tone in reply. Control unit disconnects automatically after 20 seconds.
27	Disconnect 1013A, or equivalent, hand test set from test points.	
28a	Have test location telephone set placed on-hook.	
29a	Place associated telephone set on-hook.	
30a	Swing List 3 signaling unit back into position and fasten by turning the retaining screws.	
31	Replace outer cover and connect customer J1 plug to control unit.	
32	The customer may now proceed to test his alarm device. ***Note:*** All Telephone Company-provided telephone sets associated with the line connected to the KS-20445 control unit must be connected to the T1 and R1 terminals. This is to prevent an off-hook extension on the line disabling an alarm call.	

5.06 ***Test B—SU7:***

STEP	ACTION	VERIFICATION
7	Listen for dial tone on associated telephone set (connected to terminals T1 and R, Fig. 4).	Dial tone is heard.
8	While monitoring on associated telephone set, dial a test number using 1013A, or equivalent, hand test set.	LS relay remains operated. Since muting contacts of repertory dialer are not being used, clicks will be heard in associated telephone set.
9	Talk to called party on associated telephone set.	
10	Place the associated telephone set on-hook.	
11	Disconnect 1013A, or equivalent, hand test set from test points.	
12	Replace outer cover and connect customer J1 plug to control unit.	

STEP	ACTION	VERIFICATION
13	Test associated telephone set for manual service.	

5.07 Maintenance of the KS-20445 control unit is limited to checking connections and performing the operating tests described. If a failure is indicated in the KS-20445 control unit, replace the unit.

5.08 If the tests are satisfactory, remove all test connections to restore circuit to normal and follow local reporting procedures for CP trouble.

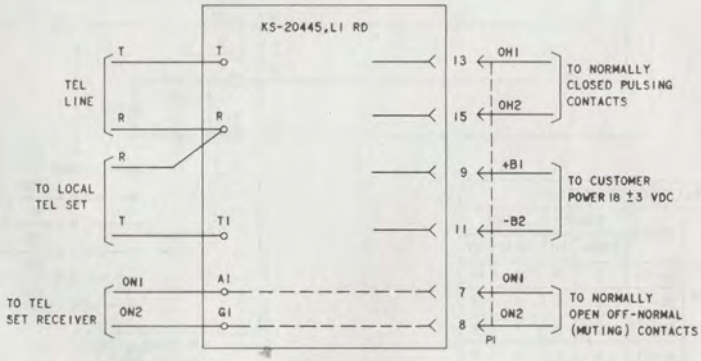
Do not attempt any test or repair to the CPE.

5.09 When in the repairman's judgment the trouble is located in the CPE, the Repair Service Bureau should be notified so that proper Maintenance of Service Charge billing can be initiated as outlined in Section 660-101-312 entitled Maintenance of Service Charge on Services With Customer-Provided Equipment (CPE).

6. CONNECTIONS

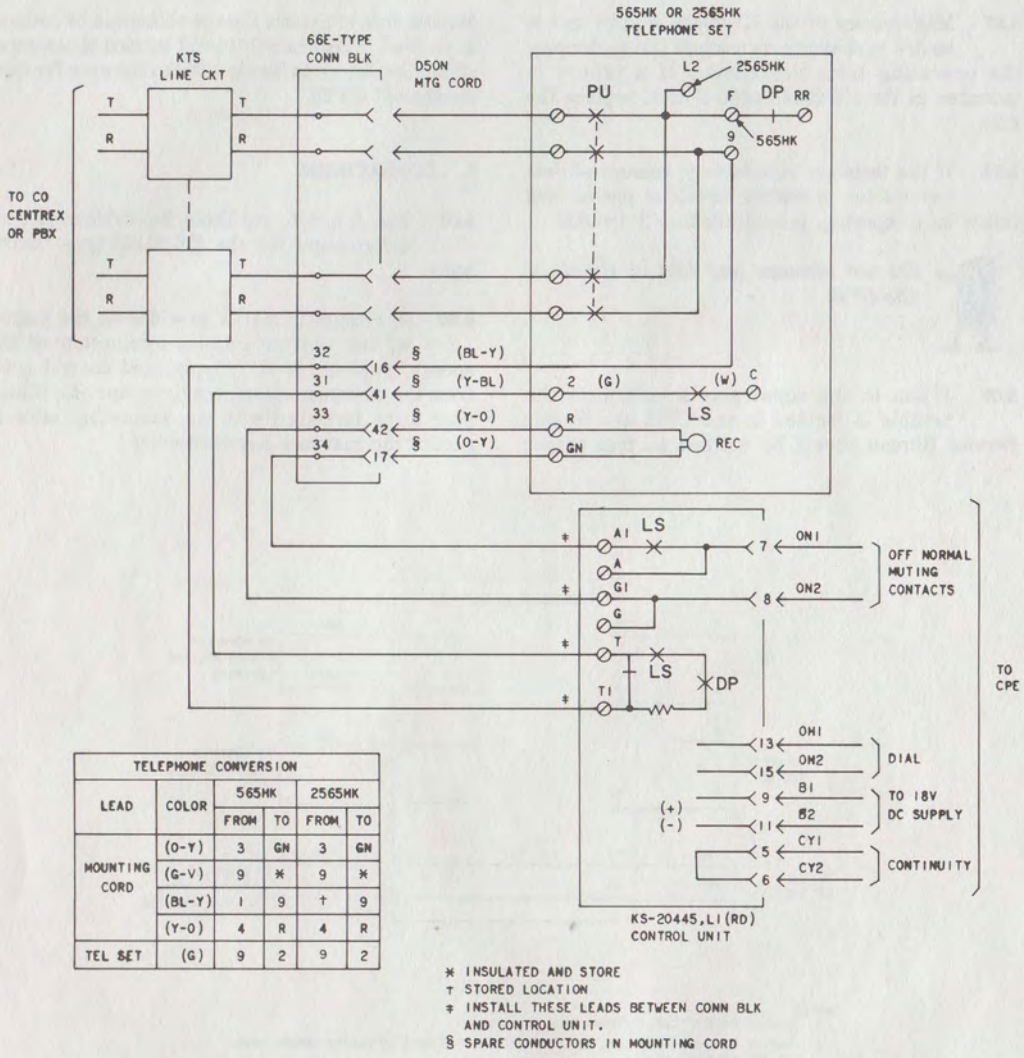
6.01 Fig. 3, 4, 5, 6, and Table B provide connection information for the KS-20455 type control units.

6.02 A receptacle (J1) is provided at the bottom of the unit to permit connection of the speech, pulsing, power supply, and control leads from the customer equipment by means of a (Cinch) plug to be furnished with the connecting cable as part of the customer device (see 3.01).



NOTES:
1. PLUG P1, PART OF CABLE FROM CUSTOMER CIRCUIT.
2. PULSING CONTACTS CONNECTED TO LEADS OH1 AND OH2 MUST BE CLOSED BEFORE LOCAL TEL SET GOES OFF HOOK.
3. CONNECT ON1 AND ON2 LEADS FROM SCREW TERMINALS A1 AND G1 ACROSS RECEIVER OF LOCAL TEL SET AS SHOWN IN TABLE B.

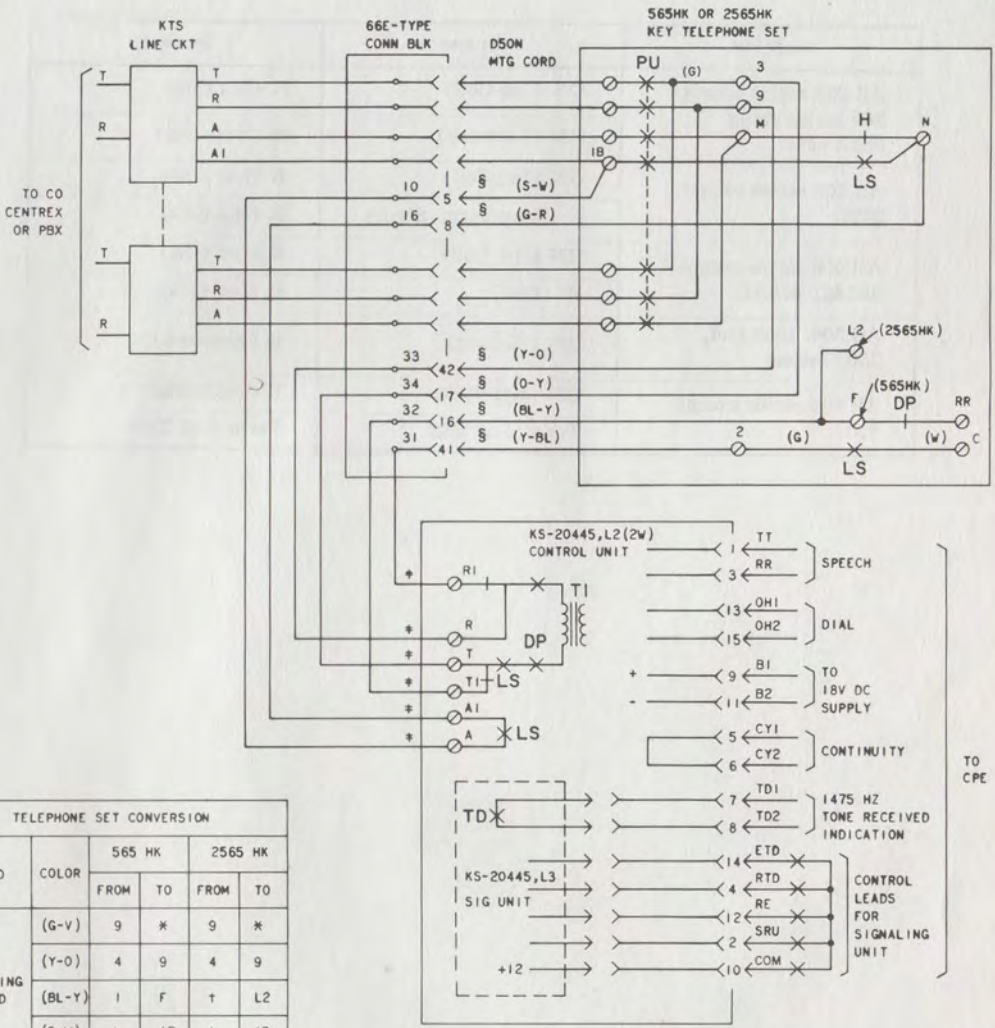
Fig. 4—Typical Connections for KS-20445, List 1 (RD) Control Unit, SU7 and Single Line Telephone Set



TELEPHONE CONVERSION					
LEAD	COLOR	565HK		2565HK	
		FROM	TO	FROM	TO
MOUNTING CORD	(O-Y)	3	GN	3	GN
	(G-V)	9	*	9	*
	(BL-Y)	1	9	†	9
	(Y-O)	4	R	4	R
TEL SET	(G)	9	2	9	2

* INSULATED AND STORE
† STORED LOCATION
‡ INSTALL THESE LEADS BETWEEN CONN BLK AND CONTROL UNIT.
§ SPARE CONDUCTORS IN MOUNTING CORD

Fig. 5—Typical Connections for KS-20445, List 1 (RD) Control Unit, SU7 and Multiline Key Telephone Sets 565HK and 2565HK



TELEPHONE SET CONVERSION					
LEAD	COLOR	565 HK		2565 HK	
		FROM	TO	FROM	TO
MOUNTING CORD	(G-V)	9	*	9	*
	(Y-O)	4	9	4	9
	(BL-Y)	1	F	†	L2
	(S-W)	†	1B	†	1B
	(G-R)	†	N	†	N
TEL SET	(G)	F	3	L2	3
	(G)	9	2	9	2

* INSULATE AND STORE
† STORED LOCATION
‡ INSTALL THESE LEADS BETWEEN CONN BLOCK AND CONTROL UNIT.
§ SPARE CONDUCTORS IN D5ON MOUNTING CORD.

Fig. 6—Typical Connections for KS-20445, List 1 (2W), SU6 or List 2 (2W) SU6 and SU3, Control Unit and Multiline Key Telephone Set 565HK and 2565HK

TABLE B

TELEPHONE SET RECEIVER MUTING CONNECTIONS (VCA SU7)

TEL SET TYPE	ON1 LEAD	ON2 LEAD
All 200 series except: 200 series using 685A sets	GN (Ind Coil)	R (Ind Coil)
	GN (Network)	B (Network)
All 300 series except: 332C	GN (Ind Coil)	R (Ind Coil)
	E (Ring Term. Strip)	R (Ind Coil)
All 400 series except: 462AC, 466AC	GN (Ind Coil)	R (Ind Coil)
	W (Dial)	R (Ind Coil)
All 500, 1500 and 2500 series	GN (Network)	R (Network)
All 600 series except: 610A	GN (Network)	R (Network)
	Term. 1 of TS2	Term. 2 of TS2