

A. E. CO. TYPE 860A CALL COMMANDER<sup>®</sup> KEY TELEPHONE  
DESCRIPTION AND INSTALLATION

CONTENTS	PAGE
1. GENERAL . . . . .	1
2. DESCRIPTION . . . . .	1
Connections and Cabling . . . . .	3
3. OPERATION . . . . .	4
Pick-Up Keys . . . . .	4
Hold Keys . . . . .	5
Signal Keys . . . . .	6
4. MODIFICATIONS . . . . .	6
Conversion for Use with Type 10A Key Telephone System . . . . .	6
Conversion from Key-Strip Blank to Key-Strip Unit . . . . .	7
Addition of Blocking Ring . . . . .	8
Conversion of Hold Key to Line Pick-Up Key . . . . .	8
Conversion for Station Busy Indication . . . . .	8
Conversion from Line Pick-Up Key to Signal Key . . . . .	9
Conversion from Ringer to Buzzer . . . . .	9
5. INSTALLATION . . . . .	10
Placement . . . . .	10
Running Cables . . . . .	10
Cable Connections . . . . .	10
Key Designation Strips . . . . .	10
Stamping Dial Number Card . . . . .	10
Setting the Ringer Volume Ad- justing Lever . . . . .	11
6. MAINTENANCE . . . . .	11
Lamp Replacement . . . . .	11
Dial Replacement . . . . .	11
Key Frame Assembly Removal . . . . .	11
Mounting Cord Frame Removal . . . . .	11
Replacing Key-Strip Units . . . . .	11
Push-Button Keys and Plungers Contacts . . . . .	12
Latching Mechanism . . . . .	12
Handset and Capsules . . . . .	12

operating the telephone. Also, modification and maintenance instructions are included as an added aid for the installer.

1.02 The Type 860A key telephone (Figure 1) is intended to be used as customer's station apparatus with Automatic Electric Company Type 10A, 10A1, 10A2, or 16A key telephone systems. It is designed to originate, answer, signal, and hold calls on central office lines, PABX lines, tie lines, and intercommunication circuits associated with these key telephone systems. It can also be used with W.E.Co. Type 1A, 1A1, 1A2, or 6A key telephone systems, or comparable systems of other manufacturers.

2. DESCRIPTION

2.01 The Type 860A key telephone plastic housing measures 10-1/2" x 8", and is 4-1/4" high; the over-all size (including handset) is 12-7/8" x 8-1/2" x 4-1/4". A Type 51A dial with a translucent finger plate is mounted on the left side of the sloping front surface. Key-strip units with six keys per strip (in vertical rows) are located on the right side. Although provision has been made for 18 keys, the telephone is normally furnished equipped with 12 keys. The first vertical row of keys (key-strip unit) closest to the dial includes a red plastic hold key, and five clear plastic line pick-up keys. The third vertical row (or position) is equipped with a white plastic key-strip blank molded to resemble a set of six line pick-up keys. This blank can be removed easily, and replaced with a 6-key key-strip unit, identical to the one in the second position. Should it be desirable, the hold key can be replaced by a line pick-up key. All of the line pick-up keys are convertible to signal keys.

2.02 The plastic housing and the handset are available in two basic colors: beige and green. The handset is attached to the housing by means of a retractile cord. Five face mats, silver, gold, blue, green, and ivory are also provided with each telephone. Each face mat has the dial numbers and corresponding letters printed on it so that, when in place on the housing, they encircle the dial. A two-section clear plastic face plate is fitted over the dial and keys; this serves to protect, and secure the face mat underneath. A lever for adjusting ringer volume projects from the lower left front of the housing. See Figure 2.

1. GENERAL

1.01 This Section describes the Type 860A CALL COMMANDER key telephone. Information is included on installing and

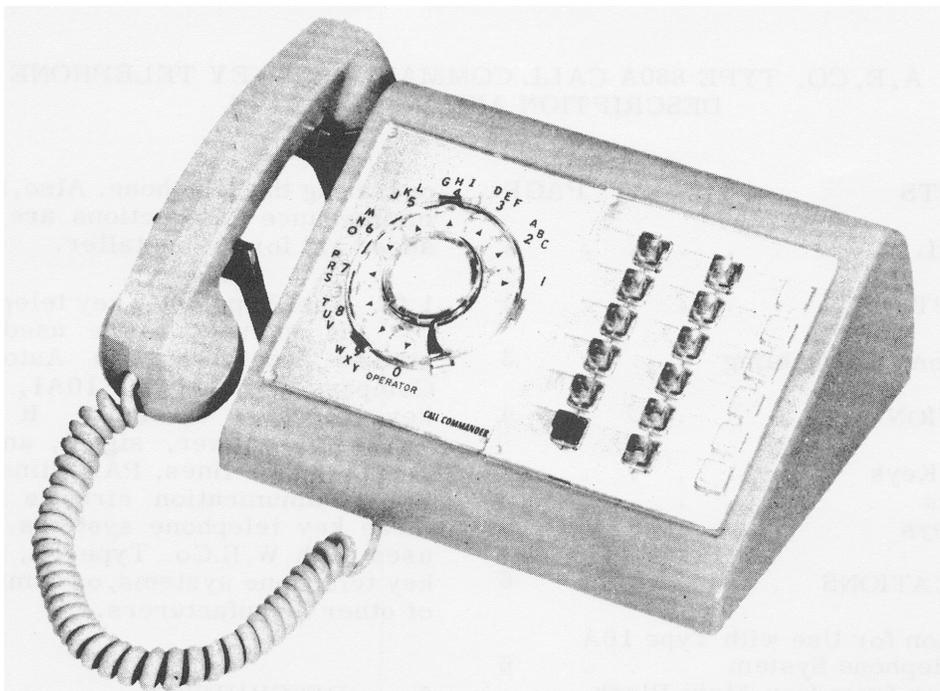


Figure 1. Type 860A Key Telephone.

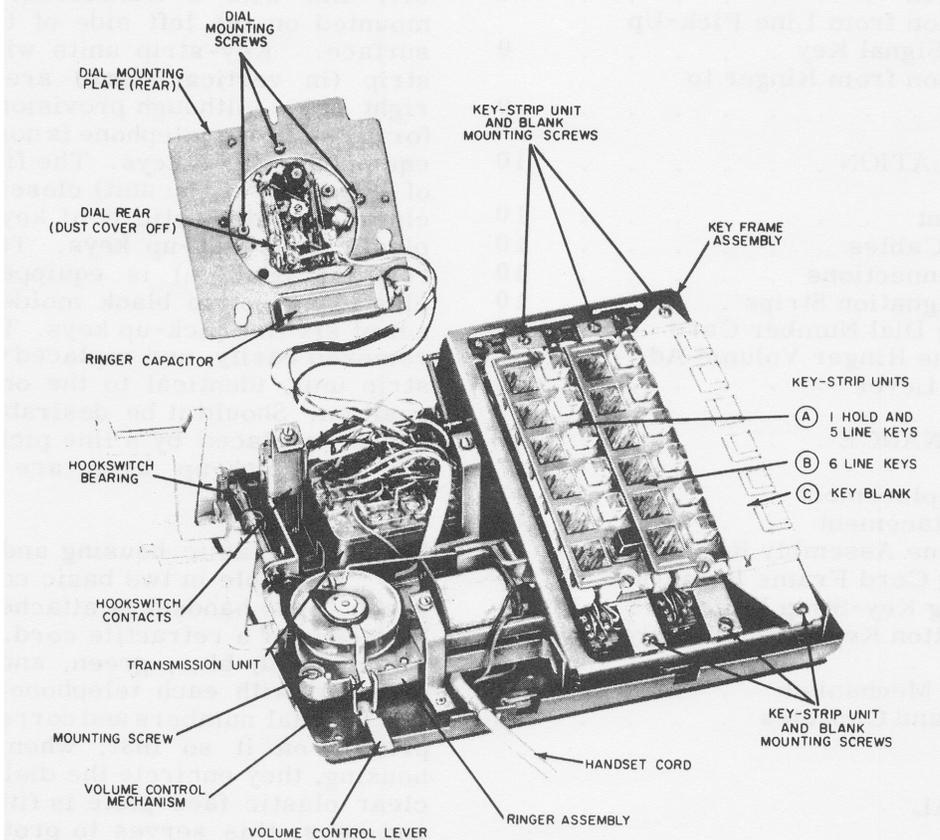


Figure 2. Type 860A Telephone with Housing Removed, and Dial Assembly Raised and Inverted.

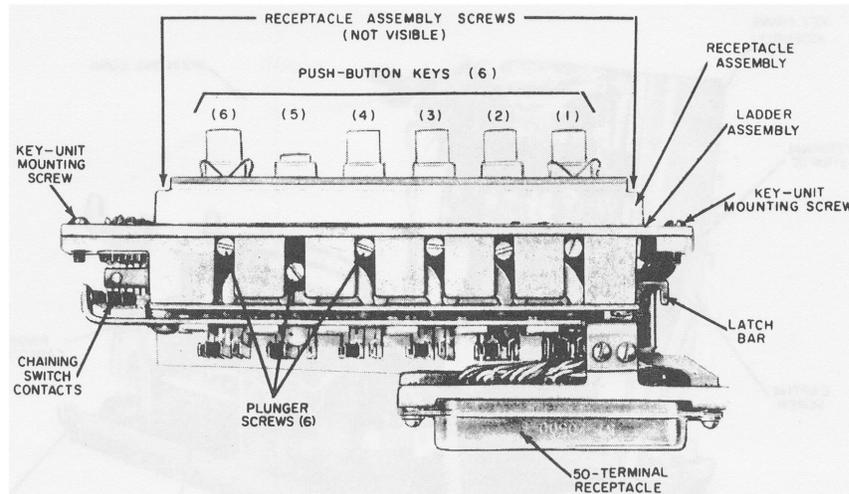


Figure 3. Key-Strip Unit (6-key) Showing Six Line Pick-Up Keys (D-59307-A).

### Connections and Cabling

2.03 Each of the 6-key, key-strip units include a 50-terminal receptacle (Figure 3). All connections from the key-strip unit are made to this receptacle. (No soldered connections or other wiring is needed.) These receptacles connect directly to 50-terminal plugs which are fastened to the key frame assembly (Figure 4). There are three 50-terminal plugs, one for each key-strip unit (or position). Not all terminals on each plug are used.

2.04 A few conductors from each 50-terminal plug on the key frame are connected to other plugs and/or to the transmission com-

ponents of the Type 860A key telephone. However, most of the conductors from the 50-terminal plugs are grouped and enter a plastic cable sheath known as the mounting cord (equivalent to the line cord of regular telephones). The mounting cord also includes a number of conductors (spade tipped) that either connect directly to the transmission components (instead of to the 50-terminal plugs), or are insulated, taped, and stored for possible future use with optional or additional features (Figure 5).

2.05 The mounting cord consists of 120 conductors, arranged in three groups of 40 conductors each. Each group is alike, as to

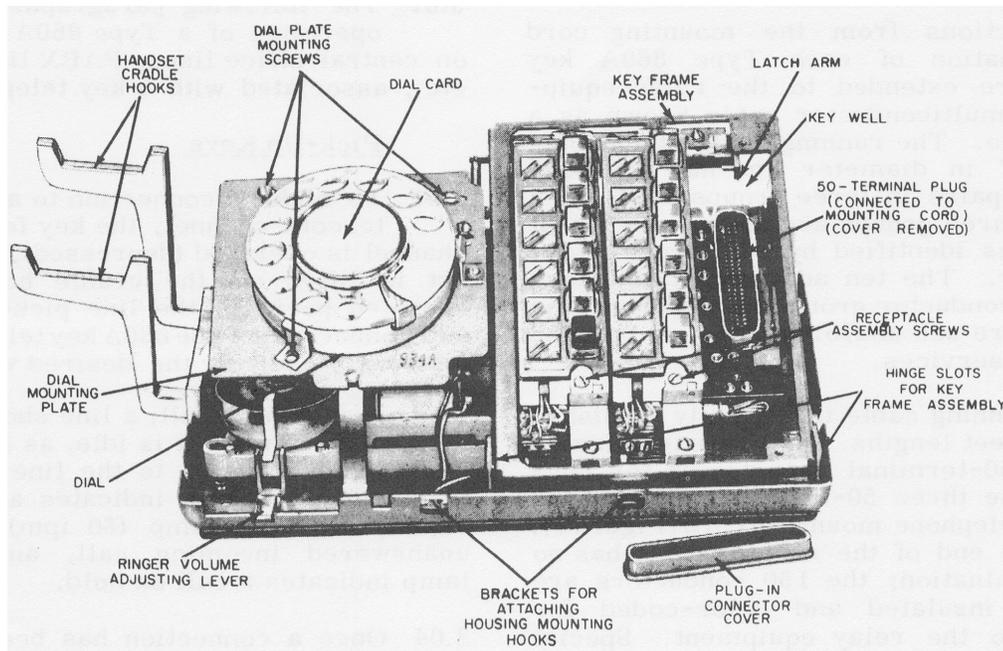


Figure 4. Type 860A Telephone with Key Blank and Cover of Plug-In Connector Removed (Ready for Installation of Third Key-Strip Unit).

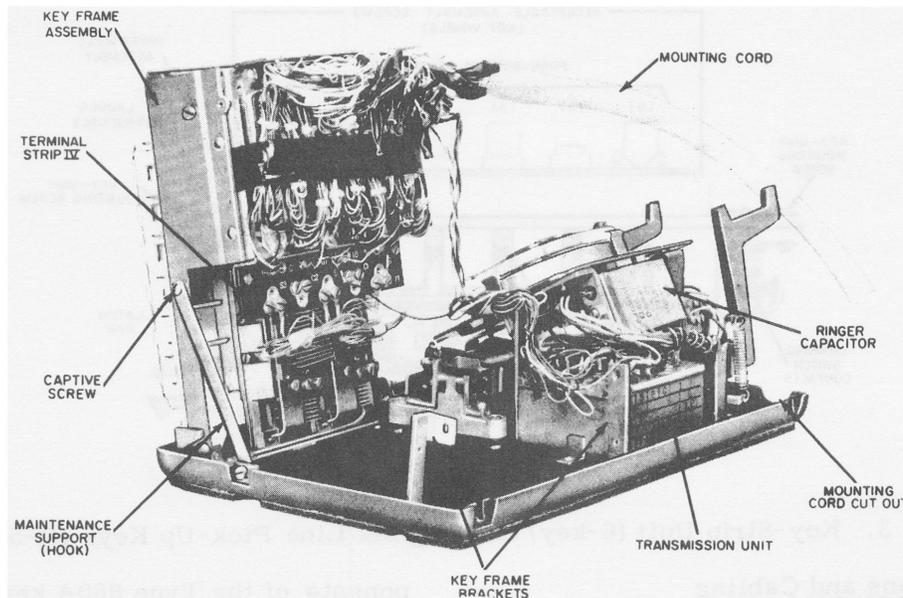


Figure 5. Rear View of the Type 860A Telephone.

color coding, etc., but is identified by a different color-coded binder. The mounting cord is approximately 5/8" in diameter and 8-feet long; its conductors all terminate on 50-terminal plugs (exactly like those used for connection to the key-strip units, at the end away from the Type 860A key telephone). One group of 40 conductors terminates on each of the three plugs; not all terminals are used.

2.06 Connections from the mounting cord termination of each Type 860A key telephone are extended to the relay equipment by a multiconductor cable known as a running cable. The running cable is approximately 3/4" in diameter and has 150 conductors; 75 pairs in three groups of 25 pairs each. The three groups are alike, except that each group is identified by a different color-coded binder. The ten additional conductors in each 50-conductor group are "spares" for possible future use and/or in case of expanded facilities or services.

2.07 The running cable is normally furnished in 50-foot lengths. One end is terminated with three 50-terminal receptacles for connection to the three 50-terminal plugs of the Type 860A telephone mounting cord (Figure 6). The opposite end of the running cable has no special termination; the 150 conductors are individually insulated and color-coded for connection to the relay equipment. Special running cables, 100 feet long, can be furnished if desired; these cables have three 50-terminal receptacles at each end, and can be cut to

provide one running cable longer than 50 feet and one shorter than 50 feet, as required. The 100-foot running cables have receptacles at both ends and, therefore, cannot be connected together for runs longer than 100 feet.

### 3. OPERATION

3.01 The following paragraphs describe the operation of a Type 860A key telephone on central office lines, PABX lines, tie lines, etc., associated with a key telephone system.

#### Pick-Up Keys

3.02 To make a connection to any line or intercom channel, the key for that line or channel is operated (depressed), and the handset is lifted off the cradle hooks. In the operated position, the line pick-up keys lock and connect the Type 860A key telephone transmission circuit to the desired voice channel.

3.03 In making a call, a line should be picked up only when it is idle, as indicated by a dark lamp adjacent to the line pick-up key. A steadily lit lamp indicates a busy line; a rapidly flashing lamp (60 ipm) indicates an unanswered incoming call, and a winking lamp indicates a call on hold.

3.04 Once a connection has been made from the Type 860A key telephone transmission circuit to any voice channel, dial to establish a connection to the desired telephone;

or, in the case of certain tie lines and intercommunication circuits, start local audible signaling by operating either the dial or push-button.

3.05 To release a line, the handset is restored on the cradle hooks. The line pick-up key will remain operated, but its lamp will be extinguished, indicating that the line is idle. If another call comes in on this same line, the lamp will flash rapidly (60 ipm) to indicate an incoming call. Since the line pick-up key is already operated, the call may be answered by lifting the handset. If a call comes in on another line, depressing the line pick-up key for that line releases the first line pick-up key, allowing it to return to its normal position.

3.06 The line pick-up keys of each 6-key-strip unit are mechanically interlocked to prevent the operation of more than one line pick-up key in a key-strip unit at the same time. The operation of a locking key within a key-strip unit will restore any other operated locking key in that unit. An additional interlocking mechanism is provided between the key-strip units. Thus, when a locking key is operated in one key-strip unit, any operated locking keys in the other key-strip units are released. The nonlocking hold key (red key) will also perform this function.

3.07 One locking key (line pick-up or intercom) in each key-strip unit may be operated simultaneously, and each will lock operated; however, an electrical "chaining switch" which is a part of each key-strip unit prevents the electrical connection of more than one line (or other voice channel) to the transmission circuit of the telephone. Operation of a locking key in the first key-strip unit (nearest the dial) operates the chain-

ing switch and opens the circuits to the chaining switch of the second position, etc.

3.08 A lamp "winking" feature may also be provided to cause the pick-up key lamps associated with a held line, at every station where the line appears, to "wink" on and off as long as the hold condition is maintained. This is to attract attention to the holding condition.

#### Hold Keys

3.09 Each Type 860A key telephone is provided with one red plastic hold key. The hold feature may be applied to all lines except tie lines and intercom circuits. When connected to any central office, PABX or similar line, operation of the nonlocking hold key disconnects the Type 860A telephone transmission circuit from that line and causes the associated relay equipment to place a holding bridge across the line until released by any telephone associated with that line. The Type 860A key telephone is then free to be connected to other lines.

3.10 The hold keys of the Type 860A key telephone can be modified to provide station busy indication. A lamp is placed into the hold position to give a visual indication that the line is in use. For example: if an executive's Type 860A telephone is on the same line with other Type 860A or Type 86 telephones, the hold positions of the other telephones are equipped with lamps which will light whenever the executive is using the line. When the executive station seizes the line, the hold lamps at the other stations light automatically and remain lit until the line becomes idle. When the line becomes idle, the hold lamps will extinguish automatically. This field modification, which may

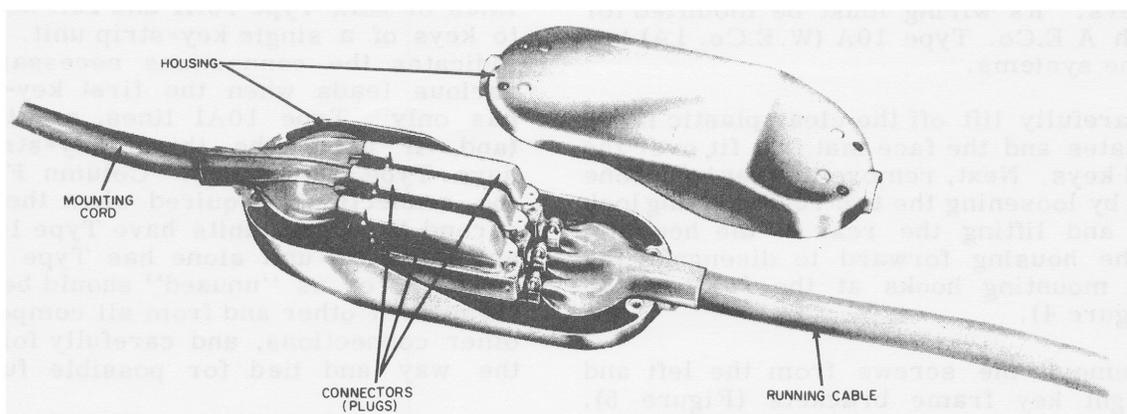


Figure 6. Type 860A Telephone Mounting Cord Plugs Connected to Running Cable Receptacles (Cover Off).

be made by the installer, is described in paragraph 4.19.

### Signal Keys

3.11 Any line pick-up keys not used for connecting to voice circuits may be converted to nonlocking, noninterlocking signal keys. Signal keys are used mainly for direct signaling of intercom stations. This avoids the necessity for dialing frequently called stations. Signal keys may also be used to signal a group of stations simultaneously for a conference call on an intercom circuit. The lines that do not have automatic ringing start must also have a nonlocking signal key to start the ringing. Nonlocking, noninterlocking signal keys may be wired to perform a wide variety of special services, depending upon the type of relay equipment used.

## 4. MODIFICATIONS

4.01 The following paragraphs describe procedures for modifying the Type 860A key telephone and its components. The interconnections between the Type 860A key telephone and relay equipment of the 10A1 (W.E.Co. 1A1) and 10A2 (W.E.Co. 1A2) key systems are identical, and no modification or conversion is necessary. References to the 10A1 (W.E.Co. 1A1) key system in the following paragraphs also apply to the 10A2 (W.E.Co. 1A2) key system. The Type 860A key telephone must be modified for use with 10A (W.E.Co. 1A) key systems.

### Conversion for Use with Type 10A Key Telephone System

4.02 The Type 860A key telephone, as normally supplied, is wired to operate with the A.E.Co. Type 16A communicating system, and 10A1 key telephone relay equipment (W.E.Co. 6A and 1A1 systems, respectively), and comparable systems of other manufacturers. Its wiring must be modified for use with A.E.Co. Type 10A (W.E.Co. 1A) key telephone systems.

4.03 Carefully lift off the clear plastic faceplates and the face mat that fit over the dial and keys. Next, remove the key telephone housing by loosening the two rear housing lock screws and lifting the rear of the housing; move the housing forward to disengage the housing mounting hooks at the front of the unit (Figure 4).

4.04 Remove the screws from the left and right key frame brackets (Figure 5). Raise the rear of the key frame assembly, and support it in this position, using the maintenance support (hook). The terminal

strips, on the underside of the attached mounting cord frame, are now accessible.

4.05 Table 1 shows the wiring changes necessary to convert the Type 860A key telephone for use with the Type 10A key telephone systems. All changes required involve only spade-tipped leads within the telephone; no soldered connections, external connections, or cable connections need be changed. Refer to Figure 8 when making wiring changes.

4.06 In Table 1, column A indicates the color code of each lead that must be changed, and when possible, a lead designation. Column B indicates the terminal or other connection point (in most cases the pin number of the 50-terminal plug on the end of the mounting cord within the Type 860A housing) to which the nonchanging end of each lead is connected. Column C indicates the terminal strip number (in Roman numerals) and the designation of the individual terminal to which the movable end of each "lead to be changed" is originally connected. In case of conversion, the terminals listed in column C, for each lead, are those which should be used when 10A1-type lines only are to be connected to the Type 860A key telephones. Columns D, E, and F indicate alternate connections for each lead, depending upon the particular conversion or application. Column D indicates the alternate connections required when lines of Type 10A systems only are to be served.

4.07 If it is necessary to connect lines of both Type 10A1 and Type 10A key telephone systems to the Type 860A key telephone, 10A1 system lines must be connected to the first or left-hand key-strip unit(s); the Type 10A system lines must be connected to the last or right-hand key-strip unit. The lines of either the Type 10A1 or the Type 10A key system may be connected to the keys of the center key-strip unit; however, it is NOT possible to connect lines of both Type 10A1 and 10A key systems to keys of a single key-strip unit. Column E indicates the connections necessary for the various leads when the first key-strip unit has only Type 10A1 lines, and the second (and, if used, the third) key-strip unit(s) have Type 10A1 lines. Column F indicates the connections required when the first and second key-strip units have Type 10A1 lines, and the third unit alone has Type 10A lines. Leads noted as "unused" should be insulated from each other and from all components and other connections, and carefully folded out of the way and tied for possible future use.

4.08 Regardless of the above variations, it is possible for any or all keys of any key-strip unit to be converted to signal use.

Table 1. Wiring Terminations for Use with Type 10A Key Telephone System.

(A)	(B)	(C)	(D)	(E)	(F)
Lead Color Code and Designation (if any)	Fixed End Permanently on Terminal (mounting cord plug)	Movable End Originally on Terminal	Movable End Moves to Terminal Indicated for Specific Conversion Desired		
		(All 10A1, 10A2)	All 10A	10A1 or 10A2 on KSU-1; 10A on KSU-2 (and 3, if used)	10A1 or 10A2 on KSU-1 and on KSU-2; 10A on KSU-3
R1 (Sl-Yel)	Pin 50	Unused	R1 of IV	1 of I	1 of II
R2 (Sl-Blk)	Pin 49	Unused	R of I	R of II	R of III
H1 (Blk-Wh)	Pin 48	H1 of I	A1 of I	H1 of I	H1 of I
H1 (Sl-Wh)	H1 of I	Unused	Unused	Unused	H2 of II
Blk-Bl	Pin 25	A1 of I	H1 of I	A1 of I	A1 of I
Bl-Wh	Pin 21	H1 of I	A1 of I	H1 of I	A1 of I
R (Red)	Transmission Unit Terminal #10	R of I	R1 of IV	R of I	R of I
R (Red-Wh)	1 of I Strapped to R of II		Retain	Remove	Retain
R (Red-Blk)	1 of II Strapped to R of III		Retain	Retain	Remove
Bl-Wh	Pin 21 of KSU-2	A2 of II	A2 of II	A2 of II	H2 of II
Hookswitch	Hookswitch H Terminal	Transmis- sion Unit	Transmis- sion Unit		
Wire (Blk)		Terminal #20	Terminal #13		

4.09 When the wiring changes have been completed, disengage the key frame maintenance support (hook) from the key frame assembly, and lower it back into place. Tighten the right and left key frame bracket screws, replace the housing on the unit, and tighten the two rear housing lock screws. Carefully replace the face mat and plastic face plates.

Conversion from Key-Strip Blank to Key-Strip Unit

4.10 A 6-key, key-strip unit (D-59307-A, Figure 3), identical to that used in the second vertical row, maybe substituted for the white plastic key-strip blank furnished in the third position when more than 12 keys are required. The following paragraphs contain the information necessary to replace a key-strip blank with a key-strip unit. A screw-

driver and the key-strip unit are needed for this conversion.

4.11 Remove the key telephone housing (paragraph 4.03) and remove the key-strip blank by loosening the mounting screws (Figure 2) which secure it to the key frame. Remove and discard the plastic dust covers protecting the third plug in the key frame and the receptacle in the key-strip unit.

4.12 Lower the key-strip unit, rear endfirst, into the key well provided for it in the key frame (Figure 4). Slide the unit toward the rear of the well until its forward end clears the frame. Engage the latch arm and the receptacle (both in the key frame assembly) with the latch bar and the plug, respectively, at the rear of the key-strip unit. Press the unit firmly into place in the well and tighten the mounting

screws at the top and bottom of the key frame. The key-strip unit should now be tested to see that the individual keys will lock operated when depressed. When satisfied that the key-strip unit is operating properly, replace the key telephone housing (paragraph 4.09).

#### Addition of Blocking Ring

4.13 If less than the 6 keys provided in a key-strip unit are to be used, or if fewer than the 12 keys normally furnished are to be used, unused keys can be prevented from operating by the addition of blocking rings. Two blocking rings are supplied with each Type 860A key telephone. Additional blocking rings (D-750008-A) can be ordered. The following paragraphs describe the procedure to be followed to block an unused key from operating. A screwdriver and the blocking ring(s) will be needed for this conversion.

4.14 Remove the key telephone housing (paragraph 4.03) and loosen the two receptacle assembly screws on the key-strip unit (Figure 4) containing the key or keys to be blocked. Lift the receptacle assembly (Figure 3) off the ladder assembly, exposing the six key shafts. Holding the receptacle assembly upside down, remove the retaining strip and place the blocking rings inside the push-button collars of the keys to be blocked.

4.15 Pressing it firmly into place, replace the retaining strip on the underside of the receptacle assembly. Place the receptacle assembly over the shafts and tighten the two receptacle assembly screws. The push-buttons of the unused keys now rest on the blocking rings and cannot be depressed; therefore, the keys cannot be operated. Depress keys having blocking rings to be sure that the keys are blocked. Replace the key telephone housing (paragraph 4.09).

#### Conversion of Hold Key to Line Pick-Up Key

4.16 If the hold key (paragraph 3.09) is not required, the key-strip unit in which it is located can be replaced with a 6-line pick-up key unit (Figure 3). Individual keys cannot be replaced. A screwdriver and the 6-key key-strip unit (D-59307-A) are needed for this conversion.

4.17 Remove the key telephone housing cover, and loosen the mounting screws (Figure 2) at both ends of the key-strip unit in position one. Raise the key-strip unit out of the key well in the key frame assembly until the receptacle of the key-strip is disengaged from the plug attached to the key frame assembly and

the latch bar is disengaged from the latch arm. Then, slide the unit toward the rear of the frame until the front end clears the front of the frame, and lift the unit out. Install the new 6-key, key-strip unit by reversing this procedure (also, see paragraph 4.12).

4.18 To perform the wiring changes necessary, raise the key frame assembly (paragraph 4.04). The terminal strips on the underside of the attached mounting cord frame are now accessible. Remove plastic sleeves from unused insulated color-coded leads OR-BL and BR-YEL. (The spade-tip is covered with a plastic sleeve.) Connect these leads to an unused terminal (use terminal C1 on terminal strip IV). Likewise connect spade-tipped leads color-coded OR-WH and BR-BLK, also insulated and unused, to another unused terminal (use C2 of terminal strip IV). Connect spade-tipped, insulated, and unused lead color-coded SL-BR, connected to terminal 12 of the 50-terminal plug (Figure 8), to terminal A1 of terminal strip I. Lower the key frame back into place, and replace the key telephone housing cover (paragraph 4.09).

#### Conversion for Station Busy Indication

4.19 To provide the station busy feature, the master (monitored) station and all other monitoring stations that have access to the same line must be modified. Use the following procedure to modify the master station (refer to Figure 7).

- (1) Move the black hookswitch wire from transmission unit terminal 20 to transmission unit terminal 13.
- (2) Connect a IN91 diode (order number FD-1029-A) between the transmission unit terminals 13 and 20.

The A (RED-BLK) lead and BL or LS (YEL-BLK) leads at transmission unit terminals 20 and 13, respectively, remain unchanged.

4.20 Use the following procedure to modify the monitoring stations (refer to Figure 7):

- (1) Connect the P3 (OR-WH) lead (pin 43 at the mounting cord end of the cable) to terminal R1 or terminal strip IV.
- (2) Connect the BR-BLK lead (pin 43 at plug set end of cable) to terminal R1 of terminal strip IV.
- (3) Connect the P4 (OR-BL) lead (pin 18 at mounting cord end of cable) to terminal C1 of terminal strip IV.

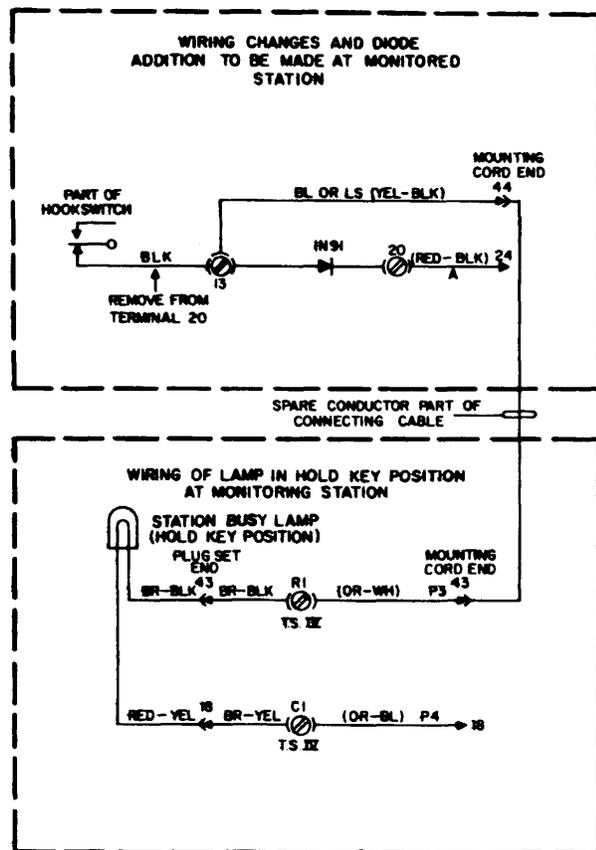


Figure 7. Conversion for Station Busy Indication.

- (4) Connect the BR-YEL lead (pin 18 at plug set end of cable) to terminal C1 of terminal strip IV.

The BR-BLK and RED-YEL hold lamp wires remain unchanged. At the mounting cord end of the line cord, terminal 44 of the monitored station is connected to terminal 43 of the monitoring stations. Any spare conductor in the connecting cable can be used for this purpose.

Conversion from Line Pick-Up Key to Signal Key

- 4.21 To convert one or more unused line pick-up keys to signal keys, follow the procedures given in paragraphs 4.22 and 4.23.
- 4.22 Remove the key telephone housing and loosen the two mounting screws at either end of the key-strip unit containing the keys to be converted. Raise the unit out of the key well in the key frame assembly. Remove the plunger screw (Figure 3) from each line pick-up key that is to be converted to signal use. Then, replace the unit in the key well, being sure to engage the latch arm and the receptacle in the key frame assembly with the latch bar and plug on

the unit. Press the unit firmly into place and tighten the two mounting screws. Test each converted key to be sure that it will not lock when depressed, nor release any locked-operated line pick-up key.

- 4.23 To perform the wiring changes necessary, raise the key frame assembly (paragraph 4.04). The terminal strips on the underside of the attached mounting cord frame are now accessible. If the converted key is in the key-strip unit in the second position, transfer its spade-tipped lead from its A2 terminal on terminal strip II to the S2 terminal on terminal strip IV. If the converted key is in the third position, its spade-tipped lead is transferred from its A3 terminal on terminal strip III to the S3 terminal on terminal strip IV, etc. (Figure 8). The key frame assembly may now be lowered into place and the housing replaced (paragraph 4.09).

Conversion from Ringer to Buzzer

- 4.24 A straight-line ringer (D-56580-A) is normally provided in each Type 860A key telephone. To use a buzzer instead of, or in addition to, the ringer, a buzzer mounting kit (H-883001-8) and a suitable buzzer (FD-1068-AB, or equivalent) are required. A screwdriver, the buzzer, and a buzzer-mounting kit are needed for this conversion.

- 4.25 Remove the key telephone housing (paragraph 4.03) and loosen the three dial mounting screws (Figure 4). Move the dial assembly toward the rear of the unit and lift it clear, exposing the transmission unit.

- 4.26 From among the spade-tipped, taped, and stored leads, select the YEL-WH and YEL-BL color-coded leads from the RED binder of the mounting cord. Remove the insulation from these leads and connect them to the terminals of the buzzer. It is not necessary to change the ringer connections, nor remove the ringer to add a buzzer. Both may be used; that is, the ringer may be used for signaling trunk calls and the buzzer for intercom signaling. For wiring information, refer to appropriate Sections pertaining to the key system being used.

- 4.27 Fasten the buzzer to the buzzer mounting bracket with two of the screws provided in the buzzer mounting kit. With the dial assembly still loose, connect the buzzer mounting bracket (with buzzer attached to it) by slipping the buzzer mounting bracket between the underside of the dial plate and top of the capacitor so that the buzzer hangs down from the right rear side of the dial mounting bracket. With the remaining two screws provided in the buzzer mounting

kit, fasten the buzzer mounting bracket in this position, using the two screw holes provided for this purpose in the dial mounting plate.

4.28 Remount the dial plate assembly, with buzzer attached, over the transmission unit by placing it in position and tightening the three dial mounting plate screws. Replace the key telephone housing (paragraph 4.09).

## 5. INSTALLATION

### Placement

5.01 The Type 860A key telephone should be located as directed by the customer. The telephone mounting cord has three 50-terminal plugs at the end away from the telephone for direct connection to the receptacles of the running cable. This connection between the mounting cord plugs and the running cable receptacles may be enclosed and protected by an aluminum housing (for terminal connectors) number FD-1038-BG (Figure 6). Attach one-half of this fitting to some convenient surface (wall or floor); install the plugs and receptacles, place the cover half of the fitting in position, and fasten. An over-the-floor duct, just large enough to accommodate a running cable, is also available.

### Running Cables

5.02 The running cable extends the leads from the Type 860A key telephone to the relay equipment. Running cables are normally 50-foot long, although the 100-foot lengths are available with receptacles at both ends; these may be cut to provide one running cable longer than 50 feet and one shorter than 50 feet for a particular installation. The Type 860A telephone(s) and relay equipment should be installed within 100 feet of each other or, where possible, within 50 feet of each other. If it is necessary to locate one or more Type 860A key telephones more than 100 feet from the relay equipment, it is recommended that an intermediate terminal box be used within 50 or 100 feet of the telephones. From this box, regular multiconductor installation cable or cables should be extended to the relay housing and power units; this cable should have sufficient conductors for the number of circuits served. Circuits common to more than one Type 860A or Type 86 key telephone may be multiplied at this box to reduce the number of conductors required between this box and the relay equipment. When this is done, care should be taken so that the wire size is adequate for the current and distance.

### Cable Connections

5.03 The end of the running cable away from the Type 860A key telephone and mounting cord is for connection to the relay equipment, and has no spade tips. Each lead in the running cable appears as an individual, insulated, color-coded conductor in one of the color-coded binder groups. Connections at this end, either to the relay equipment or to some intermediate terminal, can be made only after the cable sheath is cut back and removed, the individual conductors identified, and their insulation removed.

5.04 Figure 8 shows the plug and receptacle terminal numbers, lead designations, and color code so that proper connections can be made between the running cable conductors and the relay equipment terminals. (It is necessary to have information about the relay equipment in order to make these connections.)

### Key Designation Strips

5.05 A sheet of six designation strips is provided with each Type 860A key telephone. The strips may be detached from each other by tearing along the perforations separating them. The spares should be saved for future use. Each strip contains six squares, one for each lamp in a key-strip unit. The line or extension number and/or other identifying letters assigned to each key in the key strip should be printed, stamped, or typed in the squares.

5.06 Remove the clear plastic face plates over the dial and keys, and remove the face mat. Peel the protective covering off the adhesive-covered back of each key designation strip, place the strip face upon the light shield over the lamps, and press it firmly into place. Then, replace the face mat and the face plates. Should it become necessary in the future, the original key designation strips can be removed in the same manner, and replaced with the spares provided in the sheet.

### Stamping Dial Number Card

5.07 The dial number card is enclosed within the finger wheel. If the dial is equipped with a one-piece clear plastic finger wheel, the finger wheel must be removed to gain access to the dial number card. If the dial is of the two-piece type, the dial number card is in the escutcheon ring. For dial number card removal, refer to the appropriate section in the 473-820 series of General System Practices.

### Setting the Ringer Volume Adjusting Lever

5.08 The ringer volume adjusting lever (Figure 4) projects from the lower left front of the Type 860A key telephone. It is a mechanical device which moves the ringer gong-silencing arm, located inside the gong, away from or toward the gong wall. As the clapper arm travel is reduced, the vibrations of the gong, when struck by the clapper, are decreased; this decreases the volume of sound produced. Similarly, when the clapper arm travel is increased, by moving the gong-silencing arm away from the gong wall, the vibrations of the gong increase; thus, increasing the volume of sound. The ringer volume adjusting lever may be adjusted to obtain the ringer volume desired. The installer should point out this feature to the customer.

NOTE: Adjustment of the ringer volume adjusting lever has no effect on the sound volume produced by the buzzer if a buzzer is used. To adjust buzzer volume, remove the buzzer cover and move the adjustable tone arm until the desired volume is attained.

## 6. MAINTENANCE

### Lamp Replacement

6.01 To replace a key-strip lamp, remove the clear plastic faceplates and facemat from the telephone housing. Also, remove the light shield from the key-strip unit in which the lamp is to be replaced. With a thin-bladed screwdriver, turn the lamp until the flat portion of the wedge-shaped lamp base is facing up. Then, either work the blade of the screwdriver under the lamp base and pry the lamp out of the clips, or press down on the flat portion of the lamp base until the opposite portion of the lamp pops up. After the lamp pops up, it can be removed by gently prying it up with a screwdriver blade, pencil, or any convenient pointed instrument. Insert a new lamp (D-94085-A) in the clip, pressing it firmly into place.

NOTE: Press only on glass portion of the lamp, not the base, or the lamp may break. In order, replace the light shield, face mat, and face plates.

### Dial Replacement

6.02 If the dial requires replacement, a screwdriver and a new Type 51A dial (D-84821-J) are needed.

6.03 Remove the key telephone housing (paragraph 4.03) and loosen the three dial mounting plate screws. Move the dial mounting assembly toward the rear of the unit and lift it clear, exposing the transmission unit. Remove the plastic dial dust cover and disconnect all leads connected to the dial. Loosen the three dial mounting screws (Figure 2) and remove the dial assembly from the dial mounting plate. Place the new dial assembly in the dial mounting plate and tighten the three dial mounting screws. Reconnect the leads to the new dial; see Figure 8 for lead connections. Replace the dial mounting assembly over the transmission unit, tighten the three dial mounting plate screws, and replace the key telephone housing.

### Key Frame Assembly Removal

6.04 If the key frame assembly needs to be removed, remove the key telephone housing (paragraph 4.03) and loosen the right and left key frame bracket screws at the rear of the telephone (Figure 5). Raise the rear of the key frame assembly and lift the front end out of the hinge slots, in which it rests. The assembly is now free of the telephone unit. To replace the key frame assembly, reverse this procedure.

### Mounting Cord Frame Removal

6.05 If it becomes necessary to remove the mounting cord frame, remove the key telephone housing (paragraph 4.03) and raise the key frame assembly, using the maintenance support. Remove the dial mounting plate (paragraph 4.25). Disconnect the mounting cord leads which terminate on the ringer, the dial, and the transmission unit. Loosen the four screws which secure the mounting cord frame to the key frame. Remove the screw from the mounting cord clamp, at the left rear of the key telephone base, and remove the mounting cord from the clamp. Lift the mounting cord frame free of the telephone. To replace the mounting cord frame, reverse this procedure, and replace the dial. Lower the key frame assembly, and replace the housing cover.

### Replacing Key-Strip Units

6.06 If a key-strip unit fails to operate properly, it should be removed (paragraph 4.17) and inspected. Work done on the customer's premises should be limited to verification and analysis of the trouble, readily made adjustments, and replacement of easily accessible parts. If it cannot be repaired easily at the customer's premises, it should be replaced and the faulty unit overhauled in the shop.

### Push-Button Keys and Plungers

6.07 If any of the push-button keys bind, any accumulated dirt or other foreign matter should be removed and the parts and surfaces wiped clean with a damp cloth. DO NOT use lubricants or solvents. The plungers should move freely throughout their entire travel, and should return to normal from the operated position with a snap. If any binding or squeaking persists, replace the key-strip unit.

### Contacts

6.08 Normally open spring contacts should have a minimum separation of 0.006". Normally closed contacts should have perceptible follow. Minimum separation between adjacent springs should be 1/64".

### Latching Mechanism

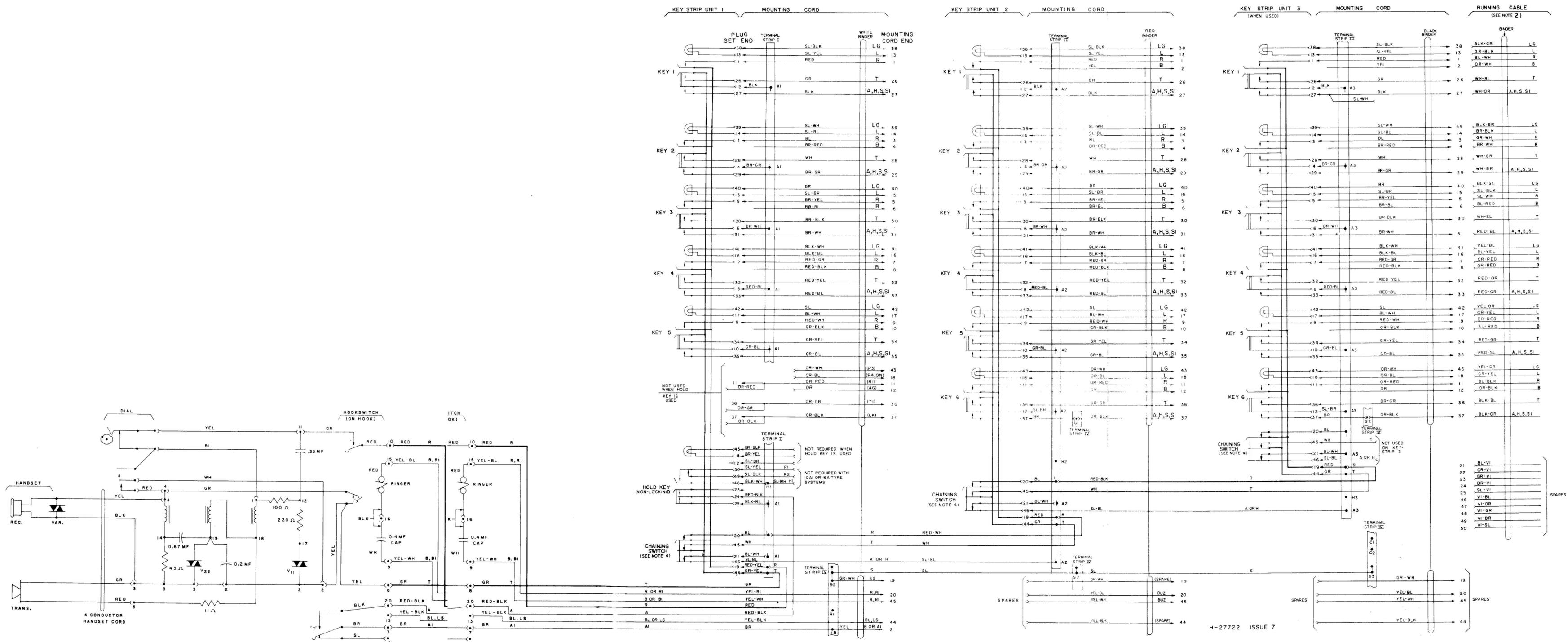
6.09 The latching mechanism should operate freely. If operation is unsatisfactory, the unit should be replaced and overhauled. The latching mechanism should NOT be lubricated, as the bearing surfaces are factory lubricated and do not require additional lubrication.

### Handset and Capsules

6.10 The Type 860A key telephone utilizes a Type 810 handset. For capsule replacement and/or handset cord replacement (at the handset), refer to the appropriate Section in the 473-801 series of General System Practices.

## NOTES FIGURE 8

1. Transmission and switching components, and mounting cord are shown in full, including color codes and all lead and terminal designations.
2. The plug-connected running cable is shown in part. One typical section or binder group, including spares, is shown fully. There are three such groups, all identical as to color code and connection to the terminals of the 50-conductor receptacles; each 50-conductor section, however, has a different color binder. The running cable binder colors are (1) blue, (2) orange, and (3) green. These binder colors identify the sections of the running cable connected to the first, second, and third 50-conductor receptacles and to the mounting cord sections associated with the first, second, and third key-strip units, respectively.
3. A third key-strip unit is shown in place; this is not furnished installed. No wiring changes, however, are involved in its installation; it is simply plug-connected to the 50-terminal mounting cord plug inside the Type 860A telephone when wanted. All other wiring shown is furnished on all units. Options and variations are explained in Part 4 of this Section.
4. Signal keys have no effect on the chaining switch and interlocks.
5. Several leads associated with the first key-strip unit are not used when 10A1 type key system lines only and the HOLD key are used. Some of these leads are needed, however, if 10A type key system lines are used and/or a line pick-up key is substituted for the HOLD key. Instructions for these conversions for converting any line pick-up key to signal function use, and for addition of a third 6-button key-strip unit are all given in Part 4 of this Section.
6. Alternate lead designations on six conductors in the white binder of the mounting cord (associated with key-strip unit one) are for possible future connections to loudspeaking telephone adapter and control equipment.
7. Spare conductors are intended for future use with additional or expanded features and should not be cut-off. Leads "BUZ" in the red binder of the mounting cord are for operation of a buzzer if required.
8. Terminal strip IV has a total of nine terminals and designations; these appear at several locations on the drawing. All terminals, including unused ones, are shown.
9. All terminals indicated as on the same terminal strip and with the same designation are connected in common.
10. The hookswitch is shown in the idle (on hook) position. When the handset is removed from the cradle, the "Y" contacts close (make) first and the "X" contacts open (break) last. When the handset is replaced on the cradle, the "X" contacts close (make) first and the "Y" contacts open (break) last.



H-27722 ISSUE 7

Figure 8. Schematic and Wiring Diagram, Type 860A Key Telephone (Includes Complete Mounting Cord and Typical Running Cable Selection).