TYPE 860A
KEY TELEPHONE

1. DESCRIPTION

1.1 General Application

The type 860A key telephone is intended to be used as subscriber's station apparatus with Automatic Electric Company type 10A, 10A1, or 16A key telephone systems. It is designed to originate, answer, signal, and hold calls on central office lines, P-B-X lines, tie lines, and intercommunication circuits associated with these key telephone systems. It can also be used with W. E. Co. type 1A, 1A1, or 6A key telephone systems, or comparable systems of other manufacturers.

1.2 Physical

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''. On the left side of the sloping front surface is mounted a type 51A dial with a translucent finger plate. On the right side are located the push-button keys (in vertical rows or strips of six keys per strip). Although provision has been made for 18 keys, it is normally furnished with 12 keys. The first vertical row or key-strip unit (KSU) adjacent to the dial includes a red plastic push-button HOLD key and five clear plastic line pick-up keys; the second vertical row (key-strip unit) contains six clear plastic line pick-up keys. The third row or position is provided with a white plastic key-strip blank molded to resemble a set of six line pick-up keys. This blank can easily be removed and replaced with a 6-key unit identical to the one in the second vertical 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-function keys.

The plastic housing and the handset that rests on the twin cradle hooks which project laterally from the left side of the housing, are available in two basic colors: sand beige and jade green. The handset is attached to the housing by means of a retractile cord which is the same color as the handset and the housing. Also provided are colored face mats that fit over the dial, key designations, and keys. Five different colored mats are furnished with each telephone; these colors are silver, gold, blue, green, and ivory. Each 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 also to secure the colored face mat underneath.

A lever allows adjustment of the sound of the ringer contained in the housing; this lever projects from the front of the housing, on the left side, near the base (see figure 3).

1.3 Connections and Cabling

Each of the six-key, key-strip units (figure 6) include a 50-terminal receptacle by means of which all of the connections to the key-strip unit are made; no soldered connections or other wiring are needed. These receptacles connect directly into 50-terminal plugs which are secured to the key frame assembly (see figure 4). There are three such plugs, one for each key-strip unit or position. Not all terminals on each plug are used.

A few wires from each 50-terminal plug on the key frame are connected to the other plugs and/or to the transmission components of the 860A key telephone. However, most of the conductors from the 50-terminal plugs are grouped and enter a plastic cable sheath; this is known as the mounting cord and is equivalent to the line cord of ordinary telephones. The mounting cord also includes a number of wires that have spade tips and either connect directly to the transmission components (instead of to the 50-terminal plugs), or are insulated, taped,

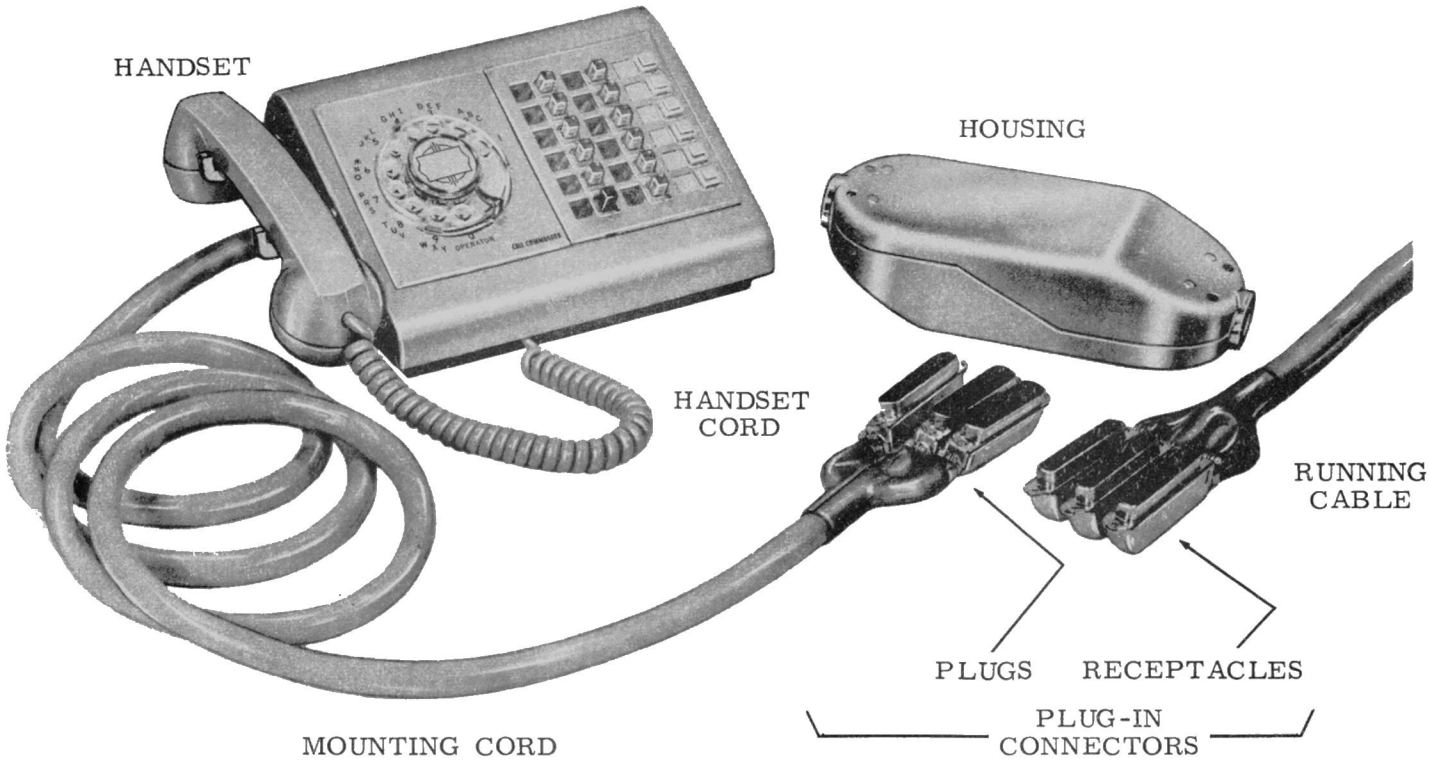

Figure 1. Type 860A key telephone, complete, showing mounting cord and plugs, running cable, running cable receptacles, and optional housing.

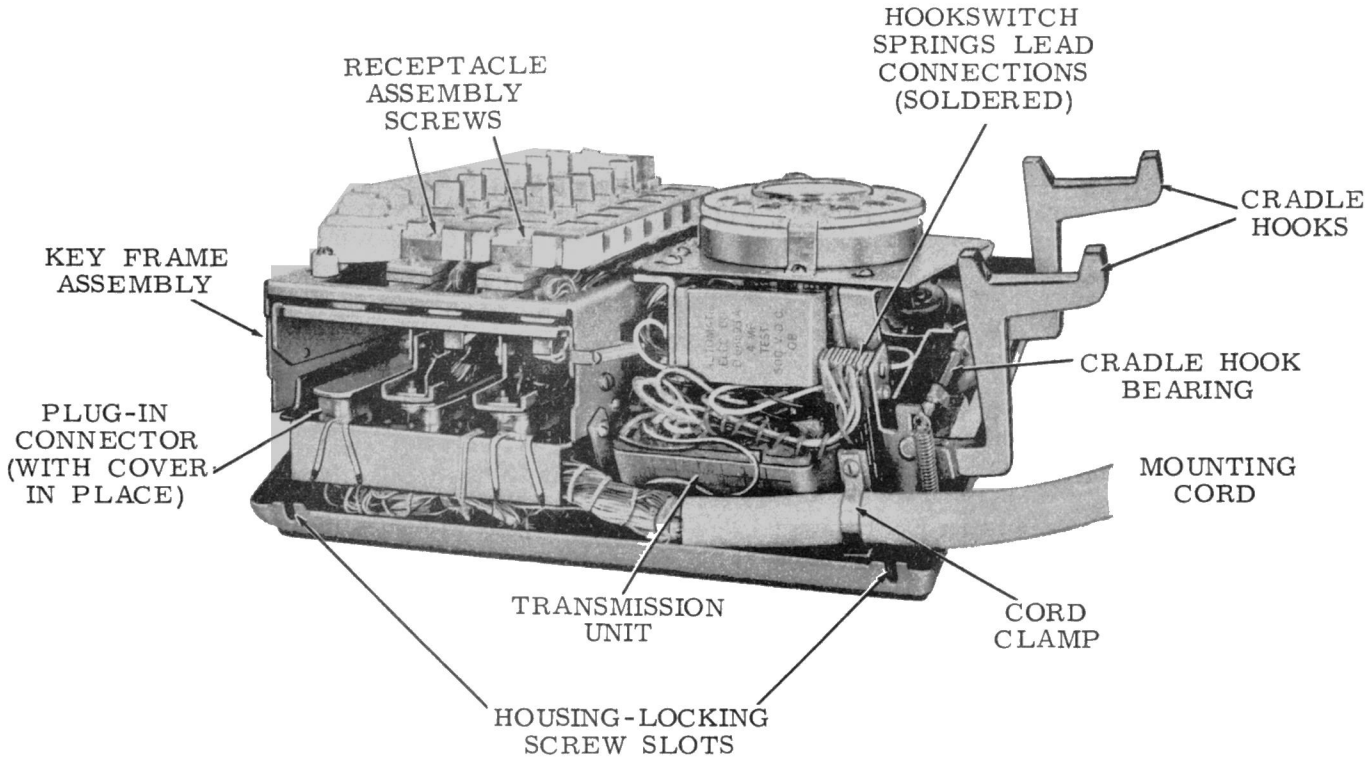

Figure 2. Rear view of type 860A key telephone.

and stored for possible future use with optional or additional features (figure 6).

The mounting cord consists of 120 conductors in three groups of 40 conductors each. Each group is alike as to color coding etc., but is identified by a different colored binder. The mounting ("line") cord is approximately 5/8" in diameter and eight feet long; its 120 conductors all terminate - at the end away from the 860A telephone - on three 50-terminal plugs exactly like those used for connection to the key-strip units (figure 1). One group of 40 conductors terminates on each plug; not all terminals are used.

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; the three groups of 50 conductors (25 pairs) are alike, except that each group is identified by a different colored binder. The ten additional conductors in each 50-group are "spares" for possible future use and/or in case of expanded facilities or services.

The 150-conductor running cable is normally furnished in fifty foot lengths. One end is equipped with three 50-terminal receptacles for connection to the three 50-terminal plugs of the 860A telephone mounting cord (figure 1). The other end of the running cable has no special termination or treatment; the 150 conductors (three groups of 25 pairs each) are individually insulated and color-coded for connection to the relay equipment. Upon special request running cables 100 feet long can be furnished; 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 may be needed for particular installations. It should be noted that these 100 foot running cables have receptacles at both ends, and, therefore, cannot be connected together for runs longer than 100 feet.

1.4 Operation

Following is a description of the operation of a type 860A key telephone on central office, P-B-X, and tie lines, etc., associated with a key telephone system.

1.4.1 Pick-up keys.

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

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

Once a connection has been made from the 860A transmission circuit to any talking channel, the subscriber must then operate his dial to send the signals necessary to establish a connection to the desired telephone; or, in the case of certain tie lines and intercommunication circuits, he must start local audible signaling by operating either his dial or a push button on his key type telephone (860A or 86).

To release a line, the handset is replaced on the hookswitch. The line pick-up key will remain operated, but its lamp will go out, indicating that the line is idle. If another call comes in on this same line, the lamp will flash rapidly to indicate an incoming call. Since the line pick-up key is already operated, the call may be answered merely by lifting the handset off the hookswitch. If a call comes in on another line, depressing the pick-up key for that line will release the first line key, allowing it to return to its normal position.

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

One locking (line pick-up or intercom) key in each 6-key unit may be operated at the same time and each will lock operated; but an electrical "chaining switch," which is a part of each 6-key unit, prevents the electrical connection of more than one line or other talking channel to the transmission circuit of the telephone. Operation of a locking key in the first 6-key group (nearest the dial) operates the chaining switch and opens the circuits to the chaining switch of the second group, etc.

TABLE "A"

(A)	(B)	(C)	(D)	(E)	(F)
Lead Color and Designation (if any)	Fixed End Permanently on Terminal (mounting cord plug)	Movable End Originally on Terminal (All 10A1)	Movable End Moves to Terminal Indicated for Specific Conversion Desired		
			All 10A	10A1 on KSU-1 10A on KSU-2 (and 3, if used)	10A1 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	A1 of I	A1 of I	H1 of I	A1 of I
R (Red)	Transmission unit terminal #5	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

1.4.2 Hold keys.

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 intercommunication circuits. When connected to any central office, P-B-X 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 860A telephone is then free to be connected to other lines.

Usually a lamp "winking" feature is also provided to cause the lamps associated with the 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 and prevent a line from being accidently left on HOLD indefinitely.

1.4.3 Signal keys.

Any line pick-up keys not used for connecting to talking circuits may be converted to nonlocking, noninterlocking signal keys. Signal keys are used, principally, 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. Tie lines that do not have automatic ringing start must also have a nonlocking signal key in order 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.

2. MODIFICATIONS

Following is a description of the operations involved in modifying the type 860A key telephone and its components to meet various requirements.

2.1 Conversion to Type 10A Key Telephone System Use

The type 860A key telephone is furnished wired to operate with A. E. Co. type 16A communication system and 10A1 key telephone system relay equipment (W. E. Co. 6A and 1A1 systems, respectively, and comparable systems of other manufacturers). Its wiring must be revised slightly for use with A.E. Co. type 10A (W. E. Co. 1A) key telephone systems. A medium-sized screw driver is needed for this conversion.

2.1.1 Gently lift off the clear plastic face plates and the colored face mat over the dial and keys. Next remove the key telephone housing by loosening the two rear housing lock screws (figure 2) 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).

Remove the screws from the left and right key frame brackets (figure 6). Raise the rear of the key frame assembly, and support it in this position using the maintenance hook or support. The terminal strips, on the underside of the attached mounting cord frame, are now accessible.

2.1.2 Table A shows the wiring changes necessary to convert the type 860A key telephone for use with type 10A key telephone systems. All changes required involve only spade-tipped leads within the telephone; no soldered connections, no external connections, and no cable connections need be changed.

In the table, column A gives the color code of each lead that must be changed and, when possible, a lead designation. Column B gives 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 gives 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 860A telephone. Columns D, E, and F give alternate connections for each lead depending upon the particular conversion or application. Column D gives the alternate connections required when lines of 10A type systems only are to be served.

If it is necessary to connect, to the type 860A key telephone, lines of both 10A1 type and 10A type key telephone systems, the 10A1 system lines must be connected to the first or left-hand key-strip unit(s); the 10A system lines must be connected to the last or right-hand key-strip unit(s). If a third 6-key, key-strip unit has been installed in the 860A telephone (per section 2.2), the same rule still applies, and lines of either the 10A1 system or of the 10A system may be connected to the keys of the center unit. However, it is NOT possible to connect lines of both 10A1 and 10A type systems to keys of a single key-strip unit.

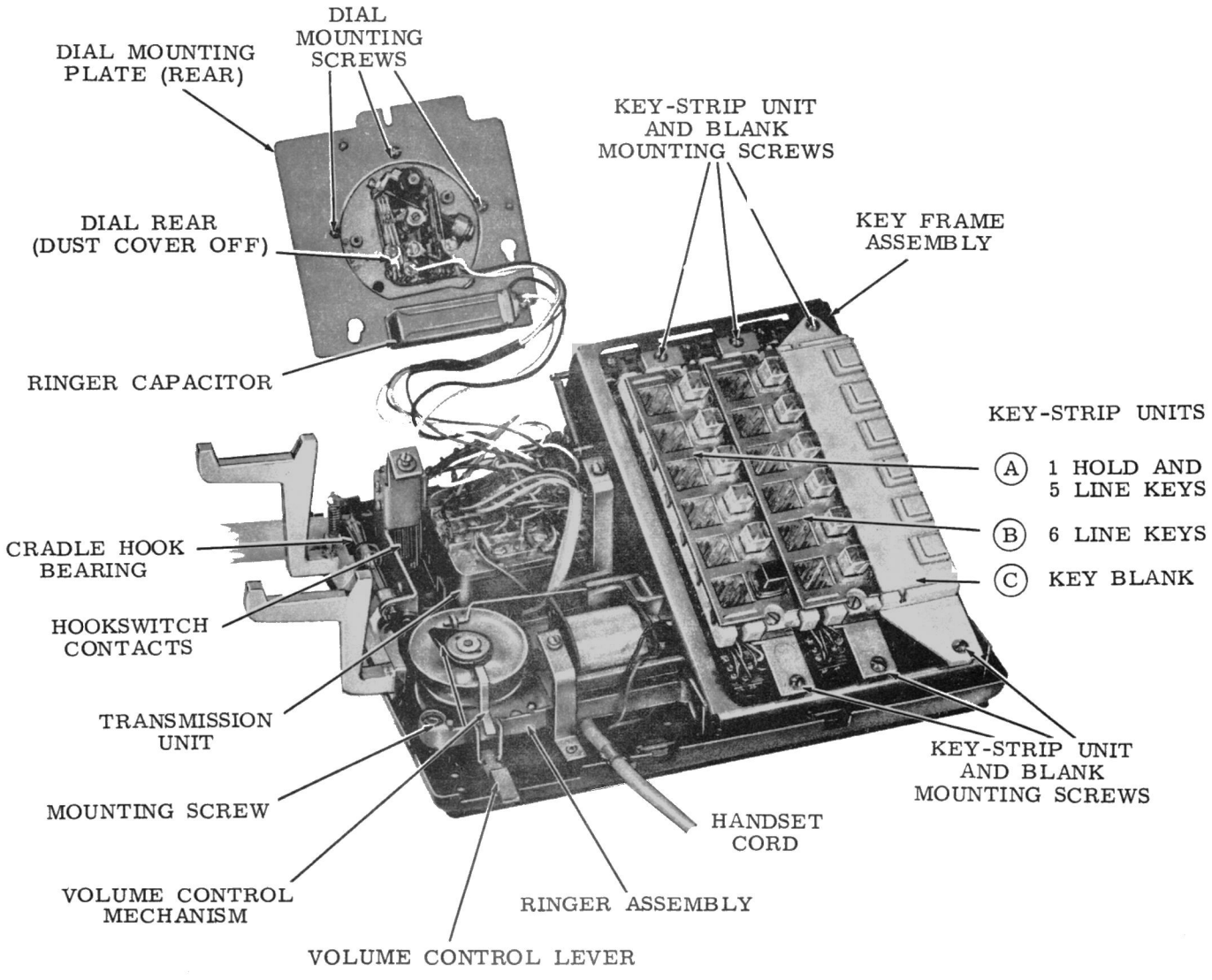

Figure 3. *Type 860A with housing removed, and dial assembly raised and inverted.*

Column E gives the connections necessary for the various leads when the first key-strip unit (KSU) only has 10A1 type lines, and the second (and, if used, the third) key-strip unit(s) have type 10A lines. Column F gives the connections required when the first and second key-strip units have 10A1 lines, and the third unit alone has 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 reuse.

Despite all the above variations, etc., it is still possible for any key of any key-strip unit (or, in fact, all keys of a key-strip unit) to be converted (per section 2.5) to signal use.

2.1.3 When the wiring changes have been completed, the key frame maintenance support is disengaged from the key frame assembly, which is then lowered back into place. The right and left key frame bracket screws are tightened, the housing is replaced on the unit, and the two rear housing lock screws are tightened. Carefully replace the colored face mat and plastic face plates.

2.2 Conversion from Key-strip Blank to Key-strip Unit

A 6-key, key-strip unit (D-59307-A: figure 5), identical to that used in the second vertical row or position, may be substituted for the white plastic key-strip blank furnished in the third vertical position if more than 12 push-button keys are required. The operations involved in converting a key-strip blank to a key-strip unit are as follows. A medium-sized screw driver and the key-strip unit are needed for this conversion.

2.2.1 Remove the key telephone housing as in section 2.1.1 above; remove the key-strip blank by loosening the mounting screws (figure 3) 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.

2.2.2 Lower the key-strip unit, rear end first, 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 it is operating properly, the key telephone housing should be replaced as in section 2.1.3 above.

2.3 Addition of a Blocking Ring

If it is desired to increase the capacity of a type 860A key telephone by less than the full six keys provided in a key-strip unit, or if fewer than the full number of (twelve) keys furnished on standard models is desired, 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 procedure to be followed in blocking an unused key is as follows. A medium-sized screw driver and the blocking ring(s) will be needed for this conversion.

2.3.1 Remove the key telephone housing as in section 2.1.1; loosen the two receptacle assembly screws (figures 2 and 4) on the key-strip unit in which are located the key or keys to be blocked. Lift the receptacle assembly (figure 5) off the ladder assembly, exposing the 6 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.

2.3.2 Replace the retaining strip over the underside of the receptacle assembly, pressing it firmly into place. 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. Push the keys to be sure that they are blocked. Replace the key telephone housing as in section 2.1.3.

2.4 Conversion of Hold Key to Line Pick-up Key

If the HOLD key (section 1.4.2) is not required, the key-strip unit in which it is located can be replaced with a 6-line pick-up key unit (figure 5); individual keys cannot be replaced. A medium-sized screw driver and the 6-line, pick-up key-strip unit (D-59307-A) are needed for this conversion.

2.4.1 Remove the key telephone housing cover as in section 2.1.1, and loosen the mounting screws (figure 3) at both ends of the first key-strip unit. Raise the key-strip unit out of the key well in the key frame assembly until the receptacle of the key-strip unit is disengaged from the plug attached to the key frame

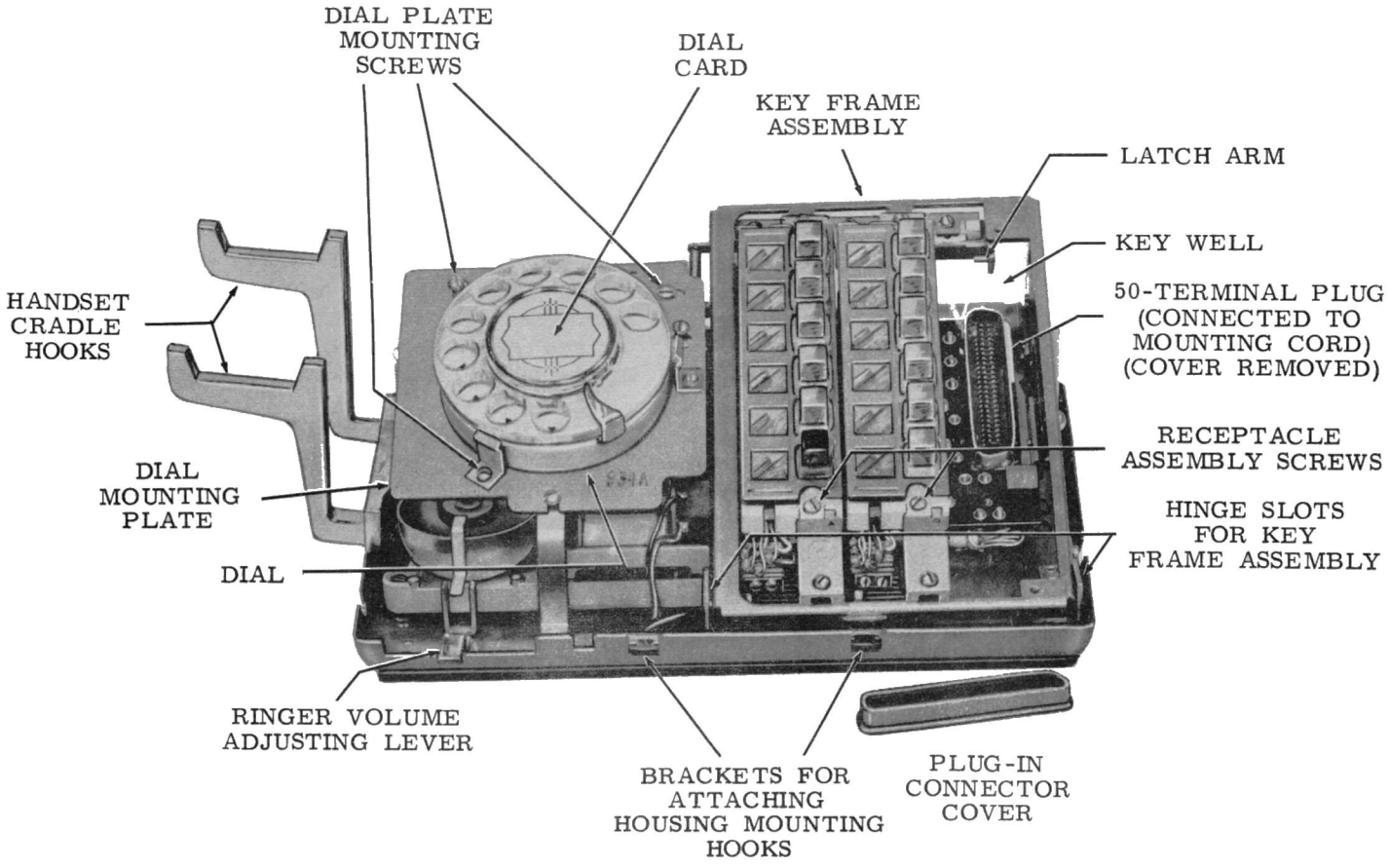

Figure 4. Type 860A with key blank and cover of plug-in connector removed (ready for installation of third key-strip unit).

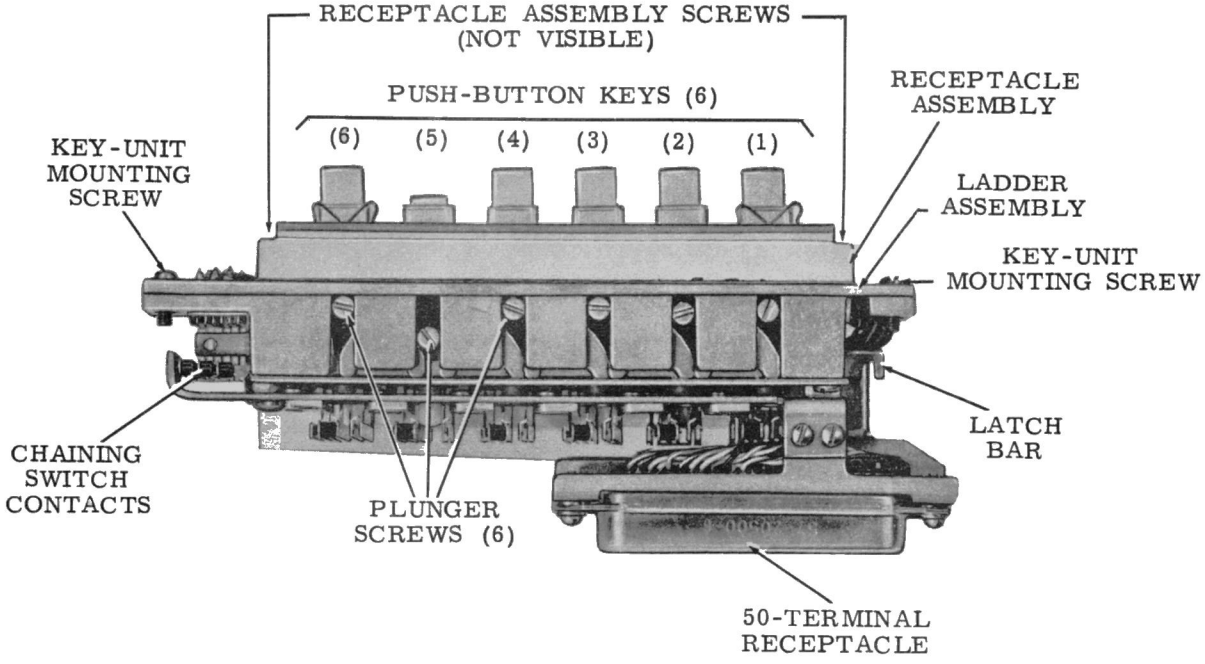

Figure 5. Key-strip unit (6-key) showing six line pick-up keys (D-59307-A).

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 it out. Install the new 6-key, key-strip unit by reversing this procedure (also see section 2.2.2 above).

2.4.2 To perform the wiring changes necessary, raise the key frame assembly as in section 2.1.1. The terminal strips on the underside of the attached mounting cord frame are now accessible. Spade-tipped leads OR-BL and BR-YEL, which are insulated (the spade tip covered with a plastic sleeve) and unused, should have their plastic sleeves removed; these leads should then be connected to an unused terminal (use terminal C1 on terminal strip IV).

Spade-tip leads OR-WH and BR-BLK, also insulated and unused, should likewise be connected to some other unused terminal (use C2 of terminal strip IV). Spade-tipped, insulated, and unused lead SL-BR connected to terminal 12 of the 50-terminal plug (figure 10) should be connected to terminal A1 of terminal strip I. The key frame should then be lowered back into place, and the key telephone housing cover replaced as in section 2.1.3.

2.5 Conversion from Line Pick-up Key to Signal Key

Should it be desirable to convert one or more unused line pick-up keys to signal keys, the procedure is as follows. A medium-sized screw driver is needed for this conversion.

2.5.1 Remove the key telephone housing as in section 2.1.1, and loosen the two mounting screws at either end of the key-strip unit in which the keys to be converted are located. Raise the unit out of the key well in the key frame assembly. Remove the plunger screw (figure 5) from each line pick-up key that is to be converted to signal use. Then replace the unit back 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 push button to be sure that it will not lock when depressed, nor release any locked-operated line pick-up keys.

2.5.2 To perform the wiring changes necessary, raise the key frame assembly as in section 2.1.1. The terminal strips on the underside of the attached mounting cord frame are now accessible. If the converted key is in the second key-strip unit, its spade-tipped lead is transferred from its A2 terminal on terminal strip II to the S2 terminal on terminal strip IV. If the converted key is in the third key-strip unit, its spade-tipped lead is transferred from its A3 terminal on terminal strip III to the S3 terminal on terminal strip IV, etc. (figure 10). The key frame assembly may now be lowered back into place and the housing replaced as in section 2.1.3.

2.6 Conversion from Ringer to Buzzer

A straight-line ringer (D-56580-A) is normally provided in each type 860A key telephone. If it is desired to use a buzzer instead of or in addition to the ringer, a buzzer mounting kit (H-883001-8) and a suitable buzzer (D-56561-A, or equivalent) must be ordered. The procedure for installing the buzzer is as follows. A medium-sized screw driver, plus the buzzer and kit, are needed for this conversion.

2.6.1 Remove the key telephone housing as in section 2.1.1; loosen the three dial mounting plate screws (figure 4). Move the dial assembly toward the rear of the unit and lift it clear, exposing the transmission pot.

2.6.2 From the spade-tipped, taped, and stored leads, select the YEL-WH and YEL-BL leads from the RED binder of the mounting cord. Remove the insulation from these leads and connect them to the proper terminals of the buzzer (terminals AC and AC/DC for buzzer operating voltages of 16 to 21 volts, ac - terminals DC and AC/DC for buzzer operating voltages of 14 to 28 volts dc). It is not necessary to change the ringer connections, nor to remove the ringer to add a buzzer; both may be used or the buzzer may be used alone.

2.6.3 Fasten the buzzer to the buzzer mounting bracket with two of the screws provided in the buzzer mounting kit. With the dial assembly still unmounted, connect the buzzer mounting bracket (with buzzer attached to it) by slipping the buzzer mounting bracket between the underside of the dial mounting plate and the 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.

2.6.4 The dial plate assembly, with buzzer attached, can now be remounted over the transmission pot by placing it in position and tightening the three dial mounting plate screws. The key telephone housing is replaced as in section 2.1.3.

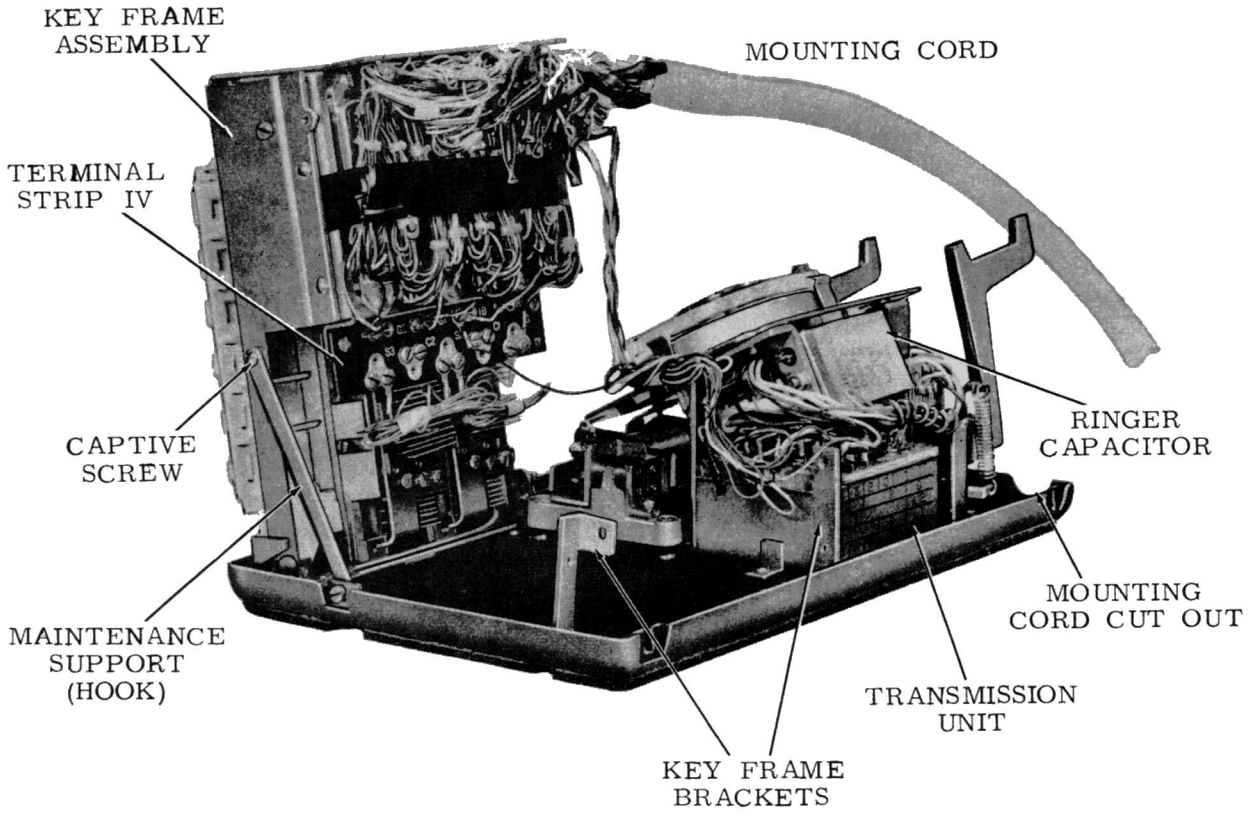

Figure 6. Elevated rear view of the type 860A.

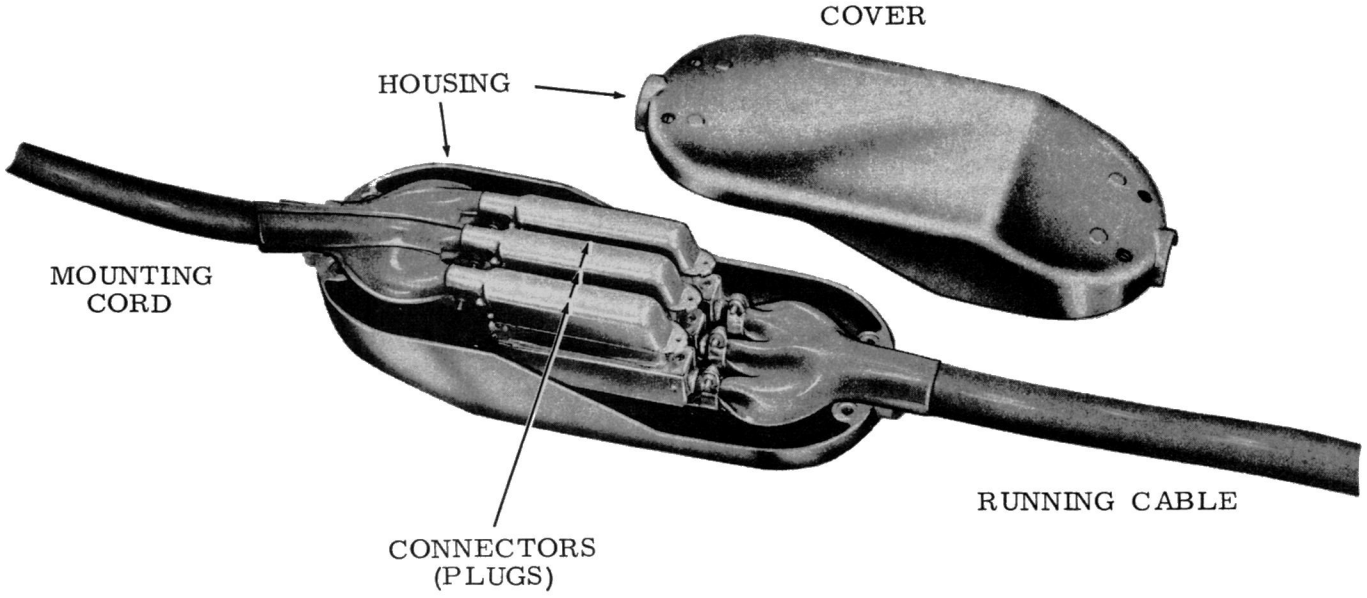

Figure 7. Type 860A mounting cord plugs connected to running cable receptacles (cover off).

3. INSTALLATION

3.1 Placement

The type 860A key telephone should be located as directed by the subscriber. Each type 860A telephone comes equipped with a 120-conductor, plastic-sheathed, mounting cord, eight feet long. The mounting cord has three 50-terminal plugs at the end away from the telephone for direct connection to the receptacles of the running cable (figure 1). This connection between the mounting cord plugs and the running cable receptacles may be enclosed and protected by use of an aluminum housing (for terminal connectors) number FD-1038-BG (figure 7). One half of this fitting may be attached to some convenient surface (wall or floor), the plugs and receptacles installed, and the cover half of the fitting put on. An over-the-floor duct just large enough to accomodate a running cable is also available for use as required.

3.2 Running Cables

The running cable extends the leads from the type 860A telephone to the relay equipment. Running cables are normally 50 feet long, although 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 if needed for a particular installation. The 860A telephone(s) and relay equipment should all 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 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 multi-conductor installation cable or cables should be extended to the relay housing and power units; this cable should have the number of conductors, length, and wire size necessary for the distance and number of circuits served. Circuits common to more than one type 860A telephone or type 86 key telephone, may be multipled at this box to reduce the number of conductors required between this box and the relay equipment. When this is done, however, care should be taken so that the wire size is adequate for the current and distance.

3.3 Cable Connections

The end of the running cable away from the 860A telephone and mounting cord - intended for connection to the relay equipment - has no spade tips or other special treatment. Each lead in the running cable simply 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.

Figure 10 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.)

3.4 Key Designation Strips

A sheet of six key designation strips is provided with each type 860A key telephone. The strips may be detached from each other simply 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 push-button key in the key strip should be printed, stamped, or typed in the squares.

Remove the clear plastic face plates over the dial and push-button keys, and the colored mat. Peel the protective covering off the adhesive-covered back of each key designation strip, lay the strip down (face up) on the light shield over the lamps, and press it firmly into place. Then replace the 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.

3.5 Filling Out the Dial Card

A small screw driver is needed to remove the paper dial card from under the plastic escutcheon ring cover in the dial assembly.

Insert the screw driver between the ring and the plastic cover, about half way between finger holes 5 and 6; this unlocks the ring. Lift the ring off the dial assembly, and remove the dial card by rotating the clamping plate, inside the ring, counterclockwise and lifting it out. This exposes the dial card, which may now be removed. The required information should be printed, stamped, or typed on the dial card, which should then be returned to the ring. The clamping plate should next be replaced in the ring, and rotated clockwise to lock the dial card in place.

To remount the ring on the dial assembly, insert the small lug on the back of the ring into the slot on the dial just above the finger stop. Place the screw driver between the ring and the plastic cover, about halfway between finger holes 5 and 6, and press down until the ring locks into place.

3.6 Setting the Ringer Volume Control Lever

The ringer volume control lever (figure 3) projects out from the lower left front of the type 860A key telephone. It is a mechanical device which moves the ringer gong-silencing arm, 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 control lever may be adjusted to obtain the ringer volume desired. The installer should point out this feature to the subscriber.

NOTE: Adjustment of the ringer volume control lever, however, has no effect on the sound volume produced by the buzzer, if a buzzer is used.

4. MAINTENANCE

4.1 Lamp Replacement

When a key-strip lamp burns out, it should be replaced in the following manner. Only the lamp itself (D-94085-A, or equivalent) is needed for this replacement.

Remove the clear plastic face plates and the colored mat from the key telephone housing; remove the light shield from the key-strip unit in which the lamp to be replaced is located. Press down on the base of this lamp with the fingertip, raising the opposite end. Using any convenient instrument (small screw driver, pencil, etc.), gently pry the lamp out of its spring clip, discard it, and insert the new lamp in the clip, pressing it firmly into place. CAUTION: Press only on glass portion of lamp, not metal base, or lamp may break. Then replace, in order, the light shield, mat, and face plates.

4.2 Dial Replacement

If the dial requires replacement, it should be removed and replaced with a new dial as follows. A medium-sized screw driver and the new dial are needed for this replacement. (Dial D-84821-J is normally used.)

Remove the key telephone housing as in section 2.1.1; 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 pot. Remove the plastic dust cover and disconnect all leads connected to the dial. Loosen the three dial mounting screws (figure 3) 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 (4) to the new dial (see figure 10 for connections). Replace the dial mounting assembly over the transmission pot, tighten the three dial mounting plate screws, and replace the key telephone housing as before.

4.3 Key Frame Assembly Removal

If, for any reason, the key frame assembly needs to be removed, the procedure is as follows. A medium-sized screw driver is needed for this operation.

Remove the key telephone housing as in section 2.1.1, and loosen the right and left key frame bracket screws at the rear of the telephone. 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, simply reverse this procedure.

4.4 Mounting Cord Frame Removal

If, for any reason, it becomes necessary to remove the mounting cord frame, which contains the three 50-terminal plugs and their connections to the mounting cord, and the four terminal strips, the procedure is as follows. A medium-sized screw driver is needed for this operation.

Remove the key telephone housing, raise the key frame assembly (use the maintenance support in this position), and remove the dial mounting plate as in sections 2.1.1 and 2.6.1. 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.

4.5 Key-strip Units

If a key-strip unit fails to operate properly, it should be removed (as per section 2.4.1) and inspected. Work done on the subscriber's premises should be limited to verification and analysis of the trouble, readily made adjustments covered in this section, and replacement of easily accessible parts. If it cannot be repaired easily at the subscriber's premises, it should be replaced and the faulty unit overhauled.

4.5.1 Push-button keys and plungers.

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 bind or squeaking persists, replace the key-strip unit.

4.5.2 Contacts.

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

4.5.3 Latching mechanism.

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.

FIGURE 10 - NOTES

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 (6-button key groups) respectively.

3. A third 6-button 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 860A telephone when wanted. All other wiring shown is furnished on all units. Options and variations are explained in section 2, Modifications.

4. Each key-strip unit includes a mechanical interlock that prevents more than one locking key within the unit from being operated at the same time; operation of one such key will restore any other locking key within the unit. Operation of a locking key also operates the chaining switch included within that key-strip unit, opening the three break combinations. Each locking key also operates a mechanical interlock between key-strip units, to restore any operated locking line keys in other key-strip units. The HOLD key also operates the chaining switch; when the HOLD key is released and restores, it will operate the mechanical interlock within the same unit and the interlock between units, to restore any other operated line keys. 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 section 2, Modifications.

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 loud-speaking 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 idle (on hook) condition. The "X" contacts operate (open) last when the handset is raised.

11. Resistance values shown are in ohms.

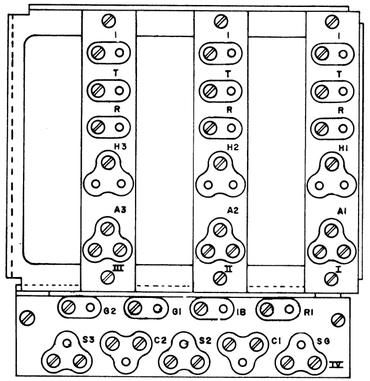

Figure 8. Terminal strips (I - IV) of key frame assembly.

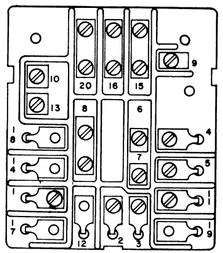

Figure 9. Type 860A transmission unit terminals.

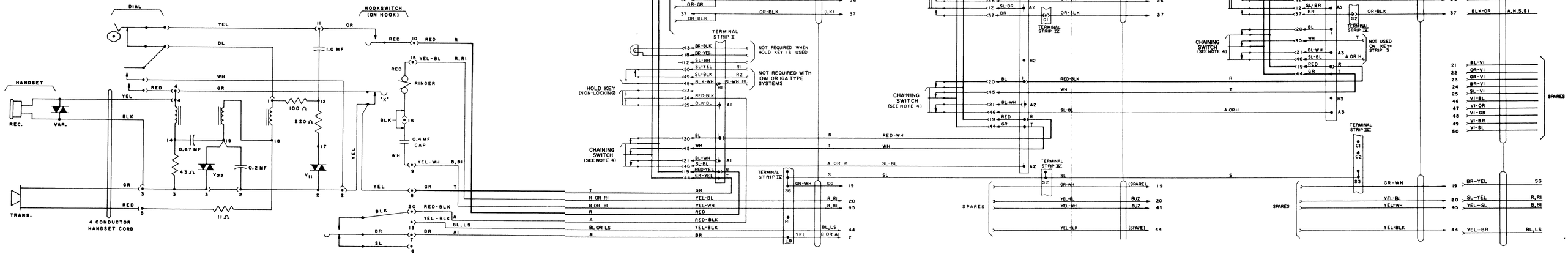

Figure 10. Combined circuit schematic and wiring diagram of the type 860A key telephone. Includes complete mounting cord and typical running cable section.