INSTALLATION
SET, TELEPHONE, A.E.CO. TYPE 86

CONTENTS PAGE

1. GENERAL

1.01 This section covers the installation of the A.E.Co. Type 86 multi-line telephone instrument (see Figure 1). For a description of the set and its circuit operation, refer to Section 473-503-100.

2. LOCATION AND CABLING

2.01 Refer to the 434 series of General System Practices for description and installation information concerning connector cables. Refer to sections in the 491 series for description and installation information covering connecting blocks, connector cable adapters, and connector cable junction housings.

2.02 In determining the location for installation, be guided by the customer's wishes insofar as installation requirements and other provisions of these practices permit. If the customer's wishes cannot be followed, explain the reason to the customer.

2.03 After the location has been determined, run 26-pair inside wiring cable or a 25-pair connector-type running cable to that point as explained in other sections of these practices. The choice between the two types of cable will depend on such factors as the availability of a location at which to mount a connecting block, the use of underfloor duct, location of the station along a cable route to other stations, and the version of set available for installation.

2.04 If the line cord of the Type 86 set is spade-terminated, mount a 168F backboard and four 44A connecting blocks on any convenient surface which is inconspicuous. Terminate the cable on the blocks as indicated in Section 491-500-200.

2.05 If the line cord of the Type 86 set is plug-terminated and the station is located at a junction point of connector cables serving other stations on the same key system lines, disengage the plug on one cable from the mating receptacle

Figure 1. Set, Telephone, A.E.Co. Type 86 (with Plug-Terminated Line Cord).

on the other cable, and reconnect them by way of a Type 60 three-way connector adapter. This leaves a vacant receptacle in the adapter into which the plug of the instrument line cord may be inserted.

NOTE: If this installation will add the second set to a cable run which previously served only a single plug-ended Type 86 set, the Speakerphone leads must be disconnected inside the existing set, as well as the one being newly installed. See Paragraph 3.14.

2.06 If the line cord of the Type 86 set is plug-terminated, install a connector-type running cable in conduit, in underfloor duct, or along wall surfaces as required, with its receptacle (female) end at the station location. To protect the junction of the cable receptacle and the line cord plug, use the floor-mounted cover assembly provided with the customer's duct system, if available. Otherwise, install a GB3293 connector housing on the baseboard or on the kneewell shield (modesty panel) of the desk, if wooden. If the desk is steel, mount the connector housing on a No. 740 adhesive mounting plate.

2.07 If the line cord of the Type 86 set is plug-terminated, but the station location is prewired for key system service with 44-type connecting blocks, disconnect the inside wiring cable from the existing blocks, mount a 66E3 connecting block (plus cover and 152A adapter, if required in floor and baseboard installations), and terminate the cable on the 66-type block as indicated in Section 491-501-100.

NOTE: Conductor assignments for inside wiring cable used with 66-type blocks and plug-ended Type 86 sets are different from those for this type of cable when used with 44-type blocks and Type 86 sets with spade-ended line cords. Using the line cord lead assignment shown in Figure 11 and the receptacle pin assignment shown in Section 491-501-100, make the necessary changes in either cable conductor assignment or in connecting block termination. If the cable run serves only this station, or if all stations served by the cable run are to be converted to plug-ended operation, the conductor assignment at the key system relay equipment should be changed from the former standard shown in Section 491-500-200 to that which applies to connector-cable installations. If the cable run serves other stations where Type 86 sets with spade-terminated line cords are to remain in service, it will be more expedient to terminate the cable conductors on the 66-type block in a nonstandard arrangement to match the existing conductor assignment.

2.08 If the line cord of the Type 86 set is plug-terminated, and Speakerphone service is to be provided, install a 149A adapter in place of a connector housing, connecting the running cable receptacle to the chassis-mounted male connector on the adapter. A female connector mounted on the opposite side of the adapter is arranged to accept the instrument line cord. Strap adapter terminal 1A to 1B and 2A to 2B, to provide continuity through the unit for the audible signal leads. Terminals A1, SG, BL, 3B, 4B, 5B, and 6B are bridging points which are not used in this application. Terminal V is vacant, and may be used as a tie point required for two leads in the eight-conductor cord of the Speakerphone adapter. Terminals 7B through 12B are wired only to the connector cable, and should be left unused. Terminals 7A through 12A are wired only to the line cord, and connect respectively to board terminal N, network terminal 11, board terminal R, network terminal 1, board terminal A and board terminal 1B in the Type 86 set. The eight-conductor cord of a Type 88AT Speakerphone adapter should be connected to these adapter terminals on the basis of their connections within the set, in accordance with the instructions in Section 473-402-200. The 44-type block and 6-conductor cord mentioned in that section are not used in this application, however.

2.09 If the line cord of the Type 86 set is plug-terminated, and additional services are to be installed, such as external line lamps, buzzers, pushbuttons, keys, repertory dialer, etc., a point of access for the accessory leads may be obtained either by using a 66E3 connecting block and raw-ended running cable, or by installing a 149A adapter with a connector-type running cable. Use of the 66-type connecting block will permit additional runs of station wire to the auxiliary devices to be made from the block, which provides clip-connection access to all 50 conductors in the cable and thereby in the line cord. While the 149A adapter does not provide access to all cable conductors, it will ordinarily satisfy nominal conductor requirements and at the same time require less installation time than the 66-type block. As a further advantage in some applications, it provides access to the cable separate from that to the line cord in the case of eight conductors. On sets with spade-terminated line cords, once the capacity of any available spare conductors has been utilized, it may be necessary to run auxiliary cords, such as are furnished with a repertory dialer or Speakerphone adapter, directly into the instrument housing.

3. WIRING MODIFICATIONS

3.01 Because of the wide variety of service options to which the Type 86 set may be adapted, wiring modifications within the set will often be necessary. Loosen the three base-mounting screws and remove the housing from the base. Loosen the two screws which hold the dial mounting in place. Lift the dial, and lay it aside to expose the terminal board underneath it. Modifications are best performed before the set is connected at the block.

3.02 If a ringer-equipped set must be provided with a buzzer in substitution, disconnect the black and red ringer leads from terminals RT and RR, remove the two screws holding the ringer in place, loosen the capacitor mounting screw to free the handset cord strain relief clamp, if necessary, and disengage the ringer mounting stud from its supporting grommet before lifting it free of the base. Remove the cover of an FD-1068-AB buzzer and attach the red and green leads from an H-883001-5 buzzer mounting kit to the buzzer terminals. Fasten the buzzer to the mounting bracket included in the kit, using the two Sems fasteners provided and locating the terminal end of the buzzer toward the base of the T-shaped bracket. Replace the buzzer cover, guiding the leads through the grommeted slot in the end placed next to the terminals. Insert the two rubber grommets provided with the kit into the slotted holes at the end of the bracket. Guide the stud at the base of the T into the grommet on the ear turned up from the base of the set beneath the hookswitch lever. Using the two shoulder-head mounting screws provided in the kit, fasten the ends of the T-bracket to the tapped studs mounted on the base, so that the bracket is isolated from the base by the grommets through which the screws pass. Connect the green lead to terminal RT and the red lead to terminal RR. If necessary, fasten the handset cord strain relief clamp to the center of the T-bracket with the Sems fastener provided in the kit (see Figure 2).

3.03 If a buzzer-equipped set must be provided with a ringer in substitution, disconnect the green and red buzzer leads from terminals RT and RR, remove the two screws holding the buzzer bracket in place, loosen the handset cord strain relief clamp retaining screw, if necessary, and disengage the bracket stud from its supporting grommet under the hookswitch before lifting it free of the base. Guide the stud at the base of a D-56560-ASL ringer into the grommet from which the bracket was removed. Using the two shoulder-head screws provided with the ringer, or the two slightly smaller ones formerly used with the buzzer bracket, fasten the two lugs of the ringer frame to the tapped studs mounted on the base, so that the frame is isolated from the base by the mounting grommets through which the screws pass. Connect the black lead to terminal RT and the red lead to terminal RR. If a Leich 014740 ringer is used, connect the black capacitor lead to terminal RT, the red ringer lead to terminal RR, and the slate capacitor and black or black-red ringer leads to terminal RC. In a set with a plug-ended line cord, remove the YBr line cord

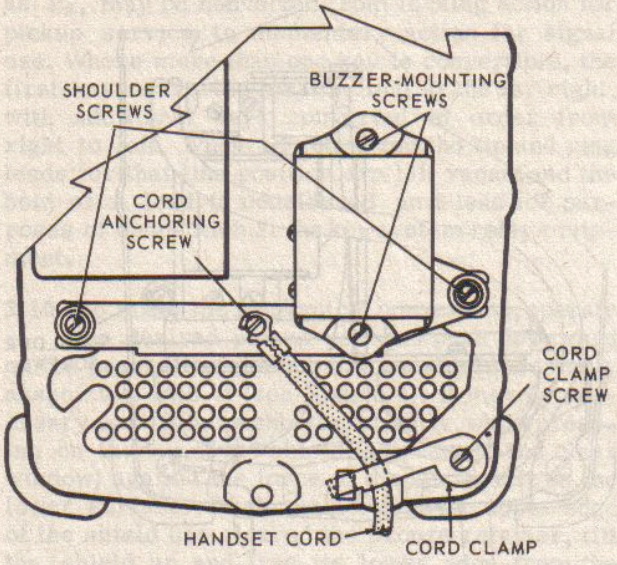


Figure 2a. Early-style Handset Cord.

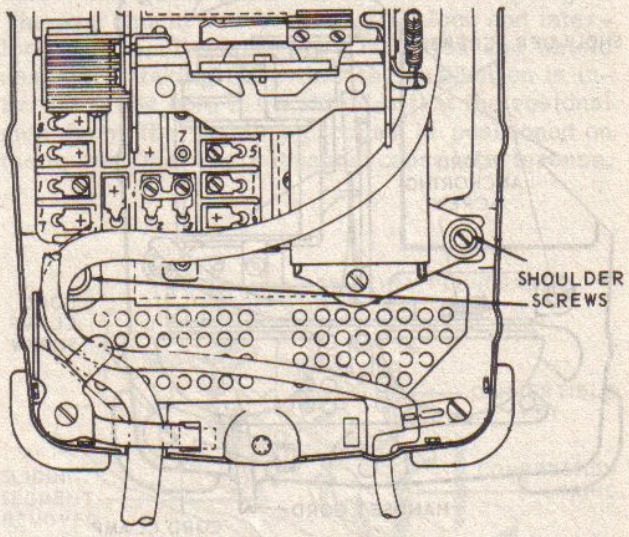


Figure 2b. Present-style Small-diameter Handset Cord.

Figure 2. Arrangement of Buzzer and Handset Cord.

lead from terminal RC and tape it. If station-busy wiring is required, use terminal 5 on the auxiliary terminal strip in place of terminal RC and terminate the YBr line cord lead at terminal 5 for use as the station busy lamp lead. If necessary, fasten the handset cord strain relief clamp under the capacitor mounting screw (see Figure 3).

3.04 If the ringer is not to be used as a common audible signal, but as a signal for one line normally answered at this station, disconnect the black and red leads from terminals RT and RR, respectively, and connect them instead to the appropriate pair of terminals (1T, 1R; 2T, 2R; 3T, 3R; etc.) for the desired line.

3.05 If the sequence in which the lines are to appear on the keys of a set with a plug-terminated line cord is to be different from that in which they appear on the keys of other sets similarly terminated on the same run of connector cable, it will be necessary to rearrange the line cord leads on the terminal panel to provide the desired sequence. For example, if TUrner 4-3801 is assigned as Line 2 at other sets along the cable run, its tip, ring and hold or A-lead conductors appear on pins 29, 4 and 30, respectively, of the running cable receptacle, and its lamp lead appears on pin 6. If it is desired to have this line appear as Line 5 at this station, the WBr, BrW and WS line cord leads must be removed from board terminals 2T, 2R and 2H, respectively, and transferred to terminals 5T, 5R, and 5H in place of the leads already there. The BR line cord lead must be removed from the third upper lamp terminal and transferred to the corresponding terminal of the sixth lamp in place of the lead already there. Since the lamp return leads (lower terminals) are ordinarily wired in multiple at the key system relay equipment, they need not be changed at the set. The line cord conductor for the balance lead in 10A key systems remains unchanged.

3.06 As assembled at the factory, each Type 86 set is wired for service in 10A1, 10A2 or 16A key telephone systems. To convert it for use in a 10A (or W.E.Co. 1A) key telephone system, the function of the hold key must be changed by a rearrangement of connections. Instructions for this rewiring are given in tabular form on the wiring diagram of each set (see Figures 7 through 11).

3.07 To convert a Type 86 set for origination of a station-busy indication, disconnect the white hookswitch lead from panel terminal N and move it to terminal RC. (If terminal RC is in use for ringer and capacitor leads, use a vacant terminal on the panel, or spare terminal 5 on the auxiliary terminal strip instead.) On a set with plug-terminated line cord, the YBr line cord conductor will also be terminated at terminal RC; if auxiliary terminal 5 must be used in substitution, move the YBr lead to that terminal. If the line cord is spade-terminated at the block end, select an unused conductor and terminate it at terminal RC. Insulate the leads of a 1N91 or similar diode with vinyl tubing and connect it between

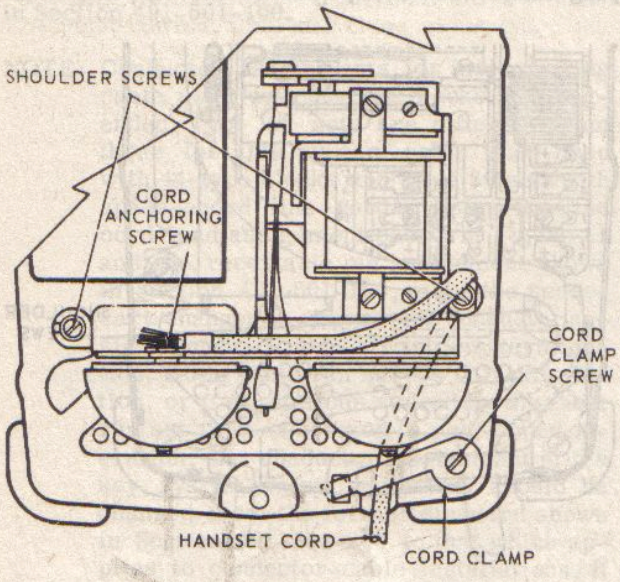


Figure 3a. Early-style Handset Cord.

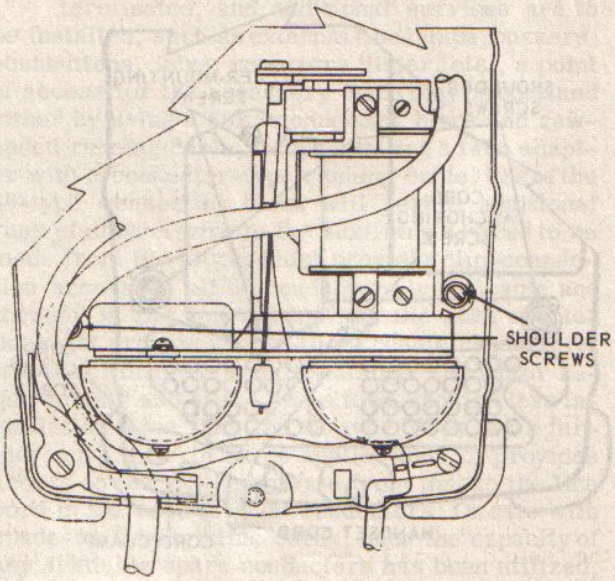


Figure 3b. Present-style Small-diameter Handset cord.

Figure 3. Arrangement of Ringer and Handset Cord.

terminals RC and N, with the anode at terminal RC. On the "top hat" style of diode case, the terminal emerging from the crown of the "hat" is the anode; the arrowhead symbol printed on the case of a tubular diode should point in the direction of terminal N.

3.08 To provide for reception of a station-busy indication within a Type 86 set, the newer model with plug-terminated line cord must be used. This requirement is not due to the cord but to the lamp jack construction; if an older set has been rebuilt in the repair shop using a new 12-terminal lamp jack, it can be used for the purpose. Since the hold button is not illuminated in ordinary service, its lamp is most often used as a busy lamp, but any unused pickup position may be chosen instead. Connect the busy lamp lead of the line cord (on plug-ended cords, it is the YBr lead from pin 44, wired to terminal RC) to the upper terminal of the lamp jack at the desired lamp position, in place of the line cord lead originally terminated there, which should be removed and taped. The line cord lead terminated at the lower terminal of the lamp jack at the same position should be connected to the lamp battery supply of the key telephone system—not to lamp ground as the remaining positions are. Thus when ground from lead A1 is connected to the busy lamp lead by operation of the hookswitch at the signal-originating station, the lamp will light to show that station as being busy.

3.09 One or more keys at the right end of the key assembly, designated on the wiring diagram as P_S, may be converted from locking action for pickup service to momentary action for signal use. Where more than one key is convertible, the first key converted must be that at the far right, with additional keys converted in order from right to left. When so converted the tip and ring leads for that line position are left vacant and the hold or A lead is considered an S lead for purposes of connection at the key system relay equipment.

3.10 To make the mechanical conversion, operate the desired pickup key and push downward on the pushbutton guide and lamp shield assembly associated with it (see Figure 4). It may be necessary to lift the pushbutton slightly, while pressing on the top of the shield (adjacent to the clear window) against the force of the spring clip on the lower surface. When the notch in the upper edge of the shield has cleared the bronze retainer, tilt the shield up and free its lower edge from the clip. Maintain a grip on the pushbutton, as otherwise it will fall free of the shield.

3.11 Operate the hold key to restore the pickup key plunger to normal, and remove the interlock stud or guide screw from the plunger. If more than one key is being converted, remove the guide screw from each such one. Tilt the entire telephone instrument to the right, and shake it, if necessary, until the sliding interlock segment (or, in the case of multiple conversion, one segment for each key being converted) falls out (see Figure 5). Then twist the plunger one half turn, until the threaded hole is again lined up with the slot in the front of the key assembly, and reinsert the guide screw in the reversed plunger. The key should now be free of all lock and interlock action. Replace the pushbutton and shield assembly, taking care that the pushbutton is inserted in the hole in the shield so that the residual gate from the molding process is positioned on the upper side, where it cannot cause interference.

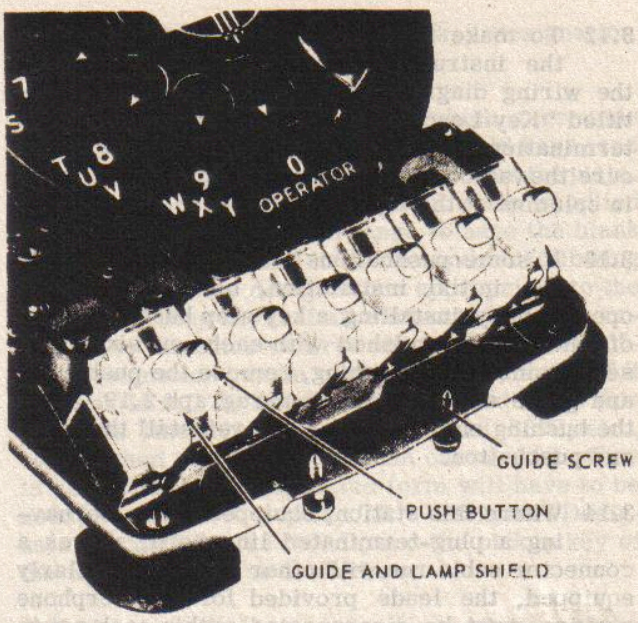


Figure 4. Key Assembly, Shown with Housing Removed.

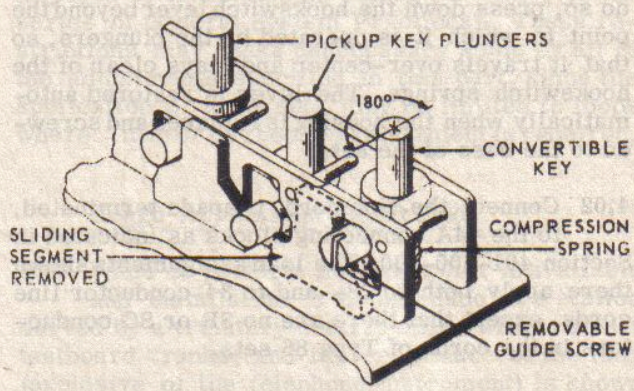


Figure 5. Pickup Key Conversion to Signal Key.

3.12 To make the electrical conversion, consult the instructions given in tabular form on the wiring diagram of each set. The column entitled "Key Leads" lists, in each case, the proper termination for each of the variable leads to secure the various possible key configurations shown in columns at the left of the table.

3.13 If some pushbuttons will remain unused in the initial installation, block them from operation by installing a key stop bushing, three of which are furnished with each new six-button set. To insert the bushing, remove the pushbutton and guide as explained in paragraph 2.19. Place the bushing on the plunger and reinstall the guide and pushbutton.

3.14 Where this station, equipped with a set having a plug-terminated line cord, shares a connector cable run with other stations similarly equipped, the leads provided for Speakerphone service must be disconnected within each set to prevent undesired common connections. Otherwise, for example, the dial pulse springs on each set would be connected in parallel with those of all other sets on the same cable run. To prevent this, disconnect the VG lead from network terminal 11, the GV lead from board terminal N, the VBr lead from network terminal 1, the BrV lead from board terminal R, the VS lead from board terminal 1B, and the SV lead from board terminal A, and tape them.

4. CONNECTION AND TESTS

4.01 When all accessory apparatus has been mounted and interconnecting cable and wire runs are laid in place, prepare the Type 86 instrument for connection by operating the hold button to restore all pickup buttons to normal. Thus, although the hookswitch contacts are closed when the handset and housing are laid aside, the set remains disconnected from the line leads. Even with a pickup key operated, disconnection can be maintained by setting the installer's hooklock. To do so, press down the hookswitch lever beyond the point to which it is operated by the plungers, so that it travels over-center and stays clear of the hookswitch springs. The lever is restored automatically when the housing is replaced and screwed to the base of the set.

4.02 Connect the line cord, if spade terminated, to the 44A connecting blocks as indicated in Section 491-500-200. The lead assignments shown there apply both to 28- and to 34-conductor line cords, except that there are no SR or SG conductors in the cords of Type 86 sets.

4.03 If the line cord is plug terminated, mate the plug with the receptacle provided at the end of the connector cable, on the 66E3 connecting block, on the 149A adapter, or on the No. 60 three-way connector adapter, whichever is used. Install the cover on the block, on the adapter, or around the joined connectors.

4.04 When connections are complete, depress the pickup key for the first central office line, and place a call to the reverting call connector, testboard or operator for an incoming call check. If the ringer is connected to this line and the central office is automatic, check for gong tap as the call is dialed. If the clapper taps against the near gong, one of the following corrective measures may be required:

(a) Check the line connections at the terminal board; on the 66-type block or 44-type block, if used; at the key system relay equipment; at the protector; and at all intermediate connecting blocks to insure that the line has not been reversed.

(b) Check the ringer lead connections to insure that they agree with those specified in Paragraph 3.04.

(c) If (a) and (b) require no correction, presume a magnetic reversal within the ringer, and reverse the ringer lead connections from those specified in Paragraph 3.04.

(d) Increase the ringer bias by moving the bias reed one notch farther over on the frame.

(e) Replace the ringer.

4.05 Operate the hookswitch lever and await the incoming ring from the central office to test the ringer or common audible signal. Check that the lamp beneath the operated pickup key flashes to signal the incoming call. Release the lever to trip the ring. The lamp beneath the key should remain lit steadily. Operate the hold key and check that the pickup key restores as the hold key is released. If the key telephone system is so arranged, check that the lamp signal changes to a winking indication of a held call. After a few seconds reoperate the pickup key and monitor the line. The connection to the reverting call connector should be maintained in an automatic exchange; if dial tone is heard, the hold key may not be properly connected to place a line on hold, or there may be a malfunction in the relay equipment for that line. In a manual exchange the cooperation of the operator or testboardman will be required to check for on-hook supervision during the period that the line is being held.

4.06 Repeat the procedure of Paragraphs 4.04 4.05 for each pickup key assigned to a central office line. On tie lines or full period circuits, secure the cooperation of some person at the distant end to carry out a similar test for signaling and holding in either direction.

4.07 If one pickup key is assigned to intercom service, depress the key and check for sidetone. With the help of an assistant, check intercom transmission between this station and each other station in the installation. If dial-selective signaling is provided, dial each assigned digit and check for proper operation of the signal at the corresponding called station. Dial the digit assigned to this station from some other station to check for proper operation of the audible and, if provided, visual signal here.

4.08 If the customer requests that the volume of the buzzer, when provided, be adjusted, remove the buzzer cover and bend the adjustable tone arm, located above the buzzer coil, to secure the desired tone. When replacing the cover, take care to guide the leads through the grommeted slot at the terminal end.

4.09 If the instrument is of the type with a manually-adjusted series rheostat, perform the adjustment specified in Part 5.

4.10 Before replacing the housing on the base, check to be sure that the line and handset cords do not foul the ringer gongs. This is particularly important in the case of the small-diameter PVC-jacketed handset cords in current use. Replace the dial in its proper position and tighten its two mounting screws. Seat the housing on the base and tighten the three base-mounting screws. When the housing is fully tightened in place, the installer's hooklock, if set, should restore, pushing up the hookswitch plungers. Replace the handset on the cradle and locate the instrument on the left rear corner of the desk or table on which it is installed.

4.11 Insert the preprinted station number disc supplied for this installation, or imprint one to suit if required, taking care not to scratch the acetate disc (where used), nor to mar the fingerwheel. Ordinarily, the number to appear on the disc is the number of the line for which the station is the principal answer location, especially if the ringer is connected across one line. In the case of a secretary or receptionist, it is probable that no such number will apply, in which case a disc imprinted only with the area code may be used. If all exchange lines to which the set has access are assigned to the same central office, the central office designation, such as WEllington 5-, may also be imprinted on the disc to avoid crowding and confusion on the key designation strip.

4.12 Lift up the acrylic plate which surrounds the buttons of the pickup and hold keys, and remove the blank designation strip from the plate. Insert the preprinted designation strip supplied for this installation, or arrange to have the blank strip typed or lettered in the second and following positions with the designations appropriate to the adjacent pickup keys. If all exchange lines are assigned to the same central office, the central office designation can be omitted to save space if it appears in full on the station number disc. In this case the line numbers, such as 1518, 3372, etc., can be used alone. If more than one central office is involved, the abbreviated form will have to be used, such as WE 5-1518, TR 6-3372, etc. Designate the hold key as HOLD, and the pickup key of the intercom line as LOCAL.

4.13 Instruct at least one representative of the customer in the proper operation and use of the instrument, and leave the installation area clean and orderly.

5. LOOP ADJUSTMENT

5.01 This part applies only to those Type 86 sets of earlier manufacture which lack the automatic sidetone compensation feature and have an externally-adjusted, slotted-shaft rheostat mounted in the base to limit the transmitter current on short loops. The slot has an arrowhead shape to permit indexing with designations from 0 to 4 which are marked on the base surrounding the shaft hole (see Figure 6). These index points correspond roughly to rheostat settings of zero through 400 ohms of series resistance inserted into the loop.

5.02 The installation of sets with the manually-adjusted rheostat is subject to restrictions imposed by transmission zoning (see the 473-050 series of General System Practices). These restrictions may make unnecessary some or all of the adjustments specified in this part, since the application of such sets may be limited to loops where little or no rheostat adjustment is required.

Rough Approximation Method

5.03 When no portable milliammeter is available and installation is being made at a station served by a tributary central office with no direct testboard trunks, and the resistance of the loop (exclusive of the telephone instrument) is known only very approximately, set the rheostat according to the following rule of thumb:

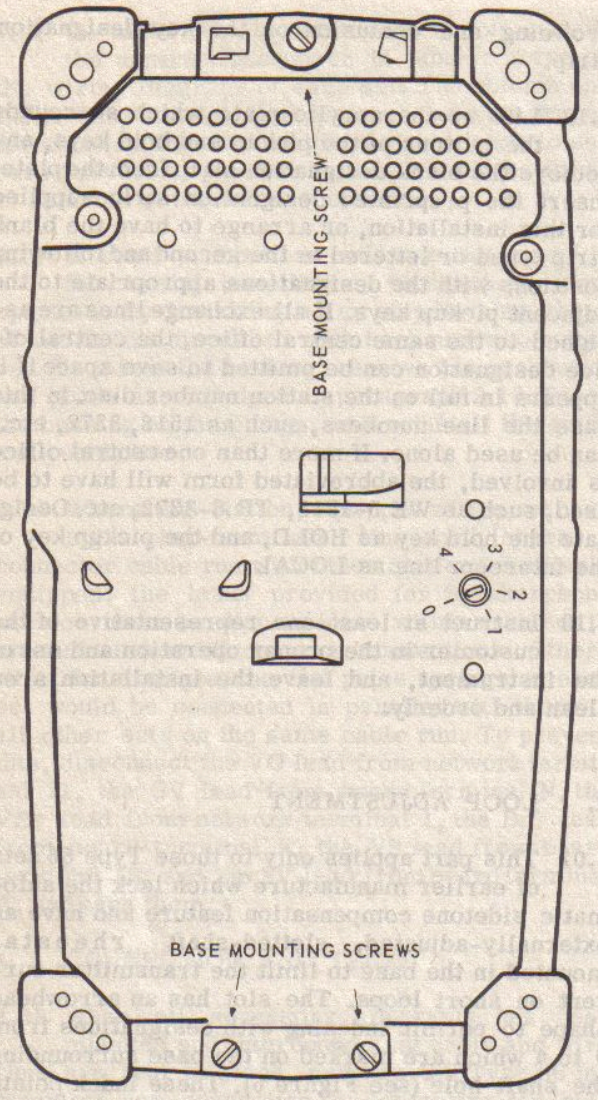


Figure 6. Base of Type 86 Set with Manually-adjusted Series Rheostat.

If the loop does not exceed 200 Ω, set the rheostat at its 2 setting;

If the loop is greater than 200 Ω, set the rheostat at its 0 setting, and note the limitation set forth in paragraph 5.11.

Close Approximation Method

5.04 When no portable milliammeter is available and installation is being made at a station served by a tributary automatic central office with no direct testboard trunks, and the resistance of the loop (exclusive of the telephone instrument) is known fairly closely, set the rheostat on the following basis:

If the loop is under 30 Ω, set the rheostat at its 4 setting;

If the loop is over 30 Ω, set the rheostat at its 3 setting;

If the loop is over 130 Ω, set the rheostat at its 2 setting;

If the loop is over 230 Ω, set the rheostat at its 1 setting;

If the loop is over 330 Ω, set the rheostat at its 0 setting, and note the limitation set forth in paragraph 5.11.

Accurate Methods

5.05 Paragraphs 5.03 and 5.04 set forth methods which give only approximate settings for the rheostat, based on an assumed central office battery potential of 50 volts and a battery feed coil resistance (to be added to the loop resistance in figuring current) of 200 Ω in each winding. The objective is to limit the current flowing in the loop and through the transmitter to a maximum of 60 milliamperes. This limits the transmitted speech to a maximum level which is not likely to cause crosstalk between circuits in the DDD network. It is much more desirable to adjust the rheostat, when required, on the basis of actual current measurements.

5.06 When installation is being made in an automatic or manual central office served by a testboard, call the testboard and ask for assistance in adjusting the rheostat. The testboardman will arrange to feed battery to the line in series with coils which are typical of those used in regular central office circuits, and in series with a milliammeter. Set the rheostat at its zero position and leave it there for a short time. If the testboardman finds that the loop current does not exceed 60 milliamperes, he will so notify you. In this case, no further adjustment is necessary, except to observe the limitation set forth in paragraph 5.11.

5.07 If the testboardman does not advise that the loop current is already below 60 milliamperes, advance the rheostat slowly until advised by the testboardman that the current is within limits.

5.08 Should the testboard for some reason not be equipped for current readings, the testboardman can connect his voltmeter across the line and determine the potential drop in the battery feed coil by subtracting the line reading from a reading taken directly across the office battery. If the resistance of the battery feed coil is known,

the correct drop for a 60-milliampere drain can be calculated. For example, if the battery potential is 50 volts and the battery feed coil resistance is 200 Ω per winding, a current of 60 milliamperes produces a drop of 200 x .060 = 12 volts per winding in the coil, resulting in a line potential of 50 - 2(12) = 26 volts.

5.09 When installation is being made at a station served by a tributary office with no direct testboard trunks, an accurate adjustment can still be made by connecting a portable milliammeter in series with one of the line conductors at the terminal board in the telephone set.

Exceptions

5.10 Limitation of the transmitter current to 60 milliamperes applies only to installations in which all multi-line or single line sets having access to the same lines, whether such sets be installed at the same location or off the premises, are of the type with a manually-adjusted series rheostat. If instruments of other circuit types are to be used on any line served by the Type 86 set, the rheostat must be set at its 0 setting, subject to the limitation set forth in the next paragraph.

5.11 The simple induction coil used in conjunction with the manually-adjusted series rheostat does not provide sidetone compensation for changes in line impedance with increasing loop length; that is, there is no element which can counteract each variation in impedance as it occurs. However, at the 0 setting of the rheostat an internal contact closes which connects a fixed resistance and capacitance across the sidetone balancing resistance in the receiver circuit. This change in the balancing impedance is intended to match the rather capacitive impedance of a long cable loop. It is not appropriate for a short cable loop (one which is only slightly higher in resistance than the value which reduces loop current to 60 milliamperes and thus requires the 0 setting of the rheostat), nor for a long open-wire loop, nor for a station on a loaded cable loop which lies less than one loading section from the nearest load coil. If a 0 setting is required in such cases, disconnect the violet rheostat wire from terminal 3 of the transmission unit and connect it to terminal A on the terminal board. Do not attempt to open the rheostat contact by choosing a setting between 0 and 1, as this introduces unnecessary loop resistance.

5.12 If battery feed to the Type 86 instrument will come from more than one off-premises source, depending upon which pickup key is operated (for example, lines to two central offices at different locations), the type of set with the manually-adjusted series rheostat should not be used. Install a set with automatic sidetone compensation. If the line selections involve one local and one off-premises battery source (for example, one intercom line and four lines to a single central-office location), set the rheostat on the basis of the current from the off-premises source.

5.13 Should any transmission complaint be received involving a Type 86 set with the manually-adjusted series rheostat, replace the instrument with one which provides automatic sidetone compensation.

6. FIELD MAINTENANCE

6.01 Refer to sections in the 473-8XX series of General System Practices for installation and maintenance procedures covering telephone set components, such as dials and handsets, which are common to other instruments of the same manufacture.

6.02 The transmission network is riveted to the base of the set and cannot be removed in the field. If trouble is found in the network, the entire set must be replaced and sent to the repair shop for disassembly and remanufacture.

6.03 One lead of the ringer capacitor is soldered to the ringer coil on the assembly provided as original equipment. If the capacitor proves to be faulty, the entire ringer assembly must be replaced and sent to the repair shop for substitution of a new capacitor.

6.04 To replace a line lamp, remove the pushbutton and lamp shield assembly as explained in Paragraph 3.10, extract the defective lamp with a pair of small duckbill pliers, install a new 10ESB lamp, and replace the pushbutton and shield assembly as noted in Paragraph 3.11

7. RADIO FREQUENCY SUPPRESSION

7.01 Effective suppression of demodulation of radio signals can be obtained by connecting three .03 μfd. ceramic capacitors in sets equipped with a self-compensating network and one .03 μfd capacitor in older instruments with a manually adjusted series rheostat.

7.02 For sets equipped with a self-compensating transmission network, connect a .03 μfd. capacitor across each of the following pairs of network terminals:

3 and 4

3 and 5

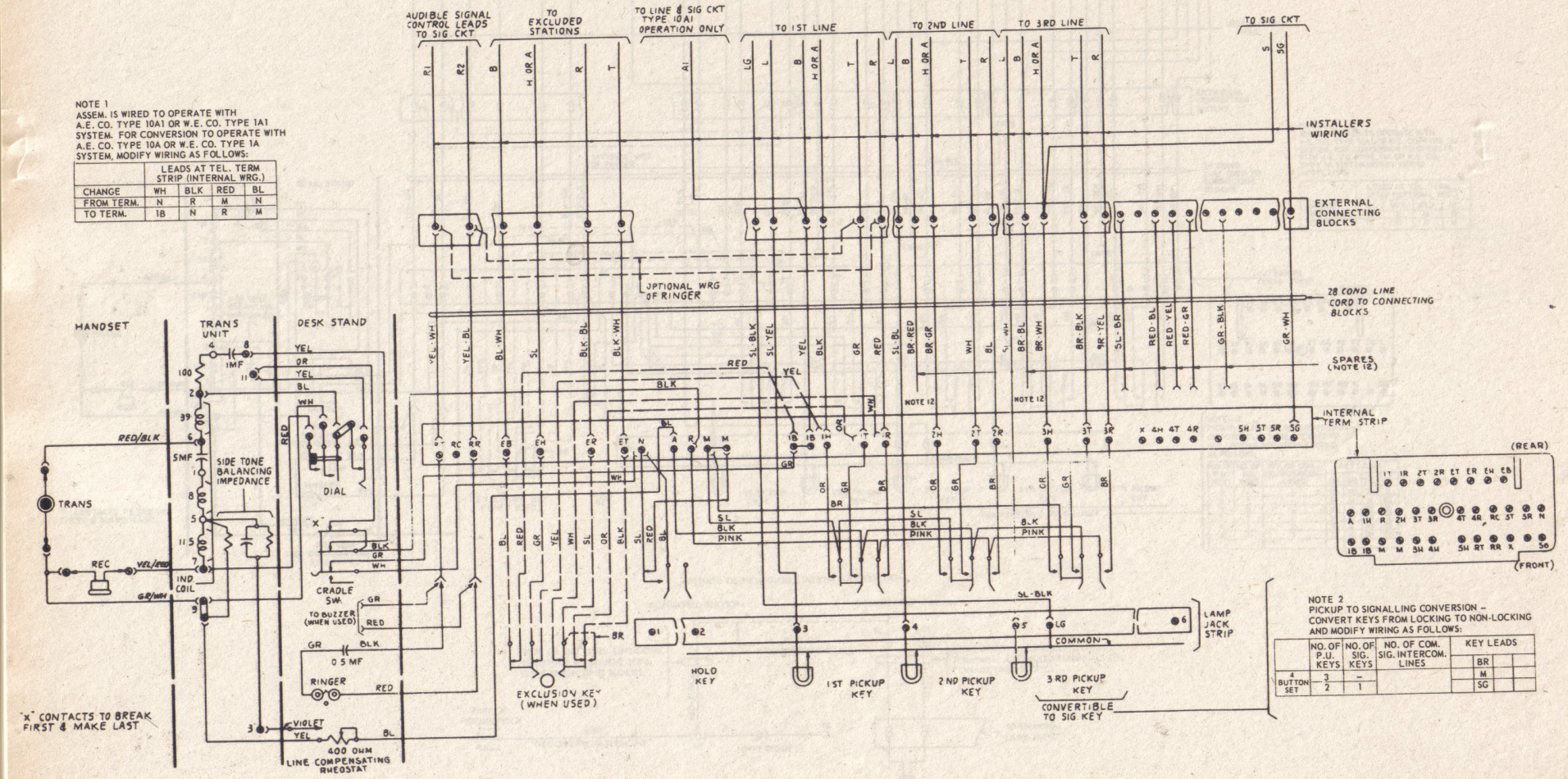
1 and 5.

The capacitor and leads can be placed along the rear edge of the network panel so as not to interfere with positioning of the housing.

7.03 For sets equipped with a manually adjusted series rheostat, connect a .03 μfd. capacitor across terminals 3 and 5, or across the transmitter terminals in the handset, whichever is more convenient.

7.04 A suitable capacitor is D-68782-AU, a ceramic unit rated at .03 μfd. (±20%), 500 WV. The leads should be insulated to within one-half inch of the ends with .042 inch I.D. sleeving, D-542410-A.

7.05 See the 471-150 series of General System Practices for additional information on radio frequency demodulation suppression.



NOTE 1
ASSEM. IS WIRED TO OPERATE WITH A.E. CO. TYPE 10A1 OR W.E. CO. TYPE 1A1 SYSTEM. FOR CONVERSION TO OPERATE WITH A.E. CO. TYPE 10A OR W.E. CO. TYPE 1A SYSTEM, MODIFY WIRING AS FOLLOWS:

	LEADS AT TEL. TERM STRIP (INTERNAL WRG.)			
CHANGE	WH	BLK	RED	BL
FROM TERM.	N	R	M	N
TO TERM.	1B	N	R	M

NOTE 2
PICKUP TO SIGNALLING CONVERSION – CONVERT KEYS FROM LOCKING TO NON-LOCKING AND MODIFY WIRING AS FOLLOWS:

	NO. OF P.U. KEYS	NO. OF SIG. KEYS	NO. OF COM. SIG. INTERCOM. LINES	KEY LEADS		
6 BUTTON SET	3	–		BR		
	2	1		M		
				SG		

Figure 7. Schematic and Wiring Diagram of Type 86 Set with HPPPs Key Arrangement and Manually-adjusted Series Rheostat.

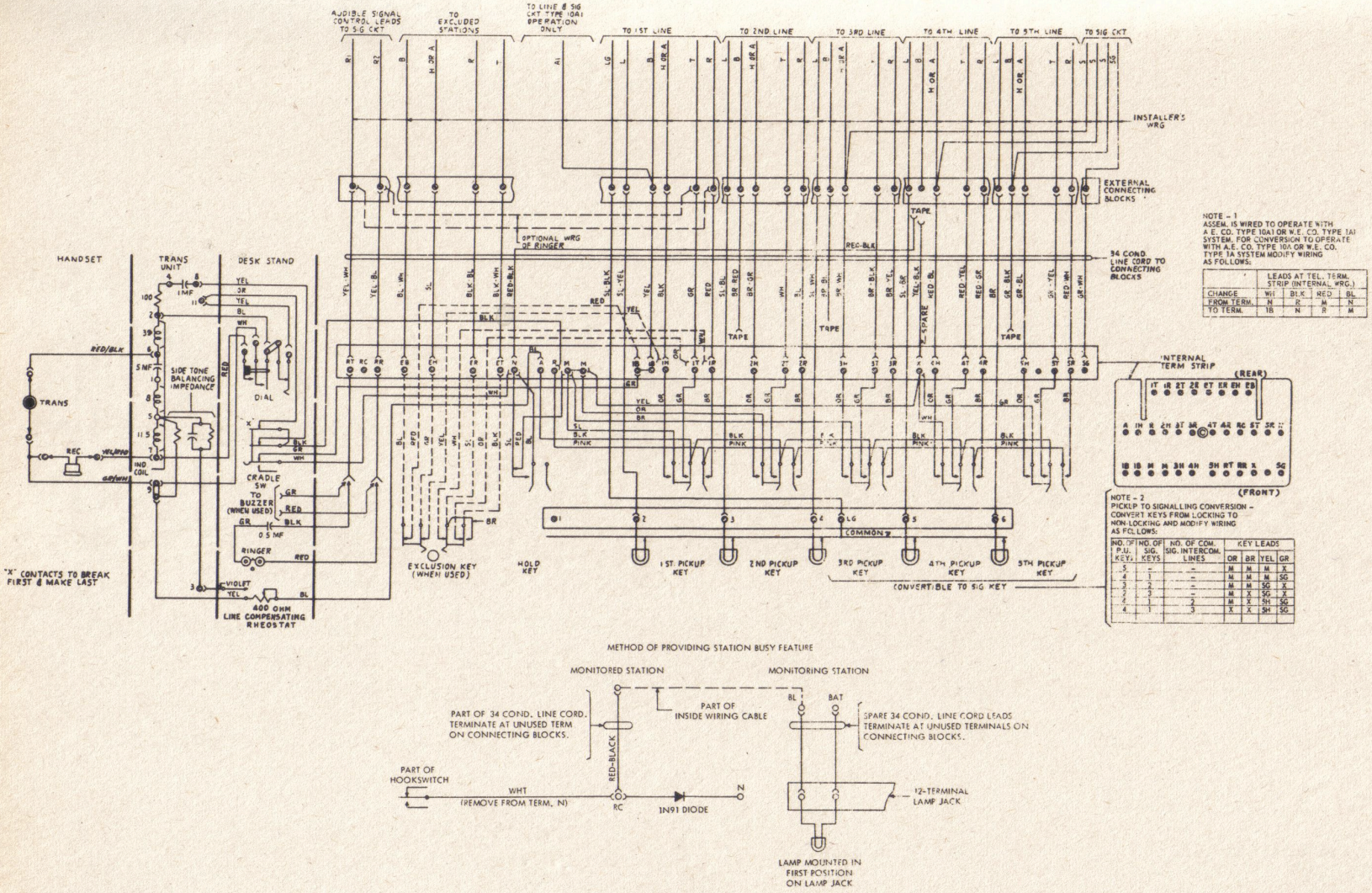
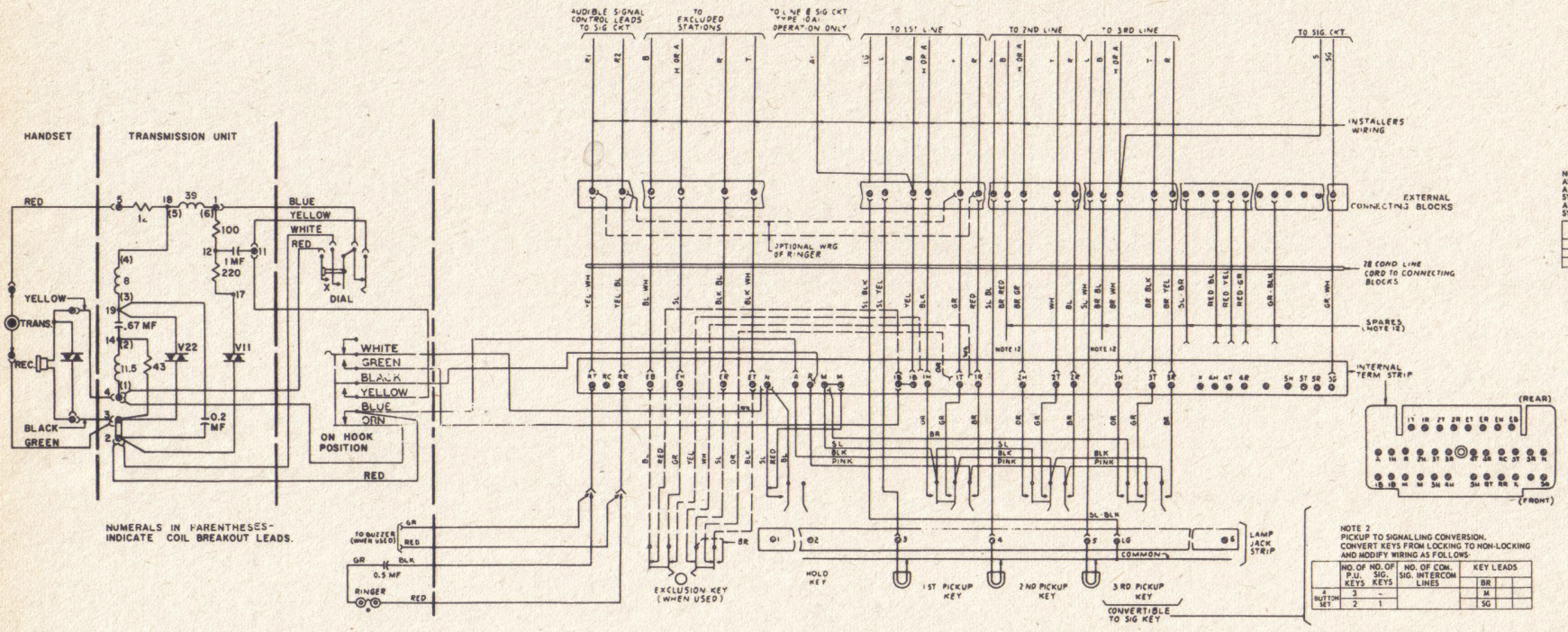


Figure 8. Schematic and Wiring Diagram of Type 86 Set with HPPP$_S$P$_S$P$_S$ Key Arrangement and Manually-adjusted Series Rheostat.



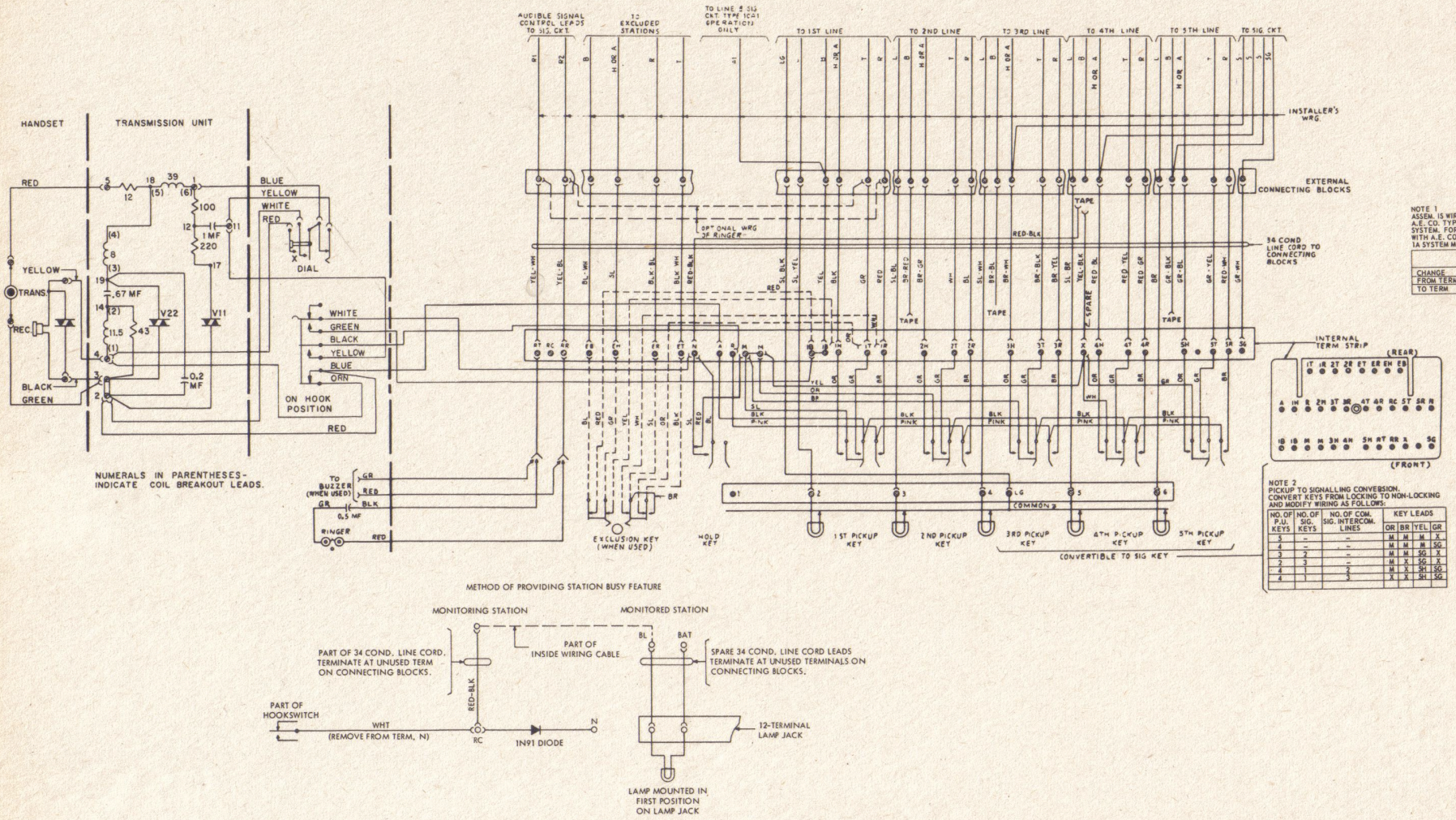
NOTE 1
ASSEM. IS WIRED TO OPERATE WITH A.E. CO. TYPE 10A1 OR W.E. CO. TYPE 1A1 SYSTEM. FOR CONVERSION TO OPERATE WITH A.E. CO. TYPE 10A OR W.E. CO. TYPE 1A SYSTEM, MODIFY WIRING AS FOLLOWS:

	LEADS AT TEL. TERM. STRIP (INTERNAL WRG.)			
CHANGE	WH	BLK	RED	BL
FROM TERM.	N	R	M	N
TO TERM.	1B	N	R	M

NOTE 2
PICKUP TO SIGNALLING CONVERSION.
CONVERT KEYS FROM LOCKING TO NON-LOCKING AND MODIFY WIRING AS FOLLOWS:

	NO. OF P.U. KEYS	NO. OF SIG. KEYS	NO. OF COM. SIG. INTERCOM LINES	KEY LEADS		
4 BUTTON SET	3	-		BR		
	2	1		M		
				SG		

Figure 9. Schematic and Wiring Diagram of Type 86 Set with HPPPs Key Arrangement and Transmission Network with Automatic Sidetone Compensation.



NOTE 1
ASSEM. 15 WIRED TO OPERATE WITH A.E. CO. TYPE 10A1 OR W.E. CO. TYPE 1A1 SYSTEM. FOR CONVERSION TO OPERATE WITH A.E. CO. TYPE 10A OR W.E. CO. TYPE 1A SYSTEM MODIFY WIRING AS FOLLOWS:

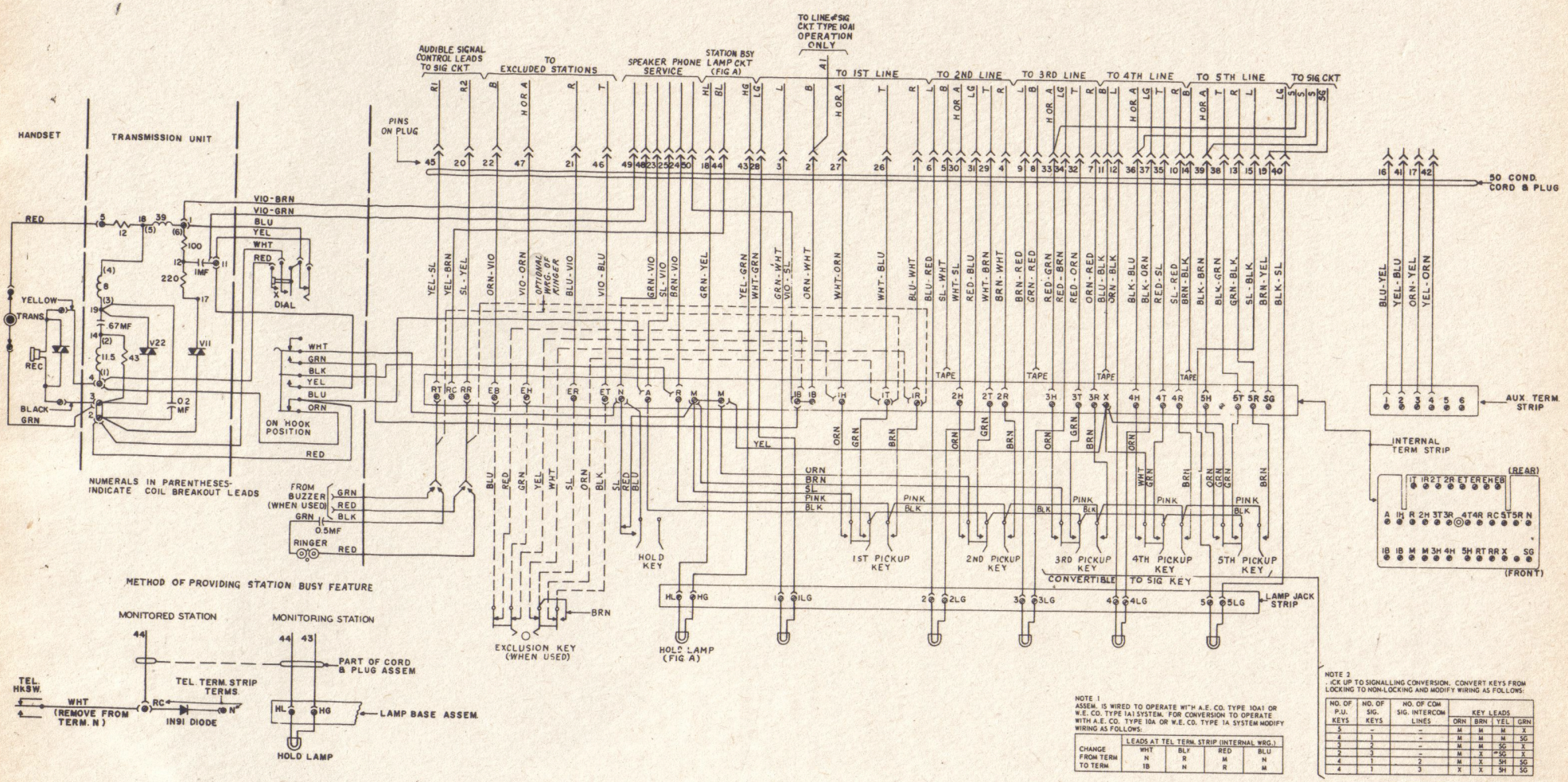
	LEADS AT TEL. TERM. STRIP (INTERNAL WRG.)			
CHANGE	WH	BLK	RED	BL
FROM TERM	N	R	M	N
TO TERM	1B	N	R	M

NOTE 2
PICKUP TO SIGNALLING CONVERSION.
CONVERT KEYS FROM LOCKING TO NON-LOCKING AND MODIFY WIRING AS FOLLOWS:

NO. OF P.U. KEYS	NO. OF SIG. KEYS	NO. OF COM. SIG. INTERCOM. LINES	KEY LEADS			
			OR	BR	YEL	GR
5	–	–	M	M	M	X
4	–	–	M	M	M	SG
3	2	–	M	M	SG	X
2	3	–	M	X	SG	X
4	1	2	M	X	SH	SG
4	–	3	X	X	SH	SG

METHOD OF PROVIDING STATION BUSY FEATURE

Figure 10. Schematic and Wiring Diagram of Type 86 Set with $HPPP_SP_SP_S$ Key Arrangement and Transmission Network with Automatic Sidetone Compensation.



NOTE 1
ASSEM. IS WIRED TO OPERATE WITH A.E. CO. TYPE 10A1 OR W.E. CO. TYPE 1A1 SYSTEM. FOR CONVERSION TO OPERATE WITH A.E. CO. TYPE 10A OR W.E. CO. TYPE 1A SYSTEM MODIFY WIRING AS FOLLOWS:

CHANGE FROM TERM TO TERM	LEADS AT TEL. TERM. STRIP (INTERNAL WRG.) WHT	BLK	RED	BLU
	N	R	M	N
	1B	N	R	M

NOTE 2
.ICK UP TO SIGNALLING CONVERSION. CONVERT KEYS FROM LOCKING TO NON-LOCKING AND MODIFY WIRING AS FOLLOWS:

NO. OF P.U. KEYS	NO. OF SIG. KEYS	NO. OF COM SIG. INTERCOM LINES	KEY LEADS ORN	BRN	YEL	GRN
5	-	-	M	M	M	X
4	1	-	M	M	M	SG
3	2	-	M	M	SG	X
2	3	-	M	X	SG	X
4	1	2	M	X	5H	SG
4	1	3	X	X	5H	SG

Figure 11. Schematic and Wiring Diagram of Type 86 Set with $HPPP_SP_SP_S$ Key Arrangement, Equipped with Plug-Terminated Line Cord and ASC Network.