

SE14 AND SE200-TYPE STATION SELECTORS

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1. GENERAL

(A) Description

1.01 The SE14 and SE200-type station selectors are automatic station-selecting devices which enable any station on a multi-station telegraph circuit, using 15-type teletypewriters, to establish connection with any other similarly equipped station or group of stations on the circuit through the medium of the teletypewriter selection code. A complete selector for one station consists of a control unit mounted on a teletypewriter table, three contact assemblies used in the typing unit, an answer-back magnet assembly used in the keyboard, and an interconnecting cable with base attachments. The SE14 selector, in addition, requires a 216-type cabinet installed apart from the teletypewriter table. An intermediate cable to connect the unit to the teletypewriter is also required.

1.02 The answer-back feature is optional and is installed only when required by the customer.

(B) Call Letters and Answer-Back Letters

1.03 Each station on the circuit is assigned a call letter and an answer-back letter if required. Letters "M", "O", "T", and "V" are not assigned as call letters because any one of these letters may be selected falsely when the line circuit for the station selector is restored at the end of the operating cycle of the station-selector start key, or after a prolonged line interruption elsewhere.

1.04 The function of the answer-back feature is to indicate automatically that communication has been established with the called station. Any letter that is not used as a station call letter may be used as an answer-back letter.

1.05 Since "M", "O", "T", and "V" can not be used for call letters, 22 stations are possible on any circuit. If the answer-back feature is required, only 13 stations can be connected to the circuit, provided "M", "O", "T", and "V" are used as answer-back letters, and only 11 stations if they are not used.

1.06 Fig. 1 shows the SE200-type control unit mounted on a table with a 15-type teletypewriter. Fig. 2 illustrates the SE14-type control unit in a 216-type cabinet. Fig. 3 illustrates the details of the SE200-type control unit which is mounted vertically on the right-hand side of the teletypewriter table. The SE14-type is mounted horizontally in the 216-type apparatus cabinet. Two SE14-type control units may be installed in the same cabinet.

(C) Operating Procedure

- 1.07 To make a call (select stations) the procedure is as follows:
- (a) Turn the start key and allow it to return to its normal position.
 - (b) Using the teletypewriter keyboard, send the call letter of a station to be selected. If equipped with the answer-back feature this station will automatically transmit a single answer-back letter indicating that the selection has been performed at the selected station. Other selections may be made after each answer back but the space bar or carriage return should not be operated between codes. The call letter of the calling station should be included at the end of all selections to hold the calling station on the connection and to identify the calling station.
 - (c) Send "SPACE" by operating the space bar.
 - (d) Send messages.
- 1.08 To disconnect after completing call:
- (a) Turn the start key and allow it to return to its normal position.
 - (b) Send "CARRIAGE RETURN."

2. THEORY OF OPERATION

(A) Selecting Stations

2.01 Referring to the schematic diagram Fig. 4 the loop or line passes through the contacts of the start key and the winding of the line relay located in the control unit. The contacts of the line relay close the circuit supplying battery to the start-relay magnet. The start relay is of the slow releasing type and even though the line relay contacts respond to the impulses carried on the line for message traffic (interrupting the circuit to the start relay), the start-relay armature remains in the position shown. When the start key is operated at any station on the circuit to make a call, the loop or line and the line-relay contacts are permitted to open sufficiently long to allow the start relay to release its armature.

(B) Operation at All Stations

2.02 The operation of the start key at the calling station will open the circuit and release the line relays at all stations permitting them to release their start relays within approximately two seconds. The start-relay armature will now complete the circuit to the green "ON" lamp and the motor-control relay. When the motor-control relay armature operates,

one of its contacts will close the circuit to the teletypewriter motor and the other will complete a circuit to the motor-control relay winding through the transfer and disconnect contacts (on the typing unit). This action starts the teletypewriter motors at all stations on the circuit and temporarily locks the control relays in their operated position.

2.03 The start key will come to rest about nine seconds after it is operated, and closes the line or loop which causes the line and start relays to attract their armatures. The green "ON" lamp and teletypewriter motor at all stations remain operated, the motors running at operating speed by this time.

(C) Operation at Selected Stations

2.04 The calling station will then transmit the call letters of the stations to be selected, and will allow sufficient time for reception of the answer-back letter of the called station if that feature is provided, before proceeding to call the next station. This time is almost instantaneous but may be a fraction of a second for the average line circuit and may be slightly greater in a long circuit due to the transmission "lag" in lengthier circuits. One or more stations may be called in on the same transmission. To retain the calling station in the hookup, the call letter of this station should also be transmitted. By sending this call letter last, the calling station will identify itself.

2.05 The call letter followed by the answer-back letter of the called station will be printed at all stations on the circuit. The teletypewriter at the called stations only, in addition to printing the code letters, will momentarily operate the call-contact function lever associated with this letter. This momentary closing of the call contact applies battery to the call relay and answer-back magnet. The answer-back magnet will operate the key lever to which it is connected and transmit the answer-back letter. The call relay locks up in the operated position by the current supplied through the operated start-relay armature to the make-before-break contacts of the call relay and through its windings to ground. The lower-operated contacts of the call relay will now supply locking battery to the motor-control relay, thereby shunting the circuit through the transfer and disconnect contacts at the "called" stations.

2.06 After all desired stations have been selected, including the calling station, the space bar must be depressed to cut off those stations not desired. Reception of the "SPACE" signal causes the transfer contacts to be operated momentarily at all stations. Although the operation of the transfer contacts

breaks the circuit to the motor-control relay, the relay and the green "ON" lamp remain operated through the call-relay contacts which are operated at all selected stations. The operation of the transfer contacts by the space signal also applies battery to the "busy" relay and red "busy" lamp. The busy relay and lamp remain operated through the operated contacts of the busy relay to the operated-start relay. With the busy relay operated the answer-back magnet and call-contact circuits are open so as to make them inoperative while messages are being transmitted.

(D) Operation at Stations Not Selected

2.07 When the space signal is received at stations not selected and causes the transfer contacts to operate momentarily, the locking circuit from these contacts to the motor-control relay and green "ON" lamp is opened. Inasmuch as the call relay is not operated at this station the power is cut off to the motor and "ON" lamp but the teletypewriter relay will be responsive to signals.

2.08 The operation of the transfer contact causes the busy relay and red "busy" lamp to operate and lock up to the start relay at the unselected stations. With the busy relay operated and the call relay not operated at these stations the transmitting contacts and start key are short-circuited and prevent interference with the line.

(E) Termination of Connection

2.09 Operation of the start key at any selected station on the circuit for the purpose of disconnecting opens the signal line, allows the line-relay armature at all stations to be released, and removes battery from the start-relay magnet. The contacts of the start relay will, in turn, open the circuit supplying locking battery to the busy relay and "busy" lamp at the uncalled stations, and to the call relay, busy relay, and "busy" lamp at the called stations. The releasing of the start-relay contacts will also cause the motor-control relay to be energized, thereby turning the motor on and illuminating the "ON" lamp at the uncalled stations, in the same manner as when calling. The motor-control relay at all stations on the circuit will now be locked in by the circuit through the disconnect and transfer contacts and all motors will be running.

2.10 When the start key comes to rest and closes the signal line, the line and start relays will again be energized. When "CARRIAGE RETURN" is transmitted, the disconnect contacts will open and interrupt the circuit to the motor-control relay and "ON" lamp at all stations. The power will then be disconnected from the motors and lamps at all stations.

(F) Monitor Switch

2.11 The monitor switch is provided to enable uncalled stations to print a copy of the transmitted messages without interrupting the other stations.

2.12 The motor-control relay and green "ON" lamp will be operated by the monitor switch and the machine will print messages but the uncalled station will be unable to transmit as the transmitting contacts remain short-circuited through the operated-busy and unoperated-call relays.

(G) D-C Break Switch

2.13 The break switch is used by the calling station when it is accidentally "locked out" of the circuit due to incorrect selective procedure of operating the space bar before all stations, including the calling station, are selected.

2.14 Depressing the d-c break switch for several seconds will open the rectifier unit supplying the d-c battery for relay operation. This will cause all operated relays to release. The calling station can then reselect the desired stations.

(H) Sequence Chart

2.15 A sequence chart of the operation for machines equipped with the answer-back feature is illustrated in Fig. 6. The operation of machines not provided with answer back is the same except for that function.

3. INSTALLATION

(A) General

3.01 On teletypewriters not equipped for station-selector operation, it is necessary to install the TP 94292 set of parts on the typing unit and the TP 106954 set of parts on the base. If the answer-back feature is desired, it is also necessary to install the TP 94294 set of parts on the keyboard.

(B) Installation of the TP 94292 Set of Typing Unit Parts

3.02 If the typing unit is equipped with a motor-stop mechanism, this mechanism together with its wiring should be removed before installing the typing unit parts for the station selector. Remove the typing unit from the base and rest it on its right side.

3.03 Loosen the two set screws which clamp the TP 74005 function-lever shaft and slide the shaft downward until it just clears the third slot from the top in the vane-frame

casting (third from the left when the unit is in its normal position). Insert the TP 94296 transfer-contact lever in the third slot so that the bearing hole is in alignment with the TP 74005 shaft and slide the shaft back into place. Make sure that the line-feed function lever is properly replaced.

3.04 Hook one end of the TP 22015 spring in the hole in the transfer-contact lever and the other end in the third hole from the top of the TP 74019 spring plate.

3.05 Remove and discard the TP 74130 space function lever and TP 74962 space function-lever spring from slot 9. Assemble the TP 94298 extension on the TP 94297 transfer-contact function lever using the two TP 76168 screws and TP 2191 lock washers. Also assemble the 33-45 adjusting screw and 34-56 nut to the function lever.

3.06 Install this transfer-contact function-lever assembly so that the slot in the function lever engages the TP 74005 shaft and so that the TP 74167 function-lever bail roller is between the vertical projections of the function lever. Hook one end of the TP 74961 spring in the spring hole of the function lever and the other end in the sixth hole from the top of the TP 74019 spring plate.

Note: With the transfer-contact function-lever extension installed in this manner, the typing unit will unshift on space. If the unshift-on-space feature is not required, reverse the extension so that its lobe will extend outward, away from the letters push bar.

3.07 On typing units equipped with the new style TP 74255 function-lever comb which has only 12 slots, install the call-contact function lever as follows:

(a) Rotate the main shaft until the printing bail is in its extreme rear position. Insert the call-contact function lever in the uppermost slot of the vane-frame casting so that the TP 74167 function-lever bail roller is between the vertical projections of the function lever.

(b) On typing units equipped with the old style TP 74255 function-lever comb which has 13 slots, it will be necessary to first loosen the three function-lever comb mounting screws before inserting the function lever as described in (a). After installing the function lever, tighten the comb mounting screws.

3.08 Hook one end of the TP 74962 spring in the spring hole of the call function lever and the other end in the uppermost hole in the TP 74019 spring plate.

3.09 Remove and discard the retaining nuts from the ends of the two TP 1222 screws in the TP 74890 call-contact assembly. Mount this assembly, by means of two TP 1222 screws, on the flat projection at the upper end of the TP 74539 send-receive mechanism plate so that the insulator on the end of the contact spring centers beneath the lobe on the end of the function lever.

3.10 Mount the TP 94295 transfer-contact assembly with bracket to the lower end of the send-receive mechanism plate, using the two TP 1161 screws and TP 2191 lock washers furnished. The middle contact-spring insulator should touch the end of the transfer-contact lever.

3.11 Place the typing unit in its normal upright position. Remove and discard the TP 74413 signal-bell-hammer backstop. Using the two TP 6746 mounting screws, washers, and lock washers just removed, mount the TP 94299 disconnect-contact assembly with bracket in place of the bell-hammer backstop. The new bracket should be positioned so that the extension at the lower end of the contact-operating lever is in contact with the upper edge of the TP 74068 carriage-return latch bar. It should be noted that the disconnect contact bracket includes an adjustable screw which replaces the bell-hammer backstop.

3.12 Remove and discard the TP 81956 blocking plate located on the function-lever bail assembly and replace it with the TP 94300 blocking plate. Use standard adjustments.

3.13 To install the TP 94301 cable in the typing unit, run the end of the cable, which has the two red and one black wires, to the disconnect contacts. Solder the two red wires to the lower contact terminal and the black wire to the upper contact terminal and tie this portion of the cable to the TP 74254 rear crossbar. Run that portion of the cable, which has the four short leads, along the TP 8884 terminal block so that the leads are opposite the terminals to which they are to be attached. Solder the white, red, orange, and blue leads to the TP 8884 terminal block furnished and install the block adjacent to the TP 8884 block already in place, using the TP 1226 screws, TP 2191 lock washers, TP 7002 washers, and the TP 74946 insulator also furnished. Tie the TP 94301 cable to the selector-magnet cable about one inch beyond the terminal blocks, and route the remainder of the cable along the rear (right) surface of the selector mounting plate along the upper flat part of the left end frame, to the call and transfer-contact assemblies. Solder the red and white leads to the upper and lower call contacts, respectively, and the orange, black, and blue leads to the transfer contacts in the order named (top to bottom).

Tie that portion of the cable running to the transfer contacts to the TP 74415 guide bracket or to the TP 74019 spring plate. It is important that the cable be positioned and tied so that it does not come into contact with any moving parts.

(C) Installation of TP 106954 Set of Base Parts

3.14 From the send-receive-break mechanism, remove and tape separately the bare ends of the black wires connected to the left contacts of both the double and single contact pile-ups. Remove, twist together, solder, and tape the ends of the two brown wires connected to the two right (break) contacts of the double contact pile-up.

3.15 From the terminal blocks at the right side of the base, remove and tape separately the wires on terminals numbered 31, 35, and 44. Remove, twist together, solder, and tape the two wires on terminal 33; then do the same with the pair of wires on terminal 36 and also those on terminal 45.

3.16 Remove the base plate from the bottom of the base. Remove the TP 74551 typing unit slip-connection cover and the screws which mount the slip-connection assembly. Without removing any connections, move the slip-connection assembly away from the base to make it accessible and install the four TP 7094 slip-connection springs on the TP 74568 block, using the TP 7095 spring plates and TP 6811 screws furnished.

3.17 In the place provided on the TP 74053 slip-connection mounting plate assembly, mount the TP 7398 spring plate, TP 7399 spring stiffener, and TP 74685 contact spring with the TP 8539 screws, TP 4293 insulators, TP 3897 bushings, TP 2191 lock washers and TP 7002 washers (all of which are furnished).

3.18 From the bottom of the base insert the end of the TP 94304 cable, that has only four wires, into the cable hole in the vertical wall of the base casting near the keyboard slip connections and solder the four wires to the four newly installed slip connections, the green wire to the 112 and slip-connection spring, and the blue, white, and orange wires to the remaining three springs. Also see that there is a strap (jumper) across slip connections 9 and 10.

3.19 In replacing the typing unit slip-connection assembly, locate the slack in the four new wires between the slip-connection springs and the vertical wall of the base casting. Run the new cable along the base cable, so that the single white wire is located beneath the base casting. Replace the slip-connection cover.

3.20 Solder the single white wire to the "spare" keyboard slip-connection spring (the end one nearest the capacitor) designated as No. 50 on the wiring diagram. Route the cable along the two base cables, against the casting to the rear of the cable-clamp boss, and tie it to the boss. Continue forming the new cable along the two larger ones and insert the free end of the cable through the hole in the base casting at the end of the motor slip-connection mounting. Tie the new cable to the base cable at two or three convenient places beneath the base casting to prevent damage.

3.21 Replace the base plate. Place the base in a position so that connections can easily be made to the three terminal blocks. Form the end of the cable which protrudes through the hole in the base so that it lies against the surface of the casting beneath the rear terminal block. Connect the longest white wire to terminal 31, the terminal-lug end of the green wire jumper to terminal 35, the blue wire to 36, the orange wire to 43, the remaining green wire with terminal lug to 44 and the remaining white wire to 45 as shown on the wiring diagram.

3.22 Remove the two wires connected to terminal 22 and test to determine which of the two connects to the governor resistors. Remove the terminal lug from the wire that connects to the resistors. Splice and solder it to the free end of the green jumper wire so that it connects the wire from the governor resistor to terminal 35. Replace the other wire on terminal 22.

(D) Installation of the TP 94294 Set of Keyboard Parts

3.23 Remove the keyboard from the base and place it upside down with the key levers toward the front.

3.24 Remove the TP 74590 right and left guide plates. Remove the 800-800-ohm resistor located on the right side of the keyboard. Also, unsolder the two wires from the resistor and pull them through the hole in the casting.

3.25 Drill the tapped hole, which was used to mount the resistor, to .196 inch diameter (No. 9 drill).

3.26 The end of the TP 94320 cable which has the two green leads should be inserted through the hole in the casting from which the resistor wires were withdrawn. Solder the ends of these two leads to the terminals on the answer-back magnet. Tape each magnet terminal and approximately one-half inch of the wires soldered to them to reduce the possibility of the terminals and bare wire touching the casting.

3.27 Install the TP 94309 magnet bracket with the M209 magnet using the TP 49056 screw and TP 2669 lock washer in the redrilled hole. Install the TP 94314 armature

assembly on the magnet bracket using the TP 6746 screw, TP 2191 lock washer, and TP 94318 washer.

3.28 Remove the resistor from the left side of the keyboard without unsoldering the leads and mount it on the TP 94319 resistor mounting plate. Also mount the 800-800-ohm resistor (previously removed) on the TP 94319 mounting plate and screw the mounting plate in place with the TP 1269 screw and TP 2191 lock washer furnished.

3.29 Remove and discard the four TP 8539 screws which mount the TP 7396 and TP 7397 left and right universal-bar brackets and retain the lock washers. Using the TP 6811 screws furnished and the lock washers previously removed mount the two TP 94305 bail brackets against the universal-bar brackets. The TP 6814 pilot screws with TP 2191 lock washers, TP 96833 eccentric with the TP 2191 lock washer, and TP 74986 screw should be assembled on the bail brackets as shown. Assemble the TP 81599 eccentric using the TP 74986 screw and TP 2191 lock washer on the TP 94306 bail. Locate the bail over the screws in the brackets with the fork of the magnet armature engaging the eccentric.

3.30 Remove the TP 74986 spring plate mounting screw nearest the answer-back magnet and install the TP 94307 bail spring beneath the lock washer on this screw.

3.31 Install the TP 94308 key-lever link on the key lever that is assigned for the answer back so that the hook on the link engages the bail. Use the TP 1163 screw furnished to clamp the link.

3.32 Place the keyboard in its normal upright position and remove the TP 74589 terminal-block (slip-connection) assembly. Using the TP 1262 screw and 34-48 nut, install the TP 96883 terminal in the vacant slot of the terminal block.

3.33 Solder the short green wire of the TP 94320 cable to the slip-connection terminal 50 just installed and splice the two red wires (adjacent to the green wire) to the two wires removed from the 800-800-ohm resistor. Solder and tape these spliced connections and place them, with the cable, beneath the slip-connection terminals. Solder the remaining green wire to slip-connection terminal 58 and route the two remaining red wires down through the cable hole at the right rear corner of the keyboard. Solder the two red wires to the 800-ohm resistor as indicated on the wiring diagram. Tie the new cable to the keyboard cable wherever necessary to prevent damage.

Note: The adjustments should then be made on the newly installed keyboard parts and the TP 74590 guide plates should be replaced. See keyboard adjustments.

(E) Installation of the Control Unit

3.34 Wooden Tables.

(a) A hole one-half inch in diameter should be drilled in the right side panel of the table, five inches from the front surface of the right front leg, and just beneath the table top, to accommodate the control-unit cable.

(b) Remove the control-unit cover which is held in place by three screws. Pass the control-unit cable through the hole in the right panel. With the TP 6332 spacer at the rear bottom and the TP 5926 spacer at the front bottom, mount the control unit so that its upper surface is on the same plane (flush) with the table top and the front edge of the control unit is in line with the front surface of the front right leg as shown in Fig. 1. Three TP 33-339 wood screws are furnished for mounting. Replace the cover on the control unit.

3.35 Metal Tables.

(a) Remove the control-unit cover which is held in place by three screws. If holes are not already in the right side of the table, they should be drilled. With the TP 96766 bakelite spacer at the rear bottom and the TP 96767 bakelite spacer at the front bottom, mount the control unit so that its upper surface is on the same plane (flush) with the table top and the front edge of the control unit is in line with the front surface of the front right leg. Three TP 33-202 screws, three TP 2669 lock washers and three TP 55216 nuts are furnished for mounting. Replace the cover on the control unit.

(F) Intermediate Wiring

3.36 The terminal lugs on the TP 114332 connecting cable should be connected to the teletypewriter-base terminal block. If the holes in the top and side of the table are too small to allow the 12 slot receptacle to pass through, it will be necessary to insert the end of this cable with the terminal lugs first, through the hole in the right side of the table, and then up through the hole in the top. Plug the receptacle into the control unit to complete all connections. The SE14 selector is coupled to the teletypewriter by inserting the TP 114529 interconnecting cable between the female connector of the TP 114332 cable and the male connector of the selector unit in the 216-type cabinet.

(G) Signal-Line and Power Connections

3.37 If the teletypewriter was modified in the field for station-selector operation, connect the signal line and power as shown on the wiring diagram furnished with the set

of base parts. If the teletypewriter was factory equipped for station-selector operation, connect the signal line and power as shown on the wiring diagram furnished with the base.

4. ADJUSTMENTS

(A) General

4.01 In making the following adjustments the control unit should be in its upright operating position. The spring tension values indicated in this specification are scale readings which should be obtained when teletype scales are used as specified.

(B) Control Unit

4.02 **Start-Key Contact Cam Adjustment.** With the key in the normal stop position, the cam-follower contact spring should be centrally located on the high portion of the cam insulator (gauge by eye). Also, there should be some clearance, not more than .010 inch between the cam hub and the end plate. To adjust, loosen the set screws which hold the contact cam to its shaft.

4.03 Start-Key Contact Adjustment.

(a) The cam-follower contact spring should be centrally located on the cam and the upper contact point should "make" approximately in the center of the lower contact. To adjust, loosen the contact mounting screws and position the contact pile-up.

(b) With the cam located so that the cam-follower contact spring is opposite the low part of the cam (off the cam insulator), and the cam-follower contact spring against its stiffener, the cam-follower contact spring should clear the low part of the cam by .030 inch to .045 inch. To adjust, bend the stiffener.

(c) With the cam-follower contact spring opposite the low part of the cam, hook an eight-ounce scale over the edge of the spring and pull horizontally at right angle to the contact spring. It should require some tension, not more than two ounces, to start the contact spring moving away from the stiffener. To adjust, bend the contact spring. Recheck (b).

(d) With the cam-follower contact spring opposite the low portion of the cam, there should be a gap of .020 inch to .030 inch between the two contact points. To adjust, bend the outer contact spring and its stiffener.

(e) With the cam-follower contact spring on the high portion of the cam insulator, hook an eight-ounce scale over the end of the outer contact spring just above the

contact and pull horizontally at right angle to the spring. A tension of one-half to two ounces should be required to just open the contacts. To adjust, bend the contact spring. Recheck (d).

4.04 **Motor-Control Relay Adjustment.**

(a) All four contacts should be closed when the anti-freeze rivet on the armature is .030 inch away from the pole piece, and should be open when the rivet is .045 inch away. To adjust, bend the contact springs.

(b) With the armature resting against the backstop screw, adjust the backstop screw so that there is a gap of .060 inch to .075 inch between the end contact springs and the contacts against which they make.

(c) With the armature against the backstop screw, apply the push end of an eight-ounce scale to the outer edge of the armature and push upward. A tension of three-fourths to one and three-fourths ounces should be required to start the armature moving. To adjust, regulate the armature-spring adjusting screw.

Note: The armature should rotate freely on its bearings.

4.05 **Line Relay Adjustment.**

(a) When the relay armature is against the backstop nut, there should be .015 inch to .018 inch clearance between the armature anti-freeze rivets and the relay core. To adjust, position the adjustable backstop nut.

(b) The lower-contact spring should exert sufficient tension (but not more than one ounce) against the armature to hold the armature against the backstop. This tension should be measured by hooking an eight-ounce scale under the end of the armature and pulling upward. Take the reading when the armature just starts moving away from the backstop.

(c) With the relay armature against the backstop, there should be a gap of .005 inch to .008 inch between the contact points. To adjust, bend the stop lug on the upper contact spring.

(d) With the relay armature against the backstop, hook an eight-ounce scale to the end of the upper contact spring. A tension of one-half to three-fourths ounce should be required to start the contact spring moving away from the spool end.

(C) Start, Call and Busy Relay Adjustment

4.06 The start, call and busy relays should meet the following requirements:

(a) **Heel-Piece Air Gap Adjustment (Fig. 7A).** There should be a clearance of .0015 inch to .003 inch between the relay armature and the end of the heel piece when the armature is in the operated position and the residual screw is backed away so that it does not touch the magnet core. To adjust, loosen the armature yoke mounting screw and position the armature.

(b) **Residual Screw Adjustment (Fig. 7B).** There should be a clearance of .0015 inch to .003 inch between the armature and the core when the armature is in the operated position. To adjust, loosen the residual screw lock nut and adjust the screw.

(c) **Stroke Gap Adjustment (Fig. 7C).**

(1) The distance between the core and the residual screw, when the armature is in the unoperated position, is called the stroke gap. Dimensions for the stroke gaps are given under CONTACT GAPS below.

(2) To adjust, place a gauge of the required thickness (equal to the stroke gap) between the core and the residual screw and push the armature and gauge toward the core. Bend the armature arms to provide a barely perceptible clearance (not more than .004 inch) between the insulator and the contact spring against which it moves. When making this adjustment, it may be necessary to back the armature backstop away.

4.07 Armature Backstop Adjustment. With the armature arm resting against the armature backstop, there should be some clearance (not more than .004 inch) between the insulator on the arm adjacent to a "BREAK" contact spring and the contact spring. To adjust, bend the armature backstop.

4.08 Contact Gaps.

(a) Contact springs which close electrical circuits when the relay is operated are called "MAKE" contacts or springs. "MAKE" contacts are adjusted so that, when a thickness gauge of specified size is inserted between the armature-residual screw and the core, the "MAKE" contacts will just make when the relay is energized.

(b) Contacts which open electrical circuits when the relay is operated and close the circuit when the relay is unoperated are called break contacts. Break contacts are adjusted so that, when a thickness gauge of the specified size is inserted between the armature-residual screw and the core, the break contacts will just break the circuit through the relay.

(c) The table showing the gauges to be inserted between the residual screw and the core, to cause the "MAKE" contacts to just make and break contacts to just open, follows:

GAUGE TABLE

<u>Stroke Gap</u>	<u>Upper Contact Group</u>	<u>Lower Contact Group</u>
Start Relay .013 inch to .015 inch	Break Contacts:	
	Break .009 inch	
	Not Break .011 inch	
	Break Contacts:	
	Make .005 inch	
	Not Make .007 inch	
Call Relay .015 inch to .017 inch	1st Make Contact:	Break Contact:
	Make .007 inch	Break .010 inch
	Not Make .009 inch	
	2nd Make Contact:	
	Make .008 inch	
	Not Make .010 inch	
	Break Contacts:	
	Break .003 inch	
Not Break .005 inch		
Busy Relay .013 inch to .015 inch	Break Contacts:	1st Make Contact:
	Break .009 inch	Make .005 inch
	Not Break .011 inch	Not Make .007 inch
		2nd Make Contact:
		Make .005 inch
		Not Make .007 inch

Note: In checking the foregoing contact gaps make sure that the armature and gauge are held firmly toward the core. Recheck the Armature Backstop Adjustment.

4.09 Contact Spring Tensions.

(a) Spring tensions are checked electrically. Values of operating and non-operating currents are specified with which the spring tensions should conform. Operating current is the value of the current with which the relay armature-residual screw should pull up against the core. Non-operating current is the value of current which should

not move the armature from the unoperated position sufficiently to close any "MAKE" contacts or open any break contacts. After adjusting spring tension, recheck Armature Backstop and Contact Gap Adjustments.

(b) Besides operate and non-operate current values, the following table indicates the nominal resistance of the relay coil windings:

CURRENT VALUES

	<u>Amperes Operating Current</u>	<u>Amperes Non-operating Current</u>	<u>Ohms Resistance</u>
Start Relay	.0065	.0050	3400
Call Relay	.0130	.0085	3400
Busy Relay	.0047	.0038	7850

(c) "MAKE" contact-armature springs should follow the armature or the preceding armature spring all the way back. "BREAK" contact armature springs should rest against the associated contact springs with at least 20 grams tension.

(D) Typing Unit Part Adjustments

4.10 Call Contact Adjustments.

(a) With the main shaft rotated so that the call-contact function lever is resting against the selector vanes, but not selected, there should be some clearance not more than .010 inch between the insulator on the end of the bail-backstop eccentric mounting screw. Hold the bail against the eccentric backstop, and turn the eccentric. Tighten the screw.

(b) With the main shaft in the same position as specified for Pgh. (a) above, there should be a contact gap of .015 inch to .020 inch. To adjust, bend the lower contact spring.

4.11 Call-Contact Function-Lever Spring Tension. With the call-contact function lever resting against the vanes, not selected, and the contact spring held away, hook a 32-ounce scale under the extreme front end and pull vertically upward. It should require a tension of 24 to 32 ounces to start the function lever moving.

4.12 Transfer Contact Adjustments

(a) With the transfer-contact lever held away from the insulator on the transfer-contact spring, the center contact should make with the lower contact. There should

also be a clearance of .030 inch to .040 inch between the center and upper contacts.

(b) To adjust, bend the upper (heavy) contact spring so that it is parallel to and in line with the insulators between which it is mounted. Bend the center-contact spring so that it rests against the lower spring with just a slight amount of tension and then bend the lower-contact spring to obtain the required gap.

(c) With the transfer-contact lever held away from the contact insulator, hook an eight-ounce scale under the center-contact spring between the insulator and the contact and pull vertically upward. A tension of four and one-half to five and one-half ounces should be required to open the contacts. To adjust, bend the center-contact spring. Recheck (a).

(d) The position of the transfer contacts in relationship to the transfer-contact lever should be such that, when the transfer-contact lever is in its lowermost position, there would be a clearance of .010 inch to .020 inch between the end of the transfer-contact lever and the insulator on the center-contact spring.

(e) To adjust, loosen the screws which secure the transfer contact bracket to the send-receive plate, and position the transfer-contact assembly so that the upper and lower contact springs are parallel to the function lever-spring plate. Tighten the transfer contact-bracket mounting screws. Set up the "SPACE" combination (front edge of No. 3 vane down, front edges of No. 1, No. 2, No. 4, and No. 5 up) and rotate the main shaft until the printing bail is in its extreme forward position. Position the adjusting screw on the transfer-contact function lever to meet the requirement, and tighten the lock nut.

4.13 Transfer Contact-Lever Spring Tension. Rest the typing unit on its right side. With the main shaft in the stop position and the transfer contact held away from the contact lever, hook a 32-ounce scale to the transfer-contact lever at the spring hole and pull horizontally in line with the spring. It should require a tension of 12 to 16 ounces to start the lever moving.

4.14 Transfer Contact Function-Lever Spring Tension. Rest the typing unit on its right side. Select "SPACE" (No. 3 vane down) and rotate the main shaft until the printing bail is in its extreme forward position. With the transfer-contact lever held away from the screw head, hook a four-pound scale to the rear end of the transfer-contact function lever and pull

horizontally. It should require a tension of one and one-fourth to one and three-fourths pounds to start the lever moving.

4.15 **Disconnect Contact Adjustments.**

(a) Set up the "CARRIAGE-RETURN" combination and rotate the main shaft until the printing bail is in its extreme forward position. There should be a clearance of .010 inch to .020 inch between the disconnect contacts. To adjust, bend the stiffener, if necessary, to obtain this clearance.

(b) With the main shaft in its "STOP" position, check to see that there is some clearance between the insulator on the lower disconnect-contact spring and the bell crank when the play in the bell crank is taken up in the direction to make this clearance a maximum. To adjust, bend the stiffener and the upper contact spring.

(c) With the teletypewriter resting on its right side and the main shaft in its "STOP" position, hook an eight-ounce scale to the lower-contact spring between the contact and insulator and pull at a right angle to the contact spring. It should require a tension of four and one-half to five and one-half ounces to just break contact. To adjust, bend the lower contact spring.

(E) **Keyboard Adjustments**

4.16 **Key-Lever Link Adjustment.** The key-lever link should be positioned on its key lever to provide a .020 inch to .040 inch clearance between the vertical edge of the link and the vertical side of the bail. To adjust, loosen the link clamping screw and position the link.

4.17 **Bail-Spring Tension.** With the keyboard upside down, hook an eight-ounce scale under the end of the bail spring and pull vertically upward. It should require a tension of three to three and one-half ounces to start the spring moving away from the bail. To adjust, bend the spring.

4.18 **Bail-Backstop Adjustment.** There should be some clearance, not more than .004 inch between the edge of the bail and the hook on the key-lever link. To adjust, loosen the bail-backstop eccentric mounting screw. Hold the bail against the eccentric backstop, and turn the eccentric. Tighten the screw.

4.19 **Answer-Back-Magnet Heel-Piece Air Gap Adjustment.** There should be a clearance of .025 inch to .030 inch between the end of the heel piece and the armature when the armature is held in the operated position. To adjust, loosen the armature-yoke mounting screw and place a .025 inch gauge

between the heel piece and the armature. Hold the armature firmly against the gauge and tighten the mounting screw.

4.20 **Bail Adjustment.** The eccentric bushing on the bail which is engaged in the forked end of the answer-back-magnet armature lever should be adjusted to provide full travel of the key lever which it operates. To adjust, loosen the eccentric bushing screw, fully depress the answer-back key lever, place the magnet armature in its operated position and rotate the eccentric bushing until the bail just touches the key-lever link. Tighten the eccentric bushing screw.

5. POWER REQUIREMENTS

5.01 The units are arranged to operate on 110 volts direct current. For those installations where a direct current power supply is not available, a compact rectifier of the vacuum tube type, for operation on 110 volts 50/60 cycle a-c, that fits within the control unit is furnished. The power consumption of the selector is approximately 30 watts d-c and 45 watts a-c when equipped with the rectifier.



Fig. 1—SE200-type control unit mounted on a table with a 15-type teletypewriter.

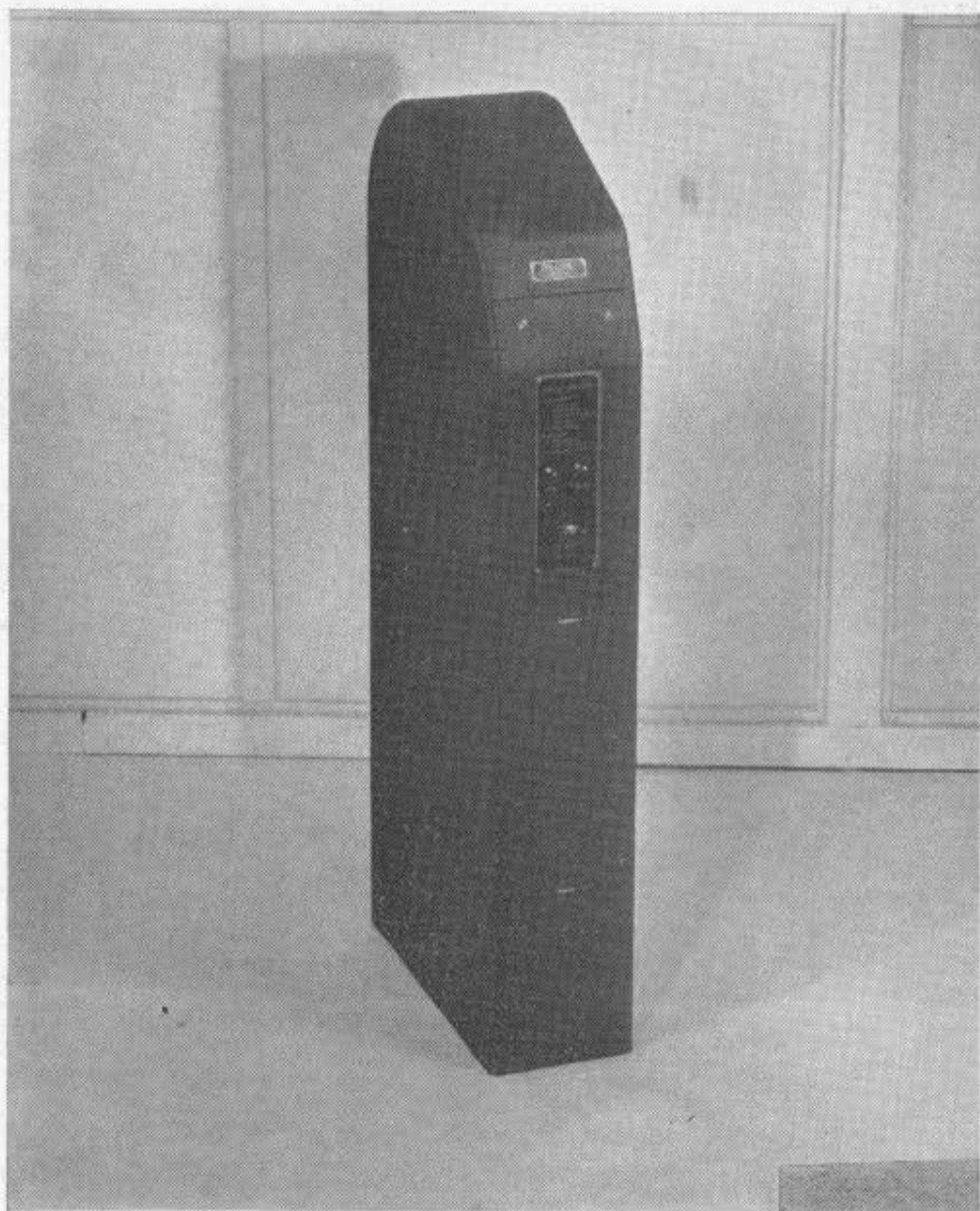


Fig. 2—SE14-type control unit in a 216-type cabinet.

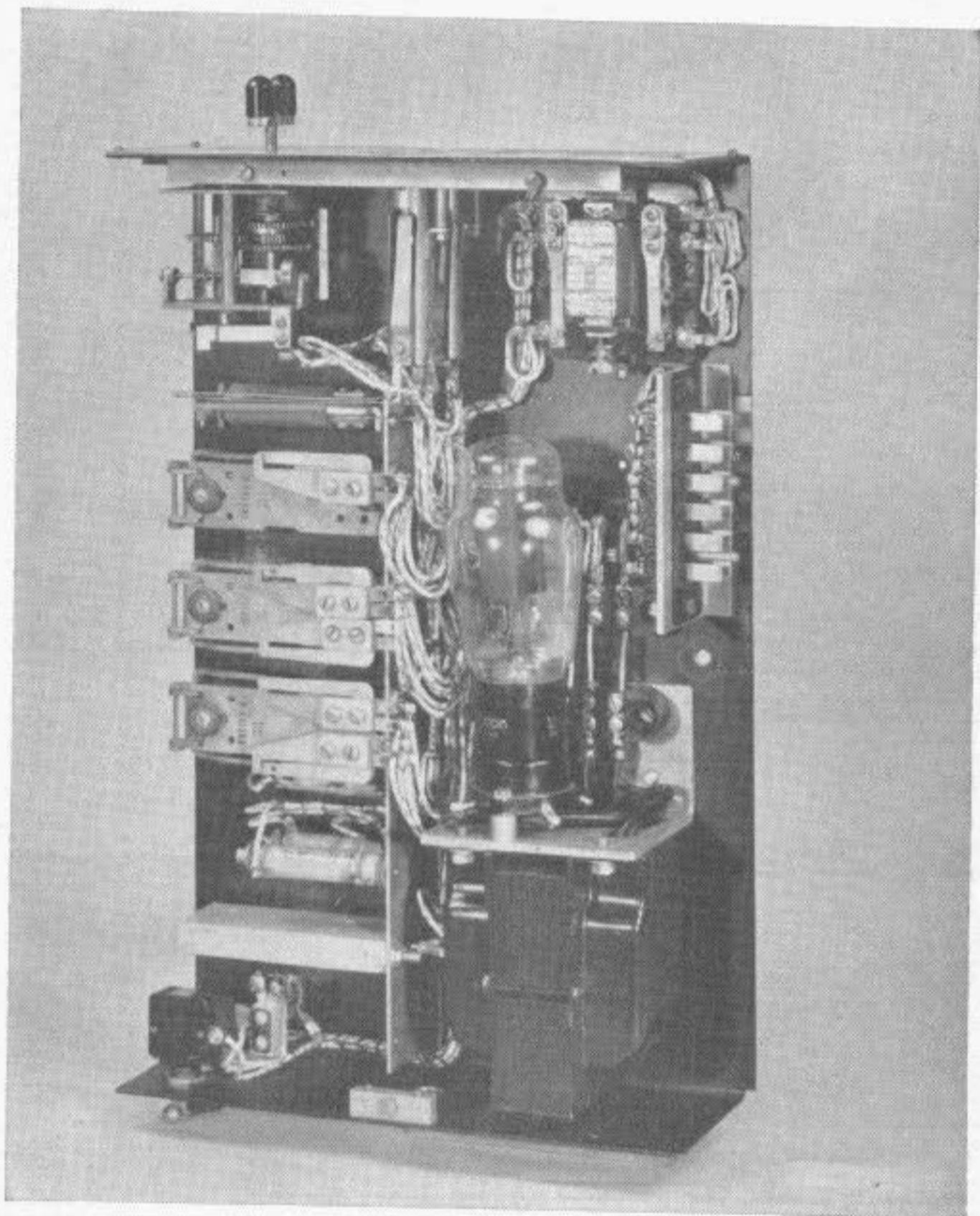


Fig. 3—Details of the SE200-type control unit.

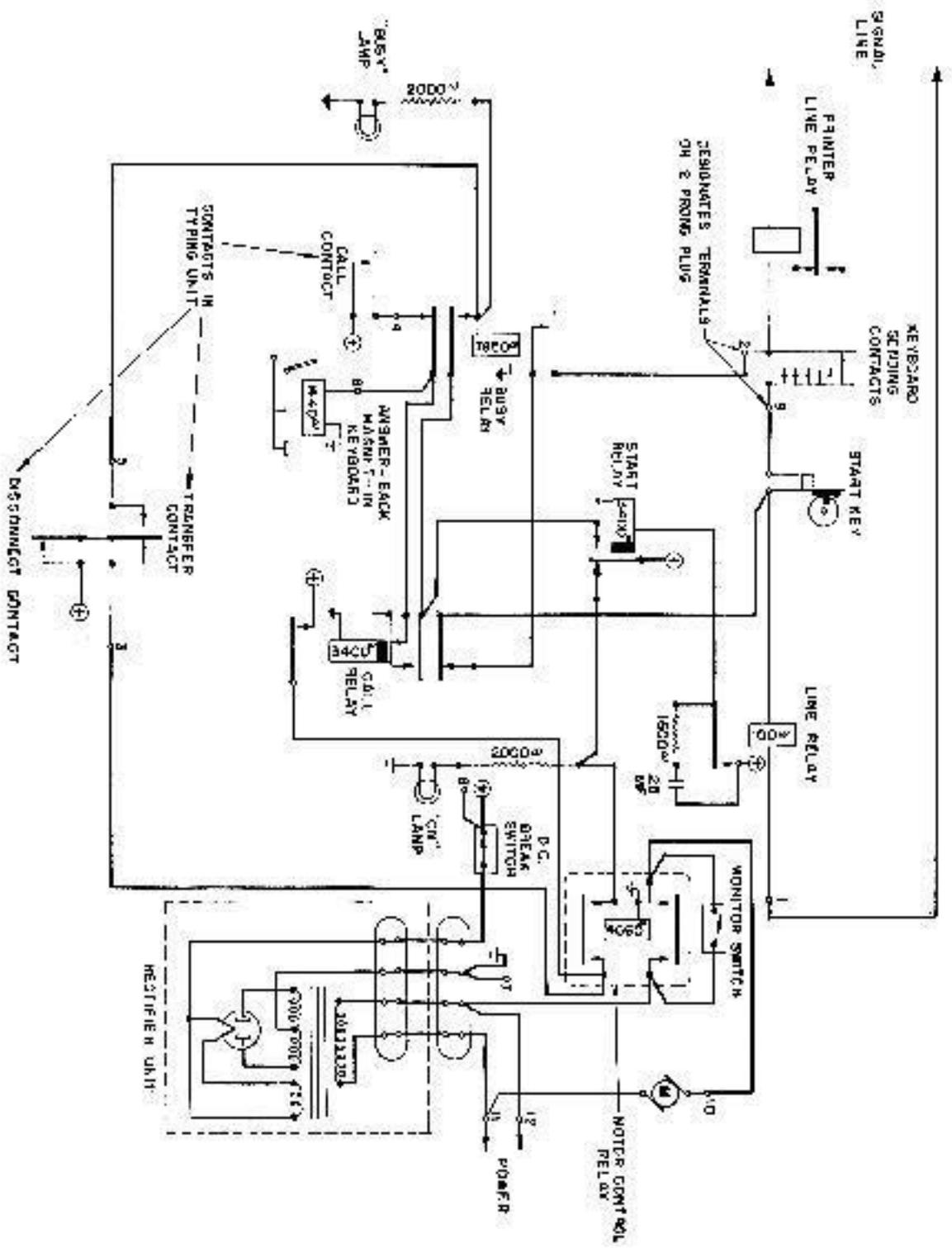


Fig. 4—Schematic diagram.

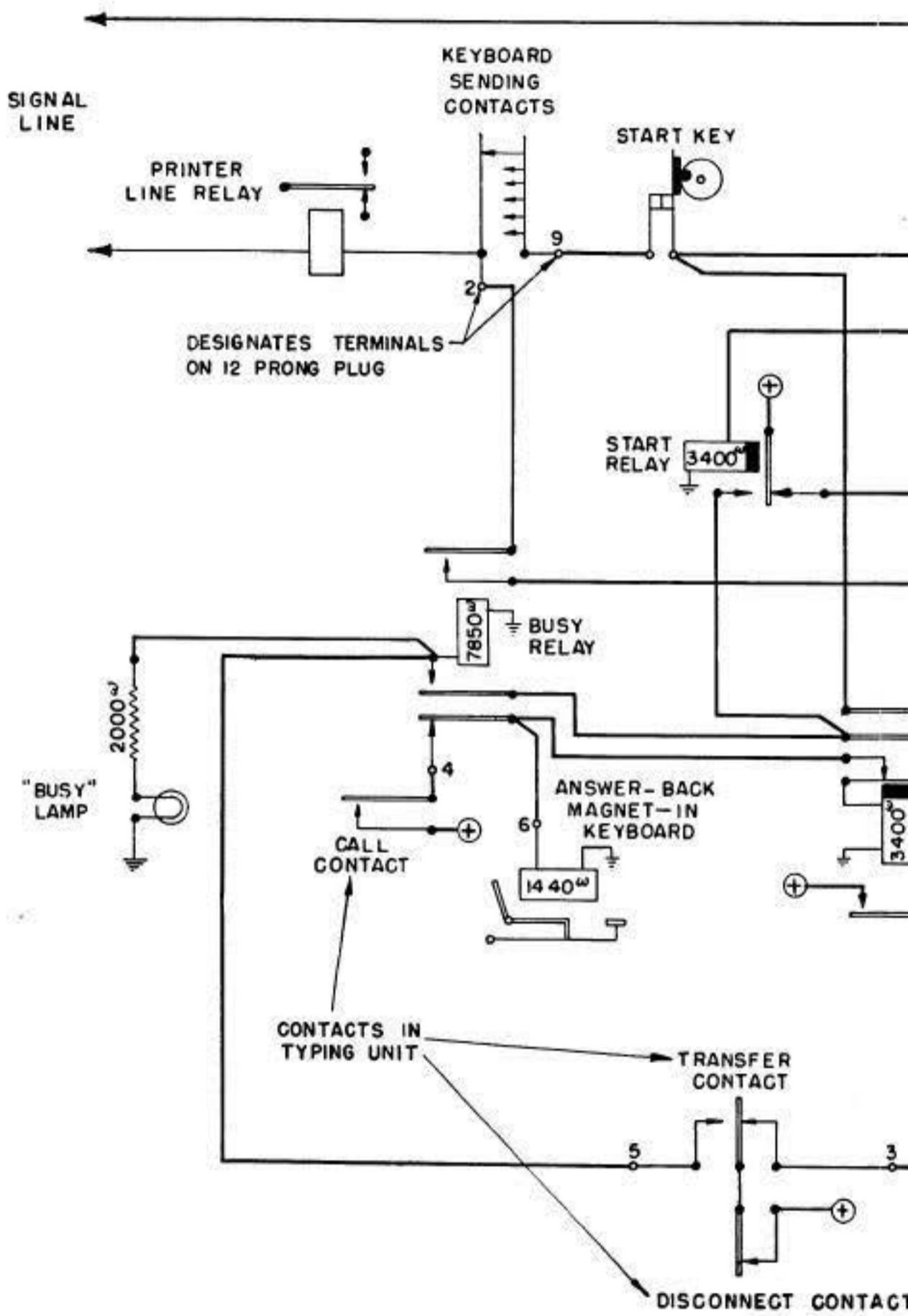
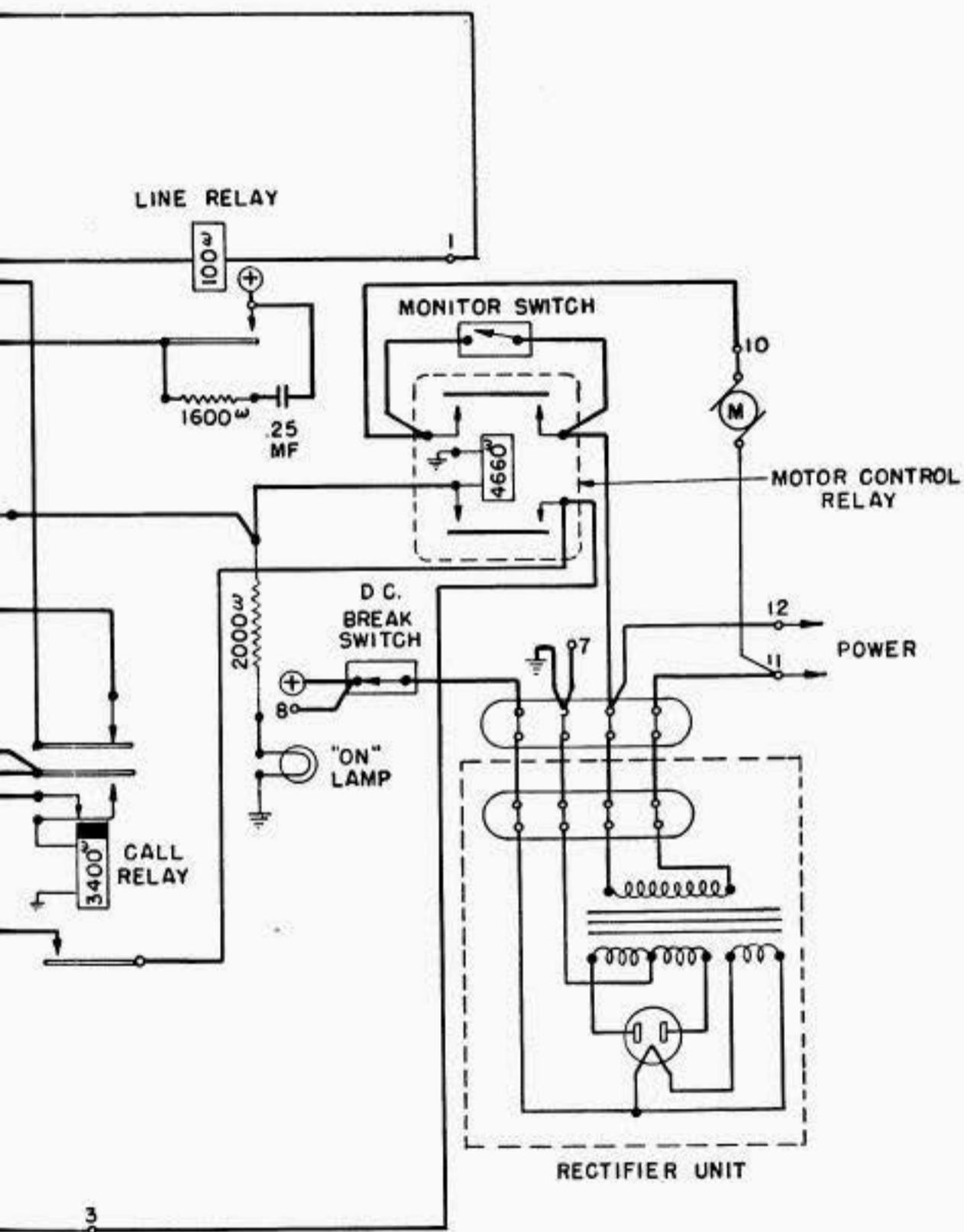


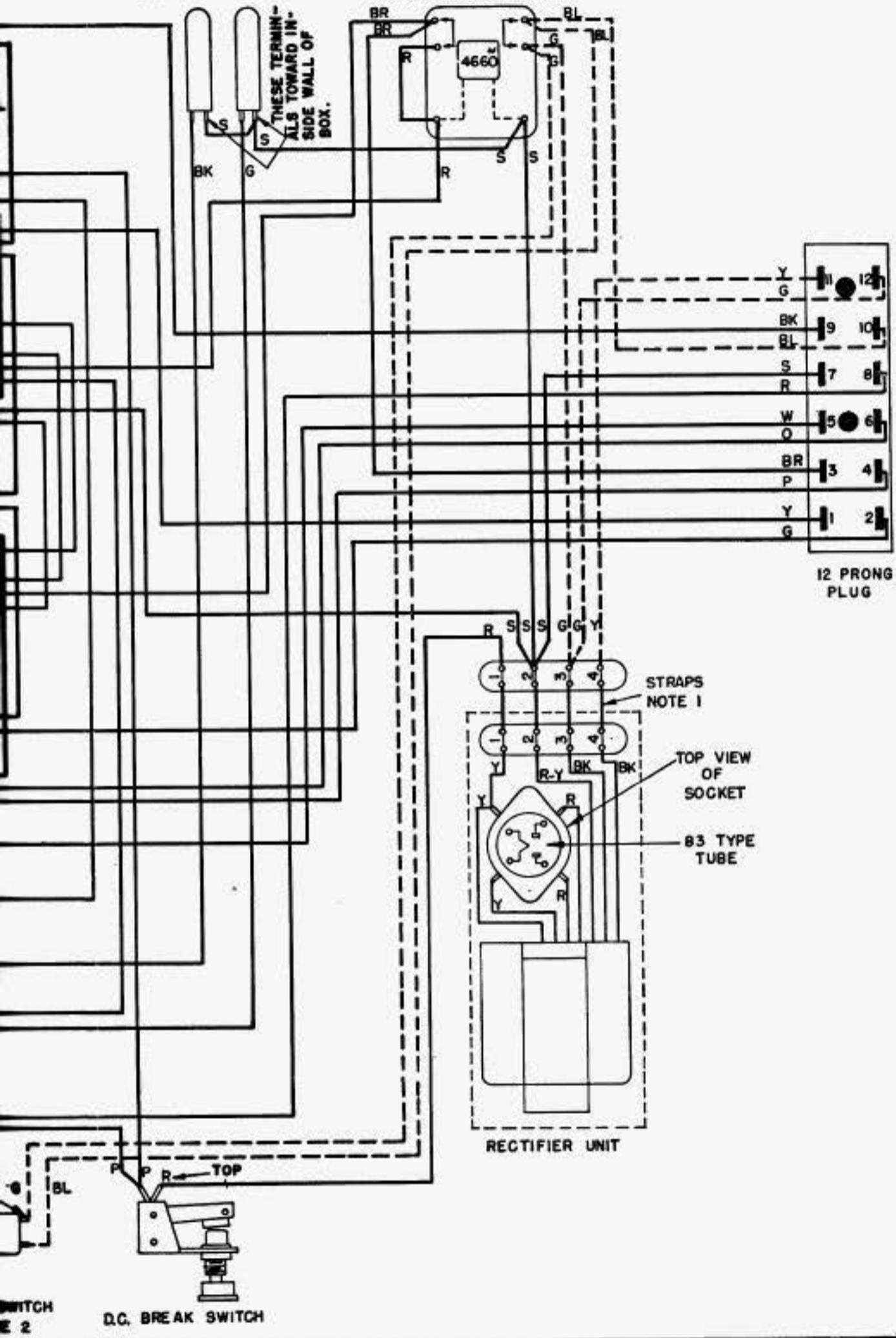
Fig. 4—Schematic diagram.



"BUSY" LAMP - "ON" LAMP

MOTOR CONTROL RELAY

THESE TERMINALS TOWARD INSIDE WALL OF BOX.



SE14 AND SE200 STATION SELECTORS SEQUENCE OF OPERATION

ACTIVATING STATIONS FOR SELECTING OPERATION

LEGEND
O = OPERATES
R = RELEASES
L = LOCKS

OPERATION AT ALL STATIONS

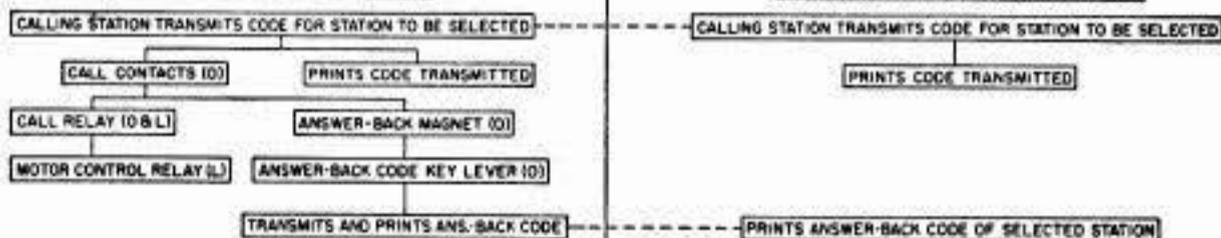


(MOTORS AND ON LAMPS REMAIN OPERATED THROUGH THE TRANSFER-DISCONNECT CONTACTS)

TRANSMISSION OF SELECTING CODE BY CALLING STATION

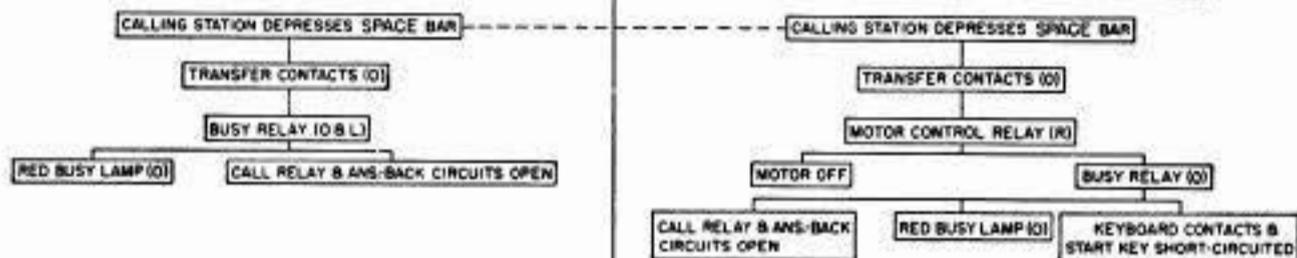
OPERATION AT SELECTED STATION

OPERATION AT NON-SELECTED STATION



(REPEAT ITEM 9 FOR OTHER STATIONS TO BE SELECTED - CALLING STATION SELECTING CODE TRANSMITTED LAST)

DEACTIVATING SELECTING MECHANISM AT COMPLETION OF SELECTIONS (INCLUDING CALLING STATION)



OPERATION AT CONCLUSION OF TRANSMISSION

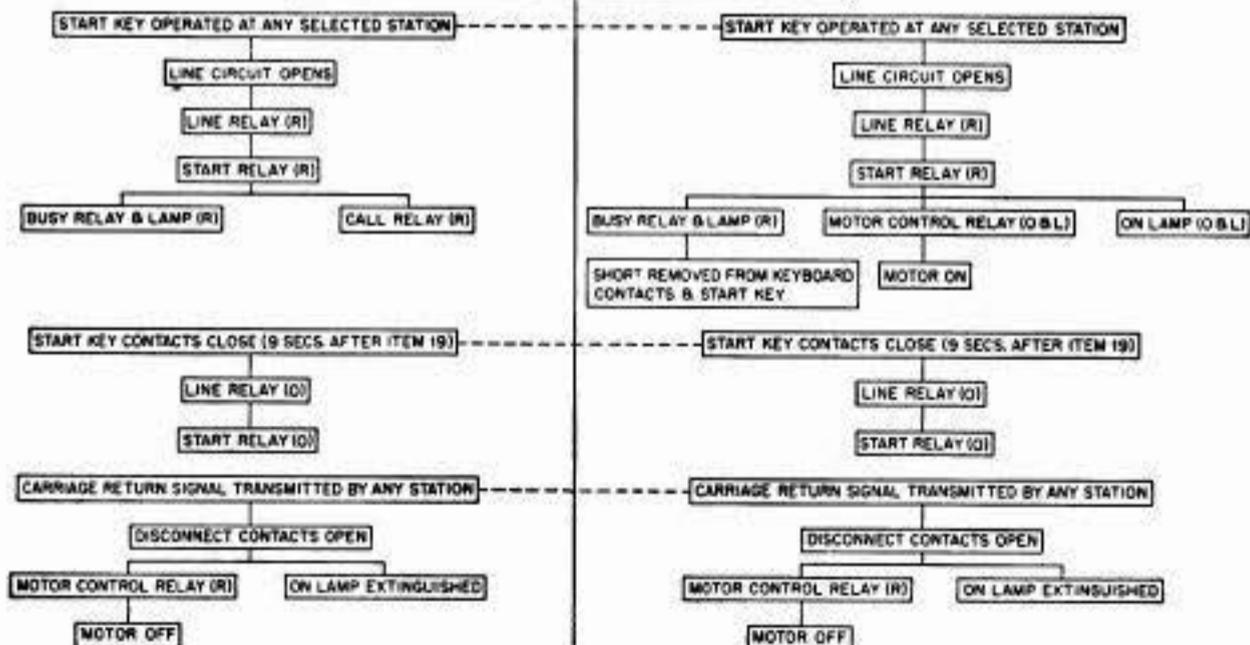
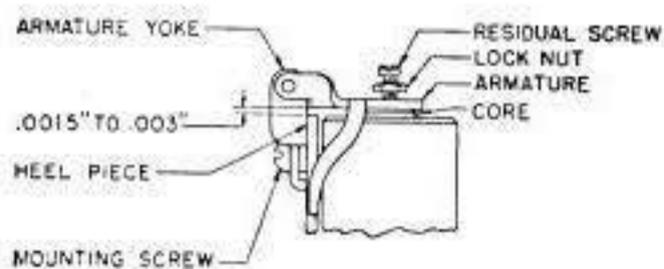
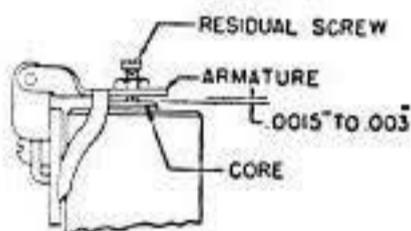


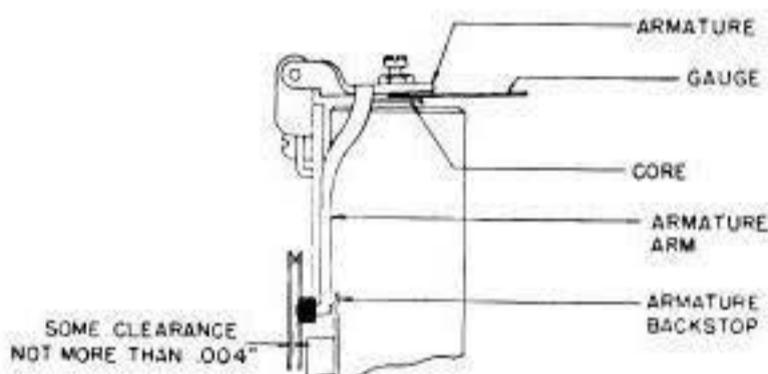
Fig. 6—Sequence chart.



(A)



(B)



(C)

Fig. 7—Start, Call and Busy Relay Adjustments.