# 112A KEY EQUIPMENT

# TWO-WIRE DIAL SELECTIVE

# EXECUTIVE CALLING SYSTEM

# MAINTENANCE

## 1.00 INTRODUCTION

**1.01** The 6A key telephone system provides executive calling intercommunicating facilities, to a maximum of 18 coded stations, which are associated with 112A key telephone equipment or 1A1 key telephone systems. This system provides for a principal station and a limited number of subordinate stations. A principal or a subordinate station may have extension stations.

**1.02** The principal station, as the master station, may signal and receive a signal from any subordinate station, or it may originate a preset conference call involving 2 to 12 stations through use of a dialed code. A subordinate station may signal and receive a signal from only the principal station. The signal is automatic whenever a subordinate station originates a call.

**1.03** This circuit provides:

- A maximum of 18 codes (*W* option) and a maximum of 9 codes (*X* option) to be dialed on the intercommunicating line.
- Means whereby the principal station may select a subordinate station through a one-digit or 2-digit dial code.
- A quick release of the selector when code 1 is dialed as the first digit.
- Busy lamps at all stations whenever the intercommunication line is in use.
- A flashing line lamp at a called station until the station answers or the call is abandoned.
- A single 1-to-2-second audible ring at a station on an incoming call.
- A steady audible signal on incoming calls through the use of an auxiliary circuit (*V* option).
- A means for originating two preset conferences with a maximum of 6 station codes each (*Z* option), or one preset conference with a maximum of 12 station codes (*Y* option).
- For a connection to a no-such-number tone when an unassigned station code is dialed.

**1.04 The *CA1*, *CA2*, or *MS* relay, associated with each station, is to be assigned locally; therefore terminal assignments must be obtained from job installation engineering data. These assignments should be entered on operational sketches when obtained.**

**1.05** Each figure comprises a sequence chart and an operational sketch.

## 2.00 SELECTION OF SUBORDINATE STATION (MAXIMUM OF 9 CODES, *X* OPTION)

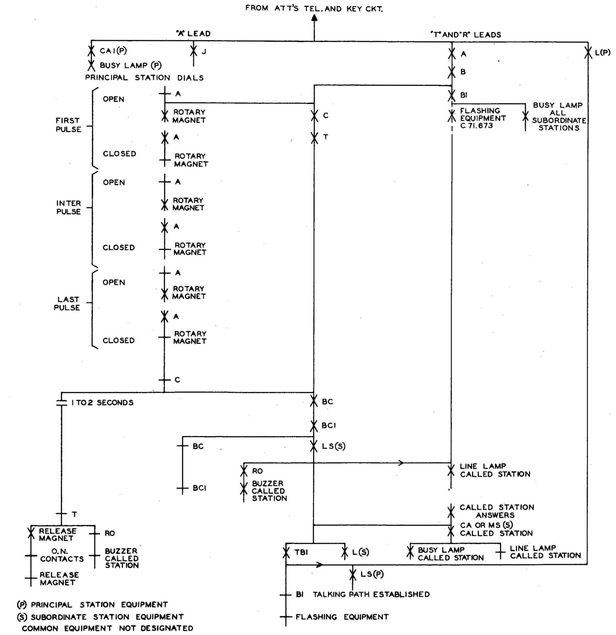
**2.01 Line Seizure:** When the principal station originates a call, the shunt on the *T* and *R* leads operates the *A* relay under control of the *LS(P)* relay associated with the station. The *A* lead associated with this operated station causes the *CA* relay to operate which lights the station's busy lamp. Ground on the *A* lead operates the *J* relay which opens the operating path of the *T1* relay to prevent a ringing signal from occurring when the called subordinate station answers. The *L(P)* relay operates, but performs no useful function. Operated *A* relay operates the *B* relay which applies ground to the *J* lead to operate the *B1* relay under control of the *TB1* relay. Operated *B1* relay lights the busy lamps at all nonoperated stations and connects the *FL* and *FR* leads to start the flashing circuit, which is described in Section C71.673.

**2.02 Selection of Subordinate Station:** The principal station may dial any of the subordinate stations which have been assigned a single digit code, 2 through 0. When the single digit code is dialed, the *A* relay releases and reoperates in unison with the dial pulses. The *B* relay is made slow to release by means of the *B* resistor and the A2 capacitor and remains operated during the dial pulses. As the *A* relay pulses, ground is connected to the rotary magnet, causing the *A* selector to step in unison with the dial pulses. The slow releasing *C* relay operates on the first release of the *A* relay and remains operated during the dial pulses. Operated *C* relay operates the *T* relay which connects the *A* resistor and *A1* capacitor across the winding of the *T* relay to make it slow to release. At the completion of the pulse train, the *A* relay remains operated and the *C* relay releases. The released *C* relay connects ground through the *A* selector to the *C* lead associated with the code dialed, to operate the *BC* relay through the winding of the *LS(S)* relay associated with the code. The *LS(S)* relay cannot operate since the necessary current cannot be obtained through the *BC* relay winding. Operated *BC* relay operates the *BC1* relay. Operated *BC1* relay shunts battery across the *BC* relay, releasing it, thus allowing the *LS(S)* relay to operate. The released *BC* relay releases the *BC1* relay. Operated *LS(S)* relay (a) opens the operate path to the *BC* relay, (b) locks up under control of the associated *L(S)* relay and the *B1* relay, (c) connects the *C* lead to the *RO* lead to operate the *RO* relay, (d) connects the *T* and *R* leads under control of the *BC1* relay, to the *TB1* battery feed relay, and (e) connects the called station's line lamp to the flashing circuit, which is described in Section C71.673. The *CH* relay, which is in series with the lockup path of the *LS(S)* relay, may operate but performs no useful function. Operated *RO* relay connects ground on the *RS1* lead through the *LS(S)* relay to the *BZ* lead to operate the audible signal at the called station. Operated *T* relay is held operated for 1- to 2-seconds after completion of the last dial pulse by the *A* resistor and *A1* capacitor across its winding. When the *T* relay releases it releases the *RO* relay to release the called station's audible signal and connects ground to the *A* selector release magnet which restores the selector to normal.

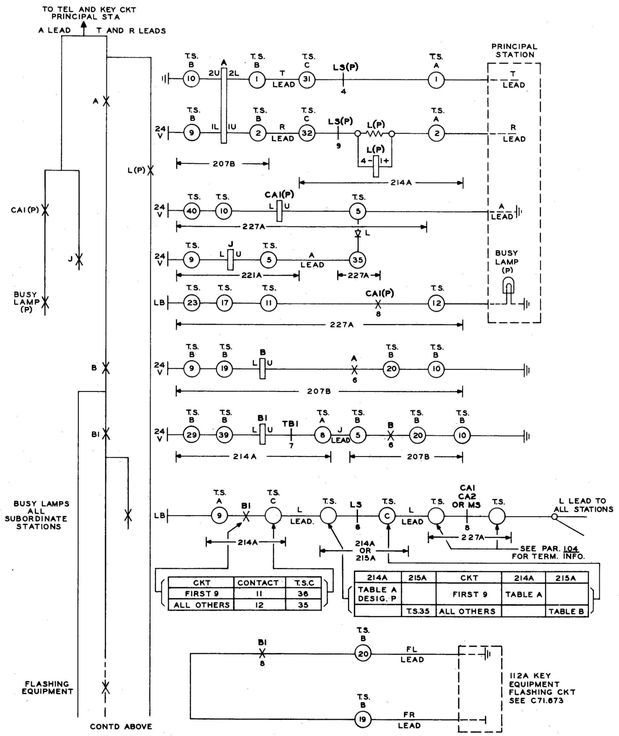
**2.03 Talking:** When the called station answers, the shunt on its *T* and *R* leads operates the *TB1* relay. The *A* lead associated with this station operates its *CA* or *MS* relay, causing the busy lamp to light. The called station's *L(S)* relay operates on the loop current, transferring the lockup path of the associated *LS(S)* relay from the *B1* to the *TB1* relay over the *A1* lead. Operated *TB1* relay (a) transfers control of the busy lamp of nonoperated stations from the *B1* relay to the *TB1* relay, (b) releases the *B1* relay which returns the flashing equipment to normal, and (c) connects ground on the *A1* lead to operate the calling station's *LS(P)* relay under control of the associated *L(P)* relay. The talking path is now established and transmitter battery is furnished to both stations by the *TB1* relay.

**2.04 Disconnection:** When a station disconnects, the associated *L* and *LS* relays release. When the last station disconnects, the *TB1* relay releases, removing the shunt across the *A* relay, thereby releasing the *A* relay which, in turn, releases the *B* relay. All relays now become normal.

## SEQUENCE CHART

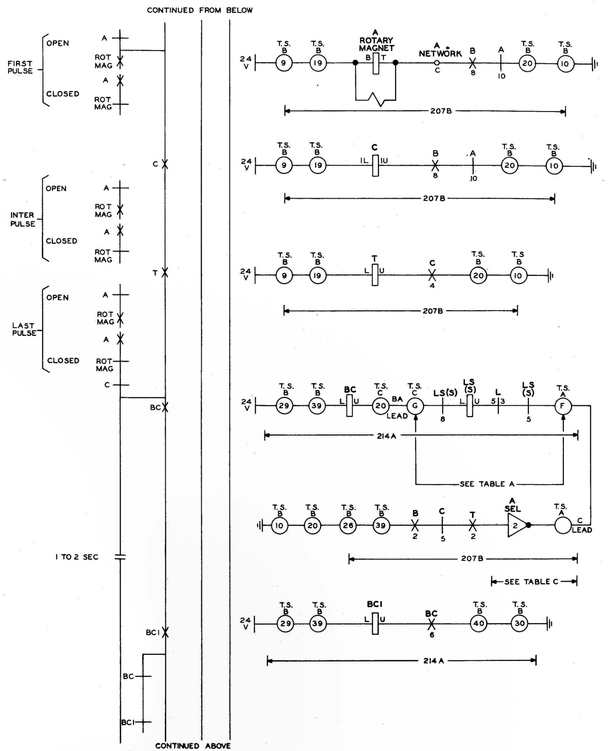



## OPERATIONAL SKETCH




| CKT | CONTACT | TS.C |
|---|---|---|
| FIRST 9 | 11 | 35 |
| ALL OTHERS | 12 | 35 |

| 214A | 215A | CKT | 214A | 215A |
|---|---|---|---|---|
| TABLE A DESIG. P | | FIRST 9 | TABLE A | |
| | TS.35 | ALL OTHERS | | TABLE B |



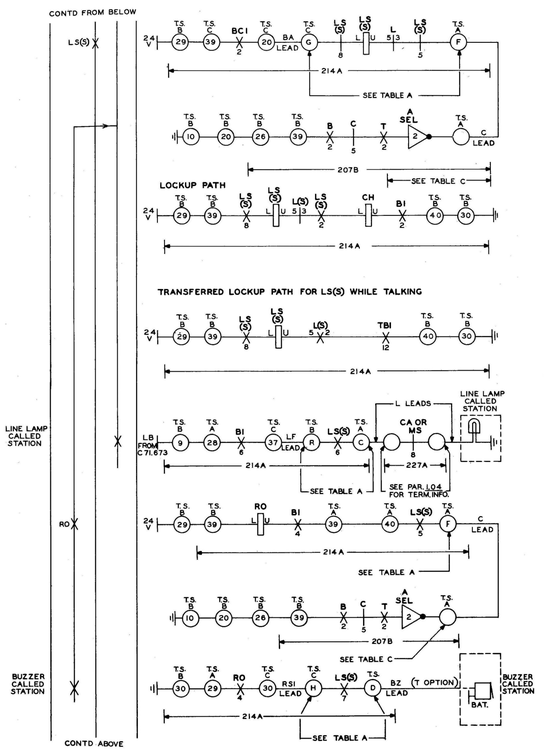
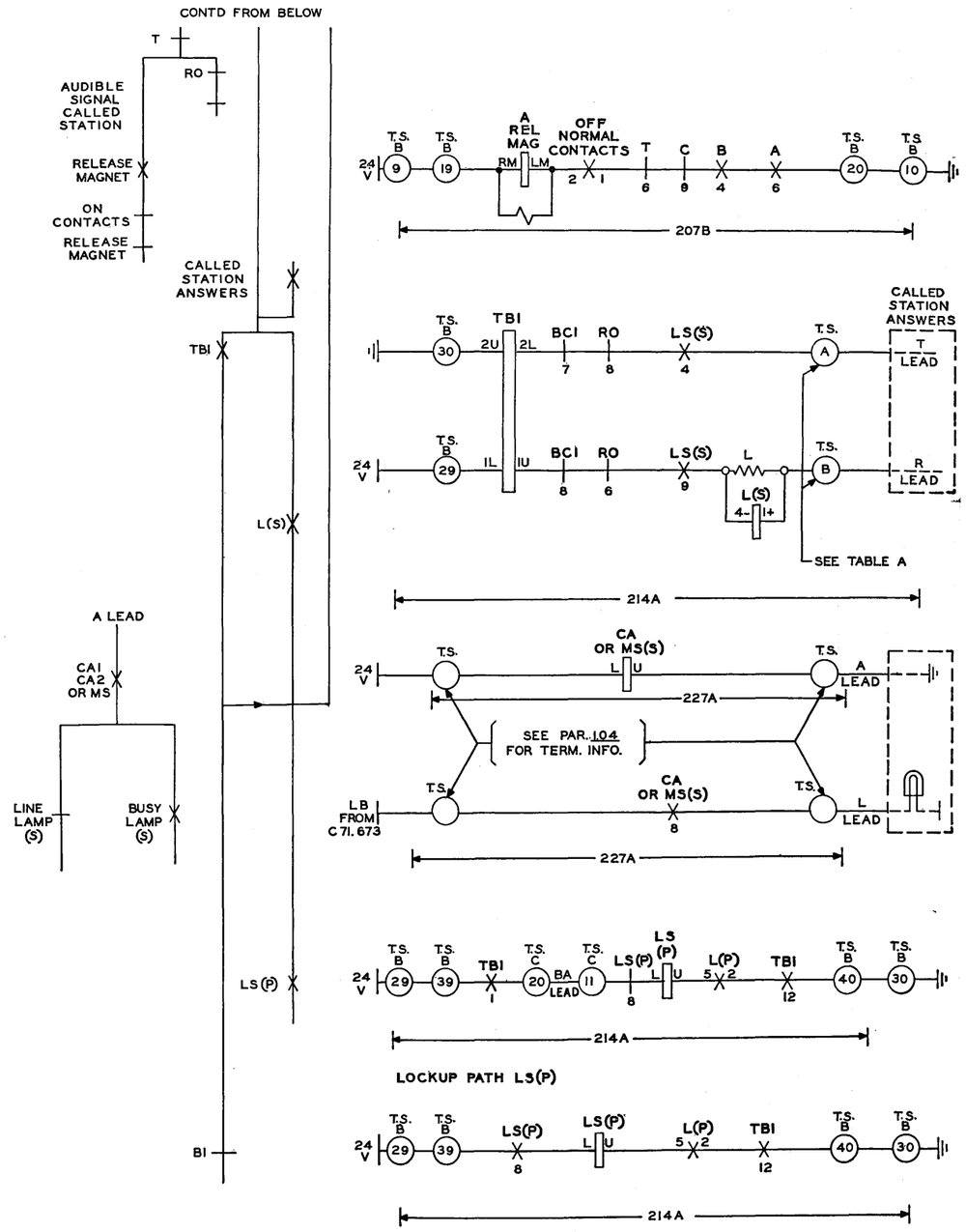




Fig. 1
Page 2
(Contd on Page 2A)




TALKING PATH

PRINCIPAL STATION TO SUBORDINATE STATION

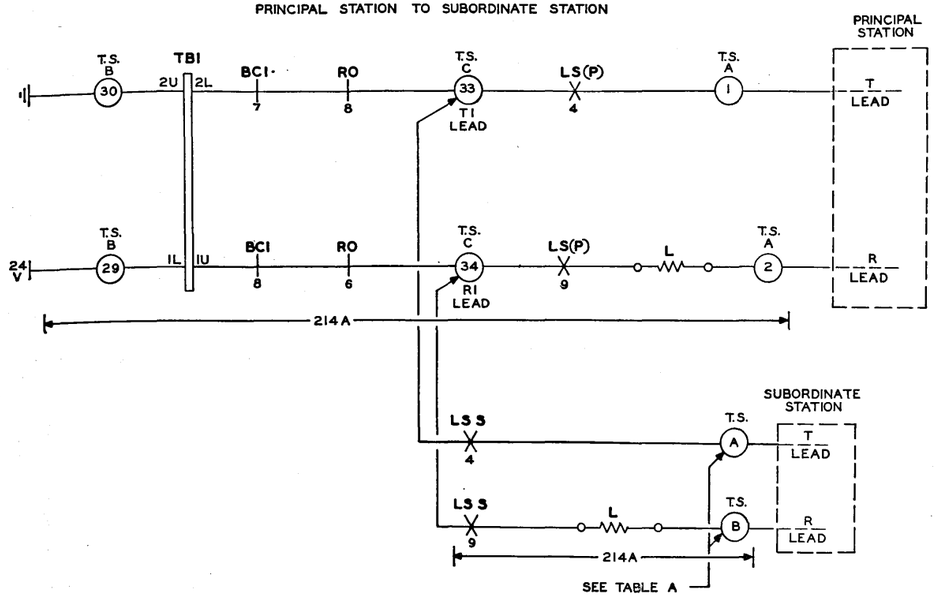



TABLE B

| REFERENCE DESIG | PUNCHING | | |
|---|---|---|---|
| | CKT 1 | CKT 2 | CKT 3 |
| A | 1 | 11 | 21 |
| B | 2 | 12 | 22 |
| C | 3 | 13 | 23 |
| D | 5 | 15 | 25 |
| E | 6 | 16 | 26 |
| F | 7 | 17 | 27 |
| G | 18 | 19 | 20 |
| H | 28 | 29 | 30 |

TABLE C

| CODE DIALED | A SELECTOR | | T.S. A | T.S. B |
|---|---|---|---|---|
| | BANK | TERM | | |
| 1 | 1 | 1 | | 17 |
| 2 | 2 | 2 | 12 | |
| 3 | 2 | 3 | 13 | |
| 4 | 2 | 4 | 14 | |
| 5 | 2 | 5 | 15 | |
| 6 | 2 | 6 | 16 | |
| 7 | 2 | 7 | 17 | |
| 8 | 2 | 8 | 18 | |
| 9 | 2† | 9 | 19† | |
| 0 | 2† | 10 | 20† | |

†LEADS FROM BANK 1 CONNECT TO PUNCHING 9 AND/OR 10, T.S. A, AS PC LEADS WHEN ARRANGED FOR PRESET CONFERENCES.

TABLE A

| REFERENCE DESIG | PRINCIPAL STATION | | SUBORDINATE STATION | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CKT 1 | | CKT 2 | | CKT 3 | | CKT 4 | | CKT 5 | | CKT 6 | | CKT 7 | | CKT 8 | | CKT. 9 | |
| | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH |
| A | A | 1 | A | 11 | A | 21 | A | 31 | B | 1 | B | 11 | B | 21 | B | 31 | C | 1 |
| B | A | 2 | A | 12 | A | 22 | A | 32 | B | 2 | B | 12 | B | 22 | B | 32 | C | 2 |
| C | A | 3 | A | 13 | A | 23 | A | 33 | B | 3 | B | 13 | B | 23 | B | 33 | C | 3 |
| D | A | 5 | A | 15 | A | 25 | A | 35 | B | 5 | B | 15 | B | 25 | B | 35 | C | 5 |
| E | A | 6 | A | 16 | A | 26 | A | 36 | B | 6 | B | 16 | B | 26 | B | 36 | C | 6 |
| F | A | 7 | A | 17 | A | 27 | A | 37 | B | 7 | B | 17 | B | 27 | B | 37 | C | 7 |
| G | C | 11 | C | 12 | C | 13 | C | 14 | C | 15 | C | 16 | C | 17 | C | 18 | C | 19 |
| H | C | 21 | C | 22 | C | 23 | C | 24 | C | 25 | C | 26 | C | 27 | C | 28 | C | 29 |
| P | A | 6 | A | 16 | A | 26 | A | 6 | A | 16 | A | 26 | A | 26 | A | 16 | A | 6 |
| R | B | 6 | B | 16 | B | 26 | B | 6 | B | 16 | B | 26 | B | 26 | B | 16 | B | 6 |

**Fig. 1 (Contd)**
**Page 2A**

## 3.00 SELECTION OF SUBORDINATE STATION, DIALING SINGLE DIGIT (18 CODE MAXIMUM, *W* OPTION)

FOR DIALING TWO DIGITS, SEE FIG. 3

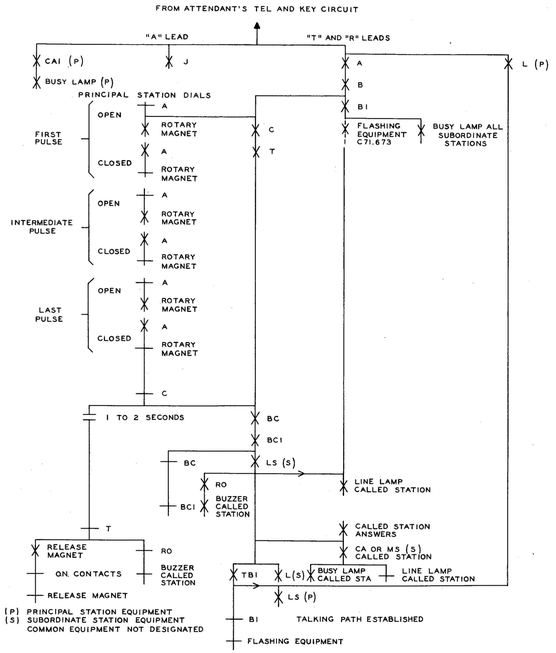
**3.01 Line Seizure:** When the principal station originates a call, the shunt on the *T* and *R* leads operates the *A* relay under control of the *LS(P)* relay associated with the station. The *A* lead associated with the operated station causes the *CA* relay to operate, and the *CA* relay then lights the station's busy lamp. Ground on the *A* lead operates the *J* relay which opens the operating path of the *T1* relay to prevent a ringing signal from occurring when the called subordinate station answers. The *L(P)* relay operates, but performs no useful function. Operated *A* relay operates the *B* relay which applies ground to the *J* lead to operate the *B1* relay under control of the *TB1* relay. Operated *B1* relay lights the busy lamps at all nonoperated stations and connects the *FL* and *FR* leads to start the flashing circuit which is described in Section C71.673.

**3.02 Selection of Subordinate Station, Single Digit Code:** The principal station may dial any of the subordinate stations which have been assigned a single-digit code, 3 through 0, or a 2-digit code, 21 through 20. When a single-digit code is dialed, the *A* relay releases and reoperates in unison with the dial pulses. The *B* relay, which is slow to release because of the *B* resistor and *A2* capacitor, remains operated during the dial pulses. As the *A* relay pulses, ground is connected to the rotary magnet, causing the *A* selector to step in unison with the dial pulses. The slow releasing *C* relay operates on the first release of the *A* relay and remains operated during the dial pulses. Operated *C* relay operates the *T* relay which connects the *A* resistor and *A1* capacitor across the winding of the *T* relay to make it a slow-releasing relay. At the completion of the pulse train, the *A* relay remains operated and the *C* relay releases. The released *C* relay connects ground through the *A* selector to the *C* lead, which is associated with the code dialed, through the normal *TR* relay contacts to operate the *BC* relay, and through the winding of the *LS(S)* relay which is associated with that code. The *LS(S)* relay cannot operate since the necessary current cannot be obtained through the *BC* relay winding. Operated *BC* relay operates the *BC1* relay. Operated *BC1* relay shunts battery across the *BC* relay, releasing it, thus allowing the *LS(S)* relay to operate. The released *BC* relay releases the *BC1* relay. Operated *LS(S)* relay (a) opens the operate path to the *BC* relay, (b) locks up under control of the associated *L(S)* relay and the *B1* relay, (c) connects the *C* lead to the *RO* lead to operate the *RO* relay, (d) connects the *T* and *R* leads, under control of the *BC1* relay, to the *TB1* battery-feed relay, and (e) connects the called station's line lamp to the flashing circuit, which is described in Section C71.673. The *CH* relay, which is in series with the lockup path of the *LS(S)* relay, may operate, but performs no useful function. Operated *RO* relay connects ground on the *RS1* lead through the *LS(S)* relay to the *BZ* lead to operate the audible signal at the called station. Operated *T* relay is held operated for 1- to 2-seconds after completion of the last dial pulse by the *A* resistor and *A1* capacitor across its winding. When the *T* relay releases, it (a) releases the *RO* relay in order to release the called station's audible signal and (b) connects ground to the *A* selector release magnet which restores the selector to normal.

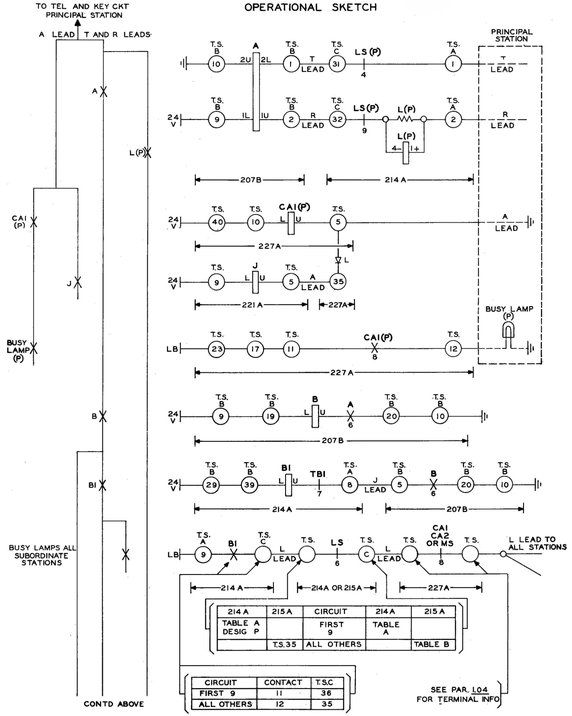
**3.03 Talking:** When the called station answers, the shunt on its *T* and *R* leads operates the *TB1* relay. The *A* lead associated with this station operates the *CA* or *MS* relay, causing the busy lamp to light. The called station's *L(S)* relay operates on the loop current, transferring the lockup path of the associated *LS(S)* relay from the *B1* to the *TB1* relay over the *A1* lead. Operated *TB1* relay also (a) transfers control of the busy lamp of nonoperated stations from the *B1* relay to the *TB1* relay, (b) releases the *B1* relay which returns the flashing equipment to normal, and (c) connects ground on the *A1* lead to operate the calling station's *LS(P)* relay under control of the associated *L(P)* relay. The talking path is now established and transmitter battery is furnished to both stations by the *TB1* relay.

**3.04 Disconnection:** When a station disconnects, the associated *L* and *LS* relays release. When the last station disconnects, the *TB1* relay releases, releasing the shunt across the *A* relay, thereby releasing the *A* relay which, in turn, releases the *B* relay. All relays now become normal.

## SEQUENCE CHART

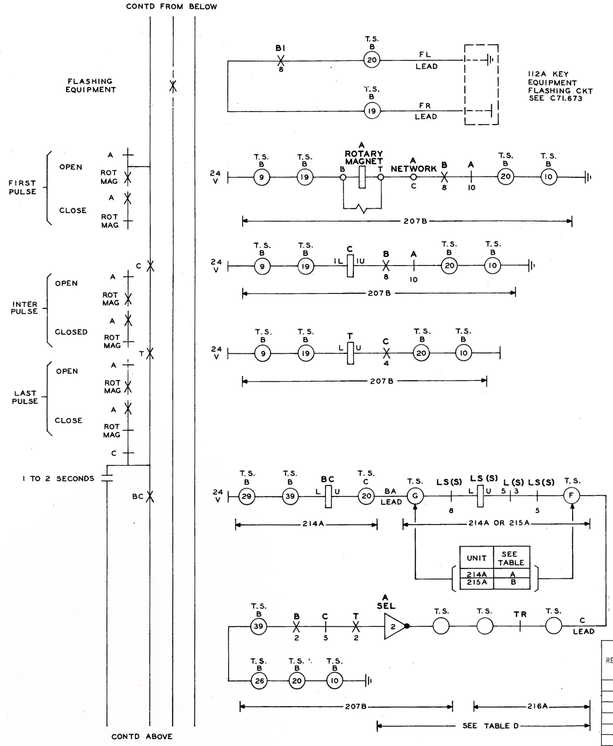



## OPERATIONAL SKETCH

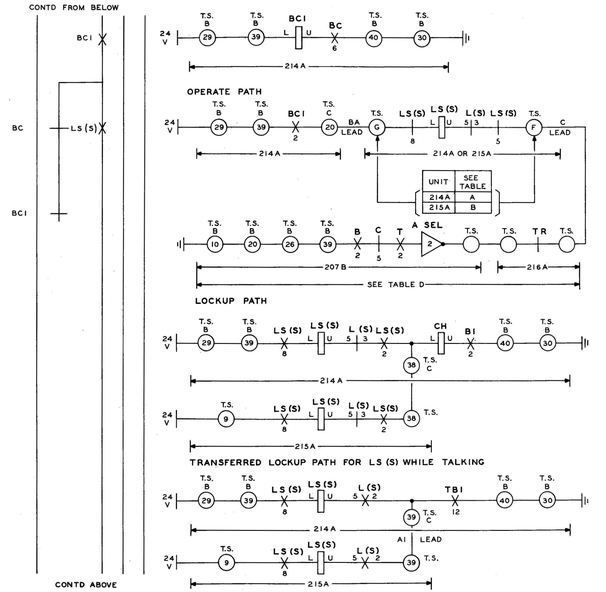



| 214A | 215A | CIRCUIT | 214A | 215A |
|---|---|---|---|---|
| TABLE A DESIG P | | FIRST 9 | TABLE A | |
| | T.S.35 | ALL OTHERS | | TABLE B |

| CIRCUIT | CONTACT | T.S.C |
|---|---|---|
| FIRST 9 | 11 | 36 |
| ALL OTHERS | 12 | 35 |




| UNIT | SEE TABLE |
|---|---|
| 214A | A |
| 215A | B |

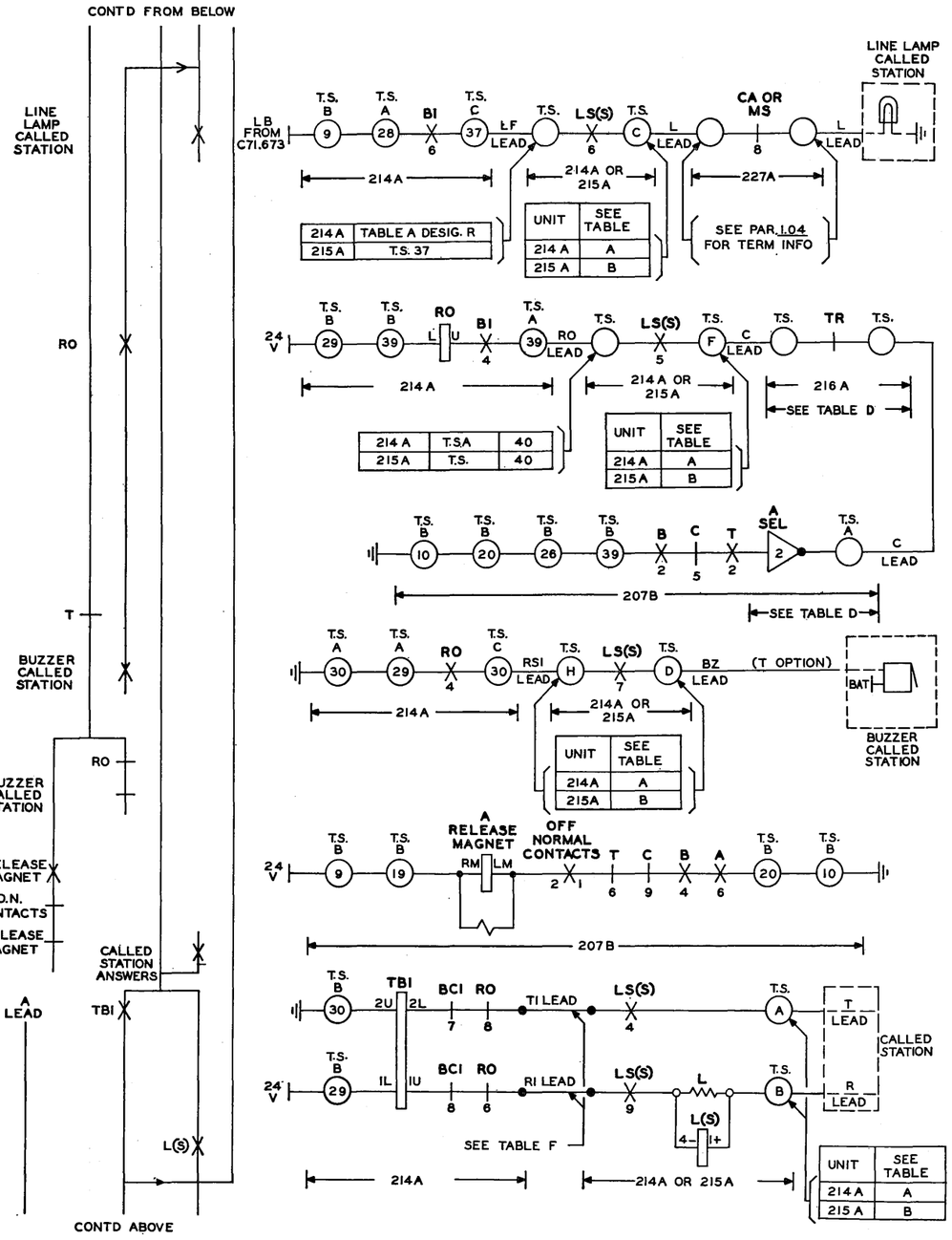



| UNIT | SEE TABLE |
|---|---|
| 214A | A |
| 215A | B |

TABLE A

| REFERENCE DESIG | PRINCIPAL STATION CKT 1 | | SUBORDINATE STATION CKT 2 | | CKT 3 | | CKT 4 | | CKT 5 | | CKT 6 | | CKT 7 | | CKT 8 | | CKT 9 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH |
| A | A | 1 | A | 11 | A | 21 | A | 31 | B | 1 | B | 11 | B | 21 | B | 31 | C | 1 |
| B | A | 2 | A | 12 | A | 22 | A | 32 | B | 2 | B | 12 | B | 22 | B | 32 | C | 2 |
| C | A | 3 | A | 13 | A | 23 | A | 33 | B | 3 | B | 13 | B | 23 | B | 33 | C | 3 |
| D | A | 5 | A | 15 | A | 25 | A | 35 | B | 5 | B | 15 | B | 25 | B | 35 | C | 5 |
| E | A | 6 | A | 16 | A | 26 | A | 36 | B | 6 | B | 16 | B | 26 | B | 36 | C | 6 |
| F | A | 7 | A | 17 | A | 27 | A | 37 | B | 7 | B | 17 | B | 27 | B | 37 | C | 7 |
| G | C | 11 | C | 12 | C | 13 | C | 14 | C | 15 | C | 16 | C | 17 | C | 18 | C | 19 |
| H | C | 21 | C | 22 | C | 23 | C | 24 | C | 25 | C | 26 | C | 27 | C | 28 | C | 29 |
| P | A | 6 | A | 16 | A | 26 | A | 6 | A | 16 | A | 26 | A | 26 | A | 16 | A | 6 |
| R | B | 6 | B | 16 | B | 26 | B | 6 | B | 16 | B | 26 | B | 26 | B | 16 | B | 6 |

**Fig. 2**
**Page 3**
**(Contd on Page 3A)**



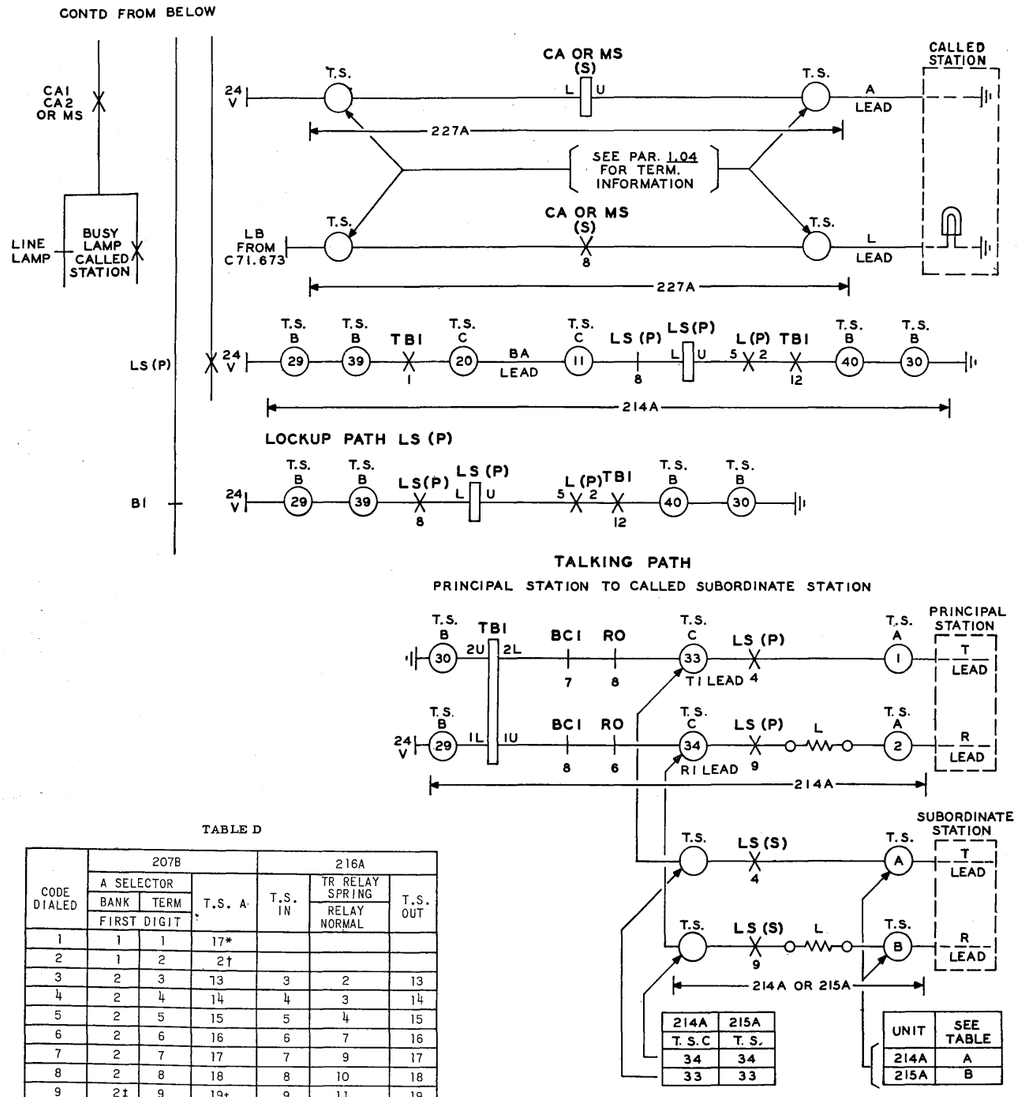




TABLE D

| CODE DIALED | 207B A SELECTOR BANK (FIRST DIGIT) | 207B A SELECTOR TERM (FIRST DIGIT) | 207B T.S. A | 216A T.S. IN | 216A TR RELAY SPRING RELAY NORMAL | 216A T.S. OUT |
|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 17* | | | |
| 2 | 1 | 2 | 2† | | | |
| 3 | 2 | 3 | 13 | 3 | 2 | 13 |
| 4 | 2 | 4 | 14 | 4 | 3 | 14 |
| 5 | 2 | 5 | 15 | 5 | 4 | 15 |
| 6 | 2 | 6 | 16 | 6 | 7 | 16 |
| 7 | 2 | 7 | 17 | 7 | 9 | 17 |
| 8 | 2 | 8 | 18 | 8 | 10 | 18 |
| 9 | 2‡ | 9 | 19‡ | 9 | 11 | 19 |
| 0 | 2‡ | 10 | 20‡ | 10 | 12 | 20 |
| SECOND DIGIT | | | | RELAY OPERATED | | |
| (2)1 | 2 | 1 | 11 | 1 | 8 | 21 |
| (2)2 | 2 | 2 | 12 | 2 | 1 | 22 |
| (2)3 | 2 | 3 | 13 | 3 | 2 | 23 |
| (2)4 | 2 | 4 | 14 | 4 | 3 | 24 |
| (2)5 | 2 | 5 | 15 | 5 | 4 | 25 |
| (2)6 | 2 | 6 | 16 | 6 | 7 | 26 |
| (2)7 | 2 | 7 | 17 | 7 | 9 | 27 |
| (2)8 | 2 | 8 | 18 | 8 | 10 | 28 |
| (2)9 | 2 | 9 | 19 | 9 | 11 | 29 |
| (2)0 | 2 | 10 | 20 | 10 | 12 | 30 |

*TERMINAL STRIP B

†SW LEAD

‡LEADS FROM BANK 1 CONNECT TO PUNCHING 9 AND/OR 10, T.S. A, AS PC LEADS WHEN ARRANGED FOR PRESET CONFERENCES.

TABLE B

| REFERENCE DESIG | PUNCHING CKT 1 | CKT 2 | CKT 3 |
|---|---|---|---|
| A | 1 | 11 | 21 |
| B | 2 | 12 | 22 |
| C | 3 | 13 | 23 |
| D | 5 | 15 | 25 |
| E | 6 | 16 | 26 |
| F | 7 | 17 | 27 |
| G | 18 | 19 | 20 |
| H | 28 | 29 | 30 |

Fig. 2 (Contd)
Page 3A

## 4.00 SELECTION OF SUBORDINATE STATION, DIALING TWO DIGITS (18 CODE MAXIMUM, *W* OPTION)

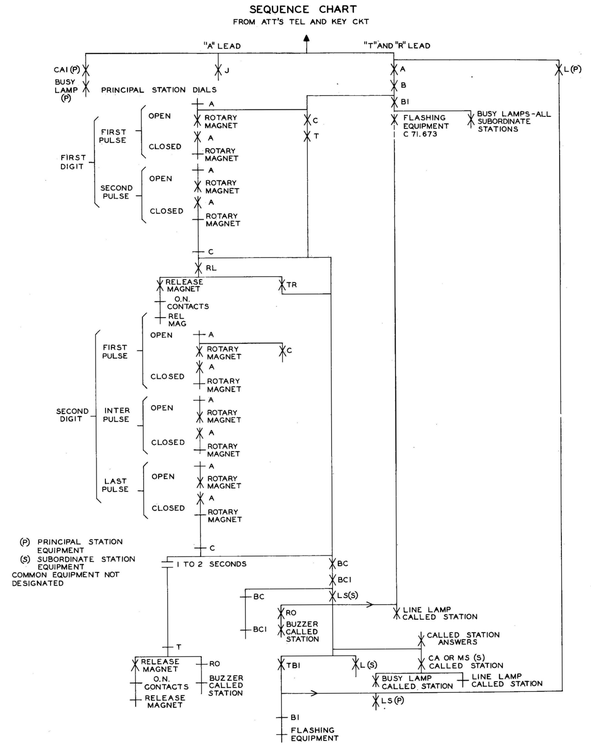
FOR DIALING ONE DIGIT, SEE FIG. 2

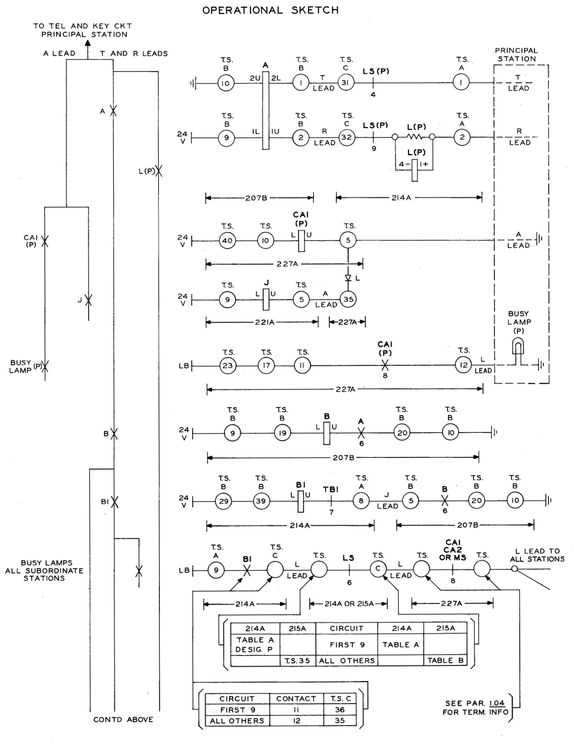
**4.01 Line Seizure:** When the principal station originates a call, the shunt on the *T* and *R* leads operates the *A* relay under control of the *LS(P)* relay associated with the station. The *A* lead associated with the operated station causes the *CA* relay to operate which in turn lights the station's busy lamp. Ground on the *A* lead operates the *J* relay, which in turn opens the operating path of the *T1* relay to prevent a ringing signal from occurring when the called subordinate station answers. The *L(P)* relay operates, but performs no useful function. Operated *A* relay operates the *B* relay which applies ground to the *J* lead to operate the *B1* relay under control of the *TB1* relay. Operated *B1* relay lights the busy lamps at all nonoperated stations and connects the *FL* and *FR* leads to start the flashing circuit, which is described in Section C71.673.

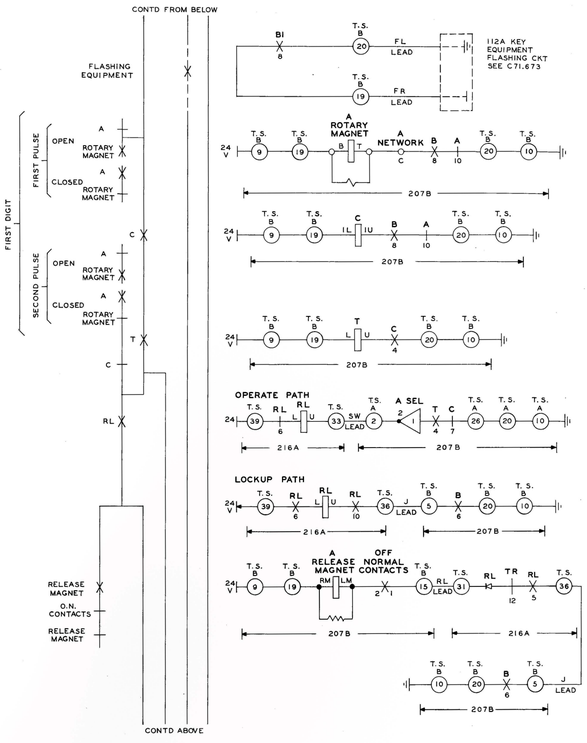
**4.02 Selection of Subordinate Station, Two-Digit Code:** The principal station may dial any of the subordinate stations; these have been assigned a single-digit code, 3 through 0, or a 2-digit code, 21 through 20. When a 2-digit code is dialed, the first digit is always "2." When the first digit is dialed, the *A* relay releases and reoperates in unison with the dial pulses. The *B* relay, which is slow to release because of the *B* resistor and *A2* capacitor, remains operated during the dial pulses. As the *A* relay pulses, ground is connected to the rotary magnet, causing the *A* selector to step in unison with the dial pulses. The slow releasing *C* relay operates on the first release of the *A* relay and remains operated during the dial pulses. Operated *C* relay operates the *T* relay which connects the *A* resistor and *A1* capacitor across the winding of the *T* relay to make it a slow releasing relay. At the completion of the first pulse train, a ground signal over the *SW* lead operates the *RL* relay. Operated *RL* relay (a) locks up under control of the *B* relay, (b) operates the release magnet of the *A* selector to restore the selector to normal, and (c) operates the *TR* relay. Operated *TR* relay (a) locks up under control of the *B* relay, (b) transfers the *C* lead from the *A* selector to the 2-digit codes, and (c) opens the operate path for the *A* selector release magnet. The selector is now ready to receive the second digit. Dialing of the second digit will follow the path for the first digit. Upon completion of the second pulse train, the *A* relay remains operated and the *C* relay releases. The released *C* relay connects ground through the *A* selector to the *C* lead, associated with the code dialed, through the operated *TR* relay contacts to operate the *BC* relay, and through the windings of the *LS(S)* relay associated with that code. The *LS(S)* relay cannot operate since the necessary current cannot be obtained through the *BC* relay winding. The operated *BC* relay operates the *BC1* relay. Operated *BC1* relay shunts battery across the *BC* relay, releasing it, thus allowing the *LS(S)* relay to operate. The released *BC* relay releases the *BC1* relay. Operated *LS(S)* relay (a) opens the operate path to the *BC* relay, (b) locks up under control of the associated *L(S)* relay and the *B1* relay, (c) connects the *C* lead to the *RO* lead to operate the *RO* relay, (d) connects the *T* and *R* leads, under control of the *BC1* relay, to the *TB1* battery-feed relay, and (e) connects the called station's line lamp to the flashing circuit, which is described in Section C71.673. The *CH* relay, which is in series with the lockup path of the *LS(S)* relay, may operate, but performs no useful function. Operated *RO* relay connects ground on the *RSI* lead through the *LS(S)* relay to the *BZ* lead to operate the audible signal at the called station. Operated *T* relay is held operated for 1- to 2-seconds after completion of the last dial pulse by the *A* resistor and *A1* capacitor across its winding. When the *T* relay releases, it (a) releases the *RO* relay which releases the called station's audible signal and (b) connects ground to the *A* selector release magnet which restores the selector to normal.

**4.03 Talking:** When the called station answers, the shunt on its *T* and *R* leads operates the *TB1* relay. The *A* lead associated with this station operates its *CA* or *MS* relay, causing the busy lamp to light. The called station's *L(S)* relay operates on the loop current, transferring the lockup path of the associated *LS(S)* relay from the *B1* to the *TB1* relay over the *A1* lead. Operated *TB1* relay also (a) transfers control of the busy lamp of nonoperated stations from the *B1* relay to the *TB1* relay, (b) releases the *B1* relay which returns the flashing equipment to normal, and (c) connects ground on the *A1* lead to operate the calling station's *LS(P)* relay under control of the associated *L(P)* relay. The talking path is now established and transmitter battery is furnished to both stations by the *TB1* relay.

**4.04 Disconnection:** When a station disconnects, the associated *L* and *LS* relays release. When the last station disconnects, the *TB1* relay releases, releasing the shunt across the *A* relay, thereby releasing the *A* relay which, in turn, releases the *B* relay. Release of the *B* relay releases the *RL* and *TR* relays. All relays now become normal.



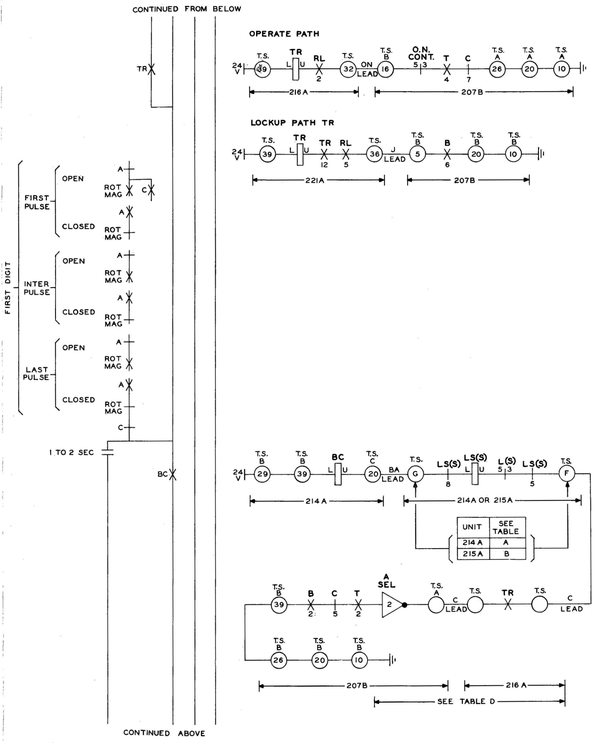
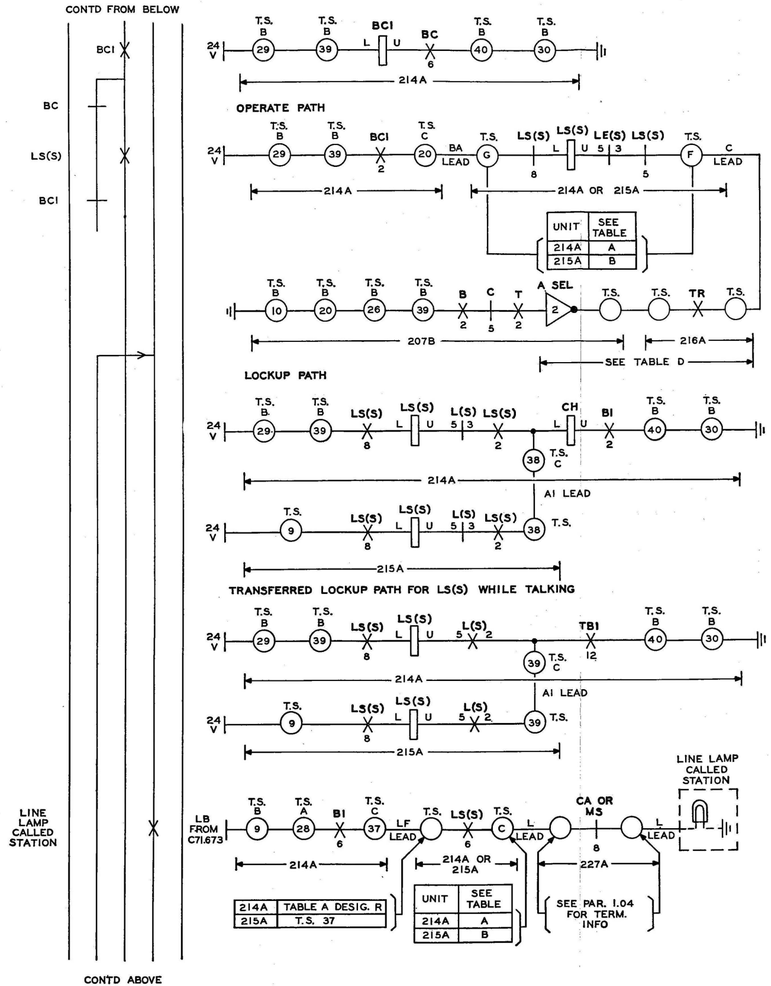
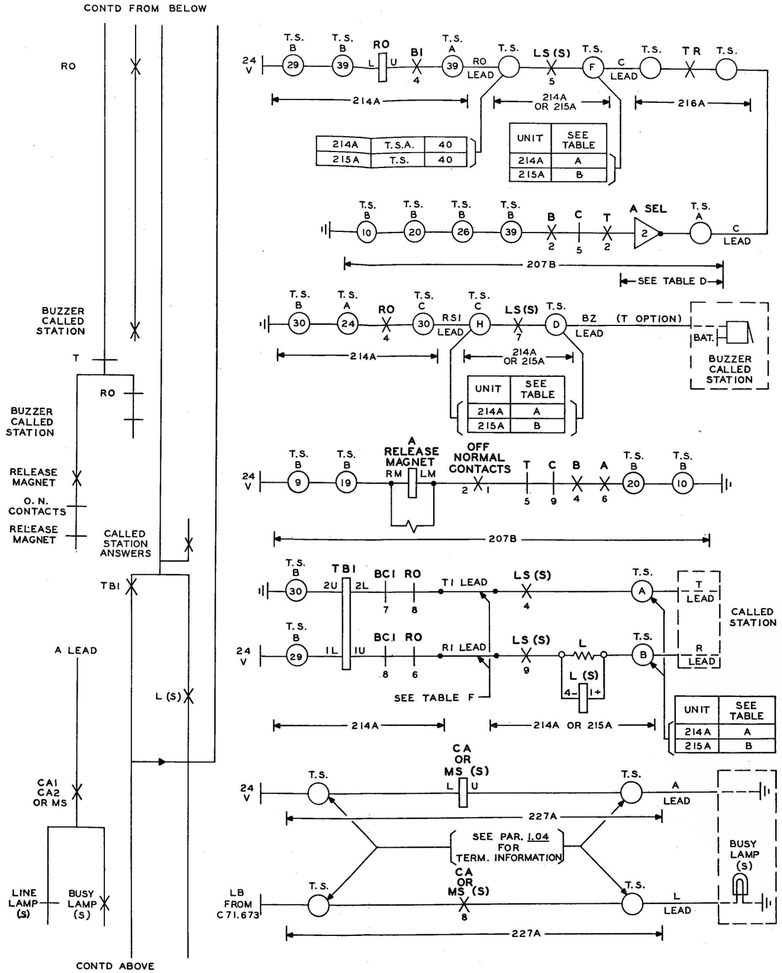




Fig. 3
Page 4
(Contd on Page 4A)




| UNIT | SEE TABLE |
|---|---|
| 214A | A |
| 215A | B |

| | |
|---|---|
| 214A | TABLE A DESIG. R |
| 215A | T.S. 37 |







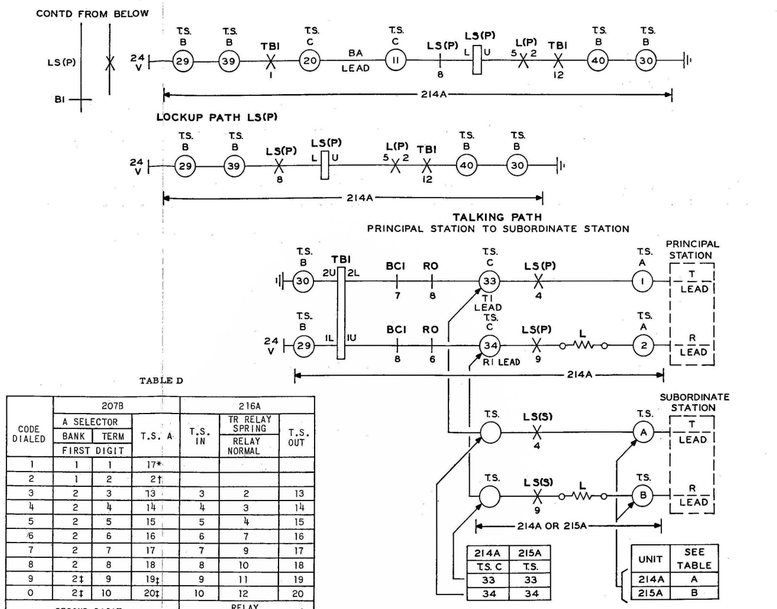
| UNIT | SEE TABLE |
|---|---|
| 214A | A |
| 215A | B |

| | | |
|---|---|---|
| 214A | T.S.A. | 40 |
| 215A | T.S. | 40 |

| UNIT | SEE TABLE |
|---|---|
| 214A | A |
| 215A | B |

| UNIT | SEE TABLE |
|---|---|
| 214A | A |
| 215A | B |

| UNIT | SEE TABLE |
|---|---|
| 214A | A |
| 215A | B |




| 214A | 215A |
|---|---|
| T.S.C | T.S. |
| 33 | 33 |
| 34 | 34 |

| UNIT | SEE TABLE |
|---|---|
| 214A | A |
| 215A | B |

TABLE D

| CODE DIALED | 207B A SELECTOR BANK | 207B A SELECTOR TERM | 207B T.S. A | 216A T.S. IN | 216A TR RELAY SPRING RELAY NORMAL | 216A T.S. OUT |
|---|---|---|---|---|---|---|
| | FIRST DIGIT | | | | | |
| 1 | 1 | 1 | 17* | | | |
| 2 | 1 | 2 | 2† | | | |
| 3 | 2 | 3 | 13 | 3 | 2 | 13 |
| 4 | 2 | 4 | 14 | 4 | 3 | 14 |
| 5 | 2 | 5 | 15 | 5 | 4 | 15 |
| 6 | 2 | 6 | 16 | 6 | 7 | 16 |
| 7 | 2 | 7 | 17 | 7 | 9 | 17 |
| 8 | 2 | 8 | 18 | 8 | 10 | 18 |
| 9 | 2‡ | 9 | 19‡ | 9 | 11 | 19 |
| 0 | 2‡ | 10 | 20‡ | 10 | 12 | 20 |
| SECOND DIGIT | | | | RELAY OPERATED | | |
| (2)1 | 2 | 1 | 11 | 1 | 8 | 21 |
| (2)2 | 2 | 2 | 12 | 2 | 1 | 22 |
| (2)3 | 2 | 3 | 13 | 3 | 2 | 23 |
| (2)4 | 2 | 4 | 14 | 4 | 3 | 24 |
| (2)5 | 2 | 5 | 15 | 5 | 4 | 25 |
| (2)6 | 2 | 6 | 16 | 6 | 7 | 26 |
| (2)7 | 2 | 7 | 17 | 7 | 9 | 27 |
| (2)8 | 2 | 8 | 18 | 8 | 10 | 28 |
| (2)9 | 2 | 9 | 19 | 9 | 11 | 29 |
| (2)0 | 2 | 10 | 20 | 10 | 12 | 30 |

*TERMINAL STRIP 8

†SW LEAD

‡LEADS FROM BANK 1 CONNECT TO PUNCHING 9 AND/OR 10, T.S. A, AS PC LEADS WHEN ARRANGED FOR PRESET CONFERENCES.

TABLE B

| REFERENCE DESIG | PUNCHING CKT 1 | CKT 2 | CKT 3 |
|---|---|---|---|
| A | 1 | 11 | 21 |
| B | 2 | 12 | 22 |
| C | 3 | 13 | 23 |
| D | 5 | 15 | 25 |
| E | 6 | 16 | 26 |
| F | 7 | 17 | 27 |
| G | 18 | 19 | 20 |
| H | 28 | 29 | 30 |

TABLE A

| REFERENCE DESIG | PRINCIPAL STATION CKT 1 T.S. | PRINCIPAL STATION CKT 1 PUNCH | SUBORDINATE STATION CKT 2 T.S. | CKT 2 PUNCH | CKT 3 T.S. | CKT 3 PUNCH | CKT 4 T.S. | CKT 4 PUNCH | CKT 5 T.S. | CKT 5 PUNCH | CKT 6 T.S. | CKT 6 PUNCH | CKT 7 T.S. | CKT 7 PUNCH | CKT 8 T.S. | CKT 8 PUNCH | CKT 9 T.S. | CKT 9 PUNCH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | A | 1 | A | 11 | A | 21 | A | 31 | B | 1 | B | 11 | B | 21 | B | 31 | C | 1 |
| B | A | 2 | A | 12 | A | 22 | A | 32 | B | 2 | B | 12 | B | 22 | B | 32 | C | 2 |
| C | A | 3 | A | 13 | A | 23 | A | 33 | B | 3 | B | 13 | B | 23 | B | 33 | C | 3 |
| D | A | 5 | A | 15 | A | 25 | A | 35 | B | 5 | B | 15 | B | 25 | B | 35 | C | 5 |
| E | A | 6 | A | 16 | A | 26 | A | 36 | B | 6 | B | 16 | B | 26 | B | 36 | C | 6 |
| F | A | 7 | A | 17 | A | 27 | A | 37 | B | 7 | B | 17 | B | 27 | B | 37 | C | 7 |
| G | C | 11 | C | 12 | C | 13 | C | 14 | C | 15 | C | 16 | C | 17 | C | 18 | C | 19 |
| H | C | 21 | C | 22 | C | 23 | C | 24 | C | 25 | C | 26 | C | 27 | C | 28 | C | 29 |
| P | A | 6 | A | 16 | A | 26 | A | 6 | A | 16 | A | 26 | A | 26 | A | 16 | A | 6 |
| R | B | 6 | B | 16 | B | 26 | B | 6 | B | 16 | B | 26 | B | 26 | B | 16 | B | 6 |

**Fig. 3 (Contd)**
**Page 4A**

## 5.00 PRESET CONFERENCES

**5.01 Z Option:** The system provides two 7-code conferences, six signaled subordinate stations, and the calling station. Two codes, 9 and 0, are used for calling these conferences and, when so used, cannot be assigned to individual stations.

**5.02 Y Option:** These two circuits may be connected in parallel to give one 13-code conference, 12 signaled subordinate stations, and the calling station. The 0 code only is used and cannot be used for calling an individual station.

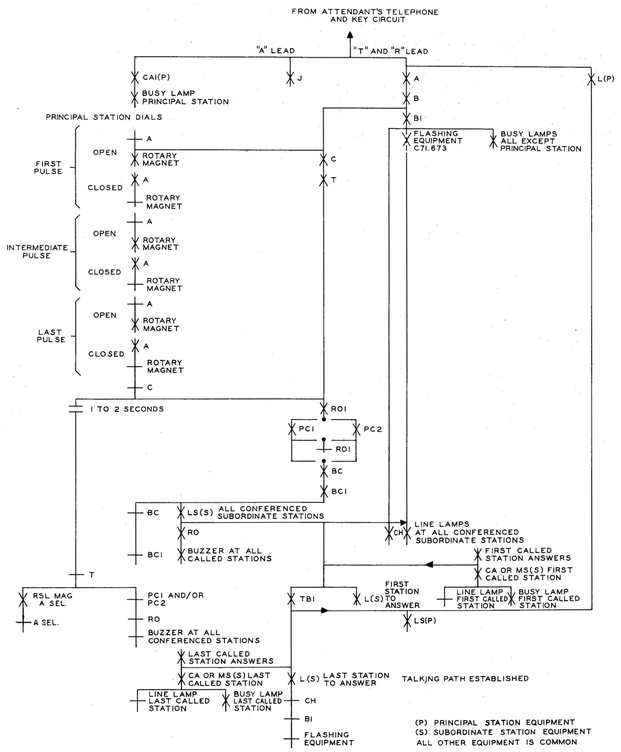
**5.03 Line Seizure:** When the principal station originates a conference call, the shunt on the *T* and *R* leads operates the *A* relay under control of the *LS(P)* relay associated with the station. The *A* lead associated with this operated station causes the *CA* or *MS* relay to operate and, in turn, causes that station's busy lamp to light. Ground on the *A* lead also operates the *J* relay which opens the operating path of the *T1* relay to prevent a ringing signal from occurring when the called subordinate stations answer. The *L(P)* relay operates, but perform no useful function. Operated *A* relay operates the *B* relay which applies ground to the *J* lead to operate the *B1* relay under control of the *TB1* relay. Operated *B1* relay lights the busy lamps at all except the principal station and connects the *FL* and *FR* leads to start the flashing circuit, which is described in Section C71.673.

**5.04 Conference Circuit Selection and Signaling:** The principal station may select either of the conference circuits by dialing a preset conference code. As the code is dialed, the *A* relay releases and reoperates in unison with the dial pulses. The *B* relay becomes a slow release relay by means of the *B* resistor and the *A2* capacitor and remains operated during the dial pulses. As the *A* relay pulses, ground is connected under control of the *B* relay to the rotary magnet, causing the *A* selector to step in unison with the dial pulses. A slow releasing *C* relay operates on the first release of the *A* relay. Operated *C* relay operates the *T* relay which connects the *A* resistor and the *A1* capacitor across its own winding to make it a slow release relay. At the completion of the pulse train, the *A* relay remains operated and the *C* relay releases. Ground over the *PC* lead, under control of the normal *C* relay and the operated *T* relay, through terminals 9 and 10 of the *A* selector, operates the *RO1* relay. When *Z* option is used, the operated *RO1* relay connects battery to (a) the *PC1* relay when the code *O* is dialed or (b) the *PC2* relay when the code 9 is dialed. If *Y* option is used, both the *PC1* and the *PC2* relays are operated when the code 0 is dialed. Operated *PC1* and/or *PC2* relays (a) open the operate path to the *RO1* relay, (b) connect ground over the *K* leads to the *LS* relays associated with the subordinate stations to be conferenced, and (c) hold under control of the *T* relay. Ground on the *K* leads, through the windings of the *LS(S)* relays operates the *BC* relay. The *LS(S)* relays do not operate since the necessary operate current cannot be obtained through the *BC* relay winding. Operated *BC* relay operates the *BC1* relay. Operated *BC1* relay shunts battery across the *BC* relay, releasing it, and allows the *LS(S)* relays to operate and lock up: the *BC1* relay now releases and the *CH* relay now operates, since there are at least two *LS* relays being held over a common lockup path. Operated *LS(S)* relays also (a) lock operated under control of their associated *L(S)* relays and the *B1* relay, (b) connect the called station's line lamps to the flashing circuit over the *LF* and *LB* leads, (c) connect the *T* and *R* leads, under control of the *BC1* relay, to the *TB1* battery feed relay, and (d) connect the *K* leads to the *RO* lead, operating the *RO* relay. Operated *RO* relay completes the audible signal path to the called stations over the *BZ* lead. This signal is timed to give a 1- to 2-second ring by means of the *A* resistor and the *A1* capacitor which are across the winding of the *T* relay to delay its release. The *T* relay releases, which in turn releases the *PC1* and/or the *PC2* relay and the *A* selector. The release of the *PC1* and/or *PC2* relay, releases the *RO* relay, which in turn retires the buzzers.

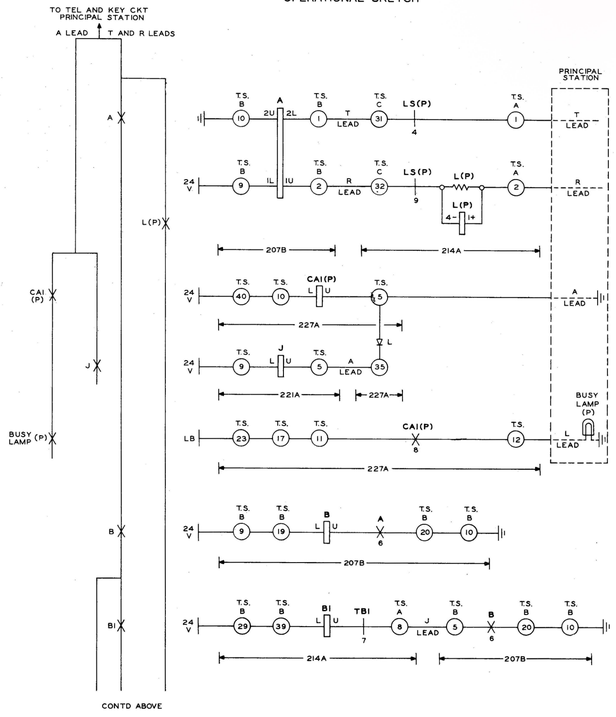
**5.05 Talking:** When the first called station answers, the shunt on the *T* and *R* leads operates the *TB1* relay and the associated *L(S)* relay. Operated *TB1* relay operates the *LS(P)* relay under control of the *L(P)* relay. The *B1* relay is now held operated under control of the *TB1* and *CH* relays to maintain the flashing lamp at each conference station until that station answers or the call is abandoned. As each called station answers, its *CA* or *MS* relay operates under control of its *A* lead (a) causing the busy lamp to light and (b) causing its *L(S)* relay to operate which, in turn, transfers the lockup path of its associated *LS(S)* relay from the *B1* to the *TB1* relay. When the last called station answers, the operate path for the *CH* relay is opened and the *CH* and *B1* relays release, thus restoring the flashing equipment to normal. The talking path is now established and transmitter battery is furnished to all conferenced stations by the *TB1* relay.

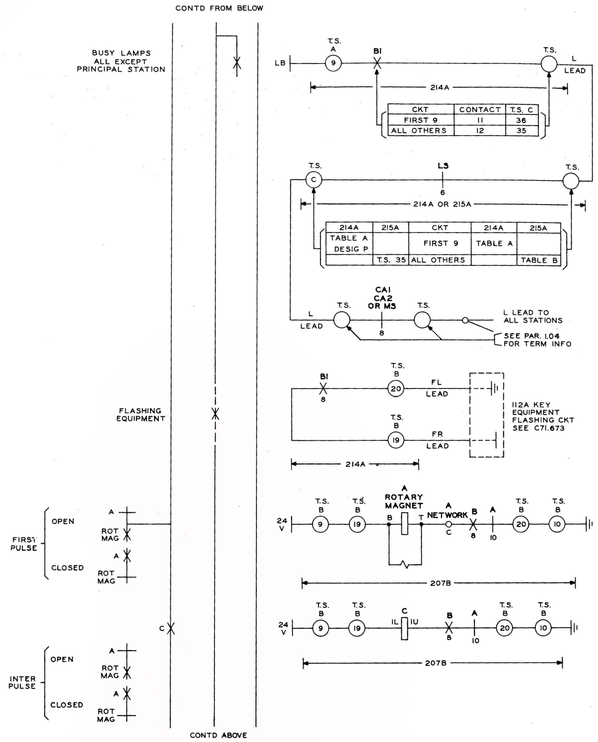
**5.06 Disconnection:** When a station disconnects, the associated *L* and *LS* relays release. When the last station disconnects, the *TB1* relay releases, opening the circuit to the busy lamps and removing the shunt across the *A* relay, thereby releasing the *A* relay which, in turn, releases the *B* relay. All relays now become normal.

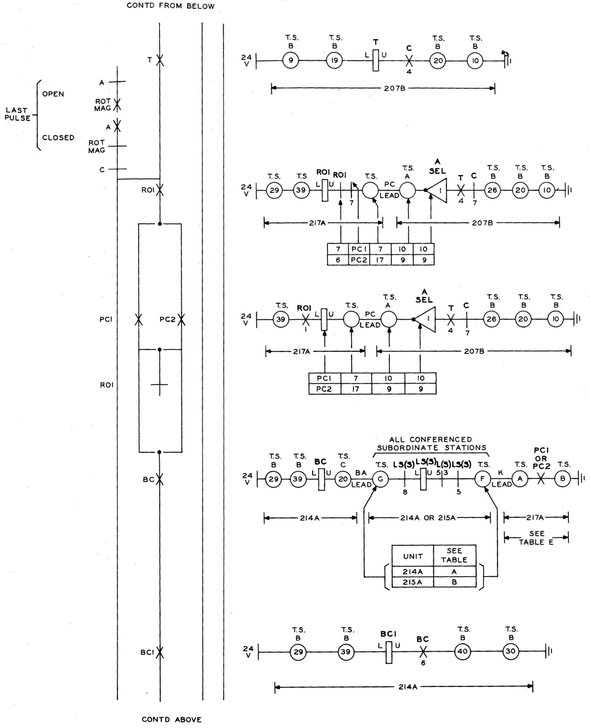
## SEQUENCE CHART




## OPERATIONAL SKETCH



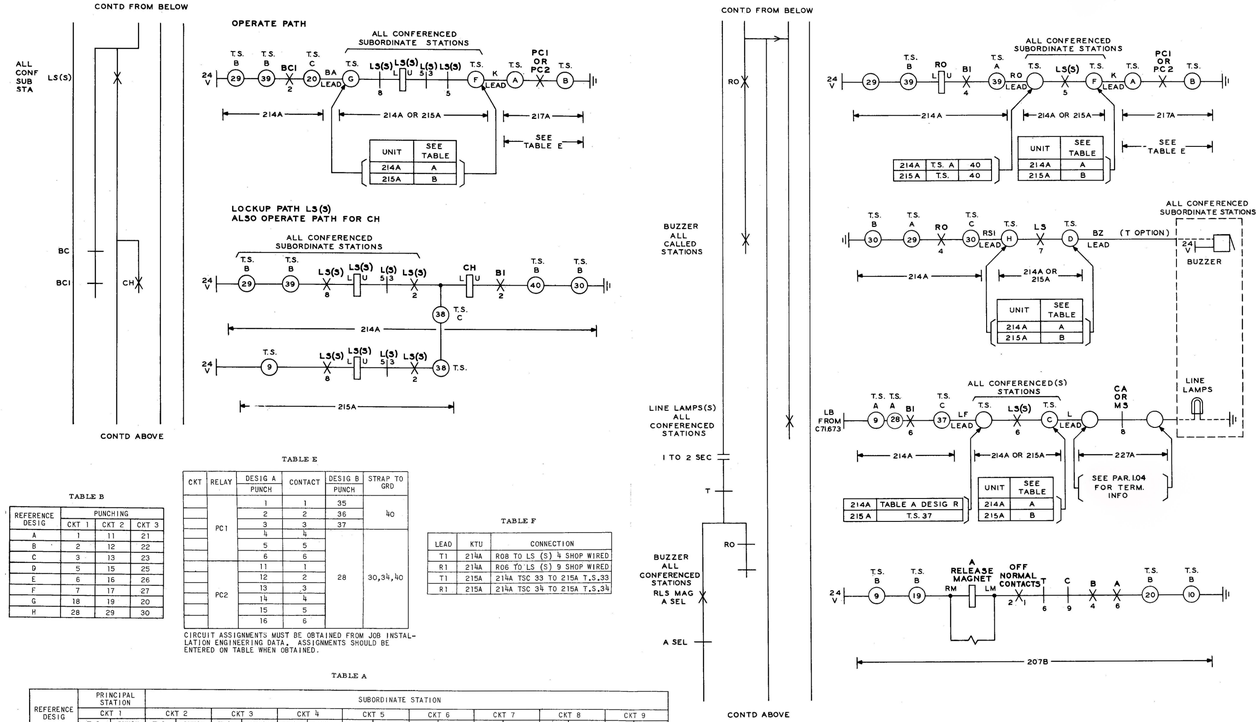



TABLE B

| REFERENCE DESIG | PUNCHING | | |
|---|---|---|---|
| | CKT 1 | CKT 2 | CKT 3 |
| A | 1 | 11 | 21 |
| B | 2 | 12 | 22 |
| C | 3 | 13 | 23 |
| D | 5 | 15 | 25 |
| E | 6 | 16 | 26 |
| F | 7 | 17 | 27 |
| G | 18 | 19 | 20 |
| H | 28 | 29 | 30 |

TABLE E

| CKT | RELAY | DESIG A PUNCH | CONTACT | DESIG B PUNCH | STRAP TO GRD |
|---|---|---|---|---|---|
| | PC1 | 1 | 1 | 35 | 40 |
| | | 2 | 2 | 36 | |
| | | 3 | 3 | 37 | |
| | | 4 | 4 | | 30,34,40 |
| | | 5 | 5 | | |
| | | 6 | 6 | | |
| | PC2 | 11 | 1 | 28 | |
| | | 12 | 2 | | |
| | | 13 | 3 | | |
| | | 14 | 4 | | |
| | | 15 | 5 | | |
| | | 16 | 6 | | |

CIRCUIT ASSIGNMENTS MUST BE OBTAINED FROM JOB INSTALLATION ENGINEERING DATA. ASSIGNMENTS SHOULD BE ENTERED ON TABLE WHEN OBTAINED.

TABLE F

| LEAD | KTU | CONNECTION |
|---|---|---|
| T1 | 214A | ROB TO LS (S) 4 SHOP WIRED |
| R1 | 214A | ROG TO LS (S) 9 SHOP WIRED |
| T1 | 215A | 214A TSC 33 TO 215A T.S.33 |
| R1 | 215A | 214A TSC 34 TO 215A T.S.34 |

TABLE A

| REFERENCE DESIG | PRINCIPAL STATION | SUBORDINATE STATION | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CKT 1 | CKT 2 | | CKT 3 | | CKT 4 | | CKT 5 | | CKT 6 | | CKT 7 | | CKT 8 | | CKT 9 | |
| | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH |
| A | A | 1 | A | 11 | A | 21 | A | 31 | B | 1 | B | 11 | B | 21 | B | 31 | C | 1 |
| B | A | 2 | A | 12 | A | 22 | A | 32 | B | 2 | B | 12 | B | 22 | B | 32 | C | 2 |
| C | A | 3 | A | 13 | A | 23 | A | 33 | B | 3 | B | 13 | B | 23 | B | 33 | C | 3 |
| D | A | 5 | A | 15 | A | 25 | A | 35 | B | 5 | B | 15 | B | 25 | B | 35 | C | 5 |
| E | A | 6 | A | 16 | A | 26 | A | 36 | B | 6 | B | 16 | B | 26 | B | 36 | C | 6 |
| F | A | 7 | A | 17 | A | 27 | A | 37 | B | 7 | B | 17 | B | 27 | B | 37 | C | 7 |
| G | C | 11 | C | 12 | C | 13 | C | 14 | C | 15 | C | 16 | C | 17 | C | 18 | C | 19 |
| H | C | 21 | C | 22 | C | 23 | C | 24 | C | 25 | C | 26 | C | 27 | C | 28 | C | 29 |
| P | A | 6 | A | 16 | A | 26 | A | 6 | A | 16 | A | 26 | A | 26 | A | 16 | A | 6 |
| R | B | 6 | B | 16 | B | 26 | B | 6 | B | 16 | B | 26 | B | 26 | B | 16 | B | 6 |

## 6.00 SUBORDINATE STATION CALLING PRINCIPAL STATION

**6.01 Line Seizure:** When a call is originated at a subordinate station, the shunt on the *T* and *R* leads operates the *A* relay under control of the *LS(S)* relay which is associated with the station. Ground on the *A* lead from the calling subordinate station causes the *CA* or *MS* relay to operate, lighting that station's busy lamp. The *A1* relay also operates under control of the *A* lead. The *L* relay operates but performs no useful function. Operated *A* relay operates the *B* relay which applies ground to the *J* lead to operate the *B1* relay under control of the *TB1* relay. The *B1* relay (a) lights the busy lamps at all nonoperated stations and (b) connects the *FL* and *FR* leads to start the flashing circuit, which is described in Section C71.673.

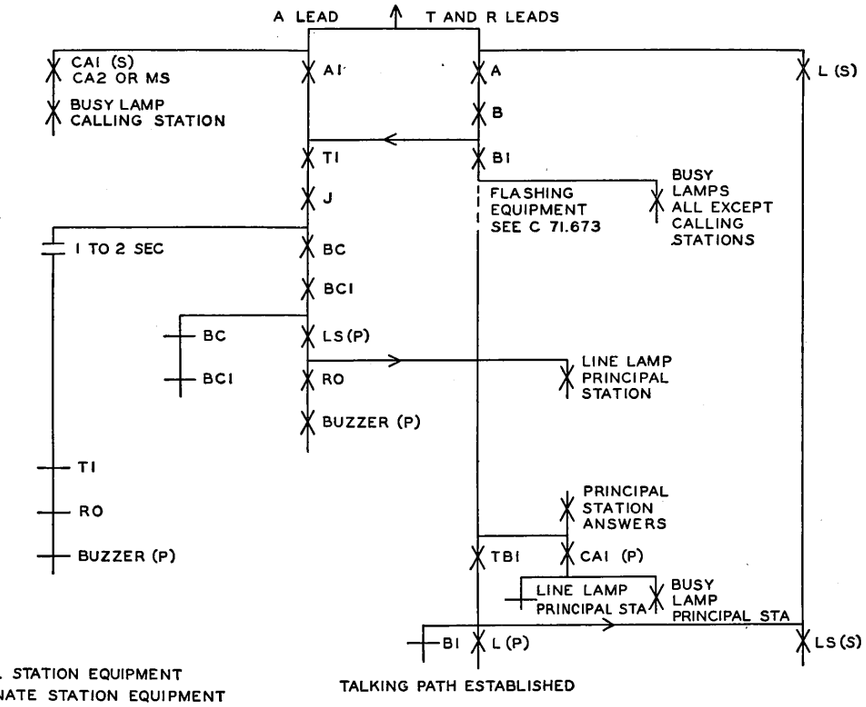
**6.02 Station Selection and Signaling:** The principal station is automatically selected and signaled whenever a subordinate station picks up. In order to prevent the subordinate station from trying to select other than the principal station, the *C* resistor is shunted across the *A* relay windings by the operated *A1* relay. The *C* resistor provides a current path across the *A* relay, preventing it from following dial pulses which would operate the selector circuit. Operated *A1* relay connects ground on the *J* lead from the operated *B* relay to operate the *T1* relay. The *T1* relay (a) operates the *J* relay which opens the operate path to the *T1* relay and (b) connects ground on the *C* lead which is associated with the principal station's *LS* relay. The *J* relay locks up under control of the *B* relay. Ground on the *C* lead, through the winding of the *LS(P)* relay, operates the *BC* relay. The principal station's *LS* relay does not operate since the necessary operate current cannot be obtained through the *BC* relay winding. The *BC* relay operates the *BC1* relay. The *BC1* relay (a) opens the operate path for the *TB1* relay and (b) shunts battery across the *BC* relay. This shunt releases the *BC* relay and allows the *LS(P)* relay to operate. The *BC1* relay now returns to normal. The *LS(P)* relay (a) opens the operate path for the *BC* relay, (b) locks up under control of the associated *L(P)* relay and the *B1* relay, (c) connects the principal station line lamp to the lamp flashing circuit over the *LF* and *LB* leads, (d) connects the *T* and *R* leads, under control of the *BC1* relay, to the battery-feed *TB1* relay, and (e) connects the *C* lead to the *RO* lead, operating the *RO* relay. The *RO* relay completes the audible signaling path to the principal station over the *BZ* lead: this signal is timed to give a 1- to 2-second ring by means of the *T1* resistor and the *T1* capacitor, which are across the windings of the *T1* relay, to delay its release. When the *T1* relay releases, the *RO* relay releases. The *CH* relay, which is in series with the lockup path for the *LS(P)* relay, may operate, but performs no useful function.

**6.03 Talking:** When the principal station answers, the shunt on the *T* and *R* leads operates the *TB1* relay. Ground on the *A* lead from the principal station causes the operation of the *CA* relay which, in turn, opens the *L* lead to the flashing circuit and closes the *LB* lead to light the principal station's busy lamp. The principal station's *L* relay operates on the loop current, transferring the lockup path of the associated *LS(P)* relay from the *B1* to the *TB1* relay over the *A1* lead. Operated *TB1* relay also (a) transfers control of the station busy lamps of nonoperated subordinate stations from the *B1* to the *TB1* relay, (b) releases the *B1* relay which returns the flashing circuit to normal, and (c) connects ground over the *A1* lead to operate the subordinate station's *LS* relay under control of the associated *L(S)* relay which was operated when the subordinate station seized the line. The stations are now connected to the common battery-feed *TB1* relay, and conversation may take place.

**6.04 Disconnection:** When a station disconnects, the associated *L* and *LS* relays release. When the last station disconnects, the *TB1* relay releases, removing the shunt across the *A* relay, thereby releasing the *A* relay which, in turn, releases the *B* relay. All relays now become normal.

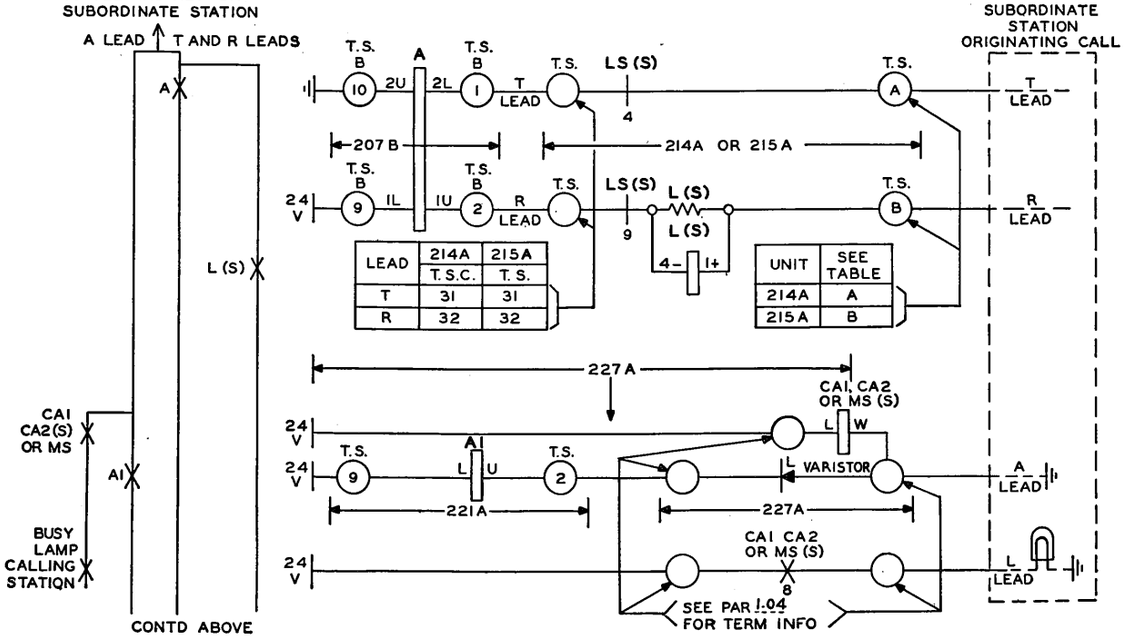
## SEQUENCE CHART

TO 112A KEY EQUIPMENT, ATT'S TEL AND KEY CKT, OR
1A1 KEY TEL SYSTEM, KEY AND TEL CKT



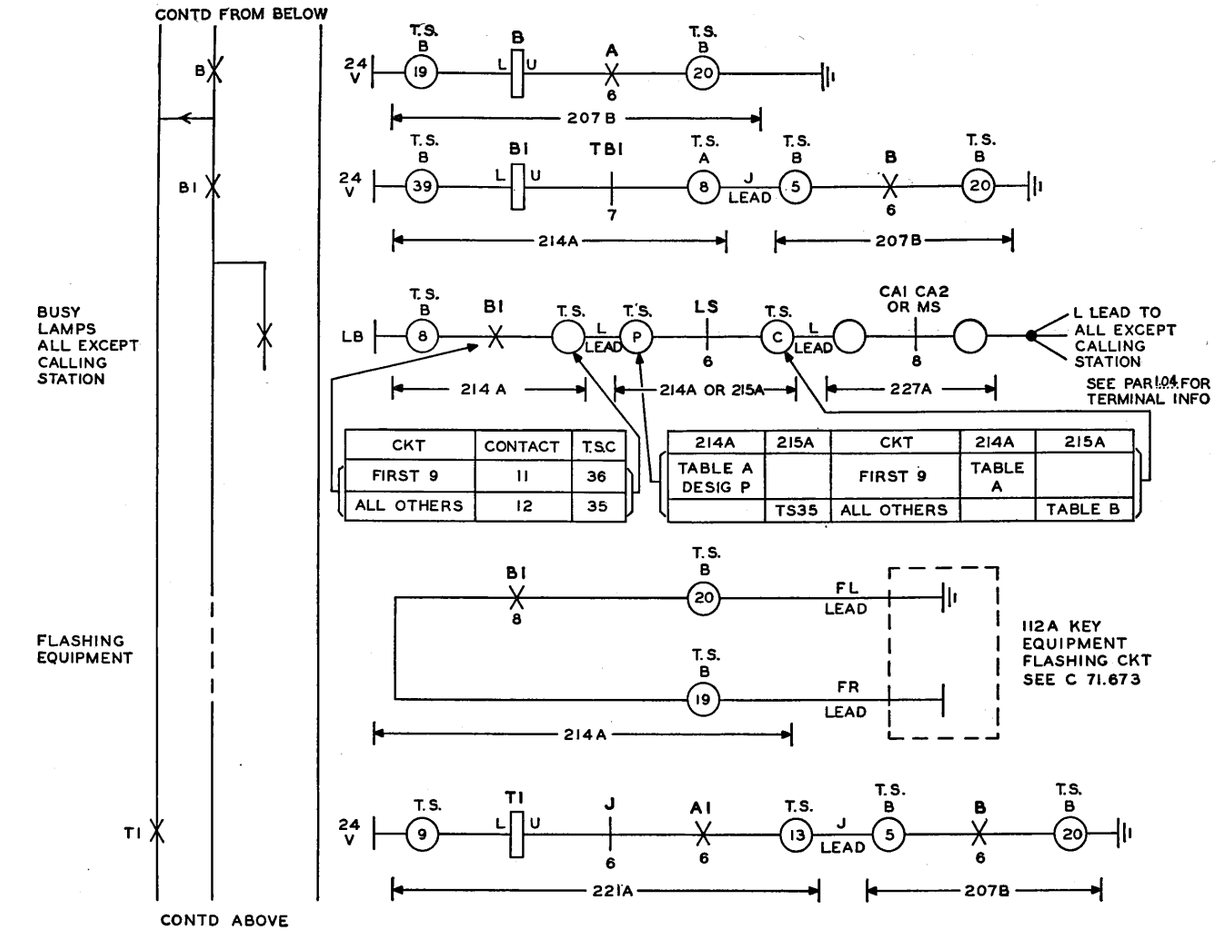

(P) PRINCIPAL STATION EQUIPMENT
(S) SUBORDINATE STATION EQUIPMENT
ALL OTHER EQUIPMENT IS COMMON

## OPERATIONAL SKETCH




| LEAD | 214A T.S.C. | 215A T. S. |
|---|---|---|
| T | 31 | 31 |
| R | 32 | 32 |

| UNIT | SEE TABLE |
|---|---|
| 214A | A |
| 215A | B |




| CKT | CONTACT | T.S.C |
|---|---|---|
| FIRST 9 | 11 | 36 |
| ALL OTHERS | 12 | 35 |

| 214A | 215A | CKT | 214A | 215A |
|---|---|---|---|---|
| TABLE A DESIG P | | FIRST 9 | TABLE A | |
| | TS35 | ALL OTHERS | | TABLE B |

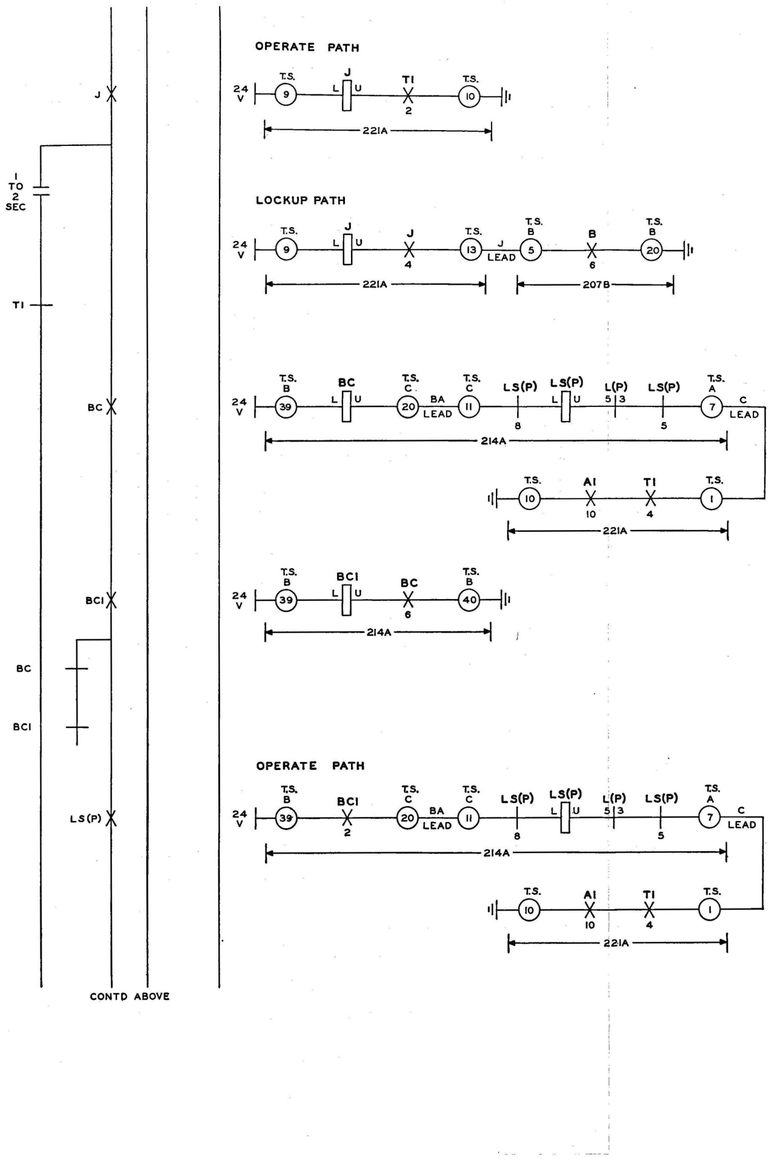
TABLE A

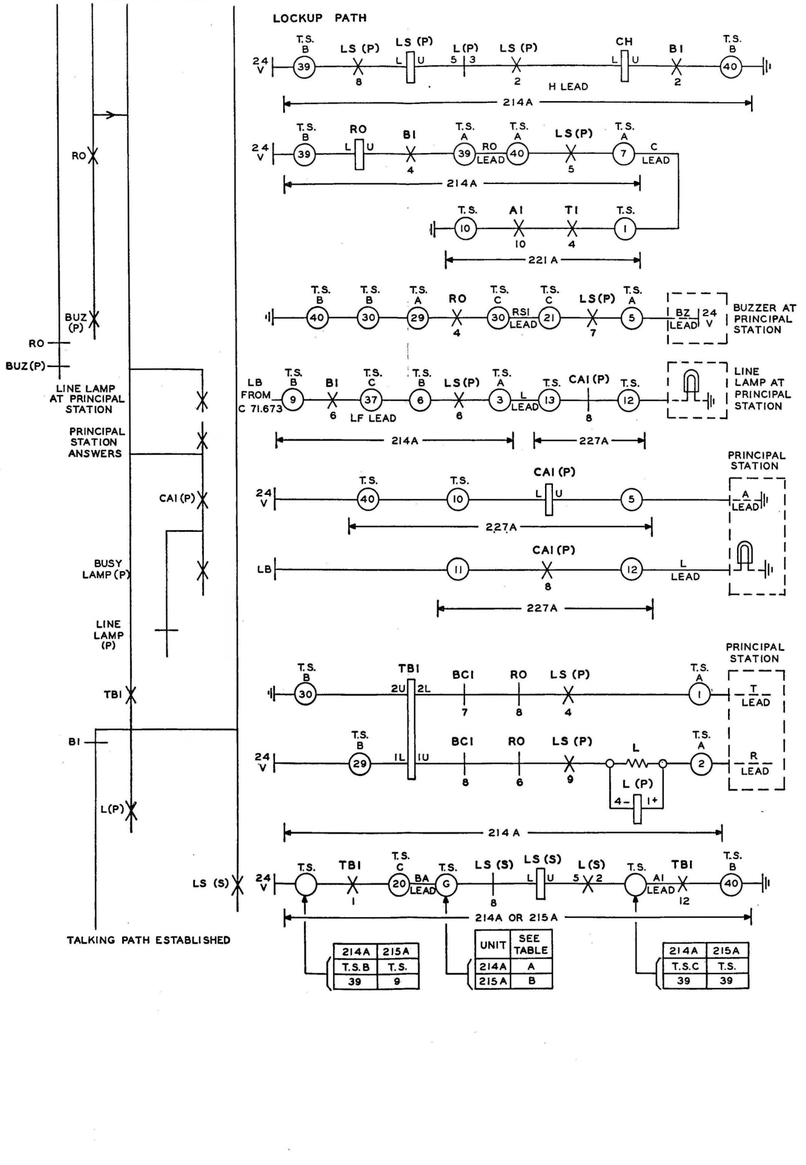
| REFERENCE DESIG | PRINCIPAL STATION CKT 1 | | SUBORDINATE STATION CKT 2 | | CKT 3 | | CKT 4 | | CKT 5 | | CKT 6 | | CKT 7 | | CKT 8 | | CKT 9 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH | T.S. | PUNCH |
| A | A | 1 | A | 11 | A | 21 | A | 31 | B | 1 | B | 11 | B | 21 | B | 31 | C | 1 |
| B | A | 2 | A | 12 | A | 22 | A | 32 | B | 2 | B | 12 | B | 22 | B | 32 | C | 2 |
| C | A | 3 | A | 13 | A | 23 | A | 33 | B | 3 | B | 13 | B | 23 | B | 33 | C | 3 |
| D | A | 5 | A | 15 | A | 25 | A | 35 | B | 5 | B | 15 | B | 25 | B | 35 | C | 5 |
| E | A | 6 | A | 16 | A | 26 | A | 36 | B | 6 | B | 16 | B | 26 | B | 36 | C | 6 |
| F | A | 7 | A | 17 | A | 27 | A | 37 | B | 7 | B | 17 | B | 27 | B | 37 | C | 7 |
| G | C | 11 | C | 12 | C | 13 | C | 14 | C | 15 | C | 16 | C | 17 | C | 18 | C | 19 |
| H | C | 21 | C | 22 | C | 23 | C | 24 | C | 25 | C | 26 | C | 27 | C | 28 | C | 29 |
| P | A | 6 | A | 16 | A | 26 | A | 6 | A | 16 | A | 26 | A | 26 | A | 16 | A | 6 |
| R | B | 6 | B | 16 | B | 26 | B | 6 | B | 16 | B | 26 | B | 26 | B | 16 | B | 6 |

TABLE B

| REFERENCE DESIG | PUNCHING CKT 1 | CKT 2 | CKT 3 |
|---|---|---|---|
| A | 1 | 11 | 21 |
| B | 2 | 12 | 22 |
| C | 3 | 13 | 23 |
| D | 5 | 15 | 25 |
| E | 6 | 16 | 26 |
| F | 7 | 17 | 27 |
| G | 18 | 19 | 20 |
| H | 28 | 29 | 30 |

**Fig. 5**
**Page 6**
**(Contd on Page 6A)**



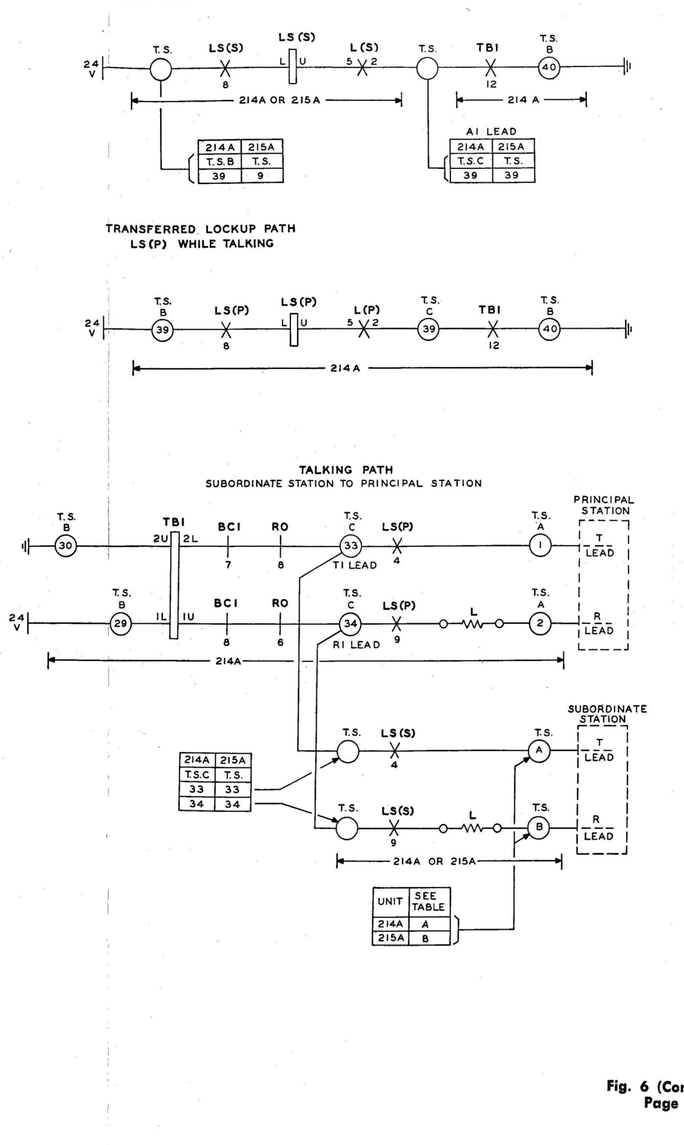



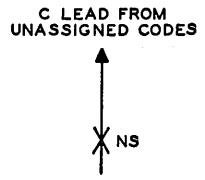

Fig. 6 (Contd)
Page 6A

## 7.00 CONNECTION TO NO-SUCH-NUMBER TONE

The unassigned *C* leads are connected to the no-such-number tone circuit, as described in Section C71.672, Fig. 3. When an unassigned code is dialed, ground on the *C* lead operates the *NS* relay which (a) locks up to ground on the *J* lead from the *B* relay, (b) connects ground on the *MS* lead to start the power ringing circuit, (c) connects ground on the *A* lead to the no-such-number tone circuit, and (d) connects the no-such-number tone on the *D* and *C* leads to the *T* and *R* leads of the principal station.

**Reference: SD69236-01, Issue 5A**

SEQUENCE CHART




OPERATIONAL SKETCH

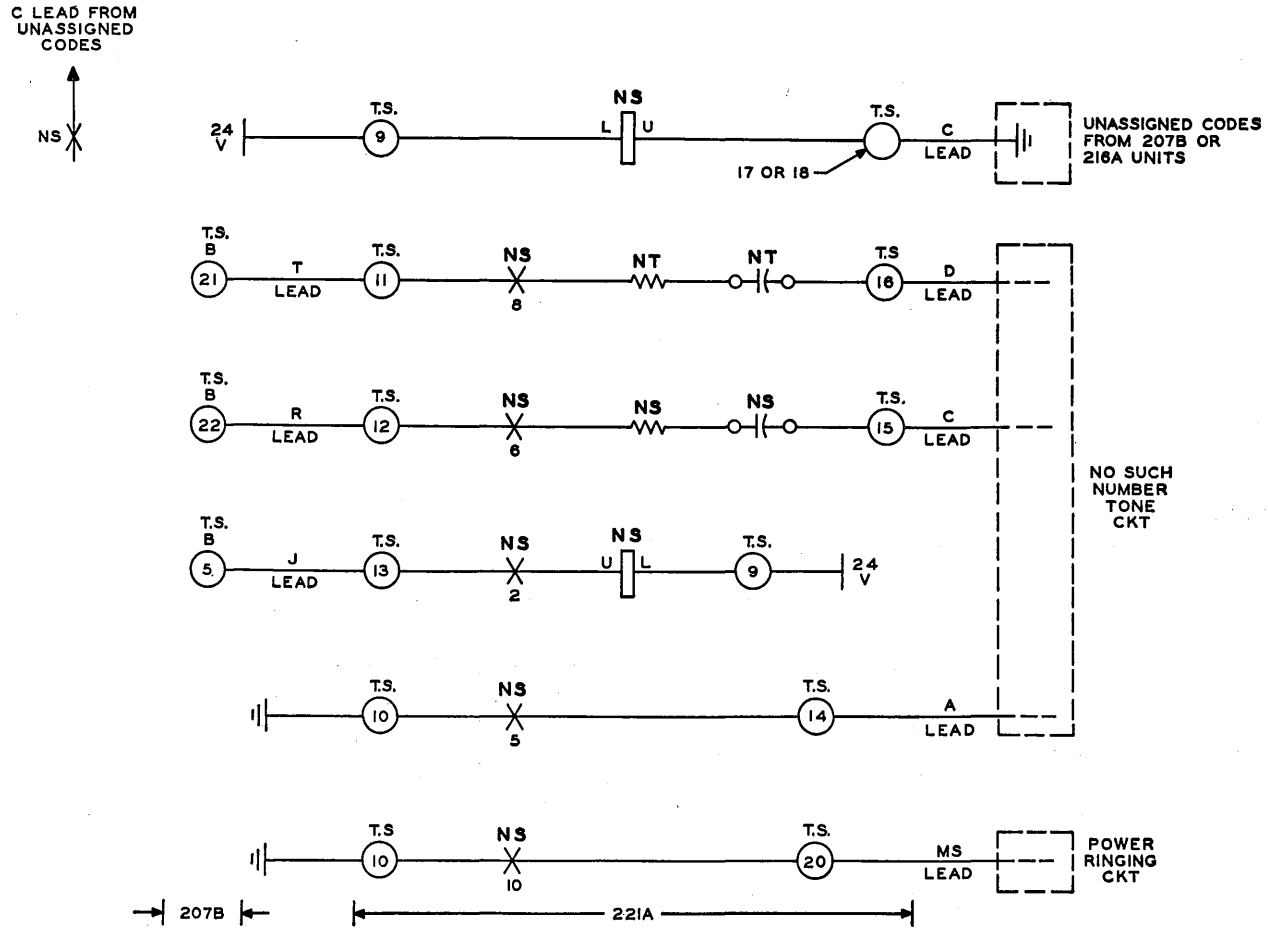



**Fig. 6**

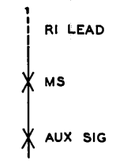
## 8.00 AUXILIARY AUDIBLE SIGNALS, *V* OPTION

**8.01** A steady audible signal may be obtained in place of the usual 1- to 2-second buzzer signal through the use of an auxiliary signal control circuit.

**8.02** The called station is selected, as described in previous figures. When the *RO* relay operates, it connects ground on the *RS1* lead through the called station's *LS* relay to the *R1* lead and operates the auxiliary *MS* relay. The *MS* relay (a) locks up to the *B1* relay under control of the associated *CA* or *MS* relay and (b) connects a signal power source to an auxiliary signal or signal relay; this signal will continue to operate until the called station answers or the call is abandoned.

**Reference: SD69236-01, Issue 5A**

SEQUENCE CHART




OPERATIONAL SKETCH