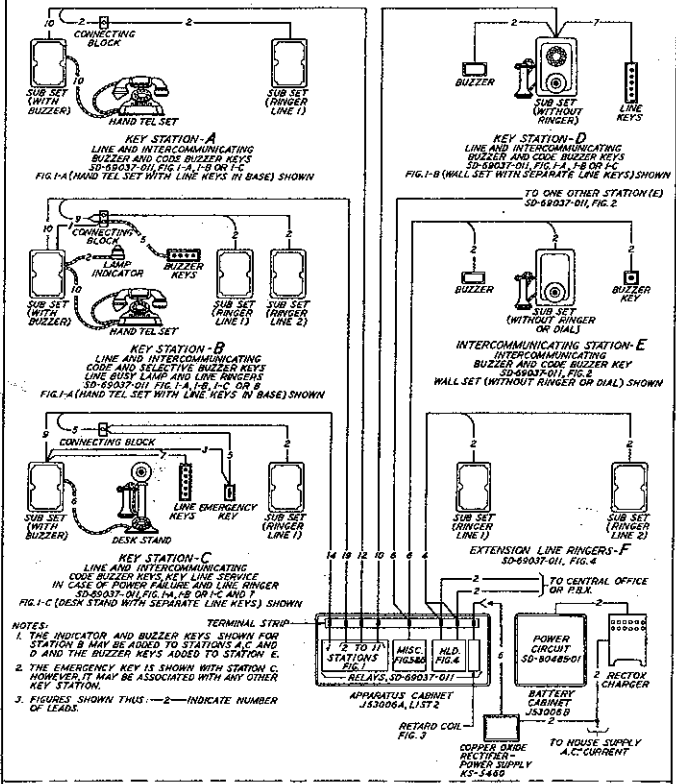


# KEY EQUIPMENT NO. 23-A TWO LINE-REMOTE CONTROL-AUTOMATIC CUT OFF- INTERCOMMUNICATING-TYPICAL STATION EQUIPMENT GROUPING AND CONDUCTOR REQUIREMENTS



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5 ISSUE

CIRCUIT DESCRIPTION  
SYSTEMS DEVELOPMENT DEPARTMENT  
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STATION SYSTEMS  
NO. 15A KEY EQUIPMENT  
ARRANGED FOR REMOTE SWITCHING

CHANGES

D. DESCRIPTION OF CIRCUIT CHANGES

- D.1 This circuit was changed to provide for its use with the J86205A copper oxide rectifier by showing the connecting information at the "IT" and "IR" leads in Fig. 1 and 2 and adding + and - designations to these leads.
- D.2 Note 117 was added.
- D.3 The cabling diagram was changed.
- All other headings, No Change.

DEVELOPMENT

1. PURPOSE OF CIRCUIT

- 1.1 This circuit is used to provide two-way service between a central office and a group of subscribers' stations over a central office line or between a P.B.X. and a group of P.B.X. stations over a P.B.X. station line. It is also used for intercommunication between stations within the group over a single intercommunicating line.

2. WORKING LIMITS

- 2.1 Max. Conductor Loop Res.:
- |   |              |
|---|--------------|
| To Man., Panel or S.X.S. cent. off.                               | 545 $\omega$ |
| To 554A, 554B, 606A or 702A P.B.X.                                | 545 $\omega$ |
| To 604C P.B.X.  | 295 $\omega$ |
| To 605A P.B.X.  | 395 $\omega$ |
| To 700C P.B.X.  | 95 $\omega$  |
| To 701A, 711A, 740A, 740B or 740C P.B.X.                          | 195 $\omega$ |
| To 710C P.B.X.  | 330 $\omega$ |
| To 550C, 550SC, 551A, 551B  | *            |
| 551C or 600C P.B.X.   |              |
| Max. Res. of each Conductor Between Apparatus Cabinet and Station | 15 $\omega$  |

Minimum Insulation Resistance:

For Subscriber's Lines -	
Manual or Panel Areas	10,000 $\omega$
Step-by-Step Areas	15,000 $\omega$
For P.B.X. Station Lines -	
Manual or Panel Areas	20,000 $\omega$
Step-by-Step Areas	30,000 $\omega$

\*Long Line Circuit should be used with these P.B.X.'s. This circuit will function over same loop limits as specified for the associated long line.

OPERATION

3. FUNCTIONS

3.1 On the Central Office or P.B.X. Line

- 3.111 Provision is made so that each station can cut off all other stations.
- 3.112 Provision is made so that two or more stations can cut off all other stations but not each other.
- 3.113 Provision is made so that a station cannot be cut off by any other station.
- 3.114 If a station not arranged for cutting off other stations is connected to the line and a station arranged for cutting off this first station is later connected to the line, the first station will not be cut off unless the handset or receiver at the first station is replaced on the switchhook.
- 3.115 When the talking key at any station is operated and the handset or receiver is off the switchhook, the station will be connected to the line if the station is not cut off by another station.
- 3.116 Connects a holding condition on the line when the holding key at the station is operated while the talking key is already operated and the handset or receiver is off the switchhook.
- 3.117 Removes the holding condition when the line is re-seized by a station.
- 3.118 Provides an audible signal on inward calls.
- 3.119 Provides for dialing.
- 3.120 Provides for lighting the (S BUSY) lamp when the talking key is operated and the handset or receiver is removed from the switchhook at a station which

is cut off from the busy line. Provides for lighting the (L BUSY) lamp when the central office or PBX line is connected to any station.

- 3.2 With two keys depressed only the Central Office or P.B.X. line can be connected to the station.
- 3.3 Provides for code or selective signalling on intercommunicating calls.
- 3.4 Provision is made to enable one station to have access to the central office or P.B.X. in case of power failure.
- 3.5 Provision is made so that the buzzer at the station at which the buzzer key is operated will not operate if the local key is operated and the handset or receiver is removed from the switchhook.

#### 4. CONNECTING CIRCUITS

- 4.1 Standard Line Circuits at Manual, Panel or Step-by-Step Central Offices.
- 4.2 Standard P.B.X. Station Line Circuits.

#### DETAILED DESCRIPTION

#### 5. INCOMING CALLS

- 5.1 On an incoming call an audible signal is received by the operation of the line ringers. Any station associated with the line can answer the call.

#### 6. ANSWERING OR ORIGINATING A CALL ON THE CENTRAL OFFICE OR P.B.X. LINE

- 6.1 To answer or originate a call the No. 1 key must be operated. When the handset or receiver is removed from the switchhook the (L2) relay operates. The operation of the (L2) relay shorts the line to prevent excessive clicks being induced in the receiver, operates the (L1) relay, connects the S winding of the (L2) relay to the holding key and closes a circuit to the busy lamp which is associated with the station. The operation of the (L1) relay closes the talking circuit through to the subscriber set, closes part of the operating circuit of the (H) relay, opens the busy lamp circuit, operates the (CO3) and (CO1) relays if "Z" wiring is used or operates the (CR) relay if "W" wiring is used, and connects battery to its own winding to hold itself operated when battery for operating the relay is opened by the operation of the (CO1) or (CO3) relay. The operation of the

(CO3) and (CO1) relays opens battery to all the (L1) relays thus preventing other stations becoming connected to the line at this time if all stations are arranged for the full lock-out feature. The operation of the (CO3) relay also operates the (CR) relay. The (CR) relay opens the short which had been placed across the line and lights the (L BUSY) lamp if provided. This (CR) relay is a slow operate relay and therefore the station will be connected to the line before the short is removed. The purpose of the (L BUSY) lamp is to provide a signal to a person such as a secretary when a call which has been transferred by the person has been taken up.

#### 6.2 Dialing

In the case of an outgoing call that requires dialing, the dial is operated in the usual manner.

#### 6.3 Holding

In case a call is to be transferred to another station the party who has answered the call will operate the (H) key which holds the (L2) relay operated, operates the (H) relay and releases the No. 1 key. The contacts of the (H) key make before the contacts of the No. 1 key break thus insuring the holding of the (L2) relay. The (H) relay operates the (HL) relay and places a short across the line to prevent excessive clicks being induced in the receiver at this time. Relay (H) locks operated under control of the (H4) relay to insure the holding circuit functioning in case the (H) key is operated momentarily. Relay (HL) opens the line toward the station and the short, and bridges the (H2) relay across the line operating the (H2) relay which operates the (H4) relay. When the (H) key which is non-locking is released the (L2) and (H) relays release. The release of the (H) relay releases the (HL) relay, the release of the (L2) relay releases the (L1) relay. Relay (HL) may release before the (L1) relay releases. This will close the talking circuit through the (H3) relay which may operate momentarily and in turn may release the (H2) relay. The (H4) relay which is a slow release relay will not release under this condition thus preventing the opening of the bridge which is across the line. The (L1) relay released, opens the talking circuit and the holding circuit to the station and releases the (CO1) and (CO3) relays, the (CO3) relay releasing the (CR) relay which extinguishes the (L BUSY) lamp is provided. The (HL) relay released, also opens the P winding of the (H2) relay.

#### 6.4 Transferring Calls

Whenever a call is transferred the line must be held by the operation of the holding key, otherwise the line will be open momentarily which may cause the call to be lost. This applies to either an inward or an outward call. The called party will be signalled by the operation of the (B) key and also the (L) key. The operation of the (L) key operates the (IC) relay (assuming the handset or receiver is still removed from the switchhook) which opens the buzzer circuit of the station calling and connects the station talking leads to the intercommunicating line. The operation of the (B) key will operate the buzzer direct or will operate the (BR) relay which in turn will operate the buzzer.

#### 6.5 Release of the Holding Circuit

If the party at the called station desired to talk on the central office or P.B.X. line the No. 1 key at that station will be operated which will operate the associated (L2) relay if the handset or receiver is off the switchhook. The operation of (L2) relay causes the (L1) relay to operate which performs the same function as the (L1) relay associated with the first station. When the line is closed through to the station, the (H3) relay will operate through the talking circuit causing (H2) relay to release by short-circuiting its S winding. The release of the (H2) relay releases the (H4) relay which releases the (H3) relay by short-circuiting its P winding restoring the holding circuit to normal. The operation of the No. 1 key also releases the (L) key which releases the (IC) relay, opening the intercommunicating line to the station.

#### 6.6 Disconnection

When the party at the called station replaces the handset or receiver on the switchhook all operated relays release.

### 7. CUT-OFF FEATURE ON CENTRAL OFFICE OR P.B.X. LINE

- 7.1 If two or more stations are to cut off other stations but not each other, the "A1" leads of these stations are multiplied and connected to one "A1" lead per Figure 6. In case one station is connected to the line and a second station in the same group operates the No. 1 key and removes the handset or receiver from the switchhook the (L1) relay of the second station will operate from the

battery which holds operated the (L1) relay of the first station thus connecting the second station to the line. However, if a station of another group operates the No. 1 key and removes the handset or receiver from the switchhook, the (L2) relay will operate but the (L1) relay will not operate as the operating path for this relay will be opened at the contacts of the (CO1) or (CO3) relays. The operation of the (L2) relay with the associated (L1) relay non-operated will cause the busy lamp at the station to light. The "B" lead is used in case a station is not to be cut off by any other station.

#### 8. NON-CUT-OFF FEATURE ON CENTRAL OFFICE OR P.B.X. LINE

- 8.1 When stations are not to cut-off other stations but are to be cut off, the "CO1" lead to these stations are left open at "Z" wiring. This prevents the (CO1) and (CO3) relays operating when a call is made from these stations thus allowing other stations to come in on the connection. The (L1) relay, however, at these non-cut-off stations will be locked operated until the handset or receiver is replaced on the switchhook. This prevents the cut-off station cutting off the connection.

#### 9. INTERCOMMUNICATION

- 9.1 When a party at one station desires to call a party at another station, the (L) key will be operated and the handset or receiver removed from the switchhook. This will operate the (IC) relay which connects the station to the intercommunicating line and opens the buzzer circuit. The (B) key will then be operated which will operate the buzzer at the desired station direct or will operate the (BR) relay which will operate the buzzer. When the party answers, the (L) key at that station will be operated and the handset or receiver will be removed from the switchhook. This will cause the (IC) relay at the called station to operate connecting the station to the intercommunicating line. This will enable both parties to communicate with each other.

#### 10. BUZZERS

- 10.1 The buzzers are arranged for both code and selective signalling. For code signalling the (B) key when operated will operate the (BR) relay which in turn will operate all the buzzers that are to be operated code. For selective signalling the (B) key when operated will operate the buzzer direct. When a buzzer is required to operate on code signal-

ling from one or more stations and selective from other stations the (B) key at the stations signalling on the code signalling basis will operate the (BR) relay which in turn operates the buzzer as previously described, whereas the keys at the station operated on a selective signalling basis will operate the buzzers direct as also previously described.

11. EMERGENCY KEY CIRCUIT

- 11.1 In the event of power failure, calls can be made to the Central Office or the P.B.X. only from the particular station designated for this purpose. When the (EM) key in Figure 7 is operated the Central Office or P.B.X. line will be opened to all stations through the holding circuit and connected to the designated station direct. The operation of this key also opens the ground lead to the keys of this station thus preventing the relays associated with the station from operating in case the power is again supplied to the system. This prevents the line becoming crossed with the intercommunicating line.

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