BELL SYSTEM PRACTICES
Station Installation and Maintenance

SECTION C53.416
Issue 1, June, 1954
AT&T Co Standard

102A KEY EQUIPMENT
DESCRIPTION

1. GENERAL

1.01 This section describes the 102A key equipment which has been made available primarily to meet the requirements of the Civil Aeronautics Administration for use at Air Route Traffic Control Centers and Airport Control Towers. This equipment, of course, is available to any subscriber desiring the features furnished by the 102A key equipment such as airline, pipeline, and various right-of-way companies.

1.02 The facilities provided by this equipment are similar in many respects to the 101A and 101B key equipments and some of the circuits and equipment arrangements are employed in both the 101A and 101B and in the 102A key equipment. One of the main differences between the 101-type key equipment and the 102A key equipment is the provision for terminating 4-wire circuits on the 102A key equipment.

1.03 Due to the complexity of this system, the equipment engineer will normally order all the equipment and drawings necessary for the installation and will assist in the ordering of the cable.

1.04 This key equipment is designed to permit one or more attendants to answer, originate, hold, and record calls on a group of lines which may include central office or PBX lines, ringdown or automatic private lines, and 2- or 4-wire private or toll lines.

1.05 These lines, which terminate on keys at one or more attendants' positions are divided into two general types of lines, one known as conference lines and the other as non-conference lines.

1.06 The conference lines are used for intercommunicating purposes between one or more locations within the local area and are arranged so that information can be transmitted simultaneously to one or more conference line stations.

1.07 The nonconference lines include central office and PBX lines, nonconference station lines, long lines to other locations, tie lines, and toll lines to other locations.

1.08 The attendants' positions are generally made up of from one to four 10-line key units which may be assembled side by side in several different mounting arrangements. These operating positions are divided into three general classifications:

(a) Positions provided with both conference and nonconference lines are called type 1 positions.

(b) Positions provided with nonconference lines only are called type 2 positions.

(c) Positions used for supervisory and monitoring purposes only are called type 3 positions.

1.09 Type 1 positions employ key units having the upper positions of the keys wired in series for nonconference lines and the lower positions wired in multiple for conference type lines.

1.10 Type 2 positions have both the upper and lower positions of the key unit wired in series.

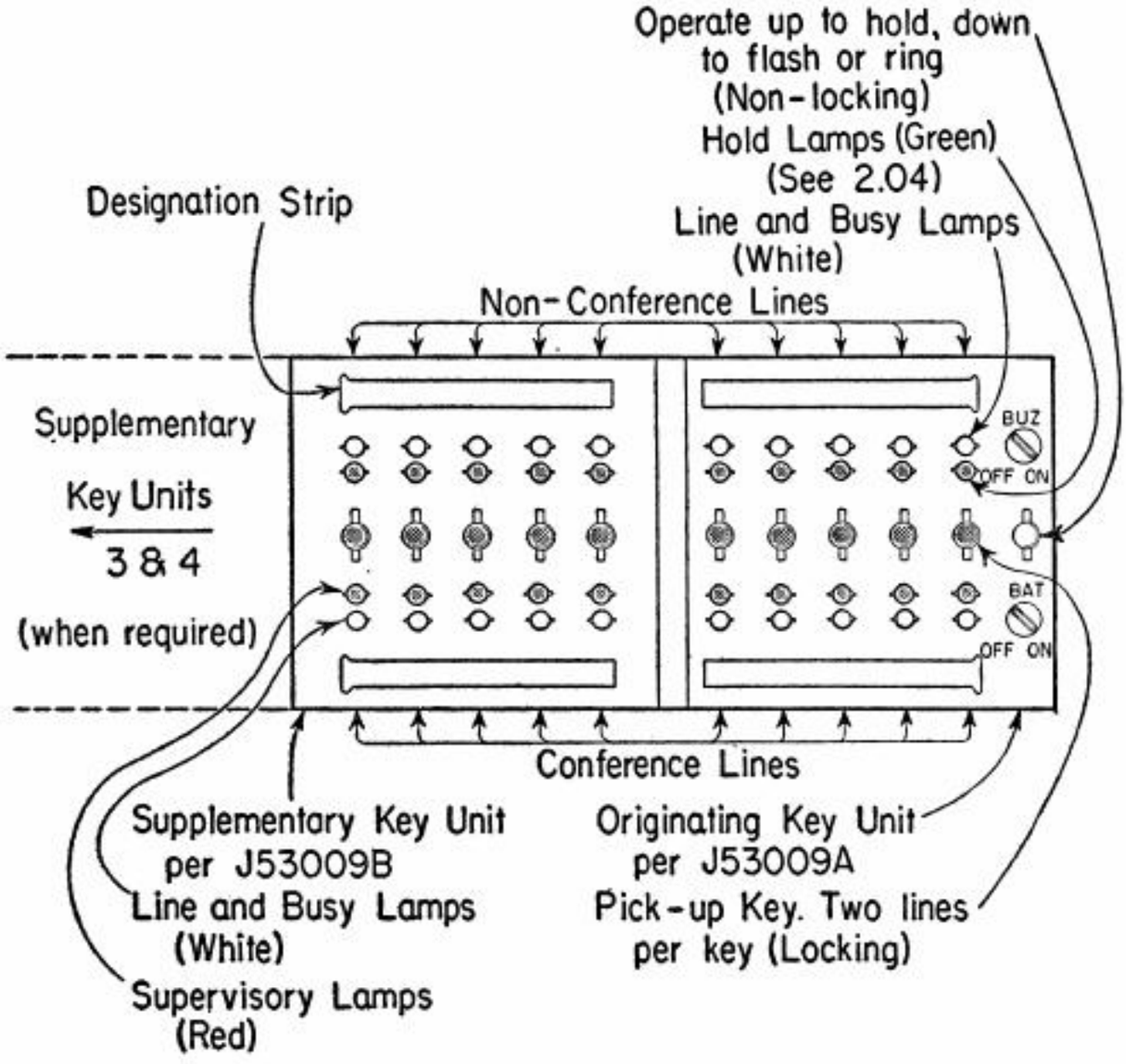
1.11 Type 3 positions are equipped with keys to associate the supervisor's telephone circuit with the telephone circuit of any of the attendants' positions.

1.12 Both type 1 and type 2 positions are arranged to control voice recorders which are furnished by the subscriber.

2. APPARATUS AND EQUIPMENT KEY UNITS

2.01 The 10-line key units provided for type 1 and type 2 positions are furnished in both originating and supplementary types. The key units are arranged for right to left growth only.

2.02 Fig. 1 illustrates a type 1 position showing the type of key units required as well as the various lamps, keys, etc., and Fig. 2 illustrates the type 2 position in the same manner.



TYPE 1 POSITION

Fig. 1

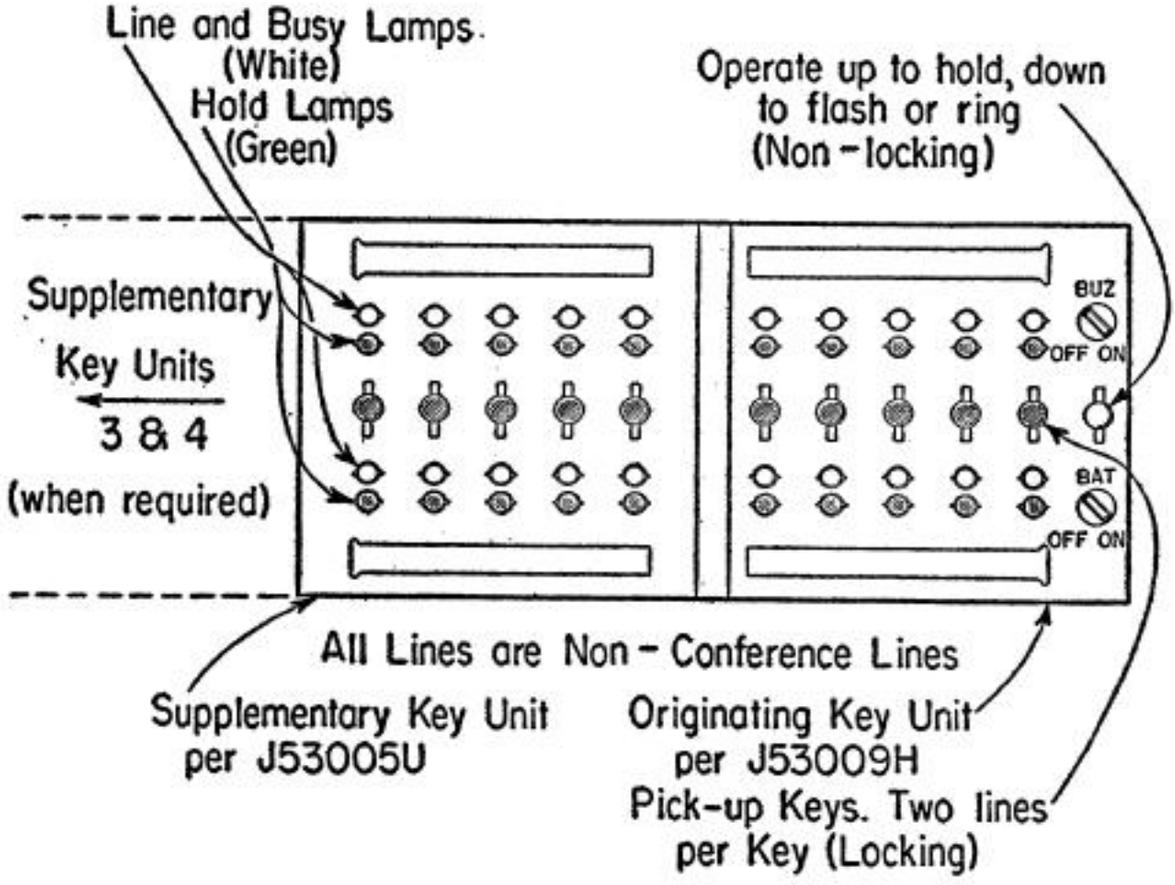


Fig. 2

2.03 When more than one attendant's position is necessary **each position** requires **one** originating unit to furnish the flash, ring, and hold key, however, only **one originating unit equipped with buzzer and battery cutoff key is required per installation.**

2.04 When long line and similar circuits are terminated in the key units the hold lamp is used as a supervisory lamp. The lamp caps associated with these circuits, in this case, may be changed in the field from green to red.

2.05 The type 3 position, which resembles the type 1 and type 2 in appearance, is used for supervisory and monitoring purposes and requires the use of key unit J53009AH. A different faceplate is furnished with this key unit which provides group (GRP) and monitor (MON) keys in the spaces otherwise occupied by the BUZ and BAT keys respectively. The flash, ring and hold key, although provided, is not required. The group key (GRP) allows the attendant at a type 3 position to answer or originate calls at an adjacent attendant's position.

The monitoring key (MON) enables the supervisor to listen in or talk to any attendant.

2.06 As shown in Figs. 3 and 4, the key and lamp units are arranged to be mounted flush in a desk or table or upright on a desk or table. The key units may also be installed in customer furnished consoles of various sizes.

2.07 The flush mounted arrangement is also designed so that the faceplate may be tilted at an angle of about 20 degrees with the mounting surface. With this tilted arrangement the front edges of the faceplate will be substantially flush with the mounting surface. A wooden framework with a mahogany walnut finish encloses the raised part of the key units. Frameworks are available to mount one, two, three, or four key units in either the flush mounted or cabinet arrangements. Frameworks are not always necessary in customer-owned consoles. Where more than four key units are required for special installations, they are generally installed in customer furnished consoles.

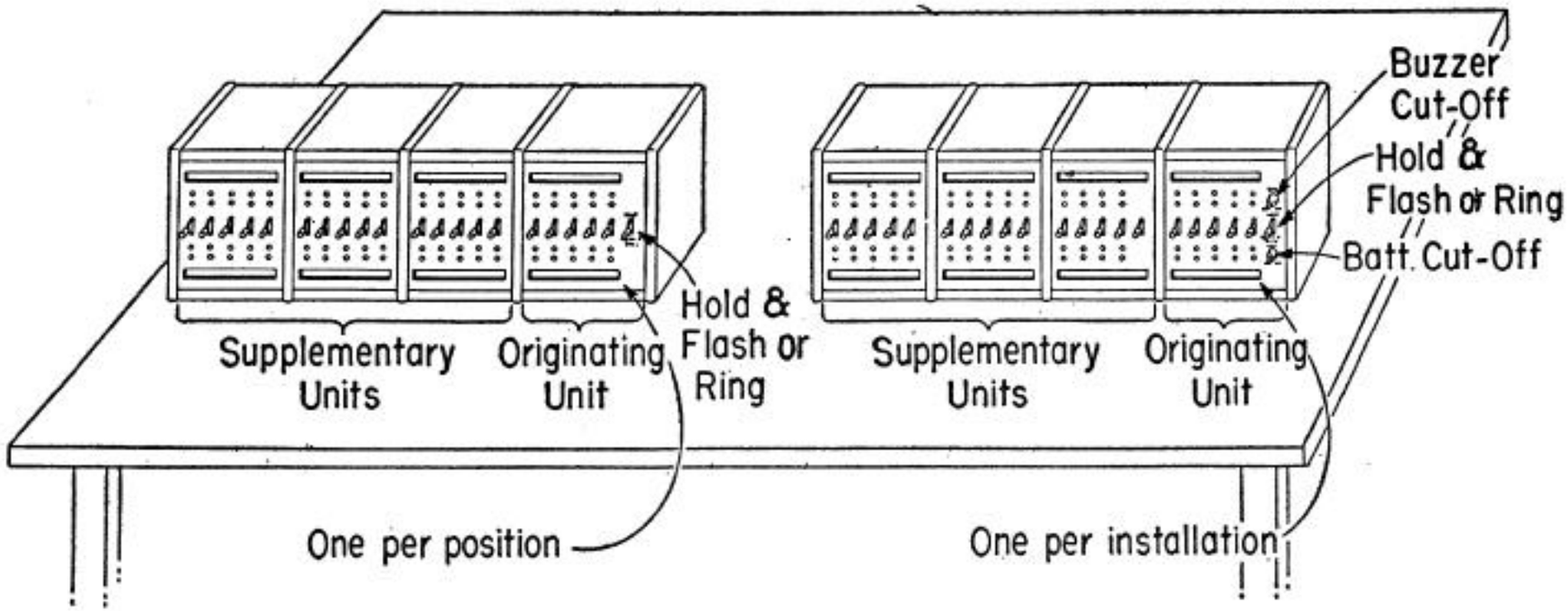


Fig. 3—Upright Installation

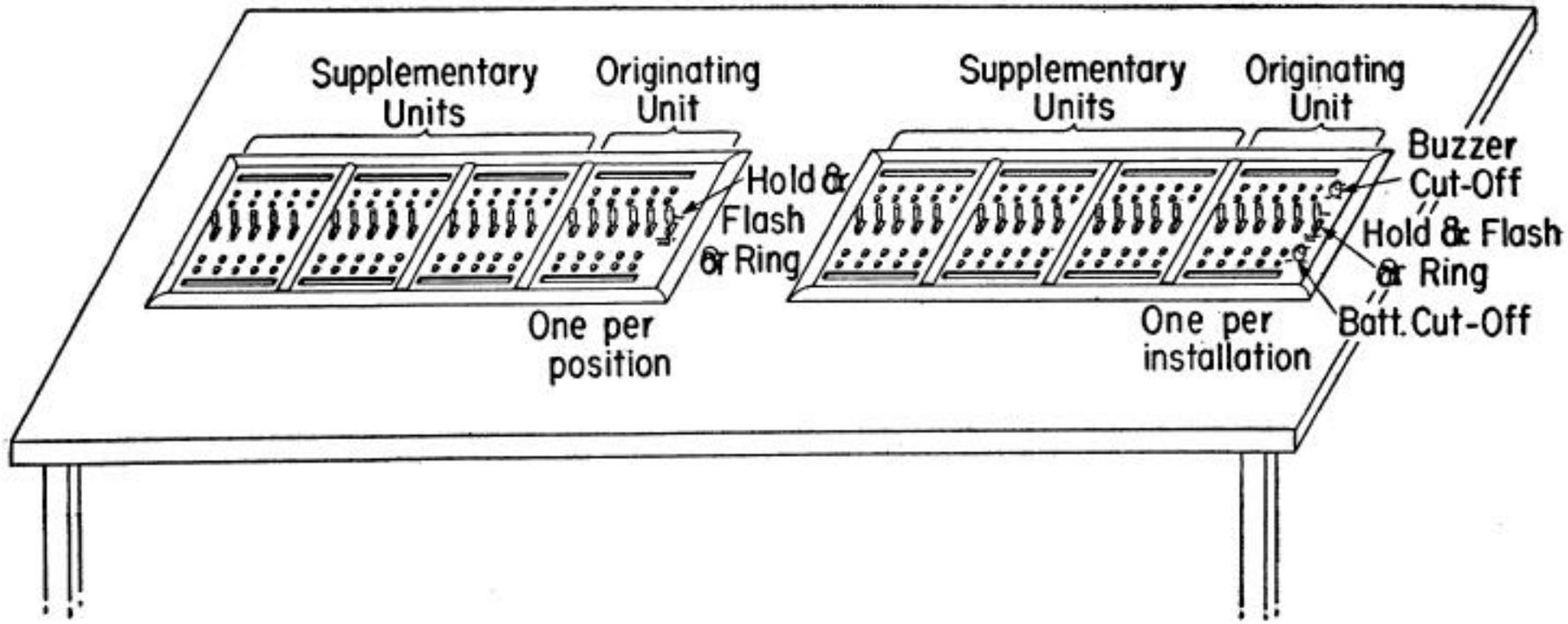


Fig. 4—Flush Installation

2.08 Designation strip holders are located at the top and bottom of the key unit faceplate and are designed to permit insertion or removal of designation strips from the front without disturbing any part of the unit. A detachable card holder, coded 9A, and a wider designation strip are available if the writing space is inadequate on the designation strip furnished with the key equipment.

Equipment Units

2.09 The relay units are furnished on 19- by 1-3/4-inch mounting plates and may be mounted in standard equipment cabinets or on 19-inch relay racks, or on 23-inch relay racks by means of adapters. Each relay unit is provided with one or more 195-type terminal strips.

Attendants' Telephone Sets

2.10 Head telephone sets and handsets equipped with or without transmitter cutout and push-to-talk switches are available for use at attendants' positions.

2.11 Conference and nonconference stations are usually equipped with subscriber sets and hangup type hand telephone sets. The 329-type telephone set may be used at these locations in lieu of the hangup type sets if desired. F3-type handsets are provided which have a push-to-talk key arranged to close the transmitter circuit when operated.

2.12 Cords used with 52-type head telephone sets are furnished in 10- and 7-foot lengths with or without (as desired) a switch to control the transmitter circuit. Retractile cords in the above lengths are available when required. The 53-D head telephone set is available with a 12-foot retractile cord only, equipped with a switch arranged for nonlocking (push-to-talk) and locking (transmitter cut in) operation.

3. SIGNALING

Visual

3.01 Incoming calls are indicated by a flashing line lamp which lights steady when answered to denote a busy condition. A second lamp associated with each line key is used for hold or supervisory signal indication. The hold lamp is used for central office, PBX, and local (2-wire) private lines terminating on nonconference keys. The hold lamp is lighted steady when the associated line is in a holding condition and is extinguished when the line key is reoperated. The supervisory lamp is used with local conference lines and toll (4-wire) nonconference lines to signal individual or groups of positions.

3.02 On manual and dial conference lines, the line and busy lamps flash at all attendants' positions on incoming calls, but the supervisory lamp lights only at the position being called. When any attendant answers, the line and busy lamps light steadily at all positions. The supervisory lamp remains lighted at the called position until the line is released.

3.03 On dial selective (2-tone) nonconference lines (when supervisory lamp is not used) the line and busy lamp flashes only at the key box position which is being called and lights the line and busy lamps steadily at other positions. When the call is answered, all line and busy lamps are lighted steadily. When the supervisory lamp is used the line and busy lamps flash at all positions and the supervisory lamp is lighted steadily at the position or group of positions dialed.

3.04 On manual long line circuits arrangements for selective signaling by long and short rings are provided when key equipment positions are divided in two groups (called A and B positions). When a long ring is received the line and busy lamps flash at all A and B positions and the buzzer sounds at the B positions. When a short ring is received the line and busy lamps light steadily at all positions and the supervisory lamp flashes at the A positions. The associated A position buzzer sounds also. When an incoming call is answered the supervisory lamp is extinguished and the line and busy lamps light steadily at all positions until the line is released. A call may be transferred from a B position to an A position by operation of the B position hold key. This causes the line and busy lamps to light steadily at all positions and the supervisory lamps to flash at the A positions. The buzzer at the A positions operates also. (See Paragraph 3.08.)

3.05 When line appearances exceed 12, auxiliary line, supervisory, and hold relay equipment is required.

3.06 Visible filament lamp caps (75-type) are available for use with key units at locations such as airport towers where the units may be exposed to direct sunlight. Use of the 75-type lamp cap on the key unit provides a very satisfactory visible signal in such instances.

Audible

3.07 A common buzzer arranged to operate on ringing current is provided, when desired, for all incoming signals. The long line circuits have a separate buzzer which operates on a dc basis in addition to the common buzzer.

3.08 When other dc buzzer circuits are required for transferring calls from one type of position to another they must be installed on a miscellaneous basis.

4. EQUIPMENT FEATURES

Attendant's Telephone and Key Circuit—SD-69159-01

4.01 This circuit in addition to various other functions, provides a means for connecting an attendant's telephone set to the following types of lines:

(a) Central office or PBX line.

(b) Tie lines to other key equipment.

(c) 2-wire private line.

(d) 4-wire private line.

(e) Long line.

(f) Station line arranged for conference service.

(g) Station line not arranged for conference service.

(h) 4-wire private line arranged for selective signaling of station by means of 600- and 1500-cycle (2-tone) signal controlled by dial pulses.

(i) 4-wire private line arranged for connecting the private line to another private line or to a local 4-wire station line by dialing two digit codes.

4.02 Typical arrangements of associating these lines with the attendant's telephone and key circuit are covered in Paragraphs 4.04 to 4.25.

Signal Circuit—SD-69127-01

4.03 This circuit provides a means for flashing the (line and busy) lamps of lines and for operating the common audible signal on incoming calls. This circuit also provides an audible and visual alarm signal which may be provided for certain installations to indicate when a fuse has operated.

Manual Conference Line—SD-69122-01 (Fig. 5)

4.04 This arrangement consists of a circuit which will provide 2-way service between the 102A key equipment and a key equipment station. Several of these lines may be picked up at the 102A key equipment position to establish conference connections. The line circuit is arranged for automatic incoming signaling to the 102A key equipment and ringdown signaling to the station. The key equipment attendant can signal two or more stations simultaneously by operation of the corresponding line keys and the common ringing key. An optional feature of this circuit is to provide a separately mounted busy lamp indicator at the station to indicate whether the 102A key equipment attendant to be called is busy on any line other than central office or PBX lines.

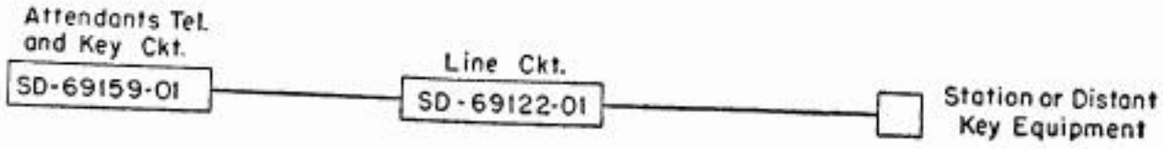


Fig. 5

Dial Conference Line—SD-69146-01 (Fig. 6)

4.05 This arrangement consists of a circuit which will provide 2-way service between the 102A key equipment and a distant station or key equipment. It is arranged for conference service and enables the distant station to dial any one of nine key equipment attendants. Signaling to the distant station by the 102A key equipment is on a ringdown basis and two or more stations may be signaled simultaneously as described in Paragraph 4.04. The push-to-talk feature at distant stations requires the use of the F3J-3 handset as shown on SD-69126-01.

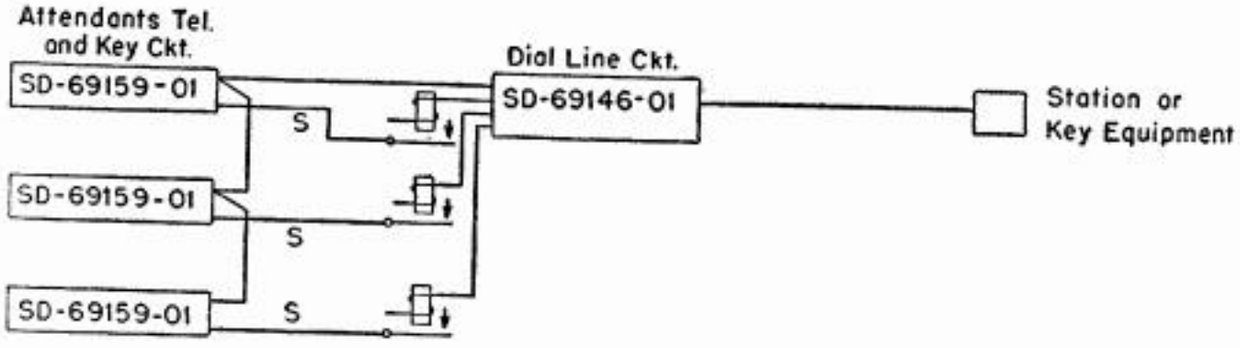


Fig. 6

Dial Conference Line—SD-69202-01 (Fig. 7)

4.06 The operating features of this circuit are the same as SD-69146-01 covered in Paragraph 4.05 except that it is arranged to enable the distant station to dial any one of 50 or 90 key equipment attendants. A 48-volt battery must also be available for this circuit.

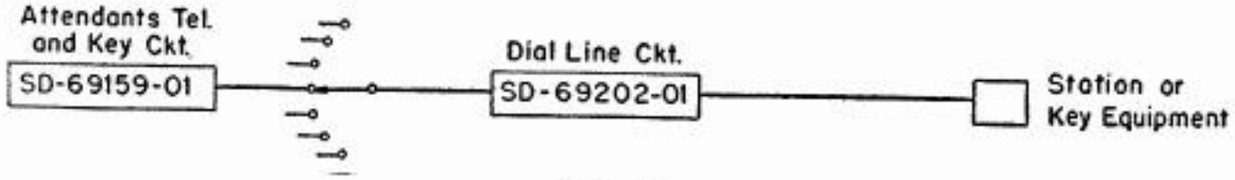


Fig. 7

Line or Ringdown Tie Line—SD-69076-01 (Fig. 8)

4.07 This arrangement consists of a circuit which will provide 2-way service between the 102A key equipment and a central office, PBX, key equipment station or another key equipment. Provision is made for ringdown or automatic signaling and for holding on central office or PBX lines.

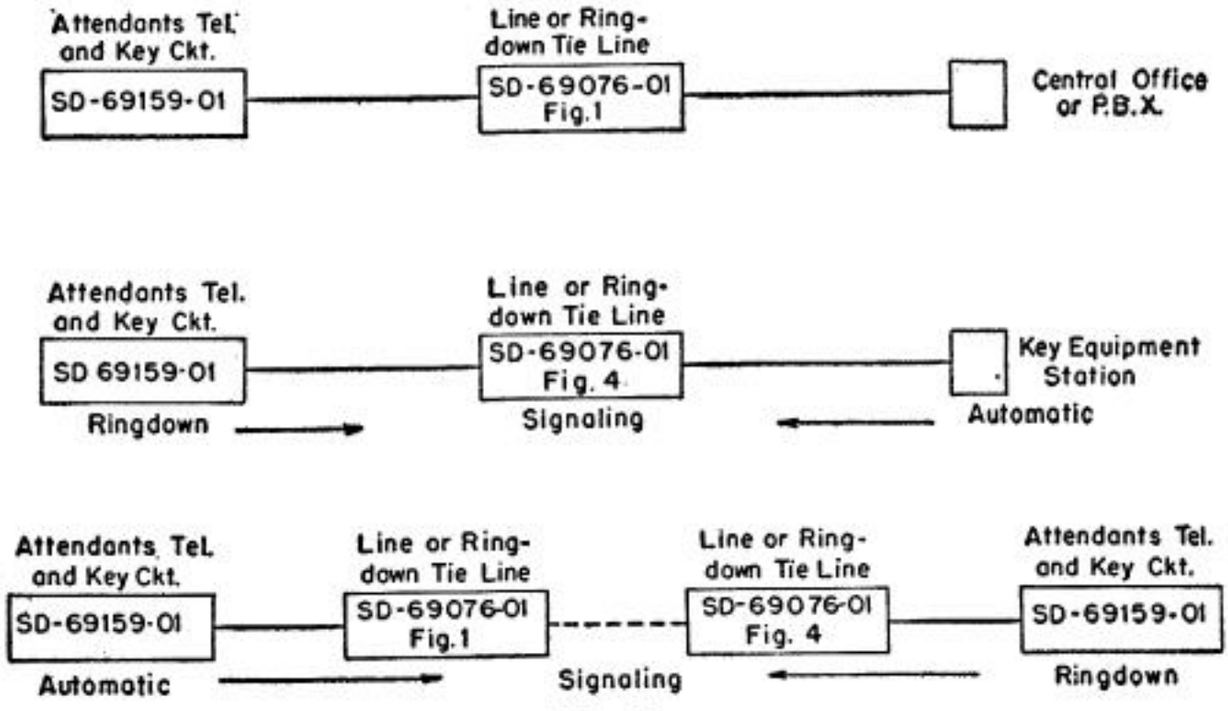


Fig. 8

Line or Automatic Tie Line—SD-69111-01 (Fig. 9)

4.08 This arrangement will provide 2-way service between 102A key equipment and other key equipments or a key equipment station.

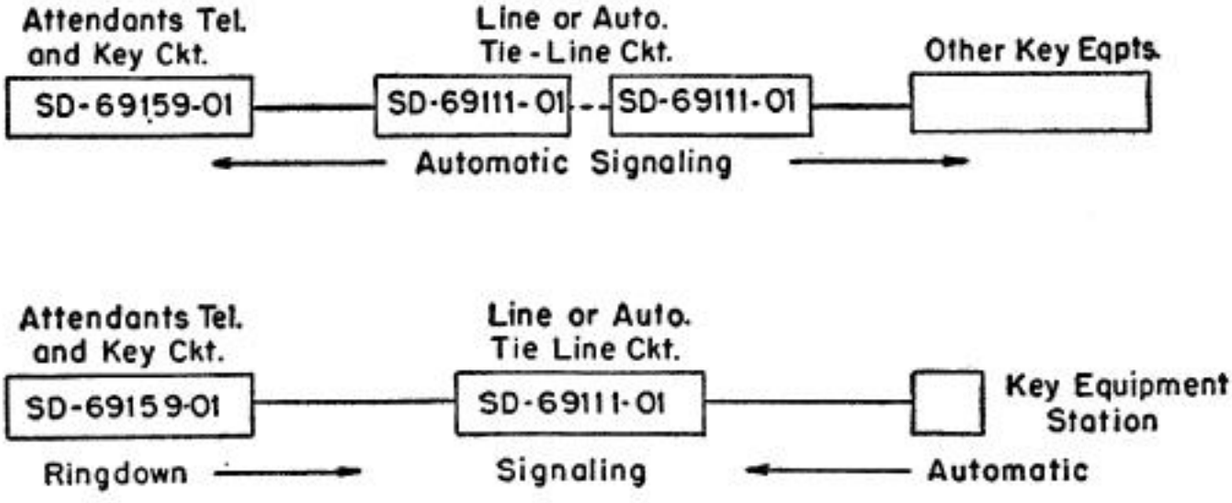


Fig. 9

Line Circuit and Station Circuit for 2-Wire Multistation—Line—SD-69157-01 (Fig. 10)

4.09 This arrangement consists of a circuit used to provide a 2-wire intercommunication line for use at a number of stations in a local area. It also provides a line circuit for a 102A key equipment that will be associated with the 2-wire intercommunication line and will permit any station on the line

to signal the attendant at the key equipment by means of a nonlocking key.

4.10 As shown in Fig. 10, signaling from the attendant's position may be either by voice or 20-cycle ringing. Where loudspeakers are also provided at the attendant's position, the nonlocking key shown at the stations is not required.

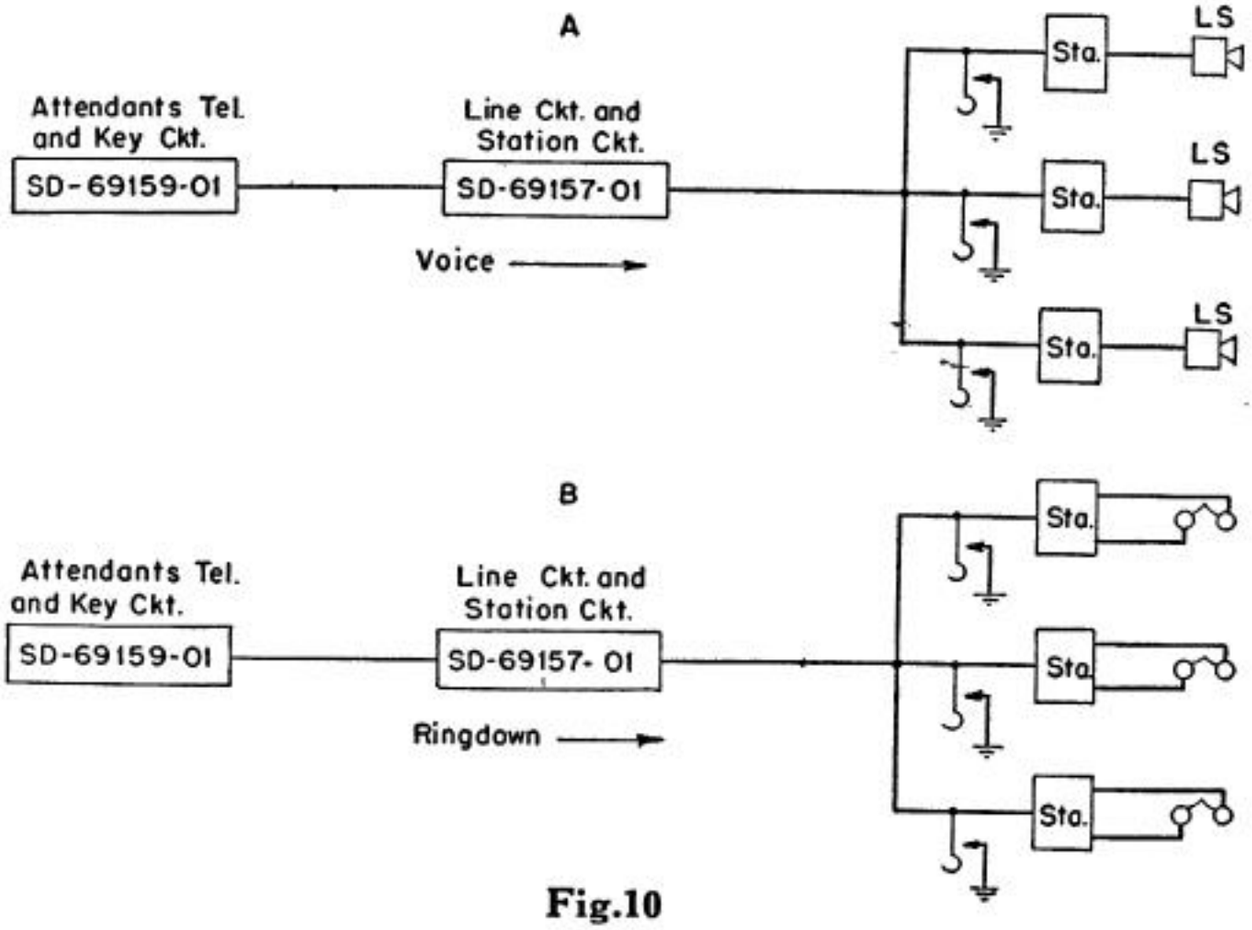


Fig.10

4.11 Arrangement A provides voice signaling between stations by means of the loudspeakers. No signaling is provided betwen stations under arrangement B.

Manual Long Line Circuit Arranged for Selective Signaling—SD-69164-01 (Fig. 11)

4.12 This arrangement provides 2-way service between a 102A key equipment and a station or a group of stations over a toll or long line. Incoming signaling is on an automatic, ringdown or dc basis. Also provided is an arrangement that will permit selectively signaling key equipment positions when they are divided into two groups. An attendant in one group may transfer a call to a position in another group. Switch control circuits are available to control the remote switching of 4-wire toll lines in the associated central office.

4.13 This circuit requires a pickup relay per line per position for each 102A key equipment position.

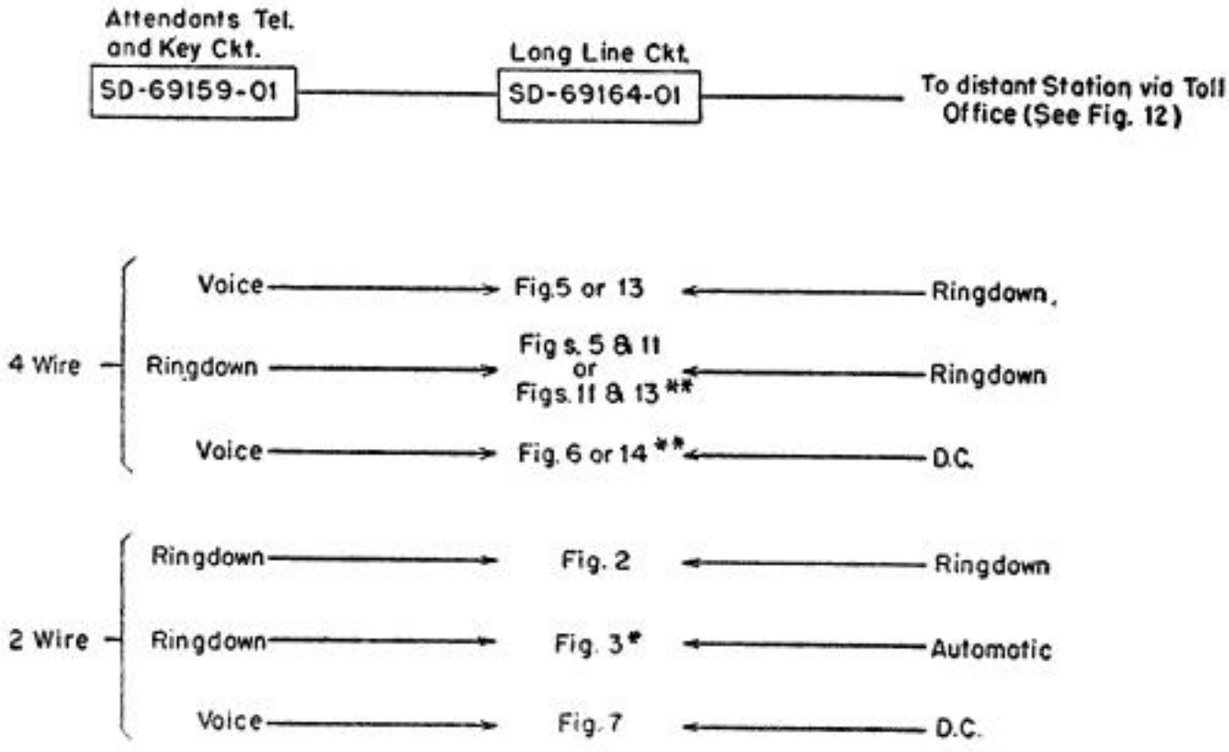


Fig. 11

* Not arranged for incoming selective signaling option. Pickup relay is not required.

** Optional simplex (SX) or composite (CX) switch control feature is provided.

2- or 4-Wire Toll Lines with Cutoff of Bridged Stations—SD-69158-01 (Fig. 12)

4.14 This circuit is for use on private toll circuits for connecting 2- or 4-wire toll lines to station sets or to key equipment positions. It is arranged so that with a 4-wire toll line either a main station set or the key equipment position will always be connected to the toll line.

4.15 Provision is made so that the key equipment or any station connected to a toll line can signal over the toll line by operating a key. Provision is made for switching keys at the key equipment or main station to permit the switching of toll lines at the toll office. 4-wire lines employing dial selective (2-tone) signaling are covered in Section C53.431. Two typical arrangements are shown in Fig. 12.

4.16 This circuit requires a pickup relay per line per position for each 102A key equipment position.

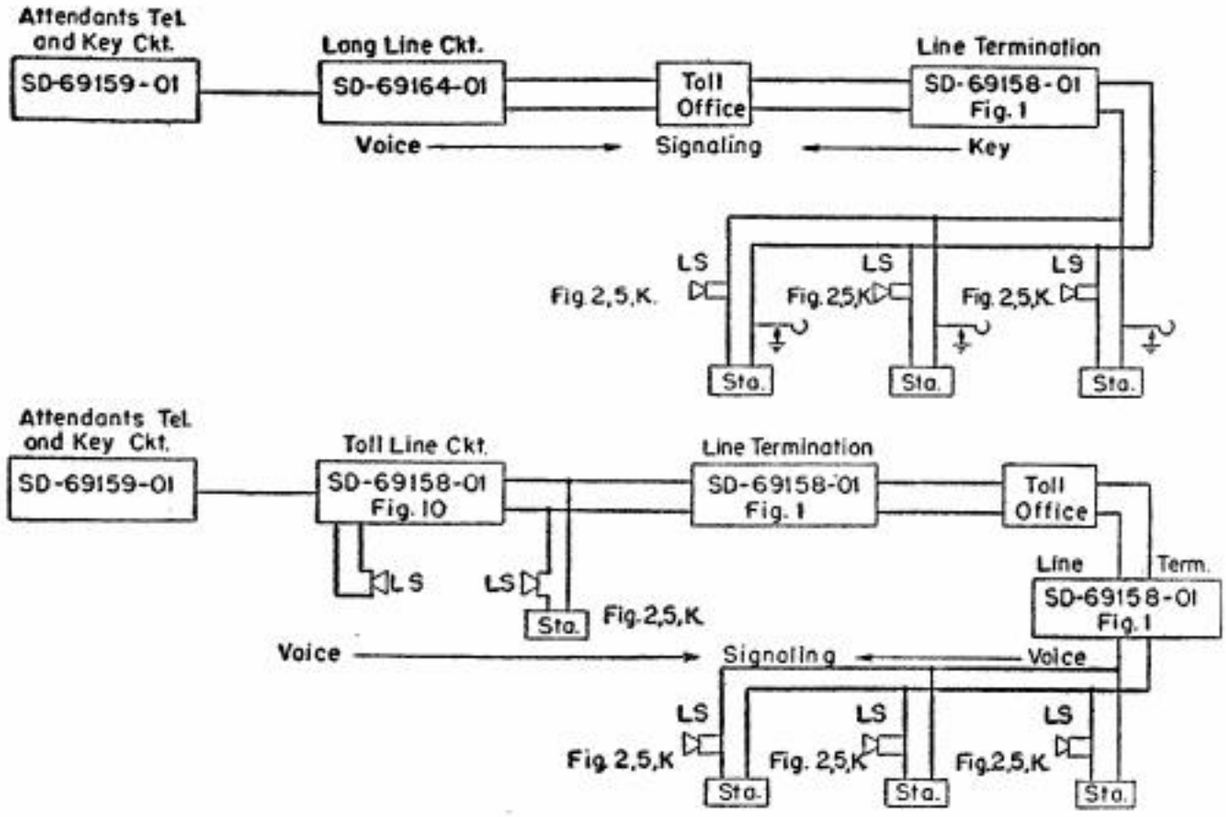


Fig. 12

Auxiliary Line Circuit for Terminating Service from Dial PBXs—SD-69201-01 (Fig. 13)

4.17 This arrangement consists of a circuit that will provide an auxiliary line circuit for overriding an attendant's telephone circuit on calls through a dial PBX.

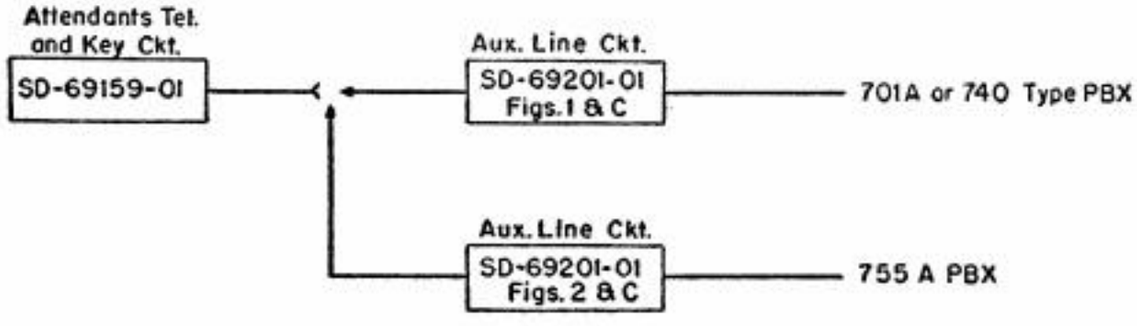


Fig. 13

Supervisor's Telephone and Key Circuit Arranged for Grouping and Common Key Monitoring—SD-69184-01 (Fig. 14)

4.18 This circuit will provide for a supervisory position to listen in or talk to any attendant and, by means of a grouping key, to answer or originate calls on an adjacent attendant's position. This arrangement consists of a type 3 key box and associated operator's telephone circuit.

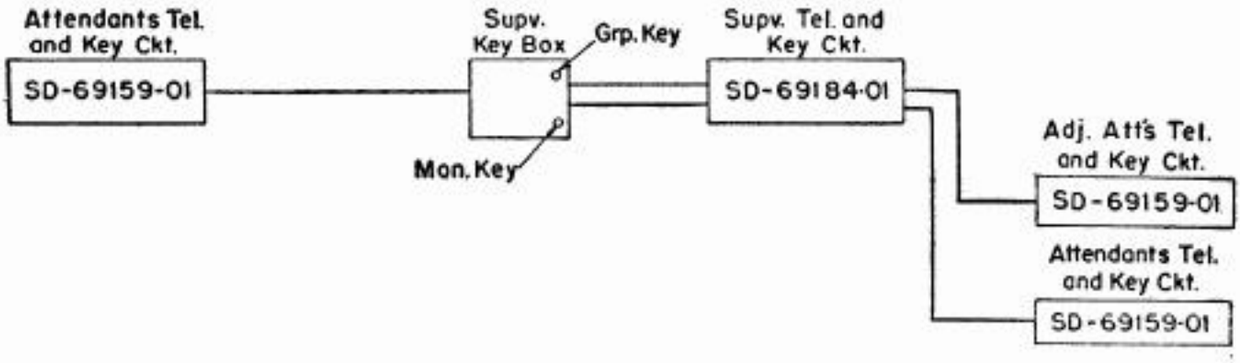


Fig. 14

Supervisor's Telephone and Key Circuit Arranged for Connecting to Two Attendants' Positions—SD-69192-01 (Fig. 15)

4.19 This circuit provides a supervisory arrangement for small installations to permit the supervisor to listen in, talk, and record on either of two attendants' positions. When a key is operated to connect to either attendant, the receiver of the supervisor's head set (or handset) will be connected across the line to the attendant for listening in and the recorder (if provided) will start recording. If it is desired to talk, the transmitter cutout switch of the head telephone set or the push-to-talk handset button must be operated.

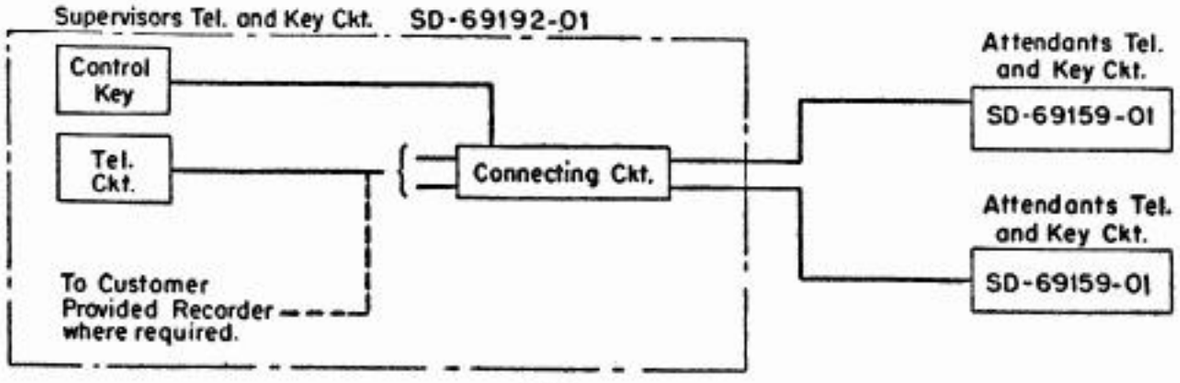


Fig. 15

Service Observing Circuit—SD-69166-01 (Fig. 16)

4.20 This circuit is for use in observing service on lines of the 102A key equipment and (if desired) for recording while observing. The talking leads of the circuits to be monitored are terminated on jacks in the cabinet and the desired line is picked up by placing the monitoring plug in the jack of the line that is to be monitored. A high impedance observing bridge is placed across the circuit and will cause no appreciable transmission impairment. Forty lines may be terminated in the cabinet.

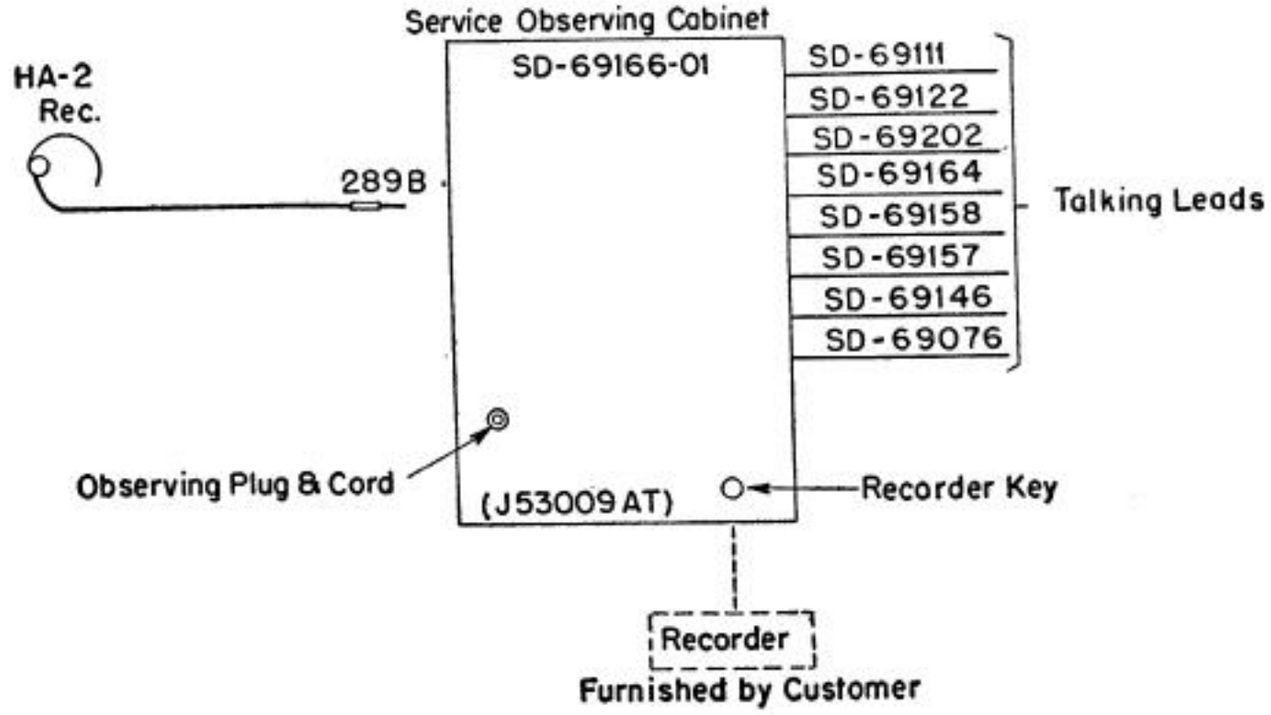


Fig. 16

Grouping Key Circuit—SD-69141-01

4.21 This circuit is used to provide a means for grouping the supervisory lamps associated with station lines and long lines arranged for dialing, from a vacant to an occupied position by means of a separate or auxiliary key.

4-Wire Private Line and Station Circuit—SD-69191-01

4.22 This circuit provides for terminating a 4-wire private line at 102A key equipment positions. It is intended primarily for use at attendants' positions of a Military Flight Control Center, the other end of the private line being terminated at a Civil Aeronautic Administration Traffic Control Center.

4.23 A feature of this circuit enables a position attendant to connect the 4-wire private line to another 4-wire private line, or to a local 4-wire station intercommunicating line, by dialing a 2-digit code. This additional feature requires supplementary equipment which is covered in Paragraph 4.24.

Private Line Selection Switch Circuit—SD-95491-01

4.24 This circuit provides a step-by-step switch which responds to dial pulses (2-digit codes) and repeats the pulses. Two of these circuits will be associated with one 4-wire private line; one circuit will be located at the 102A key equipment and the other circuit will be located at the toll office which serves the 102A key equipment installation. The bank terminals of the switches are connected to line circuits and the stepping of the switches causes the 4-wire private line to be

bridged to another 4-wire private line associated with the bank terminals reached by the switch.

Intercommunicating Line Circuit Arranged for Dialing—SD-69183-01 (Fig. 17)

4.25 This circuit is used to provide a means for communicating between attendants at the same installation. Any one of 20 attendants may dial any other attendant.

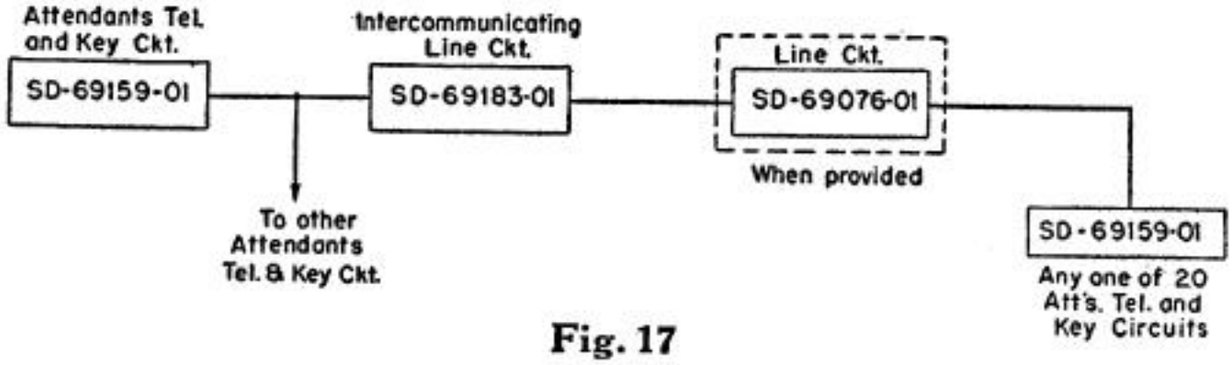


Fig. 17

Note: Intercommunication is generally provided through dial PBXs in lieu of this arrangement.

Typical Installation

4.26 Fig. 18 shows a typical 102A key equipment installation.

5. POWER SUPPLY

5.01 The circuits of the 102A key equipment are designed to operate on a 20- to 25-volt regulated battery supply and it is recommended that the 101E power plant be used for power supply. For large installations a higher capacity power plant, 101F, may be used with modifications to insure a minimum regulated voltage of 20 volts. The 101E power plant which is described in Specification J86566 has a capacity of 30-ampere hours and may be charged either by means of battery feed pairs from a central office or by means of a rectifier. The batteries and associated charging equipment are arranged to mount in a standard 18-plate apparatus cabinet.

5.02 Ringing supply for the key equipment positions will be furnished over ringing feeders from the central office or from local supply, if available.

5.03 A 48-volt supply is necessary for the conference dial arrangement (SD-69202-01). The provision of the 48-volt power supply would depend on local conditions.

6. DRAWINGS

6.01 The various drawings covering circuit and equipment details for the 102A key equipment are covered in Section AA321.008 (J53009). This section may be furnished by the Engineering Department when it is needed.

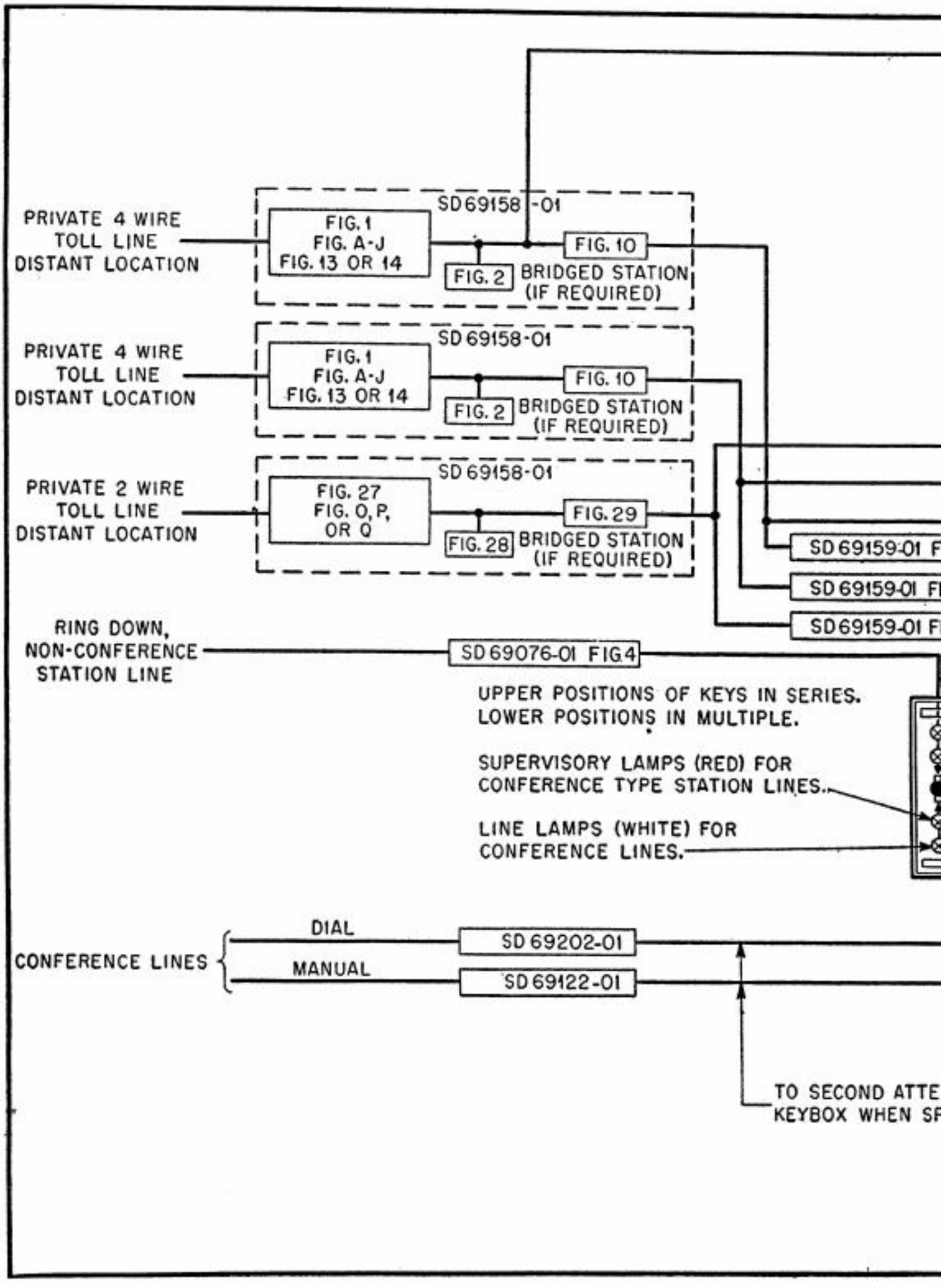
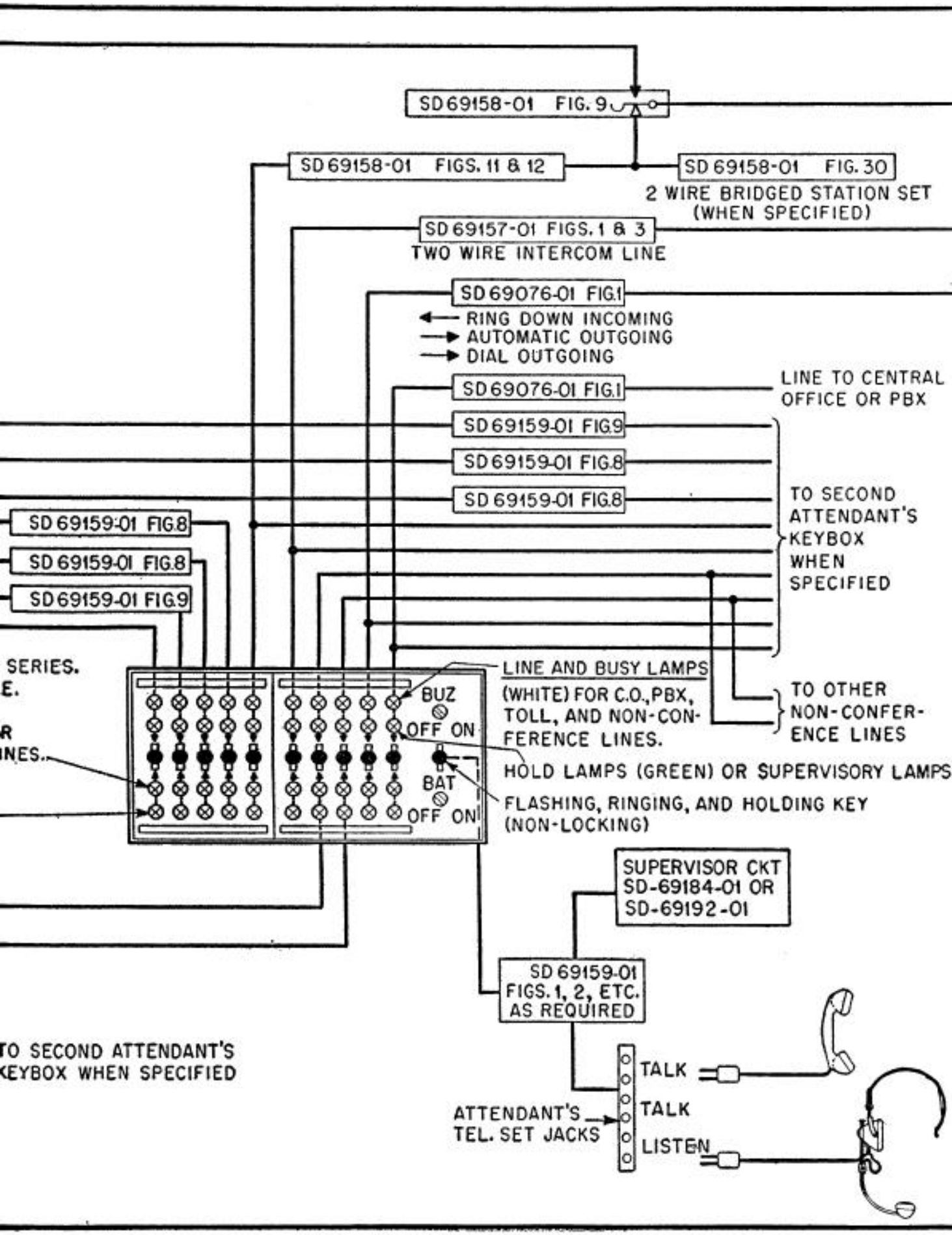
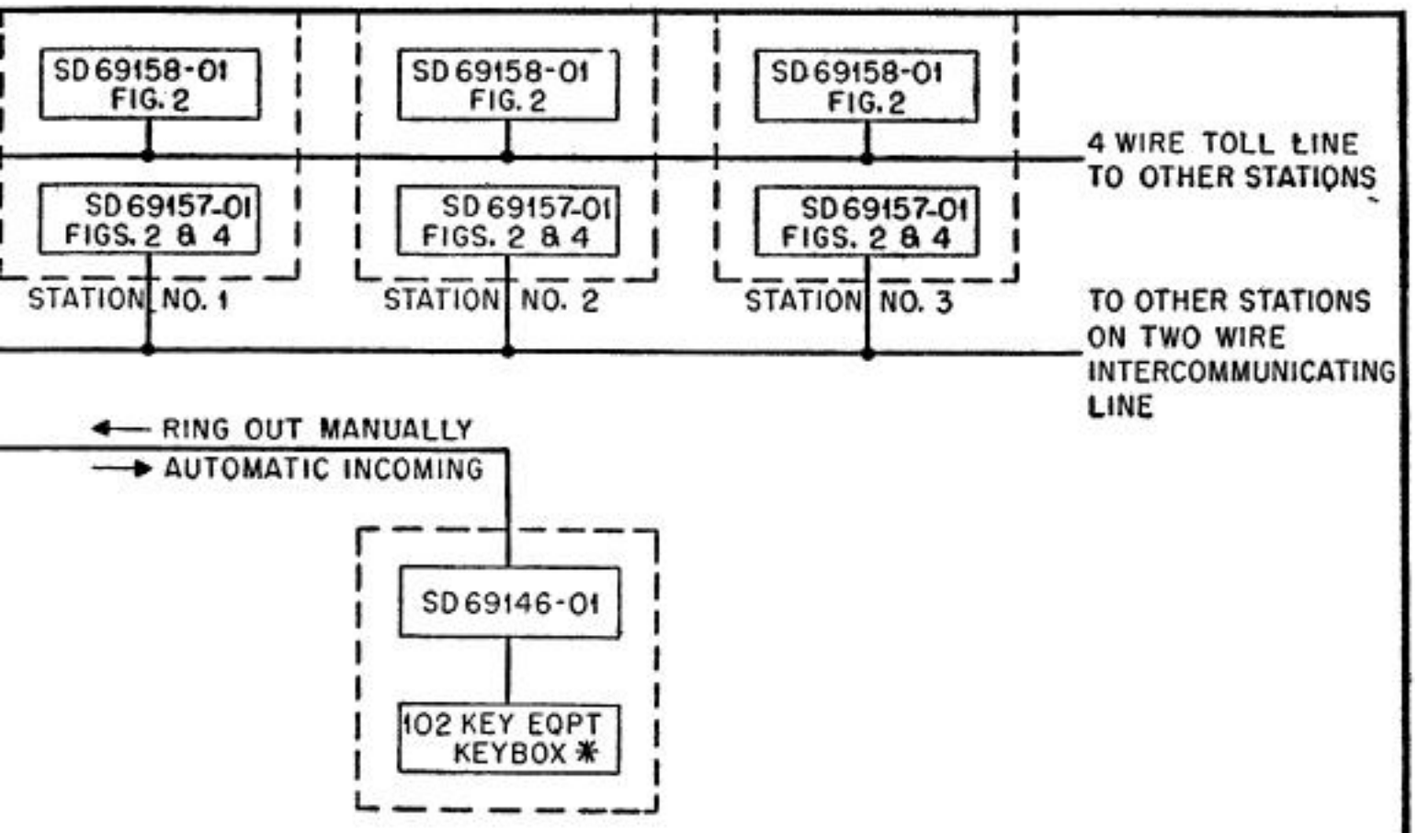

PRIVATE 4 WIRE TOLL LINE DISTANT LOCATION
SD 69158-01
FIG. 1 FIG. A-J FIG. 13 OR 14
FIG. 10
FIG. 2
BRIDGED STATION (IF REQUIRED)
PRIVATE 4 WIRE TOLL LINE DISTANT LOCATION
SD 69158-01
FIG. 1 FIG. A-J FIG. 13 OR 14
FIG. 10
FIG. 2
BRIDGED STATION (IF REQUIRED)
PRIVATE 2 WIRE TOLL LINE DISTANT LOCATION
SD 69158-01
FIG. 27 FIG. O, P, OR Q
FIG. 29
FIG. 28
BRIDGED STATION (IF REQUIRED)
SD 69159-01 F
SD 69159-01 F
SD 69159-01 F
RING DOWN, NON-CONFERENCE STATION LINE
SD 69076-01 FIG 4
UPPER POSITIONS OF KEYS IN SERIES. LOWER POSITIONS IN MULTIPLE.
SUPERVISORY LAMPS (RED) FOR CONFERENCE TYPE STATION LINES.
LINE LAMPS (WHITE) FOR CONFERENCE LINES.
CONFERENCE LINES
DIAL
SD 69202-01
MANUAL
SD 69122-01
TO SECOND ATTE
KEYBOX WHEN SP

Fig. 18


SD 69158-01 FIG. 9
SD 69158-01 FIGS. 11 & 12
SD 69158-01 FIG. 30
2 WIRE BRIDGED STATION SET (WHEN SPECIFIED)
SD 69157-01 FIGS. 1 & 3
TWO WIRE INTERCOM LINE
SD 69076-01 FIG. 1
RING DOWN INCOMING
AUTOMATIC OUTGOING
DIAL OUTGOING
SD 69076-01 FIG. 1
LINE TO CENTRAL OFFICE OR PBX
SD 69159-01 FIG. 9
SD 69159-01 FIG. 8
SD 69159-01 FIG. 8
TO SECOND ATTENDANT'S KEYBOX WHEN SPECIFIED
SD 69159-01 FIG. 8
SD 69159-01 FIG. 8
SD 69159-01 FIG. 9
SERIES.
E.
R
INES.
LINE AND BUSY LAMPS (WHITE) FOR C.O., PBX, TOLL, AND NON-CONFERENCE LINES.
TO OTHER NON-CONFERENCE LINES
BUZ
OFF ON
BAT
OFF ON
HOLD LAMPS (GREEN) OR SUPERVISORY LAMPS
FLASHING, RINGING, AND HOLDING KEY (NON-LOCKING)
SUPERVISOR CKT SD-69184-01 OR SD-69192-01
SD 69159-01 FIGS. 1, 2, ETC. AS REQUIRED
TO SECOND ATTENDANT'S KEYBOX WHEN SPECIFIED
TALK
ATTENDANT'S TEL. SET JACKS
TALK
LISTEN



* DIAL ANY ONE OF 9 POSITIONS

OTHER STATIONS AT SAME LOCATION.