

1. PURPOSE OF CIRCUIT

- 1.1 This circuit provides intercommunicating facilities to a maximum of nine stations on a single subscriber's premises, arranged so that each station on the line can selectively signal the other stations on the line by one-digit dialing codes.

2. WORKING LIMITS

- 2.1 Maximum station conductor loop 50 ohms.

3. FUNCTIONS

- 3.01 Provides talking battery for the stations interconnected by this line circuit.
- 3.02 Provides for a maximum of nine stations having access to the intercommunicating line.
- 3.03 Provides for operating the audible signal of the desired station, the selection of the station being made by stepping a single digit selector in response to pulses from a station dial.
- 3.04 Provides for operating the audible signal once for a period of one to three seconds.
- 3.05 Provides lamps either in lamp indicators or in the telephone sets at the stations, the lamps being lighted as a busy signal whenever the intercommunicating line is in use.
- 3.06 Provides for flashing the lamp at the station whose number is dialed.
- 3.07 Provides for relighting the lamp steadily when the called station answers a call on the intercommunicating line.

- 3.08 Provides means, on an optional basis, for automatically cutting off all other stations from the line when the line is seized by one of the stations.
- 3.09 When the stations are cut off by the seizure of the line by one of the stations, provides means for reconnecting only the station whose number has been dialed by the station which seized the line.
- 3.10 When the automatic cut-off of stations feature is furnished, provides for freeing the line to all stations when the stations connected to the line, disconnect.
- 3.11 In cases where local or building battery is not readily available, provides for obtaining power from a package power unit equipped with 20 volt DC, 18 volt 60 cycle, 10 volt 60 cycle, and 105 volt 20 cycle supplies.

4. CONNECTING CIRCUITS

When this circuit is listed on a key sheet, the connecting information thereon is to be followed.

- 4.1 Key Telephone System No. 1A Key and Telephone Circuits such as SD-69104-01, SD-69132-01, and SD-69133-01.
- 4.2 Key Telephone System No. 1A Station Circuits SD-69165-01.
- 4.3 Key Telephone System No. 1A Line and Signaling Circuits SD-69136-01.
- 4.4 Key Telephone System No. 1A Attendant's Telephone and Key Circuit using 101A Key Equipment Key Unit SD-69196-01.
- 4.5 Key Equipment No. 101A or 101B Telephone and Key Circuit SD-69195-01.
- 4.6 Key Telephone System No. 1A1 Key and Telephone Circuit such as SD-69206-01.
- 4.7 Key Telephone System No. 1A1 Line and Signaling Circuit SD-69203-01.
- 4.8 101G Power Plant Power Supply Circuit SD-81135-01.
- 4.9 Power Rectifier Circuit SD-80555-02.

DESCRIPTION OF OPERATION

5. LINE SEIZURE

When one of the stations having access to this line, picks up the line to call one of the other stations, relay (A) of figure 1 operates. Relay (A) operated, operates relay (B). Relay (B) operated, prepares a circuit for stepping the (A) selector and causes the line and busy lamps, if provided, to light steadily at all stations as a line busy indication.

6. DIALING

When a number is dialed at the calling station, relay (A) releases and reoperates in unison with the breaks and makes of the dial pulses while the slow releasing relay (B) holds operating during pulsing. Relay (A) releasing and reoperating, operates and releases the rotary magnet which causes the (A) selector mechanism to step in a rotary direction. The slow releasing relay (C) operates on the first release of relay (A) and remains operated during the set of pulses. The operation of relay (C) closes the circuit to operate relay (T) in parallel with the (A) resistance and 1000 microfarad condenser (A). This charges condenser (A) through resistance (A).

7. SIGNALING THE CALLED STATION

At the completion of the dial pulses, relay (A) reoperates and relay (C) releases. The release of relay (C), closes the circuit to the buzzer, bell or ringer at the station whose number had been dialed, and opens the circuit to relay (T). The 1000 microfarad condenser (A) which had been charged to 24 volts is now discharged through the resistance (A) and the winding of relay (T). This holds relay (T) operated until the discharging current reaches a value which permits the release of relay (T). The circuit elements have been chosen so that relay (T) will hold operated from 1 to 3 seconds after relay (C) is released. The release of relay (T), opens the circuit to the buzzer, bell or ringer, and operates the selector release magnet which restores the selector to normal. Thus the buzzer, bell or ringer at the called station is operated for one single interval of one to three seconds.

8. TALKING

When the called station picks up the line in answer to the signal, a talking connection is established between the calling and called stations. Talking battery for both stations is supplied through the windings of relay (A).

9. DISCONNECTION

When both stations disconnect, relay (A) releases which releases relay (B). The release of relay (B) extinguishes the line and busy lamps if provided, and restores the circuit to normal.

10. FLASHING LINE LAMP FOR KEY TELEPHONE SYSTEM NO. 1A

One figure 7 is furnished per station to provide the flashing line lamp feature in the No. 1A Key Telephone System. When the station originating the call picks up the line, relay (B) of the 6C key telephone unit in figure 7 "X" option, operates in series with relay (A) of figure 1. The operation of relay (B) performs no useful function at this time. If the automatic cut-off feature is provided, the 6C key telephone unit is not furnished. When relay (C) releases at the completion of the dial pulses, relay (SW) of the figure 7 associated with the station whose number has been dialed, operates over leads "C" and "A" of figure 1. Relay (SW) operated, (1) locks operated over lead "H" under control of the operated relay (B) of figure 1, (2) extinguishes the associated station line and busy lamp by disconnecting the lamp lead from the common lead to the battery supply, (3) connects the lamp lead to lead "L" of the flashing circuit of the line and signaling circuit, and (4) connects ground to the start lead "A" of the flashing circuit. Ground connected to lead "A" of the flashing circuit starts the flashing circuit which intermittently connects a battery supply to lead "L". This flashes the line and busy lamp at the station whose number has been dialed. The lamps at all other stations remain lighted steadily.

When the line is picked up by the station which has been signaled, relay (B) of the 6C key telephone unit, "X" option, operates. Relay (B) operated, releases relay (SW). If the automatic cut-off feature is provided, "W" option will be furnished instead of "X" option. In this case, a relay in the automatic cut-off control circuit figure 4 operates when the line is picked up,

which causes the release of relay (SW). Relay (SW) released, (1) disconnects the lamp lead from lead "L" of the flashing circuit, (2) connects the lamp lead to the common lead to the battery supply which relights the associated station line and busy lamp steadily, and (3) disconnects ground from the start lead "A" of the flashing circuit to stop the flashing circuit.

11. AUTOMATIC CUT-OFF OF STATIONS FOR KEY TELEPHONE SYSTEM NO. 1A

This feature is provided by furnishing an automatic cut-off control circuit figure 4 per station, a stations cut-off circuit per figure 5, and if 6 or more stations are provided, an auxiliary stations cut-off circuit per figure 6. When the station originating the call picks up the line, relay (L2) of the 25A key telephone unit in figure 4 associated with the station, operates in series with relay (A) of figure 1. Relay (L2) operated, operates relay (CT) of the 25A key telephone unit. Relay (CT) operated, (1) locks operated over lead "H" under control of relay (B) in figure 1 when the flashing line lamp feature per figure 7 is not provided, "M" option, (2) operates relay (CO) of the 26B key telephone unit in figure 5, and (3) provides a circuit for closing the "T" and "R" leads from figure 1 to the associated station when relay (CO) operates. Relay (CO) of figure 5 operated, operates relay (CO) of the 26B key telephone unit in figure 6, if provided. The (CO) relays operated, open the "T" and "R" leads from figure 1 to all stations except the station whose associated (CT) relay is operated. This prevents other stations from picking up the line. Relay (CT) is slow in releasing to hold operated during the dial pulses.

If the flashing line lamp feature is not provided, the release of relay (C) at the completion of the dial pulses operates relay (CT) of the 25A key telephone unit associated with the station which is being signaled, and this relay (CT) locks operated over lead "H" under control of the operated relay (B) in figure 1. If the flashing line lamp feature is provided, relay (CT) is operated from contacts of relay (SW) of the figure 7 associated with the station. Relay (CT) operated, closes leads "T" and "R" from figure 1 to the station which is signaled, and connects ground to hold relay (CO) of figure 5 operated if the station originating the call should disconnect.

12. FLASHING LINE LAMP FOR KEY TELEPHONE SYSTEM 1A1

One figure 12 is furnished per station to provide the flashing line lamp feature in the No. 1A1 Key Telephone System. When the station originating the call picks up the line, relay (L) of the figure 12 associated with this station operates over lead "A". The operation of relay (L) connects the tip and ring leads of the station to figure 1. When relay (C) releases at the completion of the dial pulses, relay (LS) of the figure 12 associated with the station whose number has been dialed, operates over leads "C" and "A" of figure 1. Relay (LS) operated, (1) locks operated over lead "H" under control of the operated relay (B) of figure 1, (2) extinguishes the associated station line and busy lamp by disconnecting the lamp lead from the common lead to the battery supply, (3) connects the lamp lead to lead "LF" of the lamp flashing and incoming signal time-out circuit, and (4) connects ground to the start lead "TO" of the flashing circuit. Ground connected to lead "TO" of the flashing circuit starts the flashing circuit which intermittently connects a battery supply to lead "LF". This flashes the line and busy lamp at the station whose number has been dialed. The lamps at all other stations remain lighted steadily.

When the line is picked up by the station which has been signaled, relay (L) of the figure 12 associated with this station, operates. Relay (L) operated, releases relay (LS). Relay (LS) released, (1) disconnects the lamp lead from lead "LF" of the flashing circuit, (2) connects the lamp lead to the common lead to the battery supply which relights the associated station line and busy lamp steadily, and (3) disconnects ground from the start lead "TO" of the flashing circuit to stop the flashing circuit. Disconnection by a station at the termination of the call, releases relay (L) of the figure 12 associated with the station.

13. AUTOMATIC CUT-OFF OF STATIONS FOR KEY TELEPHONE SYSTEM NO. 1A1

This feature is provided by furnishing an automatic cut-off control circuit figure 12 per station with "G" option and one stations cut-off circuit figure 13.

When the station originating the call picks up the line, relay (L) of the figure 12 associated with

this station operates over lead "A", through normally closed contacts of relay (CO), figure 13, to battery. Operation of relay (L) closes the tip and ring leads of the telephone set to relay (A) of figure 1 and operates relay (CO) of figure 13. Relay (CO) operated, opens the circuits of the (L) relays of the figures 12. This prevents other stations from connecting to the line. The release of relay (C) at the completion of the dial pulses operates relay (LS) of the figure 12 associated with the station which is being signaled. This relay (LS) operated, locks operated over lead "H" under control of the operated relay (B) in figure 1, and connects battery to the winding of the associated (L) relay. When the called station answers, the (L) relay associated with this station operates over the "A" lead. This connects the tip and ring of the station to figure 1 and releases the associated (LS) relay. When both the calling and called stations disconnect, the associated (L) relays release, releasing relay (CO) of figure 13.

14. AUDIBLE SIGNALS - FIGURES 2 AND 3

Figure 2 shows a buzzer or bell, and figure 3 shows a ringer for use as the audible signal at the called station.

15. LAMP CIRCUIT - FIGURE 9

Figure 9 shows the line and busy lamp when lamps in indicators are used at the stations. When lamps in key telephone sets or key equipments are used, the lamp is shown on the key telephone or key equipment circuit. Three types of lamps are shown in figure 9; the A3 lamp, "K" option, for use with 14-28 volt supply, the G2 lamp, "P" option, for use with 10 volt 60 cycle supply, and the K2 lamp, "U" option, for use with 47.5-50 volt supply.

16. LAMP RESISTANCE CIRCUITS - FIGURES 10 AND 11

When 24 volt DC power supply is used for lamps in key telephone sets, or when 48 volts DC over feeders is used for lamps in indicators, it is necessary to limit the lamp current. Figures 10 and 11 provide series resistances for this purpose.

17. POWER SUPPLY

The power required for this circuit may be obtained in accordance with the following power supply arrangements:

- (1) From No. 101G Power Plant which supplies in one packaged unit, all the power required, including 20 volt DC talking supply, 20 volt DC signaling supply, 10 volt 60 cycle supply for lighting lamps, 18 volt 60 cycle supply for operating buzzers, and 105 volt 20 cycle supply for operating ringers; or
- (2) 24 volt DC talking and signaling supply from local battery or over feeders from central office or building battery, power for lighting the lamps from the same local battery or over separate feeders from central office or building battery, or from 10 volt 60 cycle output of a 393A transformer, power for operating buzzers from 18 volt 60 cycle output of KS-5714, L1 or L2 transformer or from 16 volt 60 cycle supply of copper oxide rectifier J86205A, L1 and power for operating ringers from 105 volt 20 cycle output of ringing machine over feeders.

18. INFORMATION ON POWER REQUIREMENTS AND ARRANGEMENTS

Information figures, tables and formulas are shown for computing resistance of feeders, current requirements, and fusing arrangements.

Formulas 1, 2, and 3, with Tables 1, 2, and 3, show the methods of computing the maximum allowable resistance in the feeders from central office or building battery.

Formula No. 4 shows the method for computing the maximum allowable resistance in the feeders for DC supply of lamps.

Formula No. 5 shows the method for computing the maximum allowable resistance in the leads to the 10 volt 60 cycle supply.

Figures 101, 102, and 103 with Note A show the methods of fusing direct feeders from central office or building battery, for all equipment except the lamps in systems having lamps in key telephone sets.

Formulas 6, 7, and 8 show the methods of computing maximum currents which may be supplied over the battery feeds. These formulas are for use with Note A in determining the fusing of the feeders.

Figures 201, 202, and 203 with Note B show the methods of fusing the battery supply for the lamps for systems with lamps in key telephone sets.

Formula No. 9 gives the method of computing the maximum current which may be supplied over the leads from the 10 volt 60 cycle supply.

Formula No. 10 with Table No. 4 shows the method of computing the charging rate of a local battery.

Formulas 11 and 12 show the method of computing the resistance of the cable feeders when 24 or 48 volt battery feeders are used to charge the local 18 volt key telephone system battery. With these formulas, fusing note information is also given.

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