

GENERAL DESCRIPTION

NO. 12 SWITCHBOARD

1. GENERAL

1.01 This section describes the No. 12 Switchboard which has been designed for combination common battery and magneto service.

1.02 The No. 12 switchboard central office equipment consists of the following principal units:

(a) A switchboard assembly of single-position two panel sections.

(b) A small double-sided floor-supported distributing frame providing for the ultimate number of protectors and

terminal strips required for the office and also allowing space for mounting toll line repeating coil groups.

(c) A compact floor-supported power plant including a 23-cell battery, one or two Tungar rectifiers, and a motor-driven magneto ringing generator.

2. GENERAL EQUIPMENT AND CIRCUIT ARRANGEMENTS

Section Equipment

2.01 The No. 12 switchboard employs a two 12-inch panel single-position section, as illustrated by Fig. 1. This section serves for both local and toll service.

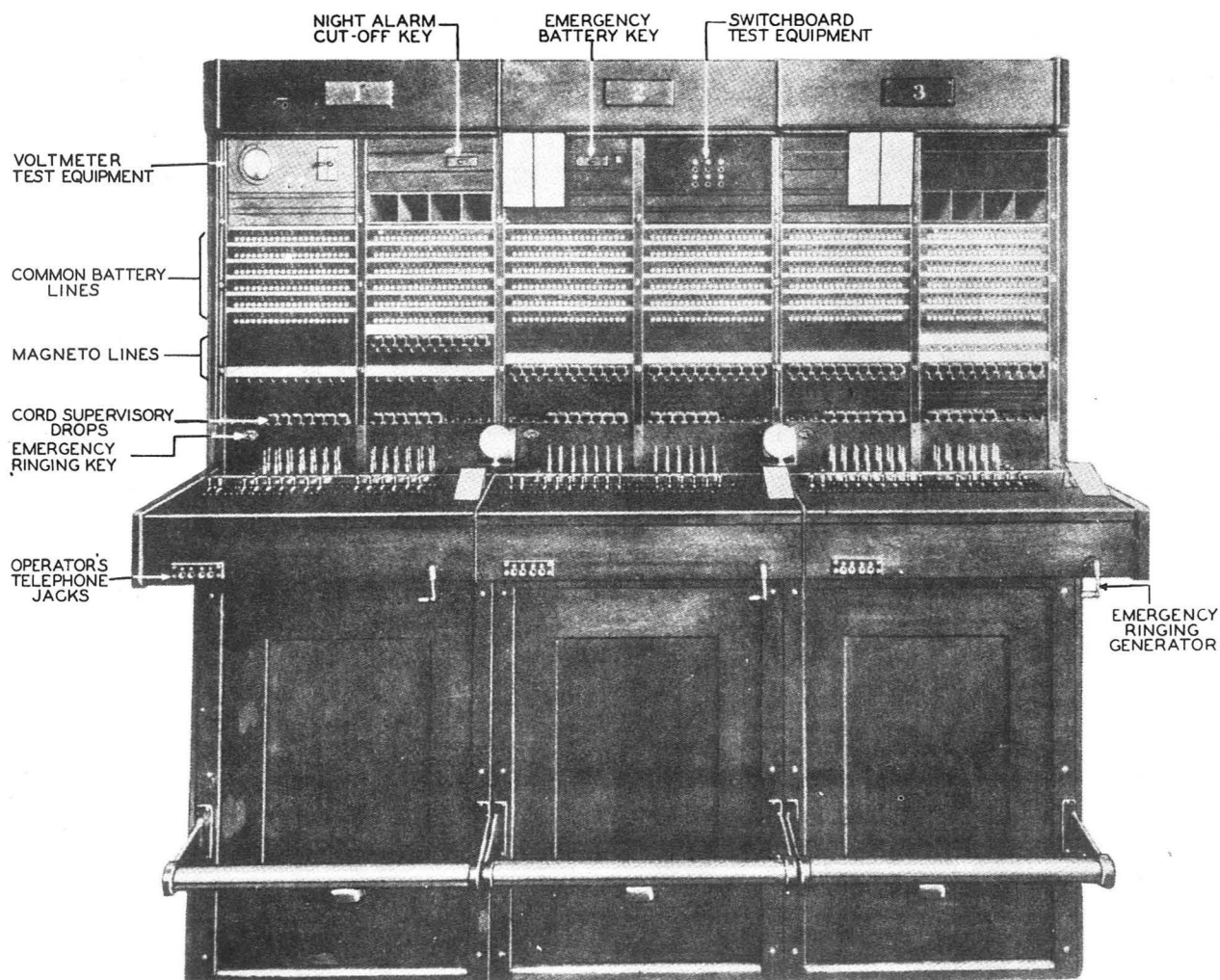


Fig. 1 - No. 12 Switchboard - Front View.

2.02 The switchboard is arranged for only one direction of growth, namely, from left to right.

2.03 The equipment arrangement provides for a maximum of 640 common battery subscriber lines and 80 magneto lines. The latter circuits may be used interchangeably for rural subscriber lines, toll lines or ringdown trunks.

2.04 All lines are multipled on a four panel basis.

Keyshelf Equipment

2.05 The keyshelf is wired for 15 full universal cords of which 13 are normally equipped. In addition to the usual back and front supervisory lamps, a clearing out drop is provided with each cord circuit and mounted in the face of the switchboard in line with the associated cord pair. Single lever short base keys are furnished for talking and ringing.

2.06 The keyshelf also includes two positional lever-type keys which are located at the left end of the position. The one at the extreme left serves as a night alarm release key when operated to a non-locking position toward the operator, and as a one-way grouping key when operated to a locking position away from the operator. The other key, which is adjacent, when operated to a locking position away from the operator is used for high impedance monitoring and when operated to a locking position toward the operator, reverses the ringing current. The latter key will, of course, be operated in conjunction with individual cord keys for monitoring and tip-party ringing, respectively.

2.07 The operator's telephone set jacks and emergency hand generator crank are located at the left and right ends of the keyshelf lock rail, respectively. Space is reserved on the keyshelf for locating a ticket pad holder and a Waltham clock.

Front Equipment

2.08 The arrangement of the front equipment in a typical office is shown in Fig. 1.

2.09 An emergency ringing key is located in the piling block of the left panel of each position. The cord drops are mounted immediately above the piling block.

2.10 An emergency talking battery arrangement is provided if required and the associated emergency battery key and guard lamp are located in the jack field of the switchboard.

2.11 A night alarm cutoff key is also provided in the jack field.

3. DESCRIPTION OF CIRCUITS

Common Battery Line

3.01 The common battery line circuit consists of one or more cutoff jacks and lamp sockets with the line lamp in series with the line, as shown in Fig. 2. Multiple lamp sockets are furnished primarily to allow flexibility in assigning answering jack lamps. A single 48-volt tungsten line lamp is capable of providing ample illumination for subscriber loops up to 600 ohms. Two lamps may be equipped for line loops not exceeding 300 ohms. Lamps and lamp caps may be selected to provide adequate illumination over loops longer than 600 ohms.

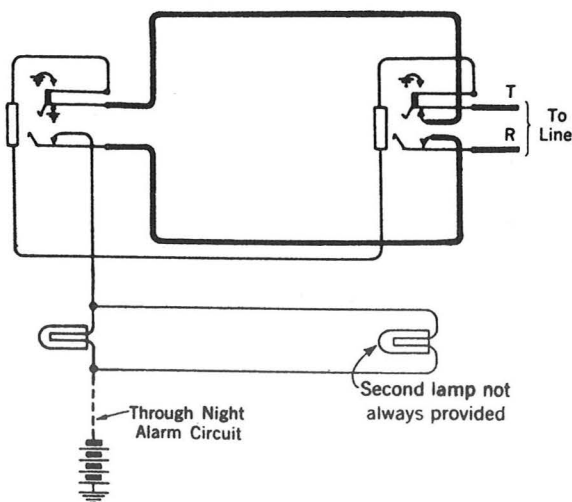


Fig. 2 - Common Battery Line Circuit.

3.02 When a cord circuit plug is inserted into a common battery line jack, separate contacts on the jack are closed to place ground on the sleeve to operate the associated cord sleeve relay.

Magneto Line

3.03 The magneto line circuit consists of one or more cutoff jacks and an answering drop in series with the line as shown in Fig. 3. This circuit may be used as a rural or toll line or as a ringdown trunk.

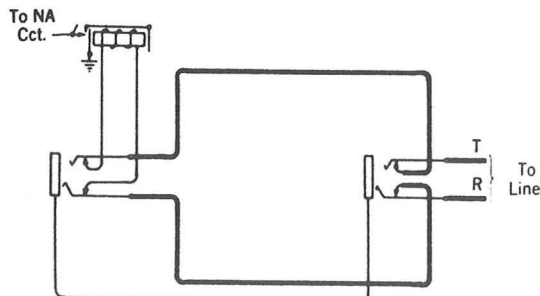


Fig. 3 - Rural or Toll Line Circuit or Ringdown Trunk.

3.04 A grounded service line may be equipped with a repeating coil if the transmission losses between that line and common battery line connections are considered excessive.

Repeating Coil Group

3.05 An arrangement of testing jacks and repeating coil groups is provided when required at the main distributing frame for direct cross connection to rural or toll lines either on a phantom or non-phantom basis. Fig. 4 shows the connections to the repeating coil.

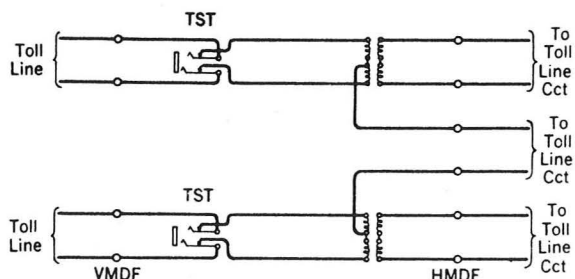


Fig. 4 - Repeating Coil Group Connections.

Night Alarm

3.06 The night alarm circuit is wired as a Wheatstone bridge having two inductive arms and two non-inductive arms, and a polar relay connected across the bridge. See Fig. 5. When a subscriber on a common battery line removes his receiver, a relatively high initial current will flow through the non-inductive arms of the Wheatstone bridge in series with the polar relay, causing the relay to operate momentarily. The momentary operation of this relay causes the associated night alarm relay to operate and remain locked, pending the subsequent operation of any release key, one of which is provided at each position. The operation of the night alarm relay sounds the night bell. Should the night alarm be connected by the operation of the office night alarm key at a time when all the subscriber lines contribute to a relatively low overall line leakage resistance, the night bell may operate as a result of the initial surge, but can be silenced by the operation of the release key at any position. Since the bridge promptly becomes stabilized the polar relay would not, thereafter, operate unless a call is originated. During the process of handling an individual call the night alarm may sound falsely on surges, as, for example, on connecting a front cord to a common battery line jack, or subsequently on disconnecting either cord from a common battery line jack.

3.07 The operation of rural or toll line or ringdown trunk drops will sound the night bell directly. The bell is silenced by the restoration of the drop.

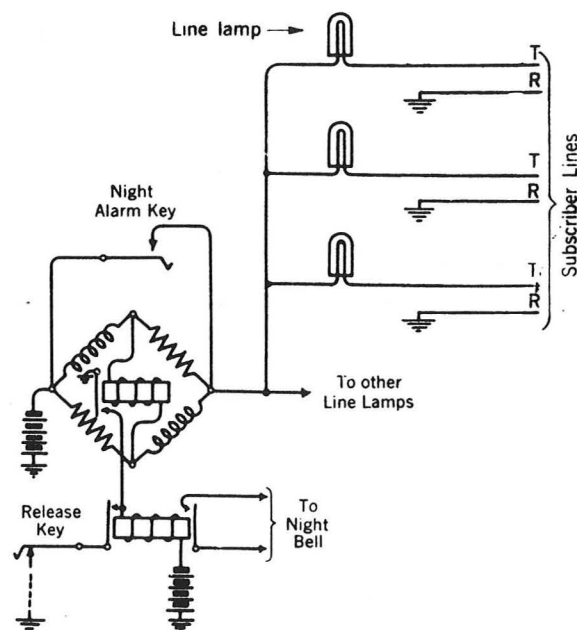


Fig. 5 - Night Alarm Circuit (Common Battery Line Connection).

3.08 During the periods when the audible alarm on incoming calls is not required, the night alarm circuit can be cut off by means of the night alarm key which is located in the face of the switchboard.

Fuse Alarm

3.09 Adequate fusing is provided by individually mounted 35-type fuses which are directly associated with a buzzer located in the rear of the switchboard. The operation of any fuse will sound the buzzer continuously until the fuse is removed or replaced by a good one.

Universal Local and Toll Cord

3.10 The full universal cord circuit employed can be used for local, toll or local to toll connections. It includes four relays, two supervisory lamps, two condensers, one magneto drop and a single key lever which can be operated for talking or ringing. See Fig. 6. Ringing current is applied to the ring conductor of the cord unless a common locking type master ringing key is first operated, in which case the operation of the cord ringing key will connect ringing current to the tip conductor of the cord.

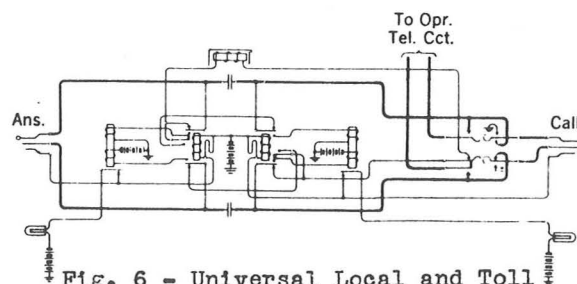


Fig. 6 - Universal Local and Toll Cord Circuit.

3.11 On connections from one common battery line to another common battery line, the back sleeve and front sleeve relays operate from ground on the sleeves of the line jacks after plug-in, and thus provide 48-volt bridged impedance talking battery supply to the cord in series with the windings of the supervisory relays which control the associated supervisory lamps. See Fig. 7.

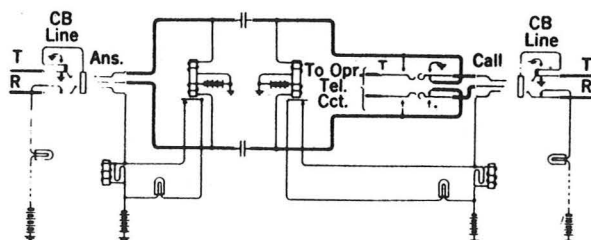


Fig. 7 - Common Battery to Common Battery Connection.

3.12 On connections from one magneto or toll line to another magneto or toll line, the sleeve relays do not operate as the sleeves of the line jacks are not grounded. A supervisory drop is connected from the tip of the answering cord to the ring of the calling cord. See Fig. 8. The connections to the cord drop are opened when the talking key is operated in order to reduce false drop operations on surges during the establishment of a connection.

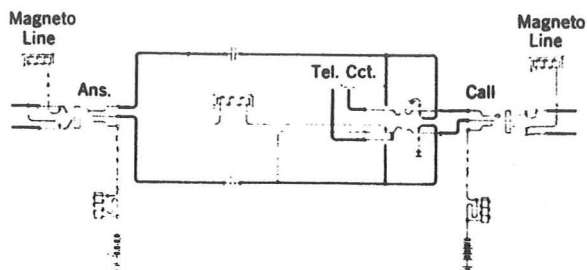


Fig. 8 - Magneto or Toll to Magneto or Toll Connection.

3.13 On connections from a common battery line to a magneto or toll line or ringdown trunk, the sleeve relay will operate on the common battery connection providing battery supply through the supervisory relay to the cord. The clearing out drop will be connected across that end of the cord which is associated with the rural or toll line or ringdown trunk. Thus the regular cord lamp supervision is provided on the common battery connection and ringdown drop supervision on the magneto, toll or trunk connection. See Fig. 9.

Operator's Telephone Set Including Emergency Talking Equipment

3.14 The operator's telephone set is arranged for positional monitoring and for one-way grouping toward the growing end of the switchboard. See Fig. 10.

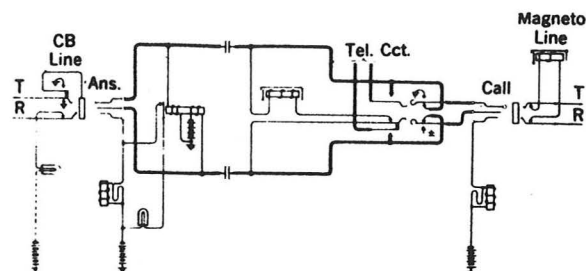


Fig. 9 - Common Battery to Magneto or Toll Line or Trunk Connection.

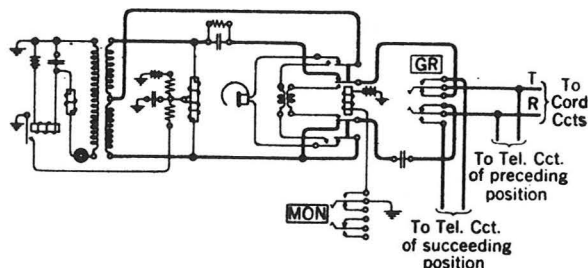


Fig. 10 - Operator's Telephone Circuit.

3.15 The busy test feature is so arranged that the volume of the busy test click is approximately the same whether it is indicated by ground on the sleeve of a common battery line jack or by battery on the sleeve of a rural or toll line or trunk jack from the sleeve of the cord connected to this jack.

3.16 When required, a one-way lever type key is provided, mounted in the face of the switchboard, for furnishing an emergency talking battery supply. The operation of the emergency battery key substitutes a dry cell battery for the regular battery supply to the telephone circuit and to a cord circuit arranged for emergency battery at the associated position. A red guard lamp associated with this key will light when the key is operated unless the central office battery voltage is insufficient to light the lamp.

4. DISTRIBUTING FRAME

4.01 The No. 12 switchboard employs a small floor-supported "B" type distributing frame which is 6 feet 2 inches high to correspond with the height of the section. The frame includes five verticals and nine horizontal shelves. Additional verticals may be added where required.

Protectors

4.02 The distributing frame accommodates 152 protectors on 3/8 inch centers for each vertical; thus, for five verticals a capacity of 760 protectors is furnished.

Terminal Strips

4.03 On the horizontal side of the distributing frame the magneto and common

battery line terminal strips are arranged in accordance with the ultimate switchboard face equipment layout. Thus, four terminal strips are mounted in a horizontal row, corresponding to the four switchboard panels. The magneto line circuit terminal strips are connected to the bottom shelf of the main frame and the common battery line terminal strips are mounted immediately above.

Repeating Coil Group Units

4.04 The repeating coil group unit is assembled on a mounting panel 6-1/2 inches square. The panel is arranged for a maximum of three toll line repeating coils and two testing jacks. These units are arranged to mount on the vertical and horizontal centers of the transverse arms supplied for the line terminal strips. The cross connections from the protectors and line terminal strips run directly to the proper coil and jack terminals.

5. POWER PLANT

5.01 The power plant for the No. 12 office consists essentially of a 23-cell battery with either one or two Tungar rectifiers operating continuously and a small motor-driven magneto generator for ringing supply. Under normal conditions the battery voltage will remain within the limits of 46 to 54 volts with extreme limits of 40 to 56 volts.

5.02 Fig. 11 shows the front view of the complete power plant unit.

5.03 Fig. 12 shows the circuit of the complete power plant. The rectifier is controlled manually, being adjusted so that it will supply during the 24 hours of the day the daily office load plus the losses of the battery. A voltmeter is provided for reading the voltage of the battery.

6. MAINTENANCE FACILITIES

6.01 When required, a testing circuit is provided for conducting various tests on the switchboard circuits and a voltmeter test circuit is furnished for testing lines and trunks. These testing circuits are described in some detail in Sections of Division A700.

6.02 Toll lines will usually be tested from the distant toll center. To assist in these tests, a test jack circuit is provided at the No. 12 office for setting up various testing conditions on the lines under test. These jacks are wired as shown in Fig. 13.

6.03 Two sets of these jacks are furnished in a panel which is arranged to mount on the distributing frame.

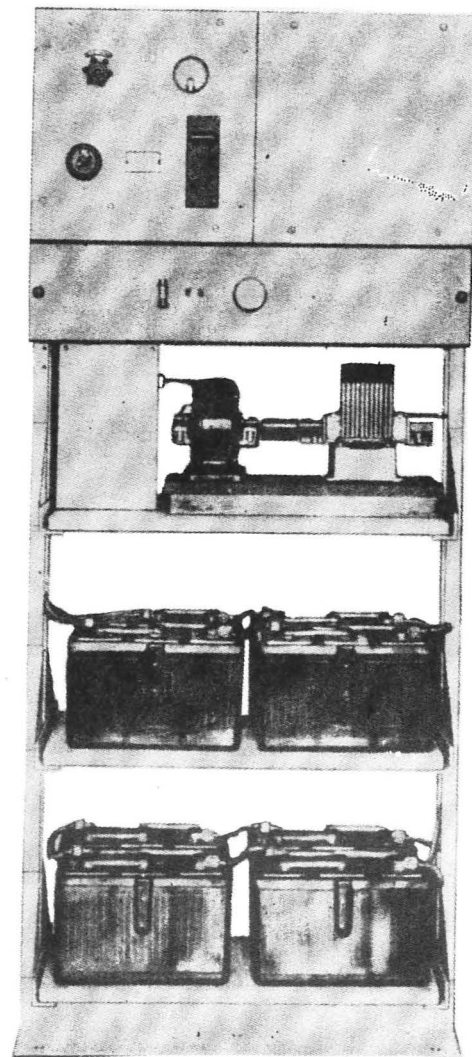


Fig. 11 - Power Plant for No. 12 Switchboard - Front View.

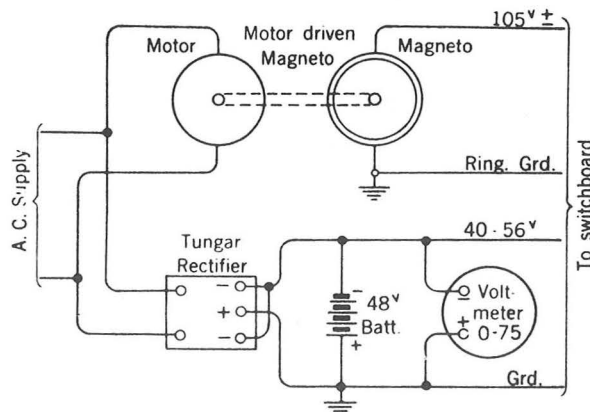


Fig. 12 - Power Circuit.

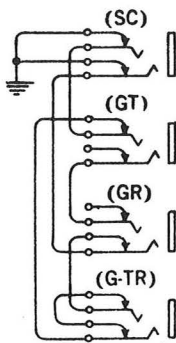


Fig. 13 - Toll Test Jacks.

6.04 Connections between the toll lines and the test jacks are made by means of patching cords which may be arranged in such a manner as to produce any of the following conditions:

- (a) Short of tip and ring.
- (b) Ground on tip.
- (c) Ground on ring.
- (d) Ground on tip and ring.
- (e) Connect any tip or ring to any other tip or ring.

6.05 Test connections will be made at the request of a tester at the distant office.

7. CIRCUIT DESCRIPTIONS

7.01 Following is a list of the circuit drawings pertaining to the No. 12 switchboard. Detailed circuit descriptions will be found in the associated CD sheets.

<u>Title</u>	<u>Drawing</u>
<u>CIRCUIT SCHEMATICS</u>	
Common Battery Line	SD-15021-01
Magneto Line	SD-15022-01
Cord (Includes Emergency Ringing and Talking)	SD-15023-01
Telephone Circuit (Includes Emergency Talking)	SD-15024-01
Fuse Alarm and Night Alarm	SD-15025-011
Toll Line Repeating Coil Group (Includes Test Jacks and Cords)	SD-15116-01
Test Circuit for Testing Cords, Drops, and Night Alarm	SD-15122-01
Voltmeter Testing Circuit	SD-15118-01
Power Plant Circuit	SD-80453-01