

This Appendix was prepared from Issue 43 of Drawing ST-54001-01.

METHOD OF OPERATION

For Miscellaneous Alarm Circuit - Appearing On Floor Alarm Board - Panel System.

Page 1 appendix 1 change paragraph 36.1 to read

36.1 Aud. Alarm Sw. Fuse Alarm

Operation of a floor alarm board or main alarm board fuse connects battery to operate relay (AF) which lights the (ASF) lamps and operates the AC auxiliary signals at the alarm board and at the main alarm board or trouble desk.

On page 5 add the following paragraph

7.8 Clock Circuit Fuse Alarm

Operation of a fuse in a load supplying interrupted battery to the group relays, operates relay (CA) thru its 200 ohm winding when the master clock contacts close. When the battery from the master clock is interrupted, the relay holds thru both windings in series. Operation of relay (CA) lights a fuse panel lamp and closes the circuit to operate relay (A1). When the operated fuse is removed, relay (CA) releases, restoring the alarm circuit to normal.

Add the following paragraphs

37. PICK-UP VOLTAGE ALARM

37.1 Relays (BR1), (BR2) and (BR3) are connected to pick-up brushes 1, 2 and 3 resp. These relays operate in rotation as the grounded segment of the interrupter makes contact with the brushes. If all relays are down at the same time due to an open brush, relay (OB) releases to bring in an intermittent alarm. In order for the (OB) relay to reoperate, two (BR) relays must be operated. The (BR) relays are also capable of detecting grounded leads in the event that the PK. U. A. brush should become open. With the PK. U. A. brush open and one or more grounded leads, there will be some part of the cycle when all (BR) relays will be operated, releasing the (AB) relay and operating the alarms. Two (BR) relays must be released in order to reoperate relay (AB). A test jack (PU) is provided for use with the test set for testing relays (BR1), (BR2) and (BR3).

( 2 Pages, Page 2 )  
Issue 3 BT 54001-01  
Appendix 2  
February 17, 1930.  
Replacing all previous  
issues.

**38. INCOMING CALL SIGNAL LAMPS FOR CHIEF SWITCHMAN'S DESK AND O.G.T. TEST BOARD**

**38.1 Lamps (CS) and (TB) light at the floor alarm board, main alarm board or power alarm cabinet and a ringer is operated when a call comes to the chief switchmans desk or O.G.T. test board, respectively.**

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February 17, 1930.  
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( 1 Page, Page 1 )  
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METHOD OF OPERATION

For Miscellaneous Alarm Circuits - Appearing On Floor Alarm Board - Panel System.

Add the following paragraph:-

36. AUD. ALARM SW. FUSE ALARM

36.1 Operation of a floor alarm board or main alarm board fuse connects battery to operate relay (FAF) which lights the alarm board fuse lamp (FA), lights the trouble desk. When the operated fuse is removed, relay (FAF) releases, restoring the circuit to normal.

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April 3, 1929.  
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METHOD OF OPERATION

SCHEMATIC

For Miscellaneous Alarm Circuits - Appearing on Floor Alarm Board - Panel  
Machine Switching System.

DEVELOPMENT

1. PURPOSE OF CIRCUIT

- 1.1 This circuit is used to bring in audible and visible signals when a trouble condition or a circuit failure takes place in any of the more important parts of the machine switching equipment.

2. WORKING LIMITS

- 2.1 None.

OPERATION

3. PRINCIPAL FUNCTIONS

- 3.1 In the event of a trouble condition or circuit failure, to notify the desk switchman or sender monitor promptly of the nature and approximate location of the trouble and of the progress being made to correct it. The signals at the trouble desk are in the nature of supervisory signals for enabling the switchman to take appropriate action if any alarm is left unattended for an undue length of time.
- 3.2 In addition to the alarm pilot equipment located at the trouble desk, there is provided on each floor a special panel known as a floor alarm board or power alarm cabinet, which mounts a set of alarm pilot signals associated with the equipment located on the corresponding floor.
- 3.3 To give distinctive audible signals for d.c. and a.c. failures.

4. CONNECTING CIRCUITS

This circuit functions with:

- 4.1 The battery bus bars associated with the selector frames, selector repeating coil rack, line relay, ringing, tone, coin, distributing panel, charge and discharge fuses on battery fuse panel, power board,

coin power, emergency lighting, and selector fuse panel or distributing fuse panel showing the greatest variation in voltage.

- 4.2 The ringing bus bars associated with the ringing generator, individual, two-party and four-party semi-selective machine ringing, positive superimposed machine ringing and negative superimposed machine ringing.
- 4.3 Special "A" board auxiliary signal and night alarm circuit.
- 4.4 Motor stop and frame busy circuit.
- 4.5 Sender pulse machine circuit.
- 4.6 Senders busy circuit.
- 4.7 Circuit breakers and rectifiers.
- 4.8 Motor transfer alarm circuit.
- 4.9 Machine ringing pick-up leads.
- 4.10 Test frames.
- 4.11 Start circuit.
- 4.12 Emergency cordless key circuit.
- 4.13 A.C. power supply.
- 4.14 D.C. power supply.
- 4.15 Selector time alarm.
- 4.16 Line switch time alarm.
- 4.17 Full mechanical tandem allotter alarms.
- 4.18 Ringing power board ringing fuse alarm.
- 4.19 Ringing power board CC- and CC+ gen. lead fuse alarm.
- 4.20 Ringing power board high tone fuse alarm.

DESCRIPTION OF OPERATION

5. SPECIAL "A" BOARD AUXILIARY SIGNAL CIRCUIT FUSE ALARM

5.1 When a fuse in a special "A" board section operates, ground from the special "A" board auxiliary signal and night alarm circuit is connected to a designated lamp at the trouble desk in series with the (AC) relay, lighting the lamp and operating the relay in turn operating the trouble desk buzzer. When the operated fuse is replaced, the ground is removed releasing the (AC) relay and extinguishing the lamp at the trouble desk. The (AC) relay released silences the buzzer.

6. SELECTOR FRAMES FUSE ALARM (24V OR 48V)

6.1 The operation of a 24 volt or 48 volt fuse at a selector frame connects exchange battery to the winding of an (A) relay in series with a SEL. FR. lamp in the selector frame fuse panel, operating the relay and lighting the lamp. The (A) relay operated, operates the (A-1) relay. The (A-1) relay operated, lights a SEL. FR. aisle lamp at the floor alarm board and a class pilot at the trouble desk, each in series with an associated (AC) relay. These (AC) relays operated, operate 43-F subset ringers. When the operated fuse is replaced, the (A) relay releases, extinguishing the SEL. FR. fuse lamp and releasing the (A-1) relay. The (A-1) relay released, extinguishes the floor alarm board and the trouble desk lamps and releases the associated (AC) relays, silencing the audible signals.

6.2 When "AL" wiring is furnished, closure of a floor alarm board main alarm board or power alarm cabinet auxiliary signal circuit causes operation of a corresponding relay in the audible alarm switching circuit. Operation of this relay closes a circuit of the associated DC bell or AC ringer at the alarm board or power alarm cabinet, and lights pilot lamps in all alarm boards and in the power alarm cabinet.

7. MISCELLANEOUS - REPEATING COIL - LINE RELAY - RINGING - TONE - COIN BATTERY FUSE - CLOCK - FUSE ALARMS

7.1 Miscellaneous Repeating Coil and Line Relay (48 Volt)

The operation of a 48 volt miscellaneous repeating coil and line relay fuse connects battery to the winding of an (A) relay in series with a designated lamp operating the (A) relay and lighting the lamp. The (A) relay operated, operates the (A-1) relay. The (A-1) relay operated, lights a designated lamp at the floor alarm board

and a class pilot at the trouble desk, each in series with an associated (AC) relay which functions as in paragraph 6.1. When the operated fuse is replaced, the (A) relay releases, and the designated lamp is extinguished, releasing the (A-1) relay. The (A-1) relay extinguishes the floor alarm board or power cabinet and the trouble desk designated lamps and releases the associated (AC) relays, silencing the ringer and buzzer.

#### 7.2 Miscellaneous Repeating Coil and Line Relay (24 Volt)

The operation of a 24 volt miscellaneous repeating coil and line relay fuse connects battery to the winding of an "A" relay in series with a designated lamp, operating the relay and lighting the lamp. The (A) relay operated, functions as in paragraph 6.1.

#### 7.3 Ringling

When a fuse in a ringling lead at a miscellaneous fuse board operates, ringling current is connected to the winding of an (A) relay in series with 650 ohms resistance and a designated lamp, operating the relay and lighting the lamp. The (A) relay operated, functions as in paragraph 6.1.

#### 7.4 Tone

When a fuse in a tone lead at a miscellaneous fuse board operates, battery is connected to the winding of an (A) relay in series with a designated lamp, operating the relay and lighting the lamp. The (A) relay operated, functions as in paragraph 6.1.

#### 7.5 Clock

The operation of a fuse associated with the lead supplying ground to the clock circuits, operates the (A) relay (B305). The (A) relay operated operates the (A-1) relay and lights a designated lamp. The (A-1) relay operated, functions as in paragraph 6.1.

#### 7.6 Negative Coin Battery

The operation of a fuse at the negative coin battery alarm bus bar connects negative coin battery to the winding of the (A) relay in series with 960 ohms resistance and a designated lamp operating the relay and lighting the lamp. The (A) relay operated, functions as in paragraph 6.1.

### 7.7 Positive Coin Battery

The operation of a fuse at the positive coin battery alarm bus bar connects positive coin battery to the winding of the (A) relay in series with 960 ohms resistance and a designated lamp, operating the relay and lighting the lamp. The (+A) relay operated operates the (A-1) relay which functions as in paragraph 6.1.

### 8. DISTRIBUTING PANEL FUSES

8.1 The operation of a fuse at a battery distributing panel connects exchange battery to the winding of the (A-1) relay operating the relay. The (A-1) relay operated, lights a DISTRIBUTING FUSE PANEL lamp at the floor alarm board and a class pilot at the trouble desk each in series with an associated (DCH) relay. The (DCH) relays operated, operate a bell at the alarm board and a bell at the trouble desk respectively. When the operated fuse is replaced, the (A-1) relay releases, extinguishing the DISTRIBUTING FUSE PANEL lamps and releasing the (DCH) relays, silencing the bells.

### 9. FRAME MOTOR STOP ALARM

9.1 When the stop contact of an alarm governor makes due to the motor stopping or slowing down below its normal minimum rated speed, a relay in the motor stop and frame busy circuit operates. This relay operated, lights the red motor stop lamp and operates the (AC) relays which in turn operate the buzzer at the trouble desk and at the floor alarm board. When the motor stop key is operated, the white motor stop guard lamp at the floor alarm board lights, indicating that the stop alarm has been removed and releases the relay in the motor stop circuit, extinguishing the trouble desk and floor alarm board red lamp and silencing the buzzer and ringer. When the motor again runs at its normal rated speed; the motor stop circuit connects ground to the lead, lighting the red motor stop lamp at the trouble desk or at the floor alarm board and operating the (AC) relays, which in turn operate the buzzer at trouble desk and ringer at the floor alarm board.

### 10. TRANSFER ALARM FOR INDIVIDUAL DUPLEX MOTOR

10.1 When an individual frame duplex motor fails, a circuit is closed from ground at the normally operated duplex motor master switch through the MOTOR TRNS. lamp at the floor alarm board of power alarm cabinet, in series with 600 ohms resistance paralleled by a 500 ohm resistance to terminal #2 of the three pole receptacle on the selector frame motor box, over the patching cord to terminal #2 of the

three pole plug at the motor, through the AC motor unit, to the #3 terminal of the three-pole plug at the motor, over the patching cord to #3 terminal of the three-pole receptacle to exchange d.c. battery, lighting the MOTOR TRNS. lamp as an indication that an individual duplex frame drive motor has been transferred from the outside A.C. supply to the exchange d.c. supply.

- 10.2 When the individual frame duplex motor is restored to service, the circuit is automatically opened, disconnecting the d.c. battery supply and extinguishing the MOTOR TRNS. lamp.

## 11. LINE FINDER TIME ALARM

- 11.1 If a line finder does not find the subscriber's line within 35 seconds after the receiver at the calling station is removed from the switchhook, an alarm is given in the following manner: When the receiver at the calling station is removed from the switchhook, various relays in the line and strip circuits operate and connect battery to lead B, winding of the (B) (frame) relay brush and terminal 1 of the START arc of the time alarm selector, break contact of the (A) frame relay, to the interrupter contact. When the interrupter contact closes, the (B) relay operates. The (A) (frame) relay does not operate, however, on account of its winding being short circuited by ground on the interrupter. When the interrupter contact opens, the short circuit is removed from the winding of the (A) relay, which now operates in series with the winding and make contact of the (B) relay, to ground on the armature of the (B) relay, thus holding both relays operated. The next operation of the interrupter operates the STP magnet, over a circuit from ground on the make contact of the interrupter, make contact of the (A) relay, terminal 1 and brush of the STP arc of the selector, to battery through the winding of the STP magnet. When the interrupter contact opens, the STP magnet releases and steps its brushes one step on its back stroke. The selector brushes advance one step for each make and break of the interrupter contact, which is of an interval of 7 seconds, until the fifth terminal of the selector is reached when the circuit through the interrupter is opened. When the fifth terminal of the selector is reached, the BA-1 lamp in the trip circuit lights from battery on the armature of the (A) (frame) relay, terminal 5 and brush of the LAMP arc of the selector, lead A, through the make contact of the (BA) relay, BA-1 lamp, lead C, to ground through the winding of the B (aisle) relay in the time alarm circuit, which operates. The (B) relay operated, operates the A (aisle) relay. The (A) relay operated, lights the aisle pilot and main

or monitoring board lamps through their respective auxiliary alarm circuits. When the source of trouble is removed and the (BA) relay, in the trip circuit has released, the circuits over leads A and B are opened, in turn releasing both the frame and aisle (A) and (B) relays, extinguishing the aisle and main or monitoring board lamps and silencing the alarm. The release of the (B) (frame) relay also closes a circuit from ground on its armature, through terminal 5 and the bridging brush of the RETURN arc of the selector to battery through the break contact and winding of the STP magnet, which operates and steps the selector brushes to terminal 6, in which position it awaits the next closure of lead B. Should the circuit over lead B be opened before the fifth terminal is reached by the selector, the (A) and (B) frame relays release. The (B) relay released, causes the selector to advance to the next normal position, awaiting closure of lead B, as previously described. The operation of the (NL) key steps the selector brushes to the next normal position by way of the STEP bridging brush and 5, 10, 15, or 20 terminal, as the case may be. If the selector has been to normal position 6, 11, or 16, when the (BA) relay operated, the operation would have been the same as described for position 1.

## 12. TELL-TALE ALARM

12.1 If a line finder selector travels to tell-tale, a circuit is closed from ground in the associated line finder circuit through the (TT) relay to battery, operating the (TT) relay. The operation of the (TT) relay operates the (D) relay, which in turn operates the (C) relay. The (C) relay operated, locks to ground on the armature of the (TT) relay, and releases the (D) relay. The release of the (D) relay lights the (TT) lamp and operates a relay in the Line Finder Time alarm circuit, thereby lighting an aisle pilot lamp and a lamp on the main alarm board. The (D) relay is made slow in releasing to prevent opening the circuit over which the (C) relay operates until the (C) relay has operated and locked.

## 13. SELECTOR FRAME TIME ALARM - (SEL. TIMING TYPE)

### 13.1 Alarm Due to Selector Sequence Switch Delay

When the sequence switch of a selector advances to a position in which the selector is allowed to remain only for a pre-determined period of time, ground in the selector circuit operates the (PS-2) relay to battery on the PU brush and normal terminal. The (PS-2) relay operated, locks to ground in the selector circuit and

operates the (STP) relay. The (STP) relay operated starts the 200-E selector stepping under control of the interrupter. When the 200-E selector reaches a terminal connected to a B lead, the (S) relay operates from battery on the PU brush to group on the (PS-2) relay. The (S) relay operated, (a) locks to ground on the (PS-2) relay, (b) lights the (TA) lamp, (c) operates the (A) relay, (d) releases the (STP) relay. The (A) relay operated lights the floor board aisle pilot and the main alarm board lamp. The (STP) relay released stops the 200-E selector on the next normal terminal. Normal terminals are blank on the ON arc and have "A" leads on the PU arc.

### 13.2 Returning to Normal When Selector Advances

When the selector sequence switch advances, ground is removed from the selector lead releasing the (PS-2) relay. The (PS-2) relay released, releases the (S) relay in turn releasing the (A) relay and extinguishing the lighted lamps.

### 13.3 Returning to Normal When Selector Advances Within Time Limit

Should the selector sequence switch advance before the 200-E selector has advanced sufficiently to operate the (S) relay, the (PS-2) relay releases preventing the (S) relay from operating and releasing the (STP) relay. The (STP) relay released steps the 200-E selector to the next normal terminal through the ON brush and strapped terminals under control of the interrupter.

## 14. DISTRICT SELECTOR FRAME TIME ALARM (RELAY TIMING TYPE)

14.1 When the lead from district selector circuits, coin circuits, link circuits, sender selectors or finals becomes grounded, relay (PS-2) operates. The operation of relay (PS-2) causes the operation of relay (A) as soon as the interrupter makes its front contact. Relay (A) locks up under control of the (S) relay and the (PS-2) relay and operates the (SL) relay. The operation of the (SL) relay cuts off the operating path of all (PS) relays, thereby preventing any (PS) relay associated with any other side of selector frame or link group from operating. The (PS-2) relay that is operated, however, locks up to ground from the selector, coin, or link circuit and remains operated as long as this ground is present. The (SL) relay is made slow operating to permit the (PS-2) relay to lock up before its operating path is opened, in case the front contact of the interrupter is made when ground first comes on.

14.2 In case the minimum period required is the same as the period of the interrupter, the closure of the back contact of the interrupter after an interval after relay (A) is operated, operates relay (SC) which also locks up under control of the (PS-2) relay and the (S) relay. The operation of the (SC) relay operates the (S) relay which locks up in series with the (S) lamp under control of the (PS-2) relay. The operation of the (S) relay, in addition to lighting the (S) lamp releases the (SC) and (A) relays, lights an aisle pilot in the floor alarm board and operates a bell common to the office.

The release of the (SC) relay opens the operating paths of all (S) relays. The release of the (A) relay releases the (SL) relay which restores the operating path of all (PS-2) relays, permitting them to operate on grounds from other selector frames or link groups.

As soon as ground disappears from the lead to selectors, coin collect circuits or link circuits relay (PS-2) releases, releasing the (S) relay, which extinguishes the lamps, silences the bell and restores the circuit to normal.

14.3 In case the minimum period required is some multiple of the period of the interrupter, the closure of the back contact of the interrupter after relay (A) has operated, operates the first relay (I-1) which locks up under control of relays (S) and (PS-2) and closes a path for operating the first relay (I-2) as soon as the front contact of the interrupter closes again. Relay (I-2) locks under control of relays (S) and (PS-2), opens the locking path of relay (I-1) and in case the period arranged for is only twice the period of the interrupter, closes a path for operating the (SC) relay as soon as the back contact of the interrupter closes again.

14.4 In case the period arranged for is longer than twice the period of the interrupter, the operation of the first relay (I-2) closes a path for operating the second relay (I-1) instead of the (SC) relay, as soon as the back contact of the interrupter closes again and opens the locking path of the first relay (I-1). The second relay (I-1) locks up under control of relays (S) and (PS-2) opens the locking path of the first relay (I-2) and closes a path for operating the second relay (I-2) as soon as the front contact of the interrupter again closes.

14.5 The second relay (I-2) in turn may close a path for operating the (SC) relay as soon as the back contact of the interrupter again closes, or it may close a path for operating a third relay (I-1), depending on the period that this circuit is arranged for.

This sequence of operations is repeated as many times as required, depending on the number of (I-1) and (I-2) relays provided, which in turn depends on the period that the circuit is arranged for. In any case, the operation of the last (I-2) relay in the series closes a path for operating the (SC) relay when the back contact of the interrupter again closes. After the (SC) relay is operated, the operation of the circuit is the same as described when the period that the circuit is arranged for is the same as the interrupter period.

15. TEST FRAME ALARM (Y WIRING)

15.1 When an automatic test circuit fails to complete a routine test due to a failure of itself or in the circuit under test, the (TF) relay operates in series with the test frame alarm lamp which lights. The (TF) relay operated, operates the (TF-1) relay which lights the Test Frame alarm lamps at the floor alarm board and at the trouble desk in series with the associated (AC) relays which bring in a ringer and buzzer at the alarm board and trouble desk. When the test circuit restores to normal or proceeds with the test, the (TF) relay releases, releasing the (TF-1) relay, extinguishing the Test Frame lamps and releasing the (AC) relays, in turn silencing the ringer and buzzer.

16. PULSE MACHINE TEST FRAME FAILURE ALARM

16.1 In case the test circuit fails to receive the right registration from the pulse machine the (OK) relay fails to operate and the (PMF) relay operates closing a circuit lighting a lamp at the floor alarm board and also at the trouble desk both in series with (AC) relays which when operated operate 43-F subset bells.

17. EMERGENCY "B" SENDER ALARM

17.1 If machine switching "B" (cordless) emergency key equipment is required, a key at the machine switching "B" board is operated, lighting the CORDLESS EM. lamp in series with the (EM) relay, operating the relay. The (EM) relay operated brings in a bell at the floor alarm board and lights the trouble desk CORDLESS EMERGENCY lamp in series with the (EM) relay, which operates, closing the trouble desk audible alarm circuit.

17.2 When the key is released at the cordless position the floor alarm board CORDLESS EM. lamp is extinguished and the (EM) relay is released in turn extinguishing the trouble desk lamp and releasing the (EM) relay opening the trouble desk audible alarm circuit.

18. SENDERS BUSY (FIG. 10)

18.1 When it is desired to determine the number of busy senders the gang key at the floor alarm board is operated. Each busy sender associated with the key connects ground to its Sender Busy lamps which lights. When the gang key is restored the busy lamps are extinguished.

19. LINE RELAY FRAME START CIRCUIT ALARM

19.1 In case the start circuit fails to release within a predetermined length of time, the start circuit (KA) relay operates and is held operated to ground on the trouble desk start circuit alarm release key. The (KA) relay operated lights the start circuit alarm lamp at the trouble desk in series with the (AC) relay which operates, in turn operating the trouble desk auxiliary signal circuit buzzer.

19.2 When the trouble desk start circuit alarm release key is operated, the start circuit (KS) relay releases, extinguishing the trouble desk start circuit alarm lamp and releasing the (SCA) relay in turn silencing the buzzer.

20. DIAL IMPULSE REPEATER ALARM

20.1 In case the circuit breaker relay operates ground is placed on the lamp lead which causes a 2Y lamp associated with the group to light and the (T) relay to operate. The operation of the (T) relay operates audible alarms as described.

21. PULSE MACHINE MOTOR STOP ALARM

21.1 When the stop contact of an alarm governor makes due to the motor stopping or slowing down below its normal minimum rated speed a relay in the pulse machine motor stop circuit operates. This relay operated, connects ground to the red PULSE MACHINE MOTOR STOP lamp and to the bell at the floor alarm board lighting the lamp and operating the bell and also connects ground to the red PULSE MACHINE MOTOR STOP lamp in series with the (DCH) relay at the trouble desk, lighting the lamp and operating the relay in turn bringing in the trouble desk bell.

21.2 When the motor again runs at its normal rated speed, the pulse machine motor stop circuit relay releases, extinguishing the floor alarm board or power alarm cabinet red PULSE MACHINE MOTOR STOP lamp and silencing the ringer and also extinguishing

the trouble desk red PULSE MACHINE MOTOR STOP lamp and releasing the (DCH) relay in turn silencing the trouble desk bell.

22. PULSE MACHINE FUSE AND BATTERY CROSS ALARM WITH AUDIBLE ALARM

22.1 "A" Pulse Lead Fuse Alarm

When a fuse associated with a pulse lead from the "A" cams of a pulse machine operates, the A pulse fuse alarm relay (PA) operates from battery, through an "A" cam, over a pulse lead, operated fuse, "A" pulse lead fuse alarm bar, primary winding to ground. The A pulse fuse alarm relay operated, is held operated through its secondary winding and make contact to ground at the normal alarm release key and operates the fuse alarm-1 relay (FA) and audible alarm relay (LA) in series with a 2-G lamp at the pulse machine fuse panel lighting the lamp. The (LA) relay operated, operates the pulse machine fuse panel alarm bell. The fuse alarm relay operated in turn operates relay (PMAL) at floor alarm board in series with a fuse alarm lamp, lighting the lamp. The (PMAL) relay operated causes the operation of an audible alarm and the lighting of a lamp at the trouble desk. When the operated fuse has been replaced, the alarm release key is operated releasing the A pulse fuse alarm relay. Relay in turn releasing the fuse alarm relay and extinguishing the pulse machine fuse panel lamp. The fuse alarm relay released, in turn releases the relays in the floor alarm board and trouble desk and extinguishes the alarm lamps.

22.2 "B" Pulse Lead Fuse Alarm

When a fuse associated with a pulse lead from the "B" cams of a pulse machine, the associated B pulse fuse alarm relay operates functioning visible and audible alarm signals at the pulse machine fuse panel floor alarm board and trouble desk as outlined in paragraph 22.1 except that the fuse alarm-2 relay operates instead of the fuse alarm-1 relay.

22.3 "A" Drum Ground Supply Fuse Alarm

When a fuse associated with an "A" drum ground supply lead operates, the A ground fuse alarm relay (GA) operates from battery, winding, ground supply alarm bar, operated fuse, 25 ohm and 5 ohm parallel windings of the A battery alarm relay (BA) to ground. Under this condition the A battery alarm relay (BA) does not receive sufficient current to operate. The A ground fuse alarm relay operated, operates the fuse alarm-1

relay (FA) in series with a 2-G lamp at the pulse machine fuse panel. The fuse alarm-1 relay operated in turn "brings in" visible alarms at the floor alarm board and trouble desk as in paragraph 22.1. When the operated fuse has been replaced, the A ground fuse alarm relay releases, in turn releasing the fuse alarm-1 relay, extinguishing the lighted lamps.

22.4 "B" Drum Ground Supply Fuse Alarm

When a fuse associated with a "B" drum ground supply lead operates, the associated R ground fuse alarm relay operated functioning visible alarm signals at the pulse machine fuse panel, floor alarm board and trouble desk as in paragraph 22.3, except that the fuse alarm-2 relay operates instead of the fuse alarm-1 relay.

22.5 "A" Battery Alarm

When an "A" pulse lead becomes crossed with battery, the A battery alarm relay operates from battery on the pulse lead, 25 ohm and 5 ohm parallel windings of the relay to ground. The A battery alarm relay operated is held operated through its 500 ohm winding and make contact to ground at the normal alarm release key and a 2-G lamp is lighted at the pulse machine fuse panel. The operation of the (BA) relay also "brings in" visible battery and audible alarms at the floor alarm board and trouble desk. When the trouble has been removed, the alarm release key is operated, releasing the A battery alarm relay, extinguishing the visible alarm lamps.

22.6 "B" Battery Alarm

When a "B" pulse lead becomes crossed with battery, the associated B battery alarm relay operates functioning visible battery alarms at the floor alarm board and trouble desk, as in paragraph 22.5

22.7 "A" Automatic Test Circuit and Retardation Coil Fuse Alarm

When an "A" fuse associated with the automatic test circuit and retardation coil feature operates, the respective (TC) relay operates from ground at the retardation coil in the test circuit. The (TC) relay operated lights an alarm lamp and operates the (FA) and (LA) relays. The (FA) and (LA) relays function as described in paragraph 22.1 to bring in signals at the floor alarm board and trouble desk. When the operated fuse is removed, the (TC) relay releases, releasing the alarm signals.

22.8 "B" Automatic Test Circuit and Retardation Coil Fuse Alarm

The operation of a "B" fuse associated with the automatic test circuit and retardation coil feature operates the associated (TC) relay which functions as described in paragraph 22.7.

23. SENDER PULSE FUSE PANEL FUSE ALARM WITH AUDIBLE RINGING AT COMBINATION RELAY RACK AND FUSE PANEL

23.1 When a fuse operates, either the (SFA-1) or (SFA-2) relay operates and locks to battery through the contacts of the alarm release key. The operation of the (SFA-1) or (SFA-2) relay closes a circuit to operate the (SFA) and (LA) relays and to light the 2-U lamp on the fuse panel. The (LA) relay closes an alarm circuit at the combination relay rack and fuse panel. The operation of the (SFA) relay closes circuits to light lamps and ring bells at the floor alarm board and trouble desk. When the operated fuse is replaced, the alarm release key is operated, releasing the (SFA-1) or (SFA-2) relay. This in turn releases the (SFA) relay, restoring the circuit to normal. There is one alarm release key and one (SFA) relay common to all the panels on the fuse board.

24. PULSE MACHINE FUSE AND BATTERY CROSS ALARM WITH AUDIBLE ALARM

24.1 "A" Pulse Lead Fuse Alarm

When a fuse associated with a pulse lead from the "A" cams of a pulse machine operates, the (PA) relay operates from battery, through an "A" cam, over a pulse lead, operated fuse, "A" pulse lead fuse alarm bar, primary winding to ground. The (PA) relay operated, is held operated through its secondary winding and make contact to ground at the normal alarm release key and operates the "A" fuse alarm relay (FA) and audible alarm relay (LA) in series with a 2-G lamp at the pulse machine fuse panel lighting the lamp. The "A" fuse alarm relay operated in turn operates a pulse machine alarm relay in series with an "A" fuse alarm lamp at the floor alarm board, lighting the lamp and also giving an audible alarm at the floor alarm board and at the trouble desk. When the operated fuse has been replaced, the alarm release key is operated releasing the (PA) relay in turn releasing the "A" fuse alarm relay and audible alarm relays (FA) and (LA) respectively and extinguishing the pulse machine fuse panel lamp. The "A" fuse alarm relay released, in turn releases the pulse machine alarm relay and extinguishes the floor alarm board "A" fuse alarm lamp and also silences the floor alarm board and trouble desk audible signals, if operating.

24.2 "B" Pulse Lead Fuse Alarm

When a fuse associated with a pulse lead from the "B" cams of a pulse machine, the associated (PA) relay operates functioning visible and audible "B" alarm signals at the pulse machine fuse panel, floor alarm board and trouble desk as in paragraph 24.1.

24.3 "A" Drum Ground Supply Fuse Alarm

When a fuse associated with an "A" drum ground supply lead operates, the (GA) relay operates from battery, winding, ground supply alarm bar, operated fuse, 25 ohm and 4 ohm parallel winding of the (BA) relay to ground. Under this condition the (BA) relay does not receive sufficient current to operate. The (GA) relay operated, operates the "A" fuse alarm relay (FA) and audible alarm relay (LA) in series with a 2-G lamp at the pulse machine fuse panel. The "A" fuse alarm relay (FA) operated in turn "brings in" visible and audible alarms at the floor alarm board and at the trouble desk as in paragraph 24.1. When the operated fuse has been replaced, the (GA) relay releases, in turn releasing the "A" fuse alarm relay, extinguishing the lighted lamps and silencing the audible signals, if operating.

24.4 "B" Drum Ground Supply Fuse Alarm

When a fuse associated with a "B" drum ground supply lead operates, the associated (GA) relay operates functioning visible and audible "B" alarm signals at the pulse machine fuse panel, floor alarm board and trouble desk as in paragraph 24.3.

24.5 "A" Battery Alarm

When an "A" pulse lead becomes crossed with battery, the (BA) relay operates from battery on the pulse lead, 25 ohm and 4 ohm parallel windings of the relay to ground. The (BA) relay operated is held operated through its 500 ohm winding and make contact to ground at the normal alarm release key and a 2-G lamp is lighted at the pulse machine fuse panel. The operation of the (BA) relay also "brings in" visible and audible "A" battery alarms at the floor alarm board and at the trouble desk. When the trouble has been removed, the alarm release key is operated, releasing the (BA) relay, extinguishing the visible alarm lamps and silencing the audible alarms, if operating.

24.6 "B" Battery Alarm

When a "B" pulse lead becomes crossed with battery, the associated (BA) relay operates functioning visible and audible "B"

battery alarms at the floor alarm board and at the trouble desk as in paragraph 24.5.

24.7 "A" Automatic Test Circuit and Retardation Coil Fuse Alarm

When an "A" fuse associated with the automatic test circuit and retardation coil feature operates, the respective (TC) relay operates from ground at the retardation coil in the test circuit. The (TC) relay operated lights an alarm lamp and operates the (FA) and (LA) relays. The (FA) and (LA) relays function as described in paragraph 24.1 to bring in signals at the floor alarm board and trouble desk. When the operated fuse is removed, the (TC) relay releases, releasing the alarm signals.

24.8 "B" Automatic Test Circuit and Retardation Coil Fuse Alarm

The operation of a "B" fuse associated with the automatic test circuit and retardation coil feature operates the associated (TC) relay which functions as described in paragraph 24.7.

25. SENDER PULSE FUSE PANEL FUSE ALARM WITHOUT AUDIBLE ALARM AT COMB. RELAY RACK AND FUSE PANEL

25.1 The operation of this circuit is the same as described in paragraph 23.1 except there is no audible alarm circuit at Rel. Rack and Fuse Panel connected through the (SFA-1) or (SFA-2) relays.

26. PULSE MACHINE FUSE AND BATTERY CROSS ALARM WITHOUT AUDIBLE ALARM AT COMBINATION RELAY RACK AND FUSE PANEL

26.1 The operation of this circuit is the same as described in paragraph 24.1 to 24.8 except that there is no audible alarm at the Relay Rack and Fuse Panel connected through the (PA) relay.

27. POWER TRANSFER ALARM - FOR COMBINED COIN COLLECT AND RINGING GENERATOR - THREE UNIT SET

27.1 When the AC line driven motor of the set fails, a circuit is closed from battery at the starting contactor located in the AC control equipment, thru the (CCR) resistance and lamp at the floor alarm board, winding of the (PTA) relay to ground at the normally operated duplex motor master switch, operating the relay and lighting the lamp. The (PTA) relay operated, operates a bell at the floor alarm board and lights a lamp at the trouble desk in series with a (DCH) relay which operates, ringing the trouble desk bell.

27.2 When the AC line driven motor is restored to service, the circuit is automatically opened at the AC control equipment releasing the (PTA) relay and extinguishing the floor alarm board (CCR) lamp. The (PTA) relay released, silences the floor alarm board bell and releases the trouble desk (DCH) relay silencing the trouble desk bell.

28. LOW TONE FAILURE ALARM

28.1 The alarm relays (LT-1) and (LT-2) for the busy and dial tone circuits are normally held operated by the interrupter battery from the low tone commutator. The alarm relays will release and cause the operation of lamp and bell signals should the tone circuit be opened at the brush contact.

29. HIGH TONE FUSE ALARM

29.1 The 62-C protectors mounted on the ringing power board operate and thereby prevent the operation of the common fuse thru which battery is supplied to the various tone interrupters, should a trouble ground occur in the external Howler or Permanent Signal Tone circuits.

29.2 The operation of a 62-C protector due to a trouble ground, opens the trouble side and closes the interrupted battery side of the tone circuit to the (HTF) relay operating this relay which in turn operates the (HTS) relay causing lamp and bell signals to operate at the alarm board and trouble desk. This circuit arrangement insures an alarm signal should the trouble ground be momentary.

29.3 The replacing of the protector fuse retires the alarm signals.

30. HOWLER AND PERMANENT SIGNAL TONE FUSE ALARMS

30.1 The 62-C protectors mounted on the power board operate and thereby prevent the operation of the common fuse thru which battery is supplied to the various tone interrupters, should a trouble ground occur in the external Howler or Permanent Signal Tone circuits.

30.2 The operation of a 62-C protector due to a trouble ground opens the interrupted battery side of the tone circuit and closes the trouble ground side to the (HFS) or (HPSFA) relay. This relay will operate and bring in lamp and bell signals in the event the trouble ground is a permanent one or during the interval in which the howler or permanent signal tone key is operated.

31. COIN POWER NO VOLTAGE ALARM (CC Machine Used)

31.1 Positive Coin Battery

When positive coin battery fails, the (+CB) relay releases operating the (CBA) relay in series with the floor alarm board (CPF) lamp and associated (AC) relay. The (AC) relay operated, brings in the alarm board ringer. The (CBA) relay operated lights the trouble desk "Coin Power Failure" lamp and operates the associated (AC) relay bringing in the trouble desk buzzer. When the positive coin battery is restored, the (+CB) relay operates, releasing the (CBA) and floor alarm board (AC) relay silencing the ringer and extinguishing the (CPF) lamp. The (CBA) relay released, extinguishes the trouble desk "Coin Power Failure" lamp and releases the (AC) relay, silencing the buzzer.

31.2 Negative Coin Battery

When negative coin battery fails, the (-CB) relay releases, operating the (CBA) in series with the (CPF) lamp similar to paragraph 31.1.

32. RINGING MACHINE NO-VOLTAGE ALARMS

32.1 Ringling Generator

32.11 The failure of ringing generator current releases the (RG) relay. The (RG) relay released, operates the (RMA) relay in series with the Ringling Generator lamp at the floor alarm board and the (DCH) relay lighting the lamp and operating the relay. The (DCH) relay operated, operates the bell at the floor alarm board. The (RMA) relay operated, lights the trouble desk. Ringling Machine Class pilot lamp in series with its (DCH) relay which operates, operating a bell signal at the trouble desk.

32.12 When ringling generator is restored, the (RG) relay operates, extinguishing the Ringling Generator lamp and releasing the (RMA) and (DCH) relays. The (RMA) relay released extinguishes the trouble desk Ringling lamp and releases the (DCH) relay. The (DCH) relays released, retire the audible signals at the floor alarm board and at the trouble desk respectively.

### 32.2 Machine Ringing No-Voltage

32.21 The failure of machine ringing current releases the particular (MR) relay. The (MR) relay released, releases the (MRA) relay. The (MRA) relay released, operates the (RMA) relay in series with the Machine Ringing lamp at the floor alarm board and in series with the winding of the (DCH) relay, lighting the lamp and operating the (DCH) relay. The (DCH) relay operated, operates the bell. The (RMA) relay operated, lights the Ringing Machine lamp at the trouble desk in series with the winding of the (DCH) relay which operates. The (DCH) relay operated, operates the bell. The (MRA) relay is made slow acting to prevent its release in case the (MR) relay releases momentarily on machine ringing alternating current.

32.22 When machine ringing current is restored the (MR) relay operates, operating the (MRA) relay, extinguishing the Machine Ringing lamp, and releasing the (RMA) relay in turn extinguishing the Ringing Machine lamp and releasing the (DCH) relays, retiring the bell signals.

### 32.3 Fuse Alarms

32.31 The operation of a cartridge type fuse on the ringing power board operates a 35 type fuse individual to the particular cartridge type fuse. The operation of a 35 type fuse opens the load side and closes the machine side of the circuit to a (RGF), (MRF), (-CF) or (+CF) relay. The operation of the alarm signals from this point is the same as described in paragraph 32.11.

32.32 The replacement of the 35 type fuse and associated cartridge fuse retires the alarm signals.

## 33. RINGING MACHINE ALARM

### 33.1 Ringing Generator

33.11 The failure of ringing generator current, releases the (RG) relay. The (RG) relay released, operates the (RMA) relay in series with the RINGING GENERATOR lamp at the floor alarm board and the (DC) relay, lighting the lamp and operating the relay. The (DC) relay operated, operates the bell at the floor alarm board. The (RMA) relay operated, lights the trouble desk RINGING lamp in series with its (DC) relay which operates, operating a buzzer at the trouble desk.

33.12 When ringing generator current is restored, the (RG) relay operates, extinguishing the RINGING GENERATOR lamp and releasing the (RMA) and (DC) relays. The (RMA) relay released, extinguishes the trouble desk RINGING lamp and releases the (DC) relay. The (DC) relays released, silence the ringer and the buzzer at the floor alarm board or power alarm cabinet and at the trouble desk respectively.

### 33.2 Individual, Two-Party and Four-Party Semi-Selective Machine Ringing

33.21 The failure of machine ringing current releases the (MR) relay. The (MR) relay released, releases the (MR-1) relay. The (MR-1) relay released, operates the (RMA) relay in series with the MACHINE RINGING lamp at the floor alarm board and in series with the winding of the (DC) relay, lighting the lamp and operating the (DC) relay. The (DC) relay operated, operates the bell. The (RMA) relay operated, lights the RINGING lamp at the trouble desk in series with the winding of the (DC) relay which operates. The (DC) relay operated, operates the bell. The (MR-1) relay is made slow acting to prevent its release in case the (MR) relay releases momentarily on machine ringing alternating current.

33.22 When machine ringing current is restored, the (MR) relay operates, operating the (MR-1) relay, extinguishing the MACHINE RINGING LAMP and releasing the (RMA) relay in turn extinguishing the RINGING LAMP and releasing the DC relays, silencing the bells.

### 33.3 Positive Superimposed Machine Ringing

33.31 The failure of positive superimposed machine ringing current releases the (+MR) relay in turn releasing the (+MR1) relay. The (+MR1) relay released, operates the (RMA) relay as in paragraph 33.21 in series with the floor alarm board designated lamp. When machine ringing current is restored, the (+MR) relay operates, in turn operating the (+MR1) relay extinguishing the lamps and silencing the bells.

33.4 Negative Superimposed Machine Ringing

33.41 The failure of negative superimposed machine ringing current releases the (-MR) relay in turn releasing the (-MR1) relay. The (-MR1) relay released, operates the (RMA) relay as in paragraph 33.21 in series with the floor alarm board designated lamp. When machine ringing current is restored, the (-MR) relay operates, in turn operating the (-MR1) relay, extinguishing the lamps and silencing the bells.

34. COIN POWER FAILURE ALARM (WHERE STORAGE BATTERY OR CC MACHINE IS USED)

34.1 Operation of this circuit same as described in paragraphs 31.1 and 31.2.

35. PICK-UP ALARM

35.1 If an incoming selector frame pick-up ringing lead becomes grounded between the pick-up lead resistance lamp and the selector frame. The (PU) relay operates in series with the pick-up lead lamp which lights as an indication of the selector group in trouble. The (PU) relay operated, lights PICK-UP alarm lamps at the floor alarm board and at the trouble desk in series with their respective (AC) relays which bring in a bell and buzzer at the alarm board or trouble desk. When the pick-up lead is cleared, the (PU) relay releases, extinguishing the PICK-UP lamps and releasing the (AC) relays, in turn silencing the ringer and buzzer.

ENG: D.C.W.  
February 4, 1927.  
BMS

CHK'D. BY: G.E.H.

APP'D. BY: E. R. COOKE  
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