

This Appendix was Prepared from Issue 22 of Drawing ST-54002-01.

METHOD OF OPERATION

Power Alarm Circuits - Panel System

Add the following paragraphs:

33. PICK-UP VOLTAGE ALARM

Relays (BR-1), (BR-2) and (BR-3) are connected to pick-up brushes No. 1, 2 and 3 respectively. 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 (FU) is provided for use with the test set for testing relays (BR1), (BR2) and (BR3).

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

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 switchman's desk or O.G.T. test board, respectively.

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This Method of Operation was prepared from Issue 17 of Drawing ST-54002-01.

#### METHOD OF OPERATION

### Power, Alarm Circuits - Panel Machine Switching System.

#### DEVELOPMENT

#### 1. PURPOSE OF CIRCUIT

- 1.1 This circuit provides audible and visible signals when a trouble condition or a circuit failure takes place in the central office equipment.

#### 2. WORKING LIMITS

- 2.1 None.

#### OPERATION

#### 3. PRINCIPAL FUNCTIONS

- 3.1 To notify the maintenance force of the nature and approximate location of a trouble condition and of the progress being made in correcting it. The trouble desk pilot signals are provided so that action may be taken if any alarm is left unattended for an undue length of time.
- 3.2 On each floor there is a special panel, known as a floor alarm board or power alarm cabinet, which carries alarm signals associated with the equipment located on the corresponding floor. On one floor, the floor alarm board may be equipped with the pilot signals, in which case it is called the main alarm board.
- 3.3 Alternating current and direct current bells are provided for the alarm equipment. The DC bells are used to indicate trouble with the AC power service and trouble with the most important equipment.

#### 4. CONNECTING CIRCUITS

This circuit connects with the various fuse panels and alarm circuits as indicated on the drawing.



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## DESCRIPTION OF OPERATION

### 5. AUXILIARY SIGNALS

- 5.1 Each floor alarm board, the main alarm board and the power alarm cabinet is provided with one AC ringer and one DC Faraday bell which serve as auxiliary signals. Closure of any circuit connected to the (AC) relay power alarm cabinet causes operation of the AC ringer. Closure of a circuit connected to a (DC), (TA), (DCH), (PTA), (MSA), (RM) or (DCF) relay, operates the corresponding relay, any one of which closes the circuit of the DC Faraday bell.
- 5.2 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 the 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.
- 5.3 The trouble desk auxiliary signals consist of an AC ringer and an AC buzzer (shown on the trouble desk auxiliary signal circuit) and a 10-D direct current bell. Closure of a circuit connected to the trouble desk relay operates the corresponding (DC) or (DCH) relay, either of which causes operation of the 10-D bell.

### 6. CHARGE AND DISCHARGE FUSES

#### 6.1 Charge Fuse

Operation of a charge fuse removes the short circuit from the winding of relay (A) which operates and lights the CHARGING FUSES lamps and operates the AC auxiliary signals at the power alarm cabinet and trouble desk. Replacement of the operated charge fuse releases relay (A) which disconnects the alarms.

#### 6.2 Discharge Fuse

Operation of a discharge fuse operates relay (A) which lights the power cabinet and trouble desk DISCHG. FUSES lamps and operates the associated DC auxiliary alarms. Replacement of the operated fuse releases relay (A) which silences the alarms.



7. CIRCUIT BREAKER AND RECTIFIER ALARM

- 7.1 When a circuit breaker in the power charging circuit trips, relay (CB) or (R) is connected to the battery being charged and its operation lights the CIRCUIT BREAKER or rectifier lamps at the power alarm cabinet and trouble desk in series with their AC auxiliary signals. When the circuit breaker is closed, relay (CB) releases, restoring the circuit to normal.
- 7.2 When current stops flowing thru a rectifier, a relay, associated with the rectifier, causes operation of relay (R) which lights the lamps and operates the AC auxiliary signals at the power alarm cabinet and trouble desk or main alarm board. Reestablishment of the current flow thru the rectifier restores the alarm circuit to normal.

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

- 8.1 When the alternating current supply to the set fails, a circuit is closed from battery at the starting contactor, located in the AC control equipment, thru the alarm board CCR lamp and winding of relay (PTA) to ground at the closed master switch. Operation of relay (PTA) lights the trouble desk CCR lamp and operates the DC auxiliary signals in the alarm board and trouble desk. When the alternating current to the set is restored, the circuit is automatically opened at the AC control equipment, releasing relay (PTA) and restoring the circuit to normal.

9. A.C. FAILURE DUPLEX MOTORS

- 9.1 When the AC power service fails or when the voltage varies beyond predetermined limits, the master switch opens, making inoperative the individual transfer alarms. Opening of the master switch operates relay (MSF). Relay (MSF) operated closes a circuit, through the normal master switch guard key, to operate relay (MSA) and light the MASTER SWITCH ALARM lamp at the power alarm cabinet. Operation of relay (MSA) lights the MASTER SWITCH ALARM lamp in the trouble desk board and operates the DC auxiliary signals in the power alarm cabinet and trouble desk. Operation of the master switch guard key lights the MASTER SWITCH GUARD lamp, extinguishes the power alarm cabinet MASTER SWITCH ALARM lamp and releases relay (MSA) which silences the power alarm cabinet auxiliary signal and extinguishes the MASTER SWITCH ALARM lamp and silences the auxiliary signal in the trouble-desk. When the AC power service is restored, the master



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switch closes. This releases relay (MSF). Relay (MSA) then operates, bringing in the power alarm cabinet and trouble desk signals and alarms, as previously described, to indicate that AC service has been restored. The guard key is then restored, releasing relay (MSA) extinguishing the lighted lamps and silencing the auxiliary signals.

#### 10. PICK-UP ALARM

10.1 If an incoming selector frame pick-up ringing lead becomes grounded between the pick-up lead resistance lamp and the selector frame, relay (PU) operates in series with the pick-up lead lamp, which lights as an indication of the selector group in trouble. Operation of relay (PU) lights the PICK-UP lamps at the power alarm cabinet and at the trouble desk and operates the associated AC auxiliary signals. When the pick-up lead is cleared, relay (PU) releases, extinguishing the lamps and opening the auxiliary signal circuits.

#### 11. RINGING POWER BOARD FUSE ALARM

11.1 Operation of a 24 or 48 volt power fuse causes operation of the associated 0.5 amp. fuse, which operates the (A) relay. Operation of the (A) relay lights corresponding power board fuse alarm lamps at the power alarm cabinet and trouble desk in series with the associated DC auxiliary signals. Removal of the operated 0.5 amp. fuse releases the (A) relay, extinguishing the lamps and opening the auxiliary signal circuit.

#### 12. COIN POWER FAILURE ALARM

##### 12.1 Negative Coin Battery

When negative coin battery fails, or the fuse protecting the alarm circuit operates, relay (-CB) releases, operating relay (CBA) and lighting lamp (CC-) and operating the AC auxiliary signal in the alarm board. Operation of relay (CBA) lights the trouble desk COIN POWER FAILURE lamp in series with the associated DC auxiliary signal. When negative coin battery is restored, relay (-CB) operates, restoring the circuit to normal.

##### 12.2 Positive Coin Battery

When positive coin battery fails, relay (+CB) releases, operating relay (CBA) and lighting lamp (CC+); otherwise the circuit functions as described in the preceeding paragraph.



### 13. A.C. POWER FAILURE

13.1 Failure of one or more phases of AC power causes the phase failure device to open, releasing relay (ACF), operating relay (ACFA) and lighting AC POWER FAILURE lamp and operating the DC auxiliary signal in the power alarm cabinet. Operation of relay (ACFA) lights the AC POWER FAILURE lamp and operates the DC auxiliary signal in the trouble desk. Operation of the phase failure guard key lights the guard lamp and releases relay (ACFA) which extinguishes the power failure lamps and silences the auxiliary signals. When AC service is restored, the phase failure device closes, operating relay (ACF). With relay (ACF) and the phase failure guard key operated, relay (ACFA) operates, bringing in the alarm as described above. When the key is restored, the alarm circuit returns to normal.

### 14. D.C. POWER FAILURE

14.1 Failure of the DC power causes the release of a transfer relay in the power control circuit which operates relay (DCA). Operation of relay (DCA) lights the DC SERVICE FAILURE lamp in the power alarm cabinet and operates relay (DCF) which operates the power alarm cabinet DC auxiliary signal and lights the DC SERVICE FAILURE lamp and operates the DC auxiliary signal in the trouble desk. Operation of the DC service failure guard key lights the guard lamp, extinguishes the power alarm cabinet service failure lamp and releases relay (DCF) which extinguishes the trouble desk service failure lamp and silences the auxiliary signals. When the DC service is restored, the power control relay operates, releasing relay (DCA). With relay (DCA) released and the DC service failure guard key operated, relay (DCF) operates, bringing in the alarms as previously described. When the key is restored, the DC SERVICE FAILURE guard lamp is extinguished and the circuit returns to normal.

### 15. EMERGENCY LIGHTING FUSE ALARM

15.1 If the emergency lighting fuse opens, relay (EL) releases, closing a circuit to operate relay (ELA), light power alarm cabinet EMERGENCY LIGHTING FUSE lamp and operate the power alarm cabinet AC auxiliary signal. Operation of relay (ELA) lights the trouble desk EMERGENCY LIGHTING FUSE lamp and operates the trouble desk or main alarm board AC auxiliary signal. When the operated emergency lighting fuse is replaced, relay (EL) operates, releasing relay (ELA) and restoring the circuit to normal.



normal. Relay (MR-1) is slow acting to prevent its release in case relay (MR) releases momentarily on machine ringing current.

19. POSITIVE SUPERIMPOSED MACHINE RINGING

19.1 Failure of positive superimposed machine ringing current releases relay (+MR) which releases relay (+MR1). Release of relay (+MR1) operates relay (RMA), lights the power alarm cabinet lamp and operates the associated DC auxiliary signal. Operation of relay (RMA) lights the RING. lamp and operates the DC auxiliary signal at the trouble desk. When machine ringing current is restored, relay (+MR) operates, operating relay (+MR1) which restores the circuit to normal.

20. NEGATIVE SUPERIMPOSED MACHINE RINGING

20.1 Failure of negative superimposed machine ringing current releases relay (-MR) which releases relay (-MR1). Release of relay (-MR1) operates relay (RMA), lights the power alarm cabinet lamp and operates the associated DC auxiliary signal. Operation of relay (RMA) lights the RING. lamp and operates the DC auxiliary signal at the trouble desk. When machine ringing current is restored, relay (-MR) operates, operating relay (-MR1) which restores the circuit to normal.

21. POWER BOARD HOWLER AND PERMANENT SIGNAL TONE FUSE ALARMS

21.1 Operation of an alarm type fuse connects the trouble ground, which caused operation of the fuse, to relay (HFA). Operation of relay (HFA) or (H.P.S.F.A.) lights the HOWLER FUSE ALM. or Howler and permanent signal lamps and operates the associated AC auxiliary signals at the alarm board and trouble desk.

22. CHARGE AND DISCHARGE FUSES

22.1 Discharge Fuse

Operation of a discharge fuse operates an alarm type fuse bridged around the discharge fuse. The operated alarm type fuse connects the winding of relay (A) to battery. Operation of relay (A) lights the DISC. FUSE lamps and operates the DC auxiliary signals at the power alarm cabinet and trouble desk or main alarm board. Removal of the operated alarm type fuse restores the alarm circuit to normal.



## 22.2 Charge Fuse

Operation of a charge fuse operates an alarm type fuse bridged around the charge fuse. Operation of the alarm type fuse operates relay (A) which lights CHG. FUSE lamps and operates the AC auxiliary signals at the power alarm cabinet and trouble desk or main alarm board. Removal of the operated alarm type fuse disconnects the alarms.

## 23. RINGING GENERATOR NO-VOLTAGE ALARM

23.1 Failure of ringing generator current or opening of the alarm circuit fuse releases relay (RG) which operates relay (RMA) and lights the RING. GEN. lamp and closes the DC auxiliary signal circuit at the alarm cabinet. Operation of relay (RMA) lights the trouble desk RING. MACH. lamp and operates the associated DC auxiliary signal. When ringing generator current is restored, relay (RG) operates, restoring the circuit to normal.

## 24. MACHINE RINGING NO-VOLTAGE ALARM

24.1 Failure of machine ringing current supply or opening of the alarm circuit fuse releases the corresponding (MR) relay which short-circuits relay (MRA). Release of relay (MRA) operates relay (RMA) and lights the corresponding MACH. RING lamp and operates the DC auxiliary signal at the alarm board. Operation of relay (RMA) lights the RING. MACH. lamp and operates the DC auxiliary signal at the trouble desk. When machine ringing current is restored, relays (MR) and (MRA) operate and disconnect the signals. Relay (MRA) is slow acting to prevent its release in case relay (MR) releases momentarily on machine ringing current.

## 25. RINGING AND COIN CONTROL FUSE ALARMS

25.1 Operation of a cartridge type fuse on the ringing power board operates an alarm type fuse individual to the particular cartridge type fuse. Operation of the alarm type fuse closes the machine side of the circuit to relay (RGF), (MRF), (-CF) or (+CF). Operation of any of these relays operates relay (RMA) and lights the RING. LEAD FUSE lamp and operates the DC auxiliary signal at the alarm board. Operation of relay (RMA) lights the RING. MACH. lamp and operates the DC auxiliary signal at the trouble desk. Removal of the operated alarm type fuse retires the alarm signals.



26. HOWLER AND PERMANENT SIGNAL TONE FUSE ALARMS

26.1 Operation of an alarm type fuse connects interrupted battery to relay (HTF). Operation of relay (HTF) operates relay (HTA) which lights HIGH TONE FUSE lamps and closes the AC auxiliary signal circuits at the alarm board and trouble desk. Removal of the alarm type fuse retires the alarm signals.

27. LOW TONE FAILURE ALARM

27.1 Busy Tone

Opening of the circuit to the busy tone brush releases the (LT-1) relay causing the (busy tone) lamp to light and operating the (TA) relay. The (TA) relay operated lights the alarm board low tone failure alarm lamp and causes the (DC) auxiliary signals to function.

27.2 Dial Tone

Opening of the circuit to the dial tone brush releases the (LT2) relay which lights the (DIAL TONE) lamp and operates the (TA) relay. The (TA) relay operated lights the alarm board low tone failure alarm lamp and causes the (DC) auxiliary signals to function.

28. GAS ENGINE STARTING FUSE ALARM

Operation of the cartridge type fuse in the power lead supplying battery to the gas engine starting motor causes the (GESM) relay to release. This operates the (GESM-A) relay and lights the gas engine starting motor lamp in the power alarm cabinet and trouble desk and also causes the (AL) signals to function.

29. MANUAL PICK-UP ALARM

If the pick-up lead of a trunk circuit becomes connected to battery the (MPU) relay operates, lighting the (MPU) relay and causing the (AC) ringer to operate.

30. COIN POWER NO VOLTAGE ALARM

30.1 Negative Coin Power

When negative coin power fails the (-CB) relay releases



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operating the (CBA) relay and lighting the coin power failure lamp in the power alarm cabinet. The (CBA) relay operated lights the corresponding lamp in the trouble desk. Both lamps light in series with the (DC) alarm relays causing the (DC) bells to ring.

### 30.2 Positive Coin Power

When positive coin power fails the (+CB) relay releases operating the (CBA) relay and lighting the coin power failure lamp in the power alarm cabinet. The circuit then functions as described in the preceeding paragraph.

### 31. HIGH AND LOW VOLTAGE AND FLOATING VOLTAGE ALARM

When the battery voltage exceeds or drops below the established limits the corresponding voltmeter relay operates. Either in turn operates the (F) relay. The (F) relay operated causes the float alarm lamps in the power alarm cabinet and trouble desk to light, and the AC alarms to sound. Operation of the (FLOAT A) key operates the (F-1) relay extinguishing the float alarm lamps silencing the bell and lighting (FG) lamp.

### 32. RING AND COIN MACHINE ALARM

When the ringing and coin machines are located on another floor the (RM) relay and (RING MACH.) are located in the power alarm cabinet. When a troubled condition prevails the (RM) relay operates and the (RING MACH.) lamp lights. The (RM) relay operated causes the DC alarms to sound.

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