

803C (J86555) POWER PLANT OPERATING METHODS

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1. GENERAL

1.01 This section describes the operation of the 803C (J86555) power plant which provides ringing current, tones, signals, and coin control voltage.

Caution: This power plant includes automatically controlled equipment, and care must be exercised to prevent accidental starting of parts of the plant on which maintenance work is to be done. Before starting work, prevent automatic starting of equipment by removing fuses, blocking relays, opening switches, etc, as necessary. When maintenance work has been completed, make sure that the circuit has been restored to normal.

1.02 The section is reissued to revise the figures, to include information covering dial tone alarm and transfer, and to bring the section up to date. Since this reissue covers a general revision, the arrows ordinarily used to indicate changes have been omitted.

1.03 The 803C power plant is designed for use with panel, No. 11 manual, No. 1 crossbar, No. 4 and No. 4A toll, No. 5 crossbar, larger step-by-step offices, and those offices combined with toll.

1.04 Routine checks should preferably be made during a period when they will cause the least service reaction.

1.05 Circuit drawings on which these instructions are based are listed below. For a detailed description of the circuit operation, see the corresponding circuit descriptions.

- SD-80594-01 — Ringing Circuit — Generator and Control Equipment (A&M Only)
- SD-80594-02 — Ringing Circuit — Interrupting and Distributing Equipment — Panel Offices (A&M Only — Replaced by SD-80594-04)
- SD-80594-03 — Ringing Circuit — Interrupting and Distributing Equipment — Step-by-Step Offices
- SD-80594-04 — Ringing Circuit — Interrupting and Distributing Equipment — Panel and Crossbar Offices (Replacing SD-80594-02, and -06)
- SD-80594-05 — Ringing Circuit — Interrupting and Distributing Equipment — No. 11 Manual Offices (A&M Only)
- SD-80594-06 — Ringing Circuit — Interrupting and Distributing Equipment — No. 4 Toll Switching System (A&M Only — Replaced by SD-80594-04)
- SD-80596-01 — Signaling Circuit — 135-cycle Supply
- SD-80597-01 — Signaling Circuit — For One Howler Interrupter (A&M Only — Replaced by SD-81171-01)
- SD-80598-02 — Ringing Circuit — Tripping Supply — Silent Interval Batteries for 4-party Selective Superimposed Ringing

- SD-80655-01 — Discharge Circuit — Coin Control Supply — Using 116/120-volt Regulated Tube Rectifier With Battery-driven Reserve Alternator (A&M Only)
- SD-80655-02 — Discharge Circuit — Coin Control Supply — Using 116/120-volt Regulated Tube Rectifier With 100/120-volt Reserve From Ringing and Coin Control Generator (A&M Only)
- SD-80686-01 — Ringing Circuit — Generator and Control Equipment (A&M Only — Replaced by SD-81352-01)
- SD-80731-01 — A-C Power Alarm Circuit
- SD-80800-01 — A-C Power Alarm Circuit — Nos. 4 and 4A Toll Switching Systems (A&M Only)
- SD-81050-01 — Applique Circuit — Vacuum Tube Low-voltage Transfer and Alarm for Nos. 803A, 803B, 804A, 805B, and Similar Plants (A&M Only)
- SD-81069-01 — Code Ringing Applique Circuit — Auxiliary Interrupting and Distributing Equipment — No. 5 Crossbar System
- SD-81070-01 — Ringing No-voltage Alarm Applique Circuit — No. 5 Crossbar System
- SD-81101-01 — Applique Circuit — Dial Tone Alarm and Transfer
- SD-81171-01 — Signaling Circuit — Howler Interrupter
- SD-81238-01 — Applique Circuit — For Absorbing Surges on Machine Ringing Brushes (Replaced by SD-81278-01)
- SD-81278-01 — Ringing Circuit — For Absorbing Surges on Machine Ringing Brushes (Replacing SD-81238-01)
- SD-81352-01 — Ringing Circuit-Generator and Control Equipment (Replacing SD-80686-01)

1.06 For more detailed information on the operation and maintenance of individual equipment or apparatus, refer to the appropriate Bell System Practices. All relays, keys, etc, should be adjusted, when required, in accordance with the BSPs and the circuit requirement tables on the circuit drawings.

1.07 List of Tools, Gauges, and Test Apparatus

| CODE OR SPEC NO. | DESCRIPTION |
|-----------------------|---|
| TOOLS | |
| 265C | Burnishing Tool |
| — | 3-Inch C Screwdriver (or the replaced 3-inch Cabinet Screwdriver) |
| GAUGES | |
| — | Voltmeter, AC-DC Thermo, Weston No. 622, 300/150/30/3 volt range |
| — | Test Cords, Weston No. D-79650 and D-79651 |
| KS-3008 | Stop Watch (or watch with second hand) |
| TEST APPARATUS | |
| 716C | Receiver |
| 2W21A | Cord |
| W1AF | Cord |

2. OPERATION

Description

2.01 General: The 803C power plant is arranged to provide ringing current, tones, and signals for machine ringing No. 11 manual, panel, No. 1 crossbar, No. 4 and 4A toll switching systems, larger step-by-step and No. 5 crossbar offices, and these offices combined with toll. Fig. 1 shows the 803C power plant and Fig. 2 shows an operational schematic of this plant.

2.02 The KS-5396-02 and KS-15816 ringing machines are provided with a 115/120-volt coin control output instead of the former 100/120-volt supply for the operation of coin magnets on extended subscriber loops. Coin control circuits for extended subscriber loops specify 116 to 120 volts, and while the ringing machine is rated at 115-volt minimum to allow for manufacturing variations, sufficient coin control output voltage can be maintained by keeping the ac ringing voltage at the upper end of the 84/88-volt range. In some cases it may be necessary to change transformer taps as covered in Section 155-410-701.

2.03 Two commercial ringing and coin control sets with tone alternators and mercury interrupters are provided; one line driven and

one battery driven. The load is normally carried by the line-driven set but is transferred automatically to the battery-driven set under conditions of high voltage, low voltage, brush failure, dial tone failure, or the failure of the ringing supply from any one of the machine ringing brushes. If the low-voltage condition (usually caused by power failure) is corrected, the load is automatically transferred back to the line set. If the transfer occurs due to high voltage, brush failure, dial tone failure, or failure of the machine ringing supply, the load remains on the battery-driven set as it is assumed that there is some trouble which will need correcting before the load can be transferred back to the line-driven set.

Note: For the purpose of this section, the line-driven set will be referred to as RING G1 and the battery-driven set as RING G2. On some jobs the sets may bear higher numbers such as RING G3 and RING G4.

2.04 The ringing voltage is kept within close limits by means of centrifugal-type voltage regulators, a separate regulator being provided for each machine. The ringing batteries (furnished in superimposed offices only) may be located on a shelf at the rear of the ringing power board or on stands which are away from the ringing power board.

2.05 As is applicable to the particular type of office being supplied, the interrupting and distributing circuit contains machine ringing interrupters, transfer switches, ringing batteries, tone coils, and the necessary distributing arrangements. It is arranged to interconnect with the generator and control circuit.

2.06 *Reserve and Optional Coin Control Supplies (Usually Found on Older Plants Similar to the 803C):* When rectifier coin control is furnished for existing offices having a coin control generator with 100/120-volt output, it may be mounted in a bay adjacent to the bays shown in Fig. 1, and this additional bay may also mount the message register equipment (103B power plant) in step-by-step offices.

2.07 *Tripping Supply:* The 46/52-volt and 60/75-volt silent interval tripping battery supply for superimposed ringing is covered by J86555D. For No. 1 crossbar and panel offices

with final multiple test line or trunk test line circuits assigned to the positive choice, 48.5/50-volt positive tripping supply is required instead of the equipment per J86555D. This equipment is covered in J86423 and is known as the 103B power plant. Keys, pin jacks, and an artificial load are provided to test the dry cell tripping battery supplies.

2.08 *Howler equipment* is furnished with provision for manual or automatic starting. A KS-5313, L2 or KS-15547 motor-driven howler interrupter is used.

2.09 *Dial Tone Alarm and Transfer Circuit:* An applique unit for dial tone alarm and transfer is provided on some plants. The unit may be located on the ringing power board or on a miscellaneous relay rack.

2.10 *Vacuum Tube Low-voltage Transfer:* An applique unit in the form of a vacuum-tube low-voltage transfer and alarm circuit is provided for conversion of older plants such as 803A, 803B, 804A, etc. The unit provides a low ringing voltage alarm and transfers the ringing load to the reserve machine.

2.11 *Signaling Circuit—135-cycle Supply (No. 1 Crossbar Only):* A 135-cycle supply unit is provided on some plants to be used for crossbar number checking. The equipment consists of two separate generators with the associated transfer and alarm circuits.

2.12 *Ringling No-voltage Alarm:* A ringing no-voltage alarm applique circuit is provided in No. 5 crossbar jobs. In No. 1 crossbar, panel, and No. 11 manual offices, a similar circuit is provided as part of the office alarm equipment. This equipment provides alarms and an intermittent test of the dc silent interval tripping battery, and causes automatic transfer of the load to the reserve ringing machine if there is a no-voltage condition on the machine ringing bus bars.

2.13 *Code Ringing Applique:* The code ringing applique circuit, which is provided in No. 5 crossbar plants to furnish interrupted ringing and ground for code ringing and signaling, uses KS-5746 ringing interrupters mounted with the mercury interrupters on the line-driven and battery-driven ringing machines.

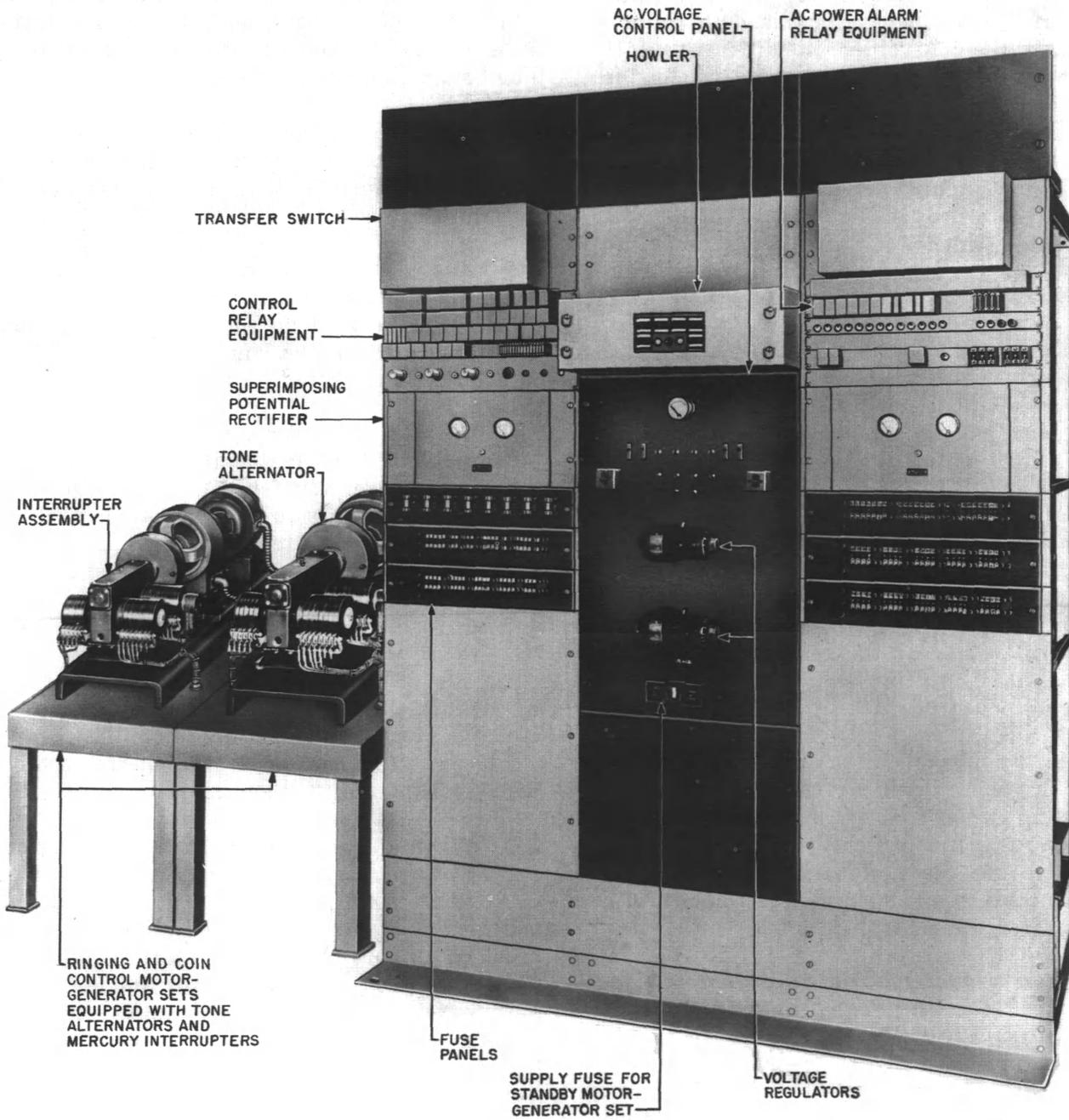


Fig. 1 - 803C Ringing Power Plant

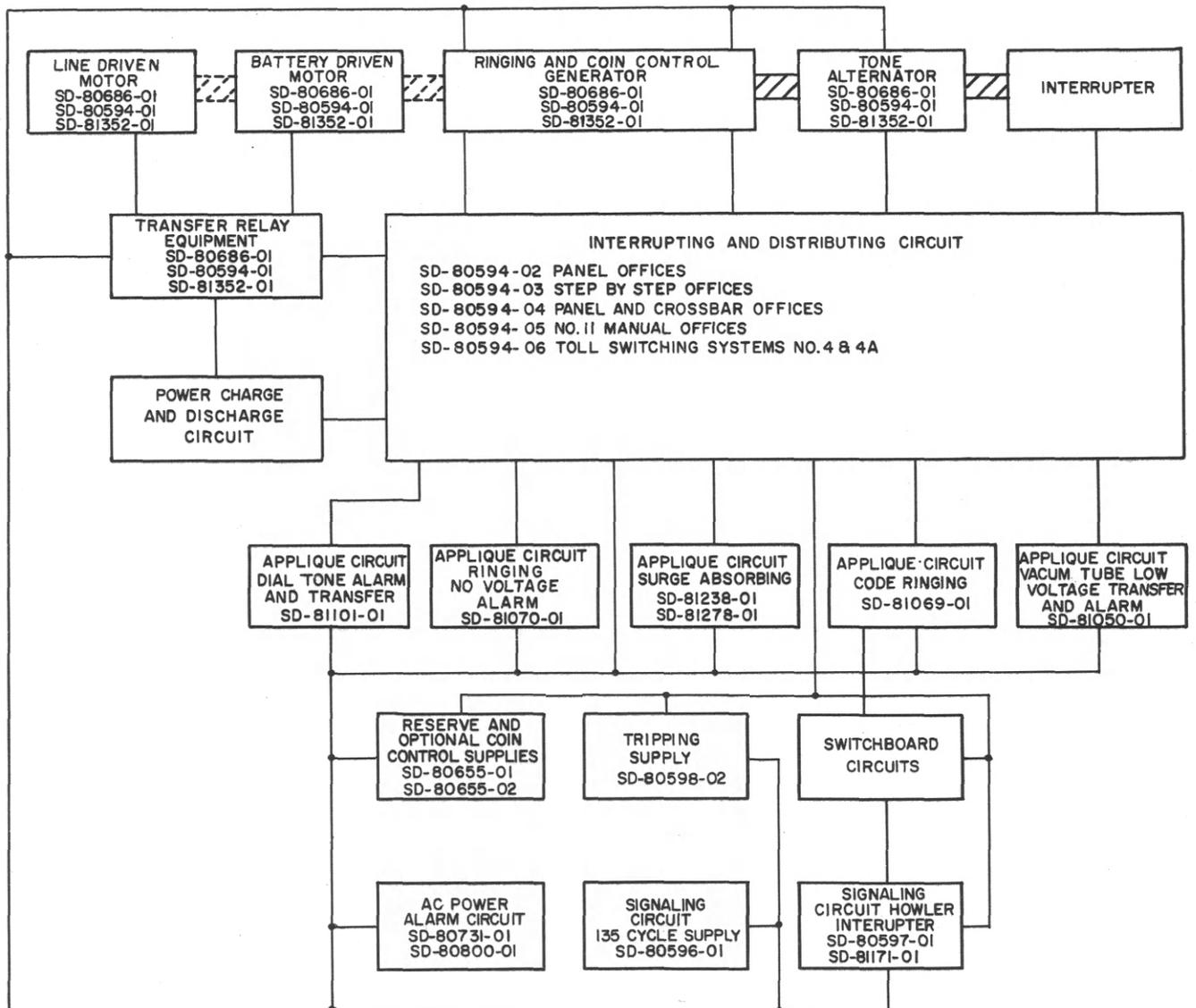


Fig. 2 – Operational Schematic — 803C Ringing Power Plant

2.14 AC Power Alarm Circuit: The 803C ringing power plant is provided with an alarm system to give audible and visual alarms in the event of a failure of the ringing, tone, or signal equipment. The various applique circuits are also tied into the ac power alarm circuit.

2.15 Surge Drain Circuit: A group of capacitors in series with a parallel pair of varistors, is provided. One circuit is connected from each machine ringing brush to ground in order to absorb surges.

Preparing to Start Initially

2.16 When putting the plant into service, check that:

- (a) All motor-generator sets are clear of any obstructions and are free to run. Where possible, as a check, it is desirable to turn by hand all parts that normally rotate.

Caution: Care must be used when doing this to prevent electric shock or physical injury.

- (b) The procedures for preparing to start in the various applicable sections have been observed.

- (c) STOP-NOR or ON-OFF keys are in the STOP and OFF positions respectively.
- (d) TEST-NOR keys are in the NOR position.
- (e) Correct size fuses are in place.

Initial Adjustments

2.17 Adjustment of Voltage Regulator for 115- to 120-volt Coin Supply: In adjusting the voltage regulator, the following procedure will apply: Connect the Weston Model No. 622 voltmeter between the CC- bus bar and the ringing ground bus bar. After the machine has run for at least 1 hour, adjust the no-load ac voltage within the 84- to 88- or 104- to 108-volt standard range by means of the voltage regulator dial so that the dc meter reads 116 volts (average fluctuations of the needle). The ac reading is indicated on the plant voltmeter when the \pm AUD key or the 105V key is operated. Mark the glass window of the ac voltmeter with a black line to indicate the reference point for future adjustments. It is considered that a similar adjustment on the battery-driven set will produce approximately the same ac reference mark. However, if this is not the case, an additional mark in red can serve as a reference point for the battery set. The 116-volt dc setting was chosen to allow an operating range of 115 to 120 volts. If higher dc adjustments are made, the dc voltage may exceed the 120-volt upper limit under full ac load conditions.

2.18 Adjustment of Generator Control Equipment: In the following paragraphs, three groups of voltage adjustments are given. To avoid repetition, the letters (A), (B), and (C) have been used to indicate the condition under which the adjustment is being made.

- (A) Normal step-by-step, panel, crossbar, or manual office — nominal voltage 84 to 88.
- (B) Step-by-step, panel, crossbar, or manual office with high capacity load due to a large number of PBX feeders.
- (C) No. 4 toll switching system — nominal voltage 104 to 108.

2.19 Preliminary to adjusting the vacuum tube relay circuit:

- (a) Give LV1, LV2, BF, HV, HVA, FT, A, and B relays the standard dc adjustments in accordance with the circuit requirement table.

- (b) Place LV1, LV2, and HV rheostats in the maximum clockwise position.

(c) Operate RING M2 switch to START position. The RING TRNS key is operated to the MAN position when it is desired to transfer the load to the reserve machine.

- (d) See that voltmeter fuses and BFA, HLVA, HVS, and LVS or 105V G1 fuses are in circuit.

2.20 Operate in (A) and (B) offices the \pm AUD or in (C) offices the 105V voltmeter key for RING G1 and RING G2, and see that the voltages of RING G1 and RING G2 are within the limits for (A) of 84 to 88, (B) 88 to 92, or (C) 104 to 108 volts as shown on the ac voltmeter.

2.21 Pull out (release) TEST key A or turn TEST key A to TST position. This transfers the HV and LV2 tubes to RING G1, removes battery from the contacts of the HVA relay to prevent operating the alarm, connects the voltmeter across RING G1, and operates the TST relay. The operation of the TST relay lights the GD lamp to indicate that the test key is in the test position, and when Y wiring is used, connects battery to terminal 4 of TR1 transformer.

2.22 Adjustment of HV Relay: Adjust the voltage of RING G1 by means of its voltage regulator for (A) to 93, (B) 97, or (C) 115 volts, and turn HV rheostat in a counter-clockwise direction until the HV relay operates. After any change in the adjustment of HV rheostat, an interval of about 10 seconds should be allowed in order that HV capacitor, which has a large capacity, may have time to charge. With this setting HV relay should operate for (A) 93, (B) 97, or (C) 115 volts and release at about 91 volts for (A), 95 for (B), or 113 for (C).

2.23 Adjustment of LV1 Relay: Pull out (release) TEST key B with TEST key A still pulled out or released, or turn TEST key B to the TST position, with the TEST key A still turned to the TST position. Adjust the voltage of RING G1 as read on the voltmeter to 78 volts for (A), 82 for (B), or 97 for (C) by means of the voltage regulator dial. Strap out resistor L2 tem-

porarily. Turn LV1 rheostat in the counterclockwise direction until LV1 relay operates. With this setting, LV1 relay should operate at 78 volts for (A), 82 for (B), or 97 for (C) and release at about 77 volts for (A), 81 for (B), or 96 for (C). After this adjustment has been made, remove strap from L2 resistor. Lower the voltage until LV1 relay releases and then raise it slowly to 79 volts for (A), 83 for (B), or 98 for (C). If LV1 relay does not operate, strap out L3 resistor and again lower the voltage until LV1 relay releases and then raise to 79 volts for (A), 83 for (B), or 98 for (C). If LV1 relay still does not operate, remove strap from L3 resistor and strap out L2 resistor. L2 and L3 resistors limit the current in the main gap of LV1 tube and the maximum resistance which allows proper operation of the relay should be used. This resistance should never be less than 1481 ohms and should be as great as possible in order to obtain longer tube life. When a new tube is placed in the LV1 socket, the adjustment procedure outlined above should be followed as the new tube may require a different strapping of resistors from the one removed.

2.24 Adjustment of LV2 Relay: For adjustment of LV2 relay, follow the same procedure as outlined in 2.22 for LV1 relay, strapping out B2 or B3 resistors as required in a manner similar to the strapping out of L2 or L3 resistors. Push in (operate) TEST key B and then A, or turn TEST key B to NOR and then A to NOR. Adjust voltage of RING G1 to 84 to 88 volts for (A), 88 to 92 for (B), or 104 to 108 for (C) as measured by operating the \pm AUD key in (A) and (B) offices or the 105V RING G1 key in (C) offices. Operate the RING TRNS key to the AUTO position, and the RING M2 switch to NORMAL position. This will connect the load to RING G1 and shut down RING G2.

Note: Do not leave test keys pulled out (released) or in TST position with GD lamp lighted. Always pull out (release) A key, then B, and if both are pulled out (released), always push in (operate) B then A; or, as the plant may call for, always turn A key to TST and then B key, and if both are in TST position, turn B to NOR and then A. If this order is not followed, an alarm will be brought in by the operation of HVA relay.

2.25 With the RING G1 voltage adjusted to 84 volts for (A), 88 for (B), or 104 for (C) measured by operating the \pm AUD voltmeter key in (A) and (B) offices or the 105V RING G1 voltmeter key in (C) offices, lift one of the ac generator collector ring brushes momentarily.

Caution: *This brush is approximately 88 volts above ground. Use care to prevent electric shock. Make sure not to lift the dc brush, as this may cause extensive damage.*

The BF relay should operate and transfer the load to RING G2. If the generator is operating at no load, it may be necessary to use a small dummy load on the 84- to 88-volt output, such as a 25-watt lamp, to build up sufficient ripple to operate BF relay. Push (operate) HVR key to reconnect load to RING G1.

2.26 If BF relay fails to operate when checked as covered in 2.25, a slight modification of its adjustment may be necessary. However, its adjustment should not be weakened to the point where it tends to operate falsely (with both collector ring brushes in circuit) under heavy ac loads.

2.27 When all previous adjustments have been made, set voltage regulator dials of both machines to give normal operating voltage.

2.28 Vacuum Tube Low-voltage Transfer and Alarm: (Adjust as follows, when equipment is furnished as per SD-81050-01.) LV relay and its associated vacuum tube circuit are adjusted by means of TST key and the ADJ potentiometer. The procedure outlined below should be followed:

- (a) Throw or connect the office load to the reserve RING G2 ringing machine, allowing RING G1 to run on no load. See 2.30.
- (b) See that the LV relay is in correct mechanical and electrical adjustment.
- (c) Operate (push in) the TST key. This inserts TST rheostat in the circuit.

Note: In subsequent paragraphs the TST key should be held operated whenever a voltage reading is taken or when observing the operate or release of LV relay. Connect the voltmeter to the VM jack.

- (d) Turn ADJ potentiometer to its maximum counterclockwise position.
- (e) Adjust TST rheostat until the voltmeter reads the release voltage. The release voltage should be 95 per cent of the lowest standard ringing voltage (for example, 79.8 volts for 84- to 88-volt range).
- (f) Strap out A and B resistors temporarily.
- (g) Turn ADJ potentiometer clockwise until LV relay operates. When changing the setting of ADJ potentiometer, wait a minute or so to allow LV capacitor to charge or discharge.
- (h) Turn ADJ potentiometer counterclockwise slowly until LV relay releases.
- (i) Leave setting of ADJ potentiometer as determined by (h) and turn TST rheostat slowly (waiting a minute or so between settings to allow for slow action of LV relay until the LV relay operates).
- (j) Adjust straps on A, B, and C resistors to permit the maximum resistance in the circuit under the conditions of (i). Under no circumstances should all three resistors be strapped out. The operate and release of the relay can easily be checked by removing the tube from the socket. The above adjustment is to permit the minimum current to flow so as to give maximum tube life.

Routine Adjustments (Normal Operation)

2.29 Since this plant is fully automatic, it requires only a few routine adjustments. However, the variation of plants due to the presence or absence of various applique units makes it necessary to explain all possible adjustment features. To simplify the task of locating the control or adjustment, they have been classified according to the associated piece of equipment or the affiliated circuit.

2.30 Ringing Circuit — Generator and Control Equipment

- (a) The RING TRNS key is provided to start the reserve ringing machine and transfer the load to it so that maintenance operations can be carried out on the line-driven set. After the RING TRNS key is placed in the MAN position, the line-driven set may be shut down

by opening the normally closed RING M1 switch which is located on the machine table. The normally open RING M2 switch is provided to start the reserve ringing machine without transferring the load to it from the line-driven machine. The RING M2 fuse should be removed when it is desired to work on the reserve machine when it is not running. This will prevent its starting up in case of an automatic transfer from the line set.

- (b) If the ringing interrupter brushes of the battery set have been removed for maintenance and the RING TRNS switch is used to start up the reserve set instead of the RING M2, a no-voltage alarm will be brought in. If the RING TRNS switch is then thrown to AUTO, the CO relay will operate and lock up to the HVR key or relay and shut down the line set. Operating the HVR key will start the line set again but only temporarily as the no-voltage alarm stays locked out and the line set shuts down again. To restore service, both the HVR and MACH RING ACO keys must be held operated simultaneously.

Note: The condition described above does not apply to all plants.

- (c) The TEST keys A and B are not ordinarily used in the normal operation of the plant. Whenever any of the tubes in the transfer circuit are replaced, however, the initial adjustments shown in 2.17 through 2.27 must be repeated. On older plants, a TR key is provided. This key should be released to remove the plate voltage from the vacuum tubes before placing the tubes in their sockets. It may also be used in routine testing of the circuit.

- (d) In case the automatic transfer circuit operates, a minor alarm is given. The alarm can be cut off by operating the TRNS A key.

2.31 Interrupting and Distributing Equipment:

Plant voltages are indicated on the panel-mounted voltmeter by operating the 105V G1 key, \pm AUD G1 key, 105V G2 key, or \pm AUD G2 key.

2.32 Reserve and Optional Coin Control Supplies (Usually Found on Older Plants Similar to the 803C)

- (a) *Equipment as per SD-80655-01:* The ALT ST key is provided to start the emergency alternator without transferring the rectifiers

to it. The TST key is provided for transferring either the G1 or G2 rectifier loads to the reserve rectifier so that maintenance can be carried out on the regular rectifiers. The reserve rectifier is continuously energized.

(b) The starting time of the alternator is such that the rectifier can be switched from the power service to the alternator without operating the MAN ST starting switch associated with the rectifier. If the automatic operation of the circuit is interfered with in testing so that the alternator does not start promptly, the MAN ST switch on the rectifier should be turned to the start position and the usual delay observed before turning the switch to the run position. Under the automatic operation described above, this is not necessary.

(c) **Equipment as per SD-80655-02:** The TST key has been provided to transfer either the positive or negative loads to the reserve supply so that maintenance operations can be carried out on the rectifiers.

2.33 Tripping Supply

(a) **Equipment as per SD-80598-02:** The keys marked TRP BAT LOAD, +TRP, and -TRP need not be operated in the daily operation of the plant. Their use is covered under routine checks.

(b) **Equipment as per J86423:** The operation of this plant is described in Section 167-606-301.

2.34 Howler Equipment: The howler interrupter may be started by operation of the MOT ST key when necessary for maintenance or other reasons.

2.35 Dial Tone Alarm: The ALM RLS key is used to extinguish the LT2 FAIL lamp and silence the audible alarms after a dial tone failure. Some offices are provided with alarm sending apparatus which will perform the same function as the key. The T jack is used for testing purposes and is covered under routine checks.

2.36 Vacuum Tube Low-voltage Transfer: The ACO key is used to silence the audible alarms after the ringing load has been transferred to the reserve machine. TST key, VM jack, TST rheostat, and ADJ potentiometer are

used for initial adjustments and must not be disturbed during daily maintenance.

2.37 Signaling Circuit — 135-cycle Supply: The MANUAL TRANSFER key is used to select which machine will carry the office load and which machine will act as a reserve supply. The R key is used to transfer the load back to the regular machine after a transfer has occurred and the trouble has been remedied. The ACO key is used to silence the audible alarm after a transfer has occurred. The voltage output of each machine is indicated on the panel-mounted voltmeter by the operation of the VM G1 key or the VM G2 key. When it is desired to start either machine for maintenance purposes, without transferring the load, operate either the RING G1 START key or the RING G2 START key.

2.38 Ringing No-voltage Alarm: The operation of this circuit is completely automatic and contains no keys or other apparatus, which must be operated during day-to-day operation.

2.39 Code Ringing Applique: The operation of this circuit is completely automatic and contains no keys or other apparatus, which must be operated during day-to-day operation. The KS-5746 interrupters are maintained as described in Section 163-630-701.

2.40 AC Power Alarm Circuit: On newer plants, the MACH RING ACO key is used to release the MACH RING alarm. The RING OR CC RECT ACO key is used to silence the RING OR CC RECT FAIL alarm. The use of these keys is described under routine checks.

3. ROUTINE CHECKS

General

3.01 The purpose of making routine checks is to determine whether or not all the features, indications, and alarms are in proper operating condition. Basically, the objective of these checks is to cause all apparatus to operate at periodic intervals without intentionally causing drastic or harmful situations such as complete power failure. The checking time and testing intervals will be based on local conditions and past experience. Routine checks should be made

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at a time when they will least interfere with service.

3.02 Periodically the operations described under Routine Adjustments (Normal Operation) should be checked for each unit of the plant. In performing these operations, such actions as raising and lowering voltage should be kept to a minimum degree; that is, raise or lower the voltage just enough to establish the initiation of the necessary follow-up operation. Fully automatic functions of the plant can be assumed to be in good operating condition if all the manual and test conditions shown under Routine Adjustments are fulfilled during the periodic check.

Fuses

3.03 All fuse-failure alarms and indications must be checked periodically. To check the alarms and indicator lamps, use a W1AF test cord equipped with No. 365 clips. Fuse alarms are checked by momentarily bridging across the supply terminal or bus and the alarm terminal or bus of the fuse. In the fuse alarm tests which follow, frequent reference will be made to the term "test potential." For the purpose of this section, the term "test potential" will refer to whatever voltage exists on the supply terminal or bus for the particular fuse concerned.

Ringling Circuit — Generator and Control Equipment

3.04 Low-voltage Failure

(a) With No. 1 ringling generator running and carrying the load, remove the LV1 tube and observe the following:

- (1) No. 2 ringling generator starts.
- (2) The load is transferred to the battery-driven set.
- (3) A minor alarm is given and the RING TRANS lamp lights. Operation of the TRNS A key will silence the audible alarm and extinguish the RING TRANS lamp, but will cause the RING TRANS GD lamp to light until No. 1 generator is returned to normal.

(b) Remove the LV2 tube (this simulates a low-voltage condition on G2) and observe that the major alarm comes in.

(c) Replace the LV2 tube and observe that the major alarm is retired.

(d) Replace the LV1 tube. This transfers the load to G1, and G2 stops.

3.05 High-voltage Failure

(a) With No. 1 ringling generator running and carrying the load, block HV relay operated and observe the following:

- (1) No. 1 generator shuts down and No. 2 generator starts.
- (2) The load is transferred to the battery-driven set.
- (3) The alarms described in 3.04(a)(3) are displayed. In addition, the major alarm is also given.

(b) Remove block from HV relay. The major alarm retires.

(c) Momentarily operate HV relay manually. The major alarm should be brought in as long as the HV relay is held operated. This simulates a HV condition on G2.

(d) Operate HVR key momentarily and note that the load is transferred back to No. 1 generator and No. 2 machine stops.

3.06 Collector Ring Brush Failure: With No. 1 ringling generator running and carrying the load, block BF relay operated. The plant will act as described under 3.05. Remove the block from BF relay and operate the HVR key when the check is completed.

3.07 Machine Ringling No-voltage Alarm Transfer: (This test to be made only on those plants which are equipped with a BK relay.) With No. 1 ringling generator running and carrying the load, perform the following steps in the order shown:

- (a) Remove the RING M2 battery motor fuse. This will automatically open TCO switch.
- (b) Manually operate MRF relay.
- (c) MACH RING lamp should light.
- (d) Release MRF relay and replace RING M2 fuse. It may be necessary to operate the MACH RING ACO key to extinguish the MACH RING lamp.

3.08 Transfer on Failure of TR1 or ALT FLD 1 Fuse: (These fuses are found in older offices only.) The tests on TR1 and ALT FLD 1 fuses are identical but must be performed separately. Impress test potential (see 3.03) on the alarm stud of the fuse under test. The following indications should be observed:

- (a) No. 2 generator starts and takes the load from No. 1 generator, which stops.
- (b) Audible alarms sound and the RING PB FA lamp lights.
- (c) Remove test potential.
- (d) The alarms should continue to sound until the HVR key is operated. Operation of the HVR key also returns the load to No. 1 generator.

3.09 The GD lamp can be tested by operating either TEST key in accordance with the note shown in 2.24.

3.10 The tests on TRNS A and RING M2 fuses are identical but must be performed separately. Impress test potential on the alarm stud of the fuse under test, and note that audible alarms sound and the RING PB FA lamp lights. Remove test potential and operate HVR key.

Ringling Circuit — Interrupting and Distributing Equipment

3.11 Periodically test all ringling, tone, coin control, 24V, and 48V fuses on the fuse panels. The tests on all of the fuses are identical but must be performed separately. It is desirable but not essential that the alarm for each fuse be tested. Apply test potential to the alarm stud of the fuse under test, and note that audible alarms sound and the RING PB FA lamp lights. Remove test potential.

Reserve and Optional Coin Control Supplies (Usually Found on Older Plants Similar to the 803C)

3.12 Equipment per SD-80655-01: Periodically operate the TST key to the G1 and G2 positions. In the TST G1 position, the CCG1 TRNS lamp should light. In the TST G2 position, the CCG2 TRNS lamp should light. Either operated position of the TST key should transfer the

coin control load to the 120V G3 reserve rectifier. Restore the TST key to its unoperated position.

3.13 Periodically remove one of the ac fuses labelled CC RECT, and note that the CCA reserve alternator starts and takes the coin collect rectifier load. ALT ST and CC TRNS lamps should light and an audible alarm should be sounded. Replace fuse. Operation of the ALT ST key should cause the reserve alternator to start and the ALT ST lamp to light, but the load will not be transferred to it. Return key to normal.

3.14 Periodically remove the ac power cord plug of each rectifier separately, allowing time between each plug removal for the rectifier which was previously tested to be started and carry the load. For 120V G1 and 120V G2 rectifiers, the corresponding CCG- TRNS lamp should light. The removal of any rectifier plug should cause an alarm. For each test, the CC RECT FAIL lamp should light and an audible alarm should sound. Operation of the CC RECT ACO key should silence the audible alarm and light the CC RECT GD lamp. All alarms should be extinguished when the power cord plug is reconnected and the rectifier is given time to take the load, using the MAN ST switch on the rectifier.

Note: The starting time of the alternator is such that the rectifier can be switched from the power service to the alternator without operating the MAN ST starting switch associated with the rectifier. If the automatic operation of the circuit is interfered with in testing so that the alternator does not start promptly, the MAN ST switch on the rectifier should be turned to the start position and the usual delay observed before turning the switch to the run position. Under the automatic operation described above, this is not necessary.

3.15 Periodically apply test potential to the CC+ and CC- distribution and capacitor bank fuse alarm terminals. In each case the RING PB FA lamp should light and an audible alarm should sound.

3.16 Equipment per SD-80655-02: Periodically operate the TST key to the G1 and G2 position. In the TST G1 position, the G1 CC

TRNS lamp should light. In the TST G2 position, the G2 CC TRNS lamp should light. Either operated position of the TST key should transfer the coin control load to the ringing machine coin control supply.

3.17 Periodically remove the ac power cord plug of each rectifier separately, allowing time between each plug removal for the rectifier which was previously tested to be started and carry the load. For each rectifier, the corresponding G- CC TRNS lamp should light, the CC RECT FAIL lamp should light, and an audible alarm should sound. Operation of the CC RECT ACO key should silence the audible alarm and light the CC RECT GD lamp. All alarms should be extinguished when the power cord plug is reconnected and the rectifier is given time to take the load.

3.18 Periodically perform the tests shown in 3.15.

Tripping Supply

3.19 *Equipment per SD-80598-02:* Periodically check the dry cell tripping batteries in the manner prescribed below.

- (a) Connect the Weston Model No. 622 voltmeter to the \pm VM jacks.
- (b) Operate the TRP BAT LOAD key.
- (c) Operate the +TRP key and note the voltage at the end of 10 seconds before releasing the key. The voltage should fall within the limits shown in Table A.
- (d) Where dry cells are used for the negative tripping battery, operate the -TRP key and note the voltage at the end of 10 seconds before releasing the key. The voltage should fall within the limits shown in Table A.
- (e) Return the TRP BAT LOAD key to its unoperated position.

TABLE A

VOLTAGE LIMITS OF DRY CELL TRIPPING BATTERIES

| TYPE OF SUBSET | VOLTS | | NUMBER OF DRY CELLS (SEE NOTE) | |
|----------------|-------|------|--------------------------------|------|
| | MIN. | MAX. | MIN. | MAX. |
| Relay | 60 | 75 | 50 | 60 |
| Tube | 46 | 52 | 34 | 46 |

Note: Add cells as required to maintain the voltage limits shown. When the maximum number of cells shown is in the circuit and the voltage is below the minimum value shown, replace the entire battery. Replacement of individual cells is not recommended.

3.20 Periodically apply test potential to the alarm terminal of the tripping battery supply fuses designated TRP 1 POS, TRP 2 POS, TRP 1 NEG, TRP 2 NEG, TRP COND 1 and TRP COND 2. The alarms should be displayed as shown in (a) and (b) below:

- (a) For dry cell tripping battery fuses, audible alarms will sound and the TRP BAT FA lamp will light.
- (b) For central office tripping battery and tripping capacitor fuses, audible alarms will sound and the RING FA lamp will light.

3.21 *Equipment per J86423:* Periodically make checks on this plant, known as the 103B power plant, as described in Section 167-606-301.

Howler Equipment

3.22 The routine checks on the KS-5313 or KS-15547 howler interrupter are shown in Section 163-675-701. Periodically apply test potential to the alarm terminal of the howler interrupter fuses designated HT2. Audible alarms should sound and the HT FA lamp should light. Apply test potential to the alarm terminal of the HLR fuse. Audible alarms should sound and RING PB FA lamp should light.

Dial Tone Alarm and Transfer

3.23 Periodically simulate a tone failure as follows. Insert a dummy plug into the T jack. This should cause the LT2 FAIL audible alarm. The G2 battery set should start, the load should be transferred to it and the G1 line set should stop. Remove the dummy plug from the T jack and momentarily depress the ALM RLS key. This should retire the LT2 FAIL alarm and extinguish the lamp. Momentarily depress the HVR key to start the G1 line set and transfer the load to it. The G2 battery set should then stop.

Vacuum Tube Low-voltage Transfer and Alarm
(On Some Older Plants Such as No. 803A, 803B,
804A, etc)

3.24 Circuit Arranged for Low-voltage Alarm

Only: Periodically remove LV tube from its socket. RING TRNS lamp should light and audible alarms should sound. Replace tube and note that alarms are cancelled.

3.25 Circuit Arranged for Low-voltage Transfer and Alarm:

Periodically remove LV tube from its socket. RING TRNS lamp should light, the reserve machine should start and have the load transferred to it, and audible alarms should sound. The alarms can be cut off by operating the ACO key which should cause RING GD lamp to light. Replace LV tube and note that the plant returns to normal operation.

Signaling Circuit — 135-cycle Supply

3.26 Automatic Transfer G1 to G2: Periodically test the automatic transfer of the 135-cycle supply as outlined herein. Operate the MANUAL TRANSFER key to the G1 position. G1 should then be running. Block LR relay in the nonoperated position. G2 should start, the load should be transferred, R and 135~ TRNS lamps should light, and audible alarms should sound. Remove relay block as soon as G2 comes up to speed. Operation of the ACO key should silence the audible alarm and extinguish the 135~ TRNS lamp. However, the 135~ TRNS GD lamp should light. Operation of R key should start up G1 and return the circuit to normal.

3.27 Automatic Transfer G2 to G1: It is not necessary to check this function because all the active equipment is checked in 3.25.

3.28 Failure of G1 and G2: Proceed as described in 3.26 to the point where the relay block was removed. This time, however, leave LR relay blocked nonoperated. The minor alarms should be cancelled, a major alarm should sound, and 135~ FAIL lamp should light. Remove the block in LR relay and operate R key to return the plant to normal.

3.29 Periodically apply test potential to the 135-cycle fuse alarm terminals. Audible alarms should sound and 135~ FA lamp should light.

Machine Ringing No-voltage Alarm
(No. 5 Crossbar Only)

3.30 Offices Which Have AC/DC Ringing: With the regular ringing machine running, remove 105± fuse which is associated with the regular machine. The 105V± lamp should light, audible alarms should sound, and the reserve ringing machine should start and have the load transferred to it. Replace the fuse. The plant will automatically return to normal operation.

3.31 Remove C1B1, C1B2, or C1B3 fuse. Audible alarms should sound. Also the MACH RING lamp should light, the reserve ringing machine should start, and the load should be transferred to it. Replace the fuse. The plant will automatically return to normal operation. Operation of the MACH RING ACO key should extinguish the MACH RING alarm lamp.

3.32 Periodically apply test potential to the alarm terminals of the 105V±, C1B1, C1B2, and C1B3 fuses. RING PB FA lamp should light and audible alarms should sound. Remove test potential.

3.33 Offices Which Have Superimposed Ringing: Perform tests as per 3.30 and 3.31 except that in 3.31 the C1B1, C1B2, C1B3, or C1+ fuse may be removed for the test. Perform tests as per 3.32, except that the test shall also include C1+ fuse.

Code Ringing Applique (No. 5 Crossbar Only)

3.34 Periodically apply test potential to the alarm terminal of the fuses listed below. RING PB FA lamp should light and audible alarms should sound. Remove test potential after test.

| | |
|----------------|-----------|
| CODE 2 GEN BR1 | -TRP 1 |
| CODE 2 GEN BR2 | -TRP 2 |
| CODE 2+ | +TRP BAT |
| CODE 3 GEN | +TRP 1 |
| CODE 4 GEN | +TRP 2 |
| CODE 5 GEN | AC-DC AUD |
| 85V± | SUP-AUD |
| | SUP+AUD |

Ringling Alarm Supply Fuses

3.35 Periodically apply test potential to the alarm terminal of the fuses listed below. RAS lamp should light and audible alarms should sound. Remove test potential after test.

SECTION 167-721-311

NO. 4 AND 4A CROSSBAR PLANTS

A, B, C
D, E, F

OTHER PLANTS

A, B, C
D, V1, V2

3.36 Charging the HV Capacitor: At intervals not exceeding 18 months, the HV capacitor connected across the HV relay shall be given a charge by blocking the HV relay nonoperated and short circuiting the HV rheostat. The capacitor shall be charged for at least 30 minutes. Restore circuit to normal.

4. TROUBLES AND ALARMS

4.01 The more likely troubles which may develop in the 803C power plant will be accompanied with one or more visual alarms and audible alarms. The table below lists all of the visual alarm lamps that may be present in the 803C power plant (some plants do not have them all) and some of the possible causes for the alarm lamp being lighted.

- RING PB FA — Indicates failure of a ringing or battery supply fuse on the ringing power board.
- 105V± — Indicates failure of the ringing supply.
- MACH RING — Indicates failure of the interrupter on the regular ringing machine. The alarm lamp is extinguished by operation of the MACH RING ACO key.
- RING HV — Indicates failure of regular ringing machine with RING M2 fuse removed or open.
- HT FA — Indicates failure of a howler circuit fuse.
- RING TRNS — Indicates that the ringing load has been transferred to the reserve machine or alternator. Operation of the TRNS A key will silence the audible alarm.
- RING TRNS GD — Indicates that the RING TRNS audible alarm has been silenced.

- 135~ TRNS — Indicates failure of the regular 135-cycle supply and transfer to the reserve supply. Operate the ACO key on the 135-cycle equipment to silence the audible alarm.
- 135~ TRNS GD — Indicates that the 135~ TRNS alarm has been extinguished.
- 135~ FAIL — Indicates a complete failure of the 135-cycle supply.
- 135~ FA — Indicates failure of a 135-cycle supply fuse.
- TRP BAT FA — Indicates failure of tripping battery fuse.
- RAS — Indicates failure of a ringing alarm supply fuse.
- RING OR CC RECT FAIL — Indicates failure of superimposing battery rectifier or failure of coin control rectifiers.
- RING OR CC RECT GD — Indicates that the RING or CC RECT FAIL alarm has been extinguished.
- ALT ST — Indicates that the emergency alternator for the coin control rectifiers has been started either manually or automatically.
- CCG1 TRNS — Indicates that the coin control load has been transferred from No. 1 rectifier to the reserve rectifier.
- CCG2 TRNS — Indicates that the coin control load has been transferred from No. 2 rectifier to the reserve rectifier.
- G1 CC TRNS — Indicates that the coin control load has been transferred from No. 1 rectifier to the reserve coin control supply.
- G2 CC TRNS — Indicates that the coin control load has been transferred from No. 2 rectifier to the reserve coin control supply.

| | | | |
|------------------|---|------------------|--|
| LT2 FAIL | — Indicates a failure of the dial tone supply. Operate the ALM RLS key to silence the audible alarm and extinguish the alarm lamp. If necessary, test the A relay, using a 35-type test set in conjunction with T jack. | RING G2 START | — Indicates that the No. 2, 135-cycle supply generator has been started manually for maintenance. |
| RING TRNS | — Indicates a low or high ringing voltage condition, ac power failure, dial tone failure, or brush failure. Cancel the audible alarm with the ACO key. | R | — Indicates that the 135-cycle load has been transferred to the reserve 135-cycle generator. |
| RING GD | — Indicates that the RING TRNS audible alarm has been silenced. | GD | — Indicates that the TEST A or TEST B key is operated. This lamp must be extinguished by returning the operated TEST key to the normal position. |
| RING G1 START | — Indicates that the No. 1, 135-cycle supply generator has been started manually for maintenance. | RING FA | — Indicates failure of a fuse on the ringing power board which supplies central office battery to the tripping battery circuit. |
| | | CC | — Coin control alarm. |
| | | PU | — Pickup alarm. |