167-217-301 in Wellton

RINGING POWER PLANT
806D (J86596)
OPERATING METHODS

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1. GENERAL

1.01 This section describes the operation of the 806D (J86596) ringing power plant which provides 20-hz ringing current, low and high tones, and signaling interruptions for manual and dial offices.

1.02 This section is reissued to incorporate tripping and superimposing battery tests and to generally update the section. Since it is a general revision, arrows are not used to indicate changes. The reissue does affect the Equipment Test List.

1.03 In this power plant two converter-type ringing machines are provided and arranged so that upon failure of the regular machine the load is automatically transferred to the reserve machine. Both machines operate from the central office battery. Some plants use low- and high-tone static-frequency generators operated from 120-volt, 60-hz commercial ac service. A J86727E voltage regulator is furnished as standard equipment with all superimposed ringing plants in 355A dial offices. The voltage regulator may be added to existing superimposed ringing plants in No. 11 manual offices and 350A and 355A dial offices. It may also be added to existing ac-dc ringing plants in 350A dial offices and No. 11 manual offices to increase the rating of the ringing plant from 0.25 to 0.50 ampere. A TOUCH-TONE 404D dial tone generator is provided in the 806D plants for the 701B and 711B PBXs or the 701A and 711A PBXs with under 200 lines. Duplicate TOUCH-TONE dial tone generators (405B) with automatic transfer are provided for PBXs with over 200 lines but under 4000 lines.

1.04 When a voltage regulator is furnished, the ringing power plant has a regulated output of 84 to 88 volts, and an automatic transfer from the regular to the reserve machine takes place under both high- and low-voltage conditions.

Warning 1: 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.

Warning 2: Voltages inside the ringing generator case are over 150 volts. Avoid all contact with terminals. Do not allow a test pick to touch two metal parts at the same time or destructive and dangerous short circuits may occur. Disconnect both the ac supply and the output before doing any work inside the ringing generator case.

1.05 ***Superimposing or Tripping Supply***

(a) ***Dry Cell Battery Supply:*** Failure of either set of batteries while in circuit will bring in a major alarm. Negative tripping voltage is obtained from fused central office battery. Failure of either the negative or positive tripping battery fuses will light the TRP lamp and bring in a major alarm. Two sets of dry batteries for positive 48-volt superimposing or tripping battery are provided. Either set of batteries may be used in the circuit by selecting the position of the +BAT key.

(b) ***DC-to-DC Converter (610D Power Plant):*** Two parallel connected converters of the 610D power plant are provided to supply +48 volt, 1-ampere dc power from −48 volt central office battery. Both converters operate simultaneously and share the connected load. Failure of one converter causes the other converter to automatically increase its current output to carry the entire load. Failure of either converter will cause a minor alarm, and failure of both converters will cause a major alarm. An NV alarm lamp is provided for each converter.

1.06 Tests should be made during a period when they will cause the least service reaction.

1.07 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-66384-01—No. 606B, 607A, 607B, 701A, or 711A PBX Systems, Miscellaneous Alarm Circuit

SD-80884-01—Ringing Circuit—Generator and Interrupting Equipment

SD-80885-01—Ringing Circuit—Distributing and Control Equipment

SD-80886-01—Signaling Circuit—Tone Supply with Static-Frequency Generators and Drum Interrupters

SD-80893-01—AC Power Alarm Circuit

SD-80895-01—Ringing Circuit—AC-DC or Superimposed Machine Ringing (Mfg. Disc.)

SD-81040-01—Ringing Circuit—Superimposing Batteries—4-Party Full Selective Ringing—8-Party Semiselective Ringing

SD-81041-01—Ringing Circuit—Tripping Supply—Silent Interval Batteries—For 4- or 8-Party Superimposed Ringing

SD-81277-01—Regulator Circuit—Voltage-Contact Type—For Use with KS-5133, KS-5510, and KS-5546 Ringing Machines

SD-81278-01—Ringing Circuit—For Absorbing Surges on Machine Ringing Brushes

SD-81719-01—Dial Tone Generator For PBX TOUCH-TONE Calling

SD-81614-01—Interrupter Gear Failure Alarm Circuit (J86727G)

If this section is to be used with equipment or apparatus that is associated with earlier or later issues of the schematic drawings, reference should be made to the SDs and CDs to determine the extent of the changes and the manner in which the section may be affected.

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

1.09 The abbreviations cw and ccw used herein refer to clockwise and counterclockwise, respectively.

2. LIST OF TOOLS AND TEST APPARATUS

CODE OR SPEC NO.	DESCRIPTION
TOOLS	
-	3-inch C Screwdriver
TEST APPARATUS	
KS-14510	L1 Volt-Ohm-Milliammeter
716C	Receiver
2W21A	Cord
W1AF	Cord

3. OPERATION

Description

3.01 The 806D plant covers ringing and signaling equipment for several types of offices. Each office may not be provided with all of the available options. No attempt has been made in this section

to specify which options are used for particular applications. This information may be obtained from the associated circuit descriptions and drawings.

3.02 The KS-5546 inverted rotary converter-type ringing machine provides 20-hz ringing current, low and high tones, and signaling interruptions. If the regular machine fails or if its fuse fails, the transfer circuit automatically starts the reserve machine, transfers the load to it, and causes an alarm. In some plants, the regular machine runs continuously, and in other plants on a call-start basis. When on a call-start basis, the regular machine starts only when required by a call. It stops after the call is completed when the machine has run to the end of its code cycle. By operation of the MAN TRNS (manual transfer) key, either of the two machines can be selected as the regular or reserve machine, so that wear can be distributed equally between the two machines. In some offices, either machine can be selected as the regular or reserve machine by the dialing of a certain number. In some offices, low and high tones can be furnished from 101A and 102A static-type frequency generators, respectively. Where static-type frequency generators which operate from commercial ac service are used, an ac service power failure causes an alarm and automatic transfer of the load to the ringing machine tone supply. If the voltage regulator is furnished, a transfer circuit automatically starts the reserve machine, transfers the load to it under high-voltage conditions, and causes an alarm.

3.03 ***Manual Transfer:*** The MAN TRNS key has two positions, G1 and G2. One ringing machine is designated G1 and the other G2. With the key in the G1 position, the G1 machine becomes the regular machine and the G2 machine becomes the reserve machine. Under normal conditions, the G1 machine then carries the load while the G2 machine remains idle. Wear can be equally distributed between the two machines by periodic operation of the MAN TRNS key to the other position. When the key is operated to the G2 position, the G2 machine starts after the G1 machine has reached the end of its code cycle, the load is transferred to the G2 machine, and the G1 machine stops.

3.04 ***Dial Transfer:*** In some offices, dialing the number associated with the particular ringing machine that is not carrying the load effects a transfer from one machine to the other. When the same number is redialed and a busy tone is heard, the transfer has been made. This feature permits the load to be transferred in case of unsatisfactory tones or similar troubles which do not cause an automatic transfer, and which occur when the office is unattended. If dial transfer is furnished, the MAN TRNS key is omitted.

3.05 ***Manual Start:*** The G1 ST and G2 ST keys are provided to manually start either machine for maintenance purposes but do not transfer the load. Operating either key lights the GD lamp to remind maintenance forces to shut down the machine before leaving. Pull the key out to shut down the machine.

3.06 ***Automatic Transfer***

(a) When the G1 ringing machine is used as the regular machine, low 20-hz output voltage of this machine causes the transfer circuit to automatically: start the reverse machine, transfer the load to the reserve machine, and stop the regular machine. A blown RING M1 or A fuse in plants with or without a voltage regulator, a high-voltage condition in plants with a voltage regulator, or an interrupter gear failure also causes an automatic transfer to the reserve machine. An automatic transfer brings in a minor alarm in dial offices and a major alarm at a distant alarm receiving point in PBXs and lights the G1 FAIL and RING MACH TRNS lamps. After the trouble has been corrected, the circuit can be restored to the regular machine and the G1 FAIL lamp extinguished by operation of the RT key in offices equipped for manual transfer or the RT1 key in offices equipped for dial transfer. This key should be operated at the end of the code cycle to avoid mixing ringing codes when the transfer is made. Failure of the reserve machine to provide sufficient 20-hz voltage output after an automatic transfer in plants with or without a voltage regulator, or a high-voltage condition after an automatic transfer in plants with a voltage regulator, brings in a major alarm, which is transmitted in PBXs to the same distant alarm receiving point as above, and lights the RING FAIL lamp.

(b) When the G2 ringing machine is used as the regular machine, the transfer circuits function just as in (a), but the designations are different. The fuses are designated RING M2 and B; the alarm lamp is designated G2 FAIL;

the key is designated RT in offices equipped for manual transfer or RT2 in offices equipped for dial transfer.

3.07 ***Ringing Machine Tone Alarms (350A Offices Only):*** When tone supply is furnished from a ringing machine, sustained failure of dial or busy tones brings in a major alarm and lights a lamp. Failure of the dial tone lights the DT FAIL lamp. Failure of the busy tone lights the BT FAIL lamp. the DT TEST and BT TEST keys are provided to check these alarms.

3.08 ***Tone Supply Transfer:*** Where static-frequency tone generators are used, an ac power failure causes an automatic transfer of the load to the ringing machine tone supply. This brings in a minor alarm and lights the TONE GEN TRNS lamp. Operation of the ACO (alarm cutoff) key silences the alarm and extinguishes the TONE GEN TRNS lamp, but lights the GD lamp. When the static-frequency generator is restored to service, the GD lamp is extinguished.

Preparing to Start

3.09 When putting the plant into service:

(1) Rotate the ADJ potentiometer in the ringing plant fully ccw.

(2) If a voltage regulator is furnished, rotate the HV ADJ potentiometer fully ccw.

(3) Operate the MAN TRNS key (if furnished) to the G1 position or dial the number that transfers the load to the G1 ringing machine.

(4) Release (pull out) the G1 ST and G2 ST keys.

(5) Release (pull out) the BT TEST and DT TEST keys.

(6) Operate the TEST key to the NOR position.

(7) Check that the correct size fuses are in place.

(8) When provided, check that the proper dry batteries are installed for the superimposing and tripping circuit and that each set of batteries has the taps connected to put 31 cells in circuit.

(9) When provided, check that the 610D dc-to-dc converters are properly connected in accordance with the SD drawings.

Initial Adjustments

3.10 If a voltage regulator is furnished, make the proper adjustments on the voltage regulator before adjusting the LV and HV relay and electron tube circuits. Proceed as follows.

(1) Connect a Hubbell No. 310 Bakelite weather-proof socket from ground to the $105 \pm$V lead.

(2) Operate (push in) the G1 and G2 ST keys. This starts both ringing machines and also prevents an automatic transfer while initial adjustments are being made.

(3) Check the output voltage of the G1 ringing machine. If necessary, adjust the ADJ V1 potentiometer in the regulator circuit so that the output voltage is 88 volts at light load (approximately 0.10 ampere). If the load on the plant is not 0.10 ampere, a correction must be made as follows.

LOAD	CORRECTION
No load	Insert a 7.5 watt bulb in the lamp socket.
Over 0.10 amperes	Adjust the ADJ V1 potentiometer to a value between 84 and 88 volts in proportion to the percent load with no bulb in the socket.

(4) Check that the full load voltage does not drop below 84 volts as follows. If the plant initially had no load and a 7.5 watt bulb was used, remove the 7.5 watt bulb and insert a 25 watt bulb (for ringing machines rated at 0.25 ampere) or a 50 watt bulb (for ringing machines rated at 0.50 ampere) in the socket. Observe that the voltage does not drop below 84 volts. If the plant initially had a load in excess of 0.10 ampere, additional load must be added to bring the load to rated output of the ringing machines. A second socket may be desirable to obtain full

load current. Load may be added according to the following table:

BULB	APPROXIMATE CURRENT
10 watt	0.10 ampere
25 watt	0.25 ampere
50 watt	0.50 ampere

Note: The addition of a voltage regulator increases the rating of the ringing plant in 350A dial offices and No. 11 manual offices from 0.25 to 0.50 ampere.

(5) Operate the MAN TRNS key, if furnished, to the G2 position, or dial the number that transfers the load to the G2 ringing machine.

(6) Check the output voltage of G2. If necessary, adjust the ADJ V2 potentiometer in the voltage regulator circuit so that the output voltage of G2 is as specified for G1 in (3) and (4).

(7) Release (pull out) the G1 ST and G2 ST keys.

(8) Disconnect the Hubbell No. 310 Bakelite weather-proof socket from ground and the 105±V lead.

3.11 The circuit for transfer at low voltage, consisting of the LV relay and its associated electron tube circuit should be adjusted as follows.

(1) Operate (push in) the G1 ST and G2 ST keys.

(2) Operate the TEST key to the TST position.

(3) Adjust the TST potentiometer until the voltmeter reads 73 volts, if the circuit is connected for 75- to 110-volt operation; 70 volts, if connected for 72- to 88-volt operation; 63 volts, if connected for 65- to 90-volt operation; or 70 volts, if a voltage regulator is furnished for 84- to 88-volt operation.

Note: When a voltage regulator is furnished, the TEST key and the TST potentiometer are mounted on the voltage regulator equipment.

(4) Temporarily strap out the B and C resistors associated with the 313C electron tube.

(5) Rotate the ADJ potentiometer slowly cw until the LV relay operates. Wait a minute or so between changes in setting of the ADJ potentiometer to allow the LV capacitor to charge or discharge.

(6) Rotate the ADJ potentiometer slowly ccw until the LV relay just releases.

(7) With the ADJ potentiometer left as adjusted in (6), rotate the TST potentiometer slowly cw (waiting a minute or so between changes in settings to allow for slow action of the LV relay) until the LV relay operates.

(8) Remove straps from the B and C resistors. Remove the LV electron tube from its socket to release the LV relay. Restore the LV electron tube in its socket. If the LV relay fails to reoperate, strap out the C resistor. If the LV relay then fails to reoperate after removing and restoring the LV electron tube, remove the strap from the C resistor and strap out the B resistor. If the LV relay still fails to reoperate after removing and then restoring the LV electron tube, strap out both the B and C resistors.

(9) If the LV relay fails to reoperate after removing and then restoring the LV electron tube with the B and C resistors strapped out, discard the 313C electron tube, replace with a new one, and repeat (8).

(10) If a voltage regulator is furnished, proceed according to 3.12. If a voltage regulator is not furnished, restore the TEST key to the NOR position and release (pull out) the G1 ST and G2 ST keys.

3.12 If a voltage regulator is furnished, the HV relay and its associated electron tube circuit should be adjusted as follows.

(1) With the G1 ST and G2 ST keys operated (pushed in) and the TEST key in the TST position, adjust the TST potentiometer until the voltmeter reads 100 volts. It may be necessary to make several adjustments of the TST potentiometer in order to obtain a constant reading of 100 volts.

(2) Rotate the HV ADJ potentiometer cw until the HV relay operates. Wait a minute or so between settings of the HV ADJ potentiometer to allow the HV capacitor to charge or discharge.

(3) Reduce the voltage by adjusting the TST potentiometer. The HV relay should release at 98 volts.

(4) Repeat (1) through (3) to recheck the adjustments.

(5) Restore the TEST key to the NOR position and release (pull out) the G1 ST and G2 ST keys.

Routine Adjustments

3.13 Since the plant is fully automatic, no routine adjustments need be made.

4. ROUTINE CHECKS

4.01 Periodically change the position of the MAN TRNS key or make a dial transfer to use the other ringing machine as the regular machine.

4.02 Periodically check plant alarms and transfer circuits as follows.

(a) With the regular ringing machine running, first remove the alarm fuse parallel to the Fusetron supplying the regular ringing machine, and then remove the Fusetron. Remove the RING M1 Fusetron if G1 is the regular machine, or the RING M2 Fusetron if G2 is the regular machine. This should cause an automatic transfer, bring in a major alarm at a distant alarm receiving point in PBXs or a minor alarm in other offices, and light the RING MACH TRNS lamps and either G1 FAIL or G2 FAIL, depending on whether G1 or G2 was used as the regular machine. Depress the associated ACO key. This should extinguish the RING MACH TRNS lamp, silence the alarm, and light the GD lamp.

(b) With the reserve machine running and the regular machine fuses still removed as in (a), first remove the alarm fuse parallel to the Fusetron supplying the reserve ringing machine, then remove the Fusetron. In all offices, this should bring in a major alarm, which is transmitted in PBXs to the same distant alarm receiving point as in (a), and light the RING FAIL lamps and either G1 FAIL or G2 FAIL, depending on whether G1 or G2 was used as the reserve machine.

Note: Until the fuses are restored, this leaves the office temporarily with no ringing current. If this is objectionable, check the alarm and the RING FAIL lamp instead by manually opening the LV relay armature.

(c) To restart the reserve machine and retire the alarms, first restore the Fusetrons supplying both machines, and then restore the alarm fuses. In offices where no dial transfer is provided, operate the RT key. In offices where dial transfer is provided, operate the RT1 key if G1 is used as the regular machine, or the RT2 key if G2 is used as the regular machine. This key, in any case, should be operated only at the end of the interrupter code cycle to avoid mixing ringing codes when transferring from one machine to the other. Operation of this key should transfer the load back to the regular machine and extinguish the GD lamp.

(d) With the regular ringing machine running, simulate an interrupter gear failure alarm and automatic transfer as follows. Remove the protective interrupter cover from the regular ringing machine. Using an insulated tool, such as an orange stick, manually close the contacts of the 120-ipm spring pack. This will remove the 120 ipm from the MA relay, releasing the normally operated MF relay in the interrupter gear failure circuit. Releasing the MF relay will open the holding ground to the LV1 relay. Automatic transfer to the reserve machine will occur. This operates a minor alarm and the G1 or G2 FAIL and RING TRANS lamps. Remove the insulated tool. Return the ringing machine circuit to its normal condition. Using the insulated tool, manually open the contacts of the 120-ipm spring pack. Automatic transfer will again occur. Remove the insulated tool, replace the protective cover, and return the ringing machine circuit to its normal condition.

Note: Due to leakage of the capacitors in the interrupter gear failure alarm circuit, the MA relay or MF relay may be held operated and gear failure alarm and automatic transfer may not occur.

(e) In offices where low and high tones are supplied from a ringing machine, operate (push in) the BT TEST and DT TEST keys. This should light lamps at BT FAIL and DT FAIL and bring in major alarms. Restore (pull out) the BT TEST and DT TEST keys to retire the alarms.

(f) In offices where low and high tones are furnished from static-frequency generators, disconnect the ac power plug on the 101A frequency generator. This should cause the tone load to transfer from the static-frequency generators to the ringing machine tone drum supply, bring in a minor alarm, and light the TONE GEN TRNS lamp. Depress the associated ACO key. This should extinguish the TONE GEN TRNS lamp, silence the alarm, and light the GD lamp. Reconnect the ac power plug on the 101A frequency generator. This should transfer the tone load back to the static-frequency generators and extinguish the GD lamp.

(g) Check fuse alarms where 35-type fuses are used by bridging a W1AF test cord, equipped with No. 365 clips, between the fuse alarm and battery bus bars or posts.

4.03 ***Tripping and Superimposing Batteries:*** Check and switch the tripping or superimposing dry batteries as follows.

(1) Connect a KS-14510 L1 voltmeter (60-volt scale) to the VM pin jacks.

(2) Operate the TEST key to the unused battery position (if key +BAT is in position 1, operate the TST key to position B2, and vice versa).

(3) Hold LOAD key depressed for 10 seconds, read the voltage while LOAD key is still depressed, and then release the key.

Requirement: The voltmeter should indicate between 45 and 52 volts.

Note 1: If the requirement is met, proceed to (5). If the requirement is not met, continue with (4).

Note 2: As the batteries age in service, additional cells may be connected by changing battery taps to meet the voltage requirement.

(4) Select taps to obtain 48 volts or higher.

Note 1: When all 45 cells of the three batteries are required to meet the voltage requirements, replace all the batteries.

Note 2: When new batteries are installed, connect taps to put 31 cells in the circuit and repeat the voltage check.

Caution: Where dry cell terminals are within a foot of countercells, changing of taps and replacement of dry cells should be done when countercells are not gassing, that is, not during boost charges.

(5) Operate the +BAT key to the other position and repeat (3) and (4).

(6) Remove KS-14510 L1 volt-ohm-milliammeter.

4.04 Check the ringing machines in accordance with their individual section. Either machine may be started for maintenance purposes by operating the G1 ST or G2 ST key. If the ringing machine is to be serviced in place, remove its fuses and both connecting plugs so that the machine cannot start unexpectedly or have any voltage on the interrupter contacts.

4.05 Check the low and high tones. An experienced attendant should listen to the low and high tones with a receiver to ascertain that the volume and frequency sound normal.

5. TROUBLES

5.01 Troubles which may occur in the plant will usually be indicated by an alarm. Tabulated below is a list of the alarms and the troubles which may have caused them.

TROUBLE	POSSIBLE CAUSES
(a) No ringing voltage	Defective static ringing generator or short circuit on output
(b) No ringing voltage after an ac service power failure	Bad contact in transfer circuit relays or contactors
	Defective 313C tube
	Bad contact in M potentiometer
	Defective inverter or operated RING Fusetron.
(c) Low or high ringing voltage after an ac service power failure	Inverter commutator or brushes require maintenance
	Inverter field resistor out of adjustment or making poor contact
	Inverter battery supply voltage high or low.
(d) Wrong ringing codes	Interrupter out of adjustment.
(e) No low or high tones	Defective low- or high-tone frequency generator.
(f) Low superimposing or tripping battery voltage	Discharged superimposing or tripping dry cell batteries or, when provided, defective 610D power plant
	Open leads or operated fuses.

5.02 Troubles which may occur in the ringing machines may be due to improper commutation, defective brushes, interrupter gear failure, or poor bearings.

5.03 The 101A or 102A low- or high-tone frequency generators are sealed units and have no adjustments. Replace if defective.

5.04 An automatic transfer from the regular to the reserve ringing machine when neither the regular ringing machine nor the voltage regulator is defective may be due to a poor 313C electron tube in either the HV or the LV socket, or both. After placing a new tube in the LV socket, repeat the initial adjustment procedure outlined in 3.11. After placing a new tube in the HV socket, repeat the initial adjustment prcedure outlined in 3.12.

5.05 ***Trouble Chart:*** Should any of the following troubles occur, a check of the possible causes is given below.

ALARM LAMP	POSSIBLE TROUBLE
(a) G1 FAIL	Operated RING M1 fuse
	G1 ringing machine defective
	Interrupter gear failure
	High-voltage condition on voltage regulator, if furnished
	Electron tube circuit associated with LV relay or electron tube circuit associated with HV relay, if furnished, out of adjustment
	Connector pulled out.
(b) G2 FAIL	Operated RING M2 fuse
	G2 ringing machine defective
	Interrupter gear failure
	High-voltage condition on voltage regulator, if furnished
	Electron tube circuit associated with LV relay or electron tube circuit associated with HV relay, if furnished, out of adjustment
	Connector pulled out.
(c) RING MACH TRNS	Transfer to reserve machine due to G1 FAIL or G2 FAIL.
(d) RING FAIL	Failure of reserve ringing machine when regular machine is also defective
(d) RING FAIL (Cont)	High-voltage condition on voltage regulator after transfer to reserve ringing machine
	See G1 FAIL or G2 FAIL
(e) GD (between G1 ST and G2 ST)	Indicates that G1 or G2 ringing machine was left running.
(f) HLR FA	Operated HLR (howler) fuse.
(g) DT FAIL	Dial tone failure possibly due to defective ringing machine.
(h) BT FAIL	Busy tone failure possibly due to defective ringing machine.
(i) TONE GEN FAIL	Commercial ac power failure
	Defective 101A static-frequency generator.
(j) GD (adjacent to TONE GEN FAIL)	Indicates that TONE GEN FAIL alarm has been silenced but that static-frequency generators are still inactive.
(k) FA	Indicates that one or more of the 48-volt fuses are operated.
(l) NV	Indicates failure of 610D power plant. See Section 167-684-304.