

J86727E VOLTAGE REGULATOR

OPERATING METHODS

1. GENERAL

1.01 This section covers the operation of a J86727E voltage regulator circuit. This circuit was designed to hold the output voltage of ringing machines, such as KS-5133, KS-5510, and KS-5546 between 84 and 88 volts with any battery supply voltage between 45 and 52 volts.

1.02 These voltage regulators are used in ringing plants, such as 805A, 806C, or 806D.

1.03 The instructions are based on drawing SD-81277-01. For a detailed description of the circuit operation, see the corresponding circuit description.

1.04 Additional information on the operation and maintenance of individual pieces of apparatus, such as keys and relays is given in other sections and the attendant should be familiar with them. All relays, etc., should be adjusted in accordance with these sections and the circuit requirements table on the drawing. Jack T is provided on the regulator panel for making adjustments on the HV relay.

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

1.06 Clockwise and counterclockwise rotation are referred to herein as cw and ccw.

1.07 Replacement or adjustment of KS-15546 voltage regulator unit springs or contacts is not recommended because of their delicacy. If out of adjustment, replace the whole unit.

1.08 Information in this section is arranged under the following headings:

1. GENERAL

2. OPERATION

Description
Preparing to Start Initially
Initial Adjustments

3. ROUTINE CHECKS AND ADJUSTMENTS

4. TROUBLES

1.09 List of Tools and Gauges (Equivalents may be substituted)

Tools

Cords, test, Weston, Nos. D-79650 and D-79651

Screwdriver, KS-6854

Gauges

Volt-ohm-milliammeter, KS-14510, L1

Voltmeter, Weston Model 622 AC-DC range, 300/150/30/3 volts

2. OPERATION (See Fig. 1)

2.01 Description: The KS-15546 voltage regulator units VR1 and VR2 have an adjustable dashpot-type sensitive solenoid or actuating element with a moving armature which operates a pushbar. The movement of the pushbar governs the position of direct acting fingers. These fingers open or close contacts which change the series resistance in the regulator circuit. The solenoid coil is actuated from a rectifier bridge which is connected across the ringing transformer secondary. Any change in the ringing transformer output voltage therefore results in movement of the solenoid to increase or decrease the amount of resistance in series with the boost transformer primary. The boost transformer secondary is in series with the ringing transformer primary which is connected to the ringing machine 20-cycle output. Any change in the ringing transformer output voltage is thus compensated for by changing the boost transformer voltage in an opposite direction.

2.02 The ADJ V1 or ADJ V2 potentiometer in series with the regulator circuit is used to adjust the ringing transformer output to 86 volts.

2.03 The regulator circuit panel is normally equipped with two regulators, one for the regular ringing machine and the other for the reserve ringing machine. A transfer circuit on this panel will transfer regulation control from regulator VR1 to regulator VR2 when actuated by a signal from the associated plant or by operation of the HV relay. Where the panel is equipped for a single voltage regulator, the transfer circuit is omitted.

2.04 If a low-ringing voltage condition causes the associated plant to transfer the load from the regular to the reserve ringing machine, this circuit automatically transfers regulation control to the regulator for the reserve ringing machine.

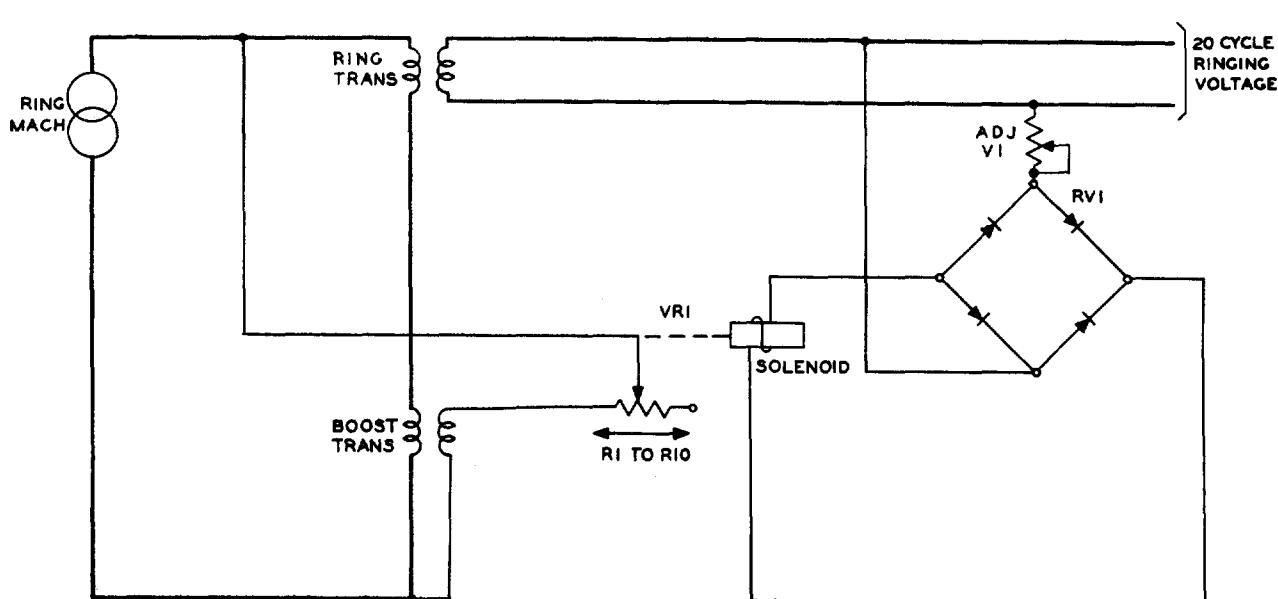


Fig. 1 - Simplified Regulator Circuit

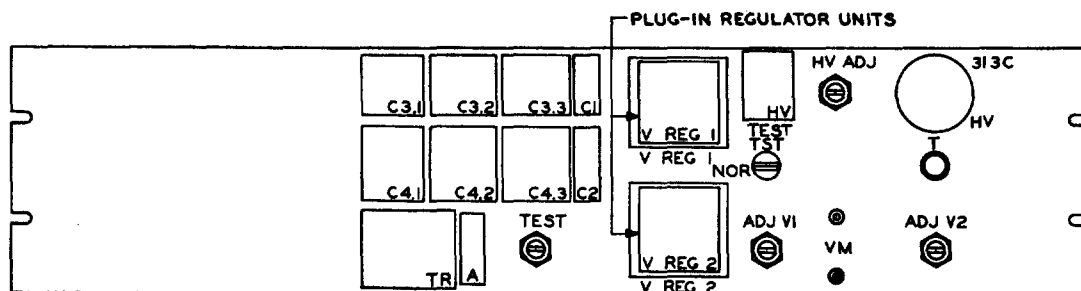


Fig. 2 - Regulator Panel

2.05 If a high-ringing voltage due to a defective solenoid or sticking contacts on the regulator unit occurs, relay HV will operate thus sending a signal to the associated plant to transfer to the reserve ringing machine. The TR relay is then operated by a signal from the plant to transfer regulation control to the reserve regulator.

Preparing to Start Initially (See Fig. 2)

2.06 When putting the regulator panel into service, proceed as follows:

- Check that the KS-15546 voltage regulator units and the HV electron tube are firmly plugged into their respective sockets on the panel.
- Rotate potentiometers HV ADJ, TEST, ADJ V1, and ADJ V2 fully ccw.

(c) Where the associated ringing plant does not have a panel voltmeter to read the ringing voltage, connect the Weston Model 622 voltmeter (150-volt ac scale) to pin jacks VM.

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

Initial Adjustments

2.07 Check that the regular ringing machine in the associated plant is running and is operating at normal input voltage.

2.08 With the regular ringing machine hot (1 hour running time) and the TR relay on the regulator panel not operated, adjust the ADJ V1 potentiometer on the regulator panel so that the ringing voltage is between 87 and 88 volts at light load (below 0.1 ampere). Read this voltage on the associated

plant panel voltmeter if provided, or on the portable voltmeter plugged into the VM jacks. Without changing the adjustment, check that this voltage does not go below 84 volts when the ringing machine is artificially loaded to full-load capacity. See the section on test loads for power equipment.

Note: If the voltage is abnormally low, the internal connections on the BOOST transformer may be incorrect. In this case, interchange the wiring on terminals 5 and 6 on this transformer and mark it as not conforming to the SD drawing so that confusion may be avoided if the transformer is replaced.

2.09 Block relay HV operated and check that relay TR operates, that the reserve machine in the associated plant starts and connects to the load, and that an alarm in the plant is caused.

Note: If the associated plant is arranged so that either ringing machine may be selected as the regular supply (as in the 806D plant), the TR relay will be normally operated when G2 is used as the regular machine. In this case operation of relay HV will release relay TR. Where only one ringing machine is furnished, disregard transfer instructions.

2.10 With the reserve machine hot (1 hour running time) adjust the ADJ V2 potentiometer so that the ringing voltage is between 87 and 88 volts at light load (below 0.1 ampere). Without changing the adjustment, check that this voltage does not go below 84 volts when the ringing machine is artificially loaded to full-load capacity. See the section on test loads for power equipment.

2.11 Remove the blocking from relay HV and operate the proper key in the associated ringing plant to transfer back to the regular ringing machine. Check that relay TR has released.

2.12 Adjust the HV electron tube and relay circuit as follows:

- (a) Check the notes on SD-81277-01 to see which of the X, Y, or Z option is used. For the Z option, temporarily strap terminals 3 and 23 on terminal strip B. For the X and Y options, insulate contacts 1 and A on the HV relay.
- (b) Check that relay HV has been correctly adjusted in accordance with the circuit requirements table. Jack T is provided to facilitate these adjustments.
- (c) Operate TEST key to the TEST position.
- (d) Rotate the TEST potentiometer cw until the voltmeter (plant panel voltmeter or portable voltmeter in VM pin jacks) reads 100 volts.

(e) Starting fully ccw rotate the HV ADJ potentiometer cw as follows until relay HV operates. Rotate potentiometer HV ADJ slowly in small increments to allow the HV capacitor to charge or discharge as the adjustment is changed. With this setting, relay HV should operate at 100 volts and release at about 98 volts.

(f) Remove the strapping or contact insulation as performed in (a) to restore the circuit to normal and operate the TEST key to NOR.

(g) Raise the voltage slowly with the ADJ V potentiometer for each machine in turn (transfer as required) and check that relay HV operates at between 96 and 104 volts. Restore to 86 volts at normal load.

3. ROUTINE CHECKS AND ADJUSTMENTS

3.01 Periodically check and if necessary adjust the ringing voltage to 86 volts for both the regular and reserve ringing machines. Read the voltage on the associated plant voltmeter or on a portable voltmeter connected to the VM pin jacks. Operate the proper control on the associated ringing plant to transfer the ringing machines.

3.02 Periodically check the transfer circuit as in 2.09.

3.03 Periodically check the adjustment of HV high-voltage transfer circuit as in 2.12. If the HV tube (313C) does not fire properly, see 4.03.

3.04 If trouble occurs without an automatic transfer, manually transfer to the other machine, using the controls in the associated ringing plant, before investigating the trouble.

4. TROUBLES

4.01 If the ringing machine hunts, the regulator unit dashpot may be out of adjustment. Hunting is indicated by periodic voltage variations, by frequent momentary releasing of relay LV in the associated ringing plant or by momentary lighting of the HV electron tube. The voltage regulator unit should be checked for proper adjustment to eliminate it as the source of trouble. Adjust the regulator unit dashpot as follows:

(a) Using a KS-6854 screwdriver, unscrew the cover screws and remove the cover.

(b) With the unit plugged in and cover removed, the dashpot adjusting screw may be seen on the face of the unit between the two screws holding the dashpot cylinder.

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(c) Using a KS-6854 screwdriver, rotate the dashpot screw ccw until the hunting becomes rapid, then rotate cw until the hunting just stops, and then rotate further cw about 20 degrees.

(d) Replace the cover when finished.

Note: The dashpot adjusting screw controls regulation response damping. Insufficient damping may cause false transfers. Excessive damping will cause sluggish response to sudden load changes.

4.02 The regulator unit solenoid coil current should be between 30 and 35 milliamperes dc when the ringing machine output is 86 volts. If the solenoid coil or any element in its series path is suspected of being defective, open this path at regulator unit socket terminal 14, and with clip leads connect a dc milliammeter between the disconnected lead and terminal 14 to check the current. If the current is not within the limits, shut off the ringing machine and use an ohmmeter to locate the defective element. Lack of adjustment control may be due to a defective rectifier stack. Improper time response may be due to defective capacitors C3.1 to C3.3.

4.03 If the adjustment of the high-voltage HV transfer circuit per 2.12 is not possible, replace the HV 313C electron tube and repeat the adjustment.

4.04 If, after a transfer to the reserve ringing machine is made due to high voltage, the circuit quickly transfers back to the regular machine, the trouble is probably due to a defective HV capacitor.

4.05 Poor or jumpy contact of small potentiometers can sometimes be cleared up by rotating the shaft rapidly back and forth several times. If not, replace the potentiometer.

4.06 The RV1 or RV2 varistor may eventually age to the point where the ringing voltage cannot be increased enough to meet the requirements. If so, replace the varistor.

Trouble Chart

4.07 If any of the following troubles develop, it is suggested that the possible causes be checked. If the trouble is not found, look for open or loose connections or short circuits due to foreign material lying across wiring terminals.

<u>Trouble</u>	<u>Possible Cause</u>
Erratic ringing voltage	Regulator hunting Poor regulator contact Poor potentiometer contact
Low-ringing voltage	Varistors RV1 or RV2 aged Defective regulator
High-ringing voltage	AD potentiometer mis-adjusted Defective regulator HV transfer circuit out of adjustment ADJ potentiometer mis-adjusted