

AC LINE VOLTAGE REGULATORS  
J86215A AND KS-5695  
MOTOR-DRIVEN AUTOTRANSFORMER TYPE  
OPERATING METHODS

1. GENERAL

1.01 This section covers the operation of a-c line voltage regulators, J86215A and KS-5695, of the motor-driven, continuously tapped autotransformer type, which are intended for use where the a-c power service voltage limits are excessive.

CAUTION: As these regulators include 230-volt circuits, care must be used to avoid contact with exposed terminals. Whenever practicable maintenance work should be done with the equipment disconnected from the power supply.

1.02 It is reissued to add the KS-5695 regulator. The subject matter has been rearranged. Significant changes are marked by arrows.

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

1.04 The instructions are based on the following drawings. For detailed description of the operation of individual circuits, see the corresponding circuit descriptions.

SD-80938-01 A-C Line Regulating  
Circuit (J86215A)  
SD-80980-01 A-C Line Regulating  
Circuit (KS-5695)

1.05 More detailed information on the operation and maintenance of individual pieces of apparatus such as the relays, is given in other BSP sections and the attendants should be familiar with them. All apparatus is assumed to have been adjusted in accordance with these sections and the circuit requirements tables on the circuit drawings. Refer also to the apparatus requirement and adjusting procedure sections for KS-5563 Rheostats, autotransformers, instruments, electrolytic capacitors, voltage relays, and signal relays.

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

1. GENERAL

2. OPERATION

2.01 Description  
2.02 Initial Preparation and Adjustments  
2.03 Routine Adjustments and Checks

3. GENERAL TROUBLES

4. POINT-TO-POINT VOLTAGES

1.07 List of Gauges (Equivalents may be substituted) Meter, M9B

2. OPERATION

2.01 Description

J86215A

(a) The regulator consists of a dual autotransformer with two fixed-ratio insulating transformers designated KS-5621, and associated controls. The variable output voltages of the autotransformer are applied through the insulating transformers to boost or buck, as required, the voltages of the two sides of a 230-volt, single-phase, 3-wire circuit. It is driven by a motor under the control of a voltage relay.

(b) The autotransformer, its units designated TR1 and TR2, respectively, with their driving motor TR, the fixed-ratio insulating-type auxiliary transformers, TA1 and TA2, and control equipment not requiring frequent operating attention, are mounted in a cabinet. The voltage relay VR, voltmeter V, voltage adjusting rheostat R3, and all control switches are mounted on the door of the cabinet so as to be readily observed or operated without opening the door.

(c) The CONTROL switch connects the entire control circuit to the output side of the regulator. When OFF it prevents all regulation of the output voltage and permits maintenance work to be done on the control circuit without shutting down the regulator, if desired. Care should be taken to avoid contact with live terminals of other equipment in the regulator.

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(d) The regulator consists of a single autotransformer with a fixed-ratio

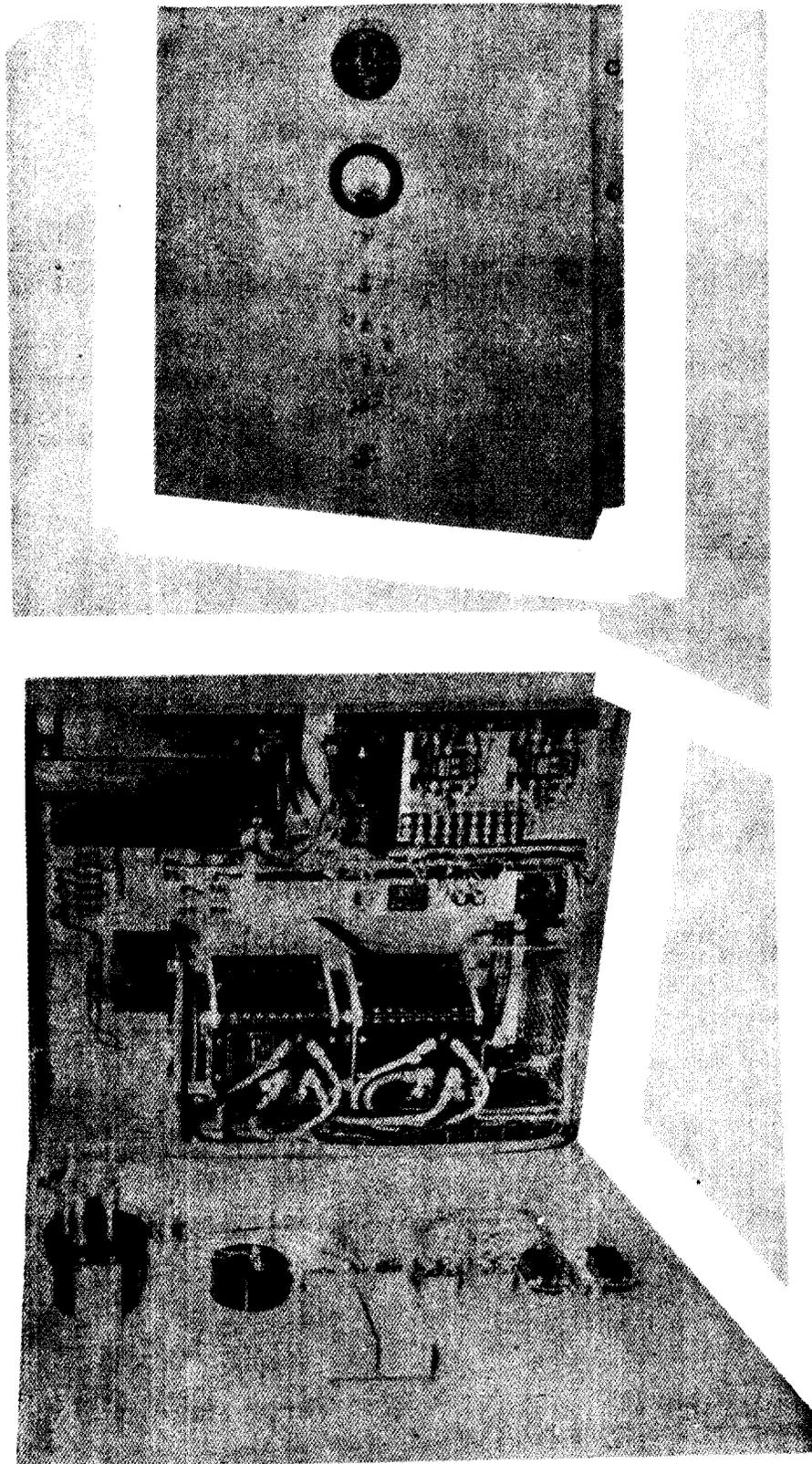


Fig. 2 - J86215A, A-C Line Regulator - View of Interior

insulating transformer, designated KS-5702, and associated controls. It is arranged to regulate a 230-volt, 2-wire ungrounded circuit. It is driven by a motor under control of a voltage relay.

(e) The autotransformer, TR1, with its driving motor, TR, and control equipment not requiring frequent operating attention are mounted on a panel and enclosed in a casing having a hinged door. The voltage relay VR, voltmeter V, voltage adjusting rheostat R3 and all control switches are mounted on a subpanel behind an opening in the door and are accessible without opening the door. Transformer TA1 is mounted separately.

(f) The CONTROL switch, when OFF, disconnects automatic regulation only, and leaves manual regulation available. It is recommended that maintenance work other than the adjustment of the R3 or NV rheostats, be done only with the regulator disconnected from power.

#### J86215A and KS-5695

(g) The VM switch, in the LINE or LOAD position connects the voltmeter to input or output, respectively.

(h) The RAISE or LOWER, MAN REG switches permit raising or lowering the output voltage manually.

(i) The AUTO REG switch controls the automatic feature of the regulation. When it is in the OFF position only manual regulation is available.

### 2.02 Initial Preparation and Adjustments

(a) Examine electrolytic capacitor C2 for a date stamped on it. If no date is found, tag it with the date of installation.

(b) See that all equipment supplied by the regulator is disconnected from it.

(c) With the VM switch in the LOAD position and CONTROL switch ON, adjust the output voltage manually to 230 volts. While maintaining the output voltage at this value, adjust rheostat R3 so that the contact arm of relay VR is midway between the high and low contacts.

### 2.03 Routine Adjustments and Checks

(a) Routine starting, after initial adjustments have been made, is as follows:

(1) See that all equipment supplied by the regulator is disconnected

from it, and that the a-c fuses supplying the regulator are in place.

(2) See that the CONTROL and AUTO REG switches are in the ON position for automatic operation.

(3) After the regulator has brought the output voltage to normal, apply the load.

(b) If the output voltage as read on voltmeter V is high or low, check the adjustment of rheostat R3. See 2.02 (c) Small adjustments of voltage are made with rheostat R3 (CW to raise and CCW to lower) on automatic regulation without resetting the voltage relay.

(c) When replacing an electrolytic capacitor pole the new one properly. Observe the polarity marking.

(d) The varistors require no maintenance, but are subject to aging which may necessitate their replacement. Replace varistor B, when its output voltage is less than 20 volts, with normal regulator output voltage. When, during routine voltage adjustment, rheostat R3 reaches its maximum counterclockwise position, check the position of relay VR contact arm. See 2.03 (b) If the contact arm moves smoothly with changes in rheostat R3 setting, but cannot be brought to the midpoint when the output voltage is held manually at normal value, replace varistor A.

### 3. GENERAL TROUBLES

3.01 If any of the following troubles are encountered, it is suggested that the possible causes be checked in the order listed. If the cause is not found, voltage measurements and continuity tests may be necessary.

<u>Trouble</u>	<u>Possible Cause</u>
No output voltage	A-C supply open Fuse in a-c supply leads blown.
High or Low output voltage	High or low a-c line voltage. Rheostat R3 improperly adjusted. Voltage relay VR out of adjustment, has dirty contacts, or fails to operate. AUTO REG switch in OFF position. CONTROL switch in OFF position. Failure of motor. Failure of autotransformers. Failure of varistor B.

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High output voltage Failure of varistor A. Relay L1 or relay RL fails to operate, is out of adjustment, or has dirty contacts.

Low output voltage Relay R1 or relay RR fails to operate, is out of adjustment, or has dirty contacts.

(b) D-C Voltages

Reading	Voltmeter Connections		Use Voltage Range	Typical D-C Volts
	V	-V		
Varistor A output	1T of Varistor A	2T of Varistor A	30	26
Varistor B output	1T of Varistor B	2T of Varistor B	30	22

4. POINT-TO-POINT VOLTAGES

4.01 Point-to-point voltages are given below for the regulators to assist in locating trouble. Since they are typical of the regulator in operation they will be useful also in general maintenance.

CAUTION: Do not allow a test pick to touch two metal parts at the same time or destructive and dangerous short circuits may occur.

J86215

(a) A-C Voltages

Reading	Voltmeter Connections	Use Voltage Range	Typical A-C Volts 2000 $\omega/v$
Regulator input		Plant VM	212
Regulator output		Plant VM	230
Varistor A input	1B and 2B of varistor A	30	27
Varistor B input	1B and 2B of varistor B	30	23

KS-5695

(a) A-C Voltages

Reading	Voltmeter Connections	Use Voltage Range	Typical A-C Volts 2000 $\omega/v$
Regulator input		Plant VM	221
Regulator output		Plant VM	230
Varistor A input	1B and 2B of varistor A	150	33.5
Varistor B input	1B and 2B of varistor B	150	30

(b) D-C Voltages

Reading	Voltmeter Connections		Use Voltage Range	Typical D-C Volts
	V	-V		
Varistor A output	1T of Varistor A	2T of Varistor A	150	31.5
Varistor B output	1T of Varistor B	2T of Varistor B	30	29

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