Beech Aircraft Corporation

OVERHAUL SPECIFICATION

VOLTAGE REGULATORS - MODEL C-45G, C-45H, AND SNB-5

OVERHAUL SPECIFICATION 3614

ISSUED April 27, 1953

REVISED August 7, 1953

T. R. Taylor
Writer

R. B. Bosworth
Chief Liaison Engineer

for M. DeLapp
Model Project Engineer

A. S. Odevseff
Chief Project Engineer - Military

USAF Quality Control

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Beech Aircraft Corporation

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ISSUED April 27, 1953

WRITTEN BY W. W. Taylor REVISED August 7, 1953

1. SCOPE

1.1 Purpose.- The purpose of this specification is to provide instructions for reconditioning and/or modifying 1589-1-A, 1589-1-B, 1589-1-C, and 1589-2-A voltage regulators for use on Model C-45G, C-45H, and SNB-5 aircraft.

1.2 Application.- All reconditioning operations and repairs covered by this specification may be accomplished where required without further authorization. Repairs not authorized by this specification cannot be performed without further authorization.

1.3 List of Pages and Revisions.- This specification consists of the pages listed below. An asterisk (*) denotes the pages revised by the current revision.

Page	Date	Description of Revision	Serial Effectivity
1*	8-7-53	Incorporate SNB-5	Record change
2*	8-7-53	Incorporate SNB-5	Record change
3*	8-7-53	Incorporate SNB-5	Record change
4*	8-7-53	Incorporate SNB-5	Record change
5*	8-7-53	Incorporate SNB-5	Record change
6*	8-7-53	Incorporate SNB-5	Record change
7*	8-7-53	Incorporate SNB-5	Record change
8*	8-7-53	Incorporate SNB-5	Record change
9*	8-7-53	Incorporate SNB-5	Record change
10*	8-7-53	Incorporate SNB-5	Record change
11*	8-7-53	Incorporate SNB-5	Record change
12*	8-7-53	Incorporate SNB-5	Record change
13*	8-7-53	Incorporate SNB-5	Record change
14*	8-7-53	Incorporate SNB-5	Record change
15*	8-7-53	Incorporate SNB-5	Record change
16*	8-7-53	Incorporate SNB-5	Record change

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2. APPLICABLE PUBLICATIONS

2.1 Beech.-

OS 7008 General Acceptable Quality Standards

2.2 Technical Orders.- Compliance with this specification constitutes compliance with the technical orders listed below.

03-5AA-30 D-6 Carbon Pile Voltage Regulator, dated August 30, 1952

3. REQUIREMENTS

3.1 Parts Involved:

3.1.1 Parts Not Used.- The following parts will not be reused and will be disposed of at the direction of the customer.

126738 Carbon contact plugs
Carbon pile discs

3.1.2 Parts to be Reconditioned.- The following parts are to be reconditioned in accordance with instructions contained herein. "Reconditioned" means the disassembly, cleaning, inspection and correction of discrepancies, repair and/or replacement of components, and modifications to incorporate changes in accordance with applicable engineering drawings to assure an operationally safe and serviceable aircraft.

(a) All parts of those voltage regulators referred to in Paragraph ... of this specification will be reconditioned except those parts listed in Paragraph ... of this specification.

3.1.3 Parts to be Supplied New.-

Carbon pile discs
126738 Carbon contact plugs

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3.2 Cause for Rejection.- The following specific conditions as well as damage or wear that cannot be corrected by one or more of the methods described herein is cause for rejection.

3.2.1 Voltage Regulator, All Types:

3.2.1.1 Adjusting Screw Spring.- Scrap and replace adjusting screw springs which are cracked, broken, severely burned, or have scarred inner edges.

3.2.1.2 Insulators.- Scrap and replace insulators which are severely worn or chipped.

3.2.1.3 Armature Assembly.- Scrap and replace armature assemblies which have unserviceable diaphragms or which fail the ground and/or continuity tests specified in Paragraph 3.3.1.1.(d). Scrap and replace dented or distorted shims.

3.2.1.4 Base Assembly.- Scrap and replace base assemblies which fail to pass the ground test specified in Paragraph 3.3.1.1.(e); have burned or cracked contact insulators; have loose, bent, or broken contacts, or contacts with the plating worn through; have broken terminal lugs. Replace carbon pile tubes which are chipped, cracked, broken, or rough and scored on the outside surface.

3.2.1.5 Coil Assembly.- Scrap and replace coil assemblies which do not pass the resistance tests specified in Paragraphs 3.3.1.1.(g) and 3.3.2.1.(d), and those which have broken leads or burned or cracked insulation.

3.2.1.6 Resistors.- Scrap and replace resistors if their resistance is not within the limitations specified herein or if they are severely burned, have cracked enamel or broken leads.

3.2.1.7 Rheostats.- Scrap and replace rheostats which have excessively burned windings, broken terminals, unserviceable sliding contacts, or if the resistance is not within the limits specified herein.

3.2.1.8 Panel Board Assembly.- Scrap and replace cracked or broken panel boards.

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3.3 Reconditioning Operations:

3.3.1 Voltage Regulator - 1589-1-A and 1589-2-A -

3.3.1.1 Regulator Assembly.-

(a) Disassemble as follows:

(1) Disengage from base.

(2) Remove the pile adjusting screw cover and assembly.

(3) Remove carbon pile discs on a thin rod so as to avoid touching the discs with the hands as body acids may change the resistance of the discs.

(4) Tap out the carbon contact plug from the pile adjusting screw using a short piece of drill rod and fixture shown in Figure 1 of this specification.

(5) Remove adjusting screw bracket, bushings, and insulator from the pile housing. Separate screw plate from the bracket and slide out the phosphor-bronze adjusting screw spring.

(6) Remove the pile housing from the studs. Remove the tube locks and slide the pile tube out of the housing.

(7) Remove the armature assembly with red lead from magnet case assembly. Remove armature stop shims from case.

(8) Using drill rod and fixture referred to in (4) above, remove contact plug from armature. DO NOT DISASSEMBLE THE ARMATURE ASSEMBLY BEYOND THIS POINT UNLESS NECESSARY FOR REPAIR. THE COIL ASSEMBLY, WHICH INCLUDES COLORED LEADS, SHOULD NOT BE DISASSEMBLED.

(9) Remove ferrule assembly.

(10) Separate end plate assembly from the magnet case. Remove magnet core from end plate. Remove magnet coil assembly and temperature compensating ring. DO NOT REMOVE THREE MAGNET CASE STUDS FROM MAGNET CASE UNLESS NECESSARY.

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3.3.1.1 Regulator Assembly - (Continued)

(11) Remove rheostat and adjusting nut assembly from clip and bracket assembly. Remove bakelized insulating washer from rheostat shaft.

(12) Unsolder all leads from rheostat terminal contacts, terminal lugs, and terminal contacts of the resistor. Remove sleeving from the 330-ohm stabilizing resistor. Remove resistor and resistor mounting screw.

(b) Carefully examine all parts to be reconditioned for nonrepairable conditions.

(c) Thoroughly clean all parts to be reconditioned, except the coil, in clear unleaded gasoline or other suitable solvent. DO NOT USE CARBON TETRACHLORIDE.

(d) Ground test the armature by touching one terminal of a 550-volt a-c test lamp circuit to the armature while touching the other test lamp circuit terminal to the contact plug ferrule. Replace the armature assembly if the test lamp flickers or lights. Test the armature for continuity by touching the free end of the red lead with a terminal of the test lamp circuit and touch the lead at the opposite end of the red lead with the other terminal of the test lamp. If the lamp flickers or fails to light, replace the armature.

(e) Ground test the base assembly by touching one terminal of the 550-volt a-c test lamp circuit to a terminal contact and the other test lamp terminal to the base. Replace the base assembly if the lamp lights. Repeat this test operation for every terminal contact.

(f) Repair base assembly contacts as necessary, as authorized in Paragraph 3.4 of this specification.

(g) Check the resistance of the shunt, equalizer, and temperature compensating windings of the coil assembly with a Wheatstone bridge or similar measuring device. The resistance of the shunt windings, measured between the terminals of the black and white leads must be between 5.4 and 6.6 ohms. The resistance of the equalizer coil, measured between the terminals of the yellow and green leads, must be between 0.36 and 0.44 ohms. The resistance of the temperature compensating coil, measured between the terminals of the red and blue leads, must be between

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3.3.1.1 Regulator Assembly.- (Continued)

234 and 286 ohms. If any one of the resistance values falls outside of the values given above, the coil assembly must be replaced. Test for shorted windings by touching the terminals of the 550-volt a-c test lamp circuit to the ends of the black and yellow, black and blue, and yellow and blue coil leads. Replace the coil assembly if the lamp flickers or lights.

(h) Test the continuity of all leads by touching the terminals of the test lamp circuit to the ends of each lead. If the lamp flickers or does not light, replace the lead.

(i) Check the resistance of the stabilizing 330-ohm resistor between the ends of the resistor leads, using a Wheatstone bridge or similar resistance-measuring device. The resistance must measure between 297 and 363 ohms. Replace the resistor if the resistance is not within these limits.

(j) Check the resistance of the tubular resistor and lead assembly between the terminals of the resistor. Replace the resistor if the resistance is not between 13.5 and 16.5 ohms.

(k) Check resistance of the voltage adjusting rheostat by turning the rheostat adjusting screws so that the slider is nearest the stop toward the shorted terminals. Measure the resistance of the rheostat between the two outside terminals. If the measured resistance is outside the limits of 2.7 to 3.3 ohms, replace the rheostat.

(l) Reassemble, using new carbon contact plugs and carbon pile. During reassembly, the following operations will be performed and the following precautionary measures noted.

(1) Rivet magnet case studs in place if they have been removed for any purpose and [illegible] Specification TT-L-189. [illegible]

[illegible] the [illegible]

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3.3.1.1 Regulator Assembly.- (Continued)

(3) Be certain that inside of armature assembly ferrule and pile adjusting screw are clean before installing contact plugs. Do not handle plugs with bare hands. Contact plugs must be fully seated and held in place firmly.

(4) If the pile adjusting screw sticks or jams during reassembly, the condition may be corrected by cleaning any possible metal particles from screw threads with a scriber or knife point. Pencil lead rubbed on threads will act as a lubricant to prevent seizure.

(5) Test pile adjusting screw bracket assembly for a possible grounded condition by touching one terminal of a 550-volt test lamp circuit to bracket and other terminal to pile housing. If the lamp lights, the bracket insulators are defective and must be replaced.

(6) Test rheostat and adjusting nut assembly by touching one terminal of test lamp circuit to a terminal contact of rheostat and other terminal to clip and bracket assembly. If the lamp lights, disassemble the rheostat and adjusting nut assembly and replace all insulators. Pin stake brass mounting nut on rheostat shaft in place.

(7) In all cases where resoldering of electrical connections is necessary, unless otherwise specified, use rosin core solder composed of 33 percent tin and 64 percent lead conforming to Specification QQ-S-571. Use rosin as a flux, and clean soldered connections with alcohol.

(8) Test tubular resistor by touching one terminal of a 110-volt, ac test lamp circuit to resistor mounting screw and the other terminal to each of the two resistor terminals in turn. If the test lamp lights, the resistor is defective and must be replaced. Flood-solder nut to resistor mounting screw.

(9) Solder leads as shown in Figure 2 of this specification.

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3.3.1.1 Regulator Assembly.- (Continued)

(10) The rheostat terminals must not touch the contacts of the terminal prongs. If they do, or if the clearance is small, carefully bend terminals upward until safe clearance is obtained.

(11) When reassembling new carbon pile discs, do not allow the discs to come in contact with the bare hands.

(m) Upon completion of reassembly, adjust regulator assembly as outlined in Paragraph 3.5 of this specification.

3.3.1.2 Panel Board Assembly Type 1700-1-A.-

(a) Disassemble as follows:

(1) Separate panel board assembly from shock mount assembly.

(2) Remove terminals. Do not remove terminal screws unless it is necessary to replace contact blades or jumpers. Remove three red fiber barriers.

(3) Remove paralleling rheostat assembly. Do not disassemble rheostat assembly unless replacement of rheostat is required.

(b) Inspect parts for nonrepairable conditions.

(c) Clean contact blades with a cloth moistened with unleaded gasoline.

(d) Tighten loose rivets with a rivet set and suitable punch.

(e) Fill all panel board holes containing rivets with red glyptal lacquer, Specification MIL-V-6893 or MIL-V-6894.

(f) Resolder any loose soldered connections.

(g) Check resistance of rheostat between the two outside terminals with a Wheatstone bridge or similar resistance-measuring device. If measured resistance is outside the limits of 2.7 to 3.3 ohms, replace the rheostat.

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3.3.1.2 Panel Board Assembly Type 1700-1-A.- (Continued)

(h) Reassemble, performing the following operations during the reassembly.

(1) Touch one terminal of a 110-volt a-c test lamp circuit to a terminal contact of the rheostat and the other terminal to the bracket assembly. If the lamp lights, disassemble the rheostat and adjusting nut assembly and replace all insulators.

(2) Pin stake brass mounting nut in place.

(3) The head of the contact screw must be soldered to the contact blade or jumper. Solder jumpers to contact blades.

3.3.1.3 Shock Mount Assembly.-

(a) Disassemble as follows:

(1) Disengage the two bonding cables. Remove locking clips and the rubber grommets from top tray. Remove top tray assembly, tubing, springs, and bumper pads.

(2) Remove locking clips and rubber grommets from bottom tray. Lift off center tray assembly, tubing, springs, and bumper pads. Remove rubber bumpers from bottom tray.

(b) Inspect parts for nonrepairable conditions.

(c) Clean rubber grommets and bumpers by wiping with a clean dry cloth.

(d) Reassemble.

3.3.2 Voltage Regulator - 1589-1-B and 1589-1-C.-

3.3.2.1* Regulator Assembly.-

(a) Disassembly procedure is similar to that outlined in Paragraph 3.3.1.1.(a) except that temperature compensating winding has been eliminated and the composition stabilizer resistor has been replaced with a tubular resistor.

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3.3.2.1 Regulator Assembly.- (Continued)

(b) After disassembly, inspect parts for nonrepairable conditions.

(c) Clean as outlined in Paragraph 3.3.1.1.(c) of this specification.

(d) Check resistance of shunt and equalizer windings of coil assembly with a Wheatstone bridge or similar resistance-measuring device. The resistance of the shunt windings, measured between the terminals of the black and white leads, must be between 3.1 and 3.9 ohms. The resistance of the equalizer coil, measured between the yellow and green leads, must be between 0.36 and 0.44 ohms. If any one of these resistance values falls outside of the values given above, the coil assembly must be replaced. Test for shorted windings as described in Paragraph 3.3.1.1.(g).

(e) Check the resistance values between the ends of the 350-ohm resistor leads, using a Wheatstone bridge or similar resistance-measuring device. The resistance must be between 333 and 367 ohms. Replace the resistor if the resistance is not within these limits.

(f) Check the resistance values between the terminals of the 19-ohm resistor with a Wheatstone bridge. Replace the resistor if the resistance is not within 18 and 20 ohms.

(g) Paragraphs 3.3.1.1.(d), (e), (f), (h), and (k) for the 1589-1-A and 1589-2-A voltage regulators apply also to the 1589-1-B and 1589-1-C voltage regulators except that the limits described in Paragraph 3.3.1.1.(k) should be 4.0 to 4.8 ohms for the 1589-1-C voltage regulators.

(h) Reassembly procedure is similar to that outlined in Paragraph 3.3.1.1.(l).

3.3.2.2 Panel Board Assembly Types 1700-3-A and 1700-4-A.-

(a) Disassembly procedure is similar to that outlined in Paragraph 3.3.1.2 for the Type 1700-1-A panel board, except that the 1700-3A and 1700-4-A have an adjustable resistor assembly instead of the rheostat and adjusting nut assembly.

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3.3.2.2 Panel Board Assembly Types 1700-3-A and 1700-4-A.- (Continued)

(b) Paragraphs 3.3.1.2.(b), (c), (d), (e), and (f) for the 1700-1-A apply also to the 1700-3-A and 1700-4-A.

(c) Check the resistance of the adjustable resistor assembly between the ends of the resistor leads with a Wheatstone bridge. If the measured resistance is outside the limits of 1.8 and 2.2 ohms, replace the adjustable resistor assembly.

(d) Reassemble.

3.3.2.3 Shock Mount Assembly.-

(a) Reconditioning operations are identical to those described in Paragraph 3.3.1.3 of this specification.

3.4 Authorized Repairs:

3.4.1 Base Assembly.-

(a) Polish contacts lightly with No. 0000 sandpaper if they are pitted, corroded, or discolored.

3.5 Adjustment.- Adjust the voltage regulator in accordance with the procedure outlined below. If there is evidence of malfunction of the voltage regulator, discontinue the adjustment immediately and determine the source of trouble. Do not continue with the adjustment procedure until the trouble has been corrected. Adjustment must be performed on a test stand containing suitable equipment and capable of driving a generator of the type normally installed with the voltage regulator. The test equipment should include a set of earphones to assist in detecting instability in the voltage regulator operation indicated by a rapid series of popping noises.

(a) Adjust the core flush with the inside face of the magnet case, loosen the pile screw, and adjust the rheostat slider arm to the center of the potentiometer, then start the generator on the test equipment.

(b) Operate the generator at mid-speed, no load.

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3.5 Adjustment.- (Continued)

(c) Slowly turn the pile adjusting screw inward (clockwise). As the pile adjusting screw is tightened, the regulated voltage will rise to a maximum point and then decrease.

(d) When the regulated voltage has dropped about 1 volt from the maximum, adjust the core to obtain 28.0 volts regulated output. Turning the core counterclockwise (out) will increase the output voltage. Apply and remove full load several times. The output voltage should dip and return to the no-load reading. If it fails to do so, continue to shock-load the regulator and adjust the pile screw until the point of best regulation is obtained.

(e) Remove all load. Connect a voltmeter across the pile (terminals "F+" and "G+") and decrease the generator speed until the voltmeter reads 14.0 volts. Then, with the generator running at this reduced speed, heat the regulator for one hour. This condition of operation will assure the maximum heating of the regulator.

(f) Immediately after the heat run, operate the generator at minimum speed, disconnect voltmeter, and close and open the pile shorting switch slowly five or six times to flex the diaphragm armature assembly. Make the final adjustments by adjusting the pile screw in small increments and performing the regulation run shown in Table I until the regulation is approximately flat at mid-speed. The regulator must show no signs of instability at any time. Adjust the core to obtain 28.0 volts. Tighten the core locking screws. Make certain to readjust the core to obtain 28.0 volts if tightening these screws changes the setting. Then repeat the regulation run shown in Table I and check for flat regulation. The pile screw and core adjustments must be made alternately until flat regulation or minimum drop is obtained at 28.0 volts.

(g) Immediately after the heat run and final adjustment, check the operation of the regulator over the entire speed and load range of the generator. Then cool the regulator to room temperature and repeat the tests. Table I indicates the generator speeds and loads at which the voltmeter readings should be taken, and also indicates the order of testing. During the entire procedure, the difference between the minimum and maximum voltage obtained must not exceed 1.4 volts. The maximum voltage obtained must not exceed 28.7 volts. If the voltage falls

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3.5 Adjustment.- (Continued)

outside the limits, the test procedure must be repeated. If the regulator cannot be adjusted as described above, the overhaul procedure should be repeated, giving special attention to the armature, pile, contact plugs, and coil assembly.

(h) After the regulator has been removed from the mounting base, the core locking screws should be safety wired without upsetting the adjustment of the core, and the cover should be placed over the pile adjusting screw. The regulator is now ready for installation in the airplane.

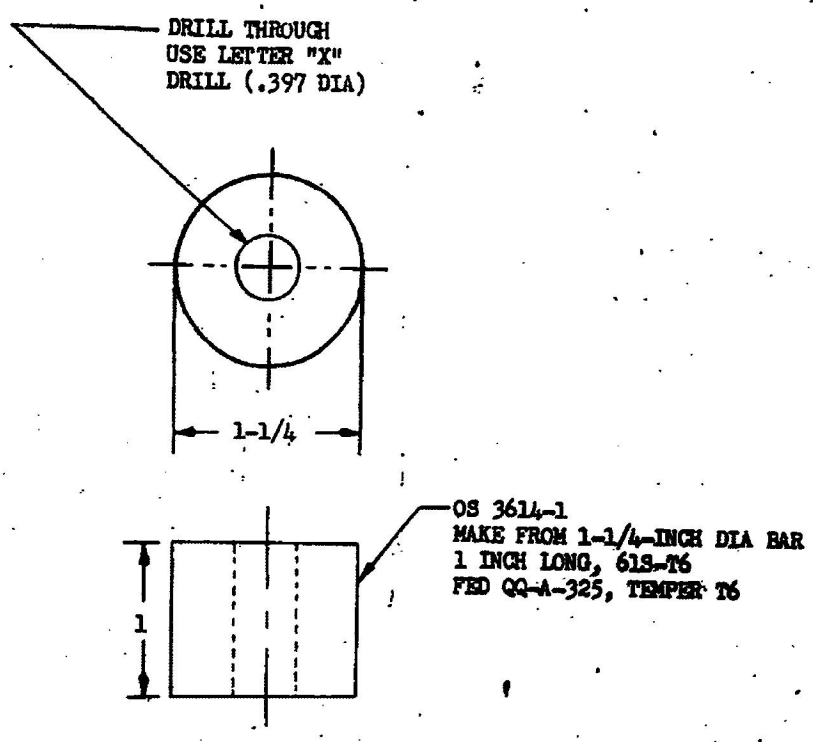
3.6 Packing and Storage after Overhaul:

3.6.1 Packing.- After the overhaul of the voltage regulator is completed satisfactorily and after the completion of the test, the unit must be packed for storage unless it is to be installed in the airplane immediately. Care must be taken to exclude dirt, dust and moisture. Wrap the regulator in heavy wax paper and completely seal with a cellulose "scotch" tape. Then wrap a protective covering of heavy craft paper to prevent accidental tearing of the wax paper.

3.6.2 Storage.- Store the regulator in a dry and reasonably dust-proof room.

4. INSPECTION

4.1 General.- The parts will be inspected to the general acceptable quality standards of Overhaul Specification 7008.



FIXTURE FOR REMOVING CARBON CONTACT PLUGS

FIGURE 1

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PROJECT ENGINEER E. F. Lee				
APPROVAL	DATE REVISED 8-7-53	Beech Aircraft CORPORATION Wichita 1, Kansas	OVERHAUL SPECIFICATION NO. 3614	PAGE 14
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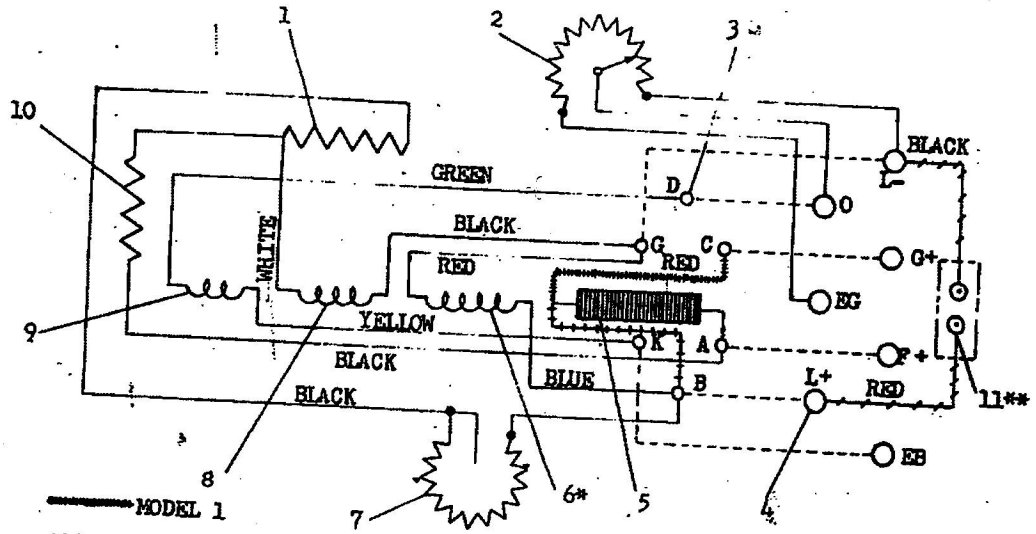

1 Large tubular resistor
2 Paralleling potentiometer
3 Voltage regulator terminal prong
4 Panel board terminal screw
5 Carbon pile
6 Temperature compensating winding
7 Voltage Adjusting rheostat
8 Coil shunt winding
9 Coil equalizer winding
10 Stabilizing resistor in Style A, small tubular resistor in Styles B and C
11 Voltage test jack

FIGURE 2

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PROJECT ENGINEER				
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REGULATION TEST	
LOAD CURRENT	GENERATOR SPEED
No load	Minimum Speed
Half load	
Full load	
No load	
No load	Mid Speed
Half load	
Full load	
No load	
No load	Maximum Speed
Half load	
Full load	
No load	
Full Load	Minimum Speed
No load	Minimum Speed
No load	Maximum Speed

TABLE I