VOLTAGE REGULATOR
TILTING PILE TYPE
REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers the apparatus requirements and adjusting procedures for General Electric voltage regulators of the carbon tilting pile type including the GDD-1M used with d-c generators, KS-5542 and the GDA-1M used with a-c alternators, KS-5467, KS-5508, KS-5518, KS-5525 and KS-5550 and GDA-30 (diactor type) used with KS-5550-01 a-c alternators.

1.02 This section is reissued to include GDA-30 regulators and to revise the section generally.

1.03 The GDD-1M and the GDA-1M regulators may be recognized by a single coil and spiral clock spring of the rheostat operating mechanism being mounted below the enclosing cover for the carbon resistance plates. The GDA-30 type regulator has two coils and helical spring controlling the rheostat operating mechanism and the complete unit is mounted under a single enclosing cover.

1.04 Reference shall be made to Section 020-010-711 covering General Requirements and Definitions for additional information necessary for the proper application of the requirements listed herein.

1.05 Requirements and associated procedures marked with a number sign (#) need not be checked for by the installer unless it is thought that the requirement is not being met or performance indicates that such a check is advisable.

1.06 Requirements marked with an asterisk (*) need not be checked for during maintenance unless the apparatus or part is made accessible for other reasons or its performance indicates that such a check is advisable.

1.07 No lubrication is required. No oil or grease should be placed on any part of these regulators.

1.08 During shipment the rheostatic elements and the voltage sensitive elements are protected by packing. Before placing in operation for the first time remove the cover and take any packing from around these elements.

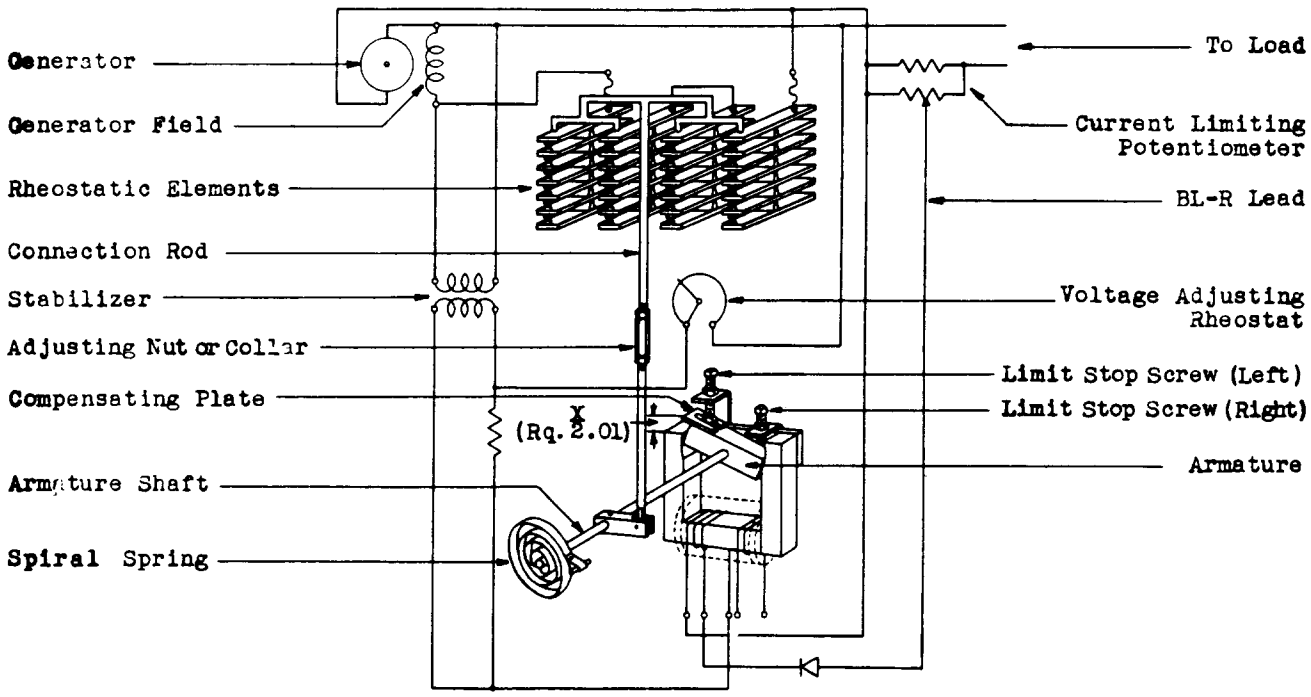

Fig. 1 - Typical Schematic Circuit
Type GDD-1M for D-C Generator

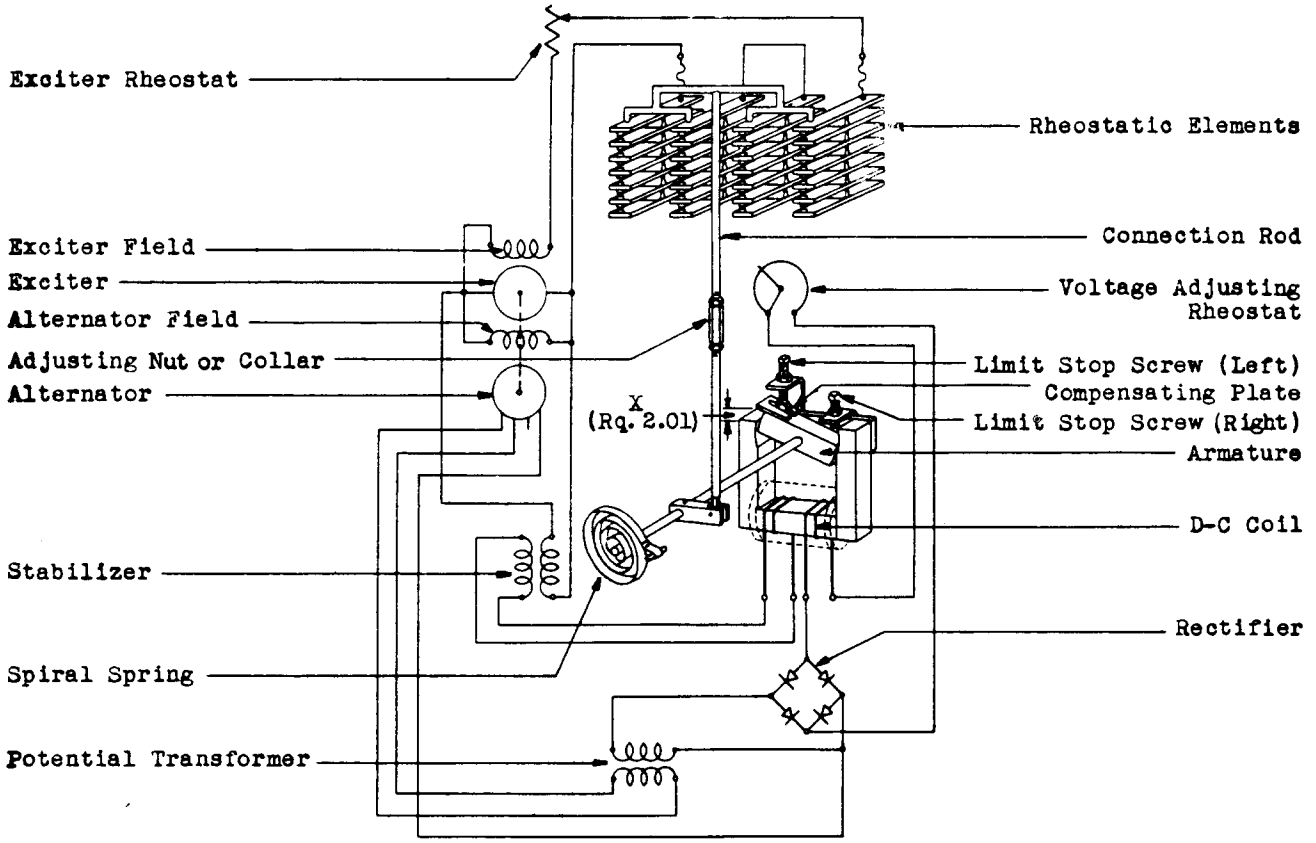

Fig. 2 - Typical Schematic Circuit
Type GDA-1M for A-C Alternator

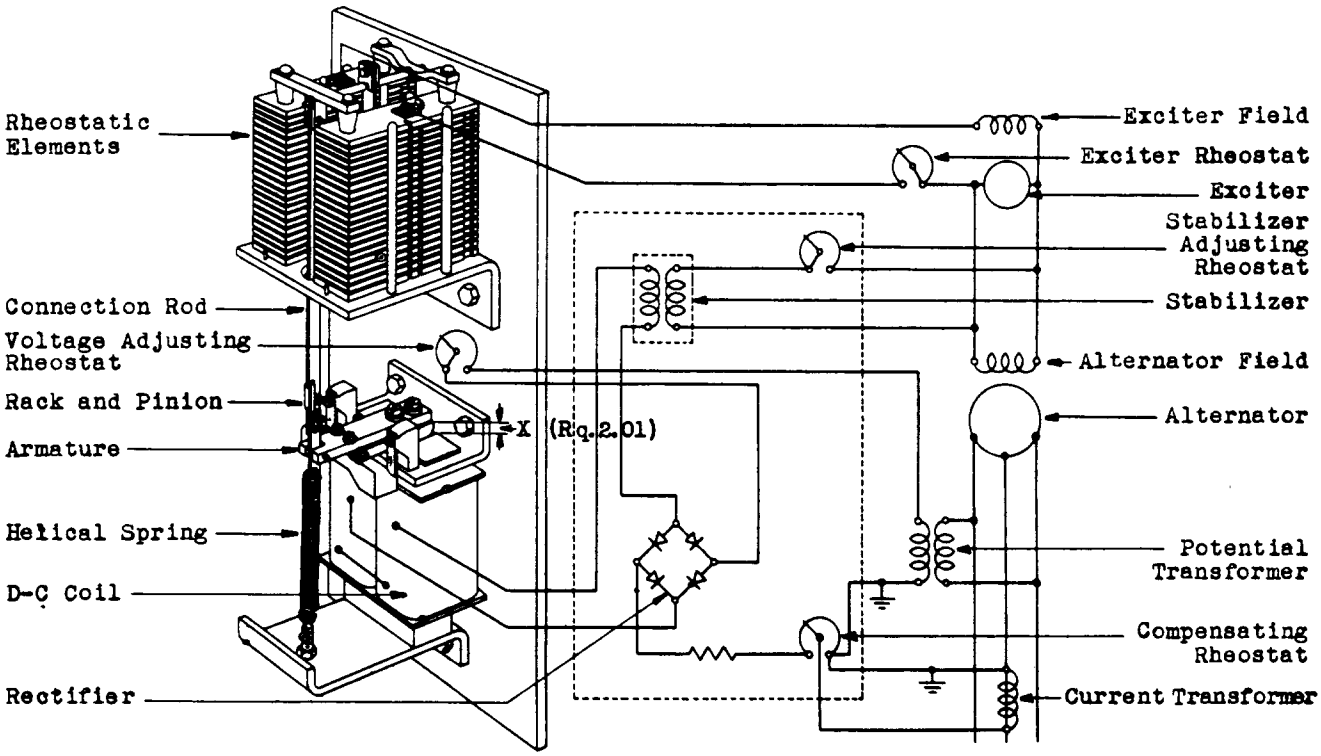

Fig. 3 - Typical Schematic Circuit
Type GDA-30 for A-C Alternator

2. REQUIREMENTS

*#2.01 Armature Position

(a) With no voltage on the regulator coil and all silver buttons of the rheostatic elements in firm contact (minimum resistance position) the length of the connection rod shall be such that the distance from the top of the armature to the top of the pole piece (distance marked X in figures) should be

2/3 to 3/4 of face of armature for GDD-1M and GDA-1M type

Approximately 3/8 inches for GDA-30 type. Gauge by eye.

(b) On units having the spiral clock spring (GDD-1M and GDA-1M type) the stops restricting the armature movement shall allow full tilting action of the rheostatic elements but shall not permit excessive pressure to be exerted on the silver contacts. Gauge by feel.

(c) The armature shaft of units having the spiral clock spring shall be free. Any end play, if present shall not exceed maximum - 1/32 inch. Gauge by eye.

2.02 Regulation

A-C Regulators Only

(a) The regulator shall hold the voltage of the alternator at the specified voltage ± 5% for the particular installation. Use a-c voltmeter.

D-C Regulators Only

(b) The voltage shall not exceed the regulated value by more than one volt from no load to full load. Use d-c voltmeter.

(c) The generator current shall be the machine rated value ± 1% when the generator voltage is 5 or 6 volts below the regulated value. Use d-c voltmeter and ammeter.

(d) The generator current shall not exceed 133-1/3% of machine rated value when battery is at 2 volts per cell or higher. Use d-c ammeter.

2.03 The dust filter on GDA-30 type regulators shall be cleaned periodically.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges and Materials (Equivalents may be substituted if desired)

Tools

Pliers, Combination
Screwdriver, Cabinet, 3 inch

Gauges

Ammeter, D-C, Weston Model 280, 1.5 - 3-30 ampere scale for currents of 3 to 30 amperes.
Ammeter, D-C, Weston Model 280, 100 ampere scale for currents above 30 amperes.
Volt-Ammeter, D-C, KS-8039 for currents less than 3 amperes and as voltmeter.
Voltmeter, A-C, Weston Model 528, 150-300 volts.

Materials

Cloth, Cleaning, Twill Jean, D-98063
Petroleum Spirits, KS-7860

3.002 CAUTION: On a-c installations never open the d-c coil circuit of the regulator with a-c voltage applied to the circuit. If the circuit is opened, full a-c voltage is applied to the associated rectifier and it will be damaged. On GDA-30 type regulators this is particularly to be watched as the rectifier is located in the auxiliary box and external connections run from the auxiliary box to the regulator coil.

3.003 CAUTION: On d-c installations always disconnect the lead to the current limiting rheostat (BL-R lead) first and replace it last when making any changes in the wiring or connections to the regulator.

#3.01 Armature Position (Rq. 2.01)

(1) With the rheostatic elements in the forward (low resistance) position (all silver buttons making contact one with the other) and the associated d-c coil de-energized, turn the adjusting nut in the center of the connecting rods or adjust the connecting rods by means of the associated collar on GDD-1M and GDA-1M type units until approximately 1/4 to 1/3 of the face of the armature is within the pole face, or loosen the pinion clamping screw and turn the pinion on GDA-30 type units until the top of the armature nearest the rheostatic elements is the desired distance above the top edge of the pole face. Tighten clamping screw.

(2) On GDD-1M and GDA-1M type units with the above adjustment loosen the lock nut and set the stop screw at the left against the armature. Tighten the locknut and manually operate the armature to make sure that all silver buttons make contact one with the other when the armature is pressed firmly against this stop screw.

(3) On GDD-1M and GDA-1M type units with the rheostatic elements in the rear touching (high resistance) position and with little or no pressure being exerted against the top plate by the crossarm connected to the connecting rod, loosen the locknut and adjust the stop screw

3.01 (Continued)

at the right until there is approximately 1/16 inch (gauge by eye) between the stop screw and the armature. Tighten the lock nut.

(4) On GDA-1M type units the end play of regulators is fixed at the factory and is non-adjustable.

3.02 Regulation (Rq. 2.02)

A-C Regulator Only

(1) On a-c installations with the alternator slip ring brushes removed (alternator field circuit open) and the rheostat elements in the forward position (all silver buttons making firm contact) adjust the exciter field rheostat to give 160 volts exciter voltage, with machine cold and mark this position for automatic regulation. Use d-c voltmeter. This rheostat position has been found satisfactory for normal exciter design although there may be cases where at full load on the alternator this setting will not allow the exciter to produce the proper excitation. In these rare instances the operating position can be determined by trial at alternator full load by cutting out resistance in the exciter field rheostat giving slightly higher no load voltage until there is some margin available to raise the a-c voltage with the regulator almost to the end of its travel. If the voltage tends to be slightly unstable, the exciter field rheostat may be set for a slightly lower no load voltage.

(2) With the voltage adjusting rheostat approximately in its mid-position adjust the spiral clock spring housing of the GDA-1M type units or the helical spring beneath the connecting rod on GDA-30 type units until the desired voltage is obtained. The spiral clock spring housing may be reset, if necessary, by first taking a firm grip on the spring housing and loosening the two clamping screws at the front of the regulator. Turning the spring housing clockwise will raise the alternator voltage while turning it counter-clockwise will lower the voltage. After the correct position of the spring housing has been obtained, tighten the clamping screws before releasing the grip on the spring housing. The helical spring is adjusted by means of a stud and nuts at the bottom of the spring.

(3) Some portable sets may be designed for use over a 208-230 volt range. In these special instances regulators for use with these sets should be adjusted to give a normal 217 volts on the alternator and the associated voltage adjusting rheostat then moved from its mid-position sufficiently to give the desired voltage. There will usually be no rheostat in the alternator field circuit, the exciter being capable of delivering the excitation necessary to provide the required alternator voltage under all conditions. The exciter brush position is checked and marked at the factory and the factory setting should be changed only as a last resort after other adjustments have been checked. Shifting the exciter brushes backward against rotation, provided it does not impair commutation may in rare instances improve the exciter regulation from no load to full load on the alternator.

(4) On the GDA-1M type units, provided the alternator voltage does not remain constant or nearly so within the specified limits there is a compensating plate at the left of the regulator armature (see Fig. 1) by means of which the compounding may be changed. If the voltage drops as the load increases, (with a corresponding increase in exciter voltage) this plate should be moved to the left (when facing the regulator). If the voltage rises with an increase in load, move the plate to the right. Care should be taken to see that the plate is moved only in small increments and not far enough to make the regulator unstable. On GDA-30 regulators, should the a-c voltage fall as load is applied the exciter field rheostat may be set for a slightly higher no load voltage. If the voltage tends to be somewhat unstable the exciter field rheostat may be set for a slightly lower no load exciter voltage.

(5) Any tendency of the regulator to hunt (if present) should be at light loads rather than at full load. To overcome hunting move the limit stop screw (left) of GDA-1M regulators to bring the armature nearer to its minimum or maximum position as outlined in requirement 2.01 or by adjusting the stabilizing adjusting rheostat in the auxiliary box (GDA-30 regulators), or by shortening the connection rods slightly. The correct position to give the least hunting may be determined by trial.

(6) Should the a-c regulated voltage become unstable during operation, such as after a severe overload or short circuit or after the exciter field circuit has been known to have been open circuited, check to see that the polarity of the exciter has not been reversed, but conforms with the polarity as indicated on the circuit drawing. If the polarity is reversed, stop the set, remove the exciter brushes and apply approximately 48 volts or more of battery to the exciter field with the correct polarity (plus battery to plus terminal and negative battery to minus terminal)

3.02 (Continued)

for a few seconds. Remove the battery, replace the brushes, start the alternator and again check the polarity. Repeat if necessary.

D-C Regulators Only

(7) With the current limiting potentiometer disconnected from the regulator, move the voltage adjusting rheostat to its mid position (usually indicated by mark on panel) and adjust the spiral clock spring as outlined in (2) to give the desired regulated voltage. Final adjustment may be made by slight movement of the rheostat knob. Do not raise the voltage so fast during this adjustment that the generator current exceeds 150% of the machine rating.

(8) Stop the generator, connect all available load, and discharge the battery approximately 10% leaving the voltage adjusting rheostat set at the position determined in (7). Reconnect the potentiometer, leave all available load connected to keep the battery voltage from rising too fast on charge, start the generator and connect to battery. Operate the current limiting potentiometer to maintain the generator output at as near machine rating as possible until the generator voltage is 5 or 6 volts below the regulated voltage and leave the potentiometer on this setting.

(9) Any tendency of the regulator to hunt (if present) should be at light load rather than at full load. To overcome hunting make certain that the stabilizing transformer leads to the exciter have the proper polarity and then move the limit stop screw (left) to bring the armature nearer to its minimum or maximum position as outlined in requirement 2.01. The correct position to give the least hunting may be determined by trial.

A-C and D-C Regulators

(10) Other conditions which may cause unsatisfactory operation of the regulator are

(a) The rheostatic elements should not bind but have free movement in their vertical guides. Usually the elements will not be in contact with the vertical guides at any point.

(b) The pigtails forming the connections at the top of the stack of rheostatic elements should in no way restrict the movement of the elements.

(c) Improper adjustment of the vertical retaining spring holding the push rods on top of the rheostatic elements. See that tension on this spring is only sufficient to insure a backward tilt (high resistance position) to the rheostatic elements when the connection rod is in the raised position. It may be adjusted by means of the two screws at the bottom of the spring beneath the rheostatic elements. This spring has a slight bend in it and should be fastened to its support so that it is inclined toward the rear of the regulator.

(d) There should be no broken or cracked rheostatic elements. Broken elements can be detected by running the finger nail up the edge of the elements raising each element slightly as it passes.

(e) Insulation and insulating spacers between rheostatic elements should be in good condition. Defective insulation may be detected by arcing between elements.

#3.03 Dust Filter (Rq. 2.03)

(1) To prevent an accumulation of dust on the regulator parts the cooling air which goes through the enclosing cover has to pass through dust filters. These filters are made of wire screen and should be removed and cleaned with petroleum spirits when dirty.