

NATIONAL ELECTROSTATICS CORP.

Instruction Manual No. 2BT059040 for

Generating Voltmeter Assembly

2BA059040

AJS/ MJS
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TABLE OF CONTENTS

I.	GENERAL INFORMATION	1.1
II.	INSTALLATION	2.1
III.	SPECIFICATIONS	3.1
IV.	MAINTENANCE	4.1
V.	DOCUMENTATION	5.1

ELECTRICAL SAFETY INSTRUCTIONS



IMPORTANT SAFETY INFORMATION READ BEFORE OPERATION AND SERVICE

SHOCK HAZARD WARNING
THIS UNIT USES AC MAINS POWER
THIS UNIT CONTAINS DANGEROUS VOLTAGES AND
ENERGY

This unit must only be operated and serviced by qualified personnel who have read the instruction manual and are familiar with the hazards associated with dangerous voltages. Proper care and judgment must always be observed.

OPERATION:

1. Before connecting input AC power, ensure that all covers are in place and securely fastened. Ensure that the required safety ground to the chassis is installed (indicated by the protective ground symbol) and sufficient cooling is supplied.
2. Proper grounding from the input AC power is required to reduce the risk of electric shock and to comply with safety agency and code requirements.
3. Use caution when connecting input AC power. Only apply the input voltage specified on the rating label.
4. Use caution when connecting any high voltage cables. Never handle any output cables when the unit is energized.
5. After the unit is switched off, dangerous voltages may remain on the outputs. Allow sufficient time for self-discharge before handling anything connected to an output. The user's load must be taken into consideration when determining the time required. Use a mechanical ground when possible.
6. When user serviceable fuses are present, always replace fuses with the same type and volt/amp rating.
7. Never attempt to operate the unit in any manner not described in the instruction manual.
8. Never remove warning labels from the unit. Replace lost or damaged labels immediately. Contact NEC for replacement labels.

SERVICE:

The following safety labels apply to this unit:



CAUTION - Risk of electrical shock



Protective Ground Conductor

1. Service is best done by NEC trained technical personnel, either at the site during installation or by returning the unit to the NEC factory. Call NEC at 608-831-7600 for a Return Materials Authorization (RMA) number and ship unit to 7540 Graber Road, Middleton, WI 53562.
2. If service of this unit is to be done at the user's site, this service may only be performed by trained and qualified personnel and must follow instructions from this manual or from NEC technical personnel.
3. Consult NEC supplied assembly drawings, parts lists, circuit board drawings and schematic diagrams for service details.

I. **GENERAL INFORMATION**

A. Introduction

The GVM (Generating Voltmeter), together with the GVM Amplifier, measures terminal voltage. The GVM Amplifier accepts an input signal from the GVM and conditions it to provide a DC output voltage proportional to terminal voltage. The amplifier output is used by the terminal voltage regulation system.

GVM signal sensitivity varies with accelerator geometry and maximum terminal voltage. To compensate for this, NEC GVM Amplifiers have internal switches for adjusting the overall amplifier gain. This allows the unit to be used in different applications. The amplifier is typically set up for between +5 and +10 VDC output at rated terminal voltage. Absolute (fine) calibration is then done at the controller. In addition, the amplifier has an internal GVM rotor selector switch for use with 2 or 4 vane rotors.

Each GVM must be matched to the particular GVM Amplifier and accelerator during installation. Refer to the appropriate sections of the amplifier manual.

B. Theory of Operation

The GVM consists of four fixed stator plates and a motor driven two plate rotor. Two opposing stator plates are grounded and the other pair are connected to a BNC connector. Both the plates and rotor are gold-plated. When exposed to an electric field, the grounded rotor alternately exposes and shields the stators from the field. This produces an AC current flow in the stator analogous to a continuously varying parallel plate capacitor. The stator current is proportional to the electric field (a function of accelerator geometry and terminal voltage), the number and size of rotor/stator vanes and the frequency of rotation. For an ideal GVM, the stator current is a square wave.

II. **INSTALLATION**

The GVM housing is designed to be directly bolted on to a port in the side of the accelerator high pressure tank. Four bolts secure the 2" ASA flange, compressing a rubber O-Ring. Ideally, the rotor will be flush with the internal face of the tank flange (a projection of 1-1/2" from the GVM flange) which, in turn, is approximately flush with the tank ID.

As a practical matter, the GVM assembly may be placed anywhere within the tank; the output signal will, of course, depend upon the relative orientation of rotor axis and the electric field and the strength of the field. The same can be said of the likelihood of spark survival and need for spark protection measures.

The motor capacitor will be internal to the amplifier, if supplied with the GVM. See the amplifier manual for installation details.

III. MAINTENANCE

The following comments apply to the assembly as depicted in Drawing No. 2-0-5904 and numbers in parenthesis identify item numbers on that drawing.

- A. Access to the motor and feedthroughs requires the removal of the four screws (30). The entire internal assembly can then be carefully lifted from the housing without disturbing the over-all alignment. Note that all interconnecting wires have sufficient length to do this and have been coiled out of the way at time of assembly.

- B. Further disassembly should be unnecessary or at least infrequent. However, the following notes may be helpful at that time:
 - 1) The stator or sector group (21) consists of two pairs of signal segments. All separations must be evenly gapped. The signal segments are secured by screws (9) clamping nylon washers (18) and (24); over-tightening the screws could destroy the washers and their insulating value.
 - 2) Wire (15) has a grounded shield and must be captured under item (4) to ensure a good ground.
 - 3) Brush (27) must have a notch filled on its end to eliminate rotation and provide good electrical contact.
 - 4) Loctite has been used to secure screws (19) and (23).
 - 5) Wire (8) must be insulated.
 - 6) Paint must be removed to ensure grounding when mounting connectors (16) & (17). The entire unit is helium leak-checked after assembly.

- C. Set screw (23) may be loosened in order to adjust the height of spindle (22) which positions the height of the rotating vane (20). This gap between the sector group (21) and rotating vane is adjusted for 1/32" at the factory.

IV. SPECIFICATIONS

Motor Power	120 VAC, 12 VA max. 3600 RPM
Motor Phase Shift Capacitor	2.0 microfarad (+/-10%); usually internal to the amplifier.
GVM Output	40 nA AC min. to 40 uA AC for rated output voltage of typical amplifiers.

V. **DOCUMENTATION**

Drawing:

GVM Assembly
Drawing No. 2BA059040
Parts List 2BA059040

GVM Motor - Schematic
Drawing No. 2HS060220

GVM Motor - Wiring Diagram
Drawing No. 2HF060220