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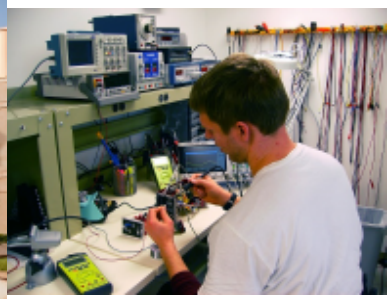
HVGM-1

High Voltage Ground Monitor
P/N: 1100-1100

Operation Manual and Data sheet





Important Notice

This document contains information intended to aid in the proper installation and operation of the product described. Although this information will prove useful to the properly trained and qualified user, it is not practical to cover every possible situation, installation contingency, or other detail.

It is imperative that proper engineering and techniques are adhered to in the installation, operation, and maintenance of this product. It is the responsibility of the user to ensure that any system utilizing this product is safe, and that all personnel involved with the selection, installation, maintenance, and use of this product are properly qualified. This product must not be used in situations where its ratings are exceeded.

While every effort has been made to make sure the information in this document is accurate, IE cannot guarantee that there are no errors. Users of this product should verify any aspects of the product's design or performance that are critical to their application, and in particular, any aspects that may affect the safety of the overall system or installation.

Product design and specifications may change without notice.

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I: General Information

The HVGM-1 is an impedance-type Ground Monitor (GM) designed to monitor the integrity of the grounding conductor between a power source and equipment being powered.

When properly installed, the HVGM-1 continuously monitors the impedance of the ground conductor. If this impedance increases by 3 ohms from its calibrated level, the HVGM-1 will trip, indicating a grounding problem.

The HVGM-1 is designed for use in power systems in High-Voltage (HV) systems (1000V or more). For low-voltage or medium-voltage systems (less than 1000V), the GLT-500, which is also available from Intermountain Electronics, is a more appropriate ground monitor choice.

Key features include:

- Analog current meter makes calibration simple and intuitive.
- Polarity switch allows optimal setting to prevent nuisance trips.
- Latching circuit-breaker trip indicator indicates when a grounding issue has occurred, even if the problem is intermittent.
- Test button allows test of the GM function.
- UVR mode (selectable via a protected rear-panel switch): The GM will trip if a bad ground is detected or if control voltage is lost. This mode is fail-safe.
- Non-UVR mode (selectable via a protected rear-panel switch): The GM will trip if a bad ground is detected. This mode is not fail-safe.
- Lockout mode (selectable via protected rear panel switch): The GM will stay tripped until the latching circuit breaker trip indicator is manually reset.
- Non-Lockout Mode (selectable via protected rear panel switch): The GM will automatically reset if the ground issue that caused the trip is cleared. However, the latching circuit-breaker trip indicator will continue to indicate that a trip occurred until it is manually reset.
- Impedance Range Switch (protected on rear panel) allows selection of 16 or 50 ohm impedance ranges. This allows up to 50 ohms of pilot/ground impedance, but improves calibration for more common, lower impedance, systems.
- Full chassis to improve reliability and to improve safety.
- Standard panel mount / pinout makes the HVGM-1 an easy upgrade for legacy products.

II: Controls & Connections

Figure 1: Front Panel

- **Latching Circuit Breaker Trip Indicator:** This breaker acts as a latching trip indicator. When a grounding problem is detected, this indicator trips, and stays tripped until manually reset.
- **Current Meter:** Measures test current in the pilot-ground loop. Used to calibrate the HVGM-1.
- **UVR & NON-UVR Indicators:** One of these will be lit to indicate which mode (UVR or Non-UVR) the HVGM-1 is set for.
- **Control A & Control B:** These knobs are used to calibrate the HVGM-1 for the system in which it is installed.
- **Polarity Switch:** This switch can be set to prevent nuisance trips caused by current surges (such as when power is applied to equipment being powered). Set the switch so that current surges increase, rather than decrease the current, as indicated on the Current Meter.
- **Fuse Holder:** Replace fuse only with a fuse of the same rating.
- **Test Button:** Pressing this button inserts four ohms into the pilot-ground loop to test the GM function. When working properly, this should cause a trip.
- **Calibration Instructions:** Follow these instructions to calibrate the HVGM-1 after installation. Unit should be re-calibrated any time a modification, such as cable change, is made to the system.

Figure 2: Rear Panel

- **Mode switch cover:** Prevents accidental changes to mode settings. Loosen the screw on right side and rotate the cover to expose switches.
- **UVR / Non-UVR Mode Switch:** Selects between UVR and Non-UVR Modes.
- **Impedance Range Switch:** Selects between high-impedance range (50 ohms) and low impedance range (16 ohms). For most precise calibration, use the 16 ohm setting when the high impedance range is not needed.
- **Lockout Mode Switch:** Enables or disables Lockout Mode.
- **I/O Connector:** Includes all necessary inputs / outputs:

Table 1: I/O Connector Pin-out

Pin	Purpose
1-3	C-form contacts (NO / C / NC), set 1
4-6	C-form contacts (NO / C / NC), set 2
7-8	Unused
9-10	Control Voltage input (120V AC)
11	Ground Input
12	Pilot Output

III: Operation & Specifications

General Description

The HVGM-1 is a high-voltage, impedance-type ground monitor. This type of ground monitor continuously monitors the ground conductor to make sure that there is no significant increase to the ground conductor impedance. If an increase greater than 3 ohms is sensed, the HVGM-1 will trip, indicating a potentially unsafe condition, such as a broken ground conductor.

Theory of operation:

The block diagram for the HVGM-1 is shown in Figure 3.

The HVGM-1, mounted in the power source (switch gear, power center, etc.), provides a 60-Hz test signal through its Pilot output to a pilot conductor, which is routed to the equipment being powered (labeled machine unit).

The pilot conductor is attached to the ground conductor at the machine unit, and the test signal returns to the ground monitor on the ground conductor. The pilot and ground conductors make up the "pilot-ground loop."

When installed, the HVGM-1 must be calibrated in the installation to set the system's baseline impedance. This is done by using the Current Meter, Test button, Control A and Control B, according to the instructions on the front panel of the HVGM-1.

Any time changes, such as cable replacements, are made to the power system that could affect the pilot-ground loop, the HVGM-1 must be recalibrated in order to work properly.

The HVGM-1 monitors the impedance of the pilot-ground loop by continuously measuring the test current through the pilot-ground loop. If this impedance increases from its calibrated baseline value by more than 3 ohms, the HVGM-1 will trip.

A polarity switch sets the phase of the test signal relative to the control voltage. This switch is used to minimize nuisance trips caused by current surges that may occur in the pilot-ground loop, such as when a machine being powered turns on.

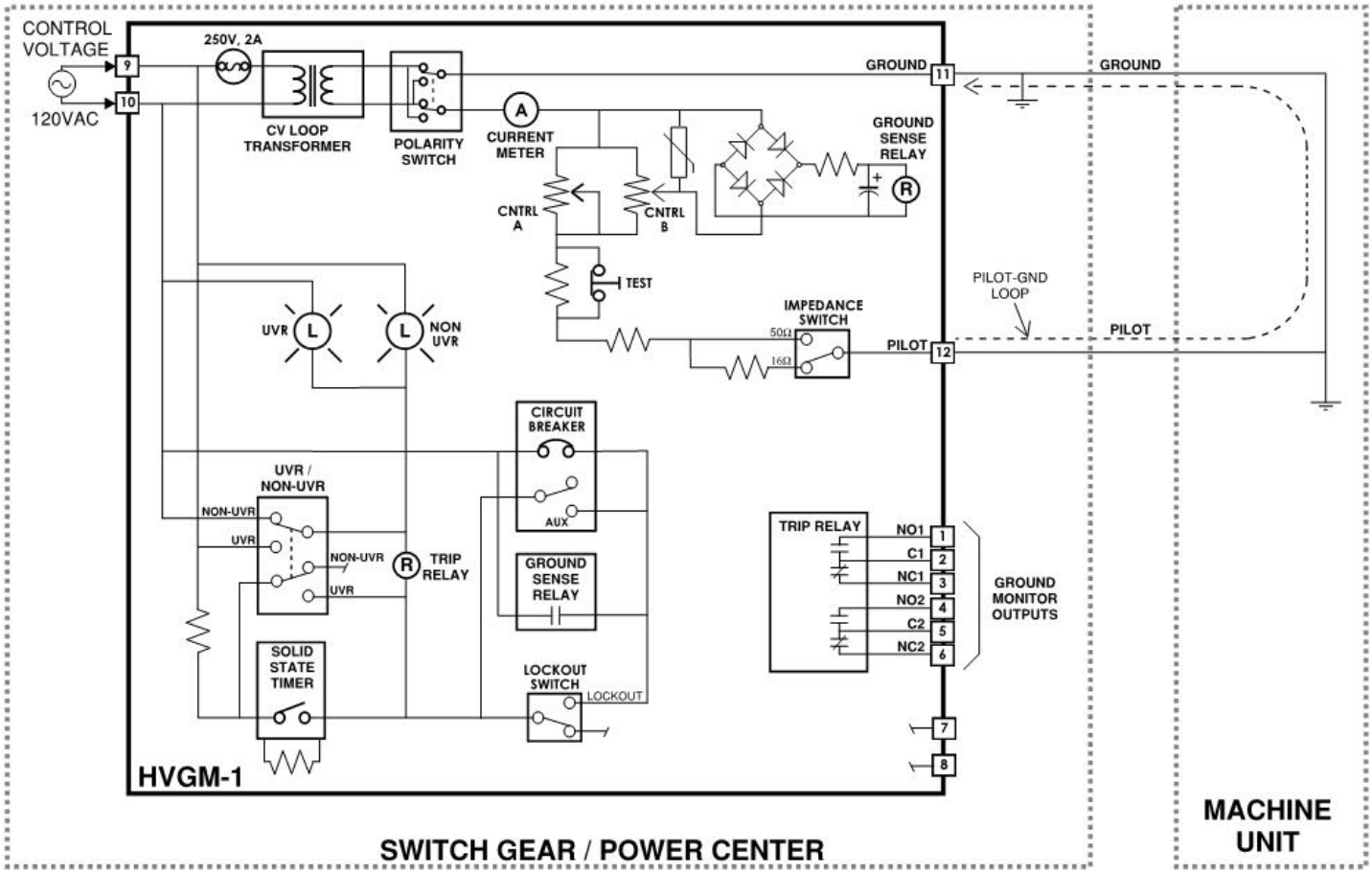
Observing the current meter during a surge will show if the test current increases or decreases when the surge occurs. The switch should be set so that the surge increases the current.

Pressing the test button places 4 ohms into the pilot-ground loop to simulate a ground conductor impedance increase. This should cause the HVGM-1 to trip.

When a trip occurs, the Ground Sense Relay will energize, or de-energize, depending on whether UVR or Non-UVR mode is selected, and the latching trip indicator will move into the "tripped" position.

The latching indicator always stays in the tripped position until it is manually reset. However, if the pilot-ground impedance returns to normal, the Ground Sense Relay will automatically reset, unless Lockout Mode has been selected (see Lockout / Non-Lockout Mode below).

Figure 3: HVGM-1 Block Diagram



Operating modes

The HVGM-1 has several operating modes that can be selected using the Mode Selection switches on the rear panel. These modes are as follows:

UVR/Non-UVR Mode:

- In UVR Mode (factory default), the HVGM-1 energizes the Ground Sense Relay if there is Control Power and pilot-ground impedance is normal. If power fails or the pilot-ground impedance increases by more than 3 ohms, the relay *de-energizes* (NC1 shorted to C1, NC2 shorted to C2, NO1 and NO2 open), indicating a trip. This mode is fail-safe, since a power loss results in a trip.
- In Non-UVR Mode, the Ground Sense Relay *energizes* (NO1 shorted to C1, NO2 shorted to C2, NC1 and NC2 open) if the pilot-ground impedance increases by more than 3 ohms. A power loss will not cause a trip, so this mode is not fail-safe. In this mode, a 0.25 second delay is utilized at power up to prevent nuisance trips.

Lockout Mode:

- When Lockout Mode is off, the Ground Sense Relay automatically resets if the pilot-ground loop returns to normal. When Lockout Mode is on (factory default), the Ground Sense Relay remains tripped until the Latching Trip Indicator is reset.

Impedance Range:

- 16 ohms (factory default): Allows HVGM-1 to be calibrated for system baseline impedances up to 16 ohms. This setting provides the best calibration resolution, and is the preferred mode for lower impedances.

Calibration Instructions

1. Rotate Control A and Control B fully clockwise, and reset the Latching Trip Indicator.
2. If the Current Meter reads over 0.5A, press the Test Button, and rotate Control B until the unit trips. Or, if the Current Meter reads less than 0.5A, press the Test Button, and rotate Control A until the unit trips.
3. Reset the trip indicator. The HVGM-1 will now trip when Pilot-Ground resistance increases by more than 3 ohms.
4. Set the polarity switch so that current surges increase the current reading on the Current Meter.

For convenience, the calibration instructions are also printed on the HVGM-1 front panel.

Specifications

Input voltage (Control Voltage):	120 VAC, +/- 15%
Power Draw:	55 VA
Pilot Output:	16VAC Max, up to 1.5A
Weight:	5.5 lbs. / 2.5 kg

Mechanical Dimensions