

Amblyonix

2000 Series

Kilovolt Meters

USER MANUAL



MODEL 2050

MODEL 2100

MODEL 2200



Amblyonix

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Dear Customer,

Thank you for purchasing one of our AC/DC Kilovoltmeters. Please read this manual in detail prior to first use, as it will acquaint you with the product and help you to use it skillfully.

Our goal is to continuously improve our products, so there may be slight differences between the product you purchased and its original instruction manual. If changes in this manual occur, you will find them in the appendix. If you have questions or would like to discuss a unique testing application, please contact us.

This product is covered by a one-year limited warranty from the date of shipment. If it is found to be defective due to parts or workmanship during the warranty period, we will repair it free of charge.

Should this product require repair either in or out of warranty please return it to us at:

Please visit our website for technical updates and news concerning this and other products available in our continuously expanding product offering.

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This product is designed to measure very high AC and DC voltages. Only properly trained personnel should operate this instrument. Prior to first use please read this manual entirely. Familiarize yourself with all aspects of this products' features and functions. Always use best testing practices when using this instrument.

Definition of Terms

Warning: Indicates that death or severe personal injury may result if proper precautions are not taken into consideration.

Caution: Indicates that property damage may result if proper precautions are not taken into consideration.

This product is designed to measure very high AC and DC voltages. Only properly trained personnel should operate this instrument. Prior to first use please read this manual entirely. Familiarize yourself with all aspects of this products' features and functions. Always use best testing practices when using this instrument.

Safety Requirements

Please read the following safety precautions carefully to avoid the risk of personal injury, and to prevent damage from occurring to this instrument and/or other devices that are connected to it. To avoid possible danger to equipment or personnel, never use this product outside of the scope of its intended use.

If this product should appear to malfunction, never attempt to perform repairs yourself. Only qualified technicians that are completely familiar with every aspect of its operation should perform repairs.

To avoid fire hazards or personal injury

- In case of emergency or if a suspected issue occurs, always turn off the high voltage first.
- Keep unqualified and/or unauthorized personnel away from the testing area.
- Always use the proper interconnecting and ground cables.
- Never touch the energized surfaces and/or output of this device during a test.
- Always use this product by connecting and disconnecting it properly to the source being measured. Never connect or disconnect the high voltage connections, or any of the other test connections during a test.
- After testing, always turn off the applied voltage first.

Grounding

- The 2000 series of AC/DC Kilovoltmeters are grounded through the dedicated ground terminal located at the base of the High Voltage stack. To prevent electric shock, good testing practice dictates that the case ground connection must be connected to a good earth ground. Before making any other connections from this device to the voltage source being measured, please ensure that your Kilovoltmeter is properly grounded.
- Do not operate this product when its covers or panels have been removed.
- Avoid coming in contact with the high-voltage connections or electrified surfaces during or after a test until the Kilovoltmeter and the voltage source has been fully de-energized.
- Do not operate this Kilovoltmeter if you suspect faulty operation. If you suspect faulty operation, stop immediately. Contact our repair department for technical assistance.
- Do not operate in wet/damp conditions. Do not operate in explosive atmospheres. Ensure that this Kilovoltmeter is clean and dry during use.

Product Introduction

The 2000 Series of AC/DC Kilovoltmeters are perfectly suited for high-voltage measurement. They are used in a wide variety of applications that include semiconductor manufacturing, electronic equipment manufacturing, power utility testing, and as calibration laboratory standards. These devices are composed of a high-voltage divider and a low-voltage meter. The two parts are connected to each other by a coaxial support cable. The high voltage section must always be grounded before use.

Features

These devices use high-voltage thin-film capacitors and precision glass resistors to produce a voltage divider with very-high input impedance, and low current/power consumption. The hand selection of these components improves the accuracy and stability of measured readings.

The signal processing section of these instruments employ high performance, high impedance operational amplifiers and state-of-the-art dual-slope A/D sampling techniques. The meter section uses a 4.5 digit liquid crystal display with a maximum resolution of up to 0.001kV. These features make the 2000 series of Kilovoltmeters a suitable replacement for electrostatic voltmeters in many applications.

The aluminum arc suppression sphere effectively improves the high-voltage field distribution, prevents partial discharge, and improves the anti-jamming ability of the test results. They are also very well shielded from external interference. The low-voltage meter display is fully enclosed in a metal case and is connected to the high-voltage divider via a shielded coaxial cable, which allows for viewing at a safe distance. These features create a Kilovoltmeter with very high stability and linearity.

A very important feature of this series of Kilovoltmeters is the construction of their High Voltage sections. Strong considerations have been made to minimize internal partial discharge. They contain no oil.

The entire instrument is housed in an aluminum alloy case and is easy to assemble and disassemble. They are small in volume, light-weight, and are convenient to store, carry, and use.

Specifications

Note: Some specifications are common, others are model specific.

Range: Model 2050: (0 to 50kVAC/DC), Model 2100: (0-100kVAC/DC), Model 2200: (0-200kVAC/DC)

Input Impedance: Model 2050: (600M Ω), Model 2100: (1.2G Ω), Model 2200: (2.4G Ω)

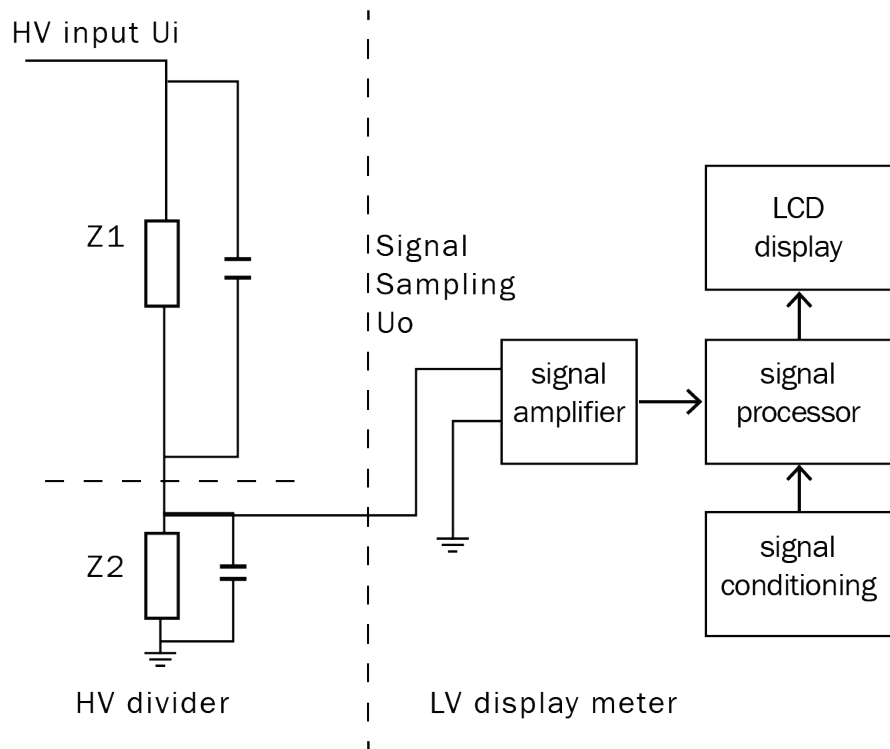
Divider Ratio: 1000:1

AC Measurement: True RMS

Accuracy: AC 1.0% rdg, DC 0.5% rdg

Coaxial Cable Length: Models 2050 and 2100: 9ft 9inches, Model 2200: 13ft

Operating Conditions: 32° to 104°F @ \leq 85% RH



Theory of Operation

These dividers use a resistance-capacitance voltage division method for testing high AC and DC voltages as depicted schematically in figure 1. The left side of the circuit is the high voltage divider and is composed of impedances Z1 and Z2. The high voltage signal (Ui) enters the circuit through the equipotential arc-suppression sphere and exits the divider as the output signal (Uo). The left side of the circuit is the low-voltage meter display circuit where Uo is processed. In this circuit the signal is rectified and filtered before it is amplified and displayed. The relationship between Ui and Uo can be expressed as shown in formula 1.

$$U_o = \frac{U_i}{Z_1 + Z_2} Z_2$$

Before You Test

Before performing any test, always make sure that your Kilovoltmeter is well grounded. Ensuring that this device is properly grounded is the first step in creating a safe testing environment. As this device is designed to be connected to, and then measure very high voltages, make certain that enough space is available to safely perform high voltage testing. When setting up to perform a test, be certain that your test set-up allows you to safely and quickly shut off the high voltage test signal if something unexpected occurs. This would include but not be limited to:

- Poor connections discovered after a test is under way.
- Unauthorized personnel entering the test area.
- Displayed readings that do not appear to be correct.
- The unanticipated sound of High-Voltage arcing.

Remove the high voltage divider and meter from the carrying case. Without making any connections to the meter, turn it ON and observe that the display is activated. If there is no display, or if a low battery indication is observed, replace the battery before performing any test.

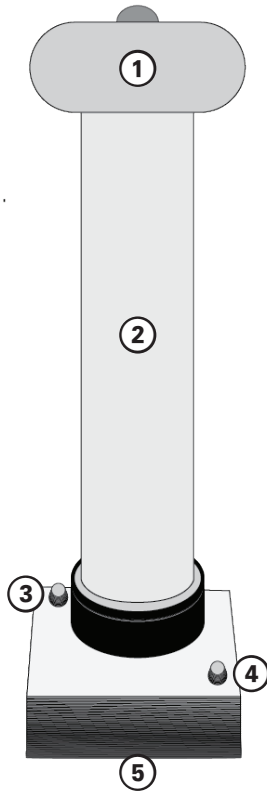
Panel Layout

This product is composed of a high voltage divider and a low voltage meter display unit with selectable ranges and voltage measurement modes.

High Voltage Divider

Figure 2

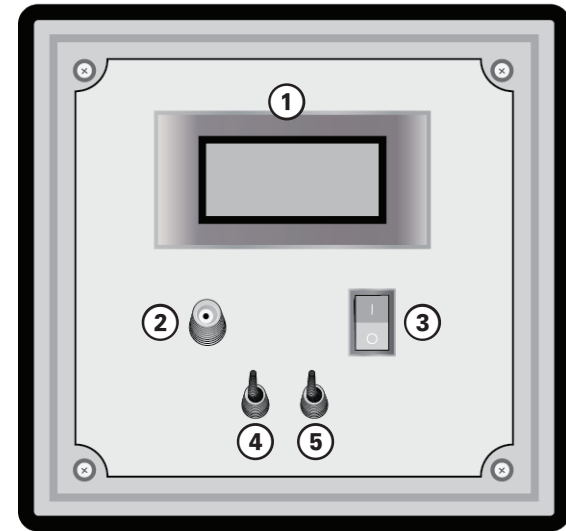
- ① Equipotential arc suppression sphere
- ② Insulated divider cylinder
- ③ Ground terminal
- ④ Signal output terminal
- ⑤ Divider base



Low Voltage Meter Display

Figure 3

- ① Liquid Crystal Display
- ② Signal Input
- ③ Power Switch
- ④ AC/DC Selection Switch
- ⑤ Range Selector Switch



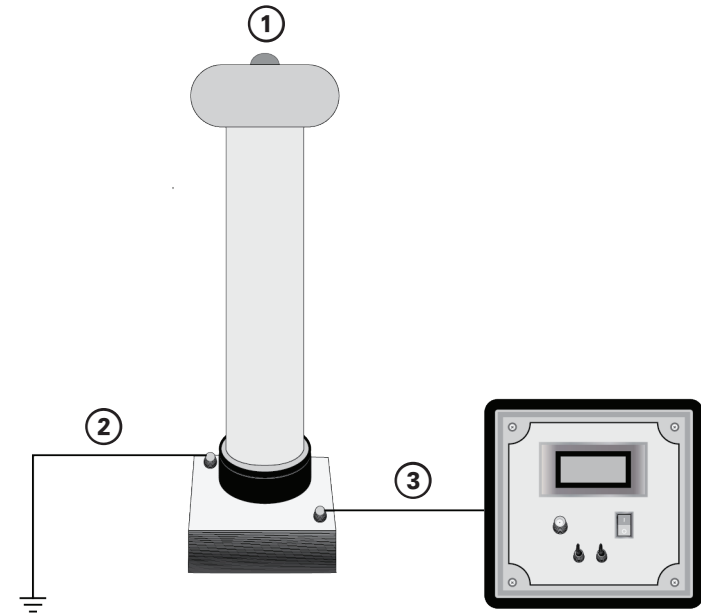
Operating Instructions

Connect the Kilovoltmeter as shown in Figure 4. Connect the High Voltage Divider to an established, known ground first. Next, connect the high voltage divider to the meter display via the supplied coaxial cable. Lastly, connect the high voltage divider to the device under test. When connecting to the Arc-suppression equipotential sphere make sure that the High voltage cable is physically elevated, and is not in close proximity to the ground. It is best if this connection is made with the cable descending from directly above and over the divider. When making connections to the device under test make certain that the low side of the output test signal is also connected to the high voltage divider's ground terminal. This is EXTREMELY important and is the most often overlooked and potentially DANGEROUS error when making connections to the divider. After all connections have been made, good testing practice dictates that connections be inspected and verified by a qualified individual, other than the individual that created the test set up. Having an observer inspect the test set up greatly enhances the overall safety of the test site. Remember, the life you save may be your own.

Wiring Diagram

Figure 4

- 1 High voltage connection
- 2 Earth ground cable
- 3 Coaxial interconnection cable



Power frequency AC High Voltage measurement

After connection and inspection, turn the POWER SWITCH on the meter display box to the ON position. Move the AC/DC FUNCTION SWITCH to the AC position, and the RANGE SWITCH to the HIGH range. Move to a safe distance from the proximity of the high voltage equipment and connections before engaging the test signal and position yourself (outside of the test area) so that you can clearly view the test set up and the readings on the METER DISPLAY. If the measured voltage is below 20KV, use the LOW voltage range to obtain the most accurate readings with the best resolution.

After the completion of the test, turn the high voltage source off first, and observe the meter display as it returns to zero before entering the test site. You may notice that when measuring AC voltage, the meter display will slowly trend down toward zero after the voltage source has been de-energized. Allow the meter to reach zero before advancing toward the test site.

DC High Voltage measurement

After connection and inspection, turn the POWER SWITCH on the meter display box to the ON position. Move the AC/DC FUNCTION SWITCH to the DC position, and the RANGE SWITCH to the HIGH range. Move to a safe distance from the proximity of the high voltage equipment and connections before engaging the test signal and position yourself (outside of the test area) so that you can clearly view the test set up and the readings on the METER DISPLAY. If the measured voltage is below 20kV, use the LOW voltage range to obtain the most accurate readings with the best resolution.

After the completion of the test, turn the high voltage source off first, and observe the meter display as it returns to zero before entering the test site. Next, physically ground the high voltage divider to remove any residual charge that may be stored in the capacitive elements of the divider circuit. Do not assume that because the meter has returned to zero that there is no charge present.

Changing the Battery

If the Power Switch on the Meter Display is turned on and the Meter Display does not activate or displays a low battery indication, the battery needs to be replaced. To replace the battery, complete the following steps:

- 1 Turn the Power Switch to the OFF position.**
- 2 Remove the four screws located on the front corners of the meter's front panel and remove the front panel.**
- 3 Remove the screw on the battery box, open the battery box cover, and replace the 9V battery.**
- 4 After replacing the battery reassemble the meter and tighten all screws before using the divider to perform any tests.**

Troubleshooting Guide

Problem	Solution
No display on Power Up	Replace the battery
Test results are erratic or fluctuate	Check the ground/ground connections. Check cables for damage.
There is a significant sound of electrical discharge.	Check to see if the divider is damp. Ensure that it is clean and dry