User Manual
ENGLISH

AEMC® INSTRUMENTS
CHAUVIN ARNOUX GROUP

DC/AC MicroProbe
Models K100 & K110

CURRENT PROBES

Measure Up
WITH AEMC INSTRUMENTS®

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
15 Faraday Drive • Dover, NH 03820 USA
Phone: (603) 749-6434 or (800) 343-1391 • Fax: (603) 742-2346

Statement of Compliance

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments certifies that this instrument has been calibrated using standards and instruments traceable to international standards.

We guarantee that at the time of shipping your instrument has met the instrument's published specifications.

An NIST traceable certificate may be requested at the time of purchase, or obtained by returning the instrument to our repair and calibration facility, for a nominal charge.

The recommended calibration interval for this instrument is 12 months and begins on the date of receipt by the customer. For recalibration, please use our calibration services. Refer to our repair and calibration section at www.aemc.com/calibration.

Serial #: _____

Catalog #: **1200.67 / 2111.73**

Model #: **K100 / K110**

Please fill in the appropriate date as indicated:

Date Received: _____

Date Calibration Due: _____

AEMC® INSTRUMENTS
CHAUVIN ARNOUX GROUP

Chauvin Arnoux®, Inc.
d.b.a AEMC® Instruments
www.aemc.com

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1. INTRODUCTION

Thank you for purchasing an **AEMC® Instruments DC/AC MicroProbe Model K100 or Model K110.**

For the best results from your instrument and for your safety, you must read the enclosed operating instructions carefully and comply with the precautions for use. Only qualified and trained operators should use this product.

1.1 INTERNATIONAL ELECTRICAL SYMBOLS

	Signifies that the instrument is protected by double or reinforced insulation.
	**CAUTION - Risk of Danger!** Indicates a **WARNING**. Whenever this symbol is present, the operator must refer to the user manual before operation.
	Application or withdrawal authorized on conductors carrying dangerous voltages. Type A current sensor as per IEC 61010-2-032.
	Indicates a risk of electric shock. The voltage at the parts marked with this symbol may be dangerous.
	Indicates Important information to acknowledge
	This product complies with the Low Voltage & Electromagnetic Compatibility European directives (73/23/CEE & 89/336/CEE).

1.2 DEFINITION OF MEASUREMENT CATEGORIES (CAT)

CAT IV: Corresponds to measurements performed at primary electrical supply (< 1000 V).
Example: primary overcurrent protection devices, ripple control units, and meters.

CAT III: Corresponds to measurements performed in the building installation at the distribution level.
Example: hardwired equipment in fixed installation and circuit breakers.

CAT II: Corresponds to measurements performed on circuits directly connected to the electrical distribution system.
Example: measurements on household appliances and portable tools.

1.3 PRECAUTIONS FOR USE

These safety warnings are provided to ensure the safety of personnel and proper operation of the instrument.

- Read the instruction manual completely and follow all the safety information before attempting to use or service this instrument.
- Use caution on any circuit: Potentially high voltages and currents may be present and may pose a shock hazard.
- Read the Safety Specifications section prior to using the Model K100/K110. Never exceed the maximum voltage ratings given.
- Safety is the responsibility of the operator.
- NEVER open the back of the instrument while connected to any circuit or input.
- ALWAYS connect the Model K100/K110 adapter to the display device before clamping the probe onto the sample under test.
- ALWAYS inspect the instrument, probe, probe cable and output terminals prior to use. Replace any defective parts immediately.
- NEVER use the Model K100/K110 on electrical conductors rated above 300 V CAT II, EN61010-1.

1.4 RECEIVING YOUR SHIPMENT

Upon receiving your shipment, make sure that the contents are consistent with the packing list. Notify your distributor of any missing items. If the equipment appears to be damaged, file a claim immediately with the carrier and notify your distributor at once, giving a detailed description of any damage.

1.5 ORDERING INFORMATION

DC/AC MicroProbe Model K100 ..... **Cat. #1200.67**

DC/AC MicroProbe Model K110 ..... **Cat. #2111.73**

Both models include an electronic plug-in module with an attached current probe, 9 V battery, and user manual.

Order Accessories and Replacement Parts Directly Online
Check our Storefront at www.aemc.com/store for availability

2. PRODUCT FEATURES

2.1 DESCRIPTION

Model K100 and Model K110 are low current measurement instruments that feature a compact, high sensitivity current probe. Unlike other instruments, the Model K100 exhibits a wide dynamic operating range, which extends from below 100 µA to ± 4 A peak, from DC to 2.0 kHz*, without the need for ranging. The K110 has an operating range of 100 µA to ± 400 mA peak, from DC to 1500 Hz.*

Models K100 and K110 are designed to be operated in conjunction with a digital multimeter, oscilloscope or recording device. The MicroProbe outputs the current measured in the form of a voltage that is the image of the current, in shape and amplitude. The Model K100 outputs 1 mV per mA of measured current. The Model K110 outputs 10 mV per mA of measured current. To take advantage of the Model K100 high sensitivity, best results are obtained through 4-1/2 digit (or more) DMM with a relative zero function. The Model K110 was designed to provide the operator with enhanced low current linearity and accuracy, but is limited to 450 mA Peak current.

The Model K100/K110 always outputs a signal proportional to the total current (AC+DC) in the conductor under test. This has proven to be the most versatile signal output format, and allows the user to isolate and measure DC and AC components of measured current separately, if so desired. Typical applications include (4 to 20) mA loop measurements, automotive current applications, benchtop electronic current consumption in circuits, and other applications requiring very low current measurements in crowded areas.

** See Electrical Specifications*

2.2 MODEL K100 FEATURES

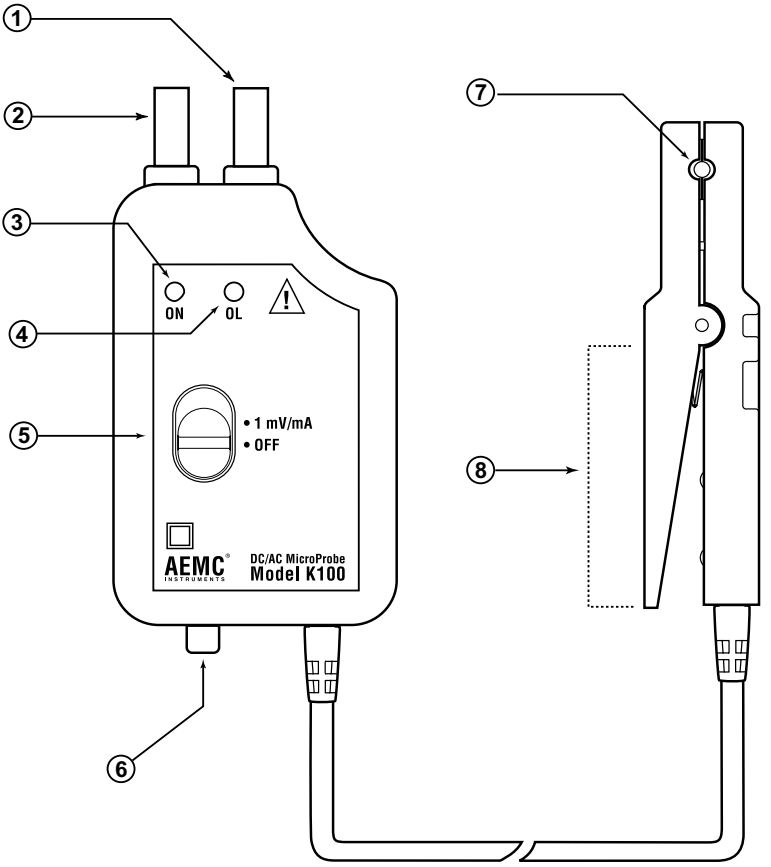

Figure 1

1. Positive: Red banana plug (+)
2. Negative: Black banana plug (-)
3. Power ON indicator (green LED)
4. OVERLOAD indicator (red LED)
5. Power switch
6. Zero adjust knob (push in and turn to zero)
7. Probe window aperture
8. Probe handle

2.3 MODEL K110 FEATURES

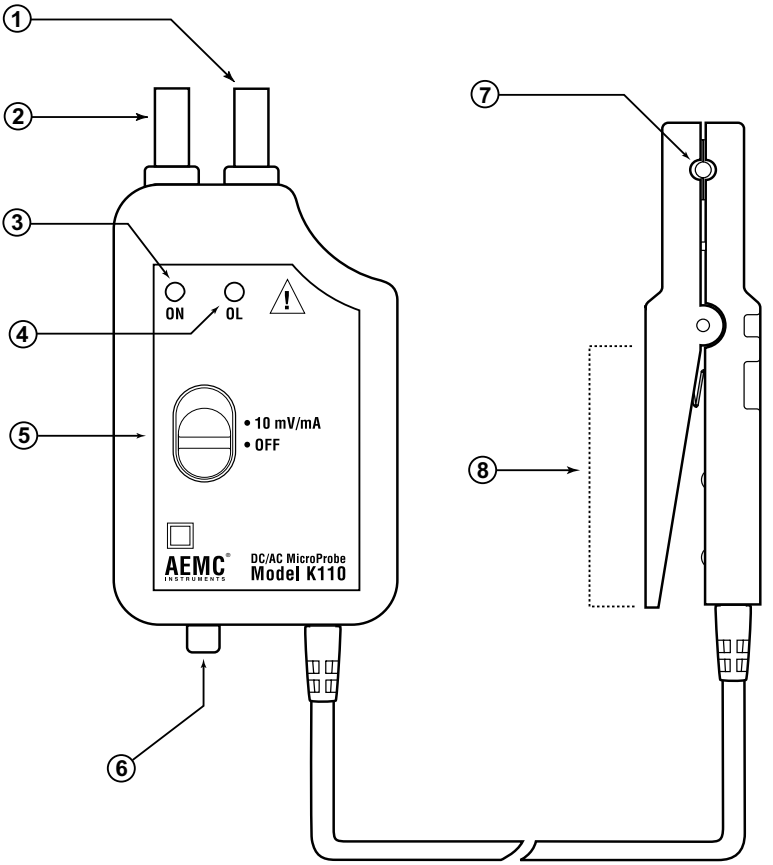

Figure 2

1. Positive: Red banana plug (+)
2. Negative: Black banana plug (-)
3. Power ON indicator (green LED)
4. OVERLOAD indicator (red LED)
5. Power switch
6. Zero adjust knob (push in and turn to zero)
7. Probe window aperture
8. Probe handle

3. SPECIFICATIONS

3.1 ELECTRICAL SPECIFICATIONS

MODEL K100

Current Range:
0 to ± 4 A
(0 to 3) ARMS (sinusoidal)

Output (Vout): 1 mV/mA

Resolution:
Before 04/01/24
DC: 50 µA typical
AC: 100 µA typical
After 04/01/24
DC: 100 µA typical
AC: 200 µA typical

Accuracy:
Before 04/01/24
DC: 1 % Reading ± 200 µA
AC: 2 % Reading ± 200 µA
After 04/01/24
DC: 1 mA to 2 A: 1 % Reading ± 300 µA
(2 to 4) A: 2 % Reading ± 500 µA
AC: 2 % Reading ± 500 µA

Output Noise:
<100 µV, DC to 3 kHz

Frequency Response:
DC to 2 kHz (@ -3 dB sine)

Zero Adjust:
± 25 mA

MODEL K110

Current Range:
0 to ± 400 mA
(0 to 300) mARMS

Output (Vout): 10 mV/mA

Resolution:
Before 04/01/24
DC: 50 µA typical
AC: 100 µA typical
After 04/01/24
DC: 50 µA typical
AC: 150 µA typical

Accuracy:
Before 04/01/24
DC: (1 to 450) mA: 0.5 % Reading ± 150 µA
AC: 0.8 % Reading ± 200 µA
After 04/01/24
DC: (1 to 200) mA: 0.5 % Reading ± 150 µA
(200 to 400) mA: 1.5 % Reading ± 200 µA
AC: 1 % Reading ± 300 µA

Output Noise:
<100 µV, DC to 3 kHz

Frequency Response:
DC to 1.2 kHz (@ -3 dB sine)

Zero Adjust:
± 25 mA

Rise Time: <200 µS, (10 to 90) % Vout

Fall Time: <200 µS, (90 to 10) % Vout

Output Impedance: 200 Ω

Probe Inductance: < 1 µH

Influence of Adjacent Conductor: <50 µA/A (K100); <1 00 µA/A (K110)

Influence of Earth's Field: <120 µA, null to maximum

Overload LED (Red): Indicates momentary or continuous overload

Power LED (Green): Indicates power ON and good battery
LED (Green) ON between (6.5 to 10) V

Power Source: 9 V alkaline, NEDA 1604, 6LR61 or IEC 6LF22
Battery life 20 h approx. with alkaline battery

(Reference Conditions: 23 °C ± 3 °, (20 to 75) % RH; battery voltage 9 V ± 0.1 V; earth's magnetic field <40 A/m; absence of AC fields; input impedance of display device ≥1 MΩ/100 pF; DC or sinusoidal AC current (45 to 65) Hz.

3.2 ENVIRONMENTAL SPECIFICATIONS

Operating Temperature: (-14 to 131) °F (-10 to 55) °C

Storage Temperature: (-40 to 176) °F (-40 to 80) °C

Humidity: <95 % @ ≤35 °C, 75 % @ 55 °C

3.3 MECHANICAL SPECIFICATIONS

Dimensions (Probe): (4.4 x 0.6 x 1.0) in (111 x 15 x 25) mm

Dimensions (Electronic Module): (4.9 x 2.5 x 1.1) in (124 x 64 x 28) mm

Weight: 9 oz (250 g)

Connectors: (2) 4 mm banana plugs; standard 3/4 in (19 mm) spacing

Maximum Conductor Diameter: 3/16 in, 0.180 in (4.5 mm)

Cable Length: 5 ft (1.5 m)

3.4 SAFETY SPECIFICATIONS

Working Voltage:

EN61010-1, 300 V CAT II

CE mark for Electromagnetic Compatibility.

Immunity (EN 50082.1), IEC 1000-4-3 aptitude criteria A:

DC: 15 mV @ 0, AC (60 Hz): 2 dB from 10 mA to 4.5 A

Emmissivity (EN 50081.1): negligible

Drop Test: 1 m per IEC 1010

Shocks: 100 G per IEC 68-2-27

Vibrations: IEC 529

Protection Index: IP 40 per IEC 529

Electromagnetic Compatibility: EN 50082-1 class A EN 50081-1

**All specifications are subject to change without notice.*

3.5 TYPICAL FREQUENCY RESPONSE

Model K100

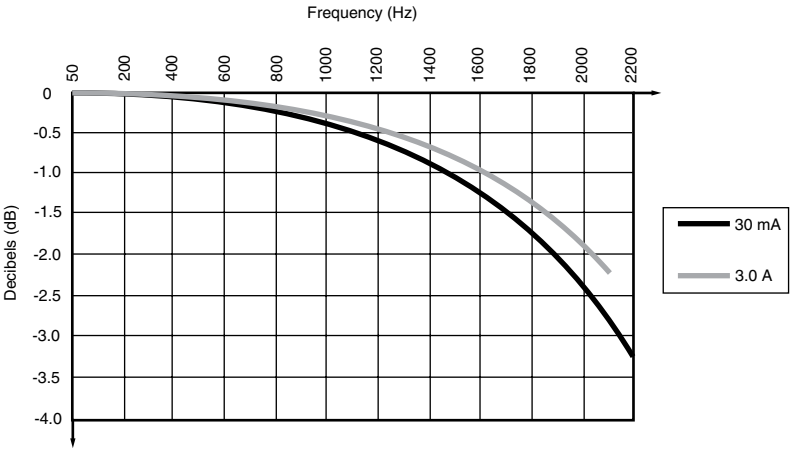

Figure 3

Model K110

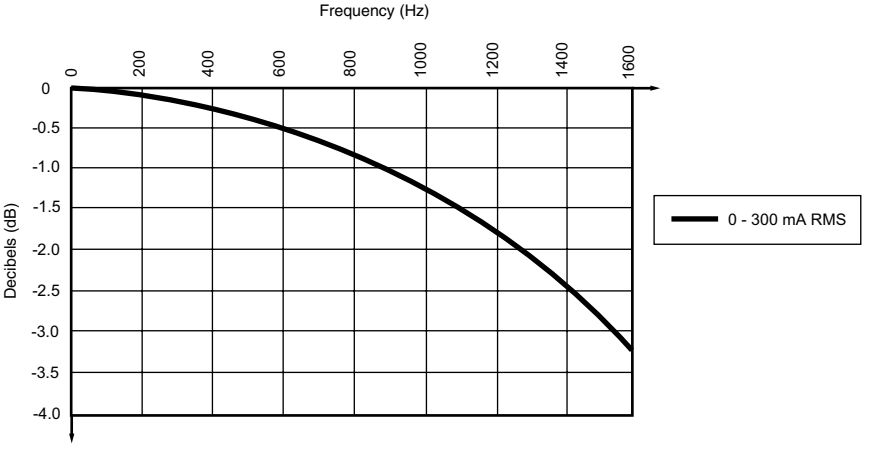

Figure 4

4. OPERATION

4.1 MAKING MEASUREMENTS WITH THE K100/K110

- Remove any conductor from within the probe jaws.
- Plug the electronic module into the displaying device (e.g., DMM, oscilloscope). Note the polarity of the module output banana plugs (red = positive [+], black = negative [-]).
- Select the appropriate range on displaying device (e.g., DMM, oscilloscope). Note that the module output is 1 mV/mA for Model K100 and 10 mV/A for Model K110.
- Turn displaying device power ON. Turn on the Model K100/K110 (the green LED should be ON, and the red LED OFF).
- With the probe disconnected from test samples (no conductor in probe jaw window), adjust the zero control (push in the knob and turn) to read zero volts on the displaying device. In the unlikely event where the zero point is unobtainable, refer to Residual Readings Following Severe Overloads (§ 4.6) - the Model K100/K110 probe may be temporarily magnetized.
- Clamp the probe around the conductor to be tested. The displaying device should now display the measured conductor current. In DC, a positive reading indicates current flowing in the direction of the arrow on the probe. A negative reading indicates current flow in the opposite direction of the arrow.

4.2 INDICATOR LIGHTS - GREEN AND RED LEDS

- The Green LED indicates that the Model K100/K110 is ON and that the battery is good. The Green LED will not light under low battery conditions. Replace the 9 V battery if the green LED is not lit.
- The Red LED indicates a momentary or continuous overload of the instrument. Readings taken while the Red LED is ON or FLASHING should be considered inaccurate. Momentary or continuous currents exceeding ± 4.7 A for Model K100 and 470 mA for Model K110, and dynamic currents with large step discontinuities will cause the red LED to turn ON.

4.3 MODEL K100 OPERATION EXAMPLES

4.3.1 DC Current Measurement Example (K100)

- Conductor carrying 20.0 mADC in the direction of the arrow
- Voltmeter placed in DC Volts mode
- Voltmeter displays 20.0 mV

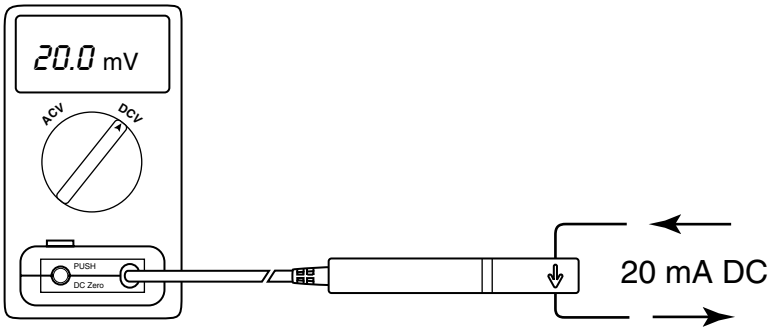

Figure 5

4.3.2 DC Current Measurement Example - Current Reversed (K100)

- Conductor carrying 20.0 mADC in opposite direction of arrow
- Voltmeter placed in DC Volts mode
- Voltmeter displays -20.0 mV

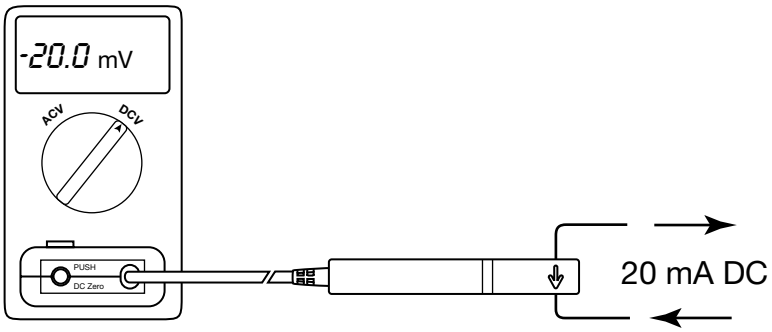

Figure 6

4.3.3 Two-Wire Sum-of-Currents Example (K100)

- Two conductors in probe aperture (note orientations)
- Voltmeter placed in DC Volts mode
- Voltmeter displays 18.0 mV

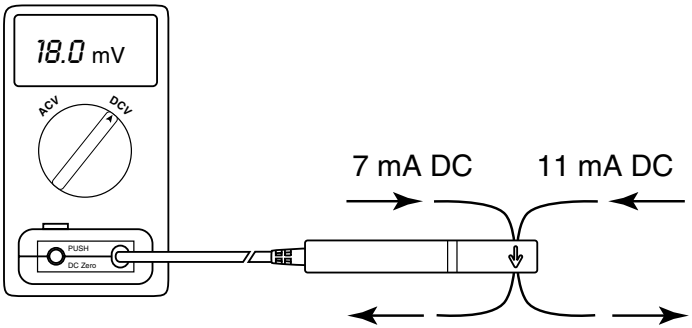

Figure 7

4.3.4 Two-Wire Current Differential Example (K100)

- Two conductors in probe aperture (note orientations)
- Voltmeter placed in DC Volts mode
- Voltmeter displays -4.0 mV

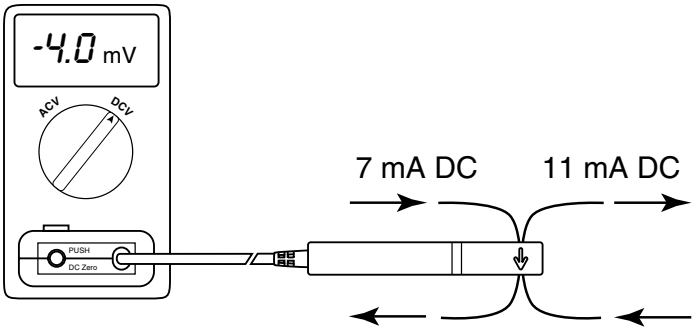

Figure 8

4.3.5 Oscilloscope Measurement Example (K100)

- Conductor carrying a 2 A peak AC waveform
- Model K100 connected to oscilloscope

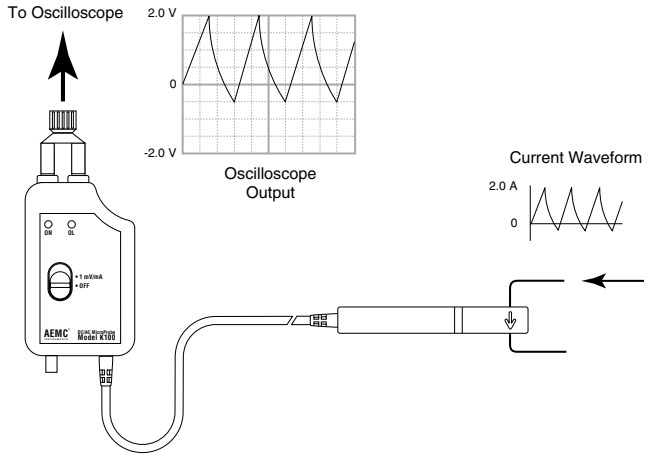

Figure 9

4.3.6 Maximum Step Discontinuity Example (K100)

- Conductor carrying non-sinusoidal AC
- Model K100 connected to oscilloscope
- Maximum allowable step-discontinuity 2 A

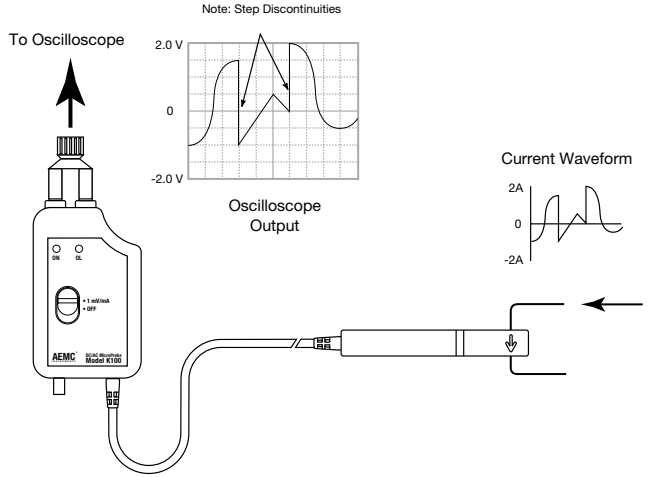

Figure 10

4.4 MODEL K110 OPERATION EXAMPLES

4.4.1 Measuring the DC Component of an (AC+DC) Waveform (K110)

- Conductor carrying 20.0 mA$_{DC}$ + 15.0 mA$_{AC}$
- Voltmeter placed in DC Volts mode
- Voltmeter displays 200.0 mV

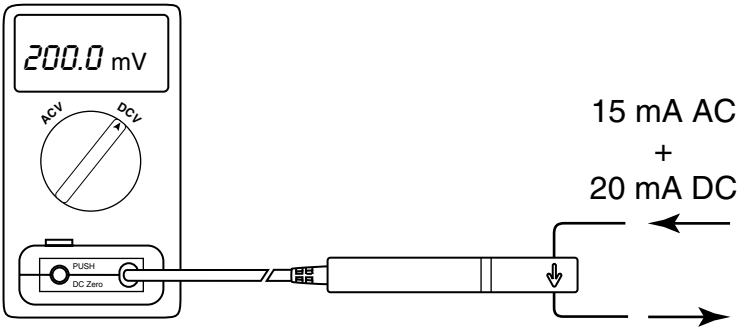

Figure 11

4.4.2 Measuring the AC Component of an (AC+DC) Waveform (K110)

- Conductor carrying 20.0 mA$_{DC}$ + 15.0 mA$_{AC}$
- Voltmeter placed in AC Volts mode
- Voltmeter displays 150.0 mV

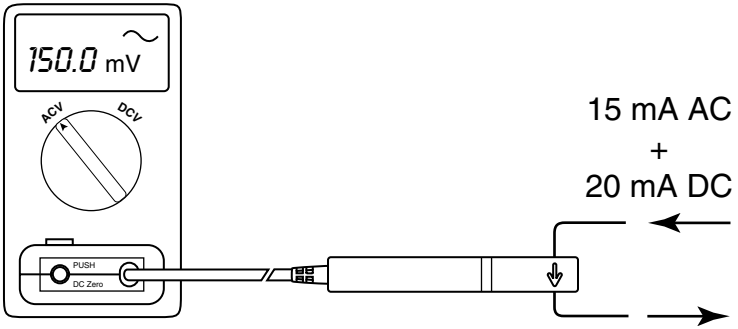

Figure 12

4.4.3 Oscilloscope Measurement Example (K110)

- Conductor carrying a 0.2 A peak AC waveform
- Model K110 connected to oscilloscope

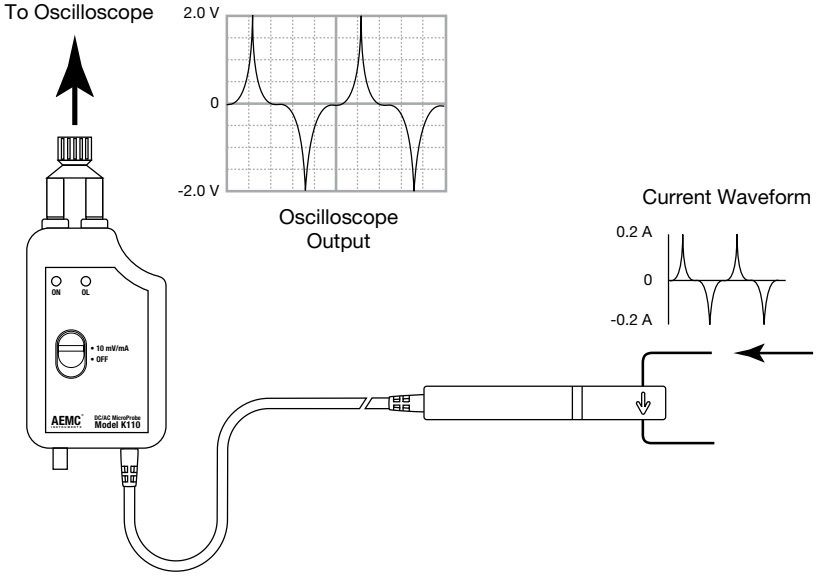

Figure 13

4.5 TIPS FOR MAKING PRECISE MEASUREMENTS

The Model K100/K110 is capable of making measurements of DC and low frequency currents over a wide range. Here are some key considerations for getting the most accuracy from your displaying instrument:

- When using the Model K100/K110 with a meter, it is important to select the range that provides the best resolution. Failure to do this may result in measurement errors. The examples shown on the next page use an ordinary 3-1/2 digit DMM with the Models K100 and K110, to measure 16.7 mADC.

Model K100

Resolution: 10mV
Display Error: 19.8%

Resolution: 1mV
Display Error: 1.8%

Resolution: 100µV
Display Error: 0%

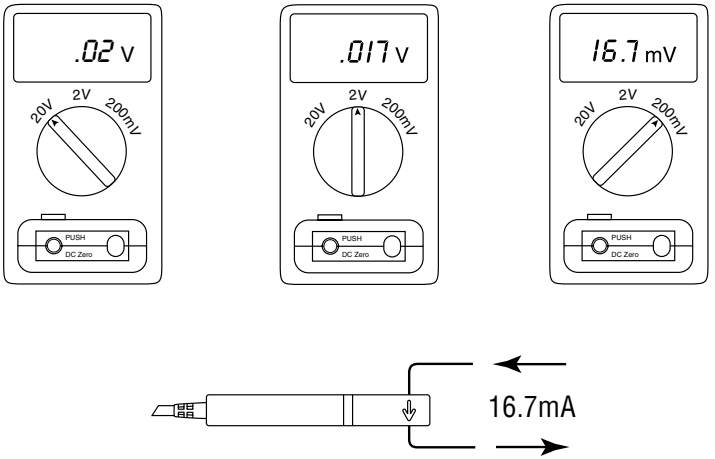

Figure 14

Model K110

Resolution: 10mV
Display Error: 1.8%

Resolution: 1mV
Display Error: 0%

Resolution: 100µV
Display Error: 0%

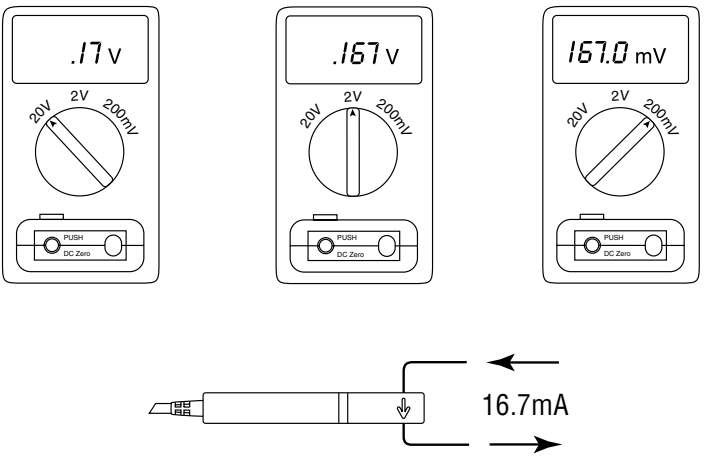

Figure 15

- Always zero the Model K100/K110 prior to making a measurement. See § 4.1 for procedure.
- Make sure that probe jaw mating surfaces are free of dust and contamination. Contaminants cause air gaps between sensor halves, making the Model K100/K110 susceptible to external magnetic fields which can contribute to measurement errors. See § 5.3 for cleaning procedure.
- Do not allow probe jaws to abruptly snap closed from the open state. This can lead to residual readings. If this happens, the Model K100/K110 will need to be rezeroed.
- Beware of short-circuit currents. Large in-rush currents (which can occur when power is first applied in a circuit) and large high-current transients may cause varying degrees of residual readings. If in doubt of a particular reading, remove the probe from the conductor under test and check to see that the display device returns zero. If not, it will be necessary to rezero the Model K100/K110.
- When using the Model K100/K110 to measure AC currents, keep in mind the maximum current ratings and the frequency response curves shown in the electrical specifications section. Dynamic currents that contain large step discontinuities and/or frequency constituents near or beyond the measurement passband are subject to measurements errors and waveform distortion (oscilloscope display). If the red LED comes on during measurement, the MicroProbe's output signal may be in error.

Many DVMs provide null (relative) measurement capability. A DVM placed in the null mode displays the difference between a stored null value and the input signal.

- You can use a DVM's null function in place of the external DC zero control to cancel any DC offset from the K100/K110. The DVM null function should be enabled with the probe removed from the conductor immediately before measurement.
- You can use a DVM's null function to display changes in measured current from a fixed (constant) level. In this application, the DVM null function is enabled with the probe connected to the conductor.

When making null (relative) measurements, the probe aperture current (not displayed current) must not exceed the maximum ratings set forth in the specifications section.

4.6 RESIDUAL READINGS FOLLOWING SEVERE OVERLOADS

Large short-circuit and transient currents outside the operating range of the Model K100/K110 may cause large residual readings. In extreme cases, the Model K100/K110 will not zero. If this happens:

- Remove the probe from the test conductor.
- Open the probe and release, allowing the jaws to snap back. Repeat this step several times.
- Rezero the instrument before making successive measurements.

5. MAINTENANCE

⚠ WARNING

Please make sure that you have already read and fully understand the Precautions for Use in Section 1.1

- To avoid electrical shock, do not attempt to perform any servicing unless you are qualified to do so.
- To avoid electrical shock and/or damage to the instrument, do not get water or other foreign agents into the case. Turn the Model K100/K110 OFF and disconnect the unit from all circuits before opening the case.

5.1 BATTERY INSTALLATION

Your Model K100/K110 has been shipped with a new 9 V battery installed. To replace the battery:

- Remove probe from any conductor and place it away from any active conductors, circuitry, etc.
- Unplug electronic module from display device (e.g. DMM, oscilloscope).
- Remove the screws from the bottom cover of the electronic module.
- Replace battery with a new 9 V alkaline type.
- Replace bottom cover and re-attach with screws.

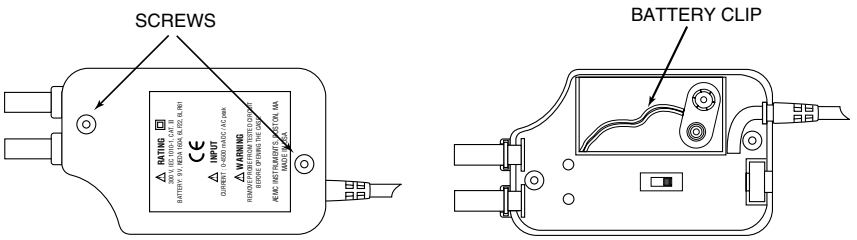

Figure 16

5.2 CLEANING

To ensure optimum performance, it is important to keep the probe jaw mating surfaces clean at all times. Failure to do so may result in increased earth's field susceptibility and overall errors in readings. The following is the recommended procedure for cleaning the probe sensor:

1. Apply a few drops of isopropyl alcohol to an ordinary sheet of white photocopy paper.
2. Open probe to expose the mating surfaces of the sensor and insert the sheet of paper into the jaws. Allow the jaws to close.
3. With the jaws closed, pull free the end of the paper through the jaws until it releases.
4. Repeat step (3) several times, using a new (dry) section of paper each time.
5. Open probe and inspect mating surfaces. They should be free of dust particles or any other contamination. Otherwise, repeat the cleaning process starting again at Step (1).

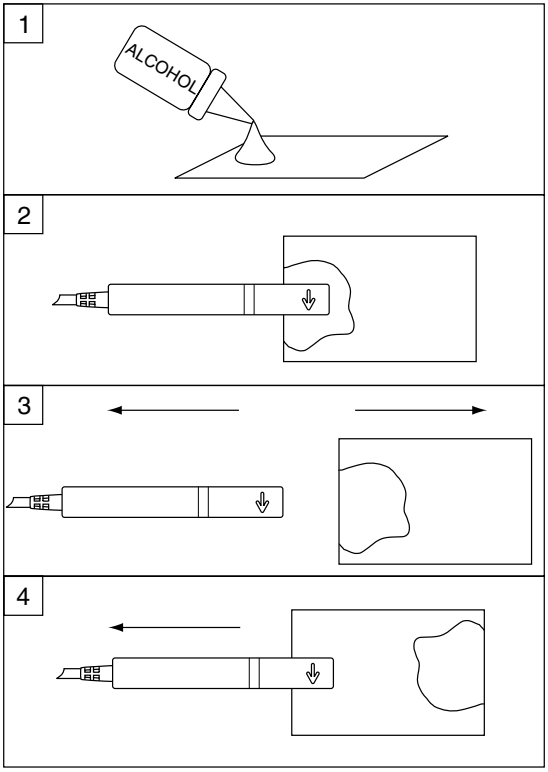

Figure 17

5.3 REPAIR AND CALIBRATION

To ensure that your instrument meets factory specifications, we recommend that it be sent back to our factory Service Center at one-year intervals for recalibration or as required by other standards or internal procedures.

For instrument repair and calibration:

You must contact our Service Center for a Customer Service Authorization Number (CSA#). Send an email to repair@aemc.com requesting a CSA#, you will be provided a CSA Form and other required paperwork along with the next steps to complete the request. Then return the instrument along with the signed CSA Form. This will ensure that when your instrument arrives, it will be tracked and processed promptly. Please write the CSA# on the outside of the shipping container. If the instrument is returned for calibration, we need to know if you want a standard calibration or a calibration traceable to N.I.S.T. (includes calibration certificate plus recorded calibration data).

Ship To: Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
15 Faraday Drive ▪ Dover, NH 03820 USA
Phone: (800) 945-2362 (Ext. 360) / (603) 749-6434 (Ext. 360)
Fax: (603) 742-2346
E-mail: repair@aemc.com

(Or contact your authorized distributor.)

Contact us for the costs for repair, standard calibration, and calibration traceable to N.I.S.T.

NOTE: You must obtain a CSA# before returning any instrument.

5.4 TECHNICAL ASSISTANCE

If you are experiencing any technical problems or require any assistance with the proper operation or application of your instrument, please call, e-mail or fax our technical support team:

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
Phone: (800) 343-1391 (Ext. 351)
Fax: (603) 742-2346
E-mail: techsupport@aemc.com
www.aemc.com

5.5 LIMITED WARRANTY

The instrument is warrantied to the owner for a period of two years from the date of original purchase against defects in manufacture. This limited warranty is given by AEMC® Instruments, not by the distributor from whom it was purchased. This warranty is void if the unit has been tampered with, abused, or if the defect is related to service not performed by AEMC® Instruments.

Full warranty coverage and product registration is available on our website at www.aemc.com/warranty.html.

Please print the online Warranty Coverage Information for your records.

What AEMC® Instruments will do:

If a malfunction occurs within the warranty period, you may return the instrument to us for repair, provided we have your warranty registration information on file or a proof of purchase. AEMC® Instruments will repair or replace the faulty material at our discretion.

REGISTER ONLINE AT: www.aemc.com/warranty.html

5.5.1 Warranty Repairs

What you must do to return an Instrument for Warranty Repair:

First, send an email to repair@aemc.com requesting a Customer Service Authorization Number (CSA#) from our Service Department. You will be provided a CSA Form and other required paperwork along with the next steps to complete the request. Then return the instrument along with the signed CSA Form. Please write the CSA# on the outside of the shipping container. Return the instrument, postage or shipment pre-paid to:

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments
15 Faraday Drive, Dover, NH 03820 USA
Phone: (800) 945-2362 (Ext. 360) / (603) 749-6434 (Ext. 360)
Fax: (603) 742-2346
E-mail: repair@aemc.com

Caution: To protect yourself against in-transit loss, we recommend that you insure your returned material.

NOTE: You must obtain a CSA# before returning any instrument.

NOTES:

CHAUVIN ARNOUX GROUP

AEMC® INSTRUMENTS
CHAUVIN ARNOUX GROUP

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AEMC® Instruments
15 Faraday Drive • Dover, NH 03820 USA
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