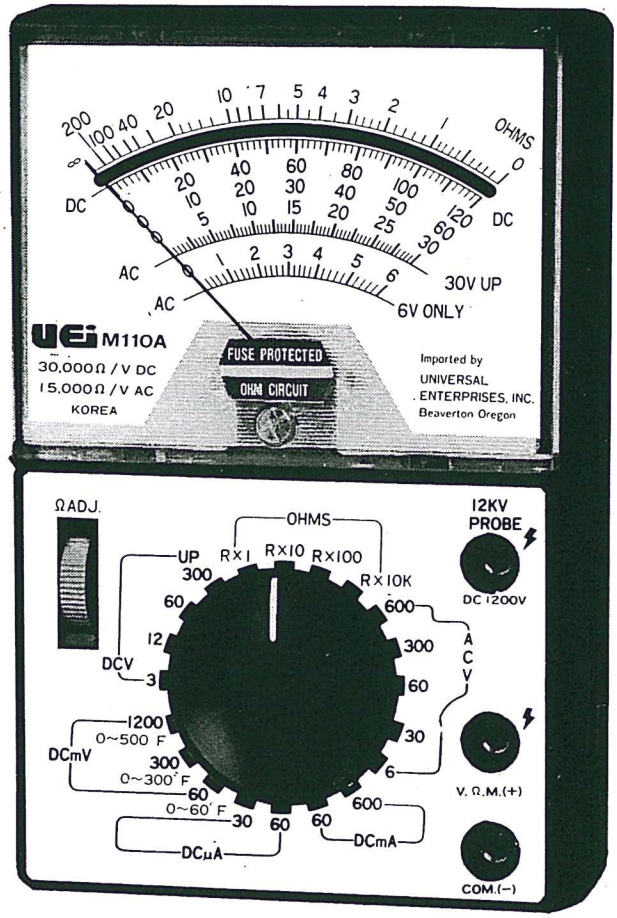
M110A OPERATING INSTRUCTIONS



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M110A

OPERATING INSTRUCTIONS

WARNING: OBSERVE ALL SAFETY PRECAUTIONS WHEN MEASURING HIGH VOLTAGES. TURN OFF POWER TO THE CIRCUIT UNDER TEST, SET THE M110A CONTROLS, CONNECT THE TEST LEADS TO THE METER AND THEN TO THE CIRCUIT UNDER TEST. REAPPLY POWER.

The M110A is a precision electrical test instrument. Take this opportunity to read these instructions and familiarize yourself with the M110A, its features, and its operation.

FEATURES

- Three color coded scale plate and front panel
- Fused ohm circuit
- Twenty-one ranges
- Mirrored scale plate
- 19mm input jack spacing to accept TA1K temperature adapter

SPECIFICATIONS

Ranges:

DC MILLIVOLTS:	0-60, 300, 1200mV
DC VOLTS:	0-3, 12, 60, 300, 1200V (0-12,000V with optional probe)
DC MICROAMPS:	0-30, 60μ A
DC MILLIAMPS:	0-60, 600m A
OHMS:	0-200Ω, 2K, 20K, 2M
AC VOLTS:	0-6, 30, 60, 300, 600V
TEMPERATURE:	0-60, 300, 500°F

Accuracy:

DC:	±3% of full scale
OHMS:	±3% of scale length
AC:	±4% of full scale
TEMPERATURE:	±2 divisions

Input Impedance: 30KΩ/VDC, 15KΩ/VAC

Batteries: Two 1.5V, size AA (NEDA #15D) batteries
One 9 V (NEDA #1604) battery

Fuse:
6/10A (0.5 ohm internal resistance) 3AG series
NOTE: To maintain calibration accuracy and instrument protection, replacement fuse must be of the proper current and resistance value.

CONTROLS

SELECTOR SWITCH

The SELECTOR switch is used to select the circuit function and range. It is good practice to start with the highest range setting of the SELECTOR switch for a particular function if the magnitude of the function is unknown. Read the section on OPERATION for more detail.

Ω ADJ

The Ω ADJ control is used only on the OHMS function. The purpose of this control is to calibrate the M110A on the particular range selected (Rx1, Rx10, etc.)

MECHANICAL ZERO ADJUST

The MECHANICAL ZERO ADJUST is a plastic screw located on the meter face just beneath the green "FUSE PROTECTED OHM CIRCUIT" label. This adjustment is used to set the pointer to the zero index mark at the left side of the scale plate.

INPUT JACKS

COM (-): The black test lead is used to connect this jack to the negative, or common, side of the circuit under test.
VΩM (+): The red test lead is used to connect this jack to the positive side of the circuit under test.
DC1200V: This jack is used for the 0-1200VDC (0-12KVDC with optional probe) range of the M110A. The red (positive) test lead is connected to this jack.

OPERATION

WARNING: OBSERVE ALL SAFETY PRECAUTIONS WHEN MEASURING HIGHER VOLTAGES. TURN OFF POWER TO THE CIRCUIT UNDER TEST. SET THE M110A CONTROLS, CONNECT THE TEST LEADS TO THE METER AND THEN TO THE CIRCUIT UNDER TEST. REAPPLY POWER.
If the pointer does not move, make sure that the protective fuse is not open. Refer to the section on MAINTENANCE.

Color Coding

The meter scale plate and front panel are color coded. The DC Voltage and DC Current meter scale and SELECTOR switch positions are in BLACK. The OHMS meter scale and SELECTOR switch positions are in GREEN. The AC Voltage meter scales and SELECTOR switch positions are in RED.
To provide an uncrowded easy-to-read meter scale plate a single meter scale may be used for more than one position of the SELECTOR switch. For example, the meter scale numerals 0-30 are used for the following positions of the SELECTOR switch: 300DCV, 3DCV, 300DCmV, 0.03DCmA, 30ACV and 300ACV. If the SELECTOR switch range is 3, multiply the scale numerals by ten. If the SELECTOR switch range is 300, divide the scale numerals by ten.

Measuring DC Voltage

Set the SELECTOR switch to the appropriate range. Always start with the 300DCV position if unsure of the magnitude of voltage present. Connect the black test lead to the - COM jack and to the negative side of the circuit under test. Connect the red test lead to the + VΩM jack and to the positive side of the circuit under test. Read the voltage on the black meter scale corresponding to the SELECTOR switch setting. When measuring DC voltage on the 1200DCV range set the SELECTOR switch to the 300DCV position and connect the red test lead to the DC1200V jack. The black test lead is connected as before. Follow safety precautions in the front of this book when measuring higher voltages.

Measuring DC Current

Set the SELECTOR switch to the appropriate range. Always start with the 600DCmA position if unsure of the magnitude of current present. Note: 0.03DCmA=30DCμA and 0.06DCmA=60μA. When taking current measurements the meter must be connected in SERIES with the circuit, or circuit element, under test. Break the connection at the point at which current is to be measured. Place the M110A in series with the circuit by connecting the black test lead to the - COM jack and to the lower voltage side of the circuit. Connect the red test lead to the + VΩM jack and to the higher voltage side of the circuit. Read the current on the black meter scale corresponding to the SELECTOR switch setting.

Measuring Resistance

> REMOVE ALL POWER TO THE CIRCUIT UNDER TEST WHEN MAKING RESISTANCE MEASUREMENTS. IF ANY VOLTAGE IS PRESENT IN THE TEST CIRCUIT AN ERRONEOUS READING WILL RESULT AND THE 6/10A FUSE MAY OPEN.

PLEASE NOTE: When the M110A is set on the Rx1 Ohm range, the accuracy of the measurements can be degraded if there is dirt on the probe tips. If the measurements are questionable, clean the tips and input connections of the probes and the input jacks of the M110A.

Set the SELECTOR switch to the appropriate range. Connect one test lead to the - COM jack and the other test lead to the + VΩM jack. Touch the free ends of the test leads together. The pointer will swing to the right hand side of the scale. Adjust the Ω ADJ control until the pointer is set on the green numeral 0. NOTE: If this adjustment cannot be made refer to the MAINTENANCE section. Rezero the M110A each time the OHMS setting of the SELECTOR switch is changed. To make the resistance measurement, connect the free ends of the test leads across the element to be measured. The measured resistance value will be the green numeral indicated on the OHMS scale times the multiplier on the SELECTOR switch. For example, if the pointer is on the numeral 4, and the SELECTOR switch is set on Rx10, the resistance is 40 ohms (4Ωx10=40Ω).

Continuity tests are normally made to test a wire, or element, to see if it is unbroken. Because continuity tests involve low values of resistance, the SELECTOR switch should be set on the Rx1 position.

Testing Diodes/Transistors

A simple check of diode or transistor quality may be made with the M110A. Using the same test procedure as for measuring resistance, connect one test lead to one end of the diode and the other test lead to the other end of the diode. Note the resistance reading. Then reverse the test leads and again note the reading. If the two readings differ by a factor of ten then the diode, (or transistor junction) is probably good. If the readings are approximately the same then the diode is shorted. If a reading cannot be obtained in either direction, the diode is probably open. Transistor junction measurements should be taken between the base and emitter leads, or between the base and collector leads.

Measuring AC Voltage

Set the SELECTOR switch to the appropriate range. Always start with the 600ACV position if unsure of the magnitude of voltage present. Connect the test leads to the - COM jack and the + VΩM jack and to the circuit under test. Read the voltage on the red meter scale corresponding to the SELECTOR switch setting. Use the lower red scale marked 6V ONLY when the SELECTOR switch is set on 6ACV. For all other ACV measurements use the upper red scale marked 30V UP.

MAINTENANCE

Batteries

The purpose of the batteries is to supply power to the circuit under test while making resistance measurements. Eventually the batteries will age to the point where it will not be possible to zero the meter with the Ω ADJ control. When this happens the batteries should be replaced. The two 1.5V size AA batteries are used only on the Rx1, Rx10, and Rx100 setting of the SELECTOR switch and should be replaced as a pair. The 9 V battery affects only the Rx10K setting of the SELECTOR switch. It may not be necessary to replace it when replacing the two 1.5V batteries. Observe the proper battery polarity when replacing batteries. It is recommended that all batteries be removed if the M110A is not to be used for a long period of time. Remove the single screw in the rear of the case for access to the batteries.

Fuse

The 6/10A, 0.5 ohm, fuse is in series with the + VΩM input jack. If this fuse is open none of the circuit functions will work. When replacing the fuse be sure to replace it with a fuse of the same current rating and internal resistance. The use of a fuse with a different internal resistance may cause the accuracy of the OHMS scale to be off. Remove the single screw in the rear of the case for access to the fuse.

Mechanical Zero Adjust

The pointer is set to register 0 at the left hand edge of the scale when there is no input to the M110A and it is laying face up on a flat surface. If the pointer does not register 0, it may be reset to that position by carefully adjusting the plastic screw in the meter face, just below the green "FUSE PROTECTED OHMS CIRCUIT" label.

ACCESSORIES

	Stock No.
Battery: 1.5V, size AA	AB1
Battery: 9 V	AB9
Fuse:6/10A, 0.5Ω (pkg. of 3)	AF10
Test leads, (set)	ATL50
Test leads, rubber (set)	ATL25
Alligator clip adaptors, insulated (pr.)	AAC
High voltage probe (12KVDC)	A12K
Carrying Case	AC110
Temperature Adapter	TA1K

LIMITED THREE YEAR WARRANTY

This product is warranted to the purchaser against defects in material and workmanship for three year from the date of purchase.

What is covered: Repair parts and labor, or replacement at the company's option. Transportation charges to the purchaser.

What is not covered: Transportation charges to the company. Damages from abuse or improper maintenance, see operating instructions. Any other expense. Consequential damages, incidental damages, or incidental expenses, including damages to property. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

How to Obtain Warranty Performance:
Attach to the product your name, address, description of problem, phone number and proof of date of purchase.
Package and return to:

Service Center
UEi
5500 S.W. Arctic Drive
Beaverton, Oregon 97005

Implied Warranties: Any implied warranties, including implied warranties of merchantability and fitness for a particular purpose, are limited in duration to three year from date of purchase. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you. To the extent any provision of this warranty is prohibited by federal and state law and cannot be preempted, it shall not be applicable. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Quality, Price & Service

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Measuring/Testing Equipment
(Analog & Digital)

- **Watt Motors**
- **Transformers**
- **Relays**
- **Thermometers**
  (Bi-metal & Glass)
- **Remote Reading**
  Thermometers
  (Analog & Digital)

Caution

To eliminate possibility of injury to operator and damage to the instrument and equipment, the following procedure is recommended. Exercise care and caution on all ranges, particularly the voltage ranges, and follow all standard published safety rules. Misuse, abuse and carelessness cannot be prevented by any written word and is fully the operator's responsibility.

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