

Milliohm Meter

16502

Quick Start Guide

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Version 1.0
April 2010
P/N A11 000967

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Material Contents Declaration

Chroma provides material contents declaration for RoHS compliant products as below:

Part Name	Hazardous Substances					
	Lead	Mercury	Cadmium	Hexavalent Chromium	Polybrominated Biphenyls	Polybromodiphenyl Ethers
	Pb	Hg	Cd	Cr ⁶⁺	PBB	PBDE
PCBA	O	O	O	O	O	O
CHASSIS	O	O	O	O	O	O
ACCESSORY	O	O	O	O	O	O
PACKAGE	O	O	O	O	O	O

"O" indicates that the level of the specified chemical substance is less than the threshold level specified in the standards of SJ/T-11363-2006 and EU 2005/618/EC.

"x" indicates that the level of the specified chemical substance exceeds the threshold level specified in the standards of SJ/T-11363-2006 and EU 2005/618/EC.

Disposal

Do not dispose of electrical appliances as unsorted municipal waste, use separate collection facilities. Contact your local government for information regarding the collection systems available. If electrical appliances are disposed of in landfills or dumps, hazardous substances can leak into the groundwater and get into the food chain, damaging your health and well-being. When replacing old appliances with new one, the retailer is legally obligated to take back your old appliances for disposal at least for free of charge.



Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or specific WARNINGS given elsewhere in this manual will violate safety standards of design, manufacture, and intended use of the instrument. *Chroma* assumes no liability for the customer's failure to comply with these requirements.



BEFORE APPLYING POWER

Verify that the power is set to match the rated input of this power supply.



PROTECTIVE GROUNDING

Make sure to connect the protective grounding to prevent an electric shock before turning on the power.



NECESSITY OF PROTECTIVE GROUNDING

Never cut off the internal or external protective grounding wire, or disconnect the wiring of protective grounding terminal. Doing so will cause a potential shock hazard that may bring injury to a person.



FUSES

Only fuses with the required rated current, voltage, and specified type (normal blow, time delay, etc.) should be used. Do not use repaired fuses or short-circuited fuse holders. To do so could cause a shock or fire hazard.



DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes. The instrument should be used in an environment of good ventilation.



DO NOT REMOVE THE COVER OF THE INSTRUMENT

Operating personnel must not remove the cover of the instrument. Component replacement and internal adjustment can be done only by qualified service personnel.

Safety Symbols



DANGER – High voltage.



Explanation: To avoid injury, death of personnel, or damage to the instrument, the operator must refer to an explanation in the instruction manual.



High temperature: This symbol indicates the temperature is now higher than the acceptable range of human. Do not touch it to avoid any personal injury.



Protective grounding terminal: To protect against electrical shock in case of a fault. This symbol indicates that the terminal must be connected to ground before operation of equipment.



The **WARNING** sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in personal injury. Do not proceed beyond a **WARNING** sign until the indicated conditions are fully understood and met.



The **CAUTION** sign denotes a hazard. It may result in personal injury or death if not noticed timely. It calls attention to procedures, practices and conditions.



This indicates important information or tips for the procedures and applications, etc. The contents should be read carefully.

Table of Contents

1.	Preface	1
1.1	An Overview of Product	1
1.2	Summary of Specification	1
1.3	Checking before Use	2
2.	Specification (15°C ~ 35°C RH ≤ 75%).....	3
2.1	Measurement Function	3
2.2	Accuracy	3
2.3	Zero.....	4
2.4	Measurement Time	4
2.5	Temp. Measurement/Correction Spec.	5
2.6	Others	5
3.	Installation	6
3.1	Ambient Environment.....	6
3.2	Power Line Connection.....	7
3.3	Fuse	7
3.4	Power Regulation	7
3.5	DUT Connection	8
4.	Description of Panel	9
4.1	Front Panel	9
4.2	Rear Panel.....	11

1. Preface

1.1 An Overview of Product

The unit was designed to solve the problems of low labor efficiency and low product quality that have occurred since the electronics sector began to flourish.

The measuring functions included in this unit are versatile inductive components: DC resistance precision measuring of Cable, Connector, Relay contacts and conductor material which supply the perfect functions on the production line and in quality control.

By using auto mode of the internal control and measuring function of programmable mode, the unit can support highly accurate, convenient, fast and reliable testing at low cost. The functions are as following: Hi or Lo-limit comparison and binning test, testing signal mode selection, data store memory, GPIB interface control 16502 and data transfer, and statistics analysis function from PC. The unit can send the test results to an external unit for checking the response of the component by handler interface.

The multi-functions testing device, ergonomics keyboard design, guided panel operation, extra-large LCD, and password protection makes the 16502 easy to operate and the test results are clearly showed on the display.

The basic accuracy is 0.05%. The measurement device (optional) can perform the calibration by keying-in the measuring parameter. The calibration procedure can be finished easily for users by offering ZERO.

1.2 Summary of Specification

- **Measurement Parameter:** R_x
- **Basic Accuracy:** Basic 0.05%
- **Measurement Range:** R_x -- 0.001m Ω ~ 2.0000M Ω
- **Measurement Current:** Fixed current 1A(MAX: range = 20m Ω)
- **Zeroing Calibration:** ZEROING

- **Interfaces:** GPIB interface, RS-232

1.3 Checking before Use

Upon receipt of this instrument, please check the items as the following and save all packing materials in case that the instrument has to be returned.

- (1) Any damages or scratches on the surface of the product.
- (2) Listed in tables 1-1 and 1-2 are accessories for this instrument.

If damage is found, please file claim with carrier immediately. Do not return the instrument to Chroma without prior approval.

Item	Part No.	Q'ty	Remark
Power Cord	W12 010170	1	Power cord for 1m length
Adaptor	N31 000039	1	For changing power plug from 3P to 2P
Power fuse slow 1A	A21 016600	2	For AC 110V used
Power fuse slow 500mA	A21 003000	2	For AC 220V used
Quick Start Guide	A11 000967	1	English
Test cable (4-Terminal)	9 16502201	1	MODEL A165022

Table 1-1 Standard Accessory

Item	Part No.	Q'ty	Remark
A165013 GPIB, Handler & temperature compensation card for 16502	9 16501399	1	With GPIB, Handler & temperature measurement functions
A165014 temperature compensation card for 16502	9 16501499	1	Temperature measurement function only
A165015 Temperature Probe	9 16501599	1	PT100 is used with temperature measurement
A110235 GPIB & Handler Card	9 11023599	1	GPIB & Handler function

Table 1-1 Optional Accessory

Note ■ Only the part number is required for obtainment of the missing or purchase of a new one.



For more detail information, please see the User's Manual in the CD attached to the shipment.

2. Specification (15°C~35°C RH ≤ 75%)

2.1 Measurement Function

Parameter: R_x

Range: Auto, Manual

Trigger mode: Internal, Manual and External (GPIB, Handler Interface)

Measuring terminals: 4-terminal testing

Measuring speed: FAST, MEDIUM, SLOW

2.2 Accuracy

- Within 1 year of factory calibration.
- Temperature: $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$
- Relative humidity: <90% RH
- Warm up: 30 minutes minimum
- Zero calibration under above conditions.

Mode		Dry Circuit = OFF				Dry Circuit = ON		
		Speed			Limit Current	Speed		
Range	Resistance	Slow	Medium	Fast			Slow	Medium
2 MΩ	2 MΩ	A=0.30	A=0.45	A=1.00	1uA	-	-	-
	200 kΩ	B=0.01	B=0.02	B=0.03	typical			
200 kΩ	200 kΩ	A=0.20	A=0.30	A=0.40	10uA	-	-	-
	20 kΩ	B=0.01	B=0.02	B=0.03	typical			
20 kΩ	20 kΩ	A=0.10	A=0.15	A=0.20	100uA	-	-	-
	2 kΩ	B=0.01	B=0.02	B=0.03	typical			
2 kΩ	2 kΩ	A=0.05	A=0.10	A=0.15	1mA	-	-	-
	200 Ω	B=0.01	B=0.02	B=0.03	typical			
200 Ω	200 Ω	A=0.05	A=0.10	A=0.15	1mA	-	-	-
	20 Ω	B=0.02	B=0.04	B=0.06	typical			
20 Ω	20 Ω	A=0.05	A=0.10	A=0.15	1mA	A=0.35	A=0.50	A=0.70
	2 Ω	B=0.03	B=0.05	B=0.08	typical	B=0.20	B=0.20	B=0.20
2 Ω	2 Ω	A=0.05	A=0.10	A=0.15	10mA	A=0.35	A=0.50	A=0.70
	200 mΩ	B=0.03	B=0.05	B=0.08	typical	B=0.20	B=0.20	B=0.20
200 mΩ	200 mΩ	A=0.05	A=0.10	A=0.15	100mA	A=2.50	A=3.00	A=4.00
	20 mΩ	B=0.03	B=0.05	B=0.08	typical	B=0.50	B=0.50	B=0.50
20 mΩ	20 mΩ	A=0.10	A=0.15	A=0.20	1A	-	-	-
	10 mΩ	B=0.03	B=0.05	B=0.08	typical			

Accuracy = ±(A % of Reading + B % of Full Range)

2.3 Zero

Zeroing: Eliminate measurement errors due to short residual impedances of the test fixture.

2.4 Measurement Time

Begin from measuring, analog sampling, calculation to binning or compare signal output measurement time. Please refer to the Table 2-1.

Item	Fast	Medium	Slow
Measurement time	65 mS	150mS	650 mS

Table 2-1 Measurement Time

2.5 Temp. Measurement/Correction Spec.

Measurement Range	Measurement Accuracy (PT100 temperature probe excluded)	Correction Accuracy (resistance measurement accuracy need to be added)
-10.0 °C ~ 39.9°C (-14.0 ~ 103.8°F)	±0.3% of the reading ±0.5°C (0.9°F)	±0.3%
40.0 ~ 99.9°C (104 ~ 211.8°F)	±0.3% of the reading ±1.0°C (1.8°F)	±0.6%

- Note**
1. Temperature measurement function needs to cooperate with optional function interface and probe for operating.
 2. It is necessary to plus the tolerance of probe as temperature measuring (the type of PT100 temperature probe is $\pm 0.5^{\circ}\text{C}$).

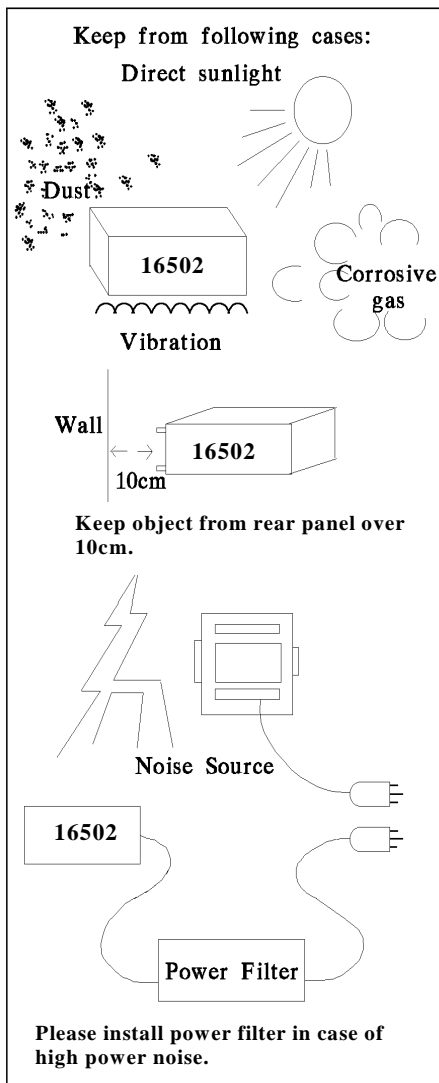
2.6 Others

- **Power:** (1) 90V ~ 125V AC 50Hz/60Hz. Power consumption is 80VA.
(2) 190V ~ 250V AC 50Hz/60Hz. Power consumption is 80VA.
- **Environment:** Operating -- 10°C to 40°C, 10 to 90% relative humidity
Storage -- 0°C to 50°C, 10 to 90% relative humidity
- **Dimension:** 320(W) x 115(H) x 350(D) (Foot pad and terminals are not included)
- **Weight:** Approximately 5.5 Kg

3. Installation

3.1 Ambient Environment

- (1) Do not use the meter in a dusty or vibrating location. Do not expose it to sunlight or corrosive gas. Please be sure that the ambient temperature is $0 \sim 40^{\circ}\text{C}$ and that the relative humidity is below 90%.
- (2) The rear panel of the meter is equipped with a cooling fan to keep internal temperature rising, so adequate ventilation should be ensured. The meter should be located at least 10cm from any object or wall behind it. Do not block the left and right ventilation holes to keep the meter in good precision.
- (3) The meter has been carefully designed to reduce the noise from AC power source. However, it should be used in a noise environment as low as possible. If noise is inevitable, please install a power filter.
- (4) The meter should be stored within the temperature range $0^{\circ}\text{C} \sim 50^{\circ}\text{C}$. If the unit is not to be in use for a long time, please store it in the original or similar package and keep it from direct sunlight and humidity for ensure good condition in later use.



3.2 Power Line Connection

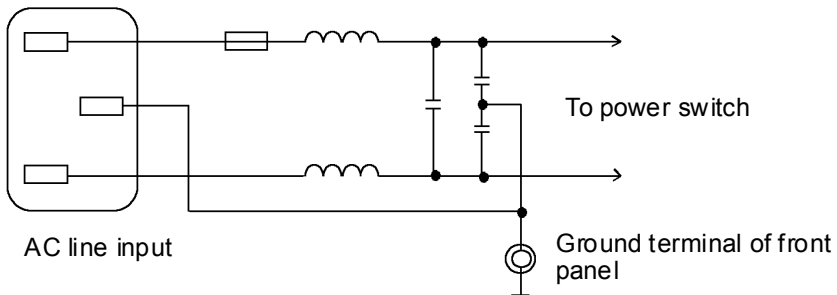
Before plugging in the power cord, please make sure the power switch is off and the voltage selector on the rear panel meets the required voltage. Please use the power supply frequency of 50 Hz or 60Hz.

3.3 Fuse

There is one fuse installed on the rear panel. When replacing the fuse, please turn off the power and pull the plug from the power supply.

Fuse spec. AC 100V ~ 120V → T1.0A 250V
AC 220V ~ 240V → T0.5A 250V

For reasons of safety and noise reduction, it is necessary to use three-wire line for connecting AC line input of rear panel, and connects GROUND terminal of front panel to earth. Illustration is as following:



3.4 Power Regulation

As this instrument is a precision electronic test device, so the accuracy is possible to be influenced seriously by input power unstable after testing. There is $\pm 10\%$ changeable power even in the laboratory, so we suggest that use the regulator in power and test devices is the only one way to avoid the reasons that caused by power unstable.

3.5 DUT Connection

For connecting the 16502 Milliohm Meter to D.U.T can through banana plugs which marked DRIVE (+), DRIVE (-), SENSE (+) and SENSE (-), thus needs external test device usually.

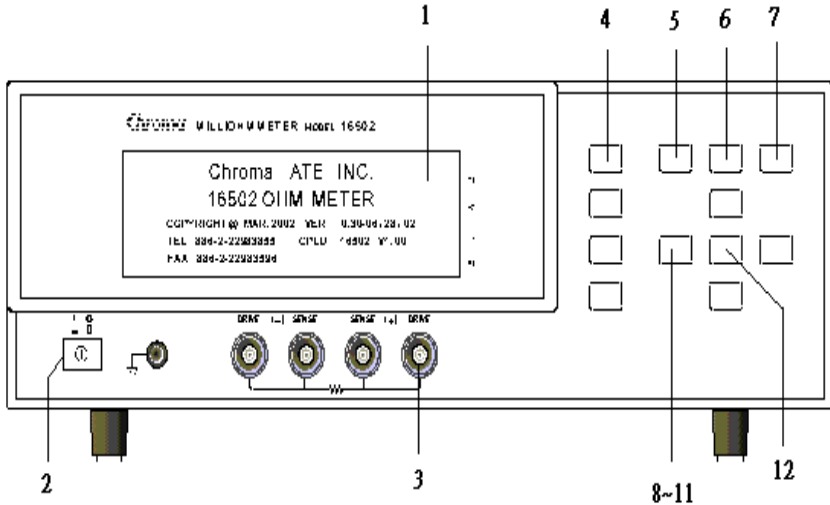


Notice

- DRIVE (-) and SENSE (-) connect to DUT should be at the same terminal, DRIVE (+) and SENSE (+) connect to another terminal.

4. Description of Panel

4.1 Front Panel



(1) LCD Display

The resolution of this instrument display is 240 x 64 dot-matrix LCD display, so all the measuring and setting values can be shown clearly.

(2) Power Switch

On-off switch

(3) Unknown DUT Sockets

Four individual BNC sockets connect an external test device or wire for unknown testing.

DRIVE(+): Current drive terminal, high potential terminal

SENSE(+): Potential detect terminal, high potential terminal

SENSE(-): Potential detect terminal, low potential terminal

DRIVE(-): Current drive terminal, low potential terminal



Notice

When the polarity component is under test, "high potential terminal" connects to (+) and "low potential terminal" connects to (-) which are marked on front panel.

⚠ WARNING : To avoid damaging the instrument, please discharge before measuring the polarity components.

(4) Function Keys

There are four function keys, the major function of these keys are to show different conditions of each key or other options which may need to be selected depending on the user's requirements.

(5) MEAS DISPLAY Key

Upon pressing this key, the instrument is under component basic measurement analysis mode. Under this screen, each test parameter can be changed directly and the value can be read. For example, test mode, test speed and ZERO etc.

Note : If users want to reserve test mode setting parameter after powered-off. The user can press System Setup Key on front panel under test screen as well as press Meas Display Key then returns to test screen. After the above steps are completed, please turn off the unit.

(6) MAIN INDEX Key

Pressing this key allows entry to the main index screen. In this screen you may select what you want to test, DUT test result binning and compare function.

(7) SYSTEM SETUP Key

Pressing this key gives access to the main system parameters setup, allowing each system parameter to be changed directly, e.g., the calibration of this instrument, memory management, selection and setting of each system and measurement parameter. (The functions of calibration and memory-management require a password for entry).

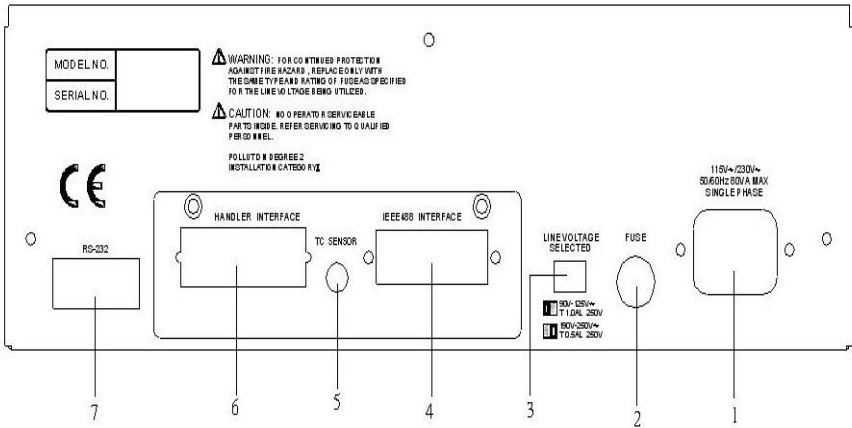
(8) ~(11) Cursor Keys

There are [△], [▽], [◀], [▶] four direction keys. These keys are for display in different conditions and control cursor, which can be useful when inputting each parameter. The keys can also be selection keys, e.g., selecting range by [◀], [▶] keys.

(12) TRIGGER Key

This key is for trigger instrument to start measurement. When the instrument is in manual trigger mode, press this key for measuring.

4.2 Rear Panel



(1) AC Line Socket

This socket is an approved (by the International Electrotechnical Commission) three-wire socket 320. Please use the correct wire, such as Beeline SPH-386 or similar power cord (W12 010130).

(2) Fuse

1.0A or 0.5A slow blow fuse to prevent the instrument being affected by excess current in 90 ~ 125V or 190 ~ 250V.

(3) Power Voltage Switch

Ensure power is off, then use screwdriver to switch to required voltage.

(4) IEEE-488 INTERFACE Socket (Option)

According to IEEE488-1978 standard input/output cord. The functions are: total remote control, output selection result, with or without controller, receives IEEE-488 interface connection line.

(5) TC SENSE Socket (Option)

The connection socket of temperature probe is mainly for temperature measuring.

(6) HANDLER INTERFACE Socket (Option)

To component controller, output is GO/NG status etc., input is "Start" signal. Receive Amphenol "Microribbon" plug P/N 57-30240 or equivalent object.

(7) RS-232 SERIES PORT
Standard RS-232 interface



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