XiTRON
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USER GUIDE

XT560

Digital Milliohmmeter

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Introduction

The purpose of this user guide is to describe the use and capabilities of the XT560 Digital Milliohmmeter.

Scope

The XT560 Digital Milliohmmeter is a dedicated, fully automatic instrument that selects the optimal test current, from 100nA to 100mA DC to accurately measure resistances from 10μΩ to 33MΩ. The XT560 will auto range between 9 ranges, or can be manually set to a fixed range. The XT560 includes a set of Kelvin test clip leads for making four-terminal measurements.

The XT560 is ideal for measuring wiring or cable resistances, windings of motors or generators, lamp filaments, cable splices, wire-to-terminal resistances, heating elements, contact resistance of breakers or switches, connector quality/resistance, fuse resistances, transformers, and grounding connections.

Features

The XT560 Digital Milliohmmeter's features include the following—

- Maximum Display of 33000

- Power Supply 90VAC to 260VAC, 50/60Hz

- Wide Measurement Range: From 10μΩ resolution to 30MΩ full scale

- High Accuracy ±0.05%
- Auto/Manual Function
- RS-232 Interface Standard
- Measurement Speed 10 samples/sec.
- HOLD, REL Function

Functional Description

This chapter describes the operation and interfaces of the XT560 Digital Milliohmmeter.

Front Panel

The front panel of the XT560 is shown in Figure 1 below.

FRONT PANEL DIAGRAM
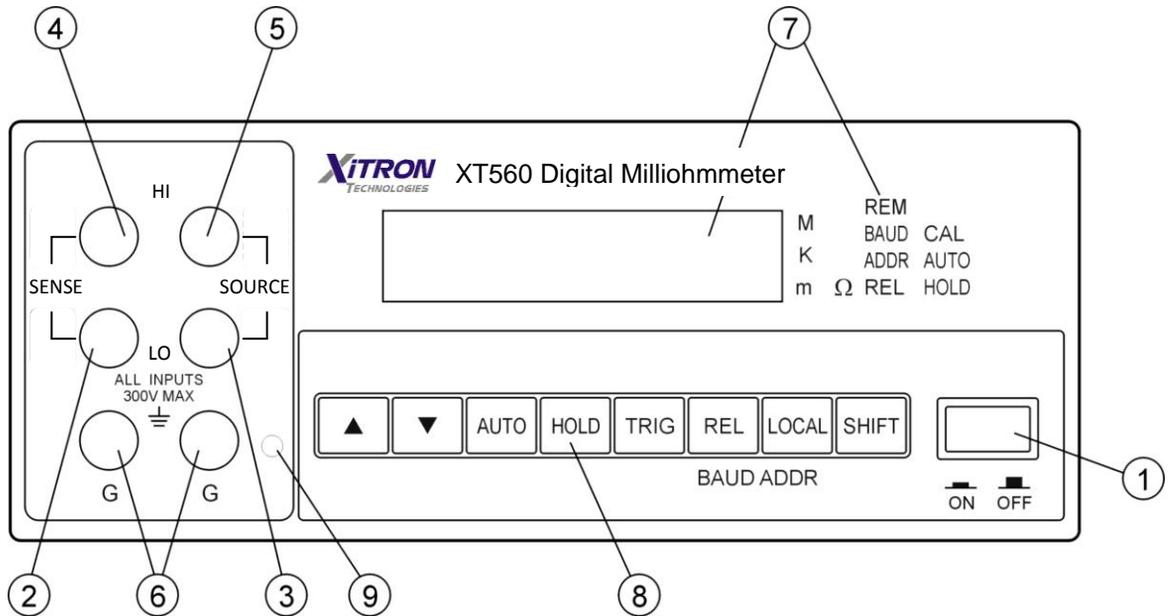
Figure 1. Front Panel

Front Panel Display

Refer to Figure 1.

1. Power push button
2. Sense LO Terminal (voltage input -)
3. Source LO Terminal (current output -)
4. Sense HI Terminal (voltage input +)
5. Source HI Terminal (current output +)
6. G Terminals (ground)
7. The display of the 5601 digital ohm meter is a 6 digit, 0.56 ", numerical LED display.

The following characters indicate the unit of the value displayed.

M	Mega	1×10^{6}	ADDR	Address
K	Kilo	1×10^{3}	REL	Relative
m	Milli	1×10^{-3}	CAL	Calibrate
Ω	ohm	Resistance	AUTO	Auto range
REM	Remote		BAUD	Baud rate

8. Function Keys

▲ key: Up range key
▼ key: Down range key
AUTO key: Auto range key
HOLD key: Touch hold key
TRIG key: Trigger a data key
REL key: Relative mode key

9. CAL Button: To enter into the calibration mode.

Rear Panel

Refer to Figure 2.

1. RS-232 Connector
2. Power-Line Cord Connector, AC, 90~264V, 50/60Hz
3. Fuse for power, 250V/1A
4. Fuse for input, 250V/0.5A
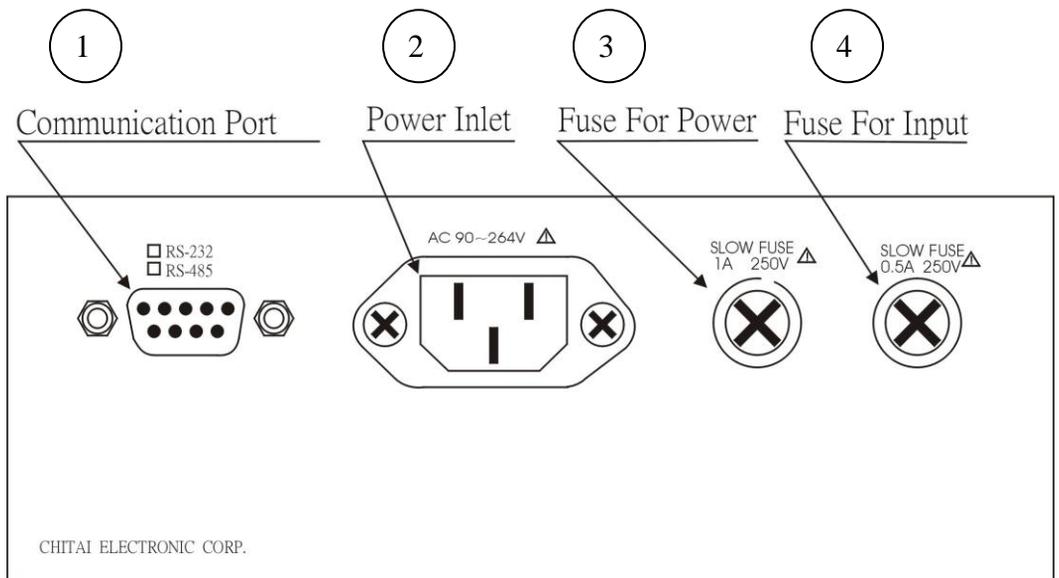
Figure 2. Rear Panel

Replacement fuses must be the same size as the original.

Dimensions and Stand Operation

Case Dimensions

Units: mm

Figure 3. Meter Dimensions

Stand Operation

There are 3 positions for the XT560 stand. Figures 4, 5, and 6 illustrate the XT560 with the stand fully retracted horizontally, as a stand, and as a handle. Figure 7 illustrates the method of changing the position of

the stand. Pull the stand with both hands from the left and right sides, turn it to the desired position, then release.
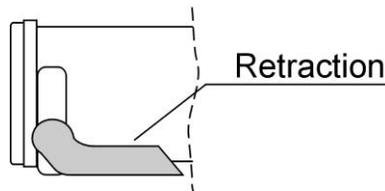
Figure 4. Stand Retracted
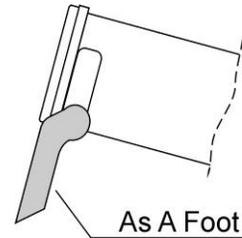
Figure 5. Standing Position
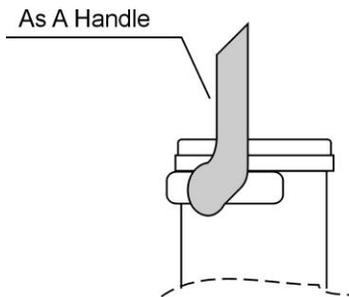
Figure 6. Stand as a Handle
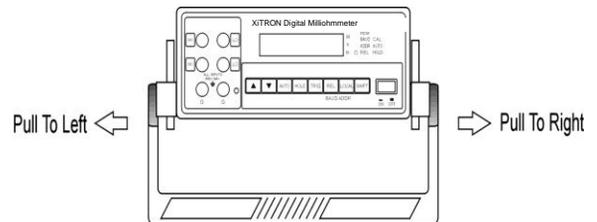
Figure 7. Changing Positions

Using the Meter

Range Selection

The XT560 digital milliohmmeter has two ranging modes, Manual and Auto. The measurement range can be selected using either auto range by pressing the Auto button, or Manual range by pressing the ▲ or ▼ buttons.

In auto range, the ohmmeter changes to a higher range when the reading is over full scale (30000 counts), and changes to a lower range

when the reading is below 9% of full scale (2700 counts). The auto range function will range from the highest range, 30Mohms, to the lowest range, 300mohms.

The XT560 measures from 10µohms to 30Mohms in 9 ranges. The ranges are: 300mohms, 3ohms, 30ohms, 300ohms, 3kohms, 30kohms, 300kohms, 3Mohms, and 30Mohms .

HOLD Mode

When the XT560 is operating in the display hold mode, pressing the HOLD key allows the user to take a measurement and hold that measurement value on the display. Press the HOLD key again to remove the hold function.

Four-Wire Measurement

The XT560 makes 4-wire resistance measurements as shown in Figure 8. The source HI and LO leads apply a known, internal current source to the unknown resistance, the sense HI and LO leads measure the voltage across the unknown resistance.
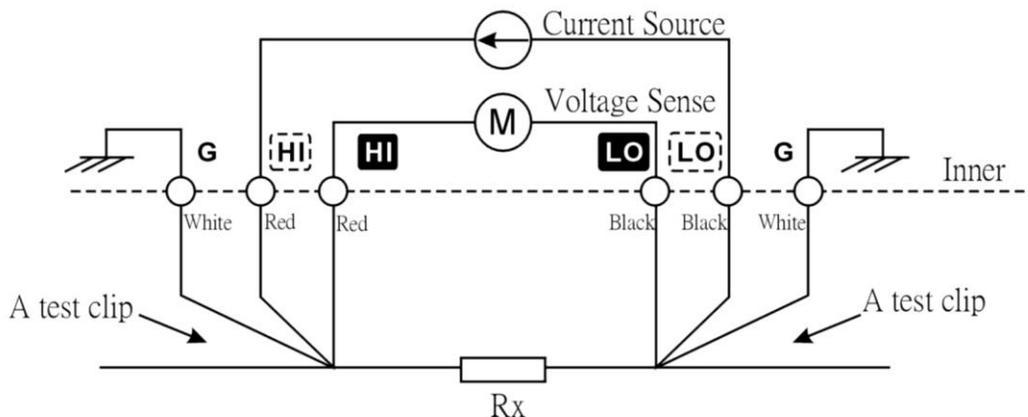
Figure 8. Four-wire Measurement Diagram

CALIBRATION

To perform a calibration, proceed as follows:
1. Press the CAL enable button to enter the calibration mode.
2. Press the UP-DOWN button to select the range to be calibrated.
3. Short the probes together and wait a minimum period of time as specified in Reference Table 1. Then press the SHIFT and TRIG keys at the same time.
4. Connect the Resistor Standard to the meter in a 4-wire configuration, refer to Figure 9. Wait for a period of time as specified in Reference Table 1, for the XT560 to stabilize. Then press the SHIFT and HOLD keys at the same time.
5. Repeat this procedure adjusting the XT560 milliohmmeter for each range: 300mΩ range, 3Ω range, … and finally the 30MΩ range.

Reference Table 1

RANGE	RESISTOR STANDARD VALUE	WAITING TIME BEFORE PRESSING KEYS	PRESS KEY
300mΩ	0Ω	5 sec …	SHIFT+TRIG SHIFT+HOLD
	100mΩ		
3Ω	0Ω	3 sec …	SHIFT+TRIG SHIFT+HOLD
	1Ω		
30Ω	0Ω	3 sec …	SHIFT+TRIG SHIFT+HOLD
	10Ω		
300Ω	0Ω	3 sec …	SHIFT+TRIG SHIFT+HOLD
	100Ω		
3KΩ	0Ω	3 sec …	SHIFT+TRIG SHIFT+HOLD
	1kΩ		
30KΩ	0Ω	3 sec …	SHIFT+TRIG SHIFT+HOLD
	10kΩ		
300KΩ	0Ω	3 sec …	SHIFT+TRIG SHIFT+HOLD
	100kΩ		
3MΩ	0Ω	5 sec …	SHIFT+TRIG SHIFT+HOLD
	1MΩ		
30MΩ	0Ω	10 sec …	SHIFT+TRIG SHIFT+HOLD
	10MΩ		

Note: **DO NOT** enter the adjustment mode if the Resistor Standard and a certified technician are not available.
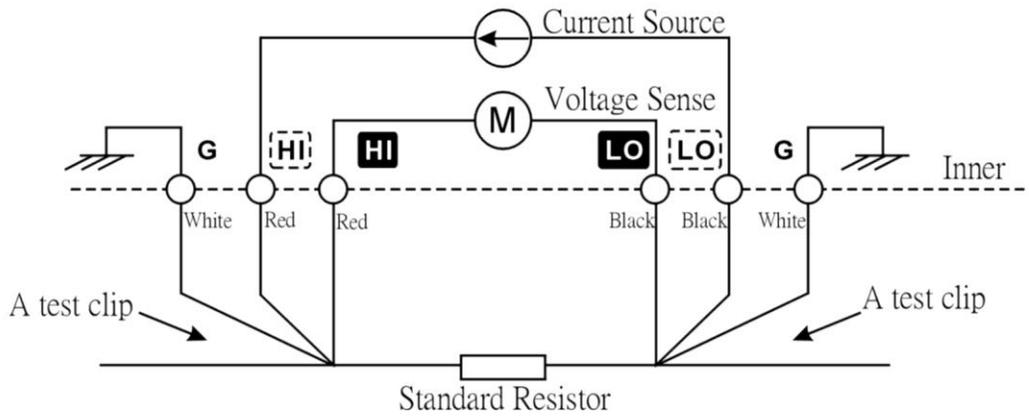
Figure 9. Calibration with Resistor Standard

LOCAL AND REMOTE OPERATION

When the meter is operated from a host computer it is said to be operated "remotely". When the meter is operated from its front panel, it is said to be operated "locally". Some operations, such as setting the communication parameters for the RS-232 interface, can only be performed from the front panel .

To change the baud rate, perform the following. Press and hold the SHIFT key, then press the REL to display the present communication rate. At this point, while holding the SHIFT key, additional presses of the REL key will select new baud rates.

RS-232 / RS-485 Communication Interface

XT560 Communication

Baud rates supported: 300, 2400, 9600
Parity: None
Number of data bits: 8 bits
Number of stop bits: 1 bit
Address: 0 to 30
Echo: On/off

Pin-out of Communication Port
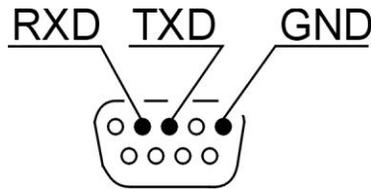
Figure 10. RS-232 Connector Pin-out

Programming Examples

Visual Basic example:

```
Private Sub Command1_Click()
    'send command to XT560
    MSComm1.Output = "VAL ?" & Chr(13)

    'delay 1 second to read XT560
    Timer1.Enabled = True
End Sub

Private Sub Form_Load()
    'set serial port
    MSComm1.InputMode = comInputModeText
    MSComm1.Settings = "9600,n,8,1"
    MSComm1.CommPort = 1
    MSComm1.PortOpen = True

    'set timer to delay 1 second
    Timer1.Enabled = False
    Timer1.Interval = 1000
End Sub
```

```
Private Sub Timer1_Timer()
   Timer1.Enabled = False

   'read XT560 data
   Text1.Text = MSComm1.Input
End Sub
```

XT560 RS-232 Communication Commands

COMMAND	FUNCTION
HOLD	Pressing the hold key stops a measurement. HOLD is indicated when the lamp is on.
HOLDCLR	Meter exits HOLD mode and display returns to normal operation.
REL	Meter reads resistance as a relative value. In REL operation, auto-range is disabled.
RELCLR	Meter exits the relative mode and returns to auto-ranging.
VAL ?	Meter returns the value shown on the display. Example format: +1.23456+0 OHMS(CR)
TRIG	Trigger a data reading.
ECHO1	Echo on.
ECHO2	Echo off.
AUTO	Causes the meter to enter the auto-ranging mode on the display .

RANGE < >	Sets the display to the range, from 1 to 9, as shown in the table below.

Range Value	Ohms range
1	300mΩ
2	3Ω
3	30Ω
4	300Ω
5	3kΩ
6	30kΩ
7	300kΩ
8	3MΩ
9	30MΩ

Appendix A - Physical Specifications

General

Note: Specifications subject to change without notice.

Environment

Operating: 0°C to 50°C, <80%RH non-condensing
Storage: -20°C to 70°C, non-condensing.

Altitude Equivalent

Atmospheric pressures and air densities from 1000ft below sea level to 15000ft above sea level.

Dimensions

247mmW $\times$ 89mmH $\times$ 280mmD

Appendix B - Measurement Specifications

Specification

Maximum Reading   33000
Sampling Rate   10 samples/sec
Display   6-digit, 7-segment LED, 14.2mm high
Over Range   "00000" flash
Range Selection   Automatic and Manual
Overload Protection   AC 330Vrms
Power Supply   AC 90~264V, 50/60Hz, <15VA
RS-232   Baud rates 300, 2400, 9600, No parity, one Stop bit

Range	Test Range	Resolution	Test Current	Accuracy
300.00mΩ	0.01mΩ~330.00mΩ	10μΩ	DC 100mA	±0.05% ± 20digits
3.0000Ω	0.0001Ω~3.3000Ω	100μΩ	DC 100mA	±0.02% ± 10digits
30.000Ω	0.001Ω~33.000Ω	1mΩ	DC 10mA	
300.00Ω	0.01Ω~330.00Ω	10mΩ	DC 1mA	
3.0000kΩ	0.0001kΩ~3.3000kΩ	100mΩ	DC 1mA	
30.000kΩ	0.001kΩ~33.000kΩ	1Ω	DC 100μA	
300.00kΩ	0.01kΩ~330.00kΩ	10Ω	DC 10μA	
3.0000MΩ	0.0001MΩ~3.3000MΩ	100Ω	DC 1μA	
30.000MΩ	0.001MΩ~33.000MΩ	1kΩ	DC 100nA	±0.05% ± 20digits