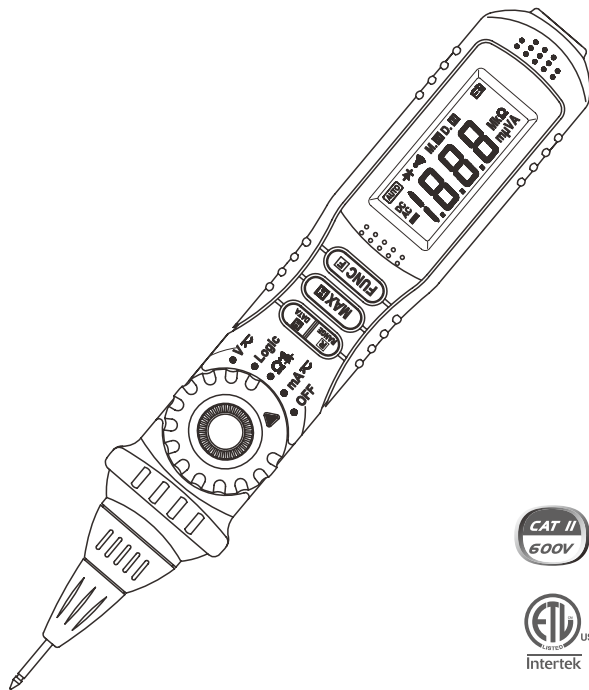


MASTECH[®]

M58211D

DIGITAL MULTIMETER INSTRUCTION MANUAL



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1. SAFETY INFORMATION



WARNING

BE EXTREMELY CAREFUL IN THE USE OF THIS METER. Improper use of this device can result in electric shock or destroy of the meter. Follow all safeguards suggested in this manual and the normal safety precautions used in working with electrical circuits.

Do not service this device if you are not qualified to do so.

To ensure safe operation, and in order to exploit to the full the functionality of the meter, please follow the directions in this section carefully.

This meter has been designed according to EN/UL 61010-1, 61010-031 concerning electronic measuring instruments with an overvoltage category CAT II 600V and pollution 2. Follow all safety and operating instructions to ensure that the meter is used safely and is kept in good operating condition. With proper use and care, the digital meter will give you years of satisfactory service.

Measurement category II is for measurements performed in the building installation. (Examples are measurements on distribution boards, circuit-breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and equipment for industrial use and some other equipment, for example, stationary motors with permanent connection to the fixed installation.)

1.1 Preliminary

- 1.1.1 When using the meter, the user must observe all normal safety rules concerning:
 - Protection against the dangers of electrical current.
 - Protection of the meter against misuse.
- 1.1.2 If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment/probe assembly may be impaired.
- 1.1.3 When the meter is delivered, check that it has not been damaged in transit.
- 1.1.4 When poor condition under harsh preservation or shipping conditions caused, inspect and confirm this meter without delay.
- 1.1.5 Test lead or test clip must be in good condition. Before using verify that the insulation on test lead or test clip is not damaged and/or the leads wire is not exposed.
- 1.1.6 Full compliance with safety standards can be guaranteed only if used with test leads supplied. If necessary, they must be replaced with the same model or same electric ratings.

1.2 During Use

- 1.2.1 Before using, you must select the right function and range.
- 1.2.2 Never exceed the protection limit values indicated in specifications for each range of measurement.
- 1.2.3 When the meter is linked to a measurement circuit, do not touch the probe tip of the meter and test lead (or test clip).
- 1.2.4 At the manual range, when the value scale to be measured is unknown beforehand, select the highest range.

- 1.2.5 Do not measure voltage if the voltage on the terminals exceeds 600V above earth ground.
- 1.2.6 Always be careful when working voltages above 60V DC or 30V AC rms, keep fingers behind the probe barrier while measuring.
- 1.2.7 Never connect the meter leads across a voltage source while the transform switch is in the resistance, diode or continuity mode. Doing so can damage the meter.
- 1.2.8 Never perform resistance, diode and continuity measurements on live circuits.
- 1.2.9 Before rotating the transform switch to change the function, disconnect the tip of meter and the probe of the test lead (or test clip) from the circuit under test.
- 1.2.10 Never use the meter under the condition of the explosive air, steam or dirt.
- 1.2.11 If any faults or abnormalities are observed, the meter can not be used any more and it has to be checked out.
- 1.2.12 Never use the meter unless the rear case is in place and fastened fully.
- 1.2.13 Please do not store or use meter in areas exposed to direct sunlight, high temperature, humidity or condensation.

1.3 Symbols

-  Important safety information, refer to the operating manual.
-  Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION
-  Conforms to european union directive



Conforms to UL STD. 61010-1, 61010-031



Earth (ground) TERMINAL



Alternating current



Direct current



Both direct and alternating current

CAT II It is applicable to test and measuring circuits connected directly to utilization points (socket outlets and similar points) of the low-voltage MAINS installation.

1.4 Maintenance

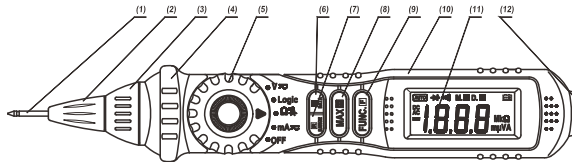
- 1.4.1 Please do not attempt to adjust or repair the meter by removing the rear case while voltage is being applied. A technician who fully understands danger involved should only carry out such actions.
- 1.4.2 Before opening the battery cover or case of the meter, always disconnect the tip of meter and the probe of the test lead (or test clip) from all tested circuits.
- 1.4.3 To avoid the wrong reading causing electricity attack, when the meter displays "", you must change the battery.
- 1.4.4 Do not use abrasives or solvents on the meter, use a damp cloth and mild detergent only.
- 1.4.5 Always set the transform switch to the OFF position when the meter is not in use.
- 1.4.6 If the meter is to be stored for a long period of time, the batteries should be removed to prevent damage to the unit.

2. DESCRIPTION

- This meter is a portable professional measuring instrument with handsome LCD easily reading.
- Single operation of a transform switch makes measurement convenient. Overload protection and low battery indication are provided, this meter is ideal for use in the fields, workshop, school, hobby and home applications.
- This meter has function of auto range and manual range.
- This meter has function of auto power off.
- This meter is with the functions of data hold and maximum value measure and hold.
- When using, it can show ranges engineering unit enunciators measuring results.

2.1 Names Of Components

- | | |
|----------------------------|----------------------|
| (1) Probe | (10) Panel |
| (2) Rotatable Probe Socket | (11) LCD Display |
| (3) LED Indicator | (12) COM Jack |
| (4) Protection Ring | |
| (5) Transform Switch | |
| (6) DATA-H Button | |
| (7) RANGE Button | |
| (8) MAX.H Button | |
| (9) FUNC. Button | |



2.2 Components Elucidation

-indicated for information about the Button operation.

Button	Function	Operation performed
DATA-H	Any switch position Power-up Option	This Button is used to hold data. Disables automatic power-off feature.
RANGE	$V \approx$, Ω and $mA \approx$	Used to transform Auto range or manual range.
MAX.H	Any switch position	Used to measure and hold the maximum value.

Button	Function	Operation performed
FUNC.	$V \approx$ Logic $\Omega \rightarrow \rightarrow \rightarrow$ $mA \approx$	Switches between dc and ac voltage. Keep pressing during the Logic testing. Switches between Resistance measurement, Diode Test and Continuity check. Switches between dc and ac current.

- Transform Switch
This switch is used to select functions and desired ranges.
- Probe
Input terminals for V mA Ω $\rightarrow \rightarrow \rightarrow$ and logic test.
Common terminal for measurement.
- COM Jack
Common terminal for measurement.
- LCD Display
The measuring result will be displayed.
- LED Indicator
At Logic test range, High level and Low level can be indicated.

- Rotatable Probe Socket
Rotating the probe in or out of the meter.
- Protection Ring
To keep the hand from the probe behind the ring.

3. SPECIFICATIONS

3.1 General specifications

Accuracy is specified for a period of year after calibration and at 18°C to 28°C (64°F to 82°F) with relative humidity to 75%.

3.1.1 Environment conditions:

600V CAT. II
Pollution degree: 2
Altitude < 2000m

Operating temperature: 0~40°C, 32°F~122°F<80%RH, <10°C non-condensing)

Storage temperature: -10~50°C, 14°F~122°F(<70% RH, battery removed)

3.1.2 Max. Voltage Between Terminals And Earth Ground: 600V DC or AC

3.1.3 Auto ranges and manual range.

3.1.4 Display: 20mm LCD

3.1.5 Max. Show Value: 1999 (3 1/2)

3.1.6 Polarity Indication: '-' indicates negative polarity.

3.1.7 Overrange Indication: Display 'OL'

3.1.8 Sampling Time: approx. 0.4 second

3.1.9 Unit showing: showing of function and electrical capacity.

3.1.10 Low Battery Indication: 'E3' displayed

3.1.11 Fuse Protection: mA: resettable fuse

3.1.12 Auto power off time: 15 min.

3.1.13 Power Supply: 1.5V×2 AAA battery.

3.1.14 Dimension: 208×38×29 mm

3.1.15 Weight: approx. 110g (including battery)

3.2 Electrical Specifications

Circumstance Temperature: 23±5°C Relative Humidity: < 75%

3.2.1 DC Voltage

Range	Resolution	Accuracy
200mV	0.1mV	±(0.7% of rdg + 2 digits)
2V	0.001V	
20V	0.01V	
200V	0.1V	
600V	1V	

- Input Impedance: 10MΩ

- Overload Protection: 200mV range: 250V DC or AC rms, 2V-600V ranges: DC 600V or AC 600V rms.

- Max. Input Voltage: 600V DC

3.2.2 AC Voltage

Range	Resolution	Accuracy
200mV	0.1mV	±(0.8% of rdg + 3 digits)
2V	0.001V	
20V	0.01V	
200V	0.1V	
600V	1V	±(1.0% of rdg + 3 digits)

- Input Impedance: 10MΩ

- Overload Protection: 200mV range: 250V DC or AC rms, 2V-600V ranges: DC 600V or AC 600V rms.

- Frequency Range: 40 to 400Hz

- Response: Average, calibrated in rms of sine wave.

- Max. Input Voltage: 600V rms AC

3.2.3 Resistance

Range	Resolution	Accuracy
200Ω	0.1Ω	±(1.0% of rdg + 3 digits)
2KΩ	0.001KΩ	±(1.0% of rdg + 1 digits)
20KΩ	0.01KΩ	
200KΩ	0.1KΩ	
2MΩ	0.001MΩ	
20MΩ	0.01MΩ	±(1.0% of rdg + 5 digits)

- Open Circuit Voltage: 0.25V
- Overload Protection: 250V DC or rms AC

3.2.4 Continuity

Range	Function
	Built-in buzzer will sound, if resistance is lower than 50Ω.

- Open circuit voltage: approx. 0.5V
- Overload Protection: 250V DC or rms AC

3.2.5 Diode

Range	Resolution	Function
	0.001V	Display :read approximate forward voltage of diode

- Forward DC Current: approx. 1mA
- Reversed DC Voltage: approx. 1.5V
- Overload Protection: 250V DC or rms AC

3.2.6 DC Current

Range	Resolution	Accuracy
20mA	0.01mA	±(1.5% of rdg + 3 digits)
200mA	0.1mA	

- Overload Protection: Resettable fuse.

3.2.7 AC Current

Range	Resolution	Accuracy
20mA	0.01mA	±(2.0% of rdg + 3 digits)
200mA	0.1mA	

- Overload Protection: Resettable fuse.
- Frequency Range: 40Hz-200Hz
- Response: Average, calibrated in rms of sine wave.

3.2.8 Logic Test

Range	Description
Logic	

- Input Impedance: approx. 1MΩ- Overload Protection: 250V DC or rms AC

4. OPERATING INSTRUCTION

4.1 Data Hold

If you need data hold when measuring, you can put on “DATA-H” button, it will hold the reading; if you put the button again, data hold is not continue.

4.2 Maximum Value Measuring And Hold

At the range of voltage, you can put on “**MAX.H**” button, it will hold the maximum value; if you put the button again, the maximum value will not be held.

4.3 Function Transform

Put down the “**FUNC.**” button when measuring the voltage. Meter will be transformed between DC and AC range. Put “**FUNC.**” button when measuring the resistance, diode and continuity, meter will transform among them.

4.4 Range Transform

The auto range is used when measuring the voltage and resistance. Put down the “**RANGE**” button if the manual range is needed. Each time you put down, range will go upward; the minimum range is transformed if “**RANGE**” is put down at the maximum range. If the “**RANGE**” button is put down more than two seconds, auto range is used again.

4.5 Auto Power Off

If there's no any operation within fifteen minutes after power is on, meter will auto power off with five short sounds and a long sound in a minute.

After auto power off, if stir the transform switch or put down any button of “**FUNC.**”, “**MAX.H**”, “**RANGE**”, meter will recover the working condition.

If presses the “**DATA-H**” button when power is on, auto power off disable. In sleep mode, the auto power off function will be cancelled if presses the “**DATA-H**” button to wake the meter.

4.6 Preparation For Measurement

4.6.1 Set the transform switch to the right range. At the manual range, when the value scale to be measured is unknown beforehand, select the highest range.

4.6.2 When measuring, at first, connect to the public (COM) testing line, then connect the probe tip of the meter to the circuit under test.

4.6.3 If the battery voltage is less than 2.4V, display will show “**⚡**”, the battery should be changed at this time.

4.7 Measuring DC Voltage

⚠ WARNING

Risk of Electrocution.

You can't input the voltage which is higher than 600V DC, it's possible to show higher voltage, but it may damage the inner circuit or cause electrical shock.

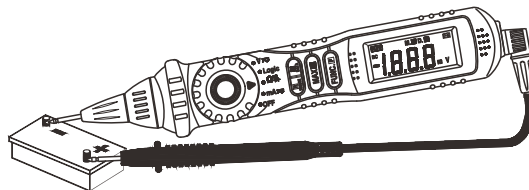
Pay attention to avoid getting an electric shock when measuring high voltage.

4.7.1 Rotate the probe socket clockwise to spin out the probe from the meter.

4.7.2 Insert the black test lead or test clip in the **COM** jack.

4.7.3 Set the transform switch at the V $\approx$ range position.

4.7.4 Press the “**FUNC.**” Button to transform to DC measurement. Auto range and manual range can be transformed by pressing the “**RANGE**” button.



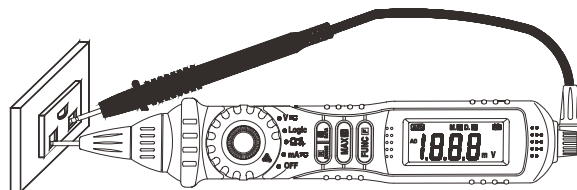
- 4.7.5 Connect the probe tip of the meter and probe tip of the test lead (or test clip) across the power source or be loaded on the two sides under measurement.
- 4.7.6 You can get a reading from LCD display. The polarity of the tested terminal which the tip of the meter connection will be indicated.

NOTE:

- At the little voltage range, the meter will show unsteady reading when test leads haven't reach the circuit, it's normal because the meter is very sensitivity. When meter touch the circuit, you can get the true reading.
- At the manual range mode, when only the figure 'OL' is displayed, it indicates overrange situation and the higher range has to be selected.
- At the manual range mode, when the value scale to be measured is unknown beforehand, select the range to the highest position and set down gradually.

4.8 Measuring AC Voltage

- 4.8.1 Rotate the probe socket clockwise to spin out the probe from the meter.
- 4.8.2 Insert the black test lead or test clip in the **COM** jack.
- 4.8.3 Set the transform switch at the $V \approx$ range position.
- 4.8.4 Press the "**FUNC**". button to transform to AC measurement. Auto range and manual range can be transformed by putting the "**RANGE**" button.
- 4.8.5 Connect the probe tip of the meter to one side of the tested circuit and probe tip of the test lead (or test clip) to the other side.
- 4.8.6 You can get reading from LCD display.



⚠ WARNING

Risk of Electrocution.

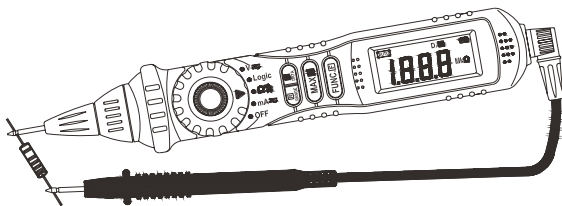
You can't input the voltage which is higher than 600V rms AC, it's possible to show higher voltage, but it may damage the inner circuit or cause electrical shock. Pay attention to avoid getting an electric shock when measuring voltage.

NOTE:

- At the manual range mode, when only the figure 'OL' is displayed, it indicates overrange situation and the higher range has to be selected.
- At the little voltage range, the meter will show unsteady reading when test leads haven't reach the circuit, it's normal because the meter is very sensitivity. When test leads touch the circuit, you can get the true reading.
- At the manual range mode, when the value scale to be measured is unknown beforehand, select the range at the highest position and set down gradually.
- Transform to the manual range when use the mV range.

4.9 Measuring Resistance

- 4.9.1 Rotate the probe socket clockwise to spin out the probe from the meter.
- 4.9.2 Insert the black test lead or test clip in the **COM** jack.
- 4.9.3 Set the transform switch at the range position. Auto range or manual range can be transformed by putting the "RANGE" button.
- 4.9.4 Connect the probe tip of the meter to one side of the tested circuit and probe tip of the test lead (or test clip) to the other side.
- 4.9.5 You can get reading from LCD display.



⚠ WARNING

Risk of Electrocutation.

When measuring in-circuit resistance, be sure the circuit under test has all power removed and that all capacitors have been discharged fully.

NOTE:

- At the manual range mode, when only the figure 'OL' is displayed, it indicates overrange situation and the higher range has to be selected.

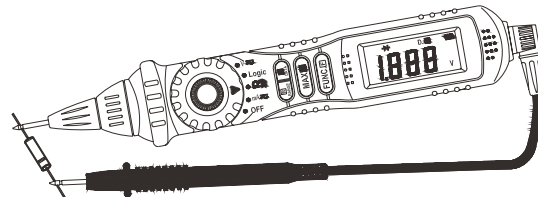
- For measuring resistance above 1MΩ, the meter may take a few seconds to get stable reading.
- When the input is not connected, i.e. at open circuit, the figure 'OL' will be displayed for the overrange condition.

4.10 Testing Diode

- 4.10.1 Rotate the probe socket clockwise to spin out the probe from the meter.
- 4.10.2 Insert the black test lead or test clip in the **COM** jack.
- 4.10.3 Set the transform switch at the $\rightarrow$ range position.
- 4.10.4 put down the "**FUNC.**" button transformed at $\rightarrow$ test.
- 4.10.5 Connect the probe tip of the meter to the anode of the diode, the black test lead (or test clip) to the cathode of the diode.
- 4.10.6 You can get reading from LCD display.

NOTE:

- The meter will show the approximate forward voltage drop of the diode.
- If the meter and the lead connection is reversed, only figure 'OL' will be displayed.
- When the input is not connected, i.e. at open circuit, the figure 'OL' will be displayed.



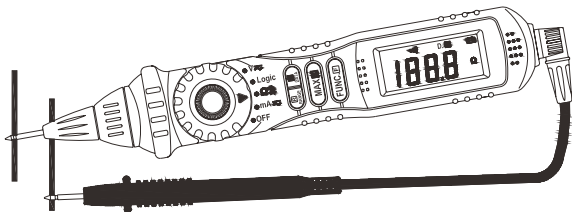
4.11 Continuity Test

WARNING

Risk of Electrocution.

When testing the circuit continuity, be sure that the power of the circuit has been shut down and all capacitors have been discharged fully.

- 4.11.1 Rotate the probe socket clockwise to spin out the probe from the meter.
- 4.11.2 Insert the black test lead or test clip in the **COM** jack.
- 4.11.3 Set the transform switch at the  range position.
- 4.11.4 Put down the “**FUNC.**” transformed at  continuity test.
- 4.11.5 Connect the probe tip of the meter to one side of the tested circuit and probe tip of the test lead (or test clip) to the other side.
- 4.11.6 If continuity exists (i.e., resistance less than about 50Ω), built-in buzzer will sound.



NOTE:

- If the input open circuit (or the circuit resistance measured is higher than 200Ω), then the figure 'OL' will be displayed.

4.12 Measuring DC Current

WARNING

Risk of Electrocution.

To avoid damage to the Meter or injury if the fuse blows, never attempt an in-circuit current measurement where the open-circuit potential to earth is greater than 250V

- 4.12.1 Rotate the probe socket anti-clockwise to spin the probe into the meter.
- 4.12.2 Insert the black test lead or test clip in the **COM** jack.
- 4.12.3 Set the transform switch at the **mA**  range position
- 4.12.4 Press the “**FUNC.**” button to transform to DC measurement. Auto range and manual range can be transformed by pressing the “**RANGE**” button.
- 4.12.5 Connect the probe tip of the meter and probe tip of the test lead (or test clip) in series with the load in which the current is to be measured.
- 4.12.6 You can get a reading from LCD display. The polarity of the tested terminal which the tip of the meter connection will be indicated.

NOTE:

- At the manual range mode, when only the figure 'OL' is displayed, it indicates overrange situation and the higher range has to be selected.

4.13 Measuring AC Current

WARNING

Risk of Electrocution.

To avoid damage to the Meter or injury if the fuse blows, never attempt an in-circuit current measurement where the open-circuit potential to earth is greater than 250V.

- 4.13.1 Rotate the probe socket clockwise to spin out the probe from the meter.
- 4.13.2 Insert the black test lead or test clip in the **COM** jack.
- 4.13.3 Set the transform switch at the mA range position.
- 4.13.4 Press the **"FUNC."** button to transform to AC measurement. Auto range and manual range can be transformed by putting the **"RANGE"** button.
- 4.13.5 Connect the probe tip of the meter and probe tip of the test lead (or test clip) in series with the load in which the current is to be measured.
- 4.13.6 You can get reading from LCD display.

NOTE:

- At the manual range mode, when only the figure **"OL"** is displayed, it indicates overrange situation and the higher range has to be selected.

4.14 Logic Test

WARNING

Risk of Electrocution.

You can't input the voltage which is higher than 100V rms AC, it may damage the inner circuit or cause electrical shock. Pay attention to avoid getting an electric shock when testing logic level.

- 4.14.1 Rotate the probe socket anti-clockwise to spin the probe into the meter.
- 4.14.2 Insert the black test clip in the **COM** jack.
- 4.14.3 Set the transform switch at the Logic range position.
- 4.14.4 Connect the black test clip to the GND(-) of the circuits being measured.
- 4.14.5 Keep pressing the **"FUNC"** button and Touch the tip to the testing object in the circuits being measured. And observe the logic state indicated by LED light. (Red LED light expresses high level/logic "1" and green LED light expresses low level/logic "0")
- 4.14.6 Also you can get reading and sign **"▲"** or **"▼"** from LCD display (**"▲"** expresses high level/logic "1" and **"▼"** expresses low level/logic "0")

NOTE:

- If the input open circuit (or the object's logic state is lower than 1.5V), the green LED will be lighted.
- You must keep pressing the **"FUNC"** button during the logic testing.

5. MAINTENANCE

5.1 Battery Replacement



WARNING

Before attempting to open the battery cover of the meter, be sure that the probe tip of the meter and test lead (or test clip) have been disconnected from measurement circuit to avoid electric shock hazard.



WARNING

Do not mix old and new batteries. Do not mix alkaline, standard (carbon-zinc), or rechargeable (ni-cad, ni-mh, etc) batteries.

- 5.1.1 If the sign '- 5.1.2 Loosen the screw fixing the battery cover and remove it.
- 5.1.3 Replace the exhausted battery with a new one.
- 5.1.4 Put the battery cover as its origin.

5.2 Test leads (Or Test Clip) Replacement



WARNING

Probe assemblies to be used for MAINS measurements shall be RATED for CAT II 600V and 10A according to EN 61010-1, 61010-031 or better.

You must be replaced the test lead if the lead is exposed.

6. ACCESSORIES

(1)	Test Lead: Electric Ratings 600V 10A	1 pcs
(2)	Test Clip: Electric Ratings 600V 10A	1 pcs
(3)	Battery: 1.5V, AAA	2 pcs
(4)	Instruction Manual	1 pcs



CAUTION

Using this appliance in an environment with a strong radiated radio-frequency electromagnetic field (approx. 3V/m), may influence its measuring accuracy. The measuring result can be strongly deviating from the actual value.



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