User's Manual

Model 73201/02/03/04
Digital Multimeters

Store this manual in a safe place for future reference.

YOKOGAWA
Yokogawa Meters & Instruments Corporation

IM 73201E
5th Edition Feb. 2006 (KP)

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IM3E-2006.2

Safety Precautions

Various symbols are used on the instrument and thoughout this manual to ensure safe use of the product and to protect against possible hazards or damage.
The following safety symbols are used where app. opriate.
Read the explanations carefully and familiarize yourself with the symbols before reading the text.

⚠ **WARNING** This symbol indicates that misuse of the instrument could result in injury or death of personnel.

⚠ **CAUTION** This symbol indicates that misuse of the instrument could result in injury of personnel or damage to the instrument.

The instrument and this manual also use the following safety symbols:

⚠ **Caution**
This symbol indicates that the operator must refer to an explanation in the instruction manual in order to avoid the risk of injury or death of personnel or damage to the instrument.

Double Insulation
This symbol indicates double insulation.

Alternating current
This symbol indicates AC voltage/current.

Direct current
This symbol indicates DC voltage/current.

Fuse
This symbol indicates a fuse.

Earth TERMINAL
This symbol indicates ground.

⚠ WARNING

■ To avoid electric shock!
- Do not use deteriorated or damaged testing leads. Check testing leads before use.
- Do not use the instrument if there is any damage to the casing or when the casing is removed.
- Disconnect the instrument from the circuit under test before opening the casing to replace the batteries or for any other reason.
- Avoid using the instrument if it has been exposed to rain or moisture or if your hands are wet.

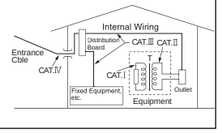
■ To avoid electrical shock or fire!
Do not use the instrument in an atmosphere where any flammable or explosive gas is present.

⚠ WARNING

■ To avoid damage to instrument or electric shock!
The restrictions on the maximum voltage level for which the 73201, 02, 03 and 04 multimeters can be used, depend on the measurement categories specified by the safety standards. These category specifications are formulated to protect operators against transient impulse voltages in power lines.

Measurement Category (CAT.)	Maximum Input Voltage
II	600 V
III	300 V

Measurement category		Description	Remarks
I	CAT. I	For measurements performed on circuits not directly connected to MAINS.	
II	CAT. II	For measurements performed on circuits directly connected to the low voltage installation.	Appliances, portable equipments, etc.
III	CAT. III	For measurements performed in the building installation.	Distribution board, circuit breaker, etc.
IV	CAT. IV	For measurements performed at the source of the low-voltage installation.	Overhead wire, cable systems, etc.



⚠ CAUTION

- Do not use the multimeter near noise-emitting equipment or where there may be a sudden temperature change. Otherwise, the instrument may produce an unstable reading or errors.
- Do not wipe the instrument using any organic solvent such as benzine or paint thinner. Otherwise, the front panel may be damaged or discolored. When cleaning the instrument, use a dry cloth.
- Do not leave the multimeter exposed to direct sunlight or in a hot and humid location such as the inside of a car, for any prolonged length of time.

Components

1) Function Switch
Turns off the power or selects the measurement mode.

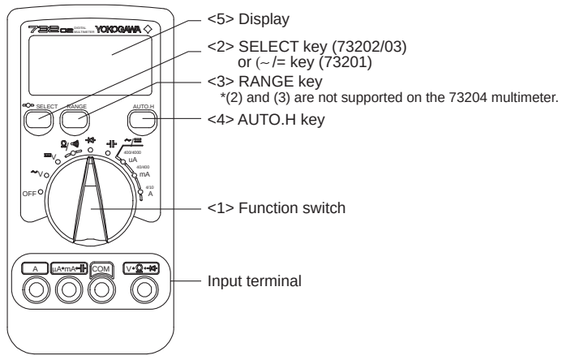
OFF:	Turns off the power.	
∼ V:	AC voltage measurement	
⎓ V:	DC voltage measurement	
Ω/ •)) :	Resistance measurement and continuity check (73202/03)	
Ω :	Resistance measurement (73201/04)	
•)) :	Continuity check (73201/04)	
⊣⊢ :	Diode test	
⊣⊢ :	Capacitor check (73202/03)	
µA:	DC/AC current measurement in micro-amperes	(73201/02/03)
mA:	DC/AC current measurement in milli-amperes	(73201/02/03)
A:	DC/AC current measurement in amperes	(73201/02/03)

2) SELECT key (73202/03) or ⎓/∼ key (73201)*
This function is not supported on the 73204 multimeter.
This key is enabled only if the multimeter is in one of the following measurement modes.
- Ω/ •)) : In this mode, the button selects between the resistance measurement and continuity test.
- ⊣⊢: In this mode, the button adjusts the stray capacitance of the testing leads and the multimeter itself to zero. (The display shows the **⊣⊢CAL** symbol.)
- µA/mA/A: In this mode, the button selects between the DC and AC modes.

* The 73201 multimeter comes with the ⎓/∼ key instead of the SELECT key. This key is used only to select between the DC and AC modes in the current measurement mode.

3) RANGE key * This function is not supported on the 73204 multimeter.
Allows the operator to select the measuring range manually (the display shows the **R • H** symbol).
To return to the normal auto-ranging mode, hold down this button for at least one second until the display shows "AUTO."

4) AUTO-H key
Set up AUTO HOLD function. (the display shows the **A • H** symbol).



5) Display View with All Elements Turned On

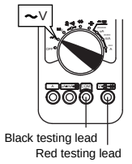
Symbol and Unit	Description
⎓	Lit when in DC-mode measurement
∼	Lit when in AC-mode measurement
—	Polarity indicator lit when the polarity is negative
⊣⊢	Lit when in diode test
•))	Lit when in continuity check
A • H	AUTO HOLD indicator
R • H	Manual range indicator
AUTO	Auto range indicator
AUTO POWER OFF	AUTO POWER OFF indicator
nF, µF	Unit for capacitance measurement
mV, V	Unit for voltage measurement
µA, mA, A	Unit for current measurement
Ω, kΩ, MΩ	Unit for resistance measurement
⊣⊢CAL	Lit when stray capacitance is adjusted to zero
▪+ –	Lit when the batteries are low

Measuring Instructions

⚠ CAUTION

To avoid damage to Instrument or equipment.
- Before starting measurement, check to which mode the function switch is set and make sure the testing leads are plugged into the terminals for the desired mode of measurement.
- Temporarily remove the testing leads from the device under test before operating the function switch.

- **AC Voltage Measurement (∼V)**



a) Set the function switch from the OFF position to the ∼V position.
b) Plug the black testing lead into the COM input terminal and the red testing lead into the V•Ω•⊣⊢ input terminal.
c) Connect the testing leads to the circuit under test and then read the multimeter when it stabilizes.
d) When measurement is complete, set the function switch back to the OFF position and turn off the multimeter.

- **DC Voltage Measurement (⎓V)**

a) Set the function switch from the OFF position to the ⎓V position.
b) Plug the black testing lead into the COM input terminal and the red testing lead into the V•Ω• ⊣⊢ input terminal.
c) Connect the testing leads to the circuit under test and then read the multimeter when it stabilizes.
d) When measurement is complete, set the function switch back to the OFF position and turn off the multimeter.

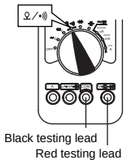
NOTE

Do not mistake the following for a malfunction!
If the 400 mV range is selected and the testing leads are left open-circuited, the multimeter may give a certain reading. This does not affect your measurement.

- **Resistance Measurement (Ω)**

⚠ CAUTION

To avoid damage to instrument!
Turn off the power to the circuit under test before starting measurement in order to prevent any excessive voltage from being applied to the multimeter.

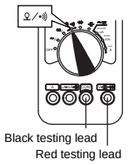


a) Place the function switch in the Ω position (73201/04) or Ω/ •)) position (73202/03).
b) Plug the black testing lead into the COM input terminal and the red testing lead into the V•Ω•⊣⊢ input terminal.
c) Connect the testing leads to the circuit under test and then read the multimeter when it stabilizes.
d) When measurement is complete, place the function switch in the OFF position and turn off the multimeter.

- **Continuity Check (•)))**

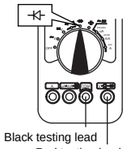
⚠ CAUTION

To avoid damage to instrument!
Turn off the power to the circuit under test before starting measurement in order to prevent any excessive voltage from being applied to the multimeter.



a) If the model is 73201 or 04, place the function switch in the •)) position.
If the model is 73202 or 03, place the function switch in the Ω/ •)) position, and then press the SELECT key. (The •)) symbol appears on the display.)
b) Plug the black testing lead into the COM input terminal and the red testing lead into the V•Ω•⊣⊢ input terminal.
c) Connect the testing leads to the circuit under check. If the circuit is continuous (no more than approximately 50 Ω), the buzzer sounds.
d) When the test is complete, place the function switch in the OFF position and turn off the multimeter.

- **Diode Test (⊣◀)**



a) Set the function switch from the OFF position to the ⊣◀ position.
b) Plug the black testing lead into the COM input terminal and the red testing lead into the V•Ω• ⊣◀ input terminal.
c) Connect the testing leads to the diode and then read the multimeter when it stabilizes.
(1) Forward-bias Diode Test
Connect the black testing lead to the cathode and the red testing lead to the anode (see Figure 1).
Silicon diodes should give a reading of approximately 0.5 V and light-emitting diodes a reading between 1.5 V and 2.0 V. Note that readings close to 0 V represent a short-circuit and the "---" symbol indicates an open-circuit.
(2) Reverse-bias Diode Test
Connect the black testing lead to the anode and the red testing lead to the cathode (see Figure 2).
Normally, the display shows the "---" symbol, indicating that the diode under test is normal. The diode is defective if the display gives a certain voltage level.
d) When the test is complete, set the function switch back to the OFF position and turn off the multimeter.

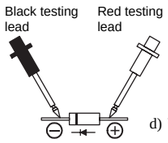


Figure 1 Forward-bias Diode Test

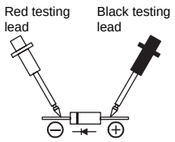
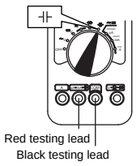


Figure 2 Reverse-bias Diode Test

- **Capacitor Check (⊣⊢)**
***This function is not supported on the 73201/04 multimeters.**

CAUTION
To avoid damage to Instrument or equipment.
Before starting measurement, be sure to discharge the capacitor under check.



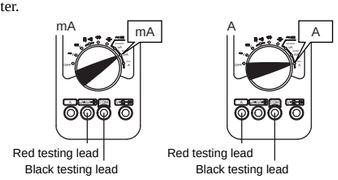
a) Set the function switch from the OFF position to the ⊣⊢ position.
b) Plug the black testing lead into the COM input terminal and the red testing lead into the μA•mA•⊣⊢ input terminal.
c) Press the SELECT key to adjust the stray capacitance to zero (the display shows the ⊣⊢CAL symbol).
d) Connect the testing leads to the circuit under check and then read the multimeter when it stabilizes.
e) When measurement is complete, set the function switch back to the OFF position and turn off the multimeter.

NOTE
Do not mistake the following for a malfunction!
Zero calibration is only effective when the 20nF range is selected.

- **Current Measurement (μA/mA/A)**
***This fucntion is not supported on the 73204 multimeter.**

CAUTION
To avoid damage to instrument!
- Check to which mode the function dial is set before starting measurement.
- A current of 11 to 20 A can also be measured if the time interval is kept within 30 seconds. The buzzer will sound if the interval exceeds 30 seconds. If this happens, immediately stop measurement. To continue measurement, wait for 2 minutes or more when restart.

a) Set the function switch from the OFF position to either the μA, mA or A position. (If the magnitude of the current being measured is not known, select the A position.)
b) When measuring AC current, press the SELECT key to select the AC mode. (The display shows the "⏦" symbol to indicate AC-mode measurement.)
c) Plug the black testing lead into the COM input terminal and the red testing lead into the A input terminal. If the current is in the order of milli-amperes or less, plug the red testing lead into the μA•mA•⊣⊢ input terminal.
d) Connect the testing leads to the circuit under test and then read the multimeter when it stabilizes.
e) When measurement is complete, set the function switch back to the OFF position and turn off the multimeter.



AUTO HOLD Function

The 732 series of multimeters can automatically retain the measured value when the testing leads are handled as described below.
a) Press the AUTO.H key. (The display shows the A•H symbol.)
b) Connect the testing leads to the object under test.
c) When the reading stabilizes, the buzzer sounds.
d) Remove the testing leads from the object under test.
e) The multimeter now shows the measured value that it retains.
f) You can repeat steps b) to e) as many times as you like as long as the display shows the A•H symbol.

NOTE
Do not mistake the following for a malfunction!
- In DC voltage measurement, the AUTO HOLD function is only available for ranges greater than the 4 V range.
- This function is not available for current-mode measurement.
- In a capacitor check, the AUTO HOLD function requires a few seconds before it takes effect.
- The AUTO HOLD function cannot be applied to unstable signals.

g) To cancel this function, press the A•H key once again.

AUTO POWER OFF Function

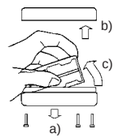
The multimeter automatically turns off if no key is pressed for a period of 20 minutes. The multimeter will beep for approximately one minute to alert the operator before the automatic power-off function takes effect. (Pressing any key while the multimeter is beeping postpones the power-off time. Pressing any key once after the power to the multimeter is automatically turned off switches the multimeter on again.)
To cancel the automatic power-off function, hold down the SELECT key and then set the function switch from the OFF to the position of any desired measurement mode. (The AUTO POWER OFF indication turns off when the function is canceled.)
To enable the function once again, temporarily switch the function switch back to the OFF position, and then select the desired measurement mode.

Battery Replacement

If the batteries fall below the normal operating voltage, the ▪+− symbol turns on. If this happens, replace the batteries with new ones (AAA-size [ANSI] batteries....2).

CAUTION
To avoid electric shock!
- Be sure to disconnect the multimeter from the circuit under test before replacing the batteries.
- Replace both batteries at the same time making sure to position them with the correct polarities.

To replace the batteries:
a) Remove the three screws on the back of the casing.
b) Open the casing.
c) Take the battery holder out of the casing.
d) Replace the batteries with new ones and install the battery holder back into the casing.
e) Close the casing and fasten it with the three screws.

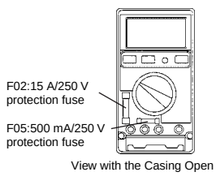


Fuse Replacement

If a current greater than the rated value flows when the multimeter is in the current-measurement range, a protection fuse may blow. If this happens, replace that fuse. The multimeter contains the following two types of fuses:
• Type F05 250 V/500 mA fuse
• Type F02 250 V/15 A fuse

CAUTION
To avoid electric shock!
- Be sure to disconnect the multimeter from the circuit under test before replacing the fuse(s).
- Do not operate the multimeter with the casing left open.
- In order to avoid damage to the multimeter or any possible accident, use fuses of the specified rating.

To replace the fuse(s):
a) Remove the three screws on the back of the casing.
b) Open the casing.
c) Remove the blown fuse from the fuse holder.
d) Install a new fuse in the holder.
e) Close the casing and fasten it with the three screws.



View with the Casing Open

Specifications

1. General Specifications

- Measurement functions: AC voltage, DC voltage, AC current (73201/02/03), DC current(73201/02/03), resistance, continuity, diode and capacitance (73202/03)
- Additional functions: Auto hold, manual range selection, over-range alarm, and Auto power off.
- Display: LCD display that is capable of indicating a significant reading of up to 4300 counts along with the indications of the unit and function. It shows the negative polarity only; no indication is given for positive polarity. The display also has the OL or over-range and ▪+− low-battery alarm indicators.
Note: The most significant reading is 210 counts for the diode test and 2300 counts for the capacitor check.
- Range selection: Manual or automatic
- Sampling: 2 times/sec
- Operating temperature and humidity ranges:
0 to 50°C (Accuracy guaranteed range: 23±5°C)
Where the range is 0 to 40°C for humidity of 80%RH or less and 40 to 50°C for humidity of 70%RH or less
- Storage temperature and humidity ranges:
-20°C to 60°C; 70% RH maximum
- Battery life: Approximately 600 hours (when continuously operated on alkaline batteries)
- Power supply: AAA-size batteries (ANSI) 2
- External dimensions: 74 (W) × 155 (H) × 31 (D) mm (excluding protrusions)
- Weight: Approx. 240 g (including batteries)
- Safety standards: EN61010-1, EN61010-2-031
(AC/DC 300V CAT.III, AC/DC 600 V CAT. II, Pollution degree2)
- EMC standards: EN55011 Group 1 Class B
EN61326-1
- Effect of EMS immunity:
Accuracy range of reading: [Rated accuracy + 5.0% of each range] for the strength of a radio-frequency electromagnetic field of 3 V/m
- Operable altitude: 2000m or less above sea level.
- Accessories: Batteries (housed in the instrument) 2
Testing leads 1set
Spare fuse: F05 (500 mA/250 V) 1
F02 (15 A/250 V) 1
Instruction manual 1

2. Electrical Specification

Test conditions: 23 ±5°C at 80% RH maximum
Accuracy: ±(percentage of reading + number of LSD reading)
Note: Each response noted below is a value measured in the Range Hold mode (manual range setting).

- **DC Voltage Measurement (⎓V)**

Range	Resolution	Accuracy			Input Resistance	Maximum Input Voltage
		73201	73202/04	73203		
400 mV	0.1 mV	0.5%+1	0.5%+1	0.3%+1	>100MΩ	600 V
4 V	0.001 V				11MΩ	
40 V	0.01 V	0.75%+1			10MΩ	
400 V	0.1 V					
600 V	1 V					

Response: 1.5 sec maximum for 400 mV range or 1 sec maximum for other ranges

- **AC Voltage Measurement (⏦V)**

(Mean-value detection and rms-value calibration)

Range	Resolution	Accuracy (40-500 Hz)			Input Resistance	Maximum Input Voltage
		73201	73202	73203/04		
4 V	0.001 V	1%+5		0.75%+5	11 MΩ, <50 pF	600 V
40 V	0.01 V				10 MΩ, <50 pF	
400 V	0.1 V					
600 V	1 V					

Response: 2 sec maximum

- **DC Current Measurement (⎓A)**
***This function is not supported on the 73204 multimeter.**

Range		Resolution	Accuracy			Voltage Drop	Maximum Input Current
			73201	73202	73203		
μA	400 μA*1	0.1 μA	1% + 2			<0.17 mV/μA	400 mA The input is protected by a 500 mA/250 V fuse
	4000 μA	1 μA					
mA	40 mA*2	0.01 mA				<3 mV/mA	
	400 mA	0.1 mA					
A	10 A*3	0.01 A	2% + 2			<0.04 V/A	10 A The input is protected by a 15 A/250 V fuse

*1, *2 These ranges may produce a readout error equivalent to several times their resolution.
*3 A current of 11 to 20 A can also be measured if the time interval is kept within 30 seconds. The buzzer will sound if the interval exceeds 30 seconds.
Response: 1 sec maximum

- **AC Current Measurement (⏦A)**
***This function is not supported on the 73204 multimeter.**

(Mean-value detection and rms-value calibration)

Range		Resolution	Accuracy (40-500 Hz)			Voltage Drop	Maximum Input Current
			73201	73202	73203		
μA	400 μA*1	0.1 μA	2% + 20			<0.17 mV/μA	400 mA The input is protected by a 500 mA/250 V fuse
	4000 μA	1 μA	2% + 5				
mA	40 mA*2	0.01 mA	2% + 20			<3 mV/mA	
	400 mA	0.1 mA	2% + 5				
A	10 A*3	0.01 A	2.5% + 20			<0.04 V/A	10 A The input is protected by a 15 A/250 V fuse

*1, *2 These ranges may produce a readout error equivalent to several times their resolution.
*3 A current of 11 to 20 A can also be measured if the time interval is kept within 30 seconds. The buzzer will sound if the interval exceeds 30 seconds.
Response: 2 sec maximum

- **Resistance Measurement (Ω)**

Range	Resolution	Accuracy	Measuring Current	Open-loop Voltage	Input Protective Voltage
		73201/02/03/04			
400 Ω	0.1 Ω	0.75%+2	<1.0 mA	<3.4 V	600 V
4K Ω	0.001 kΩ	0.75%+1	<0.5 mA	<1.0 V	
40K Ω	0.01 kΩ		<70 μA	<0.7 V	
400K Ω	0.1 kΩ		<7 μA		
4M Ω	0.001 MΩ	2%+1	<0.7 μA		
40M Ω	0.01 MΩ	5%+2	<70 nA		

Response: 1 sec maximum for ranges lower than the 400 kΩ range, 5 sec maximum for the 4 MΩ range, and 15 sec maximum for the 40 MΩ range

- **Continuity check (•))))**

Range	Resolution	Range of operation	Open-circuit Voltage	Input Protective Voltage
		73201/02/03/04		
400 Ω	0.1 Ω	The buzzer turns on for resistances lower than 50 ±20 Ω.	<3.4 V	600 V

Response: 0.2 sec maximum (for a buzzer response)

- **Diode Test (⊣◀)**

Range	Resolution	Accuracy	Open-circuit Voltage	Input Protective Voltage
		73201/02/03/04		
2 V	0.01 V	1% + 1 (for measuring currents smaller than 1.0 mA)	<3.4 V	600 V

Response: 1 sec maximum

- **Capacitor check (⊣⊢)**

Range	Resolution	Accuracy			Protection Fuse
		73201/04	73202	73203	
20 nF	0.01 nF	This function is not available.	2% + 5 typical Readings in the 20nF range are values after zero calibration has been completed.		By means of a 500 mA/250 V fuse
200 nF	0.1 nF				
2 μF	0.001 μF				
20 μF	0.01 μF				
200 μF	0.1 μF				

Response: 1 sec maximum