MODEL: HD-390I

Professional Analogue Multimeter

With robust Holster & reliable Protection

Operator's Instruction Manual

READ AND UNDERSTAND THIS MANUAL BEFORE USING THE INSTRUMENT

Failure to understand and comply with the WARING and operating Instructions can result in serious or fatal injuries and /or property damage.

BRIEF INTRODUCTION

This Multimeter is an accurate， safe， battery operated， rear tilt-stand， easy to operate handheld instrument with robust protective holster alongside and the adjustable back tilt device with hook-up design. It can offer accurate，reliable measurements of DCV & +/-DCV， ACV RMS & Peak-to-Peak， DC Current， Resistance with very high sensitive quality movement， mirrored Aluminum dial plate， double-sided glass-epoxy PCB and good-designed circuit etc.; and more it checks Diode， LED， Transistor， Decibels， AC live wire， Infrared signal， Circuit Continuity via Buzzer and Capacitance. It has the perfect full overload & mis-used protection via two Fuses， Oxide Varactor & Diodes. It is an ideal instrument for indoor use in the laboratory， school, workshop, hobby and home applications.

SPECIFICATIONS

Safety Category: IEC61010-1， CAT II 1000V， CAT III 500V and Pollution Degree 2.
Common Environment: 23°C±5°C， less than 75% RH.
Temperature Ranges:
0°C to 40°C， 32 °F to 104 °F for operating condition.
-10 °C to 50°C， 14 °F to 122°F for storage condition.
Humidity Scope: Operating condition less than 90% RH.
Storage condition: less than 80% RH.
Size: 163(W) x 115(D) x 42(H) MM
Weight: 380g approx. (including batteries 3pcs)
Accessories: One set of safety Test Leads 1000V/10A type;
Two Spare Fuses: 0.5A/250V(Φ5x20mm) & 10A/250V(Φ6x32mm).

Test Functions	Range	Accuracy	Remarks
DC V	0-0.1-2.5-10-50-250-1000V	± 3% FSD. ± 4% FSD. For 1000V	Input Impendence: 20KΩ/V Overload Protection: Max. 1000V AC/DC BUT 0.1V/2.5V/10V 250V Max.
Null DCV	±-5V， ±25V	± 5% FSD.	Input Impedance: 40KΩ/V Overload 1000V Max.
AC **Vrms**	0-10-50-250V -1000V	± 4% FSD. ± 5% FSD. For 1000V	Input Impendence: 9KΩ/V Overload Protection: Max. 1000V AC/DC But 10V/50V only 250V Max. Band width: 20 ~10K Hz
AC **Vp-p**	0-28(10)-70x2(50)-700(250) -2800V(1000) **Note: at AC50V range，** the Vp-p real reading must be **doubled.**	± 5% FSD.	Input Impendence: 9KΩ/V Overload Protection: Max. 2800V peak-to-peak But 10V/50V only 700Vp-p Max. Band width: 20 ~10K Hz
DC mA	0-0.05-2.5-25 -250 mA，10A	± 3% FSD. ± 4% FSD. at 10A range	Drop Voltage: 250 mV Overload protected by Fuses 0.5A/250V & 10A / 250V at 10A range， and Oxide Varactor.<250V AC/ DC(5s). Max. test time 1min. for 10A.
Ω	X 1: 0.2 ~ 2KΩ Midscale at 20Ω X 10: 2 ~ 20KΩ Midscale at200Ω X 100: 20 ~ 200KΩ Midscale at 2000Ω X1K: 200~ 2MΩ	± 4% of ARC of Scale Length	Overload protected by the Oxide Varactor & Fuse <250V AC/DC (5s).

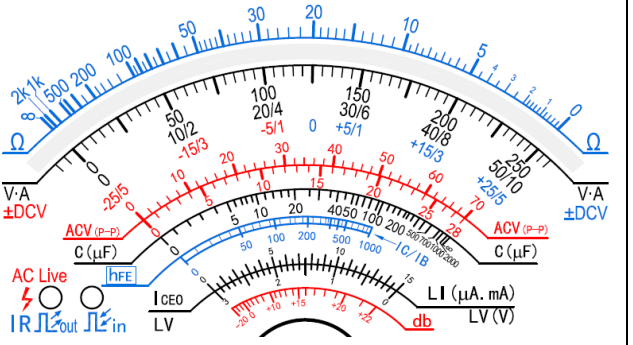
	Midscale at 0KΩ X10K: 2K~20MΩ Midscale at 200KΩ		
Capacitance (uF)	2,000uF(C)	Approx. Value	Use the R x 1K range
Infrared Check	IR Data 90±15°, < 50cm	The LED Red Light can be lit and flashing if remote control works well	
AC Live	AC Live	The LED Red Light can be flashing if the connected test lead contacts Live wire or Live terminal of outlet.	
Transistor Check	hFE: 0-1000 via special hFE socket	Approx. Value	At Ω X 10 Range
LED Check	via special hFE socket	Approx. Value	At Ω X 10 Range
Decibel	-20 dB ~ + 62 dB (0dB=1mW at 600Ω)	Approx. Value	At ACV ranges
Continuity Check	•))	Beeper sounds < 200 Ohm approx..	Overload protected by Fuse & Oxide Varactor .<250V AC/DC(5s).
POWER Source	Internal Battery: R03, AAA，1.5V x2pcs; and 6F22，NEDA1604， 9V x1pc.		

NOTE1: The extra indication error will occur as per the waveforms of measured ACV/ACA other than the sine wave. Its readings of rms value may be lower or higher than the actual root-mean-square value.

NOTE2: For 10A range， the big current loaded Max. 1min. with 5 min pause for next testing.

NOTE3: For Diode test， Max. 15 μA in the x10k range; and Max. 0.15 mA in the x1k range; and Max. 1.5 mA in the x100 range; and Max. 15 mA in the x10 range; and Max. 150 mA in the x1 range.

Scale/Value Readings Reference Table on Dial Plate



Test Function	Range	Scale/Value for reading	Multiplied
Resistance(Ω)	×1 ×10 ×100 ×1K ×10K	**1st Blue Ω Line**	×1 ×10 ×100 ×1000 ×10000
DC Volt(V)	DC 0.1V 2.5V 10V 50V 250V 1000V	**2nd Black Line V.A** Value 10(50/10) 250 10(50/10) 50(50/10) 250 10(50/10)	×0.01 ×0.01 ×1 ×1 ×1 ×100
Null DC Volt(V)	DC ±25V ±5V	**2nd Black Line V.A +/-DCV** **-Red / +Blue Value** -25, -15, -5, 0, +5,+15,+25 -5, -3, -1, 0, +1, +3, +5	×1 ×1
DC Current （A）	DC 50μA 2.5mA 25mA	**2nd Black Line V.A** Value 10(50/10) 250 250	×1 ×0.01 ×0.1

	250mA 10A	250 10(50/10)	×1 ×1
AC Vrms	AC 10V 50V 250V 1000V	**2nd Black Line V.A** Value 10(50/10) 50(50/10) 250 10(50/10)	 ×1 ×1 ×1 ×100
AC Vp-p	AC 10V 50V 250V 1000V	**3rd Red Scale Line** Value 28 70 70 28	 ×1 ×2 ×10 ×100
Capacitance	C(uF) (Rx1k)	**4th Black Scale Line** 1 ~ 2,000 uF	 x1
Transistor hFE	Ω×10	**5th Blue Line** IC/IB 0-1000	×1
Diode	Ω×10K ×1K ×100 ×10 ×1	**6th Black Line** LI 0~15μA/mA **6th Black Line** LV 0~3V	μA×1 μA×10 μA×100 mA×1 mA×10
Decibel	AC 10V 50V 250V 1000V	**7th Red Scale Line** Value -20dB ~ +22dB	 X1 X1+14dB X1+28dB X1+40dB

CALIBRATION

Ohms Zero Adjustor located at the right side of the panel，adjusting the meter pointer to the Zero mark on the right side of Ohm scale of the meter dial when the test leads are touched together at any Ω range.

Mechanical Adjustor Screw: located right below the center of the meter dial to set pointer to Zero mark at the left side of the scale.

(-) Jack: Plug-in connector at the lower left on the panel for

Black， negative test lead.
(+) Jack: Plug-in connector at the lower right on the panel for Red， positive test lead.

OPERATING INSTRUCTIONS

CAUTION

When making voltage or current measurements， develop the habit of turning off all power to the circuit under test. Connect the test leads at the desired points in the circuit， and then turn on the power while taking readings. Turn off the power before disconnecting the test leads from the circuit.

INTERNAL BATTERY CHECK

To check the battery condition， insert the black test lead into the (-) jack. Set the range switch to the R X1 range position and short the ends of the two sides of the test leads. If the pointer can not be brought to the zero mark， replace the 1.5V cells or 9V cell. (See battery replacement.)

BEFORE OPERATING

1. Set the range switch to the proper position before making any measurement.
2. Never apply more voltage or current than the rated value in every position.
3. When the voltage or current to be measured it not known， always start with the highest range.
4. If meter indication is in the lower half of the scale and falls within the range of a lower scale，reset selector switch to the lower range for greatest accuracy.
5. If the meter won’t work at all， check the fuse located on the PCB. If it’s blown， replace it. (See fuse replacement.)
6. Avoid placing the meter where extreme shock or continuous vibration is encountered and do not store in excessively hot

or damp places. Although very rugged， the meter is a sensitive measuring device and should be handled carefully & properly.

7. Do not check resistance， transistor， diode， LED， or capacitance when live voltage or current input across the circuit.
8. When the meter is not in use， keep the selector switch to the “OFF” range position， this provides direct short across meter movement for minimum needle bounce when transporting meter.
9. If you should accidentally apply excessive voltage or current on a certain range， disconnect the leads from the circuit as quickly as possible， check instrument operation on that range by applying peoper input. If the meter does not operate peoperly， check fuse. If it is blown replace it. (See fuse replacement.)

OPERATION PROCEDURES

DC Voltage Measurement

WARNING: WITH EXTREME CARE WHEN MAKING MEASUREMENTS FOR HUGE VOLTAGE. DO NOT TOUCH TERMINAL OR PROBE ENDS.

1. Set the selector switch to the appropriate DCV range to be used.
2. Connect the BLACK test lead to the “-COM” jack and the RED test lead to the “+” jack.
3. If you know the polarity of the circuit to be tested， connect the black probe to the negative side.
4. If you don’t know the polarity， connect the probes to opposite sides of the circuit and watch the pointer. If it goes to the left，reverse the probes. The RED probe will be connected to the positive.

5. Check the needle position and get the reading on the 2nd V.A scale below.

Null DCV (Central Zero) Measurement

At these two ranges， it can automatically judge the polarity of circuit as the pointer can move to the center line and become a Null meter.

1. Set the selector switch to the DCV ±5V or 25V range.
2. Connect the BLACK test lead to the “-COM” jack and the RED test lead to the Red “+” jack.
3. Set the Zero Ω adjustor to place the pointer exactly to the Central Zero position if need.
4. Connect the test leads across the circuit or load under measurement.
5. Take the readings on the 2nd Black V.A. scale line as per the Red/Blue ± values(-25/5，-15/3， -5/1; 0; +5/1， +15/3， +25/5).

NOTE: If the needle failed to be set at Central Zero position， the power of 9V battery may be weak and should be replaced by new one for normal working.

AC Voltage Measurement

WARNING: WITH EXTREME CARE WHEN MAKING MEASUREMENTS FOR HUGE VOLTAGE. DO NOT TOUCH TERMINAL OR PROBE ENDS.

AC Vrms:

1. Set the selector switch to the appropriate ACV range to be used and connect the test leads across the circuit or load under measurement. (Polarity of the test probes is unimportant on ACV test.)
2. Connect the BLACK test lead to the “-COM” jack and the RED test lead to the“+” jack.
3. Check the needle position and the get the reading on the 2nd Black V.A scales.

AC Vp-p:

1. Set the selector switch to the appropriate Red ACV range in the parentheses (28， 70x2， 700， 2800); and connect the test leads across the circuit or load under measurement. (Polarity of the test probes is unimportant.)
2. Connect the BLACK test lead to the “-COM” jack and the RED test lead to the“+” jack.
3. Check the needle position and the get the reading on the special 3rd Red ACVp-p scale.

NOTE: **at AC50V(70x2) range， the actual Vp-p value must be multiplied by twice the reading at scale.**

DC Current Measurement

WARNING: DO NOT APPLY VOLTAGE TO MEASURING TERMINAL WHILE RANGE SWITCH IS IN CURRENT POSITION. DO NOT ATTEMPT TO MEASURE AC CURRENT.

1. Set the selector switch to the appropriate DC mA range to be used and connect the test leads **in series with** the circuit or the load under measurement. If the pointer deflects to the left，reverse the probes.
2. Connect the BLACK test lead to the “-COM” jack and the RED test lead to the Red “+” jack for Current at/less than 0.25A. For large current max. 10A， move the red test lead to the Red “10A” jack.
3. Check the needle position and the get the reading on V.A scale.

Note:

Excessive current input across mA range will blow the fuse that must be replaced by a same fuse rating 0.5A/250V or 10A/250V. The max. testing time shall be not more than 1min. for big current load.

The Maximum terminal voltage drop is 250mV except for the 10A range.

Note: If connected incorrectly with the voltage at these ranges， quickly remove the test leads from the circuit as to avoid damage to this tester.
(This tester can afford the voltage <250V DC/AC rms. for the period of 5 seconds max.)

Resistance Measurement

WARNING: DO NOT APPLY VOLTAGE TO MEASURING TERMINAL WHILE RANGE SWITCH IS IN OHM POSITION.

1. Set the selector switch to the appropriate Ω range to be used.
2. Connect the BLACK test lead to the “-COM” jack and the RED test lead to the Red “+” jack.
3. Short the leads by touching the probes together. Pointer should read zero at the right hand end of the upper most scale， if it doesn’t， use the Ohm adjust knob on the right hand of the panel to line up the pointer with zero. (If pointer can’t be brought to zero， replace battery.)
4. Connect the test leads across the resistance to be measured.
5. Take reading on the top “Ω” scale and multiply it by the multiplication factor indicated by the selector switch.
6. If there is little or no pointer movement from the left side of the scale， reset the selector switch to higher range. The effective reading scope on an Ohm meter scale is within the area of between 25 degree of Arc left side to the Midscale and 25 degree right side to the Midscale.

Note: If connected incorrectly with the voltage， quickly remove the test leads from the circuit as to avoid damage to this tester. (This tester can afford the voltage <250V DC/AC rms. for the period of 5 seconds max.)

Diode Measurement

1. Set the selector switch to the appropriate Ω range to be used.

NOTE: To test the diode while current below 0.060 mA at X 10K range; current below 0.15 mA at X 1K range; current below 1.5 mA at X 100 range; current below 15 mA at X 10 range; current below 150 mA at X 1 range.

2. **For IF (forward current) test**， put the BLACK test lead to the "-COM" jack and the RED test lead to the Red "+" jack. And then connect the Black probe to the Positive terminal of the Diode， the Red probe to the Negative terminal of the Diode.
   For IR (reverse current) test， reverse the connection.
3. Read the value IF or IR of the diode on the LI scale.
4. Read the linear (forward voltage) VF of the diode on the LV scale.

Continuity Buzzer Test

WARNING: DO NOT APPLY VOLTAGE TO MEASURING TERMINAL WHILE RANGE SWITCH IS IN OHM POSITION.

Set the selector switch to the BUZZ range. Connect the test leads to two points of circuit. If the resistance is lower than 200 Ohm approx.， the Beeper sounds.
Note: Battery voltage is sufficient for Buzzer operation as long as the Zero Ohm pointer can be adjusted to the Zero scale place.

Note: If connected incorrectly with the voltage， quickly remove the test leads from the circuit as to avoid damage to this tester..
(This tester can afford the voltage <250V DC/AC rms. for the period of 5 seconds max.).

Transistor hFE and LED Test

1. Set the selector switch to the R X 10 range.
   FOR Measuring Transistor hFE
2. Take note the type of transistor "PNP" or "NPN" and then insert the transistor terminals of the Emitter， Base and Collector

separately into the proper holes of the socket on the front panel.
3. Read the approximate hFE Value directly at the hFE scale.
Note: Current 10μA. VCE 2.8V.
4. When the Base terminal cut， the value of Leak is Iceo for Transistor.

FOR Measuring LED: Insert the transistor terminals directly into the "**+**" and "**-**" holes of the socket on the front panel. And then check if the LED under testing is lighting.

IR Data(Infrared Signal) Check

This function is used to check if the remote control can yield the Infrared signal normally.

Firstly set the rotary switch to the measuring range "IR Data". And then take the remote control in vertical place(Within **90°±15°**) nearby the LED lighting on the dial panel of the tester. Push any button on the remote control and then see the indication case of LED lighting. If this Red LED light gets flashing，it means the remote control is working well. Otherwise， it means the remote control might have the problem accordingly.

Note: The distance shall be less than 50cm between meter to the remote control.

AC Live Check

This function is used to check and identify the AC Live polarity of wires or outlets.

1. Set the selector switch to the range AC Live.
2. Connect one test probe to the "+" jack of this tester
3. Take this test lead's tip to contact the terminal of wire or outlet
4. Then see the indication case of Red LED lighting. If this Red LED light is lit， it means the contacted wire or end of outlet is Live line. Otherwise，it should be the Zero line or Ground wire.

Decibels Measurement

1. Set the selector switch to AC 10V range.
2. Connect the BLACK test lead to the “-COM” jack and the RED test lead to the Red “+” jack.
3. Connect the test leads to the measuring circuit specially in series with a 0.047μF/400V Metalized Polyester Capacitor. And then read the bottom Red dB scale.
4. For more dB scope，change the selector switch to the others of ACV ranges and make the same actions. Add the appropriate number of dB scale reading as noted on the chart below.
   NOTE: For absolute dB measurements， circuit impedance must be 600 Ohm. 0 dB = 1mw dissipated in a 600 Ohm impedance (equivalent to 0.755V across 600 Ohm)

ACV RANGE	ADD dB Number
50	14
250	28
1000	40

Capacitance Measurement

WARNING: DO NOT APPLY VOLTAGE TO MEASURING TERMINAL WHILE MAKING ANY CAPACITANCE MEASUREMENTS.
BEFORE TESTING ANY CAPACITORS， DISCHARGE THE CAPACITOR COMPLETELY.

1) Set the selector switch to the R X 1K range.
2) Connect the BLACK test lead to the “-COM” jack and the RED test lead to the Red “+” jack.
3) Connect the test leads to the capacitor to be measured (Note the polarity of capacitor).
4) Watch the needle deflection to the right topside， and read the Red C2000uF scale on the Dial.

Troubleshooting

Nevertheless， problems or malfunctions may occur.
For this reason， the following is a description of how you can eliminate possible malfunctions yourself:

Error	Possible cause
The multimeter does not work.	Are the batteries exhausted? Or the inner batteries bad contacted? Check the status of the batteries and if the fuse 0.5A is good or contacted well.
No measurements possible via V/mA socket.	Is the fuse defective? Check the fuse 0.5A (fuse replacement)
No measurements possible via 10A socket.	Is the fuse defective? Check the fuse 10A (fuse replacement)
No change in measured values.	Have you selected the right measuring sockets? Is the measuring range/mode correct (AC/DC)?
Faulty measuring results are displayed.	Has null balancing of the display or a 0 Ohm calibration for the resistance measurement been carried out? Is the batteries not properly assembled in?

MAINTENANCE

Replacement for Battery and/or Fuse should only be done after the test leads have been disconnected and POWER OFF.

1. **Battery Replacement**
   1). Note the condition of the batteries using the procedure described above， if the battery needs to be replaced，remove the screw and open the upper cover of the battery cabinet on the rear case.
   2). Take off the spent batteries and replace them with a battery of the same type. Observing polarity as indicated battery polarity marking on the bottom of the battery compartments.
   3). Replace the battery cabinet cover and tighten the screw.

2. **Fuse Replacement**
   1). When the fuse needs replacement， use only UL-Listed 0.5A/250V fuse or 10A/250V fuse identical in physical size to the original type Φ5 x 20 mm 0.5A/250V; or Φ6 x 32 mm 10A/250V.
   2). Disassemble the side Holsters， and take off the screw，then open the whole rear case. Remove the old fuse from its holder; install the new fuse into it.
   3). Replace the rear cover & Holsters， and tighten the screw.