

# INSTRUCTION MANUAL

MODEL HC-5050E



**HUNG CHANG**

# SAFETY RULES

## Warning

This **tester** has been designed with safety in mind. However, no design can completely protect against incorrect use. Electrical circuits can be dangerous and/or lethal when lack of caution or poor safety practices are used.

## Read The Manual

Read this **Instruction Manual** carefully and completely.

Voltages and currents within the capability of this test equipment can be hazardous. Follow the instructions in this manual for every measurement. Read and understand the general instructions before attempting to use this **tester**. Do not exceed the limits of the **tester**.

## Safety Check

Double check the switch setting, and lead connections before making measurements. Are you following all of the instructions?

Disconnect the **tester** or turn off the power before changing switch positions.

Do not connect to circuits with voltage present when switch is in any ohms or **current** Position.

When replacing fuses, use only specified type fuses and insert in correct fuse holder.

## Don't Touch

Don't touch exposed wiring, connections or other "live" parts of an electrical circuit, If in doubt, check the circuit first for voltage before touching it.

Turn off the power to a circuit before connecting test probes to it. Be sure there is no voltage present before you touch the circuit.

Do not use cracked or broken test leads.

## High Voltage Is Dangerous

Always start with the power off. Be sure there is no voltage present before making connections to the circuit.

Don't touch the tester, its test leads, or any part of the circuit while it is switched on.

## Distribution Circuits Pack A Punch

In high energy circuits such as distribution transformers and bus bars, dangerous arcs of explosive nature can occur if the circuit is shorted. If the tester is connected across a high energy circuit when set to a low resistance range, a current range, or any other low impedance range, the circuit is virtually shorted.

Special equipment designed for use with these circuits is available. Contact a qualified person for assistance before attempting to make measurements on any high energy circuit.

**SAFETY IS NO ACCIDENT**

# SECTION 1

## Introduction & Specification

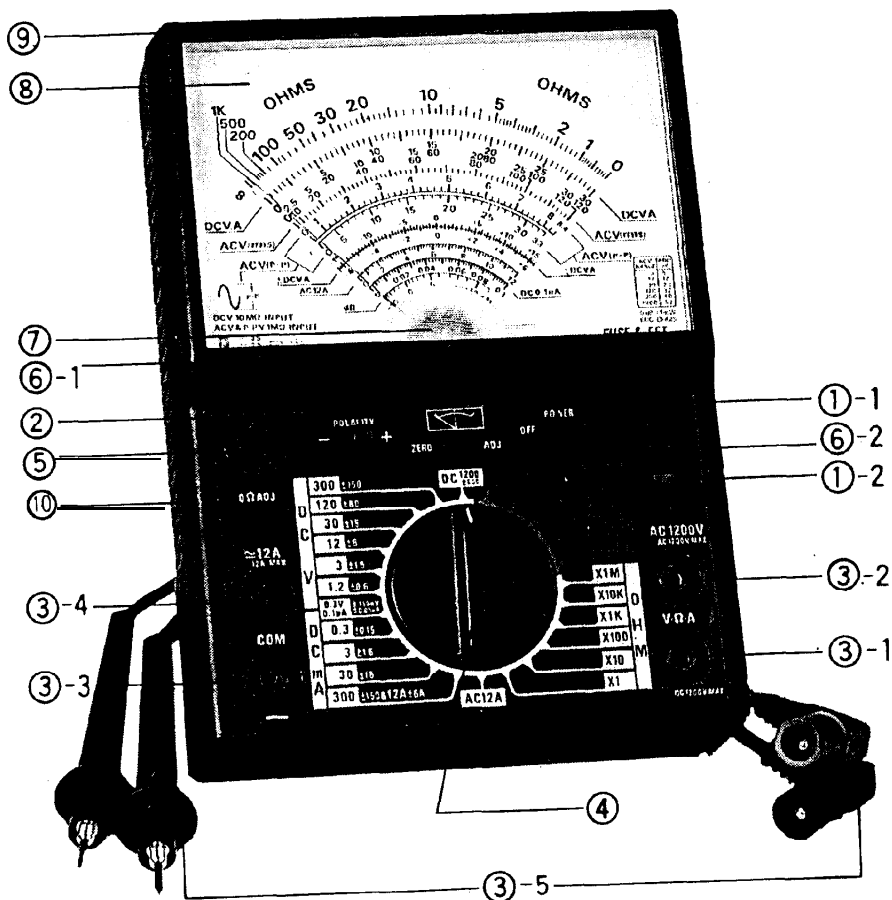


FIG. 1-1. Controls, Indicators and Connectors

## Table 1-1. Controls, Indicator and Connector

- ①-1. Power-on-off switch: A slide switch used to turn the instrument off or on.
- ①-2. Working sign lamp: The lamp will glow, indicating that 9V BAT in this instrument is applied and in good condition. If not glow, the 9V BAT should be change as soon as possible.
- ②. Polarity reverse switch: A slide switch used to change DC polarity instead if the input signal reversing.
- ③ -1, 2, 3, 4. Input Sockets (Compiled to UL1244, VDE 0411) : 4 Inputs sockets are recessed and protected against accidental contacts.
- ③-5. Test Leads (Compiled to UL 1244, VDE 0411): The test leads supplied with the equipment give added safety to the user since the jacks are shrouded , thus avoiding dangerous connections to eventual high voltages. The prods supplied have guard rings to keep fingers away from the naked end.
- ④. Range Selector Knob: The single knob ranges switch has 24 positions. It may be turned in either direction to obtain any desired range and circuit Position.
- ⑤. "0"  $\Omega$  ADJ: Every time, adjust the "O" ohm ADJ to see that the pointer indicates zero when the meter is in each O H M r a n g e .
- ⑥-1. Meter Mechanical Zero ADJ: If the meter pointer does not indicate zero after the instrument's power has been off, rotate zero adjustment screw until pointer is exactly on zero on the left side of dial.
- ⑥-2. DC Center Zero ADJ: When pointer is exactly on zero at center of meter on the  $\pm$  DC V•A scale line, this instrument will be used in Galvano meter type.
- ⑦. Inner core type moving coil movement :  
High sensitive movement Systems are patented.

PAT. No KOREA 9546  
USA 4139821  
FRANCE 7709426  
W/GERMANY 7709878  
JAPAN 1063542  
TAIWAN 11114

- ⑧ Meter Dial :  
4½" Mirrored real 90" arc, w/knife edge pointer, enables  
easy reading & more accuracy.
- ⑨. Case : High impact shock-resistant case.
- ⑩. Tilt stand :  
For Bench-Top using & slip preventing rubber feet.

## SPECIFICATIONS

### Dc Volts

Ranges : 0-0.3, 1.2, 12, 30, 120, 300, 1200V  
0- ± 1.5, 0.6, 6, 15, 60, 150, 600V at Center 0.

Input Impedance: Approx 10MΩ, 3MΩ at 300mV range.

Rated Accuracy : With ± 2.5% DC and ±3.5%AC of full scale on  
all ranges.

### AC Volts

Ranges : RMS 0-3, 12, 30, 120, 300, 1200v  
Peak-peak, 0-8.4, 33, 84, 330, 840, 3300  
RMS 1200V (peak to peak 3300V) on separate jack.

Input Impedance: Approx 1MΩ 80 pF, 2.5MΩ it 3 V Range

Rated Accuracy : 30Hz – 1 MHz ± 3.5% at sine wave  
at 3V range only  
30Hz – 5 KHz ± 3.5% at sine wave  
at 12V – 300V Range.  
30Hz – 500Hz ± 5% at sine wave. 1200V Range

dB : -10dB – + 63 dB at AC Ranges.

### DC Currents

Ranges: 0-0.1μA, 0.3, 3, 30, 300mA, 12A  
potential Drop: 300mV  
Rated Accuracy: Within ± 2.5% full scale, all ranges.

## AC Currents

Ranges: 0-12A, within  $\pm 3.5\%$  full scale. DC, AC 12 Amp range on Separate jack.

## DC Resistance

Ranges :	RX 1	0-1K $\Omega$ (Center 10)	
	Rx 10	0-10K $\Omega$ (Center 100 $\Omega$ )	
	R x 100	0-100K $\Omega$ (Center 1K $\Omega$ )	
	R x 1K	0-1M $\Omega$ (Center 10K $\Omega$ )	
	R x 10K	0-10M $\Omega$ (Center 100K $\Omega$ )	
	RX 1M	0-1000M $\Omega$ (center	10M $\Omega$ )

Accuracy :  $\pm 2.5^\circ$  Arc

Front panel controls: Range selector switch, power on-off switch, w/working sign lamp, polarity reverse switch, "0" OHM ADJ, Center "0" ADJ.

Movement: jewelled-Pivots-90" ARC, 44  $\mu$ A F.S.

Dial ARC: One Arc for OHMS, one arc for DC V.A.

9 arcs : One Arc for AC rms, 2 Arc for AC peak-peak,  
One Arc for  $\pm$ DC V.A (Center Null)  
One Arc for AC 12A  
One Arc for DC 0.1 $\mu$ A, one Arc for dB.

Scale length : 4%"

Lead reversal: Polarity Reverse Switch: on DC and OHMS ranges

Operating Position: Horizontal or Vertical, rubber feet to prevent slipping on moderate slopes.

Batteries : 2 x 1.5V A.A pencil and 9V battery.

Movement & Indicator Protection: Double F.E.T. protection & Fuse. (2A/250V).

Operating Temperature Range: 25°C (75°F) rated accuracy: less than 4% additional error over the range of -4°C (25°F) to 50°C (130°F)

Size : 125M/M (5") W x 170 (6 $\frac{3}{4}$ ")L x 50 (2") D 480g (17 ounces).

Construction: Combination high impact plastic case & phenolic: PC Board.

Color : Black with white scale.

## SECTION 11

# OPERATING INSTRUCTIONS

### CAUTION

Be extremely careful when working in high voltage circuits. Even though **meter and** test leads are well insulated, it is **not** advisable to handle the instrument or leads while power is on in the circuit being measured.

### NOTE

1. If the value of **the** voltage or **current** to be measured is unknown, always **start** with the highest range to avoid overloading the **tester**. The Range Selector **Switch** should not be rotated while **under** load.
2. The life and reliability of the **tester** will be greatly increased if test leads are removed from the circuit before **changing** ranges.
3. Before making any measurements, check to see that working sign **lamp's** flashing when the power **switch** is in the on Position.
4. Before making any measurements, check to see **that** the **pointer** indicates zero when the power **switch** is in the "Off" Position. If the **pointer** is off **zero**, make the required correction by turning the **screw** of the mechanical zero ADJ. When the power **switch** is in the "on" Position, if the **pointer** is off **zero**, rotate DC center zero ADJ until **pointer** is at zero on the left edge of dial.

### Measuring DC Voltages 0.3 through 1200 Volt Range

1. Connect the black test lead into the COM-jack and the red test lead into the V·Ω·A jack.
2. Set the range **switch** for any of the seven DC volts range positions desired. When in doubt as to **which** range to use, always **start** with the highest voltage range as a **protection** to the instrument.



3. Connect the black test lead to the negative side of the circuit to be measured and the red test lead to the positive side of the circuit .

4. Set reversing switch to the + Position. Turn the power on in the circuit to be tested. If the pointer deflects to the left of zero, the actual circuit polarity is the reverse of that anticipated,

In this case, turn off power in the circuit to be tested, set the reversing switch to the - position and turn power on again.

5. Read the voltage on the black arc marked DC which is second from the top of the dial. If the voltage is within a lower range, the switch may be set for a lower range to obtain a more accurate reading.

### Measuring AC Voltages RMS, 3V to 1200 V

(8.4V ~ 3300 v, P-P)

1. Connect the black test lead into the COM-jack and the red test leads into the  $V \cdot \Omega \cdot A$  jack.
2. Set the range switch for any of the five AC V range positions desired. When in doubt as to which range to use, always start with the highest voltage range as a protection to the instrument.
3. Turn power on in the circuit to be tested. Read the voltage on the black arc marked AC V( RMS) on the red arc marked AC V (P-P)

### Measuring AC Voltages, 1200 Volt Range Only

#### CAUTION

Be **extremely** careful when working in high voltage circuits. Even though the METER and test leads are well insulated for this voltage, it is not advisable to handle either when power is on in the circuit .

1. Set the range switch at 1.200 VAC (the same switch position as for the 300 VAC range).
2. Turn off power in the circuit being measured.
3. Connect the black test lead in the COM-jack, and the red test lead in the 1200 VAC jack.
4. Turn on power in the circuit being measured.
5. Read the voltage on the black arc marked AC V(RMS) on the red arc marked AC V(P-P).

## Measuring Decibels

For some applications, power loss or gain measurements in terms of DB are required. The DB is defined as:

$$DB = 10 \log \frac{Power_1}{Power_2} \text{ or,}$$

$$20 \log \frac{E_1}{E_2} \text{ when } R_1 = R_2$$

This instrument is calibrated with 0 DB referenced to 1 milliwatt at  $600\Omega$ . i.e., DB reading corresponds to  $20 \log \frac{E \text{ (reading)}}{0.774V}$

(E measured across  $600\Omega$ ). The decibel scale at the bottom of the dial is numbered from -10 through 0 to + 11 To measure decibels, proceed according to instructions for AC Voltages, and read the DB arc. The DB scale is calibrated for direct reading on the 3 V range. Scale factors for other ranges are given in the table below.

### DB Scale Factor (add to Reading)

Range	DB reference 1mw $600\Omega$
3v	direct
12v	(+12)
30v	(+20)
120v	(+32)
300v	(+40)
1200v	(+52)

## Measuring Resistances

When DC resistances are measured, the internal batteries furnish power for the measuring circuit. Correction for battery deterioration over long periods of time is provided by means of the Zero Adjust control which is part of the Ohmmeter circuit.

1. Set the range switch at the desired resistance range position
2. Connect the black test lead in the COM – jack, and the red test lead in the  $V \cdot \Omega \cdot A$  jack.
3. Connect the contact ends of the test leads together.

4. Observe the instrument indication. It should read "0" on the OHMS arc. which is at the top of the dial.
5. If the pointer does not read "0", rotate the ZERO OHMS knob at the left on the front panel until it does. If the pointer cannot be brought up to the "0" mark, the appropriate battery should be replaced.

### NOTE

**Disconnect** power from any resistor or circuit to be measured before measuring resistance. **Do** not apply any power before the measurements are completed and the test leads are **disconnected**.

6. Connect the test leads across the resistance which is to be measured. If there is a "forward" and "backward" resistance, such as with rectifiers and diodes, observe polarity in the lead connections to control each direction of test. With the reversing switch in the - Position, the + jack will provide a positive potential referred to the COM-jack. Setting the switch to the - position will reverse this measuring potential.
7. Read the indication on the OHMS arc at the top of the dial. Note that the arc reads from right to left for increasing values.
8. Multiply the reading by the multiplier factor indicated at the switch Position: the result is the resistance value in ohms. "K" on the dial stands for "thousand."

### CAUTION

Never connect the test leads directly across any **source** of voltage when used for **current** measurements. This will damage the instrument.

Measuring **Direct** Current, All Ranges Except 12A Range

### CAUTION

Never connect the test leads directly across any **source** of voltage when the instrument is **used** for **current** measurements. **This** will damage, the instrument.

1. Connect the black test lead in the COM – jack, and the red test lead in the  $V \cdot \Omega \bullet A$  jack.
2. Set the range switch for the appropriate milliampere range.
3. With the circuit power turned off, open the circuit at the point where its current is to be measured. Connect the instrument in series with the circuit, observing proper polarities when making connection.
4. Turn on power to the circuit being measured. If the pointer is deflected to the left of zero, the polarity is opposite to that which was anticipated. Set reversing switch to the – position to obtain an up-scale indication.

### Measuring the 12Amp Range

1. Connect the black test lead in the COM-jack, and the red test lead in the 12A jack.
2. Set the range switch at appropriate range of AC, DC.
3. With the circuit power turned off, open the circuit at the point where current is to be measured. Connect the instrument in series with the circuit, observing proper polarities when making connection.
4. Turn on power to the circuit being measured. If the pointer is deflected to the left of zero, the polarity is opposite to that anticipated. Turn power off and reverse the leads. The reversing switch must be kept in the + position on this range.
5. Read the current directly on the black arc marked at DC 12A range.
6. Read on the red arc marked AC 12A, at AC 12A range.

## MAINTENANCE

### Battery & Fuse Replacement

Two batteries are used for the ohmmeter circuits, two 1.5 volt and a 9 volt.

When the meter pointer can no longer be adjusted to zero ohms on the all ohm ranges, replace the 1.5 volt battery.

To replace batteries & Fuse (2A/250V), remove the 3 screws in the bottom of the case. Simply remove the old and replace with a new battery being careful to observe polarity.

## Care

A little precaution in handling and caring for your tester can pay big dividends in satisfaction. Treat your tester like you would do a fine watch.

Avoid placing your tester on a bench where machine tools are used or severe Vibration is encountered.

Do not place near the edge of a shelf or bench where it can easily be knocked off.

When possible, keep your tester in a place of moderate temperatures. Avoid places with extreme temperatures or severe temperature changes

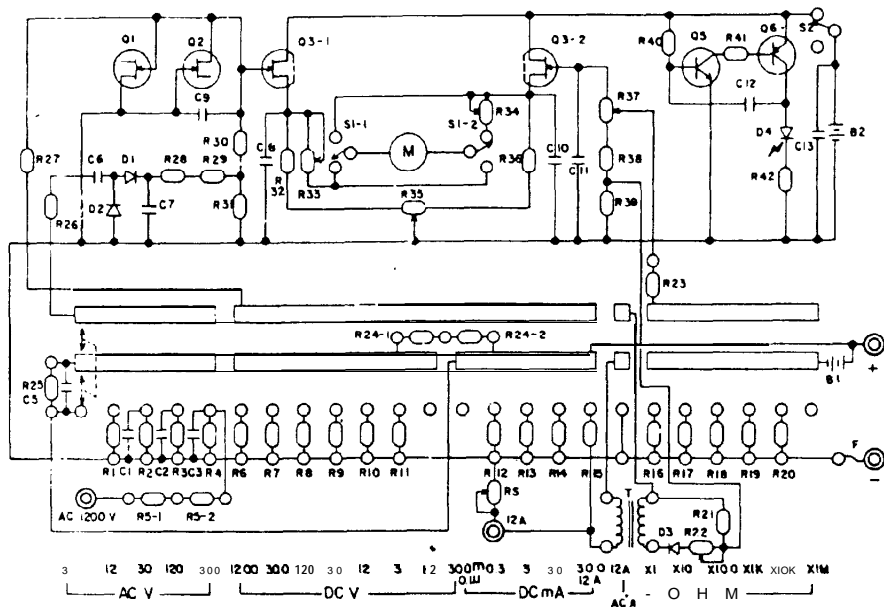
In use, don't take chances on overloading the meter. If in doubt as to the approximate reading, always start with the highest range.

Get in the habit of double checking the position of the switch before making a measurement. The meter can be burned out by applying voltage when the switch is set on the current or ohms range.

If the unit has not been in use for a long period of time, rotating the switch in both direction several times will wipe the contacts for good and clean connection .

Turn the selector switch to OFF when the unit is to be carried. The meter is damped in this position to prevent wild swinging of the pointer.

# SCHEMATIC DIAGRAM



- |       |          |                  |            |
|-------|----------|------------------|------------|
| R1    | 375K     | R37              | 1M VR      |
| R2    | 110K     | R38              | 800K       |
| R3    | 250K     | R39              | 500K       |
| R4    | 93K      | R40              | 470K       |
| R5-1  | 2M       | R41              | 5.6        |
| R5-2  | 17M      | R42              | 33         |
| Rd    | 225K     | R43              | 33         |
| r7    | 9.05K    | R44              | 15P        |
| R8    | 227K     | C1               | 15P        |
| R9    | 930K     | C3               | 200P       |
| R10   | 250K     | C5               | 4P         |
| R11   | 15M      | C8, C9, C10, C11 | 0.01M      |
| R12   | 1K       | C12              | 4.7M       |
| R13   | 100      | C13              | 68M        |
| R14   | 10       | C1, C2           | 25K30A-Y   |
| R15   | 0.975    | Q3               | 2N3950     |
| R16   | 3        |                  | 100AL1     |
| R17   | 100      | Q5               | 2N3904     |
| R18   | 1K       | D1, D2           | FDH400     |
| R19   | 10K      |                  | 0.4KLR208E |
| R20   | 101K     | B1               | 15VAAX2    |
| R21   | 4K       | B2               | 9V         |
| R22   | 30K SEMI | C2               | 100P       |
| R23   | 8M       | C6, C7           | 0.041      |
| R24-1 | 5M       | a                | 2N3905     |
| R24-2 | 4M       | Q3               | 1N40       |
| R25   | 900K     | F                | 2A250V     |
| R26   | 1K       | T                | TRANS      |
| R27   | 500K     |                  |            |
| R28   | 15M      |                  |            |
| R29   | 7.7M     |                  |            |
| R30   | 175M     |                  |            |
| R31   | 750K     |                  |            |
| R32   | 1K       |                  |            |
| R33   | 1K SEMI  |                  |            |
| R34   | 1K SEMI  |                  |            |
| R35   | 1K VR    |                  |            |
| R36   | 1K       |                  |            |



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