## CONTENTS

1. Safe Testing ........................................................................................................... 1
2. Procedure of removing cover ................................................................................. 4
   2.1 Method of removing the cover ........................................................................... 4
   2.2 Method of storing the cover ............................................................................. 4
3. Features .................................................................................................................. 5
   3.1 Instrument Layout ........................................................................................... 5
   3.2 Test Lead ......................................................................................................... 6
   3.3 Optical Adapter Model 8212 ............................................................................ 6
   3.4 Test Range (Function) ..................................................................................... 7
   3.5 Applied Standards ......................................................................................... 7
   3.6 Features ......................................................................................................... 7
4. Specification .......................................................................................................... 9
5. Loop Impedance / PSC Tests ................................................................................. 12
   5.1 Principles of Measurement ............................................................................. 12
   5.2 LOOP Impedance and PSC Testing ................................................................. 18
6. RCD Tests ............................................................................................................. 20
   6.1 Principles of Measurement ............................................................................. 20
   6.2 RCD Testing ................................................................................................... 22
7. Uc Tests ............................................................................................................... 24
   7.1 Principles of Measurement ............................................................................. 24
   7.2 Uc Testing ...................................................................................................... 24
8. Auto-Test .............................................................................................................. 25
9. Store / Recall a measured result .......................................................................... 25
   9.1 How to store data .......................................................................................... 25
   9.2 Recall the stored data .................................................................................... 26
   9.3 Delete the stored data .................................................................................... 27
   9.4 Transfer the stored data to PC ....................................................................... 27
10. Battery replacement ............................................................................................ 28
11. Servicing ............................................................................................................. 29
12. Case and Strap assembly .................................................................................... 29
1. SAFE TESTING

Electricity is dangerous and can cause injury and death. Always treat it with the greatest of respect and care. If you are not quite sure how to proceed, stop and take advice from a qualified person. This instruction manual contains warning and safety rules which must be observed by the user to ensure safe operation of the instrument and retain it in safe condition. Therefore, read through these operating instructions before using the instrument.

IMPORTANT:
1. This instrument must only be used by a competent and trained person and operated in strict accordance with the instructions. KYORITSU will not accept liability for any damage or injury caused by misuse or non-compliance with the instructions or with the safety procedures.
2. It is essential to read and to understand the safety rules contained in the instructions or with the safety procedures.

The symbol indicated on the instrument means that the user must refer to the related sections in the manual for safe operation of the instrument. Be sure to carefully read instructions following each symbol in this manual.

⚠️ DANGER is reserved for conditions and actions that are likely to cause serious or fatal injury.

⚠️ WARNING is reserved for conditions and actions that can cause serious or fatal injury.

⚠️ CAUTION is reserved for conditions and actions that can cause a minor injury or instrument damage.
**DANGER**

- This instrument corresponds to L-PE: 230V+10%-15%50Hz. (for some of ranges; L-L: 400V+10%-15%50Hz)
- Be sure to use it within this rated voltage.
- When conducting tests do not touch any exposed metalwork associated with the installation. Such metalwork may become live for the duration of the test.
- When testing, always be sure to keep your fingers behind the safety barriers on the test leads.
- For safety reasons only use accessories (test leads, probes, cases, etc) designed to be used with this instrument and recommended by KYORITSU. The use of other accessories is prohibited as they are unlikely to have the correct safety features.
- THE WIRING CHECK LED (P-E, P-N) of this instrument is to protect the user from electrical shock resulting from incorrect connection of Line and Neutral or Line and Earth.
- When the Neutral and Earth conductors are incorrectly wired, the WIRING CHECK LED function cannot identify the incorrect connection. Other procedures and test must be conducted to check and confirm that the wiring is correct prior to making measurement.
- Do not use this instrument to check the correct wiring of the power supply.
- Kyoritsu will not be held liable for any accident that may result from incorrect wiring of the power supply line.
⚠️ **WARNING**

- **Never open the instrument case** - (except for battery replacement and in this case disconnect all leads first) because dangerous voltages are present. Only fully trained and competent electrical engineers should open the case. If a fault develops, return the instrument to your distributor for inspection and repair.
- If the overheat symbol appears on the display (🔥) disconnect the test lead from the circuit and allow to cool down.
- If abnormal conditions of any sort are noted (such as a faulty display, unexpected readings, broken case, cracked test leads, etc) do not use the tester and return it to your distributor for repair.
- Never attempt to use the instrument if the instrument or your hand is wet.
- Do not rotate function switch when test button is depressed.

⚠️ **CAUTION**

- During testing it is possible that there may be a momentary degradation of the reading due to the presence of excessive transients or discharges on the electrical system under test. Should this be observed, the test must be repeated to obtain a correct reading. If in doubt, contact your distributor.
- Use a damp cloth and detergent for cleaning the instrument. Do not use abrasives or solvents.
- Before using the instrument, please insert the batteries rightly in accordance with the "10. BATTERY REPLACEMENT" of page 28. When not installing batteries, all the functions of the instruments don't work.
2. PROCEDURE OF REMOVING COVER

Model 6050 has a dedicated cover to protect against an impact from the outside and prevent the operation part, the LCD, and the connector socket from becoming dirty. The cover can be detached and put on the back side of the main body during measurement.

2.1 Method of removing the cover

![Fig. 1](image1)

2.2 Method of storing the cover

![Fig. 2](image2)
3. FEATURES

3.1 Instrument Layout

1...... LCD
2...... RCD FUNCTION SELECT SWITCH
      (MEMORY RECALL SWITCH)
3...... 0° / 180° SELECT SWITCH
      (ENTER SWITCH)
4...... UL VALUE SELECT SWITCH
      (MEMORY CLEAR SWITCH)
5...... TEST BUTTON
6...... WIRING CHECK LED
      LED indication of correct polarity is that the P-E and P-N LEDs are
      lit. P and N are reversed when the reverse LED is lit.
7...... "I\text{\textsubscript{A}}\text{\textsubscript{N}} / LOOP / PSC" SELECT SWITCH
      (MEMORY SELECT SWITCH)
8...... MEMORY MODE SWITCH
      (MEMORY MODE EXIT SWITCH)
9...... FUNCTION SWITCH

Operation at Memory mode is shown in ( ).
3.2 Test Lead
The instrument is supplied with Model 7125 Lead at socket outlets and Model 7121, which is an option, for measuring distribution board.

1. Model 7125

![Fig.6](image)

2. Model 7121 (Optional Accessory)

![Fig.7](image)

3.3 Optical Adapter Model 8212 (Optional Accessory)
For Model 6050, data can be transferred to PC via Optical Adapter Model 8212. Model 8212 is supplied with PC software "KEW REPORT".

![Fig.8](image)

Model 8212 operates PC/AT compatible machine on Windows® 98/ME/2000/XP. Please refer to "9.4 Transfer the stored"
data to PC" for further details. Windows® is a registered trade mark of Microsoft in the United states.

3.4 Test Range (Function)
Model 6050 performs four functions.
1. LOOP.....Loop impedance tester
2. RCD.......RCD tester
3. Uc............Contact voltage tester
4. PSC........Prospective short circuit current tester

3.5 Applied Standards
Instrument operation: IEC/EN61557-1,3,6,10
Safety: IEC/EN61010-1 CAT III (300V)-instrument
         IEC/EN61010-031 CAT III (600V)-test lead
Protection degree: IEC60529 (IP54)

3.6 Features
Model 6050 has the following features:

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiring check</td>
<td>Three LEDs indicate if the wiring of the circuit under test is correct.</td>
</tr>
<tr>
<td>Over temperature protection</td>
<td>Detects overheating of the internal resistor and of the current control MOS FET displaying a warning symbol ( ⬕ ) and automatically halting further measurements.</td>
</tr>
<tr>
<td>Phase angle selector</td>
<td>RCD test can be selected from either the positive (0°) or from the negative (180°) half-cycle of voltage. At both polarity, test minimum (best) and maximum (worst) trip times.</td>
</tr>
<tr>
<td>Auto data hold</td>
<td>Measured result is being held until any switch other than MEM switch is pressed. Instrument is back to voltage measurement mode when applying voltage again during data hold function is operated.</td>
</tr>
<tr>
<td>Feature</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>UL value selector</td>
<td>Select UL (limit of contact voltage value) 25V or 50V. Where Uc (contact voltage) exceeds UL value at RCD testing, “Uc H” will be displayed without starting the measurement.</td>
</tr>
<tr>
<td>Voltage Indication</td>
<td>When connecting Test Lead to circuit, voltage between L-PE is displayed. If the voltage is lower than 100V, displayed as “V L-PE Lo”. And if it is higher than 260V, displayed as ”V L-PE Hi”. But on L-L measurement range, displayed as ”V L-PE Hi” if the voltage is 440V or more.</td>
</tr>
<tr>
<td>Low battery warning</td>
<td>&quot;Battery&quot; symbol appears in the display if the battery voltage drops below 8V.</td>
</tr>
<tr>
<td>Auto power off</td>
<td>Automatically switches the instrument off after a period of approximately 10 minutes.</td>
</tr>
<tr>
<td>Display</td>
<td>The liquid crystal display has 3 1/2 digits with a decimal point and units of measurement (V, Ω, A, kA, mA, ms)</td>
</tr>
<tr>
<td>Data memory, Communication facility</td>
<td>Can store 300 measured result. Data can be transferred to PC via Optical Adapter Model 8212.</td>
</tr>
</tbody>
</table>
| Optional Accessory           | 1) Model 7121 for measuring distribution board or lighting circuit test lead.  
2) Optical Adapter Model 8212 (with PC software "Kew Report")                          |
| Auto Test                     | Instrument becomes Auto test mode by turning Test button to right and locked it. Under Auto test mode, test starts automatically only by connecting Test Lead to a measuring circuit. |
4. SPECIFICATION

Measurement Specification

<table>
<thead>
<tr>
<th>Function</th>
<th>Range</th>
<th>Rated Voltage (AC)</th>
<th>Test Current</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOOP</td>
<td>20Ω</td>
<td>L-PE : 230V $^{\pm 10%}$ 50Hz</td>
<td>3A</td>
<td>± (3%rdg+8dgt)</td>
</tr>
<tr>
<td></td>
<td>200Ω</td>
<td>L-PE : 230V $^{\pm 10%}$ 50Hz</td>
<td>15mA</td>
<td>± (3%rdg+8dgt) At L-L measurement: ± (3%rdg+12dgt)</td>
</tr>
<tr>
<td></td>
<td>2000Ω</td>
<td>L-L : 400V $^{\pm 10%}$ 50Hz</td>
<td>15mA</td>
<td>± (3%rdg+8dgt)</td>
</tr>
<tr>
<td>PSC</td>
<td>200A</td>
<td>L-PE : 230V $^{\pm 10%}$ 50Hz, L-L : 400V $^{\pm 10%}$ 50Hz</td>
<td>15mA</td>
<td>PSC accuracy is derived from measured loop impedance specification.</td>
</tr>
<tr>
<td></td>
<td>2000A</td>
<td>L-PE : 230V $^{\pm 10%}$ 50Hz</td>
<td>3A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>20kA</td>
<td>L-PE : 230V $^{\pm 10%}$ 50Hz</td>
<td>max15mA, 5mA only at 14n=10mA</td>
<td>+5%～+15% ± 8dgt</td>
</tr>
</tbody>
</table>

Function | Range | Rated Voltage (AC) | Test Current | Accuracy          |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Uc</td>
<td>100V</td>
<td>L-PE : 230V $^{\pm 10%}$ 50Hz</td>
<td>max15mA, 5mA only at 14n=10mA</td>
<td>+5%～+15% ± 8dgt</td>
</tr>
<tr>
<td>Function</td>
<td>Range</td>
<td>Rated Voltage (AC)</td>
<td>Accuracy</td>
<td></td>
</tr>
<tr>
<td>--------------------------</td>
<td>--------------------------------</td>
<td>-------------------------------------</td>
<td>---------------------------------</td>
<td></td>
</tr>
<tr>
<td>Voltage Measurement</td>
<td>100-260V</td>
<td>100-260V</td>
<td>±(2%rdg+4dgt)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>L-L corresponding range:</td>
<td>L-L corresponding range:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100-440V</td>
<td>100-440V</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function</th>
<th>Rated Voltage (AC)</th>
<th>Accuracy</th>
<th>Trip Current</th>
<th>Trip Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>× 1/2</td>
<td></td>
<td>-8%～-2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>× 1</td>
<td>L-PE :</td>
<td>+2%～+8%</td>
<td></td>
<td>± (1%+3dgt)</td>
</tr>
<tr>
<td>× 5</td>
<td>230V±10% -15% 50Hz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DC</td>
<td></td>
<td>± 10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auto Ramp</td>
<td></td>
<td>± 4%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Bias current (DC6mA) added to DRange.

RCD Trip Current (I△n) and Trip Current Duration

<table>
<thead>
<tr>
<th>RCD Trip Current Duration (ms)</th>
<th>RCD Trip Current I△n(mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td>× 1/2</td>
<td>1000</td>
</tr>
<tr>
<td>× 1</td>
<td>1000</td>
</tr>
<tr>
<td>× 5</td>
<td>200</td>
</tr>
<tr>
<td>DC</td>
<td>1000</td>
</tr>
<tr>
<td>Auto Ramp</td>
<td>Goes up by 10% from 20% to 110% of I△n. 300ms × 10</td>
</tr>
</tbody>
</table>

n.a.: not applicable

- Instrument dimensions | 186×167×89mm
- Instrument weight     | 980g
### Reference conditions
Specifications are based on the following conditions except where otherwise stated.

- Ambient temperature: 23±5°C
- Relative humidity: 45% to 75%
- Position: horizontal
- AC power source: 230V, 50Hz
- Altitude: Up to 2000m

### Operating temperature and humidity
0 to 40°C, relative humidity 85% or less, no condensation.

### Storage temperature and humidity
-20 to +60°C, relative humidity 85% or less, no condensation.

### Battery type
Eight R6 or LR6 batteries
Measurement times: approx. 800 times or more. (Measure at the interval of 30 sec on DC 10mA range of RCD function.)

### Symbols used on the instrument
- Equipment protected throughout by DOUBLE INSULATION or REINFORCED INSULATION.
- Caution (refer to accompanying instruction manual)

### Operating Errors of Loop impedance (IEC 61557-3)

<table>
<thead>
<tr>
<th>Range</th>
<th>Measuring range to keep operating error</th>
<th>Maximum percentage operating error</th>
</tr>
</thead>
<tbody>
<tr>
<td>20Ω</td>
<td>0.4 ~ 19.99Ω</td>
<td>±30%</td>
</tr>
<tr>
<td>200Ω</td>
<td>20.0 ~ 199.9Ω</td>
<td></td>
</tr>
<tr>
<td>2000Ω</td>
<td>200 ~ 1999Ω</td>
<td></td>
</tr>
</tbody>
</table>

The influencing variations used for calculating the operating error are denoted as follows:
- Temperature: 0°C and 40°C
- Phase angle: At a phase 0° to 18°
- System frequency: 49.5Hz to 50.5Hz
- System voltage: 230V+10%-15%
- Supply voltage: 8V to 13.8V
Operating Errors of trip current (IEC 61557-6)

<table>
<thead>
<tr>
<th>Function</th>
<th>Operating error of trip current</th>
</tr>
</thead>
<tbody>
<tr>
<td>×1/2</td>
<td>-10%～0%</td>
</tr>
<tr>
<td>×1</td>
<td>0%～+10%</td>
</tr>
<tr>
<td>×5</td>
<td>0%～+10%</td>
</tr>
<tr>
<td>Auto Ramp</td>
<td>-10%～+10%</td>
</tr>
</tbody>
</table>

The influencing variations used for calculating the operating error are denoted as follows:
Temperature : 0°C and 40°C
Earth electrode resistance :

<table>
<thead>
<tr>
<th>IΔn(mA)</th>
<th>Earth electrode resistance(Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>UL50V</td>
</tr>
<tr>
<td>10</td>
<td>2000</td>
</tr>
<tr>
<td>30</td>
<td>600</td>
</tr>
<tr>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>300</td>
<td>130</td>
</tr>
<tr>
<td>500</td>
<td>80</td>
</tr>
<tr>
<td>1000</td>
<td>40</td>
</tr>
</tbody>
</table>

Table 1
System voltage : 230V+10% to 15%
Supply voltage : 8V to 13.8V

⚠️ CAUTION
Even though the test current in the 2000 ohm range (15mA test current) is low some RCD's may trip due to sensitivity or where there may already be additional leakage in the circuit being tested.
The Loop impedance in a TN system is small and therefore it is not recommended to test in the 2000 ohm range. RCD's will have to be bridged to avoid tripping when using other test ranges.
5.1 Principles of Measurement

5.1-1 Measurement of Fault Loop Impedance and Prospective Fault Current

If an electrical installation is protected by over-current protective devices including circuit breakers or fuses, the earth fault loop impedance should be measured.

In the event of a fault the earth fault loop impedance should be low enough (and the prospective fault current high enough) to allow automatic disconnection of the electrical supply by the circuit protection device within a prescribed time interval.

Every circuit must be tested to ensure that the earth fault loop impedance value does not exceed that specified or appropriate for the over-current protective device installed in the circuit.

For a TT system the earth fault loop impedance is the sum of the following impedances;

- Impedance of the power transformer secondary winding.
- Impedance of the phase conductor resistance from the power transformer to the location of the fault.
- The impedance of the protective conductor from the fault location to the local earth system.
- Resistance of the local earth system (R).
- Resistance of the power transformer earth system (Ro).
For TN systems the earth fault loop impedance is the sum of the following impedances.

- Impedance of the power transformer secondary winding.
- Impedance of the phase conductor from the power transformer to the location of the fault.
- Impedance of the protective conductor from the fault location to the power transformer.

In accordance with the international standard IEC 60364 for a TT system the following condition shall be fulfilled for each circuit.
RA must be \( \leq 50/la \)
where;
RA is the sum of the resistances of the local earth system R and the protective conductor connecting it to the exposed conductor part.
50V is the maximum voltage limit (it may be 25V in certain circumstances).
Ia is the value of current that causes automatic disconnection of the protective device within 5 seconds.
When the protective device is a residual current device (RCD), Ia is the rated residual operating current \( I \triangleq n \).
For example in a TT system protected by an RCD the maximum RA values are as follows;

<table>
<thead>
<tr>
<th>RA (at 50V)Ω</th>
<th>10</th>
<th>30</th>
<th>100</th>
<th>300</th>
<th>500</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA (at 50V)Ω</td>
<td>5000</td>
<td>1667</td>
<td>500</td>
<td>167</td>
<td>100</td>
<td>50</td>
</tr>
<tr>
<td>RA (at 25V)Ω</td>
<td>2500</td>
<td>833</td>
<td>250</td>
<td>83</td>
<td>50</td>
<td>25</td>
</tr>
</tbody>
</table>
Practical example of verification of the protection is a TT system according to the international Standard IEC 60364.

For this example the maximum value is 1667 Ω, the loop tester reads 12.74 Ω and consequently the condition RA is ≤ 50/la is met.

It is fundamental for this example to test also the RCD to ensure that operation takes place quickly enough to respect the safety requirement. According to the international Standard IEC 60364 for TN system the following condition shall be fulfilled for each circuit:

$$Z_s \leq \frac{U_0}{I_a}$$

Where;
Z_s is the earth fault loop impedance.
U_0 is the nominal voltage between phase and earth.
I_a is the current that causes the automatic disconnection of the protective device within the time stated in the following table.

<table>
<thead>
<tr>
<th>U_0 (Volts)</th>
<th>T (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>120</td>
<td>0.8</td>
</tr>
<tr>
<td>230</td>
<td>0.4</td>
</tr>
<tr>
<td>400</td>
<td>0.2</td>
</tr>
<tr>
<td>&gt;400</td>
<td>0.1</td>
</tr>
</tbody>
</table>
Note:
bullet For a distribution circuit a disconnection time not exceeding 5s is permitted.
bullet When the protective device is a residual current device (RCD), Ia is the rated residual operating current IΔn.

For instance in a TN system with a nominal voltage of Uo =230V protected by type gG fuses the Ia and maximum Zs values could be:

<table>
<thead>
<tr>
<th>Rating (A)</th>
<th>Disconnecting time 5s</th>
<th>Disconnecting time 0.4s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ia(A)</td>
<td>Zs(Ω)</td>
</tr>
<tr>
<td>6</td>
<td>28</td>
<td>8.2</td>
</tr>
<tr>
<td>10</td>
<td>46</td>
<td>5</td>
</tr>
<tr>
<td>16</td>
<td>65</td>
<td>3.6</td>
</tr>
<tr>
<td>20</td>
<td>85</td>
<td>2.7</td>
</tr>
<tr>
<td>25</td>
<td>110</td>
<td>2.1</td>
</tr>
<tr>
<td>32</td>
<td>150</td>
<td>1.53</td>
</tr>
<tr>
<td>40</td>
<td>190</td>
<td>1.21</td>
</tr>
<tr>
<td>50</td>
<td>250</td>
<td>0.92</td>
</tr>
<tr>
<td>63</td>
<td>320</td>
<td>0.71</td>
</tr>
<tr>
<td>80</td>
<td>425</td>
<td>0.54</td>
</tr>
<tr>
<td>100</td>
<td>580</td>
<td>0.39</td>
</tr>
</tbody>
</table>

If the prospective fault current is measured, its value must be higher than the Ia value of the protective device concerned.
On 200A PSC range, for Loop impedance lower than 5 ohm (PSC greater than 50A approx 230V) is not possible to obtain an accurate PSC reading even if the unit will give a result. In these cases, for accurate PSC tests, please use the 2000A or 20kA ranges.
Practical example of verification of the protection is a TT system according to the international Standard IEC 60364.

![Diagram illustrating practical example](image)

Fig.12

The maximum value of Zs for this example is 2.1 Ω (16amp gG fuse, 0.4 seconds). The loop tester reads 1.14 Ω and consequently the condition $Z_s \leq \frac{U_o}{I_a}$ is met.

5.1.2 Principles of the Measurement of Line Impedance and Prospective Short Circuit Current

Line impedance is the impedance, which is measured between Phase-terminal L and Neutral-terminal N of single-phase system, or between two phases of three-phase system. Measurement principal used in this instrument is the same as it for Fault loop impedance measurement, but measurement is performed between Terminal L and N, or between two phases.

Breaking current capacity of installed over-current protection devices should be higher than Prospective Short-Circuit current, otherwise it is necessary to change the rated current of involved over-current protection device.
Method of Impedance test between Line and Neutral and Prospective Short Circuited Current test

![Diagram of Impedance test between Line and Neutral](image1)

Method of Impedance test between Line and Line and Prospective Short Circuited Current test

![Diagram of Impedance test between Line and Line](image2)

5.2 LOOP Impedance and PSC Testing

5.2.1 Preparation

1. Turn Function switch and power on the instrument. Select LOOP or PSC.

2. Select the range for a test with "IΔn / LOOP / PSC" SELECT SWITCH. By pressing "IΔn / LOOP / PSC" SELECT SWITCH, ▼ mark on LCD shifts and can select each range.
5.2.2 Wiring Check

(1) Insert the Test Lead into the instrument. (Fig.15)
(2) Connect test lead to object to be tested. (Fig.11,12,13,14)
(3) Make sure that the P-E and P-N wiring Check LEDs are lit and the wiring in correct LED is not lit. If it is not correct, disconnect the tester and check the wiring for a possible fault.

5.2.3 Testing

(1) Press the test button. A beep will sound as the test is conducted and the value of loop impedance will be displayed.

⚠️ CAUTION
The RCD of a circuit shall be bypassed when measuring on LOOP 20 Ω range. Do not operate the Test button on RCD while RCD is bypassed. Be sure to get back the bypassed RCD after test.

Note: When Test Lead removed during a measurement, "no" is displayed on LCD and a measurement will be stopped. Please check Test Lead is rightly connected.
6. RCD TESTS

6.1 Principles of Measurement
The RCD tester is connected between phase and protective connectors on the load side of the RCD after disconnecting the load. A precisely measured current for a carefully timed period is drawn from the phase and returns via the earth, thus tripping the device. The instrument measures and displays the exact time taken for the circuit to be opened. An RCD is a switching device designed for breaking currents when the residual current attains a specific value. It works on the basis of current difference between phase currents flowing to different loads and returning current flowing through the neutral conductor (for a single-phase installation). In the case where the current difference is higher than the RCD tripping current, the device will trip and disconnect the supply from the current.

There are two classifications for RCDs; the first one due to the shape of the residual current wave form (types AC and A) and the second due to the tripping time (types G and S).

- RCD type AC will trip when presented with residual sinusoidal alternating currents whether applied suddenly or slowly rising. This type is the most frequently used on electrical installations.
- RCD type A will trip when presented with residual sinusoidal alternating currents (similar to type AC) and residual pulsating direct currents (DC) whether suddenly applied or slowly rising. This type of RCD is not commonly used at present, however, it is increasing in popularity and is required by the local regulations in some countries.
- RCD type G. In this case G stands for general type (without trip-out time delay) and is for general use and applications.
- RCD type S where S stands for selective type (with trip-out time delay). This type of RCD is specifically designed for installations where the selectivity characteristic is required. In order to assure successful protection on an electrical installation using RCD’s they should be checked to test trip-out time $t_A$.
- Trip-out time $t_A$ is the time needed by the RCD to trip at a rated residual operating current of $I_A n$. The standard values of tripping time are defined by IEC 61009 (EN61009) and IEC 61008 (EN 61008) and are listed in the table below for $I_A n$ and $5I_A n$. 

---

- 20 -
<table>
<thead>
<tr>
<th>Type of RCD</th>
<th>(1 \Delta n)</th>
<th>(5 \Delta n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General(G)</td>
<td>300ms max. allowed Value</td>
<td>40ms max. allowed Value</td>
</tr>
<tr>
<td>Selective(S)</td>
<td>500ms max. allowed Value</td>
<td>150ms max. allowed Value</td>
</tr>
<tr>
<td></td>
<td>130ms min. allowed Value</td>
<td>50ms min. allowed Value</td>
</tr>
</tbody>
</table>

Typical examples of instrument connection
Practical example of 3-phase + neutral RCD test in a TT system.

![Fig.16](image1)

Practical example of 3-phase + neutral RCD test in a TN system

![Fig.17](image2)
6.2 RCD Testing

6.2.1 Preparation
(1) Turn Function switch and power on the instrument. Select RCD.
(2) Press RCD Function switch to select RCD Function for test. Selected function will be displayed on LCD.

<table>
<thead>
<tr>
<th>× 1/2</th>
<th>For testing RCD's to verify that they are not too sensitive.</th>
</tr>
</thead>
<tbody>
<tr>
<td>× 1</td>
<td>For measuring the trip time.</td>
</tr>
<tr>
<td>× 5</td>
<td>For testing at IΔn × 5.</td>
</tr>
<tr>
<td>DC</td>
<td>For testing DC sensitive RCD's.</td>
</tr>
<tr>
<td>AUTO RAMP TEST( )</td>
<td>For measuring the trip out current.</td>
</tr>
</tbody>
</table>

(3) Press the "IΔn / LOOP / PSC" SELECT SWITCH to set the Rated Tripping Current (IΔn) to the rated trip current of the RCD. Every time "IΔn / LOOP / PSC" SELECT SWITCH is pressed, ▼ mark on LCD shifts. Select IΔn with above switch.

(4) Press the UL value select switch to select switch UL value (25 or 50V).

<table>
<thead>
<tr>
<th>The Initial value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCD Function</td>
</tr>
<tr>
<td>IΔn</td>
</tr>
<tr>
<td>0° /180°</td>
</tr>
<tr>
<td>UL</td>
</tr>
</tbody>
</table>

6.2.2 Wiring Check
(1) Insert the Test Lead into the instrument. (Fig.15)
(2) Connect test lead to object to be tested. (Fig.16,17)
(3) Make sure that the P-E and P-N wiring Check LEDs are lit and the wiring in correct LED is not lit. If it is not correct, disconnect the tester and check the wiring for a possible fault.
6.2.3 Testing

(1) Press the TEST BUTTON
   Operating time of RCD is displayed on LCD. At Auto Ramp, operating current value of RCD will be displayed.
   ● × 1/2.................The Breaker should not trip.
   ● × 1..................The Breaker should trip.
   ● × 5..................The Breaker should trip.
   ● DC....................The breaker should trip.
   ● Auto Ramp(△).. The Breaker should trip. Check Trip Out Current.

(2) Press the 0° /180° switch to change the phase and repeat step (1).
(3) Change the phase again and repeat step (1).
   ● Be sure to return the tested RCD to the original condition after the test.

⚠️ CAUTION
   ● When the Uc voltage rises to UL value or greater, the measurement is automatically suspended and "UcH" is displayed on the LCD.

MAKE SURE TO KEEP CLEAR OF EARTHEDED METAL DURING THE OPERATION OF THESE TESTS.

Note:
   ● If the RCD does not trip, the tester will supply the test current for a maximum of 1000ms on the X1/2 and X1 ranges. The fact that the RCD has not tripped will be evident because the P- N and P- E LEDs will still be on.
   ● If "I△n" setting is greater than the rated residual current of RCD, RCD will trip and "no" may be displayed on LCD.
   ● If a voltage exists between the protective conductor and earth, it may influence the measurements.
   ● If a voltage exists between neutral and earth, it may influence the measurements, therefore, the connection between neutral point of the distribution system and earth should be checked before testing.
   ● If leakage currents flow in the circuit following the RCD, it may influence the measurements.
   ● The potential fields of other earthing installations may influence the measurement.
   ● Special conditions of RCDs of a particular design, for example S-type, shall be taken into consideration.
The earth electrode resistance of a measuring circuit with a probe shall not exceed table1(page 12).

For the RCD range of Model 6050, distortion factor of test current is improved compared with our traditional instruments. Therefore, at operating time measurement of RCD, operating time of some RCD and our traditional instruments may differ a little.

7. Uc TESTS

7.1 Principles of Measurement
In fig.16, when grounding is incomplete and R exists, voltage occurs to R if fault current flows in R. Person may touch this voltage, and the voltage occurs to a person at this bout is called as Uc. At Uc test, the value, when Uc reaches maximum, is calculated.

7.2 Uc Testing
7.2.1 Preparation
(1) Turn Function switch and power on the instrument. Select Uc.
(2) Press the \"IΔn / LOOP / PSC\" SELECT SWITCH to set the Rated Tripping Current (IΔn) to the rated trip current of the RCD. Every time "IΔn / LOOP / PSC" SELECT SWITCH is pressed, ▼mark on LCD shifts. Select IΔn with above switch.

<table>
<thead>
<tr>
<th>IΔn (mA)</th>
<th>10</th>
<th>30</th>
<th>100</th>
<th>300</th>
<th>500</th>
<th>1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Initial value</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IΔn</td>
<td>30mA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7.2.2 Wiring Check
(1) Insert the Test Lead into the instrument.(Fig.15)
(2) Connect test lead to object to be tested.(Fig.16,17)
(3) Make sure that the P-E and P-N wiring Check LEDs are lit and the wiring in correct LED is not lit. If it is not correct, disconnect the tester and check the wiring for a possible fault.
7.2.3 Testing
(1) Press the TEST BUTTON.
(2) Measured result is displayed on LCD.
   If the measured result is 100V or more, "UcH V" is displayed on LCD.
Note: When Test Lead removed during a measurement, "no" is displayed on LCD and a measurement will be stopped. Please check Test Lead is rightly connected.
If "IΔn" setting is greater than the rated residual current of RCD, RCD will trip and "no" may be displayed on LCD.

---

8. AUTO-TEST

When applying voltage to the instrument, with Test button is turned and being locked, voltage value is displayed on LCD. And 3sec. later, a measurement on selected function is performed automatically. Be sure to release the locked Test button after a measurement.

---

9. STORE / RECALL A MEASURED RESULT

Measured result at each function can be stored in the memory of the instrument. (MAX : 300)
9.1 How to store data
Store the result according to following sequence.
(1) After a measurement, press MEMORY MODE SWITCH ("MEM MODE" SWITCH) while measured result is being displayed. Then instrument becomes MEMORY MODE, and "MEM" mark appears on the LCD. The action of each switch changes as shown under each switch.
(2) Select the Data No you want to store with MEMORY SELECT SWITCH ("MEM ▼▲ "SWITCH).
(3) Decide it with ENTER SWITCH("ENT" SWITCH).
(4) Select the Place No you want to store with MEMORY SELECT SWITCH ("MEM ▼▲ "SWITCH).
(5) Decide it with ENTER SWITCH ("ENT" SWITCH).  
Data will be stored and back to voltage measurement mode automatically.
• By pressing MEMORY MODE EXIT SWITCH ("EXIT" SWITCH) 
during an operation, can undo the last action.
• When making a measurement, press MEMORY MODE EXIT 
SWITCH("EXIT" SWITCH) and release the MEMORY MODE. 
Measurement cannot be performed when Test button is pressed 
while "MEM" mark is being displayed on the LCD.

9.2 Recall the stored data
Stored data can be displayed on LCD according to following sequence.
(1) Press MEMORY MODE SWITCH ("MEM MODE" SWITCH) on 
stand-by(at "Lo V" is displayed).
Then instrument becomes MEMORY MODE, and "MEM" mark 
appears on the LCD. The action of each switch changes as shown 
under each switch.
(2) Press MEMORY RECALL SWITCH ("RCL" SWITCH).
(3) Select the Data you want to recall with MEMORY SELECT SWITCH 
("MEM ▼▲ "SWITCH).
(4) Decide it with ENTER SWITCH ("ENT" SWITCH).
Selected data can be called up.
(5) By pressing MEMORY SELECT SWITCH ("MEM ▼▲ "SWITCH), 
indication is changed as follows.

<table>
<thead>
<tr>
<th>Measured result</th>
<th>Measurement Function</th>
<th>PLACE No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>▲</td>
<td>▲ ▼</td>
<td>▲ ▼</td>
</tr>
</tbody>
</table>

• By pressing MEMORY MODE EXIT SWITCH ("EXIT" SWITCH) 
during an operation, can undo the last action.
• When making a measurement, press MEMORY MODE EXIT 
SWITCH("EXIT" SWITCH) and release the MEMORY MODE. 
Measurement cannot be performed when Test button is pressed 
while "MEM" mark is being displayed on the LCD.
9.3 Delete the stored data
Stored data can be deleted according to following sequence.
(1) Press MEMORY MODE SWITCH ("MEM MODE" SWITCH) on
stand-by (at "Lo V" is displayed).
Then instrument becomes MEMORY MODE, and "MEM" mark
appears on the LCD. The action of each switch changes as shown
under each switch.
(2) Press MEMORY RECALL SWITCH ("RCL" SWITCH).
(3) Select the Data you want to delete with MEMORY SELECT
SWITCH ("MEM ▼ ▲" SWITCH).
Select "ALL" when you delete all data.
(4) Press MEMORY CLEAR SWITCH ("CLR" SWITCH).
The "clr" is displayed with blinking on LCD.
(5) Press ENTER SWITCH ("ENT" SWITCH) and delete the selected
data.
● By pressing MEMORY MODE EXIT SWITCH ("EXIT" SWITCH)
during an operation, can undo the last action.
● When making a measurement, press MEMORY MODE EXIT
SWITCH ("EXIT" SWITCH) and release the MEMORY MODE.
Measurement cannot be performed when Test button is pressed
while "MEM" mark is being displayed on the LCD.

9.4 Transfer the stored data to PC
The stored data can be transferred to PC via Optical Adapter Model
8212 (Option).
● How to transfer the data:
(1) Firmly insert the D-SUB 9Pin female connector of Model 8212 into
the socket (D-SUB 9Pin male) of PC.
(2) Insert Model 8212 into Model 6050 as shown in fig.18.
Test Leads shall be removed from Model 6050 at this time.
(3) Turn on Model 6050. (Any function is OK.)
(4) Start special software "KEW REPORT" on
your PC and set the communication port.
Then click "Down load" command, and the
data in Model 6050 will be transferred to
your PC. Please refer to the instruction
manual of Model 8212 and HELP of KEW
REPORT for further details.
Model 8212 system requirements
(1) PC/AT compatible machine on which Microsoft Windows®
    98/ME/2000/XP can operate.
(2) Pentium 233MHz or more recommended.
(3) RAM 64Mbyte or more.
(4) SVGA (800X600) or more.
    XGA(1024X768) recommended.
(5) 20MB or more of free hard disk space recommended.
(6) One free COM port
(7) CD-ROM drive (necessary at installing)
● Trade mark
  Windows® is a registered trade mark of Microsoft in the United
  states.
  Pentium is a registered trade mark of Intel in the United states.

10. BATTERY REPLACEMENT

⚠️ DANGER
● Never open the battery compartment cover while making
  measurement. To avoid possible electrical shock, disconnect
  the test probe before opening the cover for battery replacement.

⚠️ CAUTION
● Install batteries in correct polarity as marked inside.

1. Disconnect Test Lead from the
   instrument.
2. Open the battery compartment
   cover by unscrewing the metal
   captive screw to reveal battery
   compartment. Always replace all
   eight batteries with new ones at
   the same time.

Battery type: 8 x R6P, 1.5V AA or
   equivalent

Fig.19
11. SERVICING

If this tester should fail to operate correctly, return it to your distributor stating the exact nature of the fault. Before returning the instrument ensure that:
1. The batteries are in good condition.

Please remember to give all the information possible concerning the nature of the fault, as this will mean that the instrument will be serviced and returned to you more quickly.

12. CASE AND STRAP ASSEMBLY

Correct assembly is shown in Fig 20,21. By hanging the instrument round the neck, both hands will be left free for testing.

Pass the strap belt down through the side panel of the main body from the top, and up through the slots of the probe case from the bottom.

Pass the strap through the buckle, adjust the strap for length and secure.