



# CLAMP METER DIGITAL

---

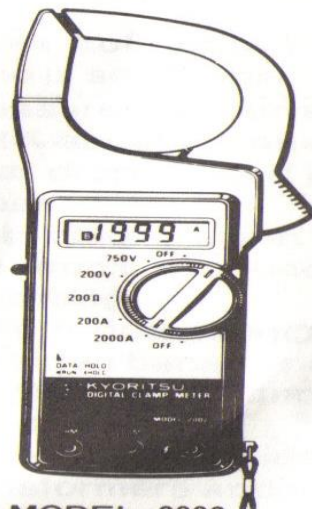
BY

EN. MOHD PUAT RAMLI & HJ. MUSTAFFA KAMAL AB. SAMAD  
CAWANGAN KEJURUTERAAN ELEKTRIK  
IBU PEJABAT JKR KUALA LUMPUR

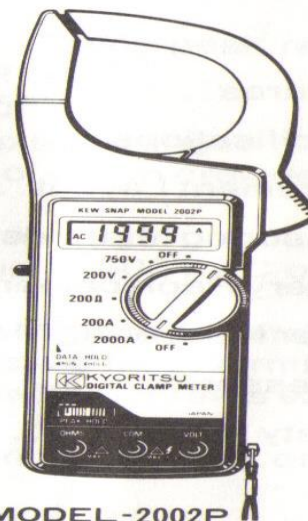




## INSTRUCTION MANUAL



MODEL-2002



MODEL-2002P  
(With Peak Hold Function)

**DIGITAL AC CLAMP METERS**

**KEW SNAP SERIES**

**MODEL 2002 • MODEL 2002P**

**KYORITSU ELECTRICAL INSTRUMENTS WORKS, LTD.  
TOKYO, JAPAN**



## 2. Specifications

<b>Ranges:</b>	AC Current	200A/2000A (0—199.9A/1999A)
	AC Voltage	200V/750V (0—199.9V/750V)
	Resistance	200 $\Omega$ (0—199.9 $\Omega$ )
<b>Accuracy</b>	AC Current at 50/60Hz	$\pm 1\%$ of rdg. $\pm 2$ dgt (0—1500A) $\pm 2.5\%$ of rdg. $\pm 2$ dgt (1500—1999A)
	at 40Hz—1 kHz	$\pm 2\%$ of rdg. $\pm 2$ dgt (0—1500A) $\pm 5\%$ of rdg. $\pm 2$ dgt (1500—1999A)
	AC Voltage at 50/60Hz	$\pm 1\%$ of rdg. $\pm 2$ digit
	at 40Hz—1 kHz	$\pm 1.5\%$ of rdg. $\pm 3$ dgt
	Resistance	$\pm 1.5\%$ of rdg. $\pm 2$ digit
<b>Open Circuit Voltage:</b>	Approx. 3V	
<b>Open Short Circuit Current:</b>	Approx. 1 mA	
<b>Withstand Voltage:</b>	2500V AC for one minute between electrical circuit and housing case or metallic section of transformer jaws.	
<b>Insulation Resistance:</b>	10M $\Omega$ min./1000V between electrical circuit and housing case or metallic section of transformer jaws.	
<b>Dimensions:</b>	245 (L) $\times$ 70 (W) $\times$ 36 (D) mm	
<b>Weight:</b>	Approx. 400g (battery included)	
<b>Size of Conductor under Test</b>	Approx. 55mm max.	
<b>Frequency Response:</b>	40Hz—1 kHz	





**Power Source:** One type 6F 22, 006P (or equivalent) 9V manganese dry battery (continuous operation up to 400 hours)

**Accessories:** Test Leads, Carrying Case, Operating Instructions  
(included)  
(optional) Multi-Tran Model 8008, Energizer Model 8021

**Note: Maximum allowable time for AC current measurement**  
Continuous for current below 1000A  
15 minutes for 1000—1500A  
5 minutes for 1500—1999A

#### **General**

**Operating Principle:** Dual integration system.

**Display:** Field effect 3-1/2 digit liquid crystal display with maximum reading of 1999

**Sensing:** Average sensing, calibrated in RMS of a sine wave.

**Range Switching:** Manual.

**Low Battery**

**Indication:** "B" sign shows.

**Overrange Indication:** "1" is displayed on highest digit (except on 750V AC range).

**Response Time:** Approx. 1 second

**Sample Rate:** Approx. 3 times per second

**Peak Hold:** Reads  $1/\sqrt{2}$  of peak input AC current and voltage (RMS calibrated reading when a sinusoidal AC current and voltage is measured)  
(Model 2002P only)

**Peak Hold Time**

**Accuracy:** Approx.  $\pm 1\%$  of initial peak reading 1 minute after peak hold

**Peak Response Time:** 10ms or 100ms is switch selected

**Data Hold:** All ranges.

**Storage Temperature & Humidity:**  $-20^{\circ}\text{C} \sim +60^{\circ}\text{C}$  at 80% max. relative humidity

**Operating Temperature & Humidity:**

$-10^{\circ}\text{C} \sim +50^{\circ}\text{C}$  at 85% max. relative humidity



**Temperature &  
Humidity for  
Guaranteed**

**Accuracy:**

23°C  $\pm$  10°C at 85% max. relative humidity

**Power Consumption:** Approx. 10mW

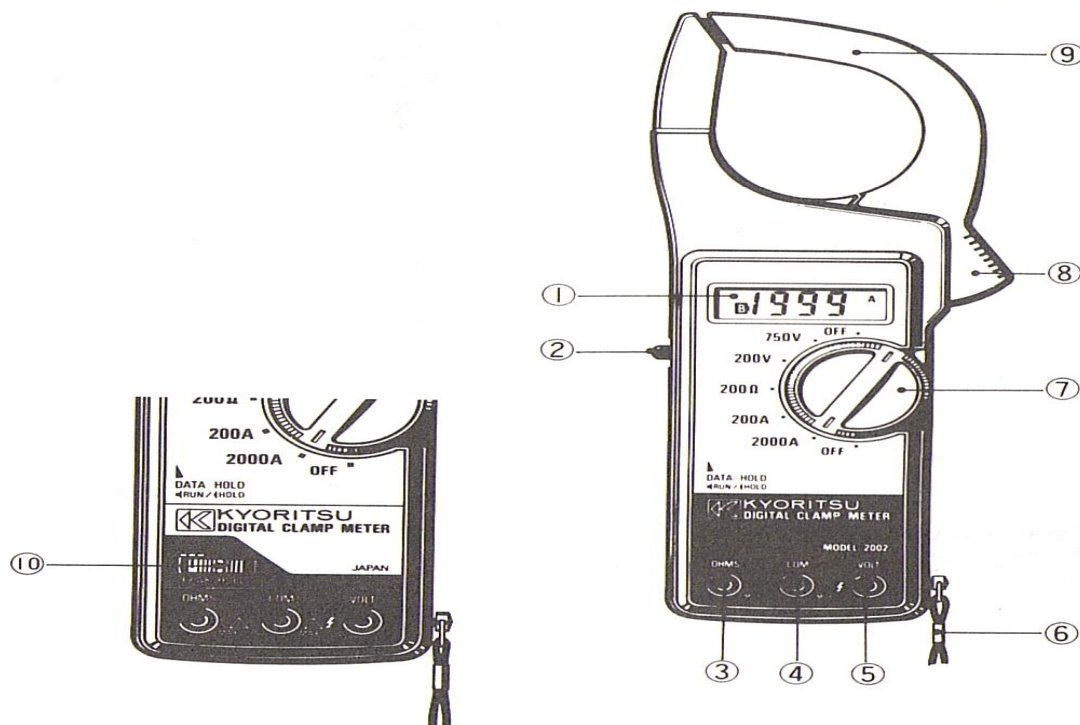
**Overload Protection:**

AC Current — Up to 3000A AC

AC Voltage — Up to 1000V AC

Resistance — 500V AC or DC for one  
minute

### 3. Instrument Layout





- (1) **LCD**  
3-1/2 digit, liquid crystal display with maximum indication of 1999.  
Function symbols AC, V, A and  $\Omega$  plus decimal point automatically appear on the display as the function/range switch is changed. "B" appears automatically for low battery warning. "1" is displayed at the highest digit for overrange warning.
- (2) **Data Hold Push Button**  
Push the data hold button to lock reading. Permits easy reading at dimly lit or crowded cable areas. After the reading is taken push the data hold button again to release the lock.
- (3) **OHM Terminal**  
Accepts red test lead for resistance measurement. The positive (+) voltage output is 3V max.
- (4) **COM Terminal**  
Accepts black test lead.
- (5) **VOLT Terminal**  
Accepts red test lead for voltage measurement.
- (6) **Safety wrist Strap**  
Prevents the instrument from slipping off the hand during use.
- (7) **Power/Function/Range Switch**  
Selects function and range. Also, turns power on. Always turn the switch to off after use.
- (8) **Jaw Trigger**  
Operates transformer jaws. Press to open the jaws.
- (9) **Transformer Jaws**  
Pick up the AC current flowing through conductor.
- (10) **Peak Hold Selector Switch (Model 2002P only)**  
Selects 10ms or 100ms peak response time. Set the switch back to the OFF position to release peak hold or make normal measurements.





## 4. Measuring Method

### 4-1. Preparation

- (1) Set the function/range switch to the required range position. If the battery is low "B" will be shown in the lower left hand corner of the display. Replace the battery with a new one in accordance with the replacement procedures outlined in section 5.
- (2) Make sure that the data hold button is not locked in before proceeding with measurement.

### 4-2. Current Measurement

**CAUTION**  
**MAKE CERTAIN THAT ALL**  
**TEST LEADS ARE**  
**DISCONNECTED FROM THE**  
**INSTRUMENT TERMINALS.**

- (1) Set the function/range switch to 200A or 2000A position.
- (2) Press the trigger to open the transformer jaws and clamp onto one conductor only. (Fig. 1) It is recommended that the conductor be placed at the centre of the closed jaws for best accuracy. Read the current directly on the display.

**Note:** Keep the instrument operation to the maximum allowable measurement time as specified in section 2. Exceeding these limits could result in instrument damage due to overheating.

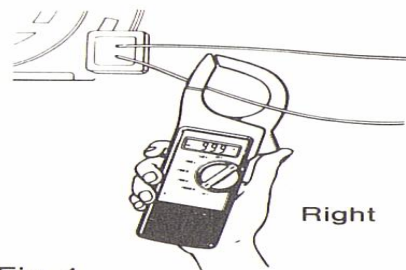
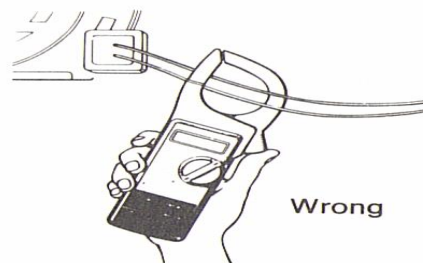


Fig. 1





The transformer jaws are made of metal and their tips are not insulated. Therefore, it is hazardous to touch the metal section of the equipment under test with the jaw tips. Be especially careful when calmping the jaws onto a bare conductor.

#### 4-3. AC Voltage Measurement

##### CAUTION

MAKE CERTAIN THAT TEST LEADS ARE INSERTED INTO VOLT AND COM TERMINALS. INSTRUMENT WILL NOT BE PROTECTED IF HIGH VOLTAGE (ABOVE 500V) IS ACCIDENTALLY APPLIED TO OHM TERMINAL.

- (1) Set the function/range switch to 200V or 750V position.
  - (2) Insert the red test lead into the VOLT terminal of the instrument and the black test lead into the COM terminal. (Fig. 2)
  - (3) Connect the prod tip or alligator clip of the test leads to the circuit under test. (Fig. 3)
- Read the voltage directly on the display.

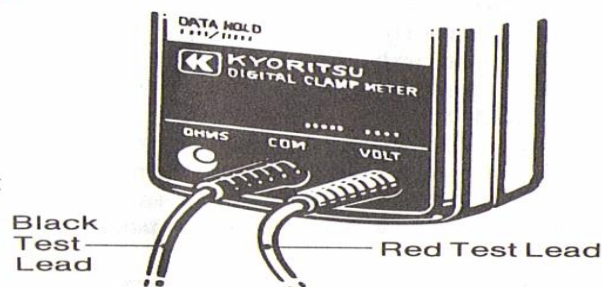


Fig. 2

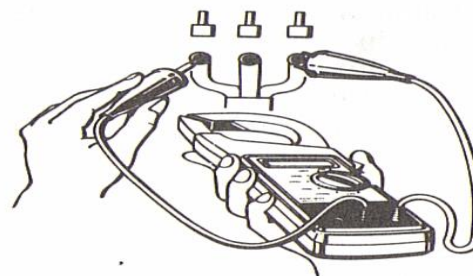


Fig. 3

#### 4-4. Peak Hold Measurement (for Model 2002P only)

When measuring peak voltage or current, set the peak hold switch to the desired peak response time position with the test leads connected to the





circuit under test or the transformer jaws clamped onto the conductor.

The peak hold display reads  $1/\sqrt{2}$  of the peak voltage or peak current. Therefore, an RMS reading will be obtained when a sinusoidal waveform is measured.



In case of a sinusoidal waveform, peak voltage

$$V_P = \sqrt{2} \times \text{RMS Value} \quad (\text{RMS value} = \frac{V_P}{\sqrt{2}})$$

Slide the peak hold selector switch back to the OFF position for a reset.

The peak hold circuit is designed to select 10ms or 100ms response time. Choose it according to your application needs. For instance, select the 10ms response time when measuring a surge voltage or current that will occur when power supply is turned on.

The 100ms response time is recommended for measuring a starting current of a motor (a stable measurement can be made as the peak hold circuit does not readily respond to the surge current at 100ms response time).

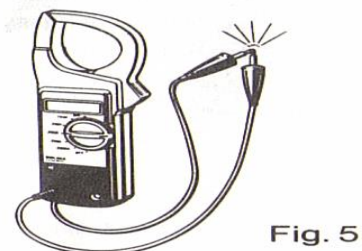
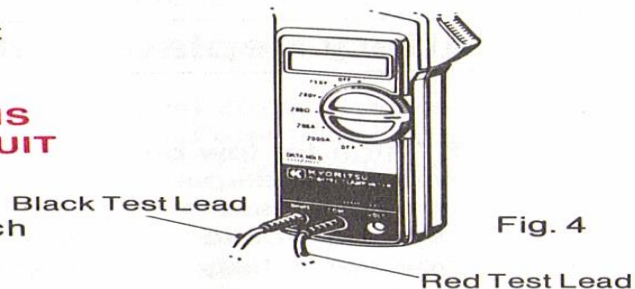
The Model 2002P uses an analog peak hold circuit to ensure a quick response to input current and voltage. Because of the nature of this circuit the peak hold reading may gradually vary with time or the instrument may go off zero by several counts when it is in the peak hold mode. However, this does not indicate a faulty condition. It is likely to be apparent when the instrument is used in a high temperature, high humidity environment. The instrument will restore its original condition when returned to normal temperature and humidity.



#### 4-5. Resistance Measurement

**CAUTION**  
**MAKE SURE THAT THERE IS NO VOLTAGE IN THE CIRCUIT OR COMPONENT BEING MEASURED.**

- (1) Set the function/range switch to 200  $\Omega$  position.
- (2) Insert the red test lead into OHM terminal and the black test lead into the COM terminal. (Fig. 4)
- (3) Make certain that the display reads "1" on the highest digit for overrange indication. By shorting the test leads make sure that the display reads zero (00.0  $\Omega$ ). (Fig. 5)



**Note:** A count of 00.2  $\Omega$  may appear. This is due to the resistance of the test leads, etc and does not indicate a faulty condition.

- (4) Connect the test leads to the circuit under test. Read the resistance directly on the display.

**Remarks:** Terminal voltage on open circuit is approx. 3V. Short circuit current is approx. 1 mA. OHM terminal (for red test lead) output is positive (+) voltage and COM terminal (for black test lead) negative (—) voltage.

#### 4-6. How to Use Data Hold Function

Push the data hold button to freeze the reading. This allows for easy reading in dimly lit or crowded cable areas.



## 5. Battery Replacement

When "B" sign for low battery warning appears at the lower left hand corner of the display replace the battery as follows:

- (1) Disconnect all test leads from the instrument and set the function/range switch to OFF position.
- (2) Replace the battery by sliding the battery compartment cover in the arrowed direction. (Fig. 6)
- (3) Install a new battery Type 6F22, 006P 9V (or equivalent) dry battery.

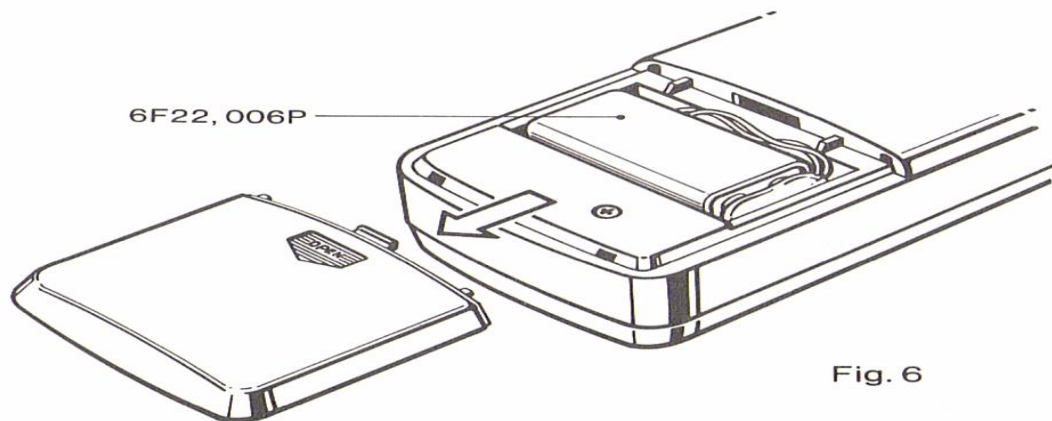


Fig. 6





## 6. Other Measuring Methods Using Optional Accessories

Model 8021 ENERGIZER will permit Model 2002 to make current and voltage measurements of household electrical appliances which are normally furnished with "twin" conductor line cords and plugs for household power outlets.

- (1) As shown below, Model 2002 or Model 2002P clamped onto "1X" position of ENERGIZER is to measure current flowing through a twin conductor line cord (up to 10A AC). (Fig. 7)
- (2) To measure a low current more accurately clamp onto "5X or 10X" position. Divide the reading by 5 or 10 to obtain a true current value.
- (3) When measuring AC voltage, connect ENERGIZER to AC power outlet or appliance under test the same way as outlined for AC current measurement. With the test leads plugged into VOLT and OHM terminals of the instrument connect one test lead prod to "VOLTLEAD" terminal on one side of ENERGIZER and the other prod to "VOLTLEAD" terminal on the other side. (Fig. 8) This will permit easy voltage measurement (up to 300V AC) without cutting off the cord.

Connection to AC Power Outlet

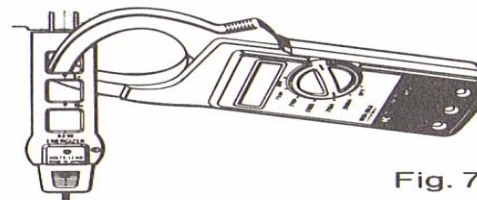


Fig. 7

Connection to Appliance under Test

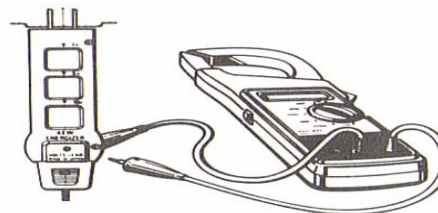


Fig. 8



Model 8008 MULTI-TRAN to measure current higher than 2000A AC or large bus-bars (up to  $150 \times 100$  mm) or conductors (up to 100mm diameter).

- (1) As shown below, open the transformer jaws of Model 2002 or Model 2002P and close them over the pickup coil of Model 8008 MULTI-TRAN to measure up to 3000A AC. Since the input to output ratio is 10 to 1 take the reading on Model 2002 and multiply by 10. (Fig. 9)

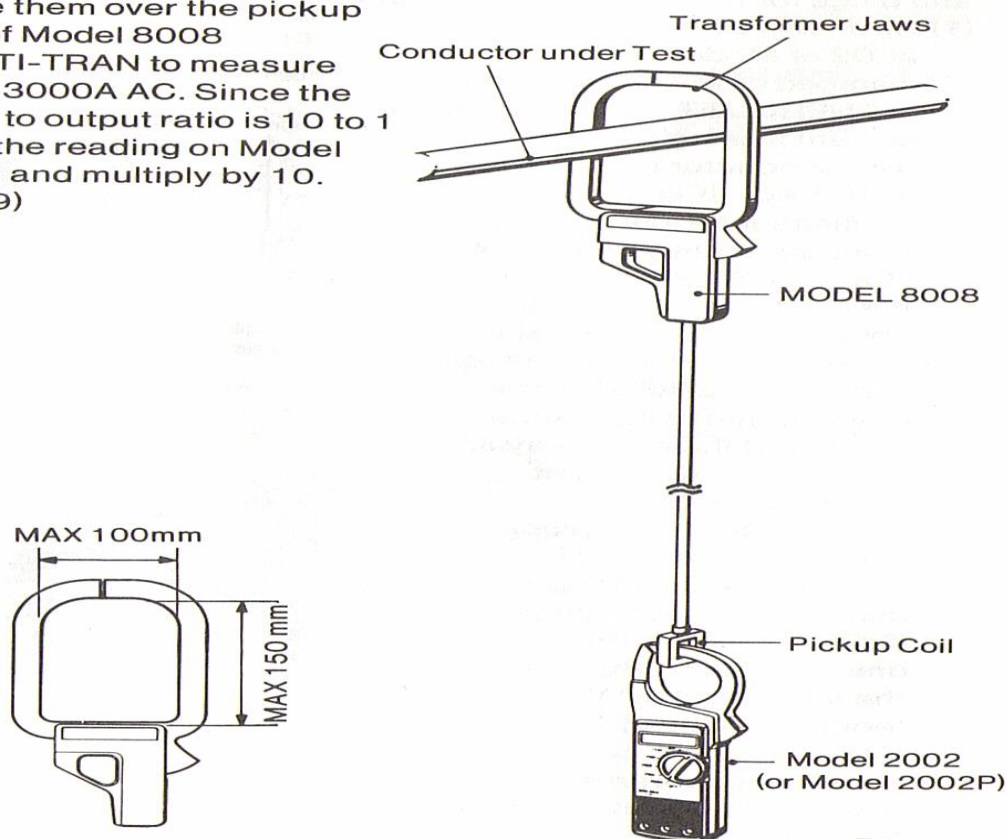


Fig. 9





## 7. Safety Notes

The instrument is fully overload protected but:

- Do NOT exceed maximum limit for each input.
- Do NOT apply voltage between COM and OHM terminals.
- Do NOT measure current with test leads inserted into voltage or ohm terminal.
- Do NOT expose the instrument to the direct sun, extreme temperature and humidity or dew fall.
- Always set Function Switch to OFF position after use.
- Do NOT use the instrument on a circuit with a voltage of higher than 600V as the instrument is not designed for measurement above this voltage.
- Do not use the instrument with the battery compartment cover removed.

### Model 2002P only

- When making normal measurements, set the peak hold selector switch to the OFF position. When making peak hold measurements, set the peak hold selector switch to the 10ms or 100ms position only after the test leads are connected to the circuit under test or the transformer jaws are clamped onto the conductor. The peak hold display may read higher than an actual value to be measured because of the noise that may develop when the peak hold switch is set before the test leads are connected or transformer jaws clamped.

**Kyoritsu** reserves the right to change specifications or designs described in this manual without notice and without obligations.