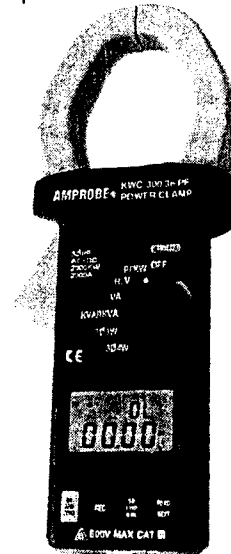


P/N 981760  
12/99

OPERATING INSTRUCTIONS  
for  
**AMPROBE**

3 $\phi$  POWER CLAMP



Model KWC-2000



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## Features

- PF(cos $\phi$ ) for 3 $\phi$ 4W, 3 $\phi$ 3W, 1 $\phi$ 2W.
- KVAR and KVA for 3 $\phi$ 4W, 3 $\phi$ 3W, 1 $\phi$ 2W
- AC+DC true power, and True RMS AC Voltage and Current
- AC+DC 2000A, AC 600V, DC 800V
- AC+DC 1200KW(1 $\phi$ ), AC+DC 2000KW (3 $\phi$ )
- Dual Display V+Hz, A+V, W+PF, KVA+KVAR
- Memory of 4 records.
- AC/DC Auto Detection.
- Auto range.

## Limited Warranty

Congratulations! You are now the owner of an AMPROBE® instrument. It has been quality crafted according to the highest standards of quality and workmanship. This instrument has been inspected for proper operation of all its functions and tested by qualified factory technicians according to the long-established standards of AMPROBE®.

Your AMPROBE® instrument has a limited warranty against defective materials and/or workmanship for one year from the date of purchase provided that the seal is unbroken or, in the opinion of the factory, the instrument has not been tampered with or taken apart.

*Should your instrument fail due to defective materials, and/or workmanship during the one year warranty period, return it along with a copy of your dated bill of sale which must identify instrument by model number and manufacturing number.*

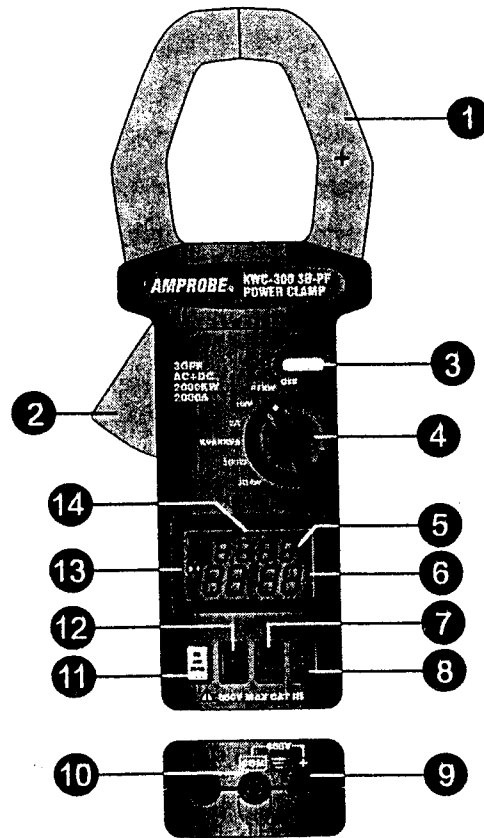
**IMPORTANT:** For your protection, please use the instrument as soon as possible. If damaged, or should the need arise to return your instrument, place it in a shipping carton packed with sufficient packing material. It must be securely wrapped. Amprobe is not responsible for damage in transit. Be sure to include a packing slip (indicating model and manufacturer number) along with a brief description of the problem. Make certain your name and address appears on the box as well as the packing slip.

Ship prepaid via Air Parcel Post insured or U.P.S. (where available) to:

Service Division  
 AMPROBE®  
 630 Merrick Road (For U.P.S.)  
 P.O. Box 329 (For Parcel Post)  
 Lynbrook, NY 11563-0329

Outside the U.S.A. the local Amprobe representative will assist you. Above limited warranty covers repair and replacement of instrument only and no other obligation is stated or implied.

## Front Panel



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## Panel Description

### 1. Transformer Jaw

This is used to pick up current signal. To measure AC+DC current or AC+DC power, conductor must be enclosed by the jaw.

### 2. Transformer Trigger

This is used to open the jaw.

### 3. Data Hold Button

Once this button is pressed, reading will be held in the LCD. Press again to release it.

### 4. Function Selection and On/Off Switch

This is used to select the function users desired, such as KW, V, A, Phase, KVA, or 3 $\phi$ .

### 5. LCD

This is a 4 digits Liquid Crystal Display with maximum indication of 9999. Function symbols, units, sign, decimal points, low battery symbols, and zero symbol are included.

### 6. Units Symbols

Once a function is selected, corresponding unit (KW, V, A, Phase, KVA, or 3 $\phi$ ) will be displayed in LCD.

### 7. 3 $\phi$ KVA/KVAR Select Button

If users want to read the value of KVA and KVAR for 3 $\phi$ 3W, or 3 $\phi$ 4W, users can press this button. Press it again to return to displays of W + PF.

### 8. Read/Next Button

When the rotary switch is set at 3 $\phi$ 3W, or 3 $\phi$ 4W function, this button is used as a NEXT button.

a) In the 3 $\phi$ 3W system mode, Pressing the NEXT button to store the measured values  $W_{RS(L1L2)}/KVAR_{RS(L1L2)}$  and  $W_{TS(L3L2)}/KVAR_{TS(L3L2)}$ . After two set of data are measured and stored, the microprocessor inside the power clamp will process these data, display the result in LCD and show the symbol of RST to represent  $W_{3\phi 3W}$ . To start another  $W_{3\phi 3W}$  measurement, press the NEXT button again.

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## Panel Description - cont.

b) In the 3 $\phi$ 4W system mode, Pressing the NEXT button to store the measured values  $W_{R(L1)}/PF_{R(L1)}$ ,  $W_{S(L2)}/PF_{S(L2)}$  and  $W_{T(L3)}/PF_{T(L3)}$ . After three set of data are measured and stored, the microprocessor inside the power clamp will process these data, display the result in LCD and show the symbol of RST to represent  $W_{3\phi W}$ . To start another  $W_{3\phi W}$  measurement, press the NEXT button again.

If the rotary switch is not set at the 3 $\phi$ 3W or 3 $\phi$ 4W functions, the button is used as a READ button. If users ever store data in the memory by pressing REC button, pressing the READ button will retrieve the data from the memory. First the data number will be shown in LCD, then the data stored. Once READ function is enabled, symbol of REC and NO. will be shown in LCD to indicate the power clamp is in READ mode. The reading shown in LCD is not current reading but data stored in memory. To exit READ function, turn the rotary switch to change function.

### 9.V Input Terminal

This terminal is used as input for voltage measurements.

### 10.COM Terminal

This terminal is used as common reference input.

### 11. DC A/W ZERO button

When users find the reading of A or W is not zero, press this button once will zero the A or W reading (Users do not need to press and hold the button). When the power clamp is doing the zero action, a symbol of ZERO will be shown in LCD.

### 12. REC button

The clamp meter can store 4 data in memory. Once the button is pressed, the data number will be shown in LCD. A REC symbol will be shown in LCD if any data is stored. If the memory is full, FULL will be show in LCD. To clear memory, users need to turn the power off and on again.

### 13. Low Battery Symbol

When this symbol appears, it means the battery voltage drops below the minimum required voltage. Refer to Section V for battery replacement.

### 14. REC and NO. symbols

If users observe REC is shown, that means data is stored in memory. If users observe both REC and NO. are shown, that means readings shown in LCD are data stored in memory not current data measured.

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## AC+DC 1 $\phi$ 2W Power Measurement (KW PF)

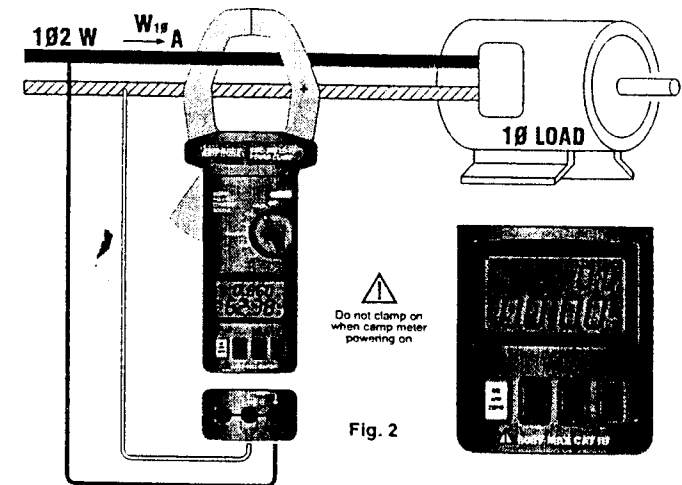


Fig. 2

### Operating Instructions

1. Turn the power on without jaws clamping on to any wire.
2. Set the rotary switch at PFKW (refer to figure 2).
3. **Always press the DCA/DCW ZERO button once to zero the watt and current readings.**
4. Insert the test leads into the input jack.
5. Connect the COM (black) test probe to the neutral line.
6. Connect the V (red) test probe to the power line.
7. Clamp on to the line where V (red) test probe is connected.
8. The power clamp will automatically select proper range.
9. Read the Watt and PF values displayed in LCD.
10. Positive PF(+) means inductance load, while negative PF(-) means capacitance load.

NOTE: The "+" sign printed on jaw must face the power source for correct measurement.

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## AC+DC Voltage Measurement (V+Hz)

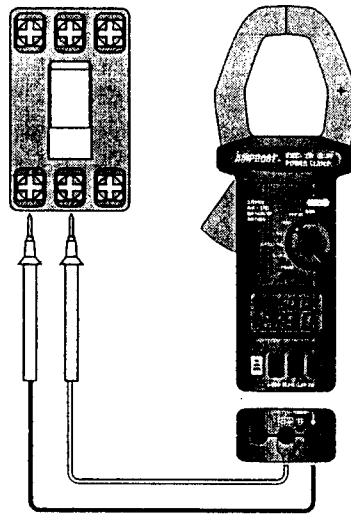


Fig. 3

**WARNING:** Maximum input for DC V is 1000, and for AC V is 750. Do not attempt to take any voltage measurement that exceeds the limits. Exceeding the limits could cause electrical shock and damage to the clamp meter.

1. Set the rotary switch at HzV (refer to figure 3).
2. Insert the test leads into the input jacks.
3. Connect the test probes to the circuit to be measured.
4. The power clamp will automatically select proper range.
5. Read the voltage and Frequency values displayed on the LCD.

**NOTE:** The sensitivity for voltage frequency measurement is 1V, and the frequency range is 10 - 1000Hz. If the frequency is < 10 Hz, LCD will show 0 Hz. If the frequency is > 1000 Hz, LCD will show OL. If voltage is DC, there will be NO frequency indication.

## AC+DC Voltage & Current Measurement (V+A)

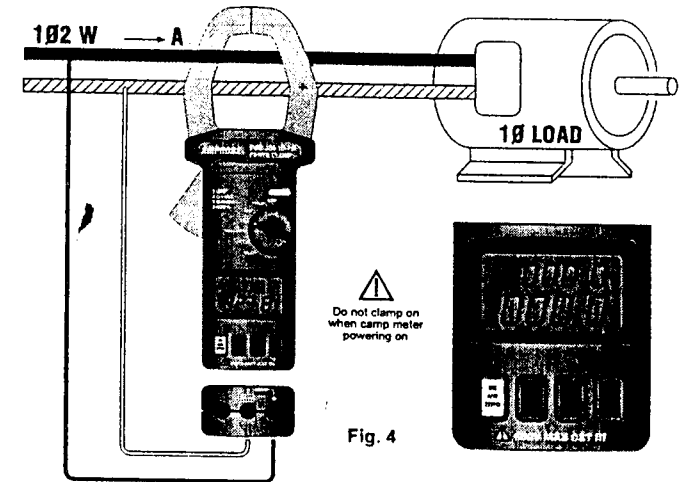


Fig. 4

### Operating Instructions

1. Set the rotary switch at VA (refer to figure 4).
2. Push the DC A/W ZERO once to zero the reading.
3. Press the trigger to open the jaw and fully enclose the conductor to be measured. No air gap is allowed between the two half jaws.
4. Connect Voltage leads across load.
5. The power clamp will automatically select proper range.
6. Read the current and voltage values displayed in LCD.

### 3 $\phi$ 3W AC+DC Power Measurement (W+PF, KVA+KVAR)

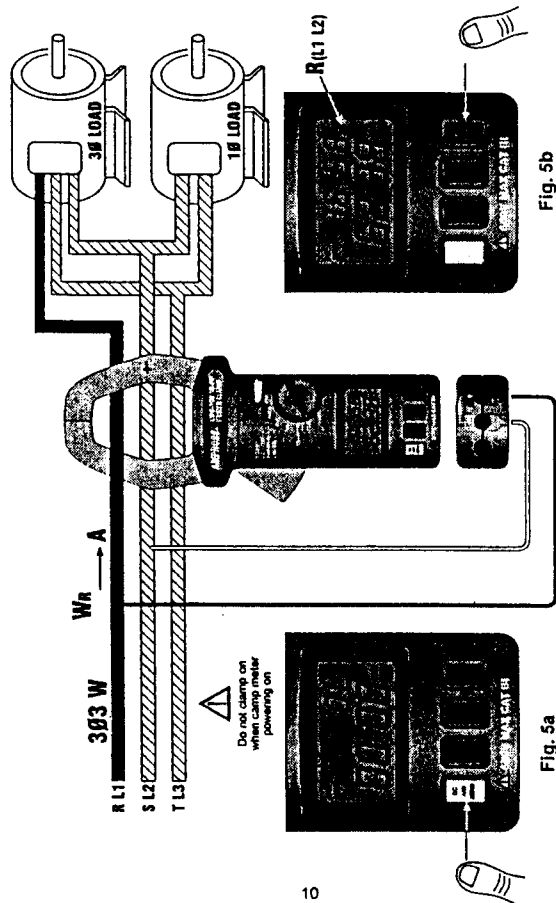


Fig. 5

### 3 $\phi$ 3W AC+DC Power Measurement (W+PF, KVA+KVAR)

Two measurements are required ( $W_{RS(L1L2)}$  /  $KVAR_{RS(L1L2)}$  and  $W_{TS(L3L2)}$  /  $KVAR_{TS(L3L2)}$ )  
 First, measure  $W_{RS(L1L2)}$  and  $KVAR_{RS(L1L2)}$  (refer to figure 5).

- 1A. Turn the power on without clamping on to any wire.
- 2A. Set the rotary switch at 33W, and R symbol blinks to instruct users to take measurement of  $W_{RS(L2L1)}$  and  $KVAR_{RS(L2L1)}$ .  $W_{RS(L2L1)}$  is displayed in the lower row of LCD while  $KVAR_{RS(L2L1)}$  is displayed in the upper row of LCD.
- 3A. **Always press the DCA/DCW ZERO button once to zero the watt and current readings (Figure 5a).**
- 4A. Insert the test leads into the input jack.
- 5A. Select one phase (eg. S or L2) as COM and connect the test probe of the COM (black) terminal to that phase (eg. S or L2).
- 6A. Connect the test probe of V (red) terminal to the second phase (eg. R or L1).
- 7A. Clamp on to the second phase as in step 6A. (eg. R or L1).
- 8A. The power clamp will automatically select proper range.
- 9A. Wait until the reading is stable, press the NEXT button (Figure 5b), and R symbol will disappear. At this moment,  $W_{RS(L2L2)}$  and  $KVAR_{RS(L2L1)}$  is stored in the memory, and T symbol appears and blinks to instruct users to take measurement of  $W_{TS(L3L2)}$  and  $KVAR_{TS}$  ( $KVAR_{L3L2}$ ).

Second, measure  $W_{TS(L3L2)}$  and  $KVAR_{TS(L3L2)}$  (refer to figure 6).

- 1B. Disconnect the red test probe from the phase where jaws is clamped on in previous measurement.
- 2B. Connect the test probe to the third phase (eg. T or L3).
- 3B. Open the jaws, and remove clamp from second phase (7A). Close Jaws.
- 4B. **Always press the DCA/DCW ZERO button once to zero the watt and current readings.**
- 5B. Camp on to the third phase where test probe is connected to (eg. T or L3)
- 6B. The power clamp will automatically select proper range.
- 7B. Wait until the reading is stable, press the NEXT button, and T symbol will disappear. At this moment,  $W_{TS(L3L2)}$  and  $KVAR_{TS(L3L2)}$  are stored in the memory.

**3 $\phi$ 3W AC+DC Power Measurement (W+PF, KVA+KVAR)**

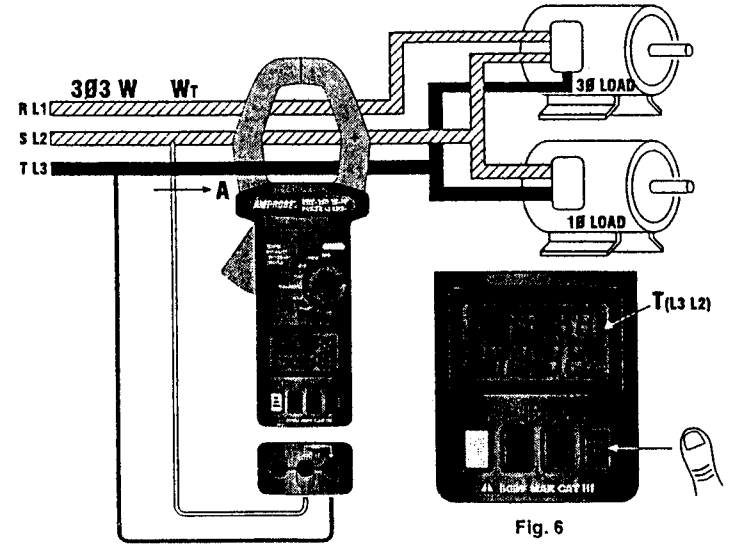


Fig. 6

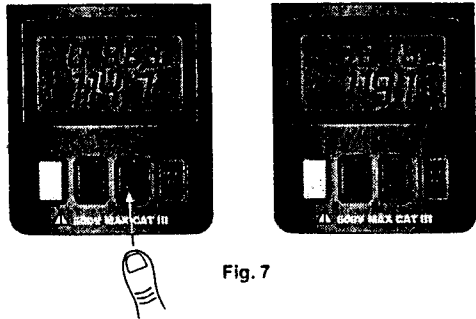


Fig. 7

**3 $\phi$ 3W AC+DC Power Measurement (W+PF, KVA+KVAR)**

Once the NEXT button is pressed after measurements of  $W_{RS(L2L1)} / KVAR_{RS(L2L1)}$  and  $W_{TS(L3L2)} / KVAR_{TS(L3L2)}$ , the power clamp will process those two set of data and show the result on the LCD. RST symbol will be shown to indicate the watt of 3 $\phi$ 3W power. Power is displayed in the lower row of LCD while PF is show in the upper row of LCD (refer to figure 7).

To display KVA and KVAR, press the 3/KVA/KVAR button. KVA will be displayed in the lower row of LCD while KVAR is displayed in the upper row of LCD.

$$W_{3\phi 3W} = W_{RS(L1L2)} + W_{TS(L3L2)}$$

$$KVAR_{3\phi 3W} = KVAR_{RS(L1L2)} + KVAR_{TS(L3L2)}$$

$$KVA_{3\phi 3W} = \sqrt{KW^2_{3\phi 3W} + KVAR^2_{3\phi 3W}}$$

$$PF_{3\phi 3W} = \frac{KW_{3\phi 3W}}{KVA_{3\phi 3W}}$$

**NOTE:** Once a phase is selected as COM, users can not change this selection in the subsequent measurement. For example, if S (or L2) phase is selected, S (or L2) phase is always connected to the COM during measurement of  $W_{RS}$  (or  $W_{L1L2}$ ) and  $W_{TS}$  (or  $W_{L3L2}$ ) in 3 $\phi$ 3W unbalanced power.

**NOTE:** The "+" sign printed on jaw must face the power source, and make sure all the connections and clamping are correct for correct measurement.

**NOTE:** In the 3 $\phi$ 3W unbalanced power measurement, one of  $W_{RS}$  or  $W_{TS}$  could be negative. So users must make sure all the connections and clamping are correct to obtain correct power and power factor.

### 3 $\phi$ 4W AC+DC Power Measurement (W+PF, KVA+KVAR)

Three measurements are required ( $W_{R(L1)}/PF_{R(L1)}$ ,  $W_{S(L2)}/PF_{S(L2)}$ , and  $W_{T(L3)}/PF_{T(L3)}$ )

First, measure  $W_{R(L1)}/PF_{R(L1)}$  (refer to figure 8).

1. Turn the power on without clamping on to any wire.
2. Set the rotary switch at 3 $\phi$ 4W.
3. **Always press the DCA/DCW ZERO button once to zero the watt and current readings.**
4. Insert the test leads into the input jack.
5. Connect the neutral line to the COM (black) terminal.
6. Connect the test probe of the V (red) terminal to the first phase (eg. R or L1).
7. Clamp on to the same phase (eg. R or L1).
8. The power clamp meter will automatically select proper range.
9. Wait until the reading is stable, press the NEXT button, and R symbol will disappear.

At this moment,  $W_{R(L1)}/PF_{R(L1)}$  are stored in memory, and S symbol appears and blinks to instruct user to take next measurement of  $W_{S(L2)}/PF_{S(L2)}$ .

Second, measure  $W_{S(L2)}/PF_{S(L2)}$  (refer to figure 9)

1. Disconnect the test probe from the phase where jaws is clamp on.
2. Connect the test probe of the V (red) terminal to the second phase (eg. S or L2).
3. Open the jaws and remove clamp meter from phase (7). Close Jaw.
4. **Always press the DCA/DCW ZERO button once to zero the watt and current readings.**
5. Camp on to phase where test probe is connected to (eg. S or L2 phase)
6. The power clamp will automatically select proper range.
7. Wait until the reading is stable, press the NEXT button, and S symbol will disappear.

At this moment,  $W_{S(L2)}/PF_{S(L2)}$  are stored in the memory.

### 3 $\phi$ 4W AC+DC Power Measurement (W+PF, KVA+KVAR)

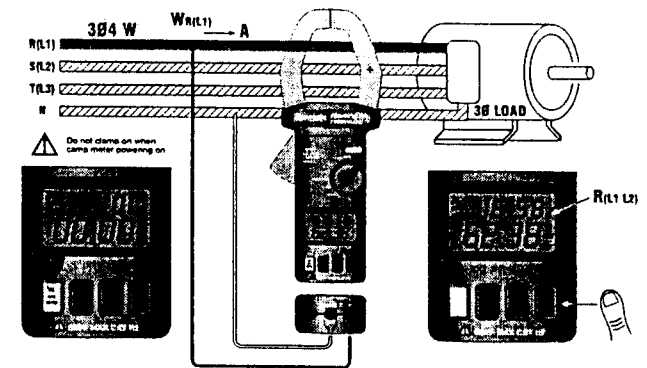


Fig. 8

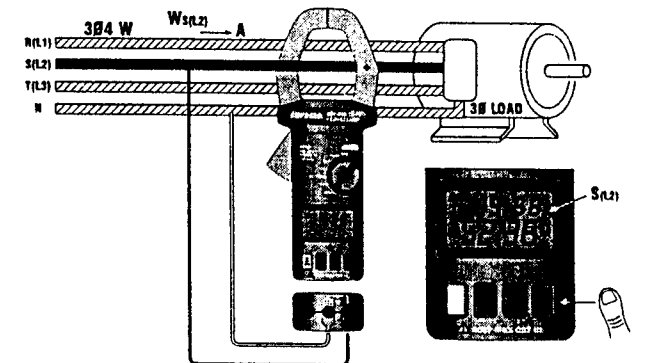


Fig. 9



### 3 $\phi$ 4W AC+DC Power Measurement (W+PF, KVA+KVAR)

Third, measure  $W_{T(L3)}/PF_{T(L3)}$  (refer to figure 10).

1. Disconnect the test probe from the phase where jaws is clamp on.
2. Connect the test probe of the V (red) terminal to the third phase (eg. T or L3 phase).
3. Open the jaws and remove clamp from phase. Close Jaw.
4. **Always press the DCA/DCW ZERO button once to zero the watt and current readings.**
5. Camp on to the phase where test probe is connected to (eg. T or L3).
6. The power clamp will automatically select proper range.
7. Wait until the reading is stable, press the NEXT button, and T symbol will disappear.

At this moment,  $W_{T(L3)}/PF_{T(L3)}$  are stored in the memory,

Once the NEXT button is pressed after measurements of  $W_{R(L1)}/PF_{R(L1)}$ ,  $W_{S(L2)}/PF_{S(L2)}$  and  $W_{T(L3)}/PF_{T(L3)}$ , the power clamp will process these three set of data, and show the result on the LCD. RST symbol will be shown to indicate the total wattage of 3 $\phi$ 4W power (refer to figure 11). Power is displayed in the lower row of LCD while PF is show in the upper row of LCD.

To display KVA and KVAR, press the 3/KVA/KVAR button. KVA will be displayed in the lower row of LCD while KVAR is displayed in the upper row of LCD.

$$W_{3\phi 4W} = W_{R(L1)} + W_{S(L2)} + W_{T(L3)}$$

$$KVAR_{3\phi 4W} = KVAR_{R(L1)} + KVAR_{S(L2)} + KVAR_{T(L3)}$$

$$KVA_{3\phi 4W} = \sqrt{KW_{3\phi 4W}^2 + KVAR_{3\phi 4W}^2}$$

$$PF_{3\phi 4W} = \frac{KW_{3\phi 4W}}{KVA_{3\phi 4W}}$$

**NOTE:** The "+" sign printed on jaw must face the power source, and make sure all the connections and clamping are correct for correct measurement.

**NOTE:** In the 3 $\phi$ 4W power measurement, all three  $W_R$  or  $W_S$  and  $W_T$  must be positive. If users find one negative power, check the connection of test leads and clamping of jaw. Make sure all the connections and clamping are correct to obtain correct power.

### 3 $\phi$ 4W AC+DC Power Measurement (W+PF, KVA+KVAR)

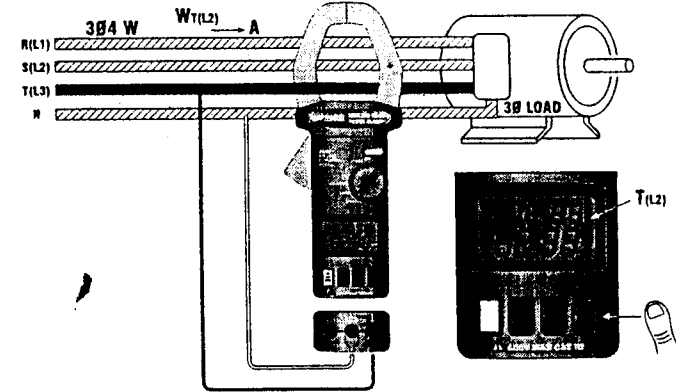


Fig. 10

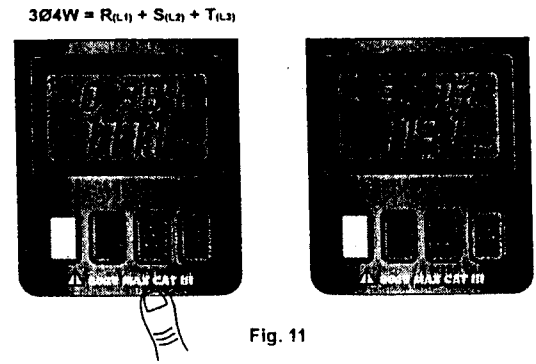


Fig. 11

## 1 $\phi$ 3W Power Measurement

1 $\phi$ 3W power measurement is similar to 3 $\phi$ 3W unbalanced power measurement except the nomenclature is different.

Two measurements are required ( $W_{RS(L1G)}$  and  $W_{TS(L2G)}$ ).

First, measure  $W_{RS(L1G)}$  (refer to figure 12).

1. Turn the power on without clamping on to any wire.
2. Set the rotary switch at 3 $\phi$ 3W.
3. **Always press the DCA/DCW ZERO button once to zero the watt and current readings.**
4. Insert the test leads into the input jack.
5. Connect the test probe of the COM (black) terminal to ground.
6. Connect the test probe of V (red) terminal to the second phase (eg. L1).
7. Clamp on to the same phase as in step 6. (eg. L1).
8. The power clamp will automatically select proper range.
9. Wait until the reading is stable, press the NEXT button, and R symbol will disappear.

At this moment,  $W_{RS(L1G)}$  is stored in the memory, and T symbol appears and blinks to instruct users to take measurement of  $W_{TS(L2G)}$ .

Second, measure  $W_{TS}$  (or  $W_{L2G}$ ) (refer to figure 13).

1. Disconnect the test probe from the phase where jaws is clamping on in the previous measurement.
2. Connect the test probe to the L2 line.
3. Open the jaw and remove clamp meter from phase.
4. **Always press the DCA/DCW ZERO button once to zero the watt and current readings.**
5. Clamp on to the L2 line where the red test probe is now connected.
6. The power clamp will automatically select proper range.
7. Wait until the reading is stable, press the NEXT button, and  $W_{TS(L2G)}$  symbol will disappear. At this moment,  $W_{TS(L2G)}$  is stored in the memory.

Once the NEXT button is pressed after measurements of  $W_{RS(L1G)}$  and  $W_{TS(L2G)}$ , the power clamp will add the two values together and show the result on the LCD. RST symbol will be shown to indicate the total wattage of 1 $\phi$ 3W power in the lower LCD (refer to figure 14) while PF is displayed in the upper LCD.

## 1 $\phi$ 3W Power Measurement

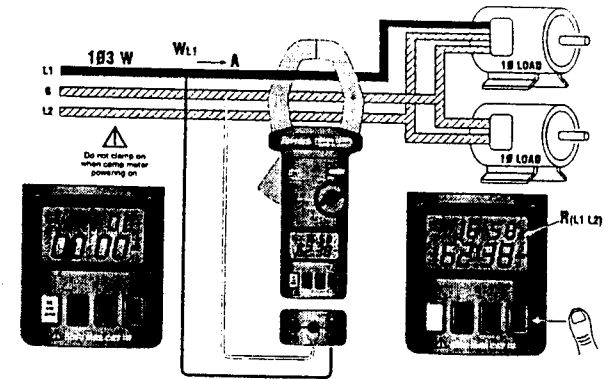


Fig. 12

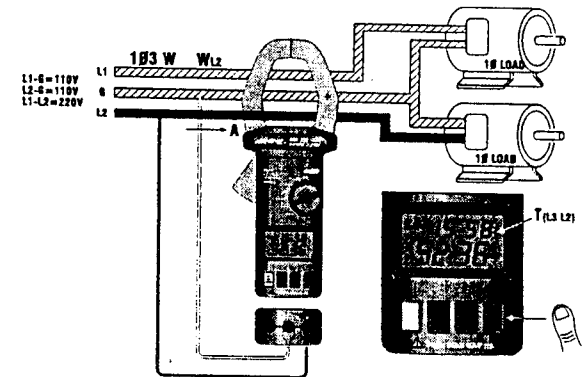


Fig. 13

## 1 $\phi$ 3W Power Measurement

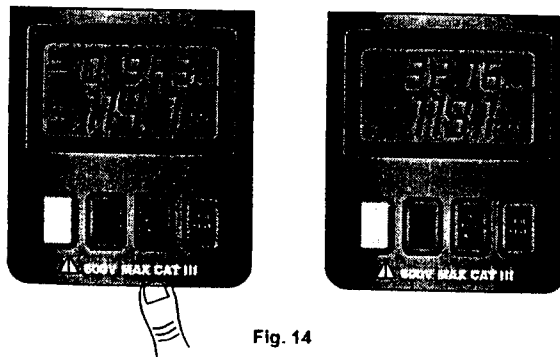


Fig. 14

## AC+DC 1 $\phi$ 2W Apparent/Reactive Power Measurement (KVA+KVAR)

Before any measurement, zero the current (A) reading. Then set the rotary switch at KVAR/KVA. The rest of the procedures are the same as AC+DC 1 $\phi$ 2W Power(KW) and Power Factor (PF) measurement. Refer to figure 2 for test leads connection and clamping of jaw.

KVAR is a calculated value in this function, and its accuracy greatly depends on the accuracy of V, A, and KW. To obtain a more accurate KVAR value when PF is greater than 0.91 ( $\phi < 25^\circ$ ), users can set the switch at 3 $\phi$ 3W and measure the KVAR for sine wave.

**WARNING:** Before taking measurement, users must make sure the current (A) reading is zero by setting the rotary switch at A position. If the current reading is not zero, users might get an incorrect KVA and KVAR values.

## Improving Power Factor of 3 $\phi$ 4W Power System

1. Measure  $KVAR_{R(L1)}$ ,  $KVAR_{S(L2)}$ , and  $KVAR_{T(L3)}$  values of each phase.
2. Based upon the measured values, user can purchase required capacitors at rated voltage and frequency to improve power factor.
3. If actual value of capacitance is needed, user can obtain the value by the following equation.

$$\text{Capacitance (Farad)} = \frac{KVAR * 1000}{2\pi fV^2}$$

It is recommended that the KVAR value of the capacitor should be a little less than the value measured.

## Improving Power Factor of 3 $\phi$ 3W Power System

1. Measure  $KVAR_{\phi}$  value of a balanced system.
2. Based upon the measured value, user can purchase required 3 $\phi$  capacitors at rated voltage and frequency to improve power factor.
3. If actual value of capacitance is needed, user can obtain the value by the following equation.

$$\text{Capacitance (Farad)} = \frac{KVAR * 1000}{2\pi fV^2}$$

It is recommended that the KVAR value of the capacitor should be a little less than the value measured.

## Improving Power Factor of 1 $\phi$ 2W Power System

1. Measure KVAR value of a 1 $\phi$ 2W power system.
2. Based upon the measured value, user can purchase required capacitor at rated voltage and frequency to improve power factor.
3. If actual value of capacitance is needed, user can obtain the value by the following equation.

$$\text{Capacitance (Farad)} = \frac{KVAR * 1000}{2\pi fV^2}$$

It is recommended that the KVAR value of the capacitor should be a little less than the value measured.

## Recording Data in Memory

The power clamp can store 4 readings in memory. To store any reading displayed in LCD, press the REC button. If the power clamp has stored 4 readings already, the LCD will display FULL. The data is lost if power is turned off.

The REC symbol will be displayed in LCD if any data is stored.

**NOTE:** If user sees REC (only) in LCD, that means there is some data stored in memory.

## Reading Data in Memory

To retrieve data in memory, press the READ button (Be sure rotary switch is not set at 3 $\phi$ 3W or 3 $\phi$ 4W function). Once the read button is pressed, the record number will be first displayed, then data is displayed. Once in the READ function, the REC. NO. will be displayed in LCD.

To exit the READ function, turn the rotary switch to change function.

**NOTE:** If user observe both REC and NO. symbols in LCD, user should know that the readings shown in LCD are not current data. They are data stored in memory.

## Sign Convention of PF and KVAR

	PF	KVAR
Inductance Load	+	-(Lag)
Capacitance Load	-	+(Lead)

## Specifications

All specifications rated for 23°C  $\pm$  5°C Temperature

AC+DC True Power (PF 0.2 - 1.0, 3 $\phi$ 3W, 3 $\phi$ 4W, 1 $\phi$ 2W, and 1 $\phi$ 3W)

Range	Resolution	Accuracy (of rdg)	Range
0 - 99.99KW	0.01KW	$\pm$ 2.0% $\pm$ 0.05KW	AC 600V, DC 800V ACA/DCA 2000A
100 - 999.9KW	0.1KW	$\pm$ 2.0% $\pm$ 0.5KW	AC 600V, DC 800V ACA/DCA 2000A
1000-1200KW	1KW	$\pm$ 2.0% $\pm$ 5KW	AC 600V DC 800V ACA/DCA 2000A

KW Autoranging Map (PF 0.2 - 1.0, 3 $\phi$ 3W, 3 $\phi$ 4W, 1 $\phi$ 2W, and 1 $\phi$ 3W)

100 - 999.9KW	0V - 200V 0.00 - 40.00KW	200V - 600VAC 200V - 800VDC 0.00 - 99.99KW 100.0 - 160.0KW
200A - 2000A	0.0 - 400.0KW	0.0 - 999.9KW 1000 - 1600KW

POWER FACTOR (PF)

$$PF = \frac{KW}{KVA}$$

AC+DC Voltage (True RMS, Crest Factor < 4, Autorange, Overload Protection 800VAC for all range)

Range	Resolution	Accuracy (of reading)		Input Impedance
		DC, 50 / 60 Hz	40 - 400Hz	
0 - 200V	0.1V	$\pm$ 1.5% $\pm$ 5dpts	$\pm$ 2.0% $\pm$ 5dpts	10M
200 - 500V	0.1V	$\pm$ 1.5% $\pm$ 5dpts	$\pm$ 2.0% $\pm$ 5dpts	10M
500 - 600VAC	1V	$\pm$ 1.5% $\pm$ 5dpts	$\pm$ 2.0% $\pm$ 5dpts	10M
500 - 800VDC	1V	$\pm$ 1.5% $\pm$ 5dpts	$\pm$ 2.0% $\pm$ 5dpts	10M

## Specifications

### AC+DC Current (True RMS, Crest Factor < 4)

Range	Resolution	Accuracy (of reading)	Accuracy (of reading)	Overload Protection
		DC, 50 / 60 Hz	40 - 400Hz	
0 - 200A	0.1A	±1.5%±5dpts	±2.0%±5dpts	AC 3000A
200 - 500A	0.1A	±2.0%±5dpts	±2.5%±5dpts	AC 3000A
500 - 2000A	1A	±2.0%±5dpts	±2.5%±5dpts	AC 3000A

### AC+DC KVAR (Reactive Power, 3φ3W Sine Wave)

Range	Resolution	Accuracy (of rdg)	Range
0 - 99.99KW	0.01KW	±2.0%±0.05KW	AC 600V, DC 800V ACA/DCA 2000A
100 - 999.9KW	0.1KW	±2.0%±0.5KW	AC 600V, DC 800V ACA/DCA 2000A
1000-1200KW	1KW	±2.0%±5KW	AC 600V DC 800V ACA/DCA 2000A

### AC+DC KVAR (Reactive Power, 3φ4W, 1φ2W, and 1φ3W)

$$(KVAR) = \sqrt{(KVA)^2 - (KW)^2}$$

KVAR is a calculated value, and its accuracy greatly depends on the accuracy of the V, A, and KW measurements, especially when PF is very close to 1. To get a more accurate value when PF is greater than 0.91 (φ < 25°), users set the rotary switch at 3φ3W, and measure the KVAR.

### AC+DC KVA (Apparent Power)

$$KVA = \frac{V \cdot A}{1000}$$

Frequency (If < 10Hz, Hz = 0)

Range	Accuracy	Sensitivity
50/60 Hz	±2dpts	V: > 1V, A: > 5A
10 - 1000 Hz	1.5% ± 2 dpts	V: > 1V, A: > 5A

## Specifications

### Indoor Use

Conductor Size:	Cable 2.1" (55mm approx.) Bus Bar 2.5" (65mm) D x .98" (24mm) W
Battery Type:	9V
Display:	2 X 4 Digits Dual Display LCD
Range Selection:	Auto
Overload Indication:	OL
Low battery Indication:	<input checked="" type="checkbox"/> X
Power Consumption:	25 mA (approx.)
Sampling Time:	0.5 sec. (V and A) 1.6 sec. (W)
Operating Temperature:	39°F to 122°F (4°C to 50°C)
Operating Humidity:	less than 85% relative
Altitude:	up to 2000M
Storage Temperature:	-4°F to 140°F (-20°C to 60°C)
Storage Humidity:	less than 75% relative
Dimension:	271mm (L) x 112mm (W) x 46mm (H) 10.7" (L) x 4.4" (W) x 1.8" (H)
Weight:	22.8 oz (647 g) batteries included
Accessories:	Carrying bag x 1 (CAT. No. CC-KWC) Users manual x 1 (CAT No. 932753) 9V battery x 1 (Installed) (CAT No. MN1604) Test leads (CAT No. DTL-2000)

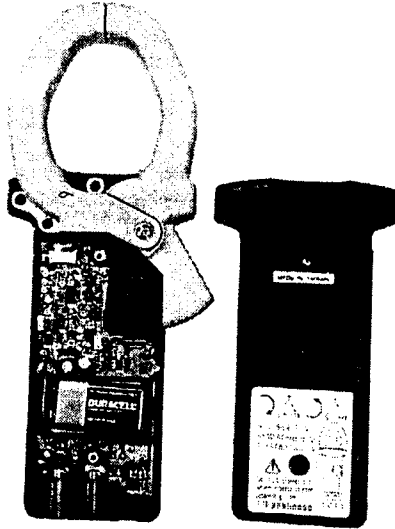
## Maintenance & Cleaning

Servicing not covered in this manual should only be performed by qualified personnel. Repairs should only be performed by qualified personnel.

Periodically wipe the case with a damp cloth and detergent; do not use abrasive or solvents.

## Battery Replacement

## Notes



When the low battery symbol is displayed on the LCD, replace the old battery with new battery.

1. Turn the power off and remove the test leads from the power clamp.
2. Remove the screws of the bottom case.
3. Lift and remove the bottom case.
4. Remove the old battery.
5. Insert new 9V battery.
6. Replace the bottom case and secure the screws.

**WARNING:** Do not touch or adjust any parts inside the power clamp when the bottom case is open.