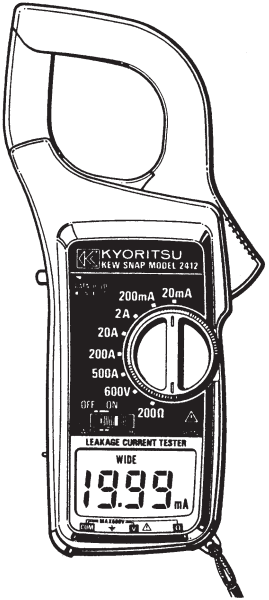
INSTRUCTION MANUAL



DIGITAL AC LEAKAGE CURRENT TESTER

KEW SNAP Series

Model 2412

KYORITSU ELECTRICAL INSTRUMENTS WORKS, LTD.

CONTENTS

1. SAFETY WARNINGS

This instruction manual contains warnings 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 starting using the instrument.

⚠ WARNING

- Read through and understand instructions contained in this manual before starting using the instrument.
- Save and keep the manual handy to enable quick reference whenever necessary.
- Be sure to use the instrument only in its intended applications and to follow measurement procedures described in the manual.
- Be sure to understand and follow all safety instructions contained in the manual.
  Failure to follow the above instructions may cause injury,instrument damage and/or damage to equipment under test.

○ The symbol ⚠ indicated on the instrument means that the user must refer to related parts in the manual for safe operation of the instrument. Be sure to carefully read the 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 minor injury or instrument damage.

Following symbols are used on the instrument and in the instruction manual. Attention should be paid to each symbol to ensure your safety.

⚠	Refer to the instructions in the manual. This symbol is marked where the user must refer to the instruction manual so as not to cause personal injury or instrument damage.
	This instrument satisfies the marking requirement defined in the WEEE Directive. This symbol indicates separate collection for electrical and electronic equipment.

⚠ DANGER

- Never make measurement on a circuit above 600VAC.
- Do not attempt to make measurement in the presence of flammable gasses, fumes, vapor or dust. Otherwise, the use of the instrument may cause sparking, which can lead to an explosion.
- Never attempt to use the instrument if its surface or your hand is wet.
- Do not exceed the maximum allowable input of any measurement range.
- Never open the battery compartment cover when making measurement.
- Never try to make measurement if any abnormal

conditions, such as broken Transformer jaws or case is noted.

- The instrument is to be used only in its intended applications or conditions. Otherwise, safety functions equipped with the instrument doesn't work, and instrument damage or serious personal injury may be caused.
- Never ground yourself when conducting electrical tests. Do not touch exposed metal pipes, outlets,fixtures, etc., which might be st ground potential.
  Keep your body isolated from ground by using dry clothing, rubber shoes, rubber mats, or any approved insulating material.
- The transformer jaws are made of metal and their tips are not insulated. Be especially careful about the hazard of possible shorting where the equipment under test has exposed metal parts.

⚠ WARNING

- Never attempt to make any measurement, if the instrument has any structural abnormality such as cracked case and exposed metal part.
- Do not turn the function selector switch with plugged in test leads connected to the circuit under test.
- Do not install substitute parts or make any modification to the instrument. Return the instrument to Kyoritsu or your distributor for repair or re-calibration.
- Do not try to replace the battery if the surface of the instrument is wet.
- Always switch off the instrument before opening the

battery compartment cover for battery replacement.

- Calibration and repair of any instrument should only be performed by qualified and trained service technicians.Do not attempt calibration or service unless trained and another person capable of rendering first aid and resuscitation is present.
- Do not install substitute parts or perform any unauthorized modification of the instrument. Return the instrument to your distributor or authorized service center for service and repair to insure that safety features are maintained.

⚠ CAUTION

- Make sure that the function selector switch is set to an appropriate position before making measurement.
- Always make sure to insert each plug of the test leads fully into the appropriate terminal on the instrument.
- Make sure to remove the test leads from the instrument before making current measurement.
- Do not expose the instrument to the direct sun, extreme temperatures or dew fall.
- Be sure to set the function selector switch to the" OFF" position after use. When the instrument will not be in use for a long period of time, place it in storage after removing the battery.
- Use a damp cloth and detergent for cleaning the instrument. Do not use abrasives or solvents.
- Never apply voltage to the Output Terminal.
- Never apply voltage above 11V to the Terminal for external Power Sorce.

2. FEATURES

- Designed for measurements of AC leakage and AC current with five ranges from 20mA to 500A. AC 20mA range provides a high resolution of 0.01mA.
- Least affected by external magnetic field.
- Also measures AC voltage up to 600V and resistance up to 200Ω.
- Provides dual frequency responses of fundamental 50／60Hz only or up to 400Hz.
  The frequency response of up to 400Hz permits measurements of current with harmonics superimposed on the fundamental frequency. High frequency current from appliances such as inverters, switching regulators etc. can therefore be measured.
  The dual frequency response is also available for AC current range.
- Data hold function to allow for easy readings in dimly light or hard-to-reach locations.
- Large easy-to-read LCD display.
- DC voltage output in proportion to AC current readings is available for connection to a recorder. With external DC 9V power supply, the instrument permits continuous leakage current monitoring.
- Automatic power off within an hour to conserve battery life.
- Designed to international safety standard.

3. SPECIFICATIONS

●AC current ranges

at 23±10℃, 85% RH

Ranges		Accuracy	
		Frequency Selector Switch	
		WIDE (40Hz～400Hz) position	50／60Hz position
20mA	0～19.99mA	±1.0%rdg±3dgt (50/60Hz) ±5.0%rdg±3dgt (40Hz～400Hz)	±1.5%rdg±5dgt
200mA	0～199.9mA		
2A	0～1.999A		
20A	0～19.99A	±1.5%rdg±3dgt (50/60Hz) ±5.0%rdg±3dgt (40Hz～400Hz)	±2.0%rdg±5dgt
200A	0～199.9A		
500A	0～500A	±2.0%rdg±3dgt (50/60Hz) ±5.0%rdg±3dgt (40Hz～400Hz)	±2.5%rdg±5dgt

Frequency Characteristics

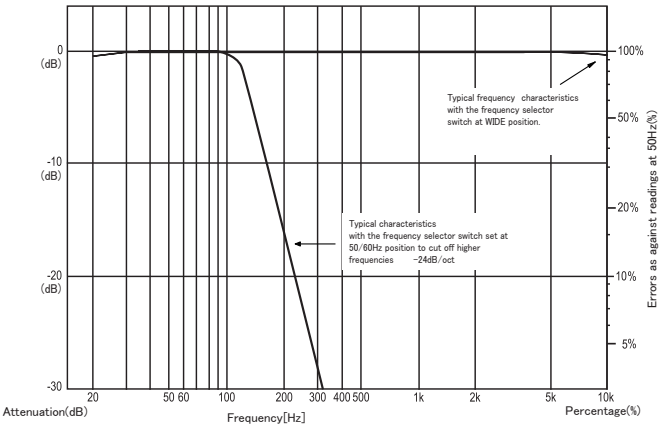


Fig.1

●AC Voltage Range (Frequency selector switch is not available)

Range		Accuracy
600V	0～600V	±2.0%rdg±5dgt (50／60Hz) ±5.0%rdg±5dgt (40Hz～400Hz)

●Resistance Range

Range		Accuracy
200Ω	0～199.9Ω	±1.5%rdg±5dgt

●DC Output Voltage (for AC current range only)

Ranges	Output Voltage	Accuracy	
		Frequency Selector Switch	
		WIDE(40Hz～400Hz)position	50／60Hz position
20／200mA／2A	0～199.9mV	±1.5%rdg±0.3mV(50／60Hz) ±5.0%rdg±0.3mV(40Hz～400Hz)	±2.0%rdg±0.5mV
20／200A		±2.0%rdg±0.3mV(50／60Hz) ±5.0%rdg±0.3mV(40Hz～400Hz)	±2.5%rdg±0.5mV
500A	0～50.0mV	±2.5%rdg±0.3mV(50／60Hz) ±5.0%rdg±0.3mV(40Hz～400Hz)	±3.0%rdg±0.5mV

●DC Output Voltage is provided as follows except on AC 500A range, but the display shows an overrange indication after exceeding full scale.

Ranges	maximun allowable current	Output Voltage
20mA 200mA 2A	0～60.0mA 0～600mA 0～6.00A	0～600mV
20A 200A	0～40.0A 0～400A	0～400mV

Accuracy is not specified.

Operating System:	Dual integration
Sensing:	Average sensing, calibrated in rms of a sinewave
Digital Display:	3-1/2 digit liquid crystal display with maximun reading of 1999
Overrange Indication:	Numeral ″1″ on the highest digit flashes except on AC 500A and AC 600V ranges
Response Time:	Apprrox. 2 second on resistance range Apprrox. 1 second on other ranges
Sample Rate:	Apprrox. three times per second
Data Hold:	For all ranges. In Date Hold mode, ″H″ symbol is displayed on the digital display
Low Battery Indicator:	″B″ symbol is displayed on the digital display.
Storage Temparature and Humidity:	−10～50℃ at 75% max. relative humidity without condensing
Operating Temparature and Humidity:	0～40℃ at 90% max. relative humidity without condensing
Power Source:	one 6F22 (DC9V) battery or equivalent, or DC9±2V external power source
Current Consumption:	Apprrox. 3mA
Auto Power Off:	Automatically turns power off in apprrox. one hour after the instrument is powered (not applicable when operating from an external power source)

Insulation Resistance:	10MΩ min. at 1000V between electrical circuit and housing case, and electrical circuit and transformer jaws
Withstand Voltage:	3700V AC for 1 minute between electrical circuit and housing case as well as electrical circuit and transformer jaws
Conductor Size:	Apprrox. 40mm diameter max.
Dimensions:	209(L)×96(W)×45(D)mm
Weight:	450g approx. (battery included)
Accessories:	6F22 battery Carrying Case Test Leads Model 7066A Output Plug Model 8025 Instruction manual
Optional Accessories:	AC Adaptor Model 8022 (AC 100V) AC Adaptor Model 8023 (AC 220V) Multi-Tran Model 8008 Output Lead Model 7256

4. INSTRUMENT LAYOUT

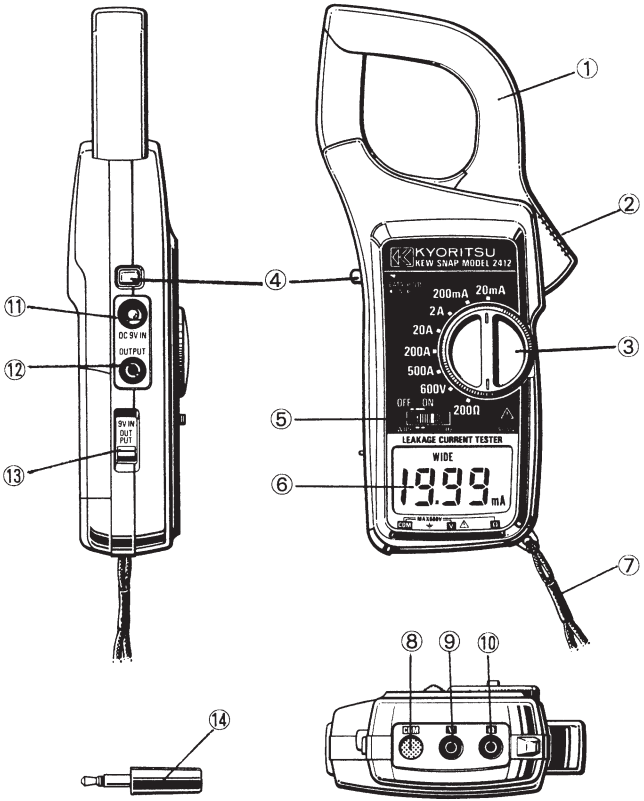


Fig.2

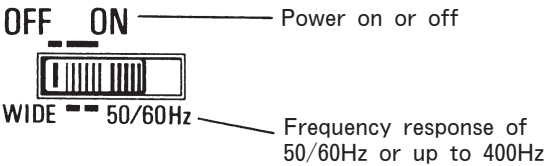
① Transformer Jaws
Pick up current flowing through the conductor.

② Jaw Trigger
Operates the transformer jaws. Press to open them.

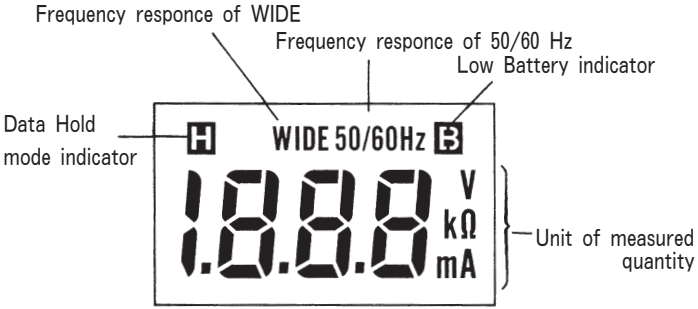
③ Range Switch
Selects ranges.

④ Data Hold Push Button
Push to freeze a reading and push again to release it. In Data Hold mode, "H" is displayed on the digital display.

⑤ Power/Frequency Selector Switch
Turns power on and then selects frequency response of 50/60Hz or WIDE.



⑥ Digital Display
Function symbols and decimal point are displayed according to the Range Switch position.



⑦ Safety Hand Strap
⑧ COM Terminal
⑨ VOLT Terminal
⑩ Ω Terminal
⑪ Terminal for External Power Source (for AC current range only)
⑫ Output Terminal (for AC current range only)
Provides DC voltage in proportion to the AC current reading.
⑬ Terminal Cover Knob
Covers the VOLT Terminal when using Output Terminal or Terminal for External Power Source.
⑭ Output Plug

5. PREPARATIONS FOR TESTS

⚠ WARNING

Always inspect your instrument, test leads and accessories for any sign of damage or abnormality before every use. If any abnormal conditions exist (eg. broken test leads, cracked cases, display not reading, etc), do not attempt to conduct any tests.

5-1 Battery Check

To check the battery voltage set the Power/Frequency Selector Switch to OFF position. If the display is clear without symbol "B" showing, battery voltage is OK. If the display blanks or "B" is indicated, replace the battery according to section 9 for Battery replacement.

NOTE

The instrument automatically turns power off approximately one hour after it is turned on. Therefore the display may be blank with the Power/ Frequency Selector Switch set to On position. To operate the instrument, set the switch back to OFF position and then ON position.

5-2 Data Hold Switch

If the Data Hold Switch is pressed in (DATA HOLD mode), press to release it. Otherwise, the display remains frozen. When the instrument is in DATA HOLD mode, "H" symbol is indicated on the display.

6. OPERATING INSTRUCTIONS

6-1 Current Measurements

⚠ WARNING

- Do not make measurements where the potential is greater than 600V AC. This may cause shock hazard and damage to the instrument or equipment under test.
- The Transformer Jaws are made of metal and their tips are not insulated. Be especially careful about the hazard of possible shorting where the equipment under test has exposed metal parts.
- Make sure to remove the test leads from the instrument before replacing the battery.
- Make sure to remove the test leads from the instrument before making current measurements.
- Do not open the battery compartment cover when making measurements.

⚠ CAUTION

- Take sufficient care to avoid shock, vibration or excessive force when handling the instrument. Otherwise, precisely adjusted Transformer Jaws will be damaged.
- When Transformer Jaws do not fully close, never try to close them by force, but make them free to move and try again. If a foreign substance is stuck in the jaw tips, remove it. If the jaw tips have been deformed, correct so that each tip is properly aligned. Otherwise, the jaws will be damaged and warranty may not cover the repair cost.

NOTE

- When making current measurements, keep the Transformer Jaws fully closed. Otherwise, accurate measurements cannot be taken. Maximum conductor size is 40mm in diameter.
- When measuring larger current, the Transformer Jaws may buzz. This is not a fault and dose not affect the accuracy either.

(1) Set the Range Switch to the desired "A" or "mA" position.

(2) Select the desired frequency response, WIDE or 50/60Hz, with the Power/Frequency Selector Switch. (see 6-2 for Frequency Selector Switch)

⚠ CAUTION

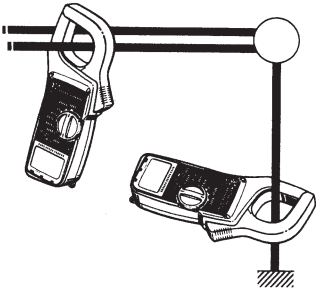
Do not exceed maximum allowable current on each current range. (see 3 for Specifications)

(3) Press the Trigger to open the Transformer Jaws and clamp onto a conductor or conductors as follows.
Take the reading on the display.

NOTE

- For more accurate measurements, place the conductor at the center of the closed jaws.
- When measuring current on a line or a grounded wire, clamp onto one conductor only.

Correct



Wrong

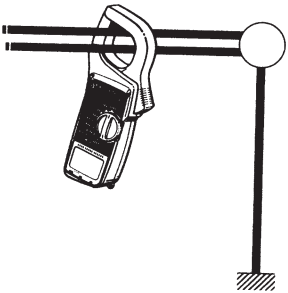
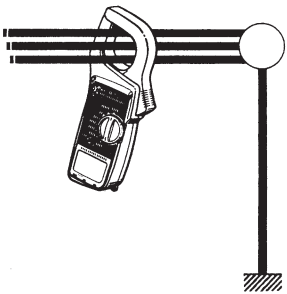
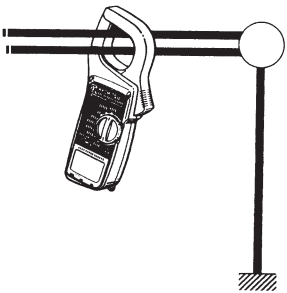


Fig.3

- When measuring out of balance leakage current, clamp onto all conductors except a grounded wire.



Three-phase system



Single-phase system

Fig.4

6-2 Frequency Selector Switch

(available on AC current ranges)

Model 2412 measures AC currents of:

(1)50/60Hz foundamental frequency only with the Frequency Selector Switch set to the 50/60Hz position ("50/60Hz" is indicated on the display), or

(2)40Hz to 400Hz with the Frequency Selector Switch set to the WIDE position ("WIDE" is indicated on the display)

Frequency respose of 40Hz to 400Hz permits measurements of current with harmonics superimposed on the fundamental frequency. High frequency current from appliances such as inverters, switching regulators etc. can therefore be measured.

NOTE

- Frequency response is not selectable on AC voltage range.
- Model 2412 has a very good frequency response due to the electrical property of the transformer jaws used for the instrument. Therefore, it measures AC current of not only 50Hz or 60Hz fundamental wave from but also of higher frequencies and harmonics superimposed on the fundamental frequency when persent in the ciucuit under test.
  To eliminate the effect of noise from the high frequency and measure AC current of 50Hz or 60Hz fundamental frequency, a filter circuit is incorporated into the Model 2412 which works when the frequency selector switch is set to the 50/60Hz position.

6-3 AC Voltage Measurements

⚠ WARNING

- Do not make measurements where the potential is greater than 600V AC. This may cause shock hazard and damage to the instrument or equipment under test.
- Do not open the battery compartment cover when making measurements. This may cause shock hazard.

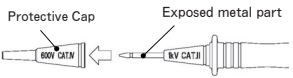
⚠ CAUTION

- Before taking measurements, always make sure that the plugs of the test leads are inserted into the COMMON and VOLT terminals. Applying voltage to the Ω Terminal damages the instrument.

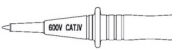
Cautions when using Test Leads

Use of our Protective Cap offers different lengths of the exposed metal part suitable for the test environments.

Please attach the Cap onto the metal part under CAT.III or higher test environments.



Uncapped condition for CAT.II environment



Capped condition for CAT.III/ IV environments

⚠ CAUTION

The Cap should be firmly attached to the Probes.

(1) Set the Range Switch to the 600V position.
(2) Slide up the Terminal Cover Knob to disclose the COMMON Terminal.

NOTE

- Output Terminal and the Terminal for External Power Source, and COMMON Terminal cannot be used at the same time because of the terminal cover. This is to prevent electrical hazard and damage to the instrument.

Terminal Cover Knob position	Terminal for External Power Source	Output Terminal	COMMON Terminal
up	not available	not available	available
down	available	available	not available

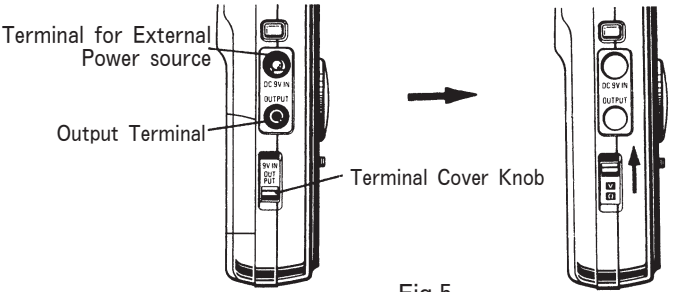


Fig.5

(3) Insert the red plug of the test leads into the VOLT Terminal and the black plug into the COMMON Terminal. (Fig. 6)

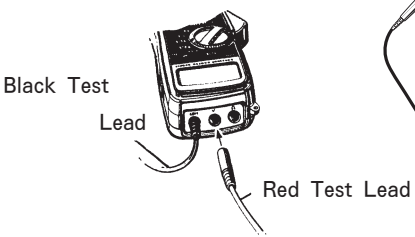


Fig.6

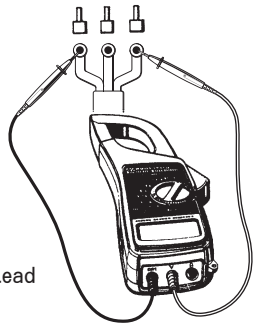


Fig.7

(4) Connect the clips of the test leads to the circuit under test. Take the reading on the digital display. (Fig. 7)

NOTE

- It is reccomendable to connect the black clip of the test lead (i.e. the COMMON Terminal) to the ground side of the circuit under test.

6-4 Resistance Mesurements

⚠ WARNING

- To avoid possible electrical shock and instrument damage, do not measure resistance on an energized (LIVE) circuit.
- Do not open the battery compartment cover when making measurements. This may cause shock hazard.

(1) Set the Range Switch to 200Ω position.
(2) Slide up the Terminal Cover Knob to uncover the COMMON Terminal. (See Fig.5)
(3) Insert the red plug of the test leads into the Ω Terminal and the black plug into the COMMON Terminal. (Fig.8)
(4) Connect the clips of the test leads to the circuit under test. Take the reading on the digital display. (Fig.9)

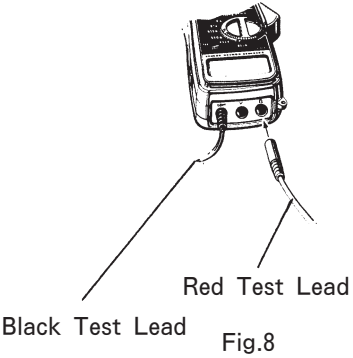


Fig.8

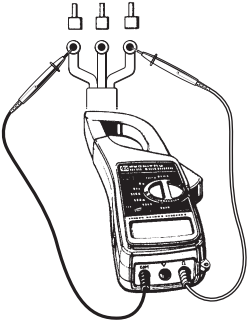


Fig.9

6-5 Date Hold

Push the Date Hold Switch Button to freeze the reading. "H" symbol is displayed on the digital display to indicate that the instrument is in Data Hold mode.

Push the button again to exit from Data Hold mode.

6-6 Automatic Power Off

Model 2412 automatically turns power off in apprrox. one hour after it is turned on. To operate the instrument, set the Power/Frequency Selector Switch back to OFF position and then ON position.

This function is not applicable when operating from an external power source.

NOTE

Use external power source (optional AC adaptor Model 8022 or 8023, or DC 9V power supply) for continuous measurement for more than one hour.

7. DC OUTPUT VOLTAGE (available on AC current ranges only)

(1) Slide down the Terminal Cover Knob to disclose the Output Terminal.
(2) Insert into the Output Terminal the attached plug connected with a lead as per Fig.10 or optional Output Lead Model 7256. (Fig.11)
(3) Connect the other end of the lead to equipment such as an recorder.

⚠ CAUTION

Do not apply voltage to the Output Terminal. It will damage the instrument.

NOTE

- When continuously monitoring for more than one hour, use external power source (optional AC adaptor Model 8022 or 8023, or DC 9V power supply).
  Otherwise, the instrument will automatically turn power off within one hour after it is turned on.
- Frequency select function works on output voltage as well as on AC current reading. Refer to section 3 for Specifications.

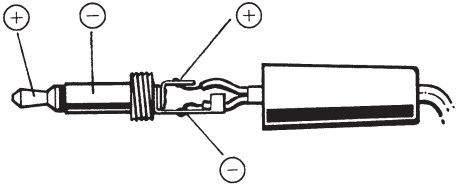


Fig.10

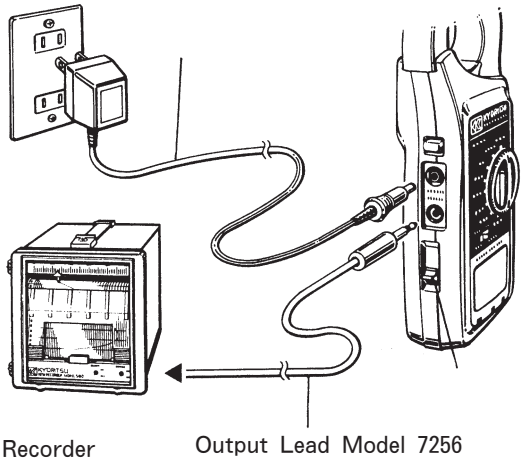


Fig.11

8. TERMINAL FOR EXTERNAL POWER SOURCE

(1) Slide down the Terminal Cover Knob to disclose the Terminal for External Power Source.

(2) Connect an AC adaptor (optional Model 8022 or 8023 is recommended) or DC power source to the terminal.
The AC adaptor or DC power source must hava positive polarity on the outer contact of its output plug and be rated at;
(1)Output voltage : DC 9V±2V
(2)Output current : DC 25mA

⚠ WARNING

- Never use the instrument with the battery compartment cover removed from it.
- Make sure to remove the test leads before connecting the AC adaptor for the an external power source.
- Use an AC adaptor or external power supply of the above ratings and designed to relevant safety standards.

⚠ CAUTION

Use only an AC adaptor or DC power source of the above ratings. Otherwise, the instrument will be damaged.

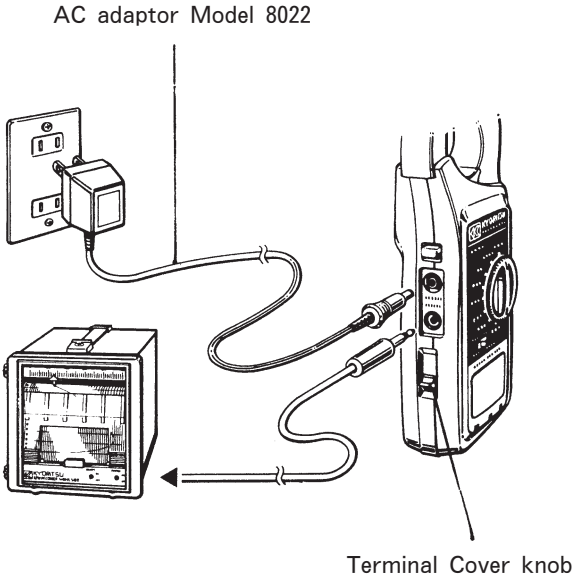


Fig.12

9. BATTERY REPLACEMENT

9-1 When to replace the battery

(1) When "B" symbol is displayed on the digital display.
(2) When the digital display does not read with the Power/Frequency Selector Switch set to ON position.

9-2 Battery replacement

(1) Set the Power/Frequency Selector Switch to OFF position.
(2) Remove all leads and connections from the instrument.
(3) Unscrew and remove the battery compartment cover.
(4) Replace the battery with a new 9V battery type 6F22 or equivalent, observing correct polarity.

⚠ WARNING
Never replace the battery during measurement.

(5) Screw the battery compartoment cover.

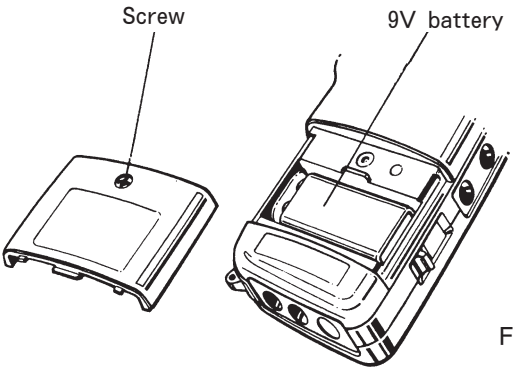


Fig.13

10. OPTIONAL ACCESSORIES

10-1 Model 8008 (Multi-Tran)

Model 8008 is a clamp-on current transformer designed to mesure AC current up to 3000A in conjunction with a clamp meter. It clamps on large bus-bars (up to 150×100 mm) and conductors (up to 100mm diameter)
As shown, clamp on a conductor with Model 8008 that pickup coil also clamped with Model 2412. Then take the reading and multiply it by 10.

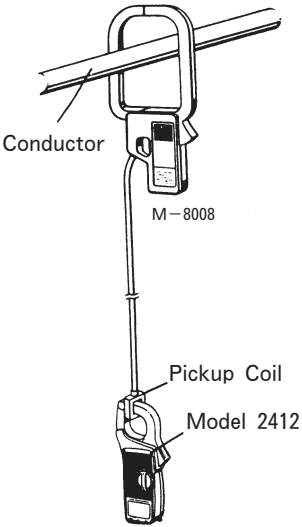


Fig.14

NOTE

Multi-Tran cannot be used for leakage current mesurement.

10-2 Model 8022 and 8023 (AC Adaptor)

Ratings are as follows;

Model 8022 : Input voltage AC 100V～120V (50/60Hz)
Output voltage DC 9V
Output current DC 25mA

Model 8023 : Input voltage AC 200V～240V (50/60Hz)
Output voltage DC 9V
Output current DC 25mA
(see Fig.12)

10-3 Model 7256 (Output Lead)

Model 7256 is a lead to provide DC output voltage for equipment such as a recorder from the Output Terminal.
(see Fig.11)

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