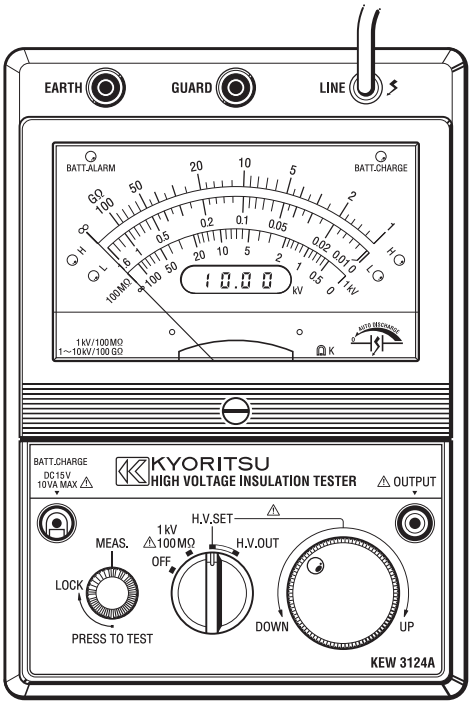
INSTRUCTION MANUAL



HIGH VOLTAGE INSULATION TESTER

KEW 3124A

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 to maintain it in safe condition. Therefore, read through these operating instructions before using the instrument.

⚠ DANGER

- ●Read through and understand instructions contained in this manual before starting to use the instrument.
- ●Keep the manual at hand to enable quick reference whenever necessary.
- ●The instrument is to be used only in its intended applications.
- ●Understand and follow all the safety instructions contained in the manual. It is essential that the above instructions are adhered to.
  Failure to follow the above instructions may cause injury, instrument damage and/or damage to equipment under test. Kyoritsu is by no means liable for any damage resulting from the instrument in contradiction to this cautionary note.

○The symbol ⚠ indicated on the instrument means that the user must refer to the related parts in the manual for safe operation of the instrument. It is essential to read the instructions wherever the symbol ⚠ appears in the 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 injury or instrument damage.

⚠ DANGER

- Do not attempt to make measurements in the presence of flammable gasses. 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.
- This insulation tester will produce a high DC Voltage of 10kV. Do not press the Test button when connecting the test leads to the equipment (circuit) under test.
- Never open the battery compartment cover during a measurement.
- To prevent possible electrical shock, do not touch the circuit under test during an insulation resistance measurement or right after a measurement.

⚠ WARNING

- Never attempt to make any measurements if any abnormal conditions such as broken case and exposed metal parts are noted.
- Do not rotate the Function switch with the test leads connected to the equipment under test.
- Do not install substitute parts or make any modifications to the instrument. Return the instrument to your local KYORITSU distributor for repair or re-calibration.
- Do not try to replace the batteries if the surface of the instrument is wet.
- Insert the plug into the terminal firmly when using test leads.
- Ensure that the instrument is switched off before opening the battery compartment cover for battery replacement.

⚠ CAUTION

- Before starting a measurement, confirm that the Function switch is at an appropriate position.
- Set the Function switch to "OFF" position after use.
  Remove the batteries if the instrument is to be stored and will not be in use for a long period.
- Do not expose the instrument to direct sunlight, high temperature and humidity or dew.
- Use a damp cloth with alcohol for cleaning the areas around the measuring terminals.
- When this instrument is wet, please store it after it dries.
- Wait for a while until the voltage indicator shows 0 V, before disconnecting the test leads from the equipment (circuit) under test, when a capacitive measurement is done.
- Low battery voltage, as a result of a long period of non-use or storing the instrument without setting the Function switch to "OFF", may trigger the internal over-discharging prevention circuit and further measurements may be stopped. In this case, charge the batteries.

Symbols

	Danger of possible electric shock
	User must refer to the manual

2. FEATURES

●Suited for heavy duty electrical maintenance and servicing of industrial installations, cables, transformers, generators and switchgears where high voltage insulation tests are required.

●Measures high voltage insulation resistance up to 100GΩ at a variable voltage between 1kV and 10kV.

●The digital display indicates set voltage at 100GΩ and output voltage. After a test, it also shows remaining charges stored in the circuit or equipment under test.
Easy-to-read auto-ranging dual scales for 100GΩ range that are colour coded for high and low resistance ranges. The LEDs illuminate in matching colour to indicate which range is operative.

●After tests, automatically discharges the charges stored in the circuit under test. Completion of discharging can be checked by voltage readings on the digital display.

●Output terminal to provide DC voltage in proportion to the test voltage and test current for connection to such equipment as a chart recorder.

●Operated by Ni-MH (Nickel metal hydride) batteries which can be charged from AC power source or 12V DC car battery.

●During insulation tests, the buzzer warns presence of high voltage.

●Battery Alarm warns by alternating its colour, when battery voltage lowers.

●Battery Charging Indicator shows completion of battery charging by alternating its colour.

3. SPECIFICATIONS

● High Voltage Range at Variable Test Voltage

Nominal Test Voltage		1kV-10kV/DC (Variable)	
Measuring Range		0-1.6GΩ/1-100GΩ (Auto ranging)	
Accuracy	Insulation Resistance	0.05-50GΩ	±10% of rdg
		Other Ranges	±1 % of scale length (When test voltage is below 2kV, the accuracy is not guaranteed at 50-100GΩ)
	Output Voltage	±2% of set value ±2dgt (on Open Circuit)	

● 1kV/ 100MΩ Range

Nominal Test Voltage		1kV	
Measuring Range		0-100MΩ	
Accuracy	Insulation Resistance	1-100MΩ	±10% of rdg
		Other Ranges	±1 % of scale length
	Output Voltage	Open Circuit	1kV ±10%
		10MΩ load	45% or more of Nominal Test Voltage

● Output Voltage and Set Voltage Indicator

Measuring Range	0 - 10kV DC
Accuracy	±2% of reading ±2dgt

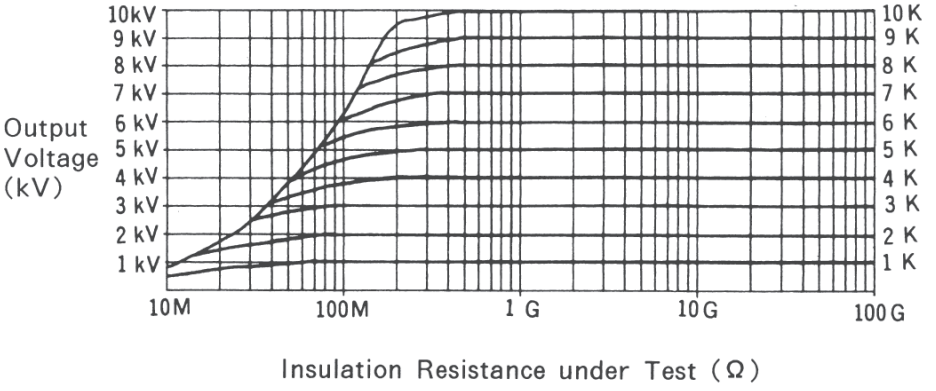
● DC Voltage Output for Recorders

Voltage Output EARTH-LINE Current	100mV DC/10μA
Voltage Output EARTH-LINE Voltage	100mV DC/1kV

Current Consumption:	80mA approx. in stand-by state, 300mA max. in operation
Battery Alarm:	As battery voltage lowers, the illuminating Battery Alarm (BATT. ALARM) alternates its colour to Green, Yellow and Red. Threshold voltages between Green and Yellow, and Yellow and Red are approximately 9.6V and 9.1V respectively. Yellow shows that batteries need to be charged and Red indicates that the instrument is going inoperative.
Battery Charging Indication:	While charging, the Battery Charging indicator (BATT. CHARGE) illuminates in Red and turns into Green to indicate completion of charging. The threshold voltage is approximately 11V. (Charge current of approximately 330mA falls to approximately 60mA after a completion of charging.)
Automatic Power Off:	The instrument automatically shuts off power as battery voltage falls below 9.0 to 8.5V. The instrument does not become operative unless the batteries are charged. (This function is provided to protect batteries from damage by over-discharge.)
Temperature and Humidity for Guaranteed Accuracy:	23℃±5℃ at 85% max. relative humidity
Operating Temperature and Humidity:	0℃ to 40℃ at 85% max. relative humidity
Storage Temperature and Humidity:	-20℃ to +60℃ at 75% max. relative humidity (not applicable to batteries)
Insulation Resistance:	1000MΩ min. at 1000V between electrical circuit and housing case.
Withstand Voltage:	5000V AC for 1 minute between electrical circuit and housing case.

Power Source:	Eight Ni-MH rechargeable AA size batteries, HR15/51 (1) Ratings Rated capacity min. 1900mAh (at discharge rate 0.1CmA) Nominal voltage 1.2V (2) Charge conditions See *section 7 for Battery charging*. (3) Storage conditions At a temperature of -20℃ to +30℃ and low humidity, where there are no corrosive gasses (4) Battery life The number of tests is not less than 500, under appropriate charge, discharge and storage conditions. When the number of tests per one charge largely decreases, battery replacement is needed. (See *section 9 for Battery replacement*.)
Typical Number of Tests:	With incorporated batteries, 70 to 80 tests of 5-minute duration per one charge, depending on operating conditions.
Accessories:	Model 9176 Carrying Case Model 8266: 120V or Model 8267: 230V Battery Charger Model 7084 Earth and Guard Leads Model 7082 Leads for Recorder Model 7083 Leads for Battery Charging Eight Nickel Metal Hydride rechargeable batteries, HR15/51 (installed) Instruction manual
Dimension:	200(L) ×140(W)×80(D)mm
Weight:	Approx. 1600g

KEW3124A Typical Output Voltage Charactaristics



4. INSTRUMENT LAYOUT

①Line Probe
②Guard Terminal
③Earth Terminal
④Battery Alarm
⑤Battery Charging Indicator
⑥High Scale
⑦Low Scale
⑧1kV/ 100MΩ Scale
⑨High Scale Indicator
⑩Low Scale Indicator
⑪Output Voltage
and Set Voltage Indicator
⑫Meter Movement Zero Adjust
⑬Terminal for Battery Charging
⑭Output Terminal for Recorder
⑮Test Button
⑯Function Switch
⑰Output Voltage Set Knob
⑱Earth Lead (Black)
⑲Guard Lead (Green)

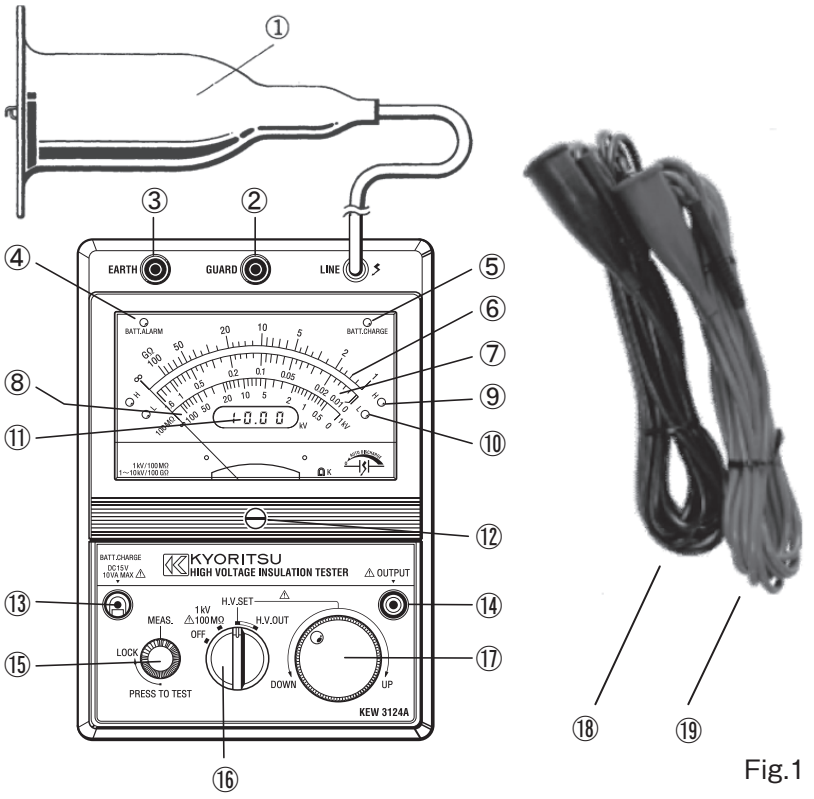


Fig.1

5. PREPARATIONS FOR TESTS

5-1 Mechanical Zero Adjustment

With the Function switch set to the OFF position, check the meter pointer lines up with the "∞" mark on the scale. If not, adjust it by rotating the Meter Movement Zero Adjust with a small screwdriver.

5-2 Test leads connection

Connect the Earth lead (black) to the Earth Terminal of the instrument. If necessary, connect the Guard lead (green) to the Guard Terminal of the instrument. (See *section 6-3 for How to use the Guard terminal.*)

5-3 Battery Check

(1) Make sure that the Test button is not locked down and set the Function switch to the H.V. SET position.

(2) If the Battery Alarm illuminates in Green, proceed to step (4). If in Yellow or Red, charge batteries.
(See *section 7 for Battery Charging.*)

Batt. voltage	> 9.6V	9.6～9.1V	< 9.1V
Battery Alarm	Green	Yellow	Red

(3) If the Battery Alarm is not lit or the digital display does not operate, confirm that the batteries are installed correctly and charge the batteries.

(4) Set the Function switch to the OFF position.

⚠ DANGER

●Do not press the Test button where the Function switch is set to any position other than "OFF" to avoid getting electrical shock.

⚠ CAUTION

- The internal over-discharging prevention circuit will be active when the battery voltage drops to 9.0 – 8.5 V or less and the measurement functions will be completely disabled.
  If the Battery Alarm is not lit or the digital display does not operate, confirm that the batteries are installed correctly and charge the batteries. (See *section 7 and 9*.)

6. OPERATING INSTRUCTIONS

6-1 Checking for absence of voltage

The circuit breaker of the equipment (circuit) under test must be turned off. Use a high voltage detector and verify there is no voltage presence before making a measurement.

6-2 Insulation tests with 1kV - 10kV/100GΩ range

⚠ DANGER

- Confirm that no electrical charges exist on the circuit under test before a measurement by using a high voltage detector.
- Put on a pair of insulated gloves for high voltage.
- Always set the Function switch and Test button to OFF before connecting the test leads.
  While the Function switch is at "1 kV/ 100 MΩ" or "H.V. OUT", high voltage is being generated at the tips of the test leads and also the circuit under test. Do not touch them to avoid getting electrical shock.
- The battery compartment cover must be closed before making a measurement.
- Do not start a measurement when thunder rumbling.
- Make sure to connect the Earth lead (black) to the earth terminal of the circuit under test.

Note:

- KEW3124A may indicate unstable readings when the insulation resistance of the equipment under test is not stable.
- It takes time to measure a capacitive load.
- At an insulation resistance measurement, positive voltage is outputted from the Earth terminal and negative voltage from the Line terminal.

(1) Make sure that the Function switch is set to the OFF position, the Test button is not locked down and the Function switch is set to OFF position.

(2) Connect the clip of Earth lead (black) to the earth point of the circuit, equipment or cable under test. If necessary, connect the clip of Guard lead (green) to an appropriate point.
(See *section 6-4 for How to use the Guard Terminal*.)

(3) Connect the clip of Line probe (red) to the circuit, equipment or cable under test.

(4) Set the Function switch to the H. V. SET position and set output voltage with the output voltage set knob. Set voltage is shown on the digital display.

(5) Set the Function switch to the H. V. OUT position and press the Test button.

(6) When the high scale indicator (green) illuminates, read the high scale marked in green, and when the low scale indicator (red) illuminates, read the low scale marked in light red.
If an insulation resistance indication varies when testing a cable that contains high capacitance, wait until the indication becomes stable.
For continuous operation, press the Test button and turn it clockwise to lock it down. To release the button, turn it counter-clockwise.

(7) KEW3124A has auto-discharge function.
Keep the test leads connected to the circuit under test and unlock the Test button when a measurement completes. The auto-discharge function operates to discharge the electrical charges on the circuit under test.
Confirm that the output voltage indicator shows 0 V.

(8) Set the Function switch to the OFF position and disconnect the clips of leads from the circuit, equipment or cable under test.

⚠ DANGER

- Never ground yourself when conducting electrical tests.
  Do not touch exposed metal pipes, outlets, fixtures, etc., which might be at ground potential. Keep you isolated from ground by using dry clothing, rubber shoes, rubber mats, or any approved insulating material.
- To avoid getting electrical shock, never touch the equipment under test or disconnect the test leads until the auto-discharge process completes after a measurement.

⚠ CAUTION

- If an insulation breakdown occurs in the circuit, equipment or cable under test, the insulation resistance indication falls to zero or its approximate value in the low scale. Immediately release the Test button and wait until the digital display reads zero.
  Then turn the Function switch to the OFF position.

Test button with Lock down feature

- Pressing and turning the Test button clockwise locks the button in the continuous operating position. Press and turn the button counter-clockwise and restore it to the initial position after a measurement.

Auto-discharge function

- Electrical charges stored in the equipment under test are automatically discharged after a measurement. The voltage output indicator shows the discharging progress.

6-3 Insulation tests with 1kV/ 100MΩ range

⚠ DANGER

- ●Confirm that no electrical charges exist on the circuit under test before a measurement by using a high voltage detector.
- ●Put on a pair of insulated gloves for high voltage.
- ●Always set the Function switch and Test button to OFF before connecting the test leads.
  While the Function switch is at "1 kV/100 MΩ" or "H.V. OUT", high voltage is being generated at the tips of the test leads and also the circuit under test. Do not touch them to avoid getting electrical shock.
- ●The battery compartment cover must be closed before making a measurement.
- ●Do not start a measurement when thunder rumbling.
- ●Make sure to connect the Earth lead (black) to the earth terminal of the circuit under test.

(1) Make sure that the Function switch is set to the OFF position, the Test button is not locked down and the Function switch is set to OFF position.

(2) Connect the clip of Earth lead (black) to the earth point of the circuit, equipment or cable under test. If necessary, connect the clip of Guard lead (green) to an appropriate point.
(See section 6-4 for How to use the Guard Terminal.)

(3) Connect the clip of Line probe (red) to the circuit, equipment or cable conductor under test.

(4) Set the Function switch to the 1 kV/ 100 MΩ position.

(5) Press the Test button and read the 1 kV/ 100MΩ scale (the inner scale).
For continuous operation, press the Test button and turn it clockwise to lock it down. To release the button, turn it counterclockwise.

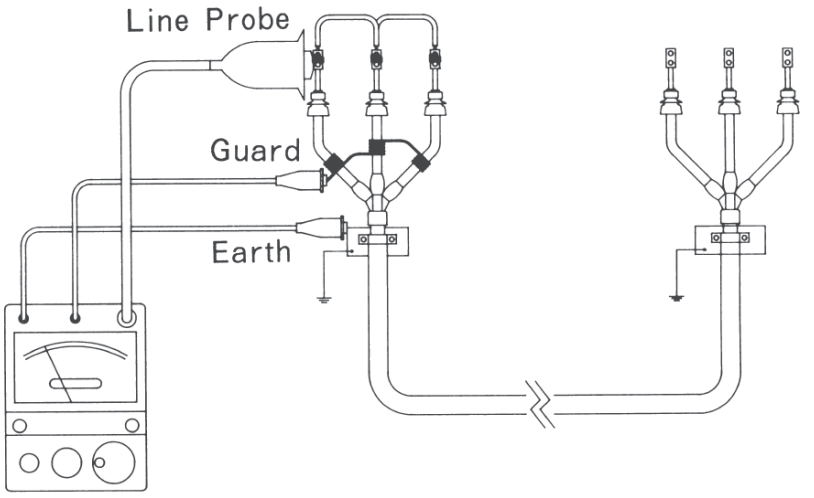
(6) Release the Test button and wait until the digital display reads zero.
(See Auto-discharge function.)

(7) Set the Function switch to the OFF position and disconnect the clips of leads from the circuit, equipment or cable under test.

6-4 How to use the Guard Terminal

In cable insulation tests, wind a conductive wire around insulation of the cable under test and connect it to the Guard terminal with the Guard lead as per Fig. 2.

This is to move out the surface leakage resistance of the cable insulation to make the test results accurate.



KEW3124A

Fig.2

7. BATTERY CHARGING

⚠ DANGER

- Do not open the battery compartment cover if the instrument is wet.
- Never replace batteries during a measurement. To avoid a risk of electrical shock, do not connect the test leads to the equipment under test and set the Function switch to OFF when replacing the batteries.
- To avoid getting electrical shock, the battery compartment cover must be closed during a measurement.

⚠ CAUTION

- Use the Ni-MH batteries specified for KEW3124A. Do not use NiCad rechargeable batteries, alkaline nor manganese batteries to prevent battery leak or explosion which may damage the instrument.
- Do not mix the different types of batteries. Always replace all the batteries with the new ones at the same time.
- Insert batteries with observing correct polarity marked on the battery compartment area.

7-1 When to charge the batteries

(1) If the Battery Alarm alternates its colour from Green to Yellow or Red during a battery check or insulation test, charge the batteries according to *section 7-2.*

Note:

- Green shows that battery voltage is sufficient, Yellow indicates that batteries need to be charged and Red warns that the instrument is about to shut off power. When battery voltage falls below 9.0V to 8.5V, the Automatic power off function turns the instrument into inoperative condition.

(2) If the instrument does not turn operative with the Function switch set to the H.V. SET position, charge the batteries according to *section 7-2.*

Proper temperature for battery charging

- Temperatures between 10℃ and 30℃ are optimum and recommended for battery charging.
- Do not charge batteries at temperatures 0℃ or lower and 40℃ or higher; otherwise the batteries will be damaged.

7-2 How to charge the batteries

(1) Set the Function switch to the OFF position.

(2) Plug the battery charger into mains socket outlet, or connect the red and black clips of the leads for battery charging to the + and - terminals of a car battery respectively.

(3) Connect the plug of the battery charger or the leads for battery charging to the Terminal for Battery Charging of the instrument.
Then the battery charging indicator (BATT. CHARGE) illuminates in red.
The battery charging indicator turns into Green to show the batteries have been charged by 80% and 5 more hours to go until completion of charging.

(4) Wait for at most 11 hours. Charging time depends on the remaining battery voltage.

(5) After charging, disconnect the plug of the battery charger or the leads for battery charging.

Rating and output polarity of battery charger

- Use the battery charger Model 8266 or 8267 designed for KEW3124A.
- Either of center positive or center negative output plug (ø5 x 2.1 x 9. mm) fits into KEW3124A.

Center negative and center positive; both are useable.

CAUTION: For the old model, Model 3124, only the charger with center negative can be used.

8. BATTERY REFRESH

8-1 How to refresh the rechargeable batteries

Incorporated Ni-MH batteries serve for more than 500 charge-discharge cycles. But their capacity may fairly reduce before their lives wear out. You can refresh them in the following steps.

1. Set the Function switch to H.V. SET. Do not press the Test button.
2. Leave the instrument until it becomes inoperative.
3. Set the Function switch to OFF.
4. Charge up the batteries. (See *section 7 for Battery Charging*.)

8-2 Quick refresh

⚠ DANGER

●Avoid touching the tips of probes, otherwise it will impose an electrical shock.

The following steps make the waiting time shorter.

1. Short the Line probe and the Earth probe.
2. Set the Function switch to H.V. SET. Turn the output voltage set knob and set the displayed value of output voltage to 1.00kV.
3. Set the Function switch to H.V. OUT and lock down the Test button for continuous testing.
4. Leave the instrument until it becomes inoperative.
5. Release the Test button and set the Function switch to OFF.
6. Charge up the batteries. (See *section 7 for Battery Charging*.)

Note:

● Incomplete discharging can temporarily reduce the capacity of a Ni-MH rechargeable battery. The capacity resumes after the Battery is discharged down to 1V.

9. BATTERY REPLACEMENT

⚠ CAUTION

- Use the specified type of Ni-MH battery only; otherwise, batteries may not be charged correctly or the instrument may be damaged.
- If batteries other than those specified in this document would be used, charge them with the same brand's battery charger and then insert the batteries in KEW3124A.

Largely decreased number of tests per one charge (see Typical number of tests, SPECIFICATIONS) shows that useful life of the batteries has reached its end. In this case, replace batteries as follows.

(1) Loosen the screw of the battery compartment cover at the bottom of the instrument and remove the cover.
(2) Replace all the eight batteries by 1.2V Nickel metal hydride rechargeable batteries of type HR15/51. Eight batteries must be of the same type and brand.

Note:

- Standard AA batteries (manganese or alkaline) can be used in place of Ni-MH batteries, however, pay extra caution so as not to charge those non-rechargeable batteries accidentally. It may cause battery leak or explosion and damage the instrument.

Battery recommendations

- When replacing the Ni-MH batteries, please replace them with the either of our recommended batteries: Panasonic eneloop BK-3MCC or BK-200AAB. (1.2 V/ min. 1900 mAh, both)
- For any inquiry about these batteries, please contact your local Kyoritsu distributors.

10. BATTERY HANDLING PRECAUTIONS

In order to take full advantage of the properties of Ni-MH batteries and also to prevent problems resulting from improper use, please note the following points.

10-1 Environmental condition

After removing the batteries from the instrument, store them under temperatures between -20℃ to +30℃ and low humidity, where there are no corrosive gasses. If the batteries will be stored for 3 months or longer, it is recommended to store them at normal temperatures between +10℃ and +30℃. Otherwise, leakage or rust to the batteries may occur.

10-2 Long storage

After a long period of storage, the capacity of the batteries may tentatively decrease to some extent and consequently reduces the number of tests. However, after several charge-discharge cycles, it resumes to the level before the storage.

When storing the tester, batteries installed, for more than one year, charge the batteries at least once a year to prevent liquid leakage or performance deterioration due to self- discharging.

11. CLEANING OF METER COVER

This instrument is tested by our company's quality standard and is delivered in the best condition after passed the inspection.
But in the dry time of winter static electricity sometimes builds upon the meter cover due to the characteristic of plastic.
When the pointer deflects by touching the surface of this tester or zero adjustment cannot be made, do not try to make measurement.
When static electricity builds up on the meter cover and affects themeter reading, use a cloth dampened with off-the-shelf anti-statics agent or detergent to wipe the meter cover surface.

12. CONNECTION TO RECORDER

DC output voltage can be obtained by inserting the leads for recorder into the output terminal for recorder. The leads provide DC voltage in proportion to the current and voltage between the EARTH and LINE terminals as follows. (Model 7082)

Plugs	Output voltage
Blue (+) Black (-)	DC100mV/10 μA of EARTH-LINE Current
Red (+) Black (-)	DC100mV/1kV of EARTH-LINE Voltage

DISTRIBUTOR

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