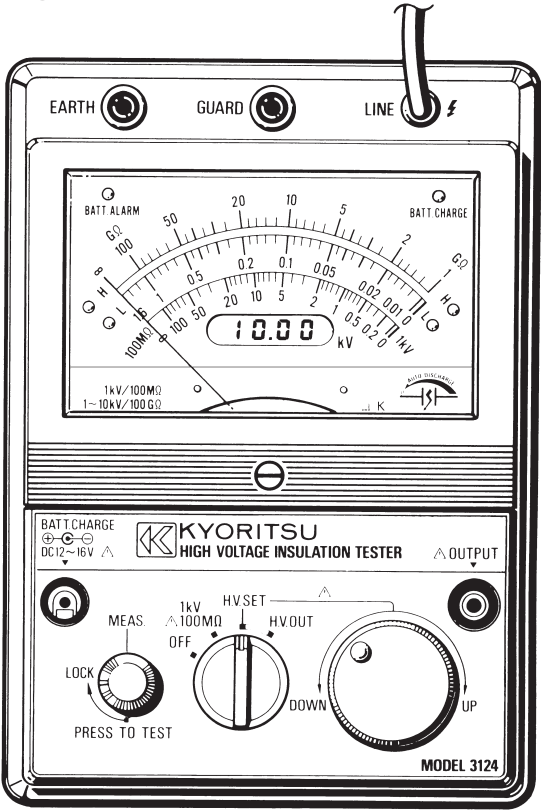


INSTRUCTION MANUAL



**BATTERY POWERED HIGH VOLTAGE INSULATION TESTER
WITH VARIABLE VOLTAGE SETTING**

MODEL 3124

KYORITSU ELECTRICAL INSTRUMENTS WORKS, LTD.,
TOKYO, JAPAN

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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 these operating instructions thoroughly and completely before using the instrument.
- The symbol \triangle on the instrument means that the user must refer to the relevant section of this instruction manual for safe operation of the instrument.
- Pay particular attention to all. WARNINGS and CAUTIONS in this instruction manual. WARNING indicates warnings to avoid electrical shock and CAUTION cautions to avoid damage to the instrument.

- 1. Insulation tests are to be performed on de-energized (DEAD) circuits and equipment only. Do not perform tests on energized (LIVE) circuits !**
- 2. Always test the circuit or equipment for the presence of voltages to ensure it is de-energized. Make sure that you can visually see that the circuit or equipment is disconnected before proceeding with an insulation test. Do not proceed with any tests if you are not sure the circuit is DEAD !**
- 3. Consult the manufacturer of the equipment you are going to test if you are not sure how to test it with a High Voltage Insulation Tester. Some equipment may contain sensitive electronic components which may be**

damaged during a test by applying a high DC Voltage. Consult the manufacturer for precautions that should be followed to avoid equipment damage.

4. This insulation tester will produce a high DC Voltage of 10kV. Do not touch the test leads and the circuit or equipment under test during an insulation test. Do not attempt to stimulate or shock anyone else with this instrument. Horse play and fooling around can result in electric shock causing Ventricular Fibrillation.
5. Do not open the battery compartment cover when conducting tests.
6. 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.

7. Never ground yourself when conducting electrical tests. Do not touch exposed metal pipes, outlets, fixtures, etc., which might be at ground potential, Keep your body isolated from ground by using dry clothing, rubber shoes, rubber mats, or any approved insulating material.
8. To avoid electric shock, use CAUTION when working with voltages above 40V DC or 20V AC. Such voltages pose a shock hazard.
9. Always make sure to set the Function Switch to the OFF position and the Press to Test Button is not locked down before connecting the Line Probe or test leads to the circuit or equipment under test.

10. To avoid electric shock, never touch exposed wiring or connections of the circuit, or the equipment under test. After test, also never touch those until you ensure that the stored charges has totaly discharged. Completion of discharging can be monitored by voltage readings on the digital display.
11. Do not attempt to operate this instrument in an explosive atmosphere (i. e. in the presence of flammable gasses or fumes, vapor or dust).
12. 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.
13. 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.
14. The instrument must be used by a competent, trained person and operated in strict accordance with the instructions. Kyoritsu Electrical Instruments Works, Ltd. will not accept liability for any damage or injury caused by misuse or non-compliance with the instructions or safety procedures. It is essential to read and understand the safety rules contained in the instructions. They must be observed when using the instrument.
15. Do not expose the instrument to the direct sun, extreme

temperature of more than 50°C or dew fall.

16. When not in use for a long period of time, place the instrument in a storage after removing the batteries from it.
17. Use a damp cloth and detergent for cleaning the case of the instrument. Do not use abrasives or solvents.

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 $100\text{G } \Omega$ at a variable voltage between 1kV and 10kV, plus low voltage insulation resistance up to $100\text{M}\Omega$ at a fixed voltage of 1kV. The $100\text{M}\Omega$ range is for a cable insulation checking.
- The digital display indicates set voltage at $100\text{G}\Omega$ and output voltage. After a test, it also shows remaining charges stored in the circuit or equipment under test. Easy-to-read autoranging dual scales for $100\text{G}\Omega$ range that are colour coded for high and low resistance ranges. LED's 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 monitored 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.
- Suited for heavy duty electrical maintenance and servicing of industrial installations, cables, transformers, generators and switchgears where high voltage insulation tests are required.

- Operated by Nickel-Cadmium batteries which can be recharged from AC power source or 12V DC can 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 (Autoranging)	
Accuracy	Insulation Resistance	0.05~50 GΩ	±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 DC	
Measuring Range		0~100MΩ	
Accuracy	Insulation Resistance	1~100MΩ	±10% of rdg
		Other Ranges	±10% of scale length
	Output Voltage	on Open Circuit	1kV±10%
		at 10MΩ	More than 45% of Nomal test Voltage 1kV (Minimum value is 450V)

• Output Voltage and Set Voltage Indicator

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

• DC Voltage Outputs 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
250mA approx. in operation

Battery Alarm: As battery voltage lowers, the illuminating Battery Alarm (BATT. ALARM) alternates its colour of 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 250mA falls to approximately 30mA after 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 overdischarge.)

**Temperature and Humidity
for Guaranteed Accuracy:**

23°C ± 5°C at 85% max. relative humidity

**Operating Temperature
and Humidity:**

0~40°C at 85% max. relative humidity

**Storage Temperature
and Humidity:**

– 20°C ~ 60°C at 75% max. relative humidity (not applicable to batteries)

Insulation Resistance:

1000 MΩ min. at 1000V between electrical circuit and housing case

Withstand Voltage:

5000V AC for 1 minute between electrical circuit and housing case

Power Source:

8 pcs of Nickel-Cadmium rechargeable battery, KR15/51 (IEC285),

(1) Ratings

Rated capacity 700mAh (at discharge rate 0.2CmA)

Nominal voltage 1.2V

(2) Charge conditions

See section 7 for Battery

charging

(3) Storage conditions

At a temperature of $-20^{\circ}\text{C} \sim +30^{\circ}\text{C}$ 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 8 for Battery replacement)

Typical Number of Tests:

With incorporated batteries, 20 to 30 tests of 5 minute duration per one charge, depending on operating conditions.

Accessories:

Model 9069 Carrying Case

Model 8079: 120V or

Model 8080: 230V

Battery Charger

Model 7084 Earth and Guard Leads

Model 7082 Leads for Recorder

Model 7083 Leads Battery

Charging

8 pcs of Nickel-Cadmium
rechargeable battery, KR15/51
(IEC285) (installed)

Instruction manual

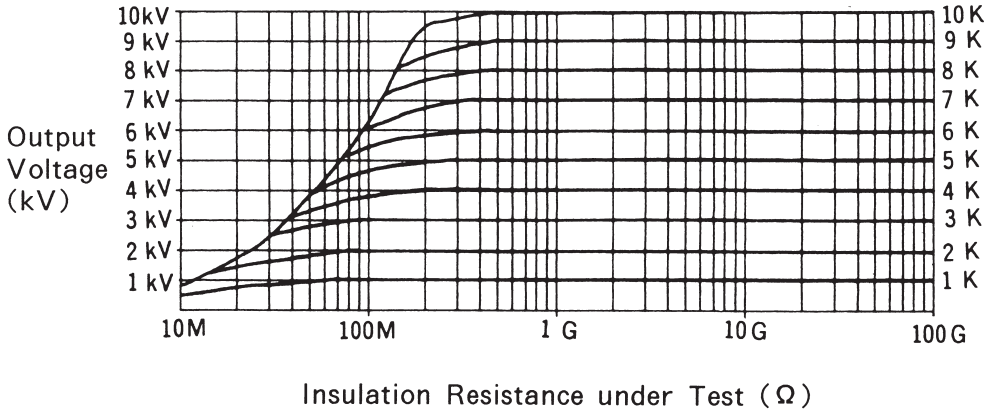
Dimensions:

200(L) × 140(W) × 80(D) mm

Weight:

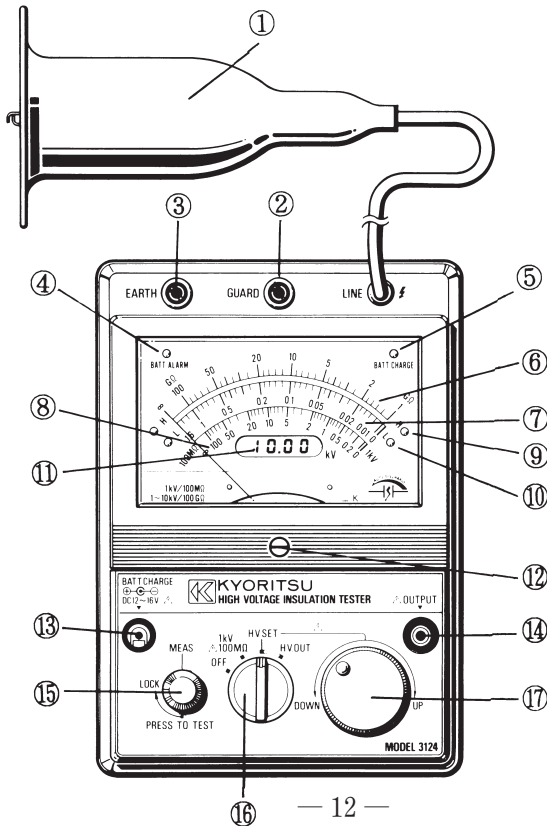
1500g approx.

MODEL-3124 Typical Output Voltage Characteristics



4. INSTRUMENT LAYOUT

- ① Line Probe
- ② Guard Terminal
- ③ Earth Terminal
- ④ Battery Alarm
- ⑤ Battery Charging Indicator
- ⑥ High Scale for 100GΩ Range
- ⑦ Low Scale for 100GΩ Range
- ⑧ Scale for 100MΩ Range
- ⑨ High Scale Indicator for 100GΩ Range
- ⑩ Low scale Indicator for 100GΩ Range
- ⑪ Output Voltage and Set Voltage Indicator
- ⑫ Meter Movement Zero Adjust
- ⑬ Terminal for Battery Charging
- ⑭ Output Terminal for Recorder
- ⑮ Press to Test Button
- ⑯ Function Switch
- ⑰ Output Voltage Set Knob



5. PREPARATIONS FOR TESTS

NOTE

After unpacking and before using the instrument, charge batteries according to section 7 for Battery Charging. Otherwise the instrument is not operative. Rechargeable batteries have already been installed.

⚠ 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.

After each insulation test or every use of the instrument, make sure that the Function Switch is set to the OFF position and the Press to Test Button is not locked down. Otherwise, High Voltage can be generated and cause an electrical shock.

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 small a screwdriver.

5-2 Connection Leads

Connect the Earth Lead (Green) to the Earth Terminal of

the instrument. If necessary, connect the Guard Lead(Black) 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 Press to Test Button is not locked down and set the Function Switch to the 1kV/100MΩ position.
- (2) If the Batt. Alarm illuminates in Green, proceed to step (4). If in Yellow or Red, charge batteries. (See section 7 for Battery Charging)

NOTE

Yellow means that battery charging is required and Red shows that the instrument is going inoperative.

- (3) If the Batt. Alarm is not lit or the digital display does not operate, check if batteries are properly installed. If so, charge the batteries.

NOTE

The instrument automatically shuts off power when battery voltage falls below 9.0 to 8.5V. The instrument does not become operative unless the batteries are charged.

- (4) Set the Function Switch to the OFF position.

6. OPERATING INSTRUCTIONS

⚠WARNING

Insulation tests are to be performed on de-energized (DEAD) circuits and equipment only. Do not perform tests on energized (LIVE) circuits!

Always test the circuit or equipment for the presence of voltages to ensure it is de-energized. Make sure that you can visually see that the circuit or equipment is disconnected before proceeding with an insulation test. Do not proceed with any tests if you are not sure the circuit is DEAD !

Consult the manufacturer of the equipment you are going to test if you are not sure how to test it with a High Voltage Insulation Tester. Some equipment may contain sensitive electronic components which may be damaged during a test by applying a high DC Voltage. Consult the manufacturer for precautions that should be followed to avoid an equipment damage.

6-1 Tests with 1kV~10kV/100 GΩ Range

⚠WARNING

Always make sure to set the Function Switch to OFF position and the Press to Test Button is not locked down before connecting the Line Probe or test leads to the circuit or equipment under test.

Do not open the battery compartment cover when conducting tests.

- (1) Make sure that the Function Switch is set to the OFF position, the Press to Test Button is not locked down and the Function Switch is set to OFF position.
- (2) Connect the Clip of Earth Lead (Green) to the earth point of the circuit, equipment or cable under test. If necessary, connect the Clip of Guard Lead (Black) to an appropriate point. (see section 6-3 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 Press to 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, read it after the indication becomes stable.

For continuous operation, press the Press to Test Button and turn it clockwise to lock it down, To release the Button, turn it counterclockwise.

△WARNING

Never ground yourself when conducting electrical tests. Do not touch exposed metal pipes, outlets,

fixtures, etc., which might be at ground potential. Keep your body isolated from ground by using dry clothing, rubber shoes, rubber mats, or any approved insulating material.

⚠ CAUTION

If an insulation breakdown has occurred 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 Press to Test Button and wait until the digital display reads zero. Then turn the Function Switch to the OFF position.

(7) Release the Press to Test Button and wait until the digital display reads zero.

⚠ WARNING

To avoid an electric shock, never touch exposed wiring or connections of the circuit, equipment or cable under test. After the test, also never touch those until you ensure that the digital display reads zero to indicate stored charges has totally discharged. Discharging can be monitored by voltage readings on the digital display.

(8) Set the Function Switch to the OFF position and disconnect the Clips of Leads from the circuit, equipment or cable under test.

6-2 Test with 1kV/100MΩ range

⚠ WARNING

Always make sure to set the Function Switch to the OFF position and the Press to Test Button is not locked down before connecting the Line Probe or test leads to the circuit or equipment under test.

Do not open battery compartment cover when conducting tests.

- (1) Make sure that the Function Switch is set to the OFF position, the Press to Test Button is not locked down and the Function Switch is set to OFF position.
- (2) Connect the Clip of Earth Lead (Green) to the earth point of the circuit, equipment or cable under test. If necessary, connect the Guard Lead (Black) to an appropriate point. (see section 6-3 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) Press the Press to Test Button and read the 100MΩ scale (the inner scale).

For continuous operation, press the Press to Test Button and turn it clockwise to lock it down. To release the Button, turn it counterclockwise.

⚠ WARNING

Never ground yourself when conducting electrical tests. Do not touch exposed metal pipes, outlets,

fixtures, etc., which might be at ground potential. Keep your body isolated from ground by using dry clothing, rubber shoes, rubber mats, or any approved insulating material.

⚠ CAUTION

If an insulation breakdown has occurred 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 Press to Test Button and wait until the digital display reads zero. Then turn the Function Switch to the OFF position.

- (5) Release the Press to Test Button and wait until the digital display reads zero.

⚠ WARNING

To avoid an electric shock, never touch exposed wiring or connections of the circuit, equipment or cable under test. After the test, also never touch those until you ensure that the digital display reads zero to indicate stored charges has totally discharged. Discharging can be monitored by voltage readings on the digital display.

- (6) Set the Function Switch to the OFF position and disconnect the Clips of Leads from the circuit, equipment or cable under test.

6-3 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.

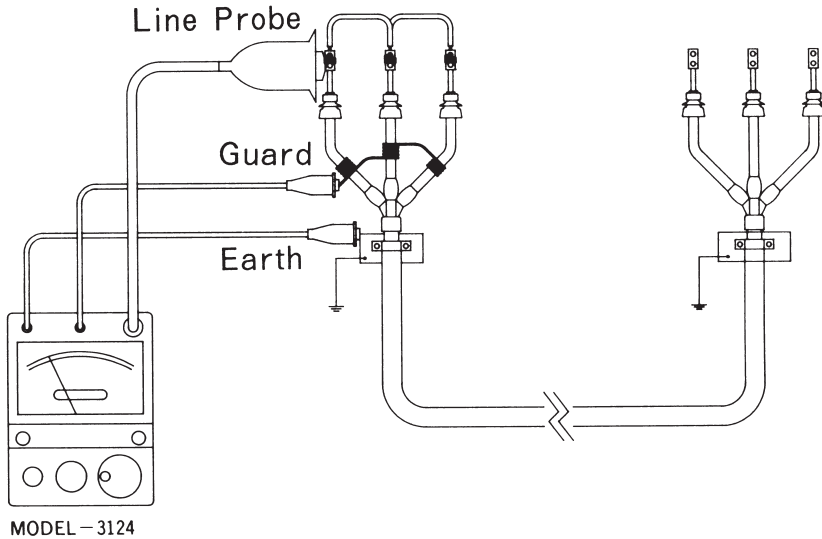


Fig. 2

7. BATTERY CHARGING

7-1 When to charge the batteries

- (1) If the Batt. Alarm alternate its color 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 1kV/100M Ω or H.V. Set position, charge the batteries according to section 7-2.

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 - terminal 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) starts illuminating in Red.
- (4) Wait for at most 10 hours. Charging time depends on the remaining battery voltage.
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.

⚠CAUTION

An ambient temperature of 10°C~30°C is recommended for battery charging. Do not carry out charging at a temperature below 0°C or over 40°C. Otherwise the batteries will be damaged.

Use the incorporated Battery Charger or those having positive(+) polarity on the outer part of the plug and rated at:

output voltage DC 12V

output current DC 0.5A

or charge from a DC 12V car battery. Otherwise the batteries may be damaged.

- (5) After charging, disconnect the plug of the Battery Charger or the Leads for Battery Charging.

⚠WARNING

Do not conduct insulation tests while the batteries are charged. This may cause electrical hazard.

8. BATTERY REPLACEMENT

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 of the eight batteries by 1.2V Nickel-Cadmium rechargeable batteries of type KR15/51 (IEC285). Eight batteries must be of the same type and brand.

⚠CAUTION

Do not use primary batteries such as Manganese or Alkaline batteries, which may cause damage to the instrument.

Replacement of Rechargeable Nickel and Cadmium battery

In case of the replacement of Nickel or Cadmium battery, use the one we recommend as follows.

Recommended battery:

Nickel and Cadmium battery

(YUASA 700APPU or SANYO N-3U 1.2V/700mAH)

* Please contact your dealer to purchase above recommended batteries.

CAUTION:

1. When using the batteries other than the recommended ones; battery charge cannot be made, or instrument may be damaged.
2. To use different rechargeable batteries other than listed above; full charge the batteries with the designated charger and install them to the instrument.

9. CLEANING OF METER COVER

This instrument is managed 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 up on the meter cover due to the characteristic of plastic.

When the pointer deflects by touching the surface of this tester or zero adjustment can not be made, do not try to make measurement.

When static electricity builds up on the meter cover and affects the meter reading, use a cloth dampened with off-the-shelf anti-statics agent or detergent to wipe the meter cover surface.

10. STORAGE OF NICKEL-CADMIUM BATTERIES

After moving the batteries from the instrument, store them in an environmental condition having a temperature of $-20^{\circ}\text{C} \sim +30^{\circ}\text{C}$ and low humidity, where there are no corrosive gasses. Otherwise, leakage or rust to the batteries may occur. 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. After the storage period exceeds a year, charge the batteries at least once a year to prevent liquid leakage or damage caused by overdischarge.

11. CONNECTION TO RECORDERS

DC output voltage can be obtained by inserting the Leads for Recorders into The Output Terminal for Recorders. The leads provide DC voltage in proportion to the current and voltage between the EARTH and LINE terminal as follows;

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

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

How to refresh the rechargeable batteries

Incorporated Ni-Cd 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 Function Switch to 100M Ω or HISET. Do not press Test Button.
2. Leave the instrument until it becomes inoperative.
3. Set Function Switch to OFF.
4. Charge up the batteries. (See Section 7 for Battery Charging)

The following steps make the waiting time shorter.

1. Short Line Probe and Earth Probe.
2. Set Function Switch to 100M Ω and lock down Test Button.

⚠ WARNING

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

3. Leave the instrument until it becomes inoperative.
4. Release Test Button and set Function Switch to OFF.
5. Charge up the batteries. (See Section 7 for Battery Charging)

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

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