

**sanwa**®

**PDR302**

**EARTH RESISTANCE METER**

**取扱説明書**

**INSTRUCTION MANUAL**



## CONTENTS

<b>[1]</b>	Warning Instruction for safe use .....	15
<b>[2]</b>	INTRODUCTION .....	16
<b>[3]</b>	PANEL ARRANGEMENT AND ACCESSORIES .....	17
<b>[4]</b>	OPERATION .....	18
	1. Arrangement of Auxiliary Earth Bars and Connections ...	18
	2. Measurement of Earth Resistance Using the Tripolar System .....	19
	3. Measurement of Earth Resistance Using the Bipolar System .....	19
	4. Measurement of Leakage Voltage Using the ACV .....	20
	5. Replacing the Batteries .....	20
	6. Maintenance .....	21
<b>[5]</b>	SPECIFICATIONS .....	22

## [1] Warning Instruction for safe use

### WARNINGS

1. Do not input voltage or signals that exceed the specified allowable values.
2. Do not open the casing or battery compartment cover except to replace the batteries. Otherwise, do not attempt to repair, modify, or disassemble the unit.
3. Be sure to use the specified type of test lead.
4. Do not use the unit with high-power and high-voltage circuits.
5. Do not use a test lead with a damaged lead wire or exposed core wire. If the insulation coating is damaged, replace the test lead with a new one.
6. Do not use the unit when it is wet, your hands are wet, or when the humidity is high (80 % RH or more relative humidity).
7. Do not touch the test pin during measurement.
8. Do not use the unit if it proves defective and is not capable of performing required measurements.

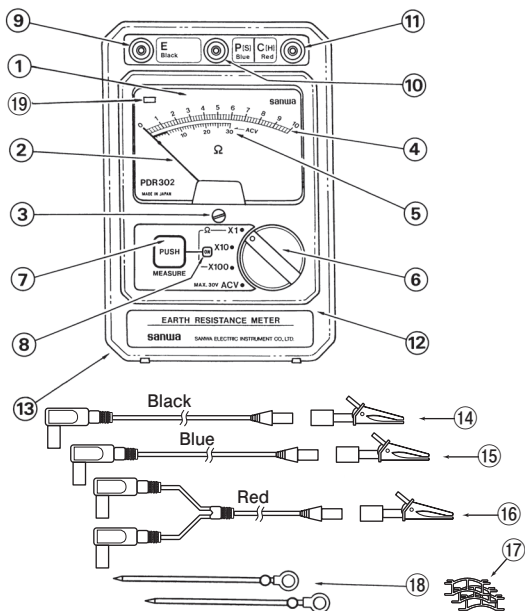
## [2] INTRODUCTION

Together with an insulation resistance meter and a circuit meter, an earth resistance meter is required for the inspection and maintenance of electrical construction work. The obligatory nature of this instrument has resulted in strong demand for an earth resistance meter with handling convenience and a maintenance facility.

The Sanwa PDR302 Earth Resistance Meter is just the device to satisfy these requirements as it features solid-state circuitry and automatic direct reading of earth resistance using a battery-powered constant-current system. Some of the main benefits and advantages of the PDR302 include:

1. The indication circuitry employs a phase detection system. This eliminates external noise interference and helps achieve high-precision measurement.
2. A stable, constant-current power source is used for measurement so self-calibration is not required each time a measurement is to be performed. Measurements can be quickly performed at the touch of a button.
3. The unit is powered by six R6 (SUM-3) 1.5 V batteries. The compact, lightweight design is easy to use.
4. An AC voltage range is reserved exclusively for measurement of grounded voltage (0~30 V) to prevent indication errors of earth resistance values caused by leakage current that flows to the earth.
5. Earth resistance measurement is a simple push-button operation, making the unit easy to use and eliminating wasteful battery consumption.

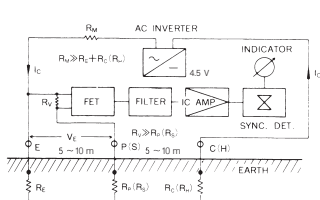
### [3] PANEL ARRANGEMENT AND ACCESSORIES



- |   |  |
|---|--|
| ① Meter (indicator)                                 | ⑩ P(S) terminal (for auxiliary grounding)  |
| ② Pointer   | ⑪ C(H) terminal (for auxiliary grounding)  |
| ③ Zero adjuster                                     | ⑫ Panel  |
| ④ Earth resistance scale (0~10 Ω), black            | ⑬ Rear case  |
| ⑤ AC voltage scale (0~30 V), red                    | ⑭ E-terminal connection cord (black), approx. 5 m, with alligator clip (black)   |
| ⑥ Range switch                                      | ⑮ P(S) terminal connection cord (blue), approx. 10 m, with alligator clip (blue) |
| ⑦ Earth resistance measurement switch (push-button) | ⑯ C(H) terminal connection cord (red), approx. 20 m, with alligator clip (red)   |
| ⑧ Power supply indicator/battery check              | ⑰ Lead wire reel, x 3  |
| ⑨ E terminal (for grounding)                        | ⑱ Earth bars (metal), 2 pcs.   |
|   | ⑲ Auxiliary grounding value excess indicator lamp                                |

## [4] OPERATION

### 1. Arrangement of Auxiliary Earth Bars and Connections



$$V_E = I_c \cdot R_E$$

$$\therefore R_E = \frac{V_E}{I_c}$$

For example

$$I_c = 1 \text{ mA}$$

$$V_E = 10 \text{ mV}$$

$$R_E = \frac{V_E}{I_c} = \frac{10 \text{ mV}}{1 \text{ mA}} = 10 \Omega$$

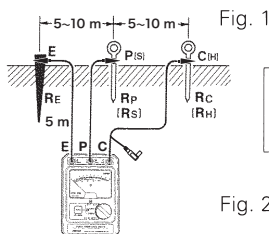


Fig. 2

### ⚠ WARNING

Take extra care not to drop the earth bars or pierce anything with them when carrying them or inserting them into the ground. The tips of the earth bars are very sharp.

As shown in Figs.1 and 2, the auxiliary bars are arranged parallel to the earth (E) at intervals of 5~10 meters. Where it is impossible to align them parallel, a certain amount of bending ( $\angle E, P(S), C(H) \geq 120^\circ$ ) is allowed.

When the nets are used instead of the bars, the  $R_P(R_S)$  and  $R_C(R_H)$  at the earth poles read larger. Normally, the impedance of the power supplying constant AC current to E-C(H) is high enough to prevent reading errors due to a slight increase of resistance. However, when the nets are used on a concrete surface, wet them to enable better contact with the ground. Measurement is not possible on asphalt surfaces. Once the bars have properly set, make connections as illustrated.

## 2. Measurement of Earth Resistance Using the Tripolar System



Make sure that the object being measured — an electric appliance, for example — is properly grounded. If the object is improperly grounded or not grounded, commercial voltage may leak into or be applied to the object. Double-check all safety precautions before starting measurement.

### CAUTION:

Make sure the earth bars are inserted into the ground securely. If they are improperly inserted,  $R_P(R_S)$  and  $R_C(R_H)$  values increase. This will result in errors in measurement values and instabilities in indicated values.

1. The range switch is placed at one of the three ranges to be selected according to the size of the earth resistance ( $R_E$ ).
2. Press the MEASURE PUSH switch. The power indicator lamp (ON) will light red and the pointer will point at the earth resistance value ( $R_E$ ).
3. For the "X1" range, the figures along the arc are read directly (0~10  $\Omega$ ). For the "X10" and "X100" ranges, they are read multiplied by 10 for 0~100  $\Omega$  and by 100 for 0~1000  $\Omega$ .
4. If the red LED (OVER AUX. R) on the upper left of the meter scale lights after the MEASURE PUSH switch is pressed, this means the auxiliary grounding resistance value is excessive and correct measurement cannot be performed. Should this happen, re-insert the earth bars into the ground.
5. If the power indicator lamp (ON) starts blinking after the MEASURE PUSH switch is pressed, this means the batteries are low. Replace them with new ones. For details, refer to "5. Replacing the Batteries."

## 3. Measurement of Earth Resistance Using the Bipolar System

1. When earth is available whose resistance value has been already detected or whose resistance is extremely low and can be regarded as immaterial with respect to the earth resistance in question, you can measure unknown earth resistance by taking advantage of the electrical circuit ground at hand.
2. The earth of unknown resistance is connected to the terminal E. Next, insert the plugs of the C-terminal connection cord to the  $P(S)$  and  $C(H)$  terminals and connect the alligator clip to a point with known earth resistance value.
3. The value measured with this method is the sum of an unknown earth resistance  $R_x$  and known earth resistance  $r_E$ . If the value is already known, obtain the true value by subtracting the known earth resistance value  $r_E$  from the meter reading  $R_E$ .



Earth resistance to be measured:  $R_x$

$$R_x = R_E - r_E$$

Connect to a point with known earth resistance

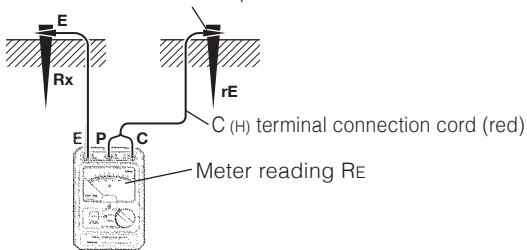


Fig.3

#### 4. Measurement of Leakage Voltage Using the ACV

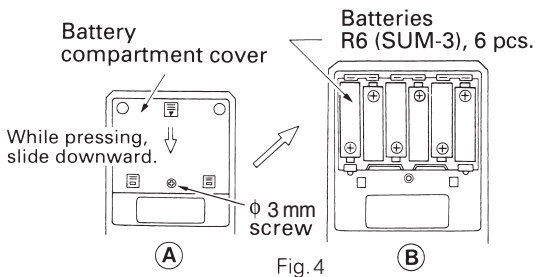
##### **! WARNINGS**

1. Never attempt to supply voltage over 30 V — the maximum allowable voltage — since the ACV of this unit uses leakage AC voltage (ground voltage).
2. Never supply standard commercial voltage (AC 100 V for example).

1. Once connections have been made, turn the range switch "ACV."
2. The pointer responds if there is any earth voltage present to indicate leakage AC current flowing into the earth circuit. The red 0~30 V scale reads it.
3. If the scale reads above 5 V, there will be interference with earth resistance measurement. In this case, before taking measurement, open either the power circuit, the equipment using the earth, or its earth circuit to reduce the effect of the voltage leak.
4. Earth voltage can be checked independently across E and P(s) without using the C(H) terminal.

#### 5. Replacing the Batteries

1. When the batteries are low, the power indicator lamp (ON) starts blinking after the MEASURE PUSH switch is pressed. When this happens, replace the batteries with new ones. Refer to Fig.4 for replacing the batteries.



2. Unfasten the screw from the battery compartment cover on the back of the unit. While pressing the rectangular protrusion in the center of the cover as shown in Fig.4 (A), slide it down to remove it. Insert new batteries and align them according to the battery directions shown in Fig.4 (B).
3. When the new batteries are loaded, replace the cover on the battery compartment and tighten the screw to secure it.

## CAUTIONS

1. Be sure to use specified batteries only. Never mix different types or brands of batteries even if the rated voltage is the same.
2. To avoid deterioration of performance, use only brand-new batteries when replacing batteries.

## 6. Maintenance

1. Remove the batteries when not using the tester for extended periods.
2. Do not drop the instrument or otherwise subject it to severe shock. Do not expose it to high temperatures or moisture.
3. The indicator cover is treated with anti-electrification coating. Do not rub it hard with a dry cloth. If the coating is found ineffective, you can spray it with disc cleaner as a temporary measure.

## [5] SPECIFICATIONS

### 1. Measurement Ranges

$\Omega$ (earth resistance):

X1 reading 0  $\sim$  10  $\Omega$ (0.2  $\Omega$  per scale)

X10 reading 0  $\sim$  100  $\Omega$ (2  $\Omega$  per scale)

X100 reading 0  $\sim$  1,000  $\Omega$ (20  $\Omega$  per scale)

ACV (leakage voltage) 0  $\sim$  30 V(1 V per scale)

### 2. Accuracy

$\pm 5$  % fs for  $\Omega \times 1$

$\pm 2.5$  % fs for  $\Omega \times 10$ ,  $\Omega \times 100$

$\pm 2.5$  % fs for ACV

### 3. Batteries

R6(SUM-3) $\times 6$

### 4. Method of Measurement

Constant-current system (tripolar & bipolar)

### 5. Constant Current AC Power

Abt. 100 V(1 kHz), through inverter

### 6. Auxiliary grounding value alarm LED lights at approx. 10 k $\Omega$ or more

### 7. Battery Alarm

Blinking LED, approx. 6.5 V operation voltage

(LED normally lights during measurement)

### 8. Accuracy Guarantee Temperature/Humidity Range

15  $^{\circ}\text{C}$   $\sim$  35  $^{\circ}\text{C}$ , 80 % RH or less

No dew condensation allowed

### 9. Operating Temperature/Humidity Range

0  $^{\circ}\text{C}$   $\sim$  40  $^{\circ}\text{C}$ , 80 % RH or less

No dew condensation allowed

### 10. Accessories

Measurement cords: 1 ea., black 5 m / blue 10 m / red 20 m ] TL-66  
3 lead wire spools

Alligator clips: 1 ea., black / blue / red (CL-302)

Earth bars: 2 ea. (CL-ER)

Carrying case: 1 (C-PDR302)

Storage bag: 1 (C-302CB)

Instruction manual: 1

### 11. Dimension and Mass

175 x 118 x 55 mm, Abt. 500 g(main unit)

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## 保証書

ご氏名

様

ご住所

□□□-□□□□

TEL

保証期間

ご購入日 年 月より3年間  
(製品の許容差については1年間)

型名

**PDR302**

製造No.

この製品は厳密なる品質管理を経てお届けするものです。  
本保証書は所定項目をご記入の上保管していただき、アフターサービスの際ご提出ください。  
※本保証書は再発行はいたしませんので大切に保管してください。

## 三和電気計器株式会社

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## 保証規定

保証期間内に正常な使用状態のもとで、万一故障が発生した場合には無償で修理いたします。但し、保証期間内であっても下記の場合には保証の対象外とさせていただきます。

### 記

- 取扱説明書に基づかない不適当な取扱い（保管状態を含む）または使用による故障
- 弊社以外による不当な修理や改造に起因する故障
- 天災などの不可抗力による故障や損傷、および故障や損傷の原因が本計器以外の事由による場合
- お買い上げ後の輸送、移動、落下などによる故障および損傷
- その他、弊社の責任ではないとみなされる故障
- 本保証書は、日本国内において有効です。

This warranty is valid only within Japan.

以上

年 月 日	修理内容をご記入ください。

※無償の認定は当社において行わせていただきます。



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