HIOKI

Instruction Manual

SM-23GN

SUPER MEGOHM CHECKER

HIOKI E. E. CORPORATION

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Table of Contents

1. Precautions in operating

1) This instrument should be handled and operated with great care since a high voltage is being generated between the measuring terminals at a low impedance.

Meanwhile, the same electric voltage potential is being generated as well between the guard terminal of the red rod and the black measuring rod, which may cause short circuits and damage the instrument. So great care should also be taken.

2) This instrument is a super megohm checker capable of measuring up to a high resistance. In making measurement of resistance, special care should be exercised to prevent external noise.

3) Polarity of measuring voltage

- voltage appears at the red measuring rod.

+ voltage appears at the black measuring rod.

4) In case the insulation resistance value of a specimen to be measured almost equals to the rated resistance value of this instrument, both "Go" and "No Go" lamps may be lighted while measuring. If such a value is smaller than the rated resistance value by 10%, the "No Go" lamp should light.

5) This instrument, when not in use, should be stored at a place of less humidity.

2. Specifications

1) Rated measuring voltage : 4 ranges of 100V, 250V, 500V and 1000V DC.

2) Rated setting resistance: 19 points of 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5, 10MΩ

3) Multi-range : 5 ranges of $\times 1$, $\times 10$, $\times 10^2$, $\times 10^3$, $\times 10^4$

4) Measuring range : 10^6 - $10^{11}\Omega$

5) Accuracy of measuring voltage : Within ±3% of each voltage

6) Accuracy of judgement : Within ±10%

7) Output of judgement : 24V DC for both Go and No open collector, within 300mA

8) Power supply : AC V, 50 to 60Hz (to be specified)

9) Dimension of main unit : About 242(W) × 180(H) × 280(D) mm

10) Weight of main unit : About 5.3kg

Standard accessory : Measuring rods 1 set

Instruction manual 1 copy

3. General description

1) Theory of operation

This instrument adopts the volt-ammeter method whereby a specimen insulator is judged whether or not it is good in insulation capacity by detecting a current flowing through it to which a measuring voltage is applied.

The instrument consists of an amplifier for amplifying input signal, a high voltage power source for supplying a voltage to a specimen to be measured, a comparator which determines the good or bad of a specimen by comparing an output voltage of the amplifier against a voltage proportional to a predetermined resis tance value and a driver circuit which displays the result of determination or generates signals of determination.

The block diagram of this instrument is shown in Fig. 1.

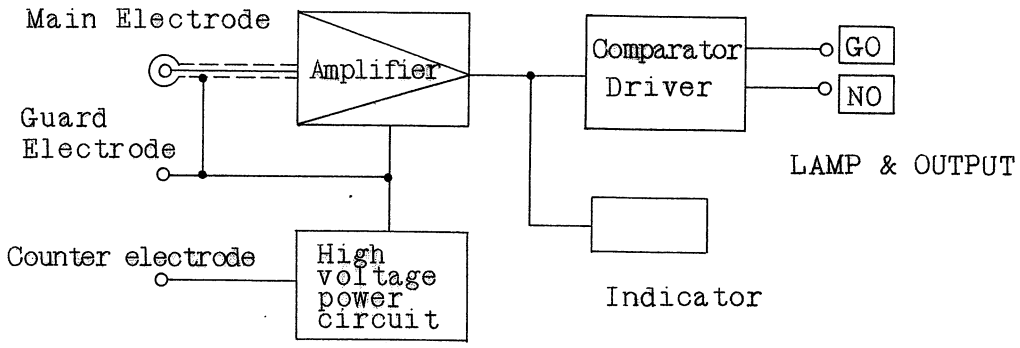


Fig. 1 Block Diagram

2) Features

This instrument is designed to have the following features which permit simple operation for performing gafe and efficient insulation test.

o. Fine division of rated setting resistance values

The 95 types of resistance values can be set by means of 19 ranges of resistance value between 1 MΩ and 100,000 MΩ being multiplied by 5 ranges of multi-range knob.

o. Many measuring voltages

This instrument is capable of measuring various types of insulator as it has 4 ranges of measuring voltages from 100V, 250V, 500V and 1,000V. The change-over of measuring voltage will not afeect a rated setting resistance range.

o. Equipped with some warning devices

Unlike the conventional one which utilizes meters for displaying the results of measurement, this instrument is equipped with lamps, buzzer and warning output device.

o. Equipped with "REST" switch

By means of this "REST" switch, a high voltage measuring voltage alone can be turned off when measurement is to be temporarily suspended for preventing danger.

o. Built-in self-calibrating circuit

This instrument is composed to be capable of self-calibrating without using external meters to insure correct measurement.

o. Easy measurement of condenser

Measurement can be expedited as the red measuring rod is provided with a tongue tip for charging a condenser.

4. Name of componet

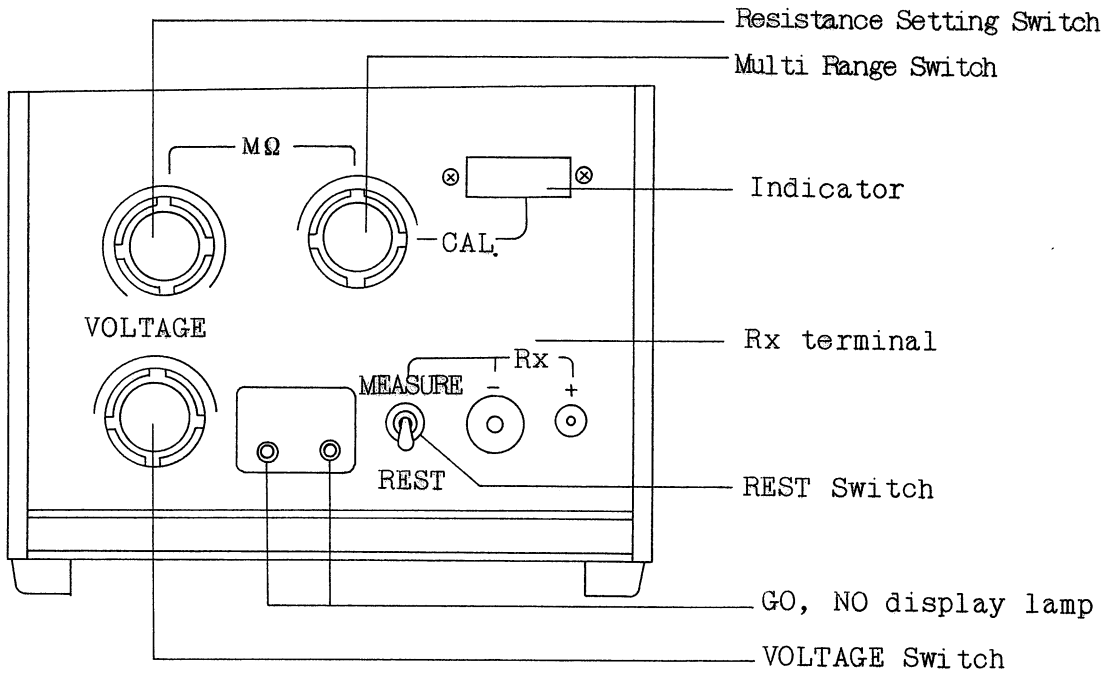


Fig. 2 Front Panel

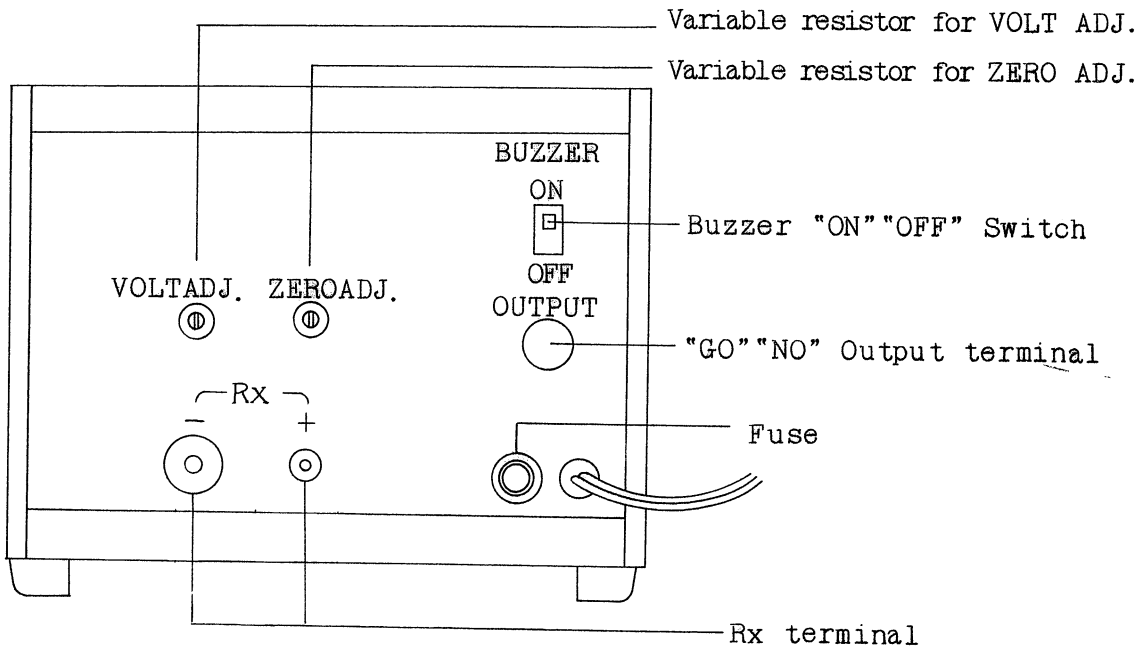


Fig. 3 Rear panel

5. Description of component

1) Front panel (Fig. 2)

o. Voltage switch (S_1)

This switch is used to change-over the measuring voltage to be impressed on a specimen for measurement to either one of 100V, 250V, 500V, and 1,000V. This is commonly used as power switch and power is turned off at the"OFF"position in the center.

o. Multi-range switch (S_2)

This switch is used to set range at X1 to X10^4 and a rated setting resistance can be expanded from 1 to 10,000 times larger. This is set at"CAL."for self-calibration.

o. Resistance setting switch (S_4)

This switch is used being combined with the multi-range switch (S_2) for setting a desired insulation resistance value.

o. "GO" "NO" display lamps

These lamps display the quality of a specimen, good or bad, as the"GO"lamp is lighted when the specimen is higher than a rated setting resistance and the"NO"lamp is lighted if it is lower.

o. REST switch (S_3)

This switch is used to turn"ON"or"OFF"the voltage of (+) terminal (VOLTAGE) of R_X terminal. A measuring voltage will not be induced at R_X terminal when this switch is set at"REST"side while not in use.

o. R_X terminal

This terminal is connected with either red or black measuring rod attached for measuring the insulation resistance of a specimen.

o. Indicator

This indicator is to monitor the operation of this instrument and primarily used for self-calibration.

2) Rear panel (Fig. 3)

o. R_X terminal

This terminal is used to connect this instrument to an automatic device for making insulation measurement, and has a main electrode, guard electrode and counter-electrode terminals.

o. Variable resistor for VOLT ADJ.

This is used to correctly adjust the measuring voltage. This should be used in accordance with Par. 6.2(2).

o. Variable resistor for ZERO ADJ.

This is used to adjust the zero point of the amplifier. This resistor should be used in accordance with Par. 6.2(1).

o. Buzzer switch

A built-in buzzer will generate sound when the insulation resistance value of a specimen to be measured is lower than a resistance setting value. The buzzer can be turned off by this switch when buzzer is not required.

o. Output

Depending on the result of measurement, "GO" or "NO" lamp will be lighted and an output can be taken out from this output terminal.

o. Fuse

This instrument uses a glass tube fuse of 1A.

6. Operating method

6.1 Preparation

1) Switches on the panel should be set as indicated below:

(1)	VOLTAGE switch (S_1)	OFF
(2)	Resistance setting switch (S_4)	1
(3)	Multi-range switch (S_2)	x1
(4)	REST switch (S_3)	REST
(5)	Rx terminal	No connection

2) Connect the power cord of the instrument to an AC receptacle and set the "VOLTAGE" switch to "1000 V"

3) The instrument will be ready for operation in several minutes. With this, preparation is now complete.

6.2 Calibration

After the instrument has been fully stabilized, self-calibration of the instrument should be performed in the following order:

1) The indicator should indicate "ZERO" point for each of switches set in the stage of preparation. If the indicator is deviated, it should be correctly adjusted to the zero point by means of "ZERO ADJ." provided on the rear panel.

2) Confirm that the indication of the indicator conforms to that of 1000V after placing S1 in 100V position. If the indicator deviates, adjust it by turning the "ZERO ADJ." on the rear panel. Conform the indication of 100V to that of 1000V finally by repeating this operation.

3) The self-calibration will be finalized if the indication of indicator comes in the position "CAL." painted in red and grey when the multi-range is placed in "CAL." position. (Fig. 4) If the indicator is deviated, it should be correctly adjusted to the zero point by means of "VOLT ADJ." provided on the rear panel.

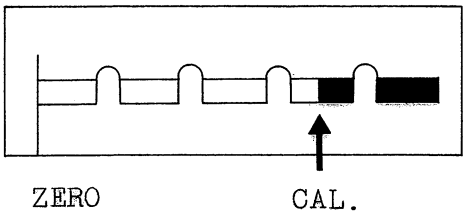


Fig. 4 Indicator scale diagram

6.3 Measurement

1) Connect the red measuring rod and black measuring rod to the Rx terminals.

2) Adjust the setting resistance to a value to be judged by means of S_2 and S_4.

3) The quality of a specimen, good or bad, can be judged by setting S_3 at"MEASURE"side and connecting the measuring rods the specimen to be measured.

The lighting of"GO"lamp means that the insulation resistance of the specimen to be measured is higher than a value set by "$S_2 \times S_4$". On the contrary, the lighting of"NO"indicates the insulation resistance of the specimen is lower than the set value of "$S_2 \times S_4$".

4) While the"GO"lamp is lighted, the section between ① and ② of the"OUTPUT"terminal becomes continuity condition. On the contrary, while the"NO"lamp is lighted, the section between ② and ③ becomes continuity condition. This output can be used at the open collector of transistors within 24V DC and 300mA. Its output terminal diagram is shown in Fig. 5 and application example is shown in Fig. 6.

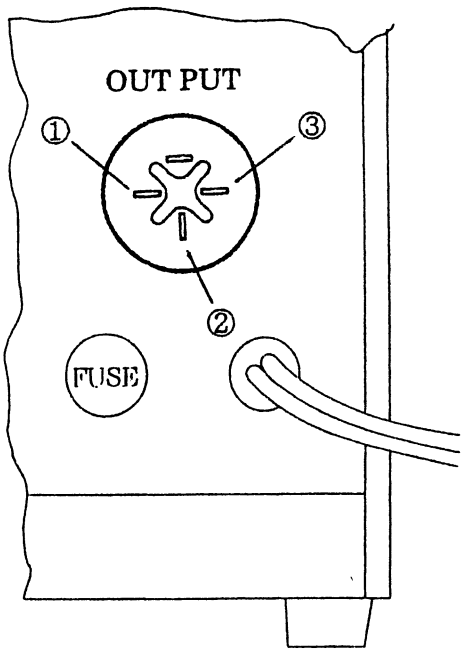


Fig. 5 Rear panel output terminal diagram

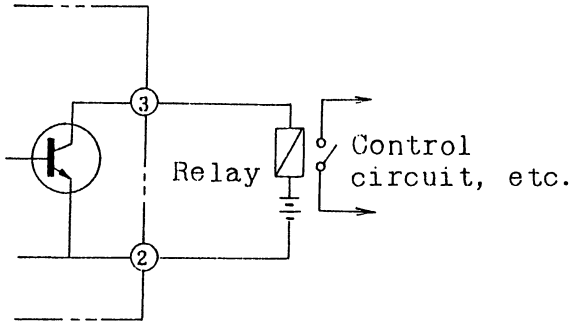


Fig. 6 Example of output terminal application

5) Rx terminals provided on the back should be connected as shown in Fig. 7 and used to connect this instrument to an automatic device, etc. Attention should be paid to induction by lead wire to be used for input.

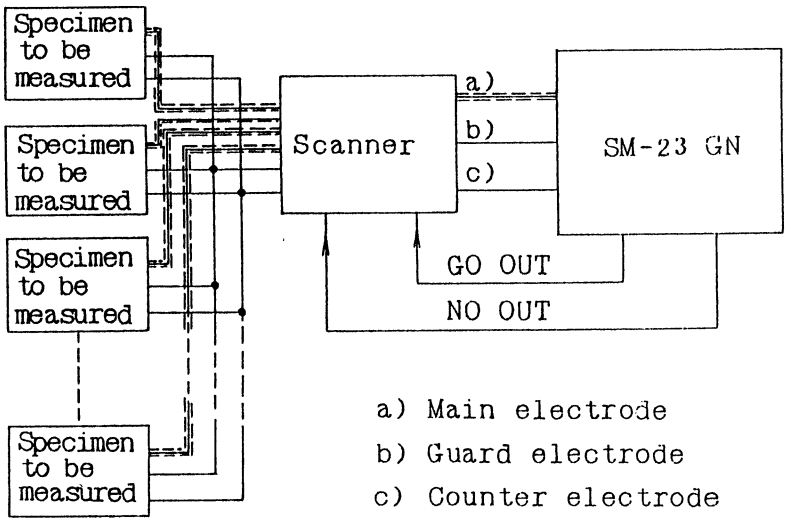


Fig. 7 Example of automatic insulation measurement

6) In case a condenser is to be measured, the black measuring rod is caused to contact with one terminal of a condenser, and then the guard terminal of the red rod is caused to contack with the other terminal of the condenser and after 2 to 3 seconds, the input terminal of the red rod is caused to contack with the terminal. In this manner, measuring time can be considerably reduced in the case of a condenser of large capacity.

The guard terminal of measuring rod, when it is not required, can be easily removed from the rod by turning it counterclockwise.

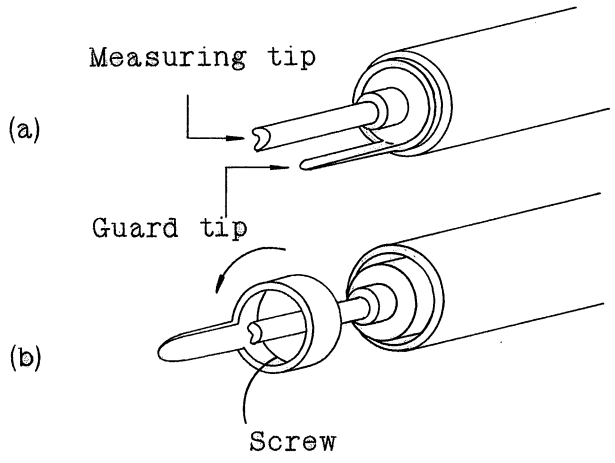


Fig. 8 Red measuring rod

7. Trouble-shooting and remedy

Although each unit of this instrument has been carefully inspected under strict specifications before shipment, it should be checked in accordance with the following instructions if it is doubted to be in trouble.

Special attention should be paid in handling this instrument since this has a high voltage circuit which is very dangerous.

1) In case the pilot lamp is not lighted even if the "VOLTAGE" switch has been set at 100V.

   a. Broken wire of power source fuse.

   b. Poor contact of power plug.

   c. Broken wire of pilot lamp.

2) In case the indicator cannot be adjusted to "ZERO" point.

   Adjust it in accordance with Par. 6.2, Calibration, of Par. 6, operating method.

3) In case indicator cannot be adjusted to "CAL". even if the multi-range switch has been set at "CAL."

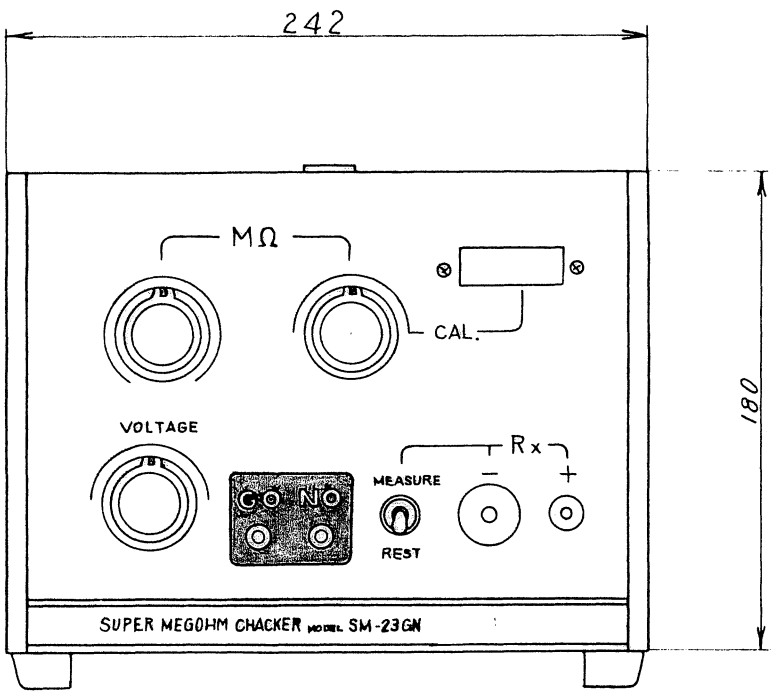
   Perform adjustment in accordance with Par. 6.2, Calibration of Par. 6, Operating method.

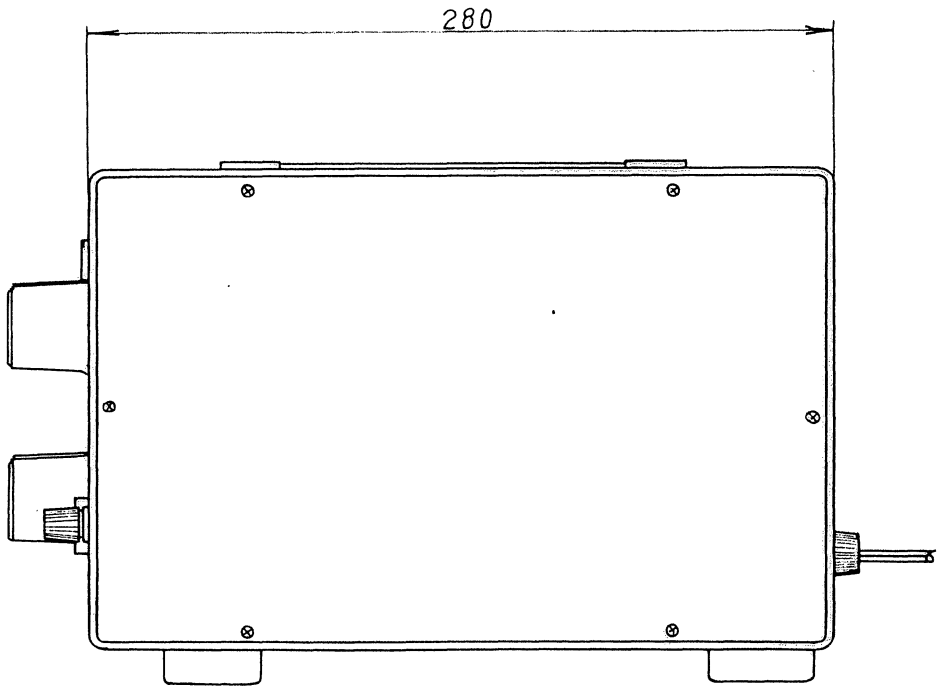
In case the instrument cannot be adjusted by performing procedures described in Par. 1) through 3) above, please contact our agent or our company.

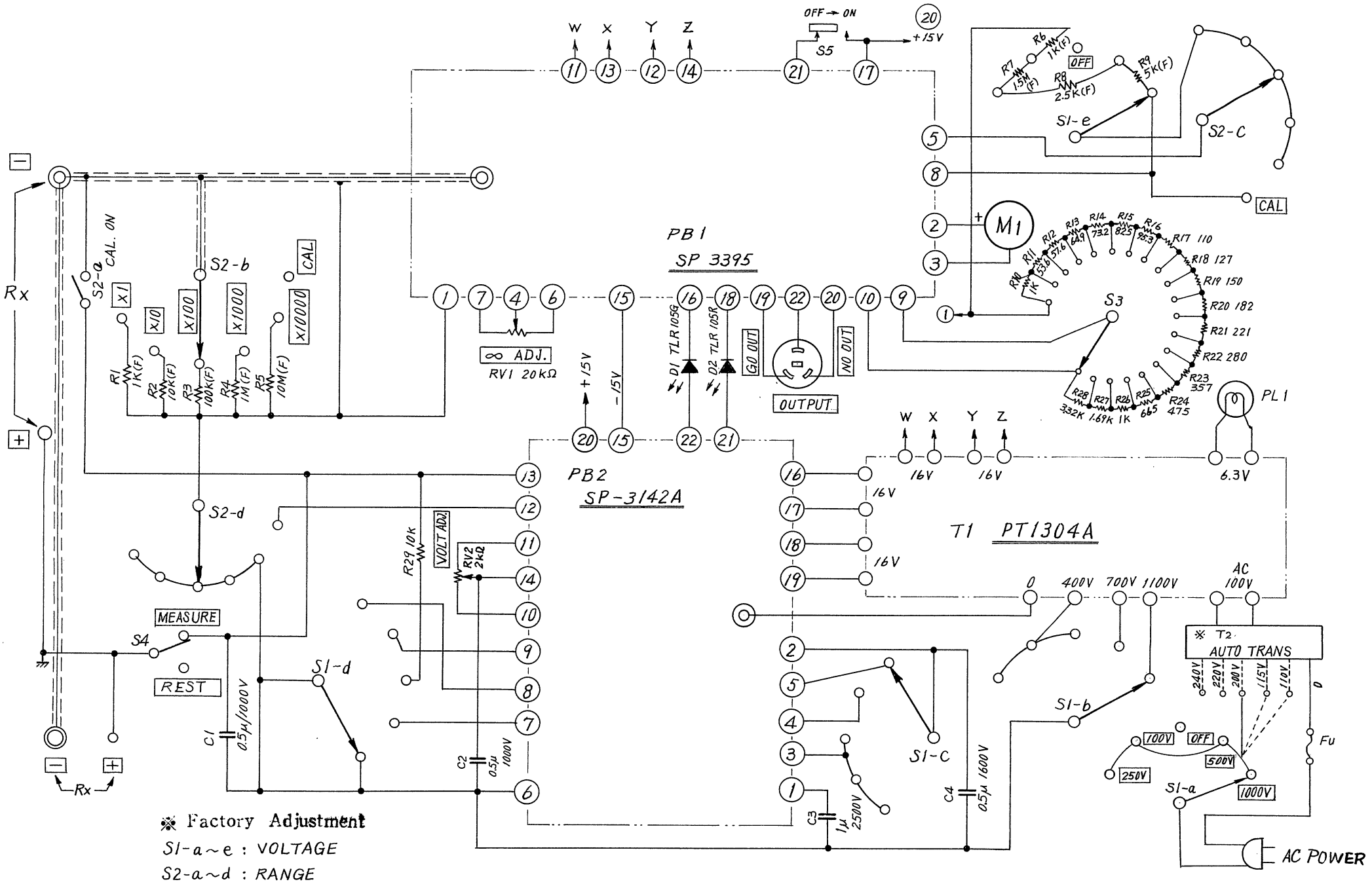
PARTS LIST

Symbol	Description	Standard	Symbol	Description	Standard
PB1	Print board	SP3395	R20	metal film resistor	¼W 182 Ω(F)
PB2	〃	SP3142A	R21	〃	〃 221 Ω(F)
			R22	〃	〃 280 Ω(F)
FU	fuse	1A tube type	R23	〃	〃 357 Ω(F)
PL1	pilot lump	8V 0.15A	R24	〃	〃 475 Ω(F)
M1	indicator	M-1349	R25	〃	〃 665 Ω(F)
T1	power trans former	PT-1304A	R26	〃	〃 1KΩ(F)
T2	〃	PT-2142 ※	R27	〃	〃 1.69KΩ(F)
			R28	〃	〃 3.32KΩ(F)
S1a~c	rotally switch	SW-1220	R29	oxidized metal film resistor	2W 10KΩ(F)
S2a~d	〃				
S3	〃				
S4	toggle switch				
S5	slide switch		D1	light emitting diode	TLR105G
			D2	〃	TLR105R
R1	metal film resistor	2W 1KΩ(F)			
R2	〃	〃 10KΩ(F)			
R3	〃	〃 100KΩ(F)	RV1	wire-wound resistor	λ13T 20KΩ
R4	〃	1W 1MΩ(F)	RV2	〃	〃 2KΩ
R5	〃	½W 10MΩ(F)			
R6	〃	¼W 1KΩ(F)			
R7	〃	〃 1.5KΩ(F)	C1	oil condenser	0.5μF 1000V
R8	〃	〃 2.5KΩ(F)	C2	〃	〃
R9	〃	〃 5KΩ(F)	C3	〃	1 μF 2500V
R10	〃	〃 1KΩ(F)	C4	〃	0.5μF 1600V
R11	〃	〃 53.6 Ω(F)			
R12	〃	〃 57.6 Ω(F)			
R13	〃	〃 64.9 Ω(F)			
R14	〃	〃 73.2 Ω(F)			
R15	〃	〃 82.5 Ω(F)			
R16	〃	〃 95.3 Ω(F)			
R17	〃	〃 110 Ω(F)			
R18	〃	〃 127 Ω(F)			
R19	〃	〃 150 Ω(F)			

※ factory adjustment


242
MΩ
CAL.
VOLTAGE
GO
NO
MEASURE
REST
Rx
−
+
180
SUPER MEGOHM CHACKER MODEL SM-23GN


280


Rx
S2-a CAL. ON
S2-b
S2-d
S1-a
S1-b
S1-C
S1-d
S1-e
S2-C
S3
S4
S5
CAL
X1
X10
X100
X1000
X10000
R1 1K(F)
R2 10K(F)
R3 100K(F)
R4 1M(F)
R5 10M(F)
R6 1K(F)
R7 1.5M (F)
R8 2.5K(F)
R9 5K(F)
OFF
M1
R10 1K
R11 153.6
R12 57.6
R13 64.9
R14 73.2
R15 82.5
R16 93.3
R17 110
R18 127
R19 150
R20 182
R21 221
R22 280
R23 357
R24 475
R25 665
R26 1K
R27 1.69K
R28 3.32K
PL1
6.3V
PB1
SP 3395
∞ ADJ.
RV1 20kΩ
+15V
-15V
D1 TLR 105G
D2 TLR 105R
GO OUT
NO OUT
OUTPUT
PB2
SP-3142A
R29 10K
VOLT ADJ
RV2 2kΩ
MEASURE
REST
C1 0.5μ/1000V
C2 0.5μ 1000V
C3 1μ 2500V
C4 0.5μ 1600V
16V
T1 PT1304A
0
400V
700V
1100V
AC 100V
※ T2
AUTO TRANS
240V
220V
200V
115V
100V
100V
OFF
500V
250V
1000V
Fu
AC POWER
※ Factory Adjustment
S1-a~e : VOLTAGE
S2-a~d : RANGE

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