ADAPTOR FOR DIGITAL MULTIMETER

Model 9310A
9320A + 9321
9330A
9340A

Ned. Ver. v

Instruction Manual

Met dank aan A.R.A. van Rossum

We would like to express our appreciation for your purchase of the 9300A series. This series OK designed using the latest in technology to ensure high reliability. To ensure that you get the most out of your new instrument, we recommend that you read carefully and follow the instructions in this manual.

One step beyond tomorrow

SOAR corporation ®

Table of Contents

1. INTRODUCTION

The new 9300A Series of adaptors includes the 9310A temperature adaptor, the 9320A and 9321 current adaptors, the 9330A capacitance-measurement adaptor, the 9340A transistor h_{FE} measurement and FET I_{DSS} measurement adaptor. These adaptors are designed for use connected to SOAR digital multimeters, without the need of a separate connecting cable. These adaptors seat directly into the input terminals of the multimeters, looking and acting as if they were actually part of the basic instrument. Using the accessory cable and output polarity-switching function, it is possible to use these adaptors even with digital multimeters of different manufacturers. They are powered by a single type 006P (9V) battery and the battery condition is constantly monitored by an LED indicator lamp.

Compared with previously available SOAR adaptors, this new series of adaptors offers such features as a dramatic reduction in power consumption (9310A), a built-in high-performance AC detector circuit, a resolution-

switching circuit (9320A), a 400.0mA full scale, reduced measurement time and improved input protection (9330A) and much more.

The new 9340A transistor adaptor features a 400.0mV full scale and a constant-current measurement techinique which enables measurements of transistor h_{FE}.

In addition, such capabilities as FET loss put this unit even further ahead of previously available adaptors.

2. SPECIFICATIONS

2－1 General Specifications

(Accuracies apply to the adaptor only at 23°C±5°C)

Low battery indication: LED blinks when battery voltage drops below operating voltage

Operational temperature: 0～40°C, 80%RH max. (Non-condensing)

Storage temperature: －20～60°C, 70%RH max. (Non-condensing)

Output polarity: Output polarity switching function

Size: 80(W)×60(H)×85(D)mm

Weight: Approx 200g

Accessories: Instruction manual ·····1

Battery (6F 22,9V) ·····1

Connection lead ·····1set

Test clip (9330A) ·····1

hFE probe (9340A) ·····1

(1) Model 9310A Temperature Adaptor

Temperature sensing probe: K type thermocouple

Measuring range: (°C)−50°C~700°C

(°F) −58°F~1292°F

Resolution: 1°C or 1°F

Accuracy: (°C)±1%rdg±2°C

(23°C±5°C) (°F)±1% rdg±4°F

(Less thermocouple sensor's error)

Output voltage: (°C)−5.0mV DC to 70.0mV DC

(°F)−5.8mV DC to 129.2mV DC

Max. allowable input voltage: DC100V

Battery: 6F22 (9V)

Power consumption: Approx 13mW

Battery life: Approx 200 hours (Manganese)

(2) Model 9320A Current Adaptor

+Model 9321 Clamp Probe

Range: (DC) 0 to 200A

(AC) 0 to 150Arms

Accuracy: (DCA) ±3%rdg±1% fullscale

(ACA) ±2%rdg ±2% fullscale (At 45Hz ~65Hz)

Resolution: 1A or 0.1A

Output voltage: (DC) 0 to 20.0mV DC (×1A)

0 to 200.0mV DC (×0.1A)

(AC) 0 to 15.0mV DC (×1A)

0 to 150.0mV DC (×0.1A)

Battery: 6F22 (9V)

Battery life: Approx 45 hours (Manganese)

Approx 80 hours (Alkaline)

Power consumption: Approx 50mW

(3) Model 9330A Capacitance Adaptor

Measuring method: Charge/discharge method

Range: 4, 40, 400nF, 4, 40, 400μF

Resolution: 1pF~0.1μF

Accuracy (tan δ=0.1% (120Hz) or less)

(4nF range) ±0.8%rdg±0.4% fullscale

(40nF~4μF range) ±0.8%rdg±0.2% full-scale

(40~400μF range) ±1.0%rdg±0.2% full-scale

Output voltage: 0 to 400.0mV DC

Battery: 6F22 (9V)

Battery life: Approx 100 hours (Manganese)

Power consumption: Approx 22mW

(4) Model 9340A Transistor hFE/IDSS Adaptor

Measuring item: (hFE) PNP/NPN transistor

(IDSS) P/N channel FET

Range: (hFE) 0~4000

(IDSS) 0~40mA

Measuring condition:(hFE) VCE 5V

(IB) 1μA/10μA

Accuracy: (hFE)±2% rdg±0.2% fullscale

(IDSS)±2% rdg±0.2% fullscale

Output voltage: 0 to 400mV DC

Battery: 6F22 (9V)

Battery life: Approx 200 hours (Manganese)

Power consumption: Approx 10mW

3. OPERATION

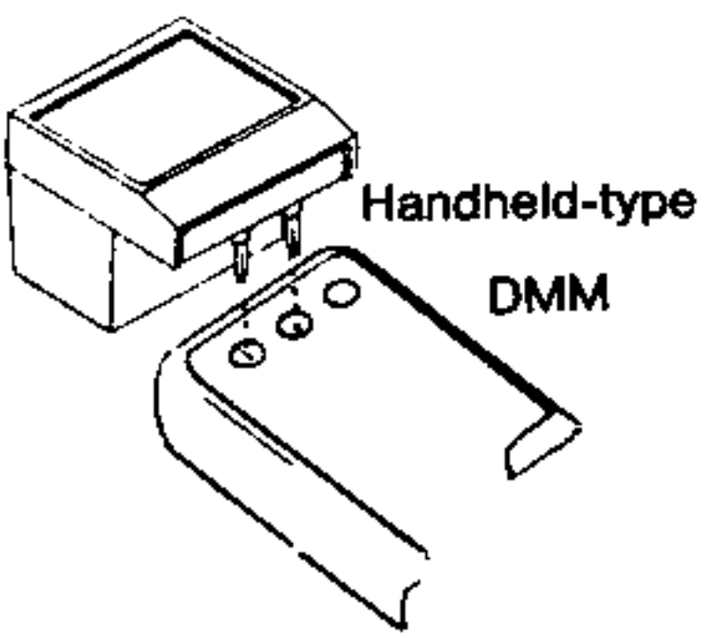
3−1 Preparations Before Measurement

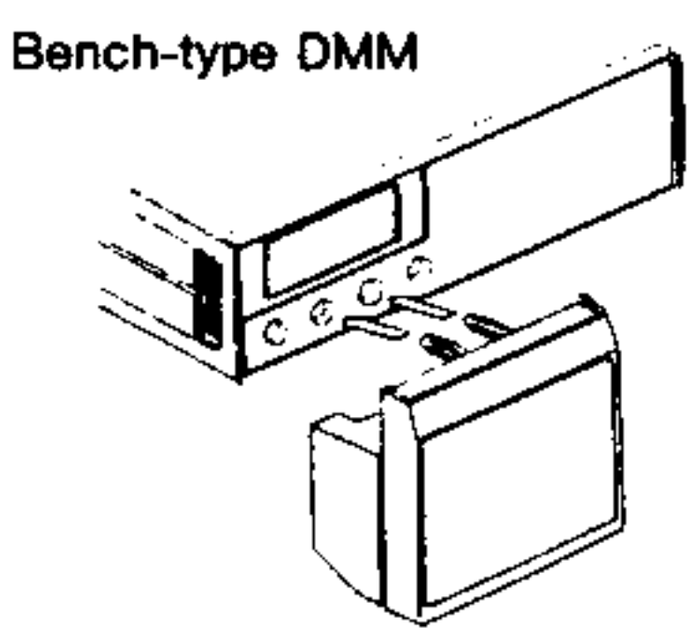
(1) First, install the battery (refer to Section 4).

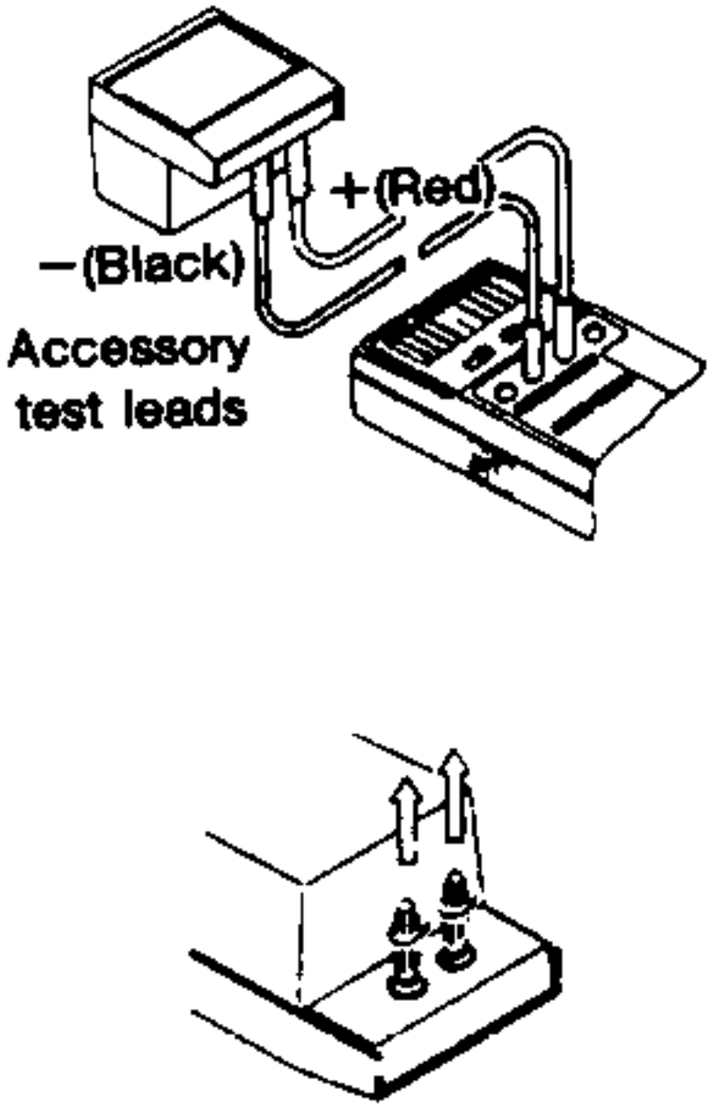
(2) Set the switch located between the output terminals of the adaptor to the output polarity position that matches the polarity of multimeter with which the adaptor is to be used.

(3) Insert the adaptor into the multimeter as you would a plug, positioning it in the easiest to mount attitude.

(4) Set the multimeter to the adaptor range (DC input), referring to the instrument's instruction manual.







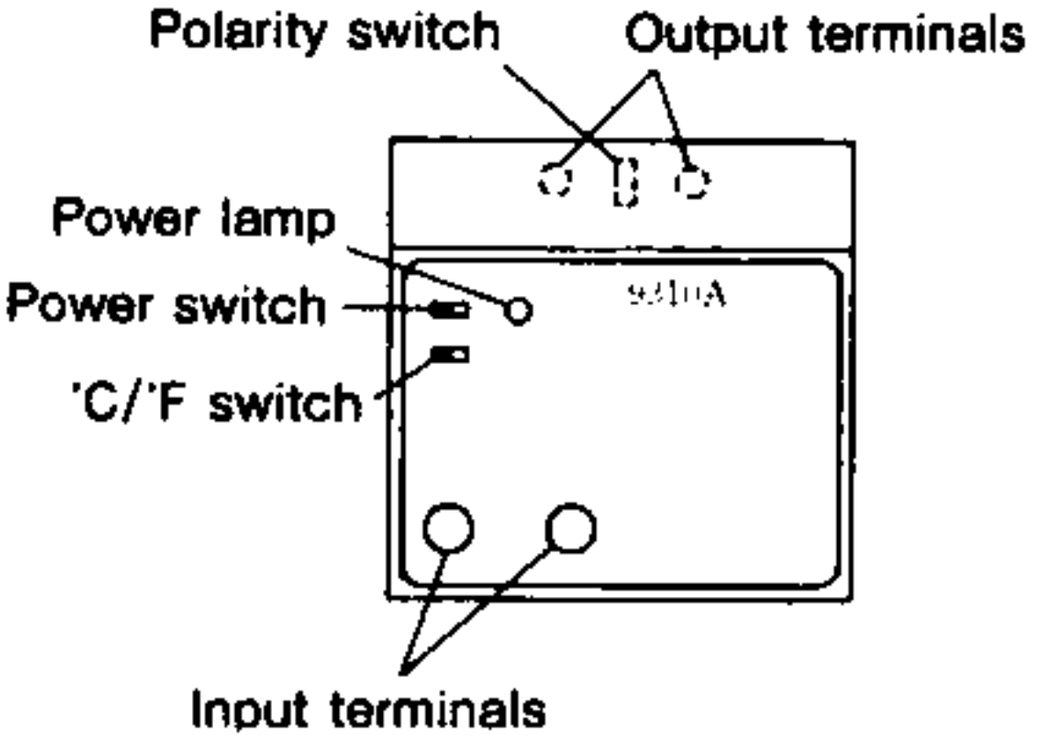
In the case in which direct connection is physically impossible.

Remove the banana plugs by grabbing them with a needle-nose pliers at the base and turning counter-clockwise.

Fig. 3−1 Adaptor Connection Examples

3－2 Measurement Method

(1) 9310A (Temperature Adaptor)



① Set the power switches of both the DMM and the adaptor to ON.

② Connect the temperature-sensing probe (option) to the input terminals. Connect the red side to (+) and the black side to (−).

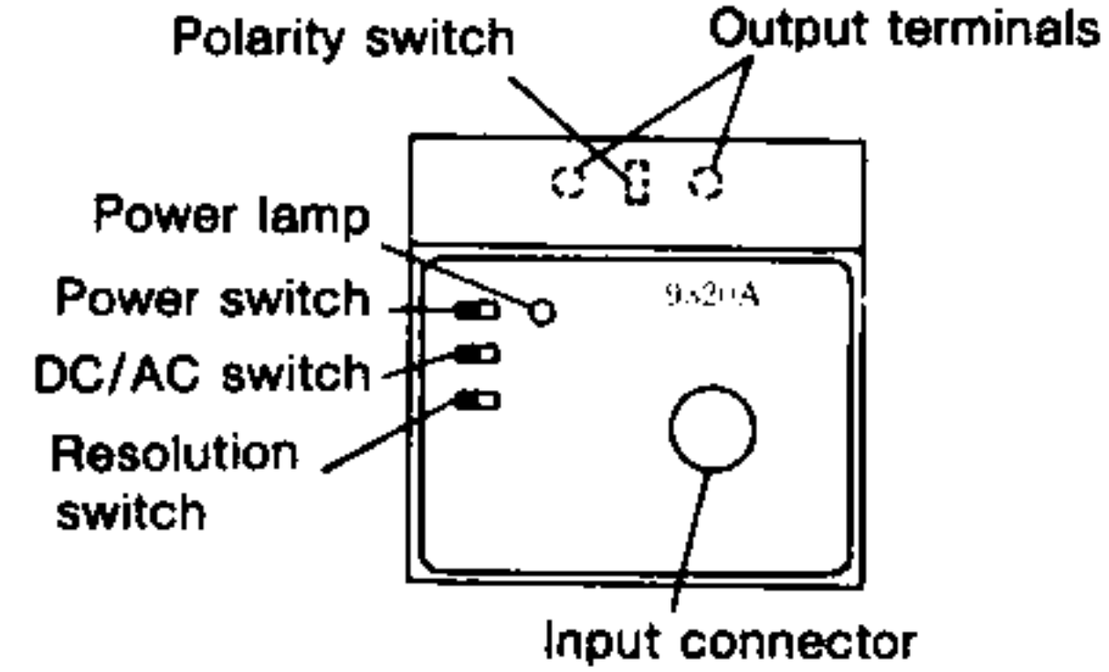
③ Set the °C/°F switch to the desired temperature reading.

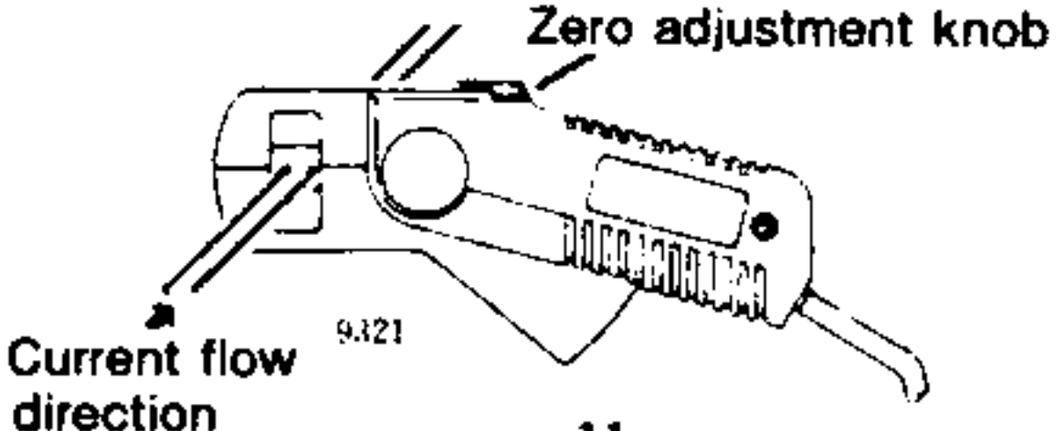
④ Make contact with the object to be measured using the probe and read the display after it has been allowed to stabilize sufficiently.

Notes

1. If the ambient temprerature varies greatly, perform measurements only after waiting 30 minutes or longer.
2. The temperature-sensing probes are described in Section 5 on Options. Select the probe that suits your measurement requirements.
3. The input impedance of the DMM used should be at least 1kΩ.

(2) 9320A+9321 (Current Adaptor)





① Set the power switches of both the DMM and the adaptor to ON.

② Connect the 9321 (clamp probe) output cable to the input connector.

③ Select DC or AC, depending upon the type of current to be measured.

④ Set the resolution switch to the desired resolution.

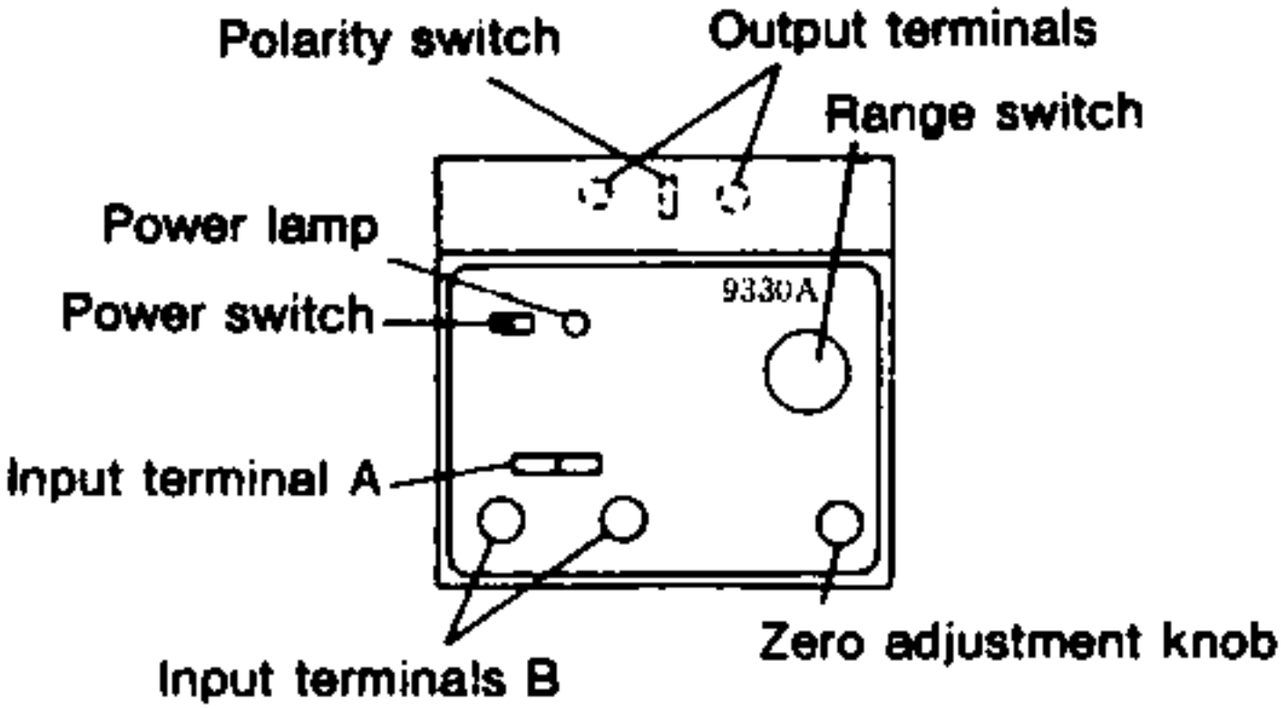
⑤ For DC current measurement, adjust the DMM reading to zero using the zero adjustment knob of the 9321.

⑥ Clamp the conductor carrying the current to be measured with the 9321 clamp and read the current as the DMM reading or 0.1 times the DMM reading, depending upon the setting of the resolution switch.

Notes

1. To reduce measurement errors try to keep the conductor in the center of the clamp's opening hole.
2. When measuring DC current, if "−" is displayed, reverse the direction of the conductor through the clamp. If the polarity switch is set correctly, the current direction shown in the figure above will result in a positive DMM reading.
3. The input impedance of the DMM used should be at least 1kΩ.

(3) 9330A (Capacitance Adaptor)



① Set the power switches of both the DMM and the adaptor to ON.

② Mount test clips if necessary, in the B input terminals and select the appropriate range.

③ Adjust the DMM reading to zero using the zero adjustment knob.

④ Connect the capacitor to be measured and read the value from the DMM display.

Notes

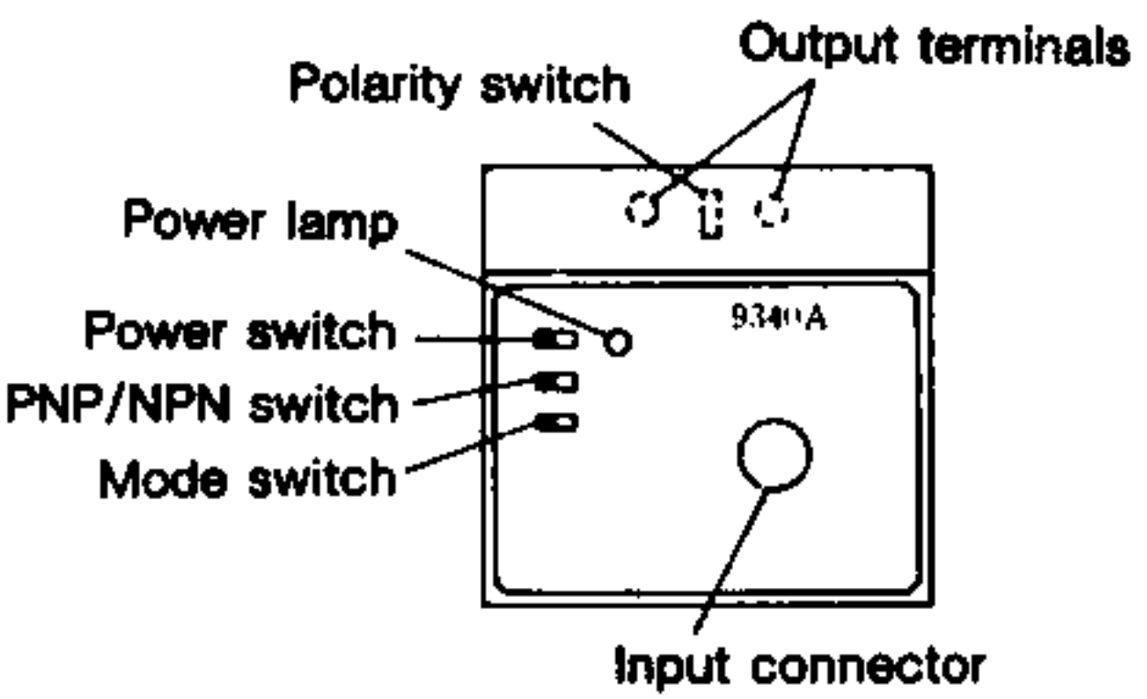
1. Always discharge capacitors thoroughly before measuring and observe the proper connection polarity.

2 For aluminum electrolytic and similar capacitors with a high loss factor, care is required, as the measurement error may increase.

3 The input impedance of the DMM used should be at least 1kΩ.

- Reading the Display
- 4nF ·····Displayed value×0.001nF
- 40nF·····Displayed value×0.01nF
- 400nF ·····Displayed value×0.1nF
- 4μF ·····Displayed value×0.001μF
- 40μF·····Displayed value×0.01μF
- 400μF ·····Displayed value×0.1μF

(4) 9340A (Transistor Adaptor)



① Set the power switches of both the DMM and the adaptor to ON.

② Set the PNP/NPN switch to match the type of transistor being measured.

③ Set the Mode switch according to the transistor to be measured.

④ Mount the transistor to be measured directly into the input connector, observing the EBC markings carefully or used the accessory probe to clip these leads. (Clip polarity is indicated on the panel in colors.) To measure the I_{DSS} of an FET, set the Mode switch to I_{DSS}.

- Reading the Display
- h_{FE} ·····Displayed value×1
- I_{DSS} ·····Displayed value×0.01mA

Notes

1. The current consumption increases during a measurement (i.e., when a transistor is connected). Therefore, to prevent unnecessary battery use, never leave a transistor connected to the adaptor unnecessarily.
2. The input impedance of the DMM used should be at least 100kΩ.
3. Do not touch the terminals during a measurement.

4. BATTERY REPLACEMENT

These adaptors feature a pilot lamp which indicates the operational condition, while serving also as a battery low indicator. During normal powered operation, the lamp will be lighted continuously. However, if the battery voltage drops below a given warning level threshold, it will begin to flash as a warning of this condition. If this occurs, the battery should be replaced.

If the lamp lights continuously in the standby condition but begins to flash when a transistor is connected, this is also an indication that the battery should be replaced shortly.

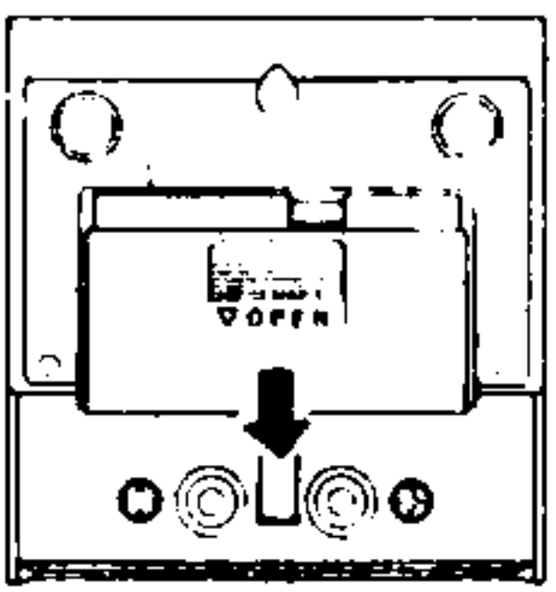
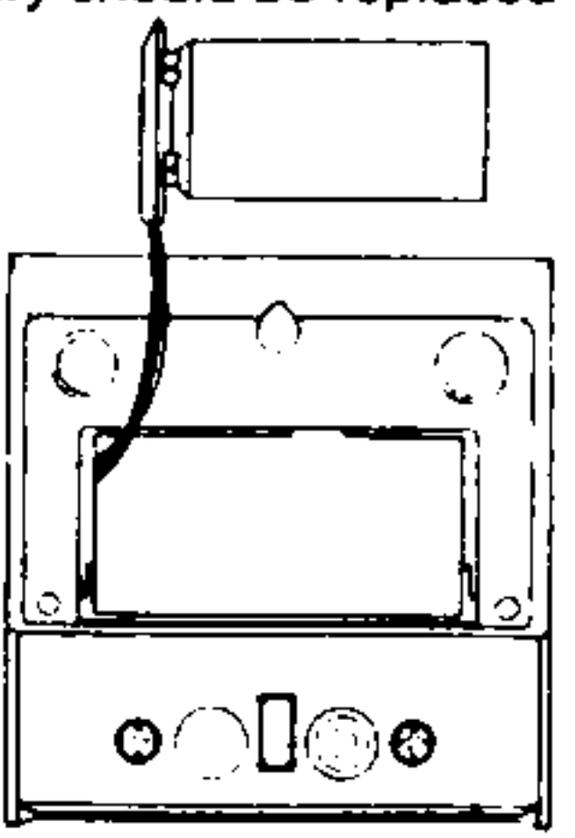


Fig. 4—1



To remove the battery cover, push the part of the cover marked OPEN in the direction of the arrow and slide open.

Connect the battery into the adaptor using the battery terminal connector.

5. OPTIONAL ACCESSORIES

The following five types of temperature probes are available as accessories for the 9310A. Other accessories can also be special ordered.

Temperature Probe	Type K (CA)	Application
TX-K10B	● −50~+300°C, JIS-class 0.4, Sheath	● Medium-Temperature measurement for liquids
TX-K11B	● −50~+800°C, JIS-class 0.4, Sheath type.	● High-temperature measurement for liquids
TX-K12B	● −50~+200°C, JIS-class 0.4, Sheath type	● Internal temperature measurement
TX-K20B	● −20~+600°C, JIS-class 0.75, Surface temp measurement	● High-temperature measurements of relatively small areas

TX-K21B	●−20~+200° C, JIS-class 0.75, Surface temp. measurement	● Medium-temperature measurements of relatively small areas

6. MAINTENANCE

Should you notice some apparently abnormal operation of your adaptor, check the items described in the table below. If this still does not resolve the problem, contact your sales representative, giving details of the problem.

Symptom	Check points
Accuracy does not satisfy specifications	● Is connection proper? ● Does the pilot lamp indicated a worn battery? ● Is the input impedance of the DMM being used within the specified limits?
Short battery life	● Has an old battery been installed? ● Has the power been left on and the adaptor left connected to the circuit under measurement?
Unrequired (−) in display	● Are the polarity switch setting, zero adjustment setting and probe connections properly made?

Notes

The output voltage of the 9330A and 9340A is 400mV full scale so that when these adaptors are connected to older type 3.5-digit DMMs with a maximum display count of 1999, the measurement range will be limited by the display range.

When making requests for repair service, please bring the instrument directly to the dealer. If this is impossible, however, send the instrument directly to our sales office. When mailing this instrument, always pack it in its original or equivalent packing material and pack together with name, address, telephone number and the warranty documentation.

- To ensure speedy and reliable repair, always include information as to the type of failure and cause.
- If required, always return accessories with the instrument.
- When contacting us, provide the model number and serial number of your instrument.

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86-07-001p-9300A Printed in Japan