



3245 Programmable Milli-Ohm Meter

Operation Manual

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1. Introduction

The 3245 programmable milli-ohm meter is designed with a microprocessor and 4-1/2 digits analog to digital converters to provide high precision, high stability, and high operating efficiency. There are 3 displays provided allows you to read measurements, HI LIMIT, and LO LIMIT simultaneously. The 3245 also provides standard RS-232 interface, it allows you to operate 3245 remotely. All the designs make your measurements easier.

1-1 Product Features

- ♦ Three independent displays, allow simultaneously display OHM, HI Limit, and LO Limit readings.
- ♦ 4-1/2 digits 0.5-inch large display.
- ♦ 4-1/2 digits analog to digital converter used to increase measurement accuracy.
- ♦ Provides auto-ranging and manual ranging selection.
- ♦ Provides compare function with a Buzzer alarm and HI/GO/LO operation.
- ♦ Provides measurement with NULL function.
- ♦ Selectable sampling rate; fast: 10-time/sec, slow: 2-time/sec.
- ♦ 1 Amp test current provided, high-resolution reach to $1\mu\Omega$.
- ♦ Standard RS-232 interface.
- ♦ Provides 4 sets of memory to store the front panel settings.
- ♦ Automatically store the latest operating settings before powered-off. Resumes all the settings at the next power-on.

1-2 Unpacking the Unit

Unpacking the unit carefully and make sure that the following accessories are included:

- ♦ Power cord x 1.
- ♦ Operation manual x 1.
- ♦ Test lead x 1.

2. Specifications

Model	3245 Programmable Milli-Ohm Meter
Measurement	
Range	20m/200m/2/20/200/2K/20K/200K/2M Ω
Accuracy	20m Ω : $\pm 0.05\%$ rdg. ± 15 dgt. 200m Ω : $\pm 0.05\%$ ± 10 dgt. 2 Ω -200K Ω : $\pm 0.03\%$ rdg. ± 7 dgt. 2M Ω : $\pm 0.05\%$ rdg. ± 20 dgt.
Current	1A/100mA/10mA/1mA/100uA/10uA/1uA
Voltage	20mV to 2V DC
Display	19999 (4-1/2 digits) LED
Method	4-terminal method
Sampling Rate	FAST (10times/sec), SLOW (2times/sec)
General Function	
Compare	HI/GO/LO LED Display with Buzzer on/off Setting
Open Circuit Terminal Voltage	Approx. 6V
NULL Function	Display Value = Reading Value – REF. Value
Range Selection	Manual or Automatic
HOLD Function	Can Hold Display Value with LED Indicate
Display	7-Segment Red LED 0.52"
Compare Display	7-Segment Red LED 0.31"
General Specification	
Interface : Standard RS-232 Interface, Data Transfer Rate only 9600 bps.	
Power Supply : AC115V/230V $\pm 10\%$, 60/50Hz Switch Selectable	
Power Consumption : Approx. 45VA on 20m Ω test range, Other range approx. 25VA	
Warm-up Time : Approx. 30 min.	
Operation Humidity/Temperature Range : 80% R.H. (+5 $^{\circ}$ C to 30 $^{\circ}$ C), 50% R.H. (+31 $^{\circ}$ C to 40 $^{\circ}$ C)	
Storage Temperature/Humidity Range : -10 to 70 $^{\circ}$ C, <80% R.H.	
Dimensions : 213(W) x 88(H) x 394(D) mm	
Net Weight : 3.6 Kg	
Accessories : Power cord x1, Operation Manual x1, Test Lead x1	

3. Panel Illustrations

3-1 Front Panel

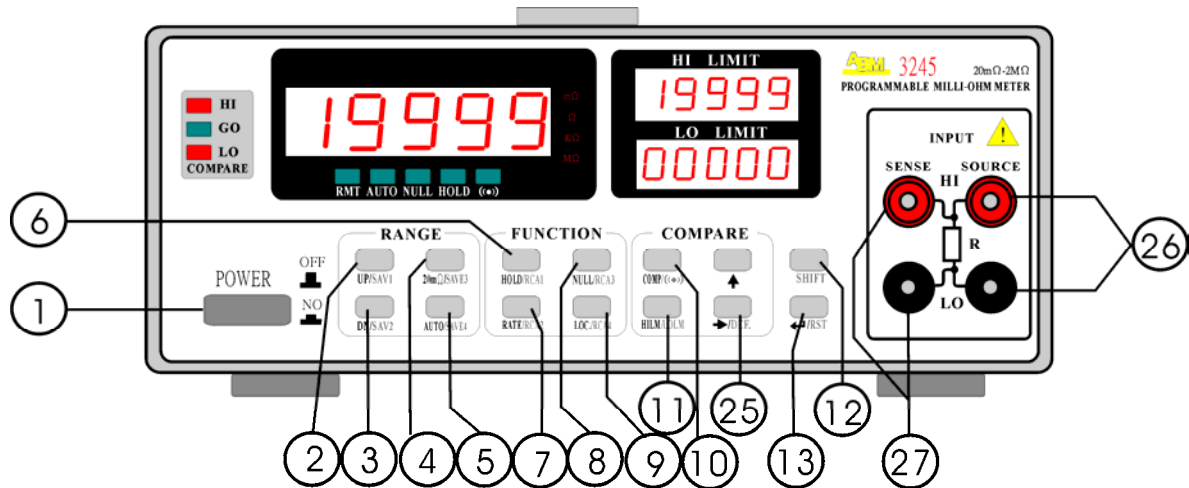


Figure 3-1. Front Panel View of 3245

Functions of the pushbuttons on the front panel:

1. **POWER:** Power switch.
2. **UP/SAV1:** Range selection. It allows you to increase the measurement range.
3. **DN/SAV2:** Range selection. It allows you to decrease the measurement range.
4. **20mΩ/SAV3:** Range selection. It allows you manually set the measurement rang of 20mΩ
5. **AUTO/SAV4:** Autoranging selection. When in autoranging, AUTO indicator turns on.
6. **HOLD/RCA1:** It allows you to “hold” the measured value on the display. When in HOLD, HOLD indicator turns on. To exit HOLD, simply press HOLD again.
7. **RATE/RCA2:** AD sampling rate selection. Two rates are provided: FAST (10times/sec), SLOW (2times/sec).
8. **NULL/RCA3:** Null reference selection. When in NULL, NULL indicator is on, and “displayed value” = “reading value” - “reference value”. To exit NULL simply press NULL again.
9. **LOC/RCA4:** It only functions while operating remotely via RS-232 interface. When in remote mode, pressing LOC. allows you to operate this meter from the front panel.
10. **COMP/((o)):** Pressing COMP allows you to enable compare function. Second press COMP to compare function and also Buzzer on NOGO. To exit COMP, simply press COMP again .
11. **HILM/LOLM:** Pressing HILM allows you to set the high limitation for the compare function.
12. **SHIFT:** Pressing SHIFT allows you to enable the extension functions of each button.

13. **←/RST**: Input confirmation.

Extension functions of the pushbuttons on the front panel:

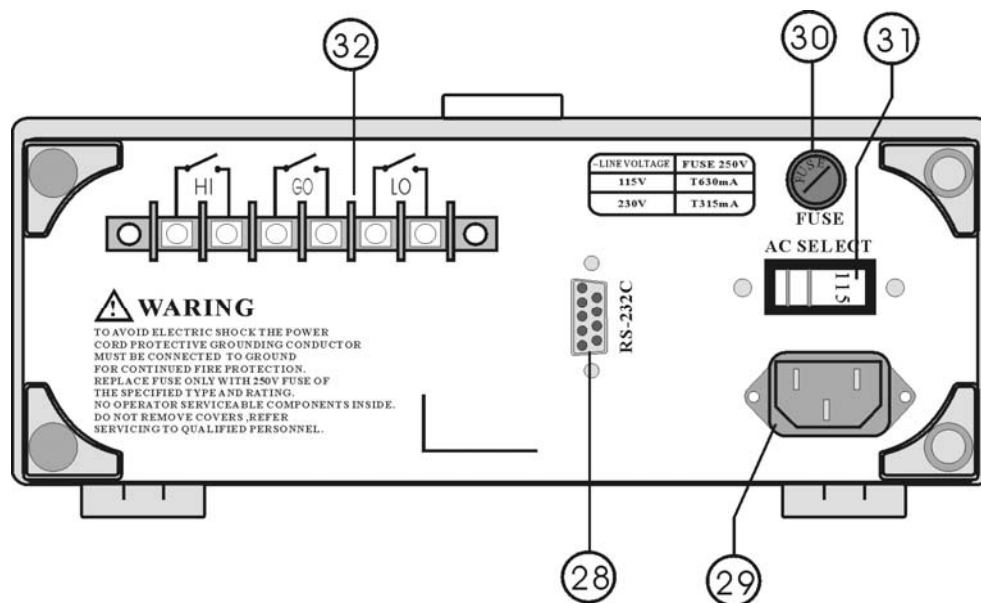
To use the extension functions, you need to press SHIFT before press any other buttons. In SHIFT, “sift” is shown on the display. The extension functions are described as below:

14. **UP/SAV1**: Saving all the current settings of the front panel in memory 1.
15. **DN/SAV2**: Saving all the current settings of the front panel in memory 2.
16. **20mΩ/SAV3**: Saving all the current settings the of front panel in memory 3.
17. **AUTO/SAV4**: Saving all the current settings of the front panel in memory 4.
18. **HOLD/RCA1**: Recalling the settings from memory 1.
19. **RATE/RCA2**: Recalling the settings from memory 2.
20. **NULL/RCA3**: Recalling the settings from memory 3.
21. **LOC./RCA4**: Recalling the settings from memory 4.
22. **COMP/((o))**: BUZZER selection. When in BUZZER, the buzzer indicator turns on. To exit BUZZER, simply press COMP again.
23. **HILM/LOLM**: Pressing HILM/LOLM allows you to set the low limitation for the compare function.
24. **←/RST**: RESET selection. Clears the setting of the selected item.
25. **→/DEF**: Default setting selection. Pressing the button allows you to set this meter as factory default.

The Input Test Terminals (INPUT):

26. **SOURCE (HI/LO)**: Fixed current output terminals.
27. **SENSE (HI/LO)**: Measurement input terminals.

3-2 Rear Panel





Rear Panel View of 3245

28. RS-232 interface
29. Power cord socket
30. Fuse holder
31. Input voltage level selection: To select input voltage level of AC 115V, or 230V, simply switch to the desired level.
32. Compare function output terminal

WARNING!

- (1) **TO AVOID ELECTRIC SHOCK, DISCONNECT THE POWER CORD FROM THE UNIT BEFORE CHANGING FUSE OR INPUT VOLTAGE SELECTION.**
- (2) **REPLACE ONLY WITH 250VAC RATED FUSE.**
- (3) **NO USER SERVICEABLE PARTS INSIDE THE UNIT CASING. THE UNIT CASING SHOULD ONLY BE DISASSEMBLED BY QUALIFIED SERVICE PERSONNEL.**

4. Operation

4-1 Pre-Operation Inspection

Before applying the power, please inspect the followings:

1. Make sure the input voltage selection matches your line voltage.
2. If users need to change the input voltage, please make sure the fuse used matches to the selection input voltage. Please refer to section 6-1 for the fuse specification.

WARNING!

TO AVOID ELECTRIC SHOCK, DISCONNECT THE POWER CORD FROM THE UNIT BEFORE CHANGING FUSE OR INPUT VOLTAGE SELECTION.

4-2 Standard Measurement Procedure

1. Insert the test leads into the input terminals.
2. Select a proper range. You can manually select the display range using UP/SAV1 and DN/SAV2 buttons, or you can press AUTO to enable the autoranging function.
3. Use the test leads to take a measurement.
4. If you would like to take an average measurement, you can press RATE to enable the average measurement function.

WARNING!

THE MAXIMUM RATED VOLTAGE OF THE TEST LEADS ARE $\pm 10V$ (DC+AC Peak), DO NOT USE THEM TO TOUCH ANYTHING WITH OVER RATED VOLTAGE TO AVOID DAMAGES.

4-3 Measurement Using NULL Function

1. Insert the test leads into the input terminals.
2. Connect the reference resistor to the test leads to show the reference resistance on the display.
3. Press NULL to set the displayed value as the reference value, meanwhile, a zero is shown on the display. Connect the unknown resistor to the test leads, then you can have a displayed value: where “displayed value” = “reading value” - “reference value”.

4-4 Measurement Using GO-NOGO Function

1. Insert the test leads into the input terminals.
2. Press HILM to set HI Limit. You can use → and ↑ buttons to modify the value to the desired one. After a desired value is selected, press ENTER to complete HI Limit configuration.
3. Press SHIFT and then Press HILM to set LO Limit. You can use → and ↑ buttons to modify the value to the desired one. After a desired value is selected, press ENTER to complete LO Limit configuration.
4. Press COMP to enable GO-NOGO measurement. Pressing COMP allows you to compare function and also Buzzer on GO. Second press COMP to compare function and also Buzzer on NOGO.
5. You can also enable BUZZER function to make your measurement easier. To enable BUZZER, press SHIFT and then press COMP. BUZZER indicator turns on simultaneously while BUZZER pressed. When in COMPARE mode with buzzer enabled, the buzzer will make a sound of you setting.

5. Operating the meter using RS-232 Interface

The 3245 is designed with RS-232 interface to communicate with a host (e.g. a terminal, controller, PC or computer). Settings and measurements all can be performed through this interface. When the connection between this milli-ohm meter and a host is established, REMOTE indicator will turn on to indicate the remote state. It is said to be operated in “REMOTE” mode. In this mode, all the operations can ONLY be done through this computer interface. When this milli-ohm meter is operated from the front panel, it is said to be operated in “LOC.”(Local) mode. You can simply press LOC. to resume the control back to the front panel. While LOC. button is pressed REMOTE indicator turns off, users can only operate this meter from the front panel.

5-1 Communication Parameters

The communication parameters for RS-232 interface are listed as below:

BAUD RATE	9600
PARITY	NONE
NUMBER OF DATA BITS	8
NUMBER OF STOP BITS	1
Start-Stop Synchronization	

After setting your terminal program with the parameters shown above, users are able to communicate with this meter remotely. To start the remote control, users need to send “[+]” (neglect the quotation marks) command first to enable the remote control function. When in the remote mode, REMOTE indicator is on. Sending “[-]” (neglect the quotation marks) allows you to resume the operation remotely to locally (i.e. terminates the function of remote control). Meanwhile, REMOTE indicator will turn off to indicate the operation state.

4 special characters used in the commands are listed below:

1. [: Used to indicate the start of a command.
2.] : Used to indicate the end of a command.
3. + : Command to enable a remote connection
4. - : Command to disable a remote connection

For example:

[+] : Command to enable/start the remote connection.

[-] : Command to terminate the remote connection.

5-2 Cabling the Meter to a Host

9 to 9 PINs RS-232 cabling:

The 3245 milli-ohm meter		Host	
	PIN NUMBER	PIN NUMBER	
TX	2	2	RX
RX	3	3	TX
GND	5	5	GND

9 to 25 PINs RS-232 cabling:

The 3245 milli-ohm meter		Host	
	PIN NUMBER	PIN NUMBER	
TX	2	3	RX
RX	3	2	TX
GND	5	7	GND

5-3 Data Output Format

Format 1

To Read	COMMAND	OUTPUT	DESCRIPTION
Measurement on the display	[?D]	R=XXXXXXXX	XXXXXXXX=Measurement
HI Limit	[?H]	H=XXXXXXXX	XXXXXXXX=settings
LO Limit	[?L]	L=XXXXXXXX	XXXXXXXX=settings
NULL Ref.	[?N]	N=XXXXXXXX	XXXXXX=NULL Ref. settings

Format 2:

Except to read a measured value as shown above, use commands in the format 2 for the rest.

A. ON/OFF status: When querying the status of a function, the meter returns a digit, “1” or “0” to represent the ON and OFF status respectively.

EX: [?G] (To query the status of HOLD function; HOLD ON/OFF), it returns G0, or G1. “G1” represents HOLD function is ON and “G0” represents HOLD function is OFF.

[?C1] (To query the status of COMPARE function; COMPARE DISPLAY STATE), it returns C1 (compare on GO), or C0 (compare OFF).

B. HI /LO: When querying the setting of these two functions, it returns a set of value.

EX: [?H] (To query the setting of the HI LIMIT), it returns H1=12345 (12345 is the set value).

C. COMPARE: When querying the comparison results, it returns M1, or M2, or M3. Each represents: ” M1” =HI, “M2 “=GO, “M3”=LO.

EX: [?M] (querying comparison results), it returns ”M1”, or “ M2”, or “M3”.

5-4 Commands

A. Configuration commands:

These commands are used to configure this milli-ohm meters.

To Set	Option	Command	To Set	Option	Command
RANGE	20mΩ	R1	HOLD	HOLD ON	G1
	200mΩ	R2		HOLD OFF	G0
	2Ω	R3	BUZZER	BUZZER ON	B1
	20Ω	R4		BUZZER OFF	B0
	200Ω	R5	NULL	NULL ON	I1
	2KΩ	R6		NULL OFF	I0
	20KΩ	R7	RATE	RATE SLOW	F1
	200KΩ	R8		RATE FAST	F0
	2MΩ	R9	COMPARE	COMPARE ON NOGO	C2
	AUTO ON	R01		COMPARE ON GO	C1



	AUTO OFF	R00		COMPARE OFF	C0
SAVE	SAVE #1	K1	RECALL	RECALL #1	J1
	SAVE #2	K2		RECALL #2	J2
	SAVE #3	K3		RECALL #3	J3
	SAVE #4	K4		RECALL #4	J4
NULL REF	NULL REF.	N=XXXXX		RECALL DEFINE	J0
HI LIMIT	HI LIMIT	H=XXXXX			
LO LIMIT	LO LIMIT	L=XXXXX			

B. Query commands:

These commands are used to query data or configuration status from this milli-ohm meter. Commands are listed as below:

To Query	Description	Command	To Query	Description	Command
RANGE	Current Operating Range	?R	VERSION	H/W, S/W version	?VER
RATE	Display Update Rate	?F	MODEL NO.	MODEL NO.	?MOD
NULL REF	Null Reference settings	?N	HOLD	Status of HOLD (ON/OFF)	?G
HI LIMIT	High Limitation	?H	NULL	Status of NULL (ON/OFF)	?I
COMPARE	COMPARE Function Status	?C	BUZZER	Status of BUZZER (ON/OFF)	?B
DISPLAY VALUE	The value on the display	?D	LO LIMIT	Low limitation	?L
AUTO RANGING	Status of autoranging (R01 ON; R00: OFF)	?R0	COMPARE	Comparison Result; M1:HI; M2:GO; M3: LO	?M

Note: NULL REF. can only be set through RS-232 interface.

6. Maintenance

6-1 Selecting different input voltages & protection fuse replacement

1. To select the input voltage level of AC 115V or 230V, simply switch the “AC SELECT” switch (on the rear panel) to the position with a desired number labeled.
2. To replace a blown fuse, first unplug the power cord. Then press and turn the fuse holder 90 degrees counter-clockwise. Slide out the fuse holder and fuse.
3. Replace the blown fuse with one of the identical rating as shown in the table below.

Model	Input AV voltage (Fuse: Time-Delay Type 5x20mm)	
	ACV115V	ACV230V
3245	T630mA/250V	T315mA/250V

WARNING!

TO AVOID ELECTRIC SHOCK, DISCONNECT THE POWER CORD FROM THE UNIT BEFORE CHANGING FUSE OR INPUT VOLTAGE SELECTION.

6-2 Cleaning and Storage

1. When the unit is not in use for a period of time, please store it in a clean, cool and ventilated environment.
2. To clean the unit please remove the power cord before clean it to avoid electric shock, and please wipe it with a clean and dry cloth or rag.
3. If the unit fails to operate, do not attempt to repair it on your own. Contact qualified service personnel for repair service.

6-3 Environmental Condition

1. Operating temperature: +5°C to +40°C.
2. Relative humidity: 80% (+5°C to +30°C), 50% (+31°C to +40°C).
3. Storage temperature: -10°C to +70°C.
4. Storage humidity: below 80%.