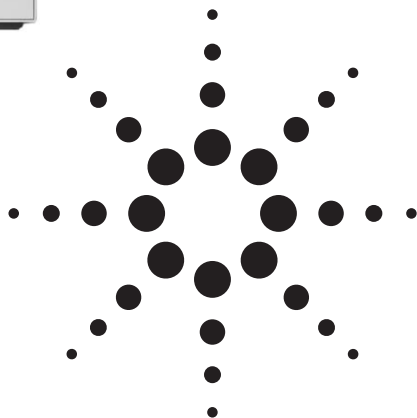


Migrating from an Agilent 4279A 1 MHz C-V Meter to an Agilent E4980A Precision LCR Meter

Technical Overview



Matching the excellence of the 4279A in semiconductor C-V test

TOP 3 reasons to migrate

- Excellent cost/performance value
- More versatile
- Easy to use



Agilent Technologies

Matching the Excellence of the 4279A in Semiconductor C-V Test

Agilent is proud to introduce the Agilent E4980A precision LCR meter to our 4279A customers. Based on the latest technology, this LCR meters provides the best combination of accuracy, speed and versatility for a wide range of component measurements. The E4980A offers excellent cost/performance value, enhancing your test and measurement efficiency by providing fast measurement speed and outstanding performance over a wide frequency range.

The Agilent 4279A, specially designed for DC bias C-V measurements with an optimized internal circuit set at 1 MHz, provides excellent measurement speed for C-V testing. The Agilent E4980A LCR meter matches the outstanding measurement capability of 4279A at 1 MHz for C-V testing and improves testing versatility by providing measurement capability at multiple frequencies (20Hz to 2MHz).

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Advantages of the E4980A LCR Meter

Excellent cost/performance value

The Agilent E4980A LCR meter¹ offers the same excellent performance and measurement capability you've come to expect from the 4279A CV meter and adds increased measurement flexibility. The E4980A matches 4279A's basic accuracy (0.1% for SHORT) and outstanding speed at 1 MHz, and increases the measurement frequency range (20 Hz to 2 MHz). Standard functions such as: Auto bias polarity control for the quick selection of the correct polarity of devices under test, and a DC bias voltage list sweep source to assure very low measurement error due to bias voltage uncertainty, are still available.

The E4980A also provides new functions such as: a variable test signal level for evaluating AC voltage characteristics and 201 point list sweep which lets you set frequency, measurement range and stimulus conditions as list parameters. Easy PC and auto-test system connectivity and an user-friendly interface further improve productivity. Please refer to Table 1 for more information.

Table 1. Comparison of the E4980A LCR meter and 4279A CV meter

	4279A	E4980A¹
Base accuracy	0.1%	0.1% for SHORT, 0.05 % for MED/LONG
Display measurement range	C: 0.00001 to 1280.00pF (6 digit resolution) D: 0.00001 to 9.99999 (6 digit resolution)	C: 0.001fF to 999.9999EF (7 digit resolution) D: 0.000001 to 9.999999 (7 digit resolution)
Frequency flexibility	1 MHz only	20 Hz to 2 MHz with 0.01 Hz (min.) setup
Cable length correction	0, 1, 2 m	0, 1, 2, 4 m
List sweep points	51 points	201 points
List sweep parameter	DC bias voltage	DC bias voltage, frequency, test signal voltage
Multiple channels	16 channels	128 channels
PC connectivity	GPIB only	GPIB/LAN/USB for interface WEB browser control, USB memory
Limit setting and comparator	No	Yes (10 BIN sorting)
Handler interface	No	Yes (E4980A-201)

1. The E4980A LCR meter with Options E4980A-001 and E4980A-301 is the functional equivalent configuration of the Agilent 4279A C-V meter.

The E4980A matches the outstanding measurement speed of 4279A

The following graphs and tables show the measurement accuracy, measured data fluctuation, and measurement speed comparison between the E4980A and the 4279A. These graphs are based on results of 100 continuous tests.

Note: The measured data at LONG mode is the reference point. The difference of the measured data at SHORT and MED modes is compared from this reference point.

The test setup is:
DUT: 1 pF standard capacitor
Frequency: 1 MHz
Test signal voltage: 20 mV

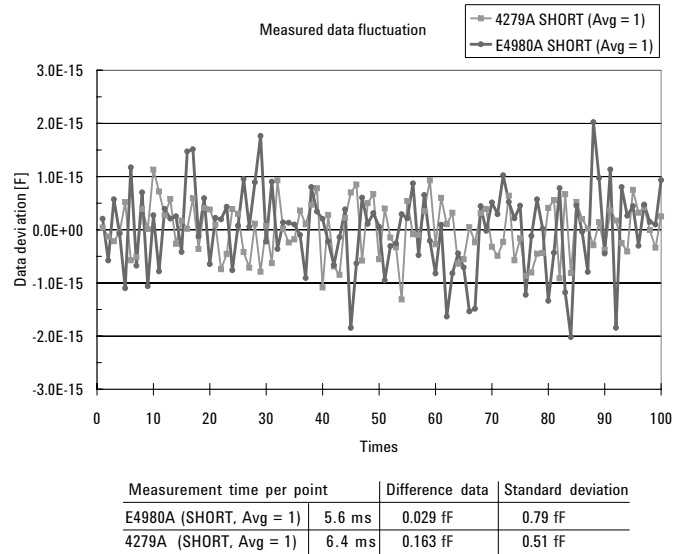


Figure 1. The E4980A has a faster measurement speed in SHORT mode with the same level of data fluctuation as the 4279A.

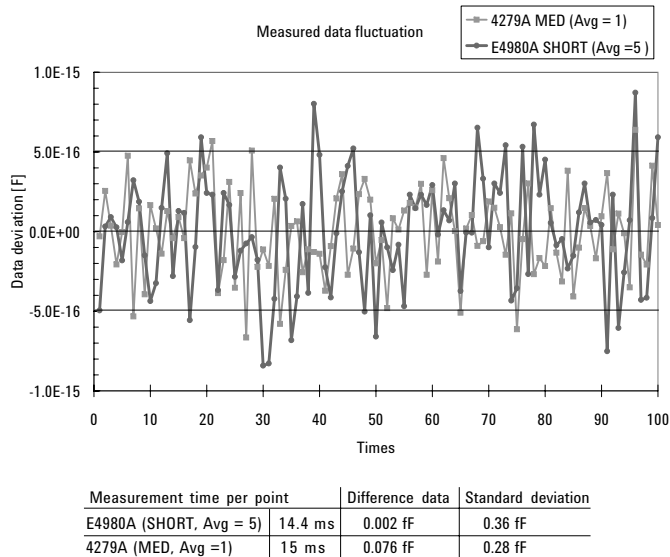
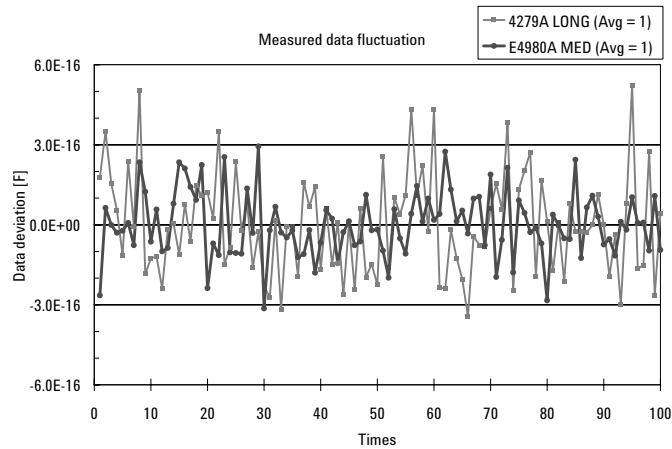
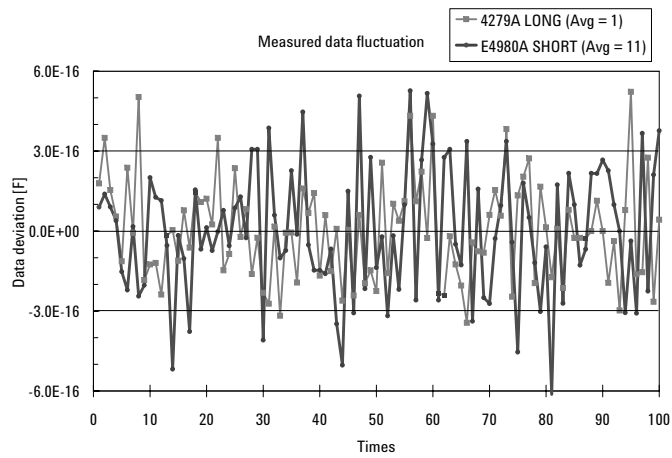


Figure 2. The E4980A SHORT mode with an average time of 5 has the same measurement time as the 4279A in MED mode with similar accuracy and data fluctuation.



Measurement time per point	Difference data	Standard deviation
E4980A (SHORT, Avg = 11)	27.6 ms	0.002 fF
E4980A (MED, Avg = 1)	88 ms	0.12 fF
4279A (LONG, Avg = 1)	27.6 ms	0.19 fF

Figure 3. The E4980A in SHORT mode with an average time of 11 has the same measurement time as the 4279A in LONG mode with similar accuracy and data fluctuation.

In conclusion, the E4980A has a faster measurement speed in SHORT mode with the same level of data fluctuation as the 4279A. In MED mode, the E4980A has better accuracy and less data fluctuation than the 4279A in either MED or LONG mode. However, the measurement speed of E4980A MED mode is quite a bit slower than the measurement speed of the 4279A in MED or LONG mode.

In order to maintain fast measurement speed and high test throughput, Agilent advises the use of SHORT mode with the average times shown below.

- 4279A SHORT mode: E4980A SHORT mode with average time 1
- 4279A MED mode: E4980A SHORT mode with average time 5
- 4279A LONG mode: E4980A SHORT mode with average time 11

GPIB data transfer speed comparison

The E4980A's GPIB data transfer speed is 3-10 times faster than the data transfer speed of the 4279A.

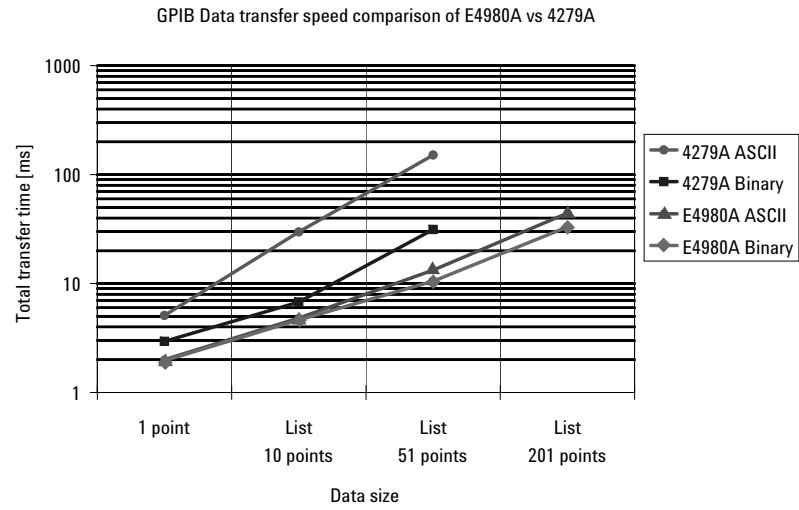


Figure 4. GPIB data transfer speed comparison of the E4980A and the 4279A.

More versatile

The E4980A provides powerful features to increase test reliability and efficiency. The instrument has a new user interface that is easier to use and measurement capabilities to suit your applications.

User friendly interface offers more PC connectivity

Flexible connectivity: Use USB (USB-TMC), LAN and GPIB interfaces to control the E4980A. You can even use a LAN cable with a computer and a Web browser.

USB memory interface: A USB memory device can be used to save setup states, measurement log data and graphic image files.¹



Figure 5. Control your instrument using USB (USB-TMC) or LAN connections



Figure 6. A USB memory device can be used to remotely and easily save set up states, data or graphs.

Advanced easy-to-use interface

- New “skip” key let you access lower-level menus quickly and easily
- Larger windows improve readability
- “Quick recall” key shortens recall time
- New [Preset] key enables fast, easy clearing and resetting of test setups

1. USB memory device is not included with instrument.

Enhanced setup flexibility

The E4980A provides more accurate evaluation under actual usage situations. This is due to:

- Enhanced resolution of test signal voltage and DC bias voltage (max.).
 - Test signal: Min. 100 μ V (Only six fixed points for 4279A, such as 20 mV, 50 mV, 100 mV, 1000 mV.)
 - Bias voltage: Min. 330 μ V (1 mV for the 4279A)
- Enhanced data display: 7 digit resolution for the E4980A (6 digit resolution for the 4279A),
- Delay time resolution: Min 100 μ s (1 ms for the 4279A) for step delay. Min 100 μ s (N/A for the 4279A) for trigger delay.

201 points list sweep with 2 parameter flexibility

<LIST SWEEP DISPLAY>					PREV PAGE
MODE	SEQ				NEXT PAGE
No.	FREQ[Hz]	Cp[F]	D[-]	CHP	
191	119.1 k	999.442 f	2.02263 m		
192	119.2 k	999.434 f	2.06183 m		
193	119.3 k	999.436 f	2.04843 m		
194	119.4 k	999.476 f	2.01826 m		
195	119.5 k	999.497 f	2.02726 m		
196	119.6 k	999.466 f	2.00342 m		
197	119.7 k	999.477 f	2.07176 m		
198	119.8 k	999.496 f	2.00966 m		
199	119.9 k	999.430 f	2.04773 m		
200	120 k	999.457 f	2.02296 m		

Use Softkeys to select

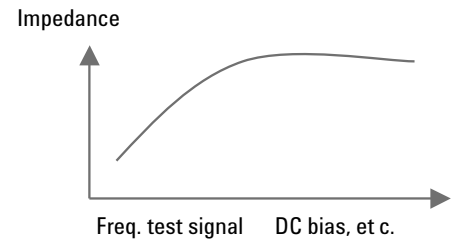


Figure 7. 201 point list sweep lets you set your own parameters

With the E4980A LCR, you can set frequency, measurement range and stimulus conditions as list parameters (up to 201). Set two parameters independently to achieve measurement results under a variety of conditions.

With an external PC and a data spreadsheet application such as Microsoft® Excel, you can simplify character analysis of impedance vs frequency (test signal, DC bias, etc.).

The Agilent 4279A has been the industry standard in semiconductor C-V test for approximately 20 years. Its replacement, the E4980A LCR meter, provides same high speed and accuracy you've come to expect from the 4279A with increased measurement flexibility, PC connectivity and auto-test system connectivity helping to improve the overall cost/performance value.

Migration Reference

Differences between the E4980A LCR and 4279A C-V Meter

- The “Ext Bias” function up to 100 V is not available for the E4980A LCR meter.
- Key and menu operation, GPIB commands and status byte assignment must be updated when using the E4980A LCR meter.

1. Key and menu operation

The E4980A and 4279A do not have similar menu and key operations. Please refer to the “Appendix 4” on page 14 of this document for a list of 4279A menu and key operations and the corresponding E4980A operation information.

2. Remote control: GPIB command compatibility

E4980A and 4279A GPIB commands are not compatible. Please refer to the “Appendix 5” on page 16 of this document for a complete list of 4279A GPIB commands and the corresponding E4980A commands.

3. Status byte

The E4980A and 4279A status byte assignment is not the same. Please refer to the “Appendix 6” on page 19 of this document for a list of status byte assignment for the 4279A and the corresponding E4980A assignment.

Appendix 1.

Specification Comparison

Table 2. Specifications for the 4279A and E4980A

	4279A	E4980A
Frequency	1 MHz	DC, 20 Hz to 2 MHz
AC signal voltage level	Fixed, 20 mV, 50 mV, 100 mV, 200 mV, 500 mV, 1000 mV	Default: 0 m to 2 V_{rms} with 100 uV step Option E4980A-001: 0 m to 20 V_{rms} with 100 uV step
Output impedance	20 ohm	100 ohm
DC bias voltage level	Default: 0 to 38 V External input up to 100 V	-40 V to +40 V / -100 mA to +100 mA ¹ Default: 0, 1.5, 2.0 V / 20 mA (fixed) No external input
DC bias voltage level resolution (With Option 001 installed)	1 mV (min.)	330 uV (min.)¹
List sweep	Sweep mode: sequential Parameter: DC voltage, range Max points: 51 points	Sweep mode: sequential, step Parameter: DC voltage, range, frequency, AC voltage, AC current, DC current, DC source voltage Max points: 201 points
Remote control	GPIB	GPIB, LAN, USB, Web
Command	4279A original	4284A compatible ²
Comparator	N/A	Yes (10 BIN, Abs/tolerance)
Multi correction	Default: 16 channels	Default: none 128 channels ³
Basic accuracy	0.06 %	0.05 %
Measurement parameter	Impedance (capacitance, ESR etc.)	Impedance, DCR, DCI, DCV¹
Measurement speed (Short/Medium/Long)	6.4/15/27.6 ms @1 MHz	5.6/89/220 ms @1 MHz Use "SHORT" mode with 5 average for 4279A "MED" mode, "SHORT" mode with 11 average for 4279A "LONG" mode to maintain throughput
Cable length operation	0, 1, 2 m	0, 1, 2, 4 m
Cabinet dimension (mm)	426 (W) x 177 (H) x 498 (D) mm	370 (W) x 105 (H) x 390 (D) mm
LCD	Dot matrix LCD, approx. 6 inch monochrome, narrow LCD viewing angle	TFT LCD, approx. 4 inch (320 x 240 pixel), color, wide LCD viewing angle
Weight	15 kg	5.3 kg

1. With Option E4980A-001 installed.

2. Please see "Appendix 5" on page 16 for a complete list of GPIB commands and the corresponding E4980A commands.

3. With Option E4980A-301 installed.

Appendix 2. Measurement Speed Comparison

Table 3. Measurement speed comparison of 4279A and E4980A in SHORT, MED and LONG modes

		4279A		E4980A
One point measurement	SHORT	6.4 ms	SHORT	5.6 ms ¹
	MED	15 ms	MED	88 ms
			SHORT (Avg = 5)	14.4 ms
	LONG	27.6 ms	LONG	220 ms
			SHORT (Avg = 11)	27.6 ms
List sweep measurement	SHORT	3 + 7.5 x DC bias sweep points	SHORT (Avg = 1)	2.5 ms + 7.2 ms x DC bias sweep points ²
	MED	3 + 16 x DC bias sweep points	SHORT (Avg = 5)	2.5 ms + 16 x DC bias sweep points
	LONG	3 + 28 x DC bias sweep points	SHORT (Avg = 10)	2.5 ms + 27 x DC bias sweep points

1. In SHORT mode, measurement time [ms] = 5.6 + (Avg. times - 1) x 2.2

2. In SHORT mode, measurement time [ms] = 2.5 + [7.2 + (Avg. times - 1) x 2.2] x DC bias sweep points

Appendix 3. Option Configuration Comparison

The Agilent E4980A option configuration is similar to that of the Agilent 4279A, so only minor modifications are needed in order to migrate.

Table 4. Option configurations of the 4279A and E4980A

Options	4279A	E4980A
Function enhancements		
Built-in DC bias voltage	Default (-38 V to 38 V)	E4980A-001 (-40 V to +40 V)
Multi-channel correction	Default (16 ch)	E4980A-301 (128 ch)
1% test frequency shift	4284A-003	No option required. Set the test frequency as 1.01 MHz.
Interface options¹		
No interface	N/A	E4980A-710
Handler interface	N/A	E4980A-201
Scanner interface	N/A	E4980A-301 ²
Add manuals		
English manual	4279A-ABA	E4980A-ABA
Japanese manual	4279A-ABJ	E4980A-ABJ
Add service manual	4279A-0BW	N/A (P/N: E4980A-90100)
Calibration documents		
Commercial calibration certificate with test data	4279A-UK6	E4980A-1A7 (ISO 17025 report)
Other		
Front handle kit	4279A-907	Default
Rack mount kit	4279A-908	E4980A-1CM
Rack mount and front handle kit	4279A-909	E4980A-1CM (Handle is Default)

1. There are two slots available to install the interfaces. The two interface slots on the rear panel must be filled by selecting two different options from the interface options: E4980A-002, -201, -301 and -710. However, if only a GPIB interface is required, two blank panels (2 x E4980A-710 No Interface "blank panel") can be selected.

2. This option is needed for multi-channel correction.

Appendix 4. Key and Menu Operation Comparison

Table 5. 4279A key and menu operation and corresponding E4980A operation information

4279A	E4980A
(Display Information of Status)	[Display Format]
OSC LVL:	LEVEL
DC BIAS	BIAS
RANGE	RANGE
INTEG	MEAS TIME
AVG	Select [Meas Setup] – AVG
T-DLY	Select [Meas Setup] – TRIG DLY
S-DLY	Select [Meas Setup] – STEP DLY
TRIG	Select [Meas Setup] – TRIG
CABLE	CORR
[MENU]	[Display Format] or [Meas Setup]
MEAS PARMTR	Move the cursor to FUNC
Cp-D / Cp-Q / Cp-G	Cp-...- Cp-D / Cp-Q / Cp-G
Cs-D / Cs-Q / Cs-Rs	Cs-...- Cs-D / Cs-Q / Cs-Rs
Return 1/2	[Return]
OSC LEVEL	Move the cursor to LEVEL
20 mV/50 mV/100 mV/ 200 mV/500 mV/1000 mV	Type in the level value, then click mV or V
DC BIAS	Move the cursor to BIAS
SPOT	Type in the Bias voltage value, then click mV or V
SPOT BIAS =	
PROG SWEEP	N/A ¹
EXT	N/A
FIX POLRTY	[MEAS SETUP] Move the cursor to BIAS POL, select FIX
AUTO INVERT	[MEAS SETUP] Move the cursor to BIAS POL, select AUTO
MEAS RANGE	[Display Format] or [Meas Setup]
AUTO/2 pF/8 pF/32 pF/ 128 pF / 512 pF / 1024 pF	Move the cursor to RANGE, Using AUTO or INCR + and DECR – to select the measurement range as AUTO/10 k/ 1 k/100 ohm/10 ohm/1 ohm @ 1 MHz. When the LEVEL > 200 mV, 30 kohm range is available
MEAS TIME	[Meas Setup]
INGET TIME	
SHORT/MEDIUM/LONG	Move the cursor to MEAS TIME, select SHORT/MED/LONG
AVG RATE	Move the cursor to AVG, type in the value AVG can be set from 1 to 256 with a resolution of 1
TRIG DELAY =	Move the cursor to TRIG DLY, type in the value
STEP DELAY =	Move the cursor to STEP DLY, type in the value
CABLE LENGTH	[Meas Setup] – CORRECTION
0 m/1 m/2 m	Move the cursor to CABLE, select 0 m/1 m/2 m
TRIG MODE	[Meas Setup]
INT /EXT/MAN TRIG	Move the cursor to TRIG, select INT/MAN/EXT

1. On the E4980A, the bias sweep voltage can be set up through remote programming or manual operation. For manual operation, please refer to the E4980A User's Guide.

Table 5. 4279A key and menu operation and corresponding E4980A operation information (continued)

4279A	E4980A
COMPEN	[Meas Setup] – CORRECTION ,
OPEN ON	Move the cursor to OPEN, select ON
OPEN OFF	Move the cursor to OPEN, select OFF
OPEN COMP	Move the cursor to OPEN, select MEAS OPEN
SHORT ON	Move the cursor to SHORT, select ON
SHORT OFF	Move the cursor to SHORT, select OFF
SHORT COMP	Move the cursor to SHORT, select MEAS SHORT
STD ON	Move the cursor to LOAD, select ON
STD OFF	Move the cursor to LOAD, select OFF
STD COMP	Move the cursor to LOAD, select OFF
STD PARAMTR C-D / C-G	Move the cursor to FUNC, Select Cp-D / Cp-G
STD ENTRY	Move the cursor to REF A and REF B, enter the data
TEMP COMPEN	N/A
MULTI COMPEN	[Meas Setup] – CORRECTION , ¹ move the cursor to MODE, select MULTI
SINGLE COMPEN	Move the cursor to MODE, select SINGLE
COMPEN NO. =	Move the cursor to SPOT No., enter the number
OFFSET	[Meas Setup] move the cursor to DEV A, REF A, DEV B, REF B
OFFSET A ON	[Meas Setup] – move the cursor to DEV A, select ABS
OFFSET A OFF	[Meas Setup] – move the cursor to DEV A, select OFF
OFS A =	[Meas Setup] – move the cursor to REF A, then enter the data
OFFSET B ON	[Meas Setup] – move the cursor to DEV B, select ABS
OFFSET B OFF	[Meas Setup] – move the cursor to DEV B, select OFF
OFS B =	[Meas Setup] – move the cursor to REF B, then enter the data
DISPLY PAGE	
MEAS PAGE	[Display Format]
STATUS PAGE	[Meas Setup]
BLANK PAGE	[Display Format] – DISPLAY BLANK
DISPLY DIGIT	N/A
VALUE MONITR	
MONITR OFF	[Meas Setup] move the cursor to VDC MON and IDC MON, select OFF
OPEN	N/A
SHORT	N/A
STD	N/A
STD REF	N/A
OFFSET	N/A
HP-IB DEFINE	[System] - SYSTEM CONFIG
ADRS-ABLE	Not necessary in E4980A
TALK ONLY	N/A
HP-IB ADRS=	[System] - SYSTEM CONFIG Move the cursor to GPIB-ADDR, enter the value (0-30)
SVC FUCTN	
SELF TEST	[System] – SELF TEST
1. A4 TRD 1st null amp adjust	Not compatible. Refer to the <i>E4980A User's Guide</i>
2. A4 TRD 2nd null amp adjust	Not compatible. Refer to the <i>E4980A User's Guide</i>
3. A6 ADC test	Not compatible. Refer to the <i>E4980A User's Guide</i>
4. ROM check sum display	Not compatible. Refer to the <i>E4980A User's Guide</i>
5. LED Display test	Not compatible. Refer to the <i>E4980A User's Guide</i>
6. LCD Display test	Not compatible. Refer to the <i>E4980A User's Guide</i>

1. Option E4980A-301 is necessary.

Appendix 5. Remote Control: GPIB Command Compatibility

Condition: SPOT 1 = 1 MHz @ Standard
SPOT 1 = 1.01 MHz @ Option E4980A-003 (1% shift option)

Compatibility level <A, B, C>

A: functionally compatible
B: need consideration
C: not compatible

Table 6. 4279A GPIB commands and the corresponding E4980A commands

4279A command	Compatibility level <A, B, C>	Corresponding E4980A command	Description	Note/example
AOFF	AOFF0	A	FUNC:DEV1:MODE OFF	OFFSET A OFF
	AOFF1	A	FUNC:DEV1:MODE ABS	OFFSET A ON
APOL	APOL00	A	BIAS:POL:AUTO 0	Fixes polarity
	APOL1	A	BIAS:POL:AUTO 1	Inverts polarity
AVE=	AVE=	B	APER SHORT, <ave>	Averaging rate If short@4279, then E4980A_ave = 4279A_ave If Med@4279, then E4980A_ave = 4279A_ave * 4 If Long@4279, then E4980A_ave = 4279A_ave * 10
BTAB=	BTAB=	B	<hold range> LIST:STIM:TYPE BVOL,IRAN LIST:STIM:DATA <bias volt>, <range> <auto range> LIST:STIM:TYPE BVOL LIST:STIM:DATA <bias volt> FUNC:IMP:RANG:AUTO ON	Sweep bias entry For <Rang> "1" of 4279A -> 10000 "2" of 4279A -> 10000 "3" of 4279A -> 3000 "4" of 4279A -> 1000 "5" of 4279A -> 300 "6" of 4279A -> 100
BIAS	BIAS0	A	BIAS:STAT 0	DC BIAS OFF
	BIAS1	A	BIAS:STAT 1	DC BIAS ON
BOFF	BOFF00	A	FUNC:DEV2:MODE OFF	OFFSET B OFF
	BOFF1	A	FUNC:DEV2:MODE ABS	OFFSET B ON
BMOD	BMOD1	B	DISP:PAGE MEAS	DC BIAS mode (spot bias)
	BMOD2	B	DISP:PAGE LIST	DC BIAS mode (sweep bias)
	BMOD3	C	N/A	DC BIAS mode (external bias) No feature
CABL	CABL0	A	CORR:LENG 0	Cable length (0 m)
	CABL1	A	CORR:LENG 1	Cable length (1 m)
	CABL2	A	CORR:LENG 2	Cable length (2 m)
CN0=	CN0=	A	CORR:USE	Compensation Number selection CORR:USE 3
CSTD=	CSTD=	A	CORR:SPOT1:LOAD:STAN <reference value for C>, <reference value for D or G>	Reference data (C) of the standard capacitor
DATA?	DATA?	B	FETCH?	DATA OUTPUT query For :TRIG command, EXT trigger
DDIG	DDIG4	B	DISP:TEXT1:FMSD ON	Display digit (4 digits) 1f 10f 100f 1p 10p 100p 1n 10n 100n 1u
	DDIG5	B	DISP:TEXT2:FMSD ON	Display digit (5 digits) 10u 100u 1m 10m 100m 1 10 100 1k 10k
	DDIG6	B	:DISP:TEXT1:FMSD:DATA <string> :DISP:TEXT2:FMSD:DATA <string>	Display digit (6 digits) 100k 1M 10M 100M can be selected as most left digits of 7 digits

Table 6. 4279A GPIB Commands and the corresponding E4980A commands (continued)

4279A command	Compatibility level <A, B, C>	Corresponding E4980A command	Description	Note/example	
DFMT	DFMT1	A	FORM ASC	Data transfer format (ASCII mode)	
	DFMT2	A	FORM REAL	Data transfer format (BINARY 64 bit mode)	
DPAG	DPAG1	A	DISP:PAGE MEAS	Display page (MEASUREMENT PAGE)	
	DPAG2	B	"DISP:PAGE CSET" for correction value check, "DISP:ENAB OFF" for measurement"	Display page (STATUS PAGE) ,	
	DPAG3	A	DISP:ENAB OFF	Display page (BLANK PAGE)	
DPOL	DPOL0	C	N/A	Auto bias polarity switching Result output OFF	No feature
	DPOL1	C	N/A	Auto bias polarity switching Result output ON	No feature
DSEC	DSEC0	C	N/A	Secondary data output OFF	No feature
	DSEC1	C	N/A	Secondary data output ON	No feature
DSTD=	DSTD=	B	CORR:SPOT1:LOAD:STAN <reference value for C>, <reference value for D or G>	Reference data (D) of the standard capacitor	
ERR?	ERR?	A	SYST:ERR?	Error message query	
GSTD=	GSTD=	B	CORR:SPOT1:LOAD:STAN <reference value for C>, <reference value for D or G>	Reference data (G) of the standard capacitor	
ITIM	ITIM1	B	APER SHORT,1	Integration time (SHORT)	
	ITIM2	B	APER SHORT,5	Integration time (MEDIUM)	
	ITIM3	B	APER SHORT,10	Integration time (LONG)	
MCOM	MCOM0	A	CORR:METH SING		
	MCOM1	A	CORR:METH MULT		
MPAR	MPAR1	A	FUNC:IMP CPD	Measurement parameter (Cp-D)	
	MPAR2	A	FUNC:IMP CPQ	Measurement parameter (Cp-Q)	
	MPAR3	A	FUNC:IMP CPG	Measurement parameter (Cp-G)	
	MPAR4	A	FUNC:IMP CSD	Measurement parameter (Cs~D)	
	MPAR5	A	FUNC:IMP CSQ	Measurement parameter (Cs~Q)	
	MPAR6	A	FUNC:IMP CSRS	Measurement parameter (Cs~Rs)	
OFFA=	OFFA=	A	FUNC:DEV1:REF	OFFSET A data	FUNC:DEV1:REF 10E-12
	OFFB=	A	FUNC:DEV2:REF	OFFSET B data	FUNC:DEV2:REF 0.0001
OPEN	OPEN0	A	CORR:OPEN:STAT 0	OPEN compensation OFF	
	OPEN1	A	CORR:OPEN:STAT 1	OPEN compensation ON	
OPM?	OPM?	B	:USE:DATA?	OPEN compensation data query	

Table 6. 4279A GPIB commands and corresponding E4980A commands (continued)

4279A command	Compatibility level <A, B, C>	Corresponding E4980A command	Description	Note/example
OSC	OSC1	A	VOLT 20mV	OSC LEVEL (20mV)
	OSC2	A	VOLT 50mV	OSC LEVEL (50mV)
	OSC3	A	VOLT 100mV	OSC LEVEL(100mV)
	OSC4	A	VOLT 200mV	OSC LEVEL(200mV)
	OSC5	A	VOLT 500mV	OSC LEVEL(500mV)
	OSC6	A	VOLT 1000mV	OSC LEVEL (1000mV)
RANG	RANG0	A	FUNC:IMP:RANG:AUTO ON	AUTO range
	RANG1	A	FUNC:IMP:RANG 10000	2pF range
	RANG2	A	FUNC:IMP:RANG 10000	8pF range
	RANG3	A	FUNC:IMP:RANG 3000	32pF range
	RANG4	A	FUNC:IMP:RANG 1000	128pF range
	RANG5	A	FUNC:IMP:RANG 300	512pF range
	RANG6	A	FUNC:IMP:RANG 100	1024pF range
SBI=	SBI=	A	BIAS:VOLT <numeric>	Spot bias entry
SDEL=	SDEL=	A	TRIG:DEL <second>	Step delay time entry For 10 ms SDEL TRIG:DEL 10E-3
SHM?	SHM?	B	:USE:DATA?	SHORT compensation data query,
SHOR	SHOR0	A	CORR:SHOR:STAT 0	SHORT compensation OFF
	SHOR1	A	CORR:SHOR:STAT 1	SHORT compensation ON
SPAR	SPAR1	A	CORR:LOAD:TYPE CPD	Standard parameter (C-D)
	SPAR2	A	CORR:LOAD:TYPE CPG	Standard parameter (C-G)
STD	STD0	A	CORR:LOAD:STAT 0	STANDARD compensation OFF
	STD1	A	CORR:LOAD:STAT 1	STANDARD compensation ON
STM?	STM?	B	:USE:DATA?	STANDARD compensation meas. data query
STR?	STR?	B	CORR:SPOT1:LOAD:STAN?	STANDARD compensation ref. data query
TDEL=	TDEL=	A	TRIG:TDEL <second>	Trigger delay time entry For 300 ms TDEL TRIG:TDEL 300E-3
TRIG	TRIG1	A	TRIG:SOUR INT	Trigger mode (internal)
	TRIG2	B	"TRIG:SOUR EXT" for External trigger connector "TRIG:SOUR BUS" for "TRG "	Trigger mode (external)
	TRIG3	A	TRIG:SOUR HOLD	Trigger mode (manual)
VMON	VMON0	C	N/A	Value monitor OFF No feature. Use DISP:LINE if necessary
	VMON1	C	N/A	Value monitor (OPEN measurement value) No feature. Use DISP:LINE if necessary
	VMON2	C	N/A	Value monitor (SHORT measurement value) No feature. Use DISP:LINE if necessary
	VMON3	C	N/A	Value monitor (STANDARD measurement value) No feature. Use DISP:LINE if necessary
	VMON4	C	N/A	Value monitor (STANDARD reference value) No feature. Use DISP:LINE if necessary
	VMON5	C	N/A	Value monitor (OFFSET reference value) No feature. Use DISP:LINE if necessary

Table 6. 4279A GPIB commands and corresponding E4980A commands (continued)

4279A command		Compatibility level <A, B, C>	Corresponding E4980A command	Description	Note/example
XOP	XOP	B	CORR:SPOT1:STAT ON CORR:SPOT1:OPEN	Measure OPEN compensation data	
XSH	XSH	B	CORR:SPOT1:STAT ON CORR:SPOT1:SHOR	Measure SHORT compensation data	
XSTD	XSTD	B	CORR:SPOT1:STAT ON CORR:SPOT1:LOAD	Measure STANDARD compensation data	
XTMP	XTMP	C	N/A	Execute temperature compensation	No need to do this
*CLS	*CLS	A	*CLS	Clear status byte	
*IDN?	*IDN?	A	*IDN?	Identification query	
*LRN?	*LRN?	A	*LRN?	Learn device setup query	
*OPT?	*OPT?	A	*OPT?	Option identification query	
*RST	*RST	A	*RST	Reset the instrument	Refer to "Note" under this chart.
*SRE	*SRE	B	*SRE <numeric>	Mask the status byte	
*SRE?	*SRE?	A	*SRE?	*SRE resistor (masking number) query	Check the "Status byte" section of this material
*STB?	*STB?	A	*STB?	Read the status resistor	
*TRG	*TRG	A	*TRG	Trigger command	

Note:

The default value of the preset condition at power on or *RST is different between the 4279A and E4980A.

default value	E4980A	4279A	4279A-003
Test frequency	1 kHz	1 MHz	1.01 MHz
Test signal level	1 Vrms	20 mVrms	20 mVrms

Please tune the test frequency and the test signal level on the E4980A to align with the default value of 4279A or 4279A-003.

Appendix 6. Status Byte Assignment Comparison

Table 7. Status byte comparison

Bit no.	4279A status byte register		E4980A
	Bit weight	Description	
0 (LSB)	0/1	Measurement complete	Always 0 (zero) ¹
1	0/1	End of conversion	Always 0 (zero) No equivalent status byte ¹
2	0/1	Ignore trigger	Always 0 (zero) ²
3	0/1	End status	Always 0 (zero) ³
4	0	Always 0 (zero)	Assigned to Message available bit
5	0/1	Error	Assigned to Standard event status register summary bit ²
6	0/1	RQS (request service)	SAME
7(MSB)	0	Always 0 (zero)	Assigned to Operation status event register summary bit

1. The E4980A has two register settings to detect the measurement end.

When you use the spot bias mode, please set the following register of the E4980A as follows:

- Bit 4 of Standard operation status event register: "Measurement complete bit"
- Bit 7 of Status byte register: "Operation status event register summary bit"

When you use the program bias sweep mode, please set the register of the E4980A as follows:

- Bit 3 of Operation status event register: "List sweep measurement complete bit"
- Bit 7 of Status byte register: "Operation status event register summary bit"

2. The E4980A register detects errors. Set the register of the E4980A as follows:

- Bit 2 of Standard event status register: "Query error bit"
- Bit 3 of Standard event status register: "Device specific error bit"
- Bit 4 of Standard event status register: "Execution error bit" Trigger ignored is defined in this error.
- Bit 5 of Standard event status register: "Command error bit"
- Bit 5 of Status byte register: "Standard event status register summary bit"

3. The E4980A register detects when the correction data measurement is complete.

Set the following register of E4980A as follows:

- Bit 0 of Standard operation status event register: "Correction data measurement complete bit"
- Bit 5 of Status byte register: "Standard event status register summary bit"

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