GOOD WILL INSTRUMENT CO., LTD.

CALIBRATION PROCEDURE

LCR METER

MODEL: LCR-817/819

GOODWILL INSTRUMENT CO., LTD.		
APPROVED BY	**CHECKED BY**	**PREPARED BY**

TOTAL 16 PAGES
EXCLUDING COVER PAGE

ADJUSTMENT PROCEDURE

MODEL:	LCR-817/819	Doc. No.		Page:	**1/16**

NO.	ITEM	SPEC.	CONDITION	ADJ. POINT	ADJ. SPEC.	PQC SPEC.
Note : LCR-819 => (Test Frequency: MAX:100KHz) , LCR-817 => (Test Frequency :MAX:10KHz) Measurement devices: 1. Digital Multimeter 2.DC POWER SUPPLY . 3.Resistor Standard kit, QuadTech CALIBRATED PART NO.:1689-9604 (SERIAL:9376462) 4.Universal Programmer 5.Resistor Specification Adjusting fixture(Fixture No.:PE-M0-195), 6. PQC Accuracy check Fixture(22 sets)。 7.PC(Installed ISP / EPROM software / K Parameter Count Auxiliary Programmer)						
Withstanding Test	I/P – FG : 1.5KV / 4.0mA ,1 min .					
1	Outlook check		To check if any scratch on the meter, front panel and case.			
2	Battery Arrangement	1. POWER OFF。 2. To make sure both ends of the battery on the PCB are open (To check with multimeter that the joint point of positive and negative polar of PCB is high resistance.) 3. Set Power Supply to 3V positive and negative terminal to PCB's "+" and "-" as simulation of battery.. 4. Check if the U314 & U315—28 PIN is 3V. If yes, mounting the battery. Repeat the steps 1 to 4.				
2	Voltage Confirmation	POWER ON				
		Confirm +12V (SW-PW indication +12V output terminal)	CHECK	+12V approx.	-----	
		Confirm -12V (SW-PW indication -12V output terminal)	CHECK	-12V approx.	-----	
		Confirm +5V (SW-PW indication +5V output terminal)	SW-PW Voltage adjusting knob	+ 5V ± 0.01V	-----	
		Check if the voltage of test point - TP11 is +2.5V 。	CHECK	+2.5V approx.	-----	
3	Operation Function Confirmation	Confirm if the LCD display is ok (240*128)	CHECK	Display ok	Display ok	
		Confirm if the KEY BOARD function is ok.	CHECK	Function ok	Function ok	
		Check if the FUNCTION KEY works well.	CHECK	Function ok	Function ok	
		1. SPEED (SLOW / MEDI / FAST) 2. DISPLAY (VALUE / DELTA% / DALTA) 3. MODE (R/Q , C/D , C/R , L/Q) 4. CIRCUIT (SERIES / PARALL) 5. INT / EXT switchable => " 7 "key, (ON/OFF) => " 8 " key. 6. C.V (ON/OFF) => " 1 " key: (Constant Voltage) 7. R.H (ON/OFF) => " 0 " key: (Range Hold) 8. AUTO / MANU switchable => " STRAT " key (more than 3 seconds.) 。 9. PPM switchable => " 4 " key.			Function ok	

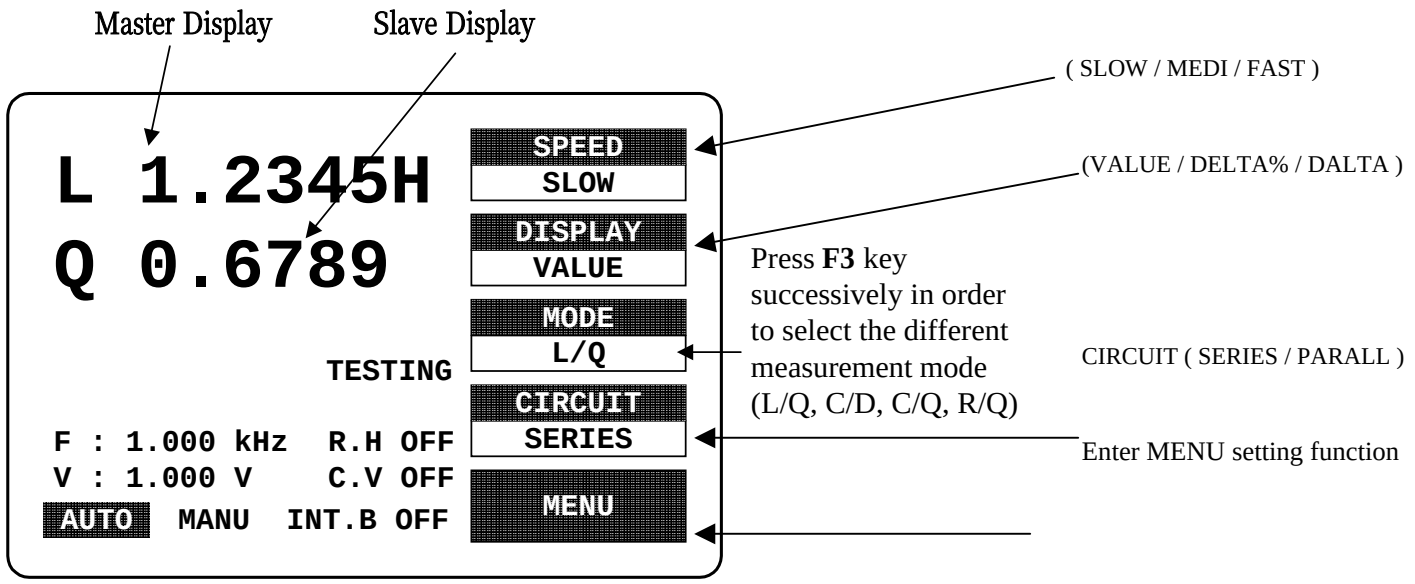


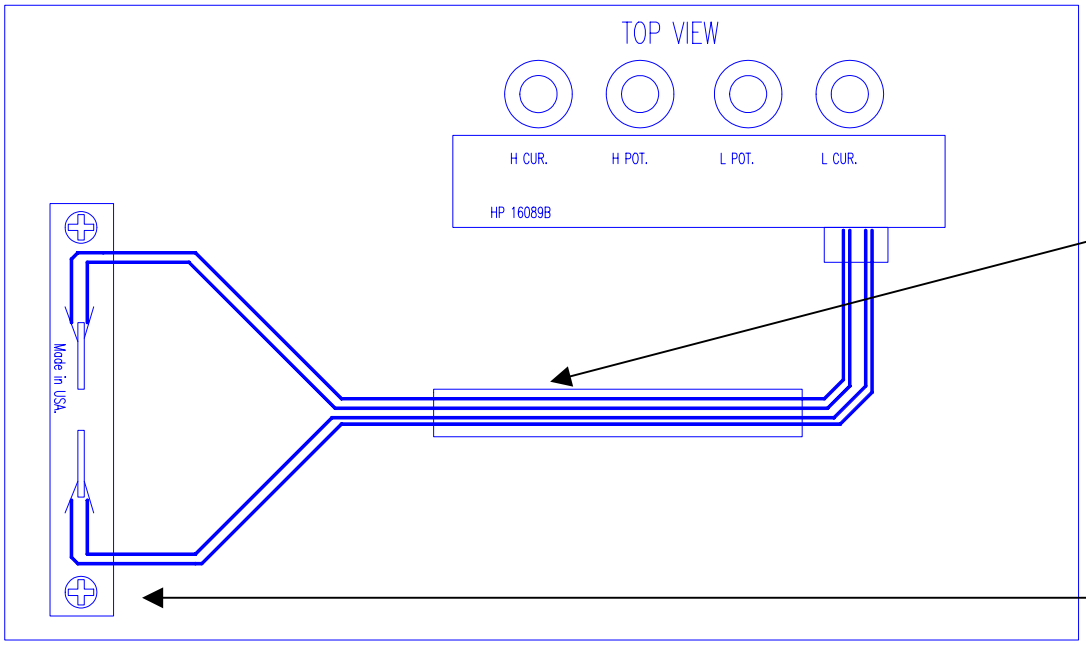
Figure 1

4	LOAD DEFAULT FACTOR Function	Download calibration value: Under the main display, press F5 to enter MENU display, press F4 function key which responses to the function of "CALIBRATION" of the fourth block. Now the display is for secret code input, input **0712** secret code, get into Calibration display, then press F4, the correspond function of "LOAD DEFAULT FACTOR", select "1" confirming key, it will appear a bar, after the bar is filled with dark color, it means the download has been finished. After the bar disappeared, press F5, the exit key, to get back to the main display.(Select "2" to cancel "LOAD DEFAULT FACTOR)..	Function ok	Function ok

ADJUSTMENT PROCEDURE

MODEL:	LCR-817/819	Doc. No.		Page:	3/16

NO.	ITEM	SPEC.	CONDITION	ADJ. POINT	ADJ. SPEC.	PQC SPEC.



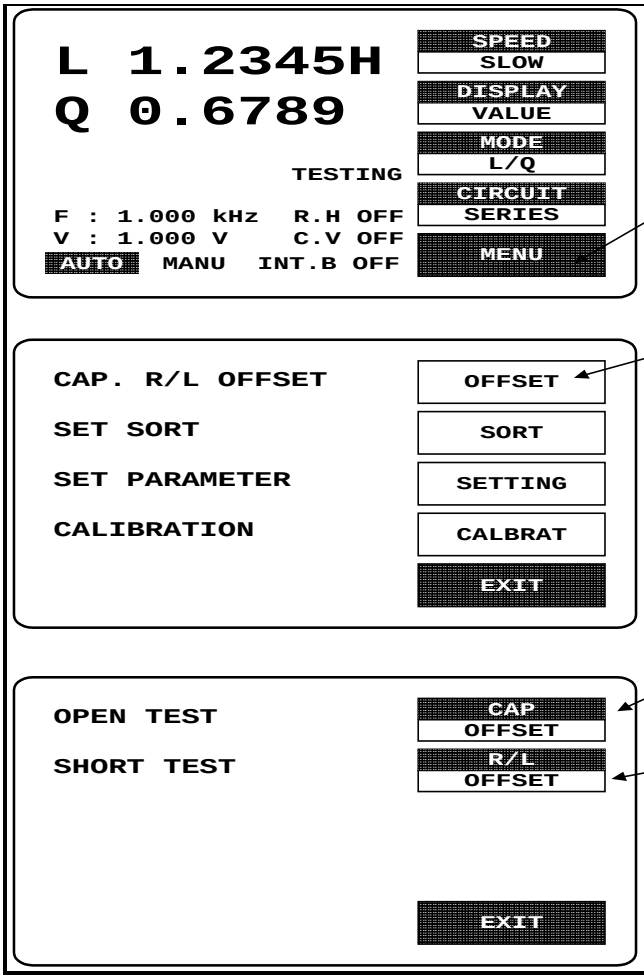
Calibration drawing for tested unit.

Open/Short/Range 1-4, Calibrate in coordination with tested fixture, Fixture wiring as left.(Test lead must be fixed)

The tested unit and calibration standard kit must be actually grounding. The test lead must be approved with PE certificate.

Standard kit(Resistor)

5	Zero Adjustment (Please set the standard kit of OPEN/SHORT to the Calibration fixture according to the Calibration drawing of tested unit.	● OPEN: Connect measured terminal to OPEN standard kit, press F5(MENU) entering MENU display. The first block of display is "OFFSET" function, which is correspond to F1 key, press F1 to appear another display, the first block of the display is "CAP OFFSET" function, correspond to F1 key, press again F1 to appear a bar. After the bar is filled with dark color, whether the OPEN function is completed or not, it will be displaying "OK" or "FAIL" signal at the upper right corner to indicate its status. Check if it is completely open. ● SHORT: Connect measured terminal to SHORT standard kit, press F5 (MENU) entering MENU display. The first block of display is "OFFSET" function, which is correspond to F1 key, press F1 to appear another display, the first block of the display is "R/L OFFSET" function, correspond to F1 key, press again F1 to appear a bar. After the bar is filled with dark color, whether the SHORT function is completed or not, it will be displaying "OK" or "FAIL" signal at the upper right corner to indicate its status. Check if the terminal is completely short. After the bar is disappeared, press F5 back to main display. Please refer to the following Figure 2: Summary of zeroing menu	C/R MODE Display C=± 0.0003 (nF) R/Q MODE Display R=± 0.0010 (Ω)



Test Condition:

Test voltage=1V

Test frequency=1KHz

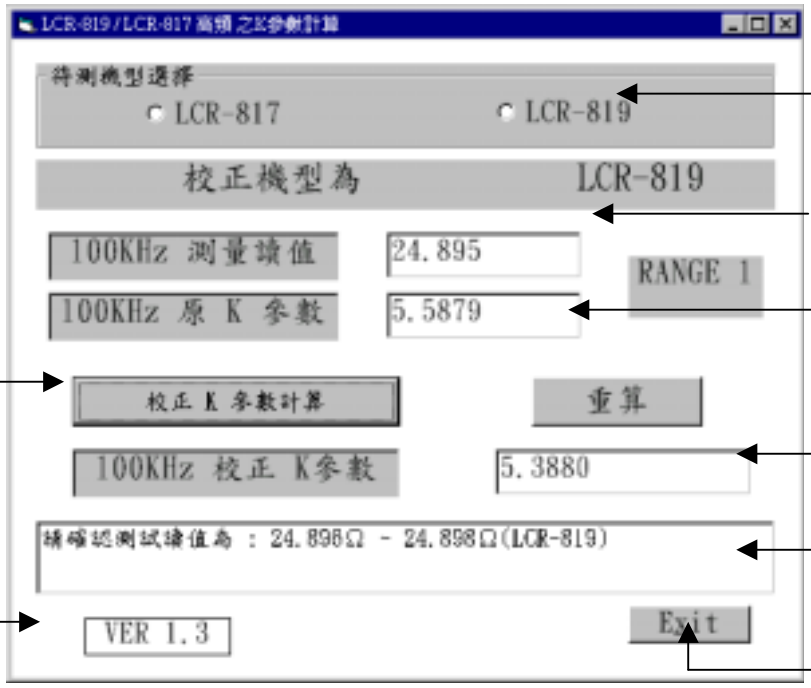
Test speed = SLOW

R.H = OFF

C.V = OFF

Figure 2: Summary of zeroing menu

6	Calibrating RANGE 1 R4 calibrator: R=24.897 Q=8 Please set the R4 standard kit to the Calibration fixture according to the Calibration drawing of tested unit.	a. Take R4 calibration standard kit from calibration cabinet, put to the position shown as attached drawing. Measure and record R resistance value. b. F5→F4→0712→F1→F1 c. Input standard value to the standard kit, press enter. d. Press F5 back to main display, after 30 seconds observation, confirm whether the R value is meet the standard value. ADJ => 1KHz :LCR-819 & LCR-817 :（24.897 ± 1 count）. If yes, proceed next step e, if not, repeat the steps from a to d. e. Set frequency at 100kHz for LCR-819, 10kHz for LCR-879, after 30 seconds observation, confirm whether the R value is met the standard value. ADJ => LCR-819:100kHz, LCR-879:10kHz : 24.896 24.898 If yes, jump to step 7 to calibrate RANGE 2, if not, continue the step f. f. F5→F4→0712→F2→F1, start to calculate k value with the formula as below: LCR-819 :k1=（100kHz measured value－24.897） ÷ 0.01 LCR-817 :k1=（ 10kHz measured value－24.897) ÷ 0.00001 K=K+k1 Remark：Above calculated formula can count out accuracy as attached drawing. g. Input new k value, press ENTER key. h. Press F5 back to main display, after 30 seconds observation, confirm R value as: LCR-819: 24.896 24.898 . If the reading value draft> 24.896 24.898, then it is for LCR-817. (LCR-817 main program must be re-written from item 4. LOAD DEFAULT FACTOR function) LCR-817:10kHz, after 30 seconds observation, confirm R value as: 896 24.898 If yes, continue step j, if not, repeat steps f~h. i. Set frequency at 1kHz, repeat steps b~h



1.Select tested model

2.Input high frequency reading value

3. Input high frequency original K parameter.

4. Press calculation knob to calculate k value.

Display correct high frequency k parameter.

Display the information of calibration specification.

Program version

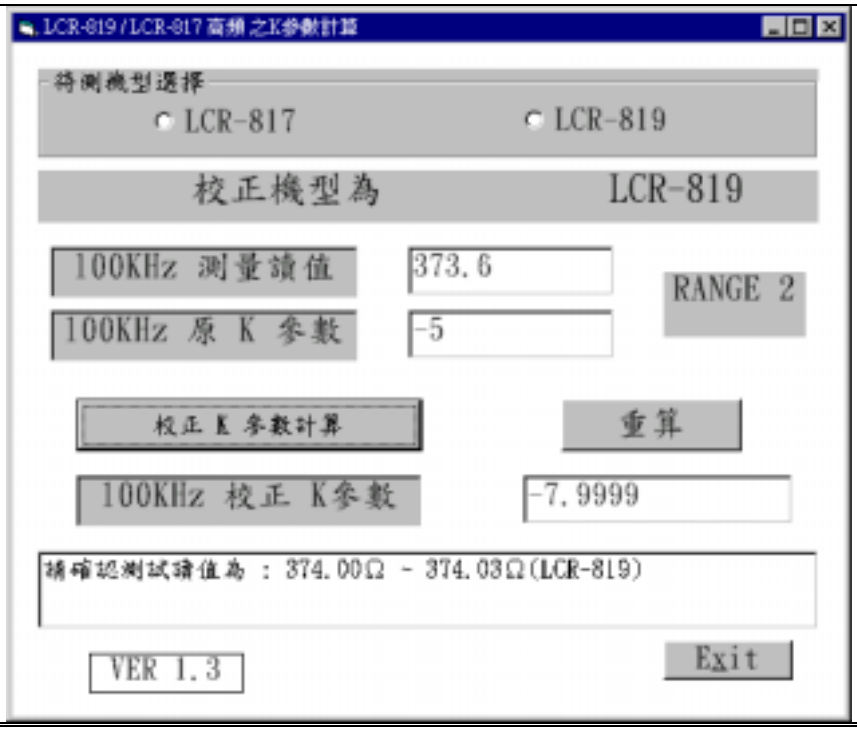
Program termination.

NO.	ITEM	SPEC.	CONDITION	ADJ. POINT	ADJ. SPEC.	PQC SPEC.
7	Calibrating RANGE 2 R3 Calibrator: R=374.02 Q=4 (Please set the R3 standard kit to the Calibration fixture according to the Calibration drawing of tested unit.)		a. Take R3 calibration standard kit from calibration cabinet, put to the position shown as attached drawing. Measure and record R resistance value. b. F5→F4→0712→F1→F2 c. Input standard value to the standard kit, press enter. d. Press F5 back to main display, after 30 seconds observation, confirm whether the R value is meet the standard value. ADJ => 1KHz :LCR-819 & LCR-817 :（374.02± 1 count）. If yes, proceed next step e, if not, repeat the steps a~ d. e. Set frequency at 100kHz for LCR-819, 10kHz for LCR-817, after 30 seconds observation, confirm whether the R value is meet the standard value. ADJ => LCR-819:100kHz, LCR-817:10kHz : 374.00~374.04 If yes, jump to step 7 to calibrate RANGE 3, if not, continue the step f. f. F5→F4→0712→F2→F2, start to calculate k value with the formula as below: LCR-819 :k1=（100kHz measured value－374.02） ÷ 0.14 LCR-817 :k1=（ 10kHz measured value－374.02) ÷ 0.001 K=K+k1 Remark：Above calculated formula can count out accuracy as attached drawing. g. Input new k value, press ENTER key. h. Press F5 back to main display, after 30 seconds observation, confirm R value as: LCR-819: 374.00~374.04 . If the reading value draft> 374.00~374.04, then it is for LCR-817. (LCR-817 main program must be re-written from item 4. LOAD DEFAULT FACTOR function) LCR-817:10kHz, after 30 seconds observation, confirm R value as: 374.00~374.04 If yes, continue step j, if not, repeat steps f~h. i. Set frequency at 1kHz, repeat steps b~h			

ADJUSTMENT PROCEDURE

MODEL:	LCR-817/819	Doc. No.		Page:	8/16

NO.	ITEM	SPEC.	CONDITION	ADJ. POINT	ADJ. SPEC.	PQC SPEC.



The calibration procedure is the same as RANGE-1

NO.	ITEM	SPEC.	CONDITION	ADJ. POINT	ADJ. SPEC.	PQC SPEC.
8	Calibrating RANGE 3 R2 Calibrator: R=5.9665 Q=-12 (Please set the R2 standard kit to the Calibration fixture according to the Calibration drawing of tested unit.)		a. Take R2 calibration standard kit from calibration cabinet, put to the position shown as attached drawing. Measure and record R resistance value. b. F5→F4→0712→F1→F3 c. Input standard value to the standard kit, press enter. d. Press F5 back to main display, after 30 seconds observation, confirm whether the R value is met the standard value. ADJ => 1KHz :LCR-819 & LCR-817 :（5.9665± 1 count）. If yes, proceed next step e, if not, repeat the steps a~ d. e. Set frequency at 100kHz for LCR-819, 10kHz for LCR-817, after 30 seconds observation, confirm whether the R value is meet the standard value. ADJ => LCR-819:100kHz: 5.9660~5.9666, LCR-817:10kHz : 5.9663~5.9667 If yes, jump to step 7, if not, continue the step f to calibrate RANGE 4. f. F5→F4→0712→F2→F3, start to calculate k value with the formula as below: LCR-819 :k1=（100kHz measurement value－5.9663） ÷ 0.00231 LCR-817 :k1=（ 10kHz measurement value－5.9665） ÷ 0.00002 K=K+k1 Remark：Above calculated formula can count out accuracy as attached drawing. g. Input new k value, press ENTER key. h. Press F5 back to main display, after 30 seconds observation, confirm R value as: LCR-819: 5.9660~5.9666 If the reading value draft> 5.9660~5.9666, then it is for LCR-817. (LCR-817 main program must be re-written from item 4. LOAD DEFAULT FACTOR function) LCR-817:10kHz, after 30 seconds observation, confirm R value as: 5.9663~5.9667 If yes, continue step j, if not, repeat steps f~h. i. Set frequency at 1kHz, repeat steps b~h			

ADJUSTMENT PROCEDURE

MODEL:	LCR-817/819	Doc. No.		Page:	**10/16**

NO.	ITEM	SPEC.	CONDITION	ADJ. POINT	ADJ. SPEC.	PQC SPEC.

The calibration procedure is the same as RANGE-1

NO.	ITEM	SPEC.	CONDITION	ADJ. POINT	ADJ. SPEC.	PQC SPEC.
9	Calibrating RANGE 4 R1 Calibrator: R=95.357 Q=-272 (Please set the R1 standard kit to the Calibration fixture according to the Calibration drawing of tested unit.)		a. Take R1 calibration standard kit from calibration cabinet, put to the position shown as attached drawing. Measure and record R resistance value. b. F5→F4→0712→F1→F4 c. Input standard value to the standard kit, press enter. d. Press F5 back to main display, after 30 seconds observation, confirm whether the R value is meet the standard value. ADJ => 1KHz :LCR-819 & LCR-817 :（95.357± 1 count）. If yes, proceed next step e, if not, repeat the steps a~ d. e. Set frequency at 20kHz for LCR-819, 10kHz for LCR-817, after 30 seconds observation, confirm whether the R value is meet the standard value. ADJ => LCR-819: 20kHz: 95.342~95.350, LCR-817:10kHz : 95.348~95.352 If yes, the calibration is finished, if not, continue the step f. f. F5→F4→0712→F2→F4, start to calculate k value with the formula as below: LCR-819 :k1=（20kHz measured value－95.346） ÷ 0.0015 LCR-817 :k1=（10kHz measured value－95.350） ÷ 0.00038 K=K+k1 Remark：Above calculated formula can count out accuracy as attached drawing. g. Input new k value, press ENTER key. h. Press F5 back to main display, after 30 seconds observation, confirm R value as: LCR-819: 95.342~95.350 If the reading value draft> 95.342~95.350, then it is for LCR-817. (LCR-817 main program must be re-written from item 4. LOAD DEFAULT FACTOR function) LCR-817:10kHz, after 30 seconds observation, confirm R value as: 95.348~95.352 If yes, continue step j, if not, repeat steps f~h. i. Set frequency at 1kHz, repeat steps b~h		

ADJUSTMENT PROCEDURE

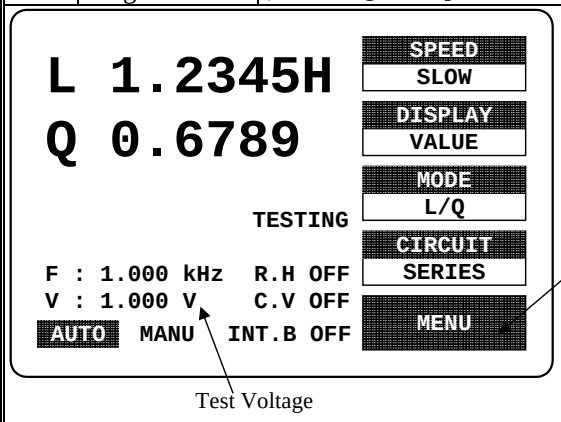
MODEL:	LCR-817/819	Doc. No.		Page:	12/16

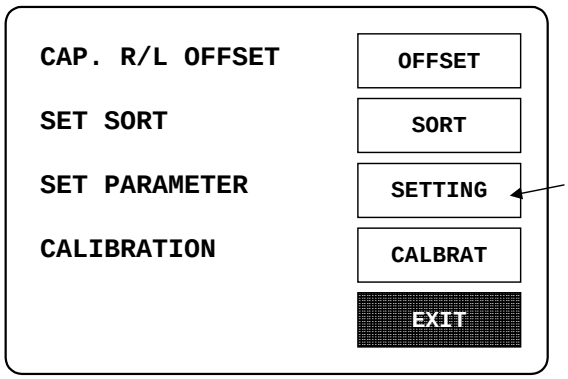
NO.	ITEM	SPEC.	CONDITION	ADJ. POINT	ADJ. SPEC.	PQC SPEC.

The calibration procedure is the same as RANGE 1

PQC INSPECTION ITEM

10	Measured Voltage setting	Measured Voltage: 5mV ~ 1.275V with 5mV interval. (Refer to Figure 4, press MENU→SET PARAMETER→VOLT)	Function ok	Function ok





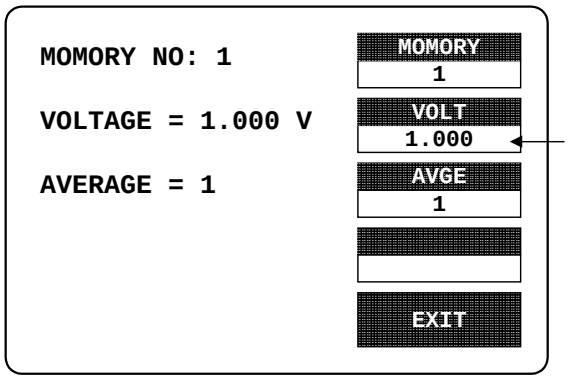
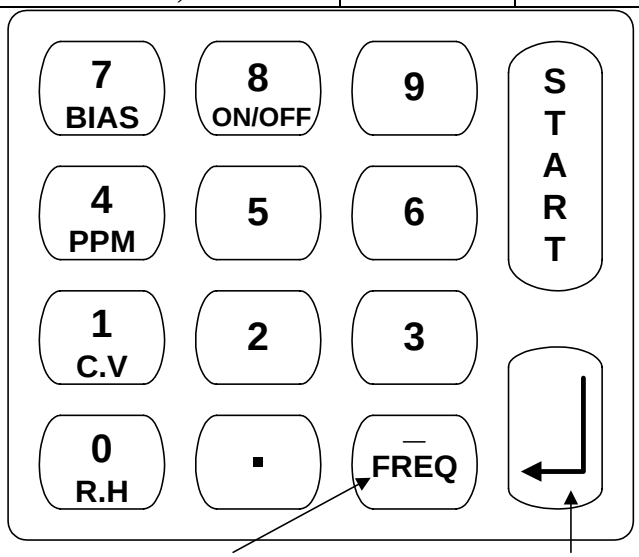


Figure 4. Programming of test voltage.



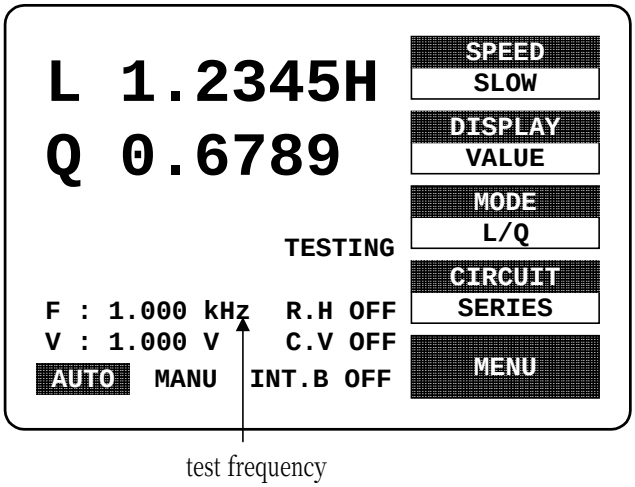
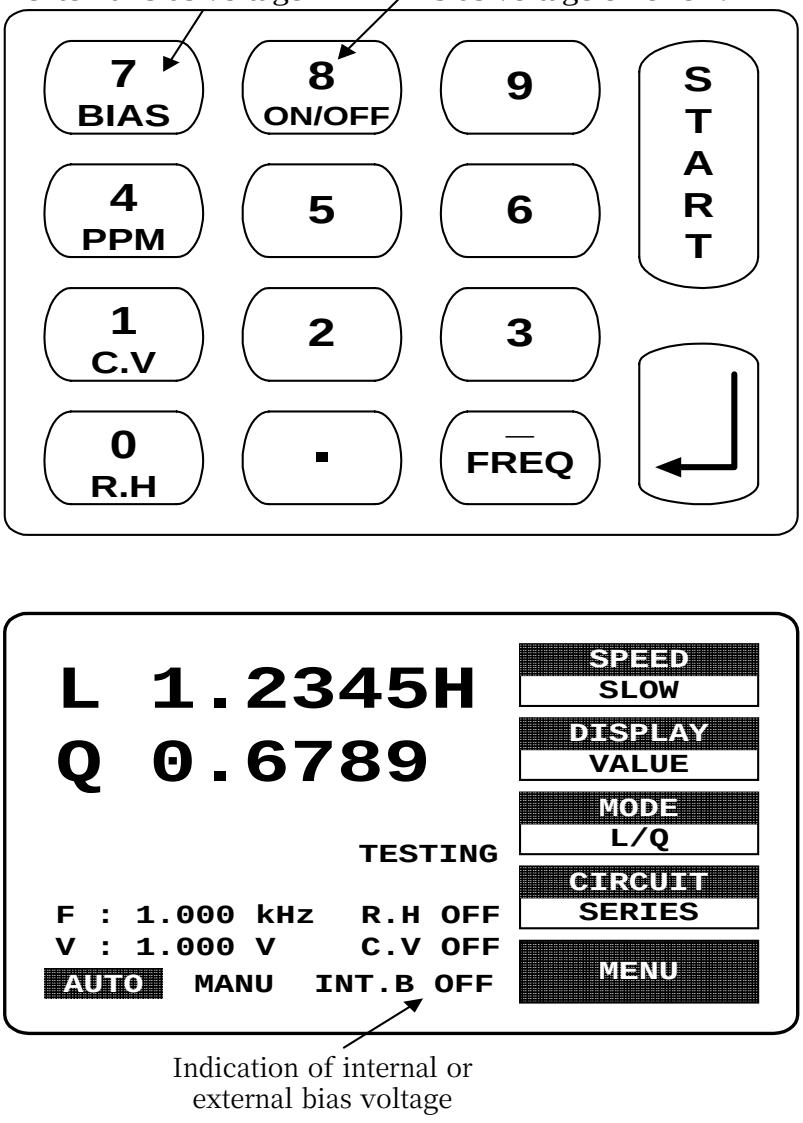


Figure 5. Inputs of test frequency

11	Measured Frequency setting	Refer to Figure 5, press ” FREQ” key, then, input measured frequency, press ENTER key. LCR-819 working frequency : 12Hz ~ 100KHz LCR-817 working frequency: 12Hz ~ 10KHz	Function ok	Function ok

NO.	ITEM	SPEC.	CONDITION	ADJ. POINT	ADJ. SPEC.	PQC SPEC.
12	Measured Status Record Setting	Refer to Figure 4, press MENU→SET PARAMETER→MEMORY 1. Press MEMORY key, select (1)RECALL /(2)STORT, then input Recall code and Memory code. 2. Totally 100 memory sets.			Function ok	Function ok
13	Average Value Output	Refer to Figure 4, press MENU→SET PARAMETER→AVGE , after AVGE key being pressed, input average numbers of times of measured value.			Function ok	Function ok
14	INT DC BAIS	1. Under main display, press number “7” BIAS key and “8” ON/OFF key, switching on INT B. 2. Measured both terminals “+” and “-” voltage of FORCE with DC measured range of digital multimeter.(No load)		CHECK	+2V± 5%	+2V± 5%
15	EXT DC BIAS	1. Under main display, press number “7” BIAS key and “8” ON/OFF key, switching on INT B 2. Input DC voltage to EXT BIAS terminal. (MAX: 30VDC / 200mA). 3. Measured both terminals “+” and “-” voltage of FORCE with DC measured range of digital multimeter.(No load)		CHECK	Same as input voltage	Same as input voltage



BIAS key:

INT / EXT BIAS Voltage switching.

ON / OFF (8) key:

BIAS Voltage output switching.

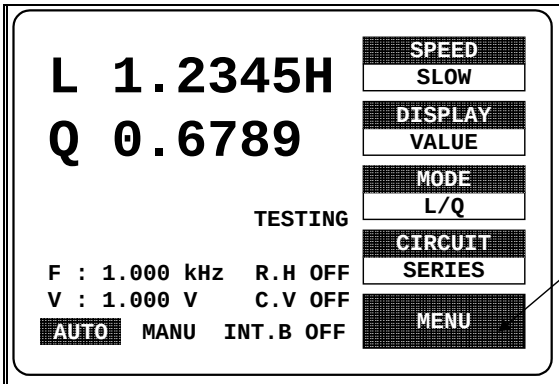
Figure 6. Selection of “BIAS” voltage

16	Standard Unit Setting Tested	1. The setting describes as follows: 2. Co-operate with DISPLAY function key, (VALUE / DELTA% / DALTA) can get the error percentage and error value.	Function ok	Function ok

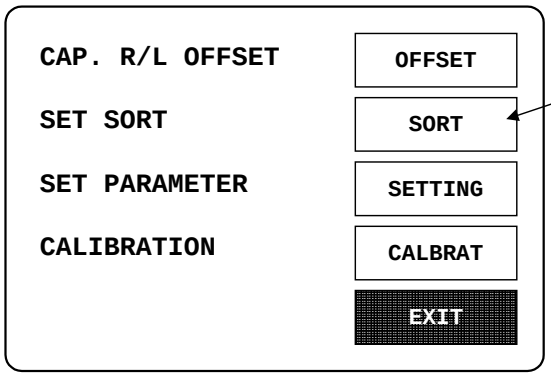
ADJUSTMENT PROCEDURE

MODEL:	LCR-817/819	Doc. No.		Page:	**16/16**

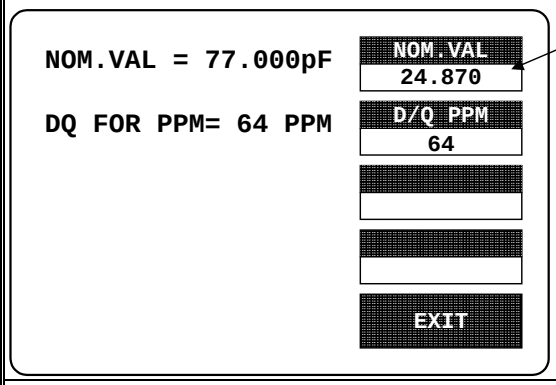
NO.	ITEM	SPEC.	CONDITION	ADJ. POINT	ADJ. SPEC.	PQC SPEC.



1. Select MENU key, enter Function key selection..



2. Select SORT key, enter SORT MANU.



3. Select NOM.VAL key, set standard value for the tested unit.
4. Select D/Q PPM key, set standard D/Q value for the tested unit.
5. Press EXIT key, back to main display of measurement.

17. Accuracy Confirmation for each range

Note:

A. Please be according to the attached inspection data to compare the test distortion value with the model of HP4284A and LCR-817/819(based on HP4284A test value, compare the error distortion value with LCR-817/819).

B. Before testing HP4284A, re-operate the OPEN/SHORT zero adjustment(not necessary for every frequency point to do the zero adjustment procedure.)

C. For the LCR-817/819, every frequency points listed must do the zero adjustment.

D. The tested unit waiting for confirming the specification must not be piled up together, keep the distance for every units about 10 cm more and put on the cover for testing.