

1 GENERAL INFORMATION

The 1687-B is a microprocessor-controlled, automatic LC meter. It measures L, C, X, or B, and R, G, D, or Q, and simultaneously displays the reactive and loss components of the device under test (DUT). A front-panel keyboard selects measurement functions and programs automatic component sorting.

The applied ac test signal is nominally 10, 100, or 1000 mV (depending on probe used) at 1 MHz. A dc voltage of up to 60 V can be applied through a rear-panel jack to bias a capacitor under test. Consult the instruction manual for further information about accuracy, operation, and service, as well as for detailed specifications.

2 START-UP

Check line voltage switch (rear panel) for proper voltage; if the unit includes the optional IEEE interface, check that the TALK switch (rear panel) is set to TALK ONLY (except when instructions are to be received from an IEEE bus) and that EXTERNAL BIAS (front panel) is set to OFF, unless a bias voltage (from rear-panel connector) is to be applied. Connect the measurement probe to the front-panel connector. Attach probe nose, or insert (without nose) into the optional test fixture. Depress POWER button. A sequence of self-check codes will flash on the display.

If a fault is detected, measurements are blocked and an error code remains on the display. All fives indicate a connection fault—check all probe and fixture connections. If the fault indication persists, service may be required.

If keyboard indicator lights remain dark, the keyboard is locked. To lock or unlock the keyboard, refer to instruction manual, para 3.1.

3 ZEROING

Before making measurements, zero the meter as follows:

a. Open Circuit: Set probe or test fixture contacts to desired spacing. Press keys: [1] [6] [8] [7] [=] [OPEN ZERO]. Left-hand display shows a single 0; ZERO CALIB, GO, and AVERAGE indicators light. Keep hands and all objects at least 10 cm from probe or fixture contacts. Press [START] to initiate zeroing operation. Wait until GO relights, showing that zeroing is complete.

b. Short Circuit: Short the probe or fixture contacts with a piece of copper wire. Do not alter contact spacing. Press [1] [6] [8] [7] [=] [SHORT ZERO]. The left-hand display shows a single 5, and GO lights. Press [START] and wait until GO relights. For maximum accuracy, this zeroing procedure should be performed at the start of each day and every time the probe or fixture configuration is changed.

4 MEASUREMENT

Choose general measurement conditions by pressing each key one or more times, as necessary, to obtain selection indicated by light on keyboard panel:

Press [FUNCTION] to obtain MEASURE.

Press [DISPLAY] to obtain VALUE.

Press [MODE] to obtain SINGLE.

Press [MEASURE RATE] to obtain SLOW.

Press [EQUIVALENT CIRCUIT] to obtain SERIES.

See below for other measurement conditions.

1. To Measure C and D of a Capacitor (C Range 0.001 to 99999 pF, D range 0.0001 to 999.9) Press [Cs/D]. Place the capacitor in the test fixture or press the probe terminals against the capacitor terminals or circuit nodes to be measured. Press [START]. The left-hand display shows the equivalent series capacitance, Cs, in pF; the right-hand display shows the dissipation factor, D.

2. To Measure L and Q of an Inductor (L range 0.001 to 99999 μ H; Q range 0.0001 to 999.9) Press [Ls/Q]. Make contact with the inductor. Press [START]. The left-hand display shows the equivalent series inductance, Ls, in μ H; the right-hand display shows the quality factor, Q.

3. To Measure an Impedance (X, R range 0.01 ohm to 999.9 kilohms) Press [Xs/Rs]. Make contact with the device or circuit board points. Press [START]. The left-hand display shows the value of the equivalent series reactance, Xs, in ohms or kilohms (NEG lights if the reactance is capacitive). The right-hand display shows the equivalent series resistance, Rs, in ohms or kilohms.

4. Other Measurements, Conditions Cs/Rs may be measured in addition to the above series parameters. Press [EQUIV CIRCUIT], obtaining PARALLEL, to measure Lp/Q, Cp/D, Cp/Gp, or Bp/Gp. To obtain a faster measurement rate, press [MEAS RATE] to obtain FAST. For continuous measurements or for averaged measurements, press [MODE] to light CONT or AVE. In the AVE mode, a series of 10 measurements is averaged to obtain the final displayed value. Press [START] to initiate a SINGLE or AVE measurement.

5 LIMIT ENTRY FOR GO/NO-GO TESTING, SORTING

Components may be tested on a go/no-go basis or sorted into tolerance bins according to value, as follows.

Press [DISPLAY] to obtain VALUE.

Press [FUNCTION] to obtain ENTER.

a. Entry of Limits

QDRG Limit (Bin 0). A single Q, D, R, or G limit can be specified. Press parameter keys appropriate to the components you wish to measure. If you select Cs/Rs, Cp/Gp, Xs/Rs, or Bp/Gp, repeat keying will change ohms to kilohms.

Enter the maximum acceptable value of D, G, or R, or the minimum value of Q on the numerical keyboard; the value entered will appear on the left-hand display. Press [=] [BIN NO.] [0]. The value moves to the right-hand display, showing that it has been entered.

If you do not wish to test for Q, D, or R, press [Ls/Q] and enter [0] [=] [BIN NO.] [0] to disable the QDRG test (all DUTs pass).

If you make a mistake, press the parameter key again.

LCXB Limits (Bins 1-8). To program symmetrical percentage tolerances (nested bins):

Enter the nominal value of the components to be sorted in the L, C, X, or B units selected above; the value appears on the left-hand display. Then press [=] [NOM VALUE].

Enter the value in percent of the narrowest tolerance to be sorted, e.g., for $\pm 2\%$, press [2] [%] [=] [BIN NO.] [1]. The corresponding actual L or C value of the upper limit appears on the left-hand display; and the lower limit appears on the right-hand display. Enter the next larger tolerance value; then press [%] [=] [BIN NO.] [2]. Increasingly wider tolerance ranges for sorting may be entered up to bin 8.

To program various nominal values (bucket sort):

Choose up to 8 nominal values to be sorted and compute non-overlapping tolerance ranges for each. For bin 1, proceed as above, but for bin 2, first enter a new nominal value, then the tolerance value. Continue, adding new nominal values and tolerances for as many bins as desired, up to bin 8.

To enter unsymmetrical tolerance limits $+x\%$ and $-y\%$, press (x) [%] [-] (y) [%] [=] [BIN NO.] (z) (where z is the desired bin, 1-8). To close a bin, press [0] [%] [=] [BIN NO.] [z].

b. Measure/Sort Procedure

Press [FUNCTION] to obtain MEASURE. The go/no-go lights are enabled as soon as a non-zero NOM VALUE is entered and remain active regardless of selected DISPLAY. If using SINGLE or AVE mode, press [START] to initiate measurement. Any component assigned to bin 0 (QDRG failure) or bin 9 (value outside all specified limits) lights NO GO indicator.

For bin sorting, press [DISPLAY] to obtain BIN NO. The display now shows a single number representing the bin into which the component falls.

Refer to manual, para 3.3, for complete sorting information.

6 PERCENT DEVIATION MEASUREMENT

To measure the difference between an unknown component and an entered nominal value, enter NOM VALUE as in 5 above. Return to MEASURE mode; press [DISPLAY] to obtain $\Delta\%$. Next displayed value will give the percentage difference between measured and nominal values.

7 CALIBRATION

Calibration with a standard is required once a year, or whenever the operating temperature varies more than $\pm 15^\circ\text{C}$ from the factory calibration temperature of 25°C . Refer to para 3.5 of the instruction manual.

8 IEEE 488 BUS and HANDLER INTERFACE

Refer to para 3.7 of the instruction manual.