Specifications

MEASUREMENT PARAMETERS AND MODES

Series or parallel R and Q, L and Q or C and D or C and R selected by the EQUIVALENT CIRCUIT key and the R/Q, L/Q, C/D and C/R keys. Continuous, triggered (single) or averaged (choice of 1 to 10) measurements selected by the MEASURE MODE key. The START button iniatiates triggered or averaged measurements. Parameter selection is initially made automatically based on the DUT being measuring. Automatic selection is inhibited once a specific parameter key has been selected by the operator.

DISPLAYS: LED-TYPE NUMERICAL

When the MEASURE function has been selected, either VALUE, ΔRLC, Δ% or BIN NO. may be displayed. The VALUE display provides five digits for measured R, L or C value and four digits for D, Q or R, with automatically positioned decimal points, units of measurement and minus signs when appropriate. The ΔRLC display indicates the difference between the measured R, L or C and a nominal value entered by the user with appropriate units (ohms, uF etc.). The R, L,or C difference display has five digits with a simultaneous four digit direct reading display of D, Q, or R with automatically positioned decimal points and minus signs when appropriate. The Δ% display indicates the % deviation of the measured R, L or C value the stored nominal value. The display is five digits with a maximwn resolution of one part per million with minus sign when appropriate. A four digit direct reading display of D, Q or R is simulaneously provided.
The BIN NO. display provides a single digit bin assignment number based on the measured value and user entered bin limits. When the ENTER function has been selected the display will indicate either the

nominal RLC value or bin limits, entered or recalled by the user.

MEASUREMENT RATES

Approximately 2, 4 and 8 measurements/second for the three keyboard MEASURE RATE selections SLOW, MEDIUM and FAST.

TEST FREQUENCIES

There are five test frequencies, 100Hz, 120Hz, 1kHz, 10kHz, and 100kHz selected by the SHIFT and FREQUENCY keyboard buttons. Frequency accuracy is .01%

APPLIED VOLTAGES

Ac test signals of 0.3 V or 1.0 V rms maximwm selected by the SHIFT and VOLTAGE keyboard buttons. A CONSTANT VOLTAGE mode can be selected which provides a low source impedance (25 ohms) in order to maintain a constant ac test level over a wider impedance range. Internal dc bias is 2 V. External dc bias of up to 60 V may be applied.

CHARGED CAPACITOR PROTECTION

The instrument is protected from damage due to the connection of charged capacitors with up to 1 joule of stored energy.

CALIBRATIONS

An OPEN circuit zero calibration can be performed to remove the effects of stray capacitance and conductance shunting the internal test fixture or any other fixture or cable connection. A similar SHORT circuit zero calibration can be performed to remove the effects of resistance and inductance in series in the test connections. New zero calibrations should be made to obtain best accuracy whenever the test frequency or the fixture geometry is changed. A complete recalibration of the internal standards for each measurement range may be performed by using the optional 1689-9604 Calibration Kit.

RLC AND DQ RANGES

The table below gives the overall display ranges for the two quantities measured at the same time.

Parameters	RLC Ranges	DQR Ranges
R and Q	.00001 ohm to 99999 Mohm	.0001 to 9999
L and Q	.00001 mH to 99999 H	.0001 to 9999
C and D	.00001 pF to 99999 mF	.0001 to 9999
C and R	.00001 nF to 99999 mF	.0001 ohm to 9999 kohms

Measurement range is automatically set by the unit for best accuracy and resolution. Automatic ranging can be inhibited by the keyboard's RANGE HOLD key.

RLC AND DQ ACCURACY

The table below gives the RLC and DQ accuracy for measurements made at the SLOW rate. The RLC accuracy given is valid when the phase angle of the component measured is low (Q of R < 0.1, Q of L > 10 or D of C < 0.1). Additional factors are given below the table for other conditions. Each RLC accuracy expression has three terms: the basic accuracy (0.1% of reading), an added fixed error which dominates when measuring very low values and an added % error term which dominates when measuring very high values.

The DQ error is fixed (i.e., not a percent), and the expression given holds over the RLC ranges where the added low value or high value RLC error terms are negligible. These accuracy specifications assume that an OPEN and SHORT zeroing calibrations have been made at the selected test frequency.

RLC Accuracy

Parameters & Freq	Basic Accuracy	Extreme Range Terms Low end		High End	DQ Accuracy
R & Q, 100Hz 120Hz and 1kHz	+-0.05%	+ 1 mohm	+	R/20 Mohm %	.0003(1 + Q^2)
R & Q, 10kHz	+-0.1%	+ 1 mohm	+	R/10 Mohm %	.0005(1 + Q^2)
R & Q, 100kHz	+-0.2%	+ 5 mohm	+	R/500kohm %	.001(1 + Q^2)
L & Q, 100 & 120Hz	+-0.05%	+ 1.0 uH	+	L/20kH %	.0003(1 + Q^2)
L & Q, 1kHz	+-0.05%	+ 0.1 uH	+	L/2kH %	.0003(1 + Q^2)
L & Q, 10kHz	+-0.1%	+ 0.02 uH	+	L/50H %	.0005(1 + Q^2)
L & Q, 100kHz	+-0.2%	+ 0.02 uH	+	L/1H %	.001(1 + Q^2)
C & D, 100 & 120Hz	+-0.05%	+ 2 pF	+	C/20mF %	.0003(1 + D^2)
C & D, 1kHz	+-0.05%	+ 0.1 pF	+	C/2mF %	.0003(1 + D^2)
C & D, 10kHz	+-0.1%	+ 0.01pF	+	C/50uF %	.0005(1 + D^2)
C & D, 100kHz	+-0.2%	+ 0.02pF	+	C/1uF %	.001(1 + D^2)
C & R	C accuracy is the same as given above.				
	R accuracy is the same as given above plus one count.				

MEASUREMENT RATE FACTOR

Multiply both RLC and DQ accuracy specifications by the following based on selected measurement speed:

SLOW: 1 MEDIUM: 2 FAST: 5

HIGH D AND LOW Q EFFECTS ON RLC ACCURACY

Multiply the above RLC accuracy specifications as follows:

If Q of R is > 0.1, multiply the R accuracy by (1 + Q)
If Q of L is < 10, multiply the L accuracy by (1 + 1/Q)
If D of C is > 0.1, multiply the C accuracy by (1 + D)

where D and Q are absolute values (minus sign removed).

CONSTANT VOLTAGE FACTOR

Multiply the basic RLC and DQR accuracies given above by 2 when the CONSTANT VOLTAGE mode is used.

DQ ACCURACY AT EXTREME RLC RANGE

When a High End or Low End RLC error term is not small in comparison to the basic RLC accurcies given above, multiply the above D or Q accuracies by the RLC accuracy (in percent) divided by the basic RLC accuracy (the fist term in the accuracy formulas).

SORTING

10 Bins: 8 pairs of RLC limits, one DQ limit, one fail bin. GO/NO-GO lights.

DUT CONNECTIONS

There is a built-in test fixture which will accept most common axial and radial leaded components. Four-terminal (Kelvin) connections are made to the DUT.

KEYBOARD LOCK

The keyboard can be locked to prevent inadvertent changes to test conditions and sorting routines.

PARAMETER STORAGE

All keyboards settings and programmed nominal values and bin limits can be stored in non-volatile memory for automatic reentry upon power up.

SELF-CHECK DIAGNOSTICS

Self-tests are performed during power-up to verify proper operation and validity of calibration. Coded error signals on the display notify the operator if a problem is encountered.

INTERFACE OPTION

IEEE-488 Bus: All keyboard functions are programmable from the bus except for external bias control and internal standard recalibration. All RLC, DQ and bin data are available as outputsto the bus. Output data format is ASCII or Binary. The following functions, per IEEE-488, have been implemented:

AH1 Acceptor Handshake (Listener)
SHl Source Handshake (Talker)
T5 Talker with normal and talk only modes (switch selectable) .
L4 Listener
SR1 Service Request
RL2 Remote/Local
PP0 No Parallel Poll
DC1 Device Clear
DTl Device Trigger
C0 No controller functions

Handler Outputs: Sorting results; Bins 0 thru 9 (10 lines)
ACQ OVER; (1 line) indicates end of data acquistion (component can be moved without affecting measurement results)
EOT; (1 line) indicates end of test and that valid bin nwnbers for sorting are available.

Outputs are active low (open collector drivers rated at 30 V ~x. Each will sink 16 mA at 0.4 V. External power and pull-up resistors are required).

Handler Inputs: Start; (1 line) To initiate measurement.
Input is active low ($0V < V_l < 0.4V$) and ($+2.5V < V_h < +5V$)

ENVIRONMENT

Operating; 0 to 50 degrees C, < 85% RH
Double specifications below 15 and above 35 degrees C.
Storage; -40 to +74 degrees C

ACCESSORIES SUPPLIED

Power cord, axial-lead adaptors, bias cable and instruction manual.

ACCESSORIES AVAILABLE

IEEE/Handler Interface, 1658-9620 (see above)
BNC Adaptor, 1689-9601
Extender Cable with alligator clips and banana jacks, 1657-9600
Extender Cable with Kelvin Clips, 1689-9606
Extender Cable with 874 connectors, 1688-9600
Extender Cable BNC to ENO, 1689-9602
SMD Tweezers, 1689-9603
Remote Test Fixtures, 1689-9600 or 1689-9605
Calibration Kit, 1689-9604

POWER REQUIREMENTS

90 to 125 V or 180 to 250 Vac, 50 to 60 Hz.
Voltage selected by rear panel switch. 50 W maximum.

MECHANICAL DIMENSIONS (W x H x D)

14.8" x 4.4" x 13.5" (375 x 112 x 343 mm)

WEIGHT

13 lbs (5.9 kg) net, 18 lbs (8.2 kg) shipping