1687

LC testing at 1 Megahertz. That's the most striking feature that's offered by the 1687. Like all members of the Digibridge family, the 1687 offers a broad selection of instrument accuracy, flexibility, and ease-of-use features that give GenRad its reputation as the price/performance leader in the industry. And like each member of the Digibridge family, the 1687 offers enough unique features to set it off from the family and make it the one Digibridge model that's best suited to certain users' needs.

Digibridge accuracy at 1 MHz.

With the 1687, an entire range of components—both capacitors and inductors—calling for 1 MHz test frequencies can be accurately tested: 0.1% basic accuracy for C, 0.2% basic accuracy for L.

As always, there are other Digibridge accuracy features. There's the five full-digit primary display and four full-digit secondary display capability that leads to better measurement resolution and a correspondingly higher level of accuracy.

Another important feature is the 1687's self-check and diagnostics capability. When power is switched on, the instrument quickly runs through a series of self-check and diagnostic tests. If any tests fail, the 1687 display points the operator in the direction of the trouble. That adds to both your accuracy and your peace of mind.

As always, the test fixture (optional with this model) employs guarded Kelvin measurement techniques reducing the chance of error caused by shunt admittance or series impedance.

The standard 1687 measurement interface—a specially designed probe and cable—eliminates the connection problems encountered in interfacing Megahertz bridges to special fixtures such as autohandlers. It brings the key

elements of the test circuit right up to the test head. That cuts down on the kind of noise and interference that can be especially damaging when making such high-frequency measurements.

High-frequency measurements coupled with Digibridge flexibility.

Though especially well suited to high-frequency measurements, the 1687 offers many of the by-now familiar Digibridge flexibility features.

The keyboard control of the 1687 puts a number of those features right at the user's fingertips. **First,** the unit can be set up to display the value of the parameter being measured (LC as the primary parameters; D, Q, R, and G as secondary parameters). **Second,** it can display the bin number of the component under test—that is, where the component falls in the tolerance limits pre-entered by the user. **Finally,** the unit can also display ΔC/ΔL, representing the percent difference in value of a component from a nominal value

entered on the keyboard. This ΔC/ΔL feature should be of special interest to users performing environmental testing, precision device testing, production/process control testing, component matching, and special lot testing.
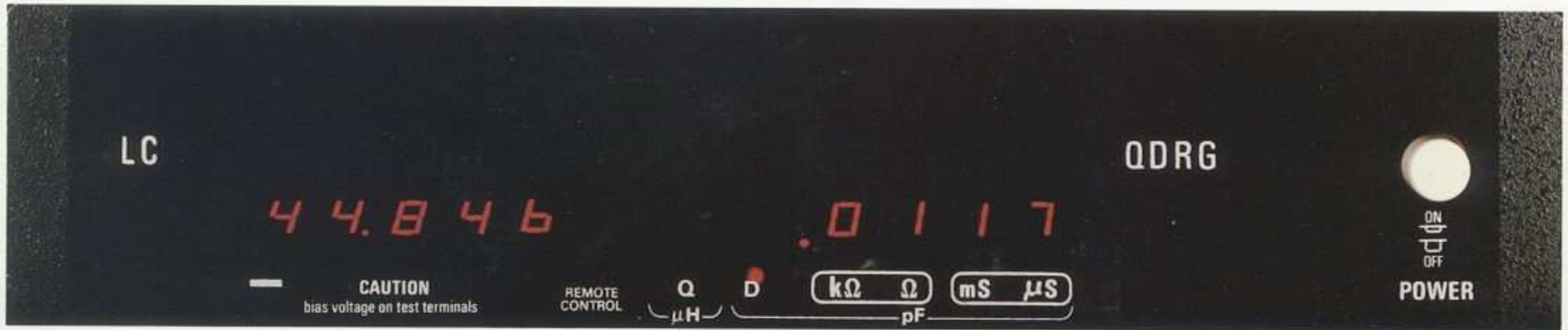
At any time while testing components, the operator can call out and display the preprogrammed bin limits as well as the nominal value. That serves both as a helpful reminder and a confidence-booster.

Selectable test speeds—either 2 or 4 measurements/second—give you the opportunity to choose the optimum balance between test accuracy and test speed.

Three measurement modes are also available: CONTINUOUS mode, for real-time, repetitive measurements; AVERAGE mode, where the 1687 averages ten consecutive measurements, and then displays that average; and SINGLE, one measurement held on the display. The one you choose (and it's a simple matter of pushing the proper control button) will depend on your specific testing application.

a.

LC   44.8846   .0117   QDRG

— CAUTION bias voltage on test terminals   REMOTE CONTROL   Q ⌐μH⌐ D   (kΩ Ω) (mS μS) ⌐pF⌐   ON/OFF POWER

b.

LC   5   QDRG

— CAUTION bias voltage on test terminals   REMOTE CONTROL   Q ⌐μH⌐ D   (kΩ Ω) (mS μS) ⌐pF⌐   ON/OFF POWER

Finally, the 1687's IEEE 488 bus/ handler option allows the 1687 to be connected to such devices as handlers, printers, or calculator-based systems. That can pay dividends in a broad range of test environments: from the production floor to the laboratory.

High frequency LC testing that's easy to use.

The 1687 provides all this accuracy and flexibility in a package so easy to use that it requires little or no technical training or experience.

Starting off with the display, all of its elements—LED readouts, indicator lights, power switch—are intuitively clear at a glance.

Like all higher-level Digibridge models, the 1687 automatically makes the measurement in the proper range. That means no operator mistakes since there's no operator guesswork.

Calibration is no problem either. A unique combination of hardware and software features allows on-line recalibration for special fixtures such as autohandlers. In fact, periodic recertification and recalibration are accomplished in a simple, two-minute calibration exercise.

As for the subject of programming limits, it's best presented by the example shown here, which shows the entry of symmetrical and asymmetrical test limits.

Example of Limit Entry.

Given: 150 pF capacitors with D < .005
Sort: ±1%, 2%, 5%, 10%, − 20%, +80%
Select desired measure rate display, measure mode.
With FUNCTION key, select ENTER
Press Cs/D key
Enter D limit: .005 = BIN 0
Enter nominal value: 150 = NOM VALUE
Enter bin limits:
    1% = BIN 1
    2% = BIN 2
    5% = BIN 3
   10% = BIN 4
80% − 20% = BIN No. 5

As with the 1658, it's a fast, straightforward, simple operation. The kind you expect from a member of the GenRad Digibridge family . . . this one, the high-frequency-testing 1687.

Measurement Parameters: Measures series L and Q; series C and D; series C and R; and parallel C and G. All measurement modes are key selectable.

Measurement Speed: Slow (2/s typical), fast (4/s typical). Key selectable. Refer to accuracy statements for speed/accuracy data.

Test Frequency: 1.000 MHz ± .01%

Measurement Ranges:
L — 00.001 to 99999 μH
C — 00.001 to 99999 pF
Q — 00.01 to 999.9
D — .0001 to 9.999
R — 00.01Ω to 999.9 kΩ
G — 00.01 μS to 999.9 mS

Display: Key selectable. Value—L/Q, C/D, C/R, C/G. Five full digits (99999) for L or C and four full digits (9999) for Q, D, R or G. Completely autoranging. Bin number—Identifies bin for tested component. Programmed limits for any bin. ΔL% or ΔC%—Percentage deviation of selected L or C measurement from stored nominal value.

Measurement Mode: Continuous, average (running average of 10 measurements), or single. Key selectable.

External Bias: Up to 60 V can be applied. Indicator lights when bias is applied.

Applied Voltage: 0.1 V rms nominal, 0.12 V rms maximum (with 1687-9603 probe). Option: 1 V rms ±20% for C values ≤100 pF and rolls-off to 0.12 V rms maximum at 1600 pF (with 1687-9604 probe).

Description	Catalog Number
1687 LC Digibridge®	1687-9700
1687 LC Digibridge® with IEEE 488 Bus/Handler Interface	1687-9701
1687-P1 Test Fixture	1687-9600
1687 1 V Measurement Probe/Cable	1687-9604
1687 Calibration Kit	1687-9605
Replacement parts:	
1687 Probe Nose Assembly	1687-9606
1687 0.1 V Measurement Probe/Cable	1687-9603
1687 Reference—Standard Adaptor	1687-9602
IEEE 488 Bus/Handler Interface option retrofit	1658-9610

Accuracy: These accuracy specifications apply when using the standard 0.1 V probe (1687-9603).

L: Accuracy = $\pm 0.05\%M \underbrace{\left[3 + \frac{L}{500\,\mu H} + \frac{50\,\mu H}{L}\right]}_{\text{Basic L Accuracy}} \underbrace{\left[1 + 1/Q\right]}_{\text{Cross Term}}$

C: Accuracy = $\pm 0.05\%M \underbrace{\left[1 + \frac{C}{500\,pF} + \frac{50\,pF}{C}\right]}_{\text{Basic C Accuracy}} \underbrace{\left[1 + D\right]}_{\text{Cross Term}}$

Q: Accuracy = $\pm \left[.01 + .001M(1+Q)Q\right]\left[\frac{\text{Basic L Accuracy}}{0.2\%}\right]$

D: Accuracy = $\pm.001M\left[1 + (1+D)D\right]\left[\frac{\text{Basic C Accuracy}}{0.1\%}\right]$

R: Accuracy = $\pm 0.1\%M\left[1 + \frac{R}{6\,K\Omega} + \frac{150\,\Omega}{R}\right]\left[1 + 1/D\right]$

G: Accuracy = $\pm 0.1\%M\left[1 + \frac{G}{6\,mS} + \frac{150\,\mu S}{G}\right]\left[1 + 1/D\right]$

These accuracy specifications apply when using the optional 1 V probe (1687-9604).

L: Accuracy = $\pm 0.05\%M \underbrace{\left[7 + \frac{L}{500\,\mu H} + \frac{50\,\mu H}{L}\right]}_{\text{Basic L Accuracy}} \underbrace{\left[1 + \frac{1}{Q}\right]}_{\text{Cross Term}}$

C: Accuracy = $\pm 0.05\%M \underbrace{\left[3 + \frac{C}{500\,pF} + \frac{50\,pF}{C}\right]}_{\text{Basic C Accuracy}} \underbrace{\left[1 + D\right]}_{\text{Cross Term}}$

Q: Accuracy = $\pm \left[.01 + .002M(1+Q)Q\right]\left[\frac{\text{Basic L Accuracy}}{0.2\%}\right]$

D: Accuracy = $\pm.002M\left[1 + (1+D)D\right]\left[\frac{\text{Basic C Accuracy}}{0.2\%}\right]$

R: Accuracy = $\pm 0.05\%M\left[3 + \frac{R}{3\,K\Omega} + \frac{300\,\Omega}{G}\right]\left[1 + 1/D\right]$

G: Accuracy = $\pm 0.05\%M\left[3 + \frac{G}{3\,mS} + \frac{300\,\mu S}{G}\right]\left[1 + 1/D\right]$

In above specifications,
M = 1, when using SLOW test rate
M = 5, when using FAST test rate
D = $2\pi fRC$ for series R and C
D = $\frac{G}{2\pi fC}$ for parallel G and C
f = 1 MHz

Accuracy specifications apply over the following temperature ranges (after warmup time of 30 minutes):

$T_a* = T_{cal} \pm 5°C$ no recalibration necessary.

$T_a* = T_{cal} \pm 15°C$ "open" and "short" recalibration required at $T = T_a \pm 5°C$.

$T_a* < T_{cal} - 15°C$ Full ("open", "short", "std").

$T_a* > T_{cal} + 15°C$ recalibration required.

*Ambient temperature range $0°C \leq T_a \leq 50°C$.

NOTE: Factory calibration is at $T_{cal} = 25°C$

T_{cal} = temperature of last full recalibration. Calibration applies for 12 months after full recalibration.

Environmental: Operating: +0° to +50°C, 0 to 85% relative humidity. Storage: −40° to +75°C.

Supplied: 0.1 V measurement probe with cable (1687-9603) and power cord.

Power: 90 to 125 V or 180 to 250 V, 48 to 62 Hz. Voltage selected by rear-panel switch. 30 W maximum.

Mechanical: Bench model. DIMENSIONS (WxHxD): 14.78x4.4x13.5 in. (37.54x11.18x34.29 cm). WEIGHT: 13.5 lb (6.14 kg) net, 18 lb (8.2 kg) shipping.