specifications

(Divided into three parts: Amplitude-Phase Measurement, Impedance Measurement, and Items Common to both measurements)

common specifications

(Amplitude-Phase and Impedance Measurements)

INTERNAL SYNTHESIZER: Output from OSC OUTPUT (H_{CUR}) terminal

Frequency Range: 5 Hz to 13 MHz

Frequency Resolution: 1 mHz (5 Hz to 10 kHz), 10 mHz (10 kHz to 100 kHz), 100 mHz (100 kHz to 1 MHz), 1 Hz (1 MHz to 13 MHz)

Frequency Accuracy: ±50 ppm (23 ±5°C)

OSC Level Accuracy (H_{CUR} terminal open): (5 + 10/f)% of setting + 2 mV* (5 Hz to 1 MHz), (4 + 1.5•F)% of setting + 2 mV* (1 MHz to 13 MHz) where f is measuring frequency in Hz, and F is measuring frequency in MHz

*10 mV when OSC level is > 100 mV.

OSC Level Resolution: 1 mV (5 mV to 100 mV), 5 mV (100 mV to 1.1 V)

Output Resistance (direct coupled): 50 Ω (amplitude-phase measurements), 100 Ω (impedance measurements, ≥ 38 kHz), 100 Ω to 10 kΩ (impedance measurements, < 38 kHz, depends on measuring range)

Level Monitor (impedance measurement): Measures and displays voltage across or current through device under test

Frequency and Level Control: Via front panel numeric keys or HP-IB, auto sweep (except for level) and manual sweep

EXTERNAL SYNTHESIZER: Can be connected to VCO INPUT connector on rear panel (HP 3325A Synthesizer or equivalent is recommended)

Frequency Range: 40.000005 MHz to 53 MHz (measuring frequency is equal to frequency of the external synthesizer minus 40 MHz)

Required Signal Level: 0 dBm to 3 dBm

NOTE: In an HP-IB system, frequency of internal synthesizer should be set to the frequency of the external synthesizer minus 40 MHz, and the 4192A and external synthesizer system should be phase-locked.

EXT REFERENCE INPUT CONNECTOR: Can be connected to a 1 MHz/10 MHz high stability reference signal (−1 dBm to +5 dBm) to improve the internal synthesizer stability. Input resistance is approximately 50 Ω.

MEASURING MODE:

Spot Measurement: At specific frequency (or dc bias*)

Swept Measurement: Between START and STOP frequencies (or dc bias*). Sweep can be automatic or manual.

Sweep Mode: Linear sweep mode (sweeps at specified step) and logarithmic sweep mode (20 points measurement per decade frequency range)

X10 STEP Key (Linear manual sweep): Multiplies the specified frequency/dc bias* step by 10.

PAUSE (temporary sweep stop) and SWEEP ABORT (sweep cancellation) functions are provided for auto sweep.

*dc bias can be used only during impedance measurements.

RECORDER OUTPUT: DC output proportional to measured values of DISPLAY A, DISPLAY B, and measuring frequency or dc bias

Maximum Output: ±1 V

Output Voltage Accuracy: ±(0.5% of output voltage +20 mV)

PEN LIFT output and X-Y recorder scaling outputs are provided.

FIVE NONVOLATILE STORAGE REGISTERS: Memorize five complete instrument measurement configurations. A measurement configuration can be set from the front panel, from the HP-IB, or both. Also, a configuration can contain measurement functions which require single keystroke setup, multiple keystroke setup, or both.

HP-IB DATA OUTPUT AND REMOTE CONTROL: Based on IEEE-std-488 and ANSI-MC1•1

Remote Control Function: All front panel functions except for LINE switch and X10 STEP key

Data Output: Measured values of DISPLAY A, DISPLAY B, and measuring frequency or dc bias

SELF TEST: Checks 4192A basic operation

TRIGGER: Internal, External, Hold/Manual, or HP-IB remote control

HP 4192A

amplitude-phase measurements

PARAMETERS MEASURED: Amplitude ratio B-A (dB), θ (degrees or radians), group delay (s), absolute amplitude A, B (dBV or dBm). Deviation (Δ and Δ%) measurement for all the above parameters.

Parameter Combinations: B-A and θ, B-A and group delay, A and B are single display

REFERENCE AMPLITUDE: 0 dBV = 1 Vrms, 0 dBm = 1 mW (into 50 Ω)

OSCILLATOR OUTPUT RESISTANCE (Direct Coupled): 50 Ω +5% −8% (50 Hz to 5 MHz)
50 Ω ±10% (< 50 Hz and > 5 MHz)

CHANNEL A AND B INPUT IMPEDANCE:
1 MΩ ±2%, shunt capacitance 25 pF ±5 pF, maximum input voltage: ±35 Vp

DISPLAY RANGE AND RESOLUTION
(Normal or Average Test Speed Mode):

B-A: 0 to +100 dB, 0.001 dB (< 20 dB), 0.01 dB (≥ 20 dB)

θ: 0 to ±180° (0 to ±π radian), 0.01°

A, B: +0.8 to −100 dBV, +13.8 to −87 dBm, 0.001 dB (> −20 dB), 0.01 dB (≤ −20 dB)

Measuring resolution decreases one digit in high speed mode.

Group Delay (t_g): 1 μs to 10 s, 8 ranges 0.1 ns maximum resolution

MEASURING ACCURACY*: Specified at measuring terminals when the following conditions are satisfied:

(1) Warmup Time: ≥ 30 min

(2) Ambient Temperature: 23 ±5°C (error limits double for 0°C to 55°C temperature range)

(3) Measuring Speed: Normal or Average mode

*NOTE: Additional errors due to power splitter, feed-through termination, etc., are to be added to specification given here.

Group Delay (t_g) Measurements: Accuracy is derived from the following equation (phase accuracy $\Delta\theta$A and $\Delta\theta$B are read from the table below):

$$\text{group delay accuracy} = \frac{\Delta\theta A + \Delta\theta B}{720 \times \Delta F} \text{ (s)}$$

where $\Delta\theta$A and $\Delta\theta$B are channel A and B phase accuracy (deg.) and ΔF is step frequency (Hz).

Example Calculation for Group Delay Accuracy:

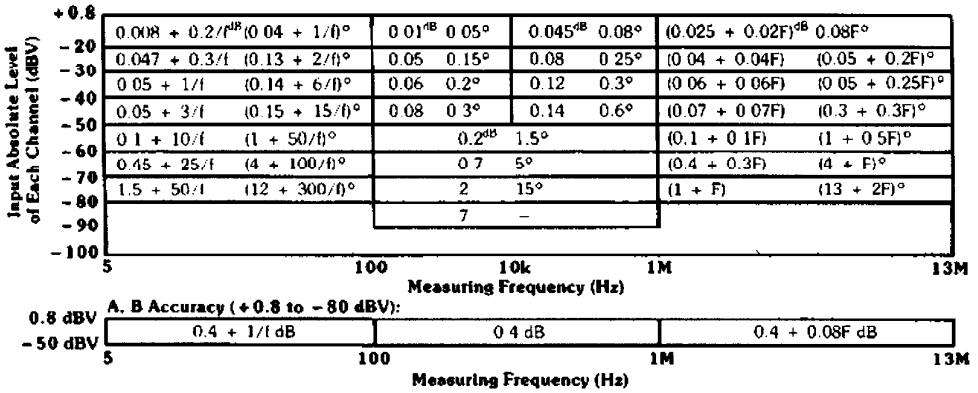
(1) Measurement conditions:
- measurement frequency = 1 kHz
- step frequency (ΔF) = 16.67 Hz
- channel A input level = −15 dBV
- channel B input level = −25 dBV

(2) Phase accuracy in Channel A ($\Delta\theta$A) is given in the table below as ±0.05°. Phase accuracy in Channel B ($\Delta\theta$B) is ±0.15°.

(3) $\text{Group delay accuracy} = \left(\frac{0.05° + 0.15°}{720 \times 16.67 \text{ Hz}}\right)$ (s)

Group delay accuracy = ±16.67 microseconds

B-A and θ Accuracy: (f in Hz, F in MHz)



- The measuring accuracy of each parameter is given above: The accuracy depends on input absolute level of each channel and measuring frequency.
- B-A and θ accuracies are the sum of each channel accuracy given in the tables above: For example, when the frequency is 1 kHz, A channel is −15 dBV and B channel is −25 dBV; the uncertainty contributed by each channel to the B-A error is 0.01 dB/0.05° and 0.05 dB/0.15°, respectively. Therefore, the final accuracy of 0.06 dB/0.2° is given by adding the accuracy of both channels.
- Accuracy is not specified for shaded areas.
- Absolute amplitude accuracy (A, B) for the range of −50 to −80 dBV is the sum of the accuracy for 0.8 to −50 dBV plus the accuracy of the absolute input level of each channel. For example, when channel A is −55 dBV at 1 kHz, accuracy is 0.6 dB; the sum of 0.4 dB and 0.2 dB.
- In the table above f is in Hz and F is in MHz.

impedance measurements

MEASURED PARAMETER: |Z| (impedance), |Y| (admittance), θ (phase angle), R (resistance), X (reactance), G (conductance), B (susceptance), L (inductance), C (capacitance), D (dissipation factor), and Q (= 1/D).

Deviation (Δ and Δ%) measurement for all the above parameters.

Floating measurements and low-grounded measurements are possible.

Parameter Combinations: $|Z|-\theta$, $|Y|-\theta$, $R-X$, $G-B$, $L-Q\bullet D\bullet R\bullet G$, $C-Q\bullet D\bullet R\bullet G$

EQUIVALENT CIRCUIT MODE: Auto, ⊸⊸ (Series) and ⊸◯⊸ (Parallel). |Z|, R and X are measured in ⊸⊸ mode, and |Y|, G and B in ⊸◯⊸ mode.

DISPLAY (NORMAL OR AVERAGE MODE): Maximum 4½ digits, maximum display 19999 (L•C measurements) or 12999 (other parameter measurements). Number of display digits depends on OSC LEVEL and measuring range.

RANGING: Auto or manual for impedance/admittance measured values

MEASUREMENT TERMINAL: 4-terminal pair configuration

AUTOMATED ZERO ADJUSTMENT: Unwanted residual impedances (L, C, R and G) are measured at a frequency selected by the operator. The residual values are stored and used as offsets for subsequent measurements. The stored residual values are applied directly at all frequencies and on all functions except R. The R offset value is calculated from the following equation:

$$R\bullet\frac{1+\sqrt{\text{measuring frequency}}}{1+\sqrt{\text{zero offset frequency}}}$$

DC BIAS: Standard furnished (valid for impedance measurements)

Voltage Range: −35 V to +35 V, 10 mV step

Setting Accuracy: (23 ±5°C): ±(0.5% of setting + 5 mV)

Output Resistance: 110Ω to 11kΩ ±10% (depends on measuring range)

Maximum Output Current: Maximum Output Current (varies with measuring frequency and range): 20 mA max. (floating measurement), 5 mA max. (low-grounded measurement).

Control: Front panel numeric keys and HP-IB remote control.

MEASURING RANGE, ACCURACY AND RESOLUTION: Accuracy is specified at UNKNOWN terminals under the following conditions:

(1) Warmup Time: ⩾ 30 min.

(2) OSC Level: ⩾ 100 mVrms (accuracy varies for level below 100 mV)

(3) Floating Measurement: (*see* GENERAL for low-grounded measurement)

(4) Measuring Frequency: zero offset adjustment is to be done

(5) Ambient Temperature: 23 ±5°C (error limits double for temperature range of 0°C to 55°C)

(6) Measuring Speed: Normal or Average mode

(7) How to interpret the graphs on the following pages: The following graphs give range, accuracy and maximum resolution for each parameter measured by the 4192A. When using the graphs, use these guidelines:

(A) Accuracies given for |Z|, |Y|, R, X, G, B and θ are for full scale readings.

(B) Accuracy for D and θ is given as ± (number of counts). Accuracy for all other parameters is given as ± (% of reading + number of counts).

(C) In the tables, f is measuring frequency in Hz and F is measuring frequency in MHz.

(D) Textured areas in the tables ▭ indicate that measurements can be obtained but accuracy is not guaranteed.

(E) The number of display digits varies with 1) measuring frequency, 2) test level and 3) measuring speed.
In general, the number of diplay digits will increase when measuring frequency is above 400 Hz, at high test levels and slow measuring speeds.

|Z| – θ and R – X Measurements:

	Measuring Range	Maximum Resolution
|Z|•R•X	1.0000 Ω to 1.0000 MΩ	0.1 mΩ
θ	– 180.00° to + 180.00°	0.01°

|Z|•R•X*& θ Accuracy: (f in Hz, F in Hz)

1 MΩ	(1.44 + 125 f)% + 1	(0.72 + 75 f)°	1.44% + 1	0.72°	(1.2 + 0.24F)% + 1 (0.6 + 0.15F)°
100 kΩ	(0.36 + 21.5 f)% + 1	(0.18 + 12.9 f)°	0.36% + 1	0.18°	(0.24 + 0.24F)% + 1 (0.12 + 0.15F)°
10 kΩ	(0.36 + 16 f)% + 1	(0.18 + 9.6 f)°	0.36% + 1	0.18°	(0.24 + 0.18F)% + 1 (0.12 + 0.11F)°
1 kΩ	(0.36 + 19 f)% + 1	(0.18 + 11.4 f)°	0.36% + 1	0.18°	(0.36 + 0.024F + 0.029F²)% + 1 (0.18 + 0.012F + 0.017F²)°
100 Ω	(0.12 + 7.4 f)% + 3	(0.08 + 4.5 f)°	0.12% + 3	0.08°	(0.12 + 0.024F + 0.029F²)% + 3 (0.08 + 0.012F + 0.017F²)°
10 Ω	(0.24 + 11 f)% + 5	(0.15 + 6.6 f)°	0.24% + 5	0.15°	(0.24 + 0.036F + 0.037F²)% + 5 (0.15 + 0.022F + 0.023F²)°
1 Ω	(0.6 + 47/f)% + 5	(0.48 + 28.2/f)°	0.6% + 5	0.48°	

5 400 1M 2M 13M

Measuring Frequency (Hz)

|Y| – θ and G – B Measurements:

	Measuring Range	Maximum Resolution
|Y|•G•B	10.000 μS to 10.00 S	0.001 μS
θ	– 180.00° to + 180.00°	0.01°

|Y|•G•B†& θ Accuracy: (f in Hz, F in Hz)

10 μS	(0.24 + 17 f)% + 3	(0.18 + 10.2 f)°	0.24% + 3	0.18°	0.24F% + 3 (0.06 + 0.15F)°
100 μS	(0.12 + 8 f)% + 3	(0.08 + 4.8 f)°	0.12% + 3	0.08°	0.24F% + 3 (0.12 + 0.15F)°
1 mS	(0.12 + 7 f)% + 3	(0.08 + 4.2 f)°	0.12% + 3	0.08°	0.18F% + 3 (0.12 + 0.15F)°
10 mS	(0.12 + 8.2 f)% + 3	(0.09 + 4.92 f)°	0.12% + 3	0.08°	(0.12 + 0.024F + 0.029F²)% + 3 (0.08 + 0.012F + 0.017F²)°
100 mS	(0.36 + 11 f)% + 1	(0.18 + 6.6 f)°	0.36% + 1	0.18°	(0.36 + 0.024F + 0.029F²)% + 1 (0.18 + 0.012F + 0.017F²)°
1 S	(0.84 + 47 f)% + 1	(0.36 + 28.2 f)°	0.84% + 1	0.36°	
10 S			3% + 1	1.56°	

5 400 16k 1M 2M 13M

Measuring Frequency (Hz)

*R and X accuracy depends on the value of D as follows: (Refer to R-X table above).

	D<1	1≤D<10	10≤D
R	Accuracy of R is equal to the accuracy of X, in number of counts, as calculated from the table above. For example, if X is 1000 counts, R is 500 counts, and the test frequency is 100 Hz, the accuracy of R is: $\left(\frac{19}{100\text{ Hz}}\text{ f}\% + 0.36\%\right)\cdot 1000 + 1 = 6.5\text{ counts}$	Two times % error given in the table above	table above
X	table above	Accuracy of X is equal to the accuracy of R, in number of counts, as calculated from the table above.	

†G and B accuracy depends on the value of D as follows: (Refer to G-B table above).

	D≤0.1	0.1 D≤1	1<D
G	Accuracy of G is equal to the accuracy of B, in number of counts, as calculated from the table above.		table above
B	table above	two times % error given in table above	Accuracy of B is equal to the accuracy of G, number of counts, as calculated from the table above.

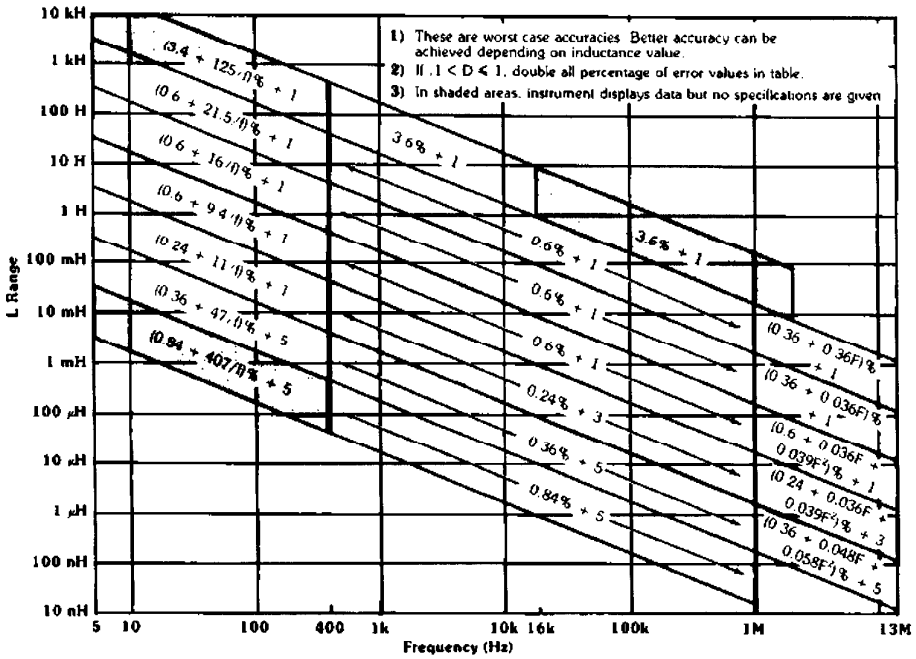
L – Q • D • R • G MEASUREMENTS: (f in Hz, F in MHz)

Refer to R – X or G – B Measurements for R and G Accuracy.

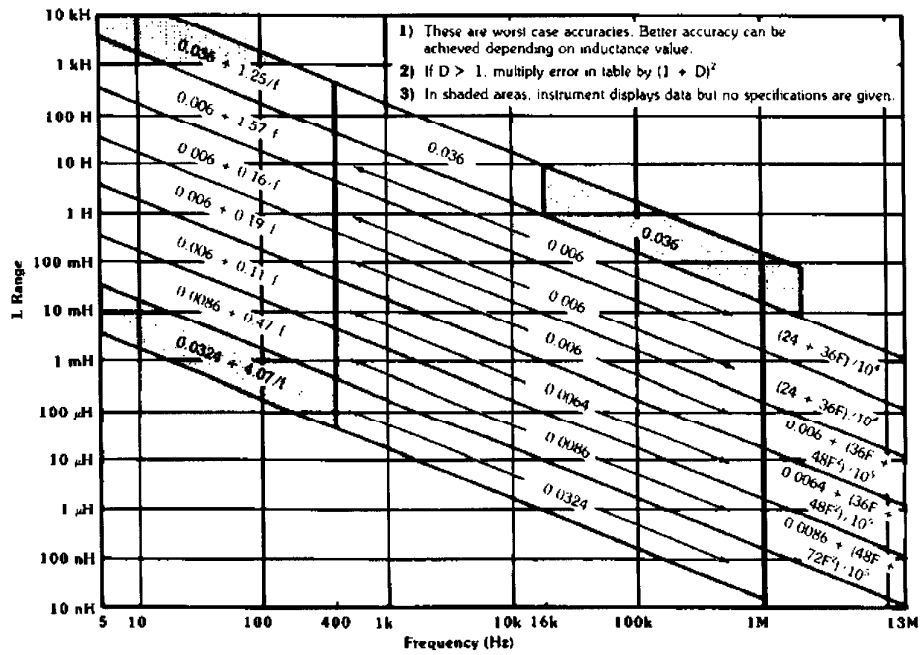
	Measuring Range*	Maximum Resolution*
L	100.00 nH to 1000 H	0.01 nH
D	1.0000 to 10.000	0.0001
Q	1000.0	0.1

*Depends on measuring frequency

L Accuracy (D ≤ 0.1)



D Accuracy (D ≤ 0.1)



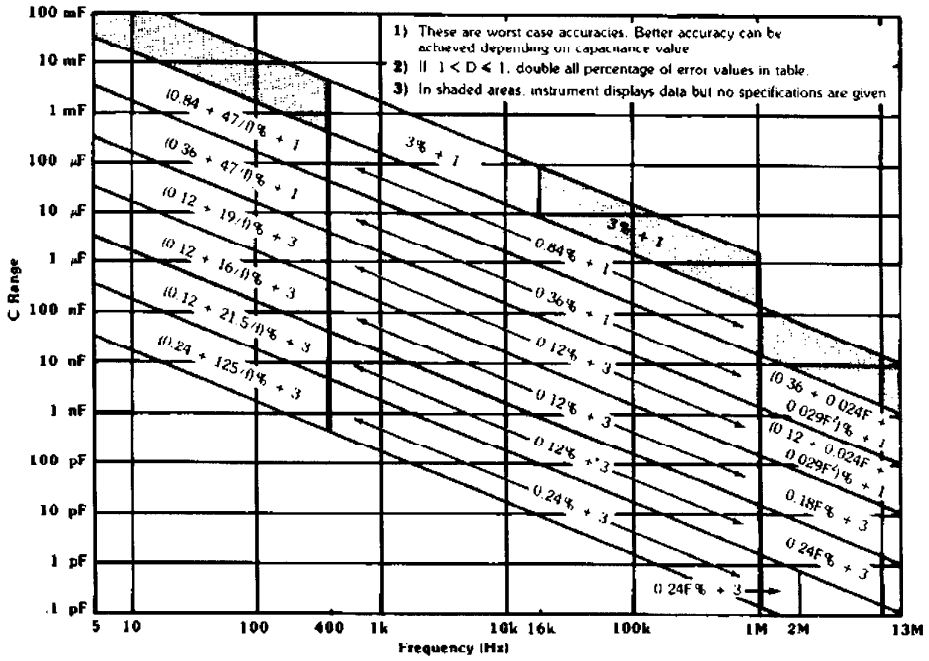
C–Q•D•R•G MEASUREMENTS: (f in Hz, F in MHz)

Refer to R–X or G–B Measurements for R and G Accuracy.

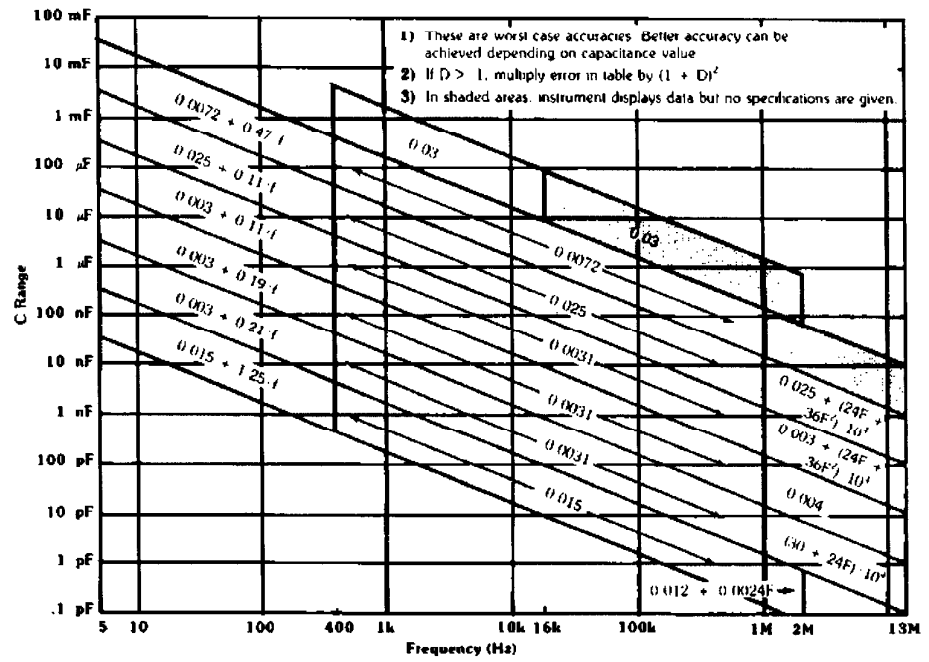
	Measuring Range*	Maximum Resolution*
C	1.0000 pF to 100.0 mF	0.1 fF
D	1.0000 to 10.000	0.0001
Q	1000 0	0.1

*Depends on measuring frequency

C Accuracy (D ≤ 0.1)



D Accuracy (D ≤ 0.1)



general information

(The following information is reference data and not guaranteed specifications)

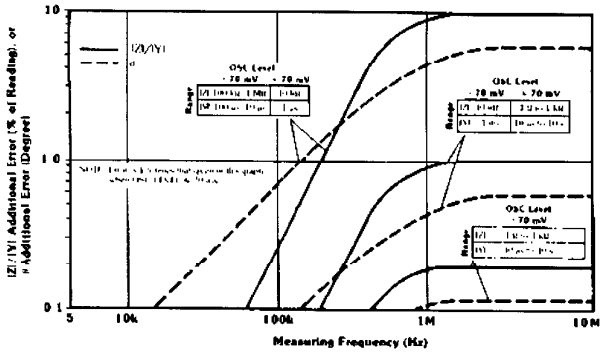
LOW GROUNDED IMPEDANCE MEASUREMENT ACCURACY: To obtain low-grounded measurement accuracy, add 1) accuracy given for floating measurements found on pages 11 – 13 plus 2) Zero Offset Errors given below plus 3) Additional Errors given in the graph below.

Zero Offset Errors: When reading is full scale and OSC LEVEL is greater than 100 mV

Parallel Admittance: 0 to ± 60 nS

Phase Offset Error: 0 to ± 0.36°

Additional Errors Graph for Low Grounded Measurements:



Example Calculation for Low Grounded Measurement Accuracy: Assume 4192A readings of |Z| = 1.0000 kΩ and θ = −45.00°

1. Measurement conditions:
   - measuring |Z| −θ on 1 kΩ range
   - test frequency = 500 kHz
   - test level = 500 mV
   - normal measuring speed
2. Accuracy calculation:
   - From top graph on page 11
     |Z| accuracy = ±(.36% + 1 count)
     = ±(.36% + 0.1 Ω)
     θ accuracy = ±0.18°
   - From Zero Offset Errors above
     Parallel G ≤ 60 nS
     θ error ≤ 0.36°
   - From Additional Errors graph below
     |Z| additional = 0.1% of reading
     θ additional = 0.1°
   - TOTAL ACCURACY

$$|Z| = 1.0000\ k\Omega \pm \left[(0.36\% \times 1\ k\Omega + 0.1\ \Omega) + \left(1.0000\ k\Omega - \frac{1\ k\Omega \times \frac{1}{60 \times 10^{-9} S}}{1\ k\Omega + \frac{1}{60 \times 10^{-9} S}}\right) + (1\ k\Omega \times 0.1\%)\right]$$

$$|Z| = 1.0000\ k\Omega \pm [(3.7\ \Omega) + (0.06\ \Omega) + (1\ \Omega)]$$

$$|Z| = 1.0000\ k\Omega \pm 4.8\ \Omega$$

$$\theta = -45.00° \pm [(0.18°) + (0.36°) + (0.1°)]$$

$$\theta = -45.00° \pm 0.64°$$

3. This accuracy calculation assumes that residual impedance was compensated at the test frequency (in this case, 500 kHz). Residual compensation is done using the OPEN and SHORT front panel controls.

FLOATING IMPEDANCE MEASUREMENT ACCURACY:

Accuracy when CABLE LENGTH is 1m: 2.5 times percent error for frequencies above 1 MHz.

L•C Accuracy for D > 1: (1 + D^2) times accuracy specifications.

LEVEL MONITOR RANGE AND ACCURACY (23 ± 5°C):

	Range	Accuracy (% of reading + 1 count)
Voltage	5 mV – 1.1 V	(4 + 10/f*)% + 1 (≤ 100 Hz) 4% + 1 (100 Hz to 1 MHz) (4 + 0.8F*)% + 1 (≥ 1 MHz)
Current	1 μA – 11 mA	

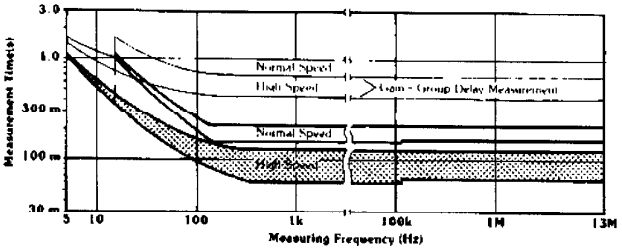
*f: Measuring frequency in Hz, F: Measuring frequency in MHz

Time Required for Level Monitor: Approximately 120 ms

1 MHZ REFERENCE OUTPUT: Square wave, ≥ 1.6 Vpp, Output resistance: Approximately 50 Ω

MEASURING SPEED: At fixed frequency, measurement range and OSC level.

Speed in Average mode is approximately 7 times that for Normal speed mode.



Frequency Switching Time: Approximately 50 to 65 ms

|Z|\|Y| Range Switching Time: Approximately 35 to 50 ms/range (> 400 Hz)

OSC Level Switching Time: Approximately 65 ms

DC Bias Voltage Settling Time: Approximately (0.4 × ΔV + 10) ms where ΔV is voltage change in volts.

OPERATING TEMPERATURE: 0 to 55°C, relative humidity ≤ 95% at 40°C

POWER: 100, 120, 220 V ± 10%, 240 V + 5% – 10%, 48 to 66 Hz, power consumption 100 VA maximum

DIMENSION: 425.5 mm (W) x 247 mm (H) x 574 mm (D) (16.75" x 9" x 22.6")

WEIGHT: Approximately 19 kg

accessories (available)

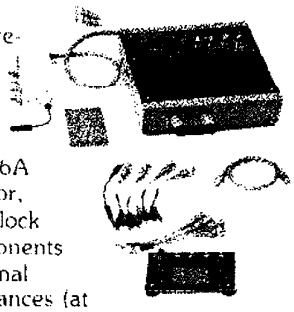
16095A Probe Fixture

For probe impedance measurements on components or entire circuits mounted on printed-circuit boards. Low lead can be floated or grounded. OSC OUTPUT connector provided for amplitude-phase measurements. BNC adapter and clip adapter furnished. Terminals for an external blocking capacitor are part of the 16095A. An external blocking capacitor can be attached to block direct current from the circuit under test.

During low grounded measurements, the 16095A ground lead should be connected to 4192A GND terminal to reduce noise.

Stray Capacitance: ≤ 150 pF
Residual Inductance: ≤ 40 nH
Residual Resistance: ≤ 100 mΩ (when BNC adapter is used)

16096A Test Fixture



Amplitude-phase measurements and input impedance measurements on two-port devices can be made alternately. Furnished with the 16096A are BNC to clip connector, BNC to SMA cable and lock type socket kit for components with 2.5 mm (.1") terminal spacing. Residual impedances (at BNC connector after zero offset):

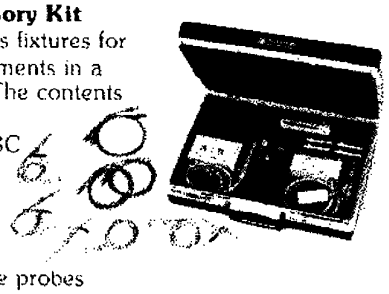
Capacitance: ≤ 0.01 pF
Inductance: ≤ (100 + 0.5 F^2) nH – where F is measuring frequency in MHz
Resistance: ≤ (50 + 5 F^2) mΩ – where F is measuring frequency in MHz

Error in amplitude/phase measurement (after cable compensation):

B-A error: ±0.1 dB
Phase error: ±0.1 degree
A,B error: ± (0.1 + 0.06 F^2) dB – where F is measuring frequency in MHz

Input impedance for channel A and B: 1 MΩ shunted by less than 15 pF

16097A Accessory Kit

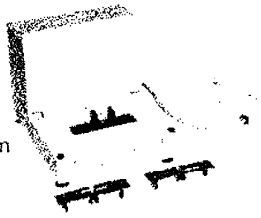


Contains various fixtures for circuit measurements in a carrying case. The contents are 16095A, 16047C/16048C Test Fixtures, 75 Ω/600 Ω Feedthrough terminations, 10:1/1:1 Scope probes and BNC cables (60 cm and 120 cm).

16047A: Direct Coupled Test Fixture

General purpose test fixture for the 4192A. Contacts for axial lead, radial lead, and short radial lead components are furnished. Maximum dc bias voltage: ±35 V. Furnished accessory with the 4192A.

16047B: Test Fixture With Safe Guard



General purpose test fixture with safe guard cover for dc bias applications. Contacts for radial, axial, and short lead radial components furnished. Maximum dc bias voltage: ±200 V.

16047C: High Frequency Test Fixture

This direct attachment fixture is useful for high frequency measurements requiring high accuracy. Two screw knobs insure optimum contact of electrodes and sample leads. Maximum applied dc bias is ±35 V.

16048A: Test Leads With BNC Connector

Four-terminal pair configuration test leads for interface with user test fixture or handler. Maximum applied dc bias voltage: ±300 V.

16048B: Test Leads With RF Miniature Connector

Four-terminal pair configuration test leads for interface with user test fixture or prober. Maximum applied dc bias voltage: ±300 V.

16048C: Test Leads With Alligator Clips

Four-terminal test leads convert to two clip-on probes for ease of operation. Ideal for various shapes and sizes of components. Recommended for frequencies below 100 kHz. Maximum applied dc bias voltage: ±35 V.

16034B: Test Fixture for Chip Components

Tweezer type test fixture for chip components. Components are measured with three-terminal configuration. Maximum applied dc bias voltage: ±35 V.

related accessories / parts (available)

HP-IB Interface Cable: 10631A (approx. 1m), 10631B (approx. 2m), 10631C (approx. 4m), 10631D (approx. 0.5m)

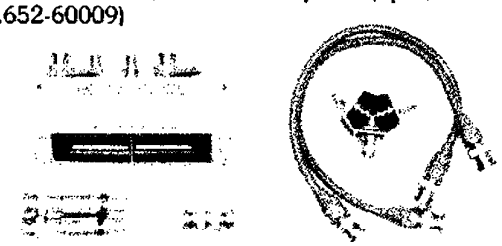
Line Fuse: hp P/N: 2110-0007 (100/120 V)
hp P/N: 2110-0202 (220/240 V)

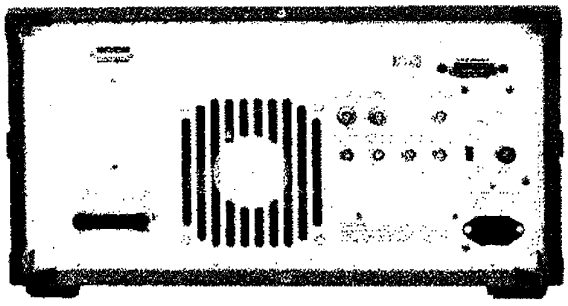
16095A Related Parts:
Probe Tips: hp P/N 16095-60012
Earth Pins: hp P/N 16095-65001
Earth Lead: hp P/N 16095-61611
BNC Adapter: hp P/N 16095-60011
Clip Adapter: hp P/N 16095-61612

16096A Related Parts:
Textool® Test Board Assembly:
hp P/N 16096-65001
BNC to Dual Clip Connector:
hp P/N 16096-61614
BNC to SMA connector: hp P/N 16096-61611
Banana to Clip Connector: hp P/N 16096-61613

accessories (furnished)

Furnished Accessories and Parts: 16047A Test Fixture, 11048C 50 Ω Feedthrough Termination (2 ea.), 11170A BNC Cable (2 ea.), BNC Adapter (hp P/N: 1250-0216) and Power Splitter (hp P/N: 11652-60009)





4192A Rear Panel

ordering information

OPTIONS

(Use part number listed when ordering separately)

Option 907: Front Handle Kit (hp P/N 5061-0091)

Option 908: Rack Flange Kit (hp P/N 5061-0079)

Option 909: Rack and Handle Kit (hp P/N 5061-0085)

Option 910: Extra Manual (hp P/N 04192-90000)

ACCESSORIES AVAILABLE

16047A: Test Fixture, Direct Coupled (One 16047A Test Fixture is supplied with each 4192A)

16047B: Test Fixture, safeguard

16047C: Test Fixture, high frequency

16048A: Test Leads, BNC

16048B: Test Leads, RF min.

16048C: Test Leads, alligator clips

16034B: Test Fixture, chip

16095A: Probe Fixture

16096A: Test Fixture

16097A: Accessory Kit

STANDARD INSTRUMENT

4192A LF Impedance Analyzer

Manufactured by Yokogawa-Hewlett Packard LTD., Tokyo

For more information, call your local HP Sales Office or nearest Regional Office: • Eastern (201) 265-5000; • Midwestern (312) 255-9800; • Southern (404) 955-1500; • Western (213) 970-7500; • Canadian (416) 678-9430. Ask the operator for instrument sales. Or write Hewlett-Packard, 1501 Page Mill Road, Palo Alto, CA 94304. **In Europe:** Hewlett-Packard S.A., 7, rue du Bois-du-Lan, P.O. Box, CH 1217 Meyrin 2, Geneva, Switzerland **In Japan:** Yokogawa-Hewlett-Packard Ltd., 29-21, Takaido-Higashi 3-chome, Suginami-ku, Tokyo 168.

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