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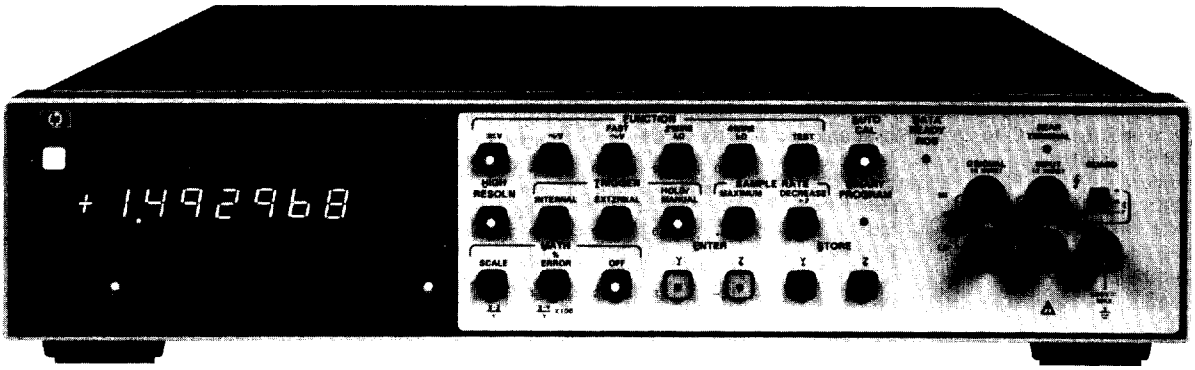
Find the *Keysight / Agilent 3455A* at our website: ***Click HERE***

DIGITAL VOLTMETERS

5½/6½-digit DVM with Auto Cal

Model 3455A

- AutoCal
- Self test
- Bench/system
- AC/DC/OHMS
- High speed
- Removable reference



HP-IB

Description

Hewlett-Packard's 3455A Digital Voltmeter is a microprocessor controlled 5½- or 6½-digit integrating voltmeter for bench or systems applications. The standard instrument measures DC volts, AC volts, and resistance. HP-IB I/O for systems applications is also standard.

Measuring speed

The 3455A is fully guarded and has greater than 60 dB normal mode noise rejection at reading rates of up to 24 readings per second on all DC ranges. Ohms reading rates are up to 12 readings/second and an AC fast mode gives reading rates of up to 13 readings/second at frequencies above 300 Hz. (Readings/seconds given for 60 Hz operation and high resolution off.)

Performance

DC measurements can be made with up to 1μV sensitivity. Ohms measurements are made with either a 2-wire and 4-wire mode. The High Resolution (6½-digit) mode gives DC and Ohms measurements with greater than 1 part per million resolution. AC voltage measurements can be made from 30 Hz to 250 kHz with the optional average responding converter.

True rms

The standard true rms converter gives AC measurements from 30 Hz to 1 MHz. Complex signals with crest factors of up to 7:1 at full scale can be measured.

Math

The math functions provide the user with unique computational capability. The Scale mode ($\frac{X-Z}{Y}$) allows the user to offset, take ratios, or scale readings to give readouts in physical units. The % Error mode ($\frac{X-Y}{Y}$ x 100%) converts readings into percentage change from Y which is entered as a reference. For the math functions X is the present reading. Y and Z are previously entered readings or numbers entered from the front panel or by remote program.

Auto Cal

The auto cal feature gives the user accurate DC volts and ohms measurements and simplifies calibration of these functions. The DC and ohms operating circuits are checked against internal references and any errors are corrected digitally. All dc and ohms adjustments are in a removable reference assembly.

Serviceability

The self-test feature is used to aid in troubleshooting as well as verifying operation of the 3455A. Test verifies proper operation of the DC measuring circuits by comparing their parameters against predetermined limits. If a problem is found, the display is used to assist in finding the problem area by indicating which parameter is in error. Detailed troubleshooting can then be used to quickly isolate the problem.

Routine maintenance and calibration has been simplified with the removable reference assembly. Calibration of DC and ohms functions can be done by replacing the reference assembly with a recently calibrated one. Extra reference assemblies are available as HP accessory number 11177A. A spare assembly is ideal for one or more 3455A's. Calibrate DC and ohms in a 3455A without removing it from the bench or system. Just return the extra reference assembly to the cal lab or HP for calibration and have it back in time to calibrate the 3455A next time.

Data-sheet systems

The 3455A is included as part of the 3052A standard system. The 3052A is fully integrated, tested, verified and specified as a system and comes with complete systems software and documentation. This system provides complete solutions to many of your measurement problems.

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3052A Automatic data acquisition system

The 3052A Automatic Data Acquisition System has been designed to solve your data acquisition, control and automatic testing problems.

The 3052A consists of:

- 3455A DVM
- 3437A System Voltmeter
- 3495A Scanner
- 9825A, 9835A/B, or 9845A System Controller & ROMs

These 3052A features give you a wide range of problem solutions:

- Signal digitizing (>5000 readings/second)
- High speed scanning (≤1000 channels/second)
- System timing
- Vectored interrupt system for simultaneous control and processing of multiple tasks
- High speed data access and storage
- Alphanumeric CRT display for easy operator interaction

Typical applications are:

- Process control development
- Signal analysis
- Thermocouple measurements

For further information on this system, refer to page 74–75 or contact your local HP field engineer.

HP Technology

HP has developed an instrument oriented microprocessor to provide the high performance of the 3455A. The microprocessor has a parallel architecture to give the high speed necessary to control the measurement processes of a bench/systems voltmeter. Two microprocessors are used: one for control of the measurement and the second for interface to the HP-IB and computation of the math functions.

Auto cal is a process by which the 3455A internally checks its DC and ohms operating circuits against internal references and corrects for errors. The benefits of auto cal are high accuracy and simplified calibration. Only four adjustments for calibration of DC and ohms are required and these are in the removable reference assembly. The microprocessor is also used to control the auto cal process and compute the correction factors.

The HP-developed fineline tantalum nitride resistor technology used in several HP digital voltmeters is also used in the 3455A. This technology provides accurate temperature tracking resistors that result in excellent long term DC accuracy.

Specifications

DC Voltage

Ranges		Maximum Display	
High Resolution Off	High Resolution On	High Resolution Off	High Resolution On
0.1	—	±0.149999 V	—
1	1	±1.49999 V	±1.499999 V
10	10	±14.9999 V	±14.99999 V
100	100	±149.999 V	±149.9999 V
1000	1000	±1000.00 V	±1000.000 V

Performance

(High Resolution Off)

Accuracy

24 Hours: 23°C ±1°C
- **10 V range:** ±(0.002% of reading + 1 digit).
- **1 V range:** ±(0.003% of reading + 1 digit).
- **0.1 V range:** ±(0.004% of reading + 4 digits).
- **100 & 1000 V range:** ±(0.004% of reading + 1 digit).

90 days 23°C ±5°C
- **10 V range:** ±(0.005% of reading + 1 digit).
- **1 V range:** ±(0.006% of reading + 1 digit).
- **0.1 V range:** ±(0.007% of reading + 4 digits).
- **100 & 1000 V range:** ±(0.007% of reading + 1 digit).

6 months 23°C ±5°C
- **10 V range:** ±(0.008% of reading + 1 digit).
- **1 V range:** ±(0.009% of reading + 1 digit).
- **0.1 V range:** ±(0.010% of reading + 5 digits).
- **100 & 1000 V range:** ±(0.010% of reading + 1 digit).

1 year 23°C ±5°C
- **10 V range:** ±(0.013% of reading + 1 digit).
- **1 V range:** ±(0.014% of reading + 1 digit).
- **0.1 V range:** ±(0.015% of reading + 6 digits).
- **100 & 1000 V range:** ±(0.015% of reading + 1 digit).

(High Resolution On)

Accuracy

24 hours 23°C ±1°C
- **10 V range:** ±(0.002% of reading + 3 digits).
- **100 & 1000 V range:** ±(0.004% of reading + 3 digits).
- **1 V range:** ±(0.003% of reading + 4 digits).

90 days 23°C ±5°C
- **10 V range:** ±(0.005% of reading + 3 digits).
- **100 & 1000 V range:** ±(0.007% of reading + 3 digits).
- **1 V range:** ±(0.006% of reading + 4 digits).

6 months 23°C ±5°C
- **10 V range:** ±(0.008% of reading + 3 digits).
- **100 & 1000 V range:** ±(0.010% of reading + 3 digits).
- **1 V range:** ±(0.009% of reading + 5 digits).

1 year 23°C ±5°C
- **10 V range:** ±(0.013% of reading + 3 digits).
- **100 & 1000 V range:** ±(0.015% of reading + 3 digits).
- **1 V range:** ±(0.014% of reading + 6 digits).

Input characteristics

Input resistance: 0.1 V through 10 V range: $>10^{10}$ ohms. 100 V and 1000 V range: 10 megohm ±0.1% with Auto Cal." off ".

Maximum input voltage
- **High to low input terminals:** ±1000 V peak.
- **Guard to chassis:** ±500 V peak.
- **Guard to low terminal:** ±200 V peak.

Normal mode rejection (NMR): NMR is the ratio of the peak normal-mode voltage to the peak error voltage in the reading.

NMR at 50 or 60 Hz ±0.1%: >60 dB.

Effective common mode rejection (ECMR): ECMR is the ratio of the peak common-mode voltage to the resultant peak error voltage in the reading.

ECMR with 1 kΩ unbalance in low lead at
- **DC:** >140 dB.
- **50 Hz or 60 Hz ±0.1%:** >160 db.

Maximum reading rate

	60 Hz Gate Length		50 Hz Gate Length	
	High Resolution Off	High Resolution On	High Resolution Off	High Resolution On
Local	5 rdg/s	3 rdg/s	3.5 rdg/s	2.5 rdg/s
Remote	24 rdg/s	6 rdg/s	22 rdg/s	5 rdg/s

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DIGITAL VOLTMETERS

5½/6½-digit DVM with Auto Cal

Model 3455A (cont.)

AC Voltage (rms converter)

(High Resolution On or Off)

Ranges: 1.00000 V, 10.0000 V, 100.000 V, 1000.00 V
Maximum Display: 1.49999 V, 14.9999 V, 149.999 V, 1000.00 V

Range selection: Manual, Automatic or Remote.
Function selection: ACV or Fact ACV.

Input characteristics

Input impedance
Front terminals: 2 MΩ ±1% shunted by less than 100 pf.
Rear terminals: 2 MΩ ±1% shunted by less than 75 pf.
Maximum input voltage
High to low terminals: ±1414 volts peak.
Subject to a 10^7 volts—Hz limitation.
Guard to chassis: ±500 V peak.
Guard to low terminal: ±200 V peak.
Maximum reading rate

	60 Hz Gate Length		50 Hz Gate Length	
	ACV	FAST ACV	ACV	FAST ACV
Local	1.3 rdg/s	4.5 rdg/s	1.1 rdg/s	3.5 rdg/s
Remote	1.3 rdg/s	13 rdg/s	1.1 rdg/s	12 rdg/s

Response time

ACV and FAST ACV
First reading to <0.1% of step size when triggered coincident with step change when on correct range (for AC signals with no DC component).

AC voltage (average converter) Opt 001

(High Resolution On or Off)

Ranges: 1 V, 10 V, 100 V, 1000 V
Maximum Display: 1.49999 V, 14.9999 V, 149.999 V, 1000.00 V

Range selection: Manual, Automatic or Remote.
Function selection: ACV or Fast ACV.

Input characteristics

Input impedance:
Front Terminals—2 MΩ ±1% shunted by less than 100 pf.
Rear Terminals—2 MΩ ±1% shunted by less than 75 pf.
Maximum input voltage
High to low terminals: ±1414 volts peak.
Subject to a 10^7 volts—Hz limitation.
Guard to chassis: ±500 V peak.
Guard to low terminal: ±200 V peak.
Maximum reading rate

	60 Hz Gate Length		50 Hz Gate Length	
	ACV	FAST ACV	ACV	FAST ACV
Local	1.3 rdg/s	4.5 rdg/s	1.1 rdg/s	3.5 rdg/s
Remote	1.3 rdg/s	13 rdg/s	1.1 rdg/s	12 rdg/s

Ohms

Ranges		Maximum Display	
High Resolution Off	High Resolution On	High Resolution Off	High Resolution On
0.100000 kΩ	—	0.149999 kΩ	—
1.00000 kΩ	1.000000 kΩ	1.49999 kΩ	1.499999 kΩ
10.0000 kΩ	10.00000 kΩ	14.9999 kΩ	14.99999 kΩ
100.000 kΩ	100.0000 kΩ	149.999 kΩ	149.9999 kΩ
1000.00 kΩ	1000.000 kΩ	1499.99 kΩ	1499.999 kΩ
10000.0 kΩ	10000.00 kΩ	14999.9 kΩ	14999.99 kΩ

Range selection: Manual, Automatic, or Remote.
Function selection: 2-wire kΩ or 4-wire kΩ.

Performance

(High Resolution Off)
Accuracy: 4-wire kΩ (1 digit = .001% of range)
24 hours: 23°C ± 1°C.
0.1 kΩ range: ±(0.003% of reading + 4 digits).
1 kΩ range: ±(0.003% of reading + 1 digit).
10 kΩ range: ±(0.005% of reading + 2 digits).
100 kΩ range: ±(0.002% of reading + 2 digits).
1000 kΩ range: ±(0.012% of reading + 5 digits).
10 000 kΩ range: ±(0.1% of reading + 5 digits).
90 days: 23°C ±5°C
0.1 kΩ range: ±(0.005% of reading + 5 digits).
1 kΩ range: ±(0.005% of reading + 1 digit).
10 kΩ range: ±(0.007% of reading + 2 digits).
100 kΩ range: ±(0.004% of reading + 2 digits).
1000 kΩ range: ±(0.014% of reading + 5 digits).
10 000 kΩ range: ±(0.100% of reading + 5 digits).

Performance (rms converter)

Accuracy ±(% of reading + digits)

Guard must be connected to low. On the 1000 V range add 0.01 ppm/volt—kHz. For inputs above 500 V multiply the accuracy by $\frac{500 + V}{1000}$

FAST ACV / ACV	AC coupling: 300 Hz-20 kHz 30 Hz-20 kHz	20 kHz–100 kHz*	100 kHz–250 kHz**	250 kHz–500 kHz**	500 kHz–1 MHz**
24 hrs: 23°C ±1°C	0.04% + 40 digits	0.4% + 80 digits	1.8% + 200 digits	4% + 400 digits	5% + 2600 digits
90 days: 23°C ±5°C	0.05% + 50 digits	0.5% + 100 digits	2.0% + 250 digits	5% + 500 digits	6% + 3100 digits
6 mos: 23°C ±5°C	0.06% + 60 digits	0.6% + 130 digits	2.1% + 300 digits	5.1% + 600 digits	6.3% + 3500 digits
1 year: 23°C ±5°C	0.07% + 70 digits	0.7% + 160 digits	2.2% + 350 digits	5.3% + 700 digits	6.6% + 3900 digits

AC <1% of range and AC/DC: add 20 digits.
*AC/DC coupled or AC coupled with frequency > 50 kHz and with input < 5% of full scale: Add 150 digits.
**Frequencies greater than 100 kHz specified on 1 and 10 V ranges only. Subject to a 10^7 volts—Hz limitation.

Crest Factor: 7:1 at Full Scale

Performance (average converter)

Accuracy ±(% of reading + digits)

Guard must be connected to Low. On the 1000 V range, add 0.01 ppm/volt—kHz.
Specifications are for input levels above 1/100th of range.

FAST ACV / ACV	300 Hz–500 Hz 30 Hz–50 Hz	500 Hz–1 kHz 50 Hz–100 Hz	1 kHz–100 kHz 100 Hz–100 kHz	100 kHz–250 kHz* 100 kHz–250 kHz*
24 hrs: 23°C ±1°C	0.47% + 70 digits	0.32% + 50 digits	0.09% + 25 digits	0.70% + 60 digits
90 days: 23°C ±5°C	0.50% + 70 digits	0.35% + 50 digits	0.1% + 25 digits	0.75% + 60 digits
6 mos: 23°C ±5°C	0.50% + 70 digits	0.40% + 60 digits	0.1% + 30 digits	0.75% + 70 digits
1 yr.: 23°C ±5°C	0.50% + 70 digits	0.40% + 70 digits	0.12% + 35 digits	0.75% + 80 digits

*Frequencies greater than 100 kHz specified on 1 and 10 V ranges only. Subject to a 10^7 volts—Hz limitation.

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6 months: 23°C ±5°C.
0.1 kΩ range: ±(0.005% of reading +6 digits).
1 kΩ range: ±(0.005% of reading +1 digit).
10 kΩ range: ±(0.007% of reading +2 digits).
100 kΩ range: ±(0.004% of reading +3 digits).
1000 kΩ range: ±(0.014% of reading +5 digits).
10,000 kΩ range: ±(0.100% of reading +5 digits).
1 year: 23°C ±5°C
0.1 kΩ range: ±(0.006% of reading +7 digits).
1 kΩ range: ±(0.006% of reading +2 digits).
10 kΩ range: ±(0.008% of reading +3 digits).
100 kΩ range: ±(0.005% of reading +4 digits).
1000 kΩ range: ±(0.015% of reading +6 digits).
10,000 kΩ range: ±(0.100% of reading +6 digits).
4-wire kΩ (1 digit = .0001% of range)
High Resolution On
24 hours: 23°C ± 1°C
1 kΩ range: ±(0.0025% of reading +4 digits).
10 kΩ range: ±(0.0045% of reading +4 digits).
100 kΩ range: ±(0.0020% of reading +5 digits).
1000 kΩ range: ±(0.0120% of reading +4 digits).
10,000 kΩ range: ±(0.1000% of reading +4 digits).
90 days: 23°C ±5°C
1 kΩ range: ±(0.0035% of reading +5 digits).
10 kΩ range: ±(0.0060% of reading +5 digits).
100 kΩ range: ±(0.0035% of reading +6 digits).
1000 kΩ range: ±(0.0135% of reading +5 digits).
10,000 kΩ range: ±(0.1000% of reading +5 digits).
6 months: 23°C ±5°C
1 kΩ range: ±(0.0040% of reading +6 digits).
10 kΩ range: ±(0.0065% of reading +6 digits).
100 kΩ range: ±(0.0040% of reading +7 digits).
1000 kΩ range: ±(0.0140% of reading +6 digits).
10,000 kΩ range: ±(0.1000% of reading +6 digits).
1 year: 23°C ±5°C
1 kΩ range: ±(0.0045% of reading +7 digits).
10 kΩ range: ±(0.0070% of reading +7 digits).
100 kΩ range: ±(0.0045% of reading +8 digits).
1000 kΩ range: ±(0.0145% of reading +7 digits).
10,000 kΩ range: ±(0.1000% of reading +7 digits).
2-wire kΩ: all accuracy specifications are the same as 4-wire kΩ except add 0.0004 kΩ to all readings.

Input characteristics

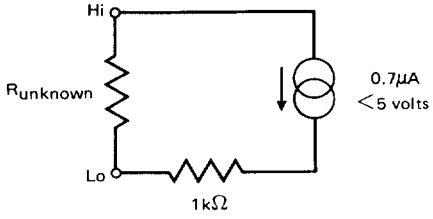
Maximum voltage generated across unknown: <5 volts for open circuit; <4.7 volts for valid reading.
Signal source driving unknown (nominal): 0.1 kΩ, 1 kΩ & 10 kΩ ranges.

Overload protection

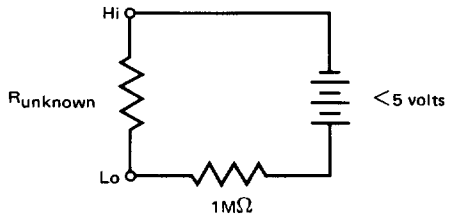
Non-destruction: ±350 V peak.

Equivalent ohmmeter circuits:

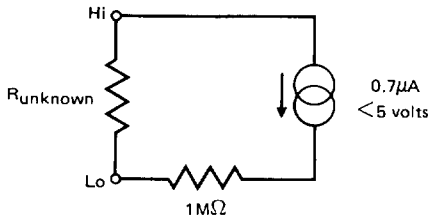
0.1 kΩ, 1 kΩ & 10 kΩ RANGES



100 kΩ



1 MΩ & 10 MΩ RANGES



Maximum reading rate

	60 Hz Gate Length		50 HZ Gate Length	
	High Resolution Off	High Resolution On	High Resolution Off	High Resolution On
Local	4.5 rdg/s	2 rdg/s	4 rdg/s	1.8 rdg/s
Remote	12rdg/s	3 rdg/s	11 rdg/s	2.5 rdg/s

Math

Scale ($\frac{X-Z}{Y}$): X is present reading. Y and Z are previously entered readings, or numbers entered from the front panel or by external program.
Maximum number (entered or displayed): ±199,999.9.
Accuracy: ±(Accuracy of X reading ±1 digit of displayed answer). This assumes no "Y" or "Z" error.
%Error ($\frac{X-Y}{Y}$ x 100%): X is present reading. Y is a previously entered reading, or number entered from the front panel or by external program.
Maximum number (entered or displayed): ±199,999.9.
Accuracy: ±(Accuracy of X reading ±1 digit of displayed answer). This assumes no "Y" error.
How to enter numbers in "Y" or "Z"
From a current displayed reading: press STORE "Y" or "Z".
From front panel: Press ENTER "Y" or "Z". The front panel is now set for numerical entry. These numbers are in blue next to the keys. Enter number and press STORE "Y" or "Z".
By remote program: send program codes for equivalent front panel operations.

General

Power: 100 V, 120 V, 240 V +5% −10%, 48 Hz to 400 Hz line operation; <60 VA with all options.
Size: 88.9 H x 425.5 W x 527.1 mm D (3½" x 16¾" x 20¾").
Weight: net, 9.38 kg (20 lb 11 oz). Shipping, 11.79 kg (26 lb).

Options	Price
001: Average converter	less $200
3455A Digital Voltmeter	**$3400**

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