

HEWLETT **hp** PACKARD

DIGITAL VOLTMETER

3439A
3440A
3441A
3442A
3443A
3444A
3445A
3446A

TECHNICAL DATA 6 APRIL 70



• AC VOLTAGE • DC VOLTAGE • DC CURRENT • RESISTANCE •

PLUG-IN FLEXIBILITY

GENERAL DESCRIPTION



The 3439A and 3440A are general purpose 4-digit Digital Voltmeters able to measure ac volts, dc volts, dc current and ohms. The 3439A is designed for bench use and lacks a BCD output. The 3440A offers a 6 column output including 4 digits of data (1-2-2-4 BCD), polarity, decimal and function. A 1-2-4-8 BCD output is available on the 3440A Option H02. The 3440A may be remotely triggered. On certain plug-ins, the range and function may be selected remotely. The sample rate on the 3440A is adjustable on the front panel at up to 5 readings/second. The sample rate is fixed on the 3439A.

VERSATILITY

The 3439A and the 3440A will accept any of six plug-ins. The 3441A and 3442A plug-ins offer three dc voltage ranges and the 3443A offers five dc voltage ranges. The 3444A has five ranges of dc volts, dc current and ohms. The last two plug-ins, the 3445A and 3446A, offer three ranges of ac volts and dc volts. Other differences are covered in Table 1.

PERFORMANCE

The accuracy of the 3439A and 3440A is dependent on a highly stable zener reference. Accuracy is verified anytime during operation by pressing a front panel button and adjusting the reading. The calibration source will stay within $\pm 0.05\%$ for 3 months and has a temperature coefficient of $\pm 0.002\%/^{\circ}\text{C}$.

The 3439A and 3440A are able to display a full 4 digits or "9999" with an additional 5% overrange indicated by an overrange light. Rated accuracy is maintained in overrange. Polarity and decimal point are indicated automatically.

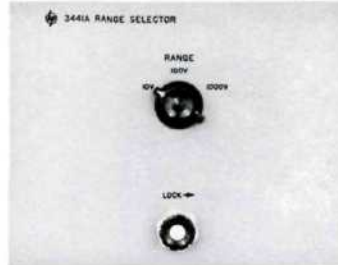
The input terminals may be floated up to 500 V dc above chassis ground. The dc input resistance is held at a constant 10.2 M Ω . The ac input impedance is held at 10 M Ω and separate input terminals are provided to reduce input capacitance.

Bright, easy-to-read display tubes are used in the 3439A and 3440A to reduce operator fatigue. The previous reading is held in the display until a new reading is completed. A polarized light filter reduces glare and improves contrast.

3439A or 3440A with:	3441A	3442A	3443A	3444A	3445A	3446A
DC Volts 10 V to 1000 V	X	X	X	X	X	X
DC Volts 100 mV to 1000 V			X	X		
DC Current 100 μA to 1000 mA				X		
AC Volts 10 V to 1000 V					X	X
Ohms 1000 Ω to 10 M Ω				X		
Autoranging		X	X		X	
Remote Ranging		X	X		X	X
Remote Function						X

Table 1. Plug-in capability chart

3439A OR 3440A WITH 3441A RANGE SELECTOR



DESCRIPTION

The 3441A allows the manual selection of one of three dc voltage ranges: 10, 100 or 1000 V.

SPECIFICATIONS

RANGES

Full range display

± 9.999 V
 ± 99.99 V
 ± 999.9 V

Overranging: 5% indicated by overrange light.

Range selection: manual.

PERFORMANCE

► **Accuracy** (25°C \pm 5°C, 30 days, after calibration against internal reference): \pm (0.05% of reading + 0.01% of range).

► **Temperature coefficient** (0°C to 50°C): \pm 0.006% of reading/°C.

Response time: < 450 ms to settle within 99.95% of final value after application of a full scale step input.

INPUT CHARACTERISTICS

Input: floating up to \pm 500 V dc with respect to chassis ground.

Input resistance: 10.2 M Ω on all ranges.

Common-Mode Rejection:

Range	10 V	100 V	1000 V
DC	90 dB	70 dB	50 dB
60 Hz	70 dB	50 dB	30 dB

Normal-Mode Rejection: 30 dB at 60 Hz increasing at 12 dB/octave.

3439A OR 3440A WITH 3442A AUTOMATIC RANGE SELECTOR



DESCRIPTION

The 3442A allows the manual, automatic or remote selection of one of three dc voltage ranges: 10, 100 or 1000 V.

SPECIFICATIONS

RANGES

Full range display

± 9.999 V
 ± 99.99 V
 ± 999.9 V

Overranging: 5% indicated by overrange light.

Range selection: manual.

PERFORMANCE

► **Accuracy** (25°C \pm 5°C, 30 days, after calibration against internal reference): \pm (0.05% of reading + 0.01% of range).

► **Temperature coefficient** (0°C to 50°C): \pm 0.006% of reading/°C.

Response time: < 450 ms to settle within 99.95% of final value after application of a full scale step input.

INPUT CHARACTERISTICS

Input: floating up to \pm 500 V dc with respect to chassis ground.

Input resistance: 10.2 M Ω on all ranges.

Common-Mode Rejection:

Range	10 V	100 V	1000 V
DC	90 dB	70 dB	50 dB
60 Hz	70 dB	50 dB	30 dB

Normal-Mode Rejection: 30 dB at 60 Hz increasing at 12 dB/octave.

► Indicates change from prior specifications

3439A OR 3440A WITH 3443A HIGH GAIN/AUTORANGE UNIT



DESCRIPTION

The 3443A includes five dc voltage ranges from 100 mV full scale to 1000 V full scale. This plug-in also has manual, automatic or remote range selection.

SPECIFICATIONS

RANGES

Full range display

- ±99.99 mV
- ±999.9 mV
- ±9.999 V
- ±99.99 V
- ±999.9 V

Overranging: 5% indicated by overrange light.

Range selection: manual, automatic or remote.

PERFORMANCE

► **Accuracy** (25°C ±5°C, 30 days, after calibration against internal reference):

Ranges	Accuracy
100 mV and 1000 mV	±(0.1% of reading +0.01% of range)
10 V through 1000 V	±(0.05% of reading +0.01% of range)

Response time: time required to settle within 99.95% of final value after application of full scale step input (without range or polarity change).

Ranges	Response Time
100 mV and 1000 mV	1 s
10 V through 1000 V	450 ms

► **Temperature coefficient** (0°C to 50°C): ±0.006% of reading/°C for all ranges.

INPUT CHARACTERISTICS

Input: floating up to ±500 V dc with respect to chassis ground.

Input resistance: 10.2 MΩ on all ranges.

► **Common-Mode Rejection:**

Range	100 mV	1000 mV	10 V	100 V	1000 V
DC	130 dB	110 dB	90 dB	70 dB	50 dB
60 Hz	<5 V p-p*	<10 V p-p*	70 dB	50 dB	30 dB

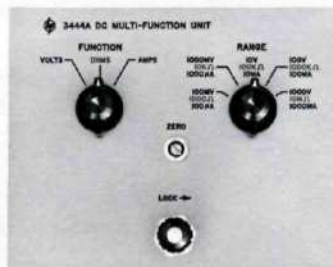
*Error <0.1% of full scale

Normal-Mode Rejection:

Ranges	Rejection
100 mV and 1000 mV	40 mV and 400 mV p-p respectively at 60 Hz <0.1% full scale error. Rejection increasing 6 dB/octave.
10 V through 1000 V	30 dB at 60 Hz increasing 12 db/octave

► Indicates change from prior Specifications

3439A OR 3440A WITH 3444A DC MULTI-FUNCTION UNIT



DESCRIPTION

The 3444A extends the measurement capability of the 3439A or 3440A to cover dc voltage, dc current and ohms. Each function covers five manually selected ranges.

SPECIFICATIONS

DC VOLTAGE RANGES

Full range display

- ±99.99 mV
- ±999.9 mV
- ±9.999 V
- ±99.99 V
- ±999.9 V

Overranging: 5% indicated by overrange light.

Range and function selection: manual.

PERFORMANCE

- **Accuracy** (25°C ±5°C, 30 days, after calibration against internal reference):

Ranges	Accuracy
100 mV and 1000 mV	±(0.1% of reading +0.01% of range)
10 V through 1000 V	±(0.05% of reading +0.01% of range)

- **Temperature coefficient** (0°C to 50°C): ±0.006% of reading/°C for all ranges.

Response time: time required to settle within 99.95% of final value after application of full scale step input (without polarity change).

Ranges	Response Time
100 mV to 1000 mV	1 s
10 V through 1000 V	450 ms

INPUT CHARACTERISTICS

Input: floating up to ±500 V dc with respect to chassis ground.

Input resistance: 10.2 MΩ on all ranges.

- **Common-Mode Rejection:**

Range	100 mV	1000 mV	10 V	100 V	1000 V
DC	130 dB	110 dB	90 dB	70 dB	50 dB
60 Hz	<5 V p-p*	<10 V p-p*	70 dB	50 dB	30 dB

*Error <0.1% of full scale

Normal-Mode Rejection:

Ranges	Rejection
100 mV and 1000 mV	40 mV and 400 mV p-p at 60 Hz respectively for <0.1% full scale error increasing 6 dB/octave.
10 V through 1000 V	30 dB at 60 Hz increasing 12 dB/octave

DC CURRENT RANGES

Full range display

- ±99.99 μA
- ±999.9 μA
- ±9.999 mA
- ±99.99 mA
- ±999.9 mA

Overranging: 5% indicated by overrange light.

Range and function selection: manual.

PERFORMANCE

- **Accuracy** (25°C ±5°C, 30 days, after calibration against internal reference): ±(0.2% of reading +0.01% of range).

Response time: 1 second to settle within 99.95% of final value after application of a full scale step input.

INPUT CHARACTERISTICS

Input: floating up to ±500 V dc with respect to chassis ground.

Input resistance:

Ranges	Input Resistance
100 μA	1000 Ω
1000 μA	100 Ω
10 mA	10 Ω
100 mA	1.3 Ω
1000 mA	0.4 Ω

Common-Mode Rejection: for error <0.1% full scale.

Ranges	DC	60 Hz
100 μA	500 V dc	3 V p-p
1000 μA through 1000 mA	500 V dc	10 V p-p

Normal-Mode Rejection: up to 40% of full scale p-p ripple at 60 Hz for 0.1% full scale error increasing 6 dB/octave.

OHMS RANGES

Full range display

- 999.9 Ω
- 9.999 kΩ
- 99.99 kΩ
- 999.9 kΩ
- 9.999 MΩ

Overranging: 50% indicated by overrange light.

Range and function selection: manual.

PERFORMANCE

- **Accuracy** (25°C ±5°C, 30 days, after calibration against internal reference):

Ranges	Accuracy
1000 Ω through 1000 kΩ	±(0.3% of reading +0.01% of range)
10 MΩ	±(1% of reading +0.01% of range)

Response time: time required to settle within 99.95% of final value after application of full scale step input.

Ranges	Response Time
1000 Ω through 1000 kΩ	1 s
10 MΩ	5 s

INPUT CHARACTERISTICS

Input configuration: 2-wire, floating.

Short circuit current:

Ranges	Current
1000 Ω	1 mA
10 kΩ	100 μA
100 kΩ	10 μA
1000 kΩ	1 μA
10 MΩ	0.1 μA

Common-Mode Rejection: for error <0.1% full scale.

DC	500 V dc
60 Hz	10 V p-p

3439A OR 3440A WITH 3445A AC/DC RANGE UNIT



DESCRIPTION

The 3445A extends the measurement capability of the 3439A or 3440A to include ac voltage and dc voltage. Each function covers three ranges from 10 V to 1000 V full scale. Any range may be manually, automatically or remotely selected. To reduce shunt capacity on ac measurements, separate input terminals are provided on the plug-in. The ac converter covers a frequency range from 50 Hz to 100 kHz and responds to the average value of the input signal calibrated in rms for a pure sine wave.

SPECIFICATIONS

DC VOLTAGE RANGES

Full range display

± 9.999 V
 ± 99.99 V
 ± 999.9 V

Overranging: 5% indicated by overrange light.

Range selection: manual, automatic or remote.

PERFORMANCE

► **Accuracy** (25°C \pm 5°C, 30 days, after calibration against internal reference): \pm (0.05% of reading +0.01% of range).

► **Temperature coefficient** (0°C to 50°C): \pm 0.006% of reading/°C.

Response time: 450 ms to settle within 99.95% of final value after application of a full scale step input.

INPUT CHARACTERISTICS

Input: floating up to \pm 500 V dc with respect to chassis ground.

Input resistance: 10.2 M Ω on all ranges.

Common-Mode Rejection:

Range	10 V	100 V	1000 V
DC	90 dB	70 dB	50 dB
60 Hz	70 dB	50 dB	30 dB

Normal-Mode Rejection: 30 dB at 60 Hz increasing at 12 dB/octave.

AC VOLTAGE RANGES

Full range display

9.999 V
99.99 V
999.9 V

Overranging: 5% indicated by overrange light.

Range selection: manual, automatic or remote.

PERFORMANCE

► **Accuracy** (25°C \pm 5°C, 30 days, after calibration against internal reference):

Frequency	Accuracy
50 Hz to 20 kHz	\pm (0.1% of reading +0.02% of range)
20 kHz to 50 kHz	\pm 0.12% of range
50 kHz to 100 kHz	\pm 0.1% to \pm 0.3% of range linearly derated with frequency

► **Temperature coefficient** (0°C to 50°C): \pm 0.006% of reading/°C.

Response time: 3 seconds to within rated accuracy; 2 additional seconds for recovery from overload.

INPUT CHARACTERISTICS

Input: floating up to \pm 500 V dc with respect to chassis ground. Input terminals on plug-in only.

Input impedance: 10 M Ω shunted by 20 pF.

► Indicates change from prior specifications

3439A OR 3440A WITH 3446A AC/DC REMOTE UNIT



DESCRIPTION

The 3446A extends the measurement capability of the 3439A or 3440A to include ac voltage and dc voltage. This plug-in is identical to the 3445A except for the following:

1. Function as well as range may be selected remotely.
2. Either the plug-in's own input terminals or the mainframe input terminals may be selected by a front panel switch.
3. When the mainframe's input terminals are used, the input capacity becomes 175 pF.
4. The plug-in's own input terminals have 35 pF of input capacity.

3439A OR 3440A MAINFRAME

GENERAL SPECIFICATIONS

BCD outputs

Digital output: 4-line BCD (1-2-2-4) including 4 digits of data, polarity, function and decimal in 6 columns available as a standard feature from the 3440A. 4-line BCD (1-2-4-8 is available from the 3440A Option H02. (3439A does not have BCD output).

BCD levels:

State	Voltage Level
"0"	-24 V to -30 V
"1"	0 to -2 V

Print command: step from -12 V to -2 V from a 100Ω source, issued from the 3440A.

Remote trigger: a +10V pulse, 20 μs wide (ac coupled), or by contact closure to ground is required to trigger the 3440A.

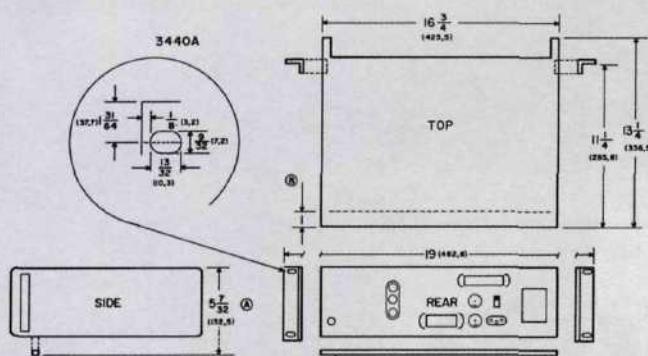
Hold-off: a level between +6 V and +15 V from a source resistance <2000 Ω is required to inhibit the 3440A.

Remote control: remote selection of range and/or function, depending on the plug-in, is made by contact closure to ground through <100 Ω. Remote selection requires 40 ms.

Operating temperature: 0°C to 50°C.

Power: 115 V or 230 V ±10%, 50 Hz to 400 Hz, 20 W to 30 W, depending on plug-in.

Outline drawing:



NOTES
 (A) EIA RACK HEIGHT (INCLUDING FILLER STRIP) FOR CABINET HEIGHT (INCLUDING FEET) ADD 3/8" TO EIA RACK HEIGHT
 (B) REAR APRON RECESS
 DIMENSIONS IN INCHES AND (MILLIMETERS)

Weight

- 3439A or 3440A: net 18 lb (8 kg); shipping 29 lb (13 kg)
- 3441A: net 1 lb (0,45 kg); shipping 4 lb (1,8 kg)
- 3442A: net 1.5 lb (0,7 kg); shipping 4 lb (1,8 kg)
- 3443A or 3444A: net 3 lb (1,35 kg); shipping 5 lb (2,3 kg)
- 3445A or 3446A: net 2.75 lb (1,24 kg); shipping 5 lb (2,3 kg)

Accessories furnished

HP 03440-84401 rack mounting kit and two extender boards.

3439A OR 3440A MAINFRAME**GENERAL SPECIFICATIONS** (Continued)**Accessories available**

HP 3440A Option K01 Plug-in Extender for servicing plug-in while operating with the mainframe. It can be used with the 3439A mainframe. \$65.

HP 562A/AR Option J74 Digital Recorder for use with the 3440A. Allows floating operation up to ± 500 V dc and accepts 1-2-2-4 BCD code. Includes special double character print wheel, 6 BCD column boards and input cable with connector.

HP 562A/AR Option J76 Digital Recorder for use with the 3440A Option H02. Allows floating operation up to ± 500 V dc and accepts 1-2-4-8 BCD code. Includes special double character print wheel, 6 BCD column boards and input cable with connector.

HP 5050A Option H44 Digital Recorder for use with the 3440A. Allows floating operation up to ± 500 V dc and accepts 1-2-2-4 BCD code. Includes special double character print wheel, 3 BCD column boards (for 6 columns of information) and input cable with connector.

► Price

HP 3439A, \$995.

HP 3440A, \$1195.

HP 3440A Option H02 (1-2-4-8 BCD output, "1" state positive), \$1255.

HP 3441A, \$50.

HP 3442A, \$160.

HP 3443A, \$525.

HP 3443A Option H02 (for use with 3440A Option H02), \$550.

HP 3444A, \$600.

HP 3444A Option H02 (for use with 3440A Option H02), \$625.

HP 3445A, \$600.

HP 3445A Option H02 (for use with 3440A Option H02), \$625.

HP 3446A, \$625.

► Indicates change from prior Specifications

For more information, call your local HP Sales Office or East (201) 265-5000 • Midwest (312) 677-0400 • South (404) 436-6181 West (213) 877-1282. Or, write: Hewlett-Packard, 1501 Page Mill Road, Palo Alto, California 94304. In Europe, 1217 Meyrin-Geneva