



Agilent U1701A Dual Display Handheld Capacitance Meter

Quick Start Guide



Agilent Technologies

Safety Information

The Agilent U1701A is safety-certified in compliance with the following safety and EMC requirements:

- IEC 61010-1:2001/EN 61010-1:2001 (2nd Edition)
- CISPR 11:2003+A1:2004
- IEC 61000-4-2:1995+A1:1998 +A2:2000
- IEC 61000-4-3:2006
- IEC 61000-4-4:2004
- IEC 61000-4-5:2005
- IEC 61000-4-6:2003+A1:2004+A2:2006
- IEC 61000-4-11:2004
- Canada: ICES-001:2004
- Australia/New Zealand: AS/NZS CISPR11:2004

Safety Notices

















CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

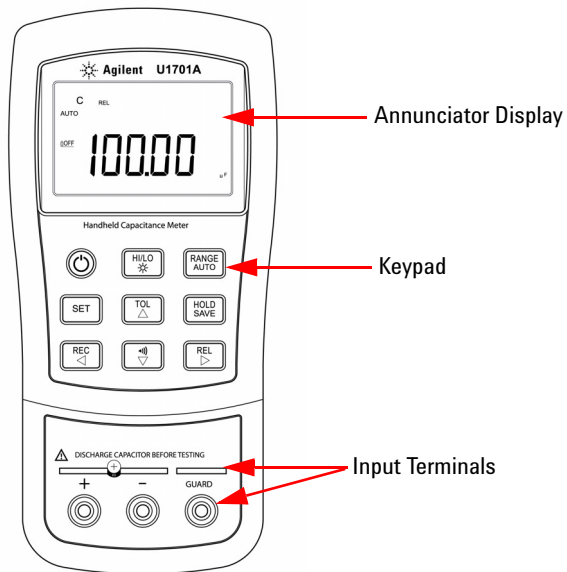
WARNING

WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.



Safety Symbols

	Direct current
	Alternating current
	Three-phase alternating current
	Both direct and alternating current
	Earth (ground) terminal
	Equipotentiality
	Caution, hot surface
	Off (supply)
	On (supply)
	Protective conductor terminal
	Caution, risk of electric shock
	Out position of a bi-stable control
	In position of a bi-stable control
	Frame or chassis terminal
	Equipment protected throughout by double insulation or reinforced insulation
	Caution, risk of danger (refer to this manual for specific Warning or Caution information)

U1701A Dual Display Handheld Capacitance Meter



Quick Start

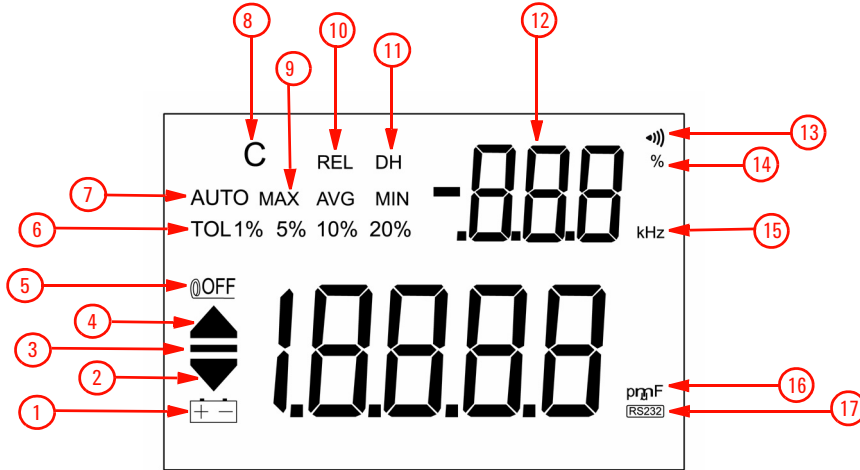
- 1 Press  to power-on the meter.
- 2 To test for capacitance, keep an open circuit on the test leads and press  to subtract the residual capacitance of the meter and leads.
- 3 Insert the capacitor legs into + and - input terminals respectively. Ensure that the polarity of the capacitor's leg are correct.
- 4 Remove your hands from capacitor to allow it to be tested.
- 5 Read the measurement on the display.

CAUTION

Measuring tip: For measuring capacitance of more than 1000 μF , first, discharge the capacitor then select a suitable range to measure it. This will shorten the measuring time to achieve an accurate value.

Degradation of some product specifications can occur in the presence of ambient electromagnetic (EM) fields and noise that couples to the product's powerline or I/O cables. The product self-recovers and operates to all specifications when the source of the ambient EM field and noise are removed or the product is protected from the ambient EM field or the product cabling is shielded from the ambient EM noise.

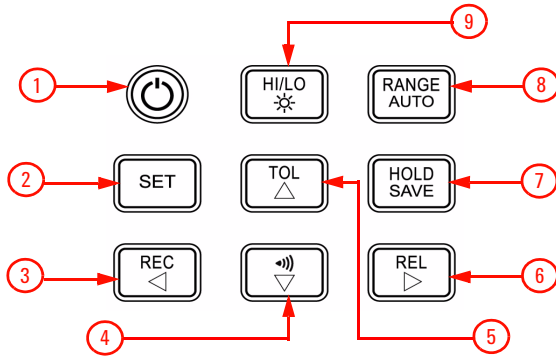
Display Annunciators



No.	Descriptions
1	Low battery indicator
2	Reading out of LO limit
3	Primary display for capacitance measurement -188.88
4	Reading out of HI limit
5	Auto power off indicator
6	Tolerance mode, to set 1%, 5%, 10%, and 20% for sorting capacitance
7	AUTO range
8	Charging period will be flashed, display as discharging period
9	Static recording mode for MAX, MIN, AVG and Present (MAXAVGMIN)

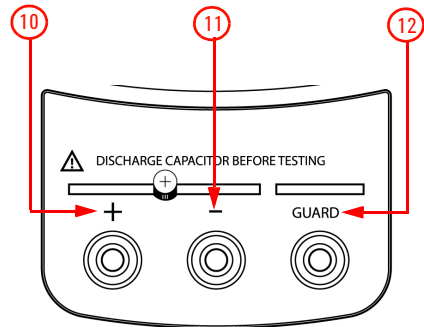
No.	Descriptions
10	Relative mode
11	Data hold to hold the displayed digital value. (DH flashing means under trigger)
12	Secondary display -.888
13	Audible alert for tolerance and compare mode
14	Unit for tolerance display
15	Unit for Beeper Frequency as setup mode
16	Unit for capacitance (pF, nF, μF, and mF)
17	Remote control

Keypad Operations



No.	Keys	Functions
1	Power	To turn ON/OFF the instrument
2	SET	Set high/low limits for compare mode
3	REC	Static recording mode
4	•))	Compare mode
5	TOL	Tolerance mode
6	REL	Relative mode
7	HOLD SAVE	Data hold To store the setting value into the memory
8	RANGE AUTO	Manual range Auto range
9	HI/LO ☀	High/Low limits Backlight display

Terminals
























No.	Terminals	Functions
10	+	Positive terminal
11	-	Negative terminal
12	GUARD	Guard terminal
















WARNING

To avoid damaging this instrument, do not exceed the input limit. Do not apply voltage to input terminals. Discharge the capacitor before testing.

Features and Functions

Actions	Steps
To power ON or OFF	Press 
To enable data hold function	Press 
To trigger holding next reading	Press  momentarily
To exit data hold mode	Press  for more than 1 s
To enable recording function <ul style="list-style-type: none"> • The beeper will beep when a new MAX or MIN value has been recorded. • The static recording captures stable values and updates the memory. It will not record values that are overloaded, OL or below 10 count value. 	Press 
To cycle through maximum, minimum, average, and present readings <ul style="list-style-type: none"> • MAX, MIN, AVG or MAX AVG MIN annunciator will be turned on respectively to indicate which value is being displayed 	Press  momentarily
To exit the recording mode	Press  for more than 1 s
To enable relative function <ul style="list-style-type: none"> • Relative function shows the difference between the measured value and the offset reference value. The display may show a non-zero value due to the presence of test leads. Use the relative function to nullify the residual. • Relative function can operate in both auto and manual ranging mode but the function cannot be set when an overload value exists. • REL annunciator will be displayed. 	Press 
To renew the relative value	Press  again
To exit relative mode	Press  for more than 1 s
To select manual range and to turn off the AUTO annunciator	Press 
To step up a range at a time	Press  again


Actions	Steps
<p>To select auto-range</p> <ul style="list-style-type: none"> In auto range mode, the AUTO annunciator is displayed and the instrument will select an appropriate range for resolution if the reading is greater than the maximum available range. OL will be displayed. The instrument will select a lower range when the reading is less than 9% of full scale. 	<p>Press  for more than 1 s</p>
<p>To enable the tolerance mode and to set the display value as a standard reference</p> <ul style="list-style-type: none"> TOL annunciator will be displayed. The tolerance will be displayed on the secondary display. The instrument range will be locked. 	<p>Press </p>
<p>To cycle through 1%, 5%, 10% and 20% tolerance</p> <ul style="list-style-type: none">  will be indicated. Beeper will beep once if the test value is within the selected tolerance. If the test value is out of the tolerance, the beeper will beep three times. This mode cannot be enabled under the following conditions: <ul style="list-style-type: none"> After setting the recording mode After setting the compare mode Display showing either OL or below 10 counts 	<p>Press  momentarily</p>
<p>To exit tolerance mode</p>	<p>Press  and hold for more than 1 s</p>
<p>To enable compare mode</p> <ul style="list-style-type: none"> Measuring range will be locked  will be displayed and the secondary display will indicate C # #, meaning which set has been used for compare mode. The two right digits indicate current compare set. The # # range from 01 to 25. The primary display shows the present measurement. In this state, it is ready for testing. If the reading is beyond the high limit,  will be indicated.  will be indicated if the reading is out of the low limit. The beeper will beep three times and the secondary display will indicate nGo. If the reading is within the high and low limits, the beeper will beep once, and the secondary display will indicate Go. After three seconds or when the reading is lower than 10 counts, the instrument will return to its ready state. The secondary display will indicate C01 to C25 according to the comparison record that has been selected. 	<p>Press </p>

Actions	Steps
To save comparison set for next entry	Press  and hold for more than 1 s
To exit compare mode	Press 
To view the High/Low limit value to be used as compare mode	Press  momentarily
<p>To cycle through HI limit, LO limit, and present values on the primary display</p> <ul style="list-style-type: none"> The secondary display showed as H # #, L # # and C # # respectively. After three seconds without pressing this button again, it will return to the present value display. 	Press 
To toggle HI and LO limits for adjustment	Press  momentarily
<p>To enter HI/LO limits setting mode</p> <ul style="list-style-type: none"> The secondary display will flash H01 and the primary display will indicate the value of HI limit. The following buttons will be used for this setting mode: <ul style="list-style-type: none"> a To select which digit to be adjusted b To increase or decrease the current digit's value c To select High or Low limit to be set. d To store the setting value in the memory. The beeper will beep twice if the selected value has been stored. If the current setting do not meet the rule that the high limit must be equal or greater than the low limit, the beeper will beep three times. e To select next compare setting. To cycle through L01 (or H01) to L25 (or H25), then return to L01 (H01) setting. 	<p>Press  for more than 1 s</p> <p>Press  (Left) or  (Right)</p> <p>Press  (Up) or  (Down)</p> <p>Press </p> <p>Press  for more than 1 s</p> <p>Press  momentarily</p>
To exit the HI/LO limit setting mode	Press  for more than 1 s
<p>To toggle backlight ON/OFF</p> <ul style="list-style-type: none"> Backlight turns off automatically after setting period by setup mode. 	Press  and hold for more than 1 s



Power-On Options








To select power-on options, press and hold  while turning the ON/OFF switch to ON position. The power-on options are listed in [Table 1-1](#):

Table 1-1 Power-On Options

Key	Description
HOLD	Demonstrate Annunciators To demonstrate the annunciators, the entire annunciators will be displayed. Press any button to exit demonstration mode.
	Reset the high and low limits to factory's default values.
RANGE	Fast power off test for factory's purpose
REL	To view the firmware revision
SET	Setup Mode To configure related parameter, please refer to "How To Enter Setup Mode".

How to Enter Setup Mode

Press and hold  and power on the instrument from OFF status. Release  when you hear a beep, the instrument will then enter setup mode. These parameters will be remained in the non-volatile memory even after the instrument is turned off. To configure the related parameters on setup mode, ensure that the following procedures are followed:

- 1 Press  (Left) or  (Right) to select the menu item to be set.
- 2 Press  (Up) or  (Down) to change the parameter.
- 3 Press  to select the digit to be adjusted, the selected digit will flash.
- 4 Press and hold  for more than 1 s to save your setting.
- 5 Press  for more than 1 s to exit setup mode.

Factory Default Settings

The following table below lists out the setup menu item and factory default settings.

Table 1-2 Outline of Setup Menu Items

Menu Item	Default	Selectable Parameters
bAUd	9600	Baud rate: 2400, 4800, 9600, 19200
PArT	none	Parity: Odd, Even or None
Data	8-b	8 bits or 7 bits (Stop bit is always 1 bit)
Echo	oFF	Echo: on or oFF
Prnt	oFF	Print: on or oFF
beep	4800	Driving frequency: 4800, 2400, 1200, 600 Hz. oFF: To disable beep.
LbUt	oFF	Lock buttons oFF: Enable keypad on: Disable keypad
AoFF	15	1~99 minutes, oFF: To disable auto power-off
blit	30	1~99 seconds, oFF: To disable turning off backlight automatically
boFF	oFF	Backlight level of brightness at OFF state: oFF~09
bon	09	Backlight level of brightness at ON state: oFF~09
dEFA	rSt	Reset the above items to factory's default setting.

General Specifications

Parameter	U1701A
Power Supply	Single standard 9 V battery (Alkaline) (Power adaptor is available as optional accessories)
Display	4 ½-digit liquid crystal display (LCD) with maximum reading of 11,000 counts and automatic polarity indication
Function	<ul style="list-style-type: none"> • Capacitance measurement by DC charge and discharge method • Visible and audible Tolerance mode assists you to sort the capacitor • Min/Max/Average, Data Hold with Manual or Auto Trigger and Relative modes • Comparison mode with 25 sets of HI/LO limits can be selected • Backlit display for easy reading in the dark • Bi-directional optic computer interface with SCPI commands • One-year calibration cycle suggested
Measuring rate	~5 times/s for capacitance <100 µF (Typical)
Battery type	Alkaline: ANSI/NEDA: 1604A / IEC: 6LR61
Power consumption	5.6 mA (Battery operation)
Battery life	~80 hours without backlight based on new alkaline
Operating temperature	0 °C to 50 °C
Storage temperature	-20 °C to 60 °C
Storage humidity	0 – 80% R.H. non condensing
Relative Humidity (R.H.)	80% R.H.
Temperature coefficient	0.1 * (Specified Accuracy)/ °C (from 0 °C to 18 °C or 28 °C to 50 °C)
Low battery indicator	 will appear when the voltage drops below ~ 6.0 V
Weight	320 g
Dimension (W x L x H)	87 mm x 184 mm x 41 mm
Safety	Designed in compliance with IEC 61010-1 for Pollution Degree 2
Standard accessories	<ul style="list-style-type: none"> • Agilent U1701A Quick Start Guide, Agilent U1701A User's and Service Guide, and software application - included in the Product Reference CD-ROM • Agilent U1701A Quick Start Guide • Alligator clip leads • 9 V Alkaline Battery • Certificate of Calibration
Optional accessories	<ul style="list-style-type: none"> • IR to USB Cable (U5481A-FG) • Power adaptor (U1780A-FG) • SMD Tweezers (U1782-FG) • Soft carrying case (U1174A-FG)

Electrical Specifications¹

Accuracy is given as \pm (% of reading + counts of least significant digit) at 23 °C \pm 5 °C, with relative humidity less than 80% R.H.

Range	Resolution	Accuracy*	Measuring rate as full scale (approx.)
1000.0 pF	0.1 pF	1% + 10	5 times/s
10.000 nF	0.001 nF	1% + 5	5 times/s
100.00 nF	0.01 nF	0.5% + 3	5 times/s
1000.0 nF	0.1 nF		5 times/s
10.000 μ F	0.001 μ F		5 times/s
100.00 μ F	0.01 μ F		5 times/s
1000.0 μ F	0.1 μ F		0.86 times/s
10.000 mF	0.001 mF	1% + 5	0.13 times/s
199.99 mF	0.1 mF	2% + 5	0.006 times/s

* The accuracy is specified to measure film capacitor or better, and use relative mode to zero residual first.

1 This specification is based on the measurement performed at the test socket.

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United States:

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