

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.

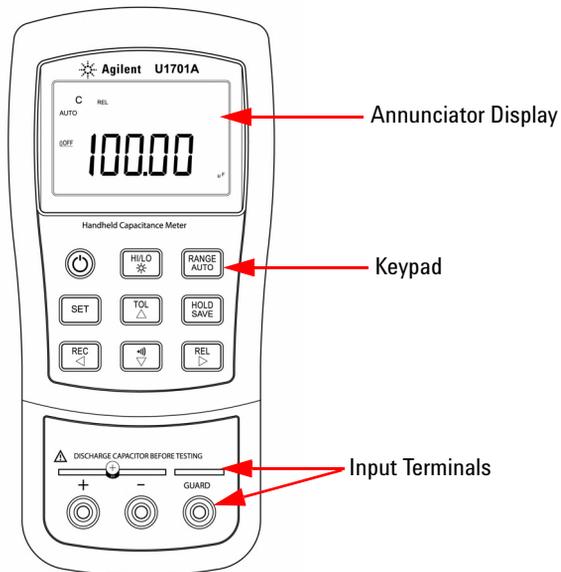
WARNING

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

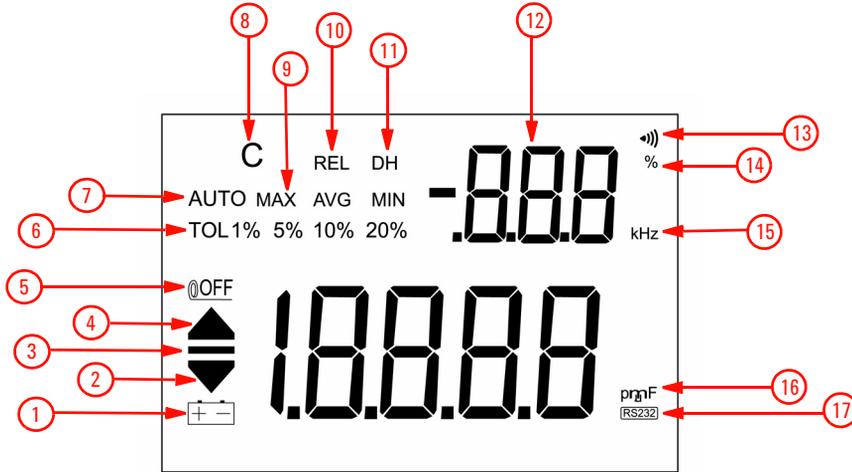
- 1 Press  to power-on the meter.
- 2 To test for capacitance, keep an open circuit on the test leads and press  to subtract the residual capacitance of the meter and leads.
- 3 Insert the capacitor legs into + and - input terminals respectively. Ensure that the polarity of the capacitor's leg are correct.
- 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.

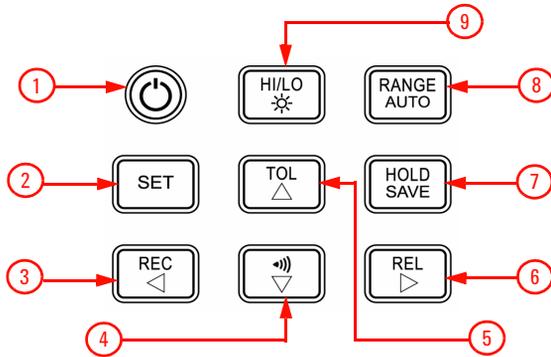
Display Annunciators



| 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) |

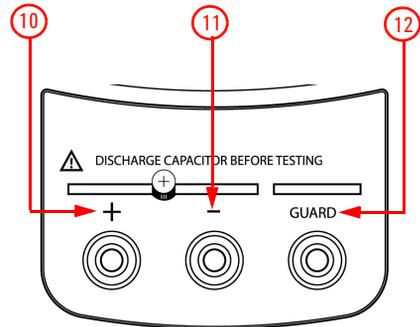
| No. | Descriptions |
|-----|--|
| 10 | Relative mode |
| 11 | Data hold to hold the displayed digital value. (DH flashing means under trigger) |
| 12 | Secondary display -.888 |
| 13 | Audible alert for tolerance and compare mode |
| 14 | Unit for tolerance display |
| 15 | Unit for Beeper Frequency 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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Printed in Malaysia

First Edition, November 28, 2008

U1701-90017



Agilent Technologies