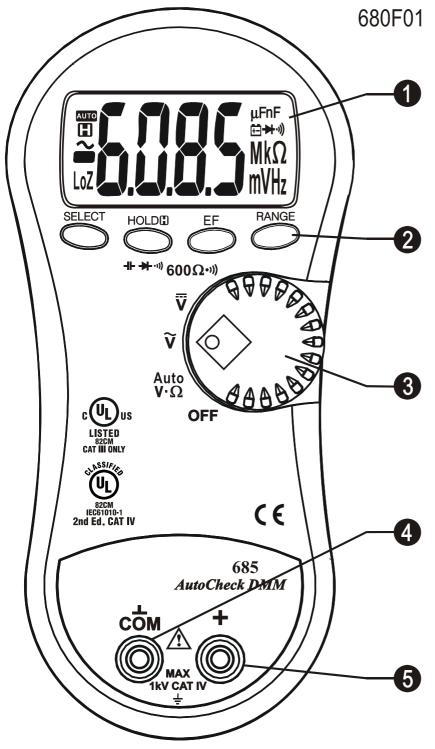


USER'S MANUAL

BM685





680F01 BM682 & BM685 USER'S MANUAL

1) PRODUCT DESCRIPTION *Note: Top of the line model is used as representative for illustration purposes. Please refer to your respective model for function availability.*

1) 3-5/6 digits 6000 counts LCD display

2) Push-button for special functions & features

3) Selector to turn the Power On or Off and select a function

4) Common (Ground reference) Input Jack (-) for all functions

5) Input Jack (+) for all functions

2) SAFETY Terms in this manual

- *WARNING* identifies conditions and actions that could result in serious injury or even death to the user.
- *CAUTION* identifies conditions and actions that could cause damage or malfunction in the instrument.

This manual contains information and warnings that must be followed for operating the instrument safely and maintaining the instrument in a safe operating condition. If the instrument is used in a manner not specified by the manufacturer, the protection provided by the instrument may be impaired. The meter is intended only for indoor use. The meter is protected, against the users, by double insulation per EN61010-1 and IEC61010-1 2nd Edition (2001) to CAT IV 1000V. The meter also meets UL61010B-1* and CSA C22.2 No. 1010-1-92* to CAT III 1000V.

*Category IV safety standard (for DMMs) was first released in IEC61010-1 2nd Edition in year 2001, and was yet an UL published standard at the time this manual was written.

Measurement Category IV (CAT IV) is for measurements performed at the source of the low-voltage installation. Examples are electricity meters and measurements on primary overcurrent protection devices and ripple control units.

Measurement Category III (CAT III) is for measurements performed in the building installation. Examples are measurements on distribution boards, circuit-breakers, wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and equipment for industrial use and some other equipment, for example, stationary motors with permanent connection to the fixed installation.

Measurement Category II (CAT II) is for measurements performed on circuits directly connected to the low voltage installation. Examples are measurements on household appliances, portable tools and similar equipment.

WARNING

To reduce the risk of fire or electric shock, do not expose this product to rain or moisture. Observe the proper safety precautions when working with voltages above 60 VDC or 30 VAC rms. These voltage levels pose a potential shock hazard to the user. Do not touch test lead tips or the circuit being tested while power is applied to the circuit being measured. Keep your fingers behind the finger guards of the test leads during measurement. Inspect test leads and probes for damaged insulation or exposed metal before using the meter. If any defects are found, replace them immediately.

INTERNATIONAL ELECTRICAL SYMBOLS

Caution ! Refer to the explanation in this Manual Caution ! Risk of electric shock

- ➡ Earth (Ground)
 Double Insulation or Reinforced insulation
 Fuse
- AC--Alternating Current
 DC--Direct Current

3) CENELEC DIRECTIVES

The instrument conforms to CENELEC Low-voltage directive 73/23/EEC and Electromagnetic compatibility directive 89/336/EEC

4) OPERATION

Note: All function operations described hereafter are via the "+" Input Jack for positive (+) polarity and "COM" Input Jack for Ground reference (-), or otherwise specified

-AutoCheck[™] mode

This innovative AutoCheckTM feature automatically selects measurement function of DCV, ACV or Resistance (Ω) based on the input via the test leads.

•With no input, the meter displays "Auto" when it is ready.

•With no voltage signal but a resistance below $6M\Omega$ is present, the meter displays the resistance value. When below 25Ω is present, the meter further gives a continuity beep tone.

•When a signal above the threshold of DC 1.2V or AC 1.5V up to the rated 1000V is present, the meter displays the voltage value in appropriate DC or AC, whichever larger in peak magnitude.

• Overload-Alert Feature: When above rated 1000V is present, the meter displays "OL" with a warning beep tone for over-range indication. Disconnect the test leads from the signal immediately to avoid hazards.

Note:

*Range-Lock Feature (BM685 only): When a measurement reading is being displayed in AutoCheck[™] mode, press the RANGE button momentarily 1 time can lock the function-range it was in. The LCD annunciator " AUTO" turns off. Range-lock can speed up repetitive measurements. Press the button momentarily repeatedly to step through the ranges. Press and hold the button for 1 second or more to resume AutoCheck[™] mode.

*As Hazardous-Alert: When making resistance measurements in AutoCheck[™] mode, an unexpected display of voltage readings alerts you that the object under test is being energized.

*Ghost-voltage buster: Ghost-voltages are unwanted stray signals coupled from adjacent hard signals, which confuse common multimeter voltage measurements. Our AutoCheckTM mode provides low (ramp-up) input impedance (approx. $4k\Omega$ at low voltage) to drain ghost voltages leaving mainly hard signal values on meter readings. It is an invaluable feature for precise indication of hard signals, such as distinguishing between hot and open wires (to ground) in electrical installation applications.

WARNING:

AutoCheckTM mode input impedance increases abruptly from initial 4.2k Ω to a few hundred k Ω 's on high voltage hard signals. "LoZ" displays on the LCD to remind the users of being in such low impedance mode. Peak initial load current, while probing 1000VAC for example, can be up to 337mA (1000V x 1.414 / 4.2k Ω), decreasing abruptly to approx. 2.8mA (1000V x 1.414 / 500k Ω) within a fraction of a second. Do not use AutoCheckTM mode on circuits that could be damaged by such low input impedance. Instead, use rotary selector \widetilde{v} or \overline{v} common input impedance voltage modes (BM685 only, Hi-Z of approx. 5M Ω) to minimize loading for such circuits.

$-\widetilde{\mathbf{v}}$ (Hi-Z ACV) function (BM685 only)

Rotate the rotary selector to the $\tilde{\mathbf{v}}$ position selects common impedance (Hi-Z) AC voltage measurements. The AC annunciator " \sim " turns on. Input impedance is set at approximately 5M Ω to minimize loading on circuits under tests.

- v (Hi-Z DCV) function (BM685 only)

Rotate the rotary selector to the $\overline{\mathbf{v}}$ position selects common impedance (Hi-Z) DC voltage measurements. There is no annunciator for DC. Input impedance is set at approximately 5M Ω to minimize loading on circuits under tests.

-600Ω••»)/→ ••»)/→ functions & SELECT button (BM685 only)

600 Ω Resistance range with Audible-Continuity is the default function. It is an extended low resistance range to complement the Resistance (Ω) function in AutoCheckTM mode. Audible-Continuity response time is also improved drastically (from that of AutoCheckTM mode) under such stand-alone range architecture. Audible-Continuity is convenient for checking wiring connections and operation of switches. A continuous beep tone indicates a complete circuit.

Press **SELECT** button momentarily selects Diode test function. The reading shows the approximate voltage drop across the test leads. When forward biased, normal forward voltage drop for a good silicon diode is between 0.400V to 0.900V. A reading higher than that indicates a leaky diode (defective). A zero reading indicates a shorted diode (defective), and the meter gives a continuous beep warning. An OL indicates an open diode (defective). Reverse the test leads connections (reverse biased) across the diode. The display shows OL if the diode is good. Any other readings indicate the diode is resistive or shorted (defective).

Press **SELECT** button momentarily AGAIN selects Capacitance function. Capacitance measurement time varies with capacitance value. Only a few seconds is required for measuring values of below 100μ F. However, one minute or more is required for measuring extreme values of around 2000μ F.

-Electric Field EF-Detection

At any function, press the **EF** button momentarily to toggle to EF-Detection feature. The meter displays "EF" when it is ready. Signal strength is indicated as a series of bar-graph segments on the display plus variable beep tones.

• *Non-Contact EF-Detection:* An antenna is located along the top of the meter, which detects electric field surrounds current-carrying conductors. It is ideal for tracing live wiring connections, locating wiring breakage and to distinguish between live or earth connections.

• *Probe-Contact EF-Detection:* For more precise indication of live wires, such as distinguishing between live and ground connections, use the Red (+) test probe for direct contact measurements.

-HOLD I feature

The Hold feature freezes the display for later viewing. Press the HOLD button momentarily to toggle to the Hold feature. The annunciator " " turns on.

-RANGE feature (BM685 only)

When the function selected has more than one range, press the **RANGE** button momentarily selects manual-ranging. The meter remains in the range it was in. The LCD annunciator **AUTO** turns off. Press the button momentarily again to step through the ranges. Press and hold the button for 1 second or more to resume auto-ranging.

Note:

*RANGE feature is not available to 600Ω•••)/→ •••)/→ functions. *To use RANGE feature in AutoCheck[™] mode, please see "Range-Lock Feature" as explained in footnotes of AutoCheck[™] mode section.

-Auto Power Off (APO)

The meter turns off intelligently after approximately 3 minutes of neither significant measurement nor button/switch activity. To wake up the meter from APO, press any button or turn the rotary selector to OFF and back on again. Always turn the rotary selector to OFF when the meter is not in use.

5) MAINTENANCE WARNING

To avoid electrical shock, disconnect the meter from any circuit, remove the test leads from the input jacks and turn OFF the meter before opening the case and/or the battery access door. Do not operate with open case. Do not attempt to repair this unit. It contains no user-serviceable parts.

Cleaning and Storage

Periodically wipe the case with a damp cloth and mild detergent; do not use abrasives or solvents. If the meter is not to be used for periods of longer than 60 days, remove the battery and store it separately

Trouble Shooting

If the instrument fails to operate, check battery, leads, etc., and replace as necessary. Double check operating procedure as described in this user's manual

If the instrument voltage-resistance input has subjected to high voltage transient (mostly caused by lightning or switching surge to your system) by accident or abnormal conditions of operation, the series fusible resistors will be blown off (become high impedance) like fuses to protect the user and the instrument. Most measuring functions through this input will then be open circuit. The series fusible resistors and the spark gaps should then be replaced by qualified technician. Refer to the LIMITED WARRANTY section for obtaining warranty or repairing service.

Battery replacement

When low battery icon 🔄 turns on, replace the battery ASAP to maintain meter accuracy and functionality. The meter uses one 9V battery: Standard 9V battery NEDA1604, JIS006P or IEC6F22; or 9V alkaline battery NEDA1604A, JIS6AM6 or IEC6LF22.

Loosen the 2 screws from the battery access door of the case bottom. Lift the battery access door and thus the battery compartment up. Replace the battery. Re-fasten the screws.

6) SPECIFICATION GENERAL SPECIFICATIONS Display: 3-5/6 digits 6000 counts

Update Rate: 5 per second nominal

Operating Temperature: -10°C ~ 50°C

Relative Humidity: Maximum relative humidity 80% for temperature up to 31°C decreasing linearly to 50% relative humidity at 50°C

Altitude: Operating below 2000m

Storage Temperature: -30°C ~ 60°C, < 80% R.H. (with battery removed)

Temperature Coefficient: Nominal 0.15 x (specified accuracy)/ °C @ (-10°C ~

 18° C or 28° C ~ 50° C), or otherwise specified

Sensing: Average sensing

Pollution Degree: 2

Safety: Meets EN61010-1 and IEC61010-1 2nd Edition (2001) to CAT IV 1000V. Also meets UL61010B-1* and CSA C22.2 No. 1010-1-92* to CAT III 1000V.

*Category IV safety standard (for DMMs) was first released in IEC61010-1 2nd Edition in year 2001, and was yet an UL published standard at the time this manual was written.

UL Certification: The meter that bears the UL markings, if any, has been investigated by UL headquarter in the USA per UL standard UL61010B-1 to its highest CAT III rating and international standard IEC61010-1 Second Edition (year 2001) to CAT IV rating. The UL markings on the meter, where applicable, are marked as "UL Listed Cat III only" and "UL Classified to IEC61010-1 2nd Ed. Cat IV".

Transient Protection: 12kV lightning surge (1.2/50µs)

Measurement Category: CAT IV 1000V AC & DC

E.M.C.: Meets EN61326 (1997, 1998/A1), EN61000-4-2 (1995), & EN61000-4-3 (1996)

In an RF Field of 3V/m:

Capacitance function is not specified

Other function ranges:

Total accuracy = Specified accuracy + 45d

Performance above 3V/m is not specified

Overload Protection: 1000VDC & VAC rms

Low Battery: Below approx. 4.5V

Power Supply: Standard 9V battery NEDA1604, JIS006P or IEC6F22; or 9V alkaline battery NEDA1604A, JIS6AM6 or IEC6LF22.

Power Consumption (typical): 2mA

APO Consumption (typical): 2µA

APO Timing: Idle for 3 minutes
Dimension: L173mm x W83mm x H48.5mm
Weight: Approx. 300 gm
Special Features: AutoCheck™ (Automatic V & Ω Selection), Display Hold and EF-Detection
Accessories: Battery installed, Test lead pair and User's manual
Optional Accessories: Soft carrying pouch

Electrical Specification

Accuracy is given as +/- (% of reading digits + number of digits) or otherwise specified @ $23^{\circ}C$ +/- $5^{\circ}C$ and less than 75% R.H.

DC Voltage

RANGE	Acc	Accuracy	
	BM682	BM685	
6000mV ¹⁾	1.3%+2d	0.8%+2d	
6.000V	1.3%+2d	0.8%+2d	
60.00V	1.3%+1d	0.8%+1d	
600.0V	1.2%+4d	1.2%+4d	
1000V	1.5%+8d	1.5%+8d	

NMRR: > 30dB @ 50Hz/60Hz

CMRR: > 100dB @ DC, 50Hz/60Hz; Rs=1k Ω

Hi-Z DCV (BM685 only) Input Impedance: 5MΩ, 90pF nominal

AutoCheck[™] Lo-Z DCV Threshold: > +1.5VDC & < -1.0VDC nominal

AutoCheck[™] Lo-Z DCV Input Impedance: Initially 4.2kΩ, 90pF nominal;

Impedance increases abruptly within a fraction of a second as display voltage is above 50V (typical). Ended up impedances vs display voltages typically are: $18k\Omega@100V$

- 125kΩ@ 300V
- $320k\Omega@600V$

 $500k\Omega@1000V$

¹⁾Range for BM685 only and can only be entered using **RANGE** button. Use the 6000mV range for voltage output accessories.

AC Voltage

RANGE	Accuracy	
	BM682	BM685
50Hz ~ 400Hz		
6000mV ¹⁾ , 6.000V, 60.00V	2.5%+3d	1.5%+3d
600.0V	2.5%+6d	2.0%+6d
1000V	2.8%+8d	2.8%+8d

CMRR: > 60dB @ DC to 60Hz, Rs=1k Ω

Hi-Z ACV (BM685 only) Input Impedance: 5MΩ, 90pF nominal

AutoCheck[™] Lo-Z ACV Threshold: > 2VAC (50/60Hz) nominal

AutoCheck[™] Lo-Z ACV Input Impedance: Initially 4.2kΩ, 90pF nominal;

Impedance increases abruptly within a fraction of a second as display voltage is above 50V (typical). Ended up impedances vs display voltages typically are: 18kΩ @ 100V

125kΩ@ 300V

320kΩ@ 600V

 $460k\Omega@1000V$

¹⁾Range for BM685 only and can only be entered using **RANGE** button. Use the 6000mV range for voltage output accessories.

RANGE	Accu	Accuracy ¹⁾	
	BM682	BM685	
6.000KΩ ²⁾	0.9%+4d ³⁾	0.9%+4d ³⁾	
60.00KΩ	0.9%+4d	0.9%+4d	
600.0KΩ	0.9%+1d	0.9%+1d	
6.000MΩ	1.2%+4d	1.2%+4d	

Ohms

Open Circuit Voltage: 0.4VDC typical

¹⁾Cool down interval 2 minutes after over 50V measurements in Auto-V Ω position ²⁾Continuity Beeper turns on while < 0.025k Ω

³⁾Add 20d to specified accuracy while reading is below 20% of range

Non-Contact EF-Detection

Typical Voltage	Bar Graph Indication
15V to 50V	-
30V to 70V	
50V to 100V	
70V to 140V	
above 100V	

Indication: Bar graph segments & audible beep tones proportional to the field strength

Detection Frequency: 50/60Hz

Detection Antenna: Top end of the meter

Probe-Contact EF-Detection: For more precise indication of live wires, such as distinguishing between live and ground connections, use the Red (+) test probe for direct contact measurements.

Diode Tester (BM685 only)

Test Current	Open Circuit Voltage
0.25mA typical	< 1.6VDC typical

600Ω with Continuity Beeper (BM685 only)

RANGE	Accuracy
600.0Ω	2.0%+6d ¹⁾

Continuity Beeper Response: < 100µs

Open Circuit Voltage: 0.4VDC typical

Audible Threshold: between 50Ω and 250Ω

¹⁾Add 30d to specified accuracy while reading is below 20% of range

Capacitance (BM685 only)

RANGE	Accuracy
100.0nF ¹⁾	3.5%+5d
1000nF, 10.00μF, 100.0μF	2.5%+2d
2000µF	2.5%+5d

Accuracies with film capacitor or better ¹⁾Accuracy below 50nF is not specified

LIMITED WARRANTY

BRYMEN warrants to the original product purchaser that each product it manufactures will be free from defects in material and workmanship under normal use and service within a period of one year from the date of purchase. BRYMEN's warranty does not apply to accessories, fuses, fusible resistors, spark gaps, batteries or any product which, in BRYMEN's opinion, has been misused, altered, neglected, or damaged by accident or abnormal conditions of operation or handling.

To obtain warranty service, contact your nearest BRYMEN authorized agent or send the product, with proof of purchase and description of the difficulty, postage and insurance prepaid, to BRYMEN TECHNOLOGY CORPORATION. BRYMEN assumes no risk for damage in transit. BRYMEN will, at its option, repair or replace the defective product free of charge. However, if BRYMEN determines that the failure was caused by misused, altered, neglected, or damaged by accident or abnormal conditions of operation or handling, you will be billed for the repair.

THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OR MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE. BRYMEN WILL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES.



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