

BK PRECISION®

Model: 5492B, 5492BGPIB

5 ½ Bench Digital Multimeter

USER MANUAL



Safety Notice

As described in the International Electrotechnical Commission (IEC) Standard IEC 664, digital multimeter measuring circuits (e.g., B&K Models 5492B) and the USB terminal are Installation Category II (CAT II). All other instruments' signal terminals are Installation Category I and must not be connected to mains.

This equipment is a POLLUTION DEGREE 2, INDOOR USE product.

Safety Summary

The following safety precautions apply to both operating and maintenance personnel and must be observed during all phases of operation, service, and repair of this instrument. Before applying power, follow the installation instructions and become familiar with the operating instructions for this instrument.

GROUND THE INSTRUMENT

To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. This instrument is grounded through the ground conductor of the supplied, three-conductor ac power cable. The power cable must be plugged into an approved three-conductor electrical outlet. Do not alter the ground connection. Without the protective ground connection, all accessible conductive parts (including control knobs) can render an electric shock. The power jack and mating plug of the power cable meet IEC safety standards.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

KEEP AWAY FROM LIVE CIRCUITS

Instrument covers must not be removed by operating personnel. Component replacement and internal adjustments must be made by qualified maintenance personnel. Disconnect the power cord before removing the instrument covers and replacing components. Under certain conditions, even with the power cable removed, dangerous voltages may exist. To avoid injuries, always disconnect power and discharge circuits before touching them.

DO NOT SERVICE OR ADJUST ALONE

Do not attempt any internal service or adjustment unless another person, capable of rendering first aid and resuscitation, is present.

DO NOT SUBSTITUTE PARTS OR MODIFY THE INSTRUMENT

Do not install substitute parts or perform any unauthorized modifications to this instrument. Return the instrument to B&K Precision for service and repair to ensure that safety features are maintained.

WARNINGS AND CAUTIONS

WARNING and **CAUTION** statements, such as the following examples, denote a hazard and appear throughout this manual. Follow all instructions contained in these statements.

A **WARNING** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in injury or death to personnel.

A **CAUTION** statement calls attention to an operating procedure, practice, or condition, which, if not followed correctly, could result in damage to or destruction of parts or the entire product.

WARNING: *Do not alter the ground connection. Without the protective ground connection, all accessible conductive parts (including control knobs) can render an electric shock. The power jack and mating plug of the power cable meet IEC safety standards.*

WARNING: *To avoid electrical shock hazard, disconnect power cord before removing covers. Refer servicing to qualified personnel.*

CAUTION: *Before connecting the line cord to the AC mains, check the rear panel AC line voltage indicator. Applying a line voltage other than the indicated voltage can destroy the AC line fuses. For continued fire protection, replace fuses only with those of the specified voltage and current ratings.*

CAUTION: *This product uses components which can be damaged by electro-static discharge (ESD). To avoid damage, be sure to follow proper procedures for handling, storing and transporting parts and subassemblies which contain ESD-sensitive components.*

SAFETY SYMBOL



This symbol serves as a warning to users of the input safety ratings. Refer to the operating instructions for details.



Electrical Shock hazard.



Chassis ground symbol.

**CAT I
(1000V)**

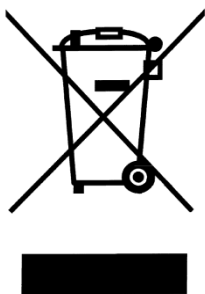
IEC Measurement Category I.
Inputs may be connected to
mains (up to 300 VAC) under
Category II overvoltage conditions.

**CAT II
(300V)**

IEC Measurement Category II.

Compliance Statements

Disposal of Old Electrical & Electronic Equipment (Applicable in the European Union and other European countries with separate collection systems)



This product is subject to Directive 2002/96/EC of the European Parliament and the Council of the European Union on waste electrical and electronic equipment (WEEE) , and in jurisdictions adopting that Directive, is marked as being put on the market after August 13, 2005, and should not be disposed of as unsorted municipal waste. Please utilize your local WEEE collection facilities in the disposition of this product and otherwise observe all applicable requirements.

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Chapter 1 **General Information**

This chapter is outlined as follows:

- 1.1 Feature Overview**
- 1.2 Input Power and Fuse Requirements**
- 1.3 Package Contents**

1.1 Feature Overview

5492B is a 5½ digital multimeter with high accuracy, stability and speed. It has a 0.01% DC voltage basic accuracy, 0.03% basic resistance accuracy and broad ranges that can measure:

- DC voltage up to 1000 V
- AC (RMS) voltage up to 750 V, or about 1000 V Peak
- DC current up to 12 A
- AC (RMS) current up to 12 A
- Two and four-wire resistance up to 120 MΩ
- Frequency from 5 Hz to 1 MHz

1.2 Input Power and Fuse Requirements

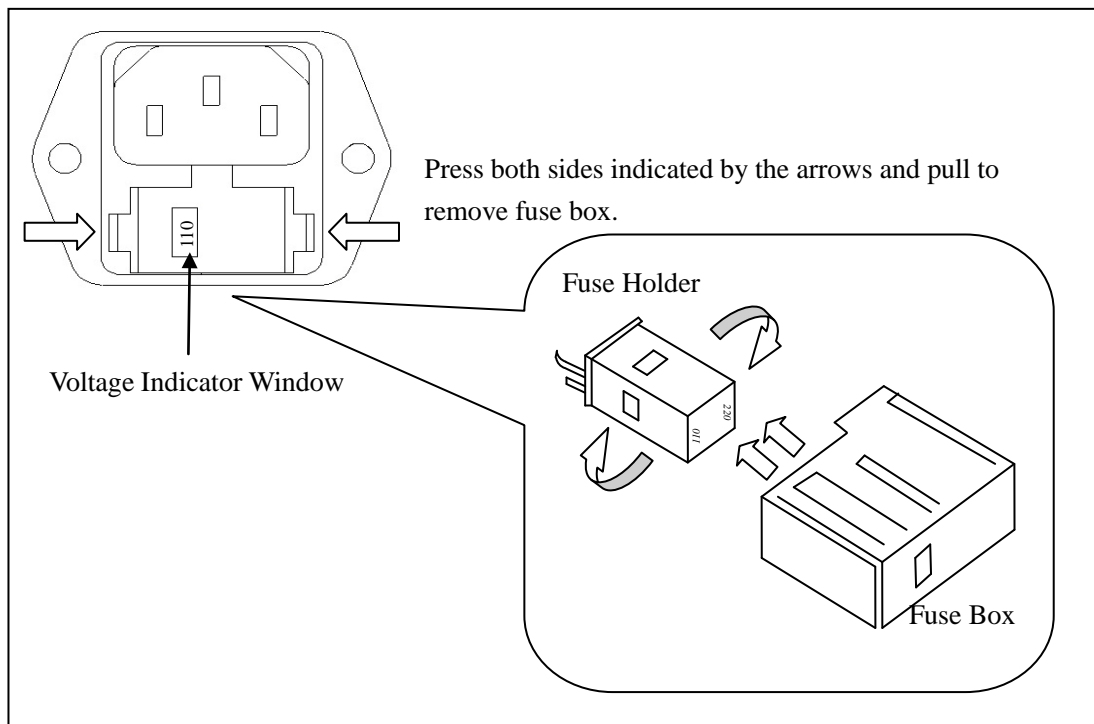
The 5492B digital multimeter can operate on 110 V or 220 V with +/- 10% tolerance at 60 Hz or 50 Hz with +/- 5% tolerance respectively. Before powering the instrument, please check for correct power input setup that corresponds to the line voltage to be used for operation. Note the label in the rear label, as shown below:

RATING	FUSE
~110 V / 60 Hz	T1AL, 250 V
~220 V / 50 Hz	T500mAL, 250 V

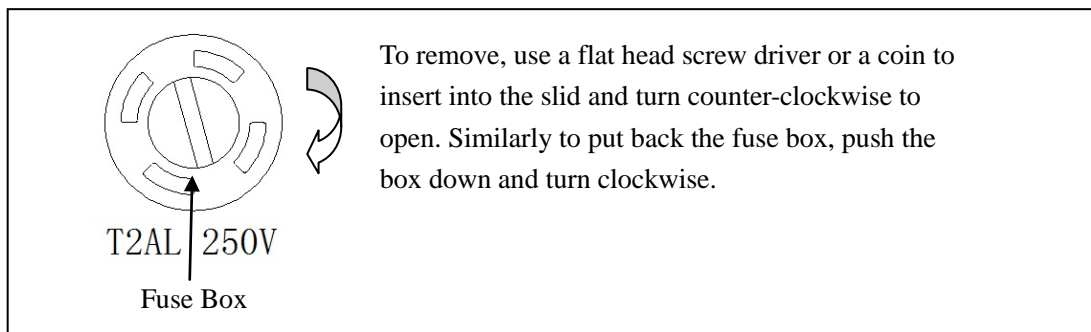
There are two items to check for:

1. Check that the correct fuse is placed inside the fuse box. Referring to the above table, use a 1 A fuse for 110 V/ 60 Hz operation, and 500 mA fuse for 220 V/50 Hz operation.
2. Check the fuse holder position. There is a voltage indicator window on the front face of the fuse box that indicates the selected line voltage. To change or select the appropriate line voltage, remove the fuse box and pull out and rotate the fuse holder, as illustrated below:

General information



There is a second fuse with a fuse holder located in the front panel of the multimeter. This is an over current protection fuse for the low current measurement input. It is rated for a T2AL, 250 V fuse. To remove and replace this fuse, see the illustration below:



There is a third fuse located inside the instrument which protects the 12 A input terminal if current exceeds the maximum rating. It is a 6 x 32 mm 250V, 20 A fast acting high energy ceramic fuse.

Chapter 2 Overview

This chapter is outlined as follows:

- 2.1 Front Panel Overview
- 2.2 Screen Display
- 2.3 Front Panel Menu Options
- 2.4 Front Panel Menu Overview
- 2.5 Rear Panel Summary
- 2.6 Power up

2.1 Front Panel Overview

The front panel of the B&K 5492B is shown in Figure 2-1. This figure includes some important abbreviated information that should be reviewed before operating the instrument.

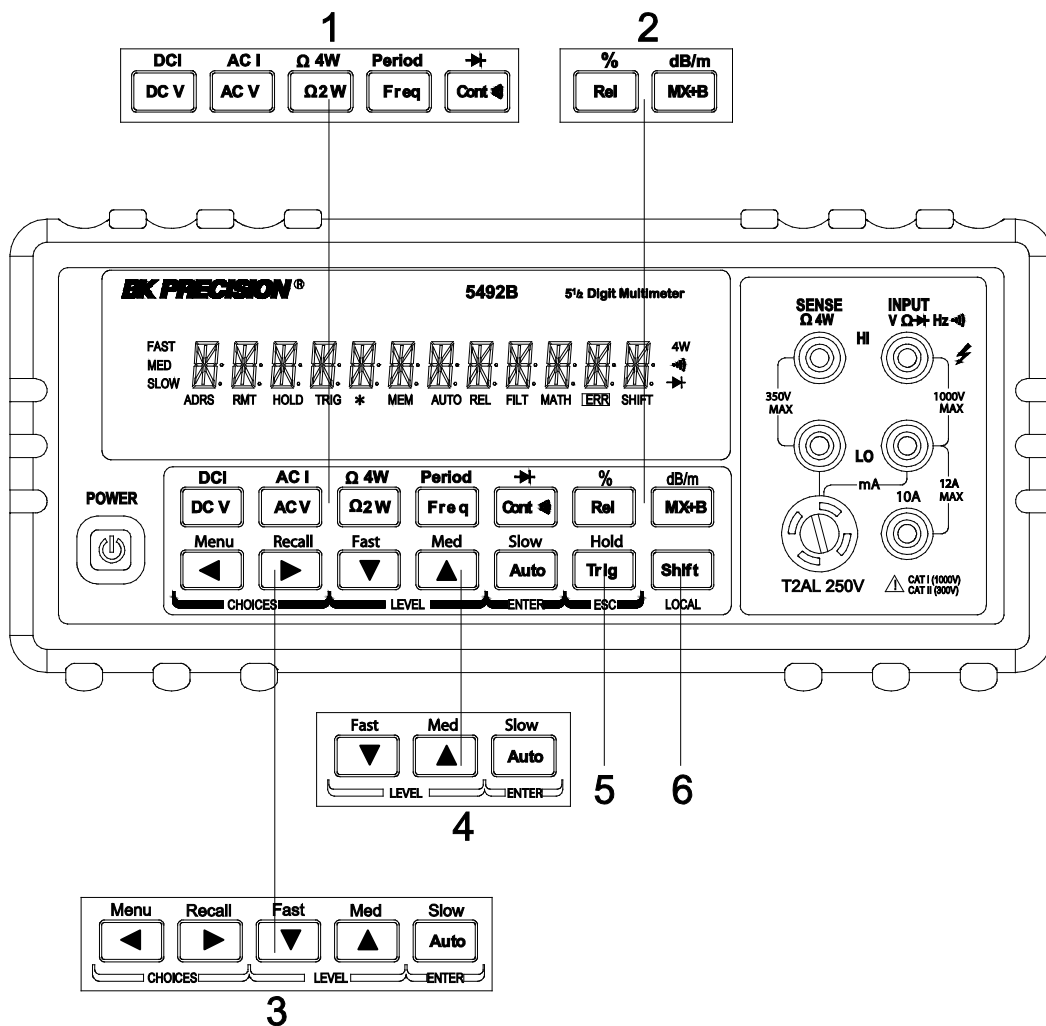


Figure 1 - Front Panel View

Overview

1. Measurement function keys


Select measurement function: DC voltage and current, AC voltage and current, 2-wire and 4-wire resistance, frequency, period, continuity and diode test.

2. Math function keys

Select math function: $mX+b$, %, dB, dBm and Rel.

3. Menu operation keys

Shift →  Open/Close menu

Shift →  Recall the menu performed last



Move through selections within menu level, sub-menu level or parameter level



Move through selections within menu level, sub-menu level or parameter level.



Move up a level.



Move down a level.

Auto (ENTER) Save the changes made on “parameter” level, and return to the “sub-menu” level.

Trig (ESC) Cancel the changes made on “parameter” level, and return to the “sub-menu” level.

4. Range and measurement speed keys



Select a higher range and disable auto ranging.




Select a lower range and disable auto ranging.



Toggle between auto ranging and manual ranging.

Shift →  Set measurement speed to Fast.

Shift →  Set measurement speed to Medium.

Shift → **Auto** Set measurement speed to Slow.

5. Trig/Hold Key

Trig Trigger a measurement from the front panel.

Shift → **Trig** Hold a stable reading on the display when selected numbers of samples are within the selected tolerance.

6. Shift/Local keys

Shift Used to access shifted keys (labels are in blue).

Shift (LOCAL) Exit remote operation and set back to local operation.

2.2 Screen Display

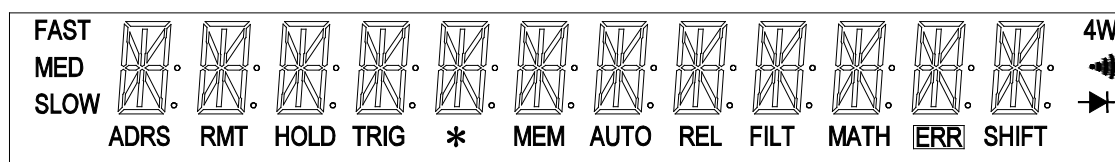


Figure 2-2 Display Annunciators

- * (asterisk) Instrument is ready to store readings (when in system menu) /
Reading is being stored (when in measurement mode)
- (Diode) Instrument is in diode testing function
- 🔊 (Speaker) Beeper on for continuity testing function
- 4W Multimeter is in 4-wire resistance measurement mode.
- ADRS Multimeter is addressed to listen or talk over the GPIB interface
- AUTO Auto ranging enabled
- ERR Hardware or remote control error detected
- FAST Fast reading rate
- FILT Digital filter enabled
- HOLD Reading HOLD is enabled
- MATH A math operation is enabled (mX+b, %, dB, dBm).
- MED Medium reading rate
- MEM Turns on when reading memory is enabled
- REL Relative reading displayed
- RMT Multimeter is in remote mode
- SHIFT Accessing shifted keys
- SLOW Slow reading rate
- TRIG Multimeter is waiting for a trigger (manual, bus, or external trigger).

2.3 Front Panel Menu Options

A : MEASUREMENT MENU

1:CONTINUITY → 2:FILTER → 3:FILT TYPE → 4:FILT COUNT

1. CONTINUITY Select the continuity beeper threshold: 1 Ω to 1000 Ω
2. FILTER Enable or disable FILTER function.
3. FILT TYPE Select the type of filter.
Select MOVNG AV (Moving Average) or REPEAT (Repeating Average).
4. FILT COUNT Set the number of readings to be filtered or averaged.

B : MATH MENU

1:SET M → 2:SET B → 3:PERCENT → 4:dB REF → 5:dBm REF → 6:LIMIT TEST → 7:HIGH LIMIT
→ 8:LOW LIMITT → 9:LIMIT BEEP

1. SET M Set the scale factor M for MX+B function.
2. SET B Set the offset factor B for MX+B function.

Overview

- | | |
|---------------|---|
| 3. PERCENT | Set the reference value for PERCENT function. |
| 4. dB REF | Set the dB reference voltage value. |
| 5. dBm REF | Set the dBm reference impedance value. |
| 6. LIMIT TEST | Enable or disable the limit testing. |
| 7. HIGH LIMIT | Set the high limit for limit testing. |
| 8. LOW LIMIT | Set the low limit for limit testing. |
| 9. LIMIT BEEP | Set the beep mode for limit testing. Select from: NEVER, HI, IN, LO, OUT. |

C : TRIGger MENU

1:TRIG MODE → 2:TRIG DELAY

- | | |
|---------------|--|
| 1. TRIG MODE | Select the trigger source.
Select IMM (Immediate), MAN (Manual), BUS, or EXT (External) trigger source. |
| 2. TRIG DELAY | Select AUTO or MANUAl trigger delay mode. Selecting manual will allow you to specify a time interval which is inserted before a measurement. |

D : SYStem MENU

1:RDGS STORE → 2:RDGS COUNT → 3:SAVED RDGS → 4:BEEP → 5:SAVE CNFG → 6:LOAD CNFG → 7:DISPLAY → 8:KEY SOUND → 9:TEST

- | | |
|---------------|--|
| 1. RDGS STORE | Enable or disable reading memory. |
| 2. RDGS COUNT | Set the number of readings to be saved (2 to 512). |
| 3. SAVED RDGS | Recall readings stored in memory. |
| 4. BEEP | Enable or disable the beeper function |
| 5. SAVE CNFG | Save the present configuration as one of the 10 user's settings. |
| 6. LOAD CNFG | Restore factory or one of the 10 user's settings |
| 7. DISPLAY | Enable or disable the front panel display. |
| 8. KEY SOUND | Enable or disable the key sound when you press a key. |
| 9. TEST | Perform a complete self-test. |

E : Input / Output MENU





1:GPIB ADDR → 2:INTERFACE → 3:BAUD RATE → 4:PARITY → 5:TX TERM → 6:RETURN

- | | |
|--------------|---|
| 1. GPIB ADDR | Set the GPIB bus address. (0 to 31) |
| 2. INTERFACE | Select between GPIB and USB/RS232 as the remote control interface. |
| 3. BAUD RATE | Select the baud rate for USB/RS232C operation.
Select from: 115.2K, 57.6K, 38.4K, 19.2K, 9600, 4800, 2400. |
| 4. PARITY | Select the parity mode for USB/RS232C operation.
Select from: NONE, EVEN, ODD. |
| 5. TX TERM | Select the terminal character for USB/RS232C communication.
Selection from: LF, CR, LFCR |
| 6. RETURN | Enable or disable echoing command strings. |

F : CALibration MENU (This function is not available)

1:SECURED → 3:CAL DATE → 4:CAL COUNT

2.4 Front Panel Menu Overview

The menu is organized in a top-down tree structure with three levels (menus, submenus and parameters) as shown in Figure 2-3. You can use down () or up () keys to browse through the menu tree from one level to another. Each of the three levels has several choices which you can view by using left () or right () keys.

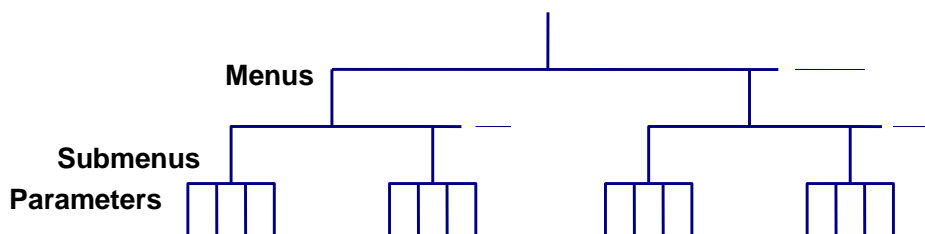













Figure 2-3 Menu Tree

- To turn on the menu, press  →  (Menu).
- To turn off the menu, press  →  (Menu), or press any of the function or math keys on the top row of front panel keys (i.e. DC V, Freq, etc.).
- To confirm a change on the “parameter” level, press  (ENTER).
- To cancel a change on the “parameter” level, press  (ESC).
- To recall the last menu command that was executed, press  →  (Recall)

The messages displayed during menu operation are listed in the following Table 2-1.

Table 2-1 Messages Displayed During Menu Operation

MESSAGES	DESCRIPTION
CHANGE SAVED	The change made on the “parameter” level is saved. This message will be displayed after you press  (ENTER) to save the changes.
TOO SMALL	The value you specified on the “parameter” level is too small for the selected command. The minimum value allowed is displayed for you to edit.
TOO LARGE	The value you specified on the “parameter” level is too large for the selected command. The maximum value allowed is displayed for you to edit.
FILE SAVING	System configuration file is being saved.
FILE LOADING	System configuration file is being restored.
SAVE SUCCEED	System configuration file is successfully saved.
LOAD SUCCEED	System configuration file is successfully restored.

Note: If you press  on the “menu” level, nothing will happen because it is at the top menu level of already. Likewise, if you press  on the “parameter” level, nothing will happen because it is at the lowest menu level.

2.5 Rear Panel Summary

The rear panel of BK 5492B is shown in Figure 2-4. This section includes important information that should be reviewed before operating the instrument.

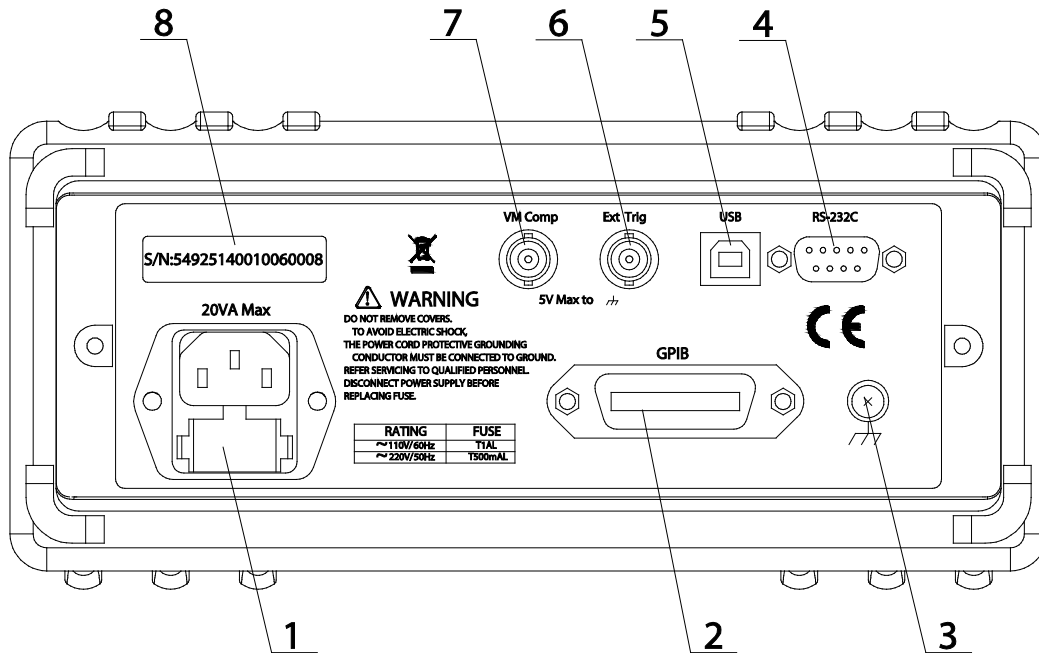


Figure 2-4 Rear Panel

1. Power line fuse holder
The multimeters can be configured for line voltage of 110/220 V ± 10 % AC at line frequency of 50/60 Hz ± 5%.
Power line fuse is used for instrument protection. (220 V/500 mA or 110 V/1 A)
Note: Please use the same-type of fuse as it is in the fuse holder. To verify and replace the fuse, remove the power cable and pull out the fuse holder. See section 1.2 for details.
2. (optional) GPIB (IEEE-488) interface (model 5492BGPIB)
3. Chassis ground screw terminal
4. RS-232 (Serial) interface
5. USB interface
6. External Trigger BNC input terminal
7. VM Comp (Voltmeter complete) BNC output terminal
8. Serial number label

Overview

Table 2-2 Factory Default Settings

Setting	Factory Default
Autozero	On
Buffer	No effect
Continuity	
Beeper	On
Digits	4 1/2
Rate	Fast(0.1 PLC)
Threshold	10 Ω
Current(AC and DC)	
Digits(AC)	5 1/2
Digits(DC)	5 1/2
Filter	On
Count	5
Mode	Moving average
Range	Auto
Relative	Off
Value	0.0
Rate(AC)	Medium(10PLC)
Rate(DC)	Medium(1 PLC)
Diode test	
Digits	5 1/2
Range	1 mA
Rate	Medium(1 PLC)
Frequency and Period	
Digits	5 1/2
Range	12 V
Relative	Off
Value	0.0
Rate	Slow(1 sec)
	DCV
Function	No effect
GPIB	8
Address	SCPI
Language	Off
Limits	ON
Beeper	+1
High limit	-1
Low limit	Off
mX+b	1.0
Scale factor	0.0
Offset	Off
Percent	1.0
Reference	

Overview

Table 2-2 Factory Default Settings (cont.)

Resistance(2-wire and 4-wire)	
Digits	5 1/2
Filter	On
Count	5
Mode	Moving average
Range	Auto
Relative	Off
Value	0.0
Rate	Medium(1 PLC)
RS-232(USB)	On
Baud	9600
Triggers	On
Continuous	Auto
Delay	Immediate
Source	
Voltage(AC and DC)	No effect
dB reference	75 Ω
dBm reference	5 1/2
Digits(AC)	5 1/2
Digits(DC)	On
Filter	5
Count	
Mode	Moving average
Range	Auto
Relative	Off
Value	0.0
Rate(AC)	Medium(10PLC)
Rate(DC)	Medium(1PLC)

2.6.5 Warm-up time




The 5492B is ready for use after power-up sequence (boot and self test) is completed. However, to achieve specified accuracy and stability, allow the instrument to warm up for half an hour. If the instrument has been subjected to extreme temperatures, allow additional time for internal temperature to stabilize


Chapter 3 Basic Measurements

This chapter is outlined as follows:

- 3.1 Overview
- 3.2 Measuring Voltage
- 3.3 Measuring Current
- 3.4 Measuring Resistance
- 3.5 Measuring Frequency and Period
- 3.6 Measuring Continuity
- 3.7 Testing Diode
- 3.8 Math Functions

3.1 Overview

The front panel has two rows of keys to select various functions and operations. Most keys have a shifted function printed in blue above the key. To perform a shifted function, press  (the **Shift** annunciator will turn on). Then, press the key that has the desired label above it. For example, to select the AC current function, press  then press  (AC I).

If you accidentally press , just press it again to turn off the **Shift** annunciator.






3.2 Measuring Voltage

Voltage ranges: 120 mV, 1.2 V, 12 V, 120 V, 1000 V (750 VAC)



Maximum resolution: 1 μ V (on 120 mV range)

3.2.1 Connections

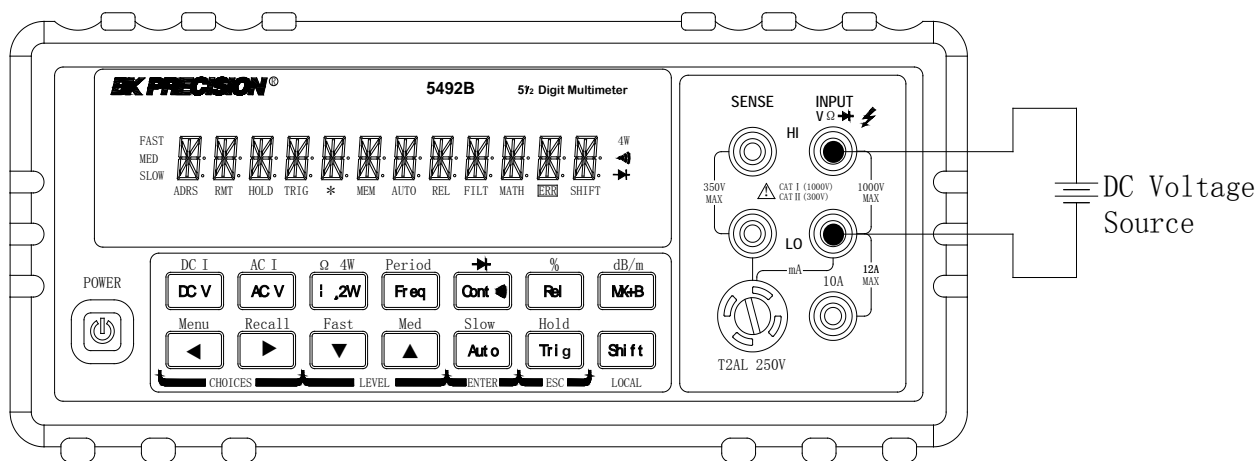
Assuming the multimeter is under factory default conditions, the basic procedure for measuring voltage is as follows:

1. Connect test leads to INPUT HI and LO terminals.
2. Select DC or AC voltage measurement by pressing  or  respectively.
3. Press  to toggle between auto and manual ranging. Notice the **AUTO** annunciator is displayed with auto ranging. For manual range, use the RANGE  and  keys to select the appropriate range for measurement.
4. Connect test leads to the sources as shown in Figure 3-1.

CAUTION: Do not apply more than 1000 V peak to the input or it will damage the instrument.

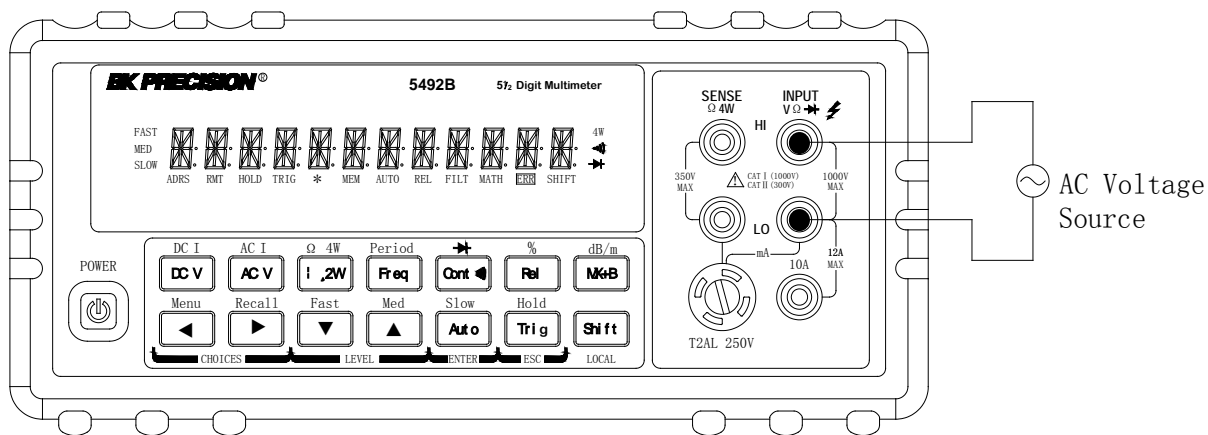
5. If the “**OVR.FLW**” message is displayed, press the up  key to select a higher range until a normal reading is displayed (or press  key for auto ranging). Use the lowest possible range for the best resolution. The measured reading is displayed.

Basic Measurements



Input Resistance = 10 MΩ on 1000 V and 120 V ranges;
 > 10 GΩ on 12 V, 1.2 V and 120 mV ranges

CAUTION: Maximum Input = 1010 V peak



Input Impedance = 1 MΩ, 100 pF

CAUTION: Maximum Input = 750 V RMS or 1000 V peak

Figure 3-1 DC and AC Voltage Measurement Connections

3.2.2 Crest factor

AC voltage and current accuracies are affected by the crest factor of the waveform, the ratio of the peak value to the RMS value. Table 3-1 lists the fundamental frequencies at which the corresponding crest factor must be taken into account for accuracy calculations.

Table 3-1 Crest Factor Limitations

Crest Factor	Fundamental Frequency
2	50 kHz
3	3 kHz
4-5	1 kHz

3.3 Measuring Current

Current ranges: 12 mA, 120 mA (DCI only, not available for ACI), 1.2 A, 12 A
 Maximum resolution: 100 nA (on 12 mA range)

Note: Auto range is only available for 12 mA and 120 mA (DCI only) ranges. For 1.2 A and 12 A range, manual range must be used.

3.3.1 Connections

Assuming the multimeter is under factory default conditions, the basic procedure for measuring current is as follows:

1. Connect test leads to INPUT LO and SENSE LO terminals
2. Select DCI or ACI measurement function by pressing **Shift** → **DCV** or **Shift** → **ACV** respectively.
3. Press **Auto** to toggle between auto and manual ranging. Notice the **AUTO** annunciator is displayed with auto ranging. For manual range, use the RANGE **▲** and **▼** keys to select a measurement range consistent with expected current.

Auto range is only available for 12 mA and 120 mA (DCI only) ranges. Manual range must be used for 1.2 A and 12 A ranges.

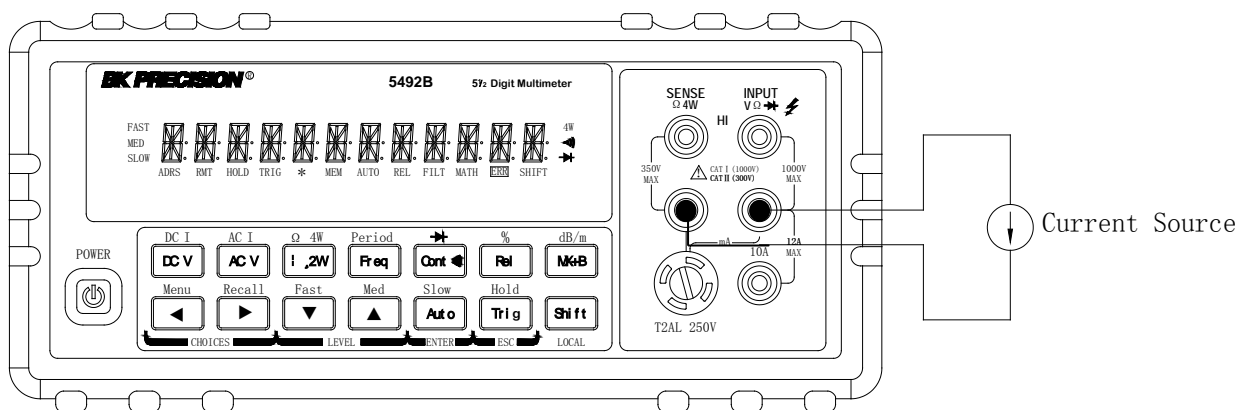
Therefore, it is recommended to use manual range when measuring current greater than 1 A with 1.2 A or 12 A range.

4. Connect test leads to the source as shown in Figure 3-2:

CAUTION: Do not apply more than 2 A between INPUT LO and SENSE LO terminals or the protective fuse on the front panel will blow. Use the 10 A terminal for measuring current above 1 A. See Figure 3-2 for details.

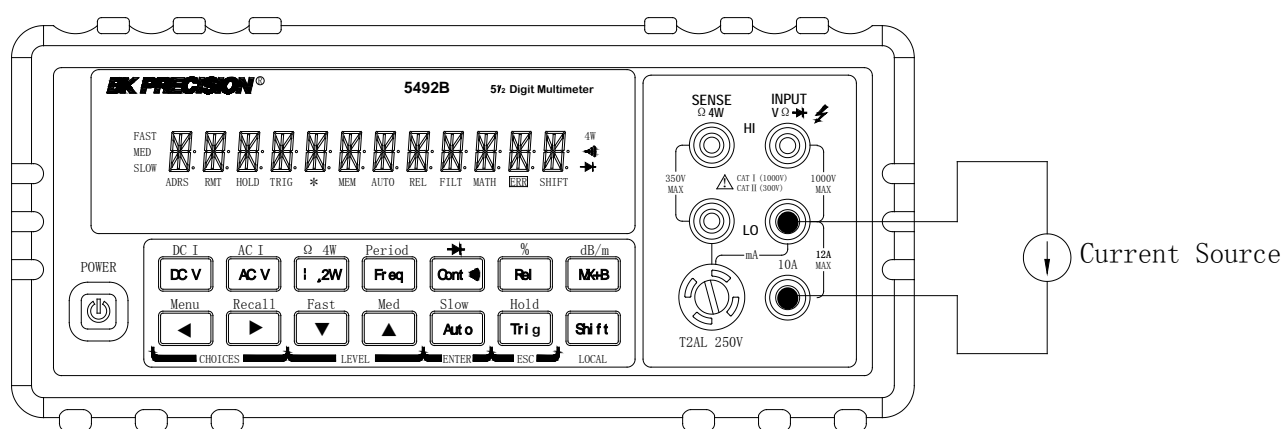
5. If the “OVR.FLW” message is displayed, press up **▲** key to select a higher range until a normal reading is displayed (or press **Auto** key for auto ranging). Use the lowest possible range for the best resolution. Note that auto ranging is only available for 12 mA and 120 mA (DCI only) ranges.

Basic Measurements



For low current measurement: INPUT LO and SENSE LO terminals are used.

CAUTION: Maximum input = 1 A DC or RMS



For 1 A or higher current measurement: 10 A and INPUT LO terminals are used.

CAUTION: Maximum Input = 12 A DC or RMS

Note: Auto range is not available for 1.2 A and 12 A ranges

Figure 3-2 DC and AC Current Measurements

3.3.2 Front Panel Fuse Replacement

WARNING: Make sure the instrument is disconnected from the power line and other equipment before replacing the fuse.

1. Turn off the power and disconnect the power line and test leads.
2. From the front panel, use a screwdriver to rotate the fuse holder several turns counter-clockwise. Take the fuse carrier out of the socket.
3. Remove the fuse and replace it with the same type (T2AL, 250 V, 5×20mm)



CAUTION: Do not use a fuse with a higher current rating than specified or instrument damage may occur. If the instrument repeatedly blows fuses, try to find out the reason before replacing the fuse.

3.5 Measuring Frequency and Period

Frequency measurement range: 5 Hz to 1 MHz.

Period measurement range: 0.2 s to 1 μ s.

Input signal range: 120 mV AC to 750 V AC RMS.

The instrument uses the volts input terminals (INPUT HI and INPUT LO) to measure frequency and period. The AC voltage range can be changed with the RANGE  and  keys. However, the signal voltage must be greater than 10% of the full-scale range.

Note: Auto ranging is not available for frequency and period measurement function.

3.5.1 Trigger Level and Measurement Errors

Frequency and Period apply a zero-crossing trigger, meaning that a count is taken when the signal crosses the zero level.




The multimeter uses an interactive counting technique to measure frequency and period. This method generates constant measurement resolution for any input frequency. All frequency counters are subject to errors when measuring low voltage, low frequency signals. Both internal noise and external noise are also critical when measuring low voltage, low frequency signals. Measurement errors will also occur if you attempt to measure the frequency (or period) of an input following a dc offset voltage change. You must allow the multimeter's DC input blocking capacitor to fully settle before making frequency measurements.

3.5.2 Gate Time

Gate time is the amount of time the multimeter uses to sample frequency or period readings. For model 5492B, all RATE settings (Fast, Med and Slow) yield a gate time of one second.

3.5.3 Connections

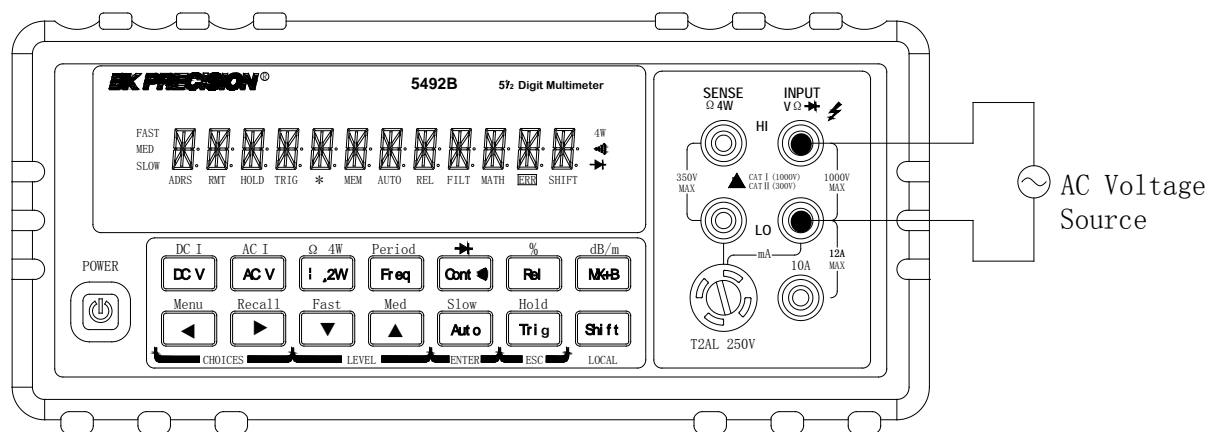
Assuming the multimeter is under factory default conditions, the basic procedure for measuring frequency or period is as follows:

1. Connect test leads to INPUT HI and LO terminals.
2. Select frequency or period measurement functions by pressing  or  →  respectively.
3. Connect test leads to the source as shown in Figure 3-4:

CAUTION: Do not exceed 1000 V peak between INPUT HI and INPUT LO or instrument damage may occur.

4. The measured reading is displayed.

Basic Measurements



Input Impedance = 1 M Ω in parallel with <100 pF

CAUTION: Maximum Input = 750 RMS, or 1000 V Peak

Figure 3-4 Frequency and Period Measurements

3.6 Measuring Continuity

The multimeter uses the 1 k Ω range to measure circuit continuity. A threshold resistance level (1 Ω to 1000 Ω) should be set. The factory default value is 10 Ω . The multimeter alerts you with a beep when a reading is below the set level.

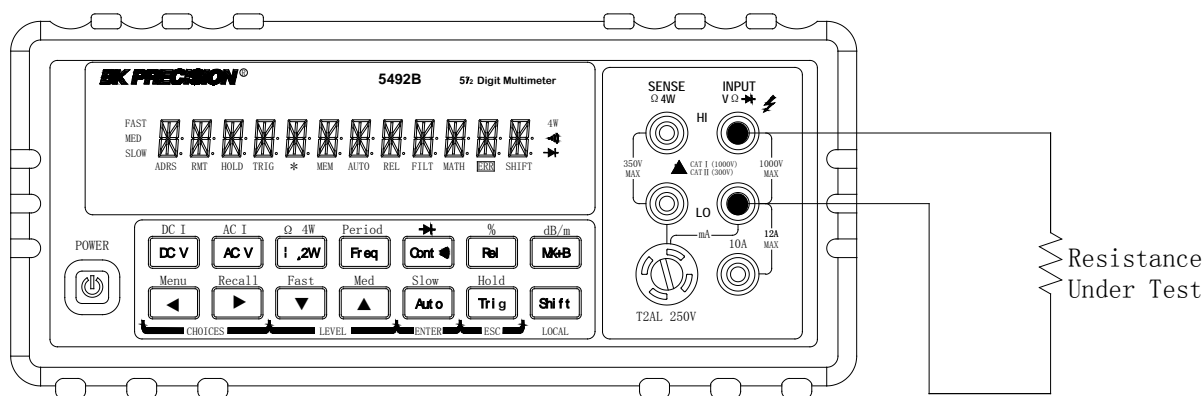
Note: Continuity function defaults to FAST (0.1 PLC) rate and cannot be changed.

3.6.1 Connections

Assuming the multimeter is under factory default conditions, the basic procedure for continuity testing is as follows:

1. Connect test leads to the INPUT HI and LO terminals.
2. Select Continuity measurement function by pressing **Cont**.
3. Connect test leads to the resistance under test as shown in Figure 3-5.
4. The measured reading is displayed.

Basic Measurements



Note: Source current flows from the INPUT HI to INPUT LO terminals.

Figure 3-5 Continuity Measurement

3.6.2 Threshold resistance level

You can define a threshold resistance from 1 Ω to 1000 Ω . Factory default value is 10 Ω . Follow the steps below to define the resistance level:

1. Press **Cont** for Continuity Measurement.
2. Press **Shift** → **▶** to enter the submenu level, “1: CONTINUITY” will be displayed.
3. Press **▼** to enter the parameter level, the current LEVEL value will be displayed.
4. Use **◀** and **▶** keys to change the cursor position and use **▲** and **▼** keys to increment or decrement the digits respectively. Enter a value from 1 to 1000.
5. Press **Auto** (ENTER) to confirm your setting. Message “CHANGE SAVED” will be displayed for a moment.
6. Press **Cont** or **Shift** → **◀** to exit the menu and return to the continuity measurement.

3.7 Testing Diode

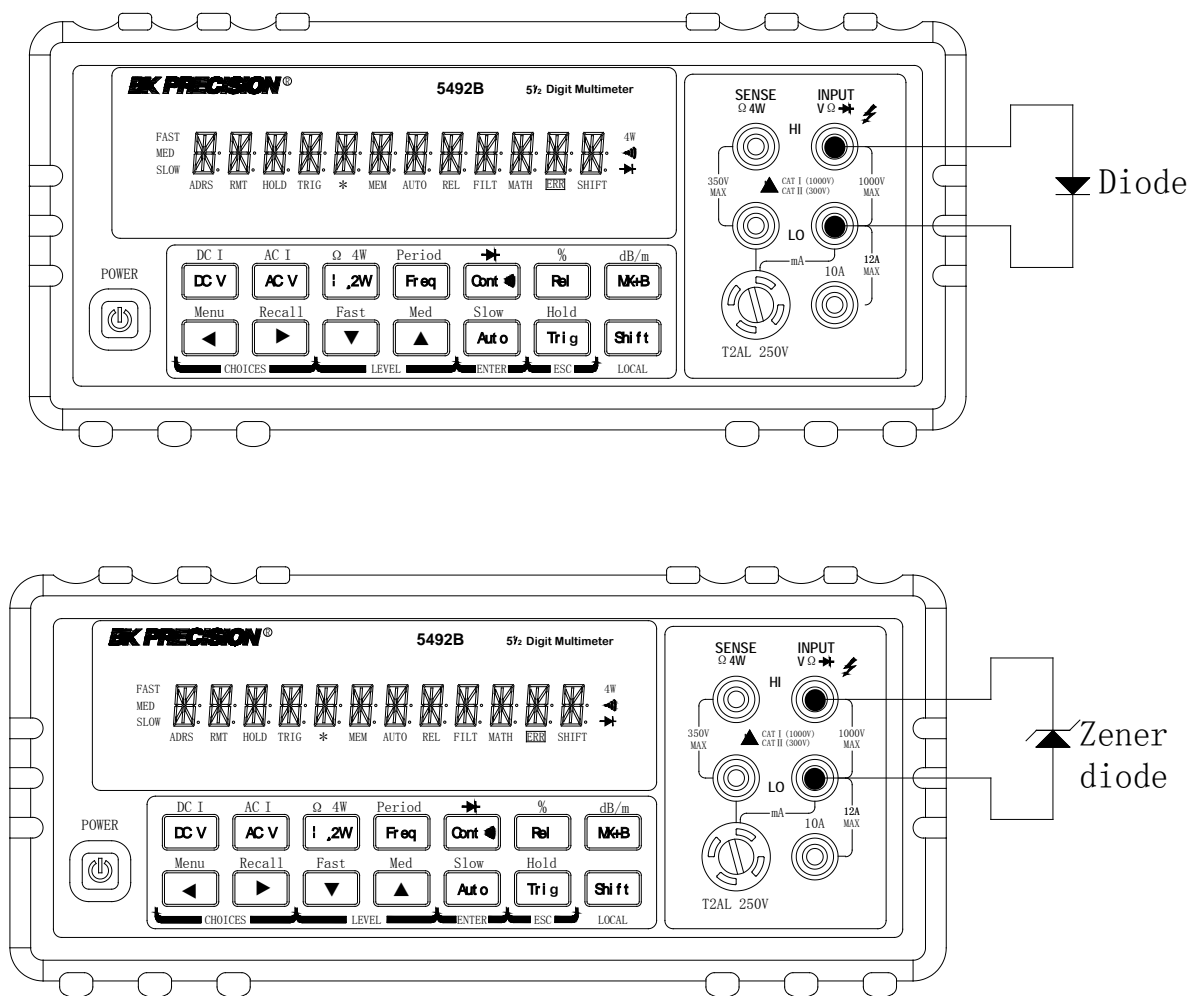
The multimeter can also be used to measure the forward voltage drop of general-purpose diodes and the zener voltage of zener diodes. A current range (1 mA, 100 μ A, or 10 μ A) can be selected for diode measurement.

Note: Diode testing defaults to MED (1 PLC) rate and cannot be changed.

3.7.1 Connections

Assuming the multimeter is under factory default conditions, the basic procedure for diode testing is as follows:

1. Connect test leads to INPUT HI and LO terminals.
2. Press **Shift** → **Cont** for diode measurement function.
3. Connect test leads to the diode under test as shown in Figure 3-6.
4. Take a reading from the display.



Note: Source current flows from the INPUT HI to INPUT LO terminals

Figure 3-6 Diode Measurement

3.7.2 Current Range

You can set the test current range from the front panel. The choices are 1 mA, 100 μ A, and 10 μ A. The factory default current range is 1 mA. To set the test current, follow the steps below:

1. Press **Shift** → **Cont** for diode measurement function
2. Using **▲** and **▼** keys to scroll through the three test current selections.

The diode test function measures voltage on the 3V range for the 1 mA test current and the 10 V range for the 100 μ A and 10 μ A ranges. If a reading is more than 10V, the multimeter will display the “OVR.FLW” message.

3.8 Math Functions

The multimeter math operations are divided into four categories:

- $mX+b$ and percent
- dB and dBm calculations
- Statistics of buffered readings
- Limit testing

The first two categories are discussed here in this section, while buffered reading statistics and reading limit testing are described in the next chapter, "Measurement Options".

Notes: *Once math is enabled for a function, the $mX+b$ and percentage calculations will take effect across function changes.*

3.8.1 $mX+b$

This math operation lets you manipulate normal display readings (X) mathematically according to the following calculation:

$$Y = mX + b$$

Where: X is the normally display actual reading

m and b are user-entered constants for scale factor and offset respectively

Y is the displayed result

To configure the $mX+b$ calculation, perform the following steps:

1. Press $mX+b$ for $mX+b$ math operation and the present scale factor M will be displayed:
M: +1.00000 Δ
2. Use the \leftarrow and \rightarrow keys to select the cursor position and use \blacktriangle and \blacktriangledown keys to increment or decrement the selected digits respectively. When the cursor position selects " Δ ", the up and down arrow keys can be used to move the decimal place left or right of its current position.
3. Press Auto (ENTER) to confirm the M value and the message "**CHANGE SAVED**" will be displayed for a moment and then the present B value will be displayed. "m" is the default unit and represents milli (10^{-3}).
B: +0.00000 m
4. Enter a value using the arrow keys, similar to step 2 above.
5. Press Auto (ENTER) to confirm the B value, "**CHANGE SAVED**" will be displayed.
6. The multimeter then returns back to the main display and will now show the results of the $mX+B$ calculation. The right of the display will show MXB.

If you want to change the M and B parameter values after enabling the math function at any time, you can also do the following:

1. Press Shift \rightarrow , "**1: SET M**" will be displayed (Submenu level).
2. Press \blacktriangledown key to enter the parameter level and the present scale factor M will be displayed:
M: +1.00000 Δ .
3. Use the \leftarrow and \rightarrow keys to select the cursor position and use \blacktriangle and \blacktriangledown keys to

Basic Measurements

increment or decrement the digits respectively. When the cursor position selects “^”, the up and down arrow keys can be used to move the decimal place left or right of its current position.

4. Press **Auto** (ENTER) to confirm the M value and the message “**CHANGE SAVED**” will be displayed for a moment and then multimeter returns back to the submenu level. Press **Trig** (ESC) to cancel the M value input, and the multimeter will return back to the submenu level without changing the M value.
5. Press **▶**, “**2: SET B**” will be displayed (Submenu level).
6. Press **▼** key to enter the parameter level and the present offset factor B will be displayed:
B: +00.0000 m.
7. Use the **◀** and **▶** keys to select the cursor position and use **▲** and **▼** keys to increment or decrement the digits respectively. Enter a value using the arrow keys.
8. Press **Auto** (ENTER) to confirm the B value. The message “**CHANGE SAVED**” will be displayed for a moment and then the multimeter will return back to the submenu level. Press **Trig** (ESC) to cancel the B value input, and the multimeter will return back to the submenu level without changing the B value.
9. Press **Shift** → **◀** to exit the menu operation and return back to the mX+b calculated display.

3.8.2 Percent

When selecting the percent calculation function, a reference value must be specified. The displayed reading will be expressed as the percent deviation from the reference value. The percentage calculation is performed as follows:

$$\text{Percent} = \frac{\text{Input} - \text{Reference}}{\text{Reference}} \times 100\%$$

Where: Input is the normally display actual reading
Reference is the user-entered constant
Percent is the displayed result

To configure the percent calculation, perform the following steps:

1. Press **Shift** → **Rel** for percent math operation and the reference value will display as:
REF: +1.00000^
2. Use the **◀** and **▶** keys to select the cursor position and use **▲** and **▼** keys to increment or decrement the digits respectively. When the cursor position selects “^”, the up and down arrow keys can be used to move the decimal place left or right of its current position.
3. Press **Auto** (ENTER) to confirm the reference value. The message “**CHANGE SAVED**” will be displayed for a moment.
4. The multimeter will display the result of the percent calculation.

If you want to change the parameter values when the percent math function is enabled, you can also do the following:

1. Press **Shift** → **▶** to enter the submenu level, “**3: PERCENT**” will be displayed.
2. Press **▼** to enter the parameter level, and the reference value will be displayed:
REF: +1.00000^.
3. Use the **◀** and **▶** keys to select the cursor position and use **▲** and **▼** keys to increment or decrement the digits. Enter a value. When the cursor position selects “^”, the up and

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down arrow keys can be used to move the decimal place left or right of its current position.

- Press **Auto** (ENTER) to confirm the reference value, "**CHANGE SAVED**" will be displayed for a moment, and the multimeter will return to the submenu level. Press **Trig** (ESC) to cancel the reference value input, and the multimeter will go back to the submenu level without changing the reference value.
- Press **Shift** → **◀** key to exit the menu and return to the percent math operation.

The multimeter will display measurement result of the percent calculation. If the value of "Input" is larger than that of "Reference", displayed result will be positive. Contrarily, it will be negative if the value of "Input" is smaller than that of "Reference".

3.8.3 dB Calculation

The 5492B can express AC and DC voltages in dB units. The relationship between dB and voltage is defined by the following equation:

$$\text{dB} = 20 \log \frac{V_{\text{IN}}}{V_{\text{REF}}}$$

Where: V_{IN} is the DC or AC input signal

V_{REF} is the specified voltage reference level

The instrument will read 0dB when the reference voltage level is applied to the input.

If a relative value is in effect when dB is selected, this relative value will be converted to dB value before REL is applied. If REL is applied after dB function has been selected, dB reading will have REL applied to it directly.

To set the reference voltage, perform the following steps:

- Press **Shift** + **mX+b** for dB math operation and the reference value is displayed:
REF: +0.00000Λ
- Use **◀** and **▶** keys to select cursor position and use **▲** and **▼** keys to increment or decrement the digits respectively. Enter a value.
- Press **Auto** (ENTER) to confirm the reference voltage, and the message "**CHANGE SAVED**" will be displayed for a moment. The multimeter will then return back to the measurement status.
- Now the multimeter will display the result of the dB calculation.

If you want to change the parameter values when dB function is in effect, you can do the following:

- Press **Shift** → **▶** to enter the command level, "**4: dB REF**" will be displayed.
- Press **▼** to enter the parameter level, and the reference value will be displayed:
REF: +1.00000Λ.
- Use **◀** and **▶** keys to select cursor position and use **▲** and **▼** keys to increment or decrement the digits respectively. Enter a value and units prefix.
- Press **Auto** (ENTER) to confirm the reference value, the message "**CHANGE SAVED**" will be displayed for a moment, and the multimeter will return to the submenu level. Press **Trig** (ESC) to cancel the reference value input, and the multimeter will return back to the submenu level without

changing the reference value.

5. Press **Shift** → **◀** key to exit the menu and return to the dB math operation.

Notes: *The dB calculation takes the absolute value of the ratio V_{IN}/V_{REF} . The largest negative value of dB is -160 dB. This will accommodate a ratio of $V_{IN} = 1 \mu V$, $V_{REF} = 1000 V$.*

3.8.4 dBm Calculation

dBm is defined as decibels above or below a 1 mW reference. With a user-programmable reference impedance, B&K 5492B reads 0 dBm when the voltage needed to dissipate 1mW through the reference impedance is applied. The relationship between dBm, reference impedance, and the voltage is defined by the following equation:

$$\text{dBm} = 10 \log \frac{(V_{IN}^2 / Z_{REF})}{1\text{mW}}$$

Where: V_{IN} is the DC or AC input signal voltage value.

Z_{REF} is the specified reference impedance.

If a relative value is in effect when dBm is selected, the relative value will be converted to dBm value before REL is applied. If REL is applied after dBm has been selected, dBm calculation will have REL applied to it directly.

To set the reference impedance, perform the following steps:

1. Press **Shift** → **mX+b**, the voltage reference value for dB math function will be displayed.
2. Press **Auto** (ENTER) to confirm the voltage reference value, now you have selected the dB math function.
3. Press **Shift** → **mX+b** again, and the impedance reference value for dBm math function will be displayed:
REF: 0075 Ω
4. Use **◀** and **▶** keys to select cursor position and use **▲** and **▼** keys to increment or decrement the digits respectively. Enter a value from 1 Ω to 9999 Ω .
5. Press **Auto** (ENTER) to confirm the reference impedance, and the message "**CHANGE SAVED**" will be displayed for a moment. The multimeter will then return back to the measurement status.
6. Now the meter will display the result of the dBm calculation.

If you want to change the impedance reference value after the dBm function is enabled, you can also do the following:

1. Press **Shift** → **▶** to enter the command level, "**5: dBm REF**" will be displayed.
2. Press **▼** to enter the parameter level, and the current impedance reference value will be displayed:
REF: +1.0000 Λ
3. Use **◀** and **▶** keys to select cursor position and use **▲** and **▼** keys to increment or decrement the digits respectively. Enter a value from 1 Ω to 9999 Ω .

Basic Measurements

4. Press **Auto** (ENTER) to confirm the reference value, and the message “**CHANGE SAVED**” will be displayed for a moment, then the multimeter will return to the submenu level. Press **Trig** (ESC) to cancel the reference value input, and the multimeter will return back to the submenu level without changing the reference value.
5. Press **Shift** → **◀** key to exit the menu and return to the dB math operation.

NOTE: *The reference impedance and input impedance mentioned in this chapter are completely different. Input impedance is inherent in the instrument and cannot be changed via foregoing methods.*

dBm is valid for both positive and negative DC voltage.

The $mX+b$ and percent math operations are applied after the dBm or dB math calculations. For example, if $mX+b$ is selected with $m=10$ and $b=0$, the display will read 10.000 MXB for a 1 VDC signal. If dBm is selected with ($Z_{REF} = 50 \Omega$), the display will read 130 MXB.

Chapter 4 Measurement Options

This chapter is outlined as follows:



- 4.1 Measurement configuration
- 4.2 Trigger Operations
- 4.3 Buffer Operations
- 4.4 Limit Operations
- 4.5 System Operations

4.1 Measurement configuration

4.1.1 Range


You can let the multimeter automatically select the range using auto ranging or you can select a fixed range using manual ranging. Auto ranging is convenient because the multimeter automatically selects the appropriate range for each measurement. However, you can use manual ranging for faster measurements since the multimeter will not have to determine which range to use for each measurement. The digital multimeter returns back to auto ranging when power has been off or after a remote interface reset. Note that auto ranging is not available for some measurement functions and ranges.

Manual ranging

To select a range, simply press  or  key. The instrument changes one range per key press. The selected range is displayed momentarily before showing the measured readings.


If the instrument displays the “OVR.FLW” message on a particular range, select a higher range until an in-range reading is displayed. Use the lowest range possible without causing an overflow to ensure best accuracy and resolution.

Autoranging

To enable auto range, press  key. The **AUTO** annunciator turns on when autoranging is selected. While selected, the instrument automatically chooses the best range to measure the applied signal.

Note that up-ranging occurs at 100% of the range, while down-ranging occurs at 10 % of normal range.

To cancel auto range, press  or  or  key. Pressing  to cancel auto range will leave the instrument in its present range.

The  key has no effect on the continuity and diode test functions.

4.1.2 Filter

FILTER lets you set the filter response to stabilize noisy measurements. The multimeter uses a digital filter. The displayed, stored and transmitted readings are simply an average of a number of reading conversions (from 1 to 100).

Perform the following steps to select a filter:

1. Press **Shift** → **Left Arrow** to enter the menu on the menu level, “**A: MEAS MENU**” will be displayed.
2. Press **Down Arrow** to move down to the submenu level within the MEAS MENU, “**1: CONTINUITY**” will be displayed.
3. Use **Left Arrow** or **Right Arrow** key to move across to the Filter option on the submenu level, “**2: FILTER**” will be displayed.
4. Press **Down Arrow** to move down a level to the filter parameter choice.
5. Using **Left Arrow** or **Right Arrow** to turn ON or OFF the filter.
6. Press **Auto** (ENTER) to confirm the selection. The message “**CHANGE SAVED**” will be displayed to show that the change is now in effect. The multimeter automatically exits the parameter level and moves up a level to the submenu level.
7. Use **Right Arrow** to move across to the filter type option on the submenu level, “**3: FILT TYPE**” will be displayed.
8. Press **Down Arrow** to move down a level to the filter type parameter choice.
9. Use **Left Arrow** or **Right Arrow** to select MOVNG AV (Moving average) or REPEAT filter type.
10. Press **Auto** (ENTER) to confirm the selection. The message “**CHANGE SAVED**” will be displayed to show that the change is now in effect. The multimeter automatically exits the parameter level and moves up a level to the submenu level.
11. Use **Right Arrow** to move across to the filter count option on the submenu level, “**4: FILT COUNT**” will be displayed.
12. Press **Down Arrow** to move down a level to edit the filter count parameter.
13. Use **Left Arrow** and **Right Arrow** keys to select cursor position and use **Up Arrow** and **Down Arrow** keys to increment or decrement the digits respectively. Enter a filter count from 1 to 100.
14. Press **Auto** (ENTER) to confirm the count value. The message “**CHANGE SAVED**” will be displayed to show that the change is now in effect. The meter automatically exits the parameter level and moves up a level to the submenu level.
15. Press **Shift** → **Left Arrow** key to exit from the menu and return to the measurement status.
16. The **FILT** annunciator will display when the filter function is ON.

NOTE: *The filter cannot be set for frequency, period, continuity and diode test functions.*

Filter Types

A. Moving Average (MOVNG AV)

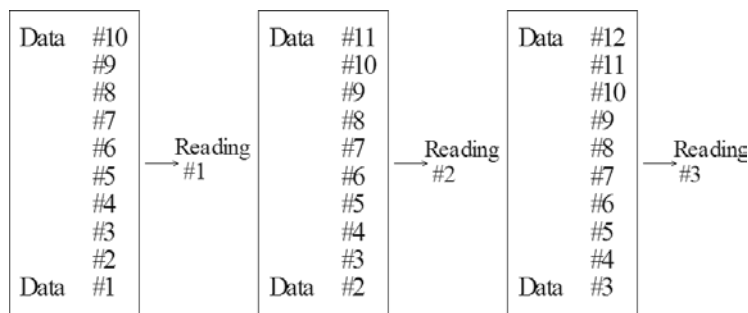
The Moving average filter uses a first-in, first-out stack. When the stack becomes full, the measurement conversions are averaged, yielding a reading. For each subsequent conversion placed into the stack,

Measurement Options

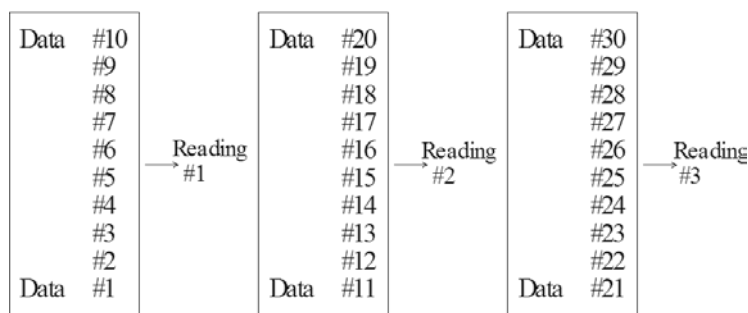
the oldest conversion is discarded, and the stack is re-averaged, yielding a new reading. See Figure 4-1 below.

B. Repeat Average (REPEAT)

For the repeating average filter, the stack is filled and the conversions are averaged to yield a reading. The stack is then cleared and the process starts over as shown in Figure 4-1.



A. Type-Moving average, Filter Count=10



B. Type- Repeat average, Filter Count=10

Figure 4-1 Moving average and repeating average filters

Response Time

The filter parameters have speed and accuracy tradeoffs for the time needed to display, store, or output a filtered reading.

4.1.3 Relative

The relative operation can be used to null offsets or subtract a baseline reading from present and future readings. When relative function is enabled, the multimeter uses the present reading as a relative value. Subsequent readings will be the difference between the actual input value and the relative value.

You can define a relative value for each function. Once a relative value is set for a measurement function, the value is the same for all ranges. For example, if 2 V is set as a relative value on the 12 V range, the relative is also 2 V on the 1000 V, 120 V, 1.2 V or 120 mV ranges.

Additionally, when you perform a zero correction for DCV, $\Omega 2$ or $\Omega 4$ measurements by enabling REL, the

Measurement Options

displayed offset becomes the reference value. Subtracting the offset from the actual input, the display will be as follows:

$$\text{Displayed reading} = \text{Actual Input} - \text{Reference}$$

Selecting a range that cannot accommodate the relative value does not cause an overflow condition, but it also does not increase the maximum allowable input for that range. For example: on the 1.2 V range, the meter still overflows for a 1.4 V input.

To set a REL value, press when the display shows the value you want as the relative value. The REL annunciator will display. To disable REL, Press again.

You can also input a REL value manually using the mX+b function. Set M for 1 and B for any value you want. Please refer to Chapter 3 for details about mX+b function.

4.1.4 Rate

The RATE operation sets the integration time of the A/D converter, the period of time the input signal is measured. The integration time affects the usable digits, the amount of reading noise, as well as the reading rate of the instrument. The integration time is specified in parameters based on a number of power line cycles (NPLC), where 1 PLC for 50 Hz is 20 msec.

In general, the fastest integration time (FAST (0.1 PLC) set from the front panel or remote interface) results in increased reading noise and fewer usable digits, while the slowest integration time (10 PLC) provides the best common-mode and normal-mode rejection. In-between settings are a compromise between speed and noise.

The RATE parameters are explained as follows:

Fast

FAST sets integration time to 0.1 PLC. Use FAST if speed is of primary importance, however it is at the expense of increased reading noise and fewer usable digits.

Medium

Medium sets integration time to 1 PLC. Use Medium when a compromise between noise performance and speed is acceptable.

Slow

Slow sets integration time to 10 PLC. SLOW provides better noise performance at the expense of speed.

For the AC functions (ACV, ACI), Rate setting determines the bandwidth setting as below:

Fast	500 Hz~100 kHz
Medium	50 Hz~100 kHz
Slow	5 Hz~100 kHz

Note: *The integration time can be set for any measurement function except frequency, period, continuity (FAST) and diode test (MEDium). For frequency and period, it is the equivalent of the gate time, 1 sec.*

4.2 Trigger Operations

The multimeter's triggering system allows you to generate triggers either manually, automatically, or externally for taking multiple readings per trigger. The following discusses front panel triggering, programmable trigger delay, and the reading hold feature.

4.2.1 Trigger Model

The flowchart below (Figure 4-2) summarizes the triggering process of the instrument.

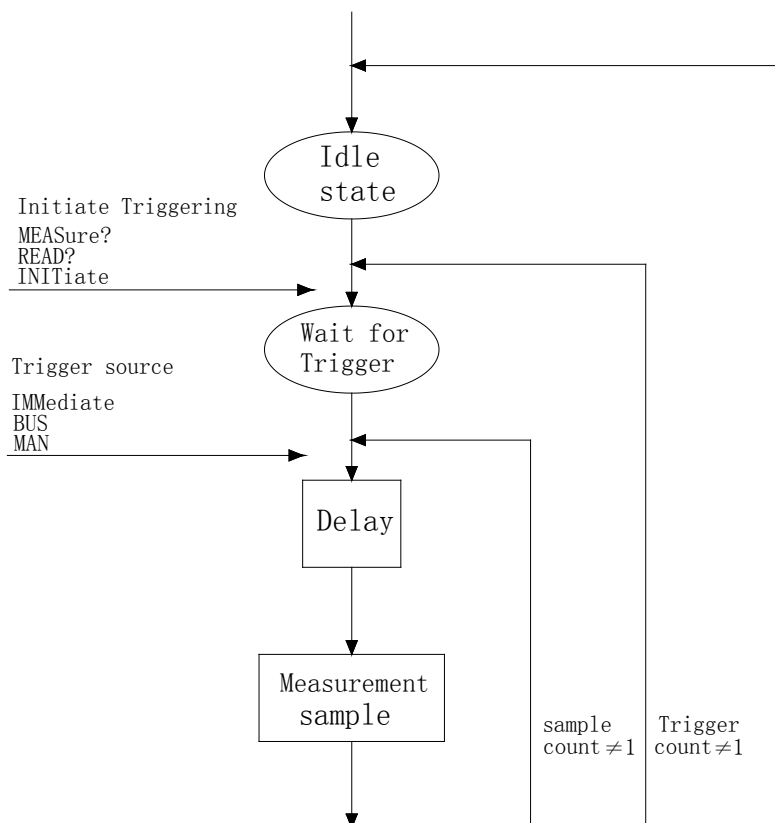


Figure 4-2 Trigger model

Idle


The instrument is considered to be in the idle state whenever it is not performing any measurement.

Wait for Trigger

The control source holds up operation until the programmable event occurs and is detected. See description below for trigger sources:

- Immediate
With this trigger source, event detection happens immediately.
- External
Event detection happens when either of the following takes place:


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1. A bus trigger (*TRG) command is received via remote control.
2. The front panel  key is pressed (The meter must be in local mode first).

Trigger Source

The trigger source can be set from the front panel trigger menu. Users can select either IMM, MAN, BUS, or EXT. Description of each are as follows:












IMM: Immediate. Event detection happens immediately and will continue making measurement continuously.

MAN: Manual. Event detection happens when the front panel  key is pressed. (The unit must already be in local mode first).

BUS: Event detection happens with a bus trigger (*TRG) command is received via remote control.

EXT: Event detection happens when an external trigger signal is sent to the EXT TRIG input terminal in the rear panel of the instrument.

To set or change the trigger source, do the following:

1. Press  →  to enter the menu on the menu level, "**A: MEAS MENU**" will be displayed.
2. Use  or  key to move across to the TRIG MENU on the menu level, "**C: TRIG MENU**" will be displayed.
3. Press  to move down to the command level within the TRIG MENU, "**1: TRIG MODE**" will be displayed.
4. Press  to move down a level to select the trigger source.
5. Use  or  to select IMM, MAN, BUS, or EXT trigger source.
6. Press  (ENTER) to confirm the selection. The message "**CHANGE SAVED**" will be displayed to show that the change is now in effect. The meter will then exit the parameter level and move up a level to the command level.
7. Press  →  key to exit from the menu and return to the measurement display.

Delay

A programmable delay is available after event detection. It can be set manually or automatically. With Auto delay, the meter selects a delay based on the function and range. The AUTO delay settings are listed in Table 4-1 below.

Measurement Options

Table 4-1 Auto delay settings

Function	Range and Delay						
DCV	120mV 1ms	1.2V 1ms	12V 1ms	120V 5ms	1000V 5ms		
ACV	120mV 400ms	1.2V 400ms	12V 400ms	120V 400ms	750V 400ms		
FREQ	120mV 1ms	1.2V 1ms	12V 1ms	120V 1ms	750V 1ms		
DCI	12mA 2ms	120mA 2ms	1.2A 2ms	12A 2ms			
ACI	12mA 400ms		1.2A 400ms	12A 400ms			
Ω 2W, Ω 4W	120 Ω 3ms	1.2k Ω 3ms	12k Ω 13ms	120k Ω 25ms	1.2M Ω 100ms	12M Ω 150ms	120M Ω 250ms
Continuity		1k Ω 3ms					
Diode testing		1mA 1ms	100uA 1ms	10uA 1ms			

To set the delay manually, follow the below steps:

8. Press **Shift** → **←** to enter the menu on the menu level, "**A: MEAS MENU**" will be displayed.
9. Use **←** or **→** key to move across to the TRIG MENU on the menu level, "**C: TRIG MENU**" will be displayed.
10. Press **▼** to move down to the command level within the TRIG MENU, "**1: TRIG MODE**" will be displayed.
11. Use **→** to move across to the TRIG DELAY command on the command level, "**2: TRIG DELAY**" will be displayed.
12. Press **▼** to move down a level to set the type of delay mode.
13. Using **←** or **→** to select AUTO or MANU (Manual) delay mode.
14. Press **Auto** (ENTER) to confirm the choice. The message "**CHANGE SAVED**" will be displayed to show that the change is now in effect. If AUTO mode is selected, the multimeter will exit the parameter level and move up a level to the command level.
15. If MANU mode is selected, a delay time will need to be specified. The screen will display like below to show the current manual trigger delay value:
 DELAY: 0000mS
16. Use **←** and **→** keys to choose a numerical place and use **▲** and **▼** keys to increment or decrement the digits. Enter a value for delay time (0 to 6000 ms).
17. Press **Auto** (ENTER) to confirm the delay time. The message "**CHANGE SAVED**" will be displayed to show that the change is now in effect. The multimeter will automatically exit the parameter level and move up a level to the command level.
18. Press **Shift** → **←** key to exit from the menu and return to the measurement display.

Note: *Changing the trigger delay to MANU (Manual) on any function changes the same for all other functions.*

Measurement Options

A 0.6k Ω reading becomes 600 Ω (HI).

When the reading is within the configured limit range specified by low and high limits, "IN" will be shown after measured display. If it is higher than the limit range, "HI" will be shown after the measured display. Similarly, if it is lower than the limit range, "LO" will be shown. You can configure the multimeter to beep or not when readings are outside of the limit range.

4.4.1 Enabling limits

Use the following procedure to turn on the limit operation:

1. Press **Shift** → **Left Arrow** to enter the menu on the menu level, "**A: MEAS MENU**" will be displayed.
2. Use **Left Arrow** or **Right Arrow** key to move across to the MATH MENU on the menu level, "**B: MATH MENU**" will be displayed.
3. Press **Down Arrow** to move down to the command level within the MATH MENU, "**1: SET M**" will be displayed.
4. Use **Left Arrow** or **Right Arrow** key to move across to the LIMIT TEST command, "**6: LIMIT TEST**" will be displayed.
5. Press **Down Arrow** to move down a level to set LIMIT TEST function to ON.
6. Press **Auto** (ENTER) to confirm the set of LIMIT TEST function. The message "**CHANGE SAVED**" will be displayed to show that the change is now in effect.
7. Press **Shift** → **Left Arrow** key to exit from the menu.
8. When the multimeter returns to the measurement display, the HI/IN/LO status will be displayed along with the reading. If the reading is within the range specified by the high and low limits (configured in the next section), it will show "IN". If higher than the range, it will show "HI". If lower than the range, it will show "LO".

4.4.2 Setting Limit Values

Follow the below steps to configure high and low limits for limit operation:

1. Press **Shift** → **Left Arrow** to enter the menu on the menu level, "**A: MEAS MENU**" will be displayed.
2. Use **Left Arrow** or **Right Arrow** key to move across to the MATH MENU on the menu level, "**B: MATH MENU**" will be displayed.
3. Press **Down Arrow** to move down to the command level within the MATH MENU, "**1: SET M**" will be displayed.
4. Use **Left Arrow** or **Right Arrow** key to move across to the HIGH LIMIT command, "**7: HIGH LIMIT**" will be displayed.
5. Press **Down Arrow** to move down a level to input the high limit value. The current high limit value will be displayed:
HI: +1.00000 Λ
6. Use **Left Arrow** and **Right Arrow** keys to choose a numerical place and use **Up Arrow** and **Down Arrow** keys to increment or decrement the digits. Enter a high limit value.
7. Press **Auto** (ENTER) to confirm the value of high limit. The message "**CHANGE SAVED**" will be displayed to show that the change is now in effect.

Measurement Options

8. Use or key to move across to the LOW LIMIT command, "**8: LOW LIMIT**" will be displayed.
9. Press to move down a level to input the low limit value. The current low limit value will be displayed:
LO: -1.00000Λ
10. Use and keys to choose a numerical place and use and keys to increment or decrement the digits. Enter a low limit value.
11. Press (ENTER) to confirm the value of low limit. The message "**CHANGE SAVED**" will be displayed to show that the change is now in effect.
12. Press → key to exit from the menu.

4.4.3 Configure Limit Beep

Users can configure the multimeter to make a beep sound upon specified conditions when using limit operation. Follow the below steps to configure:

1. Press → to enter the menu on the menu level, "**A: MEAS MENU**" will be displayed.
2. Use or key to move across to the MATH MENU on the menu level, "**B: MATH MENU**" will be displayed.
3. Press to move down to the command level within the MATH MENU, "**1: SET M**" will be displayed.
4. Use or key to move across to the LIMIT BEEP command, "**9: LIMIT BEEP**" will be displayed.
5. Press to move down a level to select the condition in which the meter should make a beep sound when using limit operation. The display should show "**ALARM:**" with the current selection blinking.
6. Use and keys to choose between one of the following:
 - NEVER: Never beep regardless of the limit status (HI, LO, IN).
 - HI: Beep only when the reading is HI (Reading is above the high limit).
 - IN: Beep only when the reading is within the range specified by high and low limits.
 - LO: Beep only when the reading is LO (Reading is below the low limit).
 - OUT: Beep only when the reading is HI or LO.
7. Press (ENTER) to confirm the value of high limit. The message "**CHANGE SAVED**" will be displayed to show that the change is now in effect.

4.5 System Operations

There are some system settings that can be configured on the 5492B multimeter, which include beeper control, saving and restoring instrument settings, front panel display control, key sound control, self-test, and calibration. The following sections will describe in details each of these settings.

4.5.1 Beeper Control

Under default settings, the multimeter will emit a beep tone whenever certain conditions are met. This beep can be disabled by the user.

- When you disable the beeper, the multimeter will not emit a tone when:
 1. A limit is exceeded in a limit test
- Disabling the beeper has no effect on the tone generated when:
 1. An internal error is generated.
 2. The continuity threshold is exceeded.
 3. A front panel key is pressed (This is controlled by KEY SOUND CONTROL setting).
- The beeper state is stored in non-volatile memory and does not change when power has been off or after a reset.

Use the following steps to change the beeper's state:

1. Press **Shift** → **◀** to enter the menu on the menu level, "**A: MEAS MENU**" will be displayed.
2. Use **◀** or **▶** key to move across to the SYS MENU on the menu level, "**D: SYS MENU**" will be displayed.
3. Press **▼** to move down to the command level within the SYS MENU, "**1: RDGS STORE**" will be displayed.
4. Use **◀** or **▶** key to move across to the BEEP command, "**4: BEEP**" will be displayed.
5. Press **▼** to move down a level to set the beeper control.
6. Use **◀** or **▶** key to select ON or OFF.
7. Press **Auto** (ENTER) to confirm the beeper control. The message "**CHANGE SAVED**" will be displayed to show that the change is now in effect.
8. Press **Shift** → **◀** key to exit from the menu.







4.5.2 Save Settings

The 5492B allows user to save up to 10 instrument settings. These settings are saved as files in non-volatile memory (10 files: FILE-0 – FILE-9). Files will not be lost when the instrument is powered off. These settings can be restored at any time after power on. The settings that can be stored in each file are the same settings listed under the default settings. Refer to section "2.6.4 Power-on Defaults" for details.

To save settings, first setup the instrument with the settings you want to save. Then, follow the steps below:














1. Press **Shift** → **◀** to enter the menu on the menu level, "**A: MEAS MENU**" will be displayed.
2. Use **◀** or **▶** key to move across to the SYS MENU on the menu level, "**D: SYS MENU**" will be displayed.
3. Press **▼** to move down to the command level within the SYS MENU, "**1: RDGS STORE**" will be displayed.
4. Use **◀** or **▶** key to move across to the SAVE CNFG command, "**5: SAVE CNFG**" will be displayed.

Measurement Options

5. Press  to move down a level to select a file to save.
6. Use  or  key to select a file from FILE-0 to FILE-9.
7. Press  (ENTER) to save the present setting to the selected file. The message **"FILE SAVING"** will display when saving is in progress. Once completed, **"SAVE SUCCEED"** will be displayed.
8. Press  →  key to exit from the menu.

4.5.3 Restore Settings

To recall previously saved settings (stored in FILE-0 to FILE-9), or to restore factory default settings, follow the below steps:

1. Press  →  to enter the menu on the menu level, **"A: MEAS MENU"** will be displayed.
2. Use  or  key to move across to the SYS MENU on the menu level, **"D: SYS MENU"** will be displayed.
3. Press  to move down to the command level within the SYS MENU, **"1: RDGS STORE"** will be displayed.
4. Use  or  key to move across to the LOAD CNFG command, **"6: LOAD CNFG"** will be displayed.
5. Press  to move down a level to select a file to restore.
6. Use  or  key to select "FACT" to restore factory default settings. To restore user saved settings, select one of the "FILE-#" locations that contain the settings you want to restore (FILE-0 to FILE-9).
7. Press  (ENTER) to restore the selected setting. The message **"FILE LOADING"** and **"LOAD SUCCEED"** will be displayed.
8. Press  →  key to exit from the menu.









4.5.4 Display Control

To speed up measurement rate for remote control, the 5492B allows the user to turn off the front panel display.






When the front panel display is turned off, readings are not sent to the display. Some annunciators will still stay lid. Front panel operation is unaffected by turning off the display.

The display will be enabled again after a power on/off or after a remote interface reset.

To control the display settings, follow the below steps:

1. Press  →  to enter the menu on the menu level, **"A: MEAS MENU"** will be displayed.
2. Use  or  key to move across to the SYS MENU on the menu level, **"D: SYS MENU"** will be displayed.
3. Press  to move down to the command level within the SYS MENU, **"1: RDGS STORE"** will be displayed.
4. Use  or  key to move across to the DISPLAY command, **"7: DISPLAY"** will be displayed.
5. Press  to move down a level to set the display control.














Measurement Options

6. Use  or  key to select ON or OFF for the front panel display.
7. Press  (ENTER) to confirm the selection. The message “**CHANGE SAVED**” will be displayed to show that the change is now in effect.
8. Press  →  key to exit from the menu.

4.5.5 Key Sound












The multimeter by default is shipped with beep sound enabled when keys are pressed. This can be set to ON or OFF by the user.



Follow the steps below to set the key sound settings:

1. Press  →  to enter the menu on the menu level, “**A: MEAS MENU**” will be displayed.
2. Use  or  key to move across to the SYS MENU on the menu level, “**D: SYS MENU**” will be displayed.
3. Press  to move down to the command level within the SYS MENU, “**1: RDGS STORE**” will be displayed.
4. Use  or  key to move across to the KEY SOUND command, “**8: KEY SOUND**” will be displayed.
5. Press  to move down a level to enable or disable the key sound.
6. Use  or  key to turn ON or turn OFF the key sound.
7. Press  (ENTER) to confirm the selection. The message “**CHANGE SAVED**” will be displayed to show that the change is now in effect.
8. Press  →  key to exit from the menu.

4.5.6 Self-test

The multimeter has a built-in self-test routine that is processed during an initial power up of the instrument. Additionally, two other self-test routines can be run from the front panel. To do this, follow the below steps:

1. Press  →  to enter the menu on the menu level, “**A: MEAS MENU**” will be displayed.
2. Use  or  key to move across to the SYS MENU on the menu level, “**D: SYS MENU**” will be displayed.
3. Press  to move down to the command level within the SYS MENU, “**1: RDGS STORE**” will be displayed.
4. Use  or  key to move across to the KEY SOUND command, “**9: TEST**” will be displayed.
5. Press  to move down a level to select the self-test to run.
6. Use  or  key to select “KEY” (tests the keys) or “BUILT-IN” self-test.
7. Press  (ENTER) to confirm the selection.

If “KEY” is selected, it will initially display a message “**NO KEY PRESS**”. At this point, pressing any keys will display the key’s function. For example, pressing  will display “**LEFT PRESS**” message. To exit the key self-test. Press  button. After it displays “**SHIFT PRESS**”

Measurement Options

message, it will return to the parameter level for selecting self-test.

If "BUILT-IN" is selected, the unit will run an internal self-test. This will take approximately 10-15 seconds. After completion, the message "TEST PASS" will display if no errors occur during the self-test.

8. Press  →  key to exit from the menu.

4.5.7 Calibration

B&K Precision recommends a calibration period of once a year.

Note: *To prevent corruption of the calibration data stored in non-volatile memory of the instrument, only authorized service center or qualified individuals may proceed with calibrating the instrument.*

Please contact B&K Precision for information about instrument calibration.

Chapter 5 Remote Operation

This chapter is outlined as follows:

- 5.1 Selecting an Interface**
- 5.2 USB & RS-232 Interface Operation**
- 5.3 GPIB Interface operation**
- 5.4 Data Format**

The 5492B supports remote control over the USB (virtual com), RS-232, and GPIB interface located in the rear panel. You can use only one interface at a time. Standard Commands for Programmable Instruments (SCPI) is supported by these interfaces (unless otherwise noted), however they use different hardware configurations and communication protocols.

5.1 Selecting an Interface

The 5492B supports the following interfaces for remote communication:

- USB (virtual COM) device interface
- RS-232 interface
- GPIB bus interface (optional) (model 5492BGPIB)

You can only use one interface at a time for remote communication. USB & RS232 interfaces are selected as the default factory setting. You can select the interface from the front panel menu system. The interface selection is stored in non-volatile memory and does not change from a power on/off or instrument reset.

5.1.1 USB (Virtual COM) Interface

The USB device interface on this instrument is a USB virtual COM. After installing the appropriate USB drivers, the instrument will be recognized and assigned to a COM port automatically by the PC as if it's a RS-232 serial interface. Aside from installing drivers, the setup and operation is the same as RS-232 serial interface, which is described in details in the following sections.

Installing USB Driver

To install the USB driver, visit www.bkprecision.com and go to the product page to download the driver. The drivers are managed and updated by a third-party, so check B&K Precision's website for the latest version.

Chapter 8 Specifications

8.1 Technical Specifications

Specifications Assumptions

- One year calibration cycle.
- Operating temperature between 18°C to 28°C
- Accuracy is expressed as: $\pm(\% \text{ of reading} + \% \text{ of range})$ after a 30 minute warm up and valid for 10 PLC (slow)
- Temperature Coefficient: add $\pm [0.1\% \times (\text{the applicable accuracy}) / ^\circ\text{C}]$ for 0°C to 18°C and 28°C to 40°C;
- Relative Humidity: Up to 80% for 0°C to 28°C (75% RH for 10 M Ω and above ranges of resistance measurement). Up to 70 for 28°C to 40°C.

Displayed Readings and Reading rates

Full Scale displayed reading

Slow	Med	Fast
119,999	119,999	11,999

Reading rates on front panel (Reading/sec, Approximate)

Measurement Function	Slow	Med	Fast
DCV	4	16	57
DCA	4	16	57
ACV	3	4	25
ACA	3	4	25
2-Wire Ω (Ranges below 120 k Ω)	4	16	57
2-Wire Ω (120 k Ω range and above)	4	16	25
4-Wire Ω (Ranges below 120 k Ω)	3	10	33
4-Wire Ω (120 k Ω range and above)	3	10	20
Freq	1	————	————
Period	1	————	————
Diode	————	16	————
Continuity	————	————	57

Specifications

DC CHARACTERISTICS

CONDITIONS: SLOW or MED with filter count of 10

DC Voltage

Resolution, Full Scale reading and Accuracy \pm (% of reading + % of range), 23 °C \pm 5 °C

Rate	Range	Resolution	Typical Input Impedance	Accuracy (1 year)	Full Scale Reading
Slow	120.000 mV	1 μ V	>10G	0.02+0.008 ⁽¹⁾	119.999
	1.20000 V	10 μ V	>10G	0.01+0.004 ⁽¹⁾	1.19999
	12.0000 V	100 μ V	>10G	0.01+0.004	11.9999
	120.000 V	1 mV	10M \pm 1%	0.01+0.004	119.999
	1000.00 V	10 mV	10M \pm 1%	0.01+0.004	1010.00 ⁽²⁾
Med	120.000 mV	1 μ V	>10G	0.02+0.015 ⁽¹⁾	119.999
	1.20000 V	10 μ V	>10G	0.01+0.008 ⁽¹⁾	1.19999
	12.0000 V	100 μ V	>10G	0.01+0.008	11.9999
	120.000 V	1 mV	10M \pm 1%	0.01+0.008	119.999
	1000.00 V	10 mV	10M \pm 1%	0.01+0.008	1010.00 ⁽²⁾
Fast	120.00 mV	10 μ V	>10G	0.02+0.040 ⁽¹⁾	119.99
	1.2000 V	100 μ V	>10G	0.02+0.020 ⁽¹⁾	1.1999
	12.000 V	1 mV	>10G	0.02+0.020	11.999
	120.00 V	10 mV	10M \pm 1%	0.02+0.020	119.99
	1000.0 V	100 mV	10M \pm 1%	0.02+0.020	1010.0 ⁽²⁾
⁽¹⁾ under REL status					
⁽²⁾ 1% over-range (1010 V) is readable at 1000 V range					

Maximum input voltage: 1000VDC or peak ac for all ranges.

Specifications

DC Current

Rate	Range	Resolution	Full Scale Reading	Accuracy (1 year)	Burden Voltage ⁽¹⁾ & Shunt Resistor
Slow	12.0000mA	0.1 μ A	11.9999	0.05+0.008 ⁽²⁾	<0.15 V / 10.1 Ω
	120.000mA	1 μ A	119.999	0.05+0.004 ⁽²⁾	<1.5 V / 10.1 Ω
	1.20000 A	10 μ A	1.19999	0.10+0.004	<0.3 V / 0.1 Ω
	12.0000 A ⁽³⁾	100 μ A	11.9999	0.25+0.004	<0.15 V / 10 m Ω
Med	12.0000mA	0.1 μ A	11.9999	0.05+0.015 ⁽²⁾	<0.15 V / 10.1 Ω
	120.000mA	1 μ A	119.999	0.05+0.008 ⁽²⁾	<1.5 V / 10.1 Ω
	1.20000 A	10 μ A	1.19999	0.10+0.008	<0.3 V / 0.1 Ω
	12.0000 A ⁽³⁾	100 μ A	11.9999	0.25+0.008	<0.15 V / 10 m Ω
Fast	12.000mA	1 μ A	11.999	0.10+0.02 ⁽²⁾	<0.15 V / 10.1 Ω
	120.00mA	10 μ A	119.99	0.10+0.02 ⁽²⁾	<1.5 V / 10.1 Ω
	1.2000 A	100 μ A	1.1999	0.10+0.02	<0.3 V / 0.1 Ω
	12.000 A ⁽³⁾	1 mA	11.999	0.25+0.02	<0.15 V / 10 m Ω

(1) Typical voltage across the input terminals at full scale reading.
 (2) Use REL function
 (3) In 12A range, >10-12 A is readable for 20 seconds maximum

TRUE RMS AC CHARACTERISTICS

AC Voltage

Resolution and Full Scale Reading

Range	Resolution		Full Scale Reading	
	Slow & Med	Fast	Slow & Med	Fast
120.000 mV	1 μ V	10 μ V	119,999	119.99
1.20000 V	10 μ V	100 μ V	1.19999	1.1999
12.0000 V	100 μ V	1 mV	11.9999	11.999
120.000 V	1 mV	10 mV	119.999	119.99
750.00 V	10 mV	100 mV	757.50 ⁽¹⁾	757.5 ⁽¹⁾

(1) 1% over- range (757.5V) is readable at 750 V range.

Accuracy

Rate	Range	Accuracy (1 year) \pm (% of reading + % of range), 23°C \pm 5°C ⁽¹⁾				
		10~20 Hz	20~50 Hz	50~20 kHz	20~50 kHz	50~100 kHz
Slow	120.000 mV	1.50+0.100	0.50+0.100	0.10+0.100	0.30+0.150	1.0+0.150
	1.20000 V	1.50+0.100	0.50+0.100	0.10+0.100	0.30+0.100	1.0+0.100
	12.0000 V	1.50+0.100	0.50+0.100	0.10+0.100	0.30+0.100	1.0+0.100
	120.000 V	1.50+0.100	0.50+0.100	0.10+0.100	0.30+0.100	1.0+0.100
	750.00 V	1.50+0.100	0.50+0.100	0.10+0.100	0.30+0.100 ⁽²⁾	1.0+0.100 ⁽¹⁾

Specifications

Med	120.000 mV	1.50+0.200	0.50+0.200	0.10+0.200	0.30+0.300	1.0+0.300
	1.20000 V	1.50+0.150	0.50+0.150	0.10+0.150	0.30+0.200	1.0+0.200
	12.0000 V	1.50+0.150	0.50+0.150	0.10+0.150	0.30+0.200	1.0+0.200
	120.000 V	1.50+0.150	0.50+0.150	0.10+0.150	0.30+0.200	1.0+0.200
	750.00 V	1.50+0.150	0.50+0.150	0.10+0.150	0.30+0.200 ⁽²⁾	1.0+0.200 ⁽¹⁾
Fast	120.00 mV		1.50+0.30	0.20+0.15	0.50+0.15	1.5+0.15
	1.2000 V		1.50+0.20	0.20+0.10	0.50+0.10	1.5+0.10
	12.000 V		1.50+0.20	0.20+0.10	0.50+0.10	1.5+0.10
	120.00 V		1.50+0.20	0.20+0.10	0.50+0.10	1.5+0.10
	750.0 V		1.50+0.20	0.20+0.10	0.50+0.10 ⁽²⁾	1.5+0.10 ⁽¹⁾
Max. crest factor: 3.0 at full scale						
⁽¹⁾ Specifications are for sine wave inputs >5% of the range						
⁽²⁾ $\leq 3 \times 10^7$ Volt-Hz at 750 VAC range						

Maximum input voltage: 750 Vrms

$\leq 3 \times 10^7$ Volt-Hz for all ranges

Input impedance: 1 M Ω ±2% in parallel with capacitance <100 pF

Maximum DCV: 500V for all AC ranges

AC Current (True RMS, AC Coupling)

Resolution and Full Scale Reading

Rate	Range	Resolution	Full Scale Reading	Burden Voltage ⁽¹⁾ & Shunt Resistor
Slow	12.0000mA	0.1 μ A	11.9999	<0.15 V / 10.1 Ω
	1.20000 A	10 μ A	1.19999	<0.3 V / 0.1 Ω
	12.0000 A ⁽²⁾	100 μ A	11.9999	<0.15 V / 10 m Ω
Med	12.0000mA	0.1 μ A	11.9999	<0.15 V / 10.1 Ω
	1.20000 A	10 μ A	1.19999	<0.3 V / 0.1 Ω
	12.0000 A ⁽²⁾	100 μ A	11.9999	<0.15 V / 10 m Ω
Fast	12.000mA	1 μ A	11.999	<0.15 V / 10.1 Ω
	1.2000 A	10 μ A	1.1999	<0.3 V / 0.1 Ω
	12.000 A ⁽²⁾	1 mA	11.999	<0.15 V / 10 m Ω
⁽¹⁾ Typical voltage across the input terminals at full scale reading. In 12A range, >10-12 A _{AC} is readable for 20 seconds maximum				

Accuracy

Rate	Range	Accuracy (1 year) \pm (% of reading + % of range), 23°C \pm 5°C ⁽¹⁾			
		10~20 Hz	20~50 Hz	50~2 kHz	2~10 kHz
Slow	12.0000 mA	1.0+0.080	0.50+0.080	0.25+0.080	2.0+0.080
	1.20000 A	1.0+0.080	0.50+0.080	0.25+0.080	2.0+0.080
	12.0000 A	1.0+0.080	0.50+0.080	0.25+0.080	2.0+0.080

Specifications

Med	12.0000 mA	1.0+0.150	0.50+0.150	0.25+0.150	2.0+0.150
	1.20000 A	1.0+0.150	0.50+0.150	0.25+0.150	2.0+0.150
	12.0000 A	1.0+0.150	0.50+0.150	0.25+0.150	2.0+0.150
Fast	12.000 mA		1.0+0.20	0.5+0.10	3.0+0.10
	1.2000 A		1.0+0.20	0.5+0.10	3.0+0.10
	12.000 A		1.0+0.20	0.5+0.10	3.0+0.10
Max. crest factor: 3.0 at full scale					
⁽¹⁾ Specifications are for sine wave inputs >5% of the range					

Maximum Input and Overload Current Protection: 2A/ 250V fuse.

Resistance (2-Wire and 4-Wire)

Accuracy \pm (% of reading + % of range), 23°C \pm 5°C

Rate	Range ⁽¹⁾	Resolution	Full Scale Reading	Test Current	Accuracy (1 year)
Slow	120.000 Ω	1 m Ω	119.999	1 mA	0.05 +0.008 ⁽²⁾
	1.20000 k Ω	10 m Ω	1.19999	1 mA	0.03 +0.004 ⁽²⁾
	12.0000 k Ω	100 m Ω	11.9999	100 μ A	0.03 +0.004 ⁽²⁾
	120.000 k Ω	1 Ω	119.999	10 μ A	0.03 +0.004
	1.20000 M Ω	10 Ω	1.19999	10 μ A	0.03 +0.004
	12.0000 M Ω	100 Ω	11.9999	7.0/(10M+Rx) μ A	0.10 +0.004
	120.000 M Ω	1 k Ω	119.999	7.0/(10M+Rx) μ A	0.50 +0.008
Med	120.000 Ω	1 m Ω	119.999	1 mA	0.05 +0.015 ⁽²⁾
	1.20000 k Ω	10 m Ω	1.19999	1 mA	0.03 +0.008 ⁽²⁾
	12.0000 k Ω	100 m Ω	11.9999	100 μ A	0.03 +0.008 ⁽²⁾
	120.000 k Ω	1 Ω	119.999	10 μ A	0.03 +0.008
	1.20000 M Ω	10 Ω	1.19999	10 μ A	0.03 +0.008
	12.0000 M Ω	100 Ω	11.9999	7.0/(10M+Rx) μ A	0.10 +0.008
	120.000 M Ω	1 k Ω	119.999	7.0/(10M+Rx) μ A	0.50 +0.015
Fast	120.000 Ω	10 m Ω	119.99	1 mA	0.05 +0.02 ⁽²⁾
	1.20000 k Ω	100 m Ω	1.1999	1 mA	0.03 +0.02 ⁽²⁾
	12.0000 k Ω	1 Ω	11.999	100 μ A	0.03 +0.02 ⁽²⁾
	120.000 k Ω	10 Ω	119.99	10 μ A	0.03 +0.02
	1.20000 M Ω	100 Ω	1.1999	10 μ A	0.05 +0.02
	12.0000 M Ω	1 k Ω	11.999	7.0/(10M+Rx) μ A	0.10 +0.02
	120.000 M Ω	10 k Ω	119.99	7.0/(10M+Rx) μ A	0.50 +0.02
⁽¹⁾ In order to eliminate the noise interference, which might be induced to the test leads, it is recommended to use a shielded test cable for measuring resistance above 120 k Ω .					
⁽²⁾ Using REL function					
Note: Rx is the measured resistance value.					

Specifications

Maximum Input Protection: 1000VDC or 750VAC for all ranges.

Open circuit voltage: Maximum voltage is 13.3 VDC for 120 Ω, 1.2 kΩ, 12 Ω, 12 MΩ and 120 MΩ ranges.

Maximum voltage is 7 VDC for 120 kΩ and 1.2M ranges.

Continuity

Accuracy ± (% of reading + % of range), 23°C ±5°C

Rate	Range	Resolution	Full Scale Reading	Test Current	Accuracy (1 year)
Fast	1 kΩ	100 mΩ	999.9	1 mA	0.10+0.020

Maximum Input Protection: 1000VDC or 750VAC for all ranges.

Open circuit voltage: <13.3 VDC

Test Current: Approximately 1 mA DC

Threshold resistance: From 1 Ω to 1000 Ω, default of power on is 10 Ω

Diode

Accuracy ± (% of reading + % of range), 23°C ±5°C

Rate	Range	Resolution	Full Scale Reading	Test Current	Accuracy (1 year)
Med	3.0000 V	100 μV	2.9999	1 mA	0.030+0.020
	10.0000 V	100 μV	10.0000	100 μA	0.030+0.020
	10.0000 V	100 μV	10.0000	10 μA	0.030+0.020

Maximum Input Protection: 1000VDC or 750VAC for all ranges.

Specifications

FREQUENCY AND PERIOD CHARACTERISTICS

CONDITIONS: SLOW RATE (GATE TIME 1 Sec)

Frequency

Accuracy: \pm (% of Reading)

ACV Range	Frequency Range	Gate Time	Resolution	Full Scale Reading	Accuracy ⁽²⁾	Input Sensitivity (Sine Wave)
100 mV to 750 V	5 ~ 10 Hz	1 s (Slow)	10 μ Hz	9.99999	0.05	200 mVrms
	10 ~ 100Hz		100 μ Hz	99.9999	0.01	40 mVrms
	100 ~ 100 kHz		1 mHz	999.999	0.005	40 mVrms
	100 k ~ 1 MHz ⁽¹⁾		1 Hz	999.999	0.005	100 mVrms

⁽¹⁾ If testing frequency is greater than 1MHz, it will be displayed but no specified accuracy is guaranteed.

⁽²⁾ Specified accuracy at input >5 % of range.

Period

ACV Range	Period Range	Gate Time	Resolution	Full Scale Reading	Accuracy ⁽²⁾	Input Sensitivity (Sine Wave)
100 mV to 750 V	1 ~ 10 μ s ⁽¹⁾	1 s (Slow)	0.01 ns	9.99999	0.005	100 mVrms
	10 μ s ~ 10 ms		0.1 ns	9.99999	0.005	40 mVrms
	10 ms ~ 100 ms		0.1 μ s	99.9999	0.01	40 mVrms
	100 ms ~ 200 ms		1 μ s	199.999	0.05	200 mVrms

⁽¹⁾ If testing frequency is greater than 1MHz, it will be displayed but no specified accuracy is guaranteed.

⁽²⁾ Specified accuracy at input >5 % of range.

Maximum Crest factor: 3.0 at full scale

Maximum input voltage: 750Vrms

$\leq 3 \times 10^7$ Volt-Hz for all ranges

Input impedance: 1 M Ω \pm 2% in parallel with capacitance <100pF

Maximum DCV: 500 V for all AC ranges

Triggering and Memory Trigger Delay: 0 to 6000ms (1 ms step size)

Memory: 512 readings can be stored

Math Functions

Rel, Max/Min/Average/StdDev (for stored readings), dB, dBm, Limit Test, % and mX+b

dBm Reference Resistance: 1 Ω to 9999 Ω (1 Ω step size)