



Electronics™

M1 MILLIOHM METER®

User Manual



30 YEARS
OF PRECISION



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M1 MILLIOHM METER®

INTRODUCTION

The M1 Milliohm Meter® is a handheld ground support bonding and grounding meter. It measures low electrical resistance where portability, safety, high precision, and ease of use are demanded and is used to ensure the regulated conformity of electrical bonding for structural and safety purposes.

The M1 Milliohm Meter® represents major innovation and advancement in modern industrial instrumentation design. It is fast, light, and convenient to use. The readings on the face of the meter are internally processed and stored. Measurements are made by the four-wire or Kelvin probe method.

The meter was created with input from over 1000 aviation industry users. It's specifically designed to meet and surpass all requirements of the aviation and aerospace sectors. The equipment is certified for accuracy, reliability, safety, and approved for use on the flightline, and in other hazardous locations. The meter is user-friendly, easy to understand and now available with optional Bluetooth® wireless technology.



FEATURES

All measurements are displayed in **Milliohms**, so there is no need to make conversions from one unit to another. The meter is completely self-ranging, it will always display the measurement on the most sensitive scale that contains the reading, so there is never any need to change scales. In addition, there is **no need to zero** the meter or to make any compensation for the resistance of the cables.

The M1 Milliohm Meter® will not display a reading unless the proper electrical continuity criteria are met, so there is no possibility of an erroneous reading. Readings are stable and accurate, so there is never a case where the operator has to "mentally average" readings. Readings cannot be accidentally lost without the operator making a conscious

choice, by either taking another reading or turning the power off. In addition, the meter has a memory that can store up to 128 readings, which can be recalled and/or downloaded at a later time.

The meter is hand-held, lightweight, and easy to use, so readings are immediately visible. The display brightness is adjustable for a wide range of lighting conditions, from dark areas to bright outdoors.

The operator can easily replace the meter probe tips without affecting the calibration. Any M1 probe may be used with any M1 Meter, as they are completely interchangeable. In addition, any BCD M1 battery charger may be used with any M1 Meter. The standard tips are sharp-point gold over steel. Special application flat-end and round-end tips are also available.

DOs

DO

review the information in this manual to become familiar with the equipment. A little preparation and care will be rewarded with years of trouble-free service.

DO

ensure proper maintenance. The M1 Milliohm Meter® is a unique application-specific, precision laboratory-grade instrument, constructed of the finest materials and processes that are available. Both the instrument and accessories are rugged by design. However, they can be easily damaged if mishandled or abused. Treat the equipment with care and familiarize yourself with the proper handling and operation.

DO

handle the cables and connectors with care. They are made with the finest materials available. Connector pins are gold over duraloy and the outer shells are hardened aluminum alloy, all of which are relatively soft materials and can be easily damaged if forced. **Connect by placing the orientation key into the correct position.** Then, using **light force only**, push the connector further until it locks in. **Red dots on the connector and receptacle indicate proper alignment.** To disconnect, pull the outer release ring straight outward. Do not pull on the cable – **never “twist” or rotate the connectors.**

DO

use the contact test tips on the instrument and remote probe(s) with care applying light force. Focus on the “continuity lights” rather than the instrument display when conducting test measurements. It’s important to note that minimal force is sufficient for proper contact. The tips are rugged and sharp and can remain sharp for years with proper use, but can be easily damaged if abused. In challenging situations, a gentle back-and-forth action may be required for contact, but only use the pressure necessary for the continuity lights to shift from red to green. **Never “twist” or rotate the tips to make contact.** Periodically, remove and clean the tips using DeoxIT or another high-quality electrical contact cleaner.

DON'Ts

DO NOT

attach any electronic devices, such as a Bluetooth® transmitter, to the equipment. Sparks may cause the explosion of jet fuel fumes.

DO NOT

attempt to make measurements on live or powered circuits, as this WILL damage the equipment. Pre-test if necessary to be sure that no electrical potentials exist on the test subject.

DO NOT

try to connect the charger connector to the remote probe receptacles or vice versa. This will cause damage to the connector, receptacle, and possibly other internal electronics, requiring the equipment to be returned to the manufacturer for repair. While the connectors may seem similar, they are not; the charge connector cannot be used in place of the probe connectors.

DO NOT

attempt to sharpen the test tips or to make any changes to them. This will remove the protective surface coatings that help suppress arcing, which is critical for operation in potentially hazardous or explosive environments. The heat from sharpening will change the temper of the tip. With proper care, the tips can remain sharp for years, but if damaged or overly dull they should be replaced in pairs.

DO NOT

attempt to disassemble or tamper with the instrument or accessories in any way. If the equipment fails to work properly for any reason it must be returned to the manufacturer for repair. Any attempt at disassembly will void product guarantees, including the UL913 certification, which is vital for operation in hazardous locations, including on the flightline. Tampering with the equipment may also increase the cost of the resulting repair. **This equipment is not field repairable.**

DO NOT

attempt to “second guess” the equipment. If you have any questions or encounter problems that aren’t covered in this manual, please reach out for assistance before moving forward. While accidents can happen, most issues can be prevented by using the instrument with a good understanding, careful handling, and proper care. Your safety and the longevity of the M1 Milliohm Meter® are our top priorities.

OPERATING THE M1 MILLIOHM METER®

Powering Up

Press the "Power" button to turn the instrument on or off. The meter is ready when you see four dashes across the middle of the display and the display register is blank.

Note that the display will turn off after 10 seconds to conserve power and can be reactivated by pressing the Recall button or taking a reading. The instrument itself will shut down to conserve battery power if there is no activity for 3 minutes. This automatic shutdown feature does not affect readings that have been stored in the memory, but the last reading made will be lost if it was not stored.

Insert one of the remote probe connectors into the receptacle marked **"SINGLE"** at the bottom of the handle. **The meter will not operate unless a probe is connected to this receptacle.**

Setting Display Brightness

The two switches on the right side of the display panel with "up" and "down" arrows have dual functions. In the normal operational mode, they control display intensity. **An operator may quickly adjust brightness by pressing and holding the "up" or "down" button.**

Establishing Continuity

Ensure that the red lights, at the top back corner of the meter and the start of the tapered portion of the remote probe, are on (these are called continuity lights). Each of these red lights signifies that the particular probe has not established continuity.

Carefully contact a metallic workpiece with each of the probes one at a time. Remember: do not attempt to make measurements on live or powered circuits, as this WILL damage the equipment. **Pre-test if necessary to be sure that no electrical potentials exist on the test subject.**

When contact is properly established with each probe, its red light will turn green. When contact is interrupted, the light will switch back to red. Try this several times to become familiar with the lights and how they work. **Use light pressures only** on the tips while monitoring the lights and do not apply any twisting forces on the tips.

Taking a Reading

To take a measurement, apply each of the probes (or probe and instrument) to the workpiece. If a red light does not change to green, move that probe slightly from side to side or back and forward, **very gently, without excessive pressure and without twisting the tips**, until its light turns green. Repeat this for the other probe if necessary.

As soon as both lights turn green the display will turn blank. This is an indication that the meter is making a measurement. It is important to maintain stable contact with both probes to the workpiece during this time. **It will normally take 3 to 5 seconds for the instrument to make its measurement.** When the test is completed the continuity lights will begin to flash green and a reading value will be displayed on the instrument.

If the display is out of view to the operator, note that both of the green lights will flash together after the measurement is complete and that the probes can be removed from the workpiece. As soon as a probe is removed from the workpiece, its continuity light will change back to red.

The reading will remain displayed for approximately 10 seconds, after which the display shuts down to conserve the battery. The reading may be recalled for an additional 10 seconds by pressing the recall button once. You may recall the reading as many times as you wish. The meter will turn itself off after three minutes of inactivity and the measurement will then be lost unless it was stored in the memory.

Storing a Reading

The reading will be stored by pressing the store button. **Readings are only storable when the meter is in operational mode** (see page 9 - The Two Modes). The meter will store each reading by first assigning a sequential tag number to the reading.

After 128 readings are stored in the memory, attempting to store another one will result in the word "FULL" being displayed, as the memory has no capacity to accept any more entries. Readings must be manually cleared to create space for new stored readings.

NOTE:

The memory mode always starts by displaying the last reading stored, so you have to start stepping or scrolling with the down button.

Recalling Readings

Enter the memory mode from the operational mode by pressing the recall button. Press once if the display is active and twice if it is not (once to reactivate the display and a second time to enter the memory mode). You can tell that the meter is in memory mode when a tag number and apostrophe are displayed. Stepping or scrolling through the memory is then possible with the up and down buttons, using the tag numbers of the readings as a reference.

The meter automatically reverts to the operational mode if there is no activity in the memory mode for approximately 5 seconds. If this happens, re-entering the memory mode places you again at the last reading stored, and not at the point in the memory where you were when the meter reverted to operational mode.

As the meter is changing back to operational mode, two periods (..) are displayed to alert you that the meter is going back to operational mode.

After reviewing the memory, either wait for 5 seconds or press the recall button to put the meter back into operational mode.

Interpreting the Display

The meter will not display different values while it is settling. It does all of the settling before it displays a value, so there is no guesswork on your part. Just apply the probes until the reading is displayed. The displayed value is always in Milliohms.

During the normal course of making measurements, there are three non-numeric displays that you may encounter:

"Err" will be displayed if there is interrupted continuity to one or both of the probes before the meter has completed its measurement. If this happens, just reapply the probes and hold them steady until the value is displayed. "Err" will also be displayed if the resistance between the two points on the test subject is intermittent, changing, or otherwise unstable.

"2bi6" will be displayed when the measurement value is higher than the meter's ability to measure or display the reading, whenever the measured value exceeds 19 999 Milliohms. A "2bi6" reading may be recalled but not stored. Attempting to store it will cause "Err" to be displayed.

"no6o" will be displayed if both probes are making valid contact but the resistance between them is too large for contact to be recognized (i.e. from five thousand ohms to infinity). In this case, the two continuity lights will be green, but a valid test is not possible. A "no6o" reading may be recalled, but not stored. Attempting to store it will cause "Err" to be displayed.

Rapid Multiple Readings

During some measurement activities, it may be necessary or preferable to make several measurements in rapid succession. This might happen if you leave one probe in one place and then move the other probe to different locations, one after the other.

To do this, each time one probe is disconnected from the workpiece you must wait a full second before attempting to re-contact the probe with the workpiece. If you do not wait for a full second, the meter will not initiate the next measurement. Watch the continuity lights – flashing green lights means it is the end of the measurement. A red light means readiness for another test.

Erasing Readings

Users can choose to erase the entire memory or to erase one reading at a time.

To erase selected readings, enter the memory mode and step or scroll through the memory to the appropriate tag number, then press the erase button. That entry in the memory is then erased, and the word "ErAS" replaces it. You can do this to as many of the stored readings in the memory as you like.

To erase the entire memory do not enter the memory mode. While the meter is in operational mode, press and hold the erase button for 3 seconds until the word "donE" appears in the display. The entire memory is then erased.

Attempting to place the meter in memory mode when the memory is empty will cause the word "no" to be displayed, indicating that there are no entries in the memory.

Downloading the Memory

The readings stored in the memory may be downloaded to a computer through a serial cable that can be attached to the 9-pin RS-232 connector on the back of the handle, or wirelessly with our M1 Meter equipped with Bluetooth® technology. For more information please refer to the Appendix on page 19.

Using Two Remote Probes

There may be situations where the body of the meter is too large to allow its two probe tips to make contact with the workpiece. In these cases, two of the remote probes may be used, with the second one connected to the receptacle marked "DUAL". The measurements are then made as before, but each hand now holds only a small remote probe. When the green lights on the probes start flashing, the measurement has been completed. This method is also very helpful when using the meter on the test bench.

When you have completed the measurements with the dual probes, be sure to disconnect the probe from the receptacle marked "DUAL", leaving the one in place at the "SINGLE" receptacle, as the meter will not work without it.

The Two Modes

The instrument can function in two different modes. The normal mode is the OPERATIONAL mode, in which the operator can make, display, and store readings.

The other mode is the MEMORY mode. In this mode, the operator may scroll through and review readings stored in memory or erase selected readings. The default mode is the operational mode. After approximately 5 seconds in the memory mode with no user activity, the instrument will automatically revert back to the operational mode.

Battery Condition Display

Pressing and holding the power on/off button when turning the unit on will display battery voltage, such as "b 7.5", indicating a voltage of 7.5 volts. Releasing the power button will return the instrument to normal operation. If the voltage is less than 7 volts, you will need to charge the battery. It may take up to 2 hours to completely charge.

"Lo b" is displayed if the battery voltage drops to the low operational threshold. The battery needs recharging. The instrument can be partially or fully charged, or remain on "automatic conditioning", without any harm to the battery.

Typical battery operational voltage is from 7.0 to 9.2 volts, depending on the state of charge. Lower battery voltage during use will not affect the validity or accuracy of the readings. Recharge the battery completely before storage.

Charging the M1 Milliohm Meter®

The M1 Meter is powered by a NiCad battery which is not field replaceable. The battery can be partially or fully charged, or left on "automatic conditioning" indefinitely without harming the battery.

When the charger is connected, the following lights are activated:

Yellow light: the battery is charging.

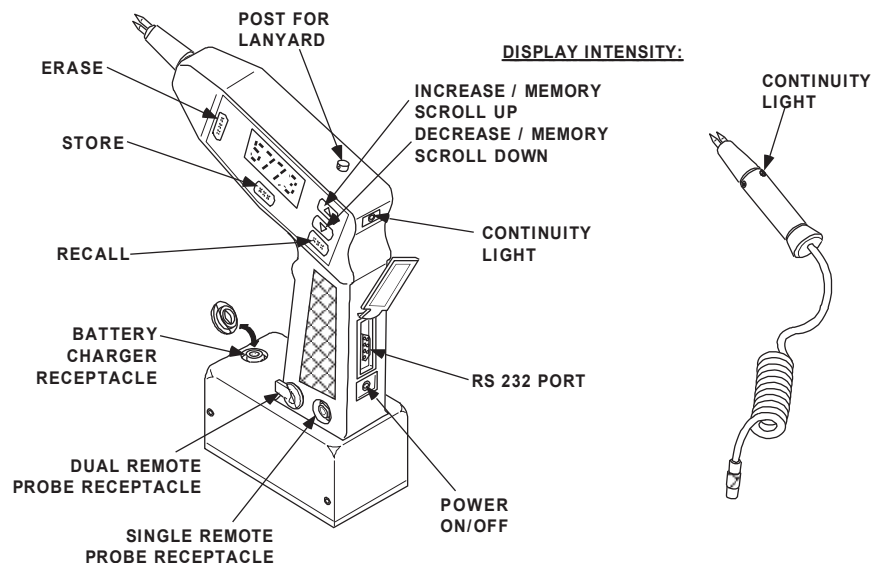
Green light: the battery power sufficient to operate, partially or fully charged.

Amber light: battery temperature problem detected.

Red light: battery voltage problem detected.

These lights indicate the charging status for the operator. Unlike conventional NiCad chargers, this charger does not need to be monitored. **We recommend fully charging the battery before long-term storage.** Do not operate the meter while it is charging.

The M1 Conditioning Charger has been designed specifically for this instrument. Do not attempt to use other types of chargers on the M1 Meter, or to use the M1 Charger for other purposes.



SUMMARY

The M1 Milliohm Meter® is a very unique high-performance electronic instrument. It is designed and manufactured specifically for aviation and aerospace professionals, to perform a wide variety of tasks with 100% accuracy. Inside the deceptively robust enclosure resides a complex and sophisticated laboratory-grade electronic instrument, with functionality and performance previously not available in this type of testing and measuring instrument.

Treat this instrument with care and respect, use light forces only on the tips and connectors. Do not leave the instrument standing where it can be bumped or knocked onto a hard surface or it may be broken. Proper care in handling and use of the equipment will be rewarded with many years of trouble-free operation, without any particular requirements for maintenance or service.

Note that **the equipment is not field repairable**. If the instrument or accessories become damaged or fail to function properly, they must be returned to BCD Electronics Ltd. for repair. **Any attempt at disassembly will void the UL913 certification for operation in hazardous locations and may also add to the repair costs.**

As OEM of the M1 Milliohm Meter®, BCD Electronics provides complete recalibration, recertification and repair services to factory standards. We are ISO 9001:2015 registered and our calibration is NIST/NRC accuracy certified.

Get to know the equipment and the information in this manual. Reach out to us at service@bcdelectronics.com if you have questions.

M1 MILLIOHM METER® AND ACCESSORIES

COMPLETE KITS (P/N: M1-R-KIT, M1-G-KIT, M1B-KIT, or M1-25) INCLUDE:

M1-R	M1 Milliohm Meter® (red display),
M1-G	M1 Milliohm Meter® (green display),
M1B	M1B Milliohm Meter (green display)
(or) M1-25	M1B Milliohm Meter (green display) with a 25mA test current for use in extremely sensitive scenarios.
M1-PROB	M1 Standard Remote Probe
M1-GPWR	M1 Conditioning Charger (90-260VAC)
M1-CASE	M1 Waterproof Kit Guard Case
	• Operator Manual
	• Certificate of calibration
	• Test Data

AVAILABLE COMPONENTS AND ACCESSORIES:

Bluetooth®	Bluetooth® wireless technology (optional on any new M1) for easy access to recent readings, stored readings, and instrument status.
M1-PROB-LNG	M1 Long Remote Probe for special applications
M1-EXT 5'	Remote Probe Extension Cable
M1-TIPS-STD	Standard Replacement tips (Pointed sharp end gold/nickel/steel)
M1-TIPS-LNG	Special Application Long Tips (Pointed sharp end gold/duraloy)
M1-TIPS-FLT	Special Application Flat Tips (Round/w flat end gold/duraloy)
M1-TIPS-RND	Special Application Round Tips (Round/w round end gold/duraloy)



TEST PROCEDURES

3.2 Switch Tests:

3.2.1 Power.

Test the power switch by cycling the instrument on and off.

3.2.2 Up/Down.

Test up and down switches by turning the instrument on and adjusting brightness up and down. After a few seconds the last setting will be stored. (If the meter is turned off immediately following brightness adjustment, the last setting would not be stored.)

3.2.3 Erase.

Test the erase switch by turning the instrument on and, while the display is active, press and hold the erase button. If the display is not on (no segments lit), press the recall button to re-activate the display, then press and hold the erase button. After 5 seconds the display will read "donE".

3.2.4 Store.

Test the store switch by turning the instrument on and, while the display is active, press the store button. If the display is not on, press the recall button to re-activate the display and then the store button. The display should read "Err", indicating no reading is available to store, as no measurements were taken since being turned on.

3.2.5 Recall.

Test recall switch by turning the instrument on and wait several seconds for the display to turn off, then press the recall switch. Four bars will be visible on the display. While this is displayed press the recall button again. The display should read "no" as no readings are in memory, having been previously erased at 3.2.3.

3.2.6 Continuity Lights.

Turn the instrument on and test that continuity lights change from red to green when electrical contact is made at the tips. Test both the instrument and the remote probe(s).

3.2.7 Probe Tips.

Probe and instrument tips can be removed by pulling them slowly and carefully, one at a time, straight out with pliers. Note that the assemblies are a very precise fit and pulling them rapidly will create a strong vacuum inside the receptacle, causing damage to the tip assembly of the probe or instrument. Time must be given to neutralize the vacuum by removing slowly. New tips are installed by press fitting, by hand, with no excessive force required.

3.3 Functionality Tests:

3.3.1 Zero Reading.

Turn the instrument on and connect a standard remote probe to the probe port marked SINGLE. A red light should be lit on the probe and another at the top rear of the instrument. Touch the two dual tips together in an overlapping configuration and adjust connections until both red lights turn to steady green. Hold the connection steady until the two green lights begin to flash, indicating the end of the test, then disconnect the probes. The instrument should read "0.00". If not, repeat the procedure until it does.

3.3.2 Store Function.

With the reading "0.00" on the display (as in 3.3.1) press the STORE button. If the display is not on, press the RECALL button to re-activate the display and then press the STORE button. The display will first assign a tag number to the reading (in this case "1" as it is the first reading stored), then the reading will be displayed. Each reading can only be stored once. Repeat the previous zero measurement and store functions for multiple stored readings.

3.3.3 Recall Function.

Test recall by pressing the RECALL button while the display is on. If the display is not on press the RECALL button to activate the display, then press the RECALL button again to enter instrument memory mode. The last reading stored is displayed by tag number first, then the reading. Scroll up and down to view other readings.

3.3.4 Memory Up/Down Functions.

While the instrument is in memory mode (as in 3.3.3), press the up and down buttons while reading the display. Observe tag numbers of stored readings, starting with the most recent. (If there are no readings stored then make some by measuring and storing the results.) Release the up or down button at the tag number of interest and the reading will be displayed. Press the up or down button again to scroll to the next tag number of interest. If the up or down buttons are held, tag numbers will scroll at an increasing rate. After several seconds of inactivity, the instrument will exit memory mode and return to normal operation, signaled by two dots on the display.

3.3.5 Erase Function.

Turn the instrument on and while the display is active press and hold the ERASE button. After 5 seconds the display will read "donE".

3.3.6 Automatic Power Off.

Verify that the instrument turns off after 3 minutes with no activity.

SPECIFICATIONS

Operation:	Fully automatic Store up to 128 readings RS 232 data communications port Optional Bluetooth® wireless technology
Instrument Range	0.00 to 19 999 Milliohms
Test Accuracy:	
M1:	Within 0.1% of readings, +/- 1 display count
M1B, M1-25:	Within 0.1% of readings, +/- 3 micro-ohms, +/-1 display count
Instrument Resolution:	
M1:	0.00 to 19 999 Milliohms, 4-1/2 digit display
M1B, M1-25:	0.000 to 19 999 Milliohms, 4-1/2 digit display
Test Current:	
M1, M1B:	100mA DC
M1-25:	25mA DC
Test Voltage:	Maximum 2.4 volts internally limited.
Battery:	6"C" cell pack, specified for UL913 and charger Nominal 7.5 volts operation.
Charger:	Manufactured for the M1 Meter, no substitutes: • Source, 90-260VAC, 50-60Hz, 30 watts • Complete charge within 2 hours. • Leave connected for continuous conditioning
Temperature:	Operating: -20°C to +40°C
Humidity:	0 – 95%
Weight:	Instrument – 2 lbs. Instrument Kit – 11 lbs.
Certifications:	ISO 9001:2015 registered NIST accuracy certified UL913 flightline approved, Class 1, Division I, Groups C and D, T3A CE International certified MIL-STD-461G for RS 103 radiated susceptibility, electric field.

NOTE:
For maximum performance maintain tips sharp and clean.
Do not use an M1 Charger in hazardous locations.

CERTIFICATION RECOMMENDATIONS

M1 Meter accuracy specification is for within 0.1% of reading, AND +/- 1 display count. (For M1B and M1-25, add +/- 3 micro-ohms.) The meter is designed to be stable and calibrated during manufacturing. However, it's a good idea to regularly check its accuracy. You can do this by measuring known stable resistance references as explained below. The certification is based on the reliability of these references, the methods used, and the proper authorization for certifying the results.

Although meter accuracy is specified to be within 0.1% of reading, it is capable of maintaining to within one display count of accuracy, or 0.005% of full scale. As this is at or near the limits of the best references and facilities available, the instrument should be considered a valuable addition to the laboratory references. Historic records should be maintained to monitor drift characteristics of both meters and the resistance references.

The M1 Meter requires 3 resistance references to calibrate each range, with values of approximately 90%, 50% and 10% of range. Three references are required in order to accurately calibrate offset, scale and linearity for each range. Overlapping values between ranges reduce the number of references required to 7 references as minimum. Interfacing software is required to lock ranges for full span tests, however, the lower ¾ of each range can be verified without range change occurring and this is sufficient to verify full span accuracy.

High range:	19000. to 20000. milliohms	95%
	10000. to 11000. milliohms	50%
	1900.0 to 2000.0 milliohms	5%
Mid range:	1900.0 to 2000.0 milliohms	95%
	1000.0 to 1100.0 milliohms	50%
	190.00 to 200.00 milliohms	5%
Low range:	190.00 to 200.00 milliohms	95%
	100.00 to 110.00 milliohms	50%
	19.000 to 20.000 milliohms	5%
Test point:	0.000	

- Recommended specifications for calibration references:
- 4 terminal fixed passive resistance (stable wirewound acceptable).
 - Minimum 8 watts current rating.
 - **Resistance value known to within 0.01% accuracy.**
 - Material temperature stability is better than 10ppm/°C.
 - Temperature monitored environment (23°C +/- 5°C).

APPENDIX



DOWNLOADING STORED READINGS FROM THE BCD ELECTRONICS M1 MILLIOHM METER®

Connect the BCD Electronics M1 Meter® to a computer using a Serial cable, or USB-to-Serial communication cable if connecting the M1 Milliohm Meter® to a computer's USB port. BCD Electronics Ltd. recommends the "IC199A-R3" USB-DB9 converter cable available from BCD Electronics Ltd. or Black Box Corporation for best compatibility but many will work.

The M1 Serial Port uses:

Baud = 9600

Parity = None

Stop Bits = 1

Data Bits = 8

Handshake = None

Note: Port configuration is often accomplished automatically.

To get just a decimal output the DMM command is DMM 01 followed by DMD to download stored readings.

For a basic terminal program, we can recommend Tera Term
<http://ttssh2.osdn.jp/> Most other terminal programs will work as well.

We are pleased to offer customers a complimentary lightweight Windows application that will download stored readings and export them to both .PDF and .CSV. Please contact us at service@bcdelectronics.com if you are interested in this free solution.

EXAMPLE (12 stored in this scenario):

```
>DMM 01
>
>DMD
>615.0
1595.0
3190
99999.
99999.
999.0
16125
999.0
0.393
```

BLUETOOTH® USER GUIDE

M1 Milliohm Meter® Bluetooth® Wireless Technology Option

An M1 Meter equipped with Bluetooth® technology provides wireless access to the current Milliohm reading, all stored readings, instrument battery level, other status information, and feature controls using industry-standard Bluetooth® Low Energy Generic Attribute Profile format.

An M1 equipped with Bluetooth® wireless technology can be connected using most Bluetooth® Low Energy scanner apps (such as the popular and free, BLE Scanner, by Bluepixel Technologies on Android), or similar iOS or Microsoft Windows Apps.

Custom mobile or desktop applications can be developed for any of these operating systems to meet specific customer operational needs and security requirements.

Bluetooth® Wireless Technology Range

10 Feet (3 meters) or more line of sight.

M1 Instrument Bluetooth® Wireless Technology Advertising

Bluetooth® automatically starts advertising for a connection when the M1 instrument is powered on.

The M1 instrument can be discovered by Bluetooth® clients by looking for the device's model and its unique serial number (also found on the M1 Instrument label). An example M1 would be "BCDM1 EE01D208".

Advertising Status Indication

When the M1 instrument display is idle (no measurement or status information displayed) it will show a blinking decimal point on the second leading digit. This indicates the M1 is advertising and not connected.

When a Bluetooth® connection is made, the blinking dot will change to a solid dot (not blinking). If the Bluetooth® module is installed but disabled, no dot will show. Additionally, the M1 gives an audible Beep indication when connection status changes. Two Beeps to indicate connection success, and four Beeps to indicate disconnection. A single Beep indicates reading completion.

Connecting

An M1 equipped with Bluetooth® does not require a pairing procedure with the client for access (pairing optional, see below). Simply connecting the client to the M1 will allow complete access.

Once the connection is made to a client the M1 stops advertising. This prevents another client from making a connection until the current client disconnects, or a disconnection is forced by cycling the M1 Power off and back on again to restart advertising.

Pairing

The M1 accepts simple pairing (without any password requirement). This can be advantageous when using the M1 with only one client device: when the M1 instrument is powered on and starts advertising, it will automatically make a connection to the paired client if within range. However, if the M1 is to be routinely used with two or more devices, pairing is not recommended.

Features

The information highlighted below is available via Bluetooth® on all M1 Bluetooth® models. Each item has a unique 32-bit identifier that can be used to request its current status and value, or in some cases change settings.

Accessible information:

- Instrument name and serial number,
- Bluetooth® MAC address,
- Firmware version,
- Instrument battery level,
- Low battery notification,
- Current Milliohm reading (each new reading is sent, via Notification, to a connected client instantly),
- Calibration date, and
- Total number of readings since last calibration.

Settings:

- Enable/disable & level control of audible indicators: the audible chirp level can be adjusted to levels 0, 1, 2, 3, 4, with level 0 (Off) to level 4 (Max).

A full list of these items and their respective 32-bit Bluetooth® Low Energy UUIDs can be provided upon request.

Secure Communications

The M1 Bluetooth® option comes without Bluetooth® security features enabled to simplify connectivity and the most common data access requirements. However, the full suite of Bluetooth® BLE Security Manager protocols are available to meet any customer requirements.



Get to know the equipment and the information in this manual. Reach out to us at **service@bcdelectronics.com** if you have questions.

Need more assistance?

Watch our instruction video:



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