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A trusted leader in measurement and calibration solutions.

User Manual

M1004 Digital Calibrator

Contents

General Information

Notification Statements

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Trademark information

Design Patent D769,141 for the digital calibrator’s LCD display.

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Glossary

Words and phrases with their definitions or explanations.

Words & phrases	***Definitions or explanations***
Blinking	▪ It indicates the active edit field on an edit screen. ▪ It indicates the displayed value is not actively changing (like **Hold** or stopped **Test**).
FS	▪ FS is the abbreviation of Full Scale.
Home	▪ Home is the first screen that displays after turning on the digital calibrator. It's the screen with **measurements and units** on it. ▪ After you press the Home key in many other screens, the digital calibrator returns you to Home.
Key and button	▪ A *key* refers to hardware push-buttons on the keypad that you can press. ▪ A *button* refers to an area in meriSuite CG that you can tap or click to select functions.
Isolated	▪ The word *isolated* refers to the sensing element being separated from the media. It is commonly used in the phrases Absolute Isolated (AI) pressure and Compound Isolated (CI) pressure.
Customer Calibration	▪ Customer calibration refers to any calibration done outside of Meriam with non-Meriam traceability. ▪ Customer calibration includes: Multipoint calibration or adjustment.

General warnings and cautions

Preventing injury

Failure to follow all instructions could result in injury:

- Read the entire manual before using the digital calibrator.
- Understand the contents before using the digital calibrator.
- Follow all safety warnings and instructions provided with this product.

Safety symbols

The following table defines the safety symbols, signal words, and corresponding safety messages used in the manual. These symbols:

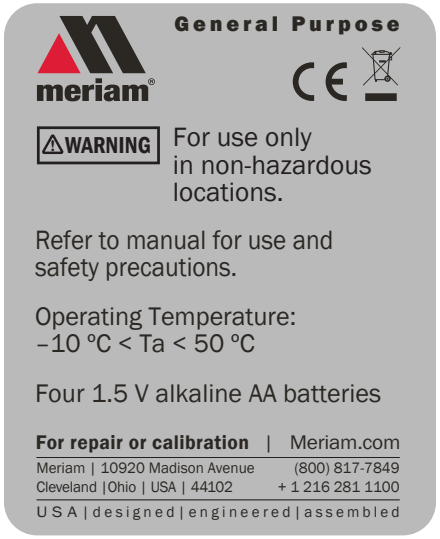
- Identify potential hazards.
- Warn you about hazards that could result in personal injury or equipment damage.

Safety symbols	Explaining the symbols
	This is the *Read directions before using* symbol. This symbol indicates that you must read the instruction manual.
DANGER	Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury.
WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE	Indicates information essential for proper product installation, operation or maintenance.

Sample label for General Purpose digital calibrators

All M1004 Series models are available for general-purpose use.

General Purpose (GP) versions are identified by the name plate located on the rear of the unit under the protective rubber boot. A sample of the General Purpose name plate is shown below:



Fire or explosion hazard

DANGER

- **Do not** use General Purpose versions in hazardous areas.
- **Do not** use General Purpose versions in areas that may contain flammable gas or vapors, combustible dusts or ignitable fibers where an unintended spark can cause a fire or explosion.

For General Purpose Series

CAUTION

Substitution of components may impair operation and safety.

- Disconnect power before servicing.
- Do not power the digital calibrator with a combination of new and old batteries.
- Do not power the digital calibrator with a combination of batteries from different manufacturers.

Do not exceed pressure limits

⚠WARNING

- **Do not** exceed the Pressure Limits listed in the Specifications section of this manual.
- Failure to operate within the specified pressure limit could result in minor or moderate injury.

Sensors

Use two wrenches to install or remove pressure connections

Connection: 1/8" female NPT, 316L SS.

- Always use a 3/4 in. wrench on the pressure manifold when you install or remove the 1/8 in. NPT fitting.
- Applying torque to the manifold can damage the plastic enclosure and voids the warranty.
- Do not over tighten.

Carefully equalize the pressure

Avoid these two issues with ***differential sensors:***

1. Connecting pressure to the incorrect pressure port on DN or DI differential pressure modules may cause damage to the pressure sensor.
2. Applying pressure to either port before both connections are made.

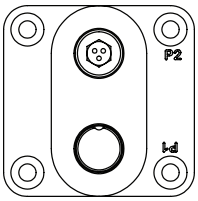
NOTICE

Apply pressure to both differential ports at the same time.

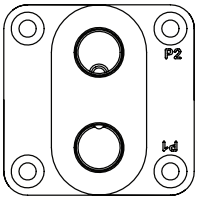
Note: See Overrange limit in the section called Specifications concerning overrange pressure limits. If over pressure damage occurs, you must return the digital calibrator to the factory for sensor replacement.

Sensor manifold types

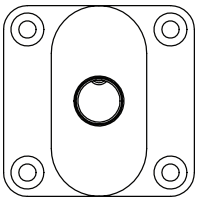
ZM1004-CNXXXX



ZM1004-DNXXXX



ZM1004-ANXXXX



Customer calibration

Calibrate the M1004 by using the keypad:

You can calibrate the digital calibrator in the field for these three types of calibration:

1. User Zero. (**Zero** key)
2. Restore Factory Calibration. (RESTORE FACTORY CAL)
3. User Span (RESPAN).

1. User Zero

How to zero Absolute Sensors

Overview of the zeroing Absolute Sensors
The digital calibrator is a stable and precise instrument. However, on occasion the digital calibrator should have a new zero taken. The new zero removes a zero drift that can occur after the digital calibrator was last zeroed. The digital calibrator can be zeroed only if the new applied zero is within ± 1 % FS of the original factory calibration zero. This prevents accidental zeroing at atmospheric pressure or other relatively high pressures. If the digital calibrator is outside this limit, the calibrator cannot zero.

1. **Referenced to Absolute Zero** - This traditional and preferred method takes a snapshot of the measured pressure when a vacuum of less than 100 microns Absolute is applied to the sensor.
2. **Restore Factory Zero** - This method restores the calibration curve to the original zero taken at the factory.

   Note: This feature is intended for comparison purposes, and should not be used for real pressure measurement. This feature does not compensate for any zero drift.

3. **User Defined Offset (Zero)** - With this method, you can enter any pressure value when a known reference is applied (for example, the local barometer). The digital calibrator compares its actual measured value with the entered value, and calculate a new zero reference based on the offset.

Steps for zeroing Absolute Sensors

You can zero the digital calibrator in one of three ways. The following may appear in a different order depending on which arrow key you press. When an absolute sensor displays on-screen as P1 or P2, press the **Zero** key to see one of the three sets of characters below and the following three messages

On-screen message	Explanations
TAP ✓ TO CHOOSE REF	▪ Tapping the **Accept** key selects the displayed reference.
ARROWS TO CHANGE REF	▪ Tapping an **Arrow** key changes the displayed reference.
X CANCELS	▪ Tapping the **Cancel** key cancels the zero request.
AbSO	▪ This is the on-screen abbreviation for **Absolute Zero.**
dFLt	▪ This is the on-screen abbreviation for **Default**. ▪ If you want to restore the **Factory Zero** on a sensor, press the **Accept** key when you see these characters appear.
USEr 0	▪ This refers to **User Defined Offset** (Zero). You can set an absolute reference point other than zero.

How to zero DN, DI, or CI sensors

1. Disconnect from a pressure source and vent the pressure port to atmosphere.

    1. Do not remove the factory installed P2 plug if it is present.
    2. The display should read close to zero.

2. Press the **Zero** key.
   The top line displays dashes ------.

3. The process is complete when the digital calibrator returns to the **Home** (Measurement Units) screen.

    Note: You can only zero the digital calibrator if the new zero value is within ± 5 % (of FS) of the original factory calibrated zero. If the zero procedure generates a new zero reference

outside this limit, the procedure fails. Factory service may be required.

2. Restore Factory Calibration

1. Press the **Backward** key from the **Home** screen to see FACTORY CAL TAP ✓ TO RESTORE.
2. Tapping ✓ key asks you to confirm that you want to restore the calibration: COMMIT FACT CAL? YES-✓ NO-X.

    1. Tapping the ✓ key for YES restores the Factory Calibration and it removes any calibration you may have entered and it takes you back to FACTORY CAL TAP ✓ TO RESTORE screen. Tap the **Home** key to exit.
    2. Tapping the X key for NO stops the Restore Factory Calibration and it takes you back to FACTORY CAL TAP ✓ TO RESTORE screen. Tap the **Home** key to exit.

3. User Span (Respan)

1. From the **Home** screen, press the **Backward** key to see RESPAN TAP ✓ TO BEGIN.

    The ✓ refers to the **Accept** *key, the following key*  .

2. After tapping the ✓ key, you see two lines of information display:

    1. A suggested reference pressure of **070.00** in large characters**.** This refers to 70 % Full Scale.
    2. APPLY REFERENCE PRESSURE ✓-CONTINUE X-CANCELS.

3. After tapping ✓ to continue, the first character flashes on the screen because you are in edit mode.

    1. Use up or down arrow keys to change the value.
    2. Or, use the right key to move to the value you need to change.

4. After editing the value, you see:
   ENTER PRESSURE TAP ✓-FINISH X-CANCELS

   1. Tapping ✓-FINISH accepts the pressure you entered and takes you back to the RESPAN TAP ✓ TO BEGIN. Tap the **Home** key to exit RESPAN.
   2. You can tap the X-CANCELS at any time to stop.

   Note: The **Units** *key is turned off during RESPAN.*

Digital Calibrator

Battery

When you turn on the digital calibrator, it draws power from the batteries and the battery icon displays in the bottom row. When you press the information button, it displays **Batt %**.

Batteries

Remove and replace batteries in non-hazardous (safe) areas only.

Turn off the backlight

- Turn off the backlight when you need to conserve battery power.
- The backlight is dimmed when the digital calibrator is in low battery mode.

Suggested brands of batteries

The following is a suggested list of batteries.

- Duracell MN1500
- Duracell PC1500
- Energizer EN91
- Panasonic LR6XWA
- Rayovac 815
- Varta 4906

Note: The digital calibrator is powered by four 1.5 volt AA size batteries.

Know your batteries

- **Never** mix batteries—not by manufacturer or by size, by capacity, or by chemistry.
- **Never** mix old and new batteries.
- **Remove** all four batteries in the digital calibrator at the same time.

- **Replace** all four batteries with batteries from the same package or with the same expiration date.

Install the batteries

1. Turn over the digital calibrator so the display faces down.
2. Remove the two screws on the battery cover with the Phillips-head screwdriver by turning them counterclockwise.
3. Insert the four AA batteries.

   Note: Pay attention to the positive (+) and negative (−) battery polarity markings at the bottom of the compartment.

4. Replace the battery cover.
5. To secure the cover, torque the screws clockwise 2 in. lbs. maximum.
6. Do not over tighten.

NOTICE

To prevent internal damage to circuitry, do not substitute screws with lengths that are different from the screws Meriam provided to you.

Watch for the low battery indicator

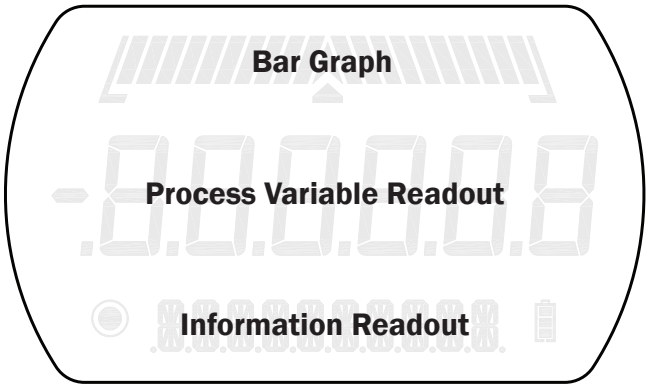
The battery indicator on the display shows the current charge.

Note: Be prepared to change batteries when you see the outline of the battery icon and the outline of the battery icon flashes. You have approximately 2 hours of run time following a low battery warning.

Refer to battery manufacturers' instructions

Visit the website of the battery manufacturer to learn more about the care, storage, shipping, use, disposal, and recycling of your batteries.

The display



The bar graph

The bar graph displays a live indication of the current pressure or temperature applied to a sensor as a percent of FS.

Note: When you press the Information key, the bar graph displays the remaining state of the charge for the batteries.

Display functions

The digital calibrator has twelve display functions. It ships with five display functions active (they appear in **bold** below). You can change which displays are active with meriSuite CG.

Press the **Forward** (or **Backward** in reverse order) key to view these modes.

1. **Home** is the default view with measurement units
2. **MIN** (Minimum)
3. **MAX** (Maximum)
4. **AVG** (Average)
5. **FACTORY CAL**(ibration) **TAP ✓ TO RESTORE**
6. **RESPAN TAP ✓ TO BEGIN**

Keypad: Description of the keys

Name	Key	Description
Backward		▪ It cycles backward through menu options.
Home		▪ Home key returns you to the **Measurement and Units** screen. ▪ Home key is disabled during tests and edits
Forward		▪ It cycles forward through menu options.
Units		▪ Select a measurement unit.
Release Hold		▪ It releases the **Hold**.
Hold		▪ It begins a **Hold**.
Up arrow		▪ It increases digits by one. ▪ It switches between the P1 and P2 sensors displays.
Left arrow		▪ It moves the blinking cursor one space at a time to the left.
Zero		▪ **Zero** key resets pressure values to zero. ▪ It resets min max values. ▪ It sets edit values to zero.
Right arrow		▪ It moves the blinking cursor one space at a time to the right.
Down Arrow		▪ It decreases digits by one. ▪ It switches between the P1 and P2 sensors displays.
Cancel or Esc		▪ **Cancel** any editing or changes without saving. ▪ It also stops tests.
Accept		▪ **Accept** applies all editing and changes, and then saves them. ▪ It also stops tests.
Power		▪ Turns the digital calibrator on or off.
Information		▪ Displays information about the digital calibrator, internal sensor, and the firmware.
Backlight		▪ It provides on and off only.

The Information key and the Home screen

The Information menu provides you with details about the digital calibrator and sensors.

1. **Batt %** displays the percentage on the bar graph and in digits**.**
2. Indicates sensor type (or measurement type): compound, absolute, or differential.
3. **CAL DATE**
4. **USL** is an abbreviation for *upper sensor limit*.
5. **LSL** is an abbreviation for *lower sensor limit.*
6. **LT MAX %** displays the Life-Time Maximum that has been reached on the sensor.
7. **SENSOR F/W VERS** (F/W is an abbreviation for *firmware*) *[this message scrolls to display the information]*
8. **SENSOR S/N** (S/N is an abbreviation for *serial number*) *[this message scrolls to display the information]*
9. **DEV F/W VER** (DEV is an abbreviation for *device;* it refers to the digital calibrator) *[this message scrolls to display the information]*
10. **DEV S/N** *[this message scrolls to display the information]*

Up and Down Arrows

1. In the edit mode, the **Up Arrow** increases the digit each time you press it. The **Down Arrow** decreases the digit  and

    1. **Up Arrow:** 0 to 1 to 2 to 3 to 4 to 5 to 6 to 7 to 8 to 9.
    2. **Down Arrow:** –0 to –1 to –2 to –3 to –4 to –5 to –6 to –7 to –8 to –9.
    3. The negative symbol in the display appears in front of the first digit when it is required.

The backlight

White backlight

The white backlight has an automatic time out. If you do not press any keys while the backlight is on, it automatically turns off.

Backlight

Press the Backlight key to cycle through: On or Off.

Flashing red backlight

The flashing red backlight indicates an error condition. Possible error conditions are:

- Pressure has exceeded the calibrated accuracy of the digital calibrator.
- Pressure has fallen below the stated accuracy of the digital calibrator.

Note: The red backlight overrides the white backlight.

Overrange condition

During an error or overrange condition, the red backlight **overrides** the white backlight.

However, once the error or overrange condition is corrected, the white backlight is restored to its previous state (if the backlight **Auto Off** timeout did not expire).

Measurement units

A measurement unit doesn't display

NOTICE

If a given measurement unit cannot display the correct number of digits, the digital calibrator automatically advances to the next displayable unit.

Note: When you turn on the digital calibrator, it defaults to the last selected measurement unit.

Measurement units are stored on a sensor

When the digital calibrator is shipped, eight (8) measurement units are active. See the following list.

Standard Measurement Units (non-custom)		
1. PSI	4. INHG0C	7. BAR
2. INW20C	5. MMHG0C	8. MBAR
3. MMW20C	6. KPA	

Auto Off (Automatic shut off)

How long will the digital calibrator remain on if I leave it unattended?

- The default setting is 30 minutes.

What does the Zero (ø) key do?

In normal measure mode

If the sensor is within a tolerance band around zero, press and hold the **Zero** key to zero the pressure measurement and to reset the Min and Max measurements.

Note: The tolerance band is approximately ± 1 % of the FS pressure value of the sensor.

In Min or Max mode

Press and hold the **Zero** key to reset the MIN and MAX measurement. However, this does not zero the pressure measurement.

In Average mode

Press and hold the **Zero** key to restart the rolling average.

Holding the Zero key

The key must be held to perform the Zero mode. The displayed value(s) dashes out during the zero process.

Specifications

Sensors: type and range

Non-Isolated: Accuracy 0.025 % of Full Scale

Model number	*Pressure range*		
Absolute Non-Isolated (AN)			
ZM1004-AN0015	0 psi	to	15 psi
ZM1004-AN0030	0 psi	to	30 psi
ZM1004-AN0100	0 psi	to	100 psi
Compound Non-Isolated (CN)			
ZM1004-CN0001	-1 psi	to	1 psi
ZM1004-CN0005	-5 psi	to	5 psi
ZM1004-CN0015	-14.5 psi	to	15 psi
ZM1004-CN0030	-14.5 psi	to	30 psi
ZM1004-CN0050	-14.5 psi	to	50 psi
ZM1004-CN0100	-14.5 psi	to	100 psi
Differential Non-Isolated (DN)			
ZM1004-DN0001	-1 psi	to	1 psi
ZM1004-DN0005	-5 psi	to	5 psi
ZM1004-DN0015	-14.5 psi	to	15 psi
ZM1004-DN0030	-14.5 psi	to	30 psi
ZM1004-DN0050	-14.5 psi	to	50 psi
ZM1004-DN0100	-14.5 psi	to	100 psi

Pressure measurements

- ± 0.025 % of FS.
- Accuracy statements include the combined effects of linearity, repeatability, hysteresis, and temperature over the specified operating temperature range.
- Warm up time: 5 minutes.
- You should zero the sensor at working ambient temperature before using it.

Temperature

- Storage: –20 °C to 70 °C (–4 °F to 158 °F)
- Operating: –10 °C to 50 °C (14 °F to 122 °F)

Relative Humidity

- 95 % non- condensing

Vibration

- 1 meter drop test

Ingress specifications

- IP52

Altitude specifications

NOTICE

Do not use the M1004 digital calibrator at an altitude above 2000 m (6561 ft.).

Keypad

- Sealed membrane 16 domes.

Media Compatibility

Pressure Types

- **DN:** Differential pressure, non-isolated sensors for use with clean, dry, non-corrosive gases only.

Pressure Limits

- **DN units:** 2x range when pressurized on high side only. 150 psi (10.5 kg/cm^2) static when applied to both sides of sensor simultaneously.

Battery Type

4 AA alkaline batteries of the same battery type.

Dimensional specifications

Weight

1000 g (35.2 oz. or 2.2 lbs.)

Enclosure

Polycarbonate/ABS alloy

Maintenance and cleaning

Cleaning

- Clean the MTS and its cable with a soft, damp cloth.
- Clean the Luer Locks with a soft, damp cloth or replace them as needed.

Prepare the digital calibrator for storage

Remove the batteries to store the digital calibrator

- We recommend that you remove the batteries from the digital calibrator if you are storing it for an extended time period.
- Follow the battery manufacturer's instructions for storing your batteries.

Store the digital calibrator

- The recommended storage temperature for the digital calibrator is between: –20 °C to 70 °C (–4 °F to 158 °F)

Help

Register your product

We want you to get the most out of your purchase, and that starts with a few, easy registration steps.

1. Go to www.meriam.com
2. In the **Product Registration** section, click **Register a product.**

Find downloads and documents

1. Go to www.meriam.com.
2. In the **Technical Resources** section, click **Learn More**.
3. Select one of these categories to find the files you need:

   Product manuals | User Manuals and Quick Start Guides

   Downloads | Applications (software), firmware, updates, installation instructions

   Certifications | Certifications and approvals

   SDS (MSDS) | Safety Data Sheets

   Control Drawings | Intrinsically Safe Drawings

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Repair or Calibration