

# BULLSEYE DASH



## Operational Manual

**YOU MUST READ THIS MANUAL BEFORE USE**

Jan 29, 2025

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## Section 1: Overview

The Bullseye DASH is a rugged portable vacuum instrument that was designed to make vacuum measurement easy, useful and intuitive while being suited for the demands of field use. It can power and read a wide variety of industry standard vacuum sensors and capacitance manometers.

Its main features include an LCD display with an white backlight which shows large numerical fonts for a simple vacuum readout, as well as digital graphics to show graphs with time horizons of data at either 1 minute, 10 minutes, or 60 minutes. This graphical display of vacuum pressure makes understanding system trends easy, and can display small changes in pressure with sub-second resolution.

### Features & Specifications

- Rugged design for field or laboratory use
- Dimensions: 6.2" x 3.7" x 1.3"
- Only requires 4 AA alkaline or Micro-B USB to Power, Lithium batteries recommended
- Magnet for convenient mounting in the field
- Detachable sensor cable
- White backlight display
- Alarm that can trigger by setpoint adjustments
- Battery life of 2800mAh/25mA, or 127 hours (~ 5 days). For longer usage, use Micro-B USB power.
  - Battery life for 1 Watt gauge: **1 hr** for **4 AA alkaline** batteries, **4 hrs 15 min** for **4 AA Lithium** batteries
- Up to 2-watt power for driving high vacuum active gauges
- Field Calibration ability to use a DigiVac calibration module to enable field calibration of the DASH handheld gauge (available 2025)

### Vacuum Sensors and Ranges

The DASH's range is sensor-dependent; see Section 8: Accuracy Specs for all DASH-compatible sensors.

The vacuum interface is also sensor-dependent; NPT, KF16, KF25, Conflat, and VCR options are all available. DigiVac also stocks a wide variety of vacuum interface adapters to provide the proper connection for your system, including hose barbs, reducers, clamps, and O-rings. Consult DigiVac for availability.

#### Currently Supported Sensors:

- DigiVac Quantum Sensors: DPP, DCP, DPCP

- Capacitance Manometers (CDG) mbar, Torr, or Pa: 0.1, 0.5, 1, 5, 10, 20, 50, 100, 1,000
- Pfeiffer: PKR251
- Sens4: std. mbar, std. Torr, std. Pa
- Edwards: APG200-XM, ASG2
- Lesker: Pirani, Cold Cathode Pirani, AGC Capacitance Manometers + Cable - 0.1 Torr, 0.5 Torr, 1 Torr, 5 Torr, 10 Torr, 20 Torr, 50 Torr, 100 Torr, 1000 Torr
- Agilent: PVG-500, PVG-550, FRG-700, PCG-750, CDG-500 CM - 1 Torr, 10 Torr, 100 Torr, 1000 Torr

## Resolution

- 1 Torr to 10 Torr: 0.01 Torr increments
- 10 Torr to 100 Torr: 0.1 Torr increments
- 100 Torr to Atmosphere: 1 Torr increments

- 
- Scientific Resolution
  - High Resolution
  - Low Resolution

## Units of Measurement

microns, millitorr, Torr, mbar, bar, kPa, kPag, Pascals, PSIA, mmHg, inHg, mmH2O, inH2O, PSIG

# Section 2: Quick Start for Bullseye DASH

**Start by unpacking** the unit to verify you've received everything you've ordered.

## Packing List

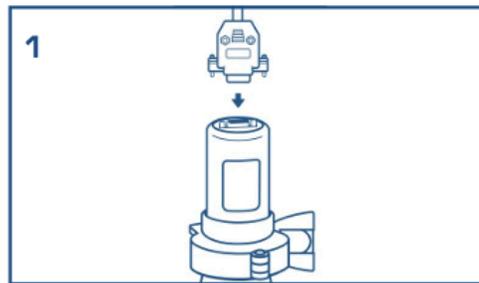
- Vacuum instrument with black rubber boot
- Includes: 10 foot sensor cable with FCC68 connector designed to plug directly into the sensor
- Vacuum sensor (specified by the user)
- Quick Start Guide or (this) user manual
- 4 AA alkaline pre installed in the instrument

## Setting Up the Bullseye DASH

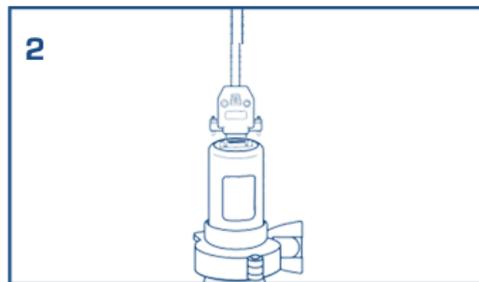
- Mount the DASH vacuum sensor into the system to be measured.

- Attach the sensor cable onto the sensor, using the provided FCC68-to-DB9 adapter if needed.
- Power on the device by pressing the HOME button. It will take about 5 seconds to fully power up and for the reading to settle.
- Your gauge comes with 4 pre-installed AA batteries. You can also power the gauge by attaching a Micro-B USB power cable and a cell phone charging block.
- The battery door is underneath the black rubber boot, which must be removed to access the door.
- If need be, turn on the backlight using the Up arrow. The backlight does not affect gauge reading or accuracy.
- Read vacuum!

**NOTE:**  
The DASH comes preconfigured and calibrated at the factory. No additional setting changes need to be done before putting the gauge into service.



1  
Attach provided adapter to Sensor



2  
Take the cable coming off the DASH and plug it into the adapter



3  
You are now ready to use your Dash

## Alarm Set Up

The DASH is equipped with an alarm function that will go off when your system pressure is either above or below your desired setpoint.

Enter the menu, then go to Settings. Go to SP (Set Point) Alarm. Here you can toggle the alarm off and on, set the vacuum level you want the alarm to go off at, and set whether you'd like the alarm to sound above or below that setpoint.

## Alarm Function & Features

1. The minimum setpoint is 0.05 Torr and the maximum setpoint is 1,000 Torr.

### Example:

#### Alarm in ABOVE mode, setpoint 2 millibar

The alarm will sound when the system pressure is higher than 2 millibar, and will turn off when the system pressure is less than 2 millibar.

#### Alarm in BELOW mode, setpoint 0.500 Torr

The alarm will sound when the system pressure is less than 0.500 Torr, and will turn off when the system pressure is higher than 0.500 Torr.

2. **NOTE:** When setting some values in for alarm set points, you have to hold the buttons before the values start moving
3. The alarm can be silenced anytime by pressing any of the 4 buttons on the DASH.

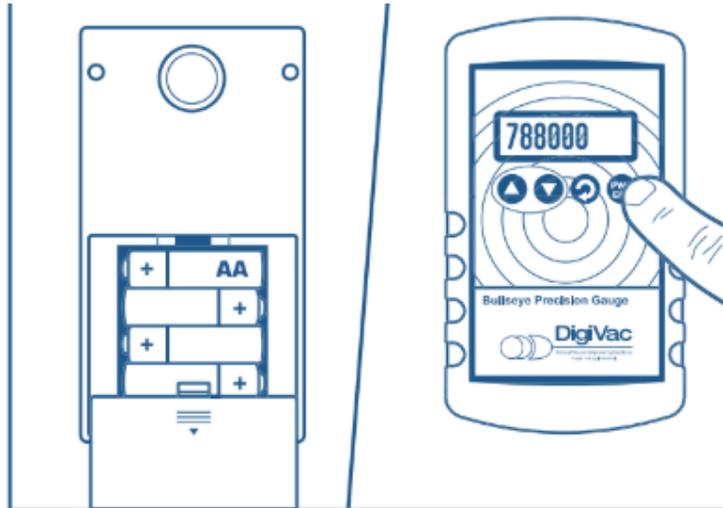
## Battery Change

The Bullseye Precision Gauge product line is powered by **either 4 AA batteries or Micro-B USB to Power.**

The Battery Icon will **ONLY** display when the battery life is low, notifying the end user to change the batteries. If the DASH battery life is dead, the unit will turn on, the battery icon will blink and the unit will turn back off. To change the batteries the following steps are provided:

1. Remove rubber protective boot cover from your Bullseye gauge.
2. Turn the Bullseye gauge over on its back to display its battery pack.
3. Press firmly on the indentations on the battery pack cover and pull/push down on the cover to reveal the batteries.

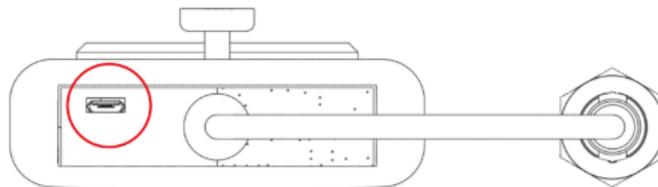
4. Replace old batteries with 4 AA batteries (we recommend lithium batteries).
5. Slide the battery pack cover back on by pressing firmly until it reaches the top, remove pressure and the cover will click into place.
6. Put the rubber boot protection cover back on the unit.
7. Power on using the “home/pwr” button.



Install batteries or Connect to USB, press power button and verify that the display lights up

\*\*NOTE: The USB is an additional option for external power, it won't charge the AAs.

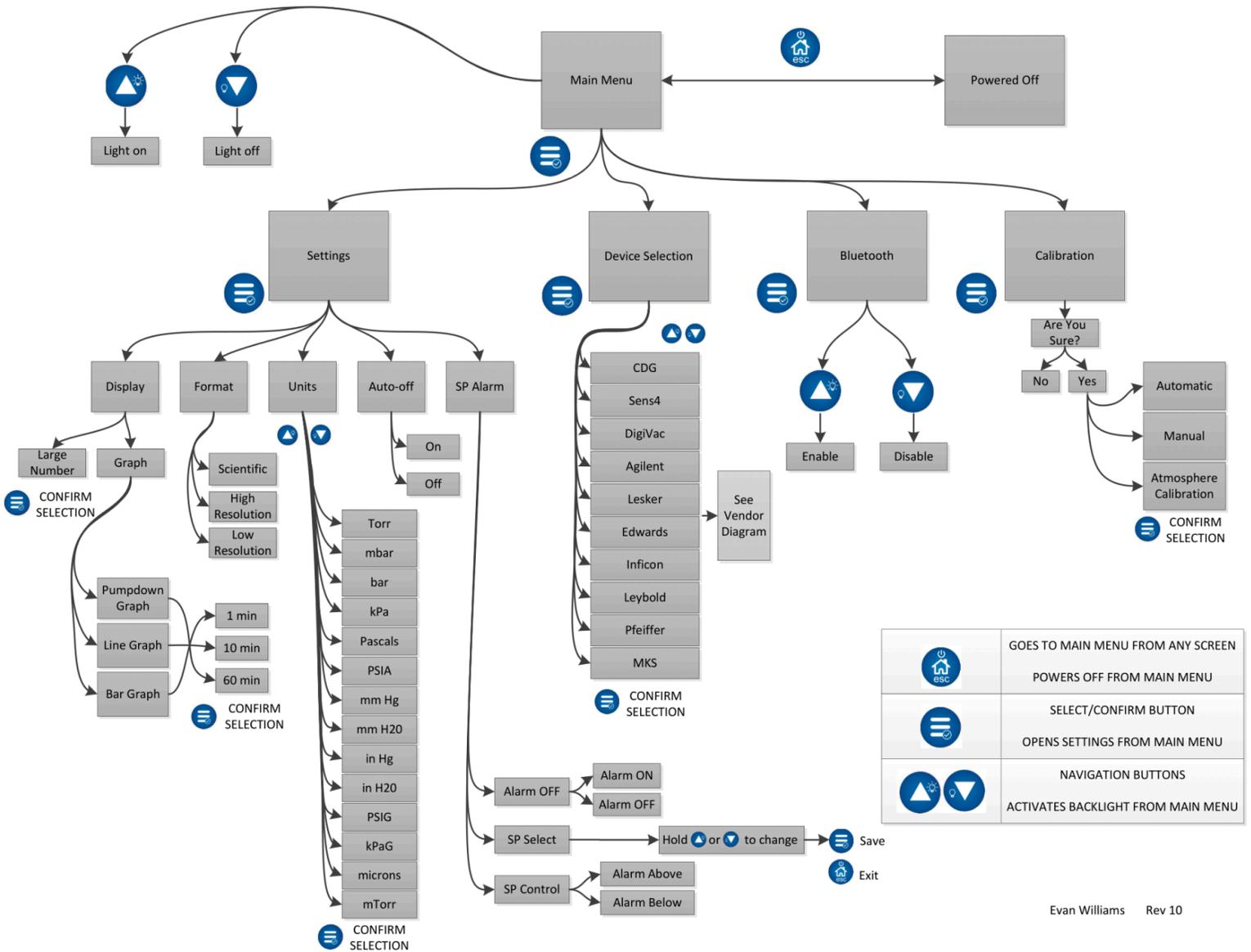
## **Bullseye Gauge Disclaimer: Use USB or batteries.**



**Circled is where you can locate the USB port used to power the DASH**

# Section 3: Menu Settings Flowchart

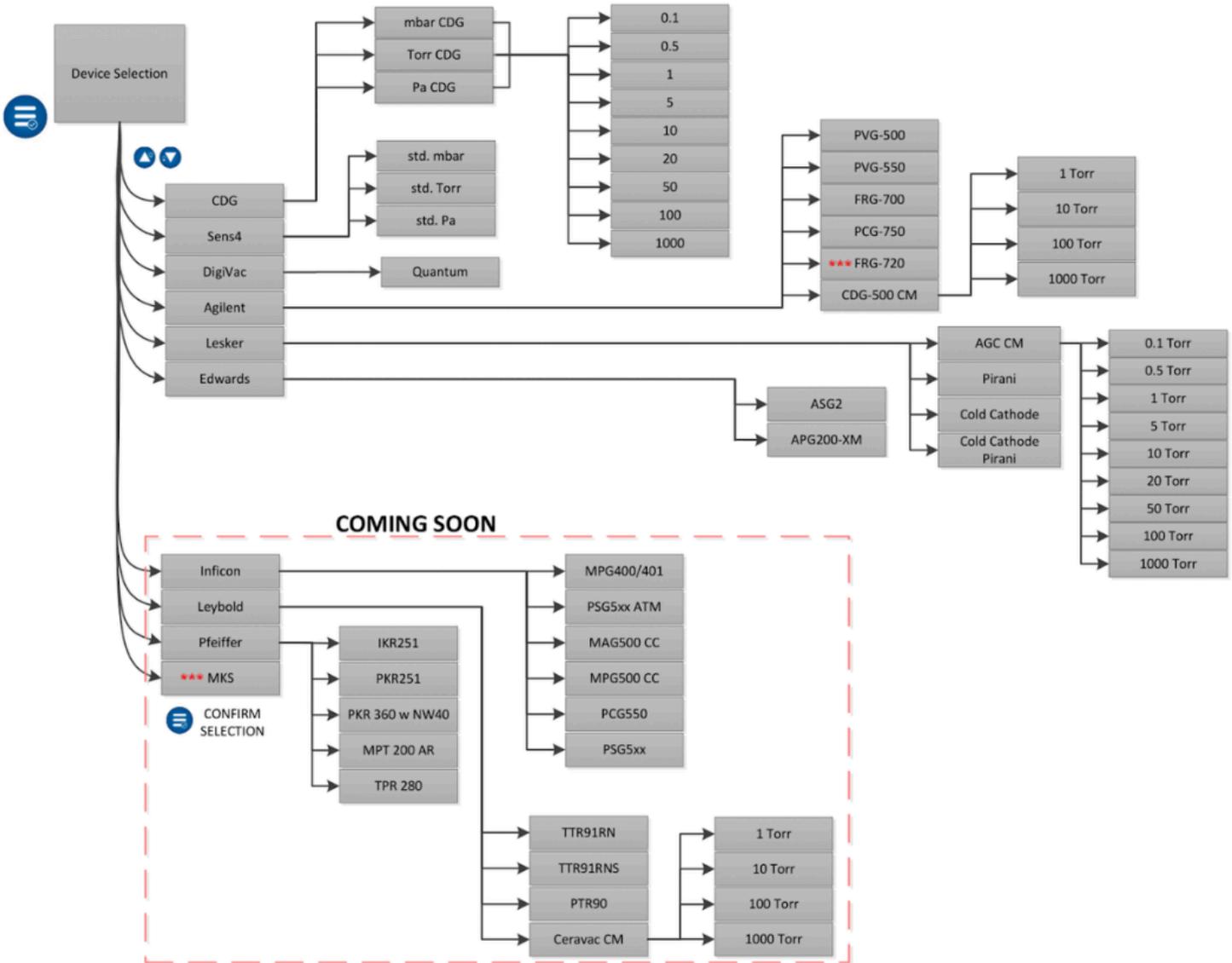
## Main Menu Diagram



Evan Williams Rev 10

## Device Selection Vendor + CDG Diagram

# Device Selection Vendor + CDG Diagram



\*\*\* Gauge(s) is currently not supported by the DASH

## Section 4: Menu and Display Options

The Bullseye DASH has two modes of display: Large Number and Graph.

The large number display is a simple numerical readout in whatever unit of measurement you've chosen.

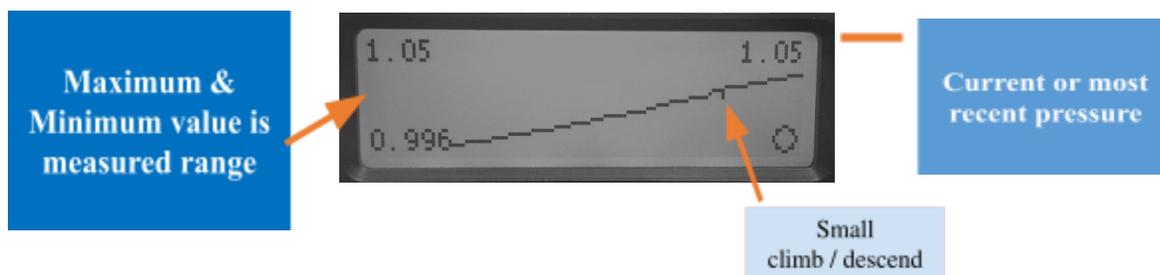
The graphical display mode features a user-selectable line graph, bar graph, or pump down graph with time horizons of: 1 minute, 10 minutes, or 60 minutes.

The large number display has 3 formats: **Scientific**, **High Resolution** and **Low Resolution**. The Scientific format has four digits of precision with a base ten exponent (ex. 760 Torr would read 7.600E+2). This format was modified in 2024 to increase precision with additional decimal places displayed. The High Resolution format is the raw vacuum data, which provides more granular readings but may appear noisy at pressures closer to atmosphere and/or when reading in microns/millitorr. The Low Resolution format when selected displays less significant digits, rounding to a neater reading.

If the sensor has failed or been disconnected, the DASH screen will read "SENSOR?". The screen will also read "Overrange" or "Underrange" if the vacuum level is lower or higher than the sensor's range (ex. A 10 Torr capacitance manometer will read "Overrange" if the vacuum level is > 10 Torr or it will read "Underrange" when the vacuum level is < 0.05 Torr).

The graphing options plot time horizontally and log pressure vertically. The vertical pressure scale is logarithmic, indicating order of magnitude from less than 1 Torr to atmosphere

The graphs will automatically adjust their range based on the time horizon chosen.



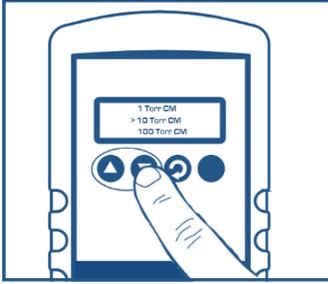
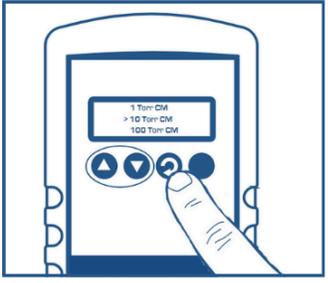
The line graph here is shown with a linear pressure scale that is fit to the pressure range of the data set.

The height of the graph display is the **pressure range** of the data set in a **linear scale (not log)**. The top left figure is the **maximum value in this range**, and the bottom left figure is the **minimum value in this range**. The top right figure is the **current or most recent value** in the instrument.

This visualization can show a very small climbing or descending trend that the vacuum analysis algorithm has not declared as a leak or pumping.

The **UP** and **DOWN** buttons turn the backlight on/off and scroll through the menu, the **MENU** button enters the configuration menu and confirms the selection, and the **HOME** button turns the gauge on or off, and exits to the main screen. Refer to [Section 3: Menu Settings Flow Chart](#) for more information.

## Changing DASH Sensor Pairing

	<p>1. Press Enter to bring you to the Settings Menu</p>		<p>4. Use the Arrow buttons to scroll through the "Device Selection" options to find your sensor of choice. (Match the Sensor you would be pairing the DASH with)</p>
	<p>2. Use Arrow Buttons to scroll through Menu options to find: Device Selection</p>		<p>5. Use the Enter button to select Sensor of Choice</p>
	<p>3. Use the Enter button to select: "Device Selection"</p>		<p>6. You are now ready to use your Dash</p>

## Section 5: Maintenance and Service

The **Bullseye DASH** is designed for trouble-free use with little or no maintenance required. A few best practices should be followed. Mount the sensor in flange-down orientation if possible. Vacuum sensors are a consumable part that can be damaged by liquid ingress, positive

pressure, or process contaminants. Protecting them from excess damage will extend their lifespan.

**Note:** The Bullseye DASH was tested and configured at the factory to work with the vacuum sensor it was purchased with. For instructions on how to change the driver so the DASH will work with a different sensor, please see the diagram above, the quick start guide in [Section 2: Quick Start for Bullseye DASH](#), or contact the technical support department at [DigiVac](#).

## Section 6: Calibration

All gauges are tested under real vacuum in our factory using certified reference standards. DigiVac offers standard calibration and repair services as well as NIST-certified calibration, where we record the DASH's readings at specific test points compared to a certified reference standard and issue paperwork with the results. In 2024 DigiVac refined the calibration process for better accuracy and reliability.

The calibration for the DASH is performed in the factory with a certified voltage reference. User adjustments to the calibration menu are not necessary and may result in the gauge malfunctioning. A confirmation step ("Are you sure?") has been added before calibration to prevent accidental actions.

Starting in 2025 the DASH will have a **Field Calibration Option**. This option will give you the ability to use a DigiVac calibration module to enable field calibration of the DASH handheld gauge.

**To learn *How to Calibrate* your DASH please reach out to our technicians at [tech\\_support@digivac.com](mailto:tech_support@digivac.com) or Call 732-765-0900, they will be able to provide assistance and our Calibration Manual upon request.**

## Section 7: Bluetooth Model Operation



The Bullseye DASH can be ordered with a Bluetooth module, which interfaces with the [Vacuum Gauge Application](#) for remote, real-time vacuum monitoring and graphing through a phone or tablet. The vacuum data can then be read and exported via [vacuumnetwork.org](#) to a .csv file and shared. The app can be found by searching “[Vacuum Gauge](#)” in the [Apple Store](#) or [Google Play Store](#). The app range is up to 300 feet under ideal conditions.

To enable Bluetooth monitoring, scroll to the menu section marked Bluetooth, and enable or disable the signal with the up or down arrow. See the Vacuum Gauge Application instructional addendum to enable app functioning.

**\*\*\*NOTE: DASH Version K25A17 is currently not compatible and does not offer our bluetooth feature, however this will be added in future iterations of the DASH to come by 2H2025**

## Section 8: Accuracy

Overall measurement accuracy is influenced by both the sensor and device accuracies. Users should account for sensor-specific tolerances in addition to the DASH’s full scale accuracy of  $\leq \pm 0.01\%$  of the sampled input (sensor) voltage.

### Instrument Accuracy

The DASH's full scale worst case error in **voltage measurement** is  $\leq 0.01\%$ .

For example, if you apply 5.0 volts, the Dash's measurement accuracy is within  $\pm 0.0005$  volts, so the DASH will read somewhere between 4.9995 and 5.0005.

The worst case sensor displayed error for a sensor with a **logarithmic equation**, like the Sens4 Std. mbar driver is  $\pm 0.2\%$ .

For example, if the actual pressure is 1000 millibar, the DASH display reading could be between 998 and 1002 mbar.

The sensor worst case displayed error for a sensor with a **linear equation**, like a 1000 Torr Capacitance Manometer is **± 0.02%**.

For example, if the actual pressure is 500 torr, the DASH display reading could be between 499.9 and 500.1 Torr.

## Sensor Accuracy

Measurement Accuracy is largely dependent on the gauge connected to the Dash. The Dash adds negligible error to the reading in all cases. Below is a list of gauges that the Dash does or will support, and their associated accuracies as of the date of this printing.

Mfr.	Sensor	Type	Range	Accuracy (as percent of reading, unless noted)
DigiVac	DCP	Capacitance Manometer + Piezo	0.01 to 1,000 Torr	0.01 to 0.099 Torr: ± 3% 0.100 Torr to 9.99 Torr: ± 2% 10 Torr to 1000 Torr: ± 3%
DigiVac	DPP	Pirani + Piezo	7.5x10E-6 to 1000 Torr	7.5x10E-6 to 7.5x10E-5: ± 50% 7.5x10E-5 to 6x10E0: ± 14% 6x10E0 to 7.5x10E+1: ± 5% 7.5x10E+1 to 1000 Torr: ± 2%
DigiVac	DPCP	Capacitance Manometer, Piezo, + Pirani	7.5x10E-6 to 1000 Torr	7.5x10E-6 to 7.5x10E-5: ± 50% 7.5x10E-5 to 7.5x10E-3: ± 20% 7.5x10E-3 to 1000 Torr: ± 3%
Kurt J. Lesker	AGC 0.1 Torr	Capacitance Manometer	~ 3 decades below full scale	± 0.50%
Kurt J. Lesker	AGC 0.5 Torr	Capacitance Manometer	~ 3 decades below full scale	± 0.20%
Kurt J. Lesker	AGC 1 Torr	Capacitance Manometer	~ 3 decades below full scale	± 0.20%
Kurt J. Lesker	AGC 5 Torr	Capacitance Manometer	~ 3 decades below full scale	± 0.20%
Kurt J. Lesker	AGC 10 Torr	Capacitance Manometer	~ 3 decades below full scale	± 0.20%
Kurt J. Lesker	AGC 20 Torr	Capacitance Manometer	~ 3 decades below full scale	± 0.20%
Kurt J. Lesker	AGC 50 Torr	Capacitance Manometer	~ 3 decades below full scale	± 0.20%
Kurt J.	AGC	Capacitance	~ 3 decades below full scale	± 0.20%

Lesker	100 Torr	Manometer		
Kurt J. Lesker	AGC 1,000 Torr	Capacitance Manometer	~ 3 decades below full scale	± 0.20%
Kurt J. Lesker	Pirani	Pirani	3.750 x 10 <sup>-4</sup> to 760 Torr	3.75 x 10 <sup>-4</sup> to 7.60 x 10 <sup>-4</sup> Torr: ±50% 7.60 x 10 <sup>-4</sup> to 75 Torr: ±15% 75 to 760 Torr: ±50%
Kurt J. Lesker	Cold Cathode Pirani	Cold Cathode Pirani Combination Gauge	760 to 7.600 x 10 <sup>-10</sup> Torr	7.60 x 10 <sup>-10</sup> to 76 Torr: ±30% 76 to 760 Torr: ±50%
Agilent	CDG-500 1 Torr	Capacitance Manometer	0.001-1 Torr	± 0.20%
Agilent	CDG-500 10 Torr	Capacitance Manometer	0.01-10 Torr	± 0.20%
Agilent	CDG-500 100 Torr	Capacitance Manometer	0.1-100 Torr	± 0.20%
Agilent	CDG-500 1000 Torr	Capacitance Manometer	1-1000 Torr	± 0.20%
Agilent	PVG-500	Pirani	5*10 <sup>-4</sup> to 1000 mbar	100 to 1000 mbar: ± 50% 1*10 <sup>-3</sup> to 100 mbar: ± 15% 5*10 <sup>-4</sup> to 1*10 <sup>-3</sup> mbar: ± 50%
Agilent	PVG-550	Pirani	3.75 x 10 <sup>-4</sup> to 750 Torr	1x10 <sup>-3</sup> to 100 mbar: ± 15 % 100 to 1000 mbar: ± 50 % 5x10 <sup>-4</sup> to 1x10 <sup>-3</sup> mbar: ± 50 %
Agilent	FRG-700	Pirani Inverted Magnetron	3.8*10 <sup>-9</sup> to 760 Torr	± 30%
Agilent	PCG-750	Pirani Capacitance Diaphragm Gauge	5*10 <sup>-5</sup> to 1500 mbar	950 to 1050 mbar: ± 2.5% 100 to 950 mbar: ± 5% 1*10 <sup>-3</sup> to 100 mbar: ± 15% 5*10 <sup>-5</sup> to 1*10 <sup>-3</sup> mbar: ± 50%
Agilent	***FRG-720	Pirani Bayard-Alpert Combination Gauge	3.8*10 <sup>-10</sup> to 760 Torr	1*10 <sup>-8</sup> to 1*10 <sup>-2</sup> mbar: ± 15%
MKS	***925	Pirani	1x10E-5 Torr to Atmosphere	5x10E-4 to 10-3 Torr: ± 10% 10-3 to 100 Torr: ± 5% 100 Torr to ATM: ± 25%
MKS	***910	Pirani + Piezo	1x10E-5 to 1,500 Torr	5x10E-4 to 1x10E-3 Torr: ± 10% 1x10E-3 to 11 Torr: ± 5% 11 to 1000 Torr: ± 0.75%
MKS	***901	Pirani + Piezo	1x10E-5 to 1,500 Torr	5x10E-4 to 1x10E-3 Torr: ± 10% 1x10E-3 to 100 Torr: ± 5% 100 Torr to ATM: ± 25%
Pfeiffer	PKR251	Cold Cathode Pirani	5x10E-9 to 1x10+3 mBar	+/- 30%
Edwards	APG200-XM	Pirani	5x10E-4 to 1,000 mBar	5x10E-4 to 1,000 mBar: ± 50% 1x10E-3 to 100 mBar: ± 15% 100 to 1,000 mBar: ± 50%

Edwards	ASG2	Strain Gauge	1 to 1,000 mBar	± 0.2% full scale
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**\*\*\*This Gauge is currently not supported by the DASH**

## Calibration Accuracy

Readings vary slightly based on whether USB power or battery power is used. For optimal accuracy, when calibrating the DASH, use the same power method as when the gauge is in everyday use - **USE CASE:** if you intend to use the DASH with batteries, use battery power when calibrating it as well.

For more information on DASH Calibration please reach out to our technicians at [tech\\_support@digivac.com](mailto:tech_support@digivac.com) or Call 732-765-0900, they will be able to provide assistance and our Calibration Manual upon request.

## Section 9: Units of Measurement and Conversions

The DASH reads in the following **units of measurement:**

**microns, millitorr, Torr, mbar, bar, kPa, kPag, Pascals, PSIA, mmHg, inHg, mmH2O, inH2O, PSIG**

Use the conversion chart below as needed.

Unit Conversions												
Scientific Notation						Scientific Notation		Gauge		Scientific Notation	Gauge	
Torr	Torr/mmHg	mTorr/microns	PSI-A	PSI-G	Bar	mbar	mbar/hPa	inH <sub>2</sub> O	KPA	Pa	inHg	ATM
1.00E-09	1E-09	0.000001	0	-14.696	0	1.33E-09	0	-406.83	0	1.33E-07	-29.92	0
1.00E-05	0.00001	0.01	0	-14.696	0	1.33E-05	0	-406.83	0	1.33E-03	-29.92	0
1.00E-04	0.0001	0.1	0	-14.696	0	1.33E-04	0	-406.83	0	1.33E-02	-29.92	0
1.00E-03	0.001	1	0	-14.696	0	1.33E-03	0.001	-406.83	0	1.33E-01	-29.92	0
5.00E-03	0.005	5	0	-14.696	0	6.67E-03	0.007	-406.83	0.001	6.67E-01	-29.92	0
1.00E-02	0.01	10	0	-14.696	0	1.33E-02	0.013	-406.82	0.001	1.33E+00	-29.92	0
1.00E-01	0.1	100	0.002	-14.694	0.0001	1.33E-01	0.133	-406.77	0.013	1.33E+01	-29.92	0.0001
1.10E-01	0.11	110	0.002	-14.694	0.0001	1.47E-01	0.147	-406.77	0.015	1.47E+01	-29.92	0.0001
5.00E-01	0.5	500	0.01	-14.686	0.0007	6.67E-01	0.667	-406.56	0.067	6.67E+01	-29.9	0.0007
1.00E+00	1	1000	0.019	-14.677	0.0013	1.33E+00	1.333	-406.29	0.133	1.33E+02	-29.88	0.0013
5.00E+00	5	5000	0.097	-14.599	0.0067	6.67E+00	6.666	-404.15	0.667	6.67E+02	-29.72	0.0066
1.00E+01	10	10000	0.193	-14.503	0.0133	1.33E+01	13.332	-401.48	1.333	1.33E+03	-29.53	0.0132
1.00E+02	100	100000	1.934	-12.762	0.1333	1.33E+02	133.322	-353.3	13.332	1.33E+04	-25.98	0.1316
7.41E+02	741	741000	14.329	-0.367	0.9879	9.88E+02	987.919	-10.21	98.792	9.88E+04	-0.75	0.975
7.60E+02	759.9998	759,999.82	14.696	0	1.0133	1.01E+03	1,013.25	-0.05	101.325	1.01E+05	0	1
7.75E+02	775	775000	14.986	0.29	1.0332	1.03E+03	1,033.25	7.98	103.325	1.03E+05	0.59	1.0197
1.00E+03	1000	1000000	19.337	4.641	1.3332	1.33E+03	1,333.22	128.41	133.322	1.33E+05	9.45	1.3158

## Section 10: Instrument Updates and History

Version	Release date	Feature updates
K22C23	2022-3-23	Original Release of the DASH
24i11	2024-09-11	There are many new sensors and features added with 24i11, as well as bug fixes and minor menu structure changes
24L13	2024-12-13	This code revision was mainly focused on improving the auto calibration and adding in a manual calibration feature
K25A17	2025-1-17	This code version improves upon the calibration features of the device. We are storing more decimal places for calzero and calspan to refine the calibration. This code version also improves the alarm SP entering, as well as battery handling.

## Section 11: Terms of Use, Limited Warranty, and Liability Waiver

**THE DIGIVAC COMPANY (“DIGIVAC”)** offers all of its products with the following terms and conditions and notices as follows. By accepting and/or using a DIGIVAC product, you hereby acknowledge and agree to the following terms and conditions, and acceptance of these terms and conditions are a condition precedent to any purchase/sale agreement between you and DIGIVAC.

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