Ideal vacuum

XACTGAUGE™
HANDHELD VACUUM METER
XG-110

THERMOCOUPLE GAUGES USER MANUAL

XACTGAUGE™
HANDHELD VACUUM METER
XG-110

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SECTION 1: OVERVIEW

The XactGauge™ XG-110 handheld gauge is a rugged, portable vacuum measurement instrument designed specifically for the demands of field use. It is a highly accurate digital vacuum gauge using field-proven thermocouple vacuum sensor technology. The XactGauge™ XG-110 offers several viewing options including numeric, bar graph, line graph and pumpdown graph display.

Portable
- Rugged design that offers a super-strong magnet for hands-free vacuum measurement
- Field-proven thermocouple vacuum sensing technology

Precise
- Xact accuracy available in 12 different measurement units (microns, millitorr, Torr, mm of Hg, mbar, bar, kPa, Pa, PSIA, inches of Hg, mm and inches of water)
- Field calibratable

Reliable
- 70 hour battery life
- Protective rubber boot
- Simple easy to use design

Features:
- Auto Off
- On/Off soft switch
- Battery level indication
- Good/Bad sensor (tube) indication
- Self test mode
- Field replaceable sensor
- 3 different graphical displays of vacuum pressure (pump-down, line, or bar graph)
- Vacuum analytics for leak, outgassing and pump-down
- Available with hard or soft protective travel cases (options)
- Bluetooth connectivity to smart phone (option)

Section 2: Quick Start: XactGauge™ XG-110 Gauge

A feature-rich *yet* easy to use digital vacuum gauge that is ideal for field use.

Unpack and Confirm: verify you've received everything you ordered

The vacuum instrument contains the following components:
1. Vacuum gauge with amber backlight and blue rubber boot attached to 7' of coiled cable with Octal connector
2. Thermocouple Plus vacuum sensor, part number SEN-VGT500
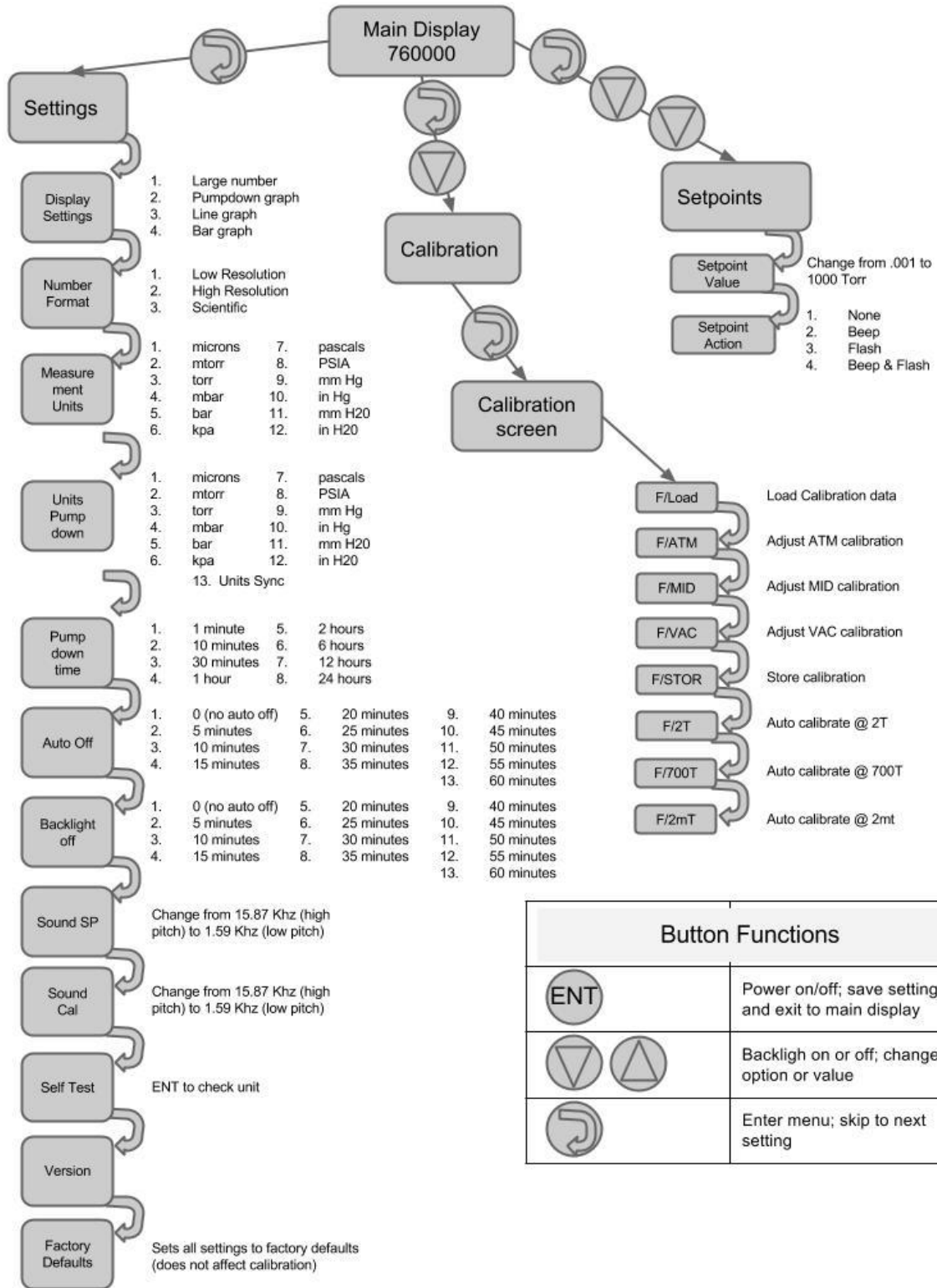3. Quick Start guide or (this) User Manual

Easy to use steps:
1. Remove protective boot.
2. Remove the battery cover and install 4 AA batteries
3. Plumb the thermocouple sensor into the system to be measured, taking care to keep the stem down
4. Power on the device by pressing the "PWR" button. It will take about 5 seconds to turn on.
5. If need be, turn on the backlight. The backlight does not affect gauge reading or accuracy
6. Read vacuum!

Feel free to explore the latest copy of this manual at www.idealvac.com for all the features that make this a truly useful vacuum measurement and system analysis tool.

SECTION 3: MENU TREE

Main Display 760000

Settings

Display Settings
1. Large number
2. Pumpdown graph
3. Line graph
4. Bar graph

Number Format
1. Low Resolution
2. High Resolution
3. Scientific

Measurement Units
1. microns   7. pascals
2. mtorr   8. PSIA
3. torr   9. mm Hg
4. mbar   10. in Hg
5. bar   11. mm H20
6. kpa   12. in H20

Units Pump down
1. microns   7. pascals
2. mtorr   8. PSIA
3. torr   9. mm Hg
4. mbar   10. in Hg
5. bar   11. mm H20
6. kpa   12. in H20
13. Units Sync

Pump down time
1. 1 minute   5. 2 hours
2. 10 minutes   6. 6 hours
3. 30 minutes   7. 12 hours
4. 1 hour   8. 24 hours

Auto Off
1. 0 (no auto off)   5. 20 minutes   9. 40 minutes
2. 5 minutes   6. 25 minutes   10. 45 minutes
3. 10 minutes   7. 30 minutes   11. 50 minutes
4. 15 minutes   8. 35 minutes   12. 55 minutes
                                      13. 60 minutes

Backlight off
1. 0 (no auto off)   5. 20 minutes   9. 40 minutes
2. 5 minutes   6. 25 minutes   10. 45 minutes
3. 10 minutes   7. 30 minutes   11. 50 minutes
4. 15 minutes   8. 35 minutes   12. 55 minutes
                                      13. 60 minutes

Sound SP
Change from 15.87 Khz (high pitch) to 1.59 Khz (low pitch)

Sound Cal
Change from 15.87 Khz (high pitch) to 1.59 Khz (low pitch)

Self Test
ENT to check unit

Version

Factory Defaults
Sets all settings to factory defaults (does not affect calibration)

Calibration

Calibration screen

F/Load — Load Calibration data
F/ATM — Adjust ATM calibration
F/MID — Adjust MID calibration
F/VAC — Adjust VAC calibration
F/STOR — Store calibration
F/2T — Auto calibrate @ 2T
F/700T — Auto calibrate @ 700T
F/2mT — Auto calibrate @ 2mt

Setpoints

Setpoint Value — Change from .001 to 1000 Torr

Setpoint Action
1. None
2. Beep
3. Flash
4. Beep & Flash

Button Functions

| Button	Function
ENT	Power on/off; save setting and exit to main display
▽ △	Backligh on or off; change option or value
↩	Enter menu; skip to next setting

Section 4: Modes of Display

The XactGauge™ XG-110 Gauge has four display modes: one numeric, and three graphical. The numeric display has three numeric formats: Low Resolution, High Resolution, and Scientific Notation. Display modes are selected from the settings menu "Display", and numeric formats are selected from the Setting option "display". The **SEL** button enters and traverses the Settings menu.

Display Large number
Numeric display with the "High Resolution" format.
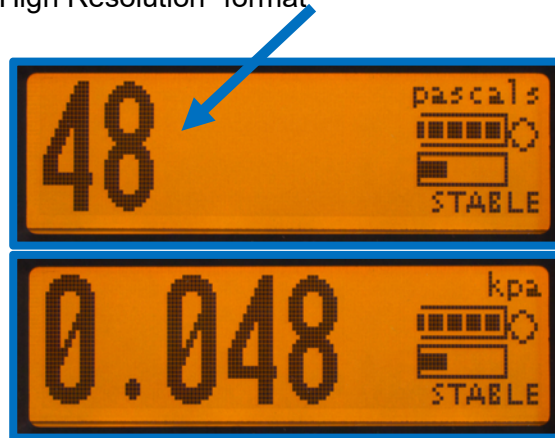
Large number display with the "scientific" format
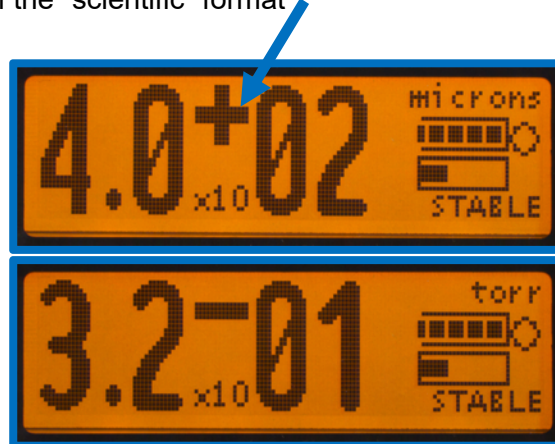
The numeric display shows the currently configured units, in these examples the vacuum pressure units are "microns" or "Torr".

In any display mode, the **UP** and **DOWN** buttons turn the backlight on and off (respectively), the **SEL** button enters the configuration menu, and the **ENT** button turns the gauge on or off.

The battery indicator shown at full strength

Vacuum Range Indicator

Bar Graph Level	Vacuum Range
Full bar	Greater than (>) 525 Torr
2/3 bar (pictured)	Between 525 Torr - .0750 Torr
1/3 bar	Less than (<) .750 Torr or >_0.025 Torr
Empty box	< 0.025 Torr

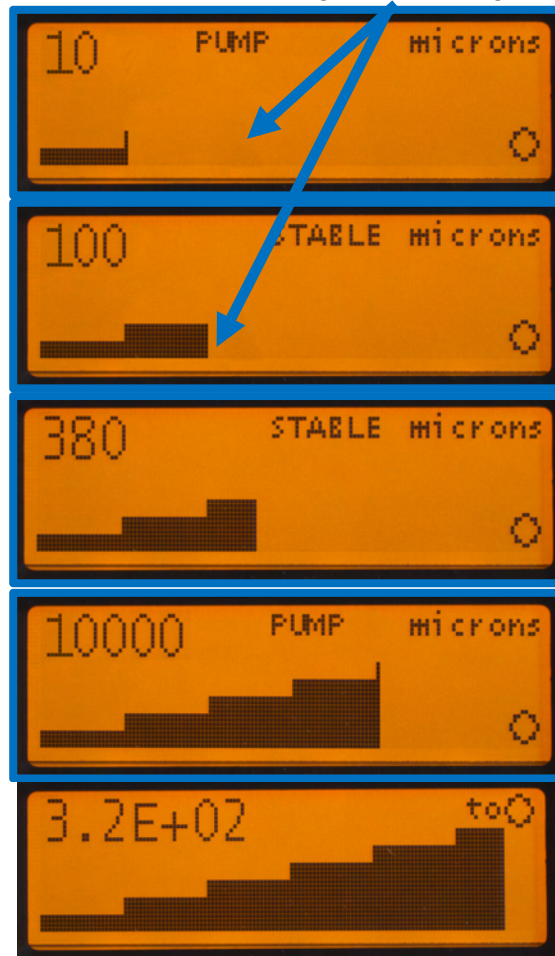In practice, this indicator changes based on the current level of pressure.

The numeric display shows when the **vacuum sensor tube** is disconnected, failed or when an over-range condition exists (pressure above 1000 Torr).
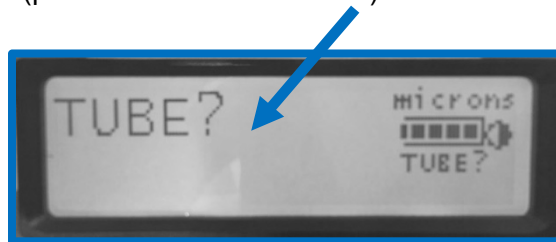
Display Bar Graph

The bar graph visualizes the current sensor reading with a 6-stage stepped bar.

Display Pump-down graph

The pump-down graph plots time horizontally and logs pressure vertically. The horizontal time scale is selected using the configuration option "**Pump-down time**". The vertical pressure scale is logarithmic, indicating order of magnitude from one micron to atmosphere.
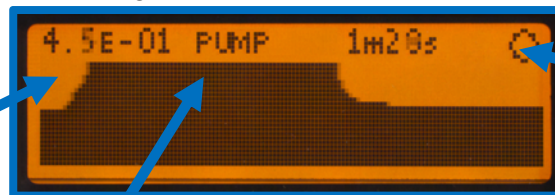
The top left is the **current vacuum pressure** display figure. In the center of the first line is the **Vacuum System Analysis**, "**PUMP**", and to the right is one of either the **pump down rate** in **units per minute**, or the **data set window size in hours, minutes and seconds**. The "**STABLE**" case shows data set window size.

Display Line graph

The **auto-scaling (or, auto-ranging) time graph** is a *microscope* into the pump down data.

Maximum & Minimum value in measured range

Current or most recent pressure

4.0E-01 STABLE   3.2E-01

3.2E-01   O.

In this mode, the **pump down graph** 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.

Please Note: Sometimes this visualization is not useful, showing noise. This noise comes from the instrument's process of measurement, as well as the vacuum system under measurement. The auto scaling graph is a data visualization microscope, in this sense.

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

Section 5: Menu of Settings

Display

Pressing the **SEL** button from the vacuum display screen will present three submenus: Settings, Calibration and Set-points.
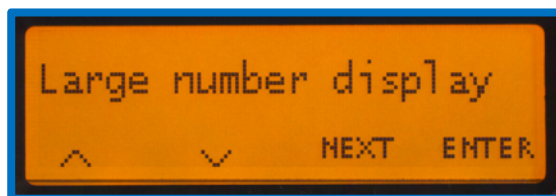
The settings menu is a linear series of menu options that are stepped or skipped through using the **SEL** button.

Above each button is a utility hint to indicate specific button function. The **SKIP** hint is above the **SEL** button to indicate that the **SEL** button is used to step or skip to the next menu screen with no configuration change. The **ENTER** hint above the **ENT** button indicates that this button is used to enter the display mode as shown in the menu screen. Using the **UP** or **DOWN** buttons will change the option available on the menu screen.
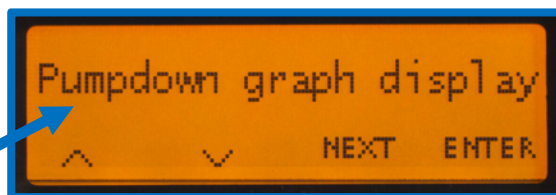
In the example above, the configuration menu is ready to change the display to the Pumpdown Graph. In this state pressing the **ENTER** button will change the display to the Pumpdown Graph, or pressing the **SKIP** button will ignore the state of the menu screen and leave the display mode unchanged.

Number format

The number format setting defines the vacuum pressure number format throughout all modes of display.

The **UP** and **DOWN** buttons select a format type from "High Resolution", "Scientific" and "Low Resolution", and the **ENT** button saves the current choice.

High Resolution

The High Resolution format has three digits of precision. For example, an internal vacuum value of 1234 microns (μm Hg) would be displayed as 1.23 Torr in the High Resolution format with torr units. Additionally, this format gives the raw vacuum measurement data which may be useful for trending, but could also result in a noisier reading.

Low Resolution

The Low Resolution format has two digits of precision. For example, an internal vacuum value of 1234 microns (μm Hg) would be displayed as 1.2 Torr in the Low Resolution numeric format with torr units. This number format also gives a filtered number depending on the accuracy of the gauge in the pressure range of measurement. For example, it may count by 100 Torr increments around 400 Torr since the accuracy in this range is +/- 100 Torr, which results in a 'quieter' gauge.

Scientific

The scientific format has two digits of precision with a base ten exponent following conventional usage. For example, an internal vacuum value of 1234 microns (μm Hg) would be displayed as 1.2×10^0 Torr. **For any resolution below 2 millitorr, the scientific format must be used.**
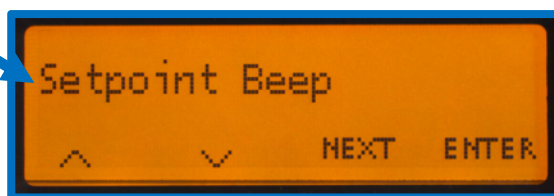
Set-point value

The Set Point Value is defined in terms of the **current vacuum pressure units**.
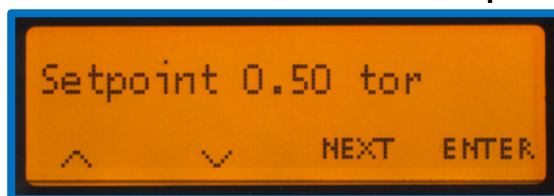
The Set Point indicates a pump down to configured pressure state according to the setting of the Set Point Action. See "Set Point Operation" for more detail.

Set-point action

The Set Point Action is defined as one of a set of choices, including: **None**, **Beep**, **Beep and Flash**, or **Flash**.
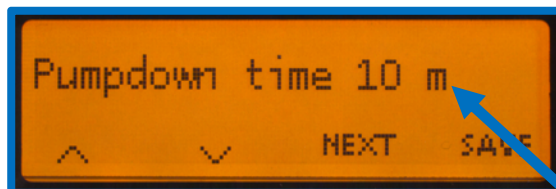

For details of operation, refer to the section "Set Point Operation".

Pumpdown time

The pump-down time configuration option defines the width of the Pumpdown Graph and pumpdown rate window.

The pumpdown rate is the difference between the start and end of the pressure data shown in the pumpdown graph. For example using a pump down time of ten minutes, a system pump down from atmospheric pressure to one torr in ten minutes has a pump down rate of 760 Torr per ten minutes or 76 Torr per minute.

Auto Off time

Use this setting to save battery power during periods of inactivity. The figure zero will disable the auto off battery saver feature. To see the specifics of this feature, look at the **Auto Off Operation section**.With a positive (non-zero) value, the unit will indicate the **Auto Off**.
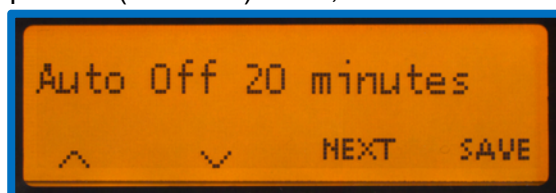

Backlight time

Use this setting to save battery power during periods of inactivity. The setting of"**0**" will never turn off the backlight. Set the Backlight time to a specific number of minutes to determine when the backlight will turn off, which can help conserve battery life.

Sound

The two sound configurations determine the audible Set Point Alarm and Calibration Storage Acknowledgement tones, named "**Sound SP**" and "**Sound Cal**" respectively.


The **Set Point Alarm** sound is typically configured to a different value from the **Calibration Acknowledgement sound**.
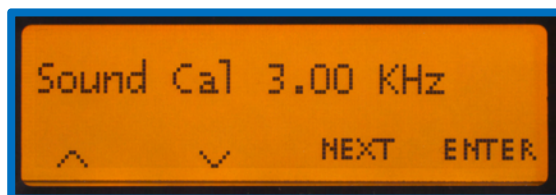

Self-Test

The self-test function reviews the **Tube** and **Battery status**, and **resets** the internal Elapsed

Time Clock, Pump Down Data, and Auto Off subsystems. Enter the Self-Test sequence with this option. Refer to the section "Self-Test Operation" for more detail.

```
Self Test

              NEXT    ENTER
```
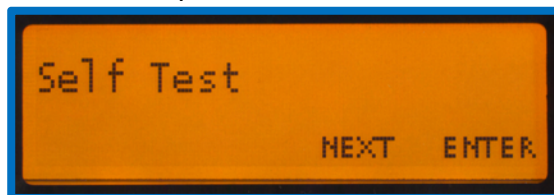
Measurement Units

The units settings permits numeric vacuum values to be displayed in any one of a 12 available vacuum pressure units including microns, millitorr, millimeters of mercury, Torr, mbar, Bar, Pa, kPa, inches of mercury, mm of water, inches of water and PSIA. *Note that inches of mercury and inches of water is zero referenced to 760 Torr absolute pressure*.

```
Measure Units microns

    ∧       ∨     NEXT    SAVE
```
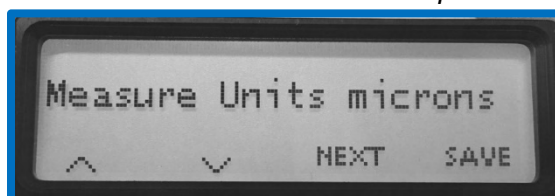
Useful Quick Note: A negative number indicates vacuum, a positive number indicates pressure relative to sea level.

Units pumpdown rate

The **Units Pump-down** configuration option permits the pumpdown rate figure displayed in the Pumpdown Graph to employ identical or different units from the numeric vacuum units. Use this option to change the pumpdown rate units—allowing you to sync with your standard operating procedures for your particular vacuum system.

```
Units pumpdn Sync

    ∧       ∨     NEXT    SAVE
```
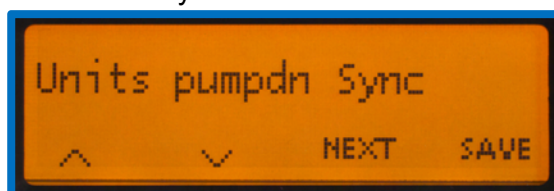
The "**Sync**" option, shown in this example (above), maintains the pumpdown rate units as identical to the primary vacuum units. **Note**: "**Sync"** is the recommended configuration—employing mixed units could be a source of misinterpretation.
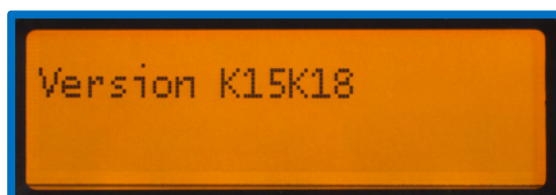
Calibration

This configuration option is available from the main menu and will enter the field calibration mode.
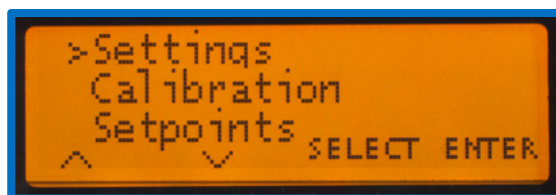
Refer to the section "**Field Calibration**" for a complete description of the operation of the Calibration function.

Version

The last step in the configuration menu reports the software version identifier.

Useful Quick Tip: This software version identifier is useful for communicating with the factory or distributor support.

Factory Defaults

The last step in the settings screen will return all the settings to factory defaults. This does not affect calibration. Tap the "**reset**" button to restore factory defaults.

Auto Off Operation

The auto off feature will engage only in the unattended mode of operation. The XactGauge™ XG-110 Gauge will not turn itself off when:
- connected to a system under vacuum (less than 100 Torr, pump down feature set)
- any button activity on instrument will reset "auto-off" time elapse
- in calibration mode

Set Point Operation

A Set Point can be enabled to alert the user when a specific vacuum level is reached. Enter the menu option "**Setpoints**". Adjust to the desired setpoint using the **Up** and **Down arrows**. Then press **Next** and use the **Up** and **Down arrows** to choose the desired **alert; Beep, Flash, or Beep/Flash**. The unit will alert the user when the defined vacuum level is reached. *Press any button to silence the alert.*

SECTION 6: VACUUM SYSTEM ANALYSIS

The result of the Vacuum System Analysis is one of "**PUMP**", "**LEAK**", "**OUTGAS**" or "**STABLE**" and is shown in some display modes.
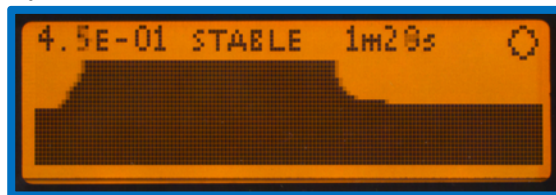
Internally, one data set serves the Pump down and Time Auto line graphs as well as the Vacuum System Analysis. The data is visualized in the **Pump down** and **Time Auto line graphs**. The data set is maintained continuously in every mode of operation.

Graphing Emailed Pump Down Date | Available with Bluetooth option: Review this manual to learn how you can take the emailed data from the XactGauge™ XG-110 Gauge and create a graph to illustrate a vacuum pump down curve for base line or troubleshooting; or to help understand the leak rate for transformer, enclosure, HVAC system or other type of repair. This data can also act as proof of ultimate vacuum level achieved.

Data set size

The width of the data set in time is configured with the option "**Pumpdown time**". This figure is employed to determine the time slices that are accumulated at a rate of roughly three updates per second. A small difference will accrue depending on the actual data set span in hours, minutes, and seconds. The Pump down graph with a "**STABLE**" case (under 100 Torr) will display the actual time window size in hours, minutes and seconds.

Differential Analysis

The Vacuum System Analysis looks at the last quarter of the pump down data set to determine the state of the system under test. The whole analysis is recomputed approximately three times per second.

- The "**LEAK**" result indicates pressure increasing towards atmosphere with rates that are not typically indicative of outgassing alone.
- The "**PUMP**" result indicates a *strong* pressure descent to vacuum as for a system under vacuum pump down.
- The "**OUTGAS**" result indicates evidence of outgassing. Evidence of outgassing is a pressure trend that is ascending at a rate that is decreasing. Eventually the rate of ascent decreases until the pressure stabilizes.
- The "**STABLE**" result indicates no particular evidence of venting **(LEAK)** or **outgassing**, and is shown for slow pump down rates.

Reset Historical Data

The pump down data set is cleared in power-off states: turned off, or dead or missing batteries.
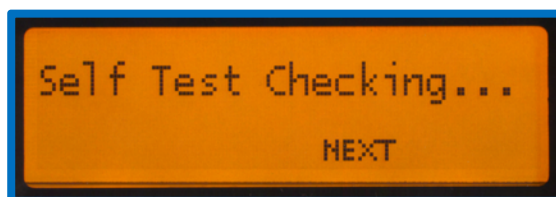
Section 7: Self-Test Operation

The Self-Test feature is available from the Configuration option "**Self-Test**", pictured below.

From this Configuration option, press the **ENT** button to enter the "**Self-Test**" sequence. The Self-Test sequence will then start after you press any other button.

Step 1. Performs tests of the Battery level and Tube connection

Step 2: Pressing any button will initiate the second step, shown below. The second step reviews the detailed results of the tests performed in the preceding step. Pressing any button will proceed to the third step.
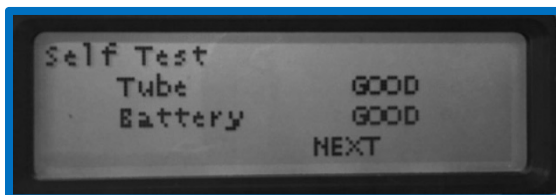
Step 3: Reports the overall condition as **GOOD** or **NOT GOOD**, based on the results reviewed in the previous step. Pressing any button will exit the Self-Test and reset the Elapsed Time Clock and dependent subsystems including the Pump Down Data Set—as occurs on any power off state (turned off or batteries dead or missing).
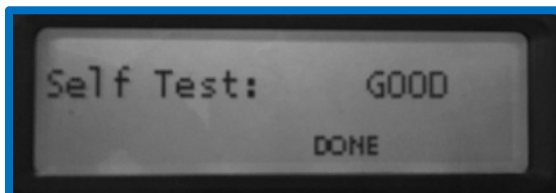
Section 8: Field Calibration

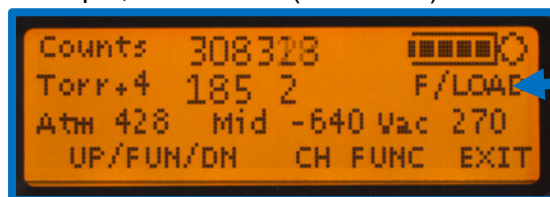From the Settings view, choose "**Calibration**", pictured below, press the **ENT** button to enter the field calibration mode.

The field calibration mode, shown below, shows digital signal counts and torr pressure times 10,000 ("Torr x 10^{+4}"). For example, one micron (or millitorr) is "10" in the "Torr x 10^{+4}" scale.

Calibration parameters

The calibration method employs a "**zero**, **mid** and **span**" model. The "**ATM**" parameter is modified to align to a calibrated **760 Torr** reference, and the "**VAC**" parameter is modified to align to **5 millitorr**. In the "Torr x 10^{+4}" scale employed in the Calibration mode, these pressures are represented with the figures **7600000** and **50**, respectively.

Calibration functions

The calibration mode can operate using a function concept. The current function is one of eight available functions (operations) and is shown above the **EXIT** button hint as "**F/LOAD**" in this example. The four functions are **F/LOAD**, **F/STORE**, **F/ATM**, **F/MID**, **F/VAC**, **F/2T**, **F/700T**, and **F/2mT**. The **SEL** button changes the current function among these four possibilities.

Functions F/ATM, F/MID and F/VAC

The **F/ATM** and **F/VAC** functions enable the **UP** and **DOWN** buttons to change these parameter values. As these parameter values change, the internal pressure value register shown in the Calibration display (at "Torr x 10^{+4}") is modified.

Useful Quick Note: These values are not saved for use beyond the calibration session until they are stored using **F/STORE**.

Functions F/LOAD and F/STORE

The **F/LOAD** and **F/STORE** functions read and write parameters from and to persistent memory (**long term storage**). One of these two functions is available when the function indicator above the **EXIT** hint shows **F/LOAD** or **F/STORE**. In this case, *pressing and releasing* the **UP** and **DOWN** buttons together will execute the function. When the function has been successfully executed the display will flash, and an audible beep will sound (with the tone configured in "**Sound Cal**").

Useful Quick Note: Completing a calibration session requires execution of **F/STORE** in order to save the parameters to persistent memory before exiting. Exiting a calibration session without successfully executing the **F/STORE** function will discard the calibration parameters.

Calibrating the instrument
Note: Calibration always happens in torr measurement units

1. **Set Cal points VAC, MID and ATM to zero**
    a. A shortcut for setting a variable to zero is to set the unit to the desired variable, such as **F/VAC**
    b. Press the **UP** and **DOWN** buttons together. That variable will now be zeroed.
2. **Set the manifold to exactly 2 Torr according to a known standard, then set the "F/MID" such that the unit reads exactly 2 Torr, or "2000 0"**
    a. A shortcut for setting the **MID** is to change the function to "**F/2T**"
    b. Then press the **UP** and **DOWN** buttons together. This will optimally set the MID calibration point.
3. **Set manifold vacuum to 760 Torr, and adjust "ATM" so the XactGauge™ XG-110 Gauge reading reflects Standard +/- 10 Torr**
    a. A shortcut for setting the **ATM** is to change the function to "**F/700**", and set the manifold to 700 Torr
    b. Then press the **UP** and **DOWN** buttons together. This will optimally set the **ATM** calibration point.
4. **Set manifold vacuum to .005 Torr, and adjust "VAC" so the XactGauge™ XG-110 Gauge reading reflects standard +/- 0.001 Torr**
    a. A shortcut for setting the **VAC** is to change the function to "**F/2mT**", and set the manifold to 2 millitorr.
    b. Then press the **UP** and **DOWN** buttons together. This will optimally set the **VAC** calibration point.
5. **Store**
6. **Check ATM is +/- 20 Torr**
7. **Check Vac is +/- 0.002 Torr**

Useful Quick Note: For calibrating the unit for repeatable sub-millitorr readings, calibrate 2 millitorr at the ambient temperature where you will be using the vacuum gauge. Let the vacuum system sit at 2 millitorr for 10 minutes, then calibrate. *The settle time for an accurate reading below 1 millitorr is approximately 2 minutes.*

Section 9: servicing and maintenance

GAUGE TUBE SERVICING

In many cases, a gauge tube may become fouled with oil or other foreign matter. It is often possible to restore the functionality of contaminated probes with cleaning. If the contaminant is known, the tube should be filled with a fluid that is known to be a solvent to that contaminant. As an example, ether is often effective in removing residues of some oils. Commercial carburetor cleaners are very powerful solvents and are highly effective against some contaminants.

After cleaning with solvents, the gauge tube should be completely dried or flushed with a volatile solvent to assure that it is dry prior to reinstalling it. ***If this is not done, contamination of the system may result.***

Maintenance

Your vacuum instrument should give you many years of trouble-free service. There are no regularly scheduled maintenance intervals. If consistent accuracy is required, it is recommended that the gauge, tube, cable and power supply be returned for a yearly calibration check.

NOTES ON CALIBRATION

The instrument is calibrated in nitrogen, which has thermal properties virtually identical to air. Other gasses will affect the readings by an amount proportional to the thermal conductivity of the gases. In most cases, the gases present in a vacuum system will be air, nitrogen, or oxygen, and no appreciable errors will occur.

Certain other gases, however, have thermal conductivity significantly greater than air and will cause the instrument to read higher than the actual amount of pressure.

Examples of such gases are water vapor, fluorocarbon refrigerants, and acetone. Conversely, other gasses have thermal conductivity significantly lower than air and will cause the instrument to read lower than actual pressure. Examples of such gases include helium, oxygen and to a lesser extent, CO_2.

When interpreting readings using gasses other than air, it should be borne in mind that the XactGauge™ XG-110 Gauge reads absolute pressure—that is the opposite of vacuum. Thus, a lower numerical reading actually is a higher level of vacuum. For more information, refer to section 8.0.

SECTION 10: ACCURACY

Instrument Repeatable Accuracy

Range	Accuracy
1~99 millitorr	+/- 2 millitorr or 20%
100~2000 millitorr	+/- 10%
2 ~ 6 Torr	+/- 25%
6~250 Torr	Continuous and monotonic
250 ~ 800 Torr	+/- 25%

Instrument Accuracy with Random Tube

This assumes the replacement Tube is the same type from the same manufacturer, **MID** and **VAC** set to zero, **ATM** rough calibrated to 760 when tube exposed to **ATM**

Range	Accuracy
.001 to .030 Torr	+/- .015 Torr
.030 to 1.00 Torr	+/- 30% of reading
1.00 to 300 Torr	In range (1, 300 Torr), increasing pressure results in increasing value
300 to 800 Torr	+/- 30% of reading

Section 11: SPECIFICATIONS

Time to resolve	**2 seconds to decade, 20 seconds to full accuracy**
Input Voltage	**4 AA Alkaline or Micro-B USB**
Maintenance Interval	**1-10 years depending on use**
Overall Dimensions, front panel	**6.0 in high, 3.5 in wide, 1.25 inches deep**
Ambient Operating range	**-14°F to 120°F**
Battery Life	**60 Hours running**
Measurement Media	**Clean Dry Air or Nitrogen**
Certifications, controller display	**CE + RoHS with 536 sensor tube**

Section 12: UNDERSTANDING Torr

This instrument and many similar instruments are calibrated in microns or "millitorr." It is appropriate to discuss what microns are and to relate microns to other measures of pressure and vacuum. Microns are not really a measure of vacuum at all, but rather of absolute pressure.

The pressure of the atmosphere is 14.696 or approximately 14.7 pounds per square inch at sea level. One Torr is an absolute pressure of one millimeter of mercury. A millitorr is equal to one thousandth of a Torr. A Micron is the same as a millitorr.
This pressure is due to the weight of all of the air in the earth's atmosphere above any particular square inch. This 14.696 PSI is equivalent to the pressure produced by a mercury column of approximately 29.92 inches high or .76 meters (~ 3/4 of a yard) or 760 millimeters of mercury.

Atmospheric pressure varies greatly with altitude. It decreases approximately 1 inch of mercury per thousand feet of altitude. It also varies widely with local weather conditions. (Variations of one half inch in a single day are common.) The word "**vacuum**" means pressure lower than atmosphere or "**suction**." However, in describing negative pressure, the atmosphere is only a satisfactory reference if we are dealing with values of vacuum down to about 27 inches of mercury. Below that, it is much more useful to talk in terms of **absolute pressure**, starting from absolute zero. The XactGauge™ XG-110 Gauge and all similar instruments do just this.

Section 13: Options

✱Part Numbers do change, contact us if incorrect.

Product	* Part Number	Interface	CE/RoHS	Features/Benefits
XactGauge™ XG-110 Gauge with Bluetooth	XGBT	1/8" NPT	N	Includes Bluetooth display and logging to Apple, Android phone, or tablet via Vacuum Gauge app
XactGauge™ XG-110 Gauge + 531 Tube	XG-531	1/8" NPT	N	XG with upgrade to an all metal 531 sensor
XactGauge™ XG-110 Gauge with Bluetooth 531 tube	XGBT-531	1/8" NPT	N	XG with all metal 531 sensor and Bluetooth display and logging to Apple and Android
XactGauge™ XG-110 Gauge + 536 tube	XG-CE	1/8" NPT	Y	XG with stainless steel 536 sensor with baffle
XactGauge™ XG-110 Gauge with Bluetooth, 536 tube	XGBT-CE	1/8" NPT	Y	XG with stainless steel 536 sensor with baffle, and Bluetooth display and logging to Apple and Android
XactGauge™ XG-110 Gauge with Bluetooth 536 tube, KF16	XGBT-KF16	KF16	Y	XG with stainless steel KF16 536 sensor with baffle, and Bluetooth display and logging to Apple and Android
XactGauge™ XG-110 Gauge with Bluetooth 536 tube, KF25	XGBT-KF25	KF25	Y	XG with stainless steel KF25 536 sensor with baffle, and Bluetooth display and logging to Apple and Android
Weatherproof XactGauge™	XGBT-WP	1/8" NPT	Y	Weatherproof XG with Bluetooth, ruggedized sensor cord, stainless steel sensor & external power supply meant for outdoor installation
XactGauge™ XG-110 Gauge | HVAC kit	XG-R	1/4" Flare	N	XactGauge™ , Refrigeration version
XactGauge™ XG-110 Gauge | HVAC kit with Bluetooth	XG-R-BT	1/4" Flare	N	XactGauge™ , Refrigeration version with Bluetooth display and logging to Apple and Android phone or tablet
XactGauge™ Hard Case	CAS-HARD-XG		Y	Hard case with die cut foam for secure storage
XactGauge™ Soft Case	CAS-SOFT-XG		Y	High quality custom protective soft case with shoulder strap
Pump Test Fitting Kit	BE-fitting-kit		Y	BE-fitting kit for hooking up a XactGauge™ to many common interfaces, including: 1/8" NPT, KF16, KF25, 1/4" I.D. hose, 3/4" I.D. hose and a modified rubber stopper for testing vacuum pumps

Section 14: Bluetooth Connectivity

- Versatile digital vacuum gauge that you can monitor right from your phone or tablet (Apple ios and android)
- Enables remote monitoring and troubleshooting
- Set low and high alarm from your phone
- Email vacuum data to document leaks, baseline pressure or pump-downs

Portable and Precise

- Rugged thermocouple vacuum gauge ideal for understanding: Leaks, Pump Downs, Outgassing or Stable Systems
- Includes a powerful magnet and kickstand to enable hands-free operation
- Long battery life and versatility with 12 different measuring units (micron, Torr, Inches of Hg, kPa, Inches of H20, millitorr, mbar, Pa, PSIA, mm of Hg, bar, and mm of H2O)
- Calibrated under actual vacuum against a NIST standard

Graphing and Analysis

- Patent Pending vacuum graphing displays vacuum and time data
- Visual graphing right on the display that identifies current system status
- Vacuum Analytics to quickly identify vacuum pressure trends
- Graphical display for quick determination of vacuum level

Android: Links via Bluetooth Low Energy to XactGauge™ XG-110 Gauge with Bluetooth to view, alarm, log readings and email data for graphing pump down curves. Ideal for vacuum pump test or finding leaks. For the medium vacuum range with typical measurements in the micron or millitorr range.

Apple: Links via Bluetooth to down curves. iPhone, iPad, Bluetooth Low Energy to XactGauge™ XG-110 Gauge with view, alarm, log readings and email data for graphing pump **Compatibility:** Requires iOS 7.0 or later. Compatible with and iPod touch.

SECTION 15: TERMS OF USE, LIMITED WARRANTY & LIABILITY WAIVER

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