



PAS
SYSTEMS INTERNATIONAL
ALCOHOL SENSOR SYSTEMS



Alcovisor[®] Mercury

Operation Manual

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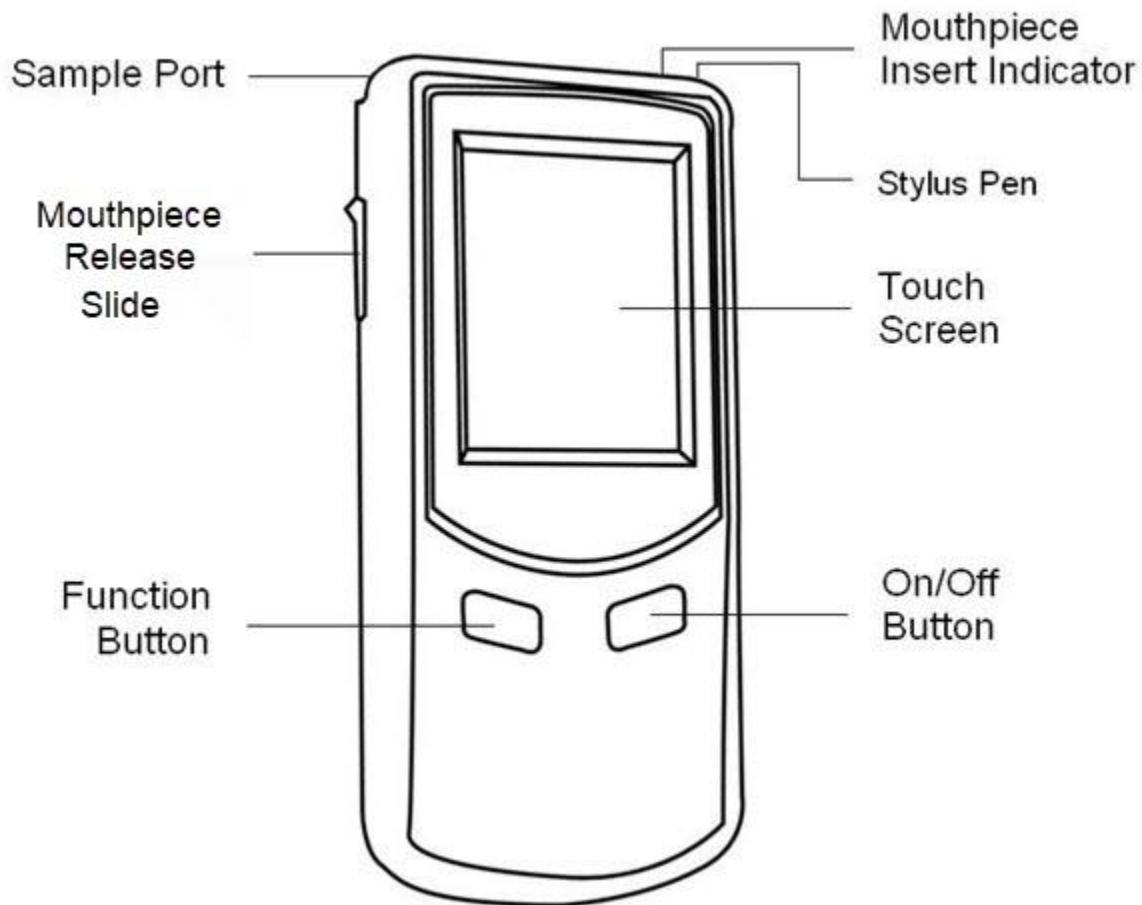
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Introduction

The Mercury instrument is the latest in the C4 Technology line of affordable, professional, handheld quantitative breath alcohol testing instruments. It can be used for law enforcement, schools, workplace safety, or medical purposes. The Mercury features easy-to-use automatic or manual sampling, a user-friendly touchscreen display, and an optional wireless printer.

The Mercury is accurate and reliable, allowing a complete breath test to be completed in about 30 seconds.

This manual describes the operation, maintenance, calibration check, and calibration adjustment of the Mercury. This manual should be read in its entirety and fully understood by each operator before testing. It is further recommended that operators practice the breath-testing process before conducting an actual “in the field” test.



NHTSA APPROVED EVIDENTIAL BREATH ALCOHOL TESTING DEVICE (EBT)

Principles of Operation

The Mercury uses an electrochemical fuel cell with two platinum electrodes to detect and measure alcohol vapor concentration in expired breath. When breath is drawn into the fuel cell by the sampling system, a small voltage is generated proportionate to the breath alcohol concentration. This voltage is then fed to an electronic amplifier, which displays it on the screen.

The instrument is simple to operate and may be used as often as required, provided that a suitable delay is allowed between successive tests. This time delay allows the fuel cell to clear itself of alcohol and prevents the possibility of additive readings. If no alcohol is present in a test, a second test may be analyzed immediately, since the fuel cell voltage is already at zero. Unless the breath alcohol level of the subject is very high, the instrument will generally be clear enough to receive and analyze a second sample in less than two minutes.

Instrument Features

1. **Disposable Mouthpiece:** For sanitary reasons, each mouthpiece is individually packaged and sealed. A new mouthpiece should be used for each test.
2. **Sampling Cup:** A sampling cup is reusable. Attach to the sample port and do not allow the subject to touch the sampling cup while providing a breath sample. Remove and clean with a mild disinfectant (alcohol-free) for the next use.
1. **Slide to Remove Mouthpiece:** For sanitary reasons, the mouthpiece can be ejected by pushing up on the slide on the left side of the Mercury instrument.
3. **Touchscreen Display:** A user-friendly touchscreen displays instructions and test results. Select the icons and buttons on the screen using the attached stylus pen, located at the top of the instrument behind the sample port.
4. **External Power Connectors:** If rechargeable AA batteries are used in the unit, the 12V auto adapter can be used to recharge the batteries.
5. **USB Connector:** A USB cable can be used to download stored test records from the Mercury instrument onto a PC.

The Alcovisor® Mercury Operation

This section details the preparation required to use the Mercury instrument and the steps for performing a breath test.

Preparing the Mercury

Before using the Mercury, batteries must be installed and the unit turned on. The Mercury instrument is powered using four (4) AA alkaline batteries.

To insert the batteries:

1. Remove the lower half of the back cover by sliding it down.
2. Insert the four (4) AA batteries into the instrument, with the plus (+) and minus (-) terminals facing the correct directions. Be sure to keep the ribbon underneath the batteries.
3. Replace the back cover.

Recharge the batteries:

1. If you insert rechargeable AA batteries into the Mercury instrument, they can be recharged while inside the unit using the auto power adaptor.
2. Plug the USB end of the adapter into the right side of the Mercury and the 12V adapter end into the car.



Be certain there are rechargeable batteries in the instrument before attempting to recharge them.

Turn On and Off

ON: Press and hold the On/Off button (right button) for 2 – 3 seconds.

OFF: Press and hold the On/Off button for 2 - 3 seconds.

You may choose to have the Mercury shut off automatically after 1, 2, 5, or 10 minutes of inactivity to conserve battery power.

Touchscreen Features



Diagram 1: Touchscreen and Features Explanations

Touchscreen and Features Explanations

1. **Weekday Indicator:** Shows the current day of the week.
2. **Time Indicator:** Shows the current time.
3. **Date Indicators:** Shows the current date in day/month/year format.
4. **Battery Indicator:** Shows how much battery power is remaining.
5. **Passive Test:** Performs a screening test to determine the presence or absence of alcohol.
6. **Standard Test:** Performs a standard test where the operator can enter information into fields such as name, license number, etc., which will appear on the printout of test results. The operator can also choose to perform a test with no such identifying information.
7. **Test Records:** Stores up to 16,000 test records.
8. **Settings:** Includes *Time* to set day and time, *Auto Off* to control when the Mercury turns off automatically, *Print* to control different print options (the Bluetooth printer is only available with DOT Mercury models), *Cal.* to perform a calibration (password needed), *Advanced Settings* (password protected), *Brightness* to adjust the brightness of the screen, and *Bluetooth*.
9. **Number of Tests Indicator:** Shows the number of tests that are currently stored in the test record memory of the Mercury.
10. **Last Calibration Date:** Date that the Mercury was last calibrated.

Performing a Breath Test

Before performing a breath test, several conditions for the test site and the test subject must be verified.

Conditions for Test Site

2. The ambient air should be free from alcohol, solvent vapors, thick tobacco smoke, and any other chemicals that will produce a positive air sample value.
- Working temperature of the Mercury instrument should be between 14°F to 122°F (-10°C to 50°C).



Do not allow an unrealistically high ethanol concentration to reach the sensor, as this can shorten the instrument's lifespan.

Conditions for Providing a Test

- The testing subject must abstain from drinking, eating, chewing gum, chewing tobacco, smoking tobacco, using mouth spray, or taking any medications for at least 15 minutes before providing a sample. If a positive sample is given in workplace testing, a minimum 15-minute waiting period must occur after the initial screening test.
- The testing subject must breathe evenly and normally before the test. The testing subject must also avoid repeated deep breaths (hyperventilation) as this will temporarily cool down the breath and may lead to a false reading.
- Should the testing subject have diminished lung capacity and be unable to activate the *Auto Test*, a manual override method is provided.



Rinsing out the mouth with water or non-alcoholic drinks **does not** substitute for the 15-minute interval between a screening test and a confirmation test.

Attaching a Mouthpiece

1. Remove the disposable mouthpiece from its wrapper, making sure not to touch the end into which the testing subject will be blowing.
2. Snap the disposable mouthpiece onto the top of the Mercury instrument to ensure a secure fit.
3. After use, the mouthpiece can be removed from the Mercury instrument by using the lever on the left of the instrument. Slide this lever up to disengage the mouthpiece without touching it.

Performing an Air Blank Test

The Mercury instrument performs an Air Blank test to determine whether ethanol is present in the ambient air or whether any residual alcohol remains from prior testing. An *Air Blank* test should be performed if there is suspicion that the ambient air contains alcohol vapor, or prior test carryover is suspected, or before a confirmatory test. The Mercury automatically performs an air blank whenever the *Standard Test Icon* is selected.

If a reading greater than 0.000% is noted on the *Air Blank Result*, return to the *Main Menu*, wait 2-3 minutes, then select the *Standard Test Icon* again and check the *Air Blank Result*.

Measuring Breath Alcohol Concentration (BrAC/BAC)

Standard Test with Input

1. Attach a disposable mouthpiece to the sample port.
2. Select the **Standard Test** icon on the Main Menu (refer to Diagram 1 on page 3).
3. The instrument will display "*Air Blank Processing*" as it checks for residual alcohol in the air or in the fuel cell.
4. The instrument will display the results of the air blank on screen for 6 seconds. When the breath test results are printed, the air blank details will include the time.

5. Input information using the stylus pen if this feature is active. **Each input has a maximum of 16 characters.** The operator can choose fields such as name, license number, etc., available under *Advanced Settings*.
3. The instrument will then automatically go into “*Testing Mode*” and display the next *test record number*.
6. When the Mercury instrument displays “*Please Blow*”, have the testing subject take a deep breath and blow into the mouthpiece until the beeping tone changes. You will notice the *Time (T)* and *Volume (V)* indicators count up from 0% to 100%.
7. Once complete, the test results are displayed on the screen.
8. If the testing subject **did not** blow within 30 seconds, the operator may select “**Refuse**” to confirm the testing subject refused to do the test, or “**Test Again**” to allow the testing subject to do the test again.
9. If the testing subject failed to provide a valid breath sample, the operator may select “**Discontinue**” to end the test, or “**Test Again**” to allow the subject to test again.



The Mercury instrument will detect if the subject attempts to suck air back through the mouthpiece. In this case, the Mercury instrument will display “**Discontinue**” or “**Test Again**” instead of displaying a test result.

10. Upon completion of the test, remove the mouthpiece by pushing up on the lever on the left side of the Mercury instrument to remove the mouthpiece.
11. Select the **Print** icon to print the test result. **The Bluetooth printer is only available with DOT Mercury models.**
12. To take another test, attach a new mouthpiece and select the **Refresh** icon. The instrument will perform another *air blank* before returning to *Test Mode* and displaying a new test record number.

Passive Test

A Passive Test is used solely for screening to determine whether alcohol is in the breath sample. Results of a Passive Test are limited to “Alcohol Detected” or “No Alcohol.” For test results that include a BrAC level, a Standard Test **must** be completed.

1. Attach a sampling cup to the instrument’s sample port.
2. Select the **Passive Test** icon (refer to Diagram 1 on page 3) on the Main Menu.
3. When the Mercury instrument displays “*Please Blow*”, instruct the testing subject to take a deep breath and blow towards the sampling cup until the beeping tone changes.
4. “Alcohol Detected” or “No Alcohol” will display on the screen.
5. A manual override may be performed by selecting “Manual” while the test subject is blowing.
6. Select the **Refresh** icon to start another test.
7. If alcohol is detected, use a mouthpiece to perform a *standard test* to obtain an accurate reading.



- The Sampling cup should be cleaned with an alcohol-free mild disinfectant.
- Screening Test results can be printed and/or stored in the test records of the device. You can elect to save Screening Test Results by selecting the “*Screening Results Saved*” option in the *Advanced Settings*.

Manual Override Test:

This method can be used with either the *Standard* or *Passive* test mode when the test subject has a diminished lung capacity and cannot activate the *Automatic Sampling* system.

1. In either the *Standard* or *Passive* Test modes, when the Mercury instrument displays “*Please Blow*”, instruct the testing subject to breathe in deeply and blow evenly into the mouthpiece without a break for a minimum of four (4) seconds.
2. While the test subject is blowing and after a minimum of four (4) seconds, select “**Manual**”.



The test subject must be actively blowing when the Green button is selected.

3. After a few seconds, the results will display.



- If the BAC is 0.000%, the display will be instantaneous. If the BAC is higher than zero, please wait 3 minutes before performing the next test.
- Use a new mouthpiece for each test.
- The interval between two measurements will depend on the alcohol concentration of the first sample. This interval **cannot** be shortened by temporarily switching off the instrument. Please wait three (3) minutes before performing the next test.

Access Test Records

1. Select the **Test Records** icon (refer to Diagram 1 on page 3) to view test records. The Mercury instrument can store up to 16,000 test records, depending on the amount of data collected.
4. Individual test records can be printed by selecting the **Print** icon while connected to the optional Bluetooth printer. The Bluetooth printer is **only** available with DOT Mercury models.
2. Use **left** or **right arrow** icons to move to the previous or next record.

Settings

Date and Time Setting

1. Set the correct Date and Time, and select “Update” to confirm. Selecting the **Use MDY** checkbox will record your test date in Month/Day/Year format.
2. A restart **is required** to save the changes.

Auto Off

1. Select the time limit to turn off the device when it is inactive automatically.
2. Once you have made your selection, select the **right arrow** icon to confirm.

Print - The Bluetooth printer is only available with DOT Mercury models.

1. Select **Auto Print** to have a test result print automatically after each test without having to select the *Print* icon, if the optional printer is available.
2. Select the number of copies to print for each test result.
3. Select the **right arrow** icon to confirm.

Cal - When the screen displays “Calibration Needed”, send the device in for calibration or, if qualified, proceed to the “*Calibration Section*” in the *Advanced Settings Manual*. A password **is required** to complete the instrument's calibration.

Brightness - Adjust the screen's brightness.

Advanced Settings - A password is required to access the Advanced Settings menu. Please refer to the *Password* section of this guide.

Bluetooth - The **Bluetooth printer is only available with DOT Mercury models**. The instrument and its printer are matched at the factory before shipping. A Bluetooth connection will automatically be established between the instrument and the printer when both are powered on.



The **keyboard** box at the bottom of the *Settings* menu **must** be selected to enable entry of information into fields such as name and license number.

Advanced Settings

Select the Advanced Settings icon, then enter the password 112112.

- **Blow:** This icon under Advanced Settings allows the user to change the initiation flow rate (in L/m), blow time (in seconds), and minimum volume (in L). These are already set to optimal performance, and it is not recommended to change them.
- **Default:** Select **Yes** under this icon to return the instrument to the default settings. NOTE: Settings have been optimized; it is not recommended to revert to the Default settings. Select NO to cancel and return to the Advanced Settings menu.
- **Unit:** Set the measurement unit and BAC/BrAC ratio. If the *unit* is changed, the instrument does not need to be recalibrated. It is not recommended to change the ratio.
- **Screening:** Select whether the results from tests performed using the Screening test method will be saved in the Test Record Memory of the Mercury instrument.
- **Delete:** This option allows for the deletion of **ALL** saved test records stored in the Mercury instrument. Once you select “**Yes**,” the test records cannot be restored.
- **Field:** Allows the user to set up to 10 different fields for input and/or printouts.
 - Use a stylus pen to select the box to the left of a field if it needs to be shown and printed.
 - Use a stylus pen to select the box to the right of a field if you want the data you input for that field to be saved until you change it. (For example, if Badge Number is the same for all tests, you can select the box to the right of Badge Number, and the information entered into this field will be remembered for all tests, unless it is changed.)
 - Touch the name of a field to input a new name for the field heading.
- **Alert:** Select the alcohol reading level that will activate an alert. Tests above this level will display in RED, and the device will beep.
- **Calibration:** Please refer to the calibration instructions included in this manual for proper calibration procedures.
- **Password:** The default passwords for advanced settings and calibration can be changed. Select “Cal” or “Advanced Settings” to change the password. Enter the new password and select the **Right Arrow** icon to confirm. The screen will display “Password Setting Succeed.”



- The instrument requires a 6-digit password. If fewer than six digits are used, the password will not be stored properly.
- If you change the password, please write it down. The new password must be sent in with your unit if it needs service.

- **Calibration Period:**

- Select the number of days in the first column and the number of tests in the second column that may be allowed to occur before calibration is needed.
- Select “LOCK” to lock the device if calibration is needed.
- Default is 360 days, 700 tests, and unlocked.

Passwords

Default Passwords:

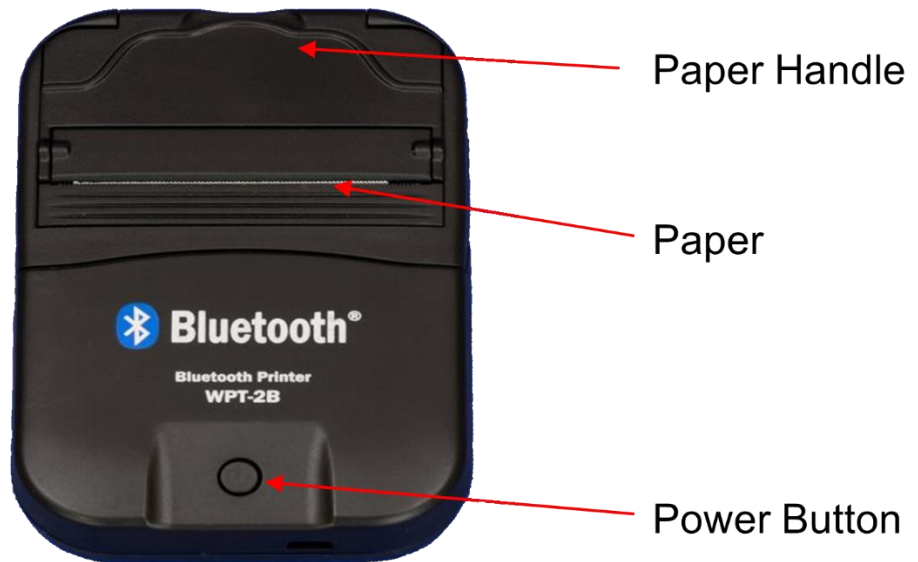
- Calibration: **119119**.
- Advanced Settings: **112112**.

The default passwords for advanced settings and calibration can be changed. To change the passwords, please refer to the “Password” section in the Advanced Settings section in this manual.



- The instrument requires a 6-digit password. If fewer than six digits are used, the password will not be stored properly.
- If you change the password, please write it down. The new password must be sent in with your unit if it needs service.

Printer Operation



The Bluetooth printer is only available with DOT Mercury models.

Battery Installation/Removal

1. Remove the battery cover from the back of the printer by pressing the tab and pulling it away from the device.
2. Insert the rechargeable battery pack.
3. Replace the battery cover.
4. Removal of the battery is the reverse of the installation steps.

Recharging the Battery

1. The battery can be charged while it is in the printer by connecting either the wall or auto adapter to the corresponding connection port on the end of the printer.
2. The LED indicator light will be red while charging and will turn green when the battery is fully charged.

Loading Printer Paper

1. To load more printer paper, open the cover by gently lifting the half-moon piece until it pops open.
2. Remove any remaining paper from the unit.
3. Unroll 1-2 inches of paper from the new roll and drop it into the printer, **glossy side up**, so it feeds easily.
4. Close the cover.

Turning the Printer On and Off

5. Turn on the printer by pressing the **Power** button for a few seconds until a green light comes on. The printer light will flash while it connects to the Mercury device. Once a connection is established, the light will remain steady on.
1. Turn off the printer by pressing and holding the **Power** button until the green light goes out.

Printing Test Results

1. Ensure the printer is on. The Printer will shut off after several minutes of inactivity.
2. Turn on the Mercury instrument and take a *Standard*, *Passive*, or *Manual* sample (see above). Once the Mercury instrument is wirelessly connected to the printer, you will see the Bluetooth Symbol displayed near the battery indicator on the screen.
3. To print the test results after a test, select the **Print** Icon at the bottom of the Mercury instrument's screen to start printing.
4. To Print from the memory of the Mercury instrument:
 - a. Choose the **Main Menu** icon.
 - b. Highlight and select the **Test Records** icon.
 - c. The most recent record will appear first. To review prior records, touch the **Left** arrow icon to scroll through the test records until you find the record you want.
 - d. Once the record is displayed on the screen, select the **Print** icon.
 - e. The test results will print immediately.
 - f. After the results have printed, gently pull the paper towards the power button to remove it.

Printer Troubleshooting

Problem	Cause	Solution
The paper is blank after printing.	The paper was inserted incorrectly.	Remove the paper and re-insert it with the glossy side up.
The paper is still blank after switching sides.	Printer malfunction.	Return to PAS Systems, Intl.
The printer will not turn on.	The printer's power supply has been exhausted.	Recharge the printer's battery with a charger.

Accuracy Checking

Accuracy testing should be performed at least once per month, per the QAP, to ensure BAC readings are reliable. If the accuracy test result is not within the acceptable range, the unit must be recalibrated by PAS Systems International, Inc. or by persons properly trained in alcohol detector calibration.



Accuracy check and Calibration of the Mercury instrument **must** be performed using an NHTSA-approved wet bath simulator or certified dry gas standard.

Due to the sensitive nature of BAC testing, it is extremely important to keep detailed records of accuracy tests for each Mercury instrument. Procedures for recording this information are covered in Breath Alcohol Technician (BAT) training and documentation, when provided.



To complete an accuracy check, use the Standard Test option. Print the results, and keep a written record indicating this standard test result was an accuracy check as **required** in the DOT testing guidelines.

Intervals for an accuracy check, also known as “*calibration check*” or “external calibration check,” are:

- **Required** every 30 days.
- **Recommended** after a positive confirmation test.
- **Recommended** if the instrument fails to air blank to 0.000 after two (2) attempts.
- **Recommended** after the instrument has undergone repairs.

When using dry gas, PAS recommends a concentration between 0.035% and 0.100% for accuracy checks. The alcohol concentration printed on the gas cylinder label must be corrected for altitude when conducting tests at or above 250 feet above sea level. Please refer to the “Dry Gas at High Altitude” section below for instructions on how to make the appropriate corrections for high altitude testing.



It is important to read through this entire process and understand it before beginning a calibration.

Wet Bath Accuracy Checking

Using wet bath simulators for accuracy checking has been the accepted method for many years. Breath alcohol simulators are specially designed water-alcohol instruments that provide equilibration of alcohol between water and air at a controlled temperature.

Accuracy checking of the Mercury instrument should be performed by authorized persons using any NHTSA-approved breath alcohol simulator.

Perform a Wet Bath Accuracy Check

1. Pour 500 mL of 0.080% Certified Solution into the glass jar.
2. Attach a piece of tubing (6 - 8” long) to the simulator inlet. Attach a regular or check valve mouthpiece to the end of this tubing.
3. Attach a 1 - 2” piece of tubing to the simulator outlet. Attach a mouthpiece to the other end of this shorter tubing. Make sure the connection is airtight.



The length of tubing connected to the simulator outlet should **not be** longer than 2” to prevent condensation.

4. Plug the Simulator in and turn the switch to the **ON** position.
5. Allow the solution to heat.
6. After 15 - 20 minutes, check the thermometer. The thermometer should read 34°C (93° F) when ready.

7. Attach the instrument to the mouthpiece. The opaque moisture trap can be used if condensation appears in the mouthpiece.
8. Switch on the Mercury instrument. Select the **Standard Test** icon, and wait for the instrument to perform the *Air Blank* test.
9. Forcefully blow into the simulator for several seconds and then press the “**Manual**” button on the screen.

After a few seconds, the measured value will be displayed. The display should read 0.080% +/-0.005.

10. Print the results using the **Print** icon at the bottom of the screen and record your results per the DOT requirements in your Accuracy Check/calibration Check log. **The Bluetooth printer is only available with DOT Mercury models.**

Out of Range Result

If the result is not within published specifications +/- .005 of the expected value for the Mercury instrument, conduct a second accuracy check to eliminate human errors that may have occurred.

Before beginning the re-check:

- Verify that the seal on the simulator is airtight.
- Verify that the outlet tube and mouthpiece are free of condensation.

If the measurement is still not within specifications (+/- 0.005) after eliminating potential human error, the instrument must be removed from service until an internal calibration can be performed.

Dry Gas Accuracy Checking

When using dry gas, PAS recommends a concentration between 0.035% and 0.100% for accuracy checks. The standard concentration used for testing is 0.080%. The alcohol concentration printed on the gas cylinder label must be corrected for altitude when conducting tests at or above 250 feet above sea level. Please refer to the “Dry Gas at High Altitude” section below for instructions on how to make the appropriate corrections for high altitude testing.



Suitable Dry Gas Standard tanks and Regulators are available from PAS Systems International, Inc. Contact: (855) 754-4433.

Perform an Accuracy Check

1. Connect the regulator to the gas tank, ensure the regulator is not pointed toward the Mercury instrument, and purge the regulator for two (2) seconds.
2. Place a new mouthpiece on the Mercury instrument.
3. Turn on the Mercury. Select the **Standard Test** icon and wait for the instrument to perform the *Air Blank* test.
4. **Always** purge the dry gas cylinder valve for a few seconds before delivering a sample for testing.
5. Connect the Mercury instrument to the dry gas cylinder’s regulator/valve. The regulator must provide a gas flow of at least 1.5 liters per minute.
6. Press the gas regulator button, allowing gas to flow into the mouthpiece for **eight (8) seconds**.
6. At the **eight (8) second** mark, while continuing to press down on the gas regulator button, select the **Manual** button on the Mercury instrument to acquire a sample. **The gas MUST be flowing into the mouthpiece while the sample is taken.**
7. Once you hear the pump “click,” indicating the sample has been taken, you may release your finger from the gas regulator button.
8. Remove the device from the regulator.

9. After a few seconds, the measured value will be displayed. If the measured value is within +/- 0.005 BrAC of the altitude-adjusted concentration value, the mercury instrument is working accurately.
10. Print the results using the **Print** icon at the bottom of the screen and record your results per the DOT requirements in your Accuracy Check/calibration Check log. **The Bluetooth printer is only available with DOT Mercury models.**



Suitable Dry Gas Standards and Regulators are available from PAS Systems International, Inc. Contact: (855) 754-4433.

Tips to Prevent Out-of-range Accuracy Check Results

Before beginning the re-check:

- Verify that the seal on the simulator is airtight.
- Verify that the mouthpiece is properly and securely attached to the device.
- Verify that the outlet tube and mouthpiece are free of condensation.
- Ensure there is adequate gas in the canister. If the regulator shows a low gas level, replace it.
- While conducting the process, ensure that gas flows for a minimum of eight (8) seconds when the test is taken.
- Ensure the gas is flowing for eight (8) seconds *and* press the **Manual** button on the count of eight (8).

If the measurement is still not within specifications (+/- 0.005) after eliminating possible human error, the unit must be removed from service until a certified Calibration Technician completes an on-site internal calibration. If a certified Calibration Technician is not available, return the instrument to PAS Systems International, Inc. for service and calibration.

Calibration

Due to the sensitive nature of BAC testing, it is extremely important to maintain detailed calibration records for each Mercury instrument. Procedures for recording this information are covered in Breath Alcohol Technician (BAT) training and documentation, when provided.



- Accuracy Check and Calibration of the Mercury instrument **must** be performed using an NHTSA-approved wet bath simulator or certified dry gas standard.
- Because precise calibration is crucial, the Mercury instrument **must** be calibrated by PAS Systems International, Inc. or a certified Calibration Technician.



Suitable Dry Gas Standards and Regulators are available from PAS Systems International, Inc. Contact: (855) 754-4433.

When to perform a calibration:

- When an accuracy check fails, for example, outside the +/- .005 tolerance limits.
- At least every 360 days, or more often as required by state and local regulations.
- When the *Calibration Alert Timeframe* setting is reached (the default setting is 360 days, unlimited number of tests), the instrument will produce a reminder alert upon the instrument's power-on.

Using an approved wet bath or dry gas simulator with the proper regulator for accuracy checks has been the accepted method for many years.

When using dry gas, PAS recommends a dry gas concentration between 0.035% and 0.100% for calibration. The alcohol concentration printed on the label of the dry gas cylinder must be corrected for altitude when conducting tests at or above 250 feet above sea level. Please refer to page 17 of this guide for specific instructions for altitude corrections.

Wet Bath or Dry Gas Calibration

1. Select the **Settings** icon and then select the “**Cal.**” option. Calibration can also be accessed under *Advanced Settings*.
2. Enter the password **119119**.
3. For mercury instruments with serial numbers ending with:
 - 10400666 or higher, select the **Calibration** option.
 - Before 10400666, skip to step four (4).
4. Enter the gas tank’s concentration to one decimal place, corrected for your elevation. Once entered, hit the **Right Arrow** icon to confirm.



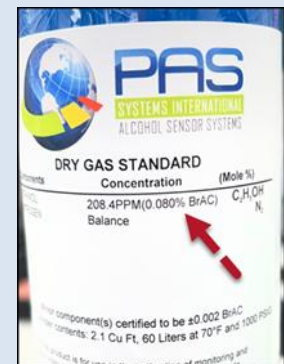
Remember to use the **High-Altitude Correction** Chart on page 17 to adjust for altitude if needed based on **your** elevation and **your** dry gas canister’s label.



Note that your device asks you to enter the % BrAC concentration in mg/ml, whereas the gas tank is in g/L. This means the decimal point of your expected value that you need to enter shifts; see the examples below:

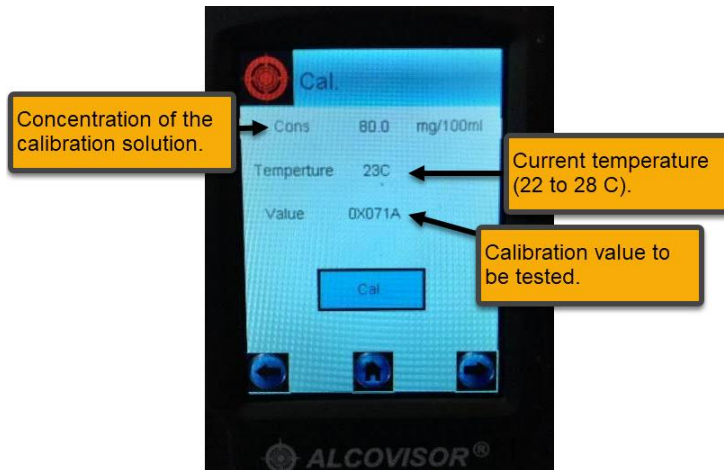
7. Using a 0.038% gas tank in Chippewa Falls, WI, at 820’ elevation, your expected value is **0.037**, and you have to enter it as **37.0**.
8. Using a 0.040% gas tank in Santa Fe, NM, at 7,199’ elevation, your expected value is **0.030**, and you have to enter it as **30.0**.
9. Using a 0.080% gas tank in Fort Collins, CO, at 5,003’ elevation, your expected value is **0.066**, and you have to enter it as **66.0**.

Remember to use the **High-Altitude Correction** Chart on page 17 to adjust for altitude if needed based on **your** elevation and **your** dry gas canister’s label.



Example Label

- The calibration screen will display the concentration of the calibration solution, the current temperature (22 to 28 C), and the calibration value to be tested.



- Place a new mouthpiece onto the Mercury instrument.
- Connect the Mercury's attached mouthpiece to the regulator, ensuring a tight fit and keeping the mouthpiece straight. Use calibration adaptor tubes between the simulator (or cylinder) and mouthpiece to ensure an airtight fit.



If the mouthpiece is not properly connected or does not remain connected during the procedure, the calibration may fail.



Mercury Instrument ending in
Serial Numbers before 10400666



Mercury Instrument ending in
Serial Numbers 10400666 or higher

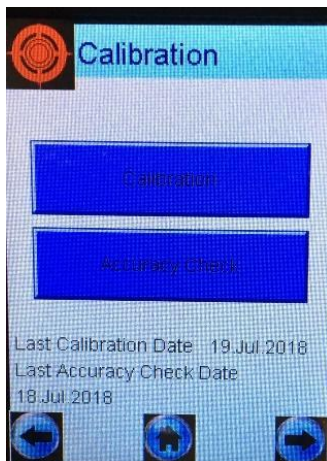
- Press the gas regulator button, starting the flow of gas, allowing gas to flow into the mouthpiece for a total of **eight (8) seconds**.
- At the **eight (8) second** mark, while continuing to press down on the gas regulator button, select the **Cal.** button on the Mercury instrument to acquire a sample. **The gas MUST be flowing into the mouthpiece while the sample is taken.**
- Once you hear the pump "click," indicating the sample has been taken, you may release your finger from the gas regulator button and remove the instrument from the regulator.

10. The screen will briefly flash “*Wait*,” and the calibrated value in the third line will be changed. The calibrated value is a mixture of letters and numbers.

If the resulting hex value has more than one zero after the leading “X”, the calibration has failed and must be repeated following the instructions provided in the Out-of-Range Calibration Results section.

For example:

- 0X01BC: successful calibration
 - 0X1B63: successful calibration
 - 0X00CB: failed calibration
 - 0X0072: failed calibration
 - 0XFFFF: failed calibration, null value returned - return the instrument to PAS Systems International to be serviced.
11. Select the **Right Arrow** icon to finish calibration.
 12. **Mercury Instrument ending in Serial Numbers before 10400666:** Return to the Main Menu and perform an accuracy check to verify the calibration results. For instructions on performing an accuracy check, please see the Accuracy Check information in this guide.
 13. **Mercury Instrument ending in Serial Numbers 10400666 or higher:** An Accuracy Check/Calibration Check should always be performed after a calibration to ensure the calibration was successful. Select the Accuracy Check option and then follow the instructions on performing an accuracy check in this guide. If an accuracy check is performed through *Advanced Settings*, the results will not be saved, but the date the check was performed will be recorded.



After a **successful calibration**, PAS Systems International, Inc. recommends turning your instrument off and back on, then following the Accuracy Check process outlined in this guide.

After a **failed calibration**, follow the instructions provided in the **Out-of-Range Calibration Results** section of this guide.

Out-of-Range Calibration Result

If the resulting hex value indicates a failure, perform a second calibration to eliminate any human error that may have occurred.

Before beginning the re-check:

- Verify that the seal on the simulator is airtight.
- Verify that the outlet tube and mouthpiece are free of condensation.
- Verify that the mouthpiece is properly and securely attached to the device.
- Ensure there is adequate gas in the canister. If the regulator shows a low gas level, replace it.
- While conducting the Calibration process, the gas must be flowing for a minimum of eight (8) seconds when the Cal button is pressed.
- Ensure that the mouthpiece was not removed from the outlet tube during the eight (8) seconds of gas flow and at the six (6) second mark when the Cal button was pressed.
- Ensure the % BrAC value on the Mercury device readout matches the Dry Gas Concentration value on the canister label. Remember to use the High-Altitude Correction chart in this guide to adjust for altitude if needed, based on your location's elevation and your dry gas canister's label. Do not rely on the examples provided in this guide.

If the instrument's hex value result still indicates a failure after eliminating possible human errors, the instrument **must** be removed from service and returned to PAS Systems International, Inc. for servicing and calibration.

Dry Gas at High Altitude

The concentration of alcohol in a dry gas standard is carefully controlled to yield the correct vapor concentration at sea level. At higher elevations (altitudes), the concentration of the alcohol in the vapor leaving the cylinder will be less. This change in concentration at sea level is negligible, but at higher altitudes, significant errors would result without corrections. Multiply the standard concentration on the gas cylinder label by the factor shown for the appropriate local altitude listing in the *High Altitude Correction Chart*. For example, if you have a dry gas standard of 0.045% and you are using it at 500 feet, you would multiply the value at sea level by the correction factor. The corrected value would be $0.045 \times 0.981 = 0.044\%$ BAC.

High Altitude Correction Chart

ALTITUDE		FACTOR	DRY GAS STANDARD					
			0.035%	0.038%	0.040%	0.080%	0.082%	0.100%
0	499	1.000	0.035	0.038	0.040	0.080	0.082	0.100
500	999	0.981	0.034	0.037	0.039	0.078	0.080	0.098
1000	1499	0.962	0.034	0.037	0.038	0.077	0.079	0.096
1500	1999	0.943	0.033	0.036	0.038	0.075	0.077	0.094
2000	2499	0.925	0.032	0.035	0.037	0.074	0.076	0.093
2500	2999	0.907	0.032	0.034	0.036	0.073	0.074	0.091
3000	3499	0.889	0.031	0.034	0.036	0.071	0.073	0.089
3500	3999	0.872	0.031	0.033	0.035	0.070	0.072	0.087
4000	4499	0.854	0.030	0.032	0.034	0.068	0.070	0.085
4500	4999	0.837	0.029	0.032	0.033	0.067	0.069	0.084
5000	5499	0.820	0.029	0.031	0.033	0.066	0.067	0.082
5500	5999	0.804	0.028	0.031	0.032	0.064	0.066	0.080
6000	6499	0.787	0.028	0.030	0.031	0.063	0.065	0.079
6500	6999	0.771	0.027	0.029	0.031	0.062	0.063	0.077
7000	7499	0.755	0.026	0.029	0.030	0.060	0.062	0.076
7500	7999	0.740	0.026	0.028	0.030	0.059	0.061	0.074
8000	-	0.724	0.025	0.028	0.029	0.058	0.059	0.072

Quality Assurance Plan

Under the U.S. Department of Transportation workplace testing program (see 49 CFR Part 40), transportation employers are required to test employees in certain safety-sensitive positions for alcohol under specific conditions. The DOT workplace testing program requires that breath test instrument manufacturers provide employers with this *Quality Assurance Plan (QAP)*, which, together with the operation instructions provided with the Mercury Evidential Breath Tester (EBT), will help ensure that breath testers are calibrated to the required degree of accuracy.

QAP

- **Allowed Calibration and Accuracy Check Units:** Any wet bath simulator listed on the NHTSA Conforming Products List of Calibration Units for Breath Alcohol Tests is allowed for unit calibration. When calibration or an Accuracy check is needed, the Wet Bath simulator should be used with a certified BAC solution at a concentration between 0.035% and 0.100%, in accordance with the manufacturer's operating manual. Alternatively, an NHTSA-approved dry gas standard with a concentration between 0.035% and 0.100% may be used.
- **Interval for Accuracy checks, also known as calibration check or external calibration check, is:**
 - a. **Required** every 30 days.
 - b. **Recommended** after a positive confirmation test.
 - c. **Recommended** if the instrument fails to air blank to 0.000 after two (2) attempts.
 - d. **Recommended** after the instrument has undergone repairs.

There is no limitation on the number of tests that may be conducted between accuracy checks, provided that the monthly accuracy checks are completed.

- **Accuracy Check Tolerance:** +/- 0.005%.
- **Calibration, also known as calibration adjustment:** Is required:
 - a. At least every 360 days, or more often as required by state and local regulations.
 - b. When an Accuracy Check fails the +/- .005 tolerance limits.
- **Intervals for Periodic Inspection:** Self-diagnostics and visual inspection by the operator are required before every use. Routine maintenance and service are recommended every two (2) years.
- **Events which require the instrument to be taken out of service and returned to PAS Systems International for repair:**
 - a. Self-diagnostic failure or indication by error code.
 - b. The power supply is not providing the necessary power to the Mercury instrument.
 - c. The Mercury instrument does not display "Please Blow" after selecting a Standard or Passive test.
 - d. A calibration failure as defined in the "**Out-of-Range Calibration Result**" section of this guide.
 - e. An Accuracy Check failure as defined in this guide, and an on-site certified Calibration Technician is not available.
 - f. General servicing and annual calibration purposes, which require a Factory Certificate of Calibration.

Follow the operating instructions provided by the dry gas manufacturer for the proper procedure for using dry gas in calibration checks.

Instruments indicating any of the above ERRORS should be returned to PAS Systems International, Inc. for repair. Please call the PAS Systems International, Inc. Technical Service Team and provide the instrument's serial number, describe the problem, and obtain information on sending the instrument in for service.

This QAP is subject to change and should neither be considered a final requirement nor a contractual term in any agreement to purchase the Mercury installation.

Troubleshooting

The troubleshooting table that follows is provided to help eliminate confusion and prevent downtime by supplying corrective procedures. If problems persist, call PAS Systems International, Inc. technical service at (855) 754-4433

Problem	Cause	Solution
The touch screen is dimly lit or slow to respond.	The unit's power supply is completely exhausted.	Change batteries.
The Mercury instrument does not display "Please Blow when a Standard or Passive test is chosen."	Instrument malfunction.	Contact PAS Systems International, Inc at (855) 754-4433.
The Mercury instrument activates a different icon than the one the stylus pen touches.	The touchscreen needs calibration.	Follow the instructions below to recalibrate the touchscreen.

Touchscreen Calibration

If the touchscreen on the Mercury instrument does not appear to be responding correctly, it may need calibration.

With the instrument **off**:

1. Press and hold the **On/Off button** (right button) and then press the **Function** button (left button) immediately.
2. Follow the on-screen instructions by tapping the **arrows** and **plus** signs as accurately as possible to calibrate the screen.

Technical Specifications

Product Name	Alcovisor - Mercury
Sensor	Platinum Electrochemical Fuel Cell.
Accuracy	Meets DOT specifications +/- 0.005% up to 0.100 % BrAC and +/- 5% above 0.100% BrAC
Sample Accuracy	0.001%
Detection Range	0.00 to 0.400 BrAC
Response Time	5 seconds or less.
Recovery Time	Less than 1 minute.
Start-up Delay	Less than 1 minute.
Sampling System	Automatically takes a deep lung sample or tests manually.
Breath Sample Time	Up to 10 seconds continuous breath – minimum 2.5 seconds.
Unit of Measure	% BrAC, mg/l, mg/100ml, or any other units.
Working Temperature	14°F to 122°F (-10 °C to +50 °C)
Storage Conditions	-13°F to 158°F (-25°C to +70°C); 15% to 90% relative humidity.
Touch Screen Size	2" x 1.5" touch screen (5.1 cm x 3.8 cm)
Dimensions	5.5" X 2.5" X 1.5" (13.9 cm X 6.3 cm X 3.8 cm)
Weight	0.56 lbs (254 g)
Self Diagnostics	Programmed self-checks assure the unit is operational upon power-up.
Power Supply	Four (4) AA batteries.
Battery Life	Not less than 500 tests.
Memory	Capable of saving 16,000 test results.
Pump	Automatically actuated electronic pump – No cocking required.
Mouthpiece	Affordable, sanitary, and individually wrapped.
Calibration	Minimum every 360 days, with accuracy checks minimum every 30 days. Use Wet Bath or Dry gas for calibration.
USB	Computer interface connection.

Safety, Maintenance, & Warranty

Safety

For correct and effective use of the Mercury instrument, it is essential to read and strictly follow the instructions contained in this document. The Mercury instrument is to be used only for the purposes specified herein.

Maintenance

Repairs of the Mercury instrument may only be performed by PAS Systems International, Inc. or an authorized service technician. Only original Mercury instrument parts may be used.

To keep the instrument clean, periodically wipe the outside of the case with a mild disinfectant and a soft cloth. **DO NOT** use alcohol to clean the unit.

Warranty

PAS Systems International, Inc. warrants the Mercury to be free of defects in material and workmanship as specified in the warranty. For a complete warranty statement, see www.pasintl.com.

Contact Information

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PASSupport@scramsystems.com

(855) 754-4433



DATIA Member



US DOT Approved



CE Approval

