

DOT

MARK V Alcovisor®



Operating Manual

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INTRODUCTION

The MARK V is an affordable, handheld, quantitative breath alcohol testing instrument. The Mark V is a NHTSA certified EBT. It can be used for law enforcement, schools, workplace safety, or medical purposes. The MARK V features easy-to-use automatic sampling or manual sampling procedures.

The MARK V is accurate and reliable, allowing a complete breath test procedure to be conducted in about 30 seconds or less.

This manual describes the operation, maintenance, calibration check, and calibration adjustment of the MARK V. This manual should be read completely and fully understood by each operator prior to testing. It is further recommended that operators practice the breath testing process before giving an actual “in the field” test.

1. USB Port (left side)

2. Mouthpiece Holder

3. LCD Display (Automatic Backlight)

4. Function Button (Red)

5. ON/OFF Button (Green)
Confirm/Select



**NHTSA APPROVED
EVIDENTIAL BREATH ALCOHOL TESTING DEVICE (EBT)**

PRINCIPLES OF OPERATION

The MARK V uses an electrochemical fuel cell containing two platinum electrodes to detect and measure the concentration of alcohol vapor 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 and displayed 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.

The MARK V Alcovisor® Operation

This section details the preparation required to use the MARK V, and the steps for performing a breath test.

Preparing the MARK V

Before using the MARK V, the batteries (AAA) must be installed and the unit turned on.

Installing Batteries

The MARK V is powered with 4 AAA Alkaline Batteries. The Battery Indicator is located at the top right of the screen when the MARK V is on.

To insert the batteries:

1. Press and slide the battery compartment cover off.
2. Place 4 AAA batteries into position in the battery compartment.
3. Replace the cover.

When replacing the batteries, always replace ALL four batteries.

Turning On & Off

ON

Press and hold the Green ON/OFF button for 2 – 3 seconds. The display light comes on and a self-test (automatic Blank Test) is carried out by the microprocessor. In a few seconds, the display will read “PLEASE BLOW”.

OFF

Press and hold the ON/OFF button for 2 - 3 seconds.

Note: You can choose to have the Mark V shut off automatically after 1, 2, 5 or 10 minutes of inactivity, to conserve battery power.



Attaching a Mouthpiece

1. Remove the disposable mouthpiece from its wrapper, making sure not to touch the end into which the subject will be blowing.
2. Insert the disposable mouthpiece into the mouthpiece holder. The mouthpiece can be inserted from either side of the MARK V.
3. Ensure a secure fit.





Settings

To access the Settings menu:

1. Turn on the MARK V.
2. When instrument displays “Please Blow”, click the LEFT (red) button until the Main Menu Icon  is highlighted, then click the RIGHT (green) button to select. This will take you to the main menu.
3. Use the LEFT (red) button to highlight the Settings Icon , then click the RIGHT (green) button to select.

Settings:

1. **Time Setting:**
 - a. Use the LEFT (red) button to change the highlighted area and RIGHT (green) buttons to select the correct Date and Time.
 - b. Select “Update” to confirm.
2. **Auto Off:**
 - a. Use the LEFT (red) and RIGHT (green) buttons to Select the time limit to turn off the device automatically if it is inactive.
 - b. Select  to confirm.
3. **Print:**
 - a. Use the LEFT (red) and RIGHT (green) buttons to Select “Auto Print” to have a test result print automatically after each test without having to select “print” (if the optional printer is available).
 - b. Select the number of copies to print for each test.
 - c. You can also choose to have the Last Calibration Date printed by selecting the “Cal” option.
 - d. Select  to confirm.
4. **Calibration:**
 - a. 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.
 - b. A password is needed for calibration.
5. **Advanced:**

A password is needed to access the advanced settings. Please refer to the Advanced Settings Manual.

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

- The ambient air should be free from alcohol, solvent vapors, and thick tobacco smoke.
- Working temperature of the MARK V should be between 23°F to 131°F (-5°C to 55°C).

Note: Do not allow an unrealistically high ethanol concentration to reach the sensor, since this can reduce the life expectancy of the unit.

Conditions for Test Subject

- The person being tested must abstain from drinking, eating, chewing gum, chewing tobacco, smoking tobacco, using mouth spray, or taking any medications for at least 15 minutes prior to 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 person being tested must breathe evenly and normally before the test. The person must also avoid repeated deep breaths (hyperventilation) as this will temporarily cool down the breath and may lead to a false reading.
- Should the person have diminished lung capacity and cannot activate the Auto Test, a manual override method is provided.

Note: 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.

Air Blank Feature



The MARK V performs an Air Blank test to determine if ethanol is present in the ambient air or if any residual alcohol is remaining 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 MARK V automatically performs an air blank every time the Test Icon is selected and before going into Test Mode.

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)



Automatic Sampling

1. Insert a new disposable mouthpiece into the mouthpiece holder. The mouthpiece can be inserted from either side of the device.
2. Turn on the MARK V.
3. Instrument will display “AirCheck Processing” as it checks for residual alcohol in the air or in the fuel cell.
4. Instrument will display the results of the Air Blank on screen for 6 seconds. The time and result of this Air Blank will be printed with the Test Result.
5. Instrument will then automatically go into Test Mode and display the next Test Record Number.
6. Ensure that the display reads “Please Blow”. The MARK V is now ready for use. The Record # will be displayed below “Please Blow”.
7. Instruct the person being tested to breathe in deeply and blow evenly into the mouthpiece, without a break, for a minimum of 4 seconds or until a click sounds. Blowing can cease when the click is heard.
8. After a few seconds, the Test Result will be displayed on the LCD.
9. If subject did not blow within 30 seconds, operator can select “Refuse” to confirm the subject refused to do the test. Or operator can select “Test Again” to allow subject to do the test again. If “Refuse” is selected, this will appear in the memory for that record number.
10. If subject failed to give a valid breath sample, operator can select “Discontinued” to confirm, or select “Test Again” to allow subject to test again. If “Discontinued” is selected it will appear on the test record.
11. If the optional printer is available, connected to the MARK V and on, use the Red button to highlight the Print Icon  on the bottom of the screen, and select it using the Green button to print out the result. (See p.9-10 for more information on Printer setup and use).
12. To take another test, attach a new mouthpiece and highlight the Test Again  Icon at the bottom of the screen using the Red button and select using the Green button. Instrument will perform another Air Blank before going back into Test Mode and displaying a new Test Record Number.

Manual Sampling

This method can be used when the test subject has a diminished lung capacity and cannot activate the Automatic Sampling test.

1. Follow steps 1-6 under automatic sampling.
2. Instruct the person being tested to breathe in deeply and blow evenly into the mouthpiece without a break for a minimum of 4 seconds.
3. While the person is blowing and after a minimum of 4 seconds, press the green button and release.
4. After a few seconds, the measured value will display.

Conducting a Passive Test (No Mouthpiece)

1. Turn the MARK V ON.
2. When "Please Blow" appears, hold the sample port (mouthpiece opening) about 4 inches from the subject's mouth.
3. Have the subject moderately blow towards the mouthpiece opening for several seconds.
4. Press the green button while the subject is blowing.
5. Results will appear on display (e.g. 0.000% or greater).

Notes:




- 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 3 minutes before performing the next test.



Accessing Test Records

The MARK V is able to store up to 10,000 individual test records. These can be viewed and printed at a later time or downloaded onto a computer.

To view records:

1. Turn on the MARK V.
2. When instrument displays “Please Blow”, click the LEFT (red) button until the Main Menu Icon  is highlighted, then click the RIGHT (green) button to select. This will take you to the main menu.
3. Use the LEFT (red) button to highlight the Test Records Icon , then click the RIGHT (green) button to select.
4. The most recent record will be shown on the screen. To view other records, use the LEFT (red) button to highlight the left arrow and click through the records using the RIGHT (green) button.
5. To print a record: Connect MARK V to optional printer, make sure the record you want to print is on the screen, highlight the Print Icon  using the LEFT (red) button and click the RIGHT (green) button to activate.

Printer Accessory



Printer Operation

Battery Installation:

1. Remove the battery cover from the back of the printer by pressing the tab and pulling it away.
2. Insert the rechargeable battery pack.
3. Replace battery cover.

Recharging the Battery:

1. Remove battery from back of printer.
2. Place in battery charger, so gold connectors on battery line up with gold connectors in charger.
3. Plug wall adaptor into charger and into the wall. Battery will charge automatically, Light will be red while charging and will turn green when battery is fully charged.







Loading printer paper:

1. To load more printer paper in the printer, open the cover by gently lifting the half-moon piece until the cover pops open.
2. Remove any remaining paper that may be in the unit.
3. Unroll 1-2 inches of paper from the new roll and drop it into the printer (with glossy side up) so the paper will easily feed through.
4. Close the cover.

Turning On/Off:

1. Turn on the printer by pressing the power button (⏻) for a few seconds until the green light comes on.
2. Turn off the printer by pressing and holding the power button (⏻) until the green light goes out.

Printing Test Results:

1. Connect MARK V to the printer using the USB cable.
2. Be sure printer is on. (Printer will shut off after several minutes of inactivity)
3. Turn on MARK V and take an automatic or manual sample.
4. To Print Results after a test, highlight the Print Icon  using the Left (red) button and then press the Right (green) button to start printing.
5. To Print from Memory:
 - a. Choose the Main Menu Icon 
 - b. Highlight and Choose the Test Records Icon 
 - c. The most recent record will appear first, to review prior records, highlight the left arrow using the Left (red) button and click through the records using the right (green) button until you find the record you want.
 - d. With the record to be printed showing on screen, highlight the Print Icon  and select it using the right (green) button.
 - e. Results will print immediately.

After results have printed, gently pull paper towards the power button to remove.

Troubleshooting (Printer):

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

Accuracy Checking and Calibration

Accuracy testing should be performed at least once per month to ensure that BAC readings are reliable. If the result of the accuracy test is not within the acceptable range, the unit must be re-calibrated by PAS Systems International, Inc. or by persons who have been properly trained for alcohol detector calibration.

Due to the sensitive nature of BAC testing, it is extremely important to keep detailed records of both accuracy tests and recalibrations for each MARK V unit. Procedures for recording this information are covered in BAT training and documentation when provided.

PAS recommends all MARK V units be calibrated annually or whenever an accuracy check shows that BAC readings are no longer within tolerance limits. Because precise calibration is crucial, it can be performed only by PAS Systems International or by persons who have been properly trained for alcohol detector calibration. (Calibration of the MARK V **must** be performed using a NHTSA-approved wet bath simulator or certified dry gas standard.) Successful completion of calibration should be recorded in a calibration log. *Instructions for calibration can be found in the Advanced Settings Manual.* Please refer to the Quality Assurance Plan (QAP) documentation on page 15 for additional calibration requirements.

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 which provide equilibration of alcohol between water and air at a controlled temperature.

Accuracy checking of the MARK V should be performed by authorized persons using any NHTSA approved breath alcohol simulator.

To 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 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 air-tight.

Note: The length of tubing connected to the simulator outlet should not be longer than 2" in order to prevent condensation.

4. Plug Simulator in and turn 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 when ready.
7. Attach instrument to the mouthpiece. (The opaque moisture trap can be used should condensation appear in the mouthpiece).
8. Switch on the MARK V. Wait for "Please Blow" to display after Air Blank Check.
9. Forcefully blow into the simulator for several seconds, press the "Green" button and release.

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

NOTE: If the result is not within published specifications for the MARK V, conduct another accuracy check. Verify that the seal on the simulator is air-tight and that the outlet tube and mouthpiece are free of condensation. If the measurement is still not within specifications (+/- 0.005), the unit must be removed from service until an internal calibration can be conducted.

Dry Gas Accuracy Checking

When using certified dry gas (PAS recommends 0.080% dry gas concentration) for accuracy checking, the alcohol concentration printed on the label of the gas cylinder must be corrected to account for altitude when conducting tests at or above an altitude of 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.

To perform the accuracy check:

1. Attach a new mouthpiece.
2. Turn on the MARK V. Wait until “Please Blow” is displayed after the Air Blank Check.
3. Always pre-purge the valve for a few seconds before delivering a sample for testing.
4. Connect the MARK V to the regulator/valve of the gas cylinder (the regulator must provide a gas flow of at least 1.5 liters per minute).
5. Depress the regulator button and allow gas to flow for 8-10 seconds. Press the “Green” button (manual test).
6. After a few seconds, the measured value will be displayed. If the measured value is within +/-0.005 BrAC, the MARK V is working accurately.

Note: Suitable Dry Gas Standards and Regulators are available from PAS Systems International, Inc. (800-660-7643)

Dry Gas At High Altitude:

The concentration of alcohol in a dry gas standard is carefully controlled to give the correct vapor concentration when the cylinder is 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 if corrections were not made. Simply 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*.

Please see the High Altitude Correction Chart for the appropriate correction factor at various elevations. 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

Elevation from Sea Level	Correction Factor	Corrected Value for 0.080% Dry Gas
0	1	0.080
500	0.981	0.078
1000	0.962	0.077
1500	0.943	0.075
2000	0.925	0.074
2500	0.907	0.073
3000	0.889	0.071
3500	0.872	0.070
4000	0.854	0.068
4500	0.837	0.067
5000	0.820	0.066
5500	0.804	0.064
6000	0.787	0.063
6500	0.771	0.062
7000	0.755	0.060
7500	0.740	0.059
8000	0.724	0.058

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 working in certain safety sensitive positions for alcohol under certain conditions. The DOT workplace testing program requires that breath test instrument manufacturers provide employers with this Quality Assurance Plan, which together with the operation instructions provided with the **MARK V Evidential Breath Tester (EBT)**, will assist in assuring that breath testers are calibrated to the required degree of accuracy.

QAP:

1. Allowed Calibration Units: Any wet bath simulator listed on the NHTSA Conforming Products List of Calibration Units for Breath Alcohol Tests. When calibration or re-calibration (not an accuracy check) is needed the simulator should be used with a certified BAC solution with a concentration between 0.035% and 0.100%, following the operating manual provided by the wet bath simulator manufacturer. Alternatively, a dry gas standard with a concentration between 0.035% and 0.100%, which has been approved by NHTSA, may also be used.
2. External Calibration Check Interval: Calibration Checks (Accuracy Checks) should be performed:
 - Once a month (every 30 days);
 - After a positive confirmation test;
 - If the unit fails to air blank to 0.000 after 2 attempts;
 - After the unit has undergone repairs.

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

3. External Calibration Check Tolerance: +/- 0.005%
4. Intervals for Periodic Inspection: Self-diagnostics and visual inspection by operator before every use. Routine maintenance and service recommended every 2 years. Calibration when 2 consecutive calibration (accuracy) checks fail (out of tolerance).
5. Events which require instrument be taken out of service: Self-diagnostics failure or indication by error code. The power supply is not providing necessary power to the MARK V. The MARK V does not display "Please Blow" after selecting a Standard or Screening test icon.
6. For other information regarding quality assurance unique to this instrument, see the MARK V Calibration Manual as set forth in the MARK V Operating Manual.

Follow the operating instructions provided by the dry gas manufacturer for proper procedure to use dry gas for calibration checks.

Instruments indicating any of the above **ERRORS** should be returned to PAS Systems International, Inc. for repair. Please call PAS Systems International, Inc. Technical Service Team to describe the problem & for more information on sending the unit in for service. Please have the serial number of the unit.

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

Contact: PAS Systems Intl, Inc
1616 Princess Anne St
Fredericksburg, VA 22401
800-660-7643

Effective: July 2013

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 800-660-7643.

PROBLEM

The display is only faintly lit.
Unit will not turn on.

CAUSE

Power supply to the unit is completely exhausted.

SOLUTION

Replace all 4 AAA Batteries.
Use only high quality batteries

PROBLEM

“Please Blow” does not display.

CAUSE

Instrument malfunction.

SOLUTION

Contact PAS Systems International, Inc. at 800-660-7643.

Technical Specifications

Product Name:	MARK V
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 % (digital display)
Detection Range:	0.00 to 0.400 BrAC
Response Time:	10 seconds or less
Recovery Time:	Less than 1 minute
Start-up Delay:	Less than 1 minute
Sampling System:	Automatically takes deep lung sample or tests manually.
Breath Sample Time:	Up to 12 seconds continuous breath – minimum 4 seconds
Unit of Measure:	% BrAC, mg/l, mg/100ml, or any other units.
Working Temperature:	23° to 131° F (-5° to +55°C)
Storage Conditions:	-13° to 158° F (-25° to 70° C); not more than 95% relative humidity.
LCD Display Size:	2.0" X 1.5" viewing area (5cm X 4 cm), Automatic backlight for night time use.
Dimensions	5.5" X 2.25" X 1.25" (140mm X 55mm X 30mm)
Weight	.43 lbs (195 grams)
Self Diagnostics:	Programmed self-check assures unit is operational upon power up.
Power Supply	Battery pack - holds four (4) AAA disposable Alkaline Batteries
Battery Life:	500 tests
Memory:	Capable of saving 10,000 test results.
Pump:	Automatically actuated electronic pump – No cocking required.
Mouthpiece:	Affordable, sanitary, and individually wrapped.
Calibration:	Annually with monthly accuracy checks. Use Wet Bath or Dry Gas.
USB Cable	Optional Printer & Computer interface connection.

Safety, Maintenance, & Warranty

Safety

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

Maintenance

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

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

Warranty

The MARK V comes with a one (1) year limited parts and labor warranty, effective on the date of purchase. The warranty does not cover batteries or accessories. The warranty does not cover freight to the service facility, misuse or abuse of the product. Warranty is void if unit is found to have been tampered with.



DATIA Member



US DOT Approved



CE Approved

**RoHS
Approved**

MARK V Alcovisor®

DOT

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