Law Enforcement

MARK V Alcovisor®

Operating Manual

PAS Systems International, Inc.
215 Southport Dr. Suite 400
Morrisville, NC 27560

www.pasintl.com
(800) 660-SNIF · (540) 372-3431

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INTRODUCTION

The MARK V is an affordable, handheld quantitative breath alcohol testing instruments. 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. Mouthpiece Holder
2. USB Port (left side)
3. LCD Display (Automatic Backlight)
4. ON/OFF Button (Green) Confirm/Select
5. Function Button (Red)

NHTSA/DOT 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 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 turned 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

- Remove the disposable mouthpiece from its wrapper, making sure not to touch the end into which the subject will be blowing.
- Insert the disposable mouthpiece into the mouthpiece opening. The mouthpiece can be inserted from either side of the unit.
- 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 hightlighted 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 (This Feature Only Used with DOT Printer Models)**

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 Advance 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 MARK V LE should be between 23°F to 131°F (-5ºC to 55ºC).

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 allows the user to perform 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 confirmation 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 Min 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 opening. 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. The results of the Air Blank test will be displayed on the screen for 6 seconds.

4. Instrument will then automatically go into Test Mode and display the next Test Record Number.

5. Ensure that the display reads “Please Blow”. The MARK V is now ready for use. The Record # will be displayed below “Please Blow”.

6. 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.

7. After a few seconds, the Test Result will be displayed on the LCD. If the unit is left on, it will power down after displaying the test result for several minutes.

8. 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.

9. 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.

10. 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 1-5 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 holder 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.

TEST RECORDS

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

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.

Accuracy Checking and Calibration

Accuracy checking 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.

PAS recommends all MARK V units be calibrated annually or whenever an accuracy test 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 12 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 34ºC 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. Connect to outlet tube.
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 Testing

When using certified dry gas (PAS recommends 0.080% dry gas concentration) for accuracy testing, 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 test:

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 5-10 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 of the altitude-adjusted concentration value, 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 chart below 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 x 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 or Breath Alcohol Technicians with this Quality Assurance Plan, which together with the operation instructions provided with the **Mark V**, 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 0.080% BAC solution, following the operating manual provided by the wet bath simulator manufacturer. Alternatively, a dry gas standard of 0.080% that has been approved by NHTSA may also be used.
2. External Calibration Check Interval: Calibration Checks (Accuracy Checks) should be performed monthly; after positive test results; or if the unit fails to air blank to 0.000 after 2 attempts, and after repair. 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 or +/- 5% at or above 0.100.
4. Intervals for Periodic Inspection: Self-diagnostics and visual inspection by the operator before every use. Routine maintenance and service recommended every 2 years. Calibration should be performed 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 “BLOW” within 2 minutes of power up.
6. For other information regarding quality assurance unique to this instrument, see the Mark V Calibration Software Manual as set forth in the Mark V Operating Manual.

Follow the operating instructions provided by the 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.

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	CAUSE	SOLUTION
The display is only faintly lit or the unit will not turn on.	The power supply to the unit is completely exhausted.	Replace all 4 AAA batteries. Use only high quality batteries.
“Please Blow” does not display.	Instrument malfunction.	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:	0.000 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:	23º to 131º F (-5º to +55ºC)
Storage Conditions:	-13º to 158º F (-25º to 70º 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

PAS Systems International, Inc. warrants the MARK V to be free of defects in material and workmanship as specified in the warranty. For a complete warranty statement, see the warranty included with the shipment of the MARK V.

DATIA Member US DOT Approved CE Approve **RoHS Approved**

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