Law Enforcement

Alcovisor® Mercury

Operating Manual

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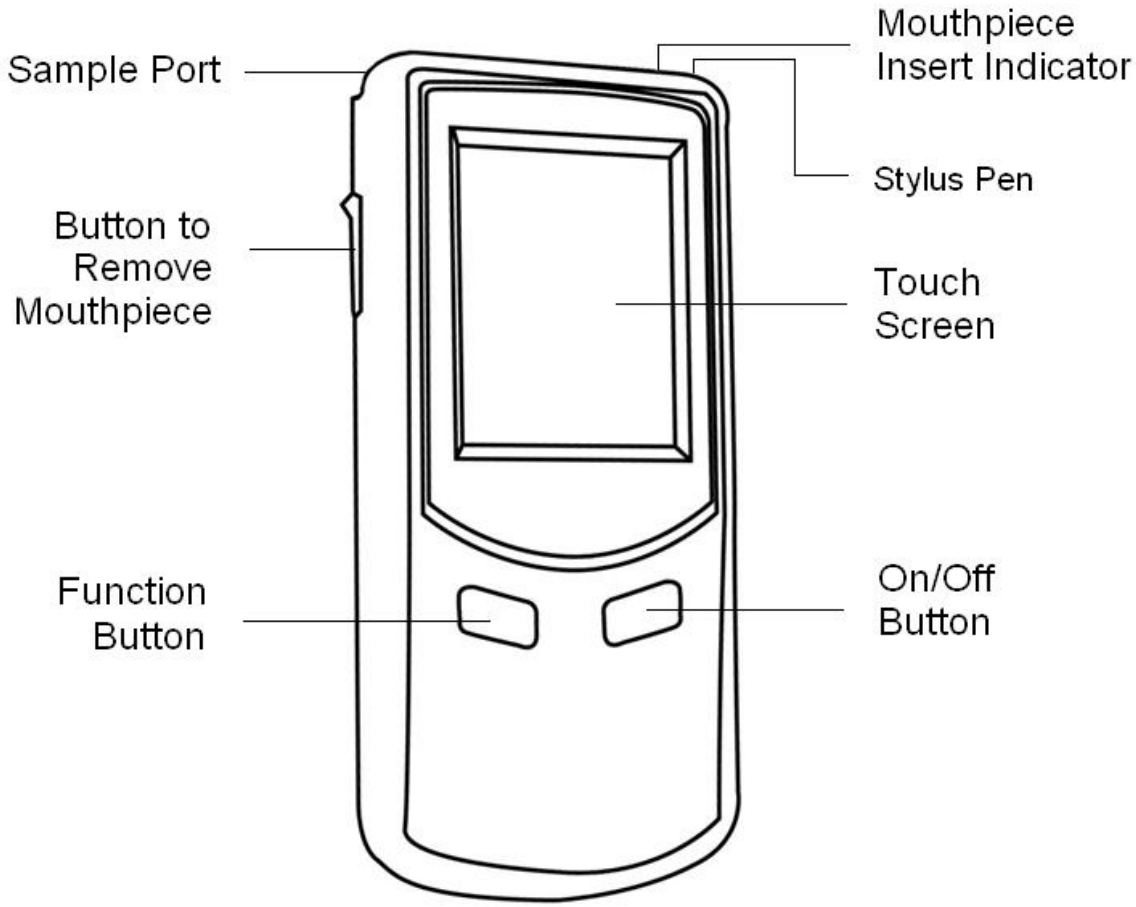
INTRODUCTION

The Mercury 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 an easy-to-use automatic sampling or manual sampling with a user-friendly touch-screen display and an optional wireless printer.

The Mercury 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 Mercury. 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.



NHTSA APPROVED
EVIDENTIAL BREATH ALCOHOL TESTING DEVICE (EBT)

PRINCIPLES OF OPERATION

The Mercury 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.

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 subject to touch the sampling cup while providing a breath sample. Remove and clean with a mild disinfectant (alcohol-free) for the next use.

3. **LEVER TO REMOVE MOUTHPIECE:** For sanitary reasons, the mouthpiece can be ejected by pushing up on the lever on the left side of the Mercury.

4. **TOUCH SCREEN DISPLAY:** A user-friendly touch-screen displays instructions and test results. Select the icons and buttons on the screen by using the attached stylus pen located on the top of the instrument behind the sample port.

5. **EXTERNAL POWER CONNECTORS:** If rechargeable AA batteries are used in the unit, the 12V auto adapter can be used to recharge the batteries.

6. **USB CABLE:** A USB cable can be used to download stored test records from the Mercury onto a PC.

The Alcovisor® Mercury Operation

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

Preparing the Mercury

Before using the Mercury, batteries must be installed and the unit turned on.

Installing Batteries

The Mercury is powered using 4 (AA) alkaline batteries.

To insert the batteries:

1. Remove the lower half of the back cover by sliding it down.
2. Insert the 4 batteries according to the plus (+) and minus (-) directions in the instrument. Be sure to keep the ribbon underneath the batteries.
3. Replace the back cover.

To recharge batteries:

1. If you inserted Rechargeable AA batteries into the Mercury, 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 other end into the car.

CAUTION: Be certain there are Rechargeable Batteries in the instrument before attempting to recharge them.

Turning On & 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.

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

Touch-Screen Features

1	Weekday Indicator	6	Standard Test
2	Time Indicator	7	Test Records
3	Date Indicator	8	Setting
4	Battery Indicator	9	Number of Tests Indicator
5	Passive Test	10	Last Calibration Date

Previous Screen/Cancel Next Screen/Confirm Main Screen

Print Repeat Test

Icon Explanations: (see diagram on page 4)

1. **Weekday**: Shows the current day of the week.
2. **Time Indicator**: Shows the current time.
3. **Date Indicator**: Shows 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 of automatically, *Print* to control different print options, *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

- The ambient air should be free from alcohol, solvent vapors, and thick tobacco smoke.
- Working temperature of the Mercury should be between 14°F to 122°F (-10ºC to 50ºC).

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.

Attaching a Mouthpiece

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

Performing an Air Blank Test

The Mercury 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 Mercury automatically performs an air blank every time the Standard 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)

Passive Test:

1. Attach a sampling cup onto the sample port.
2. When Mercury displays “Please Blow”, instruct subject to take a deep breath and blow towards the sampling cup until the beep tone changes.
3. “Alcohol Detected” or “No Alcohol” will display on the screen.
4. A manual override can be performed by selecting “Manual” while the subject is blowing.
5. Select  to start another test.
6. If alcohol is detected, use a mouthpiece to perform a standard test to obtain an accurate reading.
7. 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.

NOTE: The Screening Test (Passive Test) is used only for screening purposes to determine if alcohol is on the breath sample. An accurate test can only be obtained by using a Standard Test.

Standard Test:

1. Attach a disposable mouthpiece onto the sample port.

2. Select the Standard Test Icon on the Main Menu.

3. Instrument will display Air Blank 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 of this Air Blank will be printed with the Test Result.

5. Input information by a stylus pen, if this feature is active. (NOTE: 16 characters maximum for each input). Identifying fields, such as name, license number, etc can be chosen by the operator and are found under the Advanced Settings.

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

7. When Mercury displays “Please Blow”, have subject take a deep breath and blow until the beep tone changes. You will notice the Time (T) and Volume (V) indicators count up from 0% to 100%.

8. Test Result displays on the screen.

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.

10. If subject failed to give a valid breath sample, operator can select “Discontinue” to confirm, or select “Test Again” to allow subject to test again. The Mercury will also detect if the subject attempts to suck air back through the mouthpiece. In this case, the Mercury will display “Discontinue” or “Test Again” instead of displaying a test result.

11. Upon completion of the test, push up on the lever on the left side of the Mercury to remove the mouthpiece.

12. Select  to print the test result, if optional wireless printer is available.

13. To take another test, attach a new mouthpiece and select  . The instrument will perform another Air Blank before going back into Test Mode and displaying a new Test Record Number.

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 mode, when the Mercury displays “Please Blow”, instruct the person being tested to breathe in deeply and blow evenly into the mouthpiece for a minimum of 4 seconds.

2. While the person is blowing and after a minimum of 4 seconds, select “Manual”.

3. After a few seconds, the measured value will display.

 **Test Records**

1. Select the Test Records icon  to view test records. Up to 16,000 test records can be stored, depending on the length of the records.

2. Use  or  to move to the previous or next record.

Connect to PC/Download Test Record:

1. Test records can be downloaded onto a PC for analysis.
2. Connect the Mercury to a PC using the USB cable.
3. Please refer to the Download to PC Instruction Booklet for downloading the test records.

Settings

1. **Time Setting**
   Set correct Date and Time and select “Update” to confirm. Checking the “Use MDY” box will record your test date in month, day, year format. You must restart your device for this change to take effect.

2. **Auto Off**
   Select the time limit to turn off the device automatically if it is inactive, select  to confirm.

3. **Print**
   a. 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 and select  to confirm.

4. **Cal.** (this selection is password protected)
   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** (this selection is password protected)
   Please refer to the Advanced Settings Manual.

6. **Brightness**
   Adjusts the brightness level of the screen.

7. **Bluetooth:**
   IF your device was purchased with the optional printer, the unit and its’ printer are matched at the factory prior to shipping. Bluetooth connection will automatically be made between the unit and printer when they are both powered on.

   NOTE: The keyboard box, at the bottom of the Settings menu, must be selected to allow for information to be input into the fields such as name, license number etc.

Touch Screen Calibration

If the touch screen does not appear to be responding correctly, it may need calibration. With the instrument off, press and hold the On/Off button (right button) and then press the Function button (left button) immediately. Follow the on screen instructions by tapping the arrows and plus signs as accurately as possible to calibrate the screen.

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 Mercury unit.

PAS recommends all Mercury 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 Mercury **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. Please refer to the Quality Assurance Plan (QAP) documentation on pg 16 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 Mercury 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 Mercury. Choose the icon to perform a Standard Test and wait for instrument to perform the Air Blank test.
9. Forcefully blow into the simulator for several seconds and then press the "Maual" button on the screen.

After a few seconds, the measured value will be displayed. The display should read 0.08% +/-0.005.

NOTE: If the result is not within published specifications for the Mercury, 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 dry gas for accuracy testing (PAS recommends 0.080% dry gas concentration), 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 Mercury. Select the Standard Test icon and wait for instrument to perform the Air Blank Test. Always pre-purge the valve for a few seconds before delivering a sample for testing.
3. Connect the Mercury to the regulator/valve of the gas cylinder (the regulator must provide a gas flow of at least 1.5 liters per minute).
4. Depress the regulator button and allow gas to flow for 8 seconds. Press the "Manual" button on the screen (manual test).
5. 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 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.* 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 with this Quality Assurance Plan, which together with the operation instructions provided with the **Mercury**, 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, 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 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 Mercury. The Mercury 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 Mercury Calibration Manual as set forth in the Mercury 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 Mercury.

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
Touch Screen is dimly lit or slow to respond.	Power supply to the unit is completely exhausted.	Change batteries.
Mercury does not display “Please Blow” when a standard or screening test is chosen.	Instrument malfunction.	Contact PAS Systems International, Inc. at 800-660-7643.
Mercury activates a different Icon than what stylus pen touches	Touch-screen needs calibration.	Follow instructions on page 12 to recalibrate the touch-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 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:	14º to 122º F (-10º to +50ºC)
Storage Conditions:	-13º to 158º F (-25º to +70º 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-check assures unit is operational upon power up.
Power Supply	4 AA batteries.
Battery Life:	Not less than 500 tests
Memory:	16,000 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	Computer interface connection.

Safety, Maintenance, & Warranty

Safety

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

Maintenance

Repairs of the Mercury may only be performed by PAS Systems International, Inc. or an authorized service technician. Only original Mercury 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 Mercury to be free of defects in material and workmanship as specified in the warranty. For a complete warranty statement, see www.pasintl.com.

DATIA Member US DOT Approved CE Approved

Alcovisor® Mercury

Law Enforcement

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