
	Breath Alcohol Technical Manual	Approval Date: 07/03/2019
	Document Number: 5122	Approved By: Michael Stypa, Kim Murga, Cassandra Robertson, Darby Lanz
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Breath Alcohol Program Technical Manual

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LVMPD FORENSIC LABORATORY TECHNICAL PROCEDURES BREATH ALCOHOL

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Note: Hyperlinks were accurate at the time of manual publication.

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LVMPD FORENSIC LABORATORY TECHNICAL PROCEDURES BREATH ALCOHOL

1.0 Title: **BREATH ALCOHOL TESTING**

1.1 Purpose

The purpose of this manual is to provide the Forensic Analyst of Alcohol (FAA) with useful procedures and references for the performance of assigned duties. This manual is not designed to be an all-inclusive collection of every possible procedure or variation of a procedure to be used in the field of forensic breath alcohol testing. It is, instead, a presentation of methods which have been found to be workable by practicing FAAs.

It is not the purpose of this manual to create policy. It is expected that deviations in methodology may occur at the discretion of the individual FAA. Breath alcohol testing is thoroughly regulated by the Nevada Revised Statutes (NRS) and Nevada Administrative Code (NAC) overseen by Department of Public Safety's Committee on Testing for Intoxication (<http://ots.nv.gov/Programs/NCOTT/TestingForIntoxication/>). These regulations and guidelines must be followed to achieve legally defensible breath alcohol test results. With this in mind, at no time should individual analyst deviations be allowed to conflict with the regulations contained in the NRS and/or the NAC.

1.2 Nevada Revised Statutes and Nevada Administrative Codes

Nevada Revised Statutes (NRS 484C) and Nevada Administrative Code (NAC 484C) are found at <https://www.leg.state.nv.us> with respect to Breath Alcohol Testing.

1.3 FAA Requirements

FAA requirements are statutorily regulated in:


NAC 484C.020

NAC 484C.030

NRS 484C.620

1.4 Validation

New instrument models and updates to instrument software will be subject to a validation procedure before evidential use (see NRS 484C.610 and NAC 484C.090). New instruments on the Committee on Testing for Intoxication Approved Devices List received into the lab will be subject to a performance check and calibration prior to evidential use. Instrument software updates will be validated on one instrument, with a performance check and simulated breath test performed on each instrument updated. The results of all validations and performance checks will be kept on file.

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1.5 Computer Software

The Breath Alcohol program utilizes several software programs to organize and store the calibration and maintenance information, instrument testing data and operator certification information.

LIMS – Laboratory Information Management System

This software is utilized for Breath Alcohol as storage location for information regarding chemicals and reagents, as well as tracking of Quality Control checks and documentation (refrigerators, thermometers, etc.). The LIMS also houses the records for subpoenas, testimony and teaching.

BrAD – Breath Alcohol Database

This is the software used to store subject test results that occurred on the Intoxilyzer 8000 instruments from 2013 through December 31, 2016.

This software also houses:

1. Inventory, calibration dates and documentation for the Intoxilyzer 8000s.
2. Maintenance records for the Evidential Breath Testing (EBT) instruments
3. Inventory list for 12V500 simulators
4. Records for compressed gas tanks (calibrators and standards)
5. Records for aqueous solutions (calibrators and standards)

Microsoft Access

There are two historical databases for Breath Alcohol in Microsoft Access. These databases must be maintained according to destruction guidelines.


1. Officer Certification Database
2. Breath Database
 - a. Historical database of subject test results from the previous Intoxilyzers (Model 5000-66 and EN series).

COBRA V5 – Computer Online Breath Archive Version 5

1. Used to connect to instruments (both directly and remotely) to download data.
2. Stores subject breath test results (starting January 1, 2017).
3. Allows for reprints of subject test results.
4. Stores operator certification data.
5. Other capabilities as needed.


1.6 Instrument Printouts and Data

When performing troubleshooting, calibrations, or testing on an instrument, printouts can be obtained either from the internal printer on the instrument, or from an external printer attached to the instrument. All procedures performed in the field will produce a printout from the internal printer. An external printer may be used during in-house testing. In the event a printout on an external printer

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requires two pages, the analyst's discretion will be used to determine if retention of the second page is necessary. Any printout or page with test, calibration, or subject data must be retained. Printouts will be signed with the analyst's identification (initials, personnel number, or signature) and date.

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LVMPD FORENSIC LABORATORY TECHNICAL PROCEDURES BREATH ALCOHOL

2.0 Title: **CALIBRATION PROCEDURES FOR EVIDENTIARY BREATH INSTRUMENTS**

2.1 Purpose

The purpose of this procedure is to verify the calibration of the instrument with known concentrations of ethanol, and ensure that the instrument is responding properly.

2.2 Principle

Per NAC 484C.120, each evidential breath testing instrument must be calibrated at least once every 90 days. The calibration must consist of an appropriate response to no less than 3 levels of alcohol, within a range of 0.00 to 0.40 g/210L of breath.

All maintenance and calibration information must be entered into a DUI Logbook (NAC 484C.140), and maintained in a laboratory record (NAC 484C.150).

2.3 Procedures

2.3.1 Calibration Procedure


Calibrations must be performed at least once every 90 days or less for each instrument in service.

- Utilize three or more calibrator solutions to check the readings of the instrument, three times each, through the calibration port.
 - Examples of approximate values:
 - 0.04 g/210L
 - 0.08 g/210L
 - 0.20 g/210L
 - 0.30 g/210L
- Document/record calibration and responses in the instrument's DUI Logbook.
- Record the calibration on the 90 Day Calibration Checklist (Form 11314, located in Qualtrax).

2.3.2 Performance Checks Procedure

Additional performance checks should also be completed at the time of the calibration:

- Print diagnostics and check DVM values.
- Run reference standard, or other gas tank, once, to verify that the regulator is in working order.

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- Check and note the lot number, expiration date, and PSI of the attached gas standard.
- Simulate a breath test to ensure the instrument responds correctly to the following:
 - Instrument automatically samples standard test.
 - First Subject Sample: blow an aqueous solution, with a known concentration, through the breath tube.
 - Second Subject Sample: blow an alcohol free air sample through the breath tube.
 - Refuse the third sample.
- Interferent (acetone) detection (check at least once per calendar year). Use a breath alcohol simulator containing an aqueous solution prepared to simulate approximately 0.10 g/210L (section 3.3.1) with approximately 200 µL of acetone added, through the calibration port, three times.
- Record the results of the simulated breath test and interferent detection in the DUI logbook, and complete the 90 Day Calibration Checklist.

2.4 Interpretation of Results


2.4.1 Calibration Results

- The three instrument results must agree within $\pm 10\%$ or 0.005 (whichever is greater) of known concentrations and all be within 0.003 g/210L of each other.

2.4.2 Performance Checks Results

- Pass and print diagnostics
- Regulator check – should allow for gas to be sampled.
- DVM values
 - Channels 3 and 9: values fall between 9000 and 14000
 - S: Span (noise): ≤ 9
 - C: Sample Cell Temperature: $47^{\circ}\text{C} \pm 0.2^{\circ}\text{C}$
 - B: Breath Hose Temperature: $45^{\circ}\text{C} + 2^{\circ}\text{C}$ or -9°C
- Gas Standard
 - Note PSI and expiration date. Replace tank if necessary.
- Simulated breath test
 - Standard test must be within $\pm 10\%$ of known concentration.
 - Solution blown through the breath tube must be within $\pm 10\%$ of known concentration.
 - Alcohol free air must be negative for volatiles.
 - Instrument must accept a refusal for the 3rd subject test.
- Interferent Detection
 - Instrument must detect acetone as an interferent.


If these criteria are not met, attempt to determine the reason using previous experience, service manual or other procedures or information

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gathered from other sources and/or training. If a calibration result is outside of the accepted range, that level may be repeated. An unacceptable concentration can only be repeated twice (a total of three attempts). In situations where accurate results cannot be obtained, the instrument must be removed from service until repairs are made and calibration results are acceptable.

2.5 Reporting and Record Keeping

- Record all maintenance and calibration results in the maintenance record in BrAD.
 - If any portion of the calibration was repeated or failed:
 - the failed/repeated reason must be noted on the printout and kept with other results
 - document repeat in the maintenance record (example: "0.04 repeated – see scans")
- If the calibration and performance checks were completed satisfactorily, prepare a Report of Calibration.
 - Reports of Calibration will be technically and administratively reviewed prior to distribution. Reviews will be documented and paperwork uploaded to the service ticket object repository in BrAD.
- Maintenance records (including scans of printouts from Intoxilyzer) and log sheets will be released only by court order or with the submission of the Request for Discovery of Laboratory Records Form (document number 44095).
- The Report of Calibration (along with a related Report of Gas Standard (see section 4.4 Reporting and Record Keeping)) will be distributed to appropriate parties by laboratory staff.
 - Original Reports of Calibration are maintained by the Nevada Department of Public Safety – DMV Hearings office.
- Printouts, maintenance records and any notes generated from calibrations and instrument maintenance will be kept on site, or in a digital format, for a minimum of seven years.
 - After seven years, these records may be destroyed.

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3.0 Title: **PREPARATION and/or CERTIFICATION OF AQUEOUS SOLUTIONS**

3.1 Purpose

This procedure describes the methodology employed in this laboratory for the preparation and certification of ethanol/water solutions.

3.2 Principle

NAC 484C.070 states that a Preliminary Breath Testing (PBT) device must be checked monthly using a certified alcohol standard. The certification process of the ethanol standard is discussed in NRS 484C.190 and NRS 488.510, stating that a FAA will examine the solution or gas, and prepare a declaration identifying its concentration.

Ethanol / water solutions of varying ethanol concentrations are prepared and analyzed in the Forensic Laboratory utilizing headspace/gas chromatography techniques to determine/verify the ethanol concentration. One of these solutions is a certified standard used in the monthly accuracy check for PBT's. The remaining solutions (Calibrator Solutions) are used to calibrate a preliminary device (see Technical Procedure 8.0 - [Monthly Check and Annual Calibration Procedures for Preliminary Breath Test \(PBT\) Devices](#)). These solutions can also be used as known values to simulate a breath test during the performance checks portion following an in-field calibration (2.0 Calibration Procedures for Evidentiary Breath Instruments), or used as the base for the interferent check (2.0 Calibration Procedures for Evidentiary Breath Instruments). The following describes the preparation and/or certification of those solutions.


3.3 Reagent Preparation Procedures

Note: The lot number of the 200 proof ethanol used to make the approximately 0.10 g/210L Certified Aqueous Solution, must be different than the lot number used to make the PBT Calibrator Solutions.

The formula for solution preparation is as follows:

$$EtOH(g) \times \%EtOH = Desired\ Conc. \left(\frac{g}{210} L\ breath \right) \times 1.21 \times Total\ Vol. (L) \times 10$$

- Desired Conc. = Final concentration of Ethanol (in g/210L of breath)
- 1.21 = Partition coefficient for Ethanol at 34.0°C

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- Total Vol. = total amount of solution prepared (in Liters)
- 10 = conversion of volume in 100mL to Liters
- % EtOH = percent concentration of Ethanol used to prepare solution (200 proof Ethanol)
- EtOH = Ethanol in grams needed to prepare the desired concentration at the desired volume

Any solution prepared will be documented on a Reagent Prep Log form (Form 10676, located in Qualtrax) in the Resource Manager in LIMS. The log will contain the following:

- Identity of the reagent, including approximate concentration
- Internal lot number (the six numbers following the (T) is the date the solution was prepared)
- Initials and P# of person preparing reagent
- Expiration date of the reagent
- Ingredients and their lot numbers and expiration dates
- Item number of measuring device, if applicable
- Storage requirements
- Quality control checks performed and results
- Approval if necessary

3.3.1 Aqueous Solutions


Certified PBT Standard

This solution is used for PBT monthly checks. However, it will also be used to create the solution for the once yearly Acetone check (See 2.0 Calibration Procedures for Evidentiary Breath Instruments).

Preparation of the approximate 0.10 g/210L Certified PBT Breath Alcohol Aqueous Standard:

Note: The amounts below are an example. A different volume of solution can be made using the formula above.

- 1) Weigh 60.5 g of 200 proof ethanol in a container using an analytical balance.
- 2) Pour ethanol into a 5.0 liter volumetric flask and bring to volume with water.
- 3) Pour 5.0 liter solution into a 50 liter carboy and continue to dilute to 50 liters total.
- 4) Mix solution.
- 5) Remove samples from the top and bottom of carboy and analyze each sample 5 times per FAA using the LVMPD Forensic Laboratory Toxicology Technical Manual Section 5.0 Ethanol Analysis by Dual Column GC Headspace procedure. Determine the breath alcohol concentration of the solution from data acquired by using a multiplier factor of 0.8264. Report results on the Aqueous Standard Template form (form 8422, located in Qualtrax).

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- a. Note: if the Breath Program consists of only one FAA, then each sample will be analyzed 10 times.
- 6) Bottle solution in 500mL Nalgene bottles, cap, seal and label bottle. Labels should include the identity of the preparation, breath alcohol certified value, lot number, preparer initials, safety/hazard information and expiration date.
 - a. Expiration date is one year from preparation, or the expiration date of the earliest expiring component – whichever is sooner.
- 7) Store bottles in laboratory refrigerator and distribute to off-site locations as needed.
- 8) Follow interpretation guidelines set out below and Prepare a Report of Aqueous Standard (see Reporting and Record Keeping).

Certified Standard use as an Interferent Check:

- a. Pour one bottle of Certified PBT Standard into a simulator.
- b. Add 200uL of Acetone
- c. Label Simulator as Standard (TYMMDD-XX) ⊕ Acetone, with the Acetone lot number, and expiration date.
- d. Solution will be used for no more than 20 interferent checks (each check consisting of running the solution three times through the calibration port).
 - i. A hash mark system will be used to track this on the simulator.


PBT Calibrators

These solutions are for PBT yearly calibrations, however, the ~0.08 g/210L solution can be used for the simulated breath test during the Performance Check portion of an EBT calibration (See 2.0 Calibration Procedures for Evidentiary Breath Instruments).

Approximate 0.05 g/210L PBT Breath Alcohol Calibrator:

Note: The amounts below are examples, but different volumes and concentrations of solution can be made using the formula above.

- 1) Weigh 4.84 g of 200 proof ethanol using an analytical balance.
- 2) Pour ethanol into a 2.0 liter volumetric flask and bring to volume with water.
- 3) Pour 2.0 liter solution into an 8.0 liter carboy and dilute to 8.0L total.
- 4) Mix solution.
- 5) Remove sample from carboy and analyze it 5 times per FAA using the LVMPD Forensic Laboratory Toxicology Technical Manual Section 5.0 Ethanol Analysis by Dual Column GC Headspace procedure. Determine the breath alcohol concentrations of the solution from data acquired by using a multiplier factor of 0.8264. Report results on the Calibrator Summary Template form (form 8423, located in Qualtrax).

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- a. Note: if the Breath Program consists of only one FAA, then each solution will be analyzed 10 times.
- 6) Bottle solutions in 500mL Nalgene bottles, cap, seal and label bottles. Labels should include the identity of the preparation, breath alcohol concentration, lot number, preparer initials and expiration date.
 - a. Expiration date is one year from preparation, or the expiration date of the earliest expiring component – whichever is sooner.
- 7) Store bottles in refrigerator, use and distribute as needed for calibration of PBTs.


Approximate 0.08 g/210L PBT Breath Alcohol Calibrator:

Note: The amounts below are examples, but different volumes and concentrations of solution can be made using the formula above.

- 1) Weigh 38.72 g of 200 proof ethanol using an analytical balance.
- 2) Pour ethanol into a 5.0 liter volumetric flask and bring to volume with water.
- 3) Pour 5.0 liter solution into a 40 liter carboy and dilute to 40 liters total.
- 4) Mix solution.
- 5) Remove samples from the top and bottom of the carboy and analyze each sample 5 times per FAA using the LVMPD Forensic Laboratory Toxicology Technical Manual Section 5.0 Ethanol Analysis by Dual Column GC Headspace Procedure. Determine the breath alcohol concentrations of the solution from data acquired by using a multiplier factor of 0.8264. Report results on the Calibrator Summary Template form(form 8423, located in Qualtrax).
 - a. Note: if the Breath Program consists of only one FAA, then each solution will be analyzed 10 times.
- 6) Bottle solutions in 500mL Nalgene bottles, cap, seal and label bottles. Labels should include the identity of the preparation, breath alcohol concentration, lot number, preparer initials and expiration date.
 - a. Expiration date is one year from preparation, or the expiration date of the earliest expiring component – whichever is sooner.
- 7) Store bottles in refrigerator, use and distribute as needed for calibration of PBTs.

Using 0.08 PBT Calibrator for EBT Performance Checks:

- a. Pour one bottle of PBT Calibrator into a simulator.
- b. Label simulator with the PBT Standard information (lot #, concentration, expiration date, etc.) and acceptable +/- 10% range
- c. Solution will be used for no more than 20 performance checks.
 - a. A hash mark system will be used to track this on the simulator.

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3.4 Interpretation of Results

Results of headspace / gas chromatography must meet the criteria outlined in the LVMPD Forensic Laboratory Toxicology Technical Manual Section 5.0 Ethanol Analysis by Dual Column GC Headspace Procedure. Each solution is analyzed, and each replicate must be within ± 0.003 or 3% of the target value, whichever is greater. Outside of that range is considered an outlier and may be discarded. Dual column analysis provides two values for each sample injection, therefore, only two outliers are allowed per all compiled data, provided that those two values are from the same sample injection. Solutions with more than two outliers will be re-analyzed. If reanalysis does not yield acceptable results, a new solution will be prepared. The mean is calculated. The fourth digit is truncated.

3.6 Reporting and Record Keeping

A Report of Aqueous Standard is prepared to document the certification of the aqueous solution.

- The Data and Report will be technically and administratively reviewed.
 - Documentation of the review will be included with scans in appropriate object repository in BrAD.
- Reports of Standards are distributed to appropriate parties by the laboratory clerical staff.
- Original reports are maintained by the Nevada Department of Public Safety – DMV Hearings office.
- All reports and instrument data generated in the preparation and/or certification of an aqueous solution will be kept on site, or digitally scanned, for a minimum of seven years.
 - After seven years, these records may be destroyed.

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4.0 Title: **VERIFICATION and/or CERTIFICATION OF NITROGEN / ETHANOL DRY GAS SOLUTIONS**

4.1 Purpose

This procedure describes the methodology employed in this laboratory for the verification and certification process of Nitrogen/Ethanol Dry Gas solutions.

4.2 Principle

Per NAC 484C.120, evidential breath testing instruments must be calibrated at no less than three ethanol levels, with concentrations between 0.00 and 0.40 g/210L of breath at least every 90 days.

NAC 484C.130 also requires that a certified ethanol standard of either an aqueous solution or gas be tested prior to each subject breath test sequence to ensure accuracy of the breath testing instrument. The standard must be between 0.05 and 0.20 g/210L of breath. The certification process of the ethanol standard is discussed in NRS 484C.190 and NRS 488.510, stating that a FAA will examine the solution or gas, and prepare a declaration identifying its concentration.

4.3 Certification/Verification of the Ethanol Gases

Two types of dry gases are used, Reference Standards and Calibrators.


Dry gases are purchased from an external manufacturer, and each lot comes with a Certificate of Analysis. Breath alcohol concentrations are expressed in grams of ethanol per 210 liters of breath (g/210L). If a Certificate of Analysis is expressed in BrAC (**B**reath **A**lcohol **C**oncentration), this is assumed to be g/210L. If the concentration is expressed in parts per million (ppm), the breath alcohol concentration can be determined by the following:

$$ppm = concentration \times 2606$$

The full equation can be found in the following reference:

L.D. Silverman, K. Wong and S. Miller. Confirmation of Ethanol Compressed Gas Standard Concentrations by a NIST-Traceable, Absolute Chemical Method and Comparison with Wet Breath Alcohol Simulators. *Journal of Analytical Toxicology*. 21: 369-372 (1997).

For each lot number of ethanol dry gas received, the concentration of ethanol in the dry gas is verified with an evidentiary breath testing (EBT) device using infrared technology. This device will be dedicated for internal use only, which

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includes the verification of the gas concentrations, and would need to meet evidentiary calibration requirements prior to analysis.

Reference Standard

One tank from each lot of dry gas will be sampled a minimum of five times each by all FAAs with relevant duties. Note: If the program consists of only one FAA, the gas will be sampled a minimum of ten times.

- Each replicate must be within +/- 3% or 0.003, whichever is greater, of the expected value and within 0.003 of each other.
 - Any value outside of the range is considered an outlier and may be discarded.
 - Only one outlier is allowed per all compiled data.
- The mean of the experimentally verified concentration must agree within $\pm 3.0\%$ or 0.003, whichever is greater, of the manufacturer's certified concentration.
- Data will be tracked using a Dry Gas Concentration Verification form (form 8424, located in Qualtrax).
- A Report of Gas Standard certifying the manufacturer's concentration will be created for the lot numbers being used as Reference Standards.
- The Data and Report will be technically and administratively reviewed.
 - Documentation of the review will be included with scans in appropriate object repository in BrAD.

Calibrators


Quality Control Check: One tank from each lot number will be sampled a minimum of five times by any one FAA.

- Each replicate must be within $\pm 10\%$ or 0.005, whichever is greater, of the expected value, and within 0.003 of each other.
 - Any value outside of the range is considered an outlier and may be discarded.
 - Only one outlier is allowed per lot number.
 - The mean of the experimentally verified concentration must agree within $\pm 10.0\%$ or 0.005, whichever is greater, of the manufacturer's certified concentration.
 - Record pass/fail results on paper with printout from Intoxilyzer.
 - Results will be technically reviewed. Reviewer must indicate agreement with pass/fail results.
 - Technical/Administrative Review form not needed in a QC check.
 - Scan results in the object repository for the lot in BrAD.

4.4 Reporting and Record Keeping


A Report of Gas Standard is prepared to document the certification of the gas standard.

- Reports of Standards are distributed to appropriate parties by the laboratory clerical staff.

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- Original reports are maintained by the Nevada Department of Public Safety - DMV Hearings office.
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 - After seven years, these records may be destroyed.

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5.0 Title: **QUALITY CONTROL CHECK OF PURCHASED AQUEOUS SOLUTIONS**

5.1 Purpose

This procedure describes the methodology employed in this laboratory for the process of ensuring the quality and concentration of Ethanol/Water solutions purchased from an external source.

5.2 Principle

NIST traceable Ethanol/Water solutions are purchased from an external source and come with a Certificate of Analysis. Before they can be used in an adjustment procedure (see chapter 6: Calibration Adjustment Procedure for Evidential Breath Alcohol Instrumentation), a Quality Control check must be performed.


5.3 Procedure

One bottle in each lot will be analyzed 5 times using the LVMPD Forensic Laboratory Toxicology Technical Manual Section 5.0 Ethanol Analysis by Dual Column GC Headspace Procedure.

- Determine the breath alcohol concentrations of the solution from data acquired by using a multiplier factor of 0.8264.
- Record pass/fail results on Summary Report from GCHS.
- Results will be technically reviewed. Reviewer must indicate agreement with pass/fail results.
 - Technical/Administrative Review form is not needed in a QC check.
- Scan results into the object repository for the lot in BrAD.
- The quality control check only needs to be performed by one FAA.


5.4 Interpretation of Results

Results of headspace / gas chromatography must meet the criteria outlined in the LVMPD Forensic Laboratory Toxicology Technical Manual Section 5.0 Ethanol Analysis by Dual Column GC Headspace Procedure. Each solution is analyzed, and each replicate must be within ± 0.003 or 3% of the target value, whichever is greater. Outside of that range is considered an outlier and may be discarded. Dual column analysis provides two values for each sample injection, therefore, only two outliers are allowed per all compiled data, provided that those two values are from the same sample injection. Solutions with more than two outliers will be re-analyzed. If reanalysis does not yield acceptable results, a new solution

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must be purchased. The mean is calculated and reported to the fourth decimal place (standard rules of rounding apply).

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6.0 Title: **CALIBRATION ADJUSTMENT PROCEDURE FOR EVIDENTIAL BREATH ALCOHOL INSTRUMENTATION**

6.1 Purpose

The purpose of this procedure is to outline the process of performing a Calibration Adjustment on an Evidential Breath Alcohol Instrument.

6.2 Principle

If an evidential instrument is not passing 90 Day Calibration requirements (as described in section 2.0 Calibration Procedures for Evidentiary Instruments), performing a Calibration Adjustment is a maintenance option.

Ethanol/Water solutions used for this procedure must meet requirements laid out in this manual, section 5.0 Quality Control Check of Purchased Aqueous Solutions.

6.3 Procedure

Adjustments will be performed on an "as needed" basis.

When possible, a 90 Day Calibration will be performed per this manual, section 2.0 Calibration Procedures for Evidentiary Breath Instruments.


- This could be a Calibration performed in the field before the EBT is removed from service.
- The Calibration may not pass requirements listed in 2.0. If this occurs, you may perform 6.3.1 Adjustment Procedure.

Solutions must be fresh and may not be used for more than 5 adjustment procedures, and cannot be kept in simulators for more than 14 days.

6.3.1 Adjustment Procedure

Use Calibration Adjustment Form (form 11400, located in Qualtrax)

- Materials and Supplies:
 - Digital NIST Thermometer
 - Five wet-bath simulators
 - Label with associated concentration of solution (suggested values below)
 - Label with date solution was put into simulator
 - Water and Ethanol/Water Solutions


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- 0.000 g/210L (Distilled water. This concentration is required, not suggested)
 - 0.020 g/210L
 - 0.080 g/210L
 - 0.200 g/210L
 - 0.300 g/210L
 - Gas Cylinder
 - Current verified gas standard
- Procedure
 - Allow solutions to come to temperature for at least 10 minutes
 - Verify simulator temperature using NIST thermometer
 - Temperatures must agree within 0.20°C
 - Check DVMs
 - Check Atmospheric Pressure
 - Bring Evidential Instrument to Ready Mode
 - Enter menu
 - Perform Tank Sensor Calibration
 - Perform Optical Bench Calibration
 - Number of solutions = 5
 - Water + 4 levels of Ethanol
 - Enter certified values
 - Calibrate Gas H2O Adjust
 - Enter certified gas value
 - Perform Internal Test Procedure Calibration
 - Target Value = 0.100

6.3.2 Interpretation of Results

Use Calibration Adjustment Form (form 11400, located in Qualtrax)

- Auto Calibration
 - Max Power Res must be greater than the Auto Range Res Value
- Solution Stats Quadratic Fit
 - Chan 1
 - Actual to Fit: <0.0003 difference
 - Residual: ≥ 0.002
 - Chan 2
 - Actual to Fit: <0.0003 difference
 - Residual: ≥ 0.002
 - Chan 1 compared to Chan 2
 - Fit values within +/- 0.003 for each level
- Dry Gas H2O Results
 - Channel 1
 - Average Result + 3um H2O = total
 - 3um H2O must be <1500

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- Channel 2
 - Average Result + 9um H2O = total
 - 9um H2O must be <1500
- Compare Channel 1 total to Channel 2 total.
 - Must be ≤ 5 counts apart

6.3.3 Post Calibration

Use Calibration Adjustment Form (form 11400, located in Qualtrax)


- Check DVMS
- Check Internal Test Procedure (ITP)

Evidential breath instrument must pass a 90 Day Calibration (see section 2.0 Calibration Procedures for Evidentiary Breath Instruments) before being put into service in the field.

6.3.4 Record Keeping

- Record adjustment in the maintenance record in BrAD
 - If adjustment failed, note reason, and repeat.
 - Adjustments may be repeated once, but if it fails again, contact manufacturer.
 - Scans of the Calibration Adjustment Form and the printouts will be uploaded in the Object Repository for the corresponding maintenance record entry.

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LVMPD FORENSIC LABORATORY TECHNICAL PROCEDURES BREATH ALCOHOL

7.0 Title: **CERTIFICATION / RECERTIFICATION OF EVIDENTIARY BREATH TEST OPERATORS**

7.1 Purpose

This procedure is intended to outline the certification and re-certification process of evidentiary breath test operators.

7.2 Principle

Operators of evidential breath testing instruments must be certified to operate each instrument by successfully completing an Initial Certification course on the operation of instruments for testing a person's breath to determine the concentration of alcohol.

Per NAC 484C.110, a person holding a current certification, or a certification which has been expired for less than six months, may take a Recertification class.


When available, those with current certification may take an "Additional Instrument" course.

Per NAC 484C.100 and 484C.110, the content of all courses must have been approved by the Committee on Testing for Intoxication. All certifications are valid for a period of three years. Courses for certification / re-certification must be taught by a FAA and must include instruction on and a determination of the applicant's proficiency in the operation of the specific instruments for which the certification is granted.

7.3 Equipment

- Breath instruments
- Gas standards and harnesses
- Paper source
- Mouthpieces
- Certification Application (Reference A)
- Class Roster (Reference B)
- Instructor Evaluation (Reference C)
- Class hand-outs

7.4 Procedure

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Classes are scheduled by a FAA as needed. Notification of agencies is made by e-mail. Class includes a lecture portion which consists of a discussion of alcohols in general, possible interferences, process by which ethanol is absorbed, distributed and eliminated, the theory of breath testing, relevant Nevada Revised Statutes and Nevada Administrative Codes, and the operation of the breath instrument. There is also a written exam and practical portion. The practical portion of the class is devoted to the students demonstrating proficiency in the operation of the breath instrument.

7.5 Reporting and Record Keeping

Certification applications (Reference A), rosters (Reference B) and instructor evaluations (Reference C) are processed by the Forensic Laboratory staff. Grading the examination will take place in the classroom. Certification cards are prepared and sent to the applicants. Original certification applications are maintained by the Nevada Department of Public Safety-DMV Hearings office. A copy of the completed roster is sent to LVMPD Advanced Training Office, along with the originals of all instructor evaluations and tests taken by any LVMPD personnel. All other records generated from certification classes must be maintained on site for a minimum of seven years. After seven years, these records may be destroyed.


7.6 Statutory References

Certification / Re-Certification of evidentiary operators is statutorily regulated in:

- NAC 484C.100
- NAC 484C.110
- NRS 484C.630

Duties of Operators are statutorily regulated in:

- NAC 484C.130
- NAC 484C.140
- NRS 484C.630

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LVMPD FORENSIC LABORATORY TECHNICAL PROCEDURES BREATH ALCOHOL

8.0 Title: **MONTHLY CHECK AND ANNUAL CALIBRATION PROCEDURES FOR PRELIMINARY BREATH TEST (PBT) DEVICES**

8.1 Purpose

The PBT device is a preliminary tool used by law enforcement personnel in the field to establish probable cause for DUI arrests. This procedure is intended to ensure that the PBT device is responding properly to ethanol solutions and an alcohol free sample.

8.2 Principle

Per NAC 484C.070, each PBT device must be calibrated at least once a year by a FAA or the agency to whom the PBT belongs. The calibration must consist of an appropriate response to no less than 3 levels of alcohol, within a range of 0.00 to 0.40 g/210L of breath, and an alcohol free air sample. Annual calibrations can only be done by a FAA or PBT Instructor.

In order for a PBT to be used in the field, monthly checks are required. These consist of a check at one level using a certified alcohol standard. This check can be performed by PBT operators, instructors, or a FAA.

8.3 Procedure

Gas tanks purchased for PBT use only (either calibration or adjustment processes) must come with a certificate of analysis from the manufacturer. This certification is all that is required. An in-house verification is not needed.


Monthly checks must be performed each month.

- Utilize one certified alcohol standard (aqueous or gas) to verify the readings of the device, two times.

Note: If using a gas standard, ensure appropriate altitude correction, if needed. The chart is located on the dry gas tank.

Calibration checks must be performed at least once per year.

- Utilize three breath alcohol calibrator concentrations within the range of 0.00 to 0.40 g/210L to verify the readings of the device, two times each.
- Examples of approximate values:
 - 0.040 g/210L gas
 - 0.050 g/210L aqueous
 - 0.077 g/210L gas

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- 0.080 g/210L aqueous
- 0.100 g/210L aqueous or gas
- Provide an alcohol free air sample.

8.4 Interpretation of Results


- The two results must be within $\pm 10\%$ of known concentrations and within ± 0.005 g/210L of each other.
- Alcohol free air must be negative (<0.003 g/210L) for volatiles.

If these criteria are not met, PBTs are adjusted using the service manual or other procedures or information gathered from other sources and/or training. In situations where appropriate results cannot be obtained, the instrument must be removed from service until repairs are made and calibration results are acceptable.

8.5 Reporting and Record Keeping

A monthly or annual form (such as Reference D and E) is retained by the owner of the PBT and must include the following (* as required by NAC 484C.080):

- whether it is a monthly or annual calibration*
- model
- serial number
- ownership
- date and time of calibration*
- standard lot numbers
- the two test results*
- the alcohol free air result*
- identity of the person who performed the test*
- any repairs or maintenance*

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9.0 Title: TRAINING PROCEDURES FOR PRELIMINARY BREATH TEST (PBT) OPERATORS AND INSTRUCTORS

9.1 Purpose

This procedure is intended to outline the training process of PBT operators and instructors.

9.2 Principle

Per NAC 484C.060, operators of PBT devices must be trained to operate each device by successfully completing a course which meets the manufacturer's requirements of instruction in the proper operation of the PBT device and be approved by the Committee on Testing for Intoxication. A person's proficiency is only good for the particular PBT model training was received on. The receipt of other models requires specific training on those models.

PBT Operator classes are taught by a FAA, a manufacturer's representative, or a person approved by a FAA (i.e., PBT Instructor) (NAC 484C.060).

The yearly calibration required by NAC 484C.070 must be done by either a FAA or a representative of the agency that owns the PBT. These procedures are covered in the PBT Instructor classes. PBT Instructor classes are taught by a FAA.


9.3 Equipment and Reagents

- PBT devices
- Mouthpieces
- Wet-bath simulators and/or gas standards
- Manufacturer Instruction Manual
- Class Roster (Reference B)
- Class hand-outs

9.4 Procedure

Classes are scheduled as needed.

- The PBT operator class may include:
 - lecture portion
 - principals/theories of breath testing
 - regulations
 - fuel-cell technology and its limitations
 - the manufacturer operational requirements
 - practical portion

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- how to operate the device, perform monthly checks and complete the forms.
- The PBT instructor class must meet the requirements of the PBT operator class listed above, and in addition include:
 - how to calibrate a PBT when it does not respond accurately to a known ethanol value
 - how to perform the annual calibration checks
 - training by either a FAA or manufacturer representative to instruct others on how to operate a particular device

Note: It is highly recommended that the officer receiving the training for PBT Instructor be a certified operator of the current evidential instrument.

9.5 Reporting and Record Keeping

All records generated from training classes must be maintained on-site for a minimum of seven years. After seven years, these records may be destroyed.

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LVMPD FORENSIC LABORATORY TECHNICAL PROCEDURES BREATH ALCOHOL

10.0 Title: **COMPRESSED GAS SAFETY**

10.0 Compressed Gases


The LVMPD Forensic Laboratory Safety Manual outlines the safety requirements that are to be followed regarding compressed gases.

The Breath Alcohol Program has compressed Ethanol/Nitrogen tanks that contain approximately 34 or 105 liters and hold less than 1200 psi. The tanks are used as gas standards and calibrators for EBT, as well as for PBT checks and adjustments. These tanks do not follow the same guidelines as other tanks within the LVMPD Forensic Laboratory.


The following are the Safety Guidelines for the compressed gases utilized in the Breath Alcohol Program.

10.1 General Cylinder Handling Rules - Exceptions

- Check all cylinders upon receipt. Verify all labels, shipping paperwork and certificates of analysis.
 - Certificates of Analysis for EBT gas standards are stored in BrAD as part of the verification process.
- Do not place cylinders where they can be accidentally knocked over.
- Do not store cylinders near highly flammable solvents, combustible waste material, unprotected electrical connections, gas flames or other sources of ignition.
- Valves and regulators should be visually inspected for damage each time a cylinder is changed.
- Never tamper with the safety relief devices in valves or cylinders.
- Never attempt to repair or alter cylinders, valves or safety relief devices.
- Cylinders must be handled with extreme caution at all times to avoid dropping them or damaging the valves.

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- Never attempt to use a cylinder without the correct regulator. The threads and fittings on regulators are designed to fit only compatible tanks.
- Do not force connections that do not fit.
- When a cylinder is empty the tank will be labeled “Empty.”
 - Empty tanks will be vented, and the valve will be punctured per manufacturer’s instruction (using valve removal tool) before discarding.
- All cylinders must be labeled to indicate the contents. Labels must never be removed. If cylinder labeling is unclear, it should be marked “Contents Unknown” and returned to the supplier.
 - Exception: Proficiency tests utilizing gas cylinders will come labeled without the concentration of ethanol. All other safety information is present. After completion of the testing, labels with complete information are sent to amend the tanks and allow for lab use.
- Ensure that cylinders have proper labeling and are free from corrosion, bulges, cracks, dents, cuts, gouges, etc. before putting into service.
- Compressed gas cylinders must not be shipped through the mail by the LVMPD Forensic Laboratory.
- Cylinders past their expiration date must not be used for Evidential Breath Testing.
 - Expired tanks may be used for training purposes only, and must be labeled as such.

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11.0 Title: QUALITY CONTROL PLAN


Quality Control Plan

	Instrument	Frequency	Criteria	Corrective Action
Evidentiary Instrumentation	CMI, Inc. Intoxilyzer 8000s Instrument identifications and certification schedules are listed in BrAD and maintained by the Breath Alcohol Program.	Internal: Every 90 days or less per NAC 484C.120 (when in service).	Internal: Mandated by NAC 484C.120 specified in Breath Alcohol Technical Manual 2.0 Calibration Procedures for Evidentiary Breath Instruments.	If criteria fails, instrument is removed from service until repairs are made and criteria passes.

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Refrigerator	<p>Breath # 2</p> <p>Whirlpool Model: WRR56X18FW01 Serial: U72603971</p>	<p>Internal: Once every two weeks</p> <p>External: N/A</p>	<p>2 °C – 8 °C</p> <p>Use “Refrigerator/Freezer Temperature Log” Form found in Qualtrax</p> <p>Forms will be completed electronically in the Resource Manager in LIMS.</p>	<p>If refrigerator does not meet criteria:</p> <ol style="list-style-type: none"> 1. Check again within 2 hours. 2. Change thermometer battery and check temperature within 2 hours. 3. Check thermometer against a second NIST thermometer. Replace if needed, then go directly to step 5. If thermometer is accurate, proceed through remaining steps. 4. Adjust thermostat. Note the adjustment that was done. 5. Monitor the temperature within 24 and 48 hours to ensure stability. 6. If the above steps do not correct the problem, tag out of use and advise lab manager or supervisor (prepare a Corrective Action Report, if needed). <p>If temperature deviates more than 3 degrees outside of the acceptable range after completing step 4, move contents to an operable unit. If refrigerator/freezer appears to be malfunctioning, immediately move contents to an operable unit.</p>
NIST Thermometers	<p>VWR Model No: 61161-364 SN: 180056725</p> <p>(Breath # 2 Fridge)</p>	<p>External: N/A</p> <p>NIST Thermometers – Replace every two years or sooner per manufacturer’s guidelines.</p>	N/A	N/A

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	<p>Guth Model 4300 Serial # 302166 Digital Thermometer</p>	<p>External: Every two years</p>	<p>Must meet external vendor criteria for NIST traceability</p>	<p>No internal Calibration or maintenance is performed.</p> <p>If the thermometer appears to be damaged or exhibits any characteristics that may affect its accuracy:</p> <ol style="list-style-type: none"> 1. Tag out of use. 2. Consult Forensic Lab Safety Liaison for proper disposal procedures. 3. Replace.
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12.0 Title: APPENDIX: ABBREVIATIONS KEY

Abbreviations Key

⊕ - positive
 ∅ - negative
 + - plus
 % - Percent or Percentage
 ABT – Aborted Test
 AMB – Ambient Fail
 AQ STD – Aqueous Standard
 BrAC – Breath Alcohol Concentration
 BrAD – **B**reath **A**lcohol **D**atabase
 CAL – calibration
 Cert – Certification Number
 Cit – Citation Number
 CofA – Certificate of Analysis
 CMI – CMI, Inc. (manufacturer of Intoxilyzer EBTs and some PBTs)
 COBRA – **C**omputer **O**nline **B**reath **A**rchive
 Con't – continued
 DEF – Deficient Sample
 DOB – Date of Birth
 DSP – Digital Signal Processor
 DUI – Driving Under the Influence
 DVM – Digital Volt Measurement
 DL / Driv Lic – Driver's License
 EBT – Evidentiary Breath Test or Evidentiary Breath Testing device
 EEPROM – Electronically Erasable Programmable Read Only Memory
 EtOH – Ethanol
 FAA – Forensic Analyst of Alcohol
 IPS – Improper Sample
 INT – Interferent Detected
 Intox – Intoxilyzer
 ITP – Internal Test Procedure
 LIMS – Laboratory Information Management System

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Loc – Arrest Location

Maint – Maintenance

N/A – Not Applicable

NAC – Nevada Administrative Code

NIST – National Institute of Standards and Technology

NRS – Nevada Revised Statutes

NSG – No Sample Given

Obsr. – Observation

Oper – Operator

PBT – Preliminary Breath Test or Preliminary Breath Testing device

ppm – parts per million

PSI – pounds per square inch / pressure remaining in a pressurized tank

PUR – Purge fail

RAM – Random Access Memory

Rec'd – received

REF – Subject Test Refused

RFI – Radio Frequency Interference

Rel Std Dev – Relative Standard Deviation

RGE – Instrument Range Exceeded

RTC – Real Time Clock

SIM – simulator

SN, S/N, – Serial Number

SOL – solution

STD – Standard

Std Dev – Standard Deviation

Sub – Subject

Temp - Temperature

XXX – Invalid Sample

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