Wilkinson, Anita JAG:EX

From: Melvin, Stephanie JAG:EX
Sent: Monday, July 23, 2012 5:30 PM
To: Burchnall, Shelly K JAG:EX; 'Brian Image'
Cc: 'heather.dinn@rcmp-grc.gc.ca'; 'Denis Boucher'; 'Kevin Jones'
Subject: RE: Thank you

A huge thanks from me too Brian. That's exceptional work.

Many thanks

Stephanie

Stephanie Melvin, BA, LLB
Deputy Superintendent
Office of the Superintendent of Motor Vehicles
Ministry of Justice
4A - 940 Blanshard Street
Victoria BC V8W 9J2
250-953-3818 direct
250-356-8640 Assistant Anita Wilkinson
Website http://www.pssg.gov.bc.ca/osmv/

From: Burchnall, Shelly K JAG:EX
Sent: Thursday, July 19, 2012 8:27 AM
To: 'Brian Image'
Cc: Melvin, Stephanie JAG:EX; 'heather.dinn@rcmp-grc.gc.ca'; 'Denis Boucher'; 'Kevin Jones'
Subject: Thank you

Good Morning Brian,

I apologize for the delay in getting this note to you. I personally want to thank you for the excellent report you provided to OSMV on the use of ASDs in British Columbia. The report is very informative and comprehensive. I appreciate the great work you put into this document.

Best Regards,
Shelly

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Shelly Burchnall, MA
Director, Administrative Justice
Office of the Superintendent of Motor Vehicles
Ministry of Justice

Tel: (250) 356-0601
Fax: (250) 356-5577
~~~~~~~~~~~~~~~~~~~~~~~~~

Wilkinson, Anita JAG:EX

From: Anderson, Kathy E JAG:EX
Sent: Tuesday, July 10, 2012 10:41 AM
To: Burchnall, Shelly K JAG:EX; Esposito, Tony N JAG:EX
Subject: FW: BCACP Report on ASDs Used in BC
Attachments: Report on ASD use in BC.pdf

We'll need to go through this report and pull out what we need to update the Superintendent's Report on ASD's.

I've sent a separate email to Kevin asking if the Certificate will be updated with the Tru-Cal target value. I'm waiting to hear back from him.

Kathy Anderson
Manager, Adjudication and Training
Direct: (250) 356-8068

From: Kevin Jones [mailto:kjones@deltapolice.ca]
Sent: Tuesday, July 10, 2012 10:23 AM
To: Anderson, Kathy E JAG:EX
Cc: 'Brian Image'; 'Bima RIBEIRO'; Smith, Curtis M JAG:EX
Subject: FW: BCACP Report on ASDs Used in BC

Kathy

Attached is the updated Report on ASD use from Brian Image that was completed by himself as a member of the ASD Working Group on behalf of the ASD Working Group.

Sgt Kevin Jones

Chair ASD Working Group

604-595-2126 Office

s.17 Cell

From: Brian Image [mailto:Brian.Image@rcmp-grc.gc.ca]
Sent: Tuesday, July 10, 2012 9:35 AM

To: Kevin Jones
Cc: Heather Dinn; Jacqueline Montpetit; Kimberly Young; Melanie Brisson; Mike Rosland; Verna Mendes
Subject: BCACP Report on ASDs Used in BC

Hello Kevin,

I have attached a pdf copy of the Report on ASDs used in BC. As we agreed earlier, the report header indicates the BCACP Traffic Safety Committee is the source of the report and that it has been prepared for the OSMV.

At the end of the report I indicated it had been prepared by me as a member of the ASD working Group.

If you accept the report, please send it on to Chief Graham.

Thanks,

Brian

Brian Image, B.Sc., R.T., C/M
Toxicology Services Section
Forensic Science & Identification Services
Phone: 604-264-3438
Fax: 604-264-3858
e-mail: brian.image@rcmp-grc.gc.ca

Wilkinson, Anita JAG:EX

From: Brian Image [Brian.Image@rcmp-grc.gc.ca]
Sent: Wednesday, October 24, 2012 9:29 AM
To: Anderson, Kathy E JAG:EX
Cc: Kevin Jones
Subject: Re: ASD manual
Attachments: OperatorResourceReadingrevmarch2011.pdf

Hi Kathy,

The ASD Operator course manual was revised in March 2011 by RCMP Traffic Services so you have the previous edition. I have attached the newest edition for your information.

Since the publication of this March 2011 edition we have discovered there is an error regarding the acceptable ambient temperature range for the Alco-Sensor IV DWF. Page 5 of the manual indicates the device can be used at ambient temperatures of 0 - 100 degrees C (and page 10 refers to ambient temperatures as low as 0 degrees C). This range of temperatures was taken from the operator manual published by the manufacturer and turns out to be incorrect. The manufacturer (Intoximeters Inc) made an error when converting the ambient temperature range in Fahrenheit to Celsius. The correct ambient temperature range is -18 - 40 degrees C.

Brian

Brian Image, B.Sc., R.T., C/M
Toxicology Services Section
Forensic Science & Identification Services
Phone: 604-264-3438
Fax: 604-264-3858
e-mail: brian.image@rcmp-grc.gc.ca>>> "Anderson, Kathy E JAG:EX" <Kathy.Anderson@gov.bc.ca> 10/23/2012 3:57 PM >>>
Hi Brian,
Can you please tell me what the date was of the last edition of the ASD manual? I have the Revised April 1996 version. If I don't have the most recent edition, I was wondering whether I would be able to get a copy from the lab?

Kathy Anderson
Manager, Adjudication and Training
Adminstrative Justice, Driver Fitness and Intervention
Office of the Superintendent of Motor Vehicles

Direct: 250-356-8068
BlackBerry: s.17
Fax: 250-356-55[illegible]

File No.: GL 570-3-3

REVISED by Traffic Services
March 2011 (British Columbia Version)

This Resource Reading material has been compiled and produced by Forensic Laboratory Services, ROYAL CANADIAN MOUNTED POLICE, Ottawa

RESOURCE READING

OPERATORS

APPROVED SCREENING

DEVICES (ASD)

TABLE OF CONTENTS

APPROVED SCREENING DEVICE - Definition

-means a device of a kind that is designed to ascertain the presence of alcohol in the blood of a person and that is approved for the purposes of this section (S.254 CCC) by order of the Attorney General of Canada.

I. INTRODUCTION

A peace officer must have reasonable grounds to believe that a person is committing or at anytime within the preceding three hours has committed, as a result of the consumption of alcohol, an offence under section 253 C.C.C. before a demand for a breath test can be made. In the past, these criteria were generally satisfied by observing eccentric driving patterns, the extraordinary physical appearances of subjects, and conducting roadside sobriety tests. Such methods were time consuming and their value significantly related to the experience and subjective judgement of the peace officer. Individuals, experienced in the consumption of alcohol, may have avoided detection by exhibiting minimal physical symptoms. By these methods, the average blood alcohol concentration (BAC) of detected "impaired" drivers was between 160 to 170 milligrams of alcohol in 100 millilitres of blood (mg %). Hence, mostly intoxicated persons were being apprehended and not the impaired driver. Intoxicated drivers are severely impaired and demonstrate gross physical symptoms. Impaired drivers show few symptoms but still represent a high risk of being responsible for a motor vehicle accident. This fault was not directly attributable to the peace officer, but rather the subjective detection methods employed.

All individuals are impaired to some degree in their ability to operate a motor vehicle regardless of their experience in driving or consumption of alcoholic beverages, at blood alcohol concentration of 100 mg% and higher. Initially the mental faculties and skills such as vision, loss of inhibitions, judgement, attention, concentration and reaction time deteriorate. In some people these faculties are affected at blood alcohol concentrations as low as 50 mg%. Although these mental skills have deteriorated one may not observe the outward signs of intoxication such as slurred speech, body sway, lack of balance and difficulty in performing physical activities.

In the average social drinker these outward signs of intoxication are not evident until approximately 150 mg%. Very experienced drinkers may not show these symptoms until much higher levels.

Because of this, peace officers are unable to detect impaired drivers before signs of intoxication or aberrant driving patterns are observed.

A rapid, accurate, and scientific method was required to determine BAC's and provide an objective method of detecting impaired drivers. Contemporary technology developed portable, convenient screening devices to satisfy such requirements.

Approved screening devices (ASD) are portable, automatic, and compact electronic breath testing devices designed to assist peace officers in determining the presence of alcohol in a person's blood. The ASD is an investigative aid and is not meant to take the place of a peace officer's power of observation or skill in investigation.

Pursuant to current legislation, the "Alcolmeter S-L2" , the "Alco-Sûr", the "Alcotest 7410 PA3", the "Alcotest 7410 GLC", the "Alco Sensor FST" and the "AlcoSensor IV PWF" and "DWF" are recognized as approved screening devices for the purposes of section 254 of the Criminal Code (Reference: Canada Gazette, part II p4691 27/11/85 , p4074-4075 28/09/88, p2403 17/5/93 and p4691 15/6/94 and p609 24/1/96).

The current ASDs, the Alcolmeter S-L2, the Alco-Sûr, the Alcotest 7410s and the AlcoSensor IVs are electrochemical sensors or fuel cell devices. Fuel cells only respond to volatile substances that can be electrochemically oxidized at the electrode surface. Fuel cells are, therefore, not sensitive to breath acetone or solvents based on derivatives of organic hydrocarbons. These substances are often found in industrial working environments. Fuel cells do, however, respond to other aliphatic alcohols, such as methanol or isopropanol, if they are present.

During the operation of these ASDs a small portion of deep lung air is drawn into the fuel cell or sensor where the alcohol in the breath sample comes in contact with the electrodes. A chemical reaction at the electrodes generates an electrical current in proportion to the amount of alcohol present in the breath sample. The actual

voltage output from a fuel cell in an ASD is too small to be measured without amplification. The signal is first amplified and then displayed on the face of the ASD.

The actual reaction can be represented as follows:
Alcohol + fuel cell→ Acetic acid + electrons → CO_2 + H_2O + O_2

The time interval before the next test can be performed depends on the magnitude of the previous reading. The higher the alcohol concentration in the breath sample the longer the time required between tests to clear the cell.

It is essential that ASD operators have a thorough knowledge and understanding of the theory and operation of the device. They must be able to explain clearly and concisely the proper procedure of obtaining accurate BAC's from persons by means of breath samples evaluated by ASD's. Such explanations may be required for court testimony.

II. PHYSIOLOGY OF BREATH TESTING

When a person consumes an alcoholic beverage, it passes from the mouth via the esophagus to the stomach and small intestine where it is absorbed into the bloodstream. The absorption of alcohol is quite rapid, generally taking approximately 30 minutes after consumption for the maximum reading to be obtained. The time of absorption is primarily affected by the type and amount of food in the stomach as well as the type of beverage consumed.

Once in the bloodstream, the alcohol is distributed to all parts of the body including the lungs, brain and liver. Elimination of the alcohol begins immediately after it has entered the blood.

Elimination occurs mainly by metabolism in the liver, 95% of the total, while the remainder is excreted unchanged through the urine, sweat and breath. Elimination decreases the BAC at an average rate of 15 mg % per hour (approximately 20 mL of 40% liquor).

The fact that alcohol is eliminated unchanged by the breath allows for the concentration of alcohol in the blood to be determined by the analysis of a breath sample. The amount of alcohol in the breath is proportional to the amount of alcohol in the blood. The specific ratio expressing this relationship is 2100 parts of deep lung air contain the same amount of alcohol as 1 part of blood. On this basis, the blood alcohol concentration range can be obtained by the analysis of a breath sample using an approved screening device.

III. OPERATION OF AN ASD

The analysis of a breath sample by means of an ASD involves three (3) basic phases:

1) preparation of device;
2) sampling phase:

   i) collection of a sample of deep lung breath,
   ii) analysis of sample (detection of alcohol),
   iii) measurement (determination of alcohol concentration present);

3) reporting/display of results.
   - PASS, WARN, or FAIL.

Alco-Sensor IV DWF

The Alco-Sensor IV DWF (AS IV) was developed by Intoximeters Inc., of the USA and is manufactured by them. The Canadian distributor is Davtech Analytical Services Security in Ottawa, Ontario.

1. Preparation of the Alco-Sensor IV DWF

a. Remove disposable mouthpiece from wrapper (use only AS IV mouthpieces);
-do not touch mouthpiece with hands;
-use new mouthpiece for each test;
-mouthpiece contains a check valve to prevent the subject from sucking back on the sample. This feature prevents room air from being introduced into the breath sample.

b. Insert the AS IV DWF mouthpiece into the upper left hand side on the unit to turn the device on electrically;
-the mouthpiece is of different shape at either end, it can only be mounted in one direction in the AS IV;
- the temperature of the unit will be displayed;

-the AS IV DWF is designed to operate at a device temperature of 10□C to 40□C. If the device temperature is outside of this range some accuracy will be lost;

-the AS IV DWF can be operated in ambient temperature of 0□C to 100□C if the unit itself is in the proper temperature range of 10□C to 40□C.

c. If the power left in the battery is too low the unit will display "Bat" instead of the temperature when the unit is turned on. The battery should be replaced as soon as possible. If "Bat" is followed by "Void" there is insufficient power to conduct a test.

d. If the unit displays "Set" after the temperature display, depress the SET button on the front face of

the AS IV DWF;
-if the previous test was concluded properly the pump mechanism will be cocked and "Set" will not appear.

e. The AS IV DWF monitors the breath flow sensor and the fuel cell sensor for stability. The display will be the busy signal of a flashing ">" "<" during this time. If the sensors are stable the display will change to "Test".

2. Sampling Phase:

a. Test position;
-the screening test should be administered as soon as possible;

-the subject should be in a stable position preferably seated facing the AS IV DWF operator; and

-only the operator should handle the device during the testing procedure.

b. Instruct the subject to blow continuously and moderately hard through the mouthpiece until instructed to stop;

-a (+) sign appears in the display to indicate the subject is blowing hard enough. (12 Litres per Minute) If the + sign does not appear instruct the subject to blow harder;

-a second (++) appears on the display when the minimum volume (1.2 L) requirement has been met;

-DO NOT instruct the subject to stop at this time. Allow the subject to blow as long as possible. When the breath pressure decreases by 10% after the minimum volume has been obtained, the device will automatically take a breath sample for analysis. This ensures a true deep lung sample is captured for analysis;

c. If blowing is interrupted before the ++ sign appears the device will display "NoGo" and then return to the "TEST" display;

-after one minute or 3 NoGos the device displays "Void" and the whole test procedure must be started again.

3. Recording of B.A.C.:

a. A busy signal (< >) will appear on the display prior to the result. The fuel cell will generate a signal in proportion to the alcohol present in the sample. A result will then appear accompanied by a 3 second beep tone.

The FAIL indication is set appear at 100 mg% by the factory. The WARN indication is set to appear at 60 mg %. The results in the PASS range are expressed as digits while the WARN and FAIL levels are represented by the words "Warn" or "Fail"; Settings are as follows:

PASS (digits) - 0 to 59 mg%
WARN (Warn) - 60 to 99 mg%
FAIL (Fail) - 100 mg% or greater.

b. Record results:

-record results in writing;
- specific forms may be supplied for this purpose;

and

-results will be displayed for 2 - 3 seconds after which SET will appear in the display. The SET button should then be depressed.

c. Recalling the last test result:

Until the SET button is depressed and released the recall function is not available. Once the SET button has been pushed, depressing the "RECALL" button will display the final reading of the current test. Once the mouthpiece has been ejected the test result can no longer be recalled.

d. Mouthpiece disposal:

-when the set button is depressed the device will give an intermittent beep signal indicating to remove the mouthpiece to turn the device off;
-the mouthpiece is removed by pressing the red button on the face of the AS IV DWF;
-discard the mouthpiece from the AS IV DWF into a container designated for used mouthpieces. Do not touch mouthpiece with the hands. When full, discard entire container in accordance with local waste disposal regulations.

IV. TESTING PRECAUTIONS FOR ASD's

A. CONTROL:

The operator shall maintain control of the DEVICE AT ALL TIMES. Do not permit the test subject to touch or hold it. Hold device securely, using wrist strap (where applicable).

B. DISPOSABLE MOUTHPIECE:

Mouthpieces are supplied in individually sealed wrappers

- unwrap mouthpiece;

- affix mouthpiece in such a manner that operator's hands do not come into direct contact with mouthpiece. Touching of mouthpiece could give subject reasonable grounds to refuse to blow, because of the possibility of contagious disease transmission;

-upon completion of test re-wrap used mouthpiece into original wrapper, where applicable, and discard.

-use a sealable container designated for mouthpieces. When full dispose container in accordance with local waste disposal regulations.

C. SMOKING:

Do not allow subject to blow smoke into device; wait 5 minutes after smoking. Presence of smoke in breath sample can cause inaccurate readings and damage device.

D. MOUTH ALCOHOL:

Alcohol present in subject's mouth as a result of recent consumption of alcoholic beverages, belching, or burping, can cause inaccurate test results;

- if the peace officer honestly believes that the motorist has engaged in the above activity within the last 15 minutes, the officer should delay the test until 15 minutes from the occurrence of the activity. The officer should explain the reason for and the necessity of the delay to the motorist. (Reference: R vs BERNSHAW, Supreme Court of Canada, January 27, 1995).

E. CLIMATE:

Fuel cell devices will operate at ambient temperatures as low as 0°C but the response is sluggish and some accuracy is sacrificed. If the unit is too cold, it may be placed in a shirt pocket which will raise the temperature of the unit; and

- breath tests should be conducted inside the police vehicle.

F. RADIO FREQUENCY INTERFERENCE (RFI):

To remove any concerns regarding the potential of radio frequency interference causing false readings the following precautions should be observed:

1. Any portable radio inside the testing vehicle must be switched OFF to prevent accidental pressing of the transmission button;

2. No transmission should be done from the testing vehicle while conducting a test;

3. Police vehicles at road blocks should be parked at least 7.6 m (25 feet) from each other; and

4. Once the road block has been set up, check the ASD unit for interference while transmitting from the other vehicles. If interference is observed move vehicles further apart until no interference is observed.

V. MAINTENANCE PROCEDURES

ALCOSENSOR IV DWF

1. Battery:

If the display shows "BAT" for 2 seconds when mouthpiece is inserted the battery is getting low, but the current test can be completed. When the "BAT" display is followed by "VOID" the battery must be replaced before a test can be conducted. Return unit to a qualified calibrator for battery replacement.

2. Radio Frequency Interference:

A display of "RFI!" followed by "VOID" indicates that an RFI signal was detected which was sufficiently strong to affect the results of a test. No result will be available. Start test sequence over by removing the mouthpiece and starting again.

3. Malfunctions:

The fuel cell has a life expectancy of three to five years which is partially dependant on the amount of use and environmental conditions. Continued use at elevated temperatures (above 40□C) and low humidity will shorten the life of a fuel cell. When cell response slows to an unacceptable time to reach a reading under optimum conditions the fuel cell should be replaced.

All repairs (other than battery replacement) must be conducted by authorized repair technicians. For all repairs, ship defective unit to:

DAVTECH Analytical Services
133 Walgreen Road,
Ottawa, Ontario K0A 1L0

VI. DISCREPANCIES BETWEEN ASD AND APPROVED INSTRUMENT TEST RESULTS

ASD test results do not always correspond with those of a subsequent Approved Instrument test. For example, the ASD may determine a FAIL (i.e. BAC of 100 mg% or greater) while subsequent Approved Instrument test results of the same subject indicate a BAC of less than 100 mg %.

Normal discrepancies can be explained and usually relate to the following:

1. Time Delay:

   Since the ASD test is conducted at the roadside and the Approved Instrument afterwards at the police office, there is a time delay factor to be considered.

   The subject's body continuously eliminates ("burns off") alcohol at a rate of approximately 15 mg % per hour. Hence, the time factor between the ASD test and Approved Instrument test is significant. Consequently, the BAC measured by an Approved Instrument may be less than that previously indicated by the ASD.

2. Mouth Alcohol:

   Even when following the precautions of conducting an ASD test not less than fifteen (15) minutes after the last drink, occasionally mouth alcohol can be present and affect test results. This can occur if the subject burps shortly before the test. Such action may bring alcohol to the mouth from the stomach, causing the BAC determined by the ASD to measure higher than that of a subsequent Approved Instrument test.

3. Tolerance:

   Both, ASD and the Approved Instrument, have a tolerance or error factor of ± 10 mg% which can contribute to differences between the two results.

Wilkinson, Anita JAG:EX

From: Brian Image [Brian.Image@rcmp-grc.gc.ca]
Sent: Monday, November 5, 2012 3:23 PM
To: Esposito, Tony N JAG:EX
Cc: Anderson, Kathy E JAG:EX
Subject: Re: FW: ASD Issue

Hi Tony,

The document lists the recommended standards and procedures from the Alcohol Test Committee and was published in our Journal in 2009.

The standards deal with things other than the operation of approved instruments and ASDs. The standards deal with:

1. The way the ATC evaluate's 4 different types of equipment that can be "Approved" under the Criminal Code (including ASDs) (Part I).

2. The manufacture of materials used in breath testing such as Alcohol Standards (Part II).

3. The identification and qualifications of key personnel such as Program directors and Training Course directors (Part III).

4. The training of Qualified Technicians and ASD calibrators or operators (Part IV).

5. The maintenance of approved instruments and screening devices (ASDs) (Part V).

The procedures part of the recommendations deals with the operational procedures followed when operating the approved equipment such as ASDs, and the procedures followed when evaluating equipment for approval under the criminal code.

The recommendation the Doroshenko group refers to (recommendation 9 on page 6) is taken from Part I of the Standards section and therefore applies to the evaluation of ASDs for "Approved" status. This is not an Procedure recommendation. The fact that the Alco-Sensor IV DWF is an approved device, means that it was evaluated and met this recommendation.

The procedure recommendations for the operation and calibration of ASDs are indicated in Procedures Part I and include the 8 recommendations indicated on page 17 of the document. These operational procedure recommendations should be followed when police operate the ASDs. There is no recommendation in this section that is similar to recommendation 9 on page 6.

So the part of the document refer to by the Doroshenko group applies to the evaluation of potential approved ASDs and not the operation of ASDs. A different set of recommendations in the same document apply to the operation of the ASDs.

I hope this helps.

Brian

Brian Image, B.Sc., R.T., C/M
Toxicology Services Section
Forensic Science & Identification Services
Phone: 604-264-3438

Wilkinson, Anita JAG:EX

From: Anderson, Kathy E JAG:EX
Sent: Monday, June 18, 2012 11:33 AM
To: Burchnall, Shelly K JAG:EX; Esposito, Tony N JAG:EX
Subject: FW: ASD Operating Temperature
Attachments: ASD Temperature memo to ASD WG.pdf; ~REVISED Superintendent's Report on Approved Screening Devices August 2011.docx

Importance: High

Kevin didn't leave a stick with his presentation. He'll be back in his office by noon and send it.

He recalls that he did send my request for "no go" and "void" information to Brian last week, and will check on that progress when he's back in the office. I told him that we would like the information as soon as possible so we can update our SR on ASD's.

This is the only information we have currently to update the report. I've been updating the report to reflect the new information and have attached a latest draft for you to view.

Kathy Anderson
Manager, Adjudication and Training
Direct: (250) 356-8068

NR

Page 23 redacted for the following reason:
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NR

June 2012

This information reflects current police practices and has been compiled by the Superintendent of Motor Vehicles for conducting reviews of immediate roadside driving prohibitions.

Prescribed ASDs in Use in British Columbia

ASDs are prescribed under the *Motor Vehicle Act Approved Screening Device Regulation*. Under this regulation the following devices are approved for use in British Columbia (BC):

- Alcolmeter S-L2
- Alco-Sensor IV DWF
- Alco-Sensor FST

Serial Numbers

ASD devices used in BC have a six digit serial number. When the first and/or second digit is a "0", the serial number may be recorded as a four or five digit serial number. In some cases, inventory control or asset numbers are used in place of serial numbers.

ASD Calibration

ASDs are currently calibrated to display a "warn" reading at a blood alcohol concentration of 60 mg% (milligrams of alcohol in 100 millilitres of blood) or over, and a "fail" reading at a blood alcohol concentration of 100 mg% or over.

Calibration Expiry Date

ASDs are checked for calibration accuracy by a qualified ASD calibrator once every four weeks. The calibration expiry date refers to the date displayed on the ASD indicating when the 4 week period ends.

Service Expiry Date

ASDs are serviced by the manufacturer on an annual basis. The service expiry date is displayed on the ASD. Dates are displayed in the following manner: Year/Month, or Year/Month/Day. Where a date appears as year and month (example: 11-01 or 2011-01), the annual service expiry occurs at 2359 hours of the last day of the expiry month. Where a date is a full date (example: 11-01-15 or 2011-01-15), the annual service expiry occurs at 23:59 hours of the date indicated.

Ministry of Justice

Office of the
Superintendent
of Motor Vehicles

PO Box 9254 STN PROV GOVT
Victoria BC V8W 9J2

Telephone: 250 387-7747
Facsimile: 250 356-6544

Timing of Breath Samples

Breath samples are taken at least 15 minutes after the last drink was consumed to allow for elimination of mouth alcohol.

ASD Operating Temperature

The Alcosensor IV DWF is designed to provide maximum accuracy when the internal unit temperature is between 10 and 40 degrees C. Breath tests taken outside this range may result in falsely low readings. The unit does not prevent a test from be completed if the temperature is outside the acceptable range. The temperature is displayed briefly when the ASD test sequence is initiated and operators are trained to ensure the unit is within the acceptable range.

Breath Flow and Volume

The Alco Sensor IV DWF measures breath flow and breath volume to capture a sample for analysis. The minimum breath flow required is 12 litres per minute and the minimum volume is 1.2 litres.

"NOGO" or "VOID" is Displayed

The Alco Sensor IV DWF will display a "NOGO" when there is an interruption to the airflow before the person has blown the minimum 1.2 litres of air. The "NOGO" display is an alert to the ASD operator to indicate that airflow has been interrupted. This occurs when the person blowing into the ASD blocks the airflow into the device, or stops blowing, after initially providing some airflow. After 3 attempts or after 1 minute, the word "VOID" will be displayed. Once a "VOID" occurs, the mouthpiece has to be ejected and reinserted for the ASD to reset.

British Columbia Association of Chiefs of Police

Traffic Safety Committee:

Report on Alcohol Screening Devices used in British Columbia

Prepared for the Office of the Superintendent of Motor Vehicles 2012-06-29

Alcohol Screening Devices (ASDs), such as the Alco-Sensor IV DWF used in BC, test a person's breath to determine the blood alcohol concentration (BAC). The Alco-Sensor IV DWF has a small display (see appendix 1) for messages, prompts, and readings, and a SET button that prepares the device to take breath samples. The Alco-Sensor IV DWF also has a red mouthpiece release button to eject the mouthpiece after use, and RECALL and MANUAL buttons. These devices provide digital readings between 4 and 59 mg/100mL, 'Warn' readings between 60 and 99 mg/100mL, and 'Fail' readings for 100mg/100mL or more. Alcohol levels of 0 to 3 mg/100mL are reported as 0.

In order to ensure the device is providing reliable results, it must be operated according to the proper procedure, and its accuracy must be verified with an alcohol standard.

Operation of the Alco-Sensor IV DWF

Proper operation of the Alco-Sensor IV DWF includes annual service checks as well as monthly accuracy checks to verify instrument reliability and accuracy. ASD operators are trained to ensure these checks have been conducted within the appropriate time frames, as indicated by labels attached to the device, prior to using an Alco-Sensor IV DWF.

The test sequence is initiated by inserting a one-way mouthpiece into the device. The display will then show the current temperature of the device, in degrees Celsius, for approximately 3 seconds. The operator must note the temperature displayed, which must be within its correct operating range of 10°C to 40°C. If the device is not within this temperature range, the operator should take action to bring the device into the correct range before collecting a sample from the subject. The device will allow a sample to be collected regardless of its temperature, but, if it is not in the correct temperature range, the device will return either an accurate or a falsely low result. It is important to note that the ASD will not return a falsely high result.

The device will then display alternating "<" and ">" symbols as it checks fuel cell and breath flow sensor stability. The ASD may indicate the flashing word "Set" to instruct the user to depress the SET button, if this has not been done previously, thereby returning the sampling mechanism to the ready

position. When the SET button is depressed and the device is ready to accept a breath sample, a flashing "Test" will be displayed.

The operator should provide instructions to the subject on how to provide a sample into the device; the subject should take a breath in, seal the lips around the mouthpiece and blow until advised to stop. Alcohol breath testing instruments require minimum sample acceptance parameters to be met before the breath sample is analyzed to determine the BAC. These parameters are designed to collect the deep lung air which provides the most accurate representation of the BAC. The parameters are also selected so that the majority of the population will be able to meet the requirements. For the Alco-Sensor IV DWF, the subject must provide a sample of air into the device with a minimum flow rate of 12 L/min (0.2 L/sec) and a minimum volume of 1.2 L of breath. The device monitors the air entering the instrument and when the minimum flow rate is met, the display will show a single "+"; if the subject sustains this flow rate long enough to meet the minimum volume, the display will then show "++". Provided "++" has been displayed, when the subject runs out of air the flow rate will begin to drop and the device will automatically capture and analyze the breath. If the subject stops blowing or runs out of air before the "++" sign has been displayed, the device will show a result of "NoGo" on the display for approximately 2 seconds, accompanied by two beeps. This communicates to the operator that the subject has not provided enough volume of breath for the automatic sampling system to activate. The device will then automatically reset and display a flashing "Test" indicating another sample can be provided.

A single test sequence will allow up to three attempts for a sample to be collected: the first two unsuccessful attempts would result in "NoGo" and the third attempt would result in a message of "Void" for approximately 2 seconds, accompanied by three quick beeps. The device will beep intermittently until the mouthpiece is ejected, using the mouthpiece release button. In practice, the operator may eject the mouthpiece after each unsuccessful attempt and reinitiate the test sequence by inserting a mouthpiece. This restarts the testing procedure and can result in more than two "NoGo" messages being displayed. A "Void" message can also occur if the instrument has flashed "Test" for 1 minute without introducing a breath sample, thereby causing the device to time out. Messages such as "NoGo" or "Void" might be missed because they are only briefly displayed.

The device will display alternating "<" and ">" symbols while the breath sample is analyzed. The device will then display the result for about 3 seconds, followed by "Set", to instruct the operator to push the SET button in preparation for the next test. If the operator wishes to recall the result of the previous test, it can be displayed again by depressing the RECALL button after SET has been pressed. The device will beep intermittently once the SET button has been pressed (this beeping is paused while the RECALL button is depressed) until the mouthpiece is ejected, using the release button. Once the mouthpiece is released, the RECALL function is no longer available.

Smoking: Cigarette or cigar smoke may damage the device and lead to low readings. ASD operators are trained to have subjects wait 5 minutes after smoking before providing a sample.

Interfering Substances: The Alco-Sensor IV DWF responds to alcohols such as ethanol (beverage alcohol), and methanol or isopropanol (both found in household products not intended for consumption). It does not respond to chemicals that are not alcohols, such as acetone (sometimes found in the breath of diabetics) or toluene (sometimes found in paints and other materials).

Manual Button: The Manual Button may be used by ASD operators to override the minimum sample acceptance parameters of the device by taking a sample when this button is pressed. Operators are instructed to use this button if they are satisfied the subject is trying to comply, but is unable to meet the device sampling requirements because of a physical disability.

A short summary of the display messages of the Alco-Sensor IV DWF can be found in the following table:

Alternating	< and >	The unit is busy either checking the breath flow sensor and fuel cell stability or analyzing a sample.
	Set	The "Set" button must be depressed.
	Test	The device is ready to introduce a breath sample
	Void	This indicates an improper condition such that the test sequence must be restarted.
	NoGo	The conditions necessary for the automatic sampling system to accept a sample have not been met.
	Wait	This message will appear if several tests are conducted in a short time. It means the fuel cell is not yet cleared of alcohol.
	Bat	Battery should be changed.
	RFI!	This message, followed by, "Void" indicates that radio frequency interference has been detected by the unit.
	+	The minimum breath flow 12 L/Min (0.2 L/sec) is being provided.
	++	The minimum sample volume of 1.2 litres has been delivered.

Checking the Accuracy of the Alco-Sensor IV DWF

Analytical instrumentation, including alcohol screening devices (ASDs) used for breath testing, are checked regularly to ensure they are operating properly and providing accurate results. The Alco-Sensor IV DWF screening device has a performance standard, or tolerance, of ± 10 mg/100mL, like

evidentiary instruments such as the BAC Datamaster C and Intox EC/IR II. Checking breath testing instruments with an alcohol standard of known concentration, and ensuring the result is within 10 mg/100mL of the expected value, demonstrates the device is operating correctly and that subsequent breath tests from subjects will be accurate to the same tolerance.

An ASD will generally hold its calibration for months. However, because there are some circumstances which will cause sensitivity to drop and low readings to occur, it may occasionally require recalibration to provide the most accurate results.

Following the *Recommended Standards and Procedures of the Alcohol Test Committee* (ATC), 2009, of the Canadian Society of Forensic Science, the accuracy of ASDs is checked every 4 weeks and an ASD is recalibrated if the checking standard is not within ± 5 mg/100mL of the expected reading. Using an acceptable range of ± 5 mg/100mL, which is less than the performance standard range of ± 10 mg/100mL, prevents exceeding the performance standard even if the calibration changes slightly in the 4 weeks between accuracy checks.

It is important to note that an ASD is operating properly when an alcohol standard result is within ± 10 mg/100mL of the expected reading. Therefore, even when an ASD is operating properly, it may still be recalibrated for optimal accuracy.

According to the Motor Vehicle Act, individuals are prohibited from driving with alcohol in their blood at two thresholds: 50 mg/100mL and 80 mg/100mL, with different sanctions. ASDs are programmed to Warn at 60 mg/100mL and Fail at 100 mg/100mL. Therefore, a driver who receives a Warn reading will have exceeded the lower threshold by at least 20% and a driver who receives a Fail reading will have exceeded the higher threshold by at least 25%. These tolerances are in place to protect drivers from falsely high readings in the rare instances that calibration has drifted within the 4 week checking period.

Where an ASD calibration drifts approximately 15% or more too high, it will be identified at the time of an Accuracy Check. The ASD is then sent for servicing and identified in a Police Supplemental Report, which is sent to the Office of the Superintendent of Motor Vehicles.

Accuracy Check Procedure

The Accuracy Check procedure employs two different alcohol standards: a dry gas standard is used for the calibration check and, if required, a wet bath alcohol standard is used to recalibrate the ASD.

Dry Gas Alcohol Standard: The dry gas alcohol standard is a gaseous solution of alcohol and nitrogen contained in a pressurized aluminum cylinder. A sample of the gas can be delivered into an ASD and measured like a breath sample. Dry gas alcohol standards typically have a nominal value of 82

mg/100mL at sea level (standard barometric pressure of 101.3 kPa or 760 mmHg). Dry gas standards are available from a variety of manufacturers, such as Airgas, Ilmo, and Calgaz.
Note: These cylinders are available in a variety of different concentrations, and dry gas alcohol standards with nominal concentrations other than 82 mg/100mL can be used. In particular, Vancouver Police Department has purchased a large cylinder with a nominal value of 100 mg/100mL because this department has a very large number of ASDs.

Gas expands and contracts according to the pressure exerted on it, which means that when gas is released from a pressurized cylinder, its volume and concentration will change with the ambient barometric pressure. Because of this, dry gas alcohol standards have both a nominal value at sea level, as well as an expected value corrected for the ambient barometric pressure. Ambient barometric pressure varies with both the changing weather conditions and the altitude at the location where the gas standard is used. A True-Cal device is used, at the time and location of testing, to correct the nominal value to an expected value based on the ambient barometric pressure.

An ASD measures the dry gas alcohol standard in the Calibration Check portion of the Accuracy Check procedure. The True-Cal expected value and the result of the Calibration Check are recorded in the Accuracy Check Log. The Calibration Check result and True-Cal expected values are compared and corresponding action taken as indicated in the Table below:

Target Range	Calibration Check result	Action	Certificate of a Qualified ASD Calibrator
Acceptable	Within ±5 mg/100mL of target value	Return to use	Yes, identifies dry gas standard
Recalibration	Between ±6 to ±12 mg/100mL of target	Recalibrate & Return to use	Yes, identifies dry gas & wet bath standards
Maintenance	Greater than ±12 mg/100mL deviation from target	ASD taken out of service, sent for maintenance	No certificate. Calibrator submits a Police Supplemental Report for ASDs with high readings.

Wet Bath Alcohol Standard: Wet bath alcohol standards are used to recalibrate ASDs and to restore them to optimal performance. A wet bath alcohol standard is a solution of alcohol in water at a concentration such that, when heated to 34ºC, it will produce a vapor with an expected value of 100 mg/100mL. A simulator is used to contain the solution and maintain an appropriate operating temperature of 33.8ºC to 34.2ºC. Wet bath alcohol standards are the same solutions used to check the accuracy of evidentiary breath testing instruments, and are certified by designated analysts according to the provisions of the Criminal Code. Following the recommendations of the ATC, a wet bath alcohol standard is used a maximum of 16 times before it must be replaced with a fresh alcohol standard.

Accuracy Check Log Form: An Accuracy Check Log form is used to record information associated with each Accuracy Check as it is performed by a Qualified ASD Calibrator. A separate log is required for each ASD, and typically each line in the log form is associated with one Accuracy Check procedure, so that approximately one year of Accuracy Checks may be recorded on the form. Units of mg% written on the form are equivalent to mg/100mL. Expiry dates are understood to terminate at midnight on the last day indicated, or at the end of the month if no day is indicated.

The information recorded at the top of the form (see appendix 2) usually does not change from one Accuracy Check to the next. When interpreting this information, it should be noted that any of Guth 2100, Guth 34C, ToxiTest II, and/or Mark IIA simulators may be used. The recorded serial numbers may have variable alpha-numeric characters.

Calibration Check -Left Block: This block of information includes the dry gas alcohol standard lot number and expiry date. The calibration check value must be within ± 5 mg/100mL of the True-Cal expected value for two consecutive tests to be in the Acceptable range; if outside this, the ASD must be recalibrated. If the results are Acceptable, the calibrator proceeds to the Blank test. If the first or second calibration check value is greater than ± 5 mg/100mL from the True-Cal expected value, the calibrator will proceed directly to a recalibration.

Recalibration: If this block has no information recorded, it means no recalibration was required. The wet bath lot number and expiry date are recorded when a recalibration is required. The number of times the solution in the simulator has been used is recorded to ensure that it is not used more than 16 times; therefore the number in this column should never exceed "16".

Calibration Check -Right Block: This block will be completed only if a recalibration is performed on the ASD. Occasionally, this second calibration check may not give two calibration check values within ± 5 mg/100mL of the True-Cal expected value, and the ASD may need to be recalibrated again. If this happens, the second recalibration would be recorded on the next line of the Log form.

Blank Test: The last step of the ASD Accuracy Check procedure is to obtain a "0" result for a Blank Test before the ASD is used operationally. The ASD Calibrator provides a sample of his or her own breath to perform a blank test in the same way a subject sample is measured. The blank test is the final check before the ASD is returned to use and ensures:

- the ASD is capable of automatically accepting a sample of breath;
- the ASD gives a "0" reading for an alcohol-free subject;
- the ASD sample chamber is cleared of any residual alcohol from the alcohol standard.

The device must be capable of generating a "0" result within 3 attempts or it must be sent for servicing.

Calibration Expiry Date: The calibrator assigns a new expiry date that is 4 weeks from the date of the Accuracy Check, and attaches a corresponding expiry label to the ASD.

ASD Calibration Signature: The calibrator signs off the Accuracy Check, prepares a Certificate of a Qualified ASD Calibrator, and returns the unit to operational use.

Certificate of a Qualified ASD Calibrator

This certificate is issued by the Qualified ASD Calibrator after successfully completing an ASD Accuracy Check. It indicates the ASD was operating properly at the time it was checked, and whether it only required a calibration check, or if it also required recalibration. If the device did not pass the Accuracy Check, this certificate would not be completed.

The certificate identifies the ASD Service Expiry Date and Serial Number, the name of the ASD Calibrator performing the Accuracy Check, and the type of ASD used (Alco-Sensor IV DWF or Alco-Sensor FST). The calibrator selects a checkbox to identify whether a calibration check alone was performed (dry gas standard only), or if a recalibration was also performed (both a dry gas and wet bath standard). The alcohol standards are identified by manufacturer, lot number, and expiry date. The new Calibration Expiry Date of the ASD is indicated, as well as the date and location where the Certificate of a Qualified ASD Calibrator was created.

Police Supplemental Report

If the result of an ASD Accuracy Check is 13 mg/100mL or more, higher than the True-Cal expected value, a Police Supplemental report is completed by a Qualified ASD Calibrator and submitted to the Office of the Superintendent of Motor Vehicles. This would indicate the ASD was reading too high by at least 15%, and that any Warn or Fail reading obtained since the previous accuracy check may have been incorrectly high.

Prepared by:

Brian Image, RCMP Forensic Laboratory, Vancouver

ASD Working Group, BCACP

Appendix 1: Alco-Sensor IV DWF

Appendix 2: ASD Accuracy Check Log Form

ASD ACCURACY CHECK LOG

Alc. Std. Info.	(Dry Gas) Value @ Sea level Manufacturer:	(Sim Sol'n) Expected value: Manufacturer:	ASD S/N: Location:	Simulator S/N: True-Cal S/N:

	CALIBRATION CHECK						RECALIBRATION			CALIBRATION CHECK				BLANK TEST				
Date	Dry Gas Alc Std Lot #	Lot Exp Date	True-Cal Expected Value	Calibration Check mg/100mL	True-Cal Expected Value	Calibration Check mg/100mL	Wet Bath Alc Std Lot #	Lot Exp Date	# Sim Samples taken	True-Cal Expected Value	Calibration Check mg/100mL	True-Cal Expected Value	Calibration Check mg/100mL	Blank Test mg/100mL			Calibration Expiry Date	ASD Calibrator Signature

Wilkinson, Anita JAG:EX

From: Anderson, Kathy E JAG:EX
Sent: Wednesday, October 24, 2012 10:44 AM
To: s.15 JAG:EX; Caldwell, Arlene M JAG:EX
Cc: Esposito, Tony N JAG:EX
Subject: FW: ASD manual
Attachments: OperatorResourceReadingrevmarch2011.pdf

Please keep this to yourselves for the time being.

Just wanted to alert you to the temperature issue. Tony and I will be working on getting something in writing for the adjudication team.

Kathy Anderson
Manager, Adjudication and Training
Direct: 250-356-8068
BlackBerry. s. 17

From: Brian Image [mailto:Brian.Image@rcmp-grc.gc.ca]
Sent: Wednesday, October 24, 2012 9:29 AM
To: Anderson, Kathy E JAG:EX
Cc: Kevin Jones
Subject: Re: ASD manual

Hi Kathy,

The ASD Operator course manual was revised in March 2011 by RCMP Traffic Services so you have the previous edition. I have attached the newest edition for your information.

Since the publication of this March 2011 edition we have discovered there is an error regarding the acceptable ambient temperature range for the Alco-Sensor IV DWF. Page 5 of the manual indicates the device can be used at ambient temperatures of 0 - 100 degrees C (and page 10 refers to ambient temperatures as low as 0 degrees C). This range of temperatures was taken from the operator manual published by the manufacturer and turns out to be incorrect. The manufacturer (Intoximeters Inc) made an error when converting the ambient temperature range in Fahrenheit to Celsius. The correct ambient temperature range is -18 - 40 degrees C.

Brian

Brian Image, B.Sc., R.T., C/M
Toxicology Services Section
Forensic Science & Identification Services
Phone: 604-264-3438
Fax: 604-264-3858

e-mail: brian.image@rcmp-grc.gc.ca>>> "Anderson, Kathy E JAG:EX" <Kathy.Anderson@gov.bc.ca> 10/23/2012 3:57 PM >>>
Hi Brian,
Can you please tell me what the date was of the last edition of the ASD manual? I have the Revised April 1996 version. If I don't have the most recent edition, I was wondering whether I would be able to get a copy from the lab?

Kathy Anderson
Manager, Adjudication and Training
Adminstrative Justice, Driver Fitness and Intervention
Office of the Superintendent of Motor Vehicles

Direct: 250-356-8068
BlackBerry: s. 15
Fax: 250-356-5577

Wilkinson, Anita JAG:EX

From: Caldwell, Arlene M JAG:EX
Sent: Tuesday, November 5, 2013 7:15 AM
To: Esposito, Tony JAG:EX; Turner, Kimberley JAG:EX
Cc: Burchnall, Shelly K JAG:EX; Anderson, Kathy E JAG:EX
Subject: RE: Mandatory training - for ACTION

Good morning! Well, in a perfect world, it would be very beneficial (essential?) that all IRP/ADP Adjudicators receive training in:

- Decision writing/making (as part of a Tribunal)
- ASD/Datamaster/Intox training by police (the Brian Image/Kevin Jones presentation or similar)
- Administrative Law (feel this is particularly necessary for any Adjudicators who have a law degree)
- Drivers' system (but only functions necessary/relevant to the work of an Adjudicator)

LSB Training:

- Assessing Credibility
- Mouth Alcohol
- Care or Control

Wish List:

We have talked before about doing practice decision writing sessions whereby each Adjudicator would be given the same file to write. Point behind that is to ensure consistency in decision writing. Of course, it's been too busy to even entertain such an idea but once we have the new staff on board and up and running it would be great if we could take the time to do such things. (Think those types of exercises are essential when training new staff too.)

Anyway, there's my two bits!

From: Esposito, Tony JAG:EX
Sent: Friday, November 1, 2013 4:17 PM
To: Caldwell, Arlene M JAG:EX; Handgraaf, Harjeet JAG:EX; Labelle, Myke JAG:EX; Piercy, Danielle JAG:EX; Turner, Kimberley JAG:EX
Cc: Burchnall, Shelly K JAG:EX; Anderson, Kathy E JAG:EX
Subject: Mandatory training - for ACTION

As you may recall from our QDI session with Sam, the Superintendent asked that we compile a list of required training for each employee in the OSMV.

Please provide Shelly and I with a list of required training for your employees by November 15th. The list should only include training that is necessary for your employees to be successful in their respective roles.

Thank you.

Tony Esposito

Manager of Adjudication
Office of the Superintendent of Motor Vehicles
Telephone: 250-387-2859
Fax: 250-356-6544
Email: Tony.Esposito@gov.bc.ca

Wilkinson, Anita JAG:EX

From: Teague, John JAG:EX
Sent: Tuesday, January 28, 2014 1:57 PM
To: Burchnall, Shelly K JAG:EX
Cc: Anderson, Kathy E JAG:EX; Esposito, Tony JAG:EX
Subject: FW: BAC Datamaster C Training Manual
Attachments: Certification Manual 2009.pdf

Shelly,

Brian Image from the Forensic Laboratory in Vancouver has supplied me with a current manual for the BAC DataMaster C breath testing instrument.

For your information and use as required.

John.

Sgt. John Teague
Police Liaison Officer
Office of the Superintendent of Motor Vehicles
Office: 250-356-6502
s.15

From: Brian Image [mailto:Brian.Image@rcmp-grc.gc.ca]
Sent: Tuesday, January 28, 2014 12:10 PM
To: Teague, John JAG:EX
Subject: BAC Datamaster C Training Manuals

Here they are. I sent the one Certification course manual and two Supervisors Manuals: One is the for the old 3 day Supervisor course which was discontinued in 2009, and another for the new IIM Supervisor course.

Cheers,

B

BAC DATAMASTER C

CERTIFICATION COURSE MANUAL

REVISED MARCH 2009

NOTICE

This manual has been prepared by the Vancouver Toxicology Services Section of the RCMP Forensic Science and Identification Service for the exclusive use of Qualified Technicians taking a BAC Datamaster C Certification Course. Information contained herein only refers to the BAC Datamaster C as configured for the Province of British Columbia using the options approved by the members of that section.

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CHAPTER A

THEORY

CHAPTER A - THEORY

INTRODUCTION

The BAC Datamaster C is a scientific instrument that determines the alcohol concentration of a person's *blood* by analyzing the amount of alcohol in the person's *breath* and reports the results in milligrams of alcohol in 100 millilitres of blood.

To understand how a breath alcohol concentration can correlate to a blood alcohol concentration, one must have some knowledge of lung physiology as well as the movement of gases inside the body, such as carbon dioxide and oxygen. These gases move into and out of the body via the respiratory tract. Air, containing oxygen, moves into the body through the nose and mouth, down the trachea, into the bronchi of the lungs and continues until it reaches the alveoli. The alveoli are tiny tissue sacs in the lungs which are richly supplied with blood from the heart. Gases can exchange between the alveolar airspace and the blood. It is here that oxygen moves from the alveoli into the blood and carbon dioxide moves from the blood into the alveoli, to be exhaled. The movement of alcohol from the blood to the breath occurs in the same manner as the movement of carbon dioxide (Figure 1).

Alcohol is a volatile liquid, which means it will easily evaporate from a liquid form into a gaseous form. When alcohol is ingested, it circulates throughout the body in the blood and when the blood comes in contact with the lung alveoli, the alcohol evaporates and enters the airspace. Therefore, when the gases in the lungs are exhaled, alcohol is present in the exhaled breath.

An **equilibrium** exists between the concentration of alcohol in the blood and the concentration of alcohol in the breath. This relationship is governed by the movement of alcohol from the blood surrounding the alveoli into the lung air. Ideal conditions exist for movement of alcohol from the blood into the breath, which include a large alveolar surface area between the blood and breath (approximately 55 square meters), the volatility of alcohol and a reasonably constant temperature (about 37° C) in the lungs. Not all of the alcohol in the alveolar blood will move into the airspace. Only a portion will move, which is dependent on the concentration of alcohol in the blood. In fact, the exchange of alcohol from the blood to the breath obeys a scientific law known as **Henry's Law**:

At a given temperature, the saturated vapour above a solution contains an amount of solute proportional to the amount of solute in the solution.

CHAPTER A - THEORY

In this instance, the saturated vapour is gaseous alcohol in the air, the solute is liquid alcohol and the solution is the blood and alcohol mixture. Therefore, at a given temperature, the amount of gaseous alcohol in the alveolar air is **proportional** to the amount of alcohol in the blood.

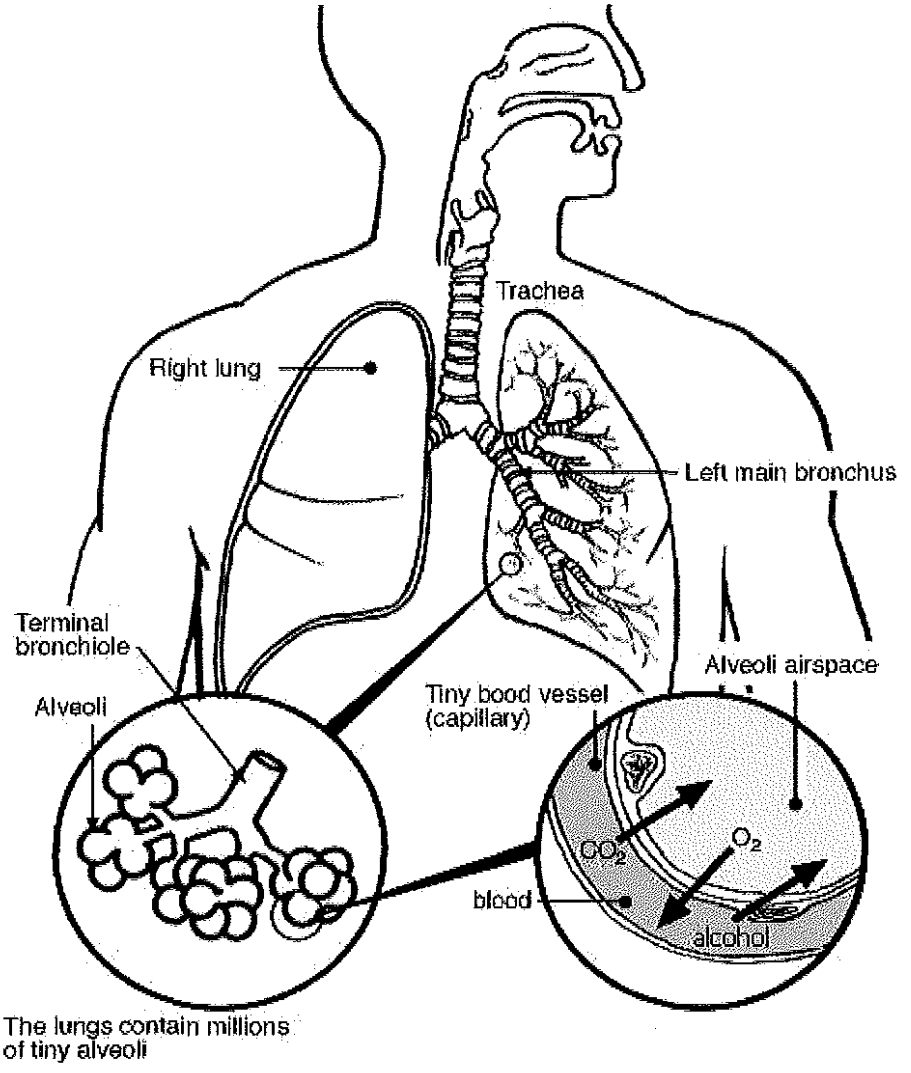


Figure 1: The lungs and the exchange of gases between the blood and the alveolar airspace

CHAPTER A - THEORY

Because the breath alcohol concentration is proportional to blood alcohol concentration, a ratio can be determined for the distribution of alcohol between the breath and the blood. This is called the **Blood / Breath Ratio** which is a constant for a given temperature. For the BAC Datamaster C, the value of the Blood/Breath ratio is 1:2100 at 34° C, which is equal to the temperature of the breath at the end of expiration, i.e. mouth temperature. Therefore, combining the Blood/Breath ratio and Henry's Law, it is possible to convert a breath alcohol concentration to a blood alcohol concentration because:

> **at 34° C, 2100 parts of deep lung air (alveolar air) contain the same amount of alcohol as 1 part blood.**

Studies have indicated that, in practice, this ratio is closer to 1:2400. However, this is not a concern for Law Enforcement purposes because 1:2100 will produce low results.

FACTORS AFFECTING THE BLOOD ALCOHOL CONCENTRATION

Physiological

1. Fever: Changes in body temperature will affect the Blood / Breath Ratio. The breath test result could be increased by approximately 6.5% for each degree Celsius increase in body temperature. Fever is the body's natural response to fight infection and illness. Normal body temperature is approximately 37°C and a person is thought to have a substantial fever when they reach temperatures of 39°C and above. In these instances the person would commonly display additional symptoms of illness such as shivering, sweating, complaints of aches and pains, etc.

2. Lung Disease: Studies have shown that a blood alcohol concentration determined by a breath sample from a subject with chronic broncho pulmonary disease to produce a blood alcohol result, will generally be lower than a blood alcohol concentration determined from a blood sample. This may be due to the fact that people with such a disease may not be able to provide a proper deep-lung air sample, which results in a low breath alcohol reading.

3. Blood/Breath Alcohol Ratio: As mentioned previously, studies have shown that the Blood to Breath Ratio is, in practice, closer to 1:2400. Therefore by using 1:2100 the BAC Datamaster C tends to underestimate the blood alcohol concentration.

CHAPTER A - THEORY

Instrumental

1. Truncation: As per the recommended procedures of the Canadian Society of Forensic Science Alcohol Test Committee, "readings of breath tests shall be truncated before being reported." This means that all readings will be rounded down to the lowest ten. For example: a breath test result of 99 mg% will be reported as 90 mg%. As a result of this, the truncation of breath test results could lower an instrumental reading a maximum of 9 mg%.

2. Calibration: Each instrument is calibrated in order to achieve an accurate result with every breath test. If the calibration is done incorrectly, then a subject breath test may be either falsely high or falsely low. To ensure that the instrument has been properly calibrated, an External Standard Test is performed with every breath test. Any calibration error would be detected during this test as the result would fall outside the expected range.

3. Mouth Alcohol: If an individual consumes alcohol immediately prior to providing a breath sample, contamination in the mouth can result in a falsely high breath test reading. In order to ensure that this does not occur, the instrument has a means of detecting mouth alcohol. In addition, a 15 minute pretest observation period is performed prior to every test to eliminate the possibility of mouth alcohol affecting the breath sample. This is discussed further in Chapter D - Observation Period And Interfering Substances.

4. Shallow Blow: When providing a breath sample, the subject must meet certain instrumental criteria known as the sample acceptance parameters. These parameters are in place to help ensure that a sample of deep lung, alveolar air is captured by the instrument. However, the instrument is still capable of accepting a breath sample that is not deep lung air, in other words, a shallow blow. If this occurs the BAC will be falsely low.

CHAPTER A - THEORY

INSTRUMENTAL ERROR AND ACCURACY

How reliable is the BAC Datamaster C result? This depends, in part, upon the accuracy (how close the result is to the true blood alcohol concentration), and the precision (the ability of the instrument to produce the same result a number of times). Precision is commonly referred to as **instrumental error**. The purpose of this section is to familiarize the technician with the accuracy and precision of the BAC Datamaster C and the relationship of the blood alcohol concentration with breath.

Instrumental Error (Precision)

The precision of every scientific instrument can be measured. This means that if a sample is tested numerous times, the result may not be the same for every test, but will fall within a specified range, which is called the instrumental error. The instrumental error of the BAC Datamaster C is ± 10 mg%. For example, a person with an actual BAC of 100 mg% could have a measured BAC as low as 90 mg% or as high as 110 mg%. Based on this range, the maximum allowable difference between two breath samples is 20 mg%.

Accuracy

The accuracy of a measurement is defined as how close a reading is to the true value. Since the BAC Datamaster C is based on low Blood/Breath Ratio, and because of truncation, the measured BAC will tend to underestimate the true BAC.

Proper Working Order

To ensure the BAC Datamaster C is in proper working order, as per Criminal Code requirements, it is tested prior to every breath test with an Alcohol Standard, by means of an External Standard Test. This test is performed prior to every subject breath sample and should produce a result of 100 mg%. As stated above, the instrumental error is ± 10mg%, and thus, the expected result can fall between the range of 90 mg% to 110 mg%. Therefore, if an External Standard Test is performed and the result is within the range of 90 - 110 mg% then the Qualified Technician can conclude the instrument is in proper working order.

CHAPTER B

FUNCTIONAL OVERVIEW

CHAPTER B - FUNCTIONAL OVERVIEW

BASIC PRINCIPLES OF INFRARED SPECTROSCOPY

Electromagnetic Energy

The type of energy that the BAC Datamaster C uses for determining the alcohol content in a breath sample is called **Infrared energy** or IR energy, which is a specific type of energy found within the **electromagnetic spectrum**. All the different types of energy found in this spectrum can be seen in Figure 1.

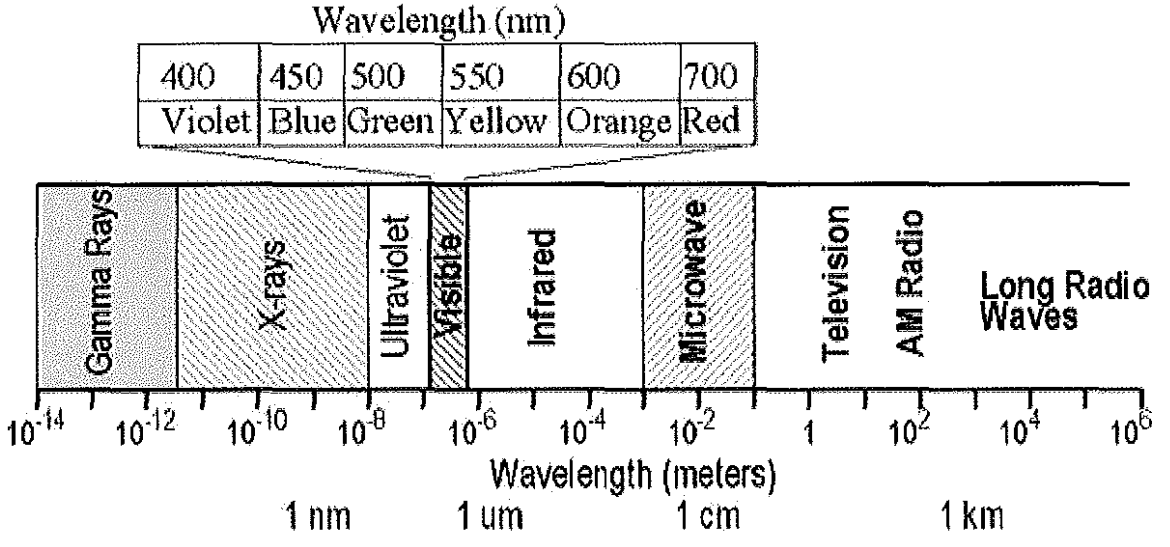


Figure 1 - The Electromagnetic Spectrum

One way to classify the different types of electromagnetic energy is through the use of wavelengths. Energy can be described using a wave model (Figure 2). Wavelength is the distance from peak to peak (or trough to trough) of the energy being measured.

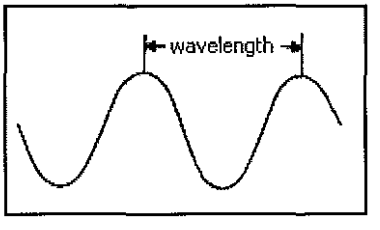


Figure 2 - Energy-Wave Model

The longest wavelengths are radio waves, the shortest are gamma rays and visible light is found in between. Visible light is made up of the different colours of the rainbow: violet, blue, green, yellow, orange and red, which is due to the different wavelengths of each colour of light.

CHAPTER B - FUNCTIONAL OVERVIEW

Infrared means "below red" and is found next to red visible light on the spectrum. However, because it is outside the visible range, it is not visible to the human eye. The scientific unit for wavelength can be expressed in a number of ways. Infrared energy falls in the range of 0.7×10^{-6} to 1.0×10^{-3} metres (m). This can also be written as 0.7 - 1000 micrometres (µm) which are also referred to as a "microns". Microns are the units that will be used in this course. Infrared light is used in many common household items, such as TV remote controls and security alarm systems however, it is also used in night vision goggles and in infrared photography.

The Ethanol Molecule

The ethanol (ethyl alcohol) molecule has a unique structure consisting of carbon, hydrogen and oxygen atoms. Ethyl alcohol has two carbon atoms, whereas methanol has one and isopropanol (rubbing alcohol) has three. Each of these atoms are held together with chemical bonds. Due to the nature of the bonds, they will absorb energy and the amount of energy absorbed depends on the different atoms at either end of the bond. As a result, there are certain wavelengths of IR energy that will be absorbed by the molecule and other wavelengths of IR energy that are not absorbed.

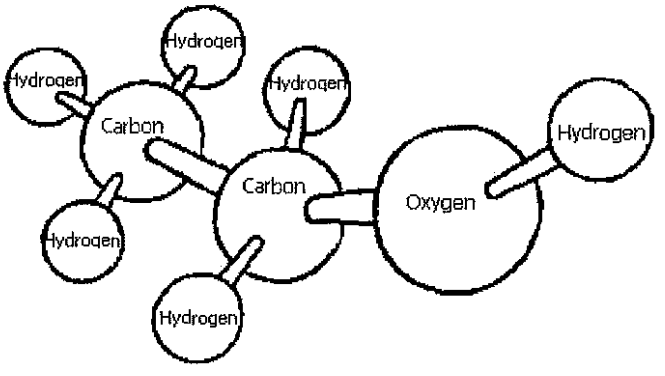


Figure 3 - The Ethanol Molecule

Alcohol absorbs a large amount of IR energy between the wavelengths 3.35 to 3.50 microns. Therefore, the BAC Datamaster C has been designed to measure infrared light at two specific wavelengths that fall within this range: 3.44 and 3.37 microns. Optical filters are used to isolate these single wavelengths (Figure 4).

CHAPTER B - FUNCTIONAL OVERVIEW

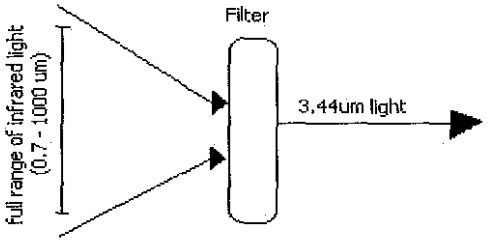


Figure 4 - Filtering IR light

When IR energy is passed through the sample chamber, the molecules of alcohol will absorb some of it, resulting in a decrease of IR energy. Therefore, by measuring the difference in IR light intensity, the concentration of alcohol in the sample can be determined. The relationship between the concentration of IR energy absorbed and the breath alcohol concentration is calculated using a scientific law, called the Beer-Lambert Law:

> **The amount of Infrared energy absorbed by the sample is proportional to the amount of alcohol in the breath sample.**

The Beer-Lambert Law is expressed as a scientific equation, which details that the final intensity of IR energy (I) is proportional to a number of variables including, the initial intensity of IR energy (I_0), a scientific constant expressing alcohol's absorption capabilities (a), the length that the IR energy must travel (b) and the concentration of the alcohol present in the sample (c).

Since all of these are known, the alcohol concentration can be determined using the equation:

$$c = \frac{\ln\left(I_0 / I\right)}{ab}$$

CHAPTER B - FUNCTIONAL OVERVIEW

THE INSTRUMENT

The BAC Datamaster C is a scientific instrument that determines the alcohol concentration of a person's *blood* by analyzing the amount of alcohol in the person's *breath* and reports the results in milligrams of alcohol in 100 millilitres of blood.

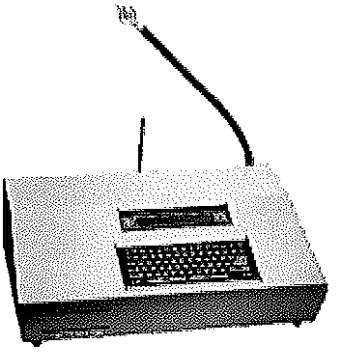


Figure 5 - The BAC Datamaster C

The BAC Datamaster C is manufactured by National Patent Analytical Systems of Mansfield, Ohio. The C refers to Canada. It was designated by the Attorney General of Canada as an "approved instrument" in the summer of 1994.

SYSTEMS OF THE BAC DATAMASTER C

There are three basic systems in the BAC Datamaster C:

Optical System

The optical system is the part of the instrument that utilizes the IR energy. It generates and detects the IR energy that is passed through the breath sample. Quartz is a type of glass that is used in many of the components of the optical system, as it allows IR energy to pass through it, without any absorption. The Optical System consists of numerous components, including (Figure 6):

1. IR Source: The source of the IR energy is a Kanthal infrared light source. The Infrared light emitted by this lamp is not visible to the human eye.

2. Sample Chamber: The sample chamber is made of highly polished aluminum and is folded to maximize the path length that the energy will follow, but to minimize the size of the sample chamber. It functions in both the Optical System, as the path of IR energy passes through the sample chamber, as well as in the Breath/Airflow system, as it contains the breath or air sample. It is heated to 50 ± 5°C in order to prevent condensation from the breath sample.

CHAPTER B - FUNCTIONAL OVERVIEW

3. Quartz Windows: Windows are located at the beginning and the end of the sample chamber. These windows allow IR energy to pass into and out of the sample chamber.

4. Mirrors: To ensure that the IR energy travels efficiently through the sample chambers, mirrors are located at the folds in the chamber to reflect the energy along the correct path.

5. Focusing Lens: The IR energy that travels through the sample chamber is a broad beam. It needs to be focused into a smaller beam to ensure proper detection.

6. Calibration Plate: A calibration plate is used as an Internal Standard to check the optical system of the instrument. Unlike all the other components, which are used for every test, the calibration plate is used ONLY during the Internal Standard Test. The calibration plate absorbs a small amount of energy. The Internal Standard Test is performed with ambient air in the sample chamber and therefore, the instrument will detect a difference in IR energy due only to the absorption of the energy by the calibration plate. This difference in energy is a known value. During the Internal Standard Test, the instrument compares the measured result to a known value programmed into the instrument. If the result is within the range, it produces a result of "VERIFIED," which demonstrates that the optical system is working properly. If not in range, the instrument produces a result of "Calibration Error."

7. Chopper Wheel: A spinning Chopper Wheel interrupts the IR beam on its way to the detector, much like a strobe, to provide a pulsed signal needed for analysis.

8. Primary/Secondary Filters: The IR energy exiting the sample chamber consists of many different wavelengths. The energy must now be filtered so that only the two selected wavelengths, 3.44 and 3.37 microns, are allowed to pass through onto the IR detector. To accomplish this, both the Primary Filter and the Secondary Filter are moved into the energy path at different times. These two filters are used to detect interfering substances.

9. IR Detector: The IR detector is the end point of the IR energy path as it converts the IR energy into an electrical signal which can be used to determine the result. The detector is cooled to 0°C to increase the sensitivity and stability of the signal.

CHAPTER B - FUNCTIONAL OVERVIEW

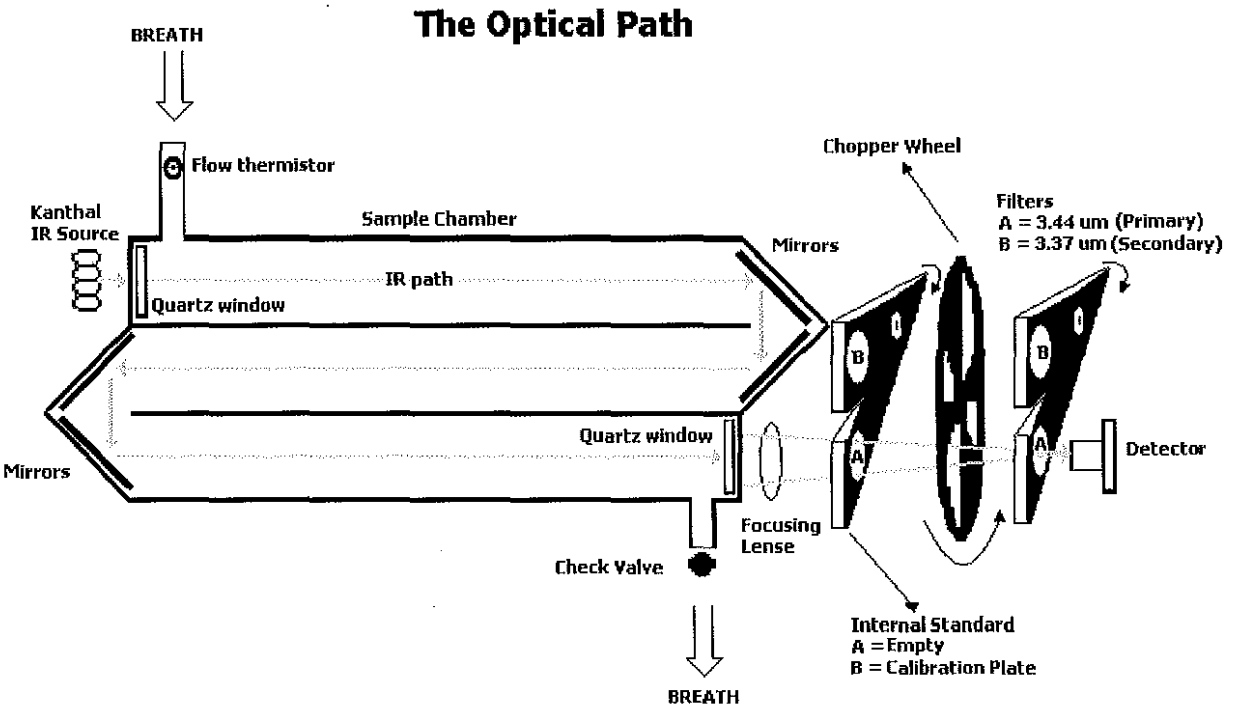


Figure 6 - The Optical System of the BAC Datamaster C

The Breath/Air Flow System

The Breath/Air Flow System is used to collect samples of deep lung air, room air, or External Standard vapour (Figure 7).

1. External breath tube: The breath tube is attached to the instrument and heated to prevent condensation of the breath sample. The QT is responsible for checking that the breath tube is warm to the touch for the entire length of the tube prior to each breath test.

2. Flow Thermistor: located just past the breath tube, it measures the flow rate of breath or air entering the instrument through the breath tube. Flow is measured to determine when the minimum flow rate is met by the subject, to help ensure delivery of deep lung air. The flow rate can be multiplied by the time of sample delivery to give the volume of air or breath.

CHAPTER B - FUNCTIONAL OVERVIEW

3. Sample chamber: the sample chamber contains the sample of breath or air that is tested using the infrared energy. It is the only component that is used in both the optical and breath/airflow systems.

4. Five-Way Valve: the five-way valve directs the air or breath through the instrument. It has two positions: the not fired (inactivated) position in which the flow of breath/air originates from the breath tube, or the fired (activated) position in which the flow of air originates from the simulator.

5. Pump/Snubber: The pump is used to draw room air and External Standard vapour into the instrument. The snubber functions to smooth out the pulses of air created by the pump.

6. One way valves: there are two one way valves along the air/breath pathway that ensure that the subject can not "suck back" the breath he or she has blown into the instrument. One is located in the breath tube, the other is the check valve. An additional one way valve is also found in the external mouthpiece, which is attached to the breath tube prior to each breath test.

7. Exits: there are two ways that breath or air can exit the instrument. The calibrate port is the exit that is used during the blank pathway, as air is drawn through the pump and vented out of the instrument. The check valve is the exit used during the subject test, as air is being blown into the instrument. The check valve is located inside the instrument and cannot be observed or accessed unless the cover the BAC Datamaster C is removed.

8. Simulator: The simulator is an external accessory to the BAC Datamaster C. It is attached to the instrument via the vapour in and pump out ports located on the back panel. The simulator is connected to the instrument in a closed loop. It is a sealed container that contains the External Standard solution, which consists of a known concentration of alcohol and has been analysed to ensure it that it is suitable for use with the instrument. The simulator stirs and heats this solution to 34.0 ± 0.2 °C. The air above the solution is tested by the instrument, during the External Standard Test, to determine if the instrument is functioning properly. During the operation of the BAC Datamaster C, numerous checks are performed on the simulator, which are discussed further in Chapter C - Operational Procedures.

CHAPTER B - FUNCTIONAL OVERVIEW

The Breath/Air Pathways

There are three pathways that air or breath can travel inside the instrument. A summary of the pathways is given below:

	Ambient Air Pathway	External Standard Pathway	Subject Breath Pathway
Pathway	External Breath Tube Flow thermistor Five-Way Valve (not fired) Sample Chamber Check Valve Pump/snubber Five-Way Valve (not fired) Calibrate Port	Simulator Five-Way Valve (fired) Sample Chamber Check Valve Pump/snubber Five-Way Valve (fired) Simulator	External Breath Tube Flow Thermistor Five-Way Valve (not fired) Sample Chamber Check Valve
Contains	Ambient Air	External Standard Vapour	Subject Breath
Purpose	Cleans out sample chamber Establishes a zero reading Tests ambient conditions	Ensures instrument is working properly	Captures subject's breath
Test	Ambient Test Blank Test Internal Standard Test	External Standard Test	Subject Test

During the **Ambient Air Pathway**, ambient air is drawn into the instrument, to ensure that any contaminants inside the sample chamber are purged. During this purge, the ambient conditions are monitored to ensure that there is nothing in the room air to interfere with the sample. Three Ambient Tests are performed, one at the beginning of the testing sequence, one between the External Standard Test and the Subject Test and one at the end of the testing sequence. Once the purge is complete a Blank Test is performed to ensure that there is nothing within the sample chamber (up to 3 mg%). After the first Blank Test, the same ambient air contained within the sample chamber is used during the Internal Standard Test.

During the **External Standard Pathway**, air is drawn from the simulator into the instrument and then returned to the simulator, in a closed loop. The External Standard is tested each time a subject test is initiated, to determine that the instrument is functioning properly. The closed loop allows numerous samples to be taken without having to replace the standard

CHAPTER B - FUNCTIONAL OVERVIEW

after each test. The External Standard can be used for a maximum of 50 tests or 2 weeks, whatever comes first.

During the **Subject Breath Pathway**, the subject provides the force with his or her lungs to push breath through the instrument. Therefore, the pump is not activated and the check valve is open. The flow and the volume of the subject's breath are monitored to ensure that the sample acceptance parameters are achieved, and that a sample of deep lung air is delivered to the instrument.

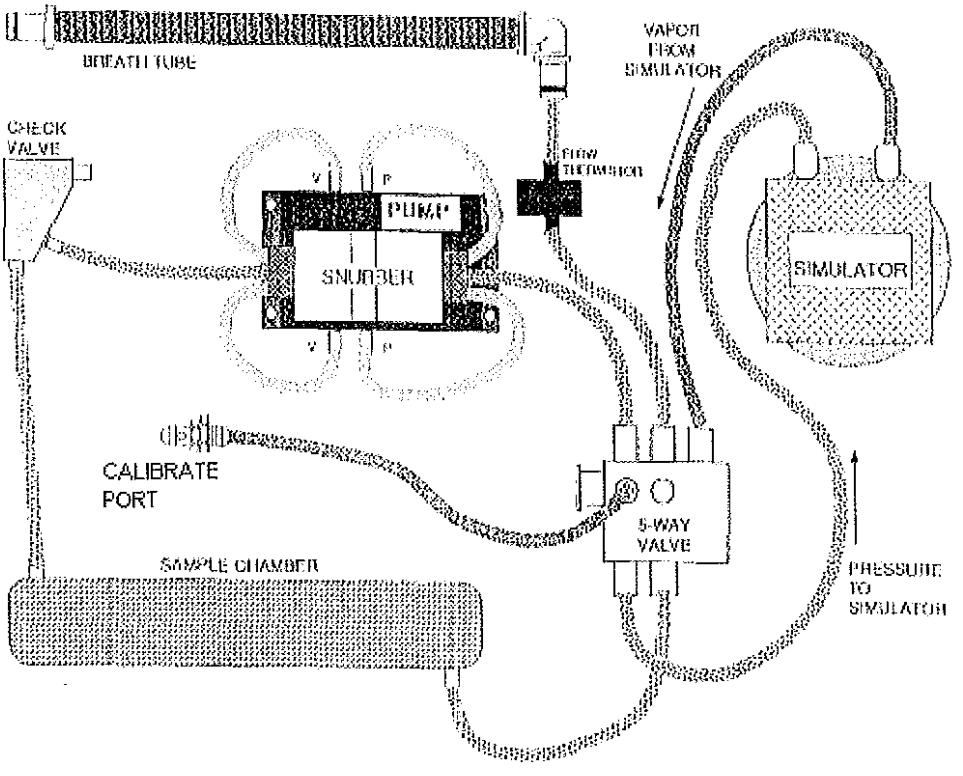


Figure 7 - The Breath/Airflow pathway of the BAC Datamaster C

CHAPTER B - FUNCTIONAL OVERVIEW

Electronics and Microprocessor System

The electronics and microprocessor system controls and monitors all instrumental systems to ensure they are functioning properly. Two of the main components include:

1. Erasable Programmable Read Only Memory (EPROM): The EPROM contains all of the programmed functions of the instrument. There is a specific EPROM custom-made for each state or province, as the breath testing procedure will vary among them and different information is required to be entered by the keyboard.

2. Random Access Memory (RAM): The RAM chip stores the data and results of each test. The RAM holds this information until the results are printed and then will clear itself once the RUN button has been pressed to initiate a new test.

SAMPLE ACCEPTANCE PARAMETERS

The BAC Datamaster C is designed to capture deep lung air, which helps to ensure that an accurate blood alcohol concentration is reported. If a shallow blow is delivered into the instrument, then the reported result will be falsely low. The parameters that must be met for the instrument to accept and capture a sample of air are as follows:

1. A minimum **FLOW RATE** of 3.7 L/min
2. A minimum **VOLUME** of 1.5 L
3. There must be a **PLATEAU** in the BAC reading
4. A decrease in **FLOW RATE** below 3.7 L/min

When the subject begins to provide a sample, his or her lungs supply the force that moves the breath into the instrument. The rate of the breath movement is measured by the flow thermistor. When the instrument detects that the minimum flow rate has been met, two changes occur:

1. The audible beeping heard when "PLEASE BLOW" is displayed becomes a steady tone
2. The flashing "PLEASE BLOW" stops flashing and is displayed steadily

The volume of sample provided into the instrument is determined by multiplying the flow rate by the amount of time that the subject provides a sample.

While the subject is blowing, the instrument is constantly measuring the alcohol content of the breath inside the sample chamber. The air that first enters the chamber originates from the mouth, followed by the air from the upper respiratory tract and finally, as the

CHAPTER B - FUNCTIONAL OVERVIEW

subject continues blowing, **deep lung air from the alveoli**. The air in the mouth and upper respiratory tract will contain a lower concentration of alcohol compared to the deep lung air, and therefore the QT will observe a gradual increase in the blood alcohol concentration on the instrument display. Eventually, the breath will contain only the deep lung air and the breath alcohol concentration will plateau (Figure 8). This is the desired sample for determining the blood alcohol concentration.

The last phase of the sample acceptance parameters ensures that the subject exhausts all of the air in his or her lungs. Therefore, the instrument will not accept a sample until the flow rate drops below 3.7 L/min, signifying the slowing of the sample delivery that occurs when the subject runs out of air.

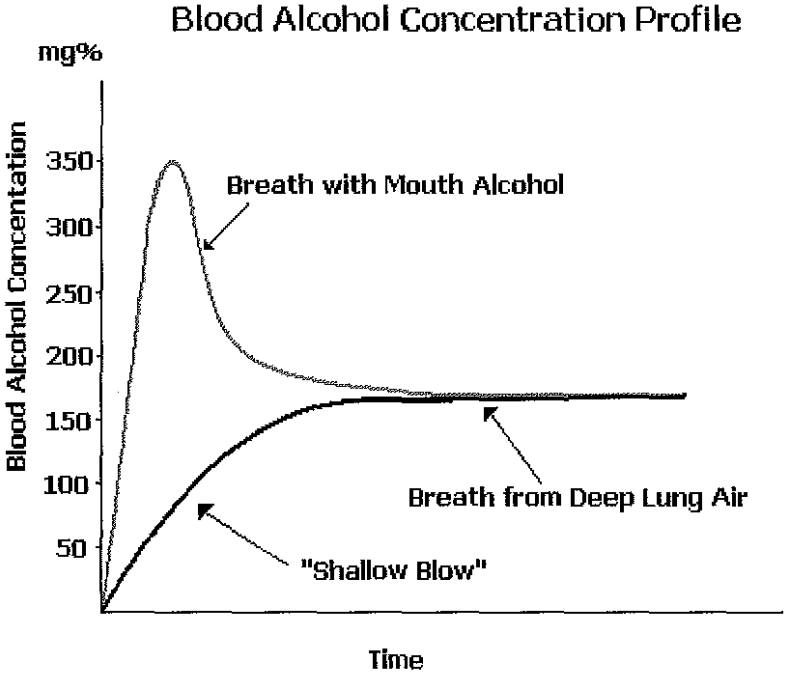


Figure 8 - BAC profile while subject provides breath into instrument

CHAPTER B - FUNCTIONAL OVERVIEW

Acceptable vs. Suitable Samples

Despite these sample acceptance parameters, the instrument may still accept a shallow blow, or a sample of breath that is not entirely deep lung air. Therefore the Qualified Technician must be able to differentiate between a suitable sample and an acceptable sample.

An **acceptable** sample is any sample that is accepted by the instrument. In most cases, this will be a sample of deep lung air, but it could also be a shallow blow.

A **suitable** sample consists of two samples that are no more than 20 mg% apart. This helps to ensure that an accurate BAC is reported.

CHAPTER C

OPERATIONAL PROCEDURE

CHAPTER C - OPERATIONAL PROCEDURE

The BAC Datamaster C will give reliable results when operated by a properly trained person following the operational procedure outlined in this chapter.

A PROPER BREATH TEST (PBT)

Our goal in performing breath tests on a subject is to obtain a proper breath test or a PBT.

A **PBT** consists of the following four items:

1. **2 Internal Standard** tests that are **VERIFIED.**

2. **2 External Standard** tests that are in the range of **90 to 110 mg%.**

3. **2** breath test readings that agree **within 20 mg% of each other**.

4. **2 properly completed** breath test tickets.

With a PBT, the proper results of the Internal and External Standard Tests ensure the instrument is working correctly and accurately, while the 2 readings within 20 mg% of each other ensure that suitable samples of breath were obtained that were free of mouth alcohol. The properly completed breath test tickets will give the court confidence that the Qualified Technician conducted the tests properly.

BREATH TEST PROCEDURE

There are 4 phases to the breath test procedure: observation period, data entry, breath test analysis and the final check.

Phase 1: Observation Period

The subject must be observed for at least 15 minutes before each breath test to ensure there is no mouth alcohol that could give a falsely high reading. Please see **Chapter D** for a complete discussion of the procedure for conducting the observation period.

CHAPTER C - OPERATIONAL PROCEDURE

Phase 2: Data Entry

While operating the instrument, the Qualified Technician is required to provide information by writing onto the breath test ticket as well as entering information with the instrument keyboard.

1. Recording Hand written information (Figure 1):

   A. Record the location in the appropriate box on the breath test ticket.

   B. Verify the subject's mouth is clear of foreign materials and then check off the appropriate box on the breath test ticket.

   C. Record the time the observation period begins and record the name of the person performing the observation in the appropriate boxes on the breath test ticket. Ensure this person is aware of proper observational procedures.

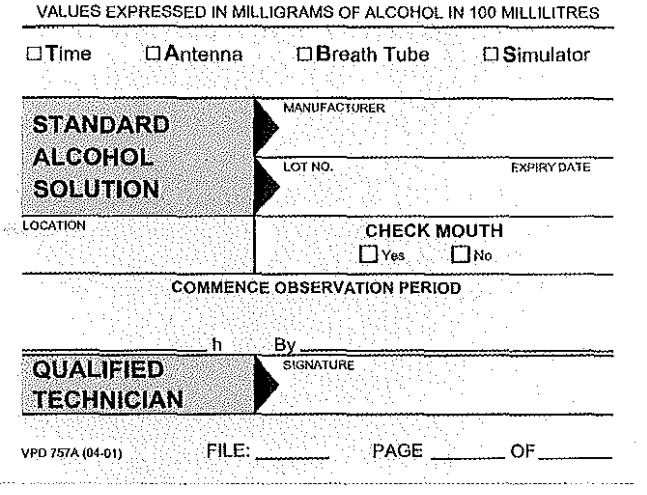


Figure 1 - Breath Test Ticket (Bottom Half)

   D. Record the name of the manufacturer and the lot number of the Ethyl Alcohol Standard on the breath test ticket in the appropriate boxes. The manufacturer's name and lot number will be found on the simulator tag (Figure 2) attached to the instrument or simulator.

CHAPTER C - OPERATIONAL PROCEDURE

E. Record this expiry date on the breath test ticket in the appropriate box. The expiry date of the external standard is indicated on the simulator tag (Figure 2).

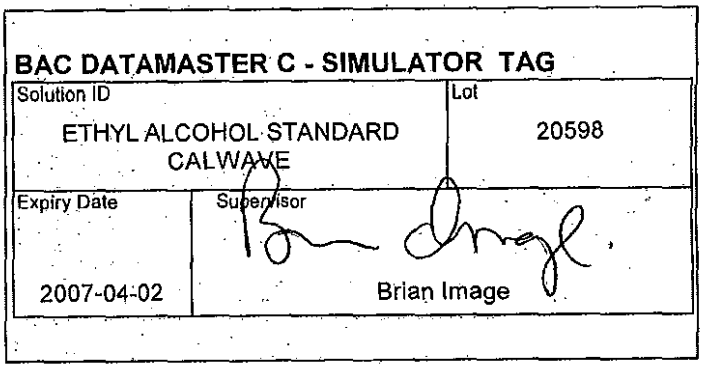
External Standard Solution Expiry:

i. This solution can be used for 14 days or 50 tests, which ever comes first, and will expire at midnight on the last day.

ii. The instrument keeps track of the expiry date and number of tests completed automatically and will not allow a breath test to commence if the solution is expired.

iii. If the solution is expired, the display will indicate a flashing CHANGE EXTERNAL STANDARD status message.

Figure 2 - Simulator Tag



F. Record page numbers.

CHAPTER C - OPERATIONAL PROCEDURE

G. Perform TABS and record the checks in the appropriate boxes on the breath test ticket. TABS is an acronym to remind the Qualified Technician of the pre-test checks that ensure the instrument is ready to perform a test.

TABS:

i. Ensure the display reads "READY - PUSH RUN", that the date and **T**ime are correct and that the simulator counter reads less than 48. Compare the BAC Datamaster C time to the Investigator's time and inform the Investigator of any difference.

ii. Check that the RFI **A**ntenna is securely in place.

iii. Check that the **B**reath tube is warm to the touch for the entire length.

iv. Confirm that the **S**imulator:

a. temperature is between 33.8 °C and 34.2 °C.

b. tag is in place and signed by your supervisor.

c. solution is not expired.

d. information recorded on the simulator tag (Figure 2) is consistent with the information in the Certificate of an Analyst (Figure 3) posted nearby to ensure that the Ethyl Alcohol Standard is suitable for use with the BAC Datamaster C.

CHAPTER C - OPERATIONAL PROCEDURE

CERTIFICATE OF AN ANALYST
(Alcohol Standard)

CERTIFICAT DE L'ANALYSTE
(Alcool type)

I,
Je soussigné, **Nicole Leah Carriere**

a person designated pursuant to subsection 254(1) of the CRIMINAL CODE of CANADA by the Attorney Generals of British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Nova Scotia, New Brunswick, Prince Edward Island, Newfoundland and Labrador, and the Attorney General of Canada for the Yukon Territory, the Northwest Territories and Nunavut, as an analyst,

en ma qualité de personne désignée comme analyste en vertu du paragraphe 254(1) du CODE CRIMINEL du CANADA par le procureur général de la Colombie Britanique, l'Alberta, la Saskatchewan, le Manitoba, l'Ontario, la Nouvelle-Écosse, le Nouveau-Brunswick, l'Île-du-Prince-Edward, Terre-Neuve et Labrador, et le procureur général du Canada pour le territoire du Yukon, les territoires du Nord-Ouest et Nunavut,

DO HEREBY CERTIFY:

That I made an analysis of a sample of an alcohol standard identified as:

ATTESTE PAR LA PRÉSENTE:

Que j'ai effectué une analyse d'un échantillon d'alcool type identifié comme:

ETHYL ALCOHOL STANDARD

STANDARD D'ALCOOL ÉTHYLIQUE

CALWAVE Lot 20598

intended for use with an approved instrument, as defined in subsection 254(1) of the CRIMINAL CODE of CANADA, and that the sample of the alcohol standard analyzed by me was found to be suitable for use with an approved instrument

conçu pour être utilisé avec un alcootest approuvé au sens du paragraphe 254(1) du CODE CRIMINEL du CANADA, et qu'il s'est révélé que l'échantillon d'alcool type analysé par moi convenait bien pour l'utilisation avec un alcootest approuvé

on the **29th day of June, 2005.**

le 29e jour de juin 2005.

I FURTHER CERTIFY:

That the statements in this certificate are true to the best of my skill and knowledge.

J'ATTESTE DE PLUS:

que les déclarations dans ce certificat sont véridiques au meilleur de ma connaissance et de mes aptitudes.

Dated this **29th day of June, 2005,**
at Winnipeg, in the Province of Manitoba.

Fait ce **29e jour de juin 2005,**
à Winnipeg, dans la province du Manitoba.

N.L. Carriere
Analyst / Analyste

NOTICE OF INTENTION TO PRODUCE CERTIFICATE

To:
À: _____

Take notice that, pursuant to subparagraph 258(1)(f) and subsection 258(7) of the CRIMINAL CODE of CANADA, the prosecution intends to produce in evidence the original certificate, a copy of which appears above.

AVIS DE L'INTENTION DE PRODUIRE LE CERTIFICAT

of
de _____

En conformité avec le sous-alinéa 258(1)(f) et le paragraphe 258(7) du CODE CRIMINELdu CANADA, avis vous est donné que la poursuite a l'intention de produire en preuve l'original de ce certificat dont une copie apparaît ci-dessus.

Dated this _____ day of _____, 20____
Fait ce _____ jour _____

Signature of person serving this notice for the prosecution
Signature de la personne qui signifie l'avis pour la poursuite _____

Figure 3 - Certificate of an Analyst

CHAPTER C - OPERATIONAL PROCEDURE

2. Use data prompts to enter information utilizing the instrument keyboard:

   A. Push the **RUN** button. When prompted for the **PASSWORD**, type **"OPERATOR."** This will initiate an internal check of the instrument and computer program. The instrument will then display **INSERT TICKET**. Insert the completed breath test ticket face down in the lower left hand slot on the front of the BAC Datamaster C.

   B. The BAC Datamaster C will then sequentially display 6 data prompts. After each answer, press the return key to advance the display to the next data prompt.

Data Prompt 1: 

i. Last, first, and middle names should be separated by a forward slash as shown above.

Data Prompt 2: 

i. Alpha and/or numeric characters can be entered.

ii. If the driver's licence number is unknown enter FTP (failed to produce).

Data Prompt 3: 

i. Last, first, and middle names should be separated by a forward slash.

Data Prompt 4: 

i. Instrument will accept Y or N only.

CHAPTER C - OPERATIONAL PROCEDURE

Data Prompt 5: SIM TEMP 33.8c - 34.2c?

i. When the BAC Datamaster C shows the above display, check the simulator solution temperature.

ii. When the temperature is between 33.8°C and 34.2°C inclusive, type **Y** for yes.

iii. If the temperature is outside of the acceptable range, type N for no, **do not proceed** with a test and wait for the instrument to return to READY - PUSH RUN.

Data Prompt 6: REVIEW DATA? < Y/N >

i. **Always REVIEW DATA after data is entered or corrected**, type **Y** for yes. The first question will reappear. Pressing the return key advances the display to the next question. To correct data, overtype it.

ii. To begin the test sequence, type **N**.

Phase 3: Breath Test Analysis

Once the breath test sequence is initiated, the instrument will sequentially display the following:

AMBIENT TESTING

The pump turns on and room (ambient) air is drawn through the breath tube into the instrument, as per the Ambient Air Pathway and analyzed to check the stability of the detector and establish a new detector baseline. If the new baseline cannot be established, an **AMBIENT FAIL** status message will occur, the test will be aborted, and the ticket will be printed with **AMBIENT FAIL**. This step will be omitted if ambient testing has been completed within the preceding 10 minutes.

CHAPTER C - OPERATIONAL PROCEDURE

PURGING 0

The pump turns on and room air is drawn through the breath tube into the instrument, as per the Ambient Air Pathway, to flush out the sample chamber and all the internal tubing. The air exits through the calibrate port. If the sample chamber cannot be flushed properly, or if an excessive amount of alcohol is detected in the room air, an **AMBIENT FAIL** status message will occur, the test will abort, and the ticket will be printed with **AMBIENT FAIL.**

AMBIENT ZEROING

The pumps turns off and the instrument detector establishes new zero references for the primary and secondary filters.

BLANK TEST

The instrument measures the zero reference established for the primary filter in the previous step and the blank test result will be printed on the breath test ticket after the test sequence has been completed. The maximum allowed result is 3 mg% and if this is exceeded, the test will be aborted, and a **BLANK ERROR** status message will be printed on the ticket.

INTERNAL STANDARD CHECK

The Internal Standard check monitors the optical components of the instrument using the calibration plate. The calibration plate absorbs IR energy which will produce a non-zero result when it is placed in the light path. This result is compared to an amount that was programmed into the memory of the instrument at the last calibration. If it is not within the acceptable tolerance, the **CALIBRATION ERROR** status message will be printed on the breath test ticket. If this test is successful, the status message **VERIFIED** will be printed on the breath test ticket after the test sequence has been completed.

CHAPTER C - OPERATIONAL PROCEDURE

EXTERNAL STANDARD 101

During the External Standard Test, the pump turns on, the 5 way valve fires, and air bubbles through the solution in the simulator as per the External Standard Pathway, while the instrument analyzes the alcohol laden air with the primary filter.

ANALYZING

The instrument display indicates ANALYZING while the secondary filter is inserted into the path of IR light and the alcohol laden vapour from the external standard test is analyzed with the secondary filter.

TEST RESULTS
ALCOHOL 101

The external standard test result that appears on the display and on the breath test ticket is not truncated. A test result, in the acceptable range of 90 - 110 mg%, verifies the instrument is operating properly and is accurately calibrated. A test result outside of the acceptable range will cause the test sequence to abort immediately, and the **SIMULATOR OUT OF RANGE** status message is printed on the breath test ticket. After the External Standard Test, the instrument has to be flushed out, as per the Ambient Air Pathway, and a second blank test performed to ensure the sample chamber is cleared of any residual alcohol vapour, before the subject test can be performed.

PURGING 0

AMBIENT ZEROING

CHAPTER C - OPERATIONAL PROCEDURE

BLANK TEST

After the second blank test is completed, the instrument pauses and a data prompt is displayed requiring action from the operator in order for the test sequence to continue to the next step.

Data Prompt 7: **SUBJECT REFUSE? < Y/N >**

i. The Qualified Technician has one minute to type in **Y** or **N**, otherwise the instrument will time out, the display will return to **READY - PUSH RUN**, and no ticket will be printed.

ii. If subject refuses to provide a breath sample, type **Y** and the test sequence will be aborted and the **REFUSED** status message will be printed on the ticket.

iii. If subject consents to the breath test, type **N** and the instrument will proceed to:

PLEASE BLOW

The BAC Datamaster C displays a flashing **PLEASE BLOW** and a beeping tone is heard.

Obtaining a Breath Sample

1. Shake mouthpiece to ensure one way valve is working properly (should rattle). Remove the mouthpiece from plastic bag. Use the bag to avoid touching the mouthpiece, and firmly insert the mouthpiece into the breath tube. Discard mouthpiece after each use by using the plastic bag to remove the mouthpiece from the breath tube.

2. Instruct the subject to provide a steady, continuous breath sample through the mouthpiece. As the subject complies, the message **PLEASE BLOW** will stop

CHAPTER C - OPERATIONAL PROCEDURE

flashing and the beeping tone will change to a steady tone. These two changes mean the subject has exceeded the minimum flow rate.

3a. If the subject fails to meet any of the sample acceptance parameters in the 2.5 minute sample acceptance window, then the instrument will proceed to the following data prompt:

Data Prompt 8: **SUBJECT REFUSE? < Y/N >**

A. If the Qualified Technician wishes to give the subject another opportunity to provide a sample, **N** is typed. The instrument prints a breath test ticket with an **INCOMPLETE** status message. The Qualified Technician should then start a new breath test sequence.

B. If the Qualified Technician decides the subject is refusing to provide a breath sample, **Y** is typed and the test sequence is aborted and the **REFUSED** status message is printed on the ticket.

C. The Qualified Technician has one minute to type in **Y** or **N**, otherwise the instrument display will return to **READY - PUSH RUN**, and no ticket will be printed.

3b. If the subject has met all of the sample acceptance requirements, the instrument will automatically analyze the breath sample.

ANALYZING

The instrument display indicates ANALYZING while the secondary filter is inserted into the path of IR light and the breath sample is analyzed with the secondary filter. The results of the analyses with the primary and secondary filters are compared and if they differ by more than 10 mg%, the **INTERFERENCE DETECTED** status message will be displayed and printed on the breath test ticket.

If the two results differ by 10 mg% or less, then an audible beep will sound and the following will be indicated on the display:

CHAPTER C - OPERATIONAL PROCEDURE

After the breath sample has been analysed, the instrument will perform a final purge to clear the sample chamber.

After the breath test analysis phase is finished, the breath test results are displayed and the ticket is printed. The ticket will automatically advance though the upper left hand slot on the front of the instrument. Remove the ticket only after the printer has stopped.

Wait the required time between tests (15 minutes minimum specified by the Criminal Code and 17 minutes minimum specified by breath testing policy), then proceed with a second breath test.

Phase 4: The Final Check

Once a Proper Breath Test has been obtained, review all the breath test tickets to ensure that all of the information is correct, place your signature on the appropriate line at the bottom of each ticket, and complete the total number of pages for each of the tickets.

CHAPTER C - OPERATIONAL PROCEDURE

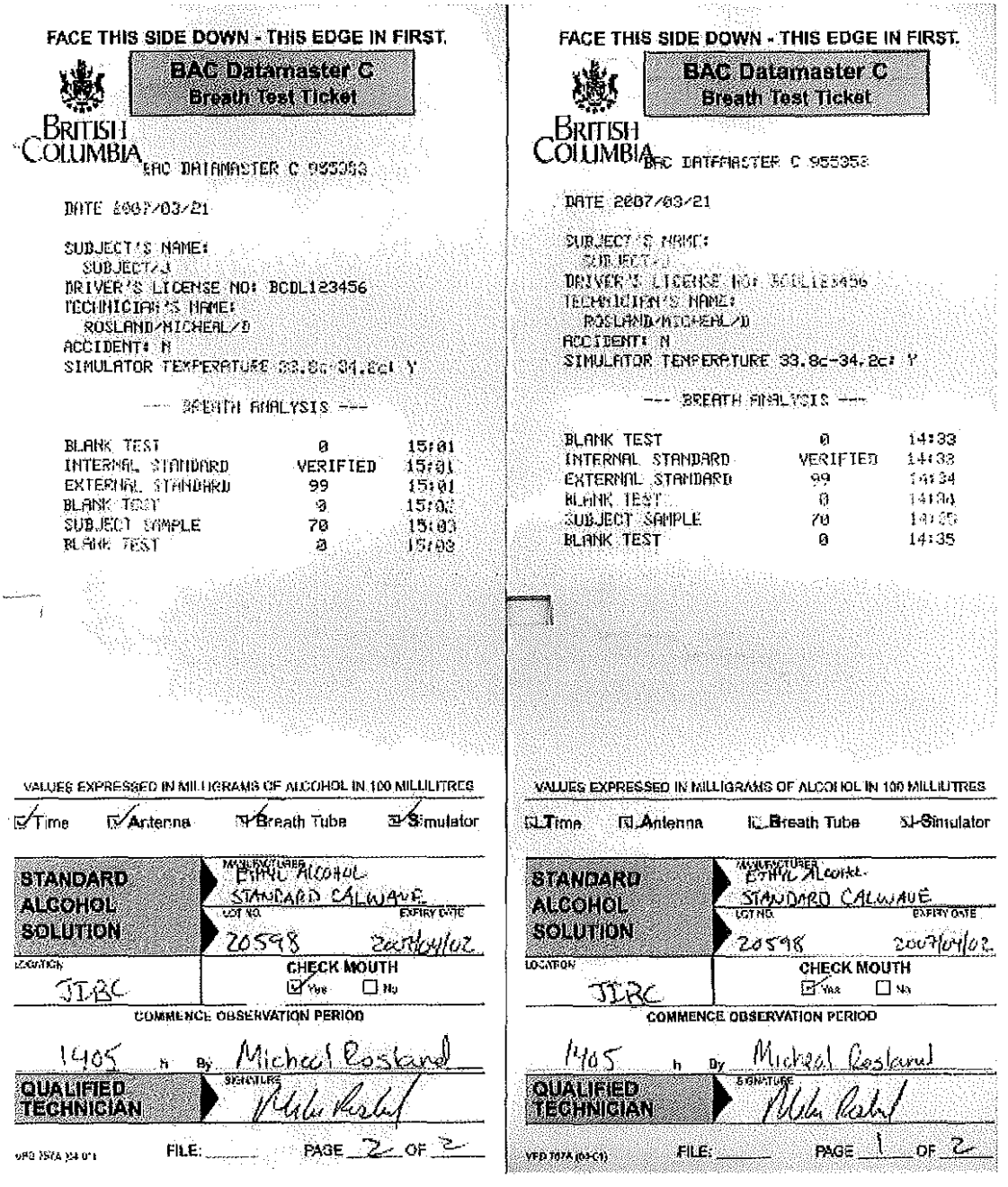


Figure 4 - A Proper Breath Test

CHAPTER C - OPERATIONAL PROCEDURE

SPECIAL PROCEDURES

3 Test Situations

In the majority of breath test analyses, only 2 tests will be needed to satisfy the 20 mg% requirement for a PBT. However, in a small number of cases a third test will be required. The third test will be conducted in the same way as all other breath tests, but at the conclusion of the testing a certificate will not be issued if there are more than two numerical results. Status messages are NOT considered numerical results.

In a 3 test situation where all results are numerical, one of the breath tests is either too low or too high compared to the other 2 breath tests. If the instrument is functioning accurately, the breath samples are deep lung air, and there is no mouth alcohol contamination, then all breath samples taken should be within 20 mg% of each other.

In most 3 test situations the outlying test result is too low because of a shallow blow. Recall that the sample acceptance parameters of the instrument are designed to collect deep lung air for analysis, and while these parameters are successful on the majority of subjects, there will occasionally be instances where a shallow blow is accepted for analysis.

In some 3 test situations the outlying test result will be too high. This kind of situation can be more difficult to explain in court. One possibility is that the outlier is too high because of mouth alcohol caused by an undetected burp during the observation period. However, an alternative explanation may be that the two lower test results are shallow blows.

Refusal Situations

Refusals can generally fall into 2 different categories: unequivocal and equivocal refusals.

1. Unequivocal Refusals: These are situations in which the subject states that they will not provide a breath sample. By recording these statements, it is usually a simple and straightforward task for the Qualified Technician to provide sufficient evidence to prove a refusal charge.

2. Equivocal Refusals: These situations can be more difficult to prove, because the subject never verbally refuses to provide a breath sample. The subject may pretend to co-operate but never provides sufficient breath to satisfy the sample acceptance parameters. Qualified Technicians must be prepared to provide abundant evidence in court. They must show that they gave the subject several

opportunities to blow, and clear blowing instructions. Operators should bear in mind that the 2.5 minute window does not sound like a long time to the courts, even though it will seem like a long time when you are trying to coax a sample from an un-cooperative subject.

One of the significant problems in equivocal refusals is proving that the instrument was capable of accepting a breath sample. It may be advisable to conduct a breath test on yourself to demonstrate that the instrument was capable of accepting a breath sample.

The No Volume (NV) Key

The sample acceptance parameters have been designed so that the average person is able to easily provide a sample of deep lung air. However, some people of small stature or with impaired lung function may encounter some difficulty in meeting the sample acceptance parameters. If a subject is honestly trying to provide a breath sample but cannot meet these parameters, you may use the **NV** key to force sample acceptance at the moment the key is pressed. This key should not be used in refusal situations.

When using the **NV** key, give clear instructions on how to blow, and encourage the subject by saying "keep blowing, keep blowing...etc." Allow the subject to try blowing several times before using the **NV** key. The qualified technician must be cognisant of the BAC on the display and only press the **NV** key when the BAC reaches a plateau.

Each breath sample should be treated independently. The use of the **NV** key for the first sample does not automatically mean the Qualified Technician should use the **NV** key for the second sample.

Where the **NV** key has been used to accept a breath sample, the status message **SAMPLE CONTROL OVERRIDE** will be printed on the breath test ticket.

A Certificate of A Qualified Technician should NOT be issued when the **NV** key has been used. Qualified Technicians are advised to write a memo to the crown explaining why the key was used, and should be prepared to give *viva voce* evidence regarding the analysis.

CHAPTER C - OPERATIONAL PROCEDURE

Copy Key

The **CPY** (copy) key can be used to print a copy of the last test providing the power has not been turned off and the **RUN** key has not been pressed to initiate another test. The key can be used by the Qualified Technician to reproduce a ticket where a printer malfunction or misfeed has destroyed or damaged the original ticket. All tickets, including damaged tickets, should be kept on file.

CHAPTER D

OBSERVATION PERIOD AND INTERFERING CHEMICALS

CHAPTER D - OBSERVATION PERIOD AND INTERFERING CHEMICALS

INTRODUCTION

Breath samples can be analyzed to determine the amount of alcohol in a person's blood because the amount of alcohol in a person's breath is proportional to the amount of alcohol in a person's blood. However, if the breath sample passes through a mouth that has been contaminated with alcohol, the sample can pick up alcohol from the mouth and give a falsely high reading. The mouth can be contaminated by any substances that contain alcohol such as alcoholic beverages and, if alcohol has been recently consumed, by stomach fluids or vomit.

Theoretically, a wet burp which brings stomach fluids containing alcohol into the mouth could result in mouth alcohol contamination. Burps that do not contain fluids (dry burps), do not lead to mouth alcohol contamination. Any respiratory issues such as coughs or sneezes also do not lead to mouth alcohol contamination.

The very real and significant risks of alcohol containing beverages producing mouth alcohol contamination and falsely high breath tests, are well documented in the scientific literature, and there is no question that this risk must be mitigated by a proper observation period.

THE OBSERVATION PERIOD

Qualified Technicians must ensure the subject is observed and does not consume anything, nor burp, belch, regurgitate, or vomit for at least 15 continuous minutes before each breath test. If any of these activities occur, the observation period must be re-started.

In the past, the forensic laboratory has used the term "face-to-face" to describe the observation period, but this general term has been interpreted by some defense counsel and Courts in ways that are so restrictive as to not permit the Qualified Technician to operate the instrument while conducting the observation period. This was not the intent of this instruction.

The Qualified Technician may perform the observation period and operate the instrument at the same time, but if necessary, should be prepared to defend this practice in court. A satisfactory observation period is performed when the Qualified Technician is in close proximity to the subject, in a quiet area, so that audible indications of burps can be heard, and that the subject is in the field of view in order to observe physical clues of burping.

Qualified Technicians may delegate the observation period duty to the investigator but they must advise the investigator of the proper requirements for the observation period, and ensure it is properly completed.

CHAPTER D - OBSERVATION PERIOD AND INTERFERING CHEMICALS

A satisfactory observation period entails the following points:

1. Checking the subject's mouth before the observation starts, and removing any foreign materials.

2. Placing the subject in close proximity, in a quiet area, and in the Qualified Technicians (or designated observer) field of view.

3. Observing the subject for at least 15 continuous minutes before each breath test.

4. Re-starting the observation period if a burp, a belch, regurgitation, vomiting or any consumption occurs.

DETECTION OF INTERFERING SUBSTANCES

The BAC Datamaster C analyzes breath samples at two different wavelengths to detect interfering substances in the breath of a person. If the results of the analyses are not within 10 mg%, an interfering substance may be present.

Some chemicals such as methanol (gas line antifreeze), iso-propanol (rubbing alcohol) or ether (starting fluid) can absorb IR energy in the wavelength range of 3.35 to 3.50 microns. If the BAC Datamaster C used a single wavelength for the analysis, one could never be certain that some other chemical wasn't absorbing IR energy and contributing to the apparent BAC. Using two wavelengths eliminates this potential problem.

INTERFERENCE DETECTED status messages are rare. If one is encountered, the Qualified Technician should repeat the test. If a second **INTERFERENCE DETECTED** message occurs, it may indicate the subject is at significant medical risk. Two **INTERFERENCE DETECTED** messages suggest the subject may have consumed significant quantities of a chemical other than alcohol, and may be toxic. The subject should be evaluated by medical personnel immediately.

There are a number of possible compounds that could produce the **INTERFERENCE DETECTED** status message, however, if **INTERFERENCE DETECTED** is not displayed on the breath test ticket, the Qualified technician can be certain that there are no interfering substances in the breath sample.

CHAPTER D - OBSERVATION PERIOD AND INTERFERING CHEMICALS

PRACTICAL DEMONSTRATIONS

1. Mouth Alcohol:

   Candidates will work in pairs. One member will swish his/her mouth with one of a number of prepared solutions of alcohol and water in different concentrations (there is no need to swallow the solutions). The other member will operate the instrument. The solutions will have concentrations of 5, 10, 20, or 40 % v/v alcohol and will be identified as having the mouth closed after the contamination or open (i.e. behave normally). Breath tests will be taken at 1, 5, 10, & 15 minutes after the mouth is contaminated. The results of the tests should be given to the instructor as they become available, so that all of the tests from the class can be tabulated.

   After the data has been charted by the instructor, examine it to answer the following questions:

   A. Does the instrument always detect the mouth alcohol with the message **INVALID SAMPLE**?

   B. How long does the mouth alcohol contamination last?

   C. Does the concentration of the solution have an effect on how long the contamination lasts?

   D. Does mouth open or closed have an effect on how long the contamination lasts?

2. Interfering Substances - Acetone:

Acetone is a chemical that can be produced naturally in the body. Qualified Technicians need to be aware that acetone is detected by the BAC Datamaster C and will produce the status message **INTERFERENCE DETECTED** if it appears in the breath of a person.

A simulator containing 100 mg% alcohol and 30 mg% acetone will be analyzed. Observe the instrument display while this acetone solution is analyzed and answer the following questions:

A. What is the apparent alcohol reading of this solution on the instrument?

B. At what point in the test sequence does the **INTERFERENCE DETECTED** status message appear on the display?

CHAPTER E

STATUS MESSAGES

CHAPTER E - STATUS MESSAGES

INTRODUCTION

The BAC Datamaster C provides information to the technician via status messages indicated on the display during all stages of the breath testing sequence. Status messages are **not** error messages, but a means by which the BAC Datamaster C communicates with the Qualified Technician. Status messages alert the Qualified Technician to the current activities of the instrument or to a particular situation which has occurred during the testing procedure.

The "Ready-Push Run" status message is usually the first prompt a Qualified Technician sees when approaching the instrument, and it indicates that the instrument is ready to be used. Once a testing sequence has begun, the instrument will notify the Qualified Technician through various messages on the display screen, as to what particular testing is being conducted. A detailed overview of this sequence is discussed in Chapter C (Operational Procedure).

There are a number of status messages which can occur during a testing procedure. In some instances the Qualified Technician can rectify the situation and continue with testing, and in other instances they need to note down the status message encountered, the surrounding circumstances, and make a detailed report to the BAC Datamaster C Supervisor. The following tables outline the various status messages that may require action on the part of the Qualified Technician.

CHAPTER E - STATUS MESSAGES

Status Message	Instrument Detects	Cause	QT Action
Ambient Fail	Volatile substance in sample chamber during purge cycle	1. Subject sitting close to breath tube inlet during purge (e.g. clothing saturated with alcohol) 2. Mouthpiece left on breath tube 3. Volatile compounds in room	1. Remove subject from room 2. Remove mouthpiece from instrument 3. Air out room
Invalid Sample ***See page E6***	A decline in apparent BAC while subject providing sample	1. Most common cause is improper blowing technique (discontinuous blowing). 2. Mouth Alcohol	Restart test immediately, no need to wait (if observation period has been properly conducted)
Incomplete	'N' is typed in response to second "Subject Refuse? Y/N" after 2.5 minute sample acceptance window has passed	Subject unable to meet sample acceptance parameters in the 2.5 minute allotted time.	Start a new breath test sequence
Interference Detected	Difference of more than 10 mg% between the primary and secondary filters	Some Substances, other than ethyl alcohol, may be in the breath. Could be either endogenous (acetone from diabetics) or exogenous (consumption of a different volatile substance)	Repeat the test. If a second Interference Detected message occurs, stop testing and seek medical assistance for subject

CHAPTER E - STATUS MESSAGES

Status Message	Instrument Detects	Cause	QT Action
Radio Interference	Radio frequency detected	1. Radio frequency detected in vicinity of instrument (ie. Radio transmitting out) 2. Antenna on instrument touched	Repeat the test immediately, and ensure that radios are removed from room and antenna is not touched
Refused	'Y' is typed in response to question "Subject Refuse? Y/N"	Individual not following QT instructions on how to provide a proper sample into instrument or unwilling to provide a sample	Charge subject with refusal
Sample Control Override	QT has pressed the NV key and over ridden normal sample acceptance parameters	QT believes subject making an **earnest** attempt to provide a sample but cannot meet the minimum sample acceptance parameters (e.g. smaller stature, diminished lung capacity)	Refer to Chapter C (Use of No Volume Key)
Pump Error	Flow detector does not detect pump operation	1. Mouthpiece left on the instrument during a purge 2. 5 way valve stuck in wrong position	1. Remove mouthpiece 2. Re-start the test
Printer Error	Printer not able to respond to computer	1. Ticket stuck in instrument 2. Printer cable loose or disconnected	1. Gently pull out ticket 2. Contact Supervisor
Detector Overflow	Instrument detects a BAC exceeding 600 mg%	1. Cleaning solutions, etc. in room in vicinity of instrument during purge 2. Subject's BAC actually exceeds 600 mg%	1. Air out room 2. Seek medical attention for subject

CHAPTER E - STATUS MESSAGES

Status Message	Instrument Detects	Cause	QT Action
Blank Error	Unable to confirm a near zero reading	Electronic instability greater than 3 mg%	Attempt test again, if unsuccessful, contact Supervisor
Simulator Out of Range	Simulator test not within 90 - 110 mg% during External Standard Test	1. Simulator temperature outside proper operating range of 33.8 - 34.2°C 2. 5 way valve stuck in wrong position 3. Instrument not functioning properly (out of calibration)	1. Ensure simulator operating properly 2. Re-start the test 3. Contact supervisor
Change External Standard	14 days or 50 external standard tests has expired	14 days or 50 external standard tests has expired	Change external standard solution
Not Calibrated	Calibration factors are lost	Could be due to power outage, power surge or static electricity	Contact Supervisor
Calibration Error	Internal Standard Test fails	Problems with optical system	Contact Supervisor
Fatal System Error at (XXXX)	Portion of software or memory not responding to computer	Could be due to power outage, power surge or static electricity	Shut off instrument. Hold down CLR key and turn on instrument at same time. "CRC Error at 8000" should appear. Hit CLR key again. If system goes to Ready-Push Run attempt a test, otherwise contact Supervisor

CHAPTER E - STATUS MESSAGES

1. Invalid Sample Status Message

   Mouth alcohol can cause the **INVALID SAMPLE** status message where there are relatively large amounts of contamination, such as with a recent consumption of an alcoholic beverage. Given the observation period Qualified Technicians conduct before every breath test, it is unlikely that this status message will be caused by mouth alcohol contamination.

   The most common cause of the **INVALID SAMPLE** status message is a discontinuous blowing pattern into the BAC Datamaster C. If the subject blows some breath into the sample chamber and stops blowing before the sample acceptance parameters are met, a partial sample will be collected in the chamber. If the subject blows again within the 2.5 minute window, the new breath initially entering the sample chamber will have an apparent BAC lower than what is in the sample chamber. As a result a negative slope may be detected by the instrument and will result in an **INVALID SAMPLE** status message.

2. Status Messages Occurring After Subject Test

   Any status message (e.g **AMBIENT FAIL, RADIO INTERFERENCE, PUMP ERROR**) that occurs AFTER a subject sample has been accepted and analysed, will not affect that particular subject test, and therefore that ticket is an acceptable ticket. There is no need to repeat the test. If a status message persists, contact your supervisor.

CHAPTER F

CERTIFICATES AND LOGS

CHAPTER F - CERTIFICATES AND LOGS

CERTIFICATES

Qualified Technicians should be familiar with the following 2 types of certificates:

1. "CERTIFICATE OF AN ANALYST" (Alcohol Standard)

   This certificate will accompany the External Standard solution when received from Pacific Region stores (Figure 1). It is the certification by an Analyst that the External Standard Solution identified within the certificate has been analyzed and found to be suitable for use with an approved instrument. As part of the TABS procedure, the Qualified Technician must compare the identification and lot number of the External Standard as noted on the simulator tag with the information in the certificate to ensure that it is the same verifying the External Standard Solution in the simulator is suitable for use.

2. "CERTIFICATE OF A QUALIFIED TECHNICIAN WHO TOOK SAMPLES OF BREATH" (Web Form ED554-6).

   This is the certificate completed by Qualified Technicians after completion of the breath tests. A properly completed certificate has been provided for your reference (Figure 2). The certificate is to be issued if there are 2 numeric results, regardless of the number of breath test tickets required to obtain a Proper Breath Test (PBT). In other words, status messages do not count as numeric results.

   A certificate should not be issued when there is only 1 numeric result or alternatively, when 3 or more numeric results are required to achieve a PBT. A certificate is not issued when the NV key has been utilized to capture a breath sample for analysis. A sample list of situations when a certificate can and cannot be issued is included for your reference (Table 1).

   Since the certificate is available as a RCMP web form, it should be typed on the computer whenever possible. Alternatively, a certificate can be hand written but please ensure that it is completely legible. If an error is made on the certificate, a new one should be prepared. The Notice of Intention to Produce Certificate should be completed by the investigating officer.

CHAPTER F - CERTIFICATES AND LOGS

Please note that the Qualified Technicians name must be indicated on the certificate exactly as written on the designation received from the Attorney General's office, i.e. no abbreviations and no rank inclusion.

The identification of the External Standard Solution and lot number should be indicated exactly as per the Certificate of an Analyst pertaining to the specific simulator solution. Additional descriptors, punctuation marks, and/or symbols not found on the Certificate of an Analyst are not to be included.

The time of the subject test is recorded as it appears on the breath test tickets. Note that the time is recorded using the 24 hour clock.

With respect to the date of the test, there is no need to put an additional suffix to the date such as "st", "nd", "rd", or "th". The numeric symbol for the date is sufficient.

The date certifying that the certificate is true should be the date when the certificate was completed and, on occasion, may differ from the date of the tests.

Qualified Technicians should issue a Certificate even if one or both of the breath test results are below the statutory limit of 80 mg%. Similarly, the Qualified Technician should issue a Certificate regardless of the amount of time that may have lapsed between the time of driving to the time of the breath tests.

CHAPTER F - CERTIFICATES AND LOGS

CERTIFICATE OF AN ANALYST
(Alcohol Standard)

CERTIFICAT DE L'ANALYSTE
(Alcool type)

I,
Je soussigné, **Nicole Leah Carriere**

a person designated pursuant to subsection 254(1) of the CRIMINAL CODE of CANADA by the Attorney Generals of British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Nova Scotia, New Brunswick, Prince Edward Island, Newfoundland and Labrador, and the Attorney General of Canada for the Yukon Territory, the Northwest Territories and Nunavut, as an analyst,

en ma qualité de personne désignée comme analyste en vertu du paragraphe 254(1) du CODE CRIMINEL du CANADA par le procureur général de la Colombie-Britannique, l'Alberta, la Saskatchewan, le Manitoba, l'Ontario, la Nouvelle-Écosse, le Nouveau-Brunswick, l'île-du-Prince-Edward, Terre-Neuve et Labrador, et le procureur général du Canada pour le territoire du Yukon, les territoires du Nord-Ouest et Nunavut,

DO HEREBY CERTIFY:

That I made an analysis of a sample of an alcohol standard identified as:

ATTESTE PAR LA PRÉSENTE:

Que j'ai effectué une analyse d'un échantillon d'alcool type identifié comme:

ETHYL ALCOHOL STANDARD

STANDARD D'ALCOOL ÉTHYLIQUE

CALWAVE Lot 20598

intended for use with an approved instrument, as defined in subsection 254(1) of the CRIMINAL CODE of CANADA, and that the sample of the alcohol standard analyzed by me was found to be suitable for use with an approved instrument

conçu pour être utilisé avec un alcootest approuvé au sens du paragraphe 254(1) du CODE CRIMINEL du CANADA, et qu'il s'est révélé que l'échantillon d'alcool type analysé par moi convenait bien pour l'utilisation avec un alcootest approuvé

on the **29th day of June, 2005.**

le 29e jour de juin 2005.

I FURTHER CERTIFY:

That the statements in this certificate are true to the best of my skill and knowledge.

J'ATTESTE DE PLUS:

que les déclarations dans ce certificat sont véridiques au meilleur de ma connaissance et de mes aptitudes.

Dated this **29th day of June, 2005,**
at Winnipeg, in the Province of Manitoba

Fait ce **29e jour de juin 2005,**
à Winnipeg, dans la province du Manitoba.

N.L. Carriere
Analyst / Analyste

NOTICE OF INTENTION TO PRODUCE CERTIFICATE

To:
À: _____

Take notice that, pursuant to subparagraph 258(1)(f) and subsection 258(7) of the CRIMINAL CODE of CANADA, the prosecution intends to produce in evidence the original certificate, a copy of which appears above.

Dated this _____ day of _____, 20____
Fait ce _____ jour _____, 20____

Signature of person serving this notice for the prosecution
Signature de la personne qui signifie l'avis pour la poursuite _____

AVIS DE L'INTENTION DE PRODUIRE LE CERTIFICAT

of
de _____

En conformité avec le sous-alinéa 258(1)(f) et le paragraphe 258(7) du CODE CRIMINEL du CANADA, avis vous est donné que la poursuite a l'intention de produire en preuve l'original de ce certificat dont une copie apparaît ci-dessus.

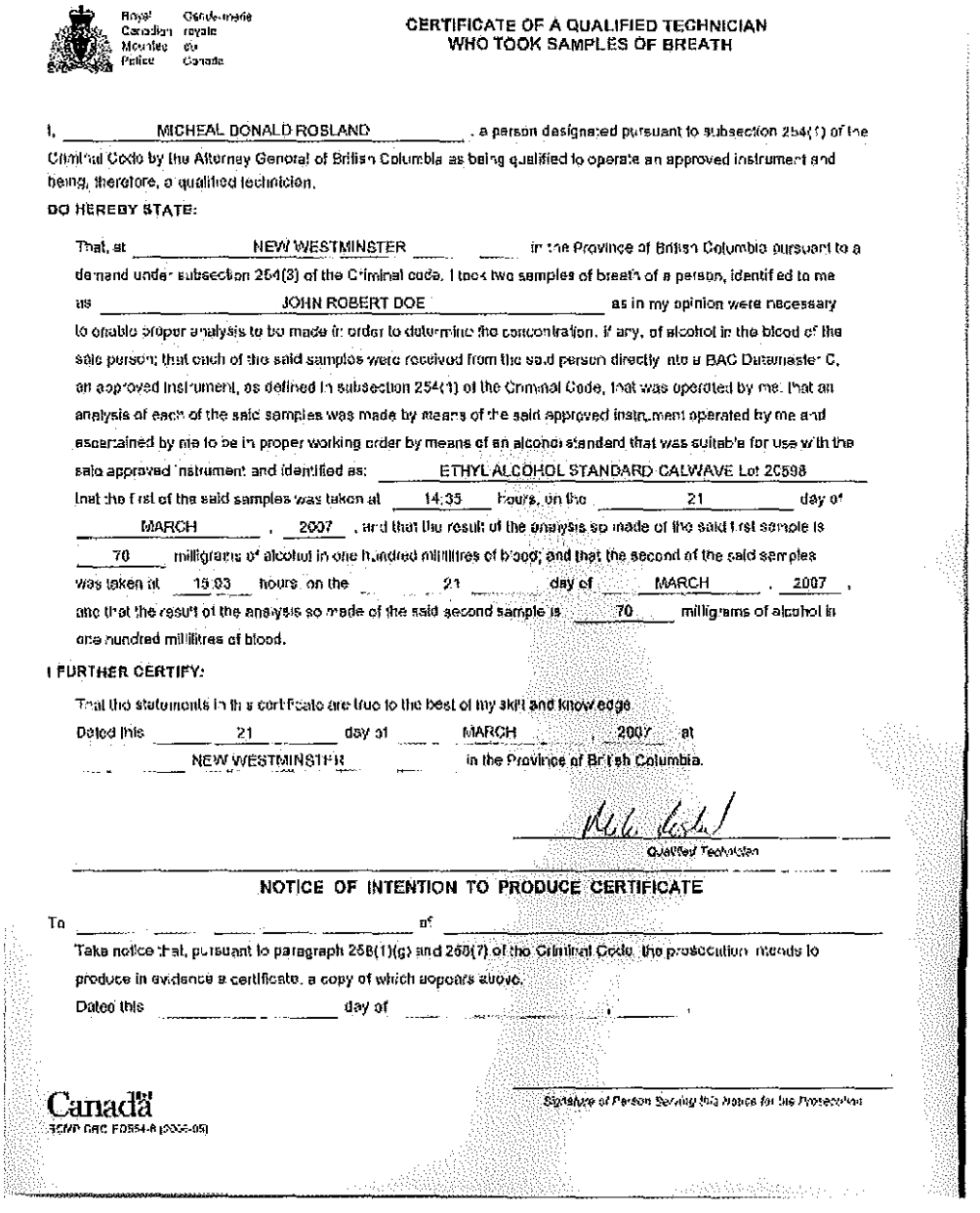
Figure 1 - Certificate of an Analyst (Alcohol Standard)

	Sample1	Wait Time (min)	Sample 2	Wait Time (min)	Sample 3	Wait Time (min)	Sample 4	Certificate of QT
Reading	200	17	180					Yes
	200	17	170	17	180			No
	200	17	Incomplete	0	Invalid	0	190	Yes
	200	17	Invalid	0	180			Yes
	190	17	200					Yes
	Incomplete	0	150	17	Refusal*			No
	200 NV	17	190 NV					No
	200 NV	17	Invalid	0	180 NV			No
	200	17	200 (Ambient Fail)					Yes
	200	17	Refusal*					No
	Refusal*							No

*Keep the mouthpiece provided to the accused for court. Perform a test on yourself to prove the instrument was capable of accepting a sample.

Table 1 - Example of when and when to not issues certificates of qualified technician who took samples of breath

CHAPTER F - CERTIFICATES AND LOGS



Royal Canadian Mounted Police / Gendarmerie royale du Canada

CERTIFICATE OF A QUALIFIED TECHNICIAN
WHO TOOK SAMPLES OF BREATH

I, MICHEAL DONALD ROSLAND, a person designated pursuant to subsection 254(1) of the Criminal Code by the Attorney General of British Columbia as being qualified to operate an approved instrument and being, therefore, a qualified technician,

DO HEREBY STATE:

That, at NEW WESTMINSTER in the Province of British Columbia pursuant to a demand under subsection 254(3) of the Criminal code, I took two samples of breath of a person, identified to me as JOHN ROBERT DOE as in my opinion were necessary to enable proper analysis to be made in order to determine the concentration, if any, of alcohol in the blood of the said person; that each of the said samples were received from the said person directly into a BAC Datamaster C, an approved instrument, as defined in subsection 254(1) of the Criminal Code, that was operated by me; that an analysis of each of the said samples was made by means of the said approved instrument operated by me and ascertained by me to be in proper working order by means of an alcohol standard that was suitable for use with the said approved instrument and identified as: ETHYL ALCOHOL STANDARD CALWAVE Lot 20598 that the first of the said samples was taken at 14:35 hours, on the 21 day of MARCH, 2007, and that the result of the analysis so made of the said first sample is 70 milligrams of alcohol in one hundred millilitres of blood; and that the second of the said samples was taken at 15:03 hours on the 21 day of MARCH, 2007, and that the result of the analysis so made of the said second sample is 70 milligrams of alcohol in one hundred millilitres of blood.

I FURTHER CERTIFY:

That the statements in this certificate are true to the best of my skill and knowledge.

Dated this 21 day of MARCH, 2007 at NEW WESTMINSTER in the Province of British Columbia.

Qualified Technician

NOTICE OF INTENTION TO PRODUCE CERTIFICATE

To _____ of _____

Take notice that, pursuant to paragraph 258(1)(g) and 258(7) of the Criminal Code, the prosecution intends to produce in evidence a certificate, a copy of which appears above.

Dated this _____ day of _____, _____.

Signature of Person Serving this Notice for the Prosecution

Canada

RCMP GRC 6854-8 (2002-05)

Figure 2 - Certificate of Qualified Technician Who Took Samples of Breath

CHAPTER F - CERTIFICATES AND LOGS

PERSONAL LOG

Every Qualified Technician will maintain his or her personal log of tests done. This will provide a complete record of the total number of tests the Qualified Technician has done, should this information be asked in court. The Qualified Technician should include all tests performed (subject, proficiency tests, invalid sample, interferences, etc.) in the personal log (Table 2). Please note that it is permissible to use more than 1 line to enter the test results if more than 2 breath test tickets were required to complete a PBT.

MONTHLY DETACHMENT LOGS (RCMP web form ED554-1)

Every Qualified Technician is also required to enter their breath test results and any external standard changes conducted into the monthly breath test log kept at each detachment (Table 3). This log is reviewed and tabulated monthly by the BAC Datamaster C Supervisor. The form is available on RCMP web form as form ED554-1.

EXTERNAL STANDARD REPLACEMENT LOGS

The external standard replacement form and associated tickets must be placed in the detachment log or file. All external standard replacement forms will be reviewed by a BAC Datamaster C Supervisor.

PERSONAL BAC DATAMASTER C LOG										
No.	File#	Subject's Name	Date	Ext Stand #1	Test #1		Ext Stand #2	Test #2		Investigator
					Time	Result		Time	Result	

Table 2 - Personal BAC Datamaster C Log

CHAPTER F - CERTIFICATES AND LOGS

BAC DATAMASTER C LOG

Detachment	Instrument Serial No.	File No.	
		Month	Year

If 3 or more tests, use next line.

TEST NO.	FILE NO.	SUBJECT NAME	Day of Month	SAS mg %	TEST 1		SAS mg %	TEST 2		MVA (X)	QUALIFIED TECHNICIAN	INVESTIGATING MEMBER
					Time	mg%		Time	mg%			
										☐		
										☐		
										☐		
										☐		
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RCMP GRC ED554-1(2004-04) ICS

Table 3 - Monthly Detachment Log (RCMP web form ED554-1)

CHAPTER G

QUALITY ASSURANCE

CHAPTER G - QUALITY ASSURANCE

INTRODUCTION

Qualified Technicians should adhere to organizational guidelines when participating in the breath test program. Such adherence ensures an efficient and effective program in which uniform procedures are followed.

The quality assurance procedures set out in this manual are in alignment with the recommended standards and procedures of the Canadian Society of Forensic Science Alcohol Test Committee. These standards and procedures are intended as recommendations to encourage the development of a quality system and best practices within a breath test program.

All breath test equipment, including approved instruments and simulators, must undergo annual maintenance, conducted by an authorized repair agency.

This program has been designed to ensure quality breath test results are produced, each stage of the process is documented which ensures a valid and accurate breath tests. The quality of breath test results depends on adhering to the stringent requirements in 3 fundamental areas:

1. Training:

   A. Initial

      Candidates will complete a comprehensive 5 day BAC Datamaster C Certification course. Upon successful completion of the course, a Certificate will be issued by the FS&IS Toxicology Services Section which will certify the candidate to operate the BAC Datamaster C for a 1 year period to the end of the month in which they are trained. **(NOTE: This is independent of the Attorney General designation)**

      Upon successful completion of the Certification Course, a recommendation will be forwarded to the Attorney General of British Columbia to have the candidate designated as a Qualified Technician within the meaning of the Criminal Code. A Qualified Technician may not conduct breath tests until he/she is both designated and certified.

   B. Ongoing Re-certification

      All Qualified Technicians should keep abreast of changes in the program by reading all bulletins forwarded by their BAC Datamaster C Supervisor. All Qualified Technicians must successfully undergo an annual re-certification process to retain their certification to operate an approved instrument. This process will include, as a minimum, a practical proficiency exam conducted by a BAC Datamaster C Supervisor.

CHAPTER G - QUALITY ASSURANCE

Under no circumstances should a Qualified Technician perform a breath test on a subject after their certification lapses. It is the responsibility of the Qualified Technician to be mindful of their expiry date. **There is no grace period for an Operator to continue to conduct subject breath tests after their certification has expired.**

i. Proficiency Test

Qualified Technicians must undergo an annual re-certification using a Proficiency Test Solution. Qualified Technicians that have successfully completed the annual Proficiency Test can be re-certified for a period of 1 year to the end of the month in which the proficiency test is completed. For example, if the proficiency test was successfully conducted on February 10, 2008, the Qualified Technician should be re-certified to the end of February 2009.

Qualified Technicians can also re-certify up to 3 months after the date of expiration by successfully completing the annual Proficiency Test. The Qualified Technician can then be re-certified for a period of 1 year to the end of the month in which the proficiency test was completed. For example, if certification expired at the end of February 2008 and the proficiency test was not conducted until April 12, 2008, certification would be renewed until the end of April 2009.

ii. Individualized Instructional Module:

If a Qualified Technician's certification has expired by more than 3 months but less than 2 years, the re-certification procedure requires successful completion of the Individualized Instruction Module (I.I.M.) as well as successful completion of a proficiency test. A supervisor should obtain and administer the I.I.M.

Once these requirements are satisfied, the Qualified Technician can be re-certified for a period of 1 year, to the end of the same month as the successful completion of the written exam and proficiency test. For example, if the Qualified Technician's certification had expired at the end of February 2007 and the written exam and proficiency test were not conducted until November 12, 2008, certification would be renewed to the end of November 2009.

iii. Retake Certification Course:

Once a Qualified Technician's certification has expired by more than 2 years, no re-certification procedure is available. The candidate would need to attend another BAC Datamaster C Certification Course and upon successful completion, a new certificate will be issued with a new 1 year certification period.

CHAPTER G - QUALITY ASSURANCE

2. Procedures:

The Qualified Technician will follow procedures outlined in the BAC Datamaster C Certification Manual.

3. Documentation:

Qualified Technicians are trained to conduct a Proper Breath Test (PBT) as outlined in the Certification Manual. All breath test procedures and results are documented onto breath test tickets utilized during the testing procedure.

Qualified Technicians may complete a Certificate of A Qualified Technician Who Took Samples of Breath if the breath test results satisfy the criteria for completing a certificate.

Qualified Technicians will enter all of their breath test results into their Personal Log as well as the Monthly Breath Test Log kept at each testing location.

CHAPTER H

PHYSIOLOGY OF ALCOHOL

CHAPTER H - PHYSIOLOGY OF ALCOHOL

INTRODUCTION

This chapter will cover the absorption, distribution, and elimination (metabolism and excretion) of alcohol in the human body, as well as the three common defences to impaired driving and the role that the Qualified Technician and/or investigator can play in addressing these defences.

The word "alcohol" as used in this chapter will mean ethyl alcohol. Other compounds such as methyl alcohol (wood alcohol) and isopropyl alcohol (rubbing alcohol) have similar patterns of absorption, distribution and excretion as ethyl alcohol.

The physiology of alcohol describes what happens to alcohol once it has been introduced into the body, i.e. what the body does with the alcohol.

ABSORPTION

Alcohol is a small molecule which readily mixes with body water. Thus, it can be taken into the body by any of the common routes of administration. The most practical route is by oral ingestion.

As soon as alcohol comes into contact with the tissues of the mouth and throat, absorption begins. Alcohol quickly passes through these tissues and enters into the rich supply of blood vessels in this area by a process of simple passive diffusion. Unlike more complex substances such as fats, carbohydrates and proteins, alcohol requires no preliminary digestion or breakdown into smaller pieces prior to absorption, and no "carrier" to assist passage into the blood. It then travels from the mouth, down the esophagus, into the stomach.

Alcoholic beverages are retained in the stomach for a period of time prior to transfer into the small intestine. Absorption of alcohol into the blood stream can occur directly through the stomach wall, but the most rapid absorption occurs through the wall of the small intestine - a specialized tissue for the uptake of nutrients into the body. The small intestine has a surface area 1000 times greater than that of the stomach, thinner lining in the walls, and a much greater blood supply, all of which enhance absorptive capacity.

Regardless of the alcohol concentration of the beverage consumed, the concentration of alcohol in the small intestine rarely exceeds 1 - 2% v/v, and is absorbed very quickly. Thus, only the mouth, throat and stomach come into contact with high concentrations of alcohol, and only in the stomach is this contact prolonged. Since the majority of alcohol

CHAPTER H - PHYSIOLOGY OF ALCOHOL

is absorbed in the small intestine, the rate of which stomach contents travel into the small intestine will affect absorption. This is referred to as gastric emptying and the rate of gastric emptying can be affected by various factors.

Any factor which will cause the alcohol to be retained in the stomach will tend to prolong the absorption time. Conditions which allow rapid passage of alcohol into the small intestine will reduce the absorption time. Although absorption will still occur in the stomach, it will be at a slower rate. Typically, about 30% of the dose of alcohol consumed is absorbed from the stomach whereas 70% is absorbed from the small intestine (See Figure 1). Factors which may affect the rate of absorption of alcohol are detailed below.

1. Amount of Food in the Stomach

   All foods require some digestion or breakdown in the stomach before being emptied into the small intestine. When alcohol is taken with food, the time spent in the stomach is increased and therefore absorption will be delayed.

2. Concentration of Alcohol in the Beverage

   Beverages with alcohol concentrations of less than 20% v/v have lower rates of absorption due to the volume of water which must also be absorbed. Beverages with alcohol concentrations greater than 40% v/v have delayed absorption because of extreme irritation to the stomach wall and the pyloric valve. The optimal rate of absorption occurs with beverages having an alcohol concentration of about 20% v/v.

3. Rate of Consumption

   Within limits, the greater the quantity of alcohol available for absorption in the stomach and small intestine, the greater the rate of absorption. Thus, if a beverage is consumed over a shorter interval of time, it will be absorbed more rapidly. In other words, the more you drink and the faster you drink, the faster the absorption.

4. Drugs, Diseases and Emotional States

   Certain drugs, diseases or anxiety may cause a decrease in the activity of the stomach and small intestine and also decrease the rate of blood flow through this area. The result is a decreased rate of absorption. The converse may also apply: For example, a relaxed atmosphere will promote absorption of alcohol.

Absorption of alcohol into the blood stream normally proceeds quite rapidly. With a single

CHAPTER H - PHYSIOLOGY OF ALCOHOL

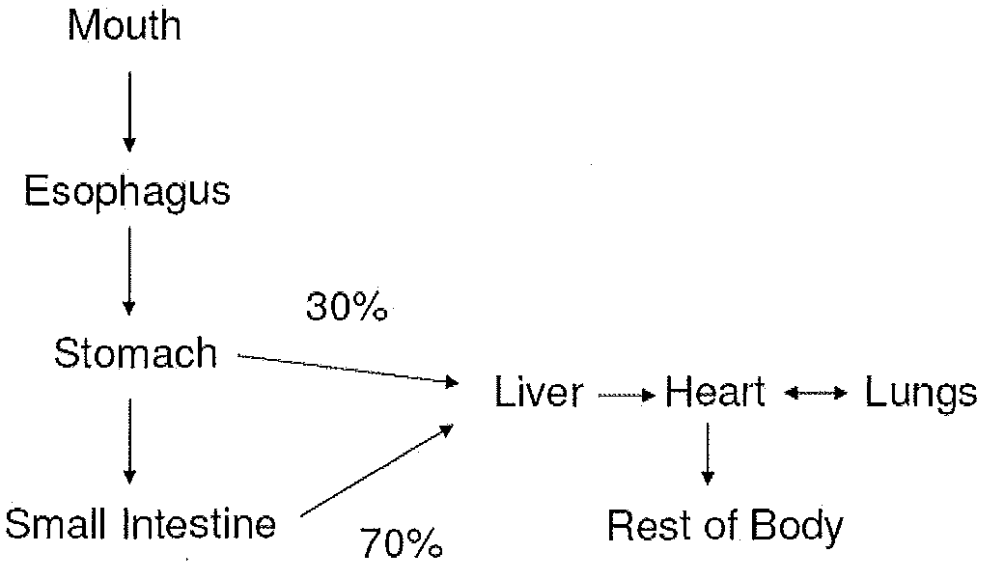
large dose of alcohol, the majority is absorbed within 15 minutes, and more than 90% of the alcohol is absorbed within one hour. With food in the stomach, complete absorption can take up to 2 - 3 hours.

As alcoholic beverages are normally consumed over a period of time, absorption occurs continuously with the gradual rise in blood alcohol concentration (BAC). The peak BAC usually occurs within 20 to 40 minutes after the completion of the last drink.

DISTRIBUTION

Once alcohol has been absorbed into the blood stream it is circulated throughout the body diffusing into body tissues and fluids, mixing and equilibrating with the total body water. The pattern of absorption and distribution of alcohol in the body is given schematically as follows:

Figure 1 - Pattern of absorption and distribution of alcohol in the body



The alcohol that is absorbed from the stomach and small intestine enters the portal vein which leads directly to the liver, the major detoxifying organ of the body. The blood, on

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leaving the liver, mixes with blood returning from the remainder of the body prior to entering the right side of the heart. The blood is then pumped through the lungs where oxygen is taken up, carbon dioxide and other volatile compounds (like alcohol) are given off. This process takes place in the alveolar sacs or the deep lung region.

The blood, on returning from the lungs, enters the left side of the heart and it is pumped into the arterial system throughout the body. About one-third of the total blood volume pumped out of the left heart goes to the brain, whereas the remaining two-thirds goes to the rest of the body and major organs. Of this latter amount, a large portion is passed through the kidneys where it is filtered and purified.

Alcohol is distributed in the body in proportion to the water content of the tissues. The more water there is in a particular tissue the greater the concentration of alcohol that will be there. For example, urine will have a higher water content than blood and will therefore have a higher alcohol concentration than blood. Alternatively, bone and fat have little water content and so will have very low alcohol concentrations as compared with the blood.

ELIMINATION

The elimination of alcohol from the body begins as soon as it is present in the body and continues until it has been totally removed. Elimination proceeds by two separate means: metabolism and excretion.

1. Metabolism

   About 90 - 98% of the total amount of alcohol consumed is removed from the body by metabolism. Metabolism, which occurs chiefly in the liver, effectively removes alcohol from the body by breaking the alcohol down into smaller molecules and changing it to other compounds. An enzyme, alcohol dehydrogenase (ADH), brings about this reaction as illustrated below. This is a multi-step process and the eventual end products of this reaction are carbon dioxide and water. Both of which are non-toxic and are excreted from the body by natural means.

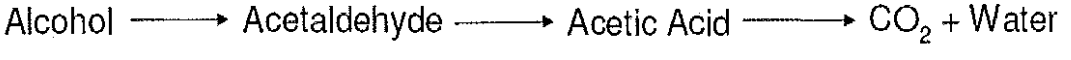

Figure 2 - Metabolism of Alcohol

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In a reaction similar to that for ethyl alcohol, methyl alcohol and isopropyl alcohol are changed to more highly toxic compounds when metabolized. This accounts for their dangerous actions on the body.

2. Excretion

About 2 - 10% of the total amount of alcohol consumed is removed from the body by excretion.

Excretion of alcohol from the body means the removal of alcohol in an unchanged form. This occurs when water leaves the body by any means, e.g., when alcohol is exhaled out in the moist breath. Examples of materials which are removed from the body and bring about the excretion of alcohol are breath, urine, sweat, tears, saliva, and feces.

RATE OF ELIMINATION

During the time a person is eliminating alcohol from his body, his BAC can be observed to change. That is, after the peak BAC has been reached, the BAC will fall steadily until there is no more alcohol left in the body.

If this rate of elimination were measured in all people, it would be observed that regardless of height, weight, sex, or amount of fatty tissue the rate is about the same for all people, on the average 15 mg% per hour. The normal range of values for this rate is between 10 mg% to 20 mg% per hour. Heavy drinkers are expected to eliminate alcohol at a higher rate than inexperienced or social drinkers. Alcoholics have been found to have elimination rates as high as 30 mg% per hour.

CORRELATION OF BAC WITH OTHER BODY FLUIDS

Other bodily fluids, in addition to blood, can be analyzed to determine alcohol concentration. Fluids such as urine, serum and vitreous humor are commonly seen in the forensic laboratory. However, when examining the results from these analyses, it may appear that the alcohol concentration in each fluid is not that same. This is because alcohol is distributed throughout the body in proportion to the amount of water in each bodily fluid. Therefore, a fluid with more water per unit of volume will appear to contain more alcohol. A conversion factor can be used to correct for the differences in water content between each of these bodily fluids, such that all results can be reported as a

blood alcohol concentration.

1. Urine: Since urine has a higher water content than blood, the urine alcohol concentration (UAC) is higher compared to blood. In practice, urine is rarely used to determine a blood alcohol concentration as results can be variable due to pooling effects in the bladder. However, urine alcohol concentration can be used to indicate whether the individual is in the post-absorptive state, i.e. the blood alcohol concentration has reached a peak concentration. Under controlled conditions, the UAC is 30% higher than blood. To ensure that freshly formed urine is taken, in the post-absorptive phase, the proper method of collection is to have the subject void the bladder, wait approximately 20 to 30 minutes, then ask the subject to void again to collect the second sample.

2. Vitreous Humor: Since vitreous humor has a higher water content than blood, the vitreous humor concentration (VAC) is higher compared to blood. This fluid is found in the eye and is generally 20% higher in alcohol content than blood. It is a good choice of sample in post-mortem cases as it is largely protected from contamination either by trauma or from bacteria.

3. Serum/Plasma: Blood is made up of two parts, a cellular portion containing the red blood cells and other agents as well as a liquid portion which primarily contains water. The cellular portion of the blood can be separated from the remaining water portion which is called serum (or plasma depending on the separation technique). Hospitals generally conduct alcohol analysis on serum samples. Since serum has a higher water content, the serum alcohol concentration (SAC) is generally higher than the whole blood alcohol concentration by 10 to 20%.

The results from **hospital samples** will generally be reported in different scientific units than milligrams of alcohol in 100 millilitres of blood (mg/100mL or mg%). The units that hospitals use are millimoles per litre (mmol/L). As a quick rule of thumb, multiply a hospital serum alcohol concentration in mmol/L by 4 to get an equivalent whole blood alcohol concentration. For example, a hospital serum alcohol concentration of 20 mmol/L is approximately the same as a blood alcohol concentration of 80 mg%.

CHAPTER H - PHYSIOLOGY OF ALCOHOL

THE THREE COMMON DEFENCES TO A BREATH TEST

As Qualified Technicians/Investigators, it is important to understand the physiology of alcohol in order to conduct a complete investigation of an impaired driver. In completing the Report to Crown Counsel it is imperative that you include any and all symptoms of impairment observed by police officers and civilian witnesses and the time at which these symptoms were noted. The completion of Part 14 of the "Drinking Driving Investigation" form (PCR 221), entitled "Drinking pattern of accused:" is also recommended. This section provides valuable information which we can be used to aid Crown in preparing their case.

The typical defences used to challenge an impaired or over 80 charge are the following:

1. **Two beer don't equal the breath test**
   When the individuals alleged drinking pattern is inconsistent with the breath test results.

2. **Drinking after the driving offence**
   The subjects BAC was below the legal limit at the time of the offence, but due to consumption after the offence, the BAC at the time of the breath test is over 80 mg%.

3. **Drinking just before the driving offence**
   The subjects BAC was below the legal limit at the time of the offence, but due to the consumption of alcohol immediately prior to driving, the BAC at the time of the breath test was over 80 mg%.

Qualified Technicians and investigators should attempt to obtain the following information to help negate these defences:

WHEN did drinking start?
WHAT was consumed?
HOW much was consumed?
WHEN did drinking end?
WAS there alcohol in the vehicle?
WHAT is the subject's weight?

The signs of impairment should also be noted so that they can be compared against the calculated BAC's in the above defences.

CHAPTER I

PHARMACOLOGY OF ALCOHOL

CHAPTER I - PHARMACOLOGY OF ALCOHOL

INTRODUCTION

It is important to understand the actions of alcohol on the human body in order to appreciate and recognize the symptoms or effects of alcohol on behaviour and performance. This chapter is designed to provide a basic understanding of what alcohol does to the body and how to assess the severity of these effects.

The pharmacologically active component of alcoholic beverages is ethanol. The other ingredients in alcoholic beverages and/or the mix that is used to dilute beverages does not generally cause any significant pharmacological effects on the body. Essentially, it is the ethanol that is responsible for the observed changes in behaviour and performance when one consumes alcoholic beverages.

DEFINITIONS

1. Pharmacology of Alcohol: The effects of alcohol on the body as these relate to mental and physical functions.

2. Central Nervous System (CNS): The brain and spinal cord.

CENTRAL NERVOUS SYSTEM (CNS) DEPRESSANT

Alcohol (ethanol) is a drug that alters normal biological processes in the body. For example, it causes diuresis (increased urine production), vasodilation (skin flushing), increased gastric secretion, as well as immeasurable subjective sensations. Alcohol is a CNS depressant and its actions are primarily and continuously upon the central nervous system - the magnitude of the effect being dependent upon the concentration of alcohol in the body.

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PROGRESSIVE EFFECTS ON CNS

As explained, the effects of alcohol on the human body are primarily due to its depressant actions on the central nervous system. The deterioration of ability and impairment of mental processes becomes greater as the BAC increases. Illustrated below are four BAC ranges and the clinical symptoms one might expect to observe:

1. Impairment: Less than 100 mg%

   - loss of inhibitions
   - talkativeness
   - increased self-confidence
   - judgement diminished
   - lessened attentiveness
   - deterioration of vision
   - increased reaction time
   - deterioration of fine muscular co-ordination

   Note: All persons are impaired by alcohol with respect to their ability to operate a motor vehicle at **100 mg%.** This is the consensus among experts when discussing driving impairment and is based on the above factors.

2. Intoxication: 100 - 250 mg%

   - disturbed vision
   - loss of balance; equilibrium is disturbed
   - vasodilation - bloodshot eyes, watery eyes
   - flushed face
   - muscular incoordination
   - fumbling
   - unsteadiness on feet
   - slurred speach
   - emotional disturbance
   - decreased pain sense (tolerance increased)

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3. Severe Intoxication: 250 - 400 mg%

   • depressed reflexes
   • apathy, unable to move (inertia)
   • stupor (conscious but not aware)
   • coma (prolonged state of unconsciousness)

4. Death: 400 mg% or greater

   Depression of respiratory centre in brain causing respiratory collapse.

EFFECT ON SENSORY FUNCTIONS

1. Vision: The consumption of alcohol results in a deterioration of visual abilities in several ways and at differing BAC's:

   A. Acuity: clarity of vision is suppressed at BAC's less than 50 mg%. The degree of suppression is dependent on the individual and increases with increasing BAC. Alcohol appears to have the same effect on vision as driving with sunglasses in twilight. In order to distinguish objects, a stronger illumination is required and dimly lit objects cannot be distinguished at all.

   B. Depth Perception: the ability to ascertain the relative distance of objects by the observer. Deterioration commences at BAC's less than 50 mg%.

   C. Peripheral Vision: the experience of tunnel vision which is likely caused by the result of lessened visual scanning or attentiveness to the periphery of one's visual field, usually occurs with BAC's in the range of 50 to 100 mg% and greater.

   D. Double Vision: begins to occur with BAC's in the range of 50 to 100 mg% and progressively becomes worse as the BAC rises.

   E. Glare Recovery: the eyes take longer to recover after being subjected to dazzling light and occurs with BAC's less than 50 mg%.

   F. Nystagmus: an involuntary jerking of the eye which begins at BAC's less than 50 mg% and progressively becomes worse with increasing BAC.

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As can readily be appreciated, the complex sense of sight is deteriorated in many ways with the consumption of alcohol. In all these aspects, vision deterioration increases with the increase in BAC.

2. Hearing: In drinking environments, it is common to experience an increase in voice levels. The cause is not due to a decrease in hearing ability but is usually the result of a lack of attentiveness of the drinkers.

3. Taste and Smell: The keenness of these senses is depressed.

4. Pain: Alcohol has an analgesic effect and, in comparison with other analgesic agents, markedly raises the pain threshold.

EFFECT ON DRIVING PERFORMANCE

1. Alcohol and Attention

The driving task has been described as a complex divided attention task involving, 1) a central visual task (tracking or maintaining the vehicle's lane position) and 2) a peripheral visual task (scanning the environment for objects, *e.g.* other traffic or potential driving hazards). When these two activities are combined into a time-shared or divided attention task, alcohol impairs driving performance at BAC's as low as 50 mg%. Neither of the two activities appears to be impaired by alcohol at these BAC levels when performed alone. However, when combined, performance is generally poorer on the peripheral visual task.

The decreased performance in divided attention tasks is most likely due to an impairment of the **rate of information processing**. It appears that alcohol has less effect on processing information from a single source than on information coming from several sources. Drivers who are under the influence of alcohol tend to concentrate on one task and neglect others in a divided attention situation.

2. Alcohol and Performance Measures

When a person has only one task to attend to, tests of simple reaction time shows alcohol increases the time it takes to react to a signal when BAC's are above 80 mg%.

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Studies examining choice reaction time where a person must attend to two or more tasks at once have reported greater alcohol impairment at lower BAC's (as low as 30 mg%).

Drivers with BAC's in the vicinity of 90 mg% showed increased steering and brake response times as well as less smooth use of the brake pedal.

In a study where the driving situation included emergency braking and evasive manoeuvres, drivers with BAC's averaging 42 mg% performed less efficiently than when driving without alcohol.

3. Alcohol and Risk Taking

Driving an automobile is usually taken for granted as being a relatively easy task, not requiring much conscious effort or critical judgement. When driving the sensory functions of the body bombard the brain with required information, which must be assimilated and processed so that smooth, controlled operation of the automobile results. The brain makes decisions and regulates motor activity based upon training and previous experience. Thus, the many complex manoeuvres that one makes while driving occur "automatically" and one does not have to be consciously aware of it.

An individual takes many risks when driving, for example, merging with traffic, going through a yellow traffic light, proceeding through a busy intersection, passing another vehicle or a bicyclist, driving in the rain, or speeding. The risks are calculated on the basis of personal driving ability, road-worthiness of the vehicle, environmental factors, and traffic considerations. Actions are taken on the basis of minimal perceived risk.

When under the influence of alcohol, a person's perception and assessment of risk is altered. Impaired drivers may take greater risks because of an increase in self confidence. This is because the alerting mechanism in the CNS is depressed such that a person does not become aware of potentially hazardous or dangerous situations that the sensory functions detect. The sensory functions themselves are deteriorated and may not be supplying complete or correct information to the brain. A person's motor functions are also impaired however, that person will feel less inhibited and more self confident about his or her driving skills. As a result a person, after having consumed alcohol, is more likely to speed into high risk situations which would normally be avoided or treated cautiously. The loss of

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judgement and the lessened quickness of decision making is critical in these situations.

IMPAIRMENT

Impairment occurs at 100 mg% or less and is a deterioration of driving ability when compared to one's norm, as a result of the consumption of alcohol. It involves a decrease of judgement, a decrease in attentiveness, a decrease in visual acuity and an increase in reaction time.

All individuals, regardless of their tolerance to alcohol, are impaired by alcohol with respect to their ability to operate a motor vehicle when their BAC reaches or exceeds 100 mg%.

Driving ability is a series of automatic reactions combined with variable requirements for skill, judgement, and the ability to make unexpected split-second decisions. It calls for co-ordination, anticipation, visual acuity, and muscular control. Thus, driving is a very demanding action. It is not surprising, then, that numerous investigators have found that all persons are impaired in their ability to drive a motor vehicle by the time their blood alcohol concentration reaches 100 mg%. Impairment is not simply the appearance of gross physical symptoms but a deterioration of judgement, attention, loss of fine co-ordination and control, possibly an increase in reaction time and a diminishing of sensory functions after the ingestion of alcohol. It has to do with the objective or measurable symptoms of the effect of alcohol on the body.

INTOXICATION

Intoxication can occur at a BAC over 100 mg%. When people speak about the effects of alcohol on a person the word "drunk" is often used. This word deals with the subjective or observable effects of alcohol and should not be confused with impairment. In actual fact intoxication is an advanced state of impairment in which the gross physical signs of the effects of alcohol are apparent: staggering, marked muscular in-coordination, slurred speech and a general confused state. These signs become apparent when the BAC exceeds 150 mg%.

CHAPTER I - PHARMACOLOGY OF ALCOHOL

TOLERANCE

It is a matter of common observation that some people "hold their liquor" better than others. This is due to a person's tolerance to alcohol. One definition of tolerance is the ability of the body to withstand or resist the effects of alcohol through adaptation. The mechanism by which the body develops tolerance to alcohol is a complex one and is the subject of continuing research by scientists in the field. Further discussion is beyond the scope of this section.

The important point to remember is that even though some people are more tolerant than others in exhibiting physical symptoms at a given BAC, all are impaired in their ability to operate a motor vehicle when their BAC is 100 mg%. According to "Relative Probability of Causing an Accident," of the Grand Rapids Study (1964),a person with a BAC of 100 mg% is about 6 times more likely to cause an accident than if he were sober (Figure 1).

ALCOHOL AND DRUGS

When alcohol and various drugs are taken in combination, unexpected results may occur. The type and degree of the combination effect depends upon the drug taken but can range from "unknown" to death. Two types of combination effects are as follows:

1. Potentiation: This is an additive effect where the actions of both drugs in combination, for example alcohol and barbiturates, are greater than what would be expected from each drug alone. Generally, severe impairment, intoxication, coma or death may result. Other drugs to avoid in combination with alcohol would include tranquillizers, antihistamines, and antidepressants.

2. Severe Toxic Reaction: This occurs when two drugs are incompatible with each other when present in the body together. A notable example is alcohol and Antabuse (Disulfiram). Antabuse interferes with the metabolism of alcohol causing a build-up of acetaldehyde in the body with resultant toxic symptoms.

Combination effects are often characterized by a relatively low BAC, 50 mg% or less, and the presence of gross symptoms of impairment and intoxication. Whenever an alcohol-drug interaction is suspected, medical assistance should be sought at once.

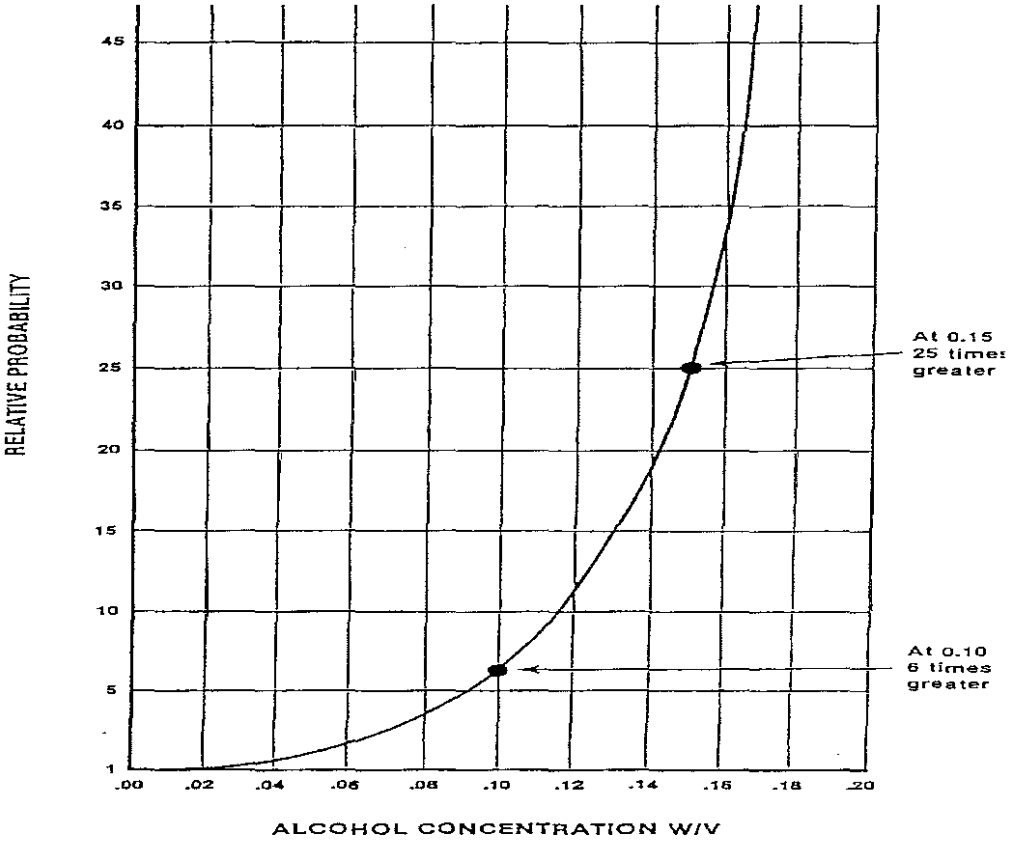

Figure 1 - Relative Probability of Causing an Accident from The Role of the Drinking Driver in Traffic Accidents Borkenstein et al (1964)

CHAPTER J

TECHNICIAN'S EVIDENCE

CHAPTER J - TECHNICIAN'S EVIDENCE

INTRODUCTION

BAC Datamaster C Qualified Technicians attend court to testify on breath alcohol results, on breath testing procedures, and subject behaviour. This session prepares the candidate to present oral testimony in court.

TECHNICIAN'S EVIDENCE

Why Will You Be Called to Court?

Typically a Certificate of a Qualified Technician Who Took Samples of Breath will be filled out by the Qualified Technician at the time of the breath test, and will be entered as evidence on their behalf at court. However, sometimes this is not the case, and Qualified Technicians must attend court to give *viva voca* evidence.

Reasons why a Qualified Technician may have to attend court include:

1. Certificate may not be valid

    A. Not served at all
    B. Not served properly on accused
    C. Error on the certificate

2. No certificate was issued at all:

    A. One test or refusal case
    B. Three numerical results obtained
    C. NV key was used to obtain a breath sample.

3. Defense has permission by the court to call the Qualified Technician to the stand.

4. The accused is charged with an offense other than impaired driving.

5. The Qualified Technician is also the investigating member.

Being Qualified In Court

Qualified Technicians are tendered as expert witnesses. It is up to the Court to decide if the Qualified Technician meets the requirements to present expert evidence in the areas

CHAPTER J - TECHNICIAN'S EVIDENCE

tendered by Crown Counsel. In some instances, defense will accept the qualifications without the need to go through them, however this is not always the case. Qualified Technicians should be prepared to go through all qualifications when dealing with the BAC Datamaster C.

Crown will first describe the area of expertise or the area to be qualified in. As a BAC Datamaster C Qualified Technician, the areas of expertise include:

"The theory and operation of the BAC Datamaster C instrument, and the analysis of breath samples for alcohol content"

The Qualified Technician must describe the type of training and experience as follows:

1. Describe the course you have completed:

   "I attended a 5 day course which covered the theory and operation of the BAC Datamaster C instrument. This course involved both class room lectures as well as practical testing. I successfully completed written, practical and oral examinations during this course, I met all requirements and was certified as of June 23, 2006 and designated by the Attorney General of British Columbia on July 30, 2006."

2. Describe any re-certifications you have completed:

   "As part of our quality assurance program, I am required to re-certify annually with my supervisor and did so on June 15, 2007."

3. Describe your area of expertise. This should not only pertain to breath tests conducted by yourself, but also to experience with impaired or intoxicated individuals, impaired driving investigations in general, and how many times you have testified as a Qualified Technician.

   "I have conducted approximately 100 impaired driving investigations and dealt with numerous impaired or intoxicated individuals over my 5 years as an officer. I have conducted 75 breath tests on the BAC Datamaster C, and have had the opportunity to present my evidence in court 10 times."

CHAPTER J - TECHNICIAN'S EVIDENCE

Preparing a CV outlining the above information will help to enhance your credibility in court and may facilitate your qualifications being accepted by defense counsel. Attach your Attorney General's Designation and Course Certificate to your CV. Crown will find this very useful when leading you through your qualifications.

Preparation Before Court

1. Review the breath test tickets thoroughly and be prepared to discuss **all** information contained on the tickets (ie. TABS and what it means, Internal Standard Tests, etc.).

2. Ensure the tickets were filled out completely. Alert Crown if you notice any problems or omissions.

3. Ensure that a proper 15 minute pre-test observation period was conducted by either yourself or the investigating member. **It is the responsibility of the Qualified Technician to ensure observation periods are conducted properly and in accordance with policy.**

4. Review any notes regarding blowing technique, symptomology of accused, as well as any admissions to amount or timing of consumption, drug use or medical conditions.

Presenting Evidence

You must present your evidence in a concise and easy to understand manner. Always use the correct scientific terms and legal words or phrases. It is highly recommended that you review the pertinent sections of the Criminal Code, prior to attending Court, to gain the correct legal terms. Try to meet and discuss the case with Crown Counsel prior to attending Court to determine why you are being called, and what evidence the Crown intends to lead from you. Any issues that defense counsel has brought up with Crown Counsel should also be discussed, and you should be prepared to answer any questions defense may have for you.

In order to present evidence in a concise manner, while meeting the particular requirements of the Criminal Code, the "10 Points" were developed to help facilitate Qualified Technician's presenting evidence in court. Take particular note of all the bolded text and the terminology used when giving this evidence.

1. Name & Designation.	I am _____, a ***Qualified Technician*** *designated by the AG of BC* for the purpose of operating an *Approved Instrument.*
2. Location of Test.	Two samples of breath ***were analyzed*** *by me* at_____BC.
3. Identity of Accused.	The samples were *received from*_____
4. Identity of Approved Instrument.	Each sample was *received* ***directly*** *into a BAC Datamaster C* which is an *Approved Instrument.*
5. Proper Working Condition.	This approved instrument *was found to be working properly by means of an alcohol standard* ***suitable for use*** with the instrument.
6. Identity of Alcohol Standard.	The alcohol standard was identified as_____
7. Date & Time of first test.	The first sample was taken at _____ hours on_____.
8. Result of first test.	The result of the first test was _____ *milligrams of alcohol in 100 milliliters of blood.*
9. Date & Time of second test.	The second sample was taken at _____hours on_____.
10. Result of second test.	The result of the second test was _____*milligrams of alcohol in 100 milliliters of blood.*

CHAPTER J - TECHNICIAN'S EVIDENCE

Answering Questions

It is important that when answering questions posed by either crown counsel or defense counsel that answers are kept simple and short. If a general question is asked, then answer in general terms and specify as required. Do not use terms you are not prepared to fully define or explain (ie. Electromagnetic spectrum, Beer-Lambert Law, Henry's Law, etc.).

If you cannot recall an answer to a question, don't be afraid to say that you cannot recall at the moment. If you are allowed to refer to your manual then feel free to look up this information, but do not count on being allowed to refer back to your manual.

You should be prepared to discuss a number of topics including:

1. The time the subject was presented to you
2. Was the pre-test observation period done properly and who conducted it?
3. How did you confirm the instrument was operating properly?
4. What are all the status messages on your ticket?
5. The manner and pattern of blowing of the accused and your standard manner of instructing individuals to blow. This is important in cases with shallow blows or refusals.
6. Symptoms of accused.
7. When and where you prepared the certificate and handed it to investigator.
8. Any policy or procedures related to the instrument (ie. External standard change policy, re-certification policy, etc.)

CHAPTER J - TECHNICIAN'S EVIDENCE

MOCK TRIAL QUESTIONS

1. **What is a BAC Datamaster C?**
   The BAC Datamaster C is a scientific instrument that determines the alcohol concentration of a person's *blood* by analyzing the amount of alcohol in the person's *breath* and reports the results in milligrams of alcohol in 100 mL of blood.

2. **What is infrared light?**
   Infrared light is a type of light used in the BAC Datamaster C and in everyday things such as remote controls.

3. **What is an Internal Standard?**
   A check performed by the BAC Datamaster C to ensure that it is working properly. The expected result is "**VERIFIED**" which I received on both occasions as illustrated on my Breath Test Tickets

4. **What is an External Standard?**
   A check of the BAC Datamaster C by an Alcohol Standard to ensure that the instrument is operating properly. The expected result is 90 to 110 mg% which I received on both occasions as illustrated on my Breath Test Tickets.

5. **Why is the acceptable range of the External Standard 90 to 110 mg%?**
   The Alcohol Standard has a target value of 100 mg%. The instrumental error is ± 10 mg%, therefore the acceptable range is 90 to 110 mg%.

6. **How do you determine the temperature of the simulator?**
   I read the simulator thermometer and ensure it is between 33.8 and 34.2°C.

7. **How do you know that the External Standard is suitable to use?**
   I look at the simulator tag to ensure the solution is not expired, that there is a signature of a supervisor, the lot number matches the Certificate of an Analyst to confirm that the Alcohol Standard is suitable for use, and the simulator temperature is between 33.8 and 34.2°C.

8. **How do you determine that the BAC Datamaster C is at the correct operating temperature?**
   The status message READY PUSH RUN tells me that the instrument is at operating temperature.

CHAPTER J - TECHNICIAN'S EVIDENCE

9. **How do you determine the temperature of the External Breath Tube?**
The temperature of the breath tube does not matter as long as it is warm to the touch, which prevents condensation. One of my four pre-test checks is to ensure that the external breath tube is warm.

10. **How do you know that the External Breath Tube is not blocked and is not the cause of your refusal (unable to provide a suitable sample after several attempts)?**
A block of the External Breath Tube would result in a status message (PUMP ERROR). I also ran a test on myself after the subject was removed from the room to prove that the instrument was capable of accepting a sample of breath.

11. **What is the cause of the status message INTERFERENCE DETECTED?**
The BAC Datamaster C has detected another chemical present on the subject's breath which would interfere with the alcohol analysis. The instrument is designed to give this status message and not to report a test result unless it can be sure that the result is due only to alcohol.

12. **What is the cause of the status message INVALID SAMPLE?**
The instrument has detected a decline in the apparent BAC while subject is providing a sample. The most common cause is improper blowing technique (discontinuous blowing) or more rarely, mouth alcohol.

13. **Why do you not wait after an invalid sample?**
Since the proper observation period had been conducted, there was no requirement to wait.

CHAPTER K

EXTERNAL STANDARD CHANGE

CHAPTER K - EXTERNAL STANDARD CHANGE

INTRODUCTION

The External Standard Solution is an alcohol solution used to ensure that the BAC Datamaster C instrument is in proper working order. The solution must be changed every 14 days or after 50 simulator tests. This chapter provides the procedure on how to change the External Standard Solution and fill out all appropriate documentation. The External Standard Solution is also known as the Standard Alcohol Solution or the Ethyl Alcohol Standard.

RESPONSIBILITIES

1. Only specifically trained personnel will change the External Standard Solution.

2. Trained personnel will be responsible for monitoring and changing the External Standard Solution as necessary.

MATERIALS REQUIRED

1. External Standard Replacement Form ED554-2 or equivalent (Figure 1).

2. External Standard Solution and associated Certificate of an Analyst.

EXTERNAL STANDARD SOLUTION

The external standard solution:

1. is analysed and certified by the Toxicology Services Section of the RCMP Forensic Laboratory.

2. MUST be obtained from RCMP Pacific Region stores and should be accompanied with a Certificate of an Analyst.

3. may only be used if it is certified, not expired, and within a sealed bottle.

CHAPTER K - EXTERNAL STANDARD CHANGE

BAC DATAMASTER C
EXTERNAL STANDARD REPLACEMENT

Location	
Solution ID	Lot
Date of Change: 2009-10-01	
Supervisor	

Refer to Manual for detailed explanation of procedure. If not all boxes can be checked, refer to the Manual for troubleshooting tips.

- ☐ Disconnect simulator and discard solution
- ☐ Dry simulator tubing and jar
- ☐ Check for breaks in mercury column of thermometer (fix break or replace thermometer)
- ☐ Perform leak test on new bottle of external standard solution
- ☐ Reassemble simulator and perform leak test
- ☐ Ensure simulator temperature is between 33.8° - 34.2° C
- ☐ Perform TABS check
- ☐ Perform Supervisor Test: **Average between 95-105 mg%** (each individual result 90-110 mg%)
- ☐ Perform Diagnostic Test - ensure all results are OKAY and instrument temperature is 50° C +/- 5° C
- ☐ Make up new simulator tag and attach to instrument
- ☐ Post Certificate of an Analyst
- ☐ Check supplies are adequate (mouthpieces, tickets, solution, etc.)

Attach:

Supervisor Test Ticket

Diagnostic Test Ticket

Old Simulator Tag

HERE

Cut and attach Tag to the Simulator

BAC DATAMASTER C - SIMULATOR TAG

Solution ID	Lot
Expiry Date: 2009-10-15	Supervisor

Figure 1 - External Standard Replacement Form (ED554-2)

CHAPTER K - EXTERNAL STANDARD CHANGE

WHEN TO CHANGE SOLUTIONS

The change interval for the External Standard Solution is automatically monitored by the instrument, which verifies both the expiry date and the number of tests conducted. The number of External Standard Tests will be shown on the right side of the display (eg. SIM = 22). The expiry date can be observed on the simulator tag, attached to the instrument. Note the solution expires at midnight on the date indicated on the simulator tag.

The External Standard Solution shall be changed every 14 days or 50 External Standard tests, whichever comes first. Failure to change the solution within these parameters will result in a status message ***"Change External Standard"*** and the BAC Datamaster C will not allow breath tests to be performed until the solution has been changed.

A particular lot of External Standard Solution has a shelf life of 2 years from the date of manufacture. Both the date of expiry and the date of manufacture are indicated on each bottle of solution. A lot of solution will expire at the end of the month indicated on the bottle. For example, an expiry date of 2011-09 indicates the lot will expire at the end of September 2011. **Do not use expired solutions.** The use of a bottle of solution MUST be within the 2 year manufacturer expiry date. For example, if lot of solution expires at the end of September 2011, DO NOT put the solution into a simulator after September 16th, 2011.

PROCEDURE

1. Prepare the External Standard Replacement form using RCMP Web Form ED554-2 or the paper equivalent. Type or write in the required information. Ensure the External Standard Solution identification and lot number exactly matches the accompanying Certificate of an Analyst. Check off the boxes on the form as each step is completed.

   If the Qualified Technician is unable to check off a box, see the respective procedural step below for troubleshooting. Contact Toxicology Services or the service agent for assistance if the troubleshooting techniques do not resolve the issue.

2. Turn off the simulator power switch and disconnect the simulator from the instrument.

3. Discard the old solution.

CHAPTER K - EXTERNAL STANDARD CHANGE

4. Dry the simulator tubing by blowing or shaking out the excess moisture. Replace the tubing if necessary. The outlet tubing from the simulator should be kept as short as possible.

5. Dry the simulator jar and elements, and check the instrument simulator ports for excess moisture and dry if necessary. Check the jar for chips or cracks and inspect the O-ring to ensure it is not cracked or broken. Replace if necessary. Ensure the simulator elements and submerged parts are cleaned to prevent algae growth.

6. Check for breaks in the mercury column of the thermometer. If a break in the mercury is observed, place the thermometer in hot water followed by cold water. If this does not fix the problem, replace with a new thermometer.

7. Ensure the outer seal of the External Standard Solution bottle is intact. Remove and perform a leak test by inverting and squeezing the bottle. If the seal is not intact, obtain a new bottle and repeat. If the seal is intact, pierce the seal and pour the entire contents of the External Standard Solution into the jar.

8. Reassemble the simulator and perform a leak test. This is done by pinching the outlet tube and blowing into the inlet tube. If the system (jar) is properly sealed there will be very little bubbling in the solution. If there is a leak in the seal of the jar, bubbling will be observed in the solution. Open the simulator and re-check for cracks in the jar or o-ring of the simulator.

9. Once the leak test passes, connect the simulator to the instrument and turn the simulator power switch on. Ensure that the paddle is turning and the power and heater lights are illuminated.

10. After waiting approximately 15 to 20 minutes, ensure that the correct temperature (34.0°C ± 0.2°C) is achieved and maintained.

11. Remove the old simulator tag and attach it to the External Standard Replacement form.

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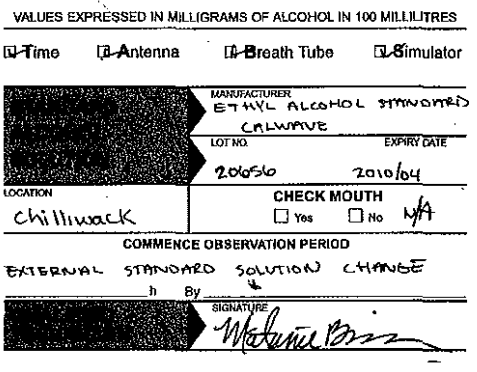
12. Complete the TABS Checks and indicate so on a breath test ticket. Complete the following information boxes on the lower part of a breath test ticket: External Standard Manufacturer Identification, Lot No., Expiry Date, Location, Signature and page number. Ensure that the External Standard Manufacturer Identification is identical to that on the Certificate of an Analyst and that the Expiry Date is taken from the label on the bottle of External Standard Solution. See Figure 2.


VALUES EXPRESSED IN MILLIGRAMS OF ALCOHOL IN 100 MILLILITRES

☑ Time ☑ Antenna ☑ Breath Tube ☑ Simulator

MANUFACTURER: ETHYL ALCOHOL STANDARD CALWAVE

LOT NO.: 206560 EXPIRY DATE: 2010/04

LOCATION: Chilliwack CHECK MOUTH ☐ Yes ☐ No N/A

COMMENCE OBSERVATION PERIOD

EXTERNAL STANDARD SOLUTION CHANGE

h By SIGNATURE: Melanie Bass

Figure 2 - Completed Breath Test Ticket for External Standard Change

13. Push the **SUP** key to conduct a Supervisor Test. When prompted for the **PASSWORD**, type in "**TECH.**"

Data Prompt 1: **TECHNICIAN'S NAME (L/F/M):**

Enter your name when requested. Last, first, and middle should be separated by a forward slash as shown above.

Data Prompt 2: **SIM TEMP 33.8c - 34.2c?**

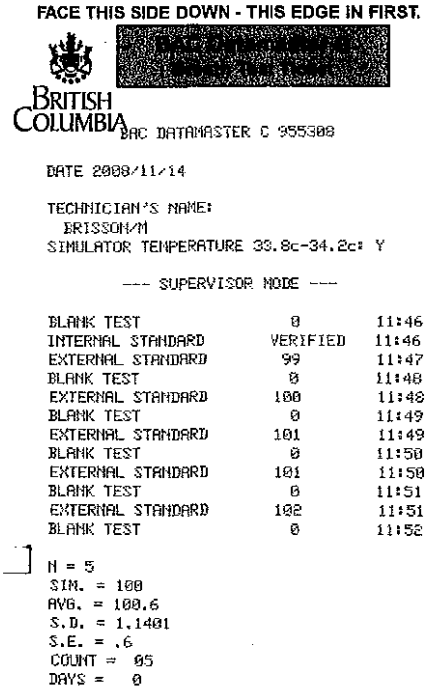
Check the simulator solution temperature. If the temperature is between 33.8°C and 34.2°C inclusive, type **Y** for yes. If the temperature is outside of the acceptable range, type **N** for no, do not proceed with the Supervisor's Test and wait for the instrument to return to READY - PUSH RUN. Wait for the temperature to reach the acceptable range and begin at step 12 again.

CHAPTER K - EXTERNAL STANDARD CHANGE

Data Prompt 3: **Solution Changed? < Y/N >**

If the solution has been changed, type **Y** for yes. This will automatically reset the External Standard Test counter. If the solution has not been changed, type **N** for no. If **N** is typed, the External Standard Test Counter will not be reset and will add External Standard Tests to the total count. The instrument will then perform five External Standard tests.

14. Review the data from the Supervisor Test. See Figure 3.


FACE THIS SIDE DOWN - THIS EDGE IN FIRST.

BRITISH COLUMBIA

BAC DATAMASTER C 955308

DATE 2008/11/14

TECHNICIAN'S NAME:
BRISSON/M
SIMULATOR TEMPERATURE 33.8c-34.2c: Y

--- SUPERVISOR MODE ---

BLANK TEST	0	11:46
INTERNAL STANDARD	VERIFIED	11:46
EXTERNAL STANDARD	99	11:47
BLANK TEST	0	11:48
EXTERNAL STANDARD	100	11:48
BLANK TEST	0	11:49
EXTERNAL STANDARD	101	11:49
BLANK TEST	0	11:50
EXTERNAL STANDARD	101	11:50
BLANK TEST	0	11:51
EXTERNAL STANDARD	102	11:51
BLANK TEST	0	11:52

N = 5
SIN. = 100
AVG. = 100.6
S.D. = 1.1401
S.E. = .6
COUNT = 05
DAYS = 0

Figure 3 - Supervisor Test Ticket

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All individual External Standard Test results MUST be in the range of 90 and 110 mg% and the average (AVG) of the 5 External Standard Tests should be in the range of 95 to 105 mg%.

A. If the average of the 5 External Standard Tests is not in the range of 95 to 105 mg% **AND/OR** any individual test is not in the range of 90 to 110 mg%, repeat steps 1 through 14, using a new bottle of External Standard Solution.

B. If after a second External Standard Solution change, the average of the 5 External Standard Tests is outside of 95 to 105 mg%, and all individual External Standard Test results are between 90 and 110 mg%, leave the instrument in service and contact Toxicology Services and the service agent as the instrument is not performing optimally.

C. If after a second External Standard Solution change, any individual External Standard Test result is outside of 90 to 110 mg%, the instrument must be taken out of service and the service agent contacted.

15. Fill out a second breath test ticket, as described in step 12.

16. Press the **TST** key to run a Diagnostic Test. If prompted for a **PASSWORD**, type in **"TECH."** The instrument will proceed with testing various functions and components of the instrument and print the results on the breath test ticket. See Figure 4.

CHAPTER K - EXTERNAL STANDARD CHANGE

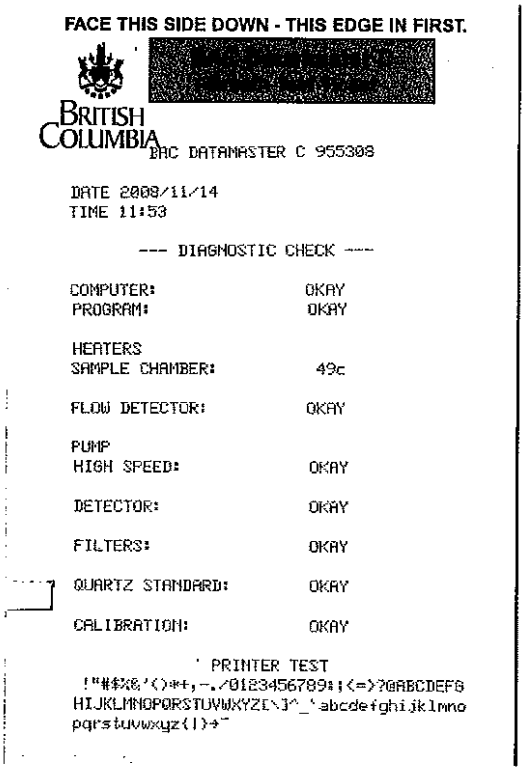


Figure 4 - Diagnostic Test Ticket

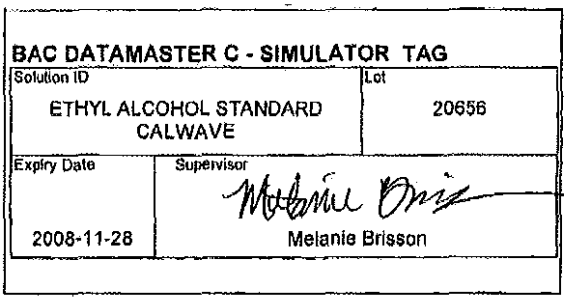
Examine the test results. All fields should indicate "Okay", with the exception of the sample chamber, which should be 50 °C ± 5 °C. The printer characters at the bottom of the ticket should be present and correct. If the type is faded, contact the service agent or a BAC Datamaster C Supervisor to replace the printer ribbon. If there are any improper results or status messages contact the BAC Datamaster C Supervisor, Toxicology Services or the service agent.

17. Attach both the white copies of the Supervisor Test and Diagnostic test tickets to the External Standard Replacement form.

18. Cut the new simulator tag from the bottom of the External Standard Replacement form and attach it to the instrument. See Figure 5.

CHAPTER K - EXTERNAL STANDARD CHANGE

Figure 5 - Simulator Tag


BAC DATAMASTER C - SIMULATOR TAG

Solution ID	Lot
ETHYL ALCOHOL STANDARD CALWAVE	20656
Expiry Date	Supervisor
2008-11-28	Melanie Brisson

19. Ensure the new simulator tag has the following information:

    A. The External Standard Solution identification and lot number exactly how it appears on the Certificate of an Analyst.

    B. The new expiry date (14 days from the date of the External Standard Solution change).

    C. The name and signature of the individual changing the External Standard Solution.

20. Complete the remaining portion of the External Standard Replacement Form as follows:

    A. Ensure there are adequate amounts of supplies, such as mouthpieces, Breath Test Tickets, and that there are additional bottles of External Standard Solution available for future solution changes.

    B. Inspect the breath tube inlet screen for debris. If debris is observed, gently remove it with an opened paper clip or tweezers.

    C. Ensure that the area around the instrument is clean and dust-free.

    D. Ensure that the **Certificate of an Analyst** for the External Standard Solution is posted near the BAC Datamaster C.

21. Leave instrument idle for 5 minutes before conducting further breath tests.

22. Place the External Standard Replacement form, along with the old simulator tag, Diagnostic Test ticket, and Supervisor Test ticket into the External Standard Change Log/File.