INTOX EC/IR II

RESOURCE READING MATERIAL

July 2011

NOTICE

This manual has been prepared by the staff of the National Breath Test Program (NBTP) of the RCMP Forensic Science and Identification Service (FS&IS) for the exclusive use of Qualified Technicians taking an Intox EC/IR II Course. Information contained herein only refers to the Intox EC/IR II, as configured for Canada, using the options approved by the members of the National Breath Test Program.

TABLE OF CONTENTS

HISTORY OF THE NATIONAL BREATH TESTING PROGRAM

The first scientific support for breath testing by the RCMP began with forensic scientists at the Regina Crime Detection Laboratory in 1957. The scientists were a part of the Chemistry Section and were assigned additional duties to support the fledgling novelty of breath alcohol testing by police officers in the field. These duties included preparation of the Alcohol Standard, quality control of the ampoules, training of police officers and scientific and technical support in Court as the breath test results were introduced into evidence.

The first breath alcohol testing was strictly a screening process, using voluntary samples given by suspected impaired drivers for testing by the Breathalyzer®.

The success and expansion of the field breath alcohol testing soon resulted in all parts of Canada using the Breathalyzer® and the need for a dedicated core of personnel by the RCMP to support what had become for all purposes, a Program. This resulted in the creation of the Alcohol Section in 1960. Support for the Program continued as legislation was passed in 1968 introducing forensic breath alcohol testing for impaired drivers based on reasonable and probable grounds of impairment by a driver. This was followed by more comprehensive legislation in 1976 which introduced Approved Screening Devices, putting additional demands on the Alcohol Section staff for scientific and technical support of expanded forensic breath alcohol testing requirements.

The Crime Detection Laboratories became the Forensic Laboratory Services (FLS) in 1985. In 1999, the Alcohol and Toxicology Sections of the FLS merged to form Toxicology Services in order to recognize the increasing need to consider the simultaneous presence of alcohol and drugs in impaired driving and criminal investigations. In 2002, the Director of the FLS created the National Breath Testing Program (NBTP), a component of Toxicology Services, in order to dedicate a core group of forensic scientists to support the increasing technical requirements of forensic breath alcohol testing.

The NBTP ensures that quality assurance and operational standards are identified to breath test programs supported by RCMP Forensic Laboratory Services. To accomplish this goal, the National Breath Testing Program staff provides training, instrument technical support, quality assurance of supplies and laboratory support to municipal and federal authorities. In addition to its responsibility for training, the NBTP provides disclosure and expert testimony to the legal community.

The scientific requirements that are promulgated by the NBTP establish specific requirements for administering breath tests. These requirements are based on the Recommended Standards and Procedures of the Canadian Society of Forensic Science Alcohol Test Committee. The result is a breath testing program that is scientifically based and accurate.

To accomplish the task of training, the NBTP partners with using senior police instructors to provide comprehensive training. All police instructors have many years of experience in impaired driving investigations and in the administration of screening and evidential alcohol testing. The NBTP staff is extremely grateful to these professional volunteer instructors for their dedicated service to the program.

The National Breath Test Program staff encourages inquiries.

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TYPES OF BREATH TEST INSTRUMENTATION

The continuing problem of the drinking driver has necessitated the advancement of detection and testing devices for alcohol since the early years of the automobile. Breath, because of the non-invasive nature of obtaining a sample, has been an obvious medium for which testing methods have been developed.

Instrument based breath testing began in 1957 in Canada with the Breathalyzer®. This instrument relied upon a chemical reaction resulting in a color change. In the mid to late 1990's the Intoxilyzer 5000C® and BAC Datamaster C® were introduced and thereafter were the approved evidential instruments used for breath testing in Canada. These instruments utilize infrared (IR) technology to determine a Blood Alcohol Concentration.

In 2009, the RCMP selected the Intox EC/IR II as a replacement instrument for evidential testing. This instrument utilizes both IR and electrochemical (EC) analysis to derive a result. As an important note, the evolution of instrumentation through the years comes not from their accuracy and precision, but from their level of automation, data retention capabilities, and ease of operation.

APPROVED SCREENING DEVICES (ASDs)

These test devices are portable and used primarily in the field prior to arrest. They are electrochemical solid-state devices with pass/warn/fail indicators and/or a digital readout. In Canada they are approved for use after reasonable suspicion of alcohol in the body of a driver. The list of approved devices is identified in the Approved Screening Devices Order.

APPROVED INSTRUMENTS

Approved instruments perform a quantitative analysis of alcohol in the breath. The Intox EC/IR II, manufactured by Intoximeters Inc., St. Louis, Missouri, is an approved instrument listed in the Approved Breath Analysis Instruments Order. The Intox EC/IR II was selected by the RCMP for use by law enforcement personnel in Canada through a competitive bidding process based on scientific, technical and cost requirements.

CHAPTER A

THEORY

In Canada it is a criminal offence for a person to operate a motor vehicle or to have care or control of a motor vehicle when the blood alcohol concentration exceeds eighty milligrams of alcohol in one hundred millilitres of blood (80 mg%).

In the vast majority of drinking / driving investigations breath samples, not blood samples are analyzed to determine the blood alcohol concentration of the person.

In Canada, breath test results for law enforcement are reported as a blood (not a breath) alcohol concentration. As such, the Qualified Technician should understand how it is possible to analyze breath for alcohol content and express the result in terms of a blood alcohol concentration.

Definition of the Intox EC/IR II

The Intox EC/IR II is an approved instrument which analyzes a sample of deep lung air and reports the results in milligrams of alcohol in 100 millilitres of blood.

In order to understand how a blood alcohol concentration relates to breath analysis, a brief knowledge of lung structure and function and gas exchange in the lungs is useful. See Fig A1.

Gas exchange occurs in the alveolar airspace (tiny air sacs located deep within the lungs). During respiration oxygen moves into the blood from the fresh air inhaled into the alveolar sacs, and carbon dioxide moves out of the blood and into the alveolar sacs to be exhaled.

Alcohol is volatile, meaning it can exist in a gas form. When alcohol is consumed, alcohol from the blood will diffuse into the alveolar airspace (similar to the carbon dioxide). A small amount of alcohol is removed from the body with each exhalation.

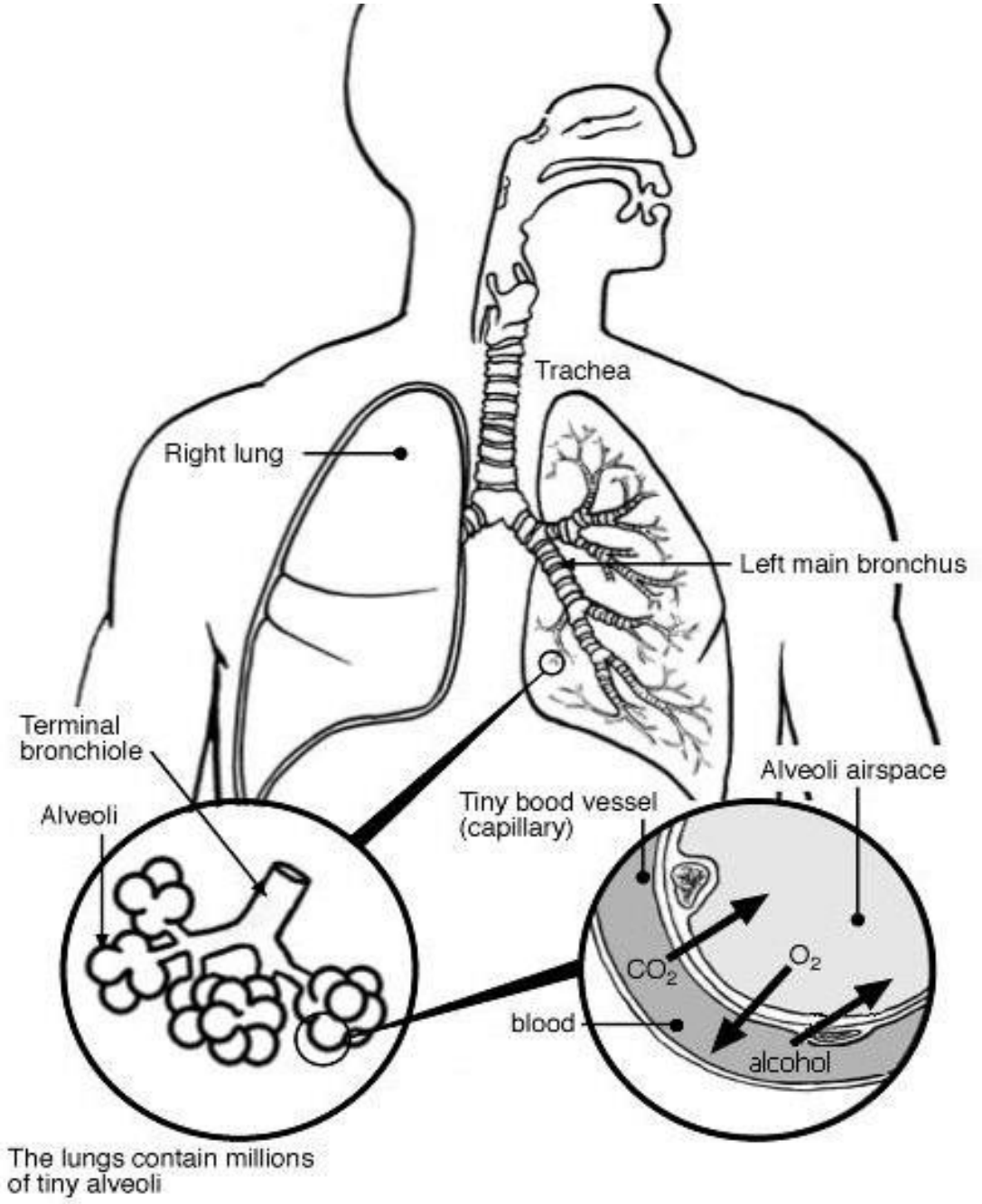

Figure A1: The lungs and the exchange of gases between the blood and the alveolar airspace

The amount of alcohol which diffuses into the alveolar airspace is directly proportional to the amount of alcohol in the blood. The exchange of alcohol from the blood into the breath is governed by Henry's Law. Henry's Law describes the actions of a volatile substance dissolved in water (or blood) and brought into contact with air.

Henry's Law states

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

To apply Henry's Law to breath testing consider that our solute is alcohol. The solute in the solution is the alcohol in the blood. The saturated vapour, would be the deep lung air. The temperature of the breath as it leaves the mouth is 34°C.

Henry's Law applied to breath testing

At 34°C the deep lung air contains a concentration of alcohol proportional to the concentration of the alcohol in the blood.

This law applies to all breath testing equipment (approved screening devices and approved instruments) used for law enforcement in Canada.

Henry's Law tells us that the concentration of alcohol in the deep lung air is proportional to the concentration of alcohol in the blood. If we measure the concentration of alcohol in the deep lung air, we will be able to determine the concentration of alcohol in the blood, if we know what the correct proportion is. This proportion is known as the breath to blood ratio.

The Breath:Blood ratio (2100:1)

At 34°C, 2100 parts of deep lung air contain the same amount of alcohol as 1 part of blood.

All breath test equipment used for law enforcement in Canada applies this ratio to convert the breath analysis result to a blood alcohol concentration. However, scientific studies indicate that the average breath:blood ratio is really closer to 2400:1. The significance of this is that breath test results tend to underestimate the actual blood alcohol concentration of most subject.

FACTORS WHICH AFFECT A BREATH TEST RESULT

There are a number of factors which can affect the results of a breath test. In order to obtain breath test results from a subject that accurately reflects his or her blood alcohol concentration, the terminal portion of a forced expired breath sample (deep lung air) must be analyzed. The air from the upper airways is mixed with clean room air and does not accurately reflect the person's blood alcohol level. The instrument determines when a sample of deep lung air acceptable for analysis has been provided by the breath test subject. The technician, not the instrument, determines if the samples accepted for analysis are suitable.

BREATH TEMPERATURE

Both Henry's Law and the breath:blood ratio is temperature dependant. If the mouth temperature is greater than 34°C, e.g. if subject has a fever, the breath test result will be falsely elevated. Alternatively, if the mouth temperature is less than 34°C, e.g. subject has placed ice chips in his mouth, the breath test result will be falsely lowered. Hyperventilation could also result in reducing the mouth temperature and therefore falsely lowered results.

MOUTH ALCOHOL

Mouth alcohol is residual alcohol remaining in the mouth. This can occur from recent consumption of an alcoholic drink, burp or regurgitation of stomach contents containing alcohol, belch or vomit, the recent use of mouthwash or breath fresheners containing alcohol.

The concentration of alcohol in beverage alcohol, mouthwash or breath fresheners is much higher than the breath alcohol concentration and can produce a false high breath test result if they are allowed to remain in the mouth.

In order to eliminate the potential effect of residual mouth alcohol, it is essential that the subject undergo a minimum 15 minute pre-test observation period prior to providing a breath sample.

SHALLOW BLOW

A shallow blow is when a subject provides a breath sample that meets the minimum sample acceptance criteria, but is not a sample of deep lung air. The effect of analyzing a shallow blow would be a falsely low result.

To minimize the potential of receiving a shallow blow, it is important for the QT to instruct the subject to provide a steady, continuous breath sample into the instrument until instructed to stop. The QT should closely observe the manner of blowing and effort exerted by the subject in providing the sample into the instrument to ensure compliance with the instructions.

ACCURACY AND PRECISION

ACCURACY: (hitting the target)

Accuracy can only be determined when you know what the target value is. Are you close to or hitting the bull's eye? With alcohol standard with a target value of 100 mg%, results of 95, 105, 97, 103, and 100 mg% provide good accuracy as all results are within 5 mg% of the target value.

Figure A2: High accuracy, but lower precision

PRECISION (getting the same result)

Precision refers to the ability of the instrument to produce the same result with multiple analysis of the same test specimen. If we were to analyze the alcohol standard 5 times and get results of 92, 91, 91, 92, and 92, we would have good precision as the results vary by only 1 mg% from the average.

When you have a tight group that is not close to the bull's eye, this may mean that your sight needs adjusting, or in the case of an approved instrument that it needs to be recalibrated.

Figure A3: High precision, but low accuracy

ACCURACY AND PRECISION OF ALCOHOL STANDARD RESULTS

Ultimately the goal is to have both accuracy and precision in breath testing. We want a nice tight group hitting the bull's eye. Ideally, we would like the same result each time we test. Perfect results with 5 alcohol standard tests with a target value of 100 mg% would be 100, 100, 100, 100 and 100 mg%. No breath test instrument is expected to be completely accurate and precise all the time.

Figure A4: High accuracy, high precision

MARGIN OF ACCEPTABILITY

The margin of acceptability for the Intox EC/IR II is an alcohol standard result within 10% of the target value of the alcohol standard. For example, if the target value for an alcohol standard is 100 mg%, the margin of acceptability is 90 mg% to 110 mg% (inclusive). If the target value for an alcohol standard is 82 mg%, the margin of acceptability is 74 mg% to 90 mg% (inclusive).

An alcohol standard test is conducted prior to each subject breath test and each alcohol standard result must be within the margin of acceptability. A result outside of this range is not acceptable, and the testing sequence will abort.

PROPER WORKING ORDER

The Alcohol Standard test challenges the calibration of the instrument. When an alcohol standard test result falls within ±10% of the target value, we are confident in saying that "the instrument was found to be in proper working order by means of an alcohol standard".

REVIEW QUESTIONS:

1. What scientific law is alcohol breath testing based on?
2. State the breath:blood ratio.
3. Why is it necessary to analyze a sample of deep lung air when determining a blood alcohol concentration?
4. How does a Qualified Technician recognize that s/he is obtaining a sample of deep lung air.
5. Why would breath testing underestimate the actual blood alcohol concentration?
6. What is the margin of acceptability of Alcohol Standard results?
7. What steps can a QT take to ensure that residual mouth alcohol does not affect a breath test result?
8. If permitted, what effect would holding ice cubes in the mouth have on a breath test result?
9. What is the suspected cause of breath test results of 190, 140 and 180 mg%?
10. What is the suspected cause of breath test results of 250, 150 and 150 mg%?

CHAPTER B

FUNCTIONAL OVERVIEW

The Intox EC/IR II is an approved instrument that analyzes a sample of deep lung air and reports the results in milligrams of alcohol in 100 millilitres of blood.

The Intox EC/IR II employs two distinct analytical techniques to achieve a blood alcohol concentration (BAC) result. Both infrared (IR) analyses and an electrochemical sensor (i.e. fuel cell) are utilized. These techniques each offer a different advantage to the sampling process.

First, the IR system monitors the quality of the breath sample and is used to detect residual alcohol in the mouth. A flow sensor continuously monitors the breath sample to determine the exact moment to introduce the sample to the fuel cell component of the instrument for final analyses.

Second, the fuel cell is specific to alcohol and facilitates a chemical reaction that results in an electrical current. This current is then used to calculate the blood alcohol content present in each sample analyzed. In combination, the IR and fuel cell analytical systems provide all the necessary information to make a determination of an alcohol concentration and ensures that the instrument takes a sample representative of the blood alcohol content.

Figure B1 – front view of the Intox EC/IR II

FEATURES

1) **Breath Tube** – an insulated and reinforced plastic tube through which the subject provides a breath sample to the instrument. It is also used to draw room air into the instrument to purge the system. It is temperature controlled to 40˚C ± 1˚C. A clean mouthpiece is attached to the breath tube for each breath sample.

2) **Display** - a two line alphanumeric display that provides menu selections, both questions and responses during data entry, information on the status of the instrument, operating conditions and any instrument warnings that may affect the operation of the instrument.

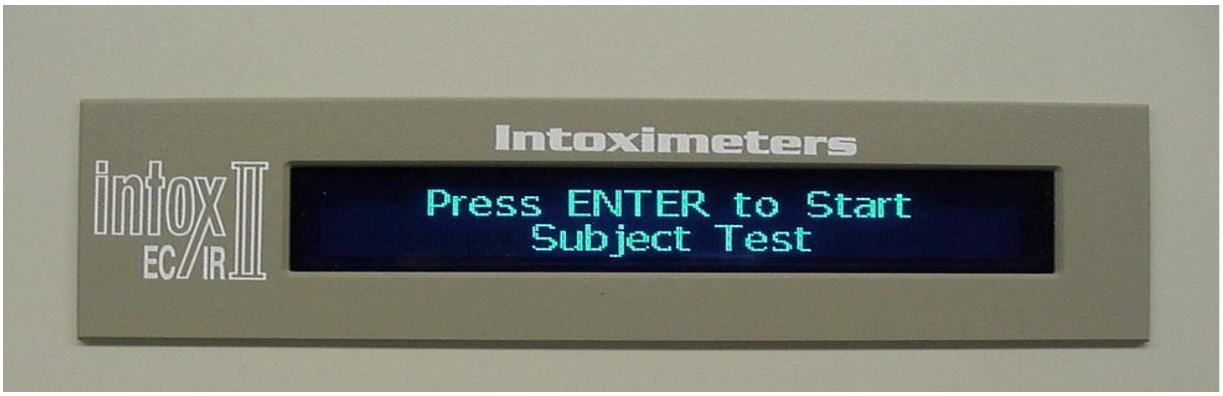

Figure B2 – view of the Intox EC/IR II display

3) **Keyboard** - standard keyboard, used to navigate the instrument prompts and enter data.

4) **Barcode Scanner** - E-SEEK 250 barcode scanner used to read mag stripe and 2D barcodes on Driver's licenses.

5) **Precise and accurate** - at blood BAC levels between 0 and 550 mg%.

6) **Standalone, Microprocessor-Controlled** - self-contained, with all necessary operating software on-board.

7) **Built-in Diagnostics** – analyzes instrument temperatures and electronic components.

8) **Software Driven Protocols** – conform to the standards of the RCMP National Breath Test Program and the ATC requirements for Canadian breath test programs.

9) **External Printer** - can print to PCL 5-compatible printers via a USB port.

10) **Wet Bath- and Dry Gas-capable** – plumbed for both wet bath simulators and dry gas cylinders for the introduction of alcohol standards. Wet bath connections at the rear of the instrument include heated inlet tubing. The dry gas compartment is located on the top of the instrument and is accessible via a lockable lid see Fig B3.

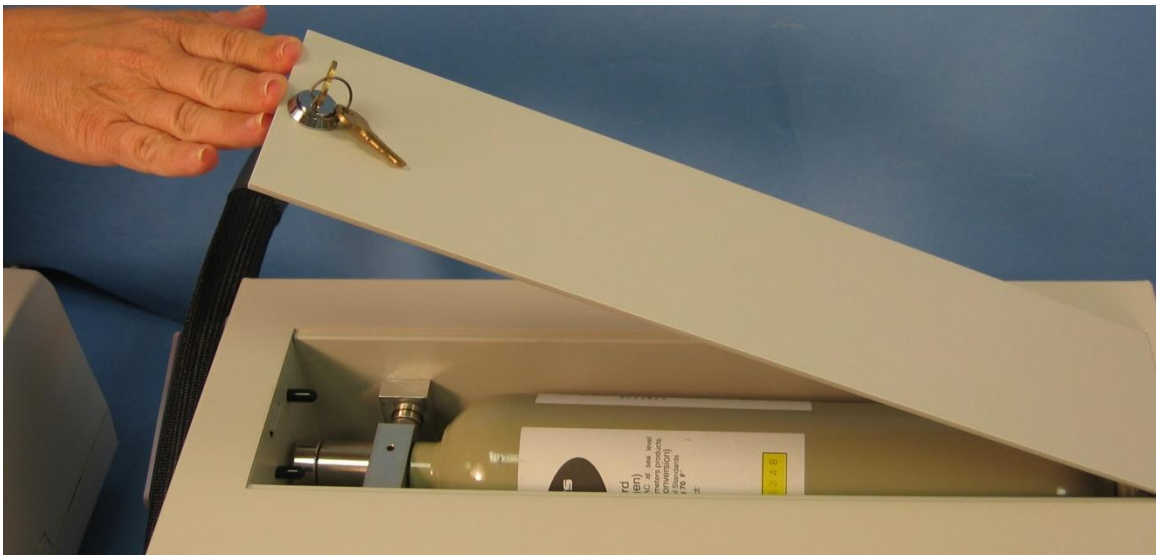

Figure B3 – Dry Gas Compartment

TECHNICAL SPECIFICATIONS

1) **Measurement Range** - 0 to 550 milligrams of ethanol in 100 millilitres of blood

2) **Specificity** - the measurement system is specific to ethyl alcohol; it does not respond to other hydrocarbons found naturally in the breath.

3) **Operating Temperature Range** - Indoor use, designed to operate in ambient temperatures between 5ºC and 40ºC.

4) **Internal Clock and Calendar** – An onboard battery provides back up power for the internal clock to allow it to operate during power outages or when the instrument is unplugged.

5) **Keyboard –** USB, AT-compatible keyboard.

6) **Display** - is a 256 x 32 pixel graphic vacuum fluorescent display. Displays 2 lines of characters with a minimum of 20 characters per line, rated for a lifetime of 50,000 hours.

7) **Input/output Connections** - one RS-232 serial communications ports, six USB ports, one RJ45 ethernet connection.

8) **Electrical** - 120 / 240V 60 / 50Hz. 1.7 / 0.9A

9) **Mechanical** - Height: 180 mm
Width: 476 mm
Depth: 368 mm
Weight: 7.0 kg

TURNING ON THE INTOX EC/IR II

Before turning power on, ensure that (1) the keyboard cable is attached; (2) breath tube is connected to the breath tube inlet and the power connector on the left side of the cabinet (3) printer is connected to a USB port and turned on, and (4) card reader is connected to a USB port. To turn instrument power on, plug the Intox EC/IR II into an AC power outlet and switch the power switch (located on the rear panel of the unit) to the ON position. The Intox EC/IR II can remain on continuously which allows the user to avoid the warm-up time that is required when the instrument has been turned off for a period of time. Once you turn the instrument on the alphanumeric display will illuminate and display a series of initialization messages. The Intox EC/IR II will then go to the scrolling screen, displaying date, time, location and serial number of the instrument.

Subject tests, accuracy checks or calibrations cannot be initiated during the warm-up period, which lasts about 20 minutes. When the instrument reaches operating temperature, the scrolling screen messages will change, indicating that the instrument is ready to run tests.

FRONT PANEL DISPLAY

The graphic display shows two lines of text for menu selections, questions and responses during data entry, and information on the status and operating conditions of the instrument. After an initial warm-up period, the scrolling screen lists such things as location, instrument serial number, date & time and any warning conditions that may affect the operation of the instrument.

THE KEYBOARD CONTROLS & INDICATIONS

A Qualified Technician (QT) performs all commands from the keyboard control for all instrument functions. The keyboard supplied with the Intox EC/IR II works just as any personal computer keyboard works. The following keys have special uses in conjunction with the Intox EC/IR II:

ENTER KEY

Found in the center right portion of the keyboard and sometimes referred to as the Return Key, this key performs several functions. First, it is used to start a test sequence. When answering many of the data input questions, pressing the Enter Key saves the answer or data in memory and moves on to the next question or data entry field. Pressing the Enter key after all the subject test data entry has been completed allows the operator to review, verify and/or correct the data entered.

ESCAPE KEY

Found in the upper left-hand corner of the keyboard, this key **("Esc")** will abort and exit the current function and return to scrolling screen. If a testing sequence (breath test, alcohol standard test, etc.) has already started when the Esc key is pressed, the test sequence aborts, an abort message is shown on the display and generally on the printout, as well.

SPACE BAR

Found at the bottom center of the keyboard, this key has two functions. Pressing the Space bar after all the subject test data entry has been completed starts a subject test. The Space Bar can also be used to toggle between options in certain menus for the selection of a specific setting.

FUNCTION KEYS

The twelve Function Keys (F1 – F12) perform pre-programmed functions and are password protected. These keys are found along the top row of the keyboard above the main set of keys.

CURSOR KEYS

The four “arrow keys” found on the lower right portion of the keyboard, are used to navigate through menus.

REAR PANEL CONNECTIONS AND CONTROLS

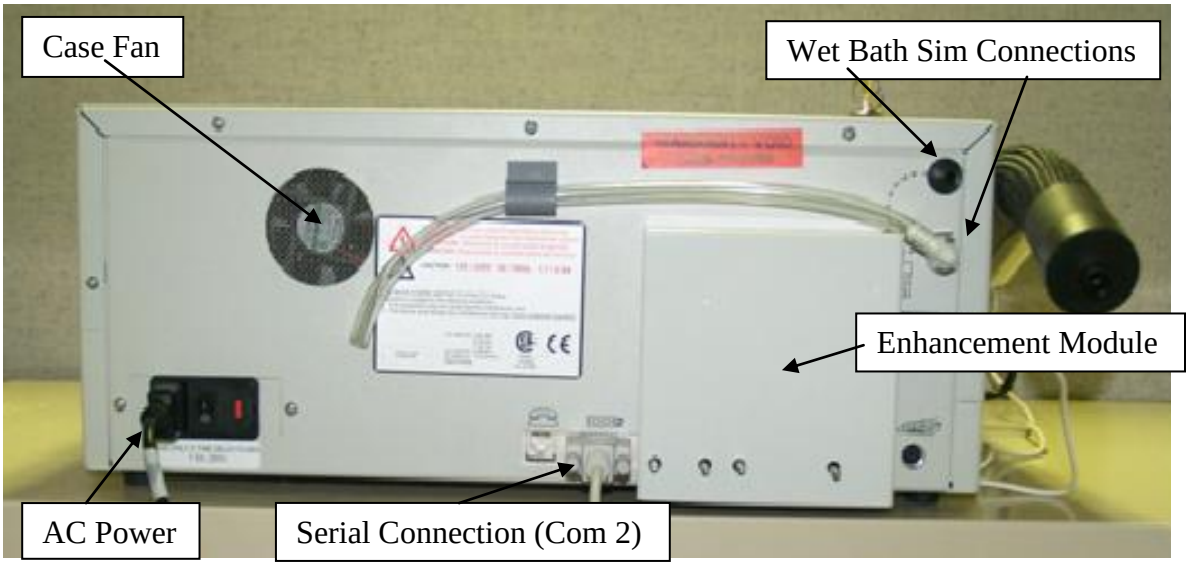

Figure B4 – rear view of the Intox EC/IR II

1) **Case Fan** - cools the instrument.

2) **AC Power** - plug-in for instrument power cord and switch to turn instrument on.

3**) Wet bath simulator connections** - including black plastic inlet port and tygon tubing connected to the white plastic quick connect on the vapour return port.

4) **Serial Connection (Com 2)** – for connection to “intelligent” wet bath simulator with serial port communication

5) **Enhancement Module** – hub that allows the following external components to be connected to the instrument: [see Fig B4]

- keyboard, a marked connection on the right side of the module
- heated simulator hose, a marked connection (5V) on the right side of the module
- card reader for drivers licenses, via any one of five USB ports on the left side of the module
- external printer, via any one of five USB ports on the left side of the module
- Ethernet connector, at the bottom of the left side of the module for RJ-45 plug to network connections

INTERNAL COMPONENTS

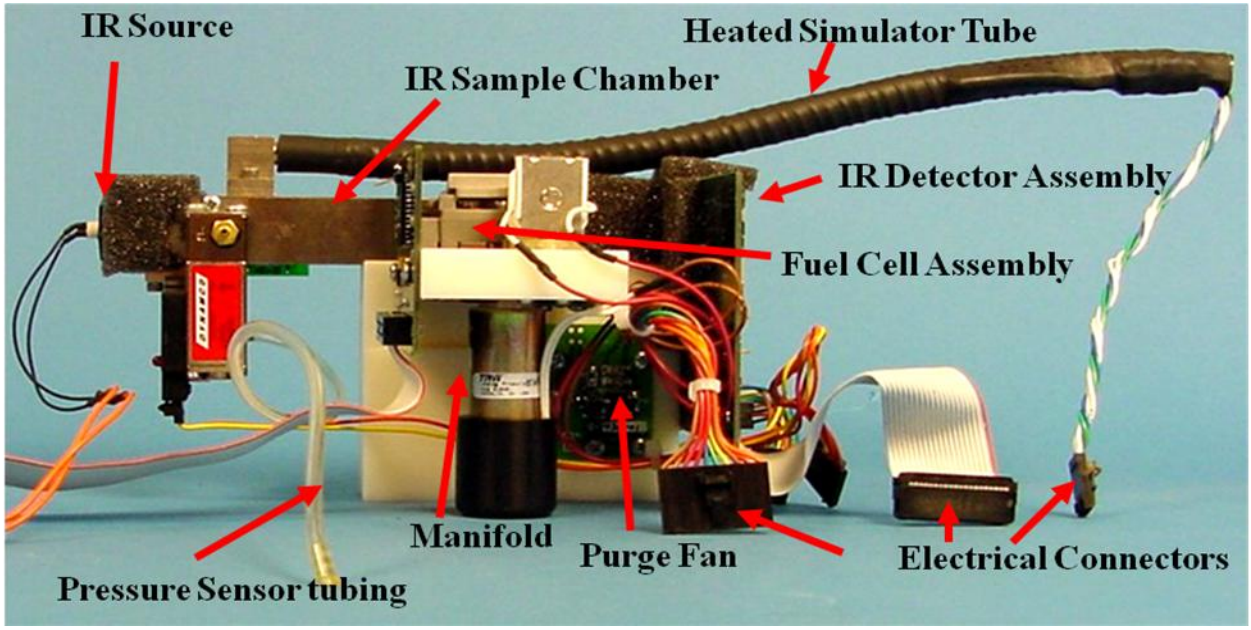

Figure B5 – internal components of the Intox EC/IR II

Figure B5 above, shows the internal components of the instrument, including the IR and fuel cell assemblies. The major components are highlighted and further detail can be found below:

1) **IR Source** – produces infrared (IR) energy, starting point for IR energy

2) **IR Chamber** – where the IR energy and the breath sample, alcohol standard or sample of ambient air come into contact

3) **IR Detector Assembly** – houses the IR filters and sensors; the endpoint for the IR energy and where the transmitted energy is detected

4) **Fuel Cell Assembly** – where the sample of breath or air is drawn in to interact with the fuel cell sensor. The assembly remains closed until the sampling criteria are met, it then opens to draw in a sample from the IR chamber for analysis.

5) **Heated Simulator Tube** – The tube through which the alcohol standard vapour is drawn into the instrument via a pump (not shown) from a wet bath simulator.

6) **Manifold** – nylon block mount for the fuel cell and IR assemblies.

7) **Purge Fan** – used to draw room air into the IR sample chamber to purge the system.

8) **Pressure sensor tubing** – this tubing leads to the pressure sensor (not shown). The pressure sensor has two purposes:

- Pressure sensor – monitors the flow rate and volume of the subject's breath sample. This is used to decide when the instrument draws a sample of breath into the fuel cell.
- Barometer – monitors ambient atmospheric pressure to determine the correction factor for dry gas standards. This reading is used to determine the target value for the dry gas alcohol standard at the time of the test (the target value varies according to atmospheric pressure).

RADIO FREQUENCY DETECTION

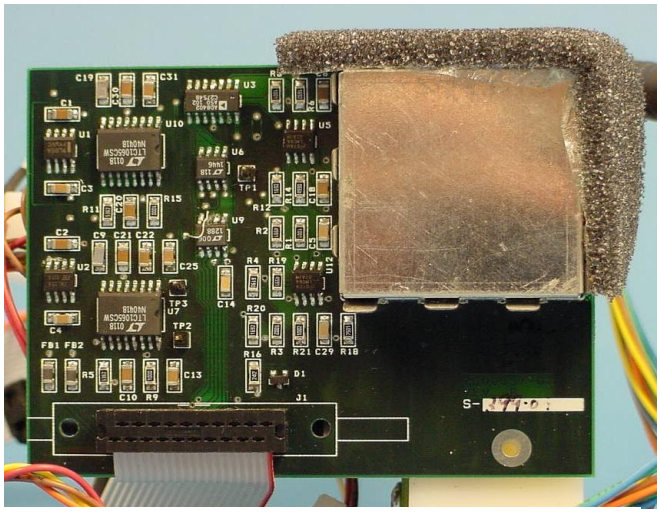

Figure B6 - Faraday cage on circuit board

The Intox EC/IR II was designed and certified by an independent laboratory to meet various radio frequency interference (RFI) immunity requirements. Although the instrument is certified as immune to certain RFI, it is recommended that no transmitting devices be used in the testing room during a test sequence.

A Faraday cage is an enclosed conducting shell that shields its interior from strong electric fields and electromagnetic waves. This metal can enhances the RFI/EMC protection which includes the design and sealing of the metal body of the instrument, as well.

If the instrument is subjected to a strong source of RFI, the instrument will abort the test and display **RFI Detected** as the status message.

BREATH SAMPLING AND ALCOHOL ANALYSIS

The Intox EC/IR II employs two distinct analytical techniques to monitor the suitability of a breath sample and to determine a blood alcohol concentration (BAC). It uses the electrochemical (EC) sensor (fuel cell) primarily to analyze the breath sample and determine the BAC. However, both the fuel cell and the infrared (IR) sensors are involved in monitoring the quality of the sample and checking for interfering substances and/or mouth alcohol.

THE FUEL CELL

The primary purpose of the fuel cell is for Blood Alcohol Concentration (BAC) determination by analyzing the breath or alcohol standard sample. A secondary function is to determine if there are interfering substances present in the breath sample.

A fuel cell is an electrochemical sensor that is specific to alcohols (see Fig B7) and provides a stable and linear response to ethyl alcohol. The fuel cell consists of a porous, chemically inert disk coated on both sides with finely divided platinum, called platinum black, with platinum wires applied to each surface and connected in a circuit. The entire assembly mounts in a plastic case which has a gas inlet that allows a fixed volume of sample (approx. 1 ml) to be introduced to the upper surface of the fuel cell.

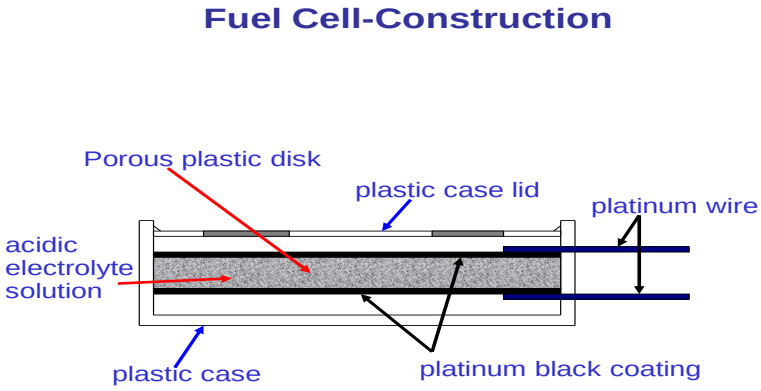

Figure B7 – Fuel Cell schematic

When ethyl alcohol comes in contact with platinum black on the upper surface, a chemical reaction occurs creating electrons and an electrical current flows through the wires to the other side of the fuel cell. The amount of current produced is proportional to the amount of ethyl alcohol present in the sample. A microprocessor evaluates the electrical current to determine the amount of ethyl alcohol present and converts it to a blood alcohol concentration.

It takes time for the chemical reaction to go to completion and the microprocessor monitors the output of the fuel cell to determine the BAC (see Fig B8). When the chemical reaction is essentially complete, the display will show the result of the analysis in milligrams of alcohol in 100 millilitres of blood.

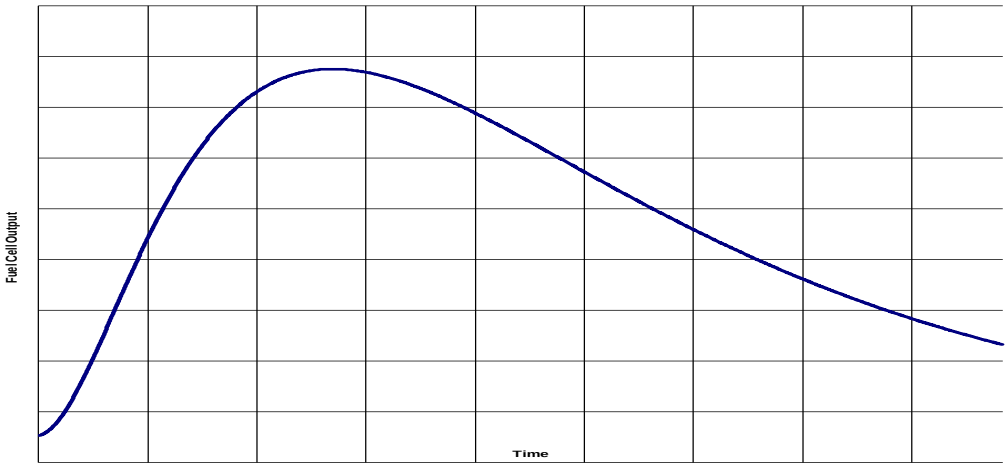

Figure B8 – output of the fuel cell over time

Fuel cells respond only to volatile substances that can be electrochemically oxidized at the surface of the cell. Fuel cells are, therefore, not sensitive to acetone or solvents based on derivatives of organic hydrocarbons. Fuel cells do, however, respond to other alcohols, such as methanol or isopropanol. However, their reaction profiles are different from that of ethyl alcohol. The Intox EC/IR II recognizes when there is an interfering substance present, displays the status message “Interfering substance” and then aborts the testing sequence.

THE INFRARED ANALYSIS SYSTEM

BASIC PRINCIPLES

Infrared absorption is another method for identifying and measuring ethyl alcohol in a sample. One property of ethyl alcohol is that it can absorb certain wavelengths of infrared energy from a light source.

That is, if infrared energy is sent through a chamber containing ethyl alcohol, not all of that infrared energy will be detected at the other end of the chamber. The energy that is "lost" is actually absorbed by the alcohol molecule, so measuring this loss at specific wavelengths of infrared energy is one way of recognizing there is ethyl alcohol in that chamber.

There is also a direct relationship between the amount of alcohol in the chamber and the amount of energy absorbed. So by monitoring the amount of energy at these specific wavelengths and measuring the amount that gets through to the detector at the end of the chamber (transmitted energy), the concentration of alcohol in the chamber can be determined by measuring how much energy is lost, or absorbed by the alcohol molecule.

This ability to absorb infrared energy is also shared by carbon dioxide. Of course, carbon dioxide is a natural component of our exhaled breath. We can monitor the presence and amount of carbon dioxide (CO_2) in this chamber in exactly the same way as we do for alcohol. CO_2 absorbs different wavelengths of infrared energy, so different wavelengths are required to "see" the loss of infrared energy due to CO_2 in the chamber. However, the same principle applies. The more CO_2 in the chamber, the greater the loss of energy at the detector for that specific wavelength of infrared energy.

The Intox EC/IR II infrared detector monitors three wavelengths (channels), one for carbon dioxide and two for ethanol. Selectivity is controlled by the use of filters. These filters have been selected to allow only the specific infrared wavelengths absorbed by ethyl alcohol or carbon dioxide to pass through. This way the detector is only looking at the loss of energy due to either ethyl alcohol or carbon dioxide.

Why monitor CO_2 when it's really alcohol that we want to measure? By looking for CO_2 in the chamber, the instrument is capable of distinguishing between a breath sample being provided by a subject and an alcohol standard or a purge. There are times when a breath sample should not be introduced, such as during a purge or during an alcohol standard test. By monitoring the CO_2 detector, the instrument is capable of recognizing when a sample of breath is being introduced into the chamber.

During a normal breath sample, the drop in infrared energy due to ethyl alcohol and the drop in infrared energy due to CO_2 are similar and follow a very similar profile. However, if mouth alcohol is present these profiles are different and the instrument can use these measurements to recognize the presence of mouth alcohol.

The infrared system in the Intox EC/IR II is used for several purposes. The IR sensor is used to not only recognize when someone is blowing into the instrument, but it can also detect residual alcohol in the mouth. Finally, the IR system is used to ensure a complete purge of the IR chamber after a test.

Figure B9 is a simplified diagram showing the infrared source, filters, infra red sample chamber and detectors.

Basic IR Detector Layout - major components

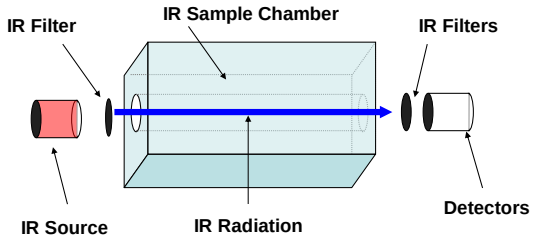

Figure B9 – schematic of a basic IR layout

MOUTH ALCOHOL DETECTION

The infrared system detects mouth alcohol by continuous monitoring of the breath sample during sample collection.

If mouth alcohol is present during breath sampling either by consumption, a burp or regurgitation, it will be quickly picked up by the breath passing through the mouth. As a result, the breath alcohol concentration and at the beginning of the breath sample will be significantly higher than the deep lung portion of the breath sample.

As this breath sample is introduced into the infrared sample chamber, there will be a large decrease in transmitted energy at the ethyl alcohol wavelengths and this will be interpreted as a very high BAC. Since the infrared chamber is fairly small in this instrument (approx. 9 mL), as the breath sample continues to flow through the sample chamber the breath with high alcohol concentration will quickly be replaced with breath at much lower alcohol concentration.

The IR detector measures this change in alcohol concentration and if the difference is large the instrument immediately aborts the test and a purge will clear out the chamber. The status message “Mouth Alcohol” is displayed, and then printed on the Breath Test Report.

The micro processor compares the transmitted infrared energy from both ethyl alcohol wavelengths to the transmitted infrared energy at the CO_2 wavelength. Normally the profiles should match or track each other exactly. When there is a distinct difference between the response profiles for ethyl alcohol and CO_2, the “Mouth Alcohol” status message will also be triggered and the test is aborted.

BREATH SAMPLING SYSTEM

The breath sampling system in the Intox EC/IR II ensures that drawing a sample for analysis on the fuel cell takes place at the end of an exhalation, once enough breath has been provided to reach deep lung air. A pressure sensor continuously monitors the breath sample and sends information to the microprocessor to determine a flow rate. The microprocessor uses this flow rate to calculate the volume of breath that has been provided.

Sample acceptance criteria for the Intox EC/IR II include:

1) minimum flow rate of 12 L/min (0.2 L/sec), and
2) minimum volume of 1.5 L, and
3) a 5% drop in flow rate after minimum volume is reached.

The automated sample acceptance criteria of the Intox EC/IR II are such that deep lung air can be captured from the vast majority of people. There are very few people whose lung volumes are compromised to the point where they are unable to meet the automated sample acceptance criteria of the instrument due to a physiological problem.

The subject must provide a breath sample with sufficient force to produce and maintain a minimum flow rate of 12L/min. If the subject stops blowing before the minimum volume is reached or the flow rate is not sufficient, a status message is displayed and the instrument will purge the sample chamber to allow further attempts to provide a suitable sample for analysis. The purging of the IR chamber is performed by a purge fan installed in the exit port of the block and vents under the instrument.

Once the minimum flow rate has been maintained and the minimum volume has been provided, the instrument will only sample once the flow rate has dropped by 5%. At this point the instrument will draw a sample into the fuel cell for analysis.

Once the sample acceptance criteria have been met, the fuel cell sampling mechanism will be activated and a small volume (approx. 1 mL) of breath from the end portion of the breath sample will be drawn onto the fuel cell surface.

OVERVIEW OF BREATH SAMPLING SEQUENCE

a) Subject provides breath sample
b) Pressure sensor detects breath flow, flow rate calculated (continuously)
c) Ethyl alcohol and CO_2 IR sensors monitor for mouth alcohol
d) Minimum flow and volume requirements are met, then 5% drop
e) Fuel cell is triggered to open and a sample is drawn into the fuel cell
f) Fuel cell reaction, monitored by microprocessor
g) Analysis of IR data
h) No mouth alcohol based on IR data
i) No interfering substances based on fuel cell analysis
j) BAC calculated and displayed

CHAPTER C

OPERATIONAL PROCEDURE

The Intox EC/IR II will provide reliable results when operated by a properly trained Qualified Technician (QT) following the operational procedure outlined in this manual. The instrument is microprocessor-controlled and follows a fully automated testing sequence. The QT is required to monitor and document certain aspects of the procedure.

CRITERIA OF A PROPER BREATH TEST (PBT)

The goal in performing breath tests on a subject is to obtain a **P**roper **B**reath **T**est (**PBT**).

A PBT consists of the following three criteria:

- **Two suitable breath samples which agree within 20 mg% of each other.**
- **Two DIAGNOSTIC TESTS that have PASSED.**
- **Two ALCOHOL STANDARD tests within 10% of the target value.**

The Qualified Technician is required to take two suitable breath samples, the results of which have to be within 20 mg% of one another. This is an objective assessment of the suitability of the samples. If the results do not agree within 20mg% of each other, additional samples must be taken until this requirement is met. Obtaining two results enhances the confidence that the blood alcohol concentration is accurate and reliable. When results differ by more than 20mg%, the lack of agreement should not be attributed to instrument performance alone, and indicates that one of the two samples provided was not suitable. The software in the Intox EC/IR II will evaluate the results of the first and second breath samples to determine if subsequent breath samples are required.

Collectively, a PBT is designed to give the court confidence that the results obtained represent an accurate blood alcohol concentration. The two breath samples with results within 20 mg% of each other ensure that suitable samples of breath were obtained from the breath test subject. The diagnostic tests and the analytical results of the Alcohol Standard tests being within the acceptable range ensure that the instrument is in proper working order. Ultimately, it is up to the QT to ensure that all of the above criteria for a PBT have been satisfied before signing the breath test report and Certificate of a Qualified Technician.

BREATH TEST PROCEDURE

There are five phases to the breath test procedure:

- Observation period
- Information gathering
- Data entry
- Breath test analysis
- Final check

OBSERVATION PERIOD

The subject must be observed for at least **15 minutes** prior to each breath test to ensure:

- Nothing is in the subject's mouth. Check the subject's mouth for the presence of food, gum, tobacco or any foreign objects or substances. These materials should be removed.
- The subject has not taken anything by mouth during the observation period and that there has been no burping, belching, or regurgitation of stomach contents during this time. Record the time that the observation period commenced and the name of the member conducting the observation period.

Please refer to Chapter D for a complete discussion of the procedure for conducting the observation period.

INFORMATION GATHERING

While operating the instrument, the QT is required to enter information via the instrument keyboard. Any additional notes that the QT may be required to make should be documented in their notebook or on official forms.

The steps listed below must be completed prior to the commencement of the breath testing procedure. Therefore, certain information should be gathered prior to commencing the test.

Step 1: ***IDENTITY***: Confirm identity of subject, either through driver's license or other forms of identification.

Step 2: ***INSTRUMENT READY FOR USE***: Look at the scrolling screen and verify that the instrument is ready for use:

Instrument Ready
Press ENTER to Start Subject Test

Ensure that no status message is being displayed indicating a problem with the instrument. If there is a status message indicating a problem with the instrument, the QT must resolve the problem prior to commencing the subject test. The instrument will not allow a subject test to be commenced if there is a problem with the instrument. A list of status messages is included in Chapter E.

Step 3: ***ALCOHOL STANDARD***: If the instrument is using an **Alcohol Standard (Wet Bath)** confirm the following:

a. Simulator temperature is between 33.8^{o}C and 34.2^{o}C (digital display or NIST-traceable thermometer) and propeller is turning.
b. Properly completed alcohol standard label is in place.
c. Manufacturer and lot number on the alcohol standard label matches the manufacturer and lot number of the posted documentation.
d. Alcohol Standard (Wet Bath) simulator solution has not expired.

The simulator solution cannot be used beyond 15 days or 50 tests, whichever comes first, and will expire at midnight on the 15th day. The instrument will monitor the expiry date of the simulator solution (expires on midnight of the 15th day), the expiry date of the alcohol standard bottle (as indicated on the alcohol standard bottle label) and the number of alcohol standard tests performed. Refer to Chapter E for list of status messages and Chapter K for alcohol standard change procedures.

Once any of these items reaches their expiry date or maximum limit, the instrument will display a status message and will not allow a test to proceed until the alcohol standard solution has been changed and data updated **('Ctrl-F10')**. As we approach these limits, messages will appear as “Instrument Warnings” on the scrolling screen.

If the instrument is using an **Alcohol Standard (Dry Gas)** confirm the following:

a. Properly completed Alcohol Standard Label is in place.
b. Manufacturer, lot number and cylinder expiry date on the alcohol standard label matches the manufacturer, lot number and cylinder expiry date of the posted documentation.
c. Alcohol Standard (Dry Gas) cylinder has not expired.

The dry gas cylinder has an expiry date of two years from the date of manufacture.

The dry gas cylinder cannot be used once the cylinder pressure drops below 50 psi.

The instrument will monitor the cylinder expiry date as well as the cylinder pressure. Refer to Chapter E for list of status messages and Chapter K for alcohol standard change procedures.

If the cylinder has passed its expiry date or below the minimum pressure limit, the instrument will display a status message and will not allow a test to proceed until the alcohol standard has been changed and data updated (F10). As we approach these limits, messages will appear as “Instrument Warnings” on the scrolling screen.

Step 4: ***CHECK MOUTH***: Verify that the subject's mouth is clear of any foreign materials.

Step 5: ***OBSERVATION PERIOD INFORMATION***: Note the time the observation period began and the name of the person conducting the observation. Verify that this person is aware of the proper observation procedures. The observation period must be at least 15 minutes and continues throughout the breath test procedure.

DATA ENTRY

Press the '**Enter**' key to begin the subject test. When prompted, enter password and press the ‘**Enter**’ key.

Pressing the '**Esc**' key at any time during the breath testing procedure will abort the test and return the instrument to the scrolling screen.

The Intox EC/IR II is programmed to ask a number of questions prior to beginning the breath test sequence. The QT uses the keyboard to type in the answers to questions or data prompts. After each question or data entry, either the '**Y**' or '**N**' key, or the '**Enter**' key is pressed to advance to the next question. Data entered by a QT will be printed on the Breath Test Report and/or the Certificate of a Qualified Technician, therefore it is important that it is correct and complete.

QTs have **one minute** to reply to each question or the instrument will return to the scrolling screen and the test sequence will have to be restarted.

The following table outlines the questions in the order that they are prompted on the display and the required responses:

Question #	Prompt/Display	Response/Input	Comments
Q1	Simulator Temp in Range? 33.8 – 34.2 C [Y/N]	Check the simulator solution thermometer or digital display (wet bath only) Y = move to next question N = abort to scrolling screen	This question will not appear if you are using a dry gas standard or if the instrument is configured to monitor the simulator temp.
Q2	Subject's Mouth Checked? [Y/N]	Y = move to next question N = abort to scrolling screen	Mouth must be checked prior to each test.
Q3	15 Min Subject Observation Period Complete? [Y/N]	Y = move to next question N = abort to scrolling screen	
Q4	Occurrence No.:	Alpha-numeric input by QT. Press 'Enter' to accept entry.	If not yet assigned then a unique identifier number must be used. Response = max 12 characters. This number may be required to begin subsequent tests.
Q5	Q.T. Last Name:	Alpha-numeric input. Press 'Enter' to accept entry.	As per designation. Response = max 24 characters
Q6	Q.T. First Name:	Alpha-numeric input. Press 'Enter' to accept entry.	As per designation. Response = max 24 characters
Q7	Q.T. Middle Name(s):	Alpha-numeric input. Press 'Enter' to accept entry.	As per designation. Response = max 24 characters

Question #	Prompt/Display	Response/Input	Comments
Q8	Alcohol Std Manufacturer:	Entry auto-populated from 'F10' or 'Ctrl-F10' data (Alc Std info). Press 'Enter' to verify data.	Verify the information against the Alcohol Standard Label. Info cannot be edited in this screen.
Q9	Alcohol Std Lot No.:	Entry auto-populated from 'F10' or 'Ctrl-F10' data (Alc Std info). Press 'Enter' to verify data.	Verify the information against the Alcohol Standard Label. Info cannot be edited in this screen.
Q10	Expiry Date of Sim Soln:	Entry auto-populated from 'F10' or 'Ctrl-F10' data (Alc Std info). Press 'Enter' to verify data.	Verify the information against the Alcohol Standard label. Info cannot be edited in this screen.
Q11	Swipe Driver's License or Press ENTER:	Swipe DL or press 'Enter' if license not compatible with card reader.	Accepts input from card reader for Q12 – Q16.
Q12	Subject's Last Name:	Alpha-numeric input by QT. Press 'Enter' to accept entry.	Response = max 24 characters
Q13	Subject's First Name:	Alpha-numeric input by QT. Press 'Enter' to accept entry.	Response = max 24 characters
Q14	Subject's Middle Name(s):	Alpha-numeric input by QT. Press 'Enter' to accept entry.	Response = max 24 characters If subject has no middle name, press the spacebar and 'ENTER'
Q15	Subject's Date of Birth:	Numeric input by QT in the format YYYY.MM.DD Press 'Enter' to accept entry.	A valid DOB must be entered at this time. If the DOB cannot be obtained, enter today's date.
Q16	Subject's Gender:	'M' or 'F' Press 'Enter' to accept entry.	Use space bar to toggle between Male and Female.

Question #	Prompt/Display	Response/Input	Comments
Q17	Observation Start Time:	Numeric input by QT. Format: hh:mm (24 hr clock) Press 'Enter' to accept entry.	Entry not valid unless at least 15 min before present time.
Q18	Observer's Last Name:	Alpha-numeric input by QT. Press 'Enter' to accept entry.	Response = max 24 characters
Q19	Observer's First Name:	Alpha-numeric input by QT. Press 'Enter' to accept entry.	Response = max 24 characters
Q20	Observer's Middle Name:	Alpha-numeric input by QT. Press 'Enter' to accept entry.	Response = max 24 characters
Q21	Starting Test Sequence SPACE=Begin ENTER=Verify	Press 'Enter' to review data. To correct data, overtype the present entry. Always review data after making any changes.	QTs have a maximum of 30 minutes at the conclusion of data entry and verification to begin each breath test sequence.

BREATH TEST ANALYSIS

a. **Initiation of Testing Sequence**: Once the space bar has been pressed, the instrument will begin with the breath test sequence. The test number is assigned and the instrument will display:

Test Number: ####

The instrument sequentially numbers all breath test series and supervisor tests with a unique number. This number should be recorded in your notes or on an official agency form in case the test record needs to be accessed at a later time. It is advisable to provide this test number to the investigator for the file. The test data will stay in the database until the memory has been deleted.

b. **Simulator Temperature within Range?:** Instrument then beeps once and displays:

Simulator Temp in Range?
33.8 - 34.2 [Y/N]

This is the final time this question is asked before the analytical sequence proceeds. This prompt will require the QT to look at the NIST-traceable

thermometer or the digital display on the simulator and verify the temperature is in the correct range. '**Y**' will continue with the breath testing sequence. If '**N**' is depressed, the instrument will display '**Operator abort**' and will return to the scrolling screen.

c. **Please Wait...:** Once the simulator temperature has been confirmed to be in the appropriate range, the instrument will display '**Please Wait...**' as the testing procedure is about to begin.

d. **Diagnostic Test**: The instrument will perform a diagnostic test. During the diagnostic test, the instrument is checking various baselines as well as temperatures.

When the instrument passes the diagnostic test, the instrument will display '**Diagnostic Test…/Passed**' and the testing sequence continues. If the diagnostic test is not successful, the instrument will display '**Diagnostic Test…/ Failed**', the testing sequence will be aborted and the instrument will return to the scrolling screen.

e. **Purging Remove Mouthpiece**: The purge fan turns on and room (ambient) air is drawn into the instrument through the breath tube. The instrument will continuously monitor the IR detector response and the fuel cell output to ensure that both are stable. The instrument also monitors the room air for contaminants. When the purge is successful, the instrument will continue with the blank check.

If the instrument detects a contaminant in the room air or is unable to obtain a stable IR signal or stable fuel cell output, it will enter another purge cycle. If the purge is still unsuccessful after three attempts, the test sequence will be aborted.

f. **Blank Check**: Instrument then performs a blank check. The purge fan turns off and a sample of the air within the IR sample chamber is drawn onto the fuel cell. The sample is analyzed on the fuel cell to confirm that it is near zero. The blank check result will be displayed on the instrument as '**Blank: X mg/100mL**'. The result will be printed on the breath test report once the testing series has been completed.

If the fuel cell output is 4 mg% or greater, the instrument will automatically run the purge sequence again. If after three blank check attempts the result is still not

acceptable, a '**High Blank'** status message will occur. The testing sequence will be aborted and the instrument will return to the scrolling screen.

g. **Please wait…**

h. **Taking Alcohol Standard**:

(i) for instruments configured with an Alcohol Standard (Wet Bath):

The instrument pump turns on and forces air to bubble through the simulator solution. The air above the solution in the simulator becomes saturated with alcohol. A sample of the vapour is drawn into the IR sample chamber while the instrument monitors the sample with the IR analytical system. The instrument then draws a sample of the air from the IR sample chamber onto the fuel cell and the instrument will display '**Analyzing Sample**' as the fuel cell reaction takes place. The alcohol standard test result appears on the display as '**Result XXX mg/100mL**'.

The test result must be within 10% of the target value. For a 100 mg% Alcohol Standard (Wet Bath), a test result in the range of 90 mg% to 110 mg% verifies the instrument is in proper working. The instrument will display '**Alcohol Standard Test Passed**'. A test result outside of this acceptable range will cause the test sequence to abort and the status message '**Alc Std Test Out of Range**' will be displayed and printed on the breath test report. For more details regarding the alcohol standard, see Chapter K.

(ii) for instruments configured with an Alcohol Standard (Dry Gas):

The instrument will display the corrected target value for the dry gas cylinder based on the atmospheric pressure (determined by the pressure sensor) as '**Target Value: XX mg/100mL**'. A valve then opens and a sample of the Alcohol Standard (Dry Gas) enters the IR sample chamber while the instrument monitors the sample with the IR analytical system. The instrument then draws a sample of the air from the IR sample chamber onto the fuel cell and the instrument displays '**Analyzing Sample**' as the fuel cell reaction takes place. The alcohol standard test result appears on the display as '**Result XX mg/100mL**'.

The test result must be within 10% of the target value. For an 82 mg% Alcohol Standard (Dry Gas), a test result in the range of 74 mg% to 90 mg% verifies the instrument is in proper working. The instrument will display '**Alcohol Standard Test Passed**'. A test result outside of this acceptable range will cause the test sequence to abort and the status message '**Alc Std Test Out of Range**' will be displayed and printed on the breath test report. For more details regarding the Alcohol Standard, see Chapter K.

i. **Purging Remove Mouthpiece**

j. **Blank check**

k. **Please wait…**

l. **Please Blow / Press 'R' for refusal**: Once the instrument is ready to obtain a breath sample from the subject, '**Please Blow / Press 'R' for refusal**' will appear on the display.

The subject has two minutes to provide a sample into the instrument. After the first minute, the instrument display will begin to flash and a beeping tone will be heard every five seconds. In the final ten seconds, the instrument display continues to flash and the beeping tone will be heard every second until the instrument "times out". After two minutes, the status message '**Breath Timeout**' will be displayed along with '**Test Aborted**'.

If the subject refuses to provide a breath sample, the QT can press the '**R**' key and answer '**Y**' to the display prompt, '**Refusal? [Y/N]**'. The display will show '**Test Refused**', the testing sequence will be aborted and '**Test refused**' will be printed on the breath test report.

Obtaining a breath sample

Shake mouthpiece to ensure one way valve is working properly. The one way valve should move and rattle. To avoid touching the mouthpiece with your fingers, hold the mouthpiece with the bag 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.

Instruct the subject to provide a steady, continuous breath sample through the mouthpiece into the instrument. '**Please blow…**' will appear on the display and a steady tone will be heard when the subject's breath flow has exceeded the minimum flow rate of 12 L/min (0.2 L/sec).
If the subject makes an attempt to provide a sample but fails to meet the sample acceptance criteria, the instrument displays '**Insufficient sample**'. The instrument enters a purge cycle to prepare itself for another attempt. The subject has two more attempts to provide a suitable breath sample before the instrument displays **'Refusal? [Y/N]'**. If the QT decides to allow the subject additional opportunities to provide a breath sample, press '**N**'. The instrument will conduct a purge cycle followed by '**Please Blow / Press 'R' for refusal**' to commence a second set of three attempts.

The subject has a total of three sets of three attempts, up to a total of nine attempts, to provide a suitable breath sample. After the ninth attempt to provide a proper sample, the testing sequence will automatically be aborted and the status message '**Insufficient sample**' will appear on the display. The breath test report will print '**Subj ***** ' on the result line and '**Test Status: Insufficient sample**' below the result.

m. **Analyzing Sample**: Once the sample acceptance criteria of the instrument have been met, the instrument will display '**Analyzing Sample**' as the fuel cell reaction takes place. The test results will appear on the display as '**Subject: XXX mg/100mL hh:mm**'. All subject test results displayed are truncated**.**

The word "truncate" means to "cut off the end". We truncate the last digit of a breath test result and replace it with a zero (i.e. round down). For example a breath test result of 89 mg% is reported as 80 mg%. Truncation can lower a breath test result by as much as 9 mg%. In accordance with the Recommended Standards and Procedures of the Canadian Society of Forensic Science Alcohol Test Committee, breath test results shall be truncated before being reported.

Truncation of results is another reason why breath testing tends to underestimate the actual blood alcohol concentration of a subject.

n. **Investigator Time/Date Check**: After the breath sample has been analyzed and the display shows the results and instrument time, the following three prompts appear on the display:

Enter Investigator Time
HH:MM

Enter Investigator Date
YYYY.MM.DD

Time / Date Correct?
HH:MM YYYY.MM.DD

o. **Purging Remove Mouthpiece**: Purge is the same as previously described.

p. **Blank check:** Blank check is the same as previously described.

q. **Please wait…**

r. **Countdown Screen**: Once the first breath sample sequence has been completed, the instrument displays a countdown screen. The *Criminal Code of Canada* requires an interval of at least 15 minutes between the times when the samples were taken. The Intox EC/IR II will not allow the QT to begin the second sample on the subject until 15 minutes has elapsed.

The instrument display will first indicate '**Please Wait 00:15:00**' and begin to countdown to zero. When 15 minutes has elapsed, the display will show:

Press Enter to begin
next breath test

The QT has one minute to press **'Enter'** at the end of the countdown screen or the display will return to the scrolling screen. If this is done, the instrument will begin a Diagnostic Test and continue with the breath test procedure.

Once the second sample has been obtained, the breath sample results will automatically be compared to one another.

If the two results for the subject are within 20 mg%, the instrument will automatically print the breath test report and display:

Print Certificate? [Y/N]

Pressing '**Y**' will print a *Certificate of a Qualified Technician*.

If the QT does not press '**Enter**' at the end of the countdown screen and the display has returned to the scrolling screen, to begin the next test on this subject the QT will need to press '**Enter**', answer the initial questions and enter an active occurrence number when prompted.

THE FINAL CHECK

Confirm the criteria of a PBT have been met.

Review the breath test report and ensure that the information is correct. Sign each page of the breath test report.

Review the *Certificate of a Qualified Technician* to ensure that all of the information is correct. Sign the *Certificate of a Qualified Technician* in the signature block.

SPECIAL CIRCUMSTANCES

Multiple Subject Testing

If more than one subject is to be tested, the QT can exit the countdown screen and return to the scrolling screen by pressing '**Esc**'. The instrument will display '**Return to Scrolling? [Y/N]**'. When '**Y**' is pressed, the instrument beeps several times, purges the sample chamber and returns to the scrolling screen. Once the instrument has returned to the scrolling screen, another subject test can be started by pressing the '**Enter**' key. A maximum of 4 occurrence numbers can be open at one time.

When '**Esc**' is used and the QT returns to the scrolling screen, the time remaining for each test subject can be monitored on the scrolling screen. The scrolling screen will indicate the occurrence number, the subject's last name and the time remaining for each subject. The QT can continue with the testing procedure on a subject by pressing

'**Enter**', answering the pre-test questions and entering the appropriate occurrence number for that subject. The instrument will recognize the occurrence number and if the 15 minute interval is complete, the instrument will proceed with the next test. If the 15 minute interval is not complete, the countdown screen for that subject will be displayed.

Procedure for More Than Two Samples

Normally only two breath samples will be required to satisfy the 20 mg% criteria for a PBT. Occasionally more than two samples will be required to satisfy this criteria. When this occurs, the instrument recognizes that more breath samples are required and commences another 15 minutes countdown. Subsequent tests are conducted in the same manner as the previous tests until either the 20 mg% criteria is satisfied or a maximum of four breath samples have been analyzed. At the conclusion of the testing, a *Certificate of a Qualified Technician* will not be issued if there are more than two numerical results. Status messages are not numerical results and will not appear on the Certificate.

Proper instruction on how to provide a breath sample must be given to the subject to ensure a sample of deep lung air is provided by the subject and to avoid shallow breath samples.

Proper observation periods are also required to ensure mouth alcohol does not contaminate a breath sample.

Subject Refusal

Refusals fall into two categories: unequivocal refusals and equivocal refusals.

1. **Unequivocal Refusals** are situations in which the subject clearly states that he/she will not provide a breath sample. The QT should record these statements and be prepared to describe the circumstances of the occurrence and the actions of the subject.

   If the breath testing sequence has begun and the subject then refuses to provide a sample, when the display shows '**Please Blow Press 'R' for refusal**', press '**R**'. The instrument then prompts '**Refusal? [Y/N]**', type '**Y**'. The testing sequence will be aborted and the status message '**Test Refused**' will be displayed. At this point the instrument will also provide the QT the opportunity to enter a short comment (up to two-lines). The breath test report will then be printed indicating '**Test**

Refused' and the QT's short comment. Record the subject's statements indicating the refusal in your notes and/or on official forms.

2. **Equivocal Refusal** is when the subject does not verbally refuse, but fails to comply with the demand to provide samples of breath that will enable a proper analysis to be made to determine the concentration of alcohol in the person's blood.
QTs must be prepared to describe the circumstances of the occurrence and the actions of the subject and document these observations in your notes and/or on official forms. The QT must show that he/she provided clear instructions on how to provide a proper sample and provided opportunities for the subject to blow.

When the subject fails to provide a suitable breath sample, the QT should read the refusal warning to the subject and be prepared to articulate to the court why you believe that the breath sample was not sufficient for a proper analysis to be made.

When the display shows '**Please Blow Press 'R' for refusal**' and the QT presses '**R**', the instrument then prompts '**Refusal? [Y/N]**'. If the QT presses **'N'**, the display returns to the **'Please Blow Press 'R' for refusal'** prompt. If the QT presses '**Y**', the testing sequence will be aborted and the status message '**Test refused**' will be displayed. At this point the instrument will also provide the QT the opportunity to enter a short comment (up to two-lines). The breath test report will then be printed indicating '**Test Refused**' and the QT's short comment.

In situations where the subject has attempted to provide a sample of breath it may be necessary to prove that the instrument was capable of accepting a breath sample and/or that the mouthpiece was not blocked. In these circumstances, it is advisable to test the mouth to confirm that no blockage exists, and/or to retain the mouthpiece as evidence for court. The '**F2**' key (Quick Test) should be used by the QT to conduct a self-test to demonstrate that the instrument was capable of accepting a breath sample.

OCCURRENCE NUMBERS and TEST NUMBERS

An Occurrence Number/Identifier No./Police File No. is assigned by the QT to identify a specific subject. A Test number is assigned internally by the Intox EC/IR II to identify each test series (up to four breath samples for one subject).

1. **Occurrence Number:** All breath tests conducted on a specific subject will be associated with the same occurrence number. If the QT escapes from the countdown screen, this number is displayed on the scrolling screen with the remaining countdown time. When the QT begins a second breath test on this subject, this occurrence number must be entered to identify this subject.

2. **Test Numbers:** These numbers are used by the QT to recall tests from memory at some future date for a specific subject. This may be required to obtain a reprint of a breath test report and/or a Certificate of a Qualified Technician.

CHAPTER D

OBSERVATION PERIOD
&
INTERFERING SUBSTANCES

OBSERVATION PERIOD

Breath testing is based on the premise that the amount of alcohol present in a subject's breath is proportional to the amount of alcohol in the subject's blood. If something is present in the subject's mouth that contaminates the subject's breath, it could lead to a falsely high determination of an individual's blood alcohol concentration.

Alcohol can be present in the mouth by way of recent consumption of a beverage containing alcohol, such as beer, liquor or hand sanitizer, or by using mouth wash or breath freshener, or by bringing stomach contents that contain alcohol from recent consumption into the mouth by vomiting or regurgitation. Theoretically a 'wet burp', where stomach contents are brought into the mouth, could contaminate the mouth with alcohol. The probability of a wet burp occurring twice, at least 15 minutes apart and producing two falsely high results that agree within 20 mg% of each other is extremely low. Coughs, hiccups and sneezes will not cause stomach contents to be brought up into the mouth.

While most breath testing instruments have methods to detect the presence of mouth alcohol in a breath sample, they are not 100% effective. As such, it is important that a continuous 15 minute observation period be conducted prior to the analysis of each breath sample to allow any alcohol which may be present in the mouth to dissipate. Studies have shown that 15 minutes is enough time to allow any alcohol that may be present in the mouth to dissipate and not affect a breath test result.

CONDUCTING A PROPER OBSERVATION PERIOD

The Qualified Technician may conduct the observation period themselves or delegate the duty to another member. Regardless of who conducts the observation period, the Qualified Technician is responsible to ensure a proper observation period is conducted prior to a breath test, which may require informing the designated member on how to properly conduct the observation period.

1. Search the subject to ensure they do not have products containing alcohol on their person. Check the mouth of the subject and ensure it contains no foreign objects such as tobacco, gum, food or other unusual objects as they may retain alcohol or present a choking hazard. Remove any objects if present. It is not required that piercings and dentures be removed.

2. Place the subject in the observer's field of view and within close proximity where clues of consumption, burps, or vomiting can be detected.

3. Observe the subject for at least 15 continuous minutes prior to each breath test, ensuring the subject does not drink any alcoholic beverages or other liquids, and does not place anything in their mouth, burp or vomit.

4. Restart the observation period if the subject is not maintained within close proximity and in the field of view of the observer or if the subject places anything in their mouth, burps or vomits.

The use of prescription inhalers to treat medical conditions is permitted, but the observation period should be restarted and the use and name of the inhaler documented.

An explanation of how the observation period was conducted may be required in court, so the observer should be prepared to properly articulate the procedure and observations made.

INTERFERING SUBSTANCES

An important function of any breath testing instrument is to analyze specifically for ethyl alcohol. Qualified Technicians and the courts must have confidence that results obtained by an approved instrument are from ethyl alcohol and not from another substance. While rare, some individuals will consume substances other than ethyl alcohol, either knowingly or unknowingly. In order for a substance to increase a breath test result, it must be volatile, non-toxic, present on the breath in sufficient quantities and produce a reaction on the fuel cell.

The Intox EC/IR II is designed to be specific for ethyl alcohol and to detect if other substances are present on the breath. Ethyl alcohol present on the breath and introduced into the fuel cell will create a chemical reaction that produces an electrical current. When other substances, such as gasoline, toluene, xylene and acetone are introduced into the fuel cell, no reaction takes place. In other words these substances, even if present on the breath of the subject, will have no impact on the result obtained by the instrument.

Typically when we refer to alcohol, we are referring to ethyl alcohol (ethanol), but there are other types of alcohols that may be present on a subject's breath. Methyl alcohol (methanol) and isopropyl alcohol (isopropanol) are two commonly available substances that may be consumed for their intoxicating effects. Methanol can be found in many commercially available products such as windshield washer fluid. Isopropanol is most commonly sold as rubbing alcohol and can be found in some hand sanitizers, perfume, cologne and cosmetics. Methanol and isopropanol are capable of producing a reaction on a fuel cell.

The Intox EC/IR II has a mechanism to detect and distinguish these different substances by monitoring the reaction profile in the fuel cell. When ethyl alcohol is introduced into the fuel cell, the reaction profile is predictable and consistent. When other volatile substances such as methanol or isopropanol are introduced into the fuel cell, the reaction profile of the fuel cell is different. See Fig D1.

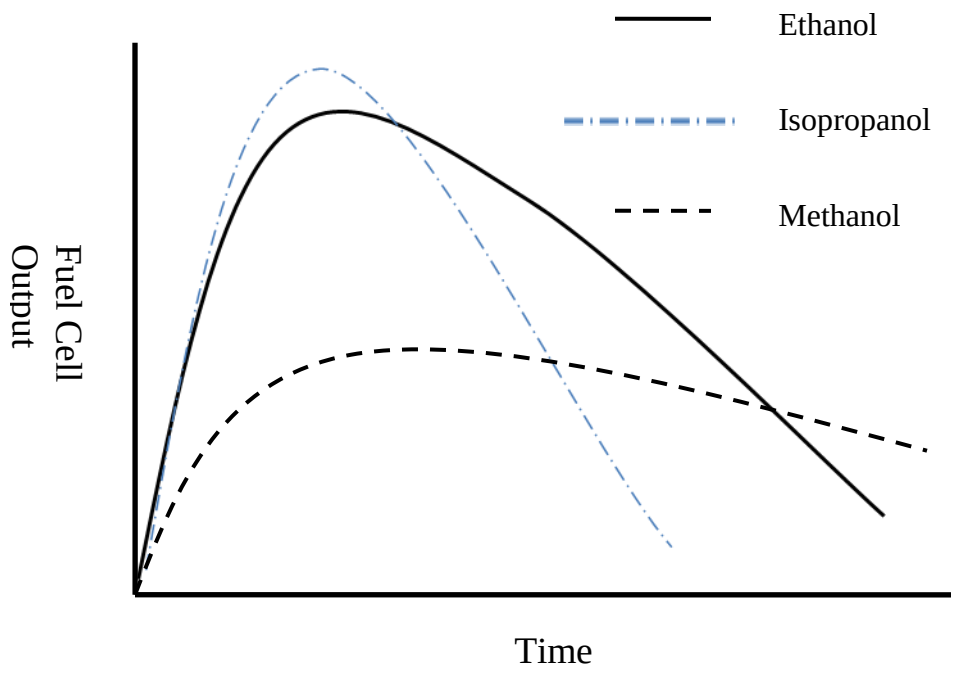

Figure D1 – Fuel Cell Output over Time (Various Substances)

As shown in Fig D1 the response of the fuel cell to isopropanol and methanol is different from that of ethyl alcohol. The Intox EC/IR II monitors the output of the fuel cell and if the response does not conform to that of ethyl alcohol, it will display the status message "**Interfering Substance"**. The instrument does not try to determine what the interfering substance is, only that the profile does not match the expected profile of ethyl alcohol.

If the Qualified Technician does encounter an "**Interfering Substance"** status message, the Qualified Technician should seek medical attention for the subject immediately. Similarly, keep in mind that many substances will not react on the fuel cell (e.g. drugs). If the level of impairment or intoxication is far greater than what may be expected for the alcohol result, the Qualified Technician should immediately consider seeking medical attention for the subject or seek a Drug Recognition Evaluating Officer if drug consumption is suspected.

OVERVIEW OF BREATH SAMPLING SEQUENCE – Interfering Substance

a) Subject provides breath sample
b) Pressure sensor detects breath flow, flow rate calculated (continuously)
c) Ethyl alcohol and CO_2 IR sensors monitor for mouth alcohol
d) Minimum flow and volume requirements are met, then 5% drop
e) Fuel cell is triggered to open and a sample is drawn into the fuel cell
f) Fuel cell reaction, monitored by microprocessor
g) Analysis of IR data
h) No mouth alcohol based on IR data
i) Interfering substance detected based on fuel cell analysis
j) **NO** BAC calculated. Status message displayed

REVIEW QUESTIONS:

1. Why is the observation period conducted?
2. What effect could mouth alcohol have on a breath test result?
3. What are the requirements of conducting a proper observation period?
4. How long must the observation period be? Why?
5. When should the observation period be restarted?
6. Can the QT conduct the observation period while operating the instrument?
7. Can the QT have another member conduct the observation period?
8. Who is responsible for ensuring the observation period is conducted properly?
9. Should the QT conduct a breath test if they cannot confirm the observation period was done properly?

CHAPTER E

STATUS MESSAGES
&
COMMAND LIST

INTRODUCTION

The Intox EC/IR II provides information to the Qualified Technician (QT) by way of status messages indicated on the display and / or printed on the breath test printout. A status message can occur during any stage of the breath test sequence. Status messages are not error messages, but rather a way of the instrument communicating to the QT the current status of the test sequence. Status messages alert the QT to the current activities of the instrument or to a particular situation that has occurred during the testing sequence.

There are a number of status messages that can occur during the breath test sequence. Some status messages can be resolved by the QT, while other status messages will require assistance from the authorized service agent. A status message that requires assistance from the service agent should be reported as soon as possible. Additionally, any noted circumstances that may have contributed to the status message should also be reported.

There are numerous status messages that may occur, but only a few that will be encountered by the QT on a regular basis. An alphabetical list of status messages that the Intox EC/IR II may generate are listed in **Table I** below. As a QT, you should be familiar with the common status messages, why they are generated, and how to address them. If a status message occurs that does not appear on the table, contact the authorized service agent.

Status messages such as 'RFI detected', 'Check Ambient Conditions', 'Breath at Improper Time', and 'High Blank', that occur AFTER a subject sample has been accepted and analyzed, will **not** affect that particular subject sample. The breath sample result is an acceptable sample and the results can be used. There is no need to repeat the test.

Table E1 below lists the status messages in alphabetical order for quick reference.

Table E2 below lists the password-protected functions available to the Operator.

Table E3 below lists the password-protected functions available to the Supervisor.

(Check with your local breath test coordinator for Supervisor level access.)

Table E1 ALPHABETICAL LIST OF STATUS MESSAGES

Status Message	Description	Action
Access Not Allowed	The QT is not able to access the function or the incorrect password was provided	Provide the correct password for the function being accessed.
Alc. Std. Expired	Expiration date for the bottle of Alcohol Standard has passed.	Replace Alcohol Standard.
Alc. Std. Expires in X days	Warns the QT that the bottle of Alcohol Standard solution will expire in the number of days indicated	Continue testing; change Alcohol Standard prior to expiry date.
Alcohol Standard Test Out of Range	Results of the Alcohol Standard test (Wet Bath or Dry Gas) is not within the acceptable range	Check simulator temperature and / or connections; change Alcohol Standard; if condition persists, instrument calibration may be required and the authorized service agent should be contacted.
Breath at Improper Time	A breath sample is introduced into the instrument at the incorrect time during the breath test sequence	Maintain control of the subject during the test; ensure the subject provides a breath sample at the 'Please blow…' prompt only. Restart the test.
Breath Timeout	A breath sample was not introduced into the instrument within 2 minutes of the 'Please blow Press 'R' for refusal' prompt being displayed	Restart the test; have subject provide a suitable breath sample into the instrument during the 'Please blow…' prompt. Document reason for breath timeout.
Calibration error	Generated during the calibration procedure	Contact authorized service agent for assistance.
Check Ambient Conditions	An infrared absorbing substance is present in the sample chamber during the purge; the IR detector or fuel cell output is unstable	Ensure mouthpiece is removed from breath tube after sample has been provided; remove breath test subject from room before / between / after test. Restart the test. If condition persists, contact the authorized service agent for assistance.
Check Simulator **Test Aborted.**	Displayed when the simulator is not working correctly. In most cases this indicates a communication problem between	Ensure simulator is turned on and properly connected to instrument; if message persists, contact authorized service agent for assistance.

Status Message	Description	Action
	the instrument and the simulator.	
CO_2 Baseline Unstable	The instrument was unable to set the CO_2 baseline to an acceptable range	Contact authorized service agent for assistance.
Diagnostic Test failed	Diagnostic check failed; failure condition detected during system diagnostic test	Contact authorized service agent for assistance.
Dry Gas Expires in X days	Indicates the number of days until the Dry Gas cylinder expires.	Continue testing; replace Dry Gas cylinder within the number of days indicated.
Dry Gas Pressure low	Dry Gas cylinder pressure falls below 100 psi	Continue testing; replace Dry Gas cylinder prior to cylinder pressure falling below 50 psi.
Dry Gas Expired	Dry Gas cylinder expiry date has passed	Replace Alcohol Standard.
Dry Gas Tank Empty	Dry Gas cylinder pressure has fallen below 50 psi	Replace Alcohol Standard.
Ethanol Baseline Unstable	The instrument was unable to set the ethanol baseline to an acceptable range	Contact authorized service agent for assistance.
Flow Baseline Unstable	The instrument was unable to set the flow baseline to an acceptable range	Contact authorized service agent for assistance.
Flow in I/R System	During the I/R baseline preparation, flow is detected	Contact authorized service agent for assistance.
Fuel Cell Leak Detected	Baseline rise during blow indicates a fuel cell leak	Contact authorized service agent for assistance.
Fuel Cell Over Range	The results of the subject test have exceeded the preset threshold value for the fuel cell	Seek medical attention for the subject if obtained on a subject sample; if obtained on an Alcohol Standard test, contact authorized service agent for assistance.
Fuel cell timeout	Fifty seconds elapsed during fuel cell analysis without meeting the criteria for a fuel cell analysis	Contact authorized service agent for assistance.
Heater Overtemp Detected	Displayed when one of the heaters has exceeded the set temperature	Contact authorized service agent for assistance.

Status Message	Description	Action
High Blank	Sensor Blank Fail; the fuel cell output is not near zero	Ensure mouthpiece is removed from breath tube after sample has been provided; remove breath test subject from room before / between / after test. Restart the test. If condition persists, contact the authorized service agent for assistance.
Instrument Not Ready	A condition exists that prevents the instrument from initiating a breath test sequence	View scrolling screen for status messages and address problem accordingly.
Insufficient Sample	Subject's breath flow has dropped by 5% before the minimum volume has been reached	Provide instructions to subject on how to provide a proper breath sample; demonstrate how to blow, if necessary; read refusal warning, if necessary.
Interfering substance	An interfering substance, such as methanol or isopropanol, was detected on the subject's breath	Seek immediate medical attention for the subject.
I/R Range Exceeded	The ethanol I/R channel has exceeded the preset maximum limits on an ethanol I/R calibration	Contact authorized service agent for assistance.
I/R Source Malfunction	The instrument has detected a problem with the I/R source	Contact authorized service agent for assistance.
I/R System Not Stable	During I/R baseline preparation, the ethanol channel varies beyond a preset threshold	Contact authorized service agent for assistance.
Mouth Alcohol	Mouth alcohol was detected on the subject's breath	Conduct a proper observation period, ensuring nothing taken by mouth for 15 minutes; wait 17 minutes and initiate breath test sequence. (Refer to Chapter B for more information)
Operator abort	The operator aborted the sequence in process by pressing the 'Esc' key	No further action required; document reason why 'Esc' key was pressed.
Printer Not Ready	When the printer is offline, out of paper, not properly selected, or otherwise malfunctioning, this will	Ensure printer is online; refill paper tray; select desired printer (i.e. External) from F9 menu; if message persists, turn off printer

Status Message	Description	Action
	be part of the scrolling screen and a test cannot be initiated	under F9 menu, continue with immediate testing and contact authorized service agent for assistance.
RFI Detected	Radiofrequency interference was detected by the instrument	Ensure no transmission of radios or cell phones during entire breath test sequence.
Sample Over Range	The value obtained exceeds the maximum permissible value as detected by the I/R detector	If message obtained on a subject test, repeat the test; if the message is obtained a second time, seek medical attention for the subject; if obtained on an Alcohol Standard test, contact authorized service agent for assistance.
Sample Solenoid Error	Sample solenoid actuation not detected	Contact authorized service agent for assistance.
Set Solenoid Error	Set solenoid actuation not detected	Contact authorized service agent for assistance.
Sim Temp out of Range	When the wet bath simulator falls out of its allowed temperature range of 33.8 – 34.2 C. Only observed when intelligent simulator is connected and monitored by the instrument.	Ensure simulator is turned on and properly connected to instrument; if message persists, contact authorized service agent for assistance.
Sim Soln Expires in X days	Warns the QT that the Alcohol Standard solution in the simulator will expire in the number of days indicated	Continue testing; change Alcohol Standard prior to expiry date.
# Sim Solution Samples Left	Indicates the number of tests remaining for the Alcohol Standard solution	Continue with test if counter is >3; change Alcohol Standard before counter reaches 0.
Solution expired	The Alcohol Standard solution in the simulator has exceeded the expiry date	Change Alcohol Standard.
System Software CRC Error	This is displayed when one of the CRC values is incorrect	Contact authorized service agent for assistance.

Status Message	Description	Action
Test Database full	The memory capacity of the instrument has been exceeded	Testing may be continued but the earliest data obtained will be overwritten (i.e. first in = first out, FIFO).
Test aborted	Associated with a status message that the instrument recognizes to abort the testing procedure	Address status message; restart test. Contact authorized service agent if necessary.
Test Refused	The QT indicated that the subject being tested is not willing to provide a breath sample by pressing the “r” key at the “Please blow” prompt	Document reason for refusal. No further action required
Wet std temp out of range	Associated with a smart simulator only. Displayed when the simulator temperature is outside of 33.8°C to 34.2°C once the breath testing sequence has been started by pressing the space bar.	Ensure simulator is on and propeller is spinning; wait until simulator temperature is within range; replace simulator, if necessary.

Table E2 OPERATOR COMMAND LIST

Key(s)	Function	Explanation
Enter	Run Subject Test	
‘P’	Print Last Test	
F2	Quick Test	Used by QT following refusal to demonstrate instrument is capable of accepting breath sample.
‘F’	Purge Cycle	Purge fan comes on and will remain running until the ‘Esc’ key is pressed. Used if the sample chamber becomes flooded.
Shift F1	Pass Code Information	Views a code that may be requested by the service agent.

Table E3 SUPERVISOR COMMAND LIST

Key(s)	Function	Explanation
F1	Print Command List	Prints the list of commands.
F3	Supervisor test	Conducts **FIVE** Alcohol Standard tests (refer to Chapter K for more information).
F5	Print test	Reprints a test using the test number assigned by the instrument .
F8	Date / Time Setup	Changes the date and time of the instrument.
F9	General Setup	Access to location, COM ports and printer setup (see below).
F10	Dry Gas Alcohol Standard setup	Changes information with respect to the Dry Gas value, lot number and expiry date of the cylinder as well as the Dry Gas manufacturer (refer to Chapter K for more information).
Shift-F1	Pass Code Information	Views a code that may be requested by the service agent.
Shift-F2	Print Software Version	Prints software version.
Shift-F5	Print Test Summaries	Allows printing of breath test summaries or complete reports that were obtained over a period of time (see below).
Ctrl-F1	View Software Version	
Ctrl-F2	View Firmware Version	
Ctrl-F5	Browse and Print Test	Browse all test records and print report. Use left/right arrow keys to browse and Enter to print.
Ctrl-F9	Location	Allows agency name, city and province to be edited.
Ctrl-F10	Wet Bath Alcohol Standard data	Changes information with respect to the Wet Bath Alcohol Standard. **Sets Alcohol Standard counter to zero.** (refer to Chapter K for more information).
Ctrl-L	Alternate Language	
Ctrl-Q	Shuts down the instrument	

Key(s)	Function	Explanation
Ctrl-S	View Simulator Temperature	Temperature of simulator will be displayed if connected.
Alt-F9	Default Standard	Changes Alcohol Standard from Wet Bath, Dry Gas and breath tube by pressing the spacebar.
Alt-F10	Standard 2 counter	Views the number of draws from the Alcohol Standard solution in the simulator.
Alt-P	View Cylinder Pressure	
F	Purge Cycle	Purge fan comes on and will remain running until the 'Esc' key is pressed. Used if the sample chamber becomes flooded.
P	Print Last Test	

'F2' - Quick Test

This function is accessed by pressing 'F2', using the Operator password. The Quick Test function conducts a modified test sequence, i.e. Air Blank (A) – Breath Test (B). A single line of data entry is required and no Alcohol Standard test is performed. It is advisable that a quick test be performed by the QT if an equivocal refusal has been obtained.

DO NOT CONDUCT A BREATH TEST ON A SUBJECT USING THE QUICK TEST FUNCTION.

'F8' - Date and Time Setup

This function is accessed by pressing 'F8', using the Supervisor password. This function allows you to set the current date and / or time on the instrument as well as the current weekday.

To set Date and or Time:

- Scroll through the Date / Time menu, use the left/right arrow keys (Current Date, Current Time, Current weekday and Date Format).
- Make a change to the current date or time, use the **down arrow key** to select that option and the **down arrow key** again to highlight the selection.
- With the field highlighted type over the data to make the change. Press '**Enter**' when the required edit has been completed.
- Press the '**Esc**' key to return to the scrolling menu.

'F9' – General Setup

This function is accessed by pressing 'F9', using the Supervisor password. Use the left/right arrow keys to scroll through the following menus – Location, COM ports and Printer Setup. Use the down arrow key to select the menu option:

Location – once in the location menu, press the **down arrow key**.

- Use the left/right arrow keys to scroll through Agency Name, City and Province.
- If one of the fields is to be edited, use the **down arrow key** to select that option and the **down arrow key** again to highlight the selection.
- With the field highlighted type over the data to make the change.
- Press '**Enter**' when the required edit has been completed.
- Press the '**Esc**' key to return to the scrolling menu.

COM Ports - once in the COM port menu, press the **down arrow key**.

- Use the left/right arrow keys to scroll through the menu and the **down arrow key** to make the edit.
- Press '**Enter**' when the required edit has been completed.
- Press the '**Esc**' key to return to the scrolling menu.

Printer Setup – once in the Printer Setup menu, press the **down arrow key**.

- Use the left/right arrow keys to scroll through Print Device, Condensed Print Mode and Number of Print Copies.
- Use the **down arrow key** to select the menu.

In the Print Device or Condensed Print Mode menu:

- Use the **spacebar** to toggle between None and External.
- Press '**Enter**' when the required edit has been completed.
- Press the '**Esc**' key to return to the scrolling menu.

In the Number of Print Copies menu:

- The field to be edited will be highlighted.
- **Type** the number of print copies required.
- Press '**Enter**' when the required edit has been completed.
- Press the '**Esc**' key to return to the scrolling menu.

'Shift-F5' - Print Test Summaries

This function is accessed by pressing 'Shift F5', using the Supervisor password. The **space bar** is used to select an option. This function will allow the Supervisor to print a summary of all tests completed based on certain parameters. The Supervisor can also choose to print either test summaries or the complete breath test record. The following records can be printed: **All Tests, Calibration records, Supervisor Tests, Subject Tests, and Quick Tests.** Tests can be selected based on range of test numbers or by range of dates. If no test number range is entered, the instrument will print all test records, starting from the oldest test record in memory and ending with the most recent test in memory. See Appendix 2.

CHAPTER F

CERTIFICATES AND LOGS

CERTIFICATES

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

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

   This certificate will accompany the Alcohol Standard when received from RCMP stores. It is the certification by an Analyst that the Alcohol Standard identified within the certificate has been analyzed and found to be suitable for use with an approved instrument. As part of the subject test procedure, the Qualified Technician must compare the identification and lot number of the Alcohol Standard as noted on the information tag with the information in the certificate to ensure that it is the same verifying the Alcohol Standard is suitable for use.

2. **"CERTIFICATE OF A QUALIFIED TECHNICIAN WHO TOOK SAMPLES OF BREATH".**

   This is the certificate completed by Qualified Technician after completion of the breath tests. The certificate is to be issued if there has been a PBT and only two numerical results.

   A certificate should not be issued when there is only one numeric result or when three or more numeric results are required to achieve a Proper Breath Test. A certificate is not issued when an **Interfering Substance** status message has been observed during a subject test.

   In most cases the completed certificate can be produced by the Intox EC/IR II at the completion of the test. However, in some circumstances the certificate may have to be created manually. A sample list of situations when a certificate can and cannot be issued is included for your reference (Table F1).

   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 officer serving the certificate.

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

The identification of the alcohol standard and lot number should be identified exactly as shown on the documentation provided. Additional descriptors, punctuation marks, and/or symbols not found in the documentation are not to be included.

The time of the subject test is recorded on the certificate in relation to the Investigator's watch. Note that the time is recorded using the 24 hour clock.

The date that the QT certifies the certificate will be the date when the certificate was printed/completed and, on occasion, may differ from the date of the tests. The date the QT certifies the certificate will be auto-populated when the certificate is printed by the instrument.

Each certificate will contain an Identifier No./Police File No./Occurrence No. entered by the QT into the instrument during data entry. This number will be auto-populated in the upper right-hand corner of the certificate when the certificate is printed by the instrument.

QTs can issue a certificate even if one or both of the breath test results are below 80 mg%. Similarly, the QT can issue a certificate regardless of the amount of time that may have lapsed between the time of driving and the time of the breath tests.

Table F1 - Example of when and when to not issue a Certificate of a Qualified Technician

Test Result 1	Test Result 2	Test Result 3	Certificate of QT Issued	Instrument-generated or Manual
200	180	n/a	Yes	Instrument
200	160	190	No	n/a
200	Breath Timeout	190	Yes	Manual
Interfering Substance - Immediately Seek Medical Attention			No	n/a
Mouth Alcohol	180	180	Yes	Instrument
180	Mouth Alcohol	180	Yes	Manual
200	200 (Check Ambient Conditions)	n/a	Yes	Manual
200	REFUSAL	n/a	No	n/a

Identifier No. / Police File No./Occurrence No.

CERTIFICATE OF A QUALIFIED TECHNICIAN

I, _____,
a person designated pursuant to subsection 254(1) of the *Criminal Code of Canada* by the Attorney General of _____, as being qualified to operate the Intox EC/IR II, an approved instrument, and being, therefore, a qualified technician,

DO HEREBY CERTIFY:

That at _____, in the Province of _____, pursuant to a demand under subsection 254 (3) of the *Criminal Code of Canada*, I did take two samples of the breath of a person identified to me as

_____,

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 I did receive each of the said samples directly into an Intox EC/IR II, an approved instrument as defined in subsection 254 (1) of the *Criminal Code of Canada*, that was operated by me.

THAT the analysis of each of the said samples was made by means of the said instrument operated by me and ascertained by me to be in proper working order by means of an alcohol standard which was suitable for use in the said approved instrument and identified as _____, Lot _____.

THAT the first of the said samples was taken at:
_____ hours on the _____ day of _____, _____,
and that the result of the proper analysis of this sample was:
_____ milligrams of alcohol in 100 millilitres of blood.

THAT the second of the said samples was taken at:
_____ hours on the _____ day of _____, _____,
and that the result of the proper analysis of this sample was:
_____ milligrams of alcohol in 100 millilitres of blood.

I FURTHER CERTIFY:

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

DATED this ____ day of _____, _____, at _____,

_____.

_____
Qualified Technician

NOTICE OF INTENTION TO PRODUCE CERTIFICATE

TO: _____

of _____

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

DATED this _____ day of _____, _____.

_____
Signature of person serving this notice for the prosecution

LOGS

Each stage of the breath test process is documented to ensure valid and accurate breath tests. Documentation is important to the integrity of the Breath Testing Program at all breath test locations for all police agencies. They provide an organized reference system for a breath test program. The following is a recommended list of documents that could be maintained and organized in logs.

- **Personal Log:** Each QT should maintain a personal log which is a record of all breath tests conducted. These logs can be used to confirm a QTs experience with the instrument. Alcohol Standard changes could also be logged in the Personal Log, as it speaks to the QTs total experience with the instrument.

- **Instrument Usage Report:** The Intox EC/IR II has the capacity to electronically store a large amount of test data. The instrument is capable of printing a summary list of all tests conducted over a defined period of time. This information can be obtained by periodically generating a usage report (Ctrl-F5). This report may be used to satisfy disclosure requests.

- **Maintenance Log:** Records of any maintenance conducted on an instrument should be kept in the maintenance log. As per ATC guidelines, it is recommended that approved instruments and associated components (simulators) have annual service. It must be conducted by an authorized service agency. The annual service conducted by the authorized service agency, and any other maintenance performed on the instrument should be documented in this log.

- **Alcohol Standard Change Log:** Documentation related to Alcohol Standard changes must be retained and kept in a file. This may include the Certificate of an Analyst which certifies the lot of Alcohol Standard, as well as the Supervisor Test report generated at the time of each Alcohol Standard change.

- **Breath Test Bulletins:** The RCMP Toxicology Services Program and/or your local Traffic Services Section will periodically send out breath test bulletins. These bulletins may contain information regarding any updates, procedural changes, or general information that arise from case law or general breath test issues. These bulletins should be made available for all QTs.

CHAPTER G

QUALITY ASSURANCE

INTRODUCTION

Quality Assurance is a system of checks and balances. The system provides the scientific proof/support required to demonstrate the accuracy and reliability of analytical results. It is important to demonstrate to the courts that the results provided are an accurate representation of a person's true blood alcohol concentration. Breath alcohol testing is a scientific analysis. Therefore, it is critical that the procedure is carried out in a systematic fashion with proper documentation.

Quality Assurance (QA) is the documentation process of a scientific procedure. It encompasses all the rules and checks required to assure accuracy and reliability of results. This includes everything from having a standard operating procedure, standardized training for Qualified Technicians (QTs), proficiency testing of QTs, the maintenance of logs (instrument, maintenance, personal, proficiency testing, alcohol standard change), as well as a Quality Control system.

Quality Control (QC) is a check of our quality assurance system. In Breath Testing, the QC check is the Alcohol Standard Test. The alcohol standard test will challenge the instrument to determine if the instrument is in proper working order. This test will also check to see if the entire system is in compliance with the rules set out in our QA system. It is the combination of the QC test results falling within the margin of acceptability and the criteria of a proper breath test that ensure the results that are reported are accurate.

The quality assurance procedures set out in this document have been developed in accordance with currently accepted scientific principles and practices in the field of Breath Alcohol testing. The procedures are also in accordance with the recommended standards and procedures of the Canadian Society of Forensic Science Alcohol Test Committee (ATC). These standards and procedures are designed to ensure the highest possible confidence in the Intox EC/IR II Breath Test Program. They provide program guidance and uniformity while still allowing for professional judgment.

STANDARD OPERATING PROCEDURE

The standard operating procedure for breath testing is outlined in Chapter C of this document – Operational Procedure. Qualified Technicians are required to adhere to organizational guidelines when participating in the breath test program.

STANDARDIZED TRAINING FOR QUALIFIED TECHNICIANS

New course candidates will complete a comprehensive five-day Intox EC/IR II Certification course. QTs trained to use a different approved instrument will complete a comprehensive three-day Intox EC/IR II Conversion course.

Upon successful completion of the course, a certificate will be issued which will demonstrate the candidate's technical training required to operate the Intox EC/IR II. Successful candidates will then be designated as a Qualified Technician, as per the *Criminal Code of Canada*, by the Attorney General (AG) or designate of their province and/or Canada. QTs may not conduct subject breath tests until they've received their designation from the AG's office.

PROFICIENCY TESTING

Proficiency Testing (PT) is a part of any Quality Assurance System. It is performed to demonstrate the ongoing proficiency of an operator to conduct evidentiary breath tests. It is necessary that an operator remains competent, beyond their initial training, and current with improvements in the technology, any changes in policy or procedure arising from case law, or rulings under appeal.

The Canadian Society of Forensic Science Alcohol Test Committee recommends that "Each breath test program shall have a process to determine the proficiency of all QTs on an annual basis. If proficiency is not demonstrated, a Technician must successfully complete refresher training before resuming activity as a QT".

DOCUMENTATION

This program has been designed to ensure quality breath test results are produced. Each stage of the process is documented to ensure valid and accurate breath tests. The documentation and monitoring of QA/QC processes is important to the integrity of the Breath Testing Program at all breath test locations for all police agencies. They provide an organized reference system for a breath test program.

Refer to your local police service standards and policy for appropriate documentation procedures. It is the responsibility of each QT to be aware of all necessary logs, their location and how to maintain them.

BREATH TEST SUPERVISOR

To ensure a quality breath test program, each detachment/department should identify a QT to be the Breath Test Supervisor and responsible for monitoring the local program.

The main roles of the Breath Test Supervisor are to keep all records and logs in order, ensure the instrument receives its annual servicing, ensure adequate supplies are maintained, and periodically review breath test reports and certificates. If errors or discrepancies are found in the documentation, the Breath Test Supervisor should be responsible for following up and ensuring that corrective action has been taken.

It is the role of the Breath Test Supervisor to ensure that all QTs at his/her location comply with their PT requirements. The Breath Test Supervisor is responsible for monitoring the following logs:

- **Instrument Usage Report**: It is recommended that this report be generated periodically (Shft-F5) to satisfy disclosure requests.

- **Maintenance Log:** It is the responsibility of the Breath Test Supervisor at each testing location to maintain this log. All QTs must advise the Breath Test Supervisor of problems they encounter which may require instrument maintenance. The Breath Test Supervisor will also be responsible for ensuring that all breath test instruments receive annual servicing.

- **Alcohol Standard Change Log:** The Breath Test Supervisor will be responsible for reviewing the documents related to Alcohol Standard changes to ensure that proper procedure has been followed.

- **Breath Test Bulletins:** The Breath Test Supervisor will be responsible for ensuring that all QTs in their detachment/department are made aware of any new bulletins.

CHAPTER H

PHYSIOLOGY OF ALCOHOL

INTRODUCTION

This chapter will cover the absorption, distribution, and elimination (metabolism and excretion) of alcohol in the human body.

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 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 Fig H1). Factors which may affect the rate of absorption of alcohol are detailed below.

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.

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.

RATE OF CONSUMPTION

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.

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.

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

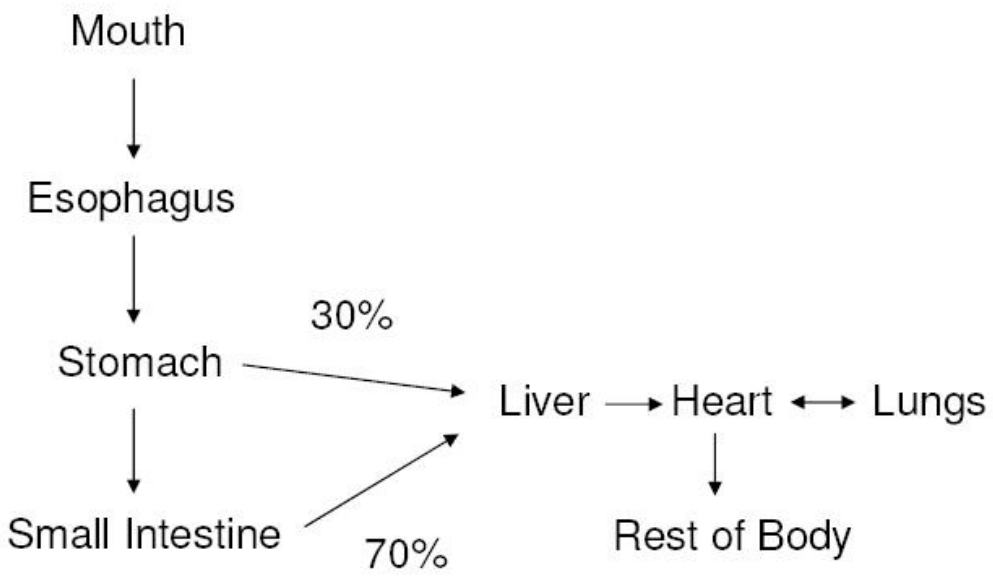

Figure H1 - Pattern of absorption and distribution of alcohol in the body

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 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 through the arterial system in the body. About one-third of the total blood volume pumped out of the left heart goes to the brain, whereas the remaining two-third goes to the rest of the body and major organs.

Alcohol is distributed in the body in proportion to the water content of the tissues and fluids. The more water there is in a particular tissue or fluid, the greater the concentration of alcohol that will be there. For example, urine will have 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 processes, metabolism and excretion.

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.

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.

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.

Regardless of height, weight, sex, or amount of fatty tissue the rate of elimination is about the same for all people. The average rate of elimination is 15 mg% per hour, with a normal range of values between 10 mg% to 20 mg% per hour. Heavy drinkers usually eliminate alcohol at a higher rate than 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, one would find 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. A conversion factor can be used to correct for the differences in water content between each of these bodily fluids.

Urine: Since urine has higher water content than blood, the urine alcohol concentration (UAC) is higher compared to blood alcohol concentration (BAC). Urine should not be 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 BAC.

Vitreous Humor: Since vitreous humor has 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.

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. After separation, the liquid portion is called serum/plasma, depending on the separation technique. Hospitals generally conduct alcohol analysis on serum samples. Since serum has 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 units of 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%.

BAC AT TIME OF DRIVING vs BAC AT TIME OF TEST

It is important for Qualified Technicians and investigators to understand the physiology of alcohol in order to conduct a complete investigation of an impaired driver. There are circumstances in which the BAC at the time of the test may not be the same as the BAC at the time of driving. Consumption of alcohol just prior to the time of driving or just after the time of driving may create a difference between the BAC at the time of driving and the time of the breath tests.

In completing documentation to the Crown Counsel you should consider including all symptoms of impairment observed by police officers and civilian witnesses and the time at which these symptoms were observed. The details of a drinking history and/or answers to questions, may provide valuable information regarding the circumstances of the case.

Qualified Technicians and investigators you should consider including to obtain the following information:

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 height/weight/gender?

CHAPTER I

PHARMACOLOGY OF ALCOHOL

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 do 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. 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.

PROGRESSIVE EFFECTS ON CNS

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. Outlined below are four BAC ranges and the clinical symptoms one might expect to observe:

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

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.

Intoxication: 100 - 250 mg%

- disturbed vision
- loss of balance; equilibrium is disturbed
- vasodilatation - bloodshot eyes, watery eyes
- flushed face
- muscular in coordination
- fumbling
- unsteadiness on feet
- slurred speach
- emotional disturbance
- decreased pain sense

Severe Intoxication: 250 - 400 mg%

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

Death: 400 mg% or greater

- depression of the respiratory centre in brain causing respiratory collapse.

EFFECT ON SENSORY FUNCTIONS

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

- Acuity: clarity of vision begins to deteriorate at BACs less than 50 mg%. The degree of deterioration is dependent on the individual and increases with rising BAC.

- Depth Perception: the ability to ascertain the relative distance between objects. Deterioration commences at BACs less than 50 mg%.

- Peripheral Vision: the field of vision is reduced resulting in tunnel vision. This can begin with BACs of the range of 50 to 100 mg%.

- Double Vision: can begin to occur with BACs of 100 mg% or greater.

- Glare Recovery: at night the eyes take longer to recover after being subjected to bright light, e.g. car headlights. This begins with BACs less than 50 mg%.

- Nystagmus: an involuntary jerking of the eye as it tracks horizontally. This begins at BACs less than 50 mg% and progressively becomes worse with increasing BAC.

- Night vision: In order to distinguish objects, a stronger illumination is required and dimly lit objects cannot be distinguished at all. Alcohol appears to have the same effect on night vision as driving with sunglasses at twilight.

Hearing: The problem is attributed to a combination of reduced hearing ability and reduced attentiveness of the drinkers. In drinking environments, it is common to observe a significant increase in voice levels.

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

Touch: The keenness of these senses is depressed.

EFFECT ON DRIVING PERFORMANCE

Alcohol and Attention

The driving task has been described as a complex divided attention task involving a central visual task (tracking or maintaining the vehicle's lane position) and a peripheral visual task (scanning the environment for objects such as other traffic or potential driving hazards). Neither of the two activities appears to be individually impaired by alcohol at low BAC levels. However when combined, there is a significant deterioration even at low BACs.

Drivers who are under the influence of alcohol tend to concentrate on one task and neglect others in a divided attention situation. The decreased performance in divided attention tasks is most likely due to increased time required for information processing. Alcohol has greater effect on information processing information when attempting to perform several tasks at the same time.

Alcohol and Performance Measures

Tests of simple reaction time shows alcohol increases the time it takes to react to a signal when BAC's are above 80 mg%.

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

In one study where the driving situation included emergency braking and evasive manoeuvres, drivers with BAC's averaging 42 mg% performed less efficiently than when their BAC was at zero.

Alcohol and Risk Taking

Driving an automobile is usually taken for granted as being a relatively easy task, not requiring much conscious effort. The brain makes decisions and regulates motor activity based upon training and previous experience for smooth, controlled operation of an automobile. The many complex manoeuvres that one makes while driving occur automatically and one may not 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 caused by a loss of critical judgment and the inability to make quick decisions in these situations. An alerting mechanism in the CNS is depressed such that a person may not recognize potentially hazardous or dangerous situations that the sensory functions detect. The sensory functions may have deteriorated and may not be supplying complete or correct information to the brain. Motor functions are impaired and 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 find themselves in high risk situations which would normally be avoided or treated more cautiously.

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 judgment, 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 at a BAC of 100 mg%.

Driving involves is a series of automatic reactions combined with variable requirements for skill, judgement, and the ability to make unexpected split-second decisions. It requires co-ordination, anticipation, visual acuity, and muscular control. Impairment by alcohol is not simply the appearance of gross physical symptoms. Impairment involves 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.

INTOXICATION

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. Intoxication is an advanced state of impairment in which the gross physical signs of the effect of alcohol are apparent: staggering, marked muscular in-coordination, slurred speech and a general confused state. These signs can become apparent when a BAC exceeds 100 mg%.

TOLERANCE

One definition of tolerance is the ability of the body to withstand or resist the effects of alcohol through adaptation. 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. The mechanism by which the body develops tolerance to alcohol is a complex one.

The important point to remember is that even though some people are more tolerant than others and may not exhibit 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 (see Fig. I-1).

ALCOHOL AND DRUGS

When alcohol and various drugs are taken in combination, unexpected results may occur. Two types of combination effects are as follows:

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. Other drugs to avoid in combination with alcohol would include tranquillizers, antihistamines, and antidepressants.

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 disulfiram. Disulfiram 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 of 50 mg% or less, and the presence of gross symptoms of impairment and intoxication. When an alcohol-drug interaction is suspected, medical assistance should be sought at once.

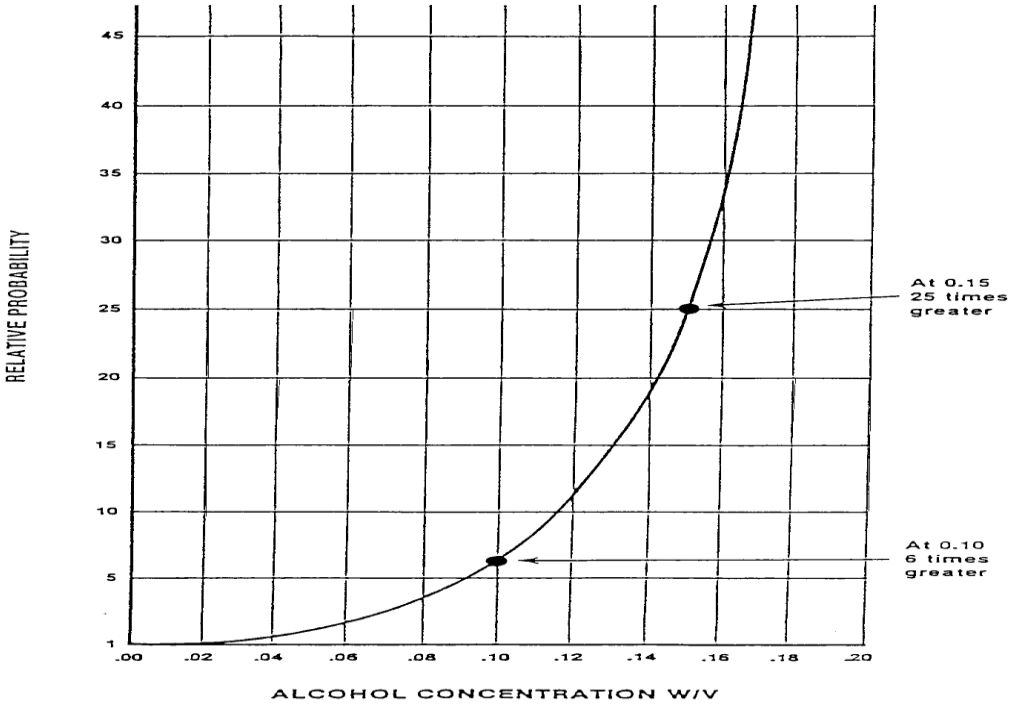

Figure I-1 Relative Probability of Causing an Accident from The Role of the Drinking Driver in Traffic Accidents Borkenstein et al (1964)

CHAPTER J

TECHNICIAN'S EVIDENCE

Introduction

Qualified Technicians (QTs) report breath test results via certificate and attend court to testify as to breath test results, breath testing procedures, and to observations relating to the subject's behaviour.

The purpose of this part of the session is to prepare the candidate to present oral testimony in court. The candidate will become familiar with the type of questioning to be expected and the extent of response recommended.

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

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

1. Certificate may not be admissible
    - Not served at all
    - Not served properly on accused
    - Error on the certificate

2. No certificate was issued at all:
    - One test or refusal case
    - More than two numerical results

3. Defense has requested to call the Qualified Technician for cross-examination.

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

A Qualified Technician may be tendered as expert witness. Refer to your regional Crown practices and procedures. It is up to the Court to decide if the Qualified Technician meets the requirements to present expert evidence in the areas 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 Intox EC/IR II.

As an Intox EC/IR II Qualified Technician, the areas of expertise may include the theory and operation of the Intox EC/IR II instrument, and the analysis of breath samples for alcohol content.

The QT should be prepared to describe the type of training and experience as follows:

1. Describe the course you have completed (for example):

   "I attended a 3-day (or 5-day) course which covered the theory and operation of the Intox EC/IR II 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 successfully completed the training course on (Month) (Day), (Year), and was designated by the Attorney General of (Province / Canada) on (Month) (Day), (Year)."

2. Describe your involvement in impaired investigations as both an investigator and a QT.

   "I have conducted approximately 50 impaired driving investigations and dealt with numerous impaired or intoxicated individuals over my 3 years as an officer. I have conducted 35 breath tests on the Intox EC/IR II, and have had the opportunity to present my evidence in court 5 times."

Preparing a CV outlining the above information may help to facilitate your qualifications being accepted by defense counsel. Attach your designation from the Attorney General and course certificate to your CV. Crown may find this useful when leading you through your qualifications. Refer to your regional Crown practices and procedures.

PREPARATION BEFORE COURT

1. Review the breath test report thoroughly and be prepared to discuss all information contained on the report (ie. diagnostic tests, alcohol standard tests, any status messages, etc.).

2. Ensure the breath test report contains all the proper information. Alert Crown if you notice any problems or omissions.

3. Review all your notes and be prepared to discuss all information contained in your notes.

4. If necessary, briefly review training materials.

PRESENTING EVIDENCE

You should present your evidence in a concise and easy to understand manner. Use the correct scientific terms and proper legal words or phrases. To familiarize yourself with the proper legal words or phrases, review the pertinent sections of the Criminal Code. Plan to meet and discuss the case with Crown Counsel prior to attending court to determine evidence the Crown intends to lead from you and any questions or issues the defense may present to you.

To assist you with presenting your evidence, “10 Points for Testimony” were developed. Take particular note of all the bolded text and the terminology used when giving this evidence.

10 Points for Testimony

1. Name & Designation, Province	I am _____, a **Qualified Technician** designated by the Attorney General of _____ as being qualified to operate an Intox EC/IR II, an approved instrument.
2. Location, Province of test	Two samples of breath were analyzed by me at_____.
3. Identity of Accused	The breath samples were received from_____.
4. Identity of Approved Instrument	Each breath sample was received **directly** into an Intox EC/IR II, an approved instrument, that was operated by me.
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 (Manufacturer) (Lot number).
7. Date & Time of first test	The first sample was taken at _____ hours on___(Date)_____.
8. Result of first test	The result of the first test was _____ milligrams of alcohol in 100 millilitres of blood.
9. Date & Time of second test	The second sample was taken at _____ hours on___(Date)_____.
10. Result of second test	The result of the second test was _____ milligrams of alcohol in 100 millilitres of blood.

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 provide more detail as required.

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 notes then look up the information required.

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

1. The time the subject was presented to you.
2. Symptoms of accused.
3. Who conducted the proper pre-test observation period?
4. The diagnostic test: when this test is conducted in the breath test sequence, how the QT knows that it was successful.
5. The blank test: when this test is conducted in the breath test sequence, how the QT knows that it was successful.
6. The Alcohol Standard test: purpose of this test, when this test is conducted in the breath test sequence, how the QT knows that it was successful.
7. The Alcohol Standard: target result and range, manufacturer, lot number and expiry date, that it was suitable for use on the day of the tests and how this determination is made.
8. Meaning of any status messages that may have been displayed during the test procedure.
9. How did you confirm the instrument was in proper working order?
10. The criteria of a proper breath test.
11. Instructions that you provided to the subject with respect to how to provide a suitable sample for analysis.
12. Your observations of the subject regarding the manner of providing the breath sample. This is important in cases with more than two breath test results, multiple sample attempts, shallow blows or refusals.
13. The sample acceptance criteria and the consequences of not meeting the criteria.
14. The significance of instrument time and date, as well as Investigator time and date for each breath sample, as printed on the Breath Test Report.
15. Preparation and service of the Certificate of a Qualified Technician.
16. Any policy or procedures related to the instrument.

MOCK TRIAL QUESTIONS

1. What is a Intox EC/IR II?

The Intox EC/IR II is an approved instrument which analyzes a sample of deep lung air and report the results in milligrams of alcohol in 100 millilitres of blood.

2. What is an Alcohol Standard Test?

A calibration check of the Intox EC/IR II that demonstrates that the instrument is in proper working order.

3. How does the Alcohol Standard Test show you that the instrument was in proper working order?

The results that were obtained were within 10% of the target value for the alcohol standard on each occasion. The results were displayed on the instrument and printed on the breath test report.

4. How is the temperature of the simulator solution determined?

During a breath test sequence, I read the NIST thermometer (or digital display) on the simulator and confirmed that the temperature was between 33.8°C and 34.2°C.

5. How do you know that the alcohol standard in your simulator is suitable to use?

The information on the alcohol standard label must match the information on the Certificate of an Analyst to confirm that the Alcohol Standard is suitable for use. The simulator temperature must be between 33.8°C and 34.2°C.

6. How do you know that the breath tube was not blocked and prevented my client from providing a sample into the instrument? (unable to provide a suitable sample after several attempts)

I conducted a “Quick Test” after the subject test to prove that the instrument was capable of accepting a sample of breath, and instrument printed a Quick Test Report.

7. What is the cause of the status message INTERFERING SUBSTANCE?

The Intox EC/IR II has detected something other than ethyl alcohol present on the subject's breath and displays this message. No test result will be reported when this occurs.

CHAPTER K

ALCOHOL STANDARD CHANGE

The Alcohol Standard change is an important procedure, which ensures quality standards are maintained within the breath test program. This chapter deals with changing the Alcohol Standard (both Wet Bath and Dry Gas) and the associated documentation.

Intox EC/IR II will initially be configured with Wet Bath Alcohol Standard and will be converted to Dry Gas Alcohol Standard as the program evolves. Qualified Technicians must be prepared to change both standards and explain their purpose in court.

PURPOSE OF THE ALCOHOL STANDARD TEST

The purpose of the Alcohol Standard Test is to check the calibration of the instrument. Calibration of an instrument is the adjustment to a specific value using a solution of known alcohol concentration. Typically this is done by the service agent using a solution with a target value of 100 mg%. Once the initial calibration is performed, the requirement is to conduct regular calibration checks with an alcohol standard to confirm the instrument remains calibrated.

The margin of acceptability of the alcohol standard test is ±10% of the target value for alcohol standard.

No adjustments are made to the calibration of the instrument with the Alcohol Standard Test. The QT will only be conducting a calibration check – not a calibration.

ALCOHOL STANDARD CHANGE POLICY

If your police agency has a designated Breath Test Coordinator, contact him/her for direction on solution change procedures and documentation.

1. Alcohol Standard (Wet Bath)

The recommendation for the frequency of alcohol solution changes is:

> "For a simulator with a recirculating system, use shall not exceed fifteen days or 50 calibration checks, whichever occurs first."

It is recommended that the Alcohol Standard (Wet Bath) change be performed every two weeks. This means changing the solution on the same day of the week, every two weeks, and provides for a regular cycle. The solution can be changed any time before midnight on the last day (day 15).

For example: Alcohol Standard is changed on Thursday, July 1, 2010, at 01:30 hr.
Next change will be required prior to 23:59 hr on Thursday, July 15, 2010.

A lot of Alcohol Standard (Wet Bath) has a shelf life of 2 years from the date of manufacture. Both the date of manufacture and the date of expiry are indicated on each bottle of solution. A lot expires at the end of the month indicated on the bottle.

2. Alcohol Standard (Dry Gas)

Alcohol Standard (Dry Gas) has an expiry date of two years from the date of manufacture. In addition, the cylinder pressure must exceed 50 psi (pounds per square inch). Status messages in the software will warn QTs when the Alcohol Standard (Dry Gas) is within 30 days of the expiry date or if the cylinder pressure drops below 100 psi. The instrument will lock out when the Alcohol Standard (Dry Gas) actually expires or the pressure drops below 50 psi.

Do not ship the instrument with a dry gas cylinder installed. It is considered Dangerous Goods and must be packaged and shipped according to the guidelines for Transportation of Dangerous Goods.

When a new dry gas cylinder is installed, the expected pressure should be between 1100 – 1200 psi. The minimum acceptable pressure for a new cylinder is 1000 psi. When installing a new cylinder and you find the initial pressure is less than 1000 psi (Alt-P), you must contact the vendor to obtain a replacement cylinder.

Do not have both a dry gas and a wet bath simulator installed for use at the same time. The instrument shall only have one alcohol standard installed at any one time.

SUITABILITY OF THE ALCOHOL STANDARD

An alcohol standard is suitable for use if it has been analyzed and certified by an Analyst designated by the Attorney General of the appropriate jurisdiction. A Certificate of an Analyst is issued pursuant to subsection 258(1)(g) C.C.C..

For an **Alcohol Standard (Wet Bath)** the following 5 points ensure the standard is suitable for use with an approved instrument:

1. Certificate of an Analyst
2. Placed in a simulator and at a temperature of 33.8º to 34.2ºC.
3. Use does not exceed 50 alcohol standard tests.
4. Use does not exceed 15 days in a simulator.
5. Used before the expiry date of the bottle.

For an **Alcohol Standard (Dry Gas)** the following 3 points ensure the standard is suitable for use with an approved instrument:

1. Certificate of an Analyst
2. Used at a cylinder pressure of 50 psi or more.
3. Used before the expiry date of the cylinder.

The Intox EC/IR II monitors the usage and the expiry dates of the Alcohol Standard (Wet Bath) and ensures that it will not be used for more than 50 tests, beyond 15 days or past the expiry date of the bottle. Status messages (instrument warnings) will inform the QT when these limits are approaching and will prevent the initiation of a breath test sequence when they are exceeded.

Similarly, with the Alcohol Standard (Dry Gas), instrument warnings will be displayed as the expiry date approaches or the cylinder pressure drops below 100 psi. The breath test sequence will not start once the expiry date has been exceeded or the cylinder pressure drops below 50 psi.

ALCOHOL STANDARD (Wet Bath) CHANGE PROCEDURE:

1. Materials Required:

a. Alcohol Standard (Wet Bath) Change Form and Wet Bath Label.

b. Alcohol Standard Solution and associated documentation.

c. Simulator with NIST-traceable thermometer or digital display.

2. Alcohol Standard:

a. Analysed and certified by an Analyst pursuant to the *Criminal Code of Canada*.

b. Must be accompanied with appropriate documentation.

c. Not expired and contained within a sealed bottle.

3. When to Change Solutions:

a. The change interval of the Alcohol Standard (Wet Bath) is monitored by the instrument, which verifies both date and number of tests. The simulator expiry date can be found on the Alcohol Standard Label attached to the front of the instrument.

b. An instrument warning of an approaching expiry date will be displayed in the scrolling screen when the Alcohol Standard (Wet Bath) has 5 days or less before the expiry date: **Alcohol Std Expires in X Days**. An instrument warning will also be displayed when the number of Alcohol Standard (Wet Bath) tests reaches 45 tests: **'# Sim Solution Samples Left'**.

c. Once the expiry date has been reached or after 50 Alcohol Standard (Wet Bath) tests have been completed the status message **'Instrument Not Ready....Solution Expired'** is displayed in the scrolling screen. The instrument will not allow a test to be performed until the solution is changed, and if a test is attempted, the following message will be displayed: **'Simulator Expired Please Call Technician...'**

4. Solution Change Procedure:

Follow the step by step procedure indicated below to change the Alcohol Standard (Wet Bath). Use the Alcohol Standard (Wet Bath) Change Form to record the completion of each step by checking the appropriate box.

Before commencing the procedure, ensure the Alcohol Standard (Wet Bath) identification and lot number indicated on the bottle label exactly match the corresponding information in the accompanying documentation. If they do not match, obtain a new bottle with corresponding documentation or obtain the proper documentation from the RCMP National Forensic Service.

Once the alcohol standard solution has been changed and after a 20 minute simulator warm-up period, the instrument will force a Supervisor Test and locks out any analytical testing until successful completion of the Supervisor Test. An automated sequence of five alcohol standard tests, separated by blank tests, is conducted with the new alcohol standard in the simulator.

The target value for an Alcohol Standard (Wet Bath) is 100 mg%. All five test results must be within 5% of the target value. The instrument will automatically abort the supervisor test if any result is not within 95 mg% to 105 mg%.

Step by Step Procedure:

1. Record the following five pieces of information into the table in the top left corner of the Alcohol Standard (Wet Bath) Change Form (this information is located on the alcohol standard bottle label):

    - Manufacturer name
    - Lot number
    - Alc Std expiry date
    - Sim Solution expiry date (two weeks from current date)
    - Changer (print your name)

2. Record the following five pieces of information on a new Alcohol Standard (Wet Bath) Label printed on an Avery label 5164 (this information is located on the alcohol standard bottle label):

    - Manufacturer name
    - Lot number
    - Alc Std expiry date
    - Sim Solution expiry date (two weeks from current date)
    - Changer (sign your name)

3. Turn the simulator power switch “OFF” and unplug the simulator. Disconnect the tubing from the simulator. Unscrew the top and discard the old solution.

4. Dry the simulator jar and elements. Ensure the simulator elements and submerged parts are cleaned to prevent algae growth. Check the jar for chips or cracks and replace if necessary.

5. Remove the NIST-traceable thermometer and inspect for breaks in the mercury column. If the break is in the upper portion of the mercury column, place the thermometer in luke warm (**not hot**) water and drive the air bubble into bulb at the top of the thermometer. With your finger, gently tap the top of the thermometer to remove the air bubble from the mercury. Allow the thermometer to cool down and ensure no further breaks are present. Replace in the simulator.

   If the break is in the lower portion of the mercury column, place the thermometer in a freezer or run under cold water to allow all of the mercury to collect in the bulb at the bottom of the thermometer. With your finger, gently tap the bottom of the thermometer to remove the air bubble from the mercury. Allow the thermometer to warm up and ensure no further breaks are present. Replace in the simulator. If this fails to correct the break you must replace the thermometer.

6. Record the serial number of the NIST-traceable thermometer on the Alcohol Standard (Wet Bath) Change form.

7. Ensure the inner seal of the Alcohol Standard Solution bottle is intact and perform a leak test by inverting and squeezing the bottle. If the seal is not intact, obtain a new bottle and repeat leak test. If the seal is intact, pierce the seal and pour the entire contents of the alcohol standard solution into the jar.

8. Reassemble the simulator and perform a leak test on the simulator.

   The leak test is done by attaching a short piece of tubing to the inlet on the top of the simulator and blocking the simulator outlet port with your finger. Attach a mouthpiece to the short piece of tubing and blow.

   If the jar is properly sealed there should be very little bubbling (or no bubbling) in the solution. If there is a leak, excessive bubbling will be observed in the solution. Open the simulator, re-seal the jar and retest.

9. Once the leak test passes, plug in the simulator and turn the power switch “ON”. Ensure that the propeller is turning and the power and heater lights are illuminated. Reconnect the tubing to the simulator.

10. Check the time and date in the instrument and adjust if necessary (**F8**).

11. Remove the previous Alcohol Standard (Wet Bath) Label from the label holder on the instrument, remove the backing from the label and attach it to the upper right corner of the Alcohol Standard (Wet Bath) Change Form.

12. Insert the new Alcohol Standard (Wet Bath) Label into the label holder on the right hand side of the face of the instrument.

13. Post the documentation for the Alcohol Standard solution.

14. Update the Alcohol Standard (Wet Bath) information in the instrument by pressing **Ctrl-F10**. When prompted for the Password, type in Supervisor password:

Prompt Question	Response required
Simulator Solution Value:	**100.** The target value for the solution will always be 100. This is taken from the Alcohol Standard bottle label.
Alcohol Std Lot Number:	Enter lot number of solution. The lot number of the Alcohol Standard is identified on the bottle label.
Expiry Date of Alc Std: **YYYY.MM.DD**	Enter the **manufacturer 2 year expiry date** of the Alcohol Standard as indicated on the bottle label as YYYY.MM.DD. If no day is indicated, then it is the last day of the month.
Expiry Date of Sim Soln: **YYYY.MM.DD**	Enter the date 2 weeks from the change date identified in Step 1, above.
Alcohol Std Manufacturer:	Enter the name of the manufacturer. The name of the Alcohol Standard manufacturer is identified on the bottle label.
Simulator S/N:	Enter the simulator serial number obtained from the simulator.
NIST Thermometer S/N:	This is the number identified on the back of the NIST-traceable thermometer and entered on the Alcohol Standard (Wet Bath) Change Form.
Alcohol Std Certificate Posted?: **Yes**	Enter Y once Certificate has been posted

Prompt Question	Response required
Simulator prepared **Heating up? [Y/N]**	Pressing Y will store and print instrument date and time on the Alcohol Standard Change report. The instrument forces a Supervisor Test (F3) and locks out any analytical testing until successful completion of a Supervisor Test.
Commit Solution Changes?: **SPACE = Commit ENTER = Verify**	Always REVIEW DATA after data is entered or corrected. Press 'Enter' and the first question will reappear. Correct data by using the arrow keys and delete or overtype. Pressing the space bar will save the new information and reset the simulator counter to zero.
Please wait...	The instrument is committing these changes to memory before changing to a countdown screen.

15. The instrument will commence a 20 minute waiting period and the display will show the countdown screen.

16. After the 20 minutes, the display will change to the scrolling screen and an instrument warning will display, "Instrument Not ready... / Press F3 to Start Supervisor Test".

    NOTE: If you have a simulator with a digital display and once the 20 minute wait period is complete, ensure both the NIST-traceable thermometer and the digital display are between 33.8ºC to 34.2ºC.

    Press F3 to start Supervisor Test.

    You will be prompted to enter information or verify the information retrieved from memory. If corrections are necessary, press "**Esc**", go back into Ctrl-F10 and make the necessary corrections. Once the information has been edited, the instrument will return to Step 15.

    After F3 is pressed, the sequence of questions appears as follows:

Prompt Question	Response required
Qualified Tech Last Name:	Type last name.
Qualified Tech First Name:	Type first name.
Qualified Tech Middle Name	Type middle name (space if not applicable).
Number of samples (1-10): **5**	Default is 5. Must always be set to 5.

Prompt Question	Response required
Simulator Solution Value: **100**	Default is **Ctrl-F10** info. This is taken from the alcohol standard bottle label.
Alcohol Std Manufacturer:	Default is **Ctrl-F10** info. This is taken from the alcohol standard bottle label.
Alcohol Std Lot No.:	Default is **Ctrl-F10** info. This is taken from the alcohol standard bottle label.
Expiry Date of Alc Std:	Default is **Ctrl-F10** info. This is the **manufacturer 2 year expiry date** as indicated on the alcohol standard bottle label.
Expiry Date of Sim Soln:	Default is **Ctrl-F10** info. This is the date 2 weeks from the change date in Step 1 above.
Simulator S/N:	Default is **Ctrl-F10** info. The number identified on the simulator.
NIST Thermometer S/N:	Default is **Ctrl-F10 info.** This is the number identified on the back of the NIST-traceable thermometer.
Alcohol Std Certificate Posted?: **Yes**	Ensure that the Certificate of an Analyst is posted near the instrument. Spacebar to toggle between Yes and No.
Starting Test Sequence: **SPACE=Begin ENTER=Verify**	The enter key will recycle the prompts to allow the information to be verified. Pressing the space bar displays the next prompt.
Simulator Temp in Range? **33.8 – 34.2 C [Y/N]**	Check the NIST-traceable thermometer or digital display. If temperature is within this range, enter "Y" and the Supervisor Test will commence. If the temperature is outside this range, enter "N" to abort to scrolling screen.

Note: Record the Test # for the Supervisor Test on the change form when it is displayed.

17. Review and sign the Supervisor Test Report.

    The target value for an Alcohol Standard (Wet Bath) is 100 mg%. All five test results must be within 5% of the target value. The instrument will automatically abort the supervisor test if any result is not within 95 mg% to 105 mg%.

    a. If any individual test is not in the range of the target value printed on the Supervisor Test plus or minus 5%, repeat steps 1 through 17, using a new bottle of alcohol standard solution.

b. After repeating the Alcohol Standard (Wet Bath) change, if any individual test is not in this range, the instrument should be taken out of service and the service agency contacted.

18. Sign and date the Alcohol Standard (Wet Bath) Change form, attach it to the Supervisor Test report and file both documents in the Alcohol Standard Change Log.

Alcohol Standard (Wet Bath) Change Form

Manufacturer	
Lot Number	
Alc Std Expiry Date	
Sim Soln Expiry Date	
Changer	

Attach Previous Alcohol Standard Label Here

- ☐ 1. Record the five pieces of information required in the table above.
- ☐ 2. Record the five pieces of information required on a new Alcohol Standard (Wet Bath) Label.
- ☐ 3. Turn simulator power switch “OFF” and unplug the simulator. Disconnect tubing from the simulator. Unscrew the top and discard the old solution.
- ☐ 4. Dry the simulator jar and elements. Check the jar for chips or cracks and replace if necessary.
- ☐ 5. Remove NIST-traceable thermometer and inspect for breaks in mercury column (fix / replace as necessary).
- ☐ 6. Record the serial number of the NIST-traceable thermometer: _____
- ☐ 7. Perform leak test on new bottle of alcohol standard soln and place new solution in the simulator jar.
- ☐ 8. Reassemble simulator and perform leak test on the simulator.
- ☐ 9. Plug in simulator, turn simulator power switch “ON” and reconnect tubing to the simulator.
- ☐ 10. Check the time and date in the instrument and adjust if necessary (F8).

- ☐ 11. Remove the previous Alcohol Standard (Wet Bath) Label from the label holder on the instrument, remove backing from the label and attach it to the upper right corner of this form.
- ☐ 12. Insert the new Alcohol Standard (Wet Bath) Label into the holder on the instrument.
- ☐ 13. Post the documentation for the alcohol standard solution.
- ☐ 14. Update the Alcohol Standard (Wet Bath) information in the instrument (Ctrl- F10).
- ☐ 15. Observe 20 minute countdown screen for simulator warm up period.
- ☐ 16. Press F3 to start Supervisor Test. Record Test # _____
- ☐ 17. Review and sign the Supervisor Test Report. Ensure all results fall between 95 mg% to 105 mg%.
- ☐ 18. Sign, date and attach this form to the Supervisor Test Report. File in Alcohol Standard Change Log.

Signature:	Date:

Alcohol Standard (Wet Bath) Label	
Manufacturer	
Lot Number	
Alc Std Expiry Date	
Sim Soln Expiry Date	
Changer	

ALCOHOL STANDARD (Dry Gas) CHANGE PROCEDURE:

1. Materials Required:

a. Alcohol Standard (Dry Gas) Change Form and Dry Gas Label.

b. Stabilized Alcohol Standard cylinder complete with new O-ring . Ensure the cylinder has been stored at room temperature for 24 hours.

c. Associated documentation, including Material Safety Data Sheet (MSDS).

2. Alcohol Standard:

a. Analysed and certified by an Analyst pursuant to the *Criminal Code of Canada*.

b. Must be accompanied with associated documentation.

c. Cylinder not expired and minimum pressure of 1000 psi.

3. When to Change Cylinders:

a. The change interval of the Alcohol Standard (Dry Gas) is monitored by the instrument, which verifies both date and pressure. The expiry date can be observed on the Alcohol Standard (Dry Gas) Label attached to the front of the instrument. An instrument warning message will be displayed on the scrolling screen when the pressure drops below 100 psi.

b. A status message warning of an approaching expiry date will be displayed in the scrolling screen when the Alcohol Standard (Dry Gas) has 30 days or less before the expiry date: **'Dry Gas Expires in X Days'**. Similarly, if the cylinder pressure drops to less than 100 psi a status message will warn of the low pressure in the scrolling screen: **'Dry Gas Standard Pressure Low'**.

c. Failure to change the cylinder before it expires or before the pressure falls below 50 psi, will result in a status message **'Dry Gas Expired'** or **'Dry Gas Tank Empty'** (respectively) displayed in the scrolling screen. The instrument will not allow a test to be performed until the cylinder is changed, and if a test is attempted, the following message will be displayed: **'Dry Gas Tank Expired Please Call Technician..."** or **'Dry Gas Tank Empty Please Call Technician'** (respectively).

4. Dry Gas Cylinder Change Procedure:

Follow the step by step procedure indicated below to change the Alcohol Standard (Dry Gas). Use the Alcohol Standard (Dry Gas) Change Form to record the completion of each step by checking the appropriate box.

Before commencing the procedure, ensure the Alcohol Standard (Dry Gas) identification and lot number indicated on the cylinder label exactly match the corresponding information in the accompanying documentation. If they do not match, obtain a new cylinder with corresponding documentation or obtain the proper documentation from the RCMP National Forensic Service.

Once the alcohol standard cylinder has been changed, the instrument will force a Supervisor Test and locks out any analytical testing until successful completion of the Supervisor Test. An automated sequence of five alcohol standard tests, separated by blank tests, is conducted with the new alcohol standard cylinder.

The target value for an Alcohol Standard (Dry Gas) will be displayed by the instrument immediately prior to each alcohol standard test. All five test results must be within 5% of the target value. The instrument will automatically abort the supervisor test if any result is not within 5% of the target value.

Step by Step Procedure:

1. Record the following four pieces of information into the table in the top left corner of the Alcohol Standard (Dry Gas) Change Form (this information is located on the alcohol standard cylinder label):

- Manufacturer name
- Lot number
- Alc Std expiry date
- Changer (print your name)

2. Record the following four pieces of information on a new Alcohol Standard (Dry Gas) Label printed on an Avery label 5164 (this information is located on the alcohol standard cylinder label):

    - Manufacturer name
    - Lot number
    - Alc Std expiry date
    - Changer (sign your name)

3. Unlock and open the dry gas compartment on top of the instrument and remove the old cylinder.

4. Inspect the new dry gas cylinder for damage, especially around the top of the cylinder.

5. Remove the old O-ring from the dry gas regulator in the cylinder compartment and replace it with the new O-ring affixed to the side of the new cylinder.

6. Install new dry gas cylinder and ensure there are no leaks. If the cylinder leaks, contact the service agency immediately.

7. Replace the dry gas compartment cover and lock.

8. Check the cylinder pressure by pressing **Alt P** and record the cylinder pressure on the Alcohol Standard (Dry Gas) Change Form. Minimum acceptable pressure is 1000 psi.

9. Check the time and date in the instrument and adjust if necessary by pressing **F8.**

10. Remove the previous Alcohol Standard (Dry Gas) Label from the label holder on the instrument, remove the backing from the label and attach it to the upper right corner of the Alcohol Standard (Dry Gas) Change Form.

11. Insert the new Alcohol Standard (Dry Gas) Label into the label holder on the right hand side of the face of the instrument.

12. Post the documentation for the Alcohol Standard cylinder, including the Material Safety Data Sheet (MSDS).

13. Update the Alcohol Standard (Dry Gas) information in the instrument by pressing **F10**. When prompted for the Password, type in Supervisor password.

Prompt Question	Response required
Dry Gas Tank Stable?: **Yes**	**Space bar** toggles the data entry between Yes and No.
DG Stabilization Start Date: **YYYY.MM.DD**	Enter date that the dry gas cylinder was stored in the breath test room at room temperature.
DG Stabilization Start Time: **HH:MM**	Enter time that the dry gas cylinder was stored in the breath test room at room temperature.
Dry Gas Value (at sea level): **82**	**82.** The target value for the dry gas will always be 82. This is identified on the cylinder label.
Alcohol Std Lot Number:	Enter lot number of solution identified at the bottom of the cylinder label.
Expiry Date of Cylinder: **YYYY.MM.DD**	Enter the **manufacturer 2 year expiry date** of the Alcohol Standard as indicated on the cylinder label as YYYY.MM.DD. If no day is indicated, then it is the last day of the month.
Alcohol Std Manufacturer:	Enter the name of the manufacturer as identified on the Certificate of an Analyst for that lot number.
Alcohol Std Certificate Posted?: **Yes**	Ensure that the Certificate of an Analyst is posted near the instrument. Spacebar to toggle between Yes and No.
Commit Dry Gas Changes?: **SPACE = Commit ENTER = Verify**	Always REVIEW DATA after data is entered or corrected. Press 'Enter' and the first question will reappear. Correct data by using the arrow keys and delete or overtype. Pressing the space bar will save the new information. The instrument forces a Supervisor Test (F3) and locks out any analytical testing until successful completion of a Supervisor Test .
Please wait...	The instrument is committing these changes to memory and returns to the scrolling screen.

14. When the display changes to the scrolling screen, an instrument warning will display, "Instrument Not ready... / Press F3 to Start Supervisor Test".

    Press F3 to start Supervisor Test.

    You will be prompted to enter information or verify the information retrieved from memory. If corrections are necessary, press **Esc**, go back into **F10** and make the necessary corrections. Once the information has been edited, the instrument will return to Step 14.

The sequence of questions appears as follows:

Prompt Question	Response required
Qualified Tech Last Name:	Type last name.
Qualified Tech First Name:	Type first name.
Qualified Tech Middle Name:	Type middle name (space if not applicable).
Number of samples (1-10): **5**	Default is **5**. Must always be set to 5.
Dry Gas Value (at sea level): **82**	Default is **F10** info. This is taken off the cylinder label.
Alcohol Std Manufacturer:	Default is **F10** info. This is taken off the cylinder label.
Alcohol Std Lot No.:	Default is **F10** info. This is taken off the cylinder label.
Expiry Date of Cylinder:	Default is **F10** info. This is taken off the cylinder label.
Alcohol Std Certificate Posted?: **Yes**	Ensure that the Certificate of an Analyst is posted near the instrument. Spacebar to toggle between Yes and No.
Starting Test Sequence: **SPACE=Begin ENTER=Verify**	The enter key will recycle the prompts to allow the information to be verified. Pressing the space bar displays the next prompt.

Note: Record the Test # for the Supervisor Test on the change form when it is displayed.

15. Review and sign the Supervisor Test Report.

    The target value for an Alcohol Standard (Dry Gas) will be displayed by the instrument immediately prior to each alcohol standard test. The instrument will automatically abort the Supervisor Test if any result is not within 5% of the target value.

    a. If any individual test is not in the 5% range of the target value printed on the Supervisor Test, press F3 and repeat the Supervisor Test using the same cylinder of Alcohol Standard (Dry Gas).

    b. After the second Supervisor Test, if any alcohol standard test is not in the 5% range of target value printed on the Supervisor Test, the instrument should be taken out of service and the service agency contacted.

16. Sign, date and attach the Alcohol Standard (Dry Gas) Change Form to the Supervisor Test Report and file both documents in the Alcohol Standard Change Log.

Alcohol Standard (Dry Gas) Change Form

Attach Previous Alcohol Standard Label Here

Manufacturer	
Lot Number	
Alc Std Expiry Date	
Changer	

- ☐ 1. Record the four pieces of information required in the table above.
- ☐ 2. Record the four pieces of information required on a new Alcohol Standard (Dry Gas) Label.
- ☐ 3. Unlock and open the dry gas compartment and remove old cylinder.
- ☐ 4. Inspect the new cylinder for damage.
- ☐ 5. Remove the old O-ring from the regulator and replace with a new O-ring.
- ☐ 6. Install new dry gas cylinder and ensure there are no leaks.
- ☐ 7. Replace the dry gas compartment cover and lock.
- ☐ 8. Check the cylinder pressure (Alt-P) and record:_____ psi (min. 1000 psi)
- ☐ 9. Check the time and date and adjust if necessary (F8).
- ☐ 10. Remove the previous Alcohol Standard (Dry Gas) Label from the label holder on the instrument, remove backing from the label and attach it to the upper right corner of this form.
- ☐ 11. Insert the new Alcohol Standard (Dry Gas) Label into the holder on the instrument.
- ☐ 12. Post the documentation for the alcohol standard cylinder, including the MSDS.
- ☐ 13. Update the Alcohol Standard (Dry Gas) information in the instrument (F10).
- ☐ 14. Press F3 to start Supervisor Test. Record Test # _____
- ☐ 15. Review and sign the Supervisor Test Report. Ensure all results fall within 5% of the target value.
- ☐ 16. Sign, date and attach this form to the Supervisor Test Report. File in the Alcohol Standard Change Log.

Signature:	Date:

Alcohol Standard (Dry Gas) Label	
Manufacturer	
Lot Number	
Alc Std Expiry Date	
Changer	

REVIEW QUESTIONS

1. State the policy regarding Alcohol Standard (Wet Bath) and Alcohol Standard (Dry Gas) change.

2. What materials are required for the Alcohol Standard (Wet Bath) change procedure?

3. How can a mercury break in a thermometer be repaired?

4. What is the purpose of the Alcohol Standard (Wet Bath) or Alcohol Standard (Dry Gas)?

5. How is a leak test performed on the simulator?

6. How long do you have to wait for the simulator to warm up and stabilize before performing a Supervisor Test?

7. What is the operating temperature of the simulator?

8. How can you edit the time and date in the instrument?

9. How many alcohol standard tests are conducted during the Supervisor Test?

10. State the acceptable range for all Supervisor Test results for the Alcohol Standard (Wet Bath)? ...and the Alcohol Standard (Dry Gas)?

11. What is done if these ranges are not met?

12. What is done with the documentation produced during the alcohol standard change procedure?

COMMAND LIST- OPERATOR

KEY	ACTION
F2	Quick Test
Shft- F1	Pass Code Information
'F'	Purge Cycle
'P'	Print Last Test
ENTER	Run Subject Test

COMMAND LIST- SUPERVISOR

KEY	ACTION
F1	Print Command List
F3	Supervisor Test
F5	Print Test
F8	Date / Time Set-up
F9	General Set-up
F10	Alcohol Standard Set-up (Dry Gas)
Shft-F1	Pass Code Information
Shft-F2	Print Software version
Shft-F5	Print Test Summaries
Ctrl-F1	View Software Version
Ctrl-F2	View Firmware Version
Ctrl-F5	Browse and Print Test
Ctrl-F9	Location
Ctrl-F10	Update Alcohol Standard (Wet Bath)
Ctrl-L	Alternate Language
Ctrl-Q	Shut Down EC/IR II
Ctrl-S	View Simulator Temperature
Alt-F9	Default Standard
Alt-F10	Standard 2 Counter
Alt-P	View Cylinder Pressure
'F'	Purge Cycle
'P'	Print Last Test

Intox EC/IR II Setup (Printer & Location)

- Press **F9** and enter Supervisor password. Display shows "**General Setup:"**
- Press left/right arrow keys to move between options:

Printer Setup ↔ Location ↔ COM Ports

- Press **ENTER** to confirm your selection

A. **Printer Setup**

- In the "**General Setup:**" screen, with **Printer Setup** on the display, press **ENTER**
- Press left/right arrow keys to move between options:

Print Device ↔ Condensed Print Mode ↔ Number of Print Copies

- Press **ENTER** to confirm your selection

A.1 In the **Printer Setup** screen, with **"Print Device"** on the display, press **ENTER**
- Press space bar to toggle between options:

None ↔ External

- Press **ENTER** to confirm your selection
- Press **ESC** three times to return to the scrolling sc**reen**

NOTE: The **Condensed Print Mode** should always be set to **None.**

A.2 In the **Printer Setup** screen, with **"Number of Print Copies"** on the display, press **ENTER.**
- the next display is "**Number of Print Copies:**

**"**

- enter the number of copies, followed by **ENTER**
- Press **ESC** three times to return to the scrolling screen

P - prints last test

F5 - print a single test by calling up test number

CTRL F5 - print a single test by browsing. Display shows Test Number, Date, Time, Test Type and for Subject Tests, the subject's last name.

SHFT F5 - prints a batch of tests (see instructions for batch printing)

B. “Location” Setup

- In the “**General Setup:**” screen, with “**Location”** on the display, press **ENTER**
- Press left/right arrows to move between options:

Agency Name ↔ City ↔ Province

- Press **ENTER** to confirm your selection, then press down arrow to enter or change data

B.1 for **“Agency Name:”**, press down arrow, enter the agency name (max 25 characters), followed by **ENTER**

B.2 for **“City:”**, press down arrow, enter the city name (max 25 characters), followed by **ENTER**

B.3 for **“Province:”**, press down arrow, enter the province name (max 25 characters), followed by **ENTER**

- Press **ESC** three times to return to the scrolling screen

How to print a batch of Test Reports

NOTE: "↔" means toggle using space bar.

Press Shft-F5 (Print Test Summary) and enter Supervisor password.

Display shows "**Format of Printing:"** Press space bar to toggle between options
Complete Records ↔ Summaries
Press ENTER to confirm your selection

Display shows "**Test Types:**" Press space bar to toggle between options
Subject Tests ↔ Quick Tests ↔ Dry Gas Standard Updates ↔ Wet Simulator Updates ↔
Calibrations ↔ Supervisor Tests ↔ Scheduled Tests ↔ Remote Tests ↔ All

Press ENTER to confirm your selection

Next display is "**Select Tests by:**" Press space bar to toggle between options
Range of Test Numbers ↔ Range of Test Dates

Press ENTER to confirm your selection

For Range of Test Numbers the next display is "Starting Test:
###.....enter your first test number, followed by ENTER

Next display is "**Ending Test:**"
###....enter your last test number, followed by ENTER

Next display is "**Print Test Summaries:**
Press SPACE to print...".....so press SPACE !!!

For Range of Test Dates, next display is "**Start Date:**"
###.....enter your beginning date, followed by ENTER

Next display is **"Ending Date:**"
###....enter your end date, followed by ENTER

Next display is "**Print Test Summaries:**"
Press SPACE to print...".....so press SPACE !!!