DMT OPERATOR TRAINING MANUAL

Minnesota Department of Public Safety
Bureau of Criminal Apprehension
Forensic Science Services
Breath Alcohol Calibration Laboratory

DATAMASTER DMT BREATH TEST OPERATOR TRAINING COURSE MANUAL

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Minnesota Department of Public Safety
Bureau of Criminal Apprehension
Forensic Science Services
Breath Alcohol Calibration Laboratory
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General Course Information

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General Course Information

Introduction

Handouts supplement the material taught by the staff of the Minnesota Bureau of Criminal Apprehension (BCA) Forensic Science Services Breath Alcohol Calibration Laboratory and are intended only as an aide to training. They do not contain the complete content of the course nor are they an authoritative statement of Minnesota statute, rule, regulation, policy or procedure. Every effort has been made to provide correct information at the time of writing.

Required P.O.S.T Statement

The BCA is a continuing education sponsor approved by the Board of Peace Officer Standards and Training (P.O.S.T). Peace officers who successfully complete this course will receive continuing education credits toward their P.O.S.T. license renewal. Operator training for new operators, as a basic course, constitutes twenty-four (24) hours of approved continuing education credit.

The BCA endeavors to provide training in an environment free of discrimination or prejudice. Discriminatory or prejudicial acts or comments by faculty members, staff or students will not be tolerated. Complaints of inappropriate behavior based on race, gender, creed, age, color, religion, national origin or marital status may be communicated in any form to any representative of the BCA. All complaints received will be handled in accordance with BCA policy.

Class credit and fee

If you need to leave because of a business or personal emergency, please let a course instructor know. You must attend 90% of the course to receive P.O.S.T. credit. Your department will be charged the full registration fee if your absence is not cleared with an instructor.

Maintenance

All DMT maintenance must be performed or authorized by the Minnesota Bureau of Criminal Apprehension Forensic Science Services Breath Alcohol Calibration Laboratory. Any unauthorized repairs could invalidate all subsequent subject tests. Any instrument problem should be brought to the immediate attention of the Bureau of Criminal Apprehension Forensic Science Services Breath Alcohol Calibration Laboratory.

Operator Requirements

1. Minnesota DMT operators are required to attend and satisfactorily complete the Bureau of Criminal Apprehension Breath Test Operator course. During the course the student will run tests, prepare breath test documentation for court, and learn the theory and background of breath testing sufficiently for competent court testimony. To complete the course the student must obtain a minimum written exam score of 70% and a minimum lab exam score of 90%.

2. To maintain an active certification, an operator must take a recertification course periodically as instructed by the BCA and achieve a passing grade on the final exam.

Summary

The Breath Test Operator training program has been developed to assist with enforcement of DWI statutes. The DMT test procedure and operator requirements are the result of the experiences of the Bureau of Criminal Apprehension Forensic Science Services Breath Alcohol Calibration Laboratory and the recommendations of the National Safety Council's Committee on Alcohol and Other Drugs. The high standards placed on operators and instruments in Minnesota have established the DMT as an accurate and impartial test for alcohol concentration. It is *imperative* that this quality be maintained.

Bureau of Criminal Apprehension and Laboratory Rules

1. 1430 Maryland is a smoke free building. Smoking is permitted only outside the building.
2. Side arms are prohibited in class whenever alcohol is being consumed. Lockers are provided for their storage.
3. Clean up spilled liquids promptly and properly. Notify an instructor immediately of any spill.
4. Return all materials to their proper storage areas at the conclusion of their use. Dispose of all refuse properly. Containers for recycling are provided. Please use them for cans, bottles and paper.
5. Keep all working areas clean and neat.

Policy on Breath Test Students Who Have a Positive Alcohol Concentration Outside of the Controlled Drinking Session

At any time during a Breath Test class, other than a controlled drinking session, if a student is found to have alcohol in their system (as tested by PBT or DMT-G), the following will occur:

- Breath Alcohol Calibration Laboratory staff will immediately notify Supervisor and Directors who will ensure that:
  - Student is removed from class and not allowed to drive regardless of alcohol concentration.
  - The law enforcement agency that employs the student will be contacted and attempts to speak with a direct supervisor will be made.
  - An appropriate response will be agreed upon between agency and BCA.

DMT Certification Course Schedule

	Day 1: Tuesday	Day 2: Wednesday	Day 3: Thursday
8:00	Course Orientation	Status Codes	Troubleshooting
8:30	Concepts of Alcohol Testing		Legal Aspects
9:00			
9:30	DMT Inside and Out	Lab	Mock Trials
10:00			
10:30			
11:00	Ancillary Equipment		Pharmacology and Toxicology of Alcohol
11:30			
12:00	Lunch	Quiz and Review	Lunch
12:30		Lunch/Drinking Lab	
13:00	Observation Period		eCharging
13:30	Minnesota Test Sequence	Testing of Drinking Subjects	Course Review
14:00			
14:30	Introductory Lab		Written Final and Lab Final
15:00	Widmark Theory		
15:30			
16:00	PBT Calibration		
16:30			
17:00			

Concepts of Alcohol Testing

Instructor _____

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Chemistry of Alcohol

C = Carbon
H = Hydrogen
O = Oxygen

```
      H   H
      |   |
H --- C ---C --- OH
      |   |
      H   H
```

Ethyl alcohol

```
      H
      |
H --- C --- OH
      |
      H
```

Methyl alcohol

```
      H   OH   H
      |    |   |
H --- C --- C --- C --- H
      |    |   |
      H    H   H
```

Isopropyl alcohol

```
      OH   H
      |    |
H --- C --- C --- H
      |    |
      H   OH
```

Ethylene Glycol

```
      H    O    H
      |   ||    |
H --- C --- C --- C --- H
      |    |    |
      H    H    H
```

Acetone

Ethyl alcohol, a simple organic compound, is composed of two carbon atoms, five hydrogen atoms and a hydroxyl group (C2H5OH). A hydroxyl group (OH) is an oxygen atom and a hydrogen atom bound together, and is common to all alcohols. Ethanol is the alcohol which is contained in all alcoholic beverages. The first byproduct of ethanol is acetaldehyde, followed by ethanoic acid, commonly known as acetic acid or vinegar. Ethyl alcohol is also known as ethanol, alcohol, grain alcohol, neutral spirits and spirit of wine. The term alcohol is from the Arabic word **AL-KOHL**. Ethyl alcohol is a clear, colorless, volatile liquid with a slight characteristic odor, which is detectable at 10 parts per million (PPM) in air and becomes disagreeable at around 500 PPM. It mixes well with water. It is flammable and considered a hazardous material. Boiling point = 78.5° C (173.3° F) freezing point = -114.1° C (-173.4° F). The density is .791 @ 20° C and .787 @ 25° C (water = 1). The vapor density is equal to 1.6 (air = 1).

Methyl alcohol, also called methanol or wood alcohol, contains one carbon atom, three hydrogen atoms and a hydroxyl group (CH3OH). Methanol is extremely toxic to the human body. The metabolic byproducts of methanol are the reason for its toxicity. The first byproduct is methaldehyde, commonly known as formaldehyde. The body converts this to formic acid. Formic acid will dissolve the rods and cones in the retina resulting in vision impairment or blindness. Formic acid unchecked results in death by causing the kidneys to cease functioning.

Isopropyl alcohol, also called isopropanol or rubbing alcohol, contains three carbon atoms, seven hydrogen atoms and a hydroxyl group (CH3CHOHCH3). The body converts Isopropanol into acetone.

Ethylene Glycol, commonly called anti-freeze, contains two carbon atoms, four hydrogen atoms and two hydroxyl groups.

Acetone, contained in fingernail polish remover, contains three carbon atoms, seven hydrogen atoms and one oxygen atom. While acetone is not an alcohol, acetone vapors may be present in the breath of diabetics, dieters or highly exercised individuals. The presence of acetone is recognized by

the IR filters and fuel cells do not react with acetone. The DMT will treat the presence of acetone on the breath as an Interference.

Beverage Labeling

The following are different means of measuring how much alcohol is contained in an alcohol beverage.

Percent by volume

Percent by Volume is the most common expression of a beverage's alcohol concentration. All distilled beverages list their alcohol concentration under the term Percent by Volume. To determine the Percent by Volume, take the volume of pure ethyl alcohol divided by the total volume of the alcoholic beverage multiplied by 100.

$$\frac{\text{Volume of Pure Ethyl Alcohol}}{\text{Total Volume}} \times 100\% = \text{Percent by Volume}$$

Percent by weight

Percent by Weight is the weight of pure ethyl alcohol divided by the total weight of the alcoholic beverage multiplied by 100.

$$\frac{\text{Weight of Pure Ethyl Alcohol}}{\text{Total Weight}} \times 100\% = \text{Percent by Weight}$$

Proof

In the United States, all distilled beverages list their alcohol concentration under the term proof.

Before scientific methods, beverage strength was measured by mixing equal amounts of spirit and gunpowder. When ignited, if the mixture did not burn it was too weak. If it burned too rapidly it was too strong. If it produced an even blue flame it was proved. This concentration is now known to be about 50 percent alcohol.

Proof is twice the percent of ethyl alcohol by volume. Therefore, pure (100%) ethyl alcohol is 200 proof; 50% alcohol by volume distillates are 100 proof and 40% alcohol by volume distillates are 80 proof.

$$\text{Percent by Volume} \times 2 = \text{Proof}$$

Alcohol Production

Fermentation

Ethyl alcohol is produced naturally through the process of fermentation of sugar or starch by yeast. Fermentation is the only process by which beer and wine are produced, and it is the first step in the product of distilled spirits. Because natural, common yeast cannot survive in high levels of alcohol, fermentation stops at about 14% ethyl alcohol by volume.

Distillation

Ethyl alcohol is traditionally concentrated through distillation. This is accomplished by heating the fermented mixture (mash) to evaporate the alcohol. The type of grain or cereal used in the mash along with the manner of processing determines the type of beverage produced. The vapors from the heated mash are collected and cooled to form a liquid. The liquid distillate portion contains the ethanol plus some water and flavorings. Simple distillation can generate 95% ethyl alcohol by volume. Pure 100% ethyl alcohol is produced by dehydration of the 95% distillate.

Fortification

Fortification is the process of increasing the alcohol concentration of a fermented beverage by adding alcohol distillate. It is used primarily to produce sweet dessert wines such as Port, Sherry, and Madeira.

The names, sources and approximate alcoholic content of various beverages

Process	Beverage	Raw Material	Percent by Volume
Fermentation	Beers and Ales	Cereals	2.3 – 6.0
	Ciders	Apples	8.0 – 10.0
	Wines	Grapes	9.0 – 14.0
	Wine and Malt Coolers	Wine or beer	4.0 – 7.0
Distillation	Whiskey	Beer	40.0 – 55.0
	Rum	Molasses	40.0 – 75.5
	Brandy	Wine	40.0 – 55.0
	Vodka	Neutral Spirits	40.0 – 55.0
	Gin	Grain	35.0 – 50.0
Fortification	Sherry, Port, Madeira	Grapes	17.0 – 22.0

Congeners

After the distillate is collected it is commonly placed in charred wooden barrels for aging. During the aging process certain chemicals are leached from the wood and dissolved in the distillate. These compounds are called congeners. Congeners are responsible for the variable taste, aroma and color of different beverages. Congeners can also be responsible for hangover potential.

Analytical Techniques for Measuring Alcohol Concentration in Breath

Chemical / Photoelectric Devices

A sample of breath passes through crystals or a solution that contains a colored chemical substance. The substance reacts with alcohol to produce a color change that can be measured. The intensity of the color change reflects the amount of alcohol in the sample.

Gas chromatography

A sample of breath passes through a tubular column to a detector. Substances in the breath move through the column at different rates and arrive at the detector at different times. The detector measures the amount of each substance and the alcohol concentration can be reported by a data system. Gas chromatography can identify and measure substances in the breath other than alcohol and it can be used to analyze other body fluids, such as blood or urine.

Infrared Absorption

A breath sample passes into a chamber of fixed volume and temperature. A beam of infrared light passes through the chamber. When the light beam exits the chamber, it is filtered to remove undesired wavelengths. The remaining wavelengths are converted to an electrical signal directly proportional to the concentration of the alcohol in the breath sample.

Platinum Fuel Cell

The alcohol in the breath sample reacts with the device to produce electricity. The amount of electricity produced reflects the amount of alcohol in the sample.

Catalytic Detector

The alcohol in a breath sample comes into contact with a semiconductor and increases the voltage across it. This voltage increase is directly proportional to the amount of alcohol in the sample.

Evidentiary Instruments

Instrument Name	**Developer(s) and year**	**Material analyzed and volume**	**Method for quantitation**
Drunkometer	Harger and co-workers 1938	Rebreathed air, volume varies	Potassium permanganate in sulfuric acid
Alcometer	Greenberg and Keator 1941	Alveolar breath, 15 ml	Iodic acid
Breathalyzer	Borkenstein 1954	Alveolar breath, 52.5 ml	Potassium dichromate and silver nitrate in sulfuric acid
Gas chromatograph Intoximeter	Forrester and Associates 1968	Alveolar breath, .25 ml	Electronic flame ionization detector
Intoxilyzer 4011	Omnicron Systems Corporation 1972	Alveolar breath, 600 ml	Infra-red absorption
Intoxilyzer 5000	MPD – CMI Inc. 1983	Alveolar breath, 81.4 ml	Infra-red absorption
Intoxilyzer 5000EN	MPD – CMI Inc. 1997	Alveolar breath, 82.2 ml	Infra-red absorption
DMT- G with Fuel Cell Option (Rev-A)	NPAS, Inc. 2010 (2011)	Alveolar breath, 23 ml	Infra-red absorption & Platinum Fuel Cell

Preliminary Breath Testing Devices			
Instrument Name	**Developer(s) and year approved**	**Material analyzed and volume**	**Method for quantitation**
Alert J2	Borg Warner 1973	Alveolar breath	Catalytic Detector
Alert J3A, +C	Borg Warner 1978	Alveolar breath	Catalytic Detector
Alco-Sensor PWF	Intoximeters Inc 1982	Alveolar breath, 1ml	Platinum Fuel Cell
CMI – LION SL-2	MPD – CMI Inc. 1989	Alveolar breath, 1ml	Platinum Fuel Cell
Alco-Sensor IV	Intoximeters Inc 1992	Alveolar breath, 1ml	Platinum Fuel Cell
Alco-Sensor III	Intoximeters Inc 1997	Alveolar breath, 1ml	Platinum Fuel Cell
CMI – LION SD-2	MPD – CMI Inc. 1997	Alveolar breath, 1ml	Platinum Fuel Cell
FC-10	LifeLoc Technologies 2001	Alveolar breath, 1ml	Platinum Fuel Cell
FC-20	LifeLoc Technologies 2002	Alveolar breath, 1ml	Platinum Fuel Cell
Alco- Sensor FST	Intoximeters, Inc. 2004	Alveolar breath, 1ml	Platinum Fuel Cell
Alco-Sensor V XL	Intoximeters, Inc. 2012	Alveolar breath, 1ml	Platinum Fuel Cell

Concepts of Breath Testing

A basic assumption underlies breath alcohol testing:

⇒ *There is a determinable ratio between the alcohol concentration in the blood (and the brain) and the alcohol concentration found in the breath.*

The National Safety Council Committee on Alcohol and other Drugs ad hoc committee, and most experts in the field, have concluded that 2100 parts of alveolar (deep lung) air contain the same amount of alcohol as 1 part of blood. ***Hence, the breath to blood ratio is 2100:1***

Strengths of Breath Testing:

Quick Results – The results are obtained very quickly.

Subject Identity – There is very little question as to the identity of the subject.

Easy Collection – The sample is easy to obtain, therefore requires less technical expertise than the collection and analysis of body fluids and tissues.

Low Cost – Breath test equipment and facilities cost less per test than performing alcohol tests in a laboratory.

Concerns with Breath Testing:

Cooperative Subject – The subject must be cooperative to give a proper sample.

Further analysis – The sample cannot be reanalyzed for drugs or alcohol.

Mouth Alcohol – Alcohol remains in the mouth after ingestion and can be introduced through products such as breath fresheners, cough syrups and medications. The operator should perform an observation period, usually 15 minutes, to ensure that mouth alcohol has dissipated.

Interference – The DMT is designed to detect substances other than ethanol on the breath and will report them as Interference.

Other Substances in the Mouth – The mouth must be free of foreign matter, such as gum, candy, cough drops, medications and tobacco products, during the observation period and the test. This prevents possible damage to the instrument and blockage of the breath flow.

Smoking – Components in smoke can affect instrument performance. Smoke can destroy fuel cells and can cause the DMT lenses to become cloudy.

Acetone – Acetone vapors may be present in the breath of diabetics, dieters or highly exercised individuals. The presence of acetone is recognized by the IR filters and fuel cells do not react with acetone. The DMT will treat the presence of acetone on the breath as an Interference.

Alveolar Air – Deep lung air provides a more accurate representation of the true alcohol concentration of a person. A shallow breath sample can produce an erroneously low reading. Although the DMT and most PBTs are designed to ensure a deep lung sample, encourage subjects to blow in a long and steady manner.

Temperature – Temperature variances can affect the alcohol readings. The DMT will not allow a test to be run if the instrument temperatures are not in the proper working ranges. PBTs should be warmed or cooled to operating temperature before administering a test.

Moisture – Breath condensation can result if the instrument is not at operating temperature. This moisture can absorb alcohol and cause a low reading. The DMT provides a heated path for incoming breath to prevent this from happening.

History of Breath Testing

Many procedures have been developed to analyze alcohol in human body fluids and tissues. The first reported breath alcohol studies were in 1847 on rabbits, and in 1874 on human subjects. Tests for alcohol have been the most commonly performed forensic chemical examination over the past 50 years, the great majority being performed to determine the extent of alcoholic influence in drivers and victims of traffic accidents.

Timeline for DWI and Breath Testing

1621 – The Pilgrims landed in America
1683 – William Penn opened the first commercial brewery in the U.S.
1814 – Steam Locomotive invented
1830 – First passenger trains
1840 – Concern about intoxicated railroad engineers
1843 – New York Central Railroad bans employee drinking

1847 – Alcohol recognized on the breath of humans and rabbits
1874 – Anstie determines mouth alcohol dissipates after 15 minutes
1898 – First patent for the automobile
1904 – Many drunk driving fatalities
1913 – First chemical test for alcohol concentration in body fluids
1914 – Widmark relates urine alcohol to driving impairment (Sweden)
1920 – Prohibition began
1930's – American Medical Association called for alcohol testing
1933 – Prohibition repealed
1938 – First law enforcement breath test instrument (Drunk-o-meter)
1939 – Indiana passed the first *per se* law at 0.15
1954 –Breathalyzer introduced
1972 –Intoxilyzer introduced
1975 – Modern PBTs with fuel cells introduced
1986 – DataMaster introduced
2005 – Minnesota adopts *per se* limit of 0.08
2010 – DMT-G with fuel cell option introduced

DMT

Instructor _____

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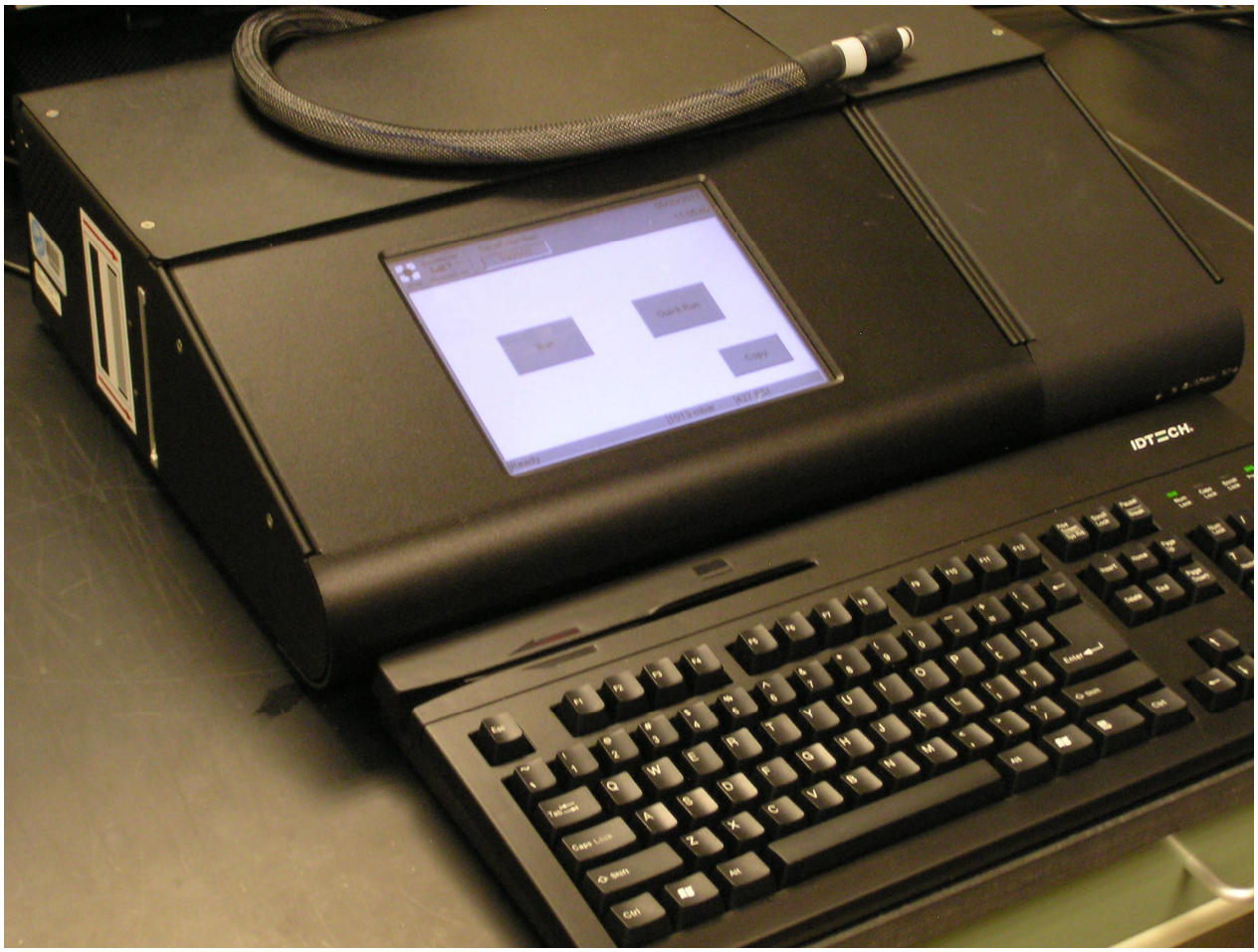
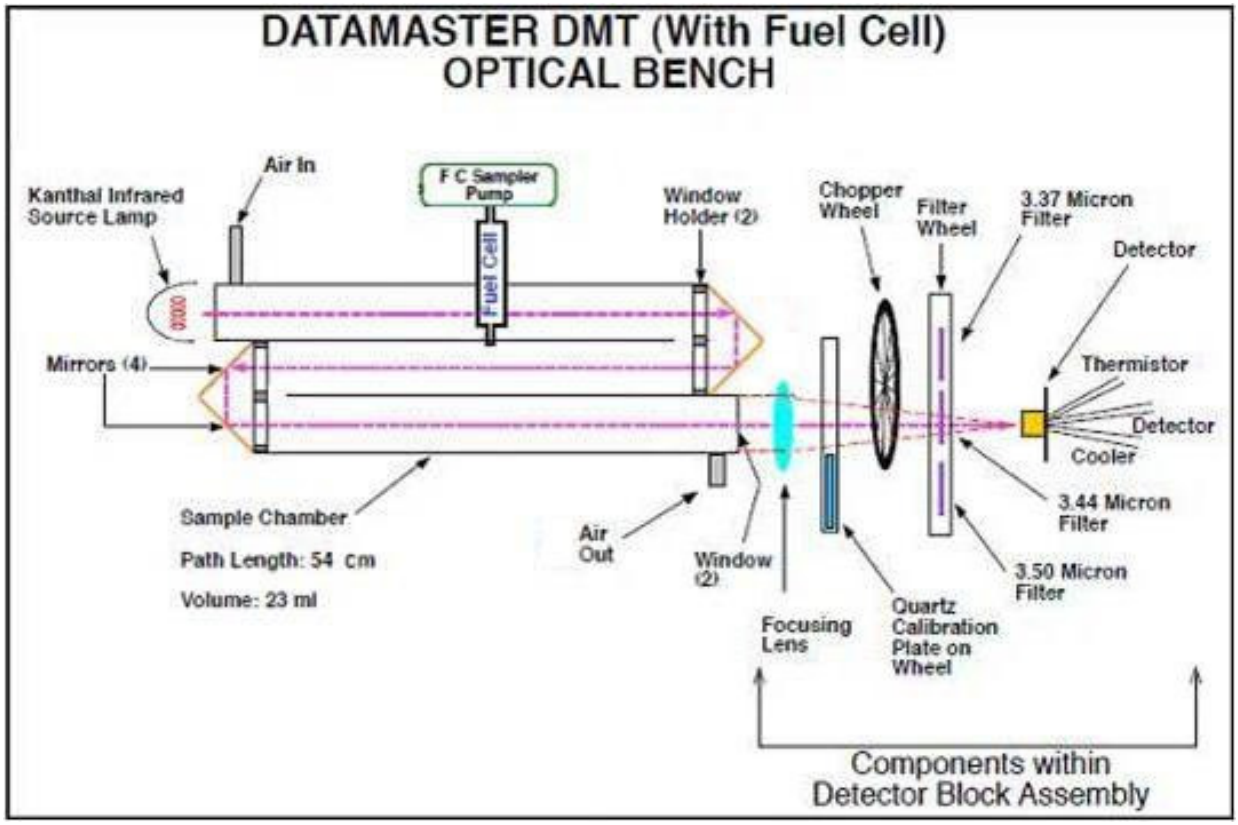


In 2013, National Patent sold the DataMaster DMT product line to Intoximeters, Inc. With this sale, the name changed from DataMaster DMT-G with Fuel Cell Option or DataMaster DMT-G with Rev. A Fuel Cell Option to Intox DMT. Regardless of the official name, the breath test instruments used throughout Minnesota are most often referred to as DMT.

The DMT is owned by Intoximeters, Inc. and manufactured by National Patent Analytical Systems, Inc. and is designed for counter top or mobile breath alcohol testing. The DMT uses the proven method of absorption of infrared energy to quantify breath ethanol levels and guard against false positives from potentially interfering compounds. This instrument incorporates a 2D barcode reader, an IDTech keyboard with a magnetic stripe reader and a Hewlett Packard printer. Read the respective sections for more information on these items.

Infrared Breath Testing: The Analytical System

Analytical Bench



Testing for the presence and quantity of a chemical such as ethanol using Infrared absorption has been in use by law enforcement for breath alcohol testing since the early 1970's.

The molecular bonds of chemical compounds such as alcohol have the characteristic of being "excited" at certain wavelengths of infrared (IR) energy, meaning that the molecular bonds holding the atoms of hydrogen and carbon together begin to vibrate when the IR energy is focused on them. When they vibrate, they absorb some of the energy.

If it is known how much IR energy was present before the alcohol was in the sample chamber and it is known how much remains while the alcohol is in the sample chamber, measuring the difference will tell how much alcohol is in the sample chamber. By allowing only the wavelengths of IR energy that are sensitive to ethanol to pass through the sample, it precludes the possibility of something other than alcohol adding to the measurement.

The DMT provides a controlled and consistent environment by maintaining the temperature of the sample chamber at 48ºC ± 4 to prevent condensation.

The DMT employs the theory that in infrared testing the longer the distance the energy must travel through the chemical, the better opportunity it will have to be absorbed and therefore a more precise differential in before and after measurement may be obtained. This is referred to as "Resolution" and is a direct function of the length of the sample chamber. The longer the sample chamber, the better the Resolution, thus the length of the sample chamber is 54 centimeters.

The DMT also employs the theory that the more pure the sample of the chemical being tested, the better the accuracy. In breath testing, it is more desirable to have a small sample of alveolar air than a larger sample of air, which would, of necessity, include more air that was not alveolar. The smaller the volume, the better the accuracy, thus the volume of the sample chamber is 23 milliliters.

For greater sensitivity, there should be as great a temperature differential as possible between the emitted IR energy and that of the detecting element. This makes the detector more responsive and gives a better signal. The DMT cools the detector to 0ºC. The cooler the detector, the better the sensitivity and precision.

The DMT employs three filters at three different wavelengths. After the breath sample is accepted as adequate by the instrument, the sample is measured at each of the three wavelengths. 3.37 Microns, 3.44 Microns and 3.50 Microns. The results are compared to each other for acceptable ratios and to ensure the sample being measured does not contain an interferent.

The quartz plate is an opaque glass filter that absorbs IR light, designed to simulate an alcohol concentration and is the Internal Standard. The filter absorbance is established during the adjustment of each DMT. The results of the Internal Standard, during each subsequent Diagnostics, must measure ±4% of the value established during the most recent adjustment.

Electrochemical Fuel Cell

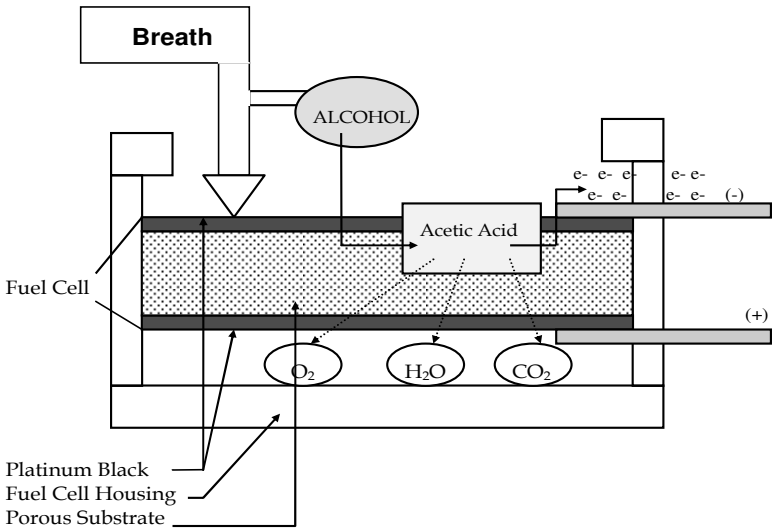
The DMT is approved for use in the state of Minnesota using only Infrared technology or Infrared in conjunction with a fuel cell. It was determined that the lifespan of the fuel cells used in the DMT was inadequate. As a result, the fuel cell option of the DMT has been turned off.

The electrochemical fuel cell (FC) can be used as a secondary means of analysis. The fuel cell result can be used as an independent measurement of the breath or control sample and compared to the result produced by IR absorption.

The fuel cell is highly sensitive and specific to alcohols. While the DMT incorporates three filters in its IR analysis that already exclude potentially interfering substances, the fuel cell analysis provides another means of determining that no interfering substances are present.

The fuel cell will only produce results if measuring alcohols. Interferents such as acetone, toluene, xylene, or any non-alcohol solvent will read zero on the fuel cell.

Fuel Cell Diagram



The fuel cell is a porous disk coated with a thin layer of platinum black on both faces and saturated with an electrolyte. The cell is supported at its outer edge in the fuel cell case. While a subject is blowing and deep lung breath is reached, the piston-sampling pump is activated. A small, fixed volume of deep lung breath is drawn onto the upper surface of the cell. The platinum oxidizes the alcohol in the breath and produces acetic acid, protons and electrons. This is known as an oxidation reaction. The electrons flow through a wire from the platinum electrode. The protons move through the lower portion of the fuel cell and combine with oxygen and the electrons on the other side to form water. The more alcohol oxidized, the greater the electrical current. The resulting electric current is translated into a breath alcohol concentration and is digitally displayed. If there is no alcohol present in the breath sample, no oxidation will occur. Because no electrons will be released, no current will be generated and the result will be a zero reading.

The fuel cell is selective in what it reacts with (just alcohols) and it will not respond to acetone, which may be present in the breath of diabetics, dieters or highly exercised individuals. It has no significant cross sensitivity to any known substance that might be found in a living human subject after a 15 minute deprivation period.

Sample Acceptance

The DMT sampling system incorporates the following criteria to establish an acceptable breath sample:

(1) a minimum flow rate of 3.0 L/m

(2) a minimum total volume of 1.5 L must be delivered

(3) the slope of the alcohol concentration must be level (an increase from one 2 consecutive point average to the next must not exceed 0.001)

(4) the flow rate must drop below the minimum rate of 3.0 L/m

*****FAILURE TO MEET ANY ONE OF THE CRITERIA WILL INHIBIT SAMPLE ACCEPTANCE*****

Criteria (1):

The breath sample must be provided at a minimum flow rate of 3.0 L/m to change the ***flashing*** "Please Blow" indicator on the display to a ***non-flashing*** "Please Blow" and an audible "beep" to a constant tone. The breath flow rate is measured by a flow sensor located adjacent to the breath path.

Criteria (2):

The sample volume is calculated as long as the continuous breath flow rate meets or exceeds 3.0 L/m. When a minimum volume of 1.5 liters of air has passed into the system, the minimum volume requirement is met. The DMT requires that the subject deliver a minimum volume of 1.5 L to accept a sample.

Criteria (3):

As a subject blows, the percentage of alcohol in the breath moving through the sample chamber will increase. The first part of a breath sample is mouth air, which has little alcohol relative to lung air. The DMT displays rising numbers as mouth air, and then lung air passes through the sample chamber. When the subject reaches the deep lung or alveolar air, which is characterized by a relatively uniform concentration of alcohol, the reading will rise at a slower rate. Although some rise can still be detected, the subject is beginning to run out of breath.

The DMT monitors the rise in alcohol concentration for a corresponding plateau. If the subject stops blowing before the instrument notes a uniformity of concentration (deep lung or alveolar air), the breath sample will not be accepted. The subject may start blowing again and introduce a sufficient amount of breath into the instrument as long as it is completed within the three minutes allowed. If the three-minute time limit is exceeded the DMT will display and print "Deficient" as the test result.

Criteria (4):

After the first three criteria are met, the fourth criteria, a reduction of the flow rate, can then be established. At this time the breath sample will be accepted.

The DMT: Rear Panel

Rear Panel

1. **PUMP OUT**: This port is used when conducting a re-circulating simulator test. This port should be connected to the “In” port of the simulator (usually this is the highest port on the simulator). The simulator may remain connected to this port as long as desired.

2. **VAPOR IN**: This port is used when conducting a re-circulating simulator test. This port should be connected to the “Out” port of the simulator (usually this is the lowest port on the simulator). The simulator may remain connected to this port as long as desired.

3. **CAL**: This port is used to vent the sample cell during a purge and is used to provide recirculation during the calibration procedure. It is never used while conducting a simulator test.

4. **SIM TUBES POWER**: This plug provides a source of power for the simulator hose heaters. It is also used to monitor the temperature of the simulator hoses.

5. **BREATH TUBE**: The breath tube is used to introduce a subject sample into the instrument.

6. **BREATH TUBE POWER**: This plug provides a source of power for the breath tube heater. It is also used to monitor the temperature of the breath tube.

7. **SIM TEMP**: The RS-232 port is used for serial communication with an external device. This is usually a simulator capable of communicating information to the DMT.

8. **ETHERNET**: The RJ-45 port is used to connect the DMT to an Ethernet network for data transmission with the DMT.

9. **USB**: The USB ports serve a variety of functions on the DMT. The primary uses are for the keyboard connector and for the printer cable as the DMT utilizes an external USB capable printer.

10. **DC/OFF/AC**: This switch controls power to the DMT. The switch is equipped with two positions. Pressing the switch to the “AC” side allows for the use of AC power. Pressing the switch to the “DC” side allows for the use of DC power. The instrument may be turned off during periods of prolonged inactivity. An internal battery backup system will maintain correct time and date.

11. **12 VDC**: For use in mobile testing with the supplied power cord (if applicable).

12. **100/240 VAC 47/63 HZ**: Use only the grounded power cord furnished with the instrument.

13. **DRY GAS**: Allows for the instrument to be used with an external dry gas standard.

Dry Gas

Instructor _____

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CONTROL SAMPLES AND DRY GAS CYLINDERS

Dry Gas Controls

A control is defined as a material of known alcohol concentration that is analyzed along with test samples in order to evaluate the accuracy of an analytical procedure. The DMT utilizes a dry gas cylinder with an approximate alcohol concentration of 0.08 g/210 Liters as the control sample.

Dry Gas Cylinder Labels and Certificates

The dry gas lot number, expiration date and control concentration information are required to run the Control Change after installing a tank into the DMT. Each dry gas cylinder purchased through a contract vendor will come with a certificate of analysis. The certificate of analysis contains the information that is needed during the installation process. This information is also available on the dry gas cylinder label.

Dry Gas Cylinder Removal

To remove the cylinder, turn the cylinder counter-clockwise until it unlocks from the connection port. Carefully remove the tank from the dry gas housing.

Dry Gas Cylinder Installation

The cylinder is installed by carefully laying it on the guides located in the dry gas housing at the rear of the DMT. Push the cylinder into the compartment until you feel it enter the connection port. Turn the tank clockwise to lock it in place. The DMT will sense the tank pressure and will notify the user accordingly in the display status bar.

Barometric Pressure

Barometric pressure has an effect on the alcohol concentration value when delivered from a compressed gas cylinder. The DMT compensates for this through the use of an integrated barometric sensor. As a result, a control target value is established for the test that will be slightly different than the value printed on the label, which is established at sea level. For example, the concentration on the label may read 0.080, but the control target printed on the test record is 0.077 due to the current barometric pressure at the time of the test. The control samples analyzed by the DMT must read within 0.008 of the control target printed on the test record, not the alcohol concentration value printed on the label and Certificate of Analysis.

Tank Pressure

An integrated pressure sensor for the gas cylinder is utilized by the DMT. This feature allows the user to monitor the dry gas cylinder level. The dry gas tank pressure in Pounds per Square Inch (PSI) can be found in the status bar of the main page on the display. A full tank will usually contain around 1000 PSI of pressure. When the tank pressure reaches 200 PSI, the operator will be notified with the message “Tank pressure getting low”. This should allow sufficient time for the department to order and receive a new dry gas cylinder. If the tank pressure drops below 25 PSI during a test, the operator will receive the message “Tank Pressure Too Low” and the test will end prior to completion. When the tank pressure is below 25 PSI, the operator will not be allowed to begin a test. The

operator will be required to exchange the empty cylinder with a full one and perform a Control Change before additional tests can be administered.

Expiration

The DMT will monitor the expiration date of the dry gas cylinder and notify the operator with the message “Change Control Soon” when the gas is within 30 days of expiration. This should allow sufficient time for the department to order and receive a new dry gas cylinder. The DMT will not allow any tests to be performed after the dry gas has expired.

Control Change

A new tank must be installed when the dry gas cylinder is below 25 PSI or the tank has expired. After a new cylinder has been installed a Control Change must be performed by a certified operator. Under the DMT drop-down menu select Control Change. Log in and follow and prompts to enter the lot number, alcohol concentration and expiration date. Each of these values is found on the dry gas cylinder label and the Certificate of Analysis included with the shipment of the cylinder. After pressing **OK** the instrument will begin a diagnostic test sequence followed by sampling the dry gas cylinder three times. Each sample will be measured by infrared and, when active, the fuel cell to verify the results are within the acceptable range of ± 0.008 from the target concentration. At the end of the test the operator will be prompted to enter remarks and sign their signature.

Dry Gas Cylinder Disposal

There are penalties for improper disposal or misuse of pressurized cylinders. Do NOT place cylinders in the garbage. Completely drain the dry gas cylinder and contact your local refuse company to determine the proper disposal procedure.

A dry gas cylinder draining tool can be used to drain and disable the valve of certain brands of dry gas cylinders. If the tank is no longer pressurized the cylinder is recyclable. See Appendix 9 for further information and purchasing details.

Dry Gas Cylinder Contracts

The State of Minnesota has granted contracts to various dry gas manufacturers. Contract prices are available to State agencies and members of the State’s Cooperative Purchasing Venture. Contact the BCA Breath Alcohol Calibration Laboratory to determine current contract prices.

Touch Screen Menu

Instructor _____

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Main Screen

The DMT is equipped with a color LCD touch screen display. All tests and functions can be initiated by trained operators by selecting the appropriate option on the display. The main screen allows you to view the date and time, monitor tank pressure, begin a subject test or quick test or print a copy of the last test run. Selecting the DMT icon in the top left corner opens a drop down menu with several additional functions.

DMT Icon Drop Down Menu

When the DMT icon is selected a drop down menu will appear displaying several options the operator may need to employ. If a menu item is not accessible to an operator it will be grayed out and inaccessible or will notify the operator that they do not have a high enough security level to access that function.

Setup

The setup menu allows certain parameters to be set. When a setup function is selected from the left screen, additional options may appear on the right screen.

DMT

Serial Number – The DMT serial number is displayed. Operators do not have access to change the serial number of a DMT.

Title – The title “State of Minnesota” appears on each test record and has been set by factory trained BCA personnel. Operators do not have access to change the title of the DMT.

Location – The location should indicate where the DMT is located. Double tap in the space to the right of Location. Using the keyboard, enter the department name where the DMT is located.

Units

Alcohol concentration is set to report in grams per 210 Liters. Operators do not have access to change the units on the DMT.

Simulator

Factory trained BCA personnel set the control type to dry gas. Additional control parameters can also be set. Operators do not have access to the simulator function of the DMT.

Subject

Operators can change the number of copies automatically printed at the completion of a subject test. Double tap the value listed after Copies and enter the desired value (1-5) from the drop down menu. Each printed copy will be identical. Additional

parameters, such as when a control will run during the subject test, can be set by factory trained BCA personnel.

Control

Operators can change the number of copies automatically printed at the completion of a control test. Double tap on the value listed after Copies and enter the desired value (1-5) from the drop down menu. Each printed copy will be identical.

Monthly Test

Factory trained BCA personnel set the DMT to perform an automatic control test on the first of every month and the hour at which the test will occur. Operators do not have access to the monthly test function of the DMT.

Control Change

Operators can change the number of copies automatically printed at the completion of a control change test. Double tap on the value listed after Copies and select the desired value (1-5) from the drop down menu. Each printed copy will be identical.

Diagnostic

Operators can set the number of copies automatically printed at the completion of a diagnostic test. Double tap on the value listed after Copies and enter the desired value (1-5) from the drop down menu.

Printer

Operators can turn the printer On or Off. While the DMT operates without a printer, in most instances this will be set to On. Network Printer should be set to No and the Printer IP Address should remain blank.

Control Panel

Operators can enter the location of the DMT and set the DMT to communicate with the FTP server at the BCA. Double tap the NCPLBCE-SMSC91181 icon. Enter the appropriate IP information for your department. Select OK. Close the box by tapping on the X in the top right corner of the display. Select the Save button. If a connection has been made to the BCA, you will see the network connection and the folder symbol on the bottom right corner of the display. This may not appear immediately.

Functions

The functions menu allows certain functions to be initiated.

Set Date/Time

Operators can set the current time and date.

Return to Service

Factory trained BCA personnel can return an instrument to a functional status after it had previously been removed from service. Operators do not have access to this function of the DMT.

Remove from Service

Factory trained BCA personnel can select this option to make an instrument non-functional to operators in the field. Operators do not have access to this function of the DMT.

Purge Sample Chamber

Operators can run an air blank that will continue for five minutes or until the Exit button is selected. This function would be used if liquid were believed to have entered either the breath tube or the sample chamber. It can also be used after a test result of Detector Overflow to assist in clearing the alcohol out of the breath path of the DMT.

Import/Export

Factory trained BCA personnel can import or export DMT tables, software or data via a USB port. Operators do not have access to this function of the DMT.

Reset Options

Factory trained BCA personnel can use this function to reset default settings on the DMT. This **does not** invalidate the existing control change or delete any transmitted data. Operators do not have access to this function of the DMT.

Invalidate Instrument Setup

Factory trained BCA personnel can ensure all settings are appropriate for field use by selecting this function. This function **does** invalidate the existing control change. Operators do not have access to this function of the DMT.

Filter Test

Factory trained BCA personnel can test the functionality of the filter assembly of the DMT. Operators do not have access to this function of the DMT.

Training Mode

Factory trained BCA personnel can set the instrument to Training Mode to ensure results from training tests are appropriately marked and are not included in field reports. Operators do not have access to this function of the DMT.

Instrument Setup

This function allows for the location of the DMT to be entered and set up the DMT to communicate with the FTP server at the BCA. After location, enter the department name where the DMT is located. Select the Set Local IP button. Double tap the NCPLBCE-SMSC91181 icon. Enter the appropriate IP information for your department. Select OK. Close the box by tapping on the X in the top right corner of the display. Select the Save button. If a connection has been made to the BCA, you will see the network connection and the folder symbol on the bottom right corner of the display. This may not appear immediately.

Reports

Operators may view and print test records of previous tests run on this DMT while at its current location. After selecting Reports, the most recent test will be displayed on the left. Select the Print button to print this test record. To view or print a previous test, use the plus (+) symbol to expand the selection of the test type on the top right display. Use the plus (+) symbol to expand the date of the test. Select the appropriate time for the test. The test record will now be displayed on the left screen. Select the Print button to print the record or the Exit button to exit Reports.

Subject Test

Operators may begin an evidential subject test. Refer to Subject Test under Testing with the DMT for further information.

Control Test

Operators may begin a control test. Refer to Control Test under Testing with the DMT for further information.

Diagnostic

Operators may begin a diagnostic test. Refer to Diagnostic under Testing with the DMT for further information.

Adjustment

Factory trained BCA personnel can initiate the portion of the certification procedure used when calibration criteria are not met. Operators do not have access to this function of the DMT.

Technician Mode

Factory trained BCA personnel can access the technician screen that allows for monitoring and adjusting of several settings. Operators do not have access to this function of the DMT.

Control Change

Operators may begin a control change test. Refer to Control Change under Testing with the DMT for further information.

Verification

Factory trained BCA personnel can initiate a verification test. This test is run as part of the DMT certification procedure. Operators do not have access to this function of the DMT.

Security

Operators may enter their password to log into the DMT to conduct tests and log off at the completion of testing.

Enter Password

If an appropriate operator certification number and passcode are entered the operator's name will appear on the lower left corner of the display.

Log Off

Select Log Off to sign out of the DMT at the completion of testing.

Help

About

The software version installed in the DMT will be displayed.

ID TECH Keyboard and Integrated Barcode Reader

Instructor _____

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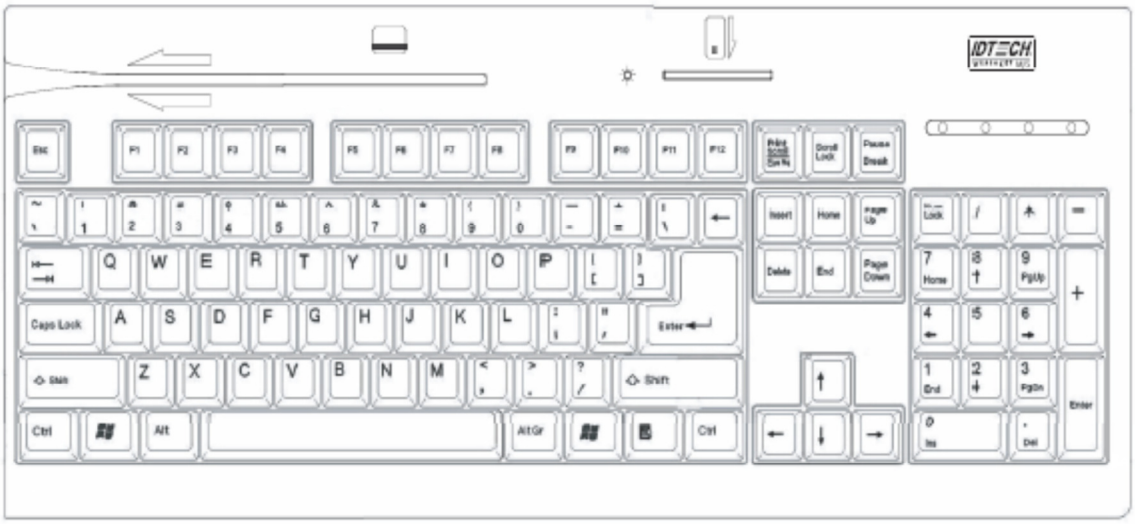


Installation and Operation

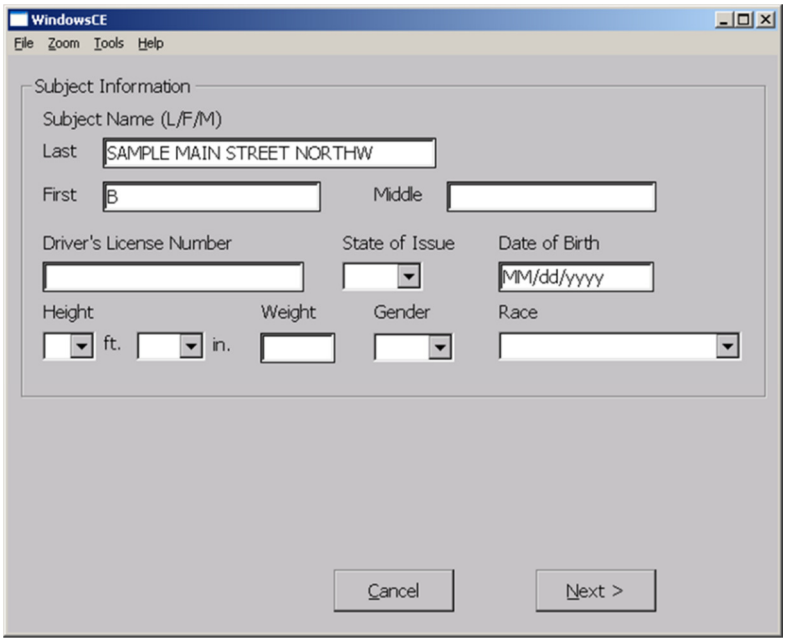
The VersaKey is a standard size keyboard with an integrated magnetic stripe (MagStripe) reader. When the VersaKey is initially plugged into the DMT, it performs a self-test and initiation sequence with the DMT. During the self-test the MagStripe reader will beep and the keyboard power LED will light to indicate power is applied. The LEDs will show the status of the *Scroll Lock*, *Num Lock*, & *Caps Lock* functions.

Magnetic Stripe Reader

The magnetic stripe reader can be used during the data entry portion of a subject test to retrieve necessary information from the subject's driver's license. To use the magnetic stripe reader, select **Swipe DL** as your method of data entry. When told, swipe a magnetic stripe card through the reader slot. The magnetic stripe must be facing toward the front of the keyboard and swipe right to left. A beep will sound to indicate a good read on each of the three magnetic tracks. There will be three beeps for a complete swipe.

The magnetically encoded data on the MagStripe is decoded (read) by the card reader. The stripe data has a fixed format defined by ISO standards. The VersaKey Reader is an intelligent magnetic stripe reader that decodes, verifies, and transmits stripe data.

If the license swipe is not complete, the DMT will reject it and offer the operator an opportunity to Scan the 2D bar code instead. If the operator does not read the entire message or misinterprets it, they may swipe the magnetic stripe again. This will result in data being assigned, in whole or in part, to the wrong field in the subject information portion of the test record as in the following example. The same result will occur if the operator selects Scan as the method of data entry, but instead swipes the magnetic stripe of the driver's license.



When this occurs, the instrument will bypass the first screen of data entry. Operators can use the "Previous" button at the bottom of the display to go back and review the data captured on the first screen. If the data is not correct, the operator can cancel the test and begin again or make manual corrections. If data entry errors are noticed on the test record, a DMT Data Correction Form listing the necessary changes can be submitted to the BCA and the corrections will be made by BCA personnel.

2D Barcode Reader

The 2D barcode reader is integrated into the left-hand side of the DMT. Licenses from most states can be read. Select **Scan DL.** With the barcode facing forward, insert the license into the slot. Select **OK** to start scan.

Hewlett Packard LaserJet P1606dn

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The printer supplied with the DMT-G is the HP LaserJet P1606 dn. It connects with the DMT-G via a USB cable. This printer uses a toner cartridge that can easily be replaced after several hundred tests. Each department is responsible for replacement toner cartridges. The part number is CE278A.

Printer Lights

1. Toner light: When toner is low, the toner light illuminates. When toner is empty, the toner light blinks.

2. Attention light: Indicates that the toner cartridge door is open or other errors exist.

3. Ready light: When the printer is ready to print the ready light is on. When the printer is processing data the ready light blinks.

4. Go light: Indicates that there is an error (along with the attention light).

5. Go button: To print a configuration page, press and hold the go button, then release the button when the ready light blinks. To print a demo page, press and release the go button. When the go light is flashing, press the go button to continue the print job.

6. Cancel button: To cancel the print job, press the cancel button.

Paper Jams

Occasionally paper can become jammed during printing. A common cause of paper jams is overfilling the paper tray or loading paper incorrectly. When you add new paper, always remove the paper from the tray and straighten the entire stack. This helps prevent multiple feeds and reduces paper jams. Additionally, the printer may need to be cleaned to remove paper dust and other particles from the paper path. Loose toner might remain in the product after a paper jam. This toner clears up after a few sheets print.

To Clear a Paper Jam

1. Open the toner cartridge door and remove the toner cartridge.
2. Keep the toner cartridge door open, using both hands grasp the side of the jammed paper that is most visible (this includes the middle), and carefully pull it free from the printer.

Replacing the toner cartridge

1. Open the toner cartridge door and remove the old toner cartridge. Follow the recycling information inside the toner cartridge box.
2. Remove the new toner cartridge from the packaging. To prevent damage to the print cartridge, hold the print cartridge at each end.
3. Pull the tab and completely remove the tape from the cartridge. Put the tab in the toner cartridge box to return for recycling.
4. Insert the new toner cartridge into the printer and close the toner cartridge door.

Testing with the DMT

Instructor _____

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DMT Setup

Installing a new DMT or exchanging an instrument at a location requires a series of connections. The following steps will install an instrument; some are unnecessary when exchanging an instrument. A keyboard carrel (organizer) with an upper shelf for the DMT and a roll out keyboard drawer is provided at each instrument location. This step-by-step setup assumes you are using the carrel.

- Install the carrel in the location where the instrument will be used with its left end situated where the left end of the DMT will be located. Provide sufficient space to the left of the DMT for the subject to stand.
- Install the keyboard in the drawer and route its cable out the back of the carrel.
- Position the instrument on the upper shelf of the carrel with the front edge just over the front edge of the organizer.
- Plug the power cord socket end into the AC plug-in on the back panel and its plug into a 110V AC outlet.
- Turn on DMT and wait for main screen to appear.
- Plug the USB connector of the keyboard cable into a USB jack on the DMT back panel.
- Position the printer in a convenient location adjacent to the instrument. Generally this should be to the right of the DMT away from where the test subject is likely to be standing. If not already in place, install a toner cartridge in the printer. Place paper in the paper input bin.
- Plug the printer power cord into the back of the printer and its plug into an AC outlet wall receptacle. Turn printer on. Plug the printer USB cable into the back of the printer and into a USB jack on the DMT back panel.
- Install a dry gas cylinder. The tank is installed by carefully laying it on the guides located in the side compartment of the rear of the DMT. Push the tank into the compartment until you feel it enter the connection port. Turn the tank clockwise to lock it in place. The DMT will sense the tank pressure and will notify the user accordingly on the display.
- After a sufficient warm up period, perform a control change.

Control Change

After the dry gas cylinder has expired or depleted below 25 PSI, replace the cylinder then perform a Control Change. If the DMT has been exchanged, insert the cylinder that was removed from the previous DMT then perform a Control Change.

- Note the lot number, alcohol concentration (as it is printed on the label or Certificate of Analysis) and expiration date of the dry gas being installed. Each of these values is found on the dry gas cylinder label and the Certificate of Analysis included with the shipment of the cylinder. Install the dry gas cylinder in the housing. The tank is installed by carefully laying it on the guides located in the side compartment of the rear of the DMT. Push the tank into the compartment until it enters the connection port. Turn the tank clockwise to lock it in place. The DMT will sense the tank pressure and will notify the user accordingly on the display. Ensure the gas is not leaking by monitoring the tank pressure on the display and listening for leaks. If a leak is observed remove the tank and attempt to reseat it in the housing.

- Select Control Change under the DMT drop-down menu or press F8.

- Enter your DMT Certification number and passcode. Select **OK**.

- Enter the lot number, alcohol concentration and expiration date of the dry gas. Select **OK**.

- The instrument will automatically begin the diagnostic test sequence followed by measuring three samples from the dry gas cylinder with air blanks between. Each of the three samples must measure within ±0.008 from the control target. The control target value has been compensated for barometric pressure and is not the same value as printed on the label or Certificate of Analysis.

- When the Remarks / Comments box appears, enter remarks regarding the test (i.e. dry gas tank changed). Select **OK** to accept the entered remarks.

- An Operator Signature box will appear on the display. Using a stylus, sign your signature. To clear the signature and sign again, select **Clear**. To accept your signature as it appears, select **Accept**.

Observation Period

Recent alcohol ingestion or reintroduction of alcohol into the mouth from actions such as belching, regurgitating or refluxing stomach contents into the mouth are possible sources of mouth alcohol. Alcohol vapors can remain in the mouth for as long as 15 minutes. A test subject should be observed for a minimum of 15 minutes prior to administering a breath test to ensure nothing is placed in the mouth and nothing erupts into the mouth.

Subject Test - Minnesota Test Sequence (DABACABA)

A subject test is performed as a means of determining a person's breath alcohol concentration for evidential purposes.

- If the DMT is in stand-by mode, touch the display anywhere other than the scrolling Minnesota State seal.

- Under DMT icon: select **Security** then select **Enter Password**. Enter DMT Certification number and passcode then Select **OK**.

- Initiate a test by pressing the **Run** button on the display, the F1 key on the keyboard or selecting Subject Test in the DMT drop-down menu.

- Indicate the method you intend to utilize to enter the driver's information.

  Scan DL indicates you intend to use the bar code scanner on the left side of the instrument. Scanning the 2D bar code on the driver's license will auto-fill the subject's last name, first name, middle name, driver's license number, State of issue and date of birth. You must manually enter the subject's height, weight and gender. Review the information for accuracy.

  Swipe DL indicates you intend to use the magnetic stripe reader on the keyboard. Swiping the license will auto-fill the subject's last name, first name, middle name, driver's license number, State of issue, date of birth, height, weight and gender. Swiping the license is only effective on licenses issued by the State of Minnesota. Review the information for accuracy. If three beeps are not heard or there is an error in the data capture, see below.

  Manual indicates you intend to enter all required information manually.

- *Incomplete Swipe*

  If an operator does not hold the license level during the swipe or the swipe is not complete, the DMT will recognize that the swipe was not complete and reject it. The DMT will offer the operator an opportunity to Scan the 2D bar code on the back of the license. Do not attempt to swipe the license at this point. Swiping the license will result in some of the data being assigned to the wrong field or fields in the subject information portion of the test record, such as portions of the address appearing in the subject name field. The same result will occur if the operator selects Scan as the method of data entry, but instead swipes the magnetic stripe of the driver's license.

- *Data Entry Review and Correction*

  After swiping a license, the data captured from that license is displayed on the first of three sequential DMT display screens. The first screen shows the subject information captured and the field to which it was assigned. If the first swipe fails and a second swipe is attempted, the instrument will bypass the first screen. Use **Previous** at the bottom of the display to go back and examine the data entered on page one. If the data is not correct, the operator can make manual corrections. If this step is missed, test records with license data in improper fields are created. Review the data and correct data entry errors to ensure test records contain accurate information. If data entry errors are noticed on the test record after the test is complete, a DMT Data Correction Form listing the necessary changes can be submitted to the BCA so the necessary corrections can be made. The DMT Data Correction Form can be found on the BCA website or obtained through the Breath Alcohol Calibration Laboratory.

- Enter the subject's race. This is not a required field.

- Select the **Next** button.

- Operator Information is auto-filled based on the log-in information. Verify the information is correct. If the name is incorrect, cancel the test, log that individual out of the DMT and log in using your certification number. If your department has changed you can correct this field for each test you run, however you must notify the BCA for a permanent change to occur.

- If the Arresting Officer and test Operator are the same person touch the **Same as Operator** box, this auto-fills the last name, first name and department of the arresting officer. If they are not the same, manually enter the information.

- Enter the arresting department ORI number, MN#######. The MN is automatically entered. The seven digits must be entered manually. For police and sheriff's offices, the first three numbers are the county number (Minnesota has 87 counties so the first of these will be zero). When eCharging, it is imperative that this number exactly match the number stored in the eCharge database for this record to automatically attach. Check County for accuracy and correct if needed. For State agencies the county must be selected from the drop down menu.

- Select the **Next** button.

- Using the drop down menu, select the appropriate Type of Test.

- Enter the PBT result, up to 12 characters are allowed. This is not a required field.

- Enter the Date of Stop or press the space bar to auto-fill today's date.

- Enter the Time of Stop.

- Enter the Case Number. This is not a required field.

- Indicate whether the subject was driving a commercial vehicle by selecting Y for Yes or N for No.

- Enter the start time of the Observation Period. The entered time must be after the time of stop and prior to the current time. You will be required to wait additional time if 15 minutes from the time entered have not elapsed.

- Enter the name of the individual that conducted the Observation Period.

- Select the **OK** button to begin testing.

- **D**IAGNOSTICS After data entry is complete, the instrument will automatically begin the diagnostic test. Each step and outcome is shown on the display, however after the diagnostic test is complete only a summary stating Diagnostic Check Passed or Diagnostic Check Failed will appear. If the instrument fails the Diagnostic Check, the test will not continue.

- **A**IR BLANK An Air Blank consists of a Purge, Ambient Zeroing and a Blank Test. During the Purge, room air is drawn through the breath tube and sample chamber and is expelled out the back of the DMT, purging the system of residual alcohol. The Ambient Zeroing sets a zero reference point. The Blank Test verifies that the DMT is measuring an alcohol concentration of zero. If the result is not 0.000 the test will not continue.

- **B**REATH SAMPLE When "PLEASE BLOW!" is flashing and the tone is beeping, the instrument is ready for the subject to provide a breath sample. Insert a mouthpiece and instruct the subject to provide a long and steady sample. While the subject is blowing into the breath tube, the "PLEASE BLOW" and tone are constant. The subject is allowed three minutes to provide a breath sample. The sample will be accepted by the DMT when a single exhalation reaches a minimum volume of 1.5 Liters of air at a flow rate at or above 3 Liters per minute and the slope of the alcohol concentration is deemed to be level.

- **A**IR BLANK An Air Blank consists of a Purge, Ambient Zeroing and a Blank Test. During the Purge, room air is drawn through the breath tube and sample chamber and is expelled out the back of the DMT, purging the system of residual alcohol. The Ambient Zeroing sets a zero reference point. The Blank Test verifies that the DMT is measuring an alcohol concentration of zero. If the result is not 0.000 the test will not continue.

- **C**ONTROL SAMPLE The dry gas control is sampled and measured between the two breath samples. The known alcohol concentration is approximately 0.080, but has been adjusted for barometric pressure and may vary from test to test. The result of the control sample must be within ±0.008 from the control target on the display and printed on the test record or the test will not continue.

- **A**IR BLANK An Air Blank consists of a Purge, Ambient Zeroing and a Blank Test. During the Purge, room air is drawn through the breath tube and sample chamber and is expelled out the back of the DMT, purging the system of residual alcohol. The Ambient Zeroing sets a zero reference point. The Blank Test verifies that the DMT is measuring an alcohol concentration of zero. If the result is not 0.000 the test will not continue.

    - The DMT will ensure that three minutes have elapsed between the two subject breath samples. You will see a countdown on the status bar on the display.

- **B**REATH SAMPLE When "PLEASE BLOW!" is flashing and the tone is beeping, the instrument is ready for the subject to provide a breath sample. Insert a mouthpiece and instruct the subject to provide a long and steady sample. While the subject is blowing into the breath tube, the "PLEASE BLOW" and tone are constant. The subject is allowed three minutes to provide a breath sample. The sample will be accepted by the DMT when a single exhalation reaches a minimum volume of 1.5 Liters of air at a flow rate at or above 3 Liters per minute and the slope of the alcohol concentration is deemed to be level.

- **A**IR BLANK An Air Blank consists of a Purge, Ambient Zeroing and a Blank Test. During the Purge, room air is drawn through the breath tube and sample chamber and is expelled out the back of the DMT, purging the system of residual alcohol. The Ambient Zeroing sets a zero reference point. The Blank Test verifies that the DMT is measuring an alcohol concentration of zero. If the result is not 0.000 the test will not continue.

- A Remarks / Comments box will appear on the display. Using the keyboard, enter remarks. Typical comments include remarks regarding the observation period and a description of how the subject provided the breath samples. After you have completed your remarks, select **OK**. An Operator Signature box will appear on the display. Using a stylus, sign your signature. To clear the box and sign again, select **Clear**. To accept the signature as it appears, select **Accept**.

- After the signature has been accepted, the DMT will create a PDF and display Saving PDF in the status bar. This will be followed by Printing if you have the printer function turned on. The test data will then be transmitted to the BCA via a secure Ethernet connection and the message Transmitting data can be seen on the status bar at the bottom of the DMT.

Quick Run

- If the DMT is in stand-by mode, touch the display anywhere other than the scrolling Minnesota State seal.
- Under DMT icon select Security and select Enter Password then input DMT Certification number and passcode. Logging in is not required for a Quick Run test
- Initiate a test by pressing **Quick Run** on the display,
- Enter the data requested: Type of Test, Subject Last Name, First Name and Middle Initial. If you are logged into the DMT prior to selecting Quick Run, the operator information will be auto-filled based on your certification number. If you are not logged in enter the operator's last name, first name and department. Note: this test can be performed by a non-certified operator.
- Select **OK** to begin the test.
- **D**IAGNOSTICS After data entry is complete, the instrument will automatically begin the diagnostic test. Each step and outcome is shown on the display, however after the diagnostic test is complete only a summary stating Diagnostic Check Passed or Diagnostic Check Failed will appear. If the instrument fails the Diagnostic Check, the test will not continue.
- **A**IR BLANK An Air Blank consists of a Purge, Ambient Zeroing and a Blank Test. During the Purge, room air is drawn through the breath tube and sample chamber and is expelled out the back of the DMT, purging the system of residual alcohol. The Ambient Zeroing sets a zero reference point. The Blank Test verifies that the DMT is measuring an alcohol concentration of zero. If the result is not 0.000 the test will not continue.
- **B**REATH SAMPLE When "PLEASE BLOW!" is flashing and the tone is beeping, the instrument is ready for the subject to provide a breath sample. Insert a mouthpiece and instruct the subject to provide a long and steady sample. While the subject is blowing into the breath tube, the "PLEASE BLOW" and tone are constant. The subject is allowed three minutes to provide a breath sample. The sample will be accepted by the DMT when a single exhalation reaches a minimum volume of 1.5 Liters of air at a flow rate at or above 3 Liters per minute and the slope of the alcohol concentration is deemed to be level.
- **A**IR BLANK An Air Blank consists of a Purge, Ambient Zeroing and a Blank Test. During the Purge, room air is drawn through the breath tube and sample chamber and is expelled out the back of the DMT, purging the system of residual alcohol. The Ambient Zeroing sets a zero reference point. The Blank Test verifies that the DMT is measuring an alcohol concentration of zero. If the result is not 0.000 the test will not continue.

Sample Test Records

CONTROL CHANGE

State of Minnesota
DataMaster DMT: 100817
Version: 208.206.205

Audit ID: 100817-545
Date: 07/30/2015
Time: 12:51:55
Location: WEPD

Operator Name: ERIK JOHNSON
Certificate #: 8447
Department: BCA LABORATORY

CONTROL INFORMATION
Style Of Test: DRY GAS
Lot Number: AG431502
Concentration: 0.080
Expiration Date: 11/11/2016

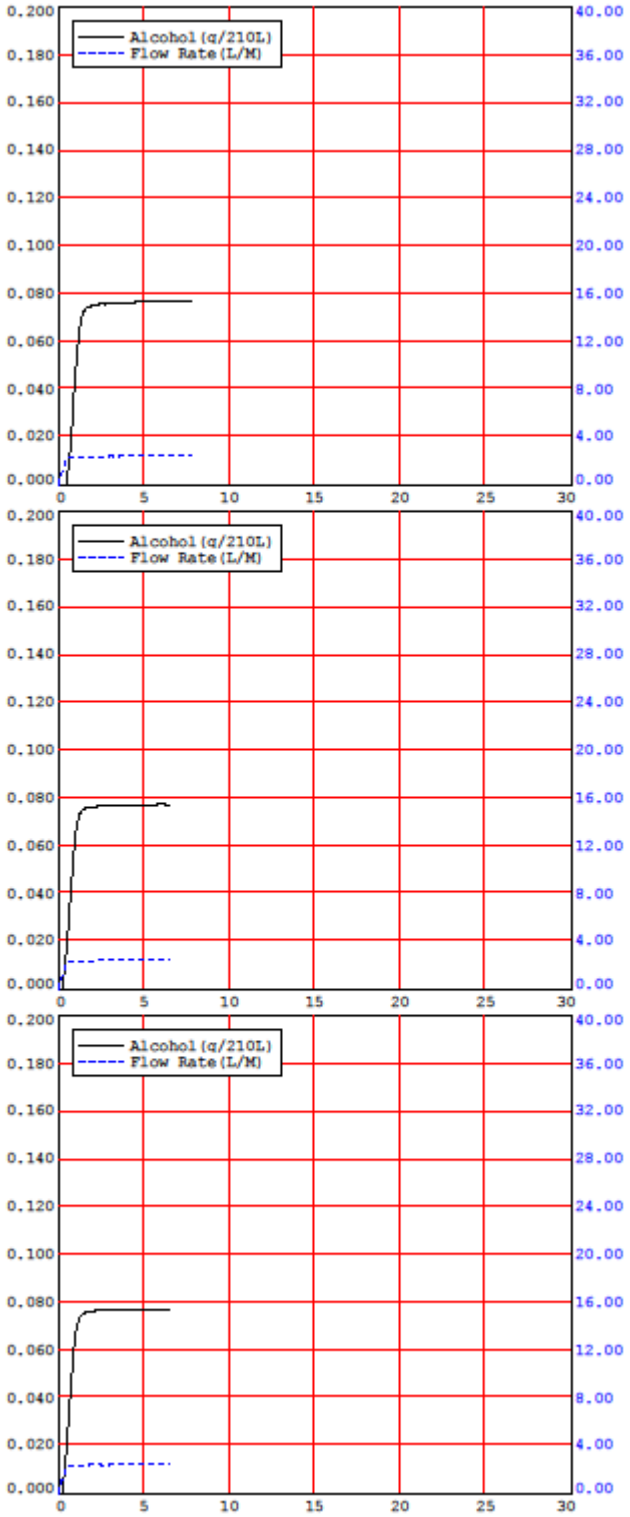
Control Target: 0.077

DIAGNOSTIC CHECK	PASSED	12:52
AIR BLANK	0.000	12:54
CONTROL SAMPLE		12:54
IR = 0.077		
AIR BLANK	0.000	12:55
CONTROL SAMPLE		12:55
IR = 0.077		
AIR BLANK	0.000	12:56
CONTROL SAMPLE		12:56
IR = 0.077		
AIR BLANK	0.000	12:57

IR Average = 0.0770
IR Std Dev = 0.0000

REMARKS:
New dry gas tank installed

Operator Signature

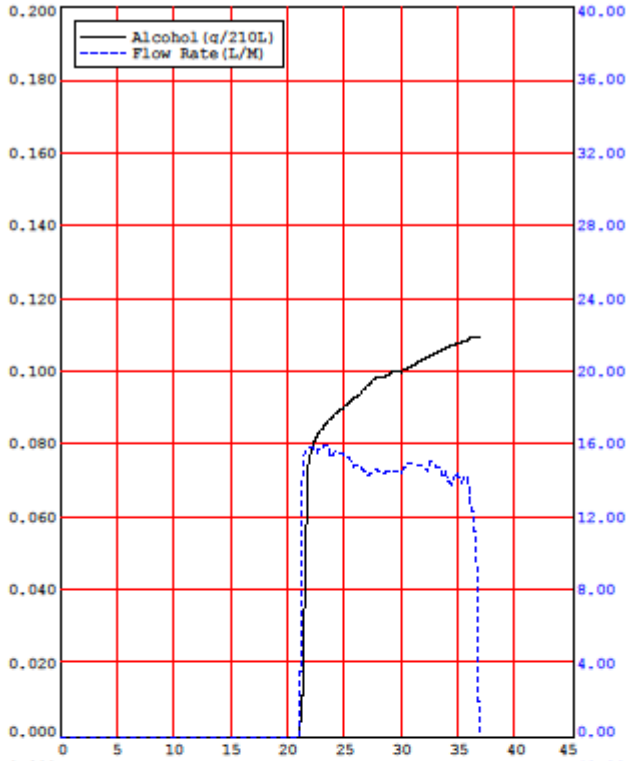


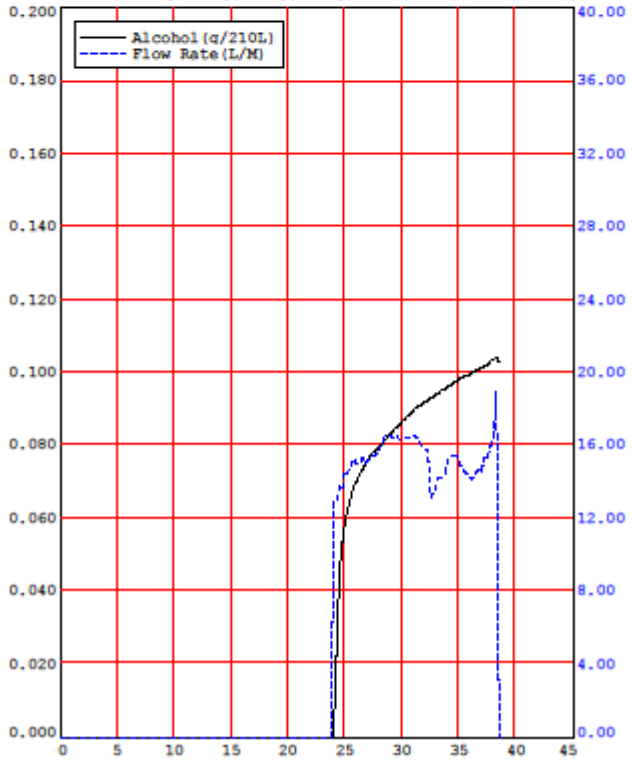
DMT Control Change Record showing the three control samples run after a new tank was installed into a DMT.

SUBJECT TEST

```
-------------------------
State of Minnesota
DataMaster DMT: 100782
Version: 208.206.205
-------------------------
Audit ID: 100782-398
Date: 02/18/2015
Time: 11:48:45
Location: BCA LAB

SUBJECT
Name: JOSEPH SMITH SAMPLE
License Number: A000042407310
State Of Issue: MN
DOB: 05/22/1958
Height: 5' 8"  Weight: 193
Gender: M

OPERATOR
Name: KARIN KIERZEK
Certificate Number: 5007
Department: BCA LABORATORY

ARRESTING OFFICER
Name: KARIN KIERZEK
Arresting Department: BCA LABORATORY
Department ORI: MN0620000
County: RAMSEY
Type Of Test: TRAFFIC
Case Number / ICR Number: ABC123
Commercial Vehicle: N
Observation Start Time: 11:30 AM
Observed By: KEK

CONTROL INFORMATION
Lot Number: 352131080A3
Control Target: 0.078
Expiration: 01/01/2016

DIAGNOSTIC CHECK          PASSED  11:48
AIR BLANK                  0.000  11:50
SUBJECT SAMPLE          Vol=3.81  11:51
  IR = 0.109
AIR BLANK                  0.000  11:52
CONTROL SAMPLE                    11:52
  IR = 0.077
AIR BLANK                  0.000  11:54
SUBJECT SAMPLE          Vol=3.69  11:55
  IR = 0.103
AIR BLANK                  0.000  11:56

****************************************
REPORTED VALUE IN g/210L     0.10  11:55
****************************************

REMARKS:
1st sample long steady breath.
2nd sample long steady breath.
No burps, belches or vomiting.
```

Operator Signature



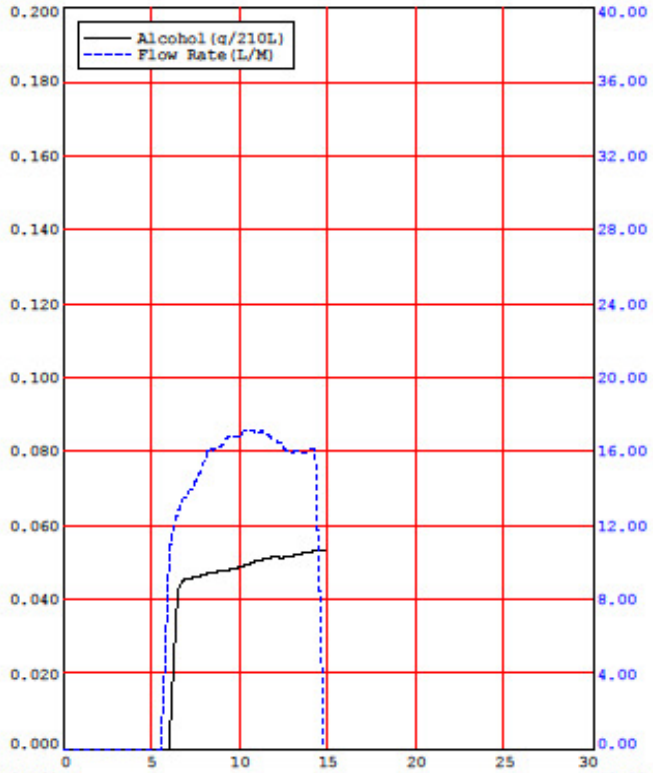


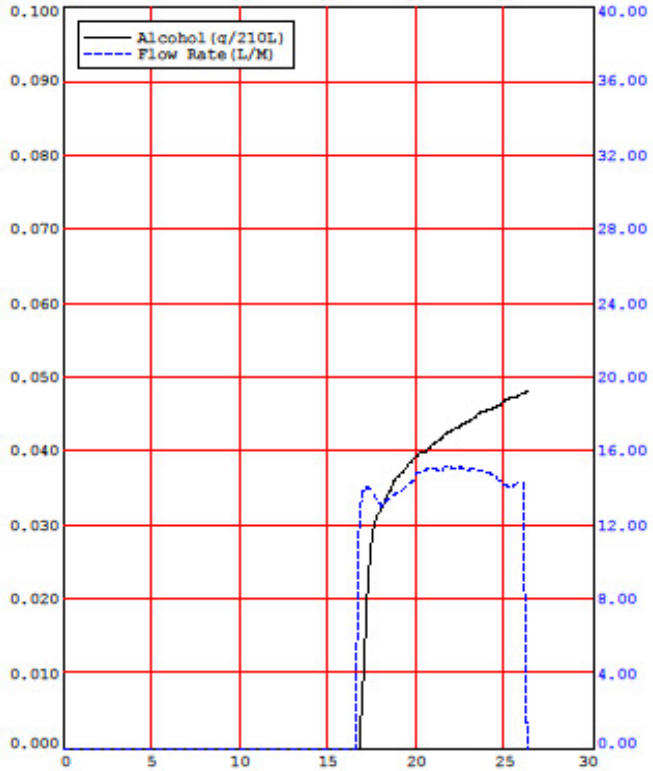
DMT Test Record showing a complete breath test consisting of two adequate samples using only the IR technology.

SUBJECT TEST

```
-------------------------
State of Minnesota
DataMaster DMT: 100830
Version: 208.206.205
-------------------------
Audit ID: 100830-50
Date: 02/05/2013
Time: 13:30:01
Location: BCA LAB

SUBJECT
Name: JOSEPH SMITH SAMPLE
License Number: A000085506108
State Of Issue: MN
DOB: 05/22/1987
Height: 5' 8"  Weight: 193
Gender: M

OPERATOR
Name: DAVID EDIN
Certificate Number: 5985
Department: BCA LABORATORY

ARRESTING OFFICER
Name: DAVID EDIN
Arresting Department: BCA LABORATORY
Department ORI: MNBCA9999
County: RAMSEY
Type Of Test: TRAFFIC
Case Number / ICR Number: 13-0001
Commercial Vehicle: N
Observation Start Time: 1:15 PM
Observed By: KEK

CONTROL INFORMATION
Lot Number: 07212080A3
Control Target: 0.077
Expiration: 04/01/2014

DIAGNOSTIC CHECK            PASSED  13:30
AIR BLANK                    0.000  13:32
SUBJECT SAMPLE            Vol=2.29  13:32
  IR = 0.054  FC = 0.052
AIR BLANK                    0.000  13:34
CONTROL SAMPLE                      13:34
  IR = 0.077  FC = 0.075
AIR BLANK                    0.000  13:36
SUBJECT SAMPLE            Vol=2.29  13:36
  IR = 0.048  FC = 0.047
AIR BLANK                    0.000  13:38

****************************************
REPORTED VALUE IN g/210L       0.04  13:36
****************************************

REMARKS:
Demonstration of graph scaling
1st sample greater than 0.050  - scales to .200
2nd sample less than 0.050 - scales to .100
```

Operator Signature



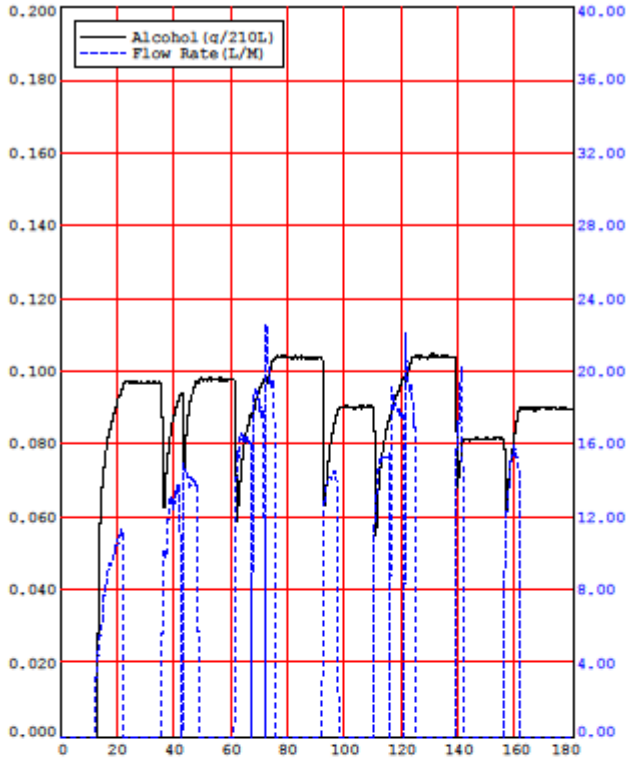


DMT Test Record showing a complete breath test consisting of two adequate samples using both the infrared (IR) and fuel cell (FC) technologies. Note the alcohol concentration is scaled to 0.200 on the top graph and to 0.100 on the bottom graph.

SUBJECT TEST

```
-------------------------
State of Minnesota
DataMaster DMT: 100782
Version: 208.206.205
-------------------------
Audit ID: 100782-401
Date: 02/18/2015
Time: 12:17:49
Location: BCA LAB

SUBJECT
Name: JOSEPH SMITH SAMPLE
License Number: A000042407310
State Of Issue: MN
DOB: 05/22/1958
Height: 5' 8"  Weight: 193
Gender: M

OPERATOR
Name: KARIN KIERZEK
Certificate Number: 5007
Department: BCA LABORATORY

ARRESTING OFFICER
Name: KARIN KIERZEK
Arresting Department: BCA LABORATORY
Department ORI: MN0620000
County: RAMSEY
Type Of Test: TRAFFIC
Case Number / ICR Number: ABC123
Commercial Vehicle: N
Observation Start Time: 11:45 AM
Observed By: KEK

CONTROL INFORMATION
Lot Number: 352131080A3
Control Target: 0.078
Expiration: 01/01/2016

DIAGNOSTIC CHECK          PASSED  12:17
AIR BLANK                  0.000  12:19
SUBJECT SAMPLE                    12:23
  IR = DEFICIENT
AIR BLANK                  0.000  12:23
CONTROL SAMPLE                    12:24
  IR = 0.077
AIR BLANK                  0.000  12:25

****************************************
Deficient
****************************************

REMARKS:
Not following directions
Short puffs and stopping air flow
```

Operator Signature

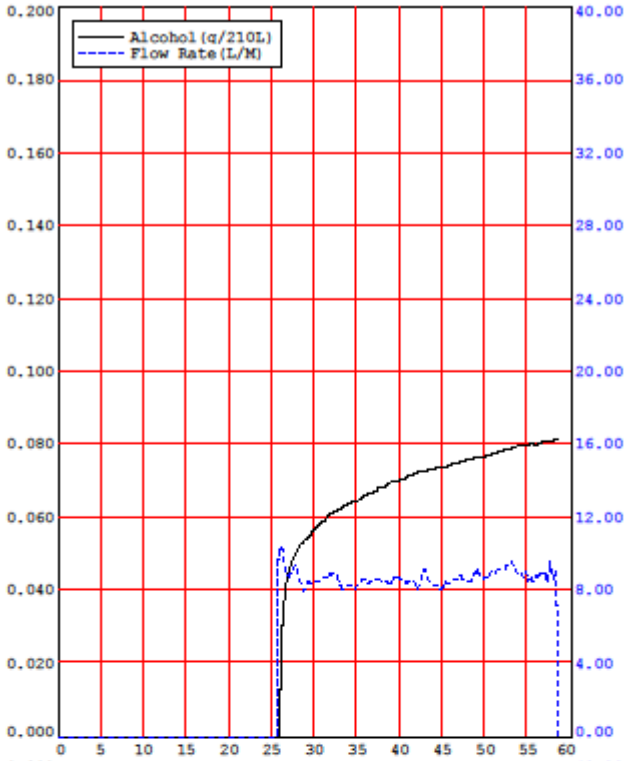


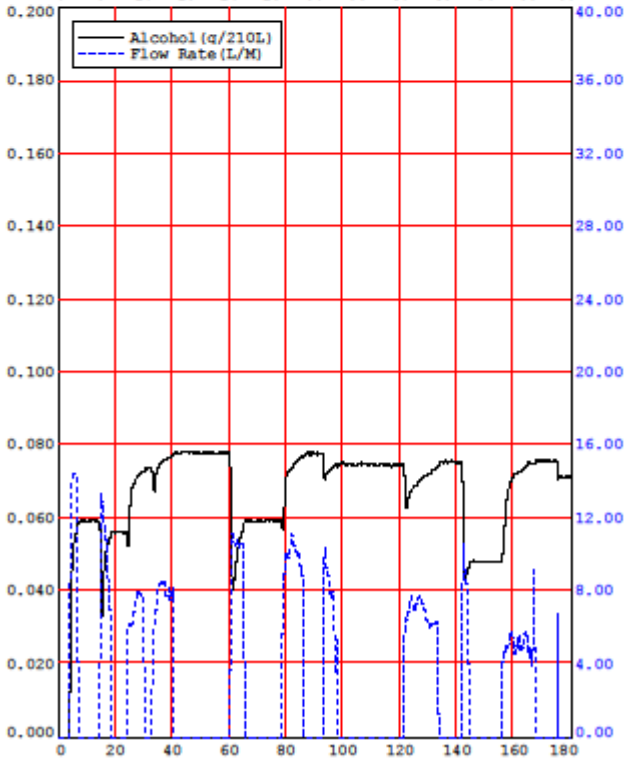
DMT Test Record showing a Deficient in the first breath sample. This means that one or more of the sample acceptance criteria was not met in any of the subject's attempts. The DMT will run an air blank, the control sample and a final air blank before ending the test. A second breath sample will not be requested from the subject during this test sequence.

SUBJECT TEST

```
-------------------------
State of Minnesota
DataMaster DMT: 100782
Version: 208.206.205
-------------------------
Audit ID: 100782-402
Date: 02/18/2015
Time: 12:28:10
Location: BCA LAB

SUBJECT
Name: JOSEPH SMITH SAMPLE
License Number: A000042407310
State Of Issue: MN
DOB: 05/22/1958
Height: 5' 8"  Weight: 193
Gender: M

OPERATOR
Name: KARIN KIERZEK
Certificate Number: 5007
Department: BCA LABORATORY

ARRESTING OFFICER
Name: KARIN KIERZEK
Arresting Department: BCA LABORATORY
Department ORI: MN0620000
County: RAMSEY
Type Of Test: TRAFFIC
Case Number / ICR Number: ABC123
Commercial Vehicle: N
Observation Start Time: 11:45 AM
Observed By: KEK

CONTROL INFORMATION
Lot Number: 352131080A3
Control Target: 0.078
Expiration: 01/01/2016

DIAGNOSTIC CHECK            PASSED  12:28
AIR BLANK                    0.000  12:30
SUBJECT SAMPLE            Vol=4.77  12:31
  IR = 0.082
AIR BLANK                    0.000  12:32
CONTROL SAMPLE                      12:32
  IR = 0.077
AIR BLANK                    0.000  12:34
SUBJECT SAMPLE                      12:37
  IR = DEFICIENT
AIR BLANK                    0.000  12:38

****************************************
Deficient
****************************************

REMARKS:
1st sample - long steady breath
2nd - short puffs, not following directions
No BBV
```

Operator Signature



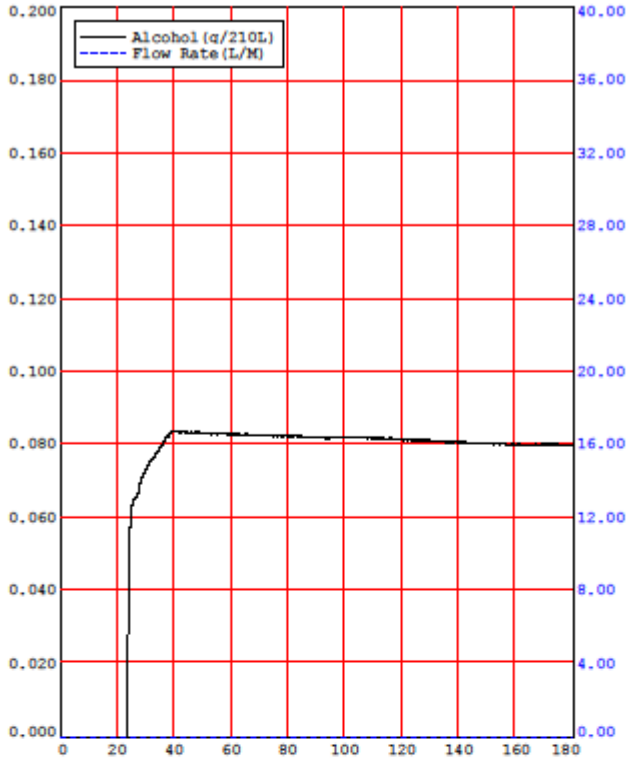


DMT Test Record showing a Deficient in the second breath sample. This means that one or more of the sample acceptance criteria was not met in any of the subject's attempts during the second breath sample.

SUBJECT TEST

```
-------------------------
State of Minnesota
DataMaster DMT: 100751
Version: 208.206.205
-------------------------
Audit ID: 100751-395
Date: 02/18/2015
Time: 12:44:39
Location: BCA LAB

SUBJECT
Name: JOSEPH SMITH SAMPLE
License Number: A000085506108
State Of Issue: MN
DOB: 05/22/1987
Height: 5' 8"  Weight: 193
Gender: M

OPERATOR
Name: DAVID EDIN
Certificate Number: 5985
Department: BCA LABORATORY

ARRESTING OFFICER
Name: DAVID EDIN
Arresting Department: BCA LABORATORY
Department ORI: MN0621000
County: RAMSEY
Type Of Test: TRAFFIC
Commercial Vehicle: N
Observation Start Time: 12:00 PM
Observed By: DLE

CONTROL INFORMATION
Lot Number: 35213080A3
Control Target: 0.078
Expiration: 01/01/2016

DIAGNOSTIC CHECK          PASSED  12:44
AIR BLANK                  0.000  12:46
SUBJECT SAMPLE                    12:49
  IR = DEFICIENT
AIR BLANK                  0.000  12:50
CONTROL SAMPLE                    12:50
  IR = 0.077
AIR BLANK                  0.000  12:51

****************************************
Deficient
****************************************

REMARKS:
Subject blowing extremely soft.
No burps, belches or vomiting.
Mouth checked  12:25
```

Operator Signature

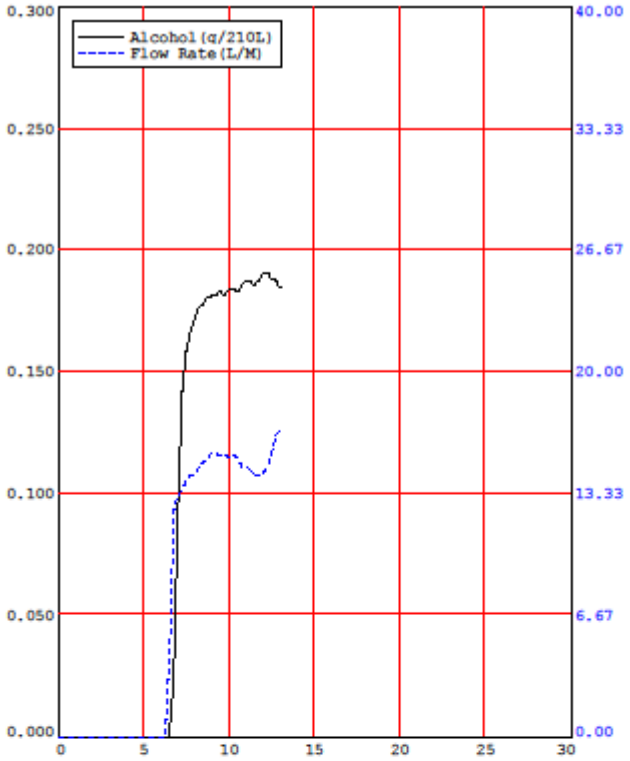


DMT Test Record showing a Deficient in the first breath sample. The subject did not blow at a flow rate above 3 L/m, therefore there is no dashed line on the graph.

SUBJECT TEST

```
-------------------------
State of Minnesota
DataMaster DMT: 100782
Version: 208.206.205
-------------------------
Audit ID: 100782-405
Date: 02/18/2015
Time: 12:55:21
Location: BCA LAB

SUBJECT
Name: JOSEPH SMITH SAMPLE
License Number: A000042407310
State Of Issue: MN
DOB: 05/22/1958
Height: 5' 8"  Weight: 193
Gender: M

OPERATOR
Name: KARIN KIERZEK
Certificate Number: 5007
Department: BCA LABORATORY

ARRESTING OFFICER
Name: KARIN KIERZEK
Arresting Department: BCA LABORATORY
Department ORI: MN0620000
County: RAMSEY
Type Of Test: TRAFFIC
Case Number / ICR Number: ABC123
Commercial Vehicle: N
Observation Start Time: 11:45 AM
Observed By: KEK

CONTROL INFORMATION
Lot Number: 352131080A3
Control Target: 0.078
Expiration: 01/01/2016

DIAGNOSTIC CHECK          PASSED  12:55
AIR BLANK                  0.000  12:57
SUBJECT SAMPLE                    12:57
  IR = INVALID
AIR BLANK                  0.000  12:58
CONTROL SAMPLE                    12:59
  IR = 0.077
AIR BLANK                  0.000  13:00

****************************************
Invalid
****************************************

REMARKS:
Short sample that ended in Invalid
```

Operator Signature

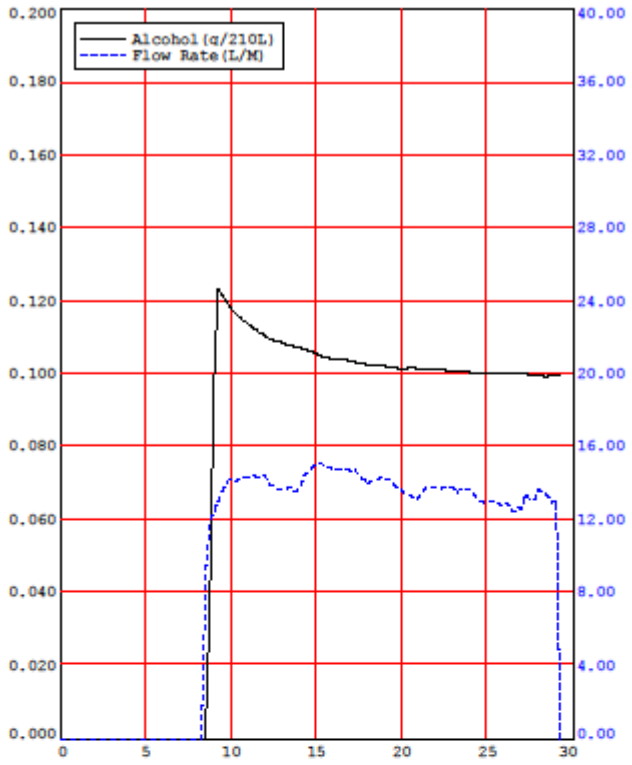


DMT Test Record showing an Invalid in the first breath sample. This means there were three consecutive comparisons of two point averages where the trend was in a negative direction after seeing at least six positive comparisons. The DMT will run an air blank, the control sample and a final air blank before ending the test. A second breath sample will not be requested from the subject during this test sequence.

SUBJECT TEST

```
-------------------------
State of Minnesota
DataMaster DMT: 100782
Version: 208.206.205
-------------------------
Audit ID: 100782-404
Date: 02/18/2015
Time: 12:47:31
Location: BCA LAB

SUBJECT
Name: JOSEPH SMITH SAMPLE
License Number: A000042407310
State Of Issue: MN
DOB: 05/22/1958
Height: 5' 8"  Weight: 193
Gender: M

OPERATOR
Name: KARIN KIERZEK
Certificate Number: 5007
Department: BCA LABORATORY

ARRESTING OFFICER
Name: KARIN KIERZEK
Arresting Department: BCA LABORATORY
Department ORI: MN0620000
County: RAMSEY
Type Of Test: TRAFFIC
Case Number / ICR Number: ABC123
Commercial Vehicle: N
Observation Start Time: 11:45 AM
Observed By: KEK

CONTROL INFORMATION
Lot Number: 352131080A3
Control Target: 0.078
Expiration: 01/01/2016

DIAGNOSTIC CHECK          PASSED  12:47
AIR BLANK                  0.000  12:49
SUBJECT SAMPLE                    12:50
  IR = INVALID
AIR BLANK                  0.000  12:51
CONTROL SAMPLE                    12:51
  IR = 0.077
AIR BLANK                  0.000  12:52

****************************************
Invalid
****************************************

REMARKS:
1st sample - long, steady breath.  Ended with
Invalid.
```

Operator Signature

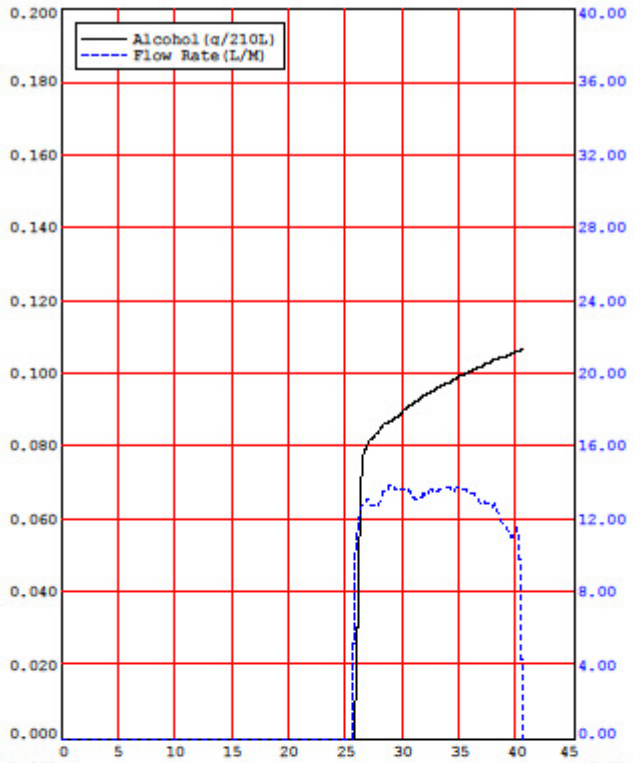


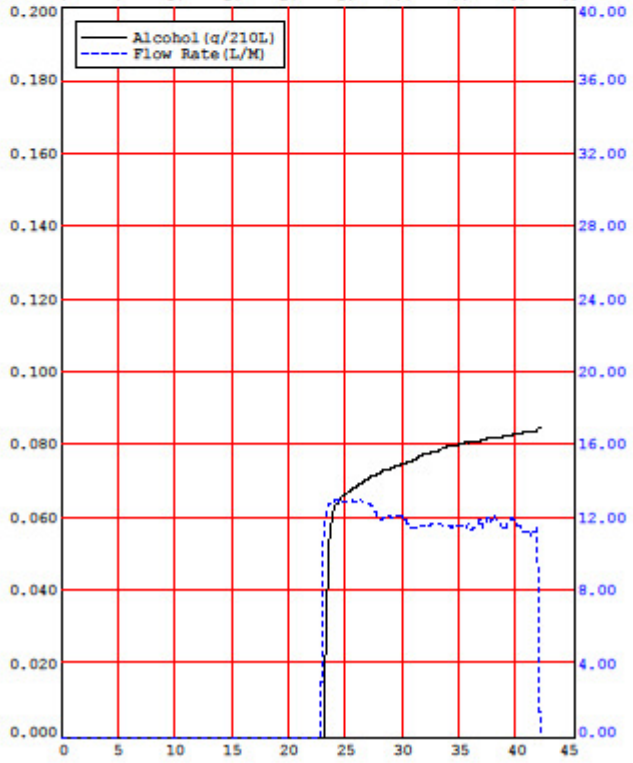
DMT Test Record showing an Invalid in the first breath sample. The final result is ≥ 0.06, but is not at least 95% of the previous high reading. A second breath sample will not be requested from the subject during this test sequence.

SUBJECT TEST

```
-------------------------
State of Minnesota
DataMaster DMT: 100751
Version: 208.206.205
-------------------------
Audit ID: 100751-391
Date: 02/18/2015
Time: 11:59:09
Location: BCA LAB

SUBJECT
Name: JOSEPH SMITH SAMPLE
License Number: A000085506108
State Of Issue: MN
DOB: 05/22/1987
Height: 5' 8"  Weight: 193
Gender: M

OPERATOR
Name: DAVID EDIN
Certificate Number: 5985
Department: BCA LABORATORY

ARRESTING OFFICER
Name: DAVID EDIN
Arresting Department: BCA LABORATORY
Department ORI: MN0621000
County: RAMSEY
Type Of Test: TRAFFIC
Commercial Vehicle: N
Observation Start Time: 11:30 AM
Observed By: DLE

CONTROL INFORMATION
Lot Number: 35213080A3
Control Target: 0.078
Expiration: 01/01/2016

DIAGNOSTIC CHECK            PASSED  11:59
AIR BLANK                    0.000  12:01
SUBJECT SAMPLE            Vol=3.20  12:01
  IR = 0.107
AIR BLANK                    0.000  12:02
CONTROL SAMPLE                      12:03
  IR = 0.077
AIR BLANK                    0.000  12:05
SUBJECT SAMPLE            Vol=3.79  12:06
  IR = 0.085
AIR BLANK                    0.000  12:07

****************************************
0.02 Agreement Not Met - Deficient Test
****************************************

REMARKS:
1st sample long steady breath after minimal
inhalation.
2nd sample deep inhalation followed by shorter
steady breath.
No burps, belches or vomiting.
Mouth checked at 11:44
```

Operator Signature



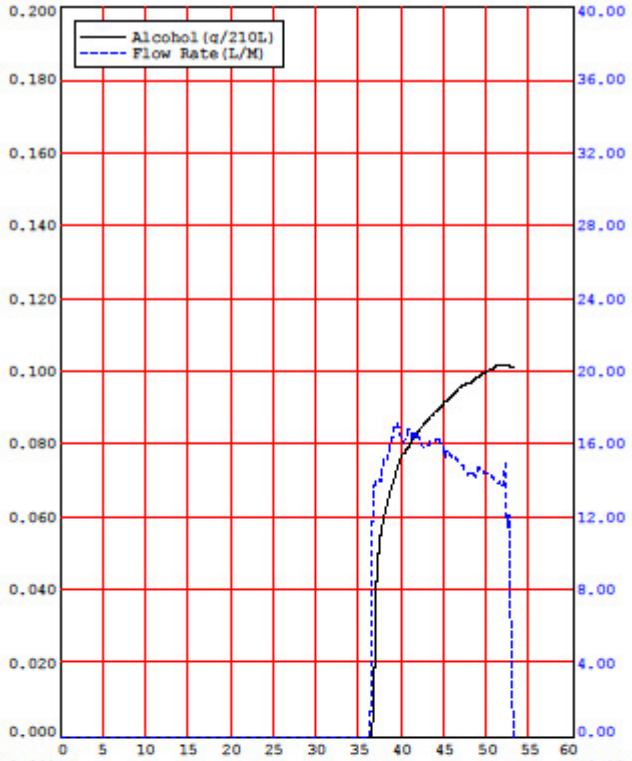


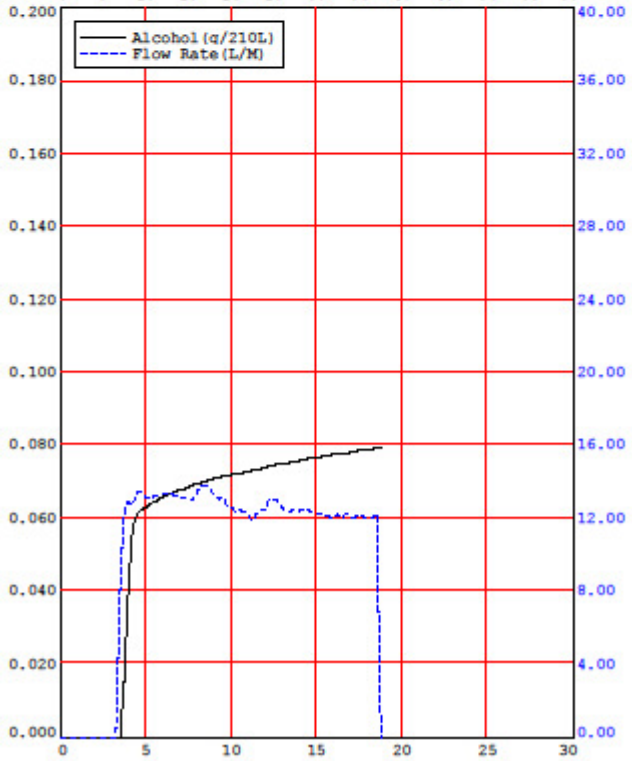
DMT Test Record showing 0.02 Agreement Not Met – Deficient Test. When using only IR technology, this means the results between the two samples are more than 0.02 apart. Administer a second breath test.

SUBJECT TEST

```
-------------------------
State of Minnesota
DataMaster DMT: 100751
Version: 208.206.205
-------------------------
Audit ID: 100751-392
Date: 02/18/2015
Time: 12:14:37
Location: BCA LAB

SUBJECT
Name: JOSEPH SMITH SAMPLE
License Number: A000085506108
State Of Issue: MN
DOB: 05/22/1987
Height: 5' 8"  Weight: 193
Gender: M

OPERATOR
Name: DAVID EDIN
Certificate Number: 5985
Department: BCA LABORATORY

ARRESTING OFFICER
Name: DAVID EDIN
Arresting Department: BCA LABORATORY
Department ORI: MN0621000
County: RAMSEY
Type Of Test: TRAFFIC
Commercial Vehicle: N
Observation Start Time: 11:30 AM
Observed By: DLE

CONTROL INFORMATION
Lot Number: 35213080A3
Control Target: 0.078
Expiration: 01/01/2016

DIAGNOSTIC CHECK          PASSED  12:14
AIR BLANK                  0.000  12:16
SUBJECT SAMPLE          Vol=4.13  12:17
  IR = 0.101
AIR BLANK                  0.000  12:18
CONTROL SAMPLE                    12:18
  IR = 0.077
AIR BLANK                  0.000  12:21
SUBJECT SAMPLE          Vol=3.21  12:21
  IR = 0.080
AIR BLANK                  0.000  12:22

****************************************
0.02 Agreement Not Met - Second Deficient Test
****************************************

REMARKS:
1st sample deep inhalation long steady breath.
2nd sample deep inhalation  but shorter sample
than first.
Mouth checked 11:55
No burps, belches  or vomiting.
```

Operator Signature



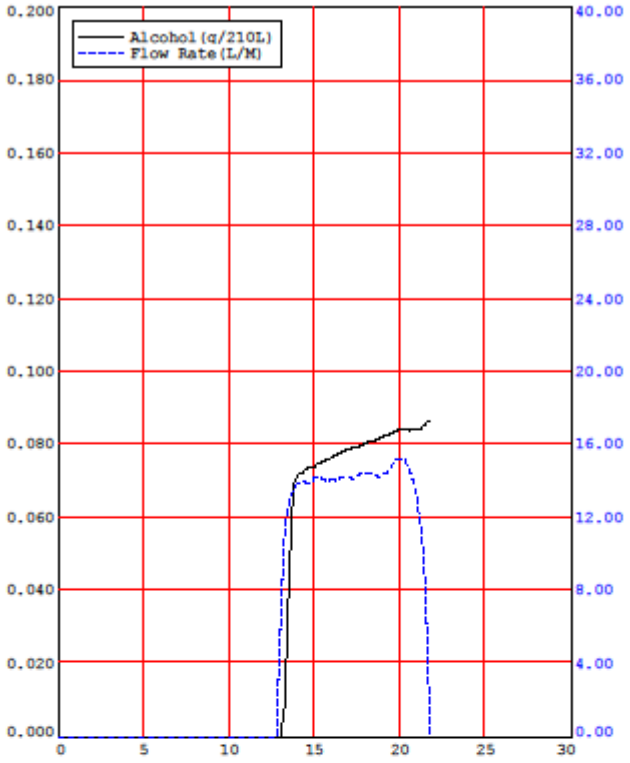


DMT Test Record showing 0.02 Agreement Not Met – Second Deficient Test. The DMT specifically identifies it as the second deficient test to demonstrate two consecutive tests ending in 0.02 Agreement Not Met on a single subject.

SUBJECT TEST

```
-------------------------
State of Minnesota
DataMaster DMT: 100751
Version: 208.206.205
-------------------------
Audit ID: 100751-397
Date: 02/18/2015
Time: 13:06:59
Location: BCA LAB

SUBJECT
Name: JOSEPH SMITH SAMPLE
License Number: A000085506108
State Of Issue: MN
DOB: 05/22/1987

OPERATOR
Name: DAVID EDIN
Certificate Number: 5985
Department: BCA LABORATORY

ARRESTING OFFICER
Name: DAVID EDIN
Arresting Department: BCA LABORATORY
Department ORI: MN0621000
County: RAMSEY
Type Of Test: TRAFFIC
Commercial Vehicle: N
Observation Start Time: 12:45 PM
Observed By: DLE

CONTROL INFORMATION
Lot Number: 35213080A3
Control Target: 0.078
Expiration: 01/01/2016

DIAGNOSTIC CHECK            PASSED  13:07
AIR BLANK                    0.000  13:09
SUBJECT SAMPLE                      13:09
  IR = INTERFERENCE
AIR BLANK                    0.000  13:10
CONTROL SAMPLE                      13:10
  IR = 0.077
AIR BLANK                    0.000  13:11

****************************************
Interference
****************************************

REMARKS:
1st sample long and steady.
Mouth checked 12:50
No burps, belches or vomiting
```

Operator Signature

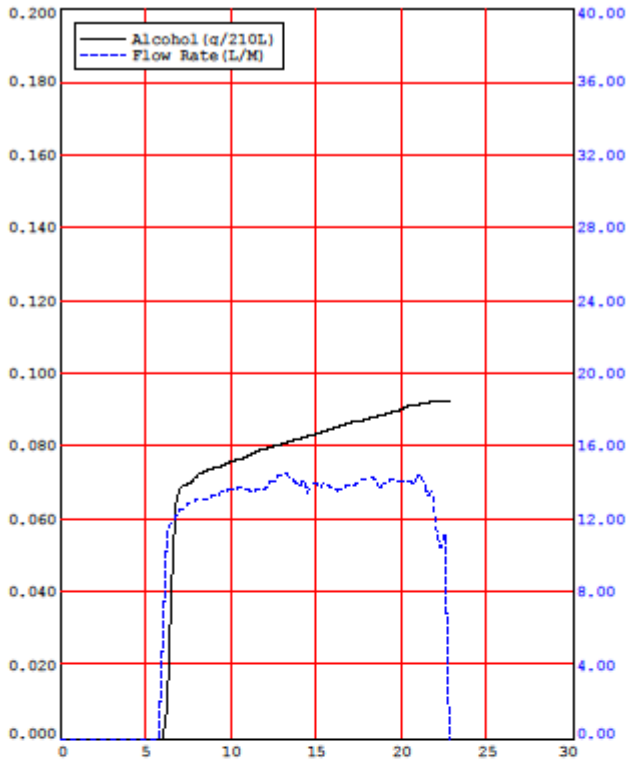


DMT Test Record showing Interference on the first breath sample. This means the ratio between the three filters was not acceptable. The DMT will run an air blank, the control sample and a final air blank before ending the test. A second breath sample will not be requested from the subject during this test sequence.

SUBJECT TEST

```
-------------------------
State of Minnesota
DataMaster DMT: 100751
Version: 208.206.205
-------------------------
Audit ID: 100751-398
Date: 02/18/2015
Time: 13:17:03
Location: BCA LAB

Type Of Test: COURT - CORRECTIONS

SUBJECT
Name: JOSEPH S SAMPLE

OPERATOR
Name: DAVID EDIN
Certificate Number: 5985
Department: BCA LABORATORY

DIAGNOSTIC CHECK            PASSED  13:17
AIR BLANK                    0.000  13:19
SUBJECT SAMPLE            Vol=3.76  13:19
  IR = 0.093
AIR BLANK                    0.000  13:20

****************************************
REPORTED VALUE IN g/210L      0.09  13:19
****************************************

REMARKS:
Long and steady sample.
No burps, belches or vomiting.
```

Operator Signature



DMT Quick Test Record. This is not an evidential test due to the lack of a second breath sample and a control sample.

DMT Training Practice Laboratory

Instructor _____

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In this laboratory session you will run a series of exercises to familiarize yourself with how the DMT operates and practice a few of the many possible situations you may encounter when testing subjects in the field.

Navigation through the different data entry fields is as follows:

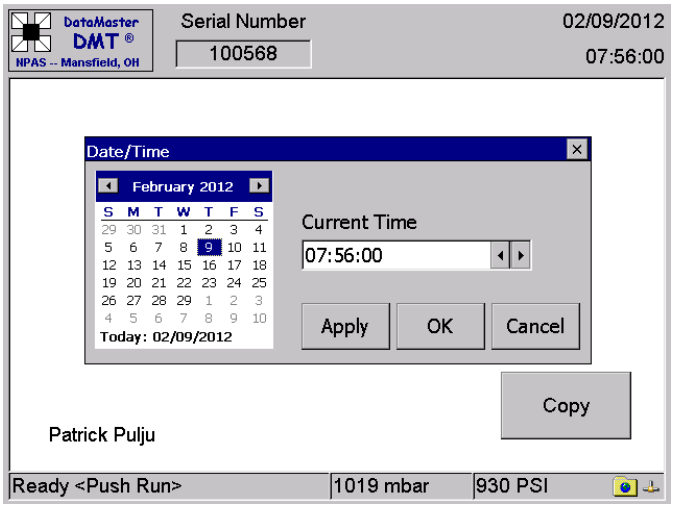
“Tab” key moves the cursor between the fields of data entry
“Enter” key selects the “Next” or “OK” buttons
Drop down fields will only allow entry of data listed – some will auto-fill data
Data fields have data validation and require valid data
Touch display allows you to move between fields and edit data in a field out of order

☐ Touch the display to bring the DMT out of screen saver mode, if necessary.

Exercise 1 **********

OBJECTIVE: Use the drop down menu to set the date and time.

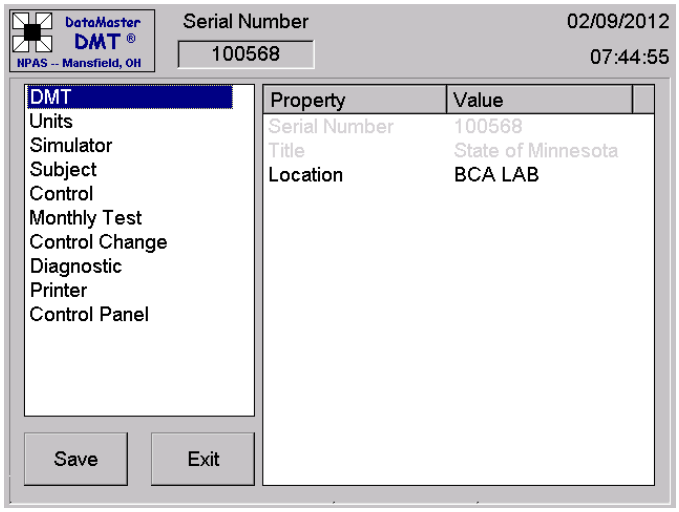
☐ Select the DMT icon in the upper left corner of the display to show the drop down menu.
☐ Select the “Functions” item in the menu.
☐ Select the “Set Date/Time” item under “Functions”.
☐ Set the date by selecting the correct day from the calendar.
☐ Set the time by entering the correct time in the time field.
☐ Select the “OK” button to set the date and time currently displayed.



Exercise 2 **********

OBJECTIVE: Use the drop down menu to set the instrument location that will be printed on each printout.

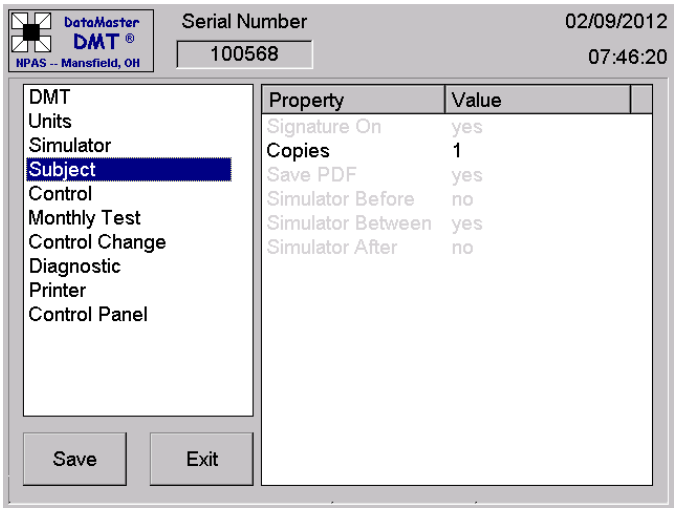
- ☐ Select the DMT icon in the upper left corner of the display to show the drop down menu.
- ☐ Select the "Setup" item in the menu.
- ☐ Select "DMT" in the left column.
- ☐ Double tap the "Location" property in the right column then type in the testing location name.
- ☐ Select the "Save" button to accept the changes made. (Note: If the "Exit" button is chosen the changes are rejected without confirmation.)



Exercise 3 **********

OBJECTIVE: Use the drop down menu to set the number of copies that will be printed for each subject test.

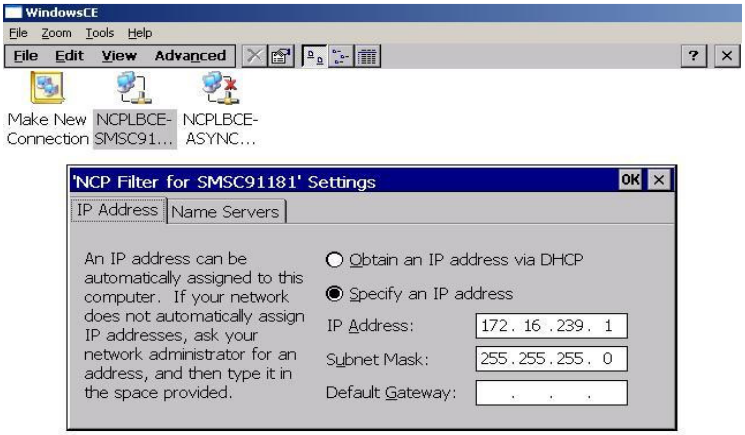
- ☐ Select the DMT icon in the upper left corner of the display to show the drop down menu.
- ☐ Select the "Setup" item in the menu.
- ☐ Select "Subject" in the left column.
- ☐ Double tap the "Copies" property in the right column then type in the quantity needed.
- ☐ Select the "Save" button to accept the changes made. (Note: If the "Exit" button is chosen the changes are rejected without confirmation.)



Exercise 4**********

OBJECTIVE: Enter IP Address to establish communication between the DMT and the BCA

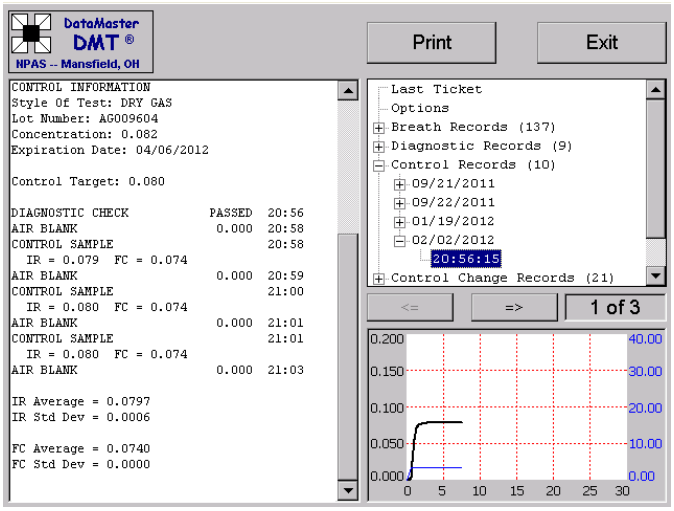
- ☐ Select the DMT icon in the upper left corner of the display to show the drop down menu.
- ☐ Select the "Functions" item in the menu
- ☐ Select "Instrument Setup"
- ☐ Verify the Instrument Location is appropriate, then select "Set Local IP"
- ☐ You will see three network icons, double click on the NCPLBCE-SMSC91181 (middle) icon
- ☐ Notice (<u>do not change</u>) the IP Address, Subnet Mask and Default Gateway. These are unique to each department and will need to be entered when a new DMT is installed in your department.
- ☐ Select OK, X, then Save



Exercise 5 **********

OBJECTIVE: Use the drop down menu to view previously run tests.

- ☐ Select the DMT icon in the upper left corner of the display to show the drop down menu.
- ☐ Select the "Reports" item in the menu. The reports window will display the last test run.



To find a previous test:

- ☐ Expand the record type you want to view by touching the plus (+) next to the title.
- ☐ Expand the date of the test you want to view by touching the plus (+) next to the appropriate date.
- ☐ Select the test you want to view by touching the time of the test. The virtual test record will appear on the left side of the display and the associated graphs will appear in the lower right.
- ☐ Select the "Print" button to print the test record.
- ☐ Select the "Exit" button to close the reports window. (Note: The report window will automatically close after 5 minutes of no activity.)

Exercise 6 **********

OBJECTIVE: Run a control change (required when a dry gas tank is installed).

☐ The test can be started by pressing the F8 key on the keyboard or selecting "Control Change" from the drop down menu. Select the DMT icon in the upper left corner of the display to show the drop down menu, then select the "Control Change" item from the menu.

DATA ENTRY FIELD	OPERATOR RESPONSE
☐ Lot Number	Type in the lot number from the dry gas tank
☐ Concentration	Type in the concentration as printed on the label of the dry gas tank.
☐ Expiration Date	Type in the expiration date of the dry gas tank.
☐ Certification Number	Review – This is taken from your log in and cannot be changed.
☐ Operator Last Name	Review – This is taken from your log in and cannot be changed.
☐ Operator First Name	Review – This is taken from your log in and cannot be changed.
☐ Operator Department	Review – This is taken from your log in. You can change this field if you have changed departments or are employed by multiple departments.

☐ Select the "OK" button to start the control change. This test cannot be cancelled after data entry has been accepted.

☐ Observe test process (Note: Displays diagnostic details while diagnostic is running then reports the status in pass/fail form on the virtual test record. Three control samples are measured during a successful control change.)

Exercise 7 **********

OBJECTIVE: Observe the effect of an incomplete driver's license swipe.

☐ Select the "Run" button on the display. The test can also be started by pressing the F1 key on the keyboard or selecting the DMT icon in the upper left corner of the display to show the drop down menu then choosing the "Subject Test" item from the menu.

☐ Select Scan as the method of data entry for the subject information.

☐ Use the magnetic stripe reader on the keyboard to automatically fill the subject information.

☐ Observe that the data entry review begins on the second data entry screen.

☐ Select the "Previous" button on the bottom of the display to return to the first data entry screen and observe the incorrectly captured data.

☐ Select Cancel

Exercise 8 **********

OBJECTIVE: Run a Minnesota Test Sequence (DABACABA).

- ☐ Select the "Run" button on the display. The test can also be started by pressing the F1 key on the keyboard or selecting the DMT icon in the upper left corner of the display to show the drop down menu then choosing the "Subject Test" item from the menu.
- ☐ Select the method of data entry for the subject information:
  - Scan – Use the 2-D bar code scanner on the left side of the DMT to automatically fill the subject information through the date of birth.
  - Swipe – Use the magnetic stripe reader on the keyboard to automatically fill the subject information through the gender.
  - Manual – Use the keyboard to type the information.

DATA ENTRY FIELD	OPERATOR RESPONSE
☐ Last	Enter or review the subject's last name.
☐ First	Enter or review the subject's first name.
☐ Middle	Enter or review the subject's middle name.
☐ Driver's License Number	Enter or review the subject's DL number.
☐ State of Issue	Enter or review the DL State of issue.
☐ Date of Birth	Enter or review the subject's date of birth.
☐ Height – ft.	Enter or review the foot portion of the subject's height.
☐ Height – in.	Enter or review the inch portion of the subject's height.
☐ Weight	Enter or review the subject's weight.
☐ Gender	Enter or review the subject's gender.
☐ Race	Enter the subject's ethnicity.

- ☐ Select the "Next" button to move to the next page.

☐ Certification Number	Review – This is taken from your log in and cannot be changed.
☐ Operator Last Name	Review – This is taken from your log in and cannot be changed.
☐ Operator First Name	Review – This is taken from your log in and cannot be changed.
☐ Operator Department	Review – This is taken from your log in but can be changed.
☐ Same As Operator	Selecting this box will copy the operator information to the arresting officer fields.
☐ Arresting Officer Last Name	Enter or review the arresting officer's last name.
☐ Arresting Officer First Name	Enter or review the arresting officer's first name.
☐ Arresting Department	Enter or review the arresting department's name.
☐ Arr. Dept ORI	Enter the arresting department's ORI.
☐ County	Enter or review the county of arrest.

- ☐ Select the "Next" button to move to the next page.

DATA ENTRY FIELD	OPERATOR RESPONSE
☐ Type of Test	Enter or select the reason for the test being performed.
☐ PBT Result	Enter the roadside PBT result if known.
☐ Date of Stop	Enter the date of the stop or first contact.
☐ Time of Stop	Enter the time of the stop or first contact.
☐ Case or ICR Number	Enter the ICR or case number assigned to this test.
☐ Commercial Vehicle	Enter whether the stop involved a commercial vehicle.
☐ Observation Start Time	Enter the time the observation period began.
☐ Observed By	Enter the name or identifying information of the person performing the observation period.

☐ Select the "OK" button to start the test.

DISPLAY	OPERATOR RESPONSE
☐ Diagnostic checks	Observe all diagnostic checks pass
☐ Air blank – Virtual test record	Observe blank
☐ Breath sample – Real time graph of subject sample	Attach mouthpiece and have subject provide an adequate sample. Remove the mouthpiece after the subject has finished providing the sample.
☐ Air blank – Virtual test record	Observe blank
☐ Control sample – Virtual test record	Observe control sample
☐ Air blank – Virtual test record	Observe blank
☐ Breath sample – Real time graph of subject sample	Attach mouthpiece and have subject provide an adequate sample. Remove the mouthpiece after the subject has finished providing the sample.
☐ Air blank – Virtual test record	Observe blank
☐ Remarks	Enter observations of subject behavior and sample delivery along with other remarks.
☐ Signature	Sign the record on the display using the stylus.
☐ Printing	Observe test record printing

Exercise 9 **********

OBJECTIVE: Print a test record after a printer error.

☐ Correct the printer problem then select "Copy" on the DMT display.
(Note: Printing a test record with the "copy" button applies only to the last test run.)

Exercise 10 **********

OBJECTIVE: Run a test with a deficient first sample.

☐ Press the “Run” button on the display to start a Minnesota Test Sequence.

☐ Enter information as requested by the DMT. At the "scan/swipe/manual" option, select “manual” and enter the subject’s information manually through the keyboard.

SUBJECT SAMPLE 1

☐ Blow into the DMT until tone starts and the volume and AC is displayed then **stop** blowing when the volume bar displayed is 1/3 filled.

☐ Allow the DMT to timeout a "Deficient Sample". This will take three minutes. Acknowledge the deficient sample when the message box appears on the display.

CONTROL

☐ Observe the Control.

SUBJECT SAMPLE 2

☐ Because the first sample was deficient there will be no request for a second sample.

Exercise 11 **********

OBJECTIVE: Log out of the DMT.

☐ Press the “DMT icon” on the display to show the drop down menu.

☐ Select ‘Security’ then ‘Logout’. Your name should no longer appear in the lower left portion of the display.

The next four (4) exercises will be run at stations 1,2,3,4. Beginning at the instrument you are currently at, follow the instructions for that station. When the person working at the station to your left has completed their work, advance clockwise around the instrument pod to the next station. Read the instructions for each station's exercise before you begin doing the exercise.

STATION 1 **********

OBJECTIVE: Observe the effect of two samples outside of .02 agreement.

☐ Log into the DMT using your operator credentials.

☐ Press the F1 key or 'RUN' button to start a test.

☐ Enter the data the DMT requests.

SUBJECT SAMPLE 1

☐ When the display reads "PLEASE BLOW", connect the 0.08 AC simulator to the breath tube and put your mouthpiece in the piece of tubing on the simulator inlet tube.

☐ Blow an adequate sample through the simulator into the DMT.

☐ **As soon as you complete blowing this sample, disconnect the simulator from the breath tube.**

CONTROL

☐ Observe the control.

SUBJECT SAMPLE 2

☐ When the display reads "PLEASE BLOW", connect your mouthpiece to the breath tube and blow an adequate sample.

☐ The DMT will display "*.02 agreement not met*" at the end of the test.

☐ Log off of the DMT.

STATION 2 **********

OBJECTIVE: Observe the effect of acetone in a subject sample.

- ☐ Log into the DMT using your operator credentials.
- ☐ Press the F1 key or 'RUN' button to start a test.
- ☐ Enter the data the DMT requests.

SUBJECT SAMPLE 1

- ☐ When the display reads "PLEASE BLOW", connect the "acetone" simulator to the breath tube and place your mouthpiece in the piece of tubing on the simulator inlet tube.
- ☐ Blow an adequate sample into the DMT through the simulator containing acetone. The DMT will display "*Interference*" instead of the AC result.
- ☐ **As soon as you complete blowing this sample, disconnect the simulator from the breath tube.**

CONTROL

- ☐ Observe the Control.

SUBJECT SAMPLE 2

- ☐ Note: The above situation will result in no request for a second sample.
- ☐ Log off of the DMT.

STATION 3 **********

OBJECTIVE: Observe the effect of ethanol introduced during an air blank.

☐ Log into the DMT using your operator credentials.

☐ Press the F1 key or 'RUN' button to start a test.

☐ Enter the data the DMT requests.

SUBJECT SAMPLE 1

☐ When the display reads "PLEASE BLOW", place your mouthpiece in the breath tube and blow an adequate sample.

☐ **As soon as you complete blowing this sample, remove the mouthpiece from the breath tube and place the open container next to the breath tube.**

☐ **During the air blank the instrument will draw in the ambient alcohol from around the container and display 'blank error'.**

CONTROL

☐ Note: The above situation will result in no control sample and no request for a second sample.

☐ Log off of the DMT.

STATION 4 **********

OBJECTIVE: Observe the effect of mouth alcohol on a subject sample.

- ☐ Swish your mouth with alcohol provided.
- ☐ Log into the DMT using your operator credentials.
- ☐ Press the F1 key or 'RUN' button to start a test.
- ☐ Enter the data the DMT requests.

SUBJECT SAMPLE 1

- ☐ When the display reads "PLEASE BLOW", place your mouthpiece in the breath tube and blow an adequate sample.
- ☐ **As soon as you complete blowing this sample, remove your mouthpiece from the breath tube.**
- ☐ Acknowledge the "Invalid sample" when the message box appears on the display.

CONTROL

- ☐ Observe the Control.

SUBJECT SAMPLE 2

- ☐ Note: The above situation will result in no request for a second sample.
- ☐ Log off of the DMT.

Pharmacology and Toxicology of Alcohol

Instructor _____

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Absorption of Alcohol

Ethanol can enter the human body in several different ways: injection, inhalation, and ingestion. Ethanol has not been observed to accumulate in the body as a result of absorption through the skin. Injection of ethanol directly into the body is an extremely dangerous procedure because it produces a localized concentration of ethanol that can severely affect the heart and other vital organs (this phenomenon is referred to as the "bolus effect").

Another possible route for ethanol to enter the body is through inhalation of alcoholic vapors. When the alcoholic vapors come into contact with the lungs and mucous membranes lining the nasal passages and throat, the ethanol can diffuse through these membranes into the blood. However, to reach significant levels of alcohol concentration requires exposure to a severely irritating environment for an extended period of time. It is, therefore, very unlikely that any individual would become intoxicated in this manner.

The usual method for alcohol to enter the body is by ingestion of an alcoholic beverage. Ethanol is not digested, but absorbed unchanged. The absorption of ethyl alcohol begins immediately following the introduction of the alcoholic beverage into the digestive system. Ethanol is readily absorbed through all mucosal surfaces, including the oral cavity and gastrointestinal tract.

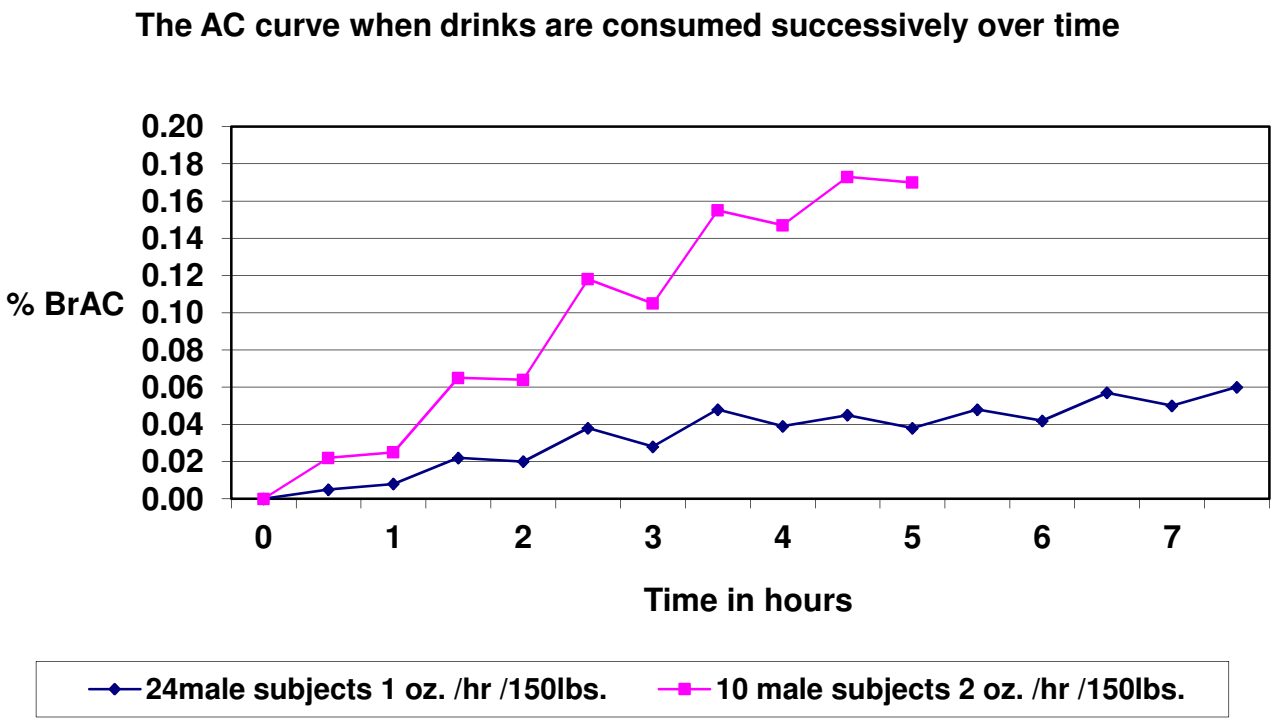
Alcohol can be absorbed through the lining of the mouth; however, the amount is normally insignificant since fluid leaves the mouth rapidly. A mouth rinsed with liquor will be free of residual alcohol in less than 15 minutes. About 20 to 30 percent of alcohol is absorbed through the stomach wall. The remainder, about 70 to 80 percent of alcohol, is absorbed from the duodenum, the first 8 to 10 inches of the small intestine.

Rate of Absorption

Absorption rates vary somewhat from person to person. Individual absorption rates can also vary depending on the condition of the body. Alcohol begins to pass into the blood stream within one to two minutes after it is consumed. Most alcohol is absorbed within 15 minutes, nearly 90 percent within one hour, and the rest within about 1.5 hours.

A portion of the ethyl alcohol can be absorbed into the blood through the walls of the stomach. The length of time the ethanol remains in the stomach before being passed on to the remainder of the gastrointestinal tract can vary due to several factors. The most significant factor is the amount of food in the stomach. The pyloric sphincter controls the passage of material from the stomach to the small intestine. On a full stomach, the pyloric sphincter remains closed longer. Ethanol remains in the stomach for a longer period of time delaying its absorption. Slowing the alcohol absorption decreases the peak alcohol concentration and may prolong the time to reach the peak concentration.

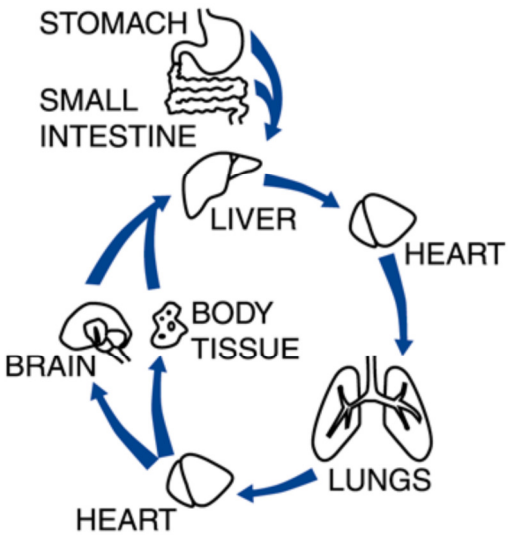
When subjects weighing 150-pounds consumed 1-ounce of 50 percent by volume whiskey every hour their AC rose slowly, reaching 0.05 after 7 hours. When the dose was doubled their AC rose rapidly, reaching 0.12 in less than 2.5 hours. Individuals who consume several drinks in a very short period may not reach their peak AC until 45 to 75 minutes after consuming the last drink. A heavier person needs to consume more alcohol than a lighter one to attain the same AC.



Distribution of Alcohol

Once ethanol has been absorbed, it travels via the blood stream from the stomach and small intestine to the liver, then to the right heart, lungs, left heart, and then to the brain and the rest of the body.

The amount of ethanol in the organs and tissues depends on the water content of each tissue or organ. Since ethyl alcohol is miscible with water, it will rapidly diffuse from an area of high alcohol concentration to an area of low concentration.



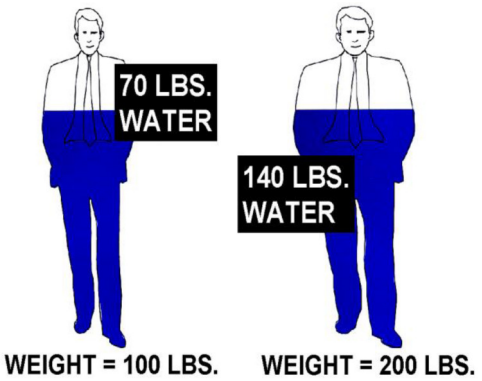
Alcohol has an affinity or attraction for water so alcohol distributes into body tissues and fluids according to their water content. The distribution ratios below are average values for alcohol in tissues and fluids compared to alcohol in whole blood, which has been assigned a value of 1.0.

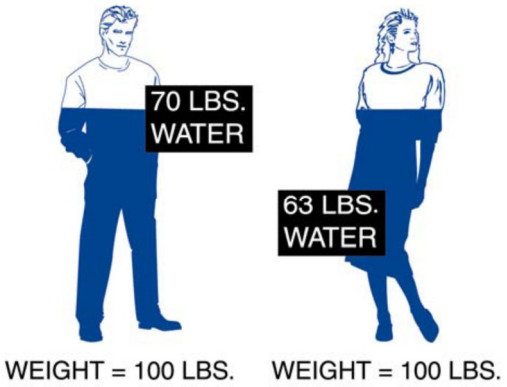
Breath	0.00043	Blood Serum	1.2	Liver	0.9
Urine	1.3	Blood Clot	0.8	Fat	0.02
Brain	0.8	Saliva	1.1	Whole body – men	0.67
Blood Plasma	1.2	Vitreous Humor	1.2	Whole body – women	0.55

During early absorption phases of drinking, the AC in arterial blood can exceed the AC in peripheral venous blood. At all times, however, the blood as it passes through the lungs and the brain is similar in alcohol content.

Body Type and Total Body Water

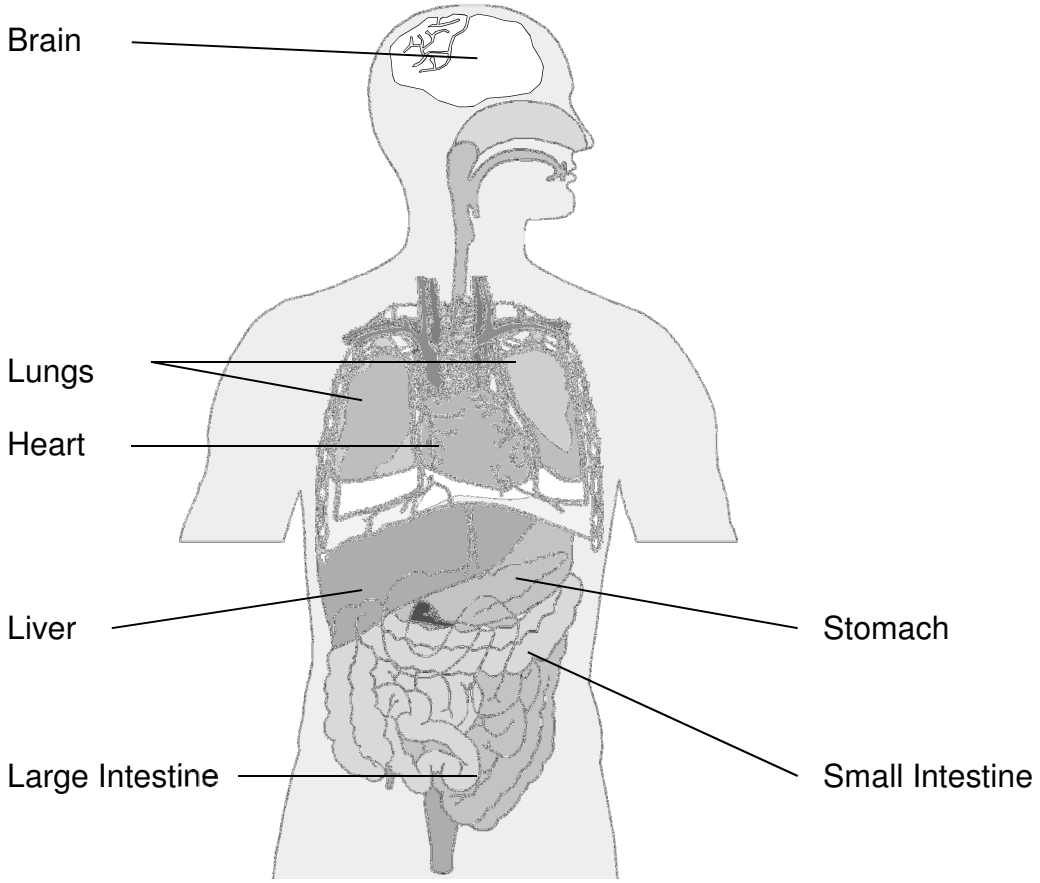
The total amount of water in the body can vary from one individual to another based upon the weight (mass) of the person. Assuming the same body type, a 200 pound man must consume more ethanol than a 100 pound man to reach the same alcohol concentration. This is because the 200 pound man has more body water to dilute the alcohol. The amount of fat tissue also affects the total amount of body water. Since fat tissue has very little water it does not absorb ethyl alcohol. A 200 pound obese person will have less body water to dilute the alcohol than a 200 pound lean person.





Gender

Total body water content also varies according to gender. On average, women have less body water than men do on a per pound basis due to body composition. The same ethanol intake in terms of body weight results in a higher alcohol concentration in women than in men. For example, a 100 pound man would have to consume more alcohol than a 100 pound woman to achieve the same concentration, because the man has more water in his body with which to dilute the ethyl alcohol.



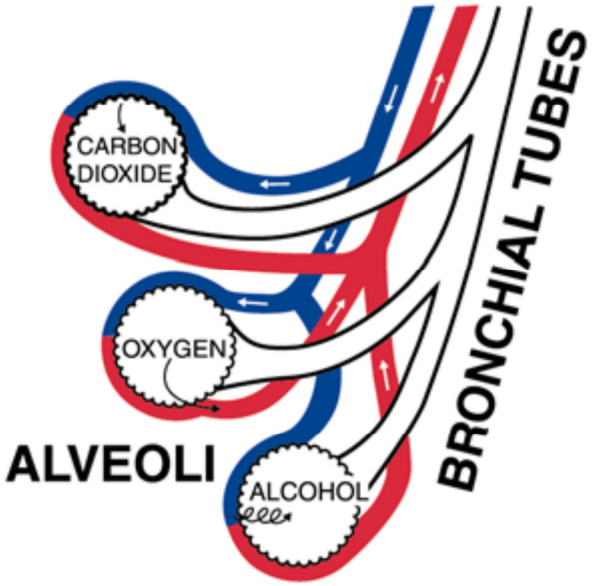
Brain and Internal Organs

Elimination of Alcohol

Alcohol is removed or eliminated from the body by metabolism and excretion. Between 90 and 98 percent of alcohol is metabolized (or oxidized) by the liver. As the alcohol is transported through the body with the blood, the liver continually metabolizes using the enzyme Alcohol Dehydrogenase (ADH). The ethanol is oxidized to simpler compounds such as acetaldehyde and acetic acid. These are then broken down by other processes into carbon dioxide and water.

An individual's rate of metabolism is fairly constant, but the *elimination* rate can vary from person to person. The average rate of elimination is **0.015 AC per hour** and the normal range of reported elimination rates varies from about 0.010-0.025 g/210 L per hour. Higher rates can occur in individuals that are alcohol abusers or alcohol dependent.

Since ethyl alcohol is miscible with water, between two and ten percent of ethanol is excreted unchanged in urine, sweat, and breath. Excretion of ethanol in the breath is the basis of the breath alcohol test. The exchange of oxygen and carbon dioxide occurs in the small tissue sacs of the lungs called the *alveoli*. The lungs contain about 300 million alveoli. Blood vessels in the lungs end in capillaries in the walls of the alveoli. Alcohol from the blood is imparted to the alveolar (deep lung) air through the alveoli. Alcohol in the alveolar air is in equilibrium with alcohol in the blood, and the accepted ratio of alcohol in the alveolar air to alcohol in the blood is 2100 to 1.



Lung Alveoli

Elimination is time dependent. Any attempt to eliminate alcohol through increased perspiration or urine output – or drinking coffee – has little or no effect.

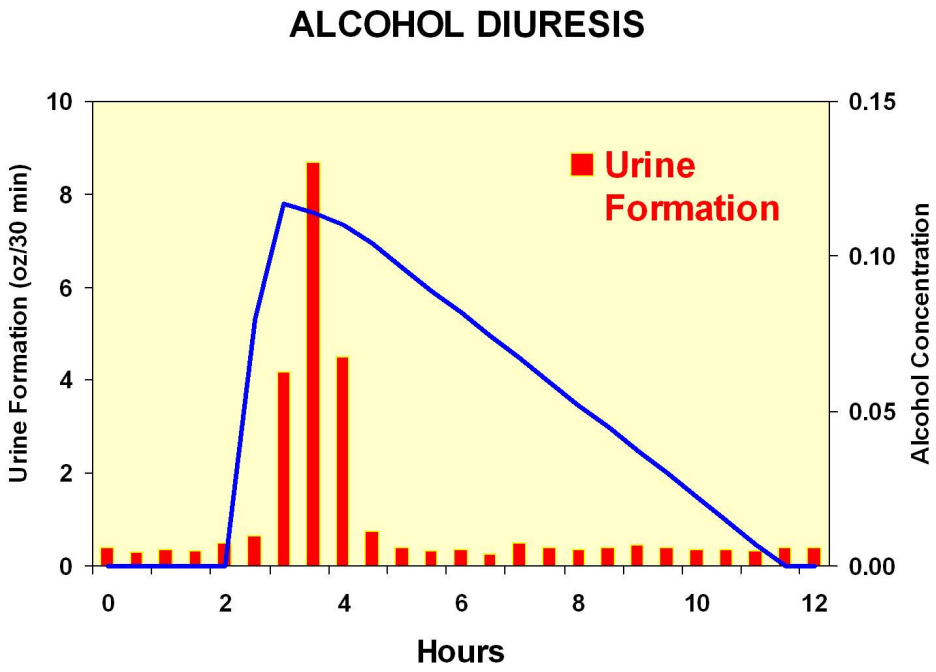
Effects on the Body

Skin. Alcohol is an antiseptic. It imparts a cool and soothing feeling when rubbed on skin. Following absorption, alcohol enlarges the capillary blood vessels near the skin, which increases circulation and causes the flushed appearance of the drinker.

Circulation. A single drinking episode has little effect on the circulatory system, other than the effect on the skin described above. At ACs of 0.45 or higher, death may result from respiratory arrest.

Liver. Alcohol can interfere with the oxidative metabolism of other drugs, potentially causing liver toxicity. Chronic alcohol use can cause a buildup of fatty tissue in the liver, inflammation, and cirrhosis.

Kidney. Alcohol is a mild diuretic (it increases urine output).



Effects on the Central Nervous System

Alcohol is a central nervous system depressant. Initially alcohol produces exhilaration due to a depression of the inhibitory processes. As the AC rises a progression of deterioration that affects concentration, decision-making abilities, coordination, and vision is followed by a loss of self-restraint until finally automatic body functions, such as breathing, are affected.

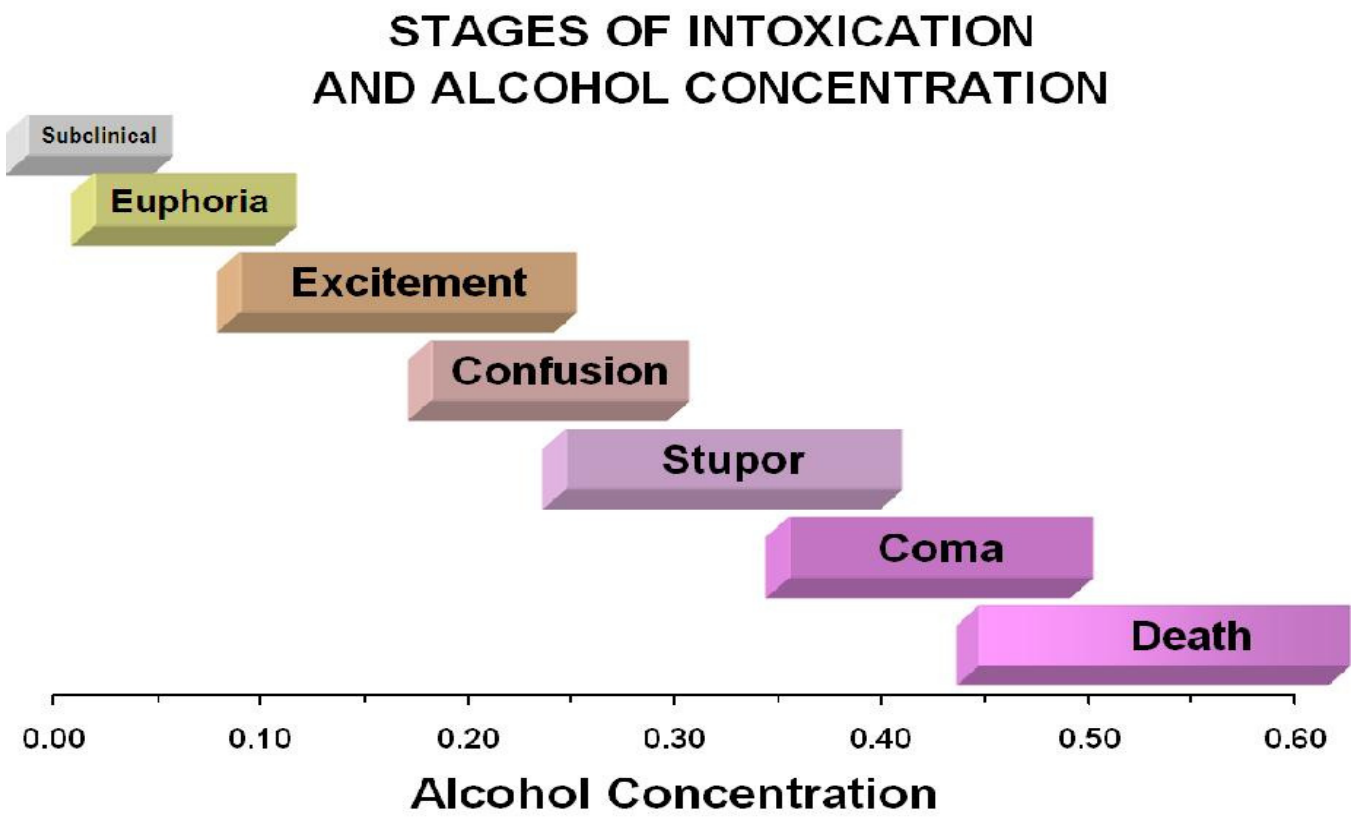
Divided attention. Alcohol impairs divided attention skills (the ability to perform more than one task at the same time) at ACs as low as 0.005.

Mental processes. Information processing and short-term memory are affected at an AC of 0.01. Inhibitions are reduced at 0.02, the ability to concentrate is affected at 0.03, and judgment and reasoning are affected at 0.04.

Vision. Tracking ability is affected starting at an AC of 0.01. Visual focus and scanning ability are affected at 0.02. Horizontal gaze nystagmus begins to appear at 0.04. At 0.06 diplopia (double vision) ensues, at 0.08 visual acuity is impaired, and at 0.09 glare recovery is affected.

Reaction time and coordination. Complex reaction time is affected at an AC of 0.02. Muscular coordination and balance are affected at 0.04.

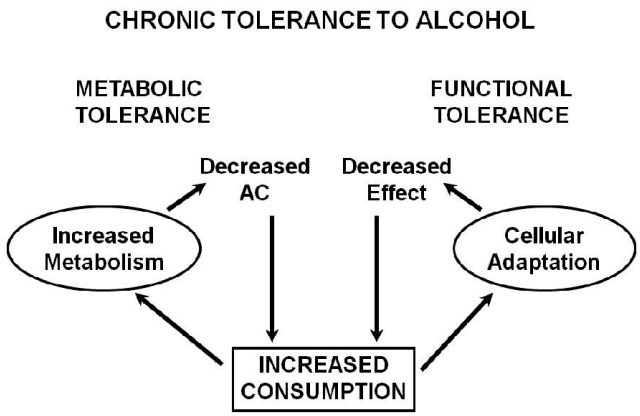
Driving. Evidence strongly suggests that impairment of some driving-related skills begins at ACs below 0.01. By 0.05 most individuals show impairment of driving skills, and at 0.08 all drivers exhibit impairment of driving skills.

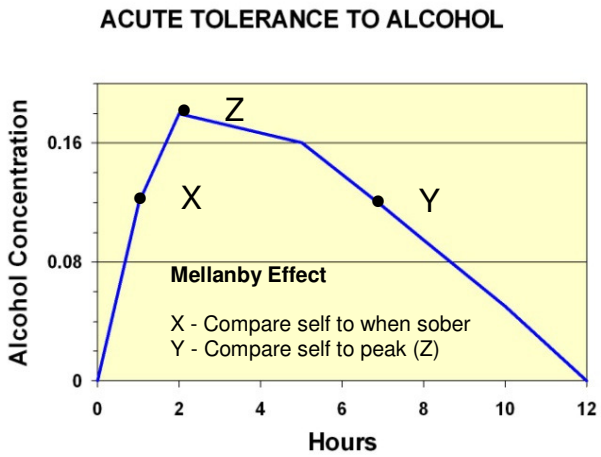


Tolerance

Chronic tolerance. Chronic, heavy drinkers can develop a rate of elimination up to three times normal, as well as greater tissue tolerance.

Acute tolerance. Tolerance can also be acquired over the course of a single drinking episode. Individuals can learn to compensate for some of the effects of alcohol during a drinking episode (for example, by standing with their feet farther apart to minimize swaying).





Symptoms of Alcoholic Influence

Common symptoms of alcoholic influence include:

Odor of alcoholic beverages on the breath	Confusion
Flushed appearance	Unusual mental changes
Muscular incoordination	Unsteady gait
Disorderly or out of the ordinary conduct	Sleepiness
Speech difficulties, such as slurred	Nausea
Horizontal gaze nystagmus	Dizziness
Impairment of attention or memory	Tremors
Impaired social functioning	Stupor or coma
Impaired judgment	Vomiting

Any one symptom or combination of symptoms does not necessarily mean that the subject is intoxicated, as some illnesses or injuries can produce similar symptoms. A low alcohol concentration may indicate that the abnormal behavior of the subject is due to the presence of other drugs.

Alcohol Combined with Other Drugs

Alcohol has some degree of interaction with a wide spectrum of other drugs.

- *Marijuana*. Marijuana impairs divided attention skills, complex reaction time, and the ability to concentrate. The combined effects with alcohol are synergistic.
- *Stimulants* (methamphetamine, cocaine, etc.). Enhanced impairment of divided attention skills occurs when alcohol is used with either methamphetamine or cocaine.
- *Depressants* (sedatives, tranquilizers, etc.). A greatly enhanced depressant effect can occur when alcohol is used with other CNS depressants. Use of depressants with alcohol can cause serious problems.
- *Narcotics* (heroin, morphine, propoxyphene, etc.). The combination of narcotics and alcohol creates a synergistic enhancement of the depressant characteristics of alcohol.

Blood versus Urine

Blood advantages. Drugs detected in blood indicate recent drug exposure. A blood test can sometimes determine that the subject is under the influence of alcohol and/or other drugs, or if the subject is misusing medication as prescribed by a physician.

Urine advantages. Urine is easier to obtain than blood. Drugs tend to be present in greater amounts in urine than in blood, and they are usually detectable for longer periods following exposure.

Other Considerations

Endogenous alcohol refers to alcohol that is normally in the body, and it is generally at an AC of less than 0.0001.

Widmark Formula

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Widmark's Formula

Erik M. P. Widmark, a Swedish scientist and pioneer in alcohol research, developed the means of estimating the amount of alcohol in a person's body that produces a given alcohol concentration (AC). This formula is used and accepted in the scientific community as a means to estimate a person's AC when the amount of alcohol consumed is known or to make a determination of how much alcohol was consumed if the AC is known.

The Widmark formula to estimate the fluid ounces of pure Ethyl Alcohol (ETOH) in the body at the time of the test is:

$$E = \frac{W * R * (AC \div 100) * 16}{SG}$$

Where: E = Fluid ounces of pure ETOH.

W = Body weight

AC = Alcohol concentration

R = Widmark factor (0.67 for males and 0.55 for females)

SG = Specific Gravity of ETOH (0.8)

Specific Gravity

- Specific gravity (SG) expresses the density of a compound. There are no units to SG—it is purely a comparison to water.
- The SG of water = 1. A SG greater than 1 is denser than water. A SG less than 1 is less dense than water. Ethanol has a specific gravity of 0.794.

Percent

- Percent compares a partial quantity to the total quantity possible on a scale of 100. For example, with a score of 27 out of 35 possible questions on a test, the percentage is calculated as follows:

  $$27 \div 35 \times 100 = 77\%.$$

  In other words, if the test consisted of 100 questions, 77 would have been correct.

- Percent can also be used to find a specific fraction of the whole. Alcoholic beverages are labeled with percent ethanol concentration. To determine how many ounces of pure ethanol are in a 12 ounce can of 4.5% by volume beer, first convert the percent ethanol concentration to decimal form by dividing by 100 (0.045), then multiply the total volume of the beverage by the percent ethanol concentration.

  $$4.5\% \div 100 = 0.045$$

  $$12\text{oz.} \times 0.045 = 0.54 \text{ oz. pure ethanol}$$

- ounces beverage x percent = ounces pure

- To determine how many ounces of beverage were consumed, divide the number of ounces of pure ethanol in the subject's body by the percent ethanol concentration of the beverage consumed. For example: A person has 2.5 ounces of pure ethanol in his body. How many ounces of 40% by volume vodka did the person consume? Divide the ounces of pure ethanol by the decimal form of the percent ethanol concentration (0.40) to get the ounces of beverage.

$$40\% \div 100 = 0.40$$

$$2.5 \text{ oz. pure} \div 0.40 = 6.25 \text{ oz. beverage}$$

- ounces pure ethanol ÷ percent = ounces beverage

Using Widmark's Formula

According to Widmark's distribution ratios, 0.67 of the adult male's total body weight and 0.55 of the adult female's total body weight absorbs alcohol.

The amount of pure ETOH consumed by a 200 pound male with an AC of 0.15 can be determined by:

$$E = \frac{200 * 0.67 * (0.15 \div 100) * 16}{0.8}$$

Step 1: Divide the AC (0.15) by 100 to convert it from a percent to a decimal equivalent (0.0015).

Step 2: Multiply the weight in pounds (200), the Widmark factor based on gender (0.67), the AC result from step 1 (0.0015) and 16 (to convert from pounds to ounces).

Step 3: Divide the result from step 2 by 0.8 (the specific gravity of ETOH) to convert the weight ounces of ETOH to fluid ounces of ETOH.

E = 4.02 Fluid ounces of pure ETOH

The 200 pound man had 4.02 fluid ounces of pure ETOH in his body at the time of the test.

Suppose the subject had been drinking 86 proof / 43% by volume whiskey. To determine how much whiskey he consumed, take

4.02	» ounces of pure ETOH
÷ 0.43	» decimal equivalent of 43% by volume
= 9.34	» ounces of beverage at 43% ETOH

The subject had 9.34 ounces of 86 proof / 43% by volume whiskey in his system at the time of the test. He consumed a minimum of nine one ounce drinks.

If the subject was drinking strong beer at 4.5%, we can determine the number of beers as follows:

4.02	» ounces of pure ETOH
÷ 0.045	» decimal equivalent of 4.5% by volume
= 89.3	» ounces of beverage at 4.5%
÷ 12	» ounces per can of beer
= 7.44	» number of beers

The subject had 89.3 ounces of 4.5% by volume beer in his system at the time of the test or nearly seven and a half 12 ounce beers.

As with any formula; if all but one of the quantities are known, the unknown can be solved. If we know a person's weight and the amount of alcohol consumed, the maximum AC can be calculated. It is the maximum because the rate of elimination has not been considered.

$$AC = \frac{E * 0.8 * 100}{W * R * 16}$$

$$AC = \frac{4.02 * 0.8 * 100}{200 * 0.67 * 16}$$

Step 1: Multiply the ounces of pure ETOH (4.02) by 0.8 (the specific gravity of ETOH) to convert the fluid ounces to weight ounces, and by 100 (to convert AC from a decimal to a percent equivalent).

Step 2: Multiply the weight in pounds (200), the Widmark factor based on gender (0.67) and 16 (to convert from ounces to pounds).

Step 3: Divide the result from step 1 by the result from step 2.

$$AC = 0.15$$

A 200 pound adult male with 4.02 fluid ounces of pure ETOH in his body at the time of the test will have an AC of 0.15.

The alcohol concentration charts for males and females, which estimate alcohol concentration (AC) in the blood, are based on number of drinks and body weight. To use these tables:

1. Count drinks consumed (one drink equals 1 ounce of 50% liquor or one 12-ounce bottle of beer).
2. Find the Alcohol Concentration listed under number of 'drinks' and opposite 'body weight'.
3. Subtract from this number the alcohol concentration eliminated during the time elapsed since first drink. Burn-off equals 0.015 AC per hour. Example: A 180 pound man has 8 drinks in 4 hours: 0.167 minus (0.015 * 4 = 0.060) = 0.107.

Body Weight (lbs.)	DRINKS											
Males	1	2	3	4	5	6	7	8	9	10	11	12
100	.038	.075	.113	.150	.188	.225	.263	.300	.338	.375	.413	.450
110	.034	.066	.103	.137	.172	.207	.241	.275	.309	.344	.379	.412
120	.031	.063	.094	.125	.156	.188	.219	.250	.281	.313	.344	.375
130	.029	.058	.087	.116	.145	.174	.203	.232	.261	.290	.320	.348
140	.027	.054	.080	.107	.134	.161	.188	.214	.241	.268	.295	.321
150	.025	.050	.075	.100	.125	.151	.176	.201	.226	.251	.276	.301
160	.023	.047	.070	.094	.117	.141	.164	.188	.211	.234	.258	.281
170	.022	.045	.066	.088	.110	.132	.155	.178	.200	.221	.244	.265
180	.021	.042	.063	.083	.104	.125	.146	.167	.188	.208	.228	.250
190	.020	.040	.059	.079	.099	.119	.138	.158	.179	.198	.217	.237
200	.019	.038	.056	.075	.094	.113	.131	.150	.169	.188	.206	.225
210	.018	.036	.053	.071	.090	.107	.125	.143	.161	.179	.197	.215
220	.017	.034	.051	.068	.085	.102	.119	.136	.153	.170	.188	.205
230	.016	.032	.049	.065	.081	.098	.115	.130	.147	.164	.180	.196
240	.016	.031	.047	.063	.078	.094	.109	.125	.141	.156	.172	.188
250	.015	.030	.044	.059	.074	.089	.104	.118	.133	.148	.163	.178
260	.014	.028	.043	.057	.071	.085	.100	.114	.128	.142	.157	.171

For clarification, if the 180lb. male had all the alcohol from 12 ounces of 100 proof whiskey or twelve 12 ounce bottles of beer in his body at one time, he would have an alcohol reading of .250.

Body Weight (lbs.)	DRINKS											
Females	1	2	3	4	5	6	7	8	9	10	11	12
90	.050	.101	.151	.202	.252	.303	.354	.404	.454	.505	.556	.607
100	.045	.091	.136	.182	.227	.273	.318	.364	.409	.455	.500	.545
110	.041	.083	.124	.165	.207	.248	.289	.331	.372	.413	.455	.496
120	.038	.076	.114	.152	.189	.227	.265	.303	.341	.379	.417	.455
130	.035	.070	.105	.140	.175	.210	.245	.280	.315	.350	.385	.420
140	.032	.065	.097	.130	.162	.195	.227	.260	.292	.325	.357	.390
150	.030	.061	.091	.121	.152	.182	.212	.242	.273	.303	.333	.364
160	.028	.057	.085	.114	.142	.170	.199	.227	.256	.284	.312	.341
170	.027	.053	.080	.107	.134	.160	.187	.214	.241	.267	.294	.321
180	.025	.051	.076	.101	.126	.152	.177	.202	.227	.253	.278	.303
190	.024	.048	.072	.096	.120	.144	.167	.191	.215	.239	.263	.287
200	.023	.046	.068	.091	.114	.137	.159	.182	.205	.228	.250	.273

Definitions

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0.02 AGREEMENT NOT MET - DEFICIENT TEST

The subject provided two adequate breath samples, however the results between the two breath samples exceeded the maximum allowed difference of 0.020. This can be caused by mouth alcohol, but is more commonly a result of the subject providing the two samples in an inconsistent manner. If mouth alcohol may be the cause, conduct a new observation period before beginning a new test.

0.02 AGREEMENT NOT MET – SECOND DEFICIENT TEST

The subject provided two adequate breath samples, however the results between the two breath samples exceeded the maximum allowed difference of 0.020. This can be caused by mouth alcohol, but is more commonly a result of the subject providing the two samples in an inconsistent manner. This has occurred on two consecutive tests and may serve as a basis for statutory refusal.

ADJUSTMENT The portion of the certification procedure used when calibration criteria are not met. This process is performed by factory trained BCA personnel in the lab.

AMBIENT FAIL The DMT was unable to establish a zero alcohol reference when measuring the air around the instrument during the initial air blank. This can be caused by a poorly ventilated room that does not allow for sufficient clearing of alcohol vapors, a breath tube pointed toward a subject, room deodorizers or hand sanitizers, etc. If possible, remove the source of ambient alcohol or move it farther away from the instrument and begin a new test.

BLANK ERROR The DMT was unable to establish the same zero alcohol reference when measuring the air around the instrument compared to the previous air blank. This can be caused by a poorly ventilated room that does not allow for sufficient clearing of alcohol vapors, a breath tube pointed towards a subject, room deodorizers or hand sanitizers, etc. If possible, remove the source of ambient alcohol or move it farther away from the instrument and begin a new test.

BREATH TUBE TEMP INVALID

The temperature of the breath tube is outside the proper range of 38℃ to 50℃. This can be caused by not plugging in the power cord, plugging it into the wrong receptacle or damage to the breath tube or wires. Verify the power cord is properly plugged in. After a sufficient warm up period begin a new test. If the message persists contact the BCA.

CALIBRATION The procedure that verifies the accuracy of the adjustment and linearity of the DMT.

CERTIFICATION The procedure performed on a DMT prior to being used in the field. This includes instrument maintenance, adjustment (if needed) and calibration followed by technical and administrative reviews.

CONTROL A material of known alcohol concentration that is analyzed to evaluate the accuracy of the analytical procedure. The DMT uses dry gas standards at approximately 0.08 g/210 L as the control.

CONTROL FAIL The result of the Control test is outside the acceptable range of .008 from the target alcohol concentration. This can be caused by a data entry error if this occurs during a control change test or could be an indication that the DMT needs an adjustment.

DEFICIENT See Deficient Sample

DEFICIENT SAMPLE
One or more of the acceptance criteria for a breath sample was not met. The subject must blow at a flow rate at or above 3 liters per minute, must meet or exceed the minimum breath volume of 1.5 liters and the alcohol concentration slope must be sufficiently level. Each of these criteria must be met in a single attempt during the three minute time limit.

DEFICIENT TEST See 0.02 Agreement Not Met

DEPRIVATION PERIOD
See Observation Period

DETECTOR OVERFLOW
The instrument measured an alcohol concentration above the operating range of 0.600. This could be the result of mouth alcohol. Conduct a new observation period and begin a new test.

FC See FUEL CELL

FILTER WHEEL ERROR
A misalignment of the filter wheel was detected. Begin a new test. If the same message occurs, call the BCA Breath Alcohol Calibration Laboratory.

FILTER (1, 2 OR 3) WON'T ZERO
The DMT is unable to obtain a zero reference value at filter noted. Begin a new test. If the same message occurs, call the BCA Breath Alcohol Calibration Laboratory.

FUEL CELL Fuel cell is a technology used to measure the alcohol concentration on a person's breath. The fuel cell has two platinum electrodes with a porous acid-electrolyte material between them. As the breath from the subject flows past one side of the fuel cell, the platinum oxidizes the alcohol in the breath and produces acetic acid, protons and electrons. The electrons flow through a wire from the platinum electrode. The protons move through the lower portion of the fuel cell and combine with oxygen and the electrons on the other side to form water. The more alcohol oxidized, the greater the electrical current. The subject's alcohol concentration is calculated based on the current measured.

GAS FLOW ERROR

The DMT is not detecting gas flow from the dry gas cylinder. This can occur when air flow from the dry gas cylinder is blocked or the tank has low pressure. Verify the tubing in the dry gas chamber is not kinked. Begin another test. If the same message occurs, call the BCA Breath Alcohol Calibration Laboratory.

GASTROESOPHAGEAL REFLUX DISEASE (GERD)

A digestive disease that occurs when stomach acid flows back (refluxes) into the esophagus. It is commonly alleged to be the source of mouth alcohol during a breath test. See Observation Period.

GERD See Gastroesophageal Reflux Disease

INFRARED (IR) Range of wavelengths (3.37 – 3.50um) of light that is directed through the sample chamber.

INFRARED ABSORPTION

Infrared light is directed through the sample chamber and onto the detector. When breath containing alcohol is introduced into the sample chamber, the alcohol absorbs some of the light passing through the chamber and less light falls on the detector. This change in light intensity is interpreted by the instrument in terms of the concentration of alcohol in the breath sample.

INTERFERENCE The expected ratios between the filters have been exceeded. The breath sample submitted may contain a substance other than alcohol or a combination of alcohol and an interfering substance. Begin a new test. If the second test yields the same result obtain a blood or urine sample.

INTERNAL STANDARD

A quartz plate is inserted into the light path and simulates a known alcohol concentration used to verify the accuracy of the calibration of the instrument. The value of the quartz standard is established during adjustment and each subsequent check during diagnostic tests must be within four percent (4%) of the target.

INTERNAL STANDARD ERROR

The measurement of the quartz standard is outside of four percent (4%) of the value established during the previous adjustment. Restart the test. If the same message occurs, call the BCA Breath Alcohol Calibration Laboratory.

INVALID See INVALID SAMPLE

INVALID SAMPLE The DMT detected a declining alcohol concentration during a subject's breath sample. This can be the result of mouth alcohol, however it can also be the result of irregular blowing patterns by the subject. If mouth alcohol is suspected to be the cause, conduct a new observation period before beginning a new test.

IR See INFRARED

IR/FC DISAGREEMENT

The Infrared and Fuel Cell results are more than 0.007 or 7%, whichever is greater, from each other. This can be caused by a fuel cell sampling malfunction, an interferent on the subject's breath, or is an indication that the DMT needs an adjustment. Begin a new test. If the second test yields the same result obtain a blood or urine sample.

MOUTH ALCOHOL

Alcohol vapors from recent ingestion can remain in the mouth for as long as 15 minutes or be reintroduced into the mouth from actions such as belching or regurgitating stomach contents into the mouth. A 15 minute observation period should be conducted to verify the alcohol concentration in the breath being measured is not falsely elevated due to mouth alcohol.

OBSERVATION PERIOD

Recent alcohol ingestion or reintroduction of alcohol into the mouth from actions such as belching, regurgitating or refluxing stomach contents into the mouth are possible sources of mouth alcohol. Alcohol vapors can remain in the mouth for as long as 15 minutes. A test subject should be observed for a minimum of 15 minutes prior to administering a breath test to ensure nothing is placed in the mouth and nothing erupts into the mouth.

PUMP ERROR The DMT did not detect proper air flow through the instrument during an air blank. This can be caused by a problem with the pump or an obstruction of the breath path. Remove the mouthpiece from the breath tube during air blanks to prevent this from occurring. Ensure the screen at the end of the breath tube is clear. Begin a new test. If the same message occurs, call the BCA Breath Alcohol Calibration Laboratory.

RADIO FREQUENCY INTERFERENCE

High levels of radio frequencies have been detected and ended the test. This can be caused by keying a radio in the vicinity of the instrument or a static discharge to the breath tube that holds the RFI antenna. Turn off radios and restart the test.

RFI See RADIO FREQUENCY INTERFERENCE

STABILITY FAIL During the diagnostic test the instrument detected a shift in the detector voltage. This is usually caused by ambient alcohol around the instrument. Also see AMBIENT FAIL and BLANK ERROR. If possible, remove the source of ambient alcohol or move it farther away from the instrument and begin a new test.

TANK PRESSURE LOW

The pressure in the dry gas cylinder is below 200 pounds per square inch (PSI). This is a notification to the operator to ensure a new dry gas cylinder is available.

TANK PRESSURE INVALID

The pressure in the dry gas cylinder is below 25 pounds per square inch (PSI). Replace the dry gas cylinder with a new dry gas cylinder and perform a control change.

VERIFICATION The procedure that verifies the accuracy of the adjustment and linearity of the DMT.

Portable Breath Test (PBT) Instruments

Instructor _____

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ALCO-SENSOR III

Power

A nine-volt alkaline battery powers the measuring circuit of the Alco-Sensor. The battery is accessible through a sliding cover on the bottom of the unit.

Temperature

The operating temperature range is 20℃ to 36℃ (68℉ - 98℉). Warmer temperatures improve the performance of the instrument and prevent condensation within the detector. A liquid crystal thermometer on its back indicates the instrument's temperature (serial numbers above 1200000 have a built in electronic thermometer that indicates the instrument's temperature).

Controls

The Alco-Sensor has two controls, the "SET" button and the "READ" button. The "SET" button, when fully depressed, will expel 1 ml of air or breath sample from the fuel cell chamber. It locks in its fully depressed position. The "READ" button has two functions. When pressed slightly it releases the "SET" button allowing the instrument to draw in a sample. Fully depressed it turns on the instruments measuring circuit to provide a reading on the digital display.

Indicators

The Alco-Sensor has a three digit digital display.

Test procedure

1. Check the instrument temperature. If the temperature is between 22℃ to 36℃, proceed to step 2. If the instrument is cold, place it in a pocket next to the body for two minutes and then recheck its temperature.
2. Depress and hold the "READ" button to observe 0.000 on the display, proceed to step 3. If any other reading, clear the chamber by fully depressing the "SET" button. Wait 1 – 2 minutes and repeat this step.
3. Press the "SET" button until it locks.
4. Place a mouthpiece on the sample port.
5. Ask the subject to blow steadily into the mouthpiece.
6. After allowing the subject to blow into the mouthpiece long enough to obtain deep lung air (no less than three (3) seconds), press the "READ" button to take a sample. This must be done while the subject is blowing.
7. Hold the "READ" button down for forty (40) to seventy (70) seconds after taking the sample to allow the fuel cell to reach its peak. Note the highest reading obtained as this is the subject's breath alcohol result. (with serial numbers above 1200000 the read button does not need to be held and the final result will be brightly illuminated)
8. Press the "SET" button to clear the fuel cell. If running another test, wait 1 to 2 minutes. If testing is complete, store the instrument with the "SET" button depressed.

Calibration check

This check eliminates the need to recalibrate the unit if it is within specifications. The operator can check the calibration by using the following procedure.

1. Check the temperature (22 - 36℃).
2. Check zero reference (depress and hold the “READ” button to observe 0.000).
3. Depress the “SET” button.
4. Attach Alco-Sensor III to simulator with mouthpiece or dry gas cylinder with regulator.
5. Blow through simulator for five (5) seconds and push “READ” button at four (4) seconds or depress the dry gas regulator button for 5 seconds and press the “ON” button at 4 seconds.
6. Hold the “READ” button down and observe display for peak reading. If peak reading is greater than ± 0.005 from the known value of the simulator solution AC or dry gas, proceed to Alco-Sensor III Calibration. (with serial numbers above 1200000 the read button does not need to be held)
7. Depress “SET” button.

Calibration procedure

If the PBT result is greater than ± 0.005, it should be recalibrated by the following procedure.

Calibration requires the following:

Simulator with simulator solution or dry gas cylinder with regulator

Alco-Sensor mouthpiece

Small screwdriver or trim potentiometer tool

(for serial numbers below 1200000)

1. Check temperature (22 - 36 degrees C).
2. Turn calibration screw 1 full turn (360 degrees) **clockwise** (CW).
3. Check **zero** reference (depress and hold **READ** button to observe .000).
4. Depress **SET** button.
5. Attach Alco-Sensor III to the simulator or dry gas cylinder with a mouthpiece.
6. Blow through Simulator for five (5) seconds and push **READ** button at four (4) seconds or depress the regulator button for 5 seconds and push **READ** button at 4 seconds.
7. **Calibrate** by turning the Calibration Screw **counterclockwise** (CCW) when the display value exceeds the known value of the simulator solution or dry gas until you reach the value of the simulator solution or dry gas. Repeat until the value on the display does not change for 5 seconds. Example: Simulated Breath AC on simulator solution Label = 0.082. When display value = 0.083, turn Calibration Screw CCW until display reads 0.082.
8. Depress **SET** button.

9. After a 3 minute wait, use a **NEW** mouthpiece to run a **CALIBRATION CHECK** with the same simulator solution or dry gas to confirm the calibration. **THE RESULT SHOULD BE WITHIN (±0.005) OF THE TARGET READING.**

(for serial numbers below 1200000)

1. Check the unit's temperature by pressing both the **READ** and **SET** buttons. (15 - 36 °C).
2. To enter into the calibration mode, depress and hold the **SET** button and depress then release the **READ** button. When the temperature is being displayed, depress and release the **READ** button three times within two seconds. "**CAL**" should be displayed followed by "**bLn**" .
3. Depress the **READ** button to perform the blank test. A moving dash "**-**" should be displayed followed by "**Set**" if the blank test is successful.
4. Depress **SET** button and "**CAL**" will be displayed.
5. Attach Alco-Sensor III to the simulator or dry gas cylinder with a mouthpiece.
6. Blow through Simulator for five (5) seconds and push **READ** button at four (4) seconds or depress the regulator button for 5 seconds and push **READ** button at 4 seconds.
7. A moving dash "**-**" should be displayed followed by a calibration result. **Calibrate** by turning the Calibration Screw until the value matches the value of the simulator solution. Example: Simulated Breath AC on simulator solution Label = 0.082. If display value = 0.083, turn Calibration Screw until display reads 0.082.
8. Depress **SET** button.
9. After a 3 minute wait, use a **NEW** mouthpiece to run a **CALIBRATION CHECK** with the same simulator solution or dry gas to confirm the calibration. **THE RESULT SHOULD BE WITHIN (±00.005) OF THE TARGET READING.**

Mouthpieces

Mouthpieces for the Alco-Sensor are packaged individually and are available through the manufacturer, Intoximeters, Inc., 8110 Lackland Road, St. Louis, Missouri 63114, telephone is (800) 451-8639.

ALCO-SENSOR IV

Power

A nine-volt alkaline battery powers the measuring circuit of the Alco-Sensor. The battery is accessible through a sliding cover on the front of the unit.

Temperature

The operating temperature range is 10℃ to 40℃ (50℉ - 104℉). Warmer temperatures improve the performance of the instrument and prevent condensation within the detector. The unit has a built in electronic thermometer that indicates the instrument's temperature.

Controls

The Alco-Sensor IV has two controls, the "SET" button and the "Manual" button. The "SET" button, when fully depressed, will expel 1 ml of air or breath sample from the fuel cell chamber. It locks in its fully depressed position. The "Manual" button will allow the operator to manually take a sample.

Indicators

The Alco-Sensor has a three digit digital display.

Test procedure

1. Place a mouthpiece into the sample port.
2. Check the instrument temperature, if any temperature between 10℃ to 40℃ is indicated proceed to step 3. If the instrument is cold, place it in a pocket next to the body for two minutes and then recheck its temperature.
3. After the "blank" check, press the "SET" button until it locks.
4. After "TEST" is displayed, ask the subject to blow steadily into the mouthpiece.
5. After unit takes the sample it will analyze it and display the AC result.
6. Press the "SET" button to clear the fuel cell.
7. Press the red eject button to eject the used mouthpiece, never pull it out. If running another test, wait 1 to 2 minutes. If testing is complete, store the instrument with the "SET" button depressed.

Calibration Check procedure

1. Place a mouthpiece into the sample port.
2. Check the instrument temperature, if any temperature between 10℃ to 40℃ is indicated proceed to step 3. If the instrument is cold, place it in a pocket next to the body for two minutes and then recheck its temperature.
3. After the "blank" check, press the "SET" button until it locks.

4. After “TEST” is displayed, connect unit to simulator or dry gas cylinder. Blow through simulator or depress the regulator button for 4 seconds and press the **MANUAL BUTTON** while still blowing.
5. After unit takes the sample it will analyze it and display the AC result. If the result is greater than ± 0.005 from the known value of the simulator solution AC, proceed to the Alco Sensor IV Calibration procedure.
6. Press the “SET” button to clear the fuel cell.
7. Press the red eject button to eject the used mouthpiece, never pull it out.

Calibration procedure

When a unit does not read a simulator solution within acceptable limits (± 0.005) it must be re-calibrated by the following procedure. The unit must be calibrated when its temperature is between 23ºC - 27ºC. If the temperature is not within the required range, the unit will not permit a calibration.

Calibration requires the following:

Simulator with simulator solution or dry gas cylinder

Alco-Sensor IV mouthpiece

Calibration tool

1. Remove battery cover to expose calibration switch access holes.
2. Insert a new mouthpiece and follow standard operation until ALCO-SENSOR IV displays a blank reading of **“.000”.**
3. While **“.000”** is still being displayed, press **BUTTON #3** and hold down until **“.XXX”** is displayed (The actual number will be that used for the last calibration that was run). When **“.XXX”** display appears, release button. If the temperature is not in the range of 23ºC - 27ºC, instead of **“.XXX”** the display will be **“Tmp>”** or **“Tmp<”** and the unit will **“Void”.** Remove the mouthpiece and correct temperature before trying again.
4. If, after a few seconds, the display goes to **“Set”**, the **SET BUTTON** should be depressed to cock sample pump. **“.XXX”** will return to the display.
5. With **”.XXX”** shown on the display, if necessary, adjust the number up **(BUTTON #1)** or down **(BUTTON #2)** until the value of the simulator solution being use is displayed.
6. Push **BUTTON #3** again and display will read **“Cal”.** This is the equivalent of **“Test”** in a normal sequence.
7. Connect unit to simulator or dry gas. Blow through simulator or depress the regulator button for 4 seconds and press **MANUAL BUTTON** while still blowing. The microprocessor will analyze the output from the **FUEL CELL** and will automatically accept the number that was programmed in Step 5.
8. Conclude the test as usual by pressing the **SET BUTTON** when **“SET”** appears. Remove the mouthpiece at the intermittent **BEEP**.
9. After a 3 minute wait, use a **NEW** mouthpiece to run an **CALIBRATION CHECK** test with the same simulator solution or dry gas to confirm the calibration. **IT SHOULD BE WITHIN (0.005) OF THE TARGET READING.**

Mouthpieces

Mouthpieces for the Alco-Sensor are packaged individually and are available through the manufacturer, Intoximeters, Inc., 8110 Lackland Road, St. Louis, Missouri 63114, telephone is (800) 451-8639.

ALCO-SENSOR FST

Power

Two AA batteries power the FST. The batteries are accessible through a sliding cover on the base of the unit.

Temperature

The operating temperature range is 0℃ to 50℃ (32℉ - 122℉).

Controls

The FST has two control buttons, the “ON” button and the “OFF” button. The “ON” button turns the instrument on and also allows the operator to capture a manual sample. The “OFF” button powers the instrument down and is also used to select several other features of the instrument.

Indicators

The Alco-Sensor FST has a three digit digital display.

Test Procedure

1. Place a mouthpiece into the sample port.
2. Press the power on button and hold for 1 second.
3. Check the instrument temperature, if any temperature between 0℃ and 50℃ is indicated proceed to step 4. If the instrument is cold, place it in a pocket next to the body for two minutes and then recheck its temperature.
4. After the “blank” check, “blo” will be displayed. Ask the subject to blow steadily into the mouthpiece.
5. After unit takes the sample it will analyze it and display the AC result for 15 second before the instrument will power itself off.

Calibration Check Procedure

1. Insert a new mouthpiece and follow standard operation until the Alco-Sensor FST displays **“blo”**.
2. Connect unit to simulator or dry gas cylinder. Blow through the simulator for 5 seconds or depress the regulator button and press the “ON” button (larger button opposite the display) at 4 seconds. The unit will analyze the output from the fuel cell and will display an alcohol concentration (AC). If result is outside +/- 0.005 of the target AC the unit must be calibrated.
3. Remove the mouthpiece.

Calibration Procedure

When a unit does not read a simulator solution or dry gas cylinder within acceptable limits (± 0.005) it must be re-calibrated using the following procedure. The unit must be calibrated when its

temperature is between 15ºC - 35ºC. If the temperature is not within the required range, the unit will not permit a calibration.

Calibration requires the following:

Simulator with simulator solution or dry gas cylinder

Alco-Sensor FST mouthpiece

1. Press and hold the “OFF” button while turning the unit on. Press the “ON” button multiple times until the unit displays “CAL”. Press and release the “OFF” button. The FST will perform an air blank sample then display “CAL” (flashing).
2. Insert a new mouthpiece and connect unit to simulator or dry gas cylinder. Blow through the simulator or depress the regulator button for 5 seconds and press “ON” button at 4 seconds. The unit will analyze the output from the fuel cell and will display the last alcohol concentration that was used.
3. Set the display to the alcohol concentration you provided. To change the value press the “ON” button until the number you want is displayed, then press the “OFF” button to move to the next digit. Repeat until the desired value is displayed. After the third digit is accepted, the display will flash three times and store the calibration.
4. Turn unit off. After a 2 minute wait, use a new mouthpiece to run a verification test with the same simulator solution or dry gas cylinder to confirm the calibration. If result is outside +/- 0.005 of the target AC the unit must be recalibrated.

Mouthpieces

Mouthpieces for the Alco-Sensor are packaged individually and are available through the manufacturer, Intoximeters, Inc., 8110 Lackland Road, St. Louis, Missouri 63114, telephone is (800) 451-8639.

FC10 / FC20

Power

Four AA 3 volt alkaline batteries power the measuring circuits of the FC10 / FC20. The battery is accessible through a sliding cover on the back of the unit.

Temperature

The operating temperature range is 10℃ to 40℃ (50℉ - 104℉). Warmer temperatures improve the performance of the instrument and prevent condensation within the detector. The unit has a built in electronic thermometer that indicates the instrument's temperature.

Controls

The FC10 / FC20 have two controls, the "Execute" button and the "Function" button. The "Execute" button will allow the operator to manually take a sample. The "Function" button allows the operator to choose different types of tests to run.

Indicators

The FC10 / FC20 have a graphical LCD backlit display.

Test procedure

1. Place a mouthpiece onto the sample port.
2. Turn on the unit. The instrument will perform a blank check and check the temperature, if temperature is outside of 10℃ to 40℃ no tests can be conducted. If the instrument is cold, place it in a pocket next to the body for two minutes and then recheck.
3. After "AUTO TEST" is displayed, ask the subject to blow steadily into the mouthpiece.
4. After unit takes the sample it will analyze it and display the AC result.
5. A sample can manually be activated by pressing the "Execute" button, if a subject doesn't meet the automatic sampling requirements.
6. Remove the used mouthpiece. If running another test, wait 1 to 2 minutes.

Calibration Check procedure

1. Place a mouthpiece onto the sample port.
2. Turn on the unit. The instrument will perform a blank check and check the temperature, if temperature is outside of 10℃ to 40℃ no tests can be conducted. If the instrument is cold, place it in a pocket next to the body for two minutes and then recheck.
3. After "AUTO TEST" is displayed, press the "Function" button repeatedly until "Calibration" is displayed then press the "Execute" button. "WET CHECK" will be displayed. Change to "DRY CHECK" if using dry gas.
4. Attach FC10/ FC 20 to the simulator or dry gas cylinder with a mouthpiece.

5. Blow through simulator or depress the regulator button for five (5) seconds and push **READ** button at four (4) seconds.
6. A graph should be displayed followed by a result. If the result is greater than ± 0.005 from the known value of the simulator solution AC, proceed to the FC10 / FC 20 Calibration procedure.
7. Remove the used mouthpiece.

Calibration procedure

When a unit does not read a simulator solution within acceptable limits (± 0.005), it must be re-calibrated using the following procedure. The unit must be calibrated when its temperature is between 23ºC - 27ºC. If the temperature is not within the required range, the unit will not permit a calibration.

Calibration requires the following:

Simulator with simulator solution or dry gas cylinder

FC10 / FC20 mouthpiece

1. Place a mouthpiece onto the sample port.
2. Press the “Function” button repeatedly until “Calibration” is displayed then press the “Execute” button. “WET CHECK” will be displayed. Press the “Function” button until “WET CALIBRATE” is displayed if using simulator solution or” DRY CHECK” if using dry gas. If the value on the display and the simulator solution match, proceed to step 4.
3. Press the “Function” button until “CAL SETTINGS” is displayed, then press the “Execute” button. Adjust the value on the display to match the simulator solution by pressing the “+” or “-“ buttons. Press the “Function” button until “EXIT” is displayed then press the “Execute” button. Press the “Function” button until “WET CALIBRATE” or “DRY CALIBRATE” is displayed.
4. Connect unit to simulator or dry gas. Blow through simulator or depress the regulator button for 4 seconds and press the “Execute” button while still blowing. The microprocessor will analyze the output from the fuel cell and will automatically accept the number that was programmed in Step 3.
5. Remove the mouthpiece.
6. After a 3 minute wait, use a new mouthpiece to run a Calibration Check test with the same simulator solution or dry gas to confirm the calibration. It should read within ±0.005 of the target reading.

Mouthpieces

Mouthpieces for the FC10 / FC20 are packaged individually and are available through the manufacturer, LifeLoc Technologies Inc., 12441 West 49th Avenue Suite #4, Wheat Ridge, Colorado 80033, telephone is (800) 722-4872

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Appendix 1

DMT Data Review

Sample chamber:
Length = 54 cm
Volume = 23 ml
Temperature = 48°C

IR Source: Kanthal Infrared Source Lamp

Infrared wavelengths:
3.37 microns
3.44 microns
3.50 microns

Detector: Lead selenide element electronically cooled to ≈ 0°C.

Internal tubing: 3/8" ID

Reading updates: Infrared AC measurement is updated approximately four times a second.

Sample acceptance: A breath flow of 3 L/m is required to initiate volume measurement. 1.5 Liters of breath must be provided, the rate of change of alcohol concentration (slope) must stabilize, and the flow rate must drop below 3 L/m for the sample to be accepted as adequate.

Dry Gas: The control target will vary depending on the barometric pressure. The range of acceptable readings is ±0.008 from the control target printed on the test record. The DMT monitors the expiration date and will not allow a test to run if the cylinder has expired or is less than 25 psi.

.02 agreement calculation: Using all results, subtract the lowest reading from the highest reading. If the result is greater than .020, the test is not acceptable.

Reported Value: The reported value is obtained by truncating the third digit of the lowest reading of alcohol concentration from an accepted sample and is reported with the time from which it is derived. If the values are identical, the first result will be the basis for the reported value.

Test sequence:
1) **D**iagnostics
2) **A**ir blank
3) **B**reath sample (includes fuel cell reading when available and measurement of volume)
4) **A**ir blank
5) **C**ontrol (includes fuel cell reading when available)
6) **A**ir blank
7) **B**reath sample (includes fuel cell reading when available and measurement of volume)
8) **A**ir blank

Internal standard: A quartz plate is inserted into the IR light path during diagnostics. The absorbance is compared to the value obtained during adjustment. These values must be within 4%.

Printer:
Hewlett Packard P1606 DN

Physiological data:
Body temperature (normal): 37°C (98.6°F).

Average rate of alcohol elimination: 0.015 AC/hour

Alcohol Concentration or AC = grams of alcohol per:
210 liters of breath
100 mL of blood
67 mL of urine

Absorption – Alcohol is primarily absorbed in the small intestine.
Distribution – Alcohol distributes into body tissues and fluids according to their water content.
Elimination – Most alcohol is eliminated by the liver.

Observation period – Alcohol deprivation time of 15 minutes.
Mouth alcohol – Dissipates at an exponential rate and is no longer present within 15 minutes of last exposure to alcohol.

Widmark's Formula:
When using these formulas:
AC = alcohol concentration
W = body weight in pounds
R = Widmark's R factor
For Men R = 0.67
For women R = 0.55
E = volume of 100% ethyl alcohol in fluid ounces

$$E = \frac{W \times R \times (AC \div 100) \times 16}{0.8}$$

$$AC = \frac{E \times 0.8 \times 100}{W \times R \times 16}$$

To solve for fluid ounces of alcohol:

$$W \times R \times AC \div 100 \times 16 \div 0.8 = E$$

To solve for AC:

$$E \times 0.8 \times 100 \div W \div R \div 16 = AC$$

Conversion factors:
F° = (C°x 1.8) + 32
C° = (F°- 32) ÷ 1.8
% by volume x .8 (specific gravity of ETOH) = % by weight
Fluid ounces 100% ethanol ÷ % alcohol by volume of beverage = fluid ounces of beverage alcohol.
Fluid ounces of beverage alcohol x % alcohol of beverage = fluid ounces of 100% ethanol.
Proof (US) = 2 x % alcohol by volume
100 proof liquor = 50% alcohol by volume
80 proof liquor = 40% alcohol by volume
1 dL (deciliter) = 100 mL (milliliters)

Ethanol Basics:
Percent by volume is the most common way to measure alcohol.
Percent by weight is used mainly for taxation purposes and beer liquor control.
Fermentation produces ethanol when a sugar and yeast are mixed. (14% by volume)
Distillation purifies the fermented product. (up to 95% by volume)
Fortification is mixing fermented and distilled products. (0-95% by volume)

Appendix 2

Minnesota Counties by Number

#	NAME	#	NAME	#	NAME	#	NAME
01	Aitkin	23	Fillmore	44	Mahnomen	66	Rice
02	Anoka	24	Freeborn	45	Marshall	67	Rock
03	Becker	25	Goodhue	46	Martin	68	Roseau
04	Beltrami	26	Grant	47	Meeker	69	St. Louis
05	Benton	27	Hennepin	48	Mille Lacs	70	Scott
06	Big Stone	28	Houston	49	Morrison	71	Sherburne
07	Blue Earth	29	Hubbard	50	Mower	72	Sibley
08	Brown	30	Isanti	51	Murray	73	Stearns
09	Carlton	31	Itasca	52	Nicollet	74	Steele
10	Carver	32	Jackson	53	Nobles	75	Stevens
11	Cass	33	Kanabec	54	Norman	76	Swift
12	Chippewa	34	Kandiyohi	55	Olmsted	77	Todd
13	Chisago	35	Kittson	56	Ottertail	78	Traverse
14	Clay	36	Koochiching	57	Pennington	79	Wabasha
15	Clearwater	37	Lac Qui Parle	58	Pine	80	Wadena
16	Cook	38	Lake	59	Pipestone	81	Waseca
17	Cottonwood	39	Lake Of The Woods	60	Polk	82	Washington
18	Crow Wing			61	Pope	83	Watonwan
19	Dakota	40	Le Sueur	62	Ramsey	84	Wilkin
20	Dodge	41	Lincoln	63	Red Lake	85	Winona
21	Douglas	42	Lyon	64	Redwood	86	Wright
22	Faribault	43	McLeod	65	Renville	87	Yellow Medicine

State Abbreviations

AB	State	AB	State	AB	State	AB	State
AL	Alabama	KS	Kansas	NC	North Carolina	WY	Wyoming
AK	Alaska	KY	Kentucky	ND	North Dakota		
AZ	Arizona	LA	Louisiana	OH	Ohio	AB	Canadian Prov.
AR	Arkansas	ME	Maine	OK	Oklahoma	AB	Alberta
CA	California	MD	Maryland	OR	Oregon	BC	British Columbia
CO	Colorado	MA	Massachusetts	PA	Pennsylvania	MB	Manitoba
CT	Connecticut	MI	Michigan	RI	Rhode Island	NK	New Brunswick
DE	Delaware	MN	Minnesota	SC	South Carolina	NF	Newfoundland
DC	District of Columbia	MS	Mississippi	SD	South Dakota	NS	Nova Scotia
		MO	Missouri	TN	Tennessee	NT	Northwest Terr.
FL	Florida	MT	Montana	TX	Texas	ON	Ontario
GA	Georgia	NE	Nebraska	UT	Utah	PE	Prince Edward Is.
HI	Hawaii	NV	Nevada	VT	Vermont	PQ	Quebec
ID	Idaho	NH	New Hampshire	VA	Virginia	SK	Saskatchewan
IL	Illinois	NJ	New Jersey	WA	Washington	YT	Yukon
IN	Indiana	NM	New Mexico	WV	West Virginia		
IA	Iowa	NY	New York	WI	Wisconsin	NA	Not Available

Appendix 3

DMT testing locations

Aitkin County S.O.
Anoka County S.O. - Andover
Anoka County S.O.
Anoka Police Dept
Apple Valley Police Dept
Appleton Police Dept
Becker County S.O.
Belle Plaine Police Dept
Beltrami County L.E.C.
Benton County S.O.
Blaine Police Dept
Bloomington Police Dept
Blue Earth County L.E.C.
Bois Forte Police Dept. B.I.A.
Brainerd Police Dept
Breckenridge Police Dept
Breezy Point Police Dept
Brooklyn Center Police Dept
Brooklyn Park Police Dept
Brown County L.E.C.
Burnsville Police Dept
Canby Police Dept
Cannon Falls Police Dept
Carlton County S.O.
Carver County S.O.
Cass County L.E.C.
Centennial Lakes P.D.
Champlin Police Dept
Chatfield Police Dept
Chippewa County S.O.
Chisago County S.O.
Chisholm Police Dept
Clearwater County L.E.C.
Columbia Heights Police Dept
Cook County S.O.
Coon Rapids Police Dept
Corcoran Police Dept
Cottage Grove Police Dept
Cottonwood County L.E.C.
Crookston Police Dept
Crystal Police Dept
Dakota County S.O.
Deephaven Police Dept
Dodge County S.O.
Douglas County S.O.
Duluth Police Dept
Duluth Police Dept - West
Eagan Police Dept
East Grand Forks Police Dept
Eden Prairie Police Dept
Edina Police Dept
Elko New Market Police Dept
Ely Police Dept
Faribault County S.O.
Farmington Police Dept
Fergus Falls Police Dept
Fillmore County S.O.
Floodwood Police Dept
Forest Lake Police Dept
Freeborn County L.E.C.
Fridley Police Dept
Golden Valley Police Dept
Goodhue County S.O.
Grant County S.O.
Hawley Police Dept
Hennepin County S.O. - Brooklyn Park
Hennepin County S.O. - Water Patrol
Hermantown Police Dept
Hibbing Police Dept
Hopkins Police Dept
Houston County S.O.
Hoyt Lakes Police Dept
Hubbard County L.E.C.
Hutchinson Police Dept
International Airport P.D.
International Falls P.D.
Inver Grove Heights P.D.
Isanti County S.O.
Itasca County S.O.
Jackson County L.E.C.
Jordan Police Dept
Kanabec County S.O.
Kittson County S.O.
La Crescent Police Dept
Lac Qui Parle County S.O.
Lake City Police Dept
Lake County L.E.C.
Lake of the Woods County S.O.
Lakeville Police Dept
Le Sueur County S.O.
Le Sueur Police Dept
Lincoln County S.O.
Lindstrom Police Dept
Lino Lakes Police Dept
Mahnomen County S.O.
Maple Grove Police Dept
Maplewood Police Dept
Marshall County L.E.C.
Marshall Police Dept
Martin County L.E.C.
McLeod County S.O.
Medina Police Dept
Meeker County L.E.C.
Melrose Police Dept
Mendota Heights Police Dept
Mille Lacs County S.O.
Mille Lacs Tribal Police Dept
Minneapolis Police Dept
Minnetonka Police Dept
Minnetrista Police Dept
Moorhead Police Dept
Morrison County S.O.
Mound Police Dept
Mounds View Police Dept
Mower County L.E.C.
MSP Hennepin Co
MSP Mobile Command Unit
MSP Olmsted Co
MSP Ramsey Co
Murray County L.E.C.
New Brighton Police Dept
New Hope Police Dept
New Prague Police Dept
Nicollet County S.O.
Nobles County L.E.C.
Norman County S.O.

North Mankato Police Dept
Northfield Police Dept
Olmsted County S.O.
Orono Police Dept
Ortonville Police Dept
Osseo Police Dept
Ottertail Co S.O. - Ottertail
Paynesville Police Dept
Pelican Rapids Police Dept
Pennington County L.E.C.
Perham Police Dept
Pine County S.O.
Pipestone County L.E.C.
Plainview Police Dept
Plymouth Police Dept
Polk County S.O. - Fosston
Pope County S.O.
Princeton Police Dept
Prior Lake Police Dept
Ramsey County S.O.
Ramsey Police Dept
Red Lake Agency
Red Lake County S.O.
Redwood County L.E.C.
Renville County S.O.
Rice County S.O.
Richfield Police Dept
Robbinsdale Police Dept
Rock County S.O.
Rogers Police Dept
Roseau County S.O.
Rosemount Police Dept
Roseville Police Dept
Sartell Police Dept
Sauk Centre Police Dept
Sauk Rapids Police Dept
Savage Police Dept
Scott County S.O.
Shakopee Police Dept
Sherburne County S.O.
Sibley County S.O.
Silver Bay Police Dept
South Lake Minnetonka P.D.
South St. Paul Police Dept
Spring Lake Park Police Dept
St. Anthony Police Dept
St. Cloud Police Dept
St. Francis Police Dept
St. Louis County S.O. - Duluth
St. Louis County S.O. - Virginia
St. Louis Park Police Dept
St. Paul Police Dept
Staples Police Dept
Steele County S.O.
Stevens County S.O.
Swift County S.O.
Todd County S.O.
Traverse County S.O.
U of M Police Dept - Twin Cities
Wabasha County S.O.
Wadena County S.O.
Waite Park Police Dept
Waseca County S.O.
Washington County S.O.
Watonwan County S.O.
Wayzata Police Dept
West Hennepin P.S.D.
West St. Paul Police Dept
White Bear Lake Police Dept
Willmar Police Dept
Winona County L.E.C.
Woodbury Police Dept
Wright County L.E.C.
Yellow Medicine County S.O.
Zumbrota Police Dept

Replacement units available at these locations:

BCA Laboratory – St. Paul
BCA Laboratory - Bemidji
MSP 2100 Rochester
MSP 2200 Mankato
MSP 2300 Marshall
MSP 2600 St. Cloud
MSP 2700 Duluth
MSP 2800 Brainerd
MSP 2900 Detroit Lakes
MSP 3100 Virginia
MSP 3200 Thief River Falls

Appendix 4

Breath Volume Tables – General Information

The following tables were derived from Title 29 Chapter XVII Part 1910.1043 Appendix C of the Code of Federal Regulations (CFR).

The Code of Federal Regulations carries the following note:

> **"LEGAL STATUS**
> The contents of the Federal Register are required to be judicially noticed (44 U.S.C. 1507). The Code of Federal Regulations is prima facie evidence of the text of the original documents (44 U.S.C. 1510)."

Tables 1 and 2 on pages 127 and 128 list average predicted Forced Vital Capacity (FVC) data for male and female subjects, respectively. The FVC is the total volume of air expired after a full inspiration.

The average predicted FVC values for African Americans must be multiplied by 0.85 to account for ethnic differences. {See 29CFR1910.1043 (i) (2) (iii)}.

Here is an example of using the tables:

A 53-year-old, 5’9” tall male provides a sample of 3.12 liters of air. This would be 71% of his average predicted FVC of 4.40 liters (3.12 ÷ 4.40 x 100 = 71%).

Table 1 Forced Vital Capacity (FVC) for Males

Age	Height 5'0" 60"	5'1" 61"	5'2" 62"	5'3" 63"	5'4" 64"	5'5" 65"	5'6" 66"	5'7" 67"	5'8" 68"	5'9" 69"	5'10" 70"	5'11" 71"	6'0" 72"	6'1" 73"	6'2" 74"	6'3" 75"	6'4" 76"	6'5" 77"	6'6" 78"	6'7" 79"	6'8" 80"	6'9" 81"	6'10" 82"	6'11' 83"	7'0" 84"
17	3.44	3.56	3.69	3.82	3.95	4.07	4.20	4.33	4.45	4.58	4.71	4.83	4.96	5.09	5.22	5.34	5.47	5.60	5.72	5.85	5.98	6.10	6.23	6.36	6.49
19	3.59	3.72	3.85	3.97	4.10	4.23	4.36	4.48	4.61	4.74	4.86	4.99	5.12	5.24	5.37	5.50	5.63	5.75	5.88	6.01	6.13	6.26	6.39	6.51	6.64
21	3.75	3.88	4.00	4.13	4.26	4.39	4.51	4.64	4.77	4.89	5.02	5.15	5.27	5.40	5.53	5.65	5.78	5.91	6.04	6.16	6.29	6.42	6.54	6.67	6.80
23	3.91	4.03	4.16	4.29	4.41	4.54	4.67	4.80	4.92	5.05	5.18	5.30	5.43	5.56	5.68	5.81	5.94	6.06	6.19	6.32	6.45	6.57	6.70	6.83	6.95
25	3.72	3.89	4.05	4.22	4.38	4.55	4.71	4.88	5.04	5.21	5.37	5.54	5.70	5.87	6.03	6.20	6.36	6.53	6.69	6.86	7.02	7.19	7.35	7.52	7.68
27	3.66	3.83	3.99	4.16	4.32	4.49	4.65	4.82	4.98	5.15	5.32	5.48	5.65	5.81	5.98	6.14	6.31	6.47	6.64	6.80	6.97	7.13	7.30	7.46	7.63
29	3.61	3.77	3.94	4.10	4.27	4.43	4.60	4.76	4.93	5.09	5.26	5.42	5.59	5.75	5.92	6.08	6.25	6.41	6.58	6.74	6.91	7.07	7.24	7.40	7.57
31	3.55	3.71	3.88	4.04	4.21	4.37	4.54	4.70	4.87	5.03	5.20	5.36	5.53	5.69	5.86	6.02	6.19	6.35	6.52	6.68	6.85	7.02	7.18	7.35	7.51
33	3.49	3.66	3.82	3.99	4.15	4.32	4.48	4.65	4.81	4.98	5.14	5.31	5.47	5.64	5.80	5.97	6.13	6.30	6.46	6.63	6.79	6.96	7.12	7.29	7.45
35	3.43	3.60	3.76	3.93	4.09	4.26	4.42	4.59	4.75	4.92	5.08	5.25	5.41	5.58	5.74	5.91	6.07	6.24	6.40	6.57	6.73	6.90	7.06	7.23	7.39
37	3.37	3.54	3.70	3.87	4.03	4.20	4.36	4.53	4.69	4.86	5.02	5.19	5.36	5.52	5.69	5.85	6.02	6.18	6.35	6.51	6.68	6.84	7.01	7.17	7.34
39	3.32	3.48	3.65	3.81	3.98	4.14	4.31	4.47	4.64	4.80	4.97	5.13	5.30	5.46	5.63	5.79	5.96	6.12	6.29	6.45	6.62	6.78	6.95	7.11	7.28
41	3.26	3.42	3.59	3.75	3.92	4.08	4.25	4.41	4.58	4.74	4.91	5.07	5.24	5.40	5.57	5.73	5.90	6.06	6.23	6.39	6.56	6.73	6.89	7.06	7.22
43	3.20	3.37	3.53	3.70	3.86	4.03	4.19	4.36	4.52	4.69	4.85	5.02	5.18	5.35	5.51	5.68	5.84	6.01	6.17	6.34	6.50	6.67	6.83	7.00	7.16
45	3.14	3.31	3.47	3.64	3.80	3.97	4.13	4.30	4.46	4.63	4.79	4.96	5.12	5.29	5.45	5.62	5.78	5.95	6.11	6.28	6.44	6.61	6.77	6.94	7.10
47	3.08	3.25	3.41	3.58	3.74	3.91	4.07	4.24	4.40	4.57	4.74	4.90	5.07	5.23	5.40	5.56	5.73	5.89	6.06	6.22	6.39	6.55	6.72	6.88	7.05
49	3.03	3.19	3.36	3.52	3.69	3.85	4.02	4.18	4.35	4.51	4.68	4.84	5.01	5.17	5.34	5.50	5.67	5.83	6.00	6.16	6.33	6.49	6.66	6.82	6.99
51	2.97	3.13	3.30	3.46	3.63	3.79	3.96	4.12	4.29	4.45	4.62	4.78	4.95	5.11	5.28	5.44	5.61	5.77	5.94	6.10	6.27	6.44	6.60	6.77	6.93
53	2.91	3.08	3.24	3.41	3.57	3.74	3.90	4.07	4.23	4.40	4.56	4.73	4.89	5.06	5.22	5.39	5.55	5.72	5.88	6.05	6.21	6.38	6.54	6.71	6.87
55	2.85	3.02	3.18	3.35	3.51	3.68	3.84	4.01	4.17	4.34	4.50	4.67	4.83	5.00	5.16	5.33	5.49	5.66	5.82	5.99	6.15	6.32	6.48	6.65	6.81
57	2.79	2.96	3.12	3.29	3.45	3.62	3.78	3.95	4.11	4.28	4.44	4.61	4.78	4.94	5.11	5.27	5.44	5.60	5.77	5.93	6.10	6.26	6.43	6.59	6.76
59	2.74	2.90	3.07	3.23	3.40	3.56	3.73	3.89	4.06	4.22	4.39	4.55	4.72	4.88	5.05	5.21	5.38	5.54	5.71	5.87	6.04	6.20	6.37	6.53	6.70
61	2.68	2.84	3.01	3.17	3.34	3.50	3.67	3.83	4.00	4.16	4.33	4.49	4.66	4.82	4.99	5.15	5.32	5.48	5.65	5.81	5.98	6.15	6.31	6.48	6.64
63	2.62	2.79	2.95	3.12	3.28	3.45	3.61	3.78	3.94	4.11	4.27	4.44	4.60	4.77	4.93	5.10	5.26	5.43	5.59	5.76	5.92	6.09	6.25	6.42	6.58
65	2.56	2.73	2.89	3.06	3.22	3.39	3.55	3.72	3.88	4.05	4.21	4.38	4.54	4.71	4.87	5.04	5.20	5.37	5.53	5.70	5.86	6.03	6.19	6.36	6.52

Table 2 Forced Vital Capacity (FVC) for Females

Age	Height 4'4" 52"	4'5" 53"	4'6" 54"	4'7" 55"	4'8" 56"	4'9" 57"	4'10" 58"	4'11" 59"	5'0" 60"	5'1" 61"	5'2" 62"	5'3" 63"	5'4" 64"	5'5" 65"	5'6" 66"	5'7" 67"	5'8" 68"	5'9" 69"	5'10" 70"	5'11" 71"	6'0" 72"	6'1" 73"	6'2" 74"	6'3" 75"	6'4" 76"
17	2.45	2.54	2.62	2.71	2.79	2.87	2.96	3.04	3.12	3.21	3.29	3.38	3.46	3.54	3.63	3.71	3.79	3.88	3.96	4.05	4.13	4.21	4.30	4.38	4.47
19	2.64	2.72	2.81	2.89	2.97	3.06	3.14	3.22	3.31	3.39	3.48	3.56	3.64	3.73	3.81	3.89	3.98	4.06	4.15	4.23	4.31	4.40	4.48	4.57	4.65
21	2.65	2.74	2.84	2.93	3.03	3.12	3.21	3.31	3.40	3.50	3.59	3.68	3.78	3.87	3.97	4.06	4.15	4.25	4.34	4.44	4.53	4.62	4.72	4.81	4.91
23	2.61	2.70	2.79	2.89	2.98	3.08	3.17	3.26	3.36	3.45	3.55	3.64	3.73	3.83	3.92	4.02	4.11	4.20	4.30	4.39	4.49	4.58	4.67	4.77	4.86
25	2.56	2.66	2.75	2.84	2.94	3.03	3.13	3.22	3.31	3.41	3.50	3.60	3.69	3.78	3.88	3.97	4.07	4.16	4.25	4.35	4.44	4.54	4.63	4.72	4.82
27	2.52	2.61	2.71	2.80	2.89	2.99	3.08	3.18	3.27	3.36	3.46	3.55	3.65	3.74	3.83	3.93	4.02	4.12	4.21	4.30	4.40	4.49	4.59	4.68	4.77
29	2.47	2.57	2.66	2.76	2.85	2.94	3.04	3.13	3.23	3.32	3.41	3.51	3.60	3.70	3.79	3.88	3.98	4.07	4.17	4.26	4.35	4.45	4.54	4.64	4.73
31	2.43	2.52	2.62	2.71	2.81	2.90	2.99	3.09	3.18	3.28	3.37	3.46	3.56	3.65	3.75	3.84	3.93	4.03	4.12	4.22	4.31	4.40	4.50	4.59	4.69
33	2.39	2.48	2.57	2.67	2.76	2.86	2.95	3.04	3.14	3.23	3.33	3.42	3.51	3.61	3.70	3.80	3.89	3.98	4.08	4.17	4.27	4.36	4.45	4.55	4.64
35	2.34	2.44	2.53	2.62	2.72	2.81	2.91	3.00	3.09	3.19	3.28	3.38	3.47	3.56	3.66	3.75	3.85	3.94	4.03	4.13	4.22	4.32	4.41	4.50	4.60
37	2.30	2.39	2.49	2.58	2.67	2.77	2.86	2.96	3.05	3.14	3.24	3.33	3.43	3.52	3.61	3.71	3.80	3.90	3.99	4.08	4.18	4.27	4.37	4.46	4.55
39	2.25	2.35	2.44	2.54	2.63	2.72	2.82	2.91	3.01	3.10	3.19	3.29	3.38	3.48	3.57	3.66	3.76	3.85	3.95	4.04	4.13	4.23	4.32	4.42	4.51
41	2.21	2.30	2.40	2.49	2.59	2.68	2.77	2.87	2.96	3.06	3.15	3.24	3.34	3.43	3.53	3.62	3.71	3.81	3.90	4.00	4.09	4.18	4.28	4.37	4.47
43	2.17	2.26	2.35	2.45	2.54	2.64	2.73	2.82	2.92	3.01	3.11	3.20	3.29	3.39	3.48	3.58	3.67	3.76	3.86	3.95	4.05	4.14	4.23	4.33	4.42
45	2.12	2.22	2.31	2.40	2.50	2.59	2.69	2.78	2.87	2.97	3.06	3.16	3.25	3.34	3.44	3.53	3.63	3.72	3.81	3.91	4.00	4.10	4.19	4.28	4.38
47	2.08	2.17	2.27	2.36	2.45	2.55	2.64	2.74	2.83	2.92	3.02	3.11	3.21	3.30	3.39	3.49	3.58	3.68	3.77	3.86	3.96	4.05	4.15	4.24	4.33
49	2.03	2.13	2.22	2.32	2.41	2.50	2.60	2.69	2.79	2.88	2.97	3.07	3.16	3.26	3.35	3.44	3.54	3.63	3.73	3.82	3.91	4.01	4.10	4.20	4.29
51	1.99	2.08	2.18	2.27	2.37	2.46	2.55	2.65	2.74	2.84	2.93	3.02	3.12	3.21	3.31	3.40	3.49	3.59	3.68	3.78	3.87	3.96	4.06	4.15	4.25
53	1.95	2.04	2.13	2.23	2.32	2.42	2.51	2.60	2.70	2.79	2.89	2.98	3.07	3.17	3.26	3.36	3.45	3.54	3.64	3.73	3.83	3.92	4.01	4.11	4.20
55	1.90	2.00	2.09	2.18	2.28	2.37	2.47	2.56	2.65	2.75	2.84	2.94	3.03	3.12	3.22	3.31	3.41	3.50	3.59	3.69	3.78	3.88	3.97	4.06	4.16
57	1.86	1.95	2.05	2.14	2.23	2.33	2.42	2.52	2.61	2.70	2.80	2.89	2.99	3.08	3.17	3.27	3.36	3.46	3.55	3.64	3.74	3.83	3.93	4.02	4.11
59	1.81	1.91	2.00	2.10	2.19	2.28	2.38	2.47	2.57	2.66	2.75	2.85	2.94	3.04	3.13	3.22	3.32	3.41	3.51	3.60	3.69	3.79	3.88	3.98	4.07
61	1.77	1.86	1.96	2.05	2.15	2.24	2.33	2.43	2.52	2.62	2.71	2.80	2.90	2.99	3.09	3.18	3.27	3.37	3.46	3.56	3.65	3.74	3.84	3.93	4.03
63	1.73	1.82	1.91	2.01	2.10	2.20	2.29	2.38	2.48	2.57	2.67	2.76	2.85	2.95	3.04	3.14	3.23	3.32	3.42	3.51	3.61	3.70	3.79	3.89	3.98
65	1.68	1.78	1.87	1.96	2.06	2.15	2.25	2.34	2.43	2.53	2.62	2.72	2.81	2.90	3.00	3.09	3.19	3.28	3.37	3.47	3.56	3.66	3.75	3.84	3.94

Appendix 5

Commissioner's Order

MINNESOTA DEPARTMENT OF PUBLIC SAFETY

Office of the Commissioner
445 Minnesota Street • Suite 1000 • Saint Paul, Minnesota 55101
Phone: 651.201.7160 • Fax: 651.297.5728 • TTY: 651.282.6555
Website: dps.mn.gov

Alcohol and Gambling Enforcement
Bureau of Criminal Apprehension
Driver and Vehicle Services
Emergency Communication Networks
Homeland Security and Emergency Management
Minnesota State Patrol
Office of Communications
Office of Justice Programs
Office of Pipeline Safety
Office of Traffic Safety
State Fire Marshal

COMMISSIONER'S ORDER

NO. 2012-1

Pursuant to the provisions of Minnesota Statutes Section 169A.03 subdivision 11 and MN Rule 7502.0425 subparts 2 and 3, the Datamaster DMT-G which uses infrared technology and optionally, fuel cell technology, is approved for use in this state for the purpose of determining the alcohol concentration of a breath sample.

Dated May 23, 2012

Ramona L. Dohman, Commissioner

Department of Public Safety

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Certificate of Procedure and Software Approval

MINNESOTA DEPARTMENT OF PUBLIC SAFETY

Bureau of Criminal Apprehension Forensic Science Service

St. Paul Facility
1430 Maryland Avenue East, St. Paul, Minnesota 55106
Phone: (651) 793-2900 FAX: (651) 793-2901 TTY: (651) 282-6555

Bemidji Facility
3700 North Norris Court NW, Bemidji, Minnesota 56601
Phone: (218) 755-6600 FAX: (218) 755-6623

Website: http://bca.dps.mn.gov

Alcohol & Gambling Enforcement

Bureau of Criminal Apprehension

Driver and Vehicle Services

Emergency Communication Networks

Homeland Security and Emergency Management

Minnesota State Patrol

Office of Communications

Office of Justice Programs

Office of Traffic Safety

State Fire Marshal and Pipeline Safety

CERTIFICATE OF PROCEDURE AND SOFTWARE APPROVAL

Pursuant to MS 169A.75 and MN Rule 7502.0410 subpart 1, the following procedure is approved and certified to be valid and reliable for the analysis of breath samples using Datamaster DMT-G with fuel cell option breath testing instruments:

1. Diagnostics
2. Air Blank
3. Subject Sample
4. Air Blank
5. Control
6. Air Blank
7. Subject Sample
8. Air Blank

Pursuant to MN Rule 7502.0410 subpart 2, the following software is approved and certified to be valid and reliable for the analysis of breath samples using Datamaster DMT-G with fuel cell option breath testing instruments:

208.206.205

Frank C. Dolejsi

Director

ANTHONY J. PETRACCA
Notary Public
Minnesota
My Commission Expires January 31, 2016

5/22/12

EQUAL OPPORTUNITY EMPLOYER

Appendix 6

DMT Troubleshooting

Lock-up - Keyboard

Unplug keyboard USB then plug it in again. Check keyboard for functionality. If it still does not respond, turn off DMT. Unplug printer and keyboard USB from back of DMT. After DMT has been off for about 10 seconds, turn it back on. After the DMT has rebooted, plug in the keyboard (black) USB cable. Press the Num Lock key on the keyboard and verify the light above the key turns on. If not, start the process over from the beginning. If the light above the Num Lock key turns on, plug in the Printer (white) USB cable. If the keyboard locked at any time during the test and the DMT had to be restarted the test is lost and must be rerun. Wait until the five-minute warm up period is complete and begin the test again.

Lock-up – Printer

Turn off DMT. Unplug printer and keyboard USB from back of DMT. After DMT has been off for about 10 seconds, turn it back on. After the DMT has rebooted, plug in the keyboard (black) USB cable. Press the Num Lock key on the keyboard and verify the light above the key turns on. If not, start the process over from the beginning. If the light above the Num Lock key turns on, plug in the Printer (white) USB cable. Press the “Copy” button on the front of the DMT to verify the printer is responding properly. After the five-minute warm up period is complete the DMT will be ready to begin a test.

Screen Freeze

Unplug keyboard USB then plug it in again. Check keyboard for functionality. If it does not respond, turn off DMT. Unplug printer and keyboard USB from back of DMT. After DMT has been off for about 10 seconds, turn it back on. After the DMT has rebooted, plug in the keyboard (black) USB cable. Press the Num Lock key on the keyboard and verify the light above the key turns on. If not, start the process over from the beginning. If the light above the Num Lock key turns on, plug in the Printer (white) USB cable. If the screen froze at any time during the test and the DMT had to be restarted the test is lost and must be rerun. Wait until the five-minute warm up period is complete and begin the test again.

Status Codes (Messages)

Refer to the Definitions Chapter of this manual or the flip chart attached to the front of the DMT. Follow directions under “Response”. If the message is not listed, begin another test. If you receive the same message on the second test, offer the subject a blood or urine test and call 651-793-2777 during normal business hours.

For any problem that cannot be readily resolved, offer the subject a blood or urine test and call 651-793-2777 during normal business hours.

Appendix 7

Importing DMT results into eCharging

The BCA's DWI eCharging program and the breath testing database are integrated, allowing officers to import the subject's breath test or lab results during the eCharging process.

When the peace officer imports the test results the applicable data fields are automatically populated and a PDF copy of the DMT Test Record (or the BCA Lab Report) is attached to the eCharging event, relieving records staff from having to manually attach those important supporting documents.

One to two minutes after a DMT test record begins to print, the breath test results become available to eCharging. On the eCharging Incident Details page, the officer simply clicks "Get Breath Test Results" (Figure 1). The DMT tests run under that agency's ORI since the date of arrest are displayed. SELECT and IMPORT the test result and record (Figure 2).

DMT operators must remember that the breath testing database and eCharging are linked by the ARRESTING AGENCY ORI. The DMT operator must accurately enter the arresting agency's ORI into the DMT during data entry. If the ORI is not accurately entered, the systems will not link and the test data will not be available to the eCharging user.

- Should that happen, the arresting officer simply needs to enter the alcohol concentration, date and time of the test sample and first and last name of the breath test operator.

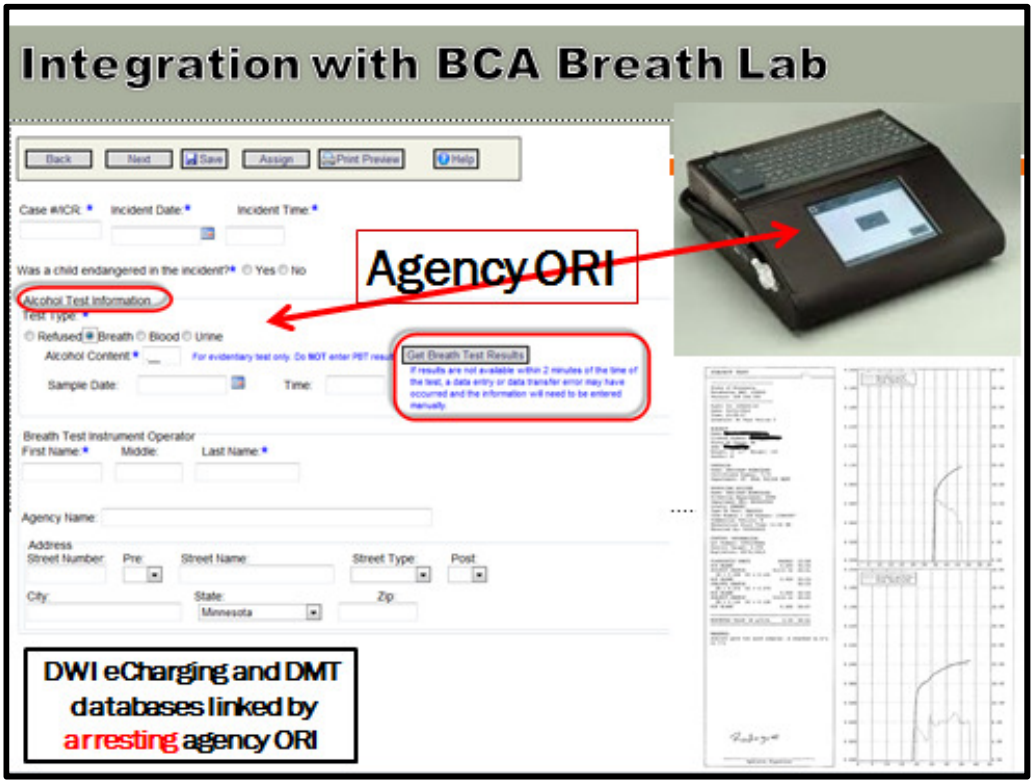

Figure 1

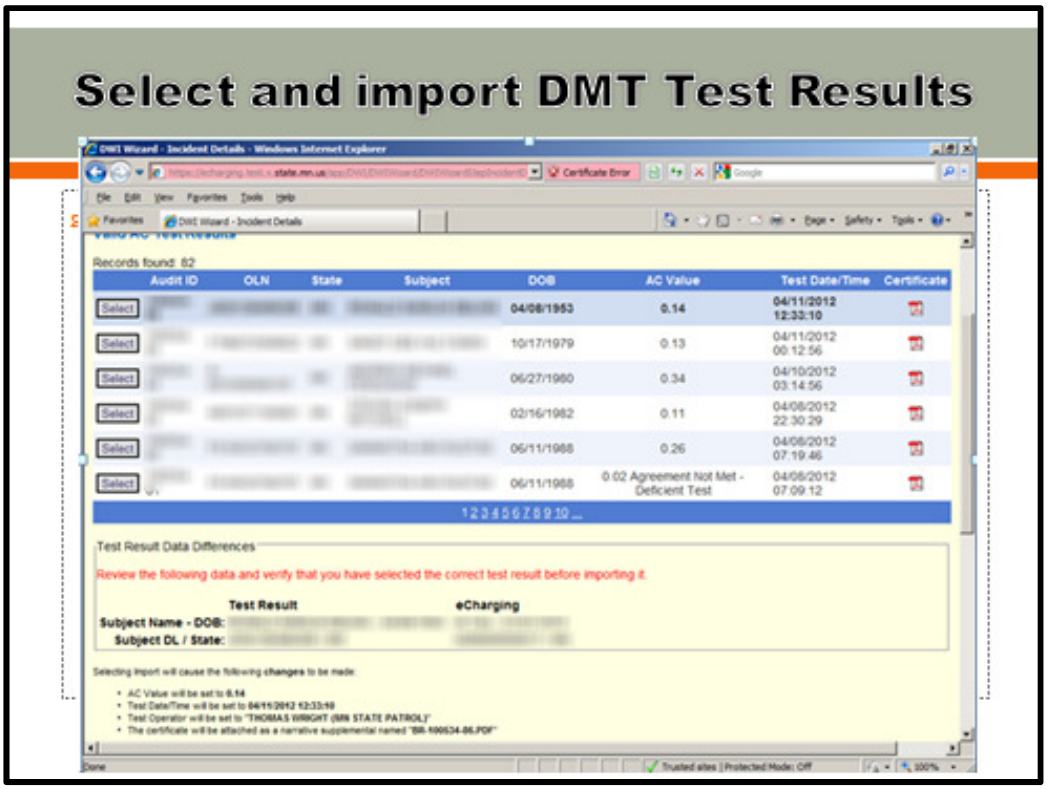
Select and import DMT Test Results
Records found: 82
Audit ID
OLN
State
Subject
DOB
AC Value
Test Date/Time
Certificate
Select
04/08/1953
0.14
04/11/2012 12:33:10
10/17/1979
0.13
04/11/2012 00:12:56
06/27/1960
0.34
04/10/2012 03:14:56
02/16/1982
0.11
04/08/2012 22:30:29
06/11/1988
0.26
04/08/2012 07:19:46
06/11/1988
0.02 Agreement Not Met - Deficient Test
04/08/2012 07:09:12
1 2 3 4 5 6 7 8 9 10 ...
Test Result Data Differences
Review the following data and verify that you have selected the correct test result before importing it.
Test Result
eCharging
Subject Name - DOB:
Subject DL / State:
Selecting Import will cause the following changes to be made:

Figure 2

Appendix 8

References and Additional Reading

Baselt, RC. Disposition of Toxic Drugs and Chemicals in Man, seventh edition. Foster City, California: Biomedical Publications, 2004.

Couper, FJ and Logan, BK. Drugs and human performance fact sheets. DOT HS 809 725. U.S. Department of Commerce, National Technical Information Service, Springfield, Virginia, 22161, 2004.

Garriott, JC (editor). Medical-Legal Aspects of Alcohol, fifth edition. Tucson, Arizona: Lawyers and Judges Publishing, 2008.

Levine, B (editor). Principles of Forensic Toxicology, second edition. Washington, DC: AACC Press, 2003.

Moskowitz, H. and Fiorentino, D. A review of the literature on the effects of low doses of alcohol on driving-related skills. Herbert Moskowitz, PhD, Incorporated, DOT HS 809 028, U.S. Department of Commerce, National Technical Information Service, Springfield, Virginia, 22161, 2000.

National Patent Analytical Systems, Inc. Product Overview DMT, 2010

Appendix 9

This information is provided as a convenience to agencies using breath testing equipment and is not a directive to do business with these particular companies. The prices listed may change; check before you order.

Mouthpieces for the DMT

CMI, Inc.
316 E. Ninth St.
Owensboro, KY 42301
☎(800)835-0690 Fax (502)685-6268

Mouthpieces for PBTs

CMI, Inc. (SD-2 & Alco-Sensor III)
316 E. Ninth St.
Owensboro, KY 42301
☎(800)835-0690 Fax (502)685-6268

Intoximeters (SD-2, Alco-Sensor III, IV & FST)
8110 Lacklund Road
St. Louis, MO 63114
☎(800)451-8639 Fax (314)429-4170

LifeLoc. (FC-10 & FC-20)
12441 West 49th Avenue Unit #4
Wheatridge, CO 80033
☎(800)722-4872 Fax (303)431-1423

Toner Cartridges for the Printer

HP printers use an HP CE278A toner cartridge. These cartridges are available from most office supply retailers.

Dry Gas Cylinders and Regulators

CMI, Inc	1-800-835-0690	Contract #:	443600
Dry-Gas – 105 Liter	$79.00		
Dry-Gas tank regulator	$90.00		
Intoximeters	1-800-451-8639	Contract #:	443601
PBT Dry-Gas – 108 Liter (C)	$105.00		
DMT Dry-Gas – 108 Liter (U)	$105.00		
Dry-Gas tank regulator	$94.00		
Dry Gas Cylinder Draining Tool (works best with Intoximeters tanks)	$34.50		
LifeLoc Technologies, Inc.	1-800-722-4872	Contract #:	443607
Dry-Gas – 105 Liter	$123.00		
Dry-Gas tank regulator	$109.00		