

STATE OF ALASKA
DEPARTMENT OF PUBLIC SAFETY
SCIENTIFIC CRIME DETECTION LABORATORY

BREATH ALCOHOL TESTING PROGRAM MANUAL

DataMaster DMT



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INTRODUCTION

This manual is intended for use as a training guide for Alaska breath test operators of the approved evidential breath test instrument. It is not a comprehensive procedure manual for impaired driving and DUI processing. Officers should use this to supplement their agencies' policies and procedures. If there are additional questions officers should contact the breath alcohol section at the Alaska Scientific Crime Detection Laboratory (crime lab).

The breath test program is part of the crime lab. The section includes the scientific director of the breath and blood alcohol testing program and the forensic scientists and technicians. The duties of the breath test program include: breath test instrument certification, calibration and maintenance; administration of records; training and court testimony. One responsibility of the breath alcohol section is to train the breath test supervisors. This is accomplished by providing certification and recertification courses at the crime lab. In turn the breath test supervisors are responsible for training the breath test operators in their area.

The following information is taken from the Alaska Criminal and Traffic Law Manual:

13 AAC 63.050. Breath test operator certification

(a) To be certified as an operator of a breath test instrument, an applicant must successfully complete a course of instruction approved by the scientific director. The course must include at least eight hours of instruction in the theory of alcohol physiology, toxicology, pharmacology, instrument maintenance, practical operation, and administrative procedures. The applicant must also obtain a score of 75 percent or higher on a written examination, approved by the scientific director, covering the content of the course.

(b) The scientific director will, in his or her discretion, issue an operator certificate and operator identification number to an applicant upon receipt of written notice from a supervisor that the applicant has successfully completed a course of training and examination that meets the requirements of this section. An operator certificate expires three years after the date issued.

13 AAC 63.060. Breath test operator recertification

(a) To renew a breath test operator's certification, a breath test operator must, during the period of the operator's current certification,

(1) complete a refresher course approved by the scientific director that includes at least four hours of instruction and training; and

(2) obtain a score of 75 percent or higher on a written examination, approved by the scientific director, covering the content of the refresher course.

(b) The breath test supervisor shall submit a written notice to the scientific director that an operator seeking to renew a breath test operator's certificate has complied with the

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requirements of (a) of this section. Upon receipt of the notice, the scientific director shall renew the breath test operator certificate and operator identification number.

(c) A breath test operator certificate that has been renewed under this section expires three years after the date issued.

13 AAC 63.070. Breath test supervisor certification and duties

(a) To be certified as a breath test supervisor, an applicant must

(1) complete a 40-hour supervisor training course approved by the scientific director; the course must include instruction in the theory of alcohol physiology, pharmacology, toxicology, instrument function, instrument maintenance, practical operation, administrative procedures, legal considerations, and other pertinent subjects as required by the scientific director;

(2) possess a valid instructor's certificate issued by the Alaska Police Standards Council under 13 AAC 87.040; and

(3) obtain a score of 75 percent or higher on a written examination, approved by the scientific director, covering the content of the training course.

(b) The scientific director shall issue a breath test supervisor certificate and an identification number to an applicant if the applicant has met the requirements of (a) of this section. A breath test supervisor certificate expires at 11:59 p.m. on December 31 of the third year after the year issued.

(c) In addition to performing all the duties of an operator, a breath test supervisor may train breath test operators and perform routine maintenance on a breath test instrument. A supervisor certificate is also an operator's certificate.

(d) A breath test supervisor shall inform the scientific director of the location of breath test instruments and the status of breath test operators under the breath test supervisor's supervision.

13 AAC 63.080. Breath test supervisor recertification

(a) To renew a breath test supervisor's certification, a supervisor must, during the period of the supervisor's current certification,

(1) complete a refresher course approved by the scientific director that includes at least 15 hours of instruction and training; and

(2) obtain a score of 75 percent or higher on a written examination, approved by the scientific director, covering the content of the refresher course.

(b) If the breath test supervisor has met the requirements of (a) of this section, that supervisor may request in writing a renewed certificate from the scientific director. Upon receipt of the request, the scientific director shall renew the certificate.

(c) A breath test supervisor certificate that is renewed under this section expires at 11:59 p.m. on December 31 of the third year after the year issued.

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BREATH TEST INSTRUMENT ASSIGNMENT TO AGENCIES

Evidential breath test instruments are the property of the State of Alaska. Exceptions exist where agencies have purchased instruments independently. The state-owned instruments are entrusted to the responsible care and use by the assigned agency. Breath test supervisors are responsible for the day-to-day operation and upkeep of these instruments and are accountable for problems arising from neglect and/or misuse of the instruments.

Evidential breath instruments are placed at law enforcement and other locations by the scientific director. The crime lab will supply and maintain breath test instruments at the designated location. The crime lab reserves the right to remove an instrument from a location.

Note: Agencies are expected to:

- Properly maintain and operate the instrument.
- Communicate with the crime lab.
- Have a breath test supervisor at the breath test instrument location.

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ETHANOL

ETHANOL BEVERAGE AND CHEMICAL PROPERTIES

The chemical formula for ethanol (ethyl alcohol) is $\text{CH}_3\text{CH}_2\text{OH}$. Ethanol is a simple molecule containing carbon, hydrogen and oxygen atoms.

Ethanol in its purest state:
is a colorless liquid.
is infinitely soluble in water.
is a volatile substance.
is slightly less dense than water.

Alcohol can be produced naturally through the process of fermentation or synthetically through chemical means.

Beer usually contains approximately 4% to 6% ethanol by volume. Wine usually contains approximately 8% and 12% ethanol by volume. Beer and wine are produced by allowing yeast to act on a mixture of grains and water (beer) or fruit and water (wine). Distilled spirits usually contain approximately 40% to 50% ethanol by volume and are produced by concentrating ethanol generated from the products of fermentation.

In the United States the ethanol concentration of distilled beverages is shown by the proof system. The proof of an alcoholic beverage is equal to twice the ethanol concentration. For example: 100-proof whiskey contains 50% ethanol by volume. Pure ethanol would be 200-proof because it is 100% ethanol.

A "standard drink" is defined as:
½ oz pure ethanol.
1 12 oz American beer.
1 to 1½ oz of 80 to 100 proof distilled spirits.
4 to 6 oz of table wine.

ETHANOL ABSORPTION

Ethanol can enter the human body in several different manners: ingestion, injection, inhalation, and skin absorption. Ingestion is the most common method for ethanol to enter the body. Ethanol is absorbed into the blood stream by contact with and diffusion through mucous membranes. The mouth, throat, and the entire gastrointestinal tract are all common sites of alcohol absorption.

Once the alcoholic beverage enters the oral cavity absorption begins immediately. The amount of ethanol absorbed in the mouth is generally insignificant due to the short amount of time that the alcohol is held in the mouth. Absorption continues as the beverage passes into the stomach. When the alcoholic beverage reaches the stomach approximately 10-20 % of the ethanol is absorbed through the stomach lining directly

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into the blood stream. The pyloric sphincter will allow the stomach contents to pass into the small intestine where approximately 80 % of the alcohol is absorbed into the blood stream. The small intestine is the site of the most rapid absorption of ethanol due to its large membrane surface area and rich blood supply.

The rate of gastric emptying is the most important factor regulating the rate of absorption of ethanol. The amount of food in the stomach is the primary factor in determining gastric emptying; however, there are many other factors that can play a minor role. In general the majority of absorption has occurred within the first sixty minutes post consumption (Garriott, 2003).

ETHANOL DISTRIBUTION

Once the ethanol has been absorbed into the blood from the digestive system it is transported throughout the body. Because ethanol is physically inseparable from water it travels throughout the body to all of the tissues containing water. The final concentration of ethanol in the various tissues depends on the tissue water content.

Body water content varies according to sex. Since the concentration of alcohol is directly proportional to the body water content the concentration varies according to lean body weight. Women have a proportionally larger amount of adipose (fat) tissue than men and therefore have less water content. The tissue water content can also vary from one individual to another. An obese person has less water per pound of body weight than an emaciated person because adipose tissue has very low water content. Based on these factors women and individuals with a higher proportion of adipose tissue will have a higher blood ethanol level than men and individuals with lean body mass after consuming the same amount of ethanol.

ETHANOL ELIMINATION

Ethanol is removed or eliminated from the body via metabolism, excretion and evaporation. Metabolic processes account for the elimination of most of the ethanol consumed. As the ethanol is transported through the body with the blood it passes repeatedly through the liver. During each pass through the liver some of the ethanol is metabolized by the enzyme alcohol dehydrogenase (ADH).

The rate at which ethanol is metabolized is relatively constant for a particular individual at a particular time but varies somewhat from one person to another. Reported rates for ethanol metabolism usually range from 0.010 g/210L to 0.025 g/210L per hour. The average elimination rate is generally accepted as 0.017 g/210L per hour. Higher rates of metabolism have been reported and are usually associated with chronic consumption of large quantities of ethanol (Garriott, 2003).

Ethanol can also be eliminated from the body through other methods such as excretion in the urine, evaporation through perspiration and exhalation of ethanol through the breath.

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Some of the ingested ethanol is eliminated from the body through gas exchange in the lungs. The exchange of ethanol from the blood to the breath occurs in the alveoli and bronchi of the lungs. The alveoli are minute tissue sacs in the lungs that are richly supplied with blood from the capillaries. By diffusion, some of the alcohol in the blood can evaporate into the breath. This exchange of alcohol from the blood to the breath can be described by Henry's Law.

Henry's Law states that at a given temperature the concentration of a volatile substance in the air above a liquid is proportional to the total concentration of the volatile substance in the liquid.

As the ethanol molecules move from the alveoli through the lungs into the mouth cavity the concentration of the ethanol decreases. This decrease is due to dilution with fresh air. Therefore deep lung or alveolar air ethanol concentration provides the closest correlation to the blood alcohol concentration.

EFFECTS OF ETHANOL IMPAIRMENT

Ethanol acts as a central nervous system depressant. Central nervous system depressants slow nerve signal transmissions resulting in the reduction of normal physical and mental faculties. In relation to driving-related impairment ethanol's primary effects are on judgment, reaction time and coordination.

An example of a judgment driving-related impairment would be speeding up to proceed through a yellow light when normally you would slow down or stop. An example of reaction time driving-related impairment would be an increase in the amount of time a driver requires to slow when another car unexpectedly crosses their path. Coordination includes the ability to perform divided attention tasks. Driving requires the individual to perform multiple duties simultaneously such as pressing the gas pedal, maintaining lane position, signaling lane changes and maintaining a safe distance from other vehicles.

IMPAIRMENT BY SUBSTANCES OTHER THAN ETHANOL

The breath test operator should be aware that symptoms similar to alcohol intoxication can be produced by a combination of ethanol and drugs, drugs alone, or certain diseases or illness.

When ethanol is consumed in combination with other drugs the symptoms of ethanol intoxication may be altered. This may explain a situation where an individual appears very intoxicated but the breath alcohol test results demonstrate a low level of ethanol. If a breath test operator observes this situation the best course of action would be to contact a Drug Recognition Expert (DRE) if available and/or obtain a legal blood sample.

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CHEMICAL TESTING FOR ETHANOL

Chemical tests for ethanol can be performed on most specimens of body fluids. Whole blood (blood containing all of its components) and serum/plasma (blood centrifuged to remove red blood cells) are examples of blood that can be used for ethanol analysis. Serum/plasma contain a higher percentage of body water than whole blood and consequently are more concentrated (~15%) with ethanol.

The units for blood or other bodily fluid testing are usually reported in grams (g) or milligrams (mg) per unit volume, measured in deciliters (dL) or the equivalent volume 100 milliliters (mL).

Example: 0.080 g/100 mL is the equivalent to 80 mg/100 mL or 80 mg/dL

Whole blood collected in a gray top vacutainer blood collection tube is the preferred specimen for analysis at the crime lab. Gray top tubes contain a preservative and anticoagulant to preserve forensic blood ethanol samples. Blood collection kits containing these tubes are available to officers through the crime lab. Blood samples submitted to the crime lab are analyzed by headspace gas chromatography and are reported in units of g/100 mL.

Blood samples analyzed in the hospital setting are typically analyzed using serum and therefore will have a higher concentration of ethanol than whole blood samples. Hospital blood samples are often reported in units of mg/dL or mg/100 mL.

Breath samples can also be analyzed for ethanol content because of the relationship between the ethanol concentration in blood and breath. This relationship is called the partition coefficient or the blood: breath ratio. On average, at a temperature of 34°C (approximate exhaled breath temperature), ethanol will move from the blood to the breath at a ratio of 2280: 1. This means that 2280 mL of breath will contain the same amount of ethanol as 1 mL of blood. Current evidential breath testing instruments use a ratio of 2100: 1 when calculating the breath result. Therefore if blood and breath tests are taken simultaneously the breath result will be an underestimate of the individual's alcohol level for the majority of the population (Garriott, 2003).

EVIDENTIAL BREATH TEST INSTRUMENT

Currently the only approved evidential breath test instruments in the State of Alaska are the DataMaster cdm and the DataMaster DMT. This manual specifically addresses the DataMaster DMT. The DataMaster is manufactured by National Patent Analytical Systems, Inc in Mansfield, Ohio.

NPAS, Inc
 PO Box 1435
 Mansfield, OH 44901
 1-800-800-8143
www.npas.com



GENERAL FEATURES

The main features of the DataMaster DMT include a thermo-electrically cooled infrared detector to increase stability, a folded optical path length of 65 cm, a 23 mL sample cell volume, narrow bandwidth optical filters, a gray body infrared source and a mass air flow sensor. Other additional features include a dedicated internal quartz standard of known and constant absorption allowing for repeated verification of calibration, a single point calibration, a sealed detection system, a three filter system that eliminates potentially interfering compounds, electronic options with password security and a radio frequency interference (RFI) detection system (DMT Product Overview, 2010).

EXTERNAL FEATURES

External features of the DataMaster DMT include: heated breath hose and simulator tubes; dry gas compartment with internal regulator; modem, Ethernet and USB ports; full color touch screen LCD display; calibration port; bar code reader; and RF protection both through shielding and external detection. The cover of the DataMaster DMT is made of black coated aluminum. The LCD display panel provides instructions and messages for operation of the DataMaster DMT.



Rear Panel of the DataMaster DMT

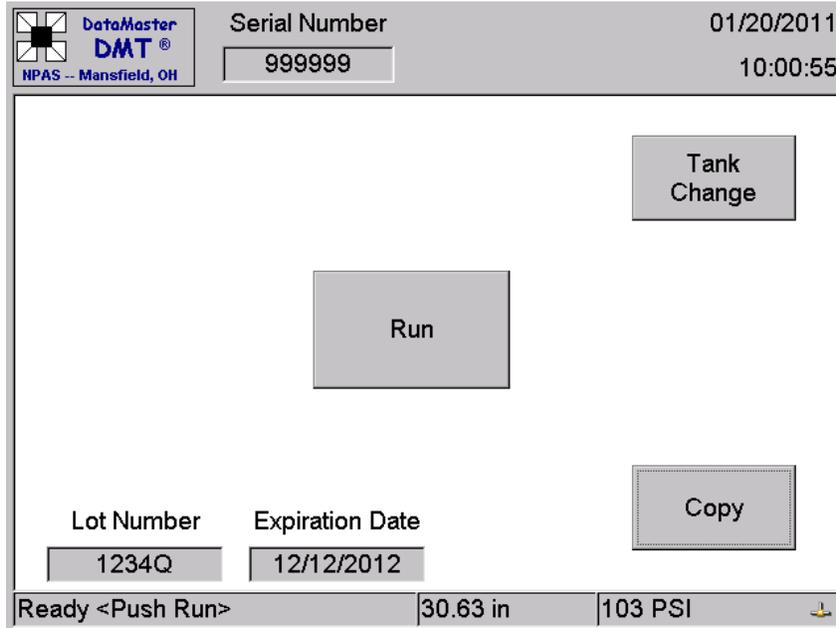
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HOME SCREEN

The DataMaster DMT is equipped with a LCD touch screen display that is used to operate the DataMaster DMT and an external keyboard that is used for data entry. Icons and menus on the screen provide access to start all tests and change the setup of the instrument.



Home Screen of DataMaster DMT

To begin, the breath test operator or breath test supervisor should touch the screen to bring up the home screen. The home screen consists of four active blocks and several status indicator boxes. The four active blocks are as follows:

- The DMT Icon: The DMT Icon is located in the upper left hand side of the display. Touching this icon will display a drop-down menu with all the functions of the DataMaster DMT. A detailed list of these menu options is listed in the section DMT ICON MENUS.
- The RUN button: Touching the RUN button will begin a subject test.
- The COPY button: Touching the COPY button will print the last test that was conducted. If a dialog box is displayed “there is nothing to copy” no test has been conducted since the instrument was turned on.
- The TANK CHANGE button: Touching the TANK CHANGE button will prompt the operator to enter the information required when installing a new dry gas external standard and then initiate a verification of calibration.

Status indicator boxes are used to indicate the status of various components of the DataMaster DMT.

- Instrument Status Box: Located in the lower left hand corner. During normal operation, this will show the “Ready” message with a flashing “Push Run”

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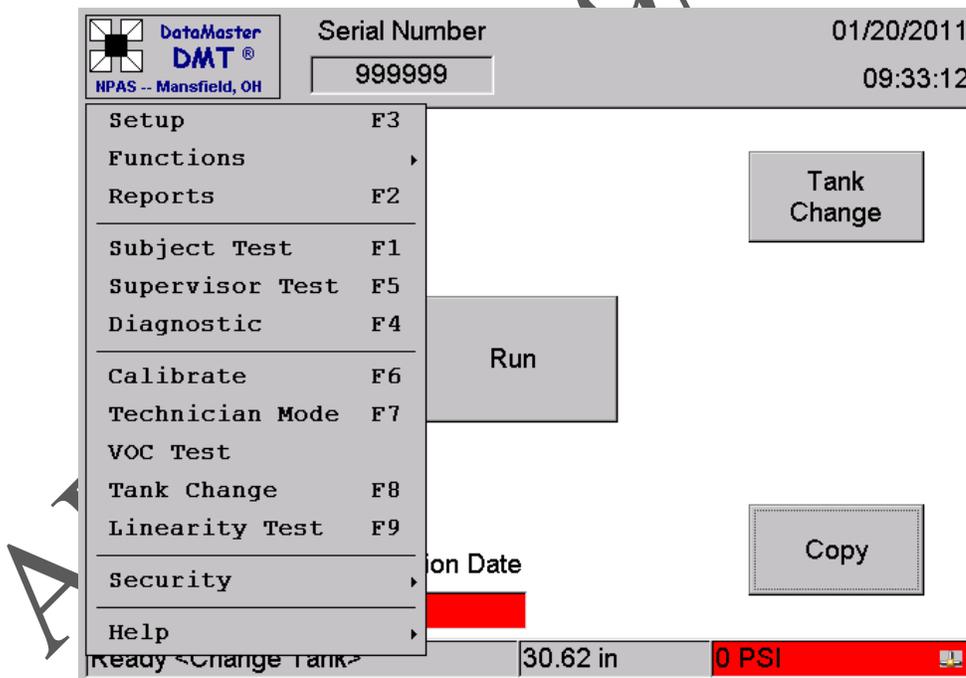
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message. This will also display the countdown until ready when the instrument is warming up, change tank soon, change tank, and perform VoC when applicable.

- Barometric Pressure Reading: Located on the bottom of the home screen this box provides the station barometric pressure as measured by the DMT in inches of mercury.
- Gas Cylinder Status Box: Located on the lower right hand corner. Displays the external standard tank pressure in psi. This box turns red when the external standard tank pressure is less than 100 psi.
- External Standard Lot Number: Located above the instrument status box, this lists the lot number of the external standard in use with the instrument.
- External Standard Expiration Date: Located above the instrument status box, this lists the expiration date of the external standard in use. This box turns red when the tank expiration is within 30 days.

DMT ICON MENUS

After touching the DMT Icon menu the drop down menu will display. Items in the menu can be selected either by touching the menu option or using the corresponding keyboard key listed on the menu.



DataMaster DMT Icon Menu

Setup (F3)

The Setup screen contains setting for the various DMT options. A password must be entered before entering the setup screen which determines the categories and options that can be viewed and changed.

DataMaster DMT
 NPAS -- Mansfield, OH

Serial Number:
01/20/2011
09:35:34

DMT	Property	Value
Units	Ask Questions	yes
Subject	Number of Tests	1
Supervisor	Alcohol Display	yes
Tank Change	Volume Display	no
Printer	Graph Display	yes
Control Panel	Graph Alcohol	no
	Graph Flow	no
	Query Refusal	no
	Wait Between Te...	0
	Signature On	no
	Copies	1
	Simulator Before	yes
	Simulator Between	no
	Simulator After	yes

Setup Screen for DataMaster DMT

The options in the Setup screen are discussed below.

- **DMT:** This menu contains information on the individual instruments and is only able to be edited by the factory.
- **Units:** Lists the units that the breath alcohol is reported in (g/210 L).
- **Subject:** This menu contains information on the various options associated with a subject test including turning graphical displays on/off and the number of copies of the test strip printed. This option is only accessible to breath test supervisors. A more detailed description of these options is listed in the Subject Test Setup Options section.
- **Supervisor:** This menu selects the number of times the external standard is run during a supervisor test. This option is only accessible to the breath test supervisor.
- **Tank Change:** This menu contains information on the various options associated with a tank change and is not accessible to the breath test supervisor or breath test operator.
- **Printer:** This menu contains options for the external printer used with the DataMaster DMT.

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- **Control Panel:** This menu contains options to run the setup for external features such as the keyboard, mouse and stylus. It is only accessible to the breath test supervisor. This option will primarily be used to calibrate the stylus for the touch screen.

Functions

From this menu the breath test operator or breath test supervisor can change the date and time display and the breath test supervisor can remove and return the instrument from and to service and import and export data from the DataMaster and purge the sample chamber.

Reports (F2)

This menu allows the breath test operator and breath test supervisor to access and print tests stored in memory. This includes prior subject tests, diagnostic tests, supervisor tests and verification of calibration reports.

Subject Test

This menu option will initiate a subject test.

Supervisor Test (F5)

This menu option will start a supervisor test. It is only accessible to the breath test supervisor.

Diagnostic Test (F4)

This menu option runs a diagnostic check on the DataMaster DMT. It is accessible to both the breath test operator and the breath test supervisor.

Technician Mode (F7)

This menu option opens the technician screen on the DataMaster DMT. This screen allows the breath test supervisor to view but not adjust the internal voltages and settings of the DataMaster DMT. It is not accessible to the breath test operator.

VOC Test

This menu option allows the breath test operator or breath test supervisor to initiate a verification of calibration.

Tank Change

This prompts the breath test operator or breath test supervisor through dry gas external standard cylinder replacement.

Linearity

This menu option is for use by the crime lab only.

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Security

This menu option allows breath test operator or breath test supervisor to log on/off of the DataMaster DMT.

Help

This menu option provides information about the instrument software versions.

SUBJECT TEST SETUP OPTIONS

The setup menu under the DMT Icon contains a screen with the various options that can be changed by the breath test supervisor for a subject test. A brief description of each of these options is as follows:

- Ask Questions: This option allows the breath test supervisor to turn off the data entry portion of the subject test. The default option is yes. This option should only be used for training purposes.
- Number of Tests: This option allows the breath test supervisor to select the number of subject tests performed in a single breath test sequence. The default option is 1 and this option should only be changed for training purposes.
- Alcohol Display: This option turns on and off the numerical real-time display of the subject's ethanol concentration on the bottom of the screen. The default option is yes.
- Volume Display: This option turns on and off the volume display bar at the bottom of the screen. This bar indicates the subject's progress in providing the minimum volume required by the DataMaster DMT. The default option is no.
- Graph Display: This option turns on and off the display of the flow and alcohol graph on the screen when the subject has completed their sample. This is not displayed while the subject is blowing, only after their sample is completed. The default option is yes.
- Graph Alcohol: This option allows the breath test supervisor to display a real-time graph of the subject's alcohol concentration on the screen while the subject is blowing. The default option is no.
- Graph Flow: This option allows the breath test supervisor to display a real-time graph of the subject's breath flow rate on the screen while the subject is blowing. The default option is no.
- Query Refusal: This option allows the breath test supervisor to turn on a query immediately prior to the subject breath sample as to whether the subject refused. If yes is selected a test strip will print with the subject sample listed as Refused. If no is selected the subject test will proceed normally. The default option is no.

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- Wait Between Tests: This option is not relevant with the current Alaska software. The default is set to 0.
- Signature On: This option turns on/off the signature option at the end of a subject test sequence. When this option is turned on the breath test operator will be asked to sign on the touch screen with the stylus to accept the subject test strip. This signature will print at the bottom of the subject test strip. The default option is yes.
- Copies: This option determines how many copies of the test strip are printed after a subject test sequence has been completed. The default option is 1.

PRINTER

The DataMaster DMT utilizes an external laser jet printer. The initial printer is provided by the crime lab. Paper, printer cartridges and replacement printers are the responsibility of the individual agencies. Contact the crime lab for more information on replacement parts or printers.

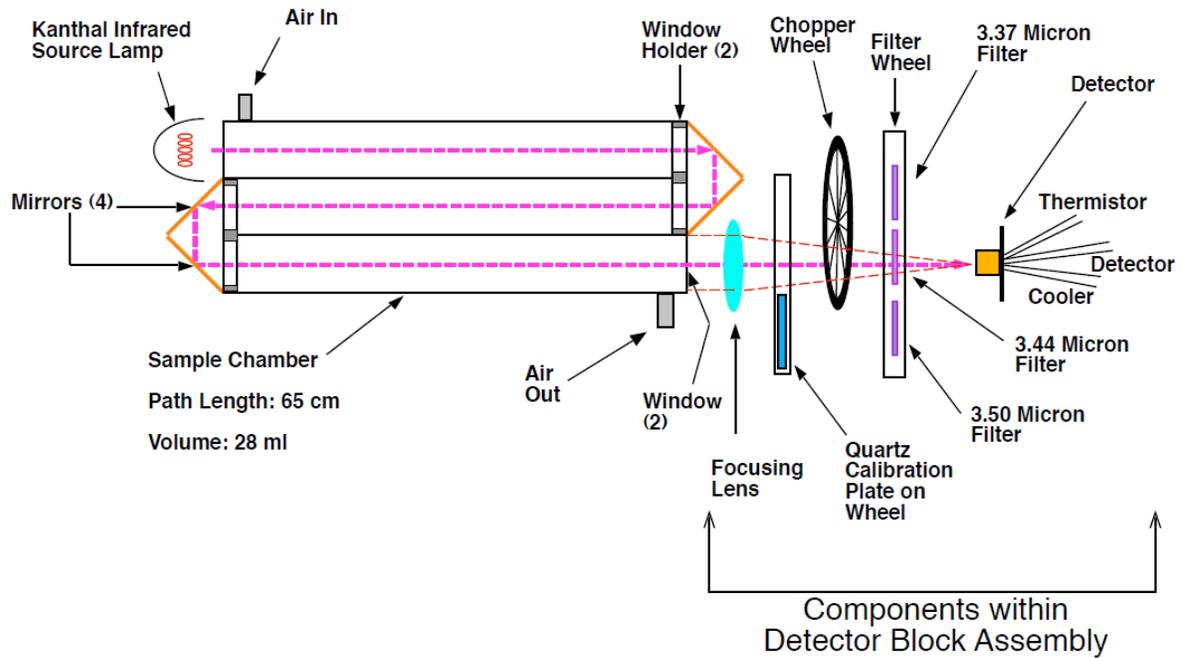
ANALYTICAL PRINCIPLES

The DataMaster DMT employs the principles of infrared spectroscopy for the purpose of measuring the level of ethanol in breath samples for forensic purposes. Infrared (IR) energy is part of the electromagnetic spectrum. It is measured in wavelength expressed as micrometers (μm). When a molecule is exposed to IR energy the bonds of the molecule will absorb the energy. Different types of molecular bonds will absorb different wavelengths of IR energy. IR energy is used by the DataMaster to detect and measure the amount of ethanol present in a breath sample. The wavelengths used are 3.37 μm , 3.44 μm and 3.50 μm .

DATAMASTER DMT SYSTEMS

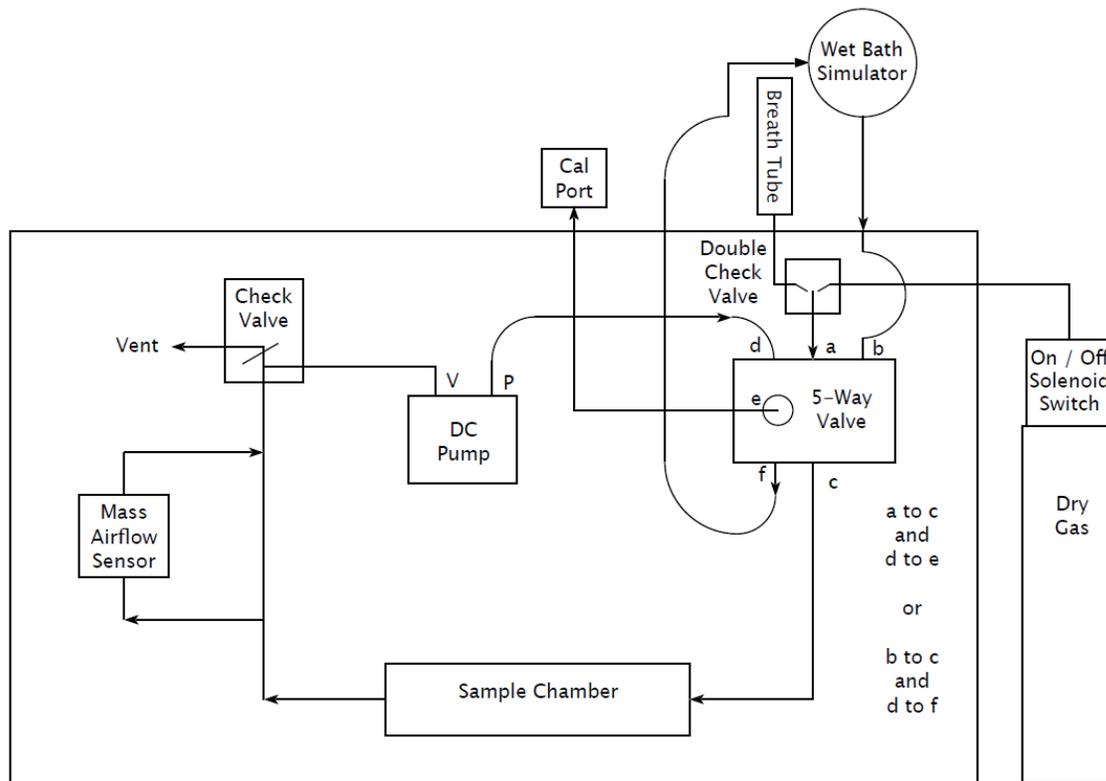
The DataMaster DMT is comprised of three basic systems: the optical system, the breath/airflow system and the electronic system.

The optical system incorporates the components of the DataMaster DMT directly involved in the analysis of vapor samples for the identification and quantification of ethanol. The optical system consists of the following components:



DataMaster DMT Optical Bench

- IR Source – emits IR energy when current passes through it
- Sample Chamber – holds approximately 23 mL of vapor, heated to 50°C +/- 5°C, and is folded to a total length of 65 cm
- Mirrors – located at both folds of the sample chamber for the purpose of reflecting IR energy
- Focusing Lens – the IR energy is focused onto the surface of the detector by a lens located in the detector block
- Chopper Wheel – interrupts the light energy as it is being focused on the detector allowing for separation and amplification of the IR energy
- Filters – The IR energy exiting the sample chamber is filtered through three filters (3.44, 3.37, and 3.50 μm)
- Calibration Plate (Internal Standard) – 1 mm thick piece of quartz that is moved into the optical path when the internal standard check is performed
- Detector – made of lead selenide (PbSe) and is typical for applications in the 2 - 5 μm range



DataMaster DMT Airflow Diagram

The breath/airflow system describes the mechanism of the DataMaster DMT that moves vapor samples in and out of the sample chamber and also purges the sample chamber with fresh air. It is comprised of the following components:

- Heated External Breath Hose
- Internal Breath Tubing – provides a pathway for vapor samples and room air to circulate between the breath hose, the intake of the control sample ports, the sample chamber and outlet ports
- 5-Way Valve – an internal valve that controls the airflow path through a series of signals sent from the microprocessor
- Sample Chamber
- Pump – a single pump that creates a vacuum/pressure that will draw or push air through the system
- Snubber – a pneumatic capacitor that levels out airflow produced by the pump, reduces air fluctuations and helps the check valve remain closed
- Check Valve – a white fitting located within the airflow pathway that only allows air flow in the proper direction
- Calibration Port
- Simulator Inlet and Outlet Ports

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The electronic system includes the power supply, microprocessor and controller board along with other components which interact as necessary to allow the instrument to function as designed and interact with the user. The DataMaster DMT utilizes a Windows CE operating system in conjunction with DMT software.

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SUBJECT TESTS

It is essential that breath test operators and breath test supervisors follow the proper procedures when administering a breath test. The subject should be carefully observed during the breath test so his/her actions, demeanor, and behavior can be documented.

PRE-TEST PROCEDURES

Radios should be turned off in the vicinity of the testing area whenever possible. This is to avoid the possibility of a radio frequency detection status message that would abort the subject test. The testing area should be free from organic solvents and fumes, including exhaust fumes. When feasible subjects should be kept away from the breath test instrument except when they are providing a breath sample.

13 AAC 63.040. Procedure for breath test analysis

(a) The following procedure must be used to obtain and analyze a breath sample on a breath test instrument:

- (1) observe the person to be tested for at least 15 minutes immediately before testing, to ensure that the person does not regurgitate or place anything in his or her mouth during that period;*
- (2) respond to the visual display on the instrument by entering the data requested;*
- (3) when the visual display indicates that the instrument is ready to accept the person's breath sample, instruct the person to blow into the mouthpiece until the visual display indicates that a satisfactory sample has been obtained.*

(b) Only a person certified as an operator under 13 AAC 63.050 may operate a breath test instrument, except that a supervisor may supervise the use of an instrument by a non-certified person for training or demonstration purposes.

INSTRUMENT PREPARATION

The DataMaster should display READY in the instrument status box. The operator should verify that the time and date display is accurate on the DataMaster and correct if necessary using the Set Date and Time feature under Functions of the DMT Icon Menu. The breath test operator should supply a new mouthpiece for each breath testing sequence.

SUBJECT TEST SEQUENCE

The breath test operator touches the RUN button to initiate a subject test. The breath test operator then selects the test type and either scans the subject's operator license using the barcode scanner or types in the requested information. If the test type Test is selected the subject name field will be prepopulated with Test, Test.

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TEST TYPES:

DUI
Minor consuming
Other
Test
VOC

SUBJECT'S NAME:

The breath test operator enters the full name of the subject being tested.

O.L.#

The breath test operator enters the driver's license number of the subject.

OPERATOR'S NAME:

The breath test operator types in his/her name.

OPERATOR'S NUMBER:

The breath test operator enters the number assigned to him/her.

DEPT/AGENCY:

The breath test operator enters the 4-character code indicating the agency he/she works for.

CASE/REPORT:

The breath test operator enters the agency case number.

The breath analysis portion of the test is automatic. Once in progress the breath test operator cannot alter the outcome of the test. The breath test operator's duty from this point until the end of the test is to instruct the subject how and when to provide a breath sample. The breath test operator should provide a new mouthpiece for each subject test sequence. The following are descriptions of each portion of the subject test:

DIAGNOSTIC CHECK

Voltages and temperatures of the instrument are checked to ensure they fall within the tolerances allowed. A passing test reads PASSED on the test strip.

PURGING AND AMBIENT TESTING

All chambers and internal plumbing are cleansed of any residual volatile substances by room air. Room air is pulled through the breath tube and pumped throughout the instrument by an internal pump. During the purging process the instrument takes two measurements of the detector voltage that must agree within prescribed tolerance. If the measurements don't agree the test aborts with an AMBIENT FAIL status message.

AMBIENT ZEROING

The DataMaster determines zero references based on ambient air in the sample chamber. Each of the three filters is inserted into the IR path to establish a zero reference at each wavelength.

BLANK TEST

A measurement is taken after the AMBIENT ZEROING phase of the operation. This ensures the sample chamber is clear before the subject sample.

INTERNAL STANDARD CHECK

A quartz plate is inserted into the IR path to assure that the accuracy of the DataMaster has not changed since the last calibration.

EXTERNAL STANDARD

A sample of an ethanol dry gas standard is pulled through the gas line into the sample chamber, the sample is analyzed and the results are displayed.

PURGING**AMBIENT ZEROING****BLANK TEST****PLEASE BLOW**

The subject provides a sample of their breath. An intermittent beeping sound will be heard until a breath sample is provided with a sufficient flow rate to satisfy the requirements of the sampling system. The subject has two minutes to provide an adequate sample. As they blow through the instrument a measurement is taken four times per second. Once the subject sample requirements have been met the final portion of the breath is captured and analyzed.

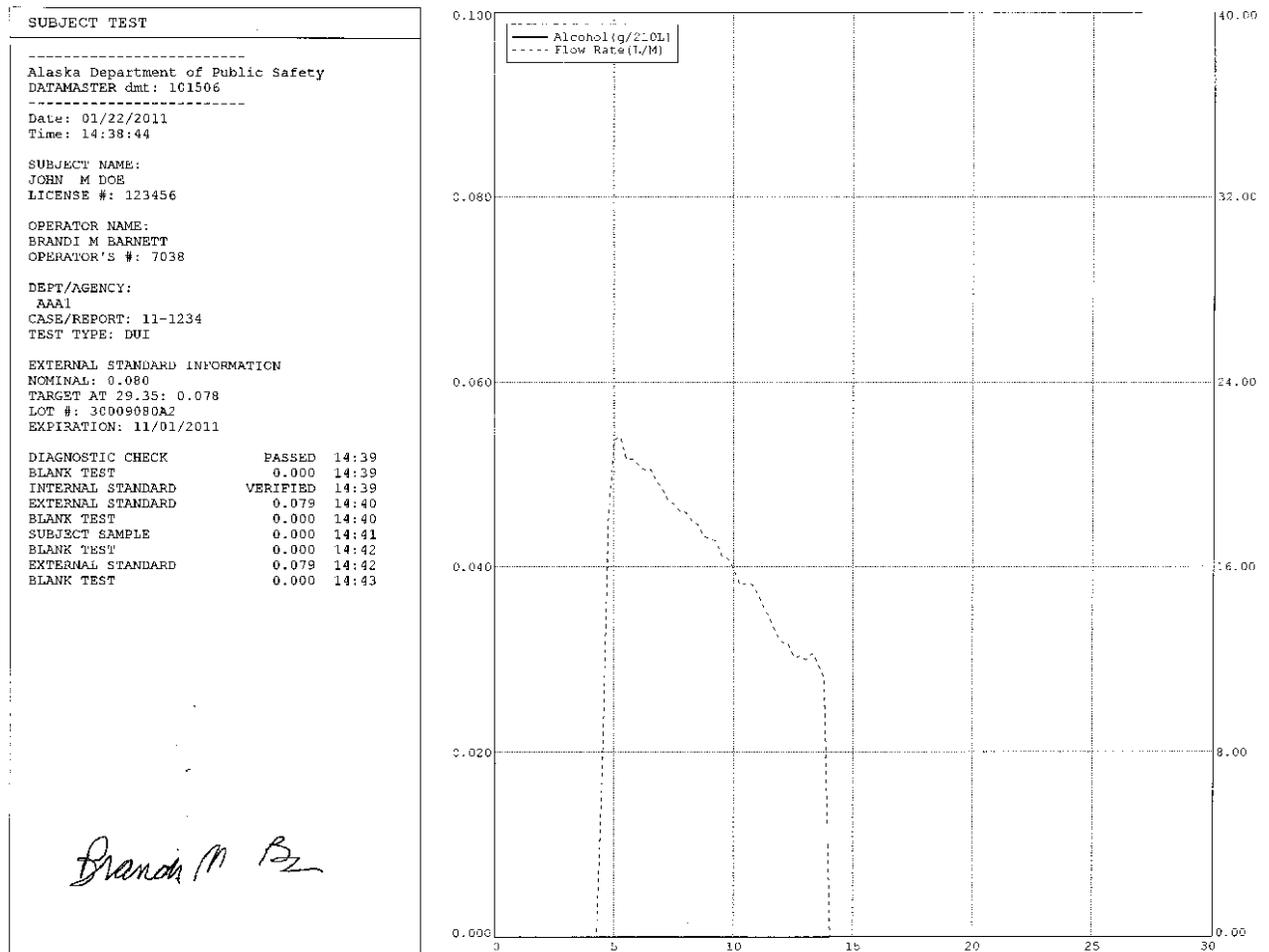
TEST RESULTS

The measured ethanol result is calculated.

PURGING**AMBIENT ZEROING****BLANK TEST****EXTERNAL STANDARD****PURGING****AMBIENT ZEROING****BLANK TEST**

If the signature option is turned on a screen will appear for the breath test operator to add an electronic signature to the bottom of the test strip. After the breath test operator has signed and pressed accept the subject test results print automatically and test results are stored into memory. These tests can be accessed using the reports menu accessed thru the DMT Icon. The crime lab uploads data files periodically. Once

tests are uploaded they are no longer accessible from the instrument and must be obtained from the uploaded data files at the crime lab. If the test strip fails to print or an error occurs during printing the breath test operator should press the COPY button which will print the last test in the memory. Following the printing of the test strip the breath test operator should verify that the test completed.



Example of a complete subject test strip

The DataMaster DMT has a graphical display option that graphs both the subject's breath flow rate and breath alcohol concentration. This graph is included on the test strip printout.

SAMPLE ACCEPTANCE PARAMETERS

The DataMaster accepts a breath sample after the subject has provided a sample into the breath hose and the sample provided has met the necessary criteria for analysis.

A breath sample is accepted when it meets the following criteria:

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- A minimum flow rate is required. For the duration of the blow the flow rate must not drop below the minimum requirements. The minimum flow rate is approximately 3.8 L/min.
- A minimum volume of breath is required. The minimum volume is approximately 1500 mL.
- The breath alcohol profile must have reached a plateau.
- The breath alcohol profile must never have a negative slope.

EXTERNAL STANDARDS

The external standard delivers a known quantity of ethanol to the DataMaster both before and after the subject sample. The purpose is to ensure the DataMaster is accurately recognizing and quantitating ethanol concentrations.

The external standards currently in use with the DataMaster DMT are commercially prepared cylinders. Each cylinder will have a label affixed which contains the lot number and expiration date of the cylinder.

The DataMaster DMT uses an internal regulator to regulate the flow of gas into the instrument. The regulator activates automatically so there is no need for the breath test operator to turn the cylinder on or off. The pressure reading for the cylinder is displayed in the lower right hand corner of the home screen. When the pressure reads 100 psi the color of the box will change to red and at 50 psi the instrument will no longer allow a subject test to be performed until the cylinder is changed.

To exchange a cylinder, open the door on the cylinder compartment and twist the existing cylinder counter-clockwise until the tank is free of the regulator. The breath test operator should then press the tank change button on the home screen.

Tank Change Screen on the DataMaster DMT

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This will bring up a window prompting the breath test operator to enter his/her name and operator number and the lot number and expiration date of the external standard cylinder. This information should be read directly from the new cylinder prior to inserting it into the dry gas compartment. The breath test operator will then be asked to verify the lot number and expiration date entry by reentering the information. If the entries do not match the breath test operator will be asked to reenter the information. After the information is entered correctly the breath test operator will be prompted to ensure the cylinder is correctly installed in the dry gas compartment. The instrument will then initiate a verification of calibration. The breath test operator will not be able to begin a subject test until a verification of calibration has successfully completed.

The lot number and expiration date entered by the breath test operator or supervisor will be the lot number and expiration date printed on the subject test performed using this external standard cylinder. It is important that the breath test operator ensure the lot number and expiration date are entered correctly.

The DataMaster DMT will also display the external standard lot number and expiration date on the home screen. The box housing this information will change color to red when the external standard is 30 days from its expiration date. The DataMaster will not allow a subject test to be performed with an expired cylinder.

Replacement external standard cylinders need to be requested from the crime lab. Breath test supervisors are responsible for making these requests. Breath test operators should notify the breath test supervisors if their agency is in need of replacement cylinders.

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QUALITY ASSURANCE

INTRODUCTION

There are numerous measures that are taken to ensure the quality of each breath sample. External standards, internal standards and blank tests are performed with each breath sample. A verification of calibration is performed at least every 60 days and when the external standard is changed.

QUALITY ASSURANCE MEASURES

A diagnostic check is performed at the beginning of each subject test sequence. The diagnostic check is a self-check of the instrument voltages and temperatures.

A blank test follows each purging cycle to verify the sample chamber is clear prior to taking a measurement.

The internal standard is a quartz plate that is inserted into the IR path to demonstrate the accuracy of the instrument has not changed since the last calibration. Each instrument stores in memory the IR absorption value of this quartz standard at the time of calibration. The measurement of the quartz plate at the time of the test is compared to the stored value and must agree within prescribed limits or the test will be aborted.

The external standard is a metal cylinder containing a mixture of ethanol and an inert gas under pressure. The external standard cylinder is connected to the instrument through an internal regulator. External standards deliver a known quantity of ethanol to the instrument at specific times in the breath test procedure. This is done to test the ability of the instrument to accurately recognize and quantitate ethanol. The allowable range for the external standard is +/- 0.005 from the target value adjusted for barometric pressure.

A verification of calibration report is performed to verify the instrument's calibration is valid and the instrument is functioning properly. It consists of a diagnostic test, which is a self-check of the instrument and five tests of the external standard. These reports are approved by the scientific director. Verification of calibration reports are required to be performed at least every 60 days or whenever the external standard cylinder is changed. The crime lab has selected a list of days throughout the year that will meet the 60 day requirement and allow for the verification of calibration schedule to be more uniform. The selected days for verification of calibrations to be conducted are as follows:

January 3rd
February 21st
April 11th
May 30th
July 18th
September 5th
October 24th
December 12th

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The instrument software will initiate a verification of calibration on each instrument on each of these days at 12:00 pm. The reports will be uploaded by the crime lab and approved by the scientific director. The dates provided above are not required dates for verifications of calibrations. The only date requirement is that a verification of calibration be performed every 60 days. Verifications of calibrations will also be performed automatically with each external standard cylinder replacement.

Records of these documents are kept in the normal course of business at the crime lab.

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BREATH TEST SUPERVISOR DUTIES

DUTIES AND RESPONSIBILITIES OF BREATH TEST SUPERVISORS

Breath test supervisors are responsible for performing the following duties at their agencies:

- Instructing fellow officers how to operate the evidential breath testing instrument and how to properly administer a breath test.
- Setting up, performing routine maintenance and troubleshooting his/her instrument.
- Ordering external standards and other breath testing supplies.
- Maintaining the paperwork associated with breath test operators he/she has instructed. This includes informing the crime lab when breath test operators relocate or change names.
- Communicate with the crime lab about instrument issues, operator status or questions about paperwork.
- Maintain and submit to the crime lab paperwork associated with the instrument.
- Timely response to all communications from the breath test section.
- Breath test supervisors may be asked to perform other duties or take on additional responsibilities depending on individual circumstances.
- Ensuring the instrument is turned on and connected to a dedicated modem line when the instrument is in service.

BREATH TEST INSTRUMENT TRANSPORT TO AND FROM AGENCIES

Breath testing equipment is shipped to agencies from the crime lab. The crime lab pays for the outgoing shipping on instruments, supplies and external standards. When instruments are to be shipped commercially they will be wrapped in a protective plastic covering and placed in an approved shipping container. A list of instructions to the breath test supervisor regarding instrument care will be included inside the shipping container. If the instrument received was intended to replace an existing instrument package the previous instrument in a similar manner and return to the crime lab.

Individual agencies are responsible for return shipment of instruments, supplies, and shipping containers to the crime lab. Agencies may use the most cost effective means to ship the equipment. External standard cylinders should be drained, rendered incapable of holding gas and disposed of by the agency. The crime laboratory will provide instructions on proper cylinder disposal with the cylinders. Do not return the empty cylinders to the crime lab. It is recommended that the supervisor notify the crime lab regarding any shipping information (carrier, waybill information, date shipped) when equipment is returned.

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BREATH TEST INSTRUMENT SET-UP

The following instructions are general guidelines for receiving and setting up an evidential breath testing instrument for operation.

1. Let the instrument sit for several hours or overnight so it can warm to room temperature.
2. Make sure that an APC line voltage regulator unit is present and set up according to the instructions with the unit. (APCs are supplied by the crime lab.)
3. Connect the external printer and ensure it is turned on and contains paper.
4. Attach the breath hose and modem line.
5. Plug the instrument into the prepared APC unit, turn it on and allow it to warm up.
6. Press the tank change button and follow the instrument prompts for installing the external standard cylinder.
7. After the instrument has completed the verification of calibration fill out a change in instrument status form to put the instrument in service.

The breath test supervisor can change various settings on the DataMaster according to the individual agency's preference. Examples of settings that can be changed include: the number of copies of the test strip printed, whether the alcohol value is displayed during the subject blow, the use of the refusal query and whether the graphical displays are on or off. A detailed description of these options is listed under Subject Test Setup Option in the Evidential Breath Test Instrument section.

The breath test supervisor can restore the default settings by selecting reset options from the Function menu under the DMT Icon.

INSTRUMENT LOCATION

It is important that the evidential breath test instrument location is secure. The power source should be of good quality and the instrument plugged into an APC supplied by the crime lab. Contact the crime lab for replacement APC units or replacement batteries.

In order to purge the sample chamber between tests the DataMaster requires that clean air is flushed through the sample chamber. A symptom of a poorly ventilated testing area is the occurrence of multiple AMBIENT FAIL status codes.

High room temperatures can cause operational problems for the instruments. A symptom of an overheated room is multiple AMBIENT FAIL status messages. It is essential that the underside of the instrument is not blocked.

The RFI detector located in the breath hose will cause a test to abort if radio frequency is detected within the immediate area. All radios in the vicinity of the instrument should to be turned off if possible when a DataMaster test is in progress or the test could abort with a Radio Frequency Interference status message.

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Agencies are required to provide a dedicated telephone line for use with the DataMaster. Subject test data is uploaded to a host computer located in the crime lab. The uploading process is initiated by the crime lab. The crime lab can also remotely access the instruments for troubleshooting purposes.

OPERATOR TRAINING

Alaska Administrative Code requires that all breath test operators complete an eight hour course of instruction approved by the scientific director. Breath test supervisors provide this instruction at their agency. The curriculum of the course should include eight hours of instruction in the theory of alcohol physiology, toxicology, pharmacology, instrument maintenance, practical operation and administrative procedures. Breath test supervisor's training includes instruction on how to teach the breath test operator courses and an approved presentation is available. At the completion of the course the operator must take and pass, with a 75 percent or greater, the approved written examination. The approved breath test operator exam and key is available through the breath section of the crime lab. Upon successful completion of the course, the breath test supervisor will complete the Request for Change in Operator Certification/Recertification form and submit it to the crime lab. The breath test operator will be issued a certificate and operator number from the scientific director which expires three years from the date of issue.

Breath test supervisors are also responsible for teaching recertification courses to breath test operators. Per Alaska Administrative Code the recertification must be completed during the period of the breath test operator's certification. It must contain at least four hours of instruction and training and they must pass the written examination with a 75 percent or greater. After completion of the course the breath test supervisor must complete the Request for Change in Operator Certification/Recertification form and submit it to the crime lab. The breath test operator will be issued a new operator card by the scientific director which will expire three years after the date of issue.

If any breath test operators are expired at the time of the course they must take the full eight hour certification course and not the recertification course. If the breath test supervisors have any questions about breath test operator instruction they should contact the crime lab for assistance.

SUPERVISOR PAPERWORK

Change in Instrument Status Report

The breath alcohol program keeps a record of all maintenance and movement of the DataMaster instruments. Breath test supervisors should notify the crime lab of any change in status of the instrument(s) at their agency by filling out a Change in Instrument Status Report and submitting it to the crime lab.

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The following situations would require a Change in Instrument Status Report to be filled out by the breath test supervisor:

1. Placing an instrument in service or removing an instrument from service.
2. The relocation of an instrument to a new building.

The completed Change in Instrument Status Reports should be sent to the crime lab where they will be entered into the instrument file.

Change in Operator Status Form

The breath alcohol program keeps a database of breath test operator information. To keep the database as accurate as possible, breath test supervisors are asked to submit a Change in Operator Status form whenever a breath test operator's status changes with regards to the breath alcohol program. E-mail notification is also acceptable.

Situations that would require a Change in Operator Status form include: a breath test operator is hired at an agency, a breath test operator's employment is terminated at an agency, a breath test operator transfers to a different agency or location in the state or a breath test operator changes their name.

Request for Certification/Recertification of Breath Instrument Operators Form

The breath alcohol program requires breath test supervisors to complete a Request for Certification/Recertification of Breath Instrument Operators form after training breath test operators at their agency.

When instructing a mixed class of certification and recertification students check the certification expiration dates for current breath test operators attending the course. If an operator's certification has expired, he/she must complete the 8-hour block of instruction. Indicate clearly on the Request for Certification/ReCertification of Breath Instrument Operators form which breath test operators are recertifying and which breath test operators are certifying or fill out two separate forms.

The crime lab issues breath test operator cards upon receipt of the Request for Certification/Recertification of Breath Instrument Operators form. The cards contain the breath test operator name, certification number, expiration date, and signature of the scientific director. The breath test operator should keep his/her card in his/her possession. Another breath test operator card will be issued when the operator completes a recertification.

Breath test operator cards are mailed to the instructor of the Certification or Recertification course. It is the responsibility of the breath test supervisor who submitted the Request for Certification/Recertification of Breath Instrument Operators form to distribute the cards to the individual breath test operators. If this is not possible it is the

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responsibility of the breath test supervisor to communicate with the crime lab about where the cards should be sent.

ORDERING SUPPLIES FROM THE BREATH ALCOHOL PROGRAM

The breath alcohol section of the crime lab supplies many of the consumables related to breath testing. These include:

- Mouthpieces for the DataMaster
- Replacement External Standard Cylinders
- Blood collection kits
- Homebrew collection kits

The crime lab provides the initial external printer used with the DataMaster DMT. Replacement printer cartridges, paper and printers are the responsibility of the individual agency. The breath test supervisor can contact the crime lab for information on which printers are compatible with the DataMaster DMT.

The breath test supervisor at each location will be contacted about annual supply orders.

Replacement cylinders and supplies can be ordered by e-mail or phone.

E-mail requests should be sent to dps.scdl.toxicology@alaska.gov.

Phone requests (907) 269-5740

To minimize shipping costs for external standard cylinders please give the crime lab 3-4 weeks to send replacement external standard cylinders.

Empty external standard cylinders should be drained of any remaining gas and rendered incapable of holding gas before being disposed of. Empty cylinders do not need to be returned to the crime laboratory.

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PROBLEM RESOLUTION (TROUBLESHOOTING)

Problems with the DataMaster stem from a variety of sources and may or may not reflect an underlying instrument malfunction. Problems with DataMaster operation are generally indicated by a status message. Some of the more common status messages are described below. A table is included with a list of status messages along with suggestions on how to address the problem.

Ambient Fail

Generally, this is an environmentally caused status message due to inadequate air quality in the vicinity of the instrument.

Incomplete

This indicates that the subject did not provide a sample that met the minimum flow and volume requirements within the two minutes allotted.

Invalid

This indicates the instrument detected a negative slope in the breath profile provided by the subject.

Interference Detected

Generally indicates the presence of a substance other than ethanol present in the subject's breath sample.

Radio Interference

This status message indicates the radio frequency detector in the breath hose of the instrument detected the presence of radio interference the vicinity of the instrument. Usually occurs when a radio transmits in the vicinity of the instrument.

Standard Out of Range

This indicates that the external standard reading was outside of the allowable tolerance (+/- 0.005) from the external standard target value adjusted for barometric pressure.

Status Message	How to Address the Problem
Ambient Fail	<ol style="list-style-type: none"> 1. Remove the subject from vicinity of the DataMaster (try test again) 2. Ventilate the room 3. Purge the sample chamber 4. Perform a non-drinking subject test 5. If ambient fail persists contact crime lab
Blank Error	<ol style="list-style-type: none"> 1. Remove the subject from vicinity of DataMaster 2. Ventilate the room 3. Purge the sample chamber 4. Perform a non-drinking subject test 5. If blank error persists contact crime lab
Breath Tube Temperature Check	<ol style="list-style-type: none"> 1. Ensure breath tube is connected properly 2. Run diagnostic to find breath hose temperature 3. Remove the breath hose from the cover if it is too hot 4. If the message persists contact the crime lab
Detector Overflow	<ol style="list-style-type: none"> 1. If the status message occurs during a subject test attempt a second test. If the sample was taken properly and no instrumental problem is suspected, take subject to hospital, their breath alcohol may be greater than 0.80. 2. If the status message occurs at a time when a subject is not being tested, contact the crime lab
Filter Wheel Error	<ol style="list-style-type: none"> 1. Attempt to run a filter test (under functions) and see if the filter will realign itself. 2. Reboot instrument. 2. If message persists contact the crime lab.
Filter 1, 2 or 3 Won't Zero	<ol style="list-style-type: none"> 1. Reboot instrument 2. If status message persists contact crime lab.
Heated Simulator Tube Temperature Check	<ol style="list-style-type: none"> 1. Contact the crime lab.
Incomplete	<ol style="list-style-type: none"> 1. Restart test and instruct subject to blow until they are out of air. 2. If subject seems to be attempting to provide a sample and is having difficulty, attempt a non-drinking subject test to determine the ability of the instrument to accept a sample. 3. Contact the crime lab if there seems to be a problem with the instrument sample acceptance.

Interference Detected	<ol style="list-style-type: none"> 1. Restart test, direct subject to provide a sample steadily. 2. If Interference Detected status message occurs twice in a row on the same subject, who appears to be blowing properly, get a search warrant for blood. 3. If Interference Detected status message occurs with unusual frequency, contact crime lab (breath test supervisors)
Internal Standard Error	<ol style="list-style-type: none"> 1. Reboot instrument 2. Contact the crime lab if the message persists.
Invalid Sample	<ol style="list-style-type: none"> 1. Restart test, direct subject to provide a sample steadily. Watch for inappropriate blowing behavior such as: blowing around the mouth piece, blocking mouthpiece with tongue, etc. 2. If Invalid Sample status message occurs with unusual frequency, contact crime lab (breath test supervisors)
Pump Error	<ol style="list-style-type: none"> 1. Check mouthpiece, check valve and breath hose screen for blockage. 2. Remove breath hose from instrument and blow through it. 5. If Pump Error persists, contact crime lab
Radio Frequency Detected	<ol style="list-style-type: none"> 1. Locate the source of the RF interference (radio in operation in vicinity of DataMaster) and remove from vicinity. Restart test. 2. If Radio Frequency Detected persists, contact the crime lab
Sample Chamber Temperature Check	<ol style="list-style-type: none"> 1. Reboot the instrument. 2. If the message persists contact the crime lab.
Simulator Time Out	<ol style="list-style-type: none"> 1. Restart test. 2. If message persists contact the crime lab.
Standard Deviation Error	<ol style="list-style-type: none"> 1. Contact the crime lab.
Standard Out Of Range	<ol style="list-style-type: none"> 1. Ensure there is sufficient pressure in the external standard tank 2. Check the barometer reading with the barometric pressure for your area, if barometer is out of range call the crime lab 6. If Standard Out of Range status message persists, contact the crime lab
Suck Back Error	<ol style="list-style-type: none"> 1. Restart test and instruct subject not to suck back air thru the mouthpiece. 2. If message persists and subject appears to be blowing properly contact the crime lab.

Any jumbled characters or status messages not described above.	1. If status message persists contact the crime lab (breath test supervisors)
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Instrument problems with no status messages	
External Standard Leaks	1. Unscrew and reinsert external standard cylinder. 2. If leak persists contact the crime lab
Test Strip Won't Print	1. Make sure the printer is set up properly and attached to the instrument. 2. Contact the crime lab.
Display Frozen	1. Reboot Instrument 2. If problem persists contact crime lab
Subject has to blow too hard or too easy to get a breath test.	1. Perform a self-test. If instrument seems to be accepting/not accepting the sample properly, contact the crime lab
RFI/Interference Detected/Invalid Sample occurs with unusually high frequency	1. Contact the crime lab

For breath test operators experiencing issues with their instruments the first step should be to contact a breath test supervisor. If a breath test supervisor is unavailable then contact the crime lab for assistance.

If these suggestions do not resolve the problem or other problems exist please contact the crime lab at:

Breath Alcohol Section
 (907) 269-5740
dps.scdl.toxicology@alaska.gov

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