



DataMaster DMT

Owners Guide



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Overview

Welcome to the DataMaster DMT Infrared Breath Alcohol Measuring Instrument. This Supervisor's guide is designed to provide the necessary information to permit the user to conduct breath alcohol testing and verify the operation and calibration of the DMT. It will cover the basic operation; the various display screens and some additional information.

NOTE: This generic guide defers all operational instructions, policies and procedures to the respective state/country's rules of operation in which the DMT is being used.

The DataMaster operates on the scientifically accepted principle of absorption of infrared energy. This technology has been in use in the art of breath alcohol testing for over 25 years and is judicially accepted in every state in the union and most foreign countries. The analytical portion of the DMT is essentially identical to the analytical portion of BAC DataMaster and DataMaster cdm. The user interface is based around a touch-screen color graphics display and a Windows CE.NET[®] embedded PC.

The DMT is approved by the National Highway Traffic Safety Administration.

Patents Pending: Patent applications are on file with the US Patent Office covering a number of areas of DMT design and operation.

Software Agreement

The software resident in the BAC DataMaster is and remains the exclusive property of National Patent Analytical Systems, Inc. ("NPAS") having its principal place of business at 2090 Harrington Mem. Rd., Mansfield, Ohio. By the purchase, acceptance, or use of this BAC DataMaster the purchaser, recipient and or user agrees to be bound by the terms of this license agreement.

NPAS provides analytical devices known in the marketplace as the "BAC DataMaster", "DataMaster". "DataMaster cdm" and "DataMaster DMT" instruments used in the measurement of alcohol in the breath of human subjects. These devices incorporate software (the "NPAS" Software), which is highly confidential and proprietary information owned by NPAS. NPAS has established that it is the owner of copyrights, both registered and unregistered on all portions of this software. Both registered and unregistered software is protected by Federal Copyright Laws.

By virtue of the purchase or use of the instrument(s) it is hereby acknowledged that NPAS grants the right to use this software for as long as the purchaser, recipient and or user uses the instrument for its intended purpose. The recipient will hold in confidence and will not disclose, copy or disseminate to anyone the NPAS Software source code in any form, or any analysis of that code except as to the extent that it may be specifically allowed by addendum(s) to this agreement. The recipient will take all measures necessary to protect the confidentiality of this information.

The recipient acknowledges that the obligations of this agreement, to maintain in confidence all information, are continuing, and remain effective even after the Confidential Information is returned to NPAS and the instrument is no longer used.

This agreement constitutes the entire agreement of the parties and is governed by the laws of the State of Ohio, without regard to its conflicts of laws provisions. In the event that suit is instituted to enforce any right hereunder, the prevailing party shall be entitled to recover from the other party its reasonable attorney's fees and cost of suit, including on any appeal.

DataMaster DMT Specifications



I. Electrical

32 Bit, 520 MHz Intel RISC Embedded PC
Full Color Touch Screen 8.4 Inch LCD Display
USB Ports (4)
Modem Port
Ethernet Port
Bar Code Reader: Internal or External
Magnetic Card Reader
Signature Pad (on screen or stand alone)
RS232 Serial Ports
10 – 18 VDC
90 – 240 VAC
Audio Output
Flash Memory, Remote Capable
RF Protection: Shielding and External Detection

II, Analytical

Range: .000 to .600 BrAC
Accuracy: +/- .002g/210L @ .100 g/210L BrAC
Wavelengths (Center): 3.37, 3.44, 3.50 μ filters
+/- 10 nm
Detector: Electrically Cooled Lead Selenide
Internal Calibration: Quartz Standard
Sample Chamber: 23cc Vol., 54cm L.
Simulation: Wet Bath or Dry Gas
Barometric Pressure Compensation for Dry Gas
Temp Controlled Heated Simulator and Breath
Tubes

Sampling: Flow, Volume and BrAC Slope
Calibration: Single Point
Chopping Frequency: 550 Hz. +/- 50 Hz.
Air Flow Sensing: Mass Flow Sensor

III. Physical

Construction: Modular, Anodized Aluminum
Weight: 20 Lbs.
Size: 15" (38cm) X 15" (38cm) X 5" (13cm) Ht.

IV. Environmental:

Temperature Range: Exceeds USDOT Standards.

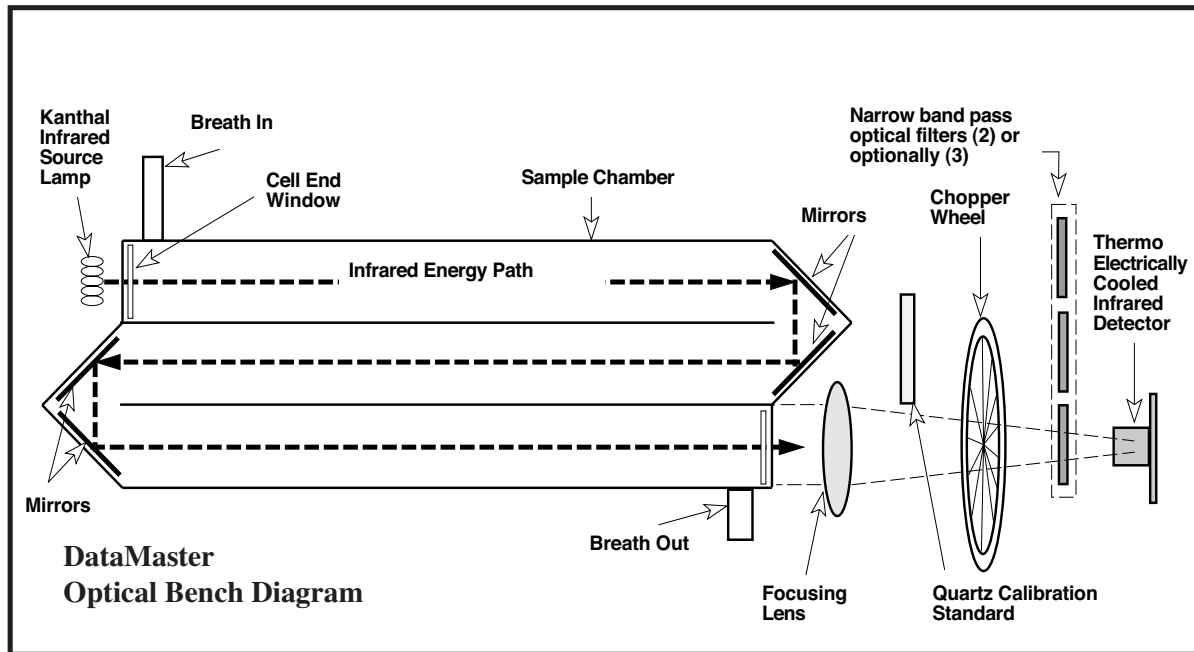
V. Additional Features

Operating System: Windows CE™
Screen controlled voltage adjustments via digital
Potentiometers
Real Time Graph representation of both Alcohol
Rise and Breath Flow.

VI. Options

Voice Prompts
Wet Bath Simulator Fixed Mounting
Digital Simulator Monitoring and Control via
RS232 Port
Printers: Laser or Ink Jet compatible Drivers

INFRARED BREATH TESTING: A LAYMAN'S EXPLANATION



Testing for the presence and quantity of a chemical such as alcohol using the principle of Infrared absorption has been in use by the law enforcement field for breath alcohol testing since the early Seventies. In layman's terms, here is what happens: The molecular bonds of chemical compounds such as alcohol have the characteristic of being "excited" at certain wavelengths of infrared energy (IR for short). By "excited," it is meant that the molecular bonds holding the atoms of hydrogen and carbon together actually start to vibrate when the IR energy is focused on them. When they do vibrate, they use up, or absorb, some of the energy.

Put simply then, if we know how much IR energy was present before the alcohol was in the cell to do the absorbing, and we know how much remains while the alcohol is there, we can tell how much alcohol is in our cell by measuring the difference. By allowing only the wavelengths of IR energy that are sensitive to alcohol to pass thru our sample, we can also preclude the possibility of something other than alcohol adding to our measurement, although in real life, a concept called "multiple wavelength filtration" is used to act as a double check in preventing the reading of other compounds that potentially could interfere with the test results.

Now that you know basically what happens, we can talk a little about what makes some instrument characteristics better than others. What we are talking about here are some basic and universally accepted scientific principles.

It is universally accepted in infrared testing that 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 cell. *The longer the cell, the better the Resolution.*

It is also universally accepted that the purer the sample of the chemical we are testing for, the better the accuracy. In breath testing, this means that 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.*

The scientific community also holds that, 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." There are cooled detectors and there are detectors that work at ambient temperatures. *The cooler the detector, the better the precision.*

This combination of a longer path length, a cooled detector and a small sample cell volume, will make an instrument very accurate at low levels of alcohol (.001 to .010). It can also measure very low levels of interfering compounds (.001 to .010). It is also more repeatable at all levels, meaning it can give virtually the same readings consistently on the same samples, test after test.

Unpacking the DMT

Included in the package you will find:

- 1 - DataMaster DMT with 1 USB Keyboard
- 1 - Breath tube
- 1 - Set of heated simulator hoses (not included in all configurations).
- 1 - AC Power cord
- Standard Mouthpieces
- 1 - Guide

Note: Depending on geographic location and specific user specifications, the contents may vary.

Setting up the DMT

Please read the following completely before setting up your new DMT.

1. Select a room or location for your new instrument keeping the following in mind.

- A. The room or area should be reasonably clean.
- B. The room should not be accessible by unauthorized persons on an unsupervised basis.
- C. The room should have adequate ventilation.
- D. The room should not be so warm or cool as to be uncomfortable for use. We suggest a temperature range of 65°F (18°C) to 78°F (26°C).

2. Select a table, desk or stand for your instrument.

- A. Optimally the desk or table should be at least 20" (500mm) deep by 30" (760mm) long and at a comfortable working height. This will allow for access to the DMT and space for a simulator.
- B. If you wish to place your printer on the same table, allow adequate space for this. The printer is furnished with a USB cable so that it can be placed remotely.
- C. The table or stand surface must be flat and firm and there must be an unobstructed clearance to the underside of the DMT for proper cooling.
- D. Arrange to have the subject retention area to the right or left of the instrument, as the operator would face it. The DMT is equipped with a longer and more flexible breath tube than previous DataMaster models to facilitate testing on either side.
- E. Arrange for an accessible area for storage of forms and mouthpieces.
- F. If the DMT is to be kept in an enclosed cabinet adequate ventilation must be provided or the instrument must be turned off when not in use.

3. Consider the power requirements for the instrument.

A. A dedicated outlet is preferable, but not essential providing there are no large appliances on the same line. Be sure no refrigerators, coffee makers, drinking fountains, air conditioners or the like are on the same line as your DMT. If this is not possible, provide both surge suppression and an uninterrupted power supply. The AC outlet should be adequately grounded.

B. Surge protection is suggested although not mandatory (unless as noted in A above). While the DMT is protected internally against surges and brown outs, additional dedicated protection is helpful.

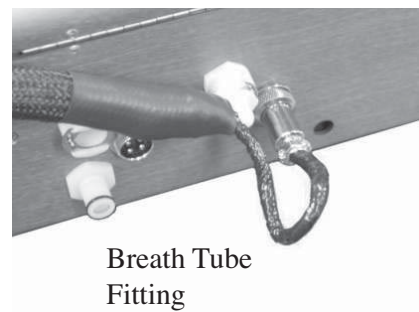
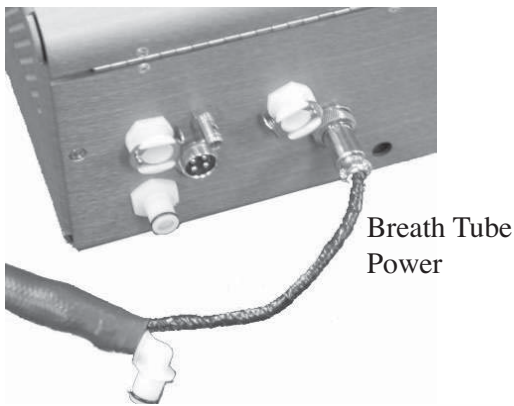
C. For the benefit of your new DMT and all your other computers and computer driven instruments, have your electrician check your emergency generator system. When it turns on, the system should not be immediately “on line.” The low voltage condition that is present as a generator comes up to power can be damaging to your equipment. Your generator should turn on, come up to speed and then switch into your main system. The difference is only a few seconds, but can save your equipment from damage due to low voltage conditions.

4. Making your DataMaster operational.

A. Unpack your new DMT and place it on the table you have selected. Inspect the DMT for any possible shipping damage.

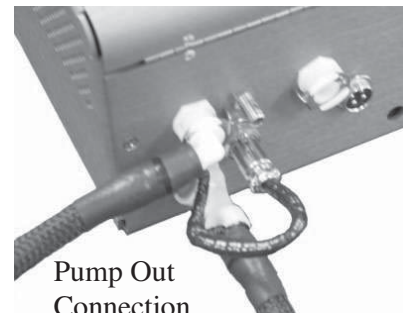
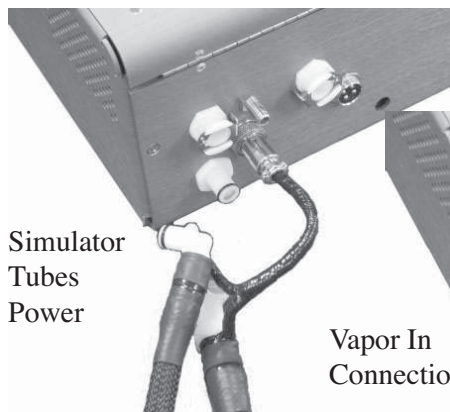
B. Remove the Breath tube, Simulator hose set, Keyboard and Power Cord from the accessory bag.

i. Connect the breath tube heater plug at the base of the breath tube into the receptacle marked “Breath Tube Heater Receptacle” on the rear panel. The plug is keyed to line up correctly and should not be forced into the receptacle. Hand-tighten the security nut.



ii. Install the breath tube by pushing the elbow fitting at the lower end of the breath tube into the receptacle marked “Breath Tube” on the rear panel.

iii. Connect the AC power cord into the instrument and the other end into the selected surge protection device or



into the nearest grounded wall outlet.

iv. Locate the keyboard cable and plug into one of the ports marked “USB” on the rear panel of the DMT.

v. Install the simulator hoses’ heater plug (if applicable) into the receptacle marked “Simulator Hose Heater Receptacle” on the rear panel. The plug is keyed to line up correctly and should not be forced into the receptacle. Hand-tighten the security nut.

vi. Install the simulator hoses (if applicable) to the receptacles marked “Simulator Pressure Out” and “Simulator Vapor In” on the rear panel. The simulator hoses were designed as heated units and will install correctly if the heater plug is connected to the DMT.

NOTE: Care should be taken when connecting the simulator hoses to the DMT. If done incorrectly, simulator solution could be introduced into the instrument and cause damage to the sampling system. If any doubts exist on the correct way to connect the simulator hoses, please contact our technical support department at 800-800-8143.

vii. Connect your printer (optionally furnished) using a standard USB printer cable.

viii. Position the DMT and keyboard on the table as desired.

C. Save the shipping carton and interior packing supplies. Use these if you should ever need to return the DMT to NPAS for service or repair.

D. Turn the DMT on at the switch marked “Power Switch” on the rear panel. The power switch has two settings. Make sure the switch is actuated to the “I” position for 12VDC operation (if applicable) or “II” for mains (AC) operation. The DMT will go through the boot up sequence and automatically start the operating console.

5. Should you leave your DMT on or turn it off between tests?

The DMT can be left turned on at all times. If the DMT is turned off it will, however, take about 10 minutes for the instrument to warm up. By the time you complete your subject observation time, the DMT will be ready to run a test. Also, if it is off, it cannot be damaged by electrical strikes, power outages and janitors that want to play with equipment. If the DMT is placed in a cabinet without adequate ventilation, (not recommended) it is better to turn the DMT off between tests.

Front Panel



The front of the DMT consists of only two components:

1. The LCD touch screen display: The touch screen is used for all aspects of use of the DMT except data entry by way of the keyboard. Icons and menus on the screen will provide access to start all tests and to change the setup of the instrument. These icons and menus are available by simply touching the screen on the appropriate section.

2. The USB keyboard: The keyboard is used for entering any necessary text data on the DMT.



Rear Panel

1. PUMP OUT (not present on all configurations): This port is used when conducting a recirculating 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 (not present on all configurations): This port is used when conducting a recirculating 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 purge and is used to provide recirculation during the process of instrument factory calibration. It is never used while conducting a simulator test.
4. SIM TUBES POWER (not present on all configurations): This plug provides a source of power for the simulator hoses’ 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. The breath tube is not to be removed except for possible cleaning.
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. PHONE: This port is used to connect to a phone line when data transmission is being utilized.
11. DC/OFF/AC: This switch controls power to the DMT. The switch is equipped with two positions. Pressing the “AC” side of the switch will allow for the use of mains (AC) power. Pressing the switch to the “DC” side will allow 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.
12. 12 VDC: For use in mobile testing with the supplied power cord (if applicable).
13. 100/240 VAC 47/63 HZ: Use only the grounded power cord furnished with the instrument.
14. DRY GAS (not present on all configurations): Allows for the instrument to be used with an external dry gas standard.

Software Navigation

Software Notes

The software written for the new “DMT” model DataMaster runs on a Windows CE operating system. This operating system handles all of the mundane tasks such as printing, display and graphing, memory storage and the like. For example, to print on the “DMT” simply requires one command - “Print”. Windows then handles the task of deciding which printer is hooked to the instrument and selecting the appropriate drivers then accessing the libraries for the reports and data to be printed. The whole routine, which uses thousands of lines of computer code is put into motion by one command – “print”.

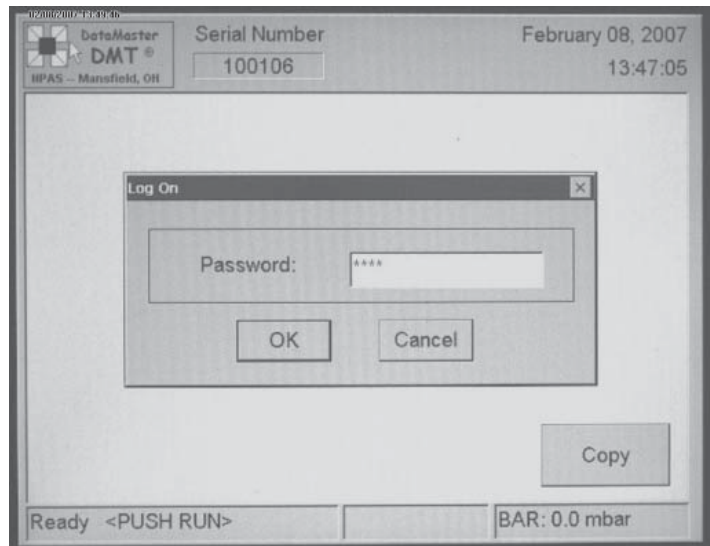
Within that Windows operating system resides the DMT software, which, again is written in “C++” computer language that is designed to work within a Windows operating system. An analogy would be that you run “Microsoft Word” on your computer operating on a Windows operating system.

In the case of the DMT, the software that drives the breath tester is organized differently and is much more akin to modern pc computers. It is much more structured and modularized and makes extensive use of libraries that function in concert with the main core of DMT operating instructions. These libraries handle the tasks of allocating memory, storing reports and making them available for printing, graphing instructions, options settings and the like.

By organizing the software in this manner, it is much safer to work with in the respect that if changes need to be made for the sake of customization, the engineer is only working with one area of the code and consequently only one area is disturbed. The use of libraries provides a permanent architecture within which modifications can be made in an organized fashion.

The Password Screen

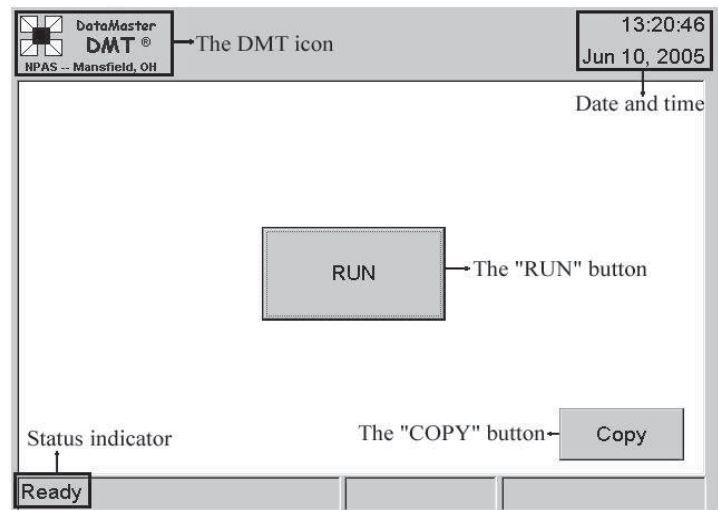
The DataMaster DMT uses various passwords to access different screens in order to protect the setting and adjustments that direct and control the operations of the instrument. There will typically be a different password for a supervisor to perform a simulator test than would be used for an operator to perform a subject test. You may or may not be able to enter the screens shown here, depending on the passwords required.



The Main Display

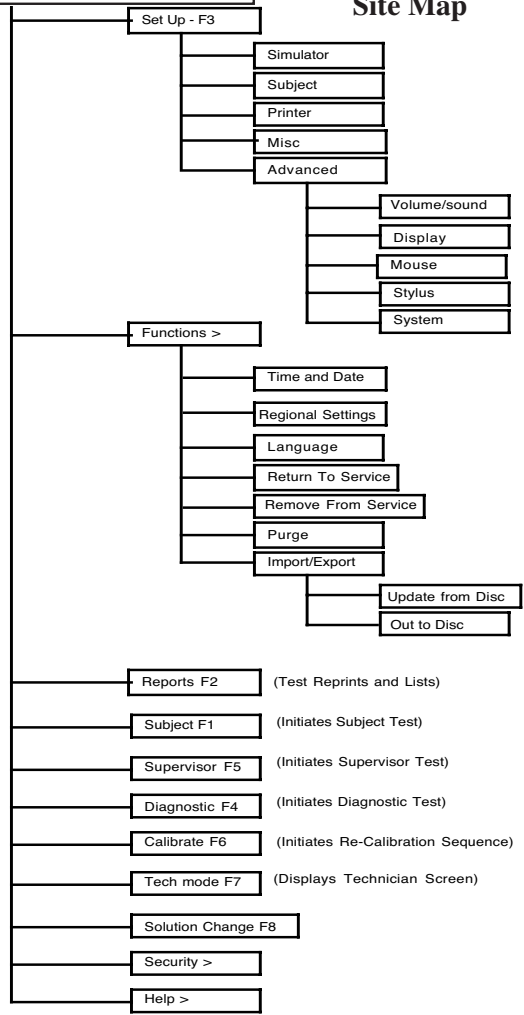
This is the display screen that is shown when the DMT is ready to run a test. All of the functions, features and setup of the DMT are software driven and can only be accessed by using the touch screen or (in a few instances) the function key row of the keyboard. The keyboard is a standard USB PC keyboard. Depending on the version of software installed on the DMT, some of these functions or features might not be accessible. During the warm-up period of the DMT, tests such as a breath or supervisor test cannot be done on the DMT. However, access to the setup screens and technician screen will be available for users with the proper password.

NOTE: Use only a soft object, pencil eraser or stylus to touch the screen, or use your fingers.





The DMT Icon and Site Map



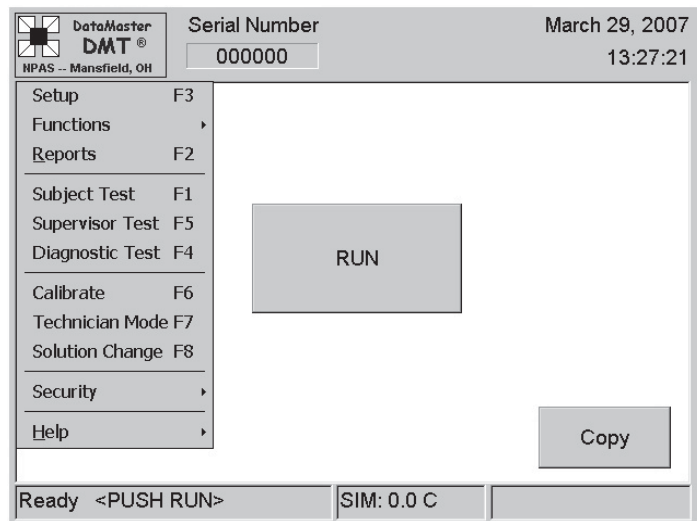
The main display has four active blocks that can be touched to bring up a dialog box along with a status box at the lower left. The design of the screen is such that the most common tests can be done from the touch screen without the need for a stylus or other pointing device. The entire menu screen available on the DMT was designed to have a familiar feel to anyone familiar with popular PC operating platforms. See "Site Map" graphic of the Main DMT Icon at left. NOTE: The visible blocks may vary, depending on the levels of password protection installed.

These active blocks are:

1. The DMT Icon: Touching the DMT icon will display a drop-down menu of all the functions of the DMT. An explanation of this menu can be found below in the "DMT Icon" section.
2. The "RUN" button: Touching the "RUN" button will start a subject test. The subject test is explained in the "Conducting a Subject Test" section.
3. The "COPY" button: Touching the "COPY" button will cause a copy of the last test that was conducted to be printed. If a dialog box is displayed "there is nothing to copy" no test has been conducted since the DMT was turned on.
4. The Date and Time block: Shows the current date and time of the instrument. Touching it will provide entry to the Date and Time setup dialog box.

The Status indicator box: During normal operation, this will show the "Ready" message that will include a flashing "<PUSH RUN>" message. During the warm up period this will display the cell temperature and show a "countdown" relative to the time remaining until the ready indicator is displayed.

After touching the DMT Icon, the drop-down menu will appear under the DMT icon as shown to the left. Any of the menu items can be selected by simply touching the text of that item. It might be necessary to use a stylus while navigating these screens as some of the radio buttons and selection menus are smaller than those encountered on the main screen. Menu items that appear with a F2, F3, F4, F5 and F7 next to them can also be accessed by simply pressing the corresponding "F" key on the keyboard.



DMT Icon Menu Items:

1. Setup F3:

This item will enter the "Setup" functions of the DMT. This is where changes can be made to the date/time, simulator, subject test, calibration and miscellaneous options along with some advanced features.

A. The “Simulator Setup” screen:

i. External Standard dialog box: Select the desired standard type by selecting the “Wet” or “Dry”. Highlighting the displayed value and typing the new value from the keyboard changes the concentration value. Select the Number of simulator tests (measurements) to be performed in a single sequence by using the “up/Down” arrows or highlighting the value and typing a new value from the keyboard.

ii. Digital Simulator dialog box: If the DMT is attached to a digital simulator, the appropriate format can be selected by touching the applicable radio button.

iii. Calibration Standard dialog box: This is only used during the calibration procedure to set the value of the standard being used to re-calibrate the DMT. Obtain the desired technique by selecting the applicable button for wet or dry. Obtain the desired value by using the up/down arrows to the right of the number display or highlighting the value and typing a new value from the keyboard. Setting the number of measurements will determine how many tests are run and then averaged into the sample for setting the calibration.

iv. Simulator tolerance dialog box: This feature compares the simulator test results to the value contained in the External Standard dialog box above and, if checked “yes”, aborts the test if not within a specified range (usually a .005 tolerance). Obtain the desired setting by selecting the applicable radio button.

Press “OK” to accept the changes or “Cancel” to leave the screen unchanged.

The screenshot shows the 'Simulator Setup' dialog box with the following settings:

- External Standard:** Wet 0.100 (g/210L), Dry 260.50 (PPM), Measurements: 5
- Calibration Standard:** Wet 0.1000 (g/210L), Dry 260.50 (PPM), Measurements: 2
- Digital Simulator:** None, Calwave, Repco, Guth
- Tolerance:** Check: Yes, No

B. The “Subject” Test Screen:

i. Number of tests: The number of tests, automatically sequenced, that a subject will be required to take. Obtain the desired value by using the up/down arrows to the right of the number display or highlighting the value and typing a new value from the keyboard. The tests will be sequenced automatically.

ii. Ask questions: Determines whether subject information will be asked before the test. Obtain the desired setting by selecting the applicable radio button.

iii. Query refusal: Determines if the subject will be asked if they will refuse the test. Selecting “No” means that the refusal question will not be asked.

iv. Two Minute Wait: If selected a forced period will be timed between tests to insure that a minimum of two minutes have elapsed before the second test.

v. Simulator order: Select appropriately so that a simulator test(s) will be sequenced automatically at the desired point(s) in the subject test(s).

vi. Graphing Options: Select as desired so that a graphic presentation of the alcohol rise and/or breath flow rate will (or will not) appear during the test sequence.

vii. Alcohol Display: Determines if the alcohol value will be shown on the display during a subject test.

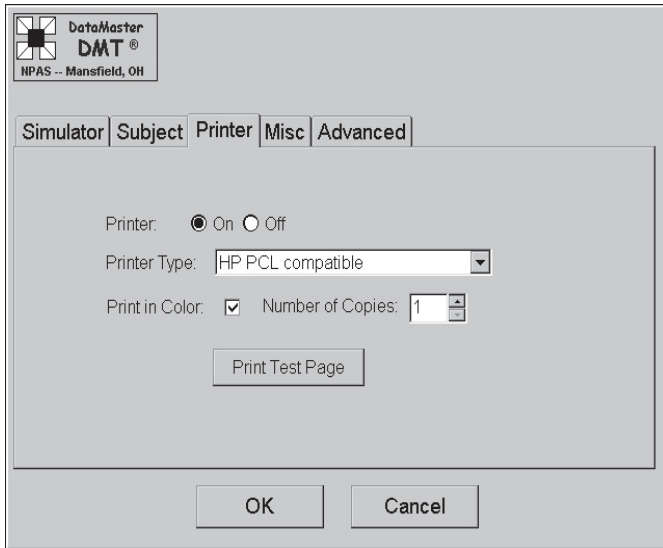
viii. Volume Display: Determines if the volume delivered by the subject will be displayed.

ix. Digits: Determines if the alcohol display will show 2 or 3 digits after the decimal point.

Press “OK” to accept the changes or “Cancel” to leave the screen unchanged.

The screenshot shows the 'Subject Test' dialog box with the following settings:

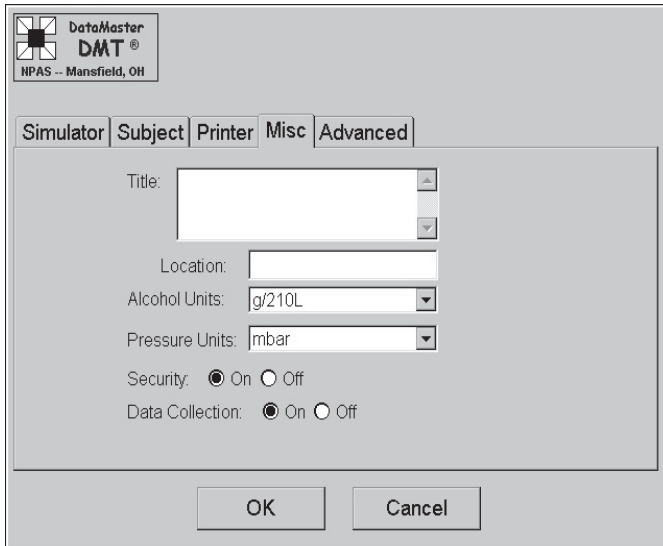
- Number of Tests:** 2
- Ask Questions:** Yes, No
- Query Refusal:** Yes, No
- Two Min. Wait:** Yes, No
- Simulator Order:** Before: Yes, No; Between: Yes, No; After: Yes, No
- Graph Options:** Graph: On, Off; Alcohol: On, Off; Flow: On, Off
- Display:** Alcohol: Yes, No; Volume: Yes, No; Digits: Two, Three



C. The “Printer” setup screen:

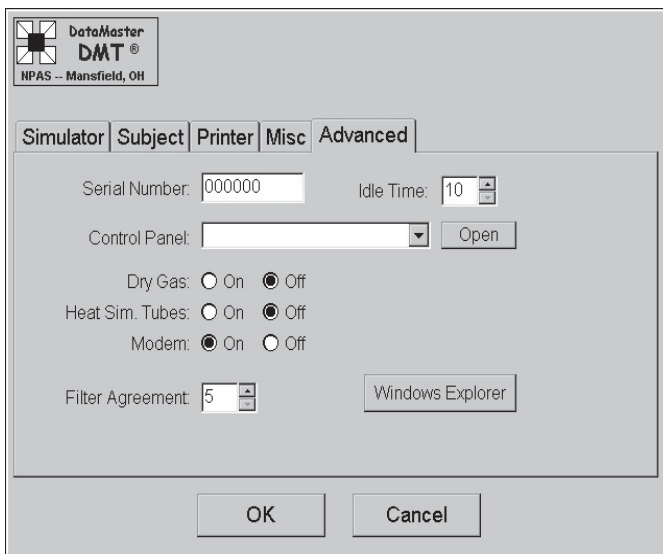
- i. Printer: If “Off, no output will be sent to the printer.
- ii. Printer Type: Selects the type of printer used. Select the appropriate printer using the pull down arrows.
- iii. Number of copies: Selects the number of copies to be printed. Obtain the desired value by using the up/down arrows to the right of the number display or highlighting the value and typing a new value from the keyboard.
- iv. Print in Color: Select this box only if you have a color capable printer.

Press “OK” to accept the changes or “Cancel” to leave the screen unchanged.



D. The “Misc” (Miscellaneous) screen:

- i. Title: Allows for the title that is printed on the results ticket to be changed.
- iii. Location: Allows for instrument location, as shown on the printed form, to be changed.
- iii. Alcohol Units: Refers to the unit that results will be displayed in. Obtain the desired setting by pressing the down arrow to the right of the display and select the desired setting.
- iv. Pressure units: (If Dry Gas Standard is used) Allows the unit measurement for barometric pressure to be changed
- v. Security: Switches the security feature off or on
- vi. Data Collection: If “Off”, test information will not be stored in the DMT memory.



E. The “Advanced” screen:

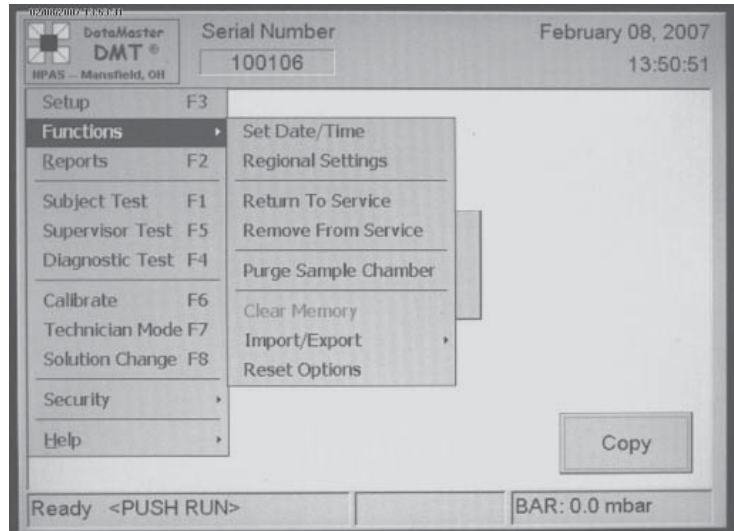
- i. “Serial Number”: This field allows entry of the DMT serial number via the keyboard. It is used by technicians only.
- ii. “Idle Time”: This field allows the setting of the allowable time permitted before the DMT “logs out” of any given password and returns to the idle security requirements.
- iii. The “Control Panel” icon: This refers to the Control Panel of the embedded PC. It also allows access to the network settings screens if the DMT needs to be connected to a network. Settings such as the sensitivity of the mouse, touch screen and sound can be adjusted here.
- iv. The “On” and “Off” control buttons are used to select or deselect the associated features.
- v. The “Filter Agreement” field is used to select the value of the interferent threshold. “.005” is expressed as “5”.

Press “OK” to accept the changes or “Cancel” to leave the screen unchanged.

2. Functions >: This is a sub-menu of the DMT Icon that allows entry to additional features. Some of these features are: setting the time and date, setting of the desired language, removing and returning the DMT from and to service, extended purging of the sample chamber, and the movement of data in and out of the DMT system.

3. Reports F2: This item will enter the “REPORT” function of the DMT. The print screen allows for reproduction of various tests stored in the instrument. Some of the reports that can be accessed here are:

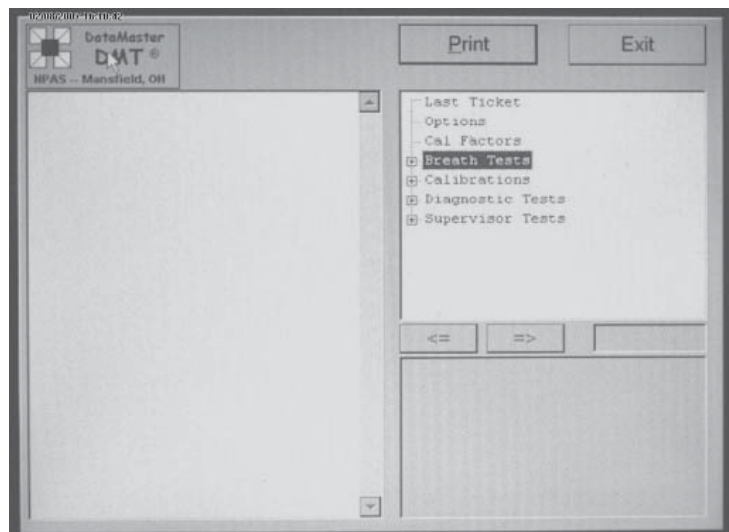
- *Last Test Reprint
- *Options Settings
- *Calibration Factors
- *Breath Test Records
- *Calibration Records
- *Diagnostic Tests
- *Supervisor (Simulator) Tests.



4. Subject Test: The subject test can be started from this item. Touching the “RUN” icon on the main display screen is the usual way to start a subject test. The subject test sequence is fully explained in the “Conducting a Subject Test” section.

5. Supervisor Test F5: Touching this menu item will start a supervisor test that is used to check the accuracy of the DMT. Pressing the “F5” key on the keyboard can also start the supervisor test. The supervisor test is fully explained in the “Conducting a Supervisor Test” section.

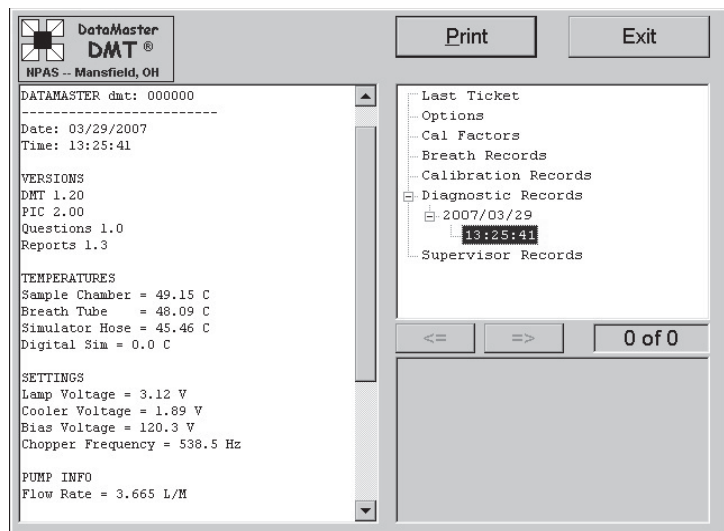
6. Diagnostic Test F4: This menu item will start a diagnostic check on the DMT. Pressing “F4” on the keyboard can also start a diagnostic check. When completed, the DMT window will appear as shown to the below right.



i. The top four lines represent similar information to that given in the “Help” menu. It is the various versions of software that are installed.

ii. The nominal parameters of the various settings (approximate):

	Nom.	Var.
Sample Chamber	48	+/-5
Breath Tube	46	+/-5
Simulator Tubes	46	+/-5
Digital Simulator	34	+/-2
Lamp	Variable	
Cooler	Variable	
Detector Bias	85 or 120	
Chopper Freq	550	



7. Calibrate: (Screen not shown) This item will allow for the calibration of the DMT.

The Technician Screen F7 contains the following sections:

- RF Sensitivity:** Includes 'Set', '-', '+', and 'Save' buttons.
- Temperatures (C):** Fields for Sample Cell (48.8), Sim. Hose (45.2), Breath Tube (48.1), and Sim. Temp (0.0).
- On/Off:** Checkboxes for Chopper (checked), Pump, Sim. Valve, and Gas Valve.
- Barometer:** Includes a 'Current' field with a 'Set' button and a 'Volume (Ltr)' field with a 'Clear' button (0.00).
- Settings:** Fields for Lamp (3.12), Bias (120.3), Cooler (1.89), and Chopper (539), each with a 'Save' button.
- Stepper:** Radio buttons for Filter 1 (selected), Filter 2, Filter 3, and their respective Quartz options.
- Voltages (V):** Fields for Flow (0.99) and Detector (0.227), with 'Plot' and 'Exit' buttons.

8. Technician Screen F7: This menu item starts the technician screen on the DMT. Pressing "F7" on the keyboard will also start this screen. The technician screen is used by authorized repair technicians to view and adjust the internal voltages and settings of the instrument in real time.

NOTE: This is informational only. Breath test supervisors are not normally expected to be familiar with the meaning of the information on this screen and changing or altering any settings or adjustments may preclude use of the instrument unless done by or at the direction of a trained technician.

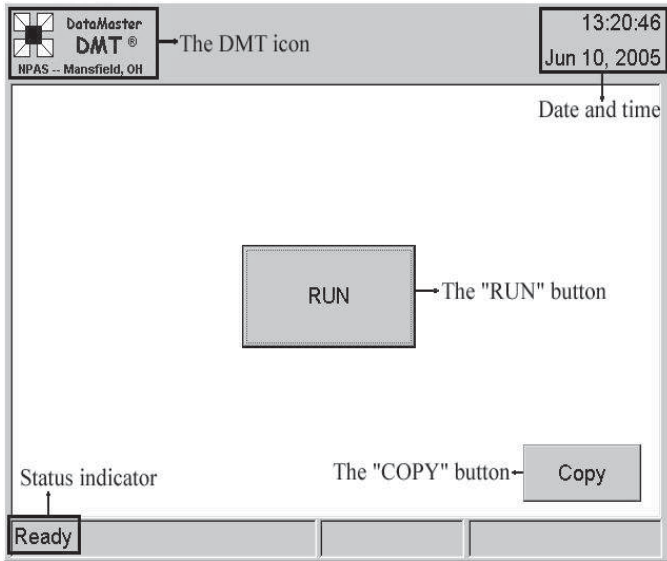
- i. RF Sensitivity: This allows setting and adjusting of the RFI Detection sensitivity level.
- ii. Temperatures: See #6 above (Diagnostic Test)
- iii. "ON/OFF" This allows manual activation of the shown items.
- iv. "Barometer": Used with Dry Gas Simulation systems only. This shows the barometric setting for gas calibration compensation.
- v. "Volume": This shows the accumulated volume of air that has passed through the sample chamber.
- vi. "Settings": This allows adjustment of these voltages. (See #6 above).
- vii. "Stepper": This allows manual activation of the optical filters system.
- viii. "Voltages": Flow represents the voltage generated by the passing of air across the sensor. The idle setting is 1 Volt nominal and the detector is the voltage generated by the detector in real time. The range at ambient is typically about .000 +/- 200mv.
- ix. "Plot": Pressing this button will cause a graph to appear on the screen that will represent the voltages generated by the detector and the flow. Pressing the "Hide" button will hide the graph.

9. Help Screen: The "About" screen provides information about the instrument software versions.

The About DMT screen displays the following information:

- DataMaster DMT** logo and NPAS -- Mansfield, OH.
- Serial Number: 000000
- Date: March 29, 2007
- Time: 13:28:23
- DMT Version: 1.20
- PIC Version: 2.00
- Question Version: 1.0
- Reports Version: 1.3
- Available Memory: 4684 KB
- Contact: National Patent Analytical Systems, 2090 Harrington Memorial Drive, Mansfield, OH 44903, 1-800-800-8143, Copyright 2004.
- A 'Copy' button is located at the bottom right of the About window.
- Bottom status bar: Ready <PUSH RUN> | SIM: 0.0 C

B. Starting the Test and Entering Keyboard Data



Step 1. Be certain the instrument is turned on, if not, turn it on. (About a 10 Minute warm up period will be necessary from a cold start.)

a. Check mouth of subject for food, gum, tobacco, or any other foreign substances.

b. Observe subject for at least 15 minutes to be sure no food or drink is ingested.

c. Record observation start time if your procedure requires it. Use the time displayed on the instrument panel only.

Step 2: Verify that the normal “Ready” display configuration (left) is showing on the bottom left corner of the DMT display.

Step 3: Push “RUN”: This button is located in the center of the display of the DMT. The instrument may ask for a Password (Type in the password, then press <Return> key or press “OK” on the screen)

Step 4: Enter Data per the following instructions as prompted by the DMT: Note: The actual questions will vary depending on your software configuration.

Display: The DMT will display a screen on which the subject test information is entered. Depending on your software, this might consist of more than one screen. By default ,the cursor will automatically appear in the first information dialog box that needs to be entered. Use the keyboard to enter all information. The cursor can be moved to the next dialog box by either pressing the “TAB” key or by touching the needed dialog box on the screen.

1. Dates are entered in the mm/dd/yyyy format. Take care that the cursor is either before the first character in the dialog box or that the whole dialog box text is highlighted. There is no need to use date separators (ex: the date April 30, 2007 can be entered as “04302007”)

2. Use the two letter abbreviation for state names.

3. Times are entered in the same way as dates and in the military (24 hour) format.

4. When all the data has been entered, it must be reviewed before pressing the “OK” button. When the “OK” button is pressed, the DMT will proceed to the automatic test sequence.

Subject Info		OK
Name	<input type="text"/>	Cancel
License #	<input type="text"/>	
Date of Birth	<input type="text" value="MM/DD/YYYY"/>	
Operator Info		
Name	<input type="text"/>	
Certificate #	<input type="text"/>	
Arrest Info		
Name	<input type="text"/>	
Location	<input type="text"/>	
Date	<input type="text" value="MM/DD/YYYY"/>	Time <input type="text" value="HH:MM"/>

C. Administering the Subject Test

Display: “TIMED PURGE”:

Note: If there is a strong odor of alcohol from the subject, remove him from the immediate test area until this cycle is completed. Excessive alcohol purged into the DataMaster from the ambient air will cause an “Ambient Failure.”

All chambers and internal plumbing are cleansed of any residual substances by ambient (surrounding) air which is pulled through the inlet (Breath) tube and pumped throughout the instrument by an internal pump. “.00” or “.000” will appear on the display if the chamber is clear. **CAUTION:** Be sure the breath tube is not lying in a position on the table top where it will suck in dust. Avoid blocking the intake area of the breath tube as restricting the air flow will cause a “pump error” condition.

Display: “AMBIENT ZEROING”

After the pump stops, the DataMaster determines zero references based on ambient air in the Sample Chamber. Different filters with known Infrared wavelengths are used to establish ratios enabling the instrument to be specific for ethanol. During this cycle all filters are inserted into the Infrared path to establish zero references at each wavelength.

Display: “BLANK TEST”

A measurement is taken after the “Ambient Zeroing”. “.000” will appear on the display if no contaminant was detected. A “Blank” test is conducted prior to any subject or simulator test.

Display: “INTERNAL STANDARD CHECK”. This indicates the internal standard was verified.

During this cycle a quartz plate is inserted into the Infrared path to assure that the accuracy of the DataMaster has not changed since it was last calibrated. Each DataMaster stores in memory the exact Infrared absorption value of this quartz standard at the time of calibration. The instrument measures the absorption of the quartz plate and compares this measured value with the value obtained at calibration. The two values must agree within prescribed limits or the operation will be aborted.



Display: “PLEASE BLOW”: “.00” or “.000” will appear below center. A beeping signal indicates the DataMaster is ready to accept a subject sample. There is approximately a 2 minute window of time in which to complete the sample. A running total of delivered sample volume will appear at lower right if this feature is turned on in the software.

Step 6: Insert a mouthpiece into the Breath Tube. Each mouthpiece is individually wrapped and can be removed from the plastic wrapper without touching it by pushing one end of the mouthpiece partially through the plastic bag. Check the opening of the mouthpiece for any plastic residue from the plastic bag. Use the plastic bag to avoid touching the mouthpiece as you insert the mouthpiece into the Breath Tube.

Step 7: It may be more convenient to position the subject on the same side as the breath tube. Communicate with the person taking the test. Give clear instructions so that the subject will understand how to provide an adequate breath sample. **Do not tell the subject to blow “hard”.**

The operator should advise the subject as follows: “Take a normal breath, place your mouth on the mouthpiece and blow long and steady into the tube until I tell you to stop.”

Once the subject starts to blow through the Breath Tube, the instrument’s beeping tone will change to a steady tone which indicates that the instrument is receiving an adequate breath flow. During this time the instrument will also display a screen (optional, if selected) which will depict the subject’s blowing pattern (thin blue line) and the subject’s alcohol concentration (thicker black line) in a graphic representation. You may tell the subject to stop blowing when you hear a single “Beep”. If an acceptable sample is not provided within the allotted time, the DataMaster will display the message “Subject Refuse?”

Display: “DID THE SUBJECT REFUSE? <Y/N>”: Touch “No” if the subject is not refusing to take the test and you wish to restart the sequence. The DataMaster will begin another purge and continue into a test cycle. Touch “Yes” if the subject is refusing to take the test and the instrument will complete the sequence by printing a ticket with a notation that the test has been refused. (Note: This sequence may vary with software for any individual state.)

Display: “TEST RESULTS”
“ALCOHOL .XX”:

The display will show the results of the subject’s first test, if the test was completed. After the results are displayed momentarily, the instrument will automatically continue the test sequence in preparation for a second test if your software is so designed.

Step 8. Remove the mouthpiece from the Breath Tube and discard it before the “PURGE” cycle begins. **Failure to remove the mouthpiece can result in a “Blank Error” as a result of alcohol condensate in the mouthpiece being drawn into the instrument during the purge.**

The DataMaster will repeat the automatic sequence in preparation for the second test if your software requires such while the operator will repeat steps 6 thru 8.

During the subject test cycle the information/results regarding the test will be displayed on the screen as each step of the test is concluded. The exception is during the time the subject is expected to introduce a breath sample into the instrument. The graphing screen will then be displayed.

This concludes the subject test portion of this Guide.

DATAMASTER DMT STATUS CODES

If any of these messages appear on the display do not take the DataMaster out of service. Contact your supervisor and / or seek advise from DataMaster service personnel by calling 1-800-800-8143. They will advise a course of action. Note: this is not a complete listing of Status Codes, and not all are applicable to all models of the DataMaster.

FILTER (1, 2 OR 3) WON'T ZERO Instrument is unable to zero detector voltage at filter noted.

TEMPERATURE LOW Sample cell temperature fails to reach or falls below 45°C.

TEMPERATURE HIGH Sample cell temperature rises to 55°C or above.

RADIO INTERFERENCE Radio frequencies of excessive strength have been detected.

CALIBRATION ERROR Internal standard is not within Tolerance.

PUMP ERROR Flow detector does not detect pump operation.

BLANK ERROR The instrument obtains a reading greater than .003 during blank test.

DETECTOR OVERFLOW The detector output exceeds that readable by the instrument.

FILTER WHEEL ERROR The filter wheel is not activating properly.

INVALID SAMPLE A downward slope detected in alcohol profile.

SIMULATOR OUT OF RANGE The simulator reading is outside acceptable limits (limits set by user).

SIMULATOR TEMPERATURE (Optional, if installed) Simulator temperature is outside acceptable limits (limits set by user).

INTERFERENCE DETECTED The expected ratio between the filters has been exceeded.

AMBIENT FAIL Ethanol or other absorbing vapor detected in the ambient air during the purge.

STANARD ACQUISITION External Simulator Standard was not accepted within the 30 second time window allowed.

SOLUTION CHANGE RECORD (SC) Contains information collected during solution change.

DIAGNOSTIC RECORD (AR) Contains information collected during diagnostic test.

Additional Considerations

1. **TWO MINUTE TIME-OUT:** When the display “**PLEASE BLOW**” and the graph screen appears, the subject has two (2) minutes to provide a breath sample. If no sample is completed, the test will terminate. **Depending on software, the DataMaster will either print "INCOMPLETE TEST" on the test report, or ask if "SUBJECT REFUSED? <Y/N>"** Touch “YES” or “NO” as appropriate. If “YES” (subject refuses to take test again) the test report will automatically be printed, documenting the refusal for that test. If “NO”, the instrument will automatically repurge itself and display: “**PLEASE BLOW**” (**flashing**) The subject may now provide another breath sample.

2. **INVALID SAMPLE** This message is seen only during a subject or simulator test if conducted during the subject test mode. The instrument has detected a negative going value during the test that is inconsistent with the expected test progression. This can be caused by any number of conditions, and is only an indication that the test did not fit the expected sample profile. Usually a retest of the subject after a short waiting period will result in a valid test. See “Invalid Sample” section..

3. **INTERFERENCE DETECTED:** If the expected ratio between the filters is exceeded the instrument will display and printout “**INTERFERENCE**”. Depending on your software, the test may or may not be aborted and a print of the results may or may not be done.

4. **RADIO INTERFERENCE** The RF Detection circuit has been activated. The instrument only "looks" for RF when the detector output is being monitored by the A to D converter. Whether or not the test results will be printed may be software dependent, but generally if the RF was not activated until after the completion of the subject blow, a valid test result will be returned and "Radio Interference" will be printed on the test report after the subject test. The RF circuit is not designed to detect all RF signals that may be generated, only those that are of sufficient strength.

*Technical Assistance:
National Patent Analytical Systems, Inc.
1-800-800-8143 (Toll Free)
1-419-526-67277 (Phone)
1-419-626---9446 (Fax)*

Interpreting the Breath Alcohol Concentration and Air Flow Profiles as seen on the graph.

These charts depict the graphic presentation of the breath alcohol rise and the breath flow on the DMT display during and upon completion of a subject test. The heavier line represents the alcohol rise in real time while the thinner line represents the breath flow. During the test, the side scale will be from .00 to .60 BrAC since this is the total measuring range of the instrument. At the completion of the test, the range will change to .00 to .20 BrAC if the final alcohol measurement is less than .200 BrAC. This is done for clarity of display values. If the final alcohol value is greater than .200 BrAC, the range of the graph will remain from .00 to .60 BrAC. The numbers at the right side of the chart depict the breath flow in liters per minute. These numbers will automatically scale depending on the range of the alcohol value calculated. The bottom numbers represent the time in seconds (Complete with respect to > 30 seconds). The lines themselves are fairly typical of what the lines of any given test might look like, but will vary depending on the blowing pattern of the individual.

The first chart represents a typical test as seen during the course of the test by the operator. The alcohol measurement rises and plateaus at a level of just under .100 BrAC, while the breath flow rises and remains fairly stable until the person ceased blowing at about 14 seconds after beginning. Since this test was completed on the first attempt the final graph would only change with respect to the scale.

The second chart again represents a typical test much the same as the first graph except that the ending breath alcohol measurement is approximately a .125 and is shown as it would appear after completion with the scale changed to .00 to .20 since the ending value was less than .200 BrAC.

The third chart is typical of a blowing pattern where the subject began blowing about 3 seconds after the "Please Blow" indication and then almost immediately ceased blowing. The breath flow line drops to "0" (first arrow) and the alcohol line stays flat indicating that there has been an alcohol breath sample introduced and is now stationary in the cell. Almost immediately (second arrow) the subject begins blowing again and effectively completes the test with no further interruptions. Since the ending

Chart 1

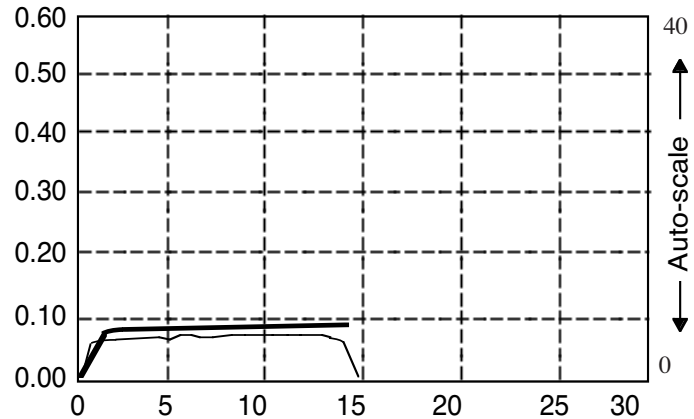


Chart 2

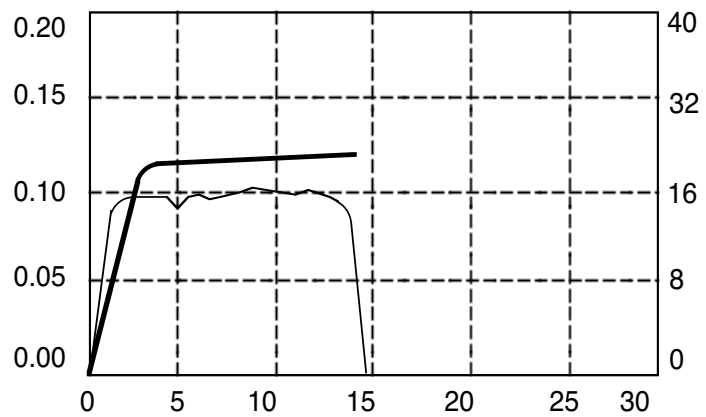
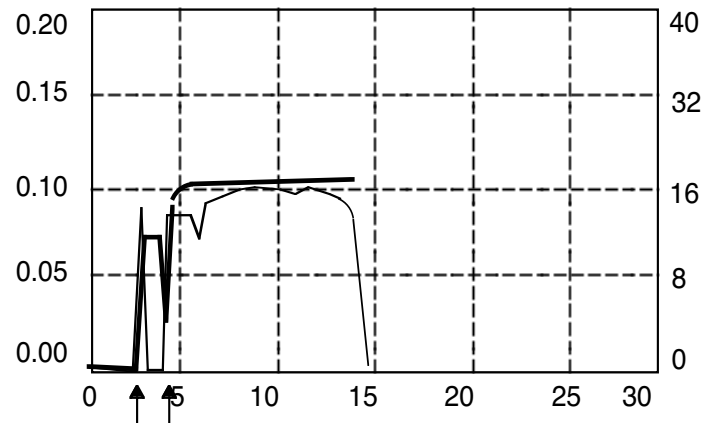
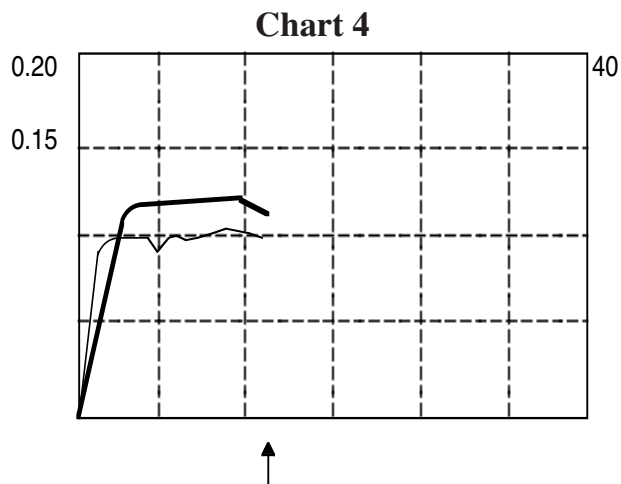


Chart 3

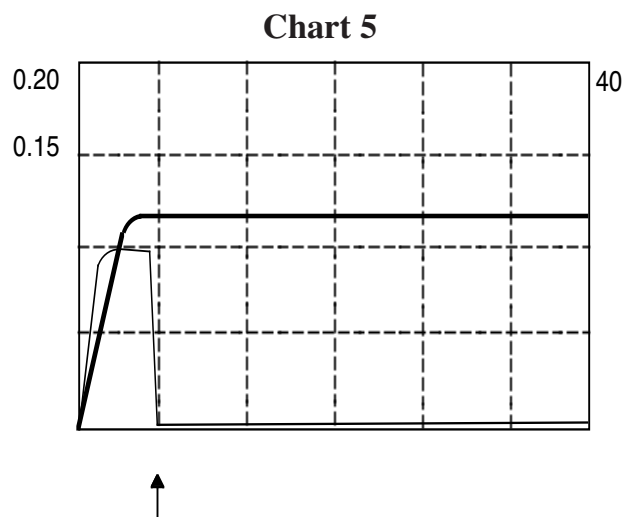


alcohol value is less than .200 BrAC, the graph would have changed to a scale of .00 to .200 BrAC at the end of the test.

The fourth chart is typical of what a test that has produced an “Invalid Sample” indication might look like. The test began normally and proceeded to approximately 9 seconds when the alcohol measurement began to decrease (arrow). A decreasing value is not a test progression that is normal and therefore the instrument would indicate “Invalid Sample.”

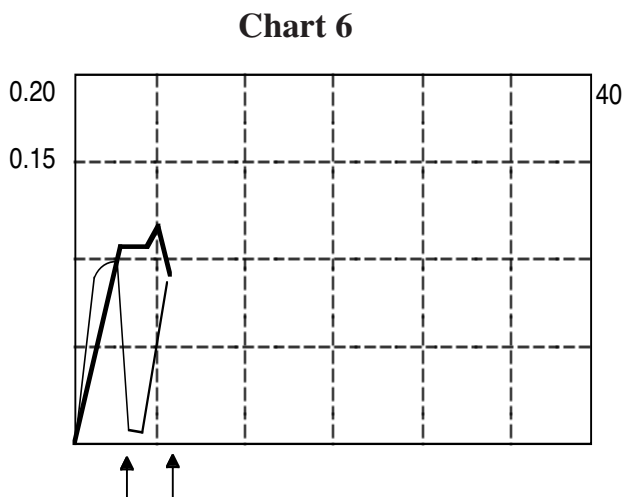


The fifth chart is typical of a test where the subject began to blow, stopped and did not attempt to restart the test again. The breath flow line drops to “0” and the alcohol line stays flat indicating the stationary presence of alcohol in the cell. The results of this test may indicate a refusal to blow on the part of the subject.



The sixth chart is typical of a test where the subject “huffed and puffed” and the test result ended in an “Invalid Sample” as a result of the discontinuous blowing pattern. The subject began to blow and then stopped (first arrow).

Then the subject began another blow (Second arrow) but at a slower flow rate. Since he took a fresh breath, there was a condition of a higher concentration followed by a lower concentration as the fresh breath forced the breath in the tubing into the cell. Continuing to blow at the slower pace, the concentration increased for a short period then began a decrease. This decrease resulted in an “Invalid Sample” because the reading was still decreasing after there was a positive reading. The best breath sample is a continuous one.



Simulating the DMT periodically with a Wet Bath Standard

NOTE: This is a suggested guide only. All users should refer to the rules and guidelines published by their respective state controlling agencies for specific instructions regarding calibration checks and simulation of the DataMaster DMT. Any rules and guidelines published by State controlling agencies supercede these guidelines. These steps will not necessarily apply if the simulator and solution are to remain attached and ready for use with each subject test.

Preparation Steps:

A. Solution:

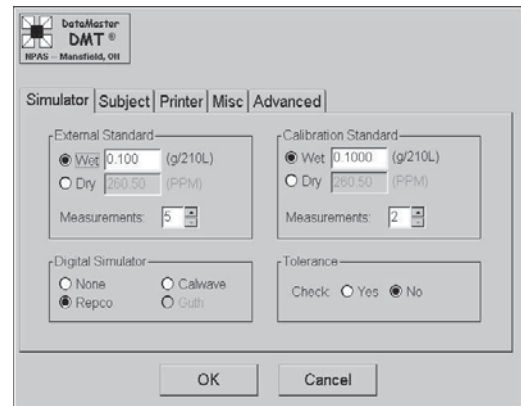
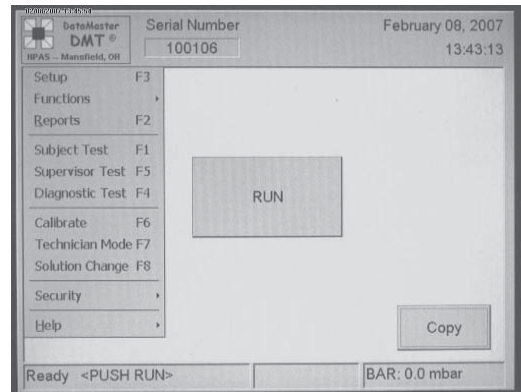
1. Check for proper solution certification documents.
2. Check the expiration date of the solution. Be certain you are within date limitations.

B. Simulator:

1. The simulator should be unplugged and turned “off”.
2. The simulator should be clean and dry prior to filling it with solution.
3. Fill Simulator jar with solution, replace and tighten jar and replace plug to AC outlet and turn simulator on. (Normally bottles of simulator solution will contain 500ml and the entire contents would typically be placed into the jar.)
4. If you intend to reuse the simulator bottle by returning the solution to it after testing, replace the top on the bottle even though it is empty. This will slow evaporation of the remaining alcohol in the jar.

C. DataMaster DMT

1. DataMaster DMT should be turned on and in “Ready” Mode with the printer (optionally) attached via the USB cable.
2. Are the settings shown in “Setup” for “External Standard” (F3) correct (below right)? (You may need password access)
 - a. Does the Solution Value agree with the certification document?
 - b. Is the number of measurements correct?
 - c. Is the simulator style correct (if Digital style simulator with monitoring)?
- d. The “Calibration Standard” should read (Wet).
 - e. Set “Tolerance check” “on” or “off” as desired or directed.
3. Exit screen by pressing “OK” to save changes or “Cancel” if no settings were changed.



Simulation Testing Steps:

A. Connect the “Pump Out” (upper female fitting) port on the rear panel of the DMT to the “Air in” port of the Simulator.

B. Connect the “Vapor In” (lower male fitting) port on the rear panel of the DMT to the “Air Out” port of the Simulator.



C. Both simulator and DataMaster DMT should be fully warmed up. Allow a little extra time for the head of the simulator to warm fully.



D. Begin the test sequence by selecting “Supervisor Test” from the pull down DMT Icon. (F5 on the keyboard may also be used.) (A Password screen may appear).

1. After selecting “Supervisor Test” (and entering the password, if required) the “Edit Concentration” screen may appear from which you may change the target value of the solution based on the solution certificate. If the displayed number agrees, press “OK” and the DMT will begin the “purge” sequence. Pressing “Cancel” will exit the screen and return the DMT to the “Ready” mode main screen.

2. The DMT will automatically sequence through the simulator tests (optionally) displaying the graphs and values. No action on the part of the operator is required during this time.

3. After completion of the simulator tests, the DMT will (optionally) print the simulator test report and return to the “Ready” mode main screen.

4. Turn the simulator off, unplug it and allow it to cool to room temperature before returning the solution to the original container (if your guidelines mandate this). The solution may also be stored in the simulator if the simulator remains refrigerated. If the solution is removed, the simulator should be dried before storage.

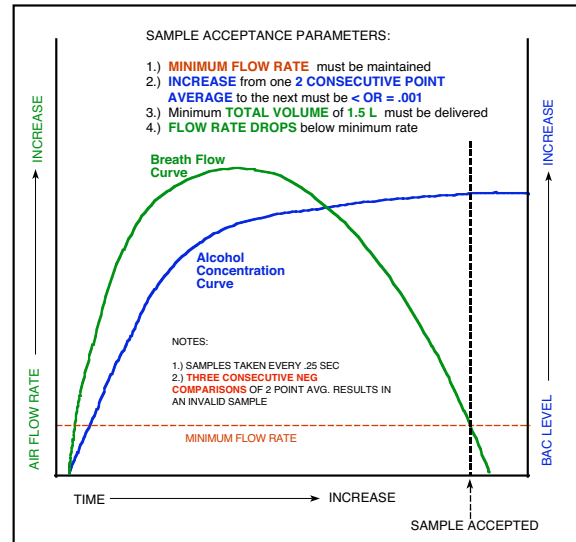
BAC DataMaster Sampling System

The sampling system in use in the DataMaster incorporates four criteria to establish a complete test. These criteria are (1) a minimum flow rate, (2) the increase from one 2 consecutive point average to the next must be $<$ or $=$ to $.001$, (3) the minimum total volume of 1.5L must be delivered and (4) the flow rate drops below the minimum rate. (The minimum volume requirement may vary depending on regulatory requirements.

First, we will look at the minimum air volume requirement. The sample volume is calculated as long as the continuous breath flow is of a sufficient rate to change the flashing “Please Blow” indication on the display to a solid (non flashing) “Please Blow” and an audible “beep” to a solid tone. This flow is measured by a flow sensor placed adjacent to the breath path and when a minimum volume of 1.5 liters of air has passed into the system the minimum volume requirement is met and the instrument can begin to monitor the other requirements.

As a drinking subject blows, the percentage of alcohol in the breath moving into and through the cell is increasing. The first portions of the breath sample are from the mouth which have relatively little alcohol compared to the lung air. Therefore, what the instrument “sees” electronically and what you see on the display are rising numbers as the air in the sample cell is replaced first by mouth air and then by lung air. When the subject reaches the deep lung air which is characterized by a relatively uniform concentration of alcohol, the rate at which the reading is rising slows, and although some rise can still be noted the subject is beginning to run out of breath.

The DataMaster microprocessor is “watching” how fast the reading is rising and is “waiting” for the fast upward movement of the display to slow down. If the subject stops blowing before the uniformity of concentration (alveolar air) is noted by the instrument, the test cycle will not be completed. If the subject starts blowing again and introduces a sufficient amount of breath into the instrument, the test can usually be completed without further difficulty, but, under some conditions the second breath may result in an “Invalid Sample”. However, if the 2 minute window of opportunity is exceeded, the instrument will either ask if the subject is refusing the test, or may print “Incomplete Sample”, depending on soft-



ware. Assuming that the sample is sufficient, the third criteria, a reduction of the flow can then be established at which time the test will be completed.

IT IS IMPORTANT TO UNDERSTAND THAT ALL THREE CRITERIA WORK TOGETHER AND THAT FAILURE TO MEET ANY ONE OF THE THREE WILL INHIBIT SAMPLE ACCEPTANCE.

A lack of understanding of the system can lead to difficulty in obtaining a sample from an alcohol free subject, particularly during training. Usually, this difficulty is because the subject fails to relax breath pressure after having completed the minimum blowing time. Maintaining a constant pressure will inhibit completion. The perception is that the instrument is asking for too much air when, in reality, if the alcohol free subject had simply eased blowing at an earlier point in the test, the instrument would have accepted the sample.

In all instruments, the best procedure for the testing officer to use is simply to tell the subject to take a normal or moderate breath and to blow until he is told to stop. The officer waits until the person runs out of breath before telling them to stop. The subject will run out of breath and the instrument will cycle complete at the same time. This is exactly how it should happen. Instructing the subject to take a deep breath or to blow hard is not helpful.

Remember, it is *CONCENTRATION UNIFORMITY*, not volume, that is necessary for a good test.

The “Invalid Sample” message and the BAC DataMaster Infrared Breath Alcohol Measuring Instrument

Occasional instances of the message “Invalid Sample” in conjunction with an evidential breath alcohol test or tests taken on the DataMaster family of instruments has led to confusion when inadequate and often contradictory explanations are presented in court, most often by defense “experts” who tend to be both uninformed and unskilled regarding the operation and technology employed by the DataMaster. This work will explain the purpose and function of the “Invalid Sample” system employed by the DataMaster family of instruments, along with some of the more common considerations that should be assessed by the users, prosecutors, defense and courts when presented with this message. All opinions and observations in this work assume, of course, that normal and adequate pre-test protocol (minimum 15 minute deprivation period) has been observed.

Background:

The alcohol measurement of breath is taken from the latter portion of the exhaled breath sample that approximates deep lung air. In order for a subject to provide this sample, the first portion to be seen during any exhalation will be that of mouth air and by its nature will be of a lower alcohol concentration than that of deep lung air. As a person continues to blow, the concentration of alcohol in the breath increases as the air expelled becomes more representative of the deep lung air. At some point, the concentration of alcohol as seen by the measuring instrument achieves a relative uniformity indicating the approximation to deep lung air. If the breath sample is exhaled continuously, this reading can be expected to rise, quickly at first, then more slowly as the concentration becomes more uniform. Under no circumstances, should this reading ever decline during any continuous exhalation. Since the measurement made by the DataMaster is made in “real time” it is possible to evaluate this increasing reading electronically.

If the reading does decrease, for any reason, the assumption is made that this is not an appropriate sample. The test is terminated and the message “Invalid Sample” is displayed.

Operation of the DataMaster:

The DataMaster is designed to measure the alcohol in a breath sample by the introduction of a continuous exhalation of breath blown at a minimum flow rate of around 3 to 4 Liters per minute coupled to a minimum volume of about 1.5 Liters. The instruction we suggest be given to the subjects by the test administrator is to provide a continuous breath until told to stop or until the DataMaster accepts the sample. During this exhalation of breath, the DataMaster is measuring the alcohol level in real time at a rate of 4 times every second. It averages every two consecutive readings and compares each average to the last average. If, in the course of the test, any three sequential averages are determined to be decreasing when preceded by an upward reading, the sample is determined to be not as expected and the test is terminated as an “Invalid Sample.” Additionally, in the DataMaster DMT, the highest measurement during the course of the test is noted and compared to the final measurement. If the final measurement is more than 5% lower than the highest measurement the test is also considered “invalid.”

Assessment of Possibilities and Opinions:

The only certain reason that we can give for any instance in which the “Invalid Sample” message appears is that the reading was going “down” instead of “up” as expected. There can be a number of reasons as to why it can go down. Some of these reasons and our position regarding the probability of each causing the “Invalid Sample” message are as follows:

1. “Invalid Samples” are seen most often on tests where the subject has not provided a continuous sample - as instructed and as the instrument is designed to measure. This can usually be substantiated by the officer’s observation and/or the use of a video tape during the test. The starting and (premature) stopping of the blow by the subject, while taking a fresh breath between these blows, sucking backwards instead of blowing, and blowing so softly that the flow rate falls below the minimum are some of the more common tactics, among others. These blowing patterns are, at best, unpredictable, and, at worst, are conducive to conditions that will cause an “Invalid Sample” message to occur. The officer’s notes and recollection of the test are of vital importance in substantiating this kind of uncooperative behavior.

Anytime there is a discontinuous blow by the person being tested, and that test results in an “Invalid Sample” message, it can be safely and reasonably assumed that the condition was triggered by the blowing pattern of the individual.

2. One of the symptoms of the presence of fresh “Mouth Alcohol” will be a rapid rise followed by a decline in the reading. However, the wealth of scientific test data that has been accumulated over the past 60 or so years regarding the dissipation of

mouth alcohol convincingly supports the position that if the observation period has been satisfied, mouth alcohol is not the cause for any given “Invalid Sample”. In the absence of any sign of visible regurgitation on the part of the subject, there is even less of a reason for this to be a consideration. Studies on the retention of alcohol by dental appliances as possibly causing this condition have been shown to not be a significant issue. (1)

One of the common defense claims is that the “burping” of raw alcohol from the stomach is a likely cause of “mouth alcohol” which, in turn, would have caused the “invalid sample.” This is not at all likely since alcohol from the stomach would be of an unabsorbed nature and of an extremely high concentration. This being the case, one would expect to see a “detector overflow” condition since alcohol breath of that concentration would exceed the measuring range of the DataMaster.

An additional consideration when speaking of the possibility of a burp bringing up raw alcohol is that adsorption from the stomach is typically complete within 20 to 60 minutes after drinking, although it is possible alcohol consumed with moderate quantities of food can extend this period to up to 90 minutes. A 90 minute absorption period has been shown to be the exception and infrequent. (2) Generally, however, if the test was conducted over 60 minutes after last drinking, this is not a consideration.

3. A variation on the burping argument is the GERDS argument. Most of the same conditions apply here that apply to the “burp”. Kechagias, in his study, concluded that the risk of alcohol erupting from the stomach was “highly improbable” (3), and the one case history that is available indicates that it triggers the “invalid sample” message (4).

Interestingly, most of the “GERDS” defenses we have had occasion to be a party to in court proceedings were cases where the condition was diagnosed but never confirmed. In one instance, the diagnosis was made within 2 days of the start of the trial. This “GERDS” defense appears, at least in some instances, to be a “manufactured” defense.

4. It is possible that the “Invalid Sample” message can be seen as a result of maintenance issues. However, if this is the case, it should be seen repeatedly and on a disproportionate number of tests, including periodic simulator tests.

Opinions and Conclusions:

Should the deprivation period be restarted if the message “invalid sample” is reported on the first test? We suggest in our manual that a “short waiting period be observed, but this is only a suggestion and we defer any specific procedure to the state guidelines since they vary somewhat on what action to take. The reason why we only “suggest” a “short” waiting period is simply because if the mandatory waiting period has been observed, the probability of the “invalid sample” being caused by mouth alcohol is virtually nonexistent. All the test data supports this position and therefore there is no need to restart the observation period. The probability that it is being caused by an uncooperative subject is extremely high and will typically be substantiated by the observation of the test administrator. Waiting a few minutes will often result in an “attitude readjustment” on the part of the subject and, in turn, a better sample the second time around.

There is some indication that officer training may play a part since some officers seem better able to coach than others and fewer of the tests they conduct result in “Invalid Samples”. Most typically, the aborted test will be followed by a valid test, usually after the subject was advised that if they did not cooperate they would be charged with a refusal. The best breath sample is produced by a continuous exhalation. It does not need to be a hard blow, nor does it necessarily need to continue until the person runs out of breath although it typically will. It needs to continue only to the point where the rise has stabilized and the minimum volume requirement has been satisfied.

A recent study, done by the Forensic Laboratory Services in Vancouver concluded the following: “Our experiment demonstrates that an “INVALID SAMPLE” status message can be generated by improper sample delivery into the BAC Datamaster C when mouth alcohol is not present. This underlines the role of the Qualified Technician to carefully monitor the subject while they are blowing into the instrument. It should also be noted that there were no “INVALID SAMPLE” status messages generated when the subjects were blowing properly. Although mouth alcohol may also trigger an “INVALID SAMPLE”, using the standardized field testing protocol and allowing for alcohol’s disappearance from the mouth, the results of this study indicate that the most likely cause of an “INVALID SAMPLE” status message is the discontinuous manner of breath sample delivery by the test subject.” (5)

Modern breath instruments are designed to help preclude the “invalid samples” caused by the discontinuous blowing patterns of subjects, but there is no way to eliminate them completely. A correct breath exhalation will rarely result in an “invalid sample.” The administration of a second complete test, with an appropriate agreement between the two complete tests, lends

substantial additional confidence to the evidence. Further, “Invalid sample” messages are seen most often resulting from tests on subjects with higher BrAC levels. Usually over a .15 BrAC, although not always. The higher the alcohol level, the higher the probability that an “invalid sample” condition can be seen when the subject is blowing in a discontinuous manner. It is highly probable that the degree of impairment at these high alcohol levels is more conducive to both uncooperative behavior and to blowing patterns that are abnormal.

The re-initiation of a further observation period after the occurrence of an “Invalid Sample” message on the BAC DataMaster is typically not warranted when the delivery of the subject exhibits a discontinuous pattern of blowing and this pattern is substantiated by the observation of the test administrator. When proper instruction has been provided by the test administrator and the subject continues to exhibit this pattern of blowing contrary to these instruction and the results are additional “Invalid Samples” a charge of “Refusal” is typically justified.

Conversely, anytime the mandatory deprivation period has been observed, and the subject has delivered a continuous breath sample as evidenced by an unbroken audible signal, and the test terminates in an “Invalid Sample”, a charge of refusal cannot be justified.

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Note: Although the above study makes reference to the BAC DataMaster C, the analytical techniques for sample acceptance in the standard DataMaster models and the DataMaster DMT are virtually identical and the same expectations will therefore apply.

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Donald R. Wilkinson, Ph.D., Delaware State College, Dept. of Chemistry, Dover, DE 19901

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