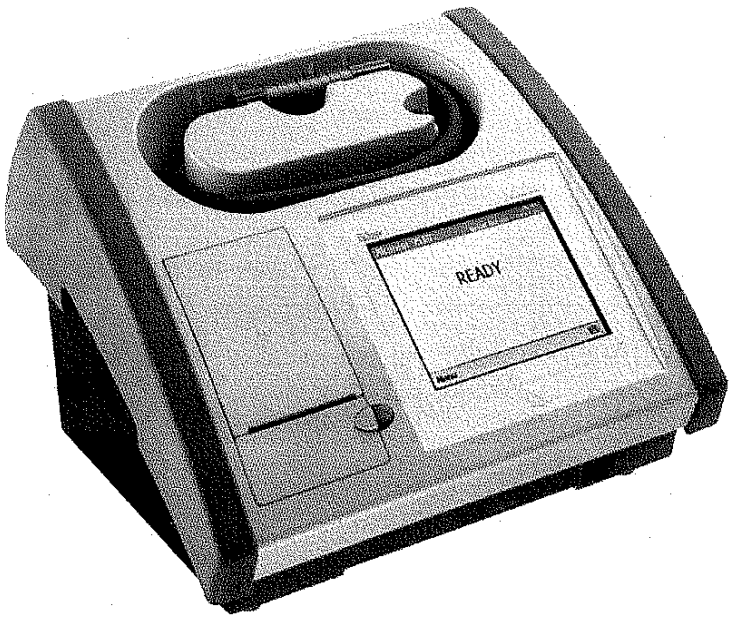
Dräger safety

State of Connecticut



Alcotest® 9510

DRAFT Based on RFP No. 07PSX0323 Specifications
Supervisor's Manual
Version 1.2

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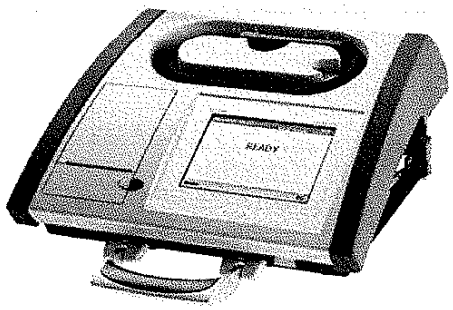

Disclaimer
The authors of this manual have incorporated their best efforts in preparing this information and ensuring that the technical content is completely accurate at the time of publication. Draeger Safety Diagnostics, Inc., accepts no responsibility for technical inaccuracies and reserves the right to make periodic changes, enhancements, revisions, and alterations to the programs and/or its manuals without obligation to notify any person, institution or organization of such changes, enhancements, revisions, and alterations.

Safety
For correct and effective use of the described instrument, it is essential to read and strictly follow the instructions contained in this document. The described instrument is to be used only for the purposes specified herein.

Maintenance
Repairs of the described instrument may only be performed by Draeger Safety Diagnostics, Inc., or an authorized service technician.

Only original Draeger spare parts may be used.

Note: In this manual, the Alcotest® 9510 is referred to as the "9510".

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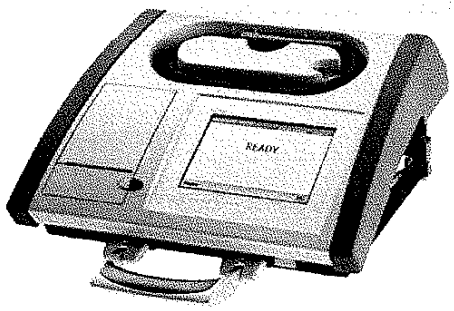

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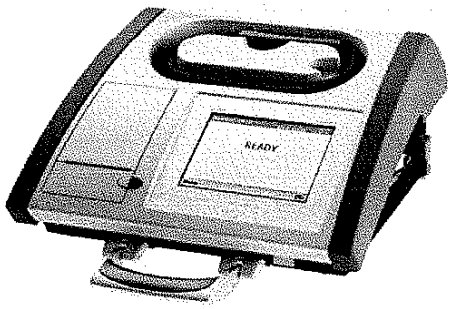
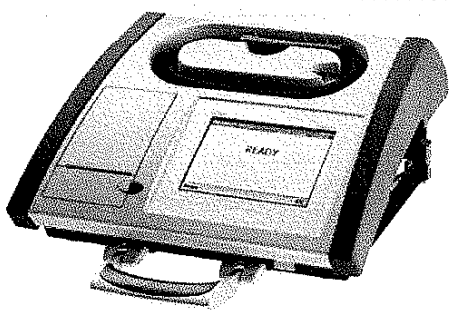


General Data



Application

The Alcotest® 9510 is a breath alcohol analyzer used for evidential breath alcohol measurements in the law enforcement, workplace, and other analytical environments. The Alcotest® 9510 provides accurate, tamper proof BrAC results, which can be displayed both on the instrument's LCD and the printout produced by the internal printer.

Product Description

The Alcotest® 9510 can be used in either a stationary or mobile location. It comprises a graphic color display, multiple interfaces (USB, Ethernet, Serial, GSM, modem and IrDA), and a comprehensive range of easily adaptable accessories. The Alcotest® 9510 has an easy one-button operation as well as a stylus stored in the recess on the top of the instrument for touch screen operation. The Alcotest® 9510 features a new ergonomic design and a low-noise thermal printer with easy to read, durable, and high class document printouts.

Operating System

Two controller systems are active in the Alcotest® 9510; A Windows CE operating system for the interfacing with peripherals, display, external printer, communication via Ethernet, GSM, RS 232, etc. and the Renesas M16 controller system for the handling of the measuring systems and for providing the results directly to the internal printer.

Peripheral Connections

The Alcotest® 9510 has the following peripheral connections: 3 USB ports, 2 RS-232, Ethernet, External Video Monitor, RFI Antenna (optional), GSM Antenna (optional), AC/DC power, RJ11 telephone jack, Speaker, and an IR Port for wireless keyboard or PC Communication.

Servicing

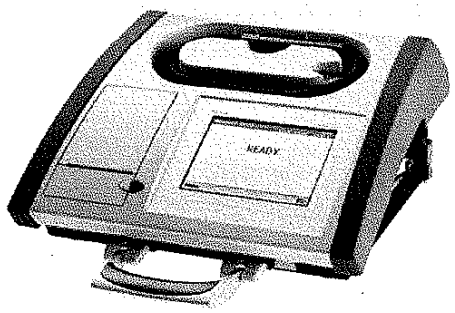
It is recommended that the 9510 instrument be inspected every 6 to 12 months and should only be performed by Draeger Safety Diagnostics, Inc., or a Draeger certified technician.

Cleaning

When cleaning the Alcotest® 9510 instrument, please follow these guidelines (external only):

- Disconnect power supply
- Wipe outside of instrument with a damp cloth
- Dry thoroughly
- Do not use any solvents or cleaning agents
- Do not allow liquids to enter the case or the breath hose

Operation



Preparation For Use

Place the instrument on an open, solid surface. Lift up on the top dust cover and store away from the instrument.

Attach the AC power cable to the socket. Apply power to the instrument with the power switch adjacent to the socket.

The display is on the right, and the thermal printer is on the left side of the instrument. The storage recess for the sampling hose is on the top.

Physical Location

The Alcotest® 9510 should be placed on a relatively level and solid surface free of obstructions. Excessive vibration and drafts should be avoided.

Data Entry

If an external keyboard is plugged into the instrument, all data entry fields will take input from the external keyboard. If there is no external keyboard connected to the instrument, the instrument will display a virtual keyboard on the touch screen for all data entry fields. To change the case of the characters displayed on the virtual keyboard, press the "up arrow" button on the virtual keyboard. The "left arrow" key is the "Enter" key, and the blank key is the space bar.

Stationary Use

Plug in the supplied power cord into a grounded power receptacle or into a surge protector. Switch on the Alcotest® 9510 using the main switch located on side of the instrument.

Mobile Use

Connect the 12 VDC power cable to the Alcotest® 9510 and the vehicle's electrical system (cigarette lighter receptacle).

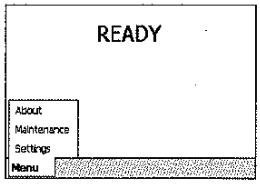
Reset

To abort a test sequence at any time, press the green start button for two seconds. This will return the instrument to the READY prompt. You may also select the "RESET" button to abort a test sequence.

Menu

The main menu button provides access to instrument settings, operational functions and instrument information. There are three submenus: About Maintenance and Settings. The functions contained in the submenus can vary depending on the accessibility rights of the user. The accessibility rights are administered by the program supervisor.

Press the "menu" button with the stylus to access the submenus.

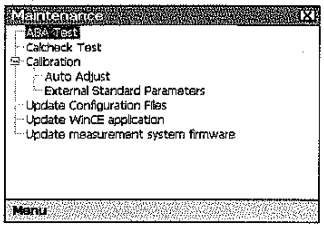


About

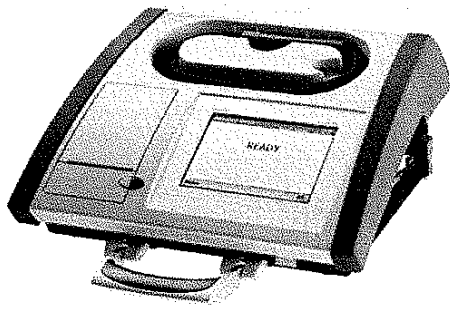
To read the software version information, choose the option "About." Press "Cancel" to close the window.

Maintenance

The submenu "Maintenance" contains the options for ABA Test, Calcheck Test, Calibration, Update Configuration Files, Update WinCE application, and Update measurement system firmware. Refer to the "Maintenance Options" section of this manual for more information on each option.

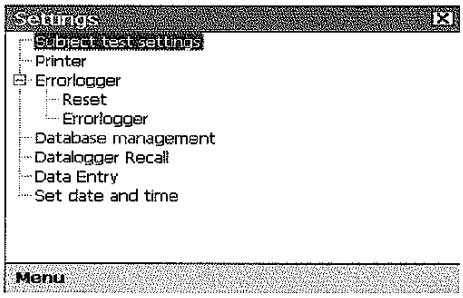


Operation (continued)



Settings

The submenu "Settings" contains the following options: Subject test settings, Printer, Errorlogger, Database management, Datalogger Recall, and Set Date and Time. Refer to the "Settings" section of this manual for more information on each option.



Touch Screen

After power is applied to the instrument, the display shows the desktop with a headline in the top block, the menu button and the current status in the center of the touch screen.

Please note: USE OF ANY WRITING UTENSILS (BALLPOINT PEN, PENCIL, ETC.) OTHER THAN THE TOUCH SCREEN STYLUS WILL DESTROY THE TOUCH SCREEN, THUS VOIDING THE WARRANTY.

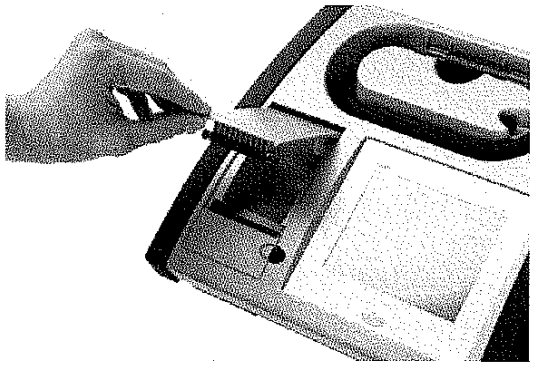
After the initial self-test and warm up cycles are performed, the instrument will automatically proceed to the READY mode. The instrument is now ready for a measurement and the operator can perform a test.

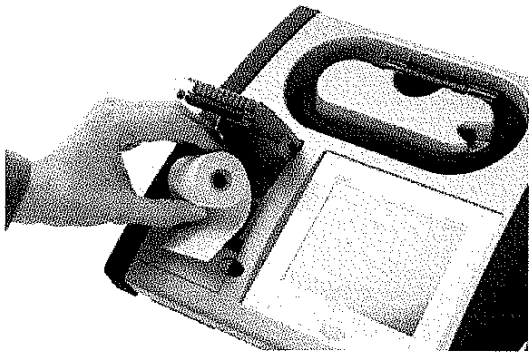
Internal Printer

The internal printer prints on 2.25" thermal paper that does not require a printer cartridge or ink ribbon.

Paper Change

Press the black button to open the paper compartment door and insert a new roll of paper (as illustrated) with the end of the paper outside of the compartment and press the paper flap closed.

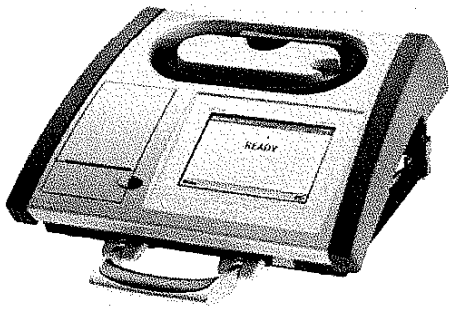




Disposal of the Instrument

At the end of the instrument's service life, dispose of the instrument in accordance with national waste disposal regulations, or ask a suitable disposal contractor to dispose of the instrument. The local environment agency can supply further details.

Measuring Technologies



The Alcotest® 9510 employs two different and independent technologies, each analyzing and quantifying a subject's breath alcohol concentration: IR spectroscopy (Infrared) and Electrochemical technology. This dual-sensorics offers the highest possible level of forensic analytical integrity.

Infrared Technology

The use of infrared technology for detection of alcohol in the breath by Law Enforcement has been around since the late sixties. In the early 1970's, scientists from the United States and Germany combined work to develop standardization on breath testing devices utilizing infrared theory. The list of definitions below are some of the common terms used involving infrared technology.

- Molecule: The smallest physical unit of a compound that can exist separately and still keep the properties of the original substance.
- Wavelength: The distance between two successive points in a wave.
- Amplitude: The strength or height of a wave.
- Frequency: The number of periodic oscillations, cycles or waves per unit of time (cycles per second).
- Electromagnetic Radiation: A form of energy transmission through space or a medium (glass) in which electric and magnetic fields are extended or transmitted as waves.
- Electromagnetic Spectrum: The complete range of frequencies of electromagnetic radiation from the lowest to the highest frequency.
- Infrared Energy: The part of the invisible spectrum, contiguous to the red end of the visible spectrum of electromagnetic radiation, which travels through space in waves. Behavior of such waves is similar to that of visible light waves.
- Micron: The unit of linear measurement of electromagnetic radiation. One micron is equal to one millionth of a meter. The symbol µm" denotes a micrometer (e.g. 9.50µm).

Infrared Theory

Depending on their physical size and structure, molecules absorb energy at specific areas in the IR spectrum. Ethanol molecules absorb IR energy in two distinct areas in the IR spectrum.

Infrared System

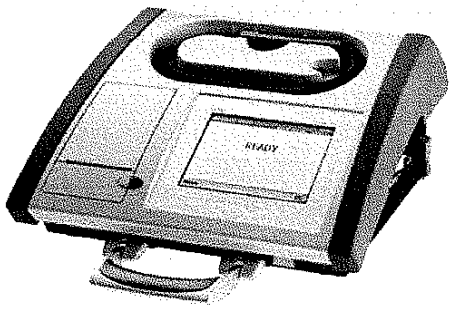
The 9510 Detects alcohol in the 9.5µm region of the IR spectrum. Utilizes an absorption chamber (cuvette) with 70 mL chamber volume, gold-coated parabolic mirrors, an electronically modulated infrared transmitter, and a pyro-infrared detector with an integrated IR filter.

Electrochemical Sensor Technology

The device known as an electrochemical fuel cell was originated in 1839 by Sir William Grove. He discovered that if two platinum electrodes were immersed in a sulfuric acid electrolyte, and hydrogen was supplied at one electrode and oxygen at the other, an electric current was produced as long as gas was supplied to the device. The chemical reaction was the same as if the hydrogen was burned, but in this case, electricity was produced directly instead of heat. The fuel cell was long envisioned as a desirable electrical generator, since no moving parts were involved, the platinum (or other catalytic material) was not consumed, and no significant heat was developed in the process. High cost and many technological problems have prevented the fuel cell from fulfilling its promise as a low cost generator of electricity and its use has, to date, been confined to relatively exotic applications such as spacecraft and satellite power sources.

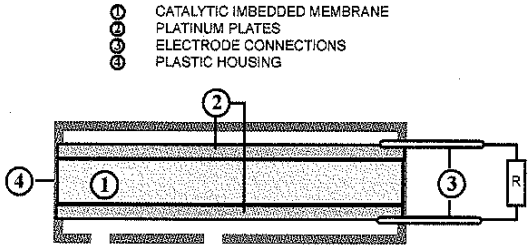
A highly important by-product of this effort has emerged in the early 1960's when a group of scientists at the University of Innsbruck, Austria demonstated a practical construction for an ethanol detector. Thus using the fuel cell sensor to detect the presence of chemical components that are capable of being oxidized by this process.

Measuring Technologies (continued)



Electrochemical Theory

In its simplest form, the fuel cell consists of a porous, acidic membrane (electrolyte), which is laminated by two platinum black plates. An electric wire is attached to each of the platinum plates. This assembly is packed into a sealed plastic housing which has a small hole (gas inlet) leading into a sample chamber, where a breath sample is introduced.



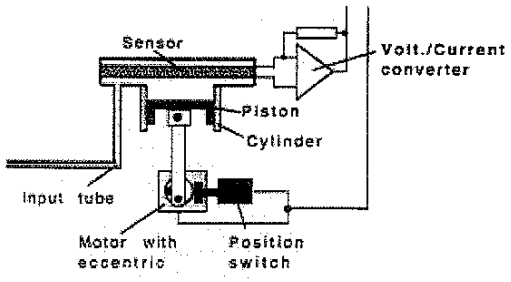
Only one platinum plate will be exposed to the breath sample. Once ethanol reaches the platinum, a chemical reaction is triggered. This chemical reaction produces an electrical current between the two platinum plates, which is measured. This becomes the usable indicator of the amount of ethanol consumed by the fuel cell, and is directly proportional to the ethanol concentration of the breath sample. After processing, a quantitative result is determined.

A rise in BrAC will result in a proportionate increase in current.

In the reaction that takes place in a fuel cell, it is known that ethanol is converted to acetic acid. (ethanol + oxygen = acetic acid + water).

Other alcohols will react in the cell, but because the chemistry is different, the rate of reaction is also different. (e.g. Isopropanol and Methanol)

Fuel Cell Analytical System of the Alcotest® 9510



The fuel cell contained within the instrument is located directly on top of the cuvette and therefore heated by the cuvette.

The fuel cell sampling system consists of:

- Fuel Cell: An alcohol specific sensor.
- Piston: Draws a 1cc sample out of the cuvette and into the fuel cell.
- Cylinder: The housing for the piston.
- Current/Voltage Converter: Sends the voltage change to the microprocessor.
- Breath Inlet Pathway: Allows the breath sample to pass from IR sample chamber within the cuvette.
- Motor: Drives the piston.
- Position Switch: Indicates that the motor has completed its cycle.

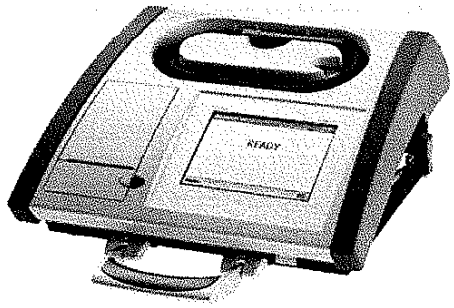
Electrochemical Sensor

Measures small samples from inside the cuvette. Once ethanol reaches the sensor, a chemical reaction is triggered. The resulting current is used to determine the amount of alcohol in the sample.

Benefits of Dual Sensing Technology

By combining two distinct analytical systems to analyze a subject's breath, the 9510 is able to provide two precise, accurate, and independent test results.

Measuring Technologies (continued)



Infrared spectroscopy requires that a zero reference be established prior to a subject's breath test. Because the fuel cell of the 9510 is "piggy backed" on the IR cuvette, we can draw a sample out of the chamber and analyze it, to ensure that a zero set is based on one that is free of absorbing alcohol vapor.

The dual system also allows for a superior degree of sensitivity to any possible existence of interfering substances. Because the fuel cell is alcohol specific, and the IR sensor operates at 9.5µm in the IR spectrum, the possibility of an interfering substance influencing a subject's ethanol reading is virtually impossible.

To quote A.W. Jones in his article, "Measuring Alcohol in Blood and Breath for Forensic Purposes - A Historical Review."

"The use of a higher wavelength (9.5µm) offered the advantage that the results were much less prone to interference from acetone and hydrocarbons which absorb IR radiation at 3.4µm and under some circumstances might be expelled in the breath. In the latest generation of evidential breath alcohol instruments, IR and electrochemical detectors are contained within the same unit (Alcotest® 9510). As mentioned earlier, analyzing alcohol by two independent methods is highly desirable feature for medicolegal purposes."

Beer-Lambert Law

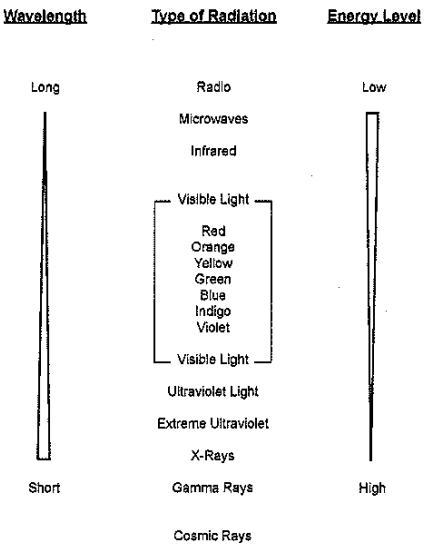
Law of Absorption

The Beer-Lambert Law states: For a defined path length (the sample chamber), containing an absorbing system (concentration of ethanol molecules), the transmitted energy (IR energy) will proportionally decrease with the increase in concentration of the absorbing system.

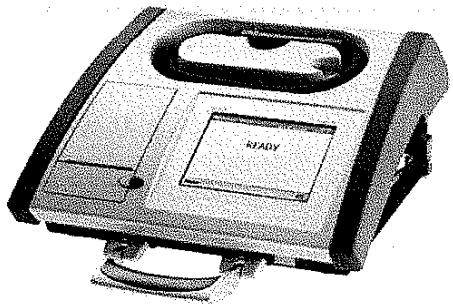
Law Applied

In an IR chamber one end has an IR source and at the other end an IR detector (similar to photoelectric cells of a Breathalyzer). The IR detector converts IR energy to electrical energy. Prior to a subject test, the IR chamber contains only ambient air. The IR detector produces a voltage output from the IR source striking it.

A breath sample saturated with ethanol is introduced into the chamber, the ethanol will absorb some of the IR energy causing less IR energy to reach the IR detector resulting in a voltage decrease. An increase in the BrAC will result in a proportional decrease in the detector's voltage.



Measuring Technologies (continued)



Infrared Spectrum

Fig. 1 shows a spectrum of human breath containing 200 ppm ethanol. Besides ethanol, there is the sharp absorption line of carbon dioxide at 4.2 µm and a broad absorption band of water ranging from 5 to 8 µm. Ethanol exhibits two strong absorption lines: one at 3.4 µm which corresponds to the stretching of the C-H bond, and the other centered at 9.5 µm caused by the vibration of the C-O bond.

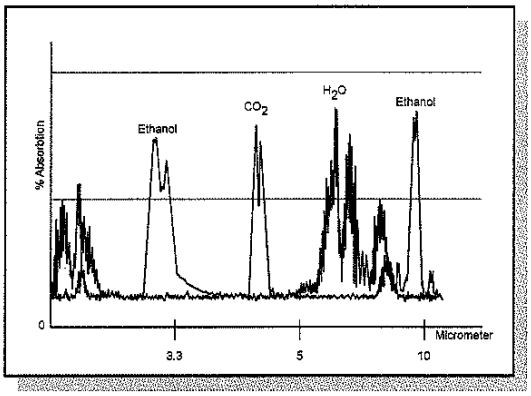


Fig. 1

Absorption of Ethanol

Fig. 2 shows the absorption of ethanol. The shaded area represents the infrared filter of the 9510. It shows the central frequency as 9.5µm with a half band width of 0.50µm which significantly increases the signal to noise ratio (Resolution).

The 9510 measures ethanol at 9.5µm because, in this area of the IR spectrum, the cross sensitivity to potentially interfering compounds found in the human breath is virtually non existent.

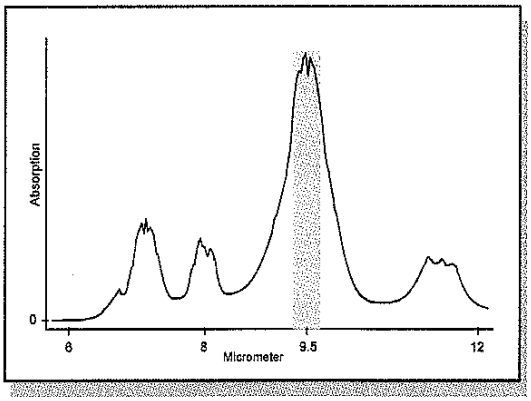
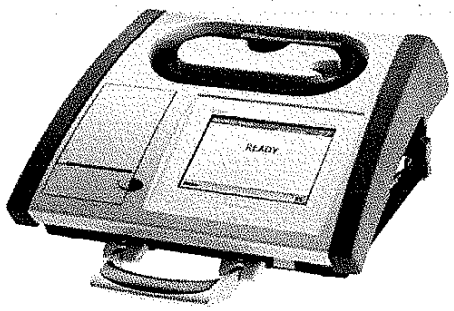


Fig. 2

Verification Standards



The 9510 accepts either ethanol vapor from a simulator, or ethanol gas from a compressed gas cylinder for calibration and accuracy checks.

Wet Bath Simulator Methodology

Using wet bath simulators for calibration testing has been the standard method for decades. Breath alcohol simulators are specially designed instruments which provide equilibration of alcohol between water and air at a controlled temperature. The water-alcohol solution is maintained at a temperature of 34°C, which is the approximate temperature of exhaled breath. The alcohol concentration of the vapor produced by a wet bath simulator is proportional to the alcohol concentration of the alcohol-water solution at a constant temperature (34°C) in accordance with Henry's Law.

Henry's Law

Henry, an English chemist, studied the behavior of solutions in which a volatile substance (one which readily evaporates to form a gas) was dissolved and in 1803 he described the behavior as a law now known as Henry's Law. Although Henry did not study alcohol solutions in his work, his law applies to aqueous (water) solutions of alcohol containing less than 20 percent alcohol.

When a volume of alcohol is added to water it dissolves to form a solution. A specific amount of this alcohol escapes from the solution in the form of gaseous alcohol, which can be detected by the odor of alcohol lingering above the solution

If an alcohol solution is poured into a bottle (so as to partially fill it), and the bottle is sealed, the concentration of alcohol vapor in the air (and water vapor) above the solution increases rapidly until it reaches a certain concentration and it then remains at this concentration. At this stage, there will be a definite ratio between the concentration of alcohol in the solution and that in the air. The concentration of the alcohol vapor above the solution depends on two factors: the temperature of the system and the concentration of alcohol in the solution. If the air in the bottle was replaced with air containing a higher alcohol concentration, alcohol would pass from the vapor to the solution until the same ratio between the two concentrations (vapor and solution) again existed, provided the temperature had not been altered. If the temperature of the solution is allowed to rise, the concentration of alcohol in the vapor will be greater than it was previously.

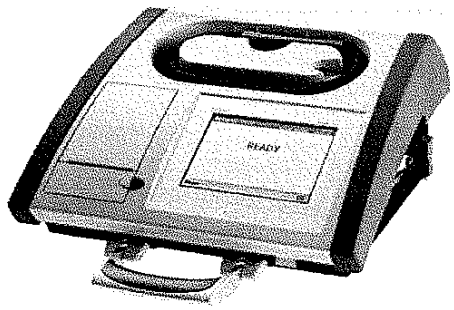
From these observations a simplified version of Henry's Law may be stated: "When an aqueous solution of a volatile compound comes to equilibrium with air, there is a fixed ratio between the concentration of the compound in air and its concentration in the solution and this ratio is constant for a given temperature."

Distribution ratios are NOT related a person's weight and/or physique. The formation of a fixed ratio (at a given temperature) of the concentration of a volatile substance in solution and in the air above the solution is called partitioning. The ratio of concentrations at equilibrium is called the distribution ratio, which is more specifically the weight of alcohol in a given volume of air to the weight of alcohol in the same volume of solution (when the air and the solution are at equilibrium).

Henry's Law also applies to the human body. The partitioning of alcohol between blood (in the lungs) and breath occurs in the same fashion as described for alcohol in aqueous solutions. An application of Henry's Law to describe the partitioning of alcohol between blood and breath in the human body is shown in the following table:

HENRY'S LAW	HUMAN BODY
When an aqueous solution	blood
of a volatile compound	alcohol
comes into equilibrium with air	in lungs
there is a fixed ratio between the concentration in solution	Ratio 2100:1 (assumption) Concentration of alcohol in blood varies.
and this ratio is constant for a given temperature	body temperature is constant
% Alcohol Reading	Blood alcohol reading is dependent on how much alcohol is present in a person's blood.

Verification Standards (continued)



Dry Gas Methodology

Each 9510 that is dry gas compatible must pass our dry gas quality control protocol in addition to our standard wet bath protocol before being factory certified as accurate.

Calibration checks are essential to validate the accuracy of EBTs. It is recommended that the National Institute of Standards and Technology (NIST) traceable gaseous Ethanol standards be used.

Dry Gas Component Specifications

- Dual stage regulator with a flow rate of 3 liters per minute.
- Pressure indication gage with a range from 0 to 1200 psi in increments of 75 psi.
- Easy access shut-off valve.
- Male/Female connectors provide an easy positive connection.
- The gas hoses are configured with check valves to prevent the backflow of gas.
- Internal solenoids control the flow of gas and allow the gas valve to remain open.
- Gas canisters are easily changed.

Issues Regarding the Use of Dry Gas

In the Federal Register of August 13, 1997, Model Specifications for Calibrating Units for Breath Alcohol Testers; Conforming Products List of Calibrating Units, NHTSA addresses the two main issues regarding the use of dry gas standards: extreme cold temperatures and atmospheric pressure.

Extreme Cold Temperatures

The National Highway Traffic Safety Administration (NHTSA) acknowledges that dry gas calibrators could freeze during shipment, and this could affect test results. As a result of freezing, alcohol could condense in the inside surface of the cylinder. If this were to happen, it is recommended that the cylinder be brought to an ambient temperature as close to 21°C (70°F) as possible and periodically rolled back and forth during a 30 minute period to ensure homogeneity.

It is possible that the gas in such cylinders might be used before equilibration occurred with the result that breath samples would be obtained at incorrect concentrations and the cylinders would not be able to be re-used. Manufacturers of dry gas calibrating units recommend that after receiving the dry gas cylinders, users should warm the cylinders to room temperature, then lay them down on a flat surface and physically roll them back and forth for a period of ten minutes to ensure equilibration of the contents.

Atmospheric Pressure

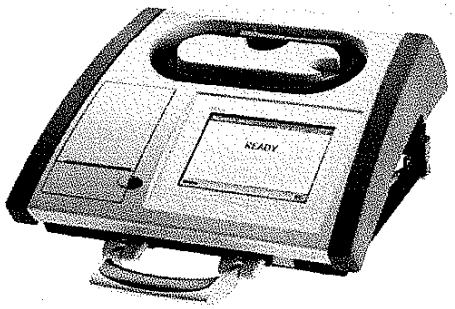
When a Calibration check is performed, some of the gas in the cylinder is released by operating the solenoid valve. The volume of the released gas will expand and its pressure will drop until prevailing atmospheric pressure is reached. The gas is prepared so that the desired concentration is obtained at normal atmospheric pressure, 760 milliliters of mercury. However, atmospheric pressure varies slightly from day to day and can change suddenly. The most significant effect comes from elevation changes. Atmospheric pressure corrections are made using an equation derived from the Ideal Gas Law: $C=C_{760}XP/760$, where C is concentration and P is the prevailing atmospheric pressure.

Shipping and Storage

Dry gas cylinders should be shipped and stored between 0°C (32°F) and 52°C (125°F). Exposure to temperatures below 0°C (32°F) may cause the Ethanol component to condense. Contact your local ground shipping representative for detailed information on shipping hazardous materials, such as dry gas. Do not use or store near heat or open flame. Exposure to temperatures above 52°C (125°F) may cause contents to vent or cause bursting. Never throw containers into fire or incinerate. Store and use with adequate ventilation. To prevent condensation on surfaces if there is a sudden change in the storage temperature of any of the devices, allow temperature equilibrium of the EBT instrument, EBS gas regulator, and EBS cylinder.

WARNING: The penalty for refilling a gas cylinder, or flying on an airplane with compressed gas, can result in a fine and/or imprisonment.

Detection of Interfering Substances



Detection of Interfering Substances

As previously mentioned, the Alcotest® 9510's infrared sensor operates in the 9.5µm range of the infrared spectrum. Acetone, toluene, and acetaldehyde, the most mentioned substances, can have a slight influence in breath analyzers operating at the 3.4µm range of the infrared spectrum. By shifting the operating range to 9.5µm, the Alcotest® 9510 is virtually free from the influence of these compounds as they relate to a living, breathing subject taking a breath test.

The Alcotest® 9510 also employs an alcohol specific electrochemical (fuel cell) sensor which is not influenced by acetone, toluene, or acetaldehyde.

During either a calibration or a calibration check, the fuel cell sensor's response to ethanol is memorized in the form of a curvature analysis profile. From this analysis, the presence of methanol or isopropanol can be detected by comparing the time constant of the curve of ethanol compared to methanol or isopropanol (see Fig. 3).

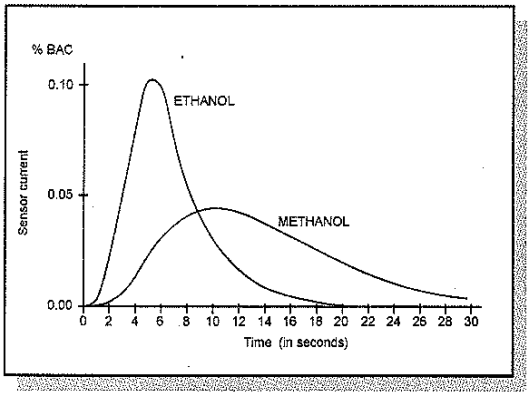


Fig. 3

If the analysis of the subject's breath reveals different curvature characteristics, "Interference" will be displayed and the test invalidated.

During a test, the subject's breath is analyzed by both the infrared and fuel cell sensors. There is a preset detection threshold that both readings must fall within for a test to be valid. The results must be within .008 g/210L or 10% of the IR reading, whichever is greater. If the two results exceed the preset tolerance, an interference message is displayed and the test invalidated.

NOTE: The interfering substance detection is activated in the regular breath test sequence only. Never run a Calcheck Test when using substances other than ethanol.

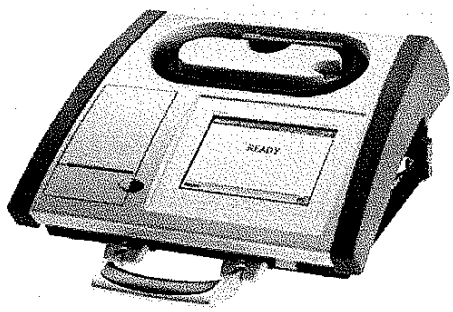
Mouth Alcohol Detection

The detection of mouth alcohol is based on the analysis of the IR's alcohol vs. time profile taken during the subject's breath sample. A normal profile is characterized by a sharp increase in the concentration at the beginning of the blow followed by a more moderate increase in the concentration until the end of the blow. For a regular breath test, the concentration always increases with time and never decreases.

In the case of mouth alcohol, the alcohol vs. time profile changes considerably. There will be sections with decreasing concentration thus, a negative slope.

For mouth alcohol detection, the Alcotest® 9510 takes up the breath alcohol profile as a sequence of discrete data points at a rate of 4 values per second. To make the assessment of the profile independent of the currently measured concentration, the profile is referenced to the last data point i.e., the concentration of all data points are divided by the concentration of the last data point. Values are therefore always ranging between 0 and 1. Analysis of the shape of the profile is achieved by calculating the first and second derivative of the normalized profile. The first derivative contains information about the slope of the profile, the second derivative is sensitive to sudden changes of the slope.

Systems & Components



Optics
The central part of the measuring system is the infrared absorption cuvette, where the breath sample resides. The breath sample is transferred into the system via the breath hose. The cuvette is heated to above 40°C to avoid condensation and to guarantee defined conditions for the analysis. The cuvette is a multi-reflection cell which provides a long absorption path for high precision yet, at the same time, has a volume of only 70mL. This small volume makes it possible to trace the concentration-time profile very carefully since fast changes are noticed. At both ends of the cell, gold coated parabolic mirrors contain the infrared source and the detector with the IR-filter. Energy from the infrared source passes through a central orifice in one of the mirrors onto the detector. The IR energy makes 7 passes before it is received by the IR detector. The IR emitter is modulated by supplying it with short current pulses, thus totally avoiding a mechanical chopper. Furthermore, the power consumption is only 0.4 Watts. The detector is a pyro-detector with very high sensitivity. Its housing also contains the alcohol specific filter. The output signal is fed into a very low noise amplifier, which brings the voltage to a considerable level for further analysis.

Sampling System
The sampling system with the EC sensor is a small piston pump assembly which pulls a fixed sample (1cc) of gas from the IR cuvette into the EC sensor.

Differential Pressure Sensor
The differential pressure sensor is used to measure the breath flow. The instrument records the flow during the subject's breath test from the beginning to the end. The recording allows the instrument to calculate the breath volume. The sensor monitors the pressure drop between the entrance of the cuvette and the entrance of the gas into the IR chamber. This pressure is transformed into a flow indication.

Pressure Sensor
The pressure sensor monitors proper operation of the pump. Furthermore, the pressure sensor constantly monitors ambient air pressure, which is necessary if dry gas standards are used to check calibration.

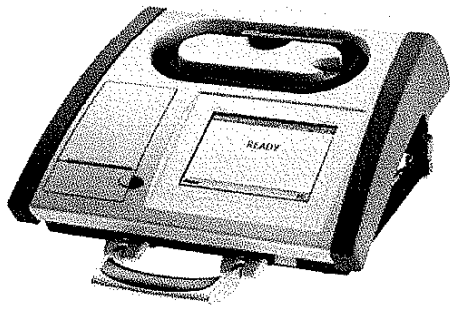
Breath Hose
The breath sample is transferred through the breath hose into the cuvette. The breath hose is heated above 40° C and microprocessor controlled to avoid condensation. It has excellent insulation to keep power consumption minimal at low temperatures. The breath hose is 46 inches long and flexible.

Microprocessor
All incoming signals from the sensors are passed to the microprocessor via a multiplexer and 12 bit A/D converters for further analysis. The microprocessor continuously checks all supply voltages and important components to ensure proper operation. It hands over the information directly to the Windows CE controller. It also has an extra pathway to send data/ results to the internal printer, which is independent from Windows CE.

Windows CE Controller System
The interface to the operator and subject is controlled by the Windows CE controller system, which is handling the display messages, addressing of peripherals, etc. It is an industrial, embedded Windows CE 4.2 operating system.

Signal Processing
The IR detector converts the pulses from the IR source to a small sinusoidal electrical signal. This signal is first amplified by a low noise amplifier and then sent through a band-pass-filter stage. At the A/D converter, this signal is sampled 128 times per second with 12 bit resolution and then it is transferred to the microprocessor.

External Components



Breath hose:
Flexible, heated and temperature controlled breath hose

Stylus:
Stylus for data entries via the touch screen

Display:
High resolution, LCD color touch screen for intuitive operation and guided data input management

Rubber bumper:
Rubber bumpers for protection

Thermal printer:
Fast, quiet and produces reliable documents. Easy paper drop-in feature.

Speaker:
For audio signals and synthesized voice prompts

Handle:
Handle for easy transport (detachable)

IR port:
IrDA port for wireless keyboard operation or PC communication

Start button:
Single button, menu driven operation

RS-232:
2 RS-232 interfaces for PC communication or card readers

Dry-gas inlet port:
Internally valved with electro solenoid

Cuvette inlet:
Simulator vapor inlet port

Dry-gas inlet ports:
Internally valved with electro solenoids

RFI antenna

GSM Antenna

RJ-11:
Modem interface

12 VDC:
Receptacle for 12 VDC vehicle power

RJ-45:
Ethernet interface

USB:
3 USB interfaces for external printer, keyboard, memory stick

Video port:
Interface for external monitor, screen, or projector

AC receptacle:
For 90-260 VAC operation, with two fuses

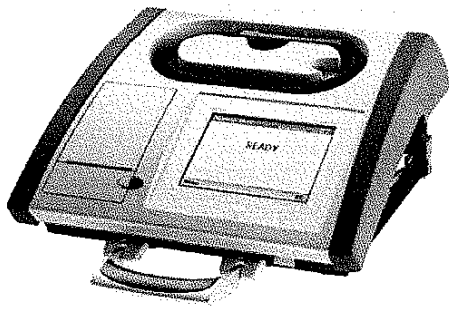
Service plug:
Electronic interface with A/D inputs, logic outputs, 5 VDC output

Cuvette outlet:
Exhaust port, protected against blockage

Air inlet

Air-out port:
Port to simulator

Block Diagram



A schematic view of the components of the Alcotest® 9510 is given in figure 4.

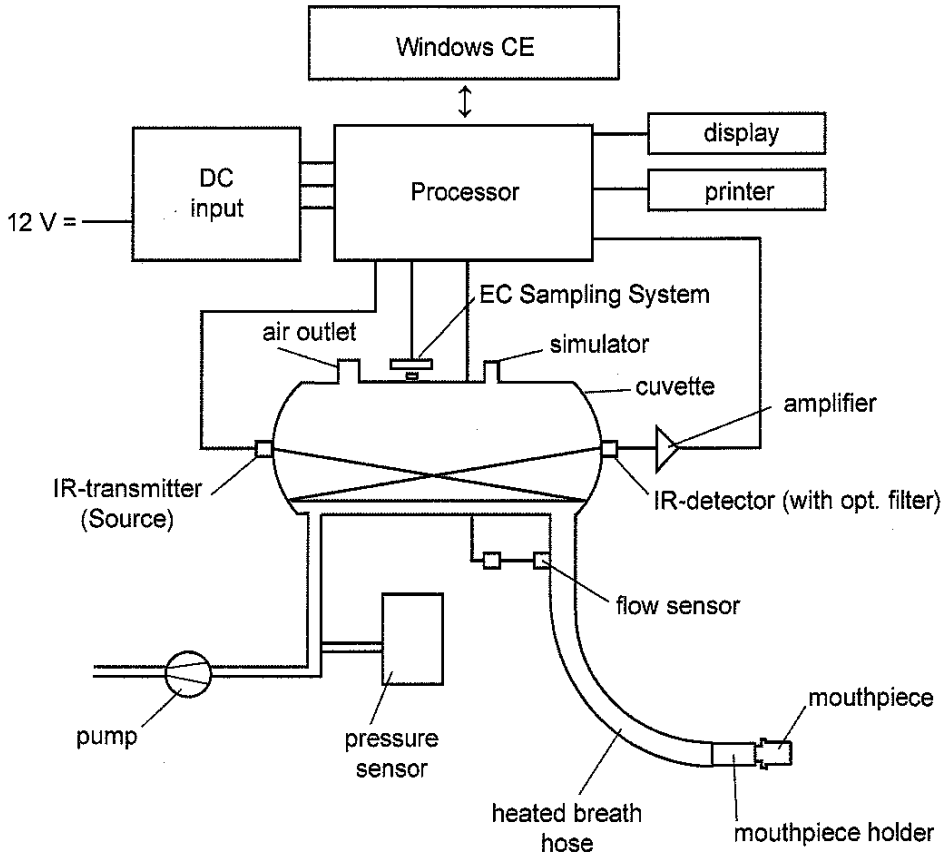
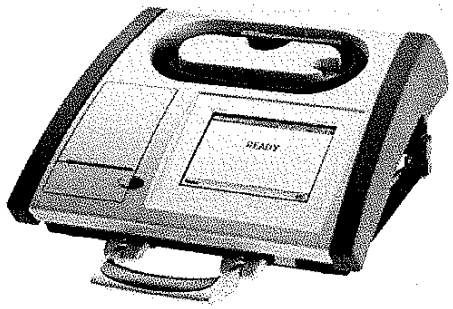


Fig. 4

The Windows CE system controls the peripheral accessories. The processor operates the measuring system and enables data transfer of the result to the Windows CE system.

Breath Test Sequence



Breath Test Sequence Warm-Up Phase

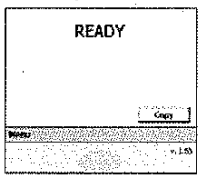
When the 9510 is turned on, an internal self-test is performed and the following messages will be displayed on the LCD:

SELFCHECK
WARMING UP
NOT READY

When the instrument is ready to begin a Breath Test Sequence, the instrument will beep, and READY will be displayed on the LCD.

When READY appears on the LCD, push the green "Start" button to begin the Breath Test Sequence.

Depending on the length of time between Breath Tests, the instrument may be in "STANDBY" mode. To wake up the instrument, tap on the touch screen to light up the screen, and press the green button to begin the instrument's "WARM UP" phase.



Press the green start button to begin a test. The instrument proceeds to the data entry sequence (if applicable.) Follow the instructions on the display and enter the appropriate data into each field following the prompts. Use the "Next" and "Prev." buttons to scroll between the entries. The progress of the number of questions completed will be between the "Prev." and "Next" buttons. Press the "Reset" button at any time to abort the question sequence, and press the "Save" button to save all entered data and proceed to the breath test.

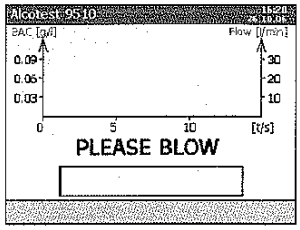
The instrument will prepare for the breath tests by performing a series of checks. Ambient air is pumped into the IR cuvette. An analysis is performed to ensure that no alcohol exists in the ambient air. An external standard test will be performed.

The display will show the following messages:

PURGING
AMBIENT AIR CHECK
BLANK CHECK
EXTERNAL STANDARD CHECK
INTERNAL STANDARD CHECK
PURGING
AMBIENT AIR CHECK
BLANK CHECK
PLEASE BLOW (SUBJECT TEST #1)
PURGING
AMBIENT AIR CHECK
BLANK CHECK
EXTERNAL STANDARD CHECK
PURGING
AMBIENT AIR CHECK
BLANK CHECK
PLEASE WAIT
PURGING
AMBIENT AIR CHECK
BLANK CHECK
EXTERNAL STANDARD CHECK
PURGING
AMBIENT AIR CHECK
BLANK CHECK
PLEASE BLOW (SUBJECT TEST #2)
PURGING
AMBIENT AIR CHECK
BLANK CHECK
EXTERNAL STANDARD CHECK
PURGING
AMBIENT AIR CHECK
BLANK CHECK

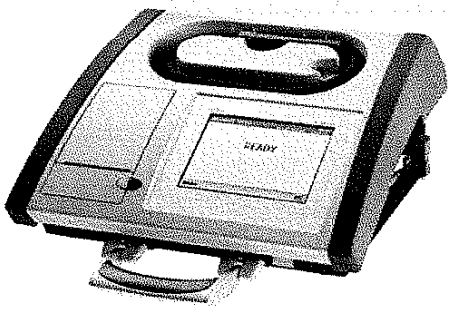
Breath Test

When the screen displays "PLEASE BLOW," remove the breath hose from the storage recess. Fit a new mouthpiece onto the breath hose for each subject test performed. Request the person being tested to inhale calmly and blow continuously and evenly into the mouthpiece. The progress of the breath sample and the amount of alcohol in the breath can be monitored by observing the real time graph displayed on the screen. The bar at the bottom of the display represents the accumulated breath volume provided in the sample.



If the sample does not meet all of the requirements, the instrument will display an error message, perform a purging cycle, and then return to the PLEASE BLOW prompt. See the insufficient samples section for more details.

Breath Test Sequence (continued)



Insufficient Samples

Any interruption of blowing or failure to satisfy the minimum requirements, such as minimum volume and minimum blowing time, will result in an insufficient breath sample. Depending on the situation encountered, one of the following messages may appear on the LCD:

MINIMUM VOLUME NOT ACHIEVED
BLOWING TIME TOO SHORT
BLOWING NOT ALLOWED
PLATEAU NOT ACHIEVED

If "MINIMUM VOLUME NOT ACHIEVED" appears on the LCD, the subject needs to blow for a longer time. If "BLOWING TIME TOO SHORT" appears on the LCD, have the subject take a deeper breath and blow for a longer time at a slower rate. If "BLOWING NOT ALLOWED" appears on the LCD, ensure that the subject waits for the "PLEASE BLOW" prompt to appear on the display before blowing into the instrument. If "PLATEAU NOT ACHIEVED" appears on the LCD, have the subject take another breath and repeat the Breath Test.

If an insufficient breath sample was provided, the Breath Test will be repeated. If any of the above messages are displayed, the 9510 will proceed with a PURGING cycle and a BLANK CHECK. Another Breath Test can be performed when the PLEASE BLOW prompt re-appears.

Printout

After the final result is displayed, a complete data and measurement report is printed. Included in the printout is the serial number, station, test no, the current date, all data entered prior to the test, and information about the test. After the printout has been completed, the operator has the ability to print another copy by pressing the "COPY" button on the lower right corner of the touch screen at the "READY" prompt. The instrument is now ready to perform another breath test.

CONNECTICUT STATE POLICE
ALCOTEST 9510

SERIAL-NO.:	ARYF-0019
STATION:	HAMPTON HQ
TEST-NO.:	00041
DATE:	11/30/2007

SUBJECT INFORMATION

NAME:	JONES, RODNEY, Q.
D.O.B.:	10/10/1987
AGE.:	30
GENDER:	MALE

ARREST INFORMATION

DATE:	11/30/2007
TIME:	1:31AM
ARRESTING MEMBER:	PARKS, DONALD
SHIELD:	1444
UF CASE NO.:	555555123
ZERO TOLERANCE CASE:	NO

TEST INFORMATION

EXT STD LOT:	123123
EXT STD EXP:	09/09/2009
SUBJ. OBS. 20 MIN:	YES
REFUSAL WARN. GIVEN:	YES
MIRANDA WARN. GIVEN:	YES

BREATH ANALYSIS
DIAGNOSTIC OK

	g/210L	TIME
AIR BLANK	0.000	13:46
EXT STD IR	0.101	13:47
EXT STD EC	0.100	13:47
INT STD	0.101	13:48
AIR BLANK	0.000	13:49
SUBJECT IR	0.000	13:50
SUBJECT EC	0.000	13:50
AIR BLANK	0.000	13:51
EXT STD IR	0.100	13:52
EXT STD EC	0.099	13:52
AIR BLANK	0.000	13:53
AIR BLANK	0.000	14:03
EXT STD IR	0.101	14:04
EXT STD EC	0.099	14:04
AIR BLANK	0.000	14:05
SUBJECT IR	0.000	14:06
SUBJECT EC	0.000	14:06
AIR BLANK	0.000	14:07
EXT STD IR	0.100	14:08
EXT STD EC	0.101	14:08
AIR BLANK	0.000	14:09

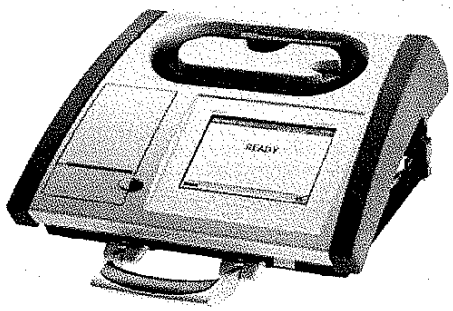
DIAGNOSTIC OK

REPORTED VALUE:
0.000 g/210L

OPERATOR INFORMATION

NAME:	SMITH, MARK
SHIELD:	333
PERMIT:	321321
PERMIT EX.:	12/12/2010
SIGNATURE:	

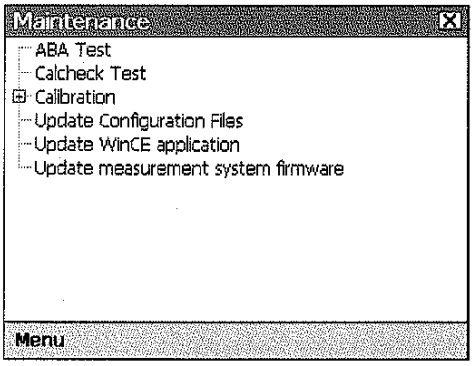
Maintenance Options (continued)



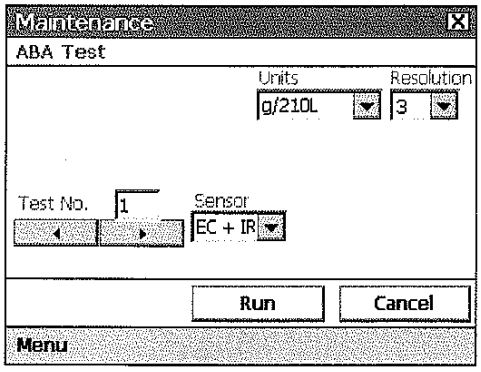
ABA Test

The ABA Test function is located in the Maintenance option under the main menu. The ABA Test allows for convenient and quick breath test(s). The testing for breath dynamics such as mouth alcohol, minimum volume, minimum flow rate, and interfering substance tests are easiest done with this test sequence.

To perform the test, double tap on "ABA Test" to select this option.



Select the number of consecutive tests to be performed (Test No.) and click "RUN" to proceed or "Cancel" to return to the menu.



The instrument will go through a purging cycle, and the following messages will be displayed on the screen:

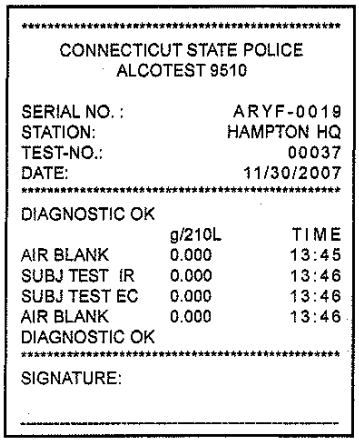
PRINTING
PURGING
BLANK CHECK
DRY GAS CHECK
ANALYZING
PURGING

When "PLEASE BLOW" is on the screen with the graph, start blowing into the mouthpiece.

After the sample has been provided, the following messages will be displayed on the screen:

REMOVE MOUTHPIECE
PURGING
BLANK CHECK
IR-RESULT
0.XXX g/210L
EC-RESULT
0.XXX g/210L

The results will be printed, and the instrument will either go back to the menu, or start another test sequence, depending on the number of ABA Tests selected to be performed.



CONNECTICUT STATE POLICE
ALCOTEST 9510

SERIAL NO. : ARYF-0019
STATION: HAMPTON HQ
TEST-NO.: 00037
DATE: 11/30/2007

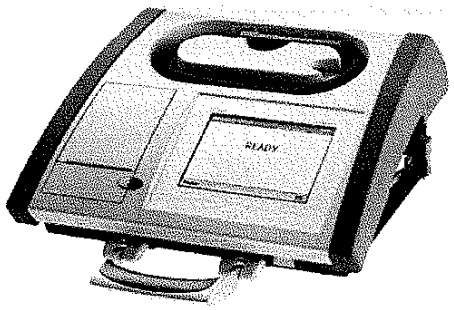
DIAGNOSTIC OK

	g/210L	TIME
AIR BLANK	0.000	13:45
SUBJ TEST IR	0.000	13:46
SUBJ TEST EC	0.000	13:46
AIR BLANK	0.000	13:46

DIAGNOSTIC OK

SIGNATURE:

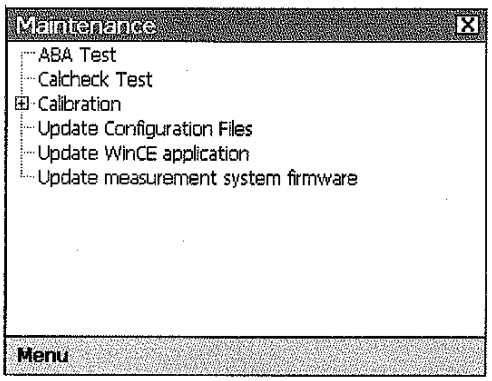
Maintenance Options (continued)



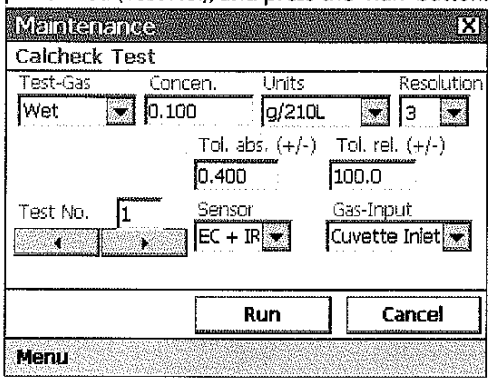
Calcheck Test

The Calcheck Test is located in the Maintenance option under the main menu. The Calcheck Test is used when the technician wants the instrument to measure and report the values of an external, certified standard. This accuracy verification test must be done with ethanol\nitrogen or ethanol\ water standards only. The Calcheck function tests for accuracy and precision of the instrument, and no interfering substances may be used.

To perform the test, select "Maintenance" in the main menu, and double tap on "Calcheck Test."



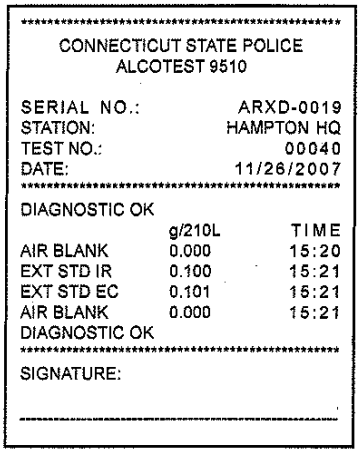
Select the number of consecutive tests to be performed (Test No.), and press the "Run" button.



The instrument will go through the following steps:

PRINTING
PURGING
BLANK CHECK
DRY GAS CHECK
ANALYZING
PURGING
BLANK CHECK
IR-RESULT
0.XXX g/210L
EC-RESULT
0.XXX g/210L

Depending on the number of tests selected, the instrument will either proceed with another test or finish printing and return to the Maintenance menu.



CONNECTICUT STATE POLICE
ALCOTEST 9510

SERIAL NO.: ARXD-0019
STATION: HAMPTON HQ
TEST NO.: 00040
DATE: 11/26/2007

DIAGNOSTIC OK

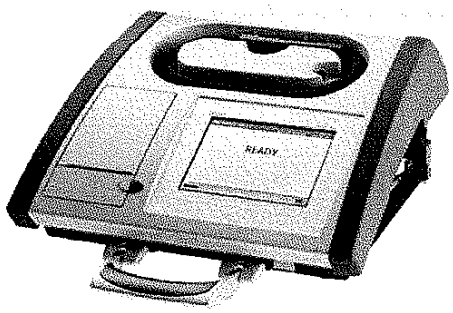
	g/210L	TIME
AIR BLANK	0.000	15:20
EXT STD IR	0.100	15:21
EXT STD EC	0.101	15:21
AIR BLANK	0.000	15:21

DIAGNOSTIC OK

SIGNATURE:

IMPORTANT NOTE: Only use ethanol solution for a Calcheck Test. Using an interfering substance in a Calcheck Test will disturb the detection system.

Maintenance Options (continued)

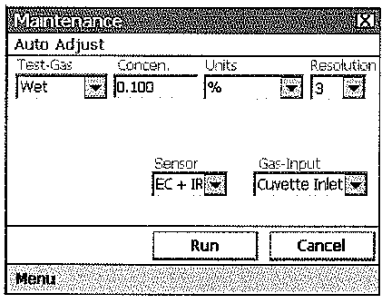


Calibration

To calibrate the 9510 instrument, use the MARK IIA, Alcotest® CU34, or any other NHTSA approved calibration unit. Prior to Calibrating the 9510 instrument, make sure the wet bath Simulator contains fresh certified solution, if it is at operating temperature, and a "Seal Check" has been performed. See the "Solution Change" section of this manual for more information on a "Seal Check".

Auto Adjust

The Calibration function is in the Maintenance option under the main menu. There is an option to perform a Calibration (Auto Adjust), and an option to set the test parameters (External Standard Parameters).



To perform a standard calibration, select the "Auto Adjust," and enter the following test concentration values: type of standard used, target concentration, units of measure, resolution, sensor, and the gas input port used for the calibration. To perform the calibration with the values entered, tap on the "RUN" button. Tap on the "Cancel" button to discontinue the Calibration and return to the maintenance menu.

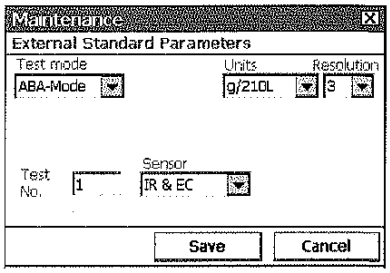
During the Calibration procedure, the 9510 will display the following screens:

PURGING
BLANK CHECK
INSERT CAL-GAS
CALIBRATION
PURGING
REFERENCE TEST
END OF ADJUST

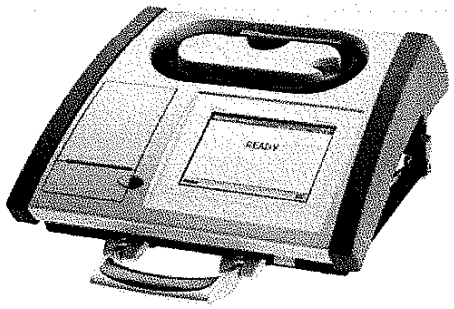
The instrument has now been calibrated with the values provided.

External Standard Parameters

The External Standard Parameters, located under Calibration in the Maintenance menu, has the settings for the target concentration, units of measure, absolute tolerance, and relative tolerance for the standard check during a breath test sequence. The Resolution setting changes the number of digits that will be displayed for a Breath Test, ABA, and Calcheck test. Edit the settings as needed and tap on "Save" to save and "Cancel" to return to the Maintenance menu.



Maintenance Options (continued)

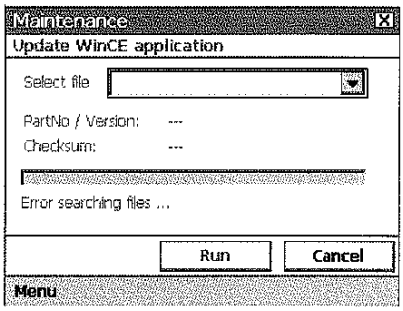


Upgrade Firmware

All firmware upgrade options require that a USB stick with the proper files and permissions to be loaded and inserted into one of the instrument's USB ports.

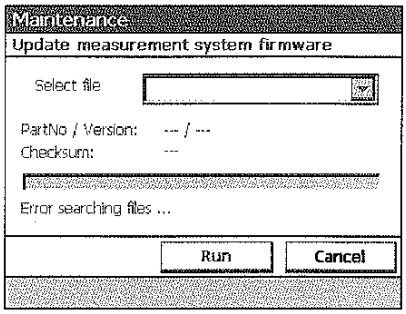
Update WinCE application

A new WinCE application can be loaded on the instrument with this option. Open the Update WinCE application under the Maintenance menu. The instrument will automatically select the appropriate file. Click the button to start the update. The instrument will return to the "READY" prompt when the WinCE application has been successfully loaded. The instrument must now be loaded with the measurement system firmware.



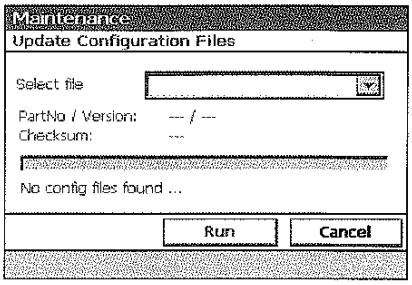
Update Measurement System Firmware

New measurement system firmware can be loaded on the instrument with this option. Open the Update measurement system firmware option under the Maintenance menu. The instrument will automatically select the appropriate file. Click the button to start the update. The instrument will display a message when the update is complete. The instrument must now be loaded with Configuration Files.

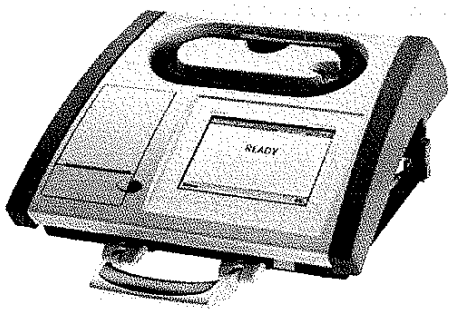


Update Configuration Files

New configuration files can be loaded on the instrument with this option. If the WinCE application or measurement system firmware has been loaded, the Configuration files must be loaded again. Open the "Update Configuration Files" option under the Maintenance menu. The instrument will automatically select the appropriate file. Click the button to start the update. The instrument will display a message when the configuration files have been successfully loaded. The instrument is now ready for use.



Maintenance Options (continued)



Solution Change and Seal Check Procedure

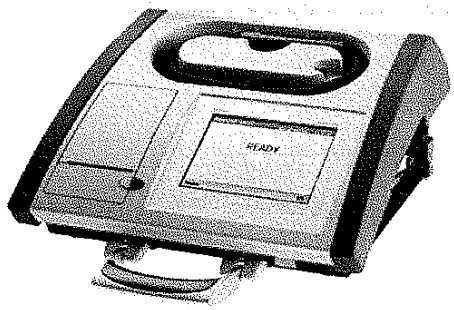
Follow the steps below to change the Simulator solution and perform a Seal Check:

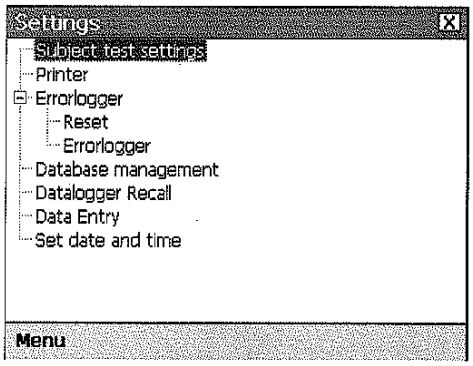
1. Turn the Simulator switch to "Off."
2. Unplug the Simulator power cord.
3. Detach the Simulator by disconnecting the following items from the 9510:
   - The two-inch gum rubber hose.
   - The six-inch clear tubing.
   - The Temperature Probe 'connector.' Do not pull the temperature probe out of the Simulator.
4. Unscrew the jar from the Top Assembly of the Simulator.

CAUTION: DO NOT remove the Top Assembly and expose the heating element to open air with the Simulator plugged into the power source. This improper handling will result in damage to the heating element.

5. Properly discard the old solution.
6. Clean the jar by rinsing with water and drying with a lint free towel.
7. Pour 500 ml of certified solution into the clean and dry Simulator jar.
8. Moisten the top of the Simulator jar with the solution.
9. Moisten the gasket/O-ring in the Simulator top assembly.
10. Assemble the simulator by screwing the jar into the top assembly.
11. Attach ¼" I.D. tubing to the air-in port on the top cover of the Simulator. If tubing is loose, secure with a nylon tie.
12. Cover the outlet port (marked "TO ANALYZER") with the thumb and cup the hand around the Simulator jar.
13. Blow forcefully into the air-in tube.
14. Note the bubbles in the jar. Initially, there will be many bubbles, but as soon as the headspace is pressurized, the bubbling must cease. This indicates that the simulator assembly is airtight.
15. If bubbles continue, repeat steps 8 through 14.
16. Re-attach the Simulator to the 9510:
    - Place the Simulator into its specified area.
    - Reconnect the two-inch gum rubber hose into the Simulator outlet and the 9510 wet gas inlet.
    - If necessary, carefully insert the Temperature Probe connector into the 9510 temperature probe port. The Temperature Probe connector can be damaged if not handled correctly, or inserted properly.
17. Plug the power cord into a standard 110VAC outlet.
    For a 220VAC Simulator, plug it into a 220VAC outlet.)
18. Turn the Simulator switch to the "On" position.
    - The 9510 will proceed to go through the "Warm Up" phase.
    - Allow the solution to heat to 34°C ± 0.2°C, which will require 20-30 minutes.

Settings





Subject test settings

Subject test settings include type of test, unit of measure, resolution for each mode (test/control.)

Printer

The Printer option allows you to turn the internal and external printer "On" and "Off," and select the number of copies. The 9510 can print externally to most printers (≥ PCL 5).

Errorlogger

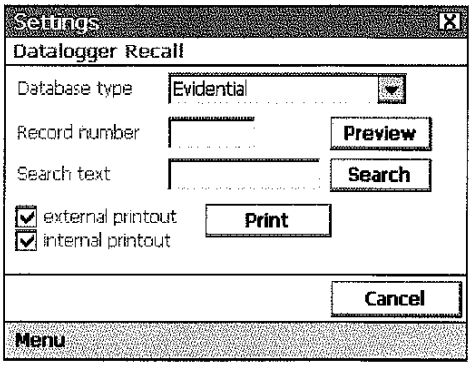
The Errorlogger contains the option to show all Logbook Errors or Reset the Errorlogger which will clear all Logbook entries.

Database Management

The Database Management allows for Implied Consent Breath Tests, ABA Tests, and Calcheck Tests to be downloaded to a USB stick and cleared from the instrument. The test types are Meas #1 (Evidential Breath Test), Calcheck, and ABA test. Each test type has its own database. To copy the data to a USB stick, power the instrument off and insert a USB stick into a USB port on the instrument. Turn the instrument on, and select the "Datalogger Statistic" option in the Settings menu. Select the appropriate test type by using the "+" or "-" button and press the "Copy to stick" button. Press the "Delete" button to delete all of that test type from the instrument.

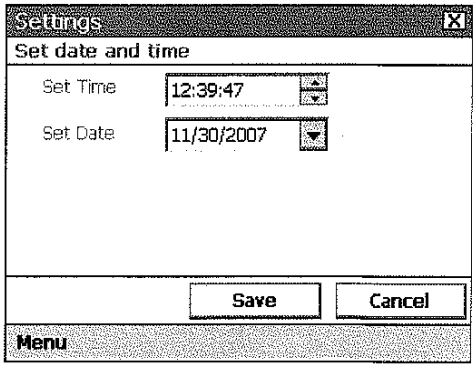
Datalogger Recall

The Datalogger Recall option allows an operator to reprint a previous test by selecting the type of test and entering the record number of the test. This function will not work if a database has been deleted from the instrument.

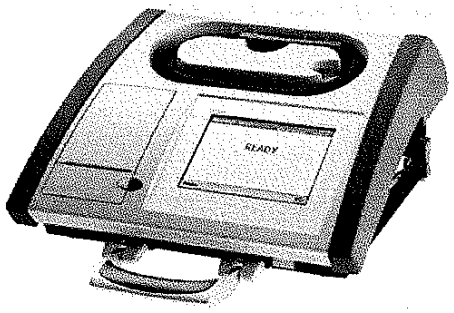


Set date and time

To change the date and time on the instrument, use the Set date and time option. Select the appropriate hour, minute, second field and use the up and down arrows to change the field. Select the down arrow next to the date and scroll through the calendar until the appropriate date is available. Press the "Save" button to save changes, and the "Cancel" button to return to the "Settings" menu without saving any data.



Glossary



Breath Test Criteria
Various criteria have to be met in order for the 9510 instrument to accept a breath sample and ensure that the breath sample analyzed represents an alveolar (deep lung) air sample. The following conditions have to be satisfied before the profile analysis is activated:

- Minimum flow rate 3.0 L/min.
- Minimum blow duration 4.5 sec.
- Minimum breath volume 1.5 L
- Slope detection

A valid breath test is characterized by a nearly constant alcohol concentration in time (plateau) at the end of the subject's sample.

Purging
The internal pump flushes the cuvette and breath hose with ambient air to ensure that an alcohol and absorbing compound free environment exists.

Air Blank Check
After the ambient air check, the intensity of the infrared energy is analyzed and stored as a reference.

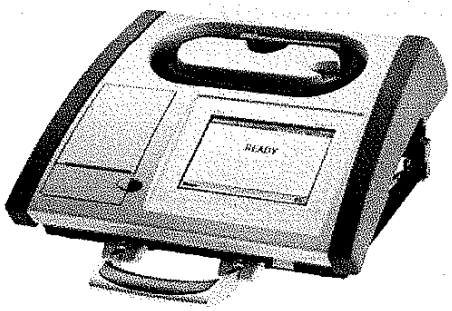
Ambient Air Check
After the purging cycle, an air sample from the cuvette is drawn into the EC sensor for analysis. This procedure ensures that the air in the cuvette is free of any absorbing substance.

Breath Test
The subject's breath is introduced through the mouthpiece and the breath hose into the cuvette. The intensity of the infrared energy is analyzed. Immediately after the IR analysis, the EC sensor pulls a 1 cc sample out of the cuvette for analysis.

Mouth Alcohol
Mouth alcohol is characterized by a sharp increase of the alcohol concentration at the beginning of the subject's breath sample followed by a decrease until the end of the sample.

Plateau
The plateau is reached if the concentration does not increase by more than 1% per ¼ second above a concentration of 200 µg/L (0.04%) and 0.001 g/210L at concentrations below 200 µg/L.

Quick Reference



How To...

Run a Breath Test:
Press the green button to begin a breath test. See page 18 for more details.

Analyze a breath sample during a drinking session/study:
The ABA function works best for this situation. Any test that has a PLEASE BLOW prompt can be used, so a subject test would also work. The ABA function does not perform a standard check before the breath sample is taken, so more consecutive tests can be performed with this function in a shorter amount of time. See page 20 for more information.

Analyze an external standard multiple consecutive times:
Select CALCHECK TEST from the MAINTENANCE menu and choose the number of consecutive tests to be performed. Tap on the OK button and the instrument will start running the selected number of tests. See page 21 for more information.

Evaluate the instrument's detection of mouth alcohol or interfering substances:
The ABA function works well in this situation. The mouth alcohol and interfering substance detection routines in this function are identical to those used in the evidential test. Note that interfering substances can only be tested when the PLEASE BLOW prompt is displayed. See page 20 for more information.

Change the Number of Digits After the Decimal:
The RESOLUTION indicates the number of digits displayed after the decimal point. To change the number of digits after the decimal point, select SUBJECT TEST SETTINGS from the SETTINGS menu. Select the TEST TYPE (evidential, supervisor) and the number of digits from the RESOLUTION drop down menu and SAVE.

Enable a DISABLED Instrument:
When the next calibration date expires, the machine will be DISABLED. In order to enable the instrument, select MAINTENANCE, CALIBRATION, then CALIBRATION DATES. Select the NEXT CALCHECK DATE drop-down menu, select a future date and SAVE.

Reprint a Test:
Select DATALOGGER RECALL from the SETTINGS menu. Choose the Database type (test type), the Record Number (test number), where you would like the results to print (internal/external printer) and select PRINT. If you do not have the test number, you can search by selecting SEARCH.

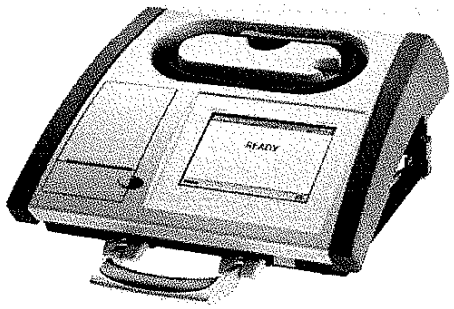
Dräger safety Contacts

If you have any questions, please contact us any time. We look forward to working with you!

Hansueli Ryser, Vice President
Ph: 866.385.5900, hansueli.ryser@draeger.com

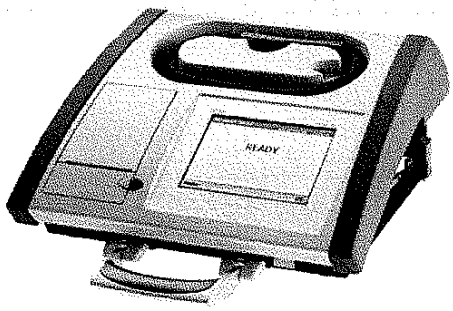
Don Pouliot, Regional Sales Manager
Ph: 973.398.3228, dpouliot@optonline.net
Fax: 973.398.3449, Cel: 973.219.9520

Fault-Cause-Remedy



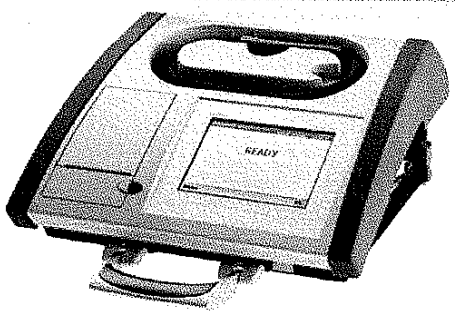
FAULT MESSAGE	POSSIBLE CAUSE	REMEDY
<ALCOHOL IN THE ENVIRONMENT>	Fuel Cell detected alcohol in the IR cuvette.	Ensure that the ambient air is free of alcohol vapors.
<BLOWING NOT ALLOWED>	Blowing without being prompted to do so.	Repeat the breath test. The instrument will initiate another breath sample.
<BLOWING TIME TOO SHORT>	The blowing duration was less than the minimum required time.	Repeat the breath test. The instrument will initiate another breath sample.
<CAL GAS SUPPLY>	The gas supply is not reaching the 9510 instrument.	Make sure the connections from the gas supply are properly attached.
<CHECK AIRWAY>	No air, or not enough air flow was detected to purge the system.	Make sure that neither the breath hose nor the cuvette exhaust port is obstructed.
<INTERFERENCE>	Interfering substances detected.	Repeat the test. If breath test cannot be completed, refer to the state regulator options.
<KEYBOARD ERROR>	Faulty keyboard.	Repeat function. If necessary, disconnect the existing keyboard and reconnect. If the error still appears, connect a new keyboard to the 9510 instrument.
<MEMORY FULL>	Data storage area is either uninitialized or completely full.	Upload data (if any) to the PC, initialize memory area.
<MEMORY NEARLY FULL>	Data storage area nearly full.	Upload data to the PC.
<MINIMUM VOLUME NOT ACHIEVED>	The provided breath volume is less than the minimum required volume.	Repeat the breath test.
<MOUTHALCOHOL>	Residual mouth alcohol detected. Either the observation period was insufficient, or the subject may have vomited or belched prior to the test.	Repeat the breath test.
<DIFFERENT ALCOHOL RESULTS>	The absolute difference of the subject breath tests is greater than 0.02%.	If this message appears after the second breath test, a third breath test will be initiated.
<OUT OF MEASURING RANGE>	The breath test result is higher than the acceptable measuring range (0.00 to 0.50% BrAC).	Subject should be checked by a physician immediately!
<PLATEAU NOT ACHIEVED>	The provided breath sample has not reached a plateau (equilibrium).	Repeat the breath test. The instrument will initiate another breath sample.
<READINESS TO BLOW EXPIRED>	The maximum allowable time to deliver a breath sample has expired.	Repeat the breath test. The instrument will initiate another breath sample.
<SIMULATOR CHECK INCORRECT>	The External Standard Test result was outside the set tolerance, or the Solution value may have been entered incorrectly.	Use new solution, check simulator temperature, and check lid for a tight seal.
<SIMULATOR TEMP ERROR>	The Simulator is not turned "On." Simulator not warming to correct operating temperature (33.8°-34.2°C). Simulator out of Calibration.	Make sure the Simulator is turned "On" and ensure that all of the connections are properly made. Let Simulator warm-up to correct temperature and repeat test.

Hardware Errors



ERROR CODE	ERROR NAME	REMEDY
100	EEPROM defect - M16	Reprogram Firmware
101	RAM defect	Contact Draeger
102	Alcohol tube defect	Check tube
103	Clock data lost	Set clock
104	Flash defect	Reprogram Firmware
105	Voltage Battery failure - (Lithium Battery)	Change Lithium Battery
106	Main Voltage failure	Check Main Input voltage
107	IR periode average failure	Change IR-Sensor
108	EC offset failure	Change EC Sensor
109	EC system defect	Check electrical connections
110	EC maximum not found	Calibrate EC Sensor, change EC Sensor
111	Flow sensor 1	Calibrate Flow sensor, change flow sensor
112	Flow sensor 2	Calibrate Flow sensor, change flow sensor
113	Pump defect	Check tubing, change pump
114	Pressure sensor defect	Calibrate relative pressure sensor, change sensor
115	Pressure sensor check failure	Calibrate relative pressure sensor, change sensor
116	Sensor 1 (NTC 1)	Check connection, calibrate sensor, change hose
117	Sensor 2 (NTC 2)	Check connection, calibrate sensor, change hose
118	NTC cuvette defect	Check connections, change NTC-cuvette or cuvette
119	NTC hose defect	Check connections, change hose
120	NTC Breath Temp heater defect	Check connections, change hose
121	Heater regulation failure	Check ambient temp, fast change of temperature
122	Printer defect	Check connections, change printer
125	Function key defect	Contact Draeger
126	IR calibration value failure	Recalibration, change cuvette
127	Data loss EEPROM	Load firmware
128	Configuration failure	Set gas type and test
129	BAC end result filter error	Load firmware

General Specifications

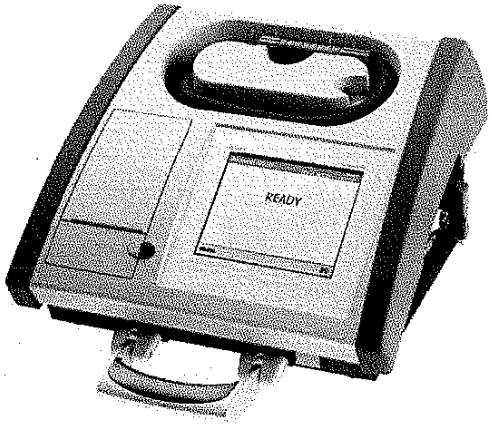


General Specifications of the Alcotest® 9510 Instrument

Resolution:	0.001%BrAC (0.001 g/210 liters of breath)
Measurement Range:	0.000% to 0.500% BrAC
Operational Conditions:	
Temperature Range:	0°C to 45°C; 32°F to 113°F
Relative Humidity:	10% to 99% relative (non condensing)
Atmospheric pressure:	600 hPa to 1300 hPa
Storage Temperature Range:	-20°C to 70°C; -4°F to 158°F (greater than 70°C/158°F for a few hours only)
Electromagnetic compatibility:	IEC 801-3, DIN408a39-1
Field strength:	10 V/m
Interference Suppression:	DIN57871, VDE0871, Class B
Warm-up Time:	Less than 15 minutes at 20°C
Printer:	High speed, high resolution thermal printer. Standard paper 2 1/4" wide (58 mm) and 85' long
Date/Time Display:	Month/Day/Year and Hour:Minute (24 hour clock)
Calibration Interval:	Recommended interval for verifying accuracy of instrument and, if required, recalibration: 12 months (alcohol and breath temperature sensing system)
Standard compliance:	NHTSA OIML Pending Submittal in 2008 to LNE - Paris
Electrical Characteristics:	
Operating voltages:	
AC power:	90-260 VAC, 50/60 Hz
DC power:	9-15.5 VDC
Power Consumption	
During warm-up	approx. 70 Watts
During measurement	approx. 30 Watts
Stand-by	< 15 Watts
Dimensions:	12.9" x 9.8" x 2.2" (front) 7.3" (back) (W x H x D)
Weight:	Approximately 15.3 lbs

Dräger safety

Warranty
Draeger Alcotest® 9510



The Draeger Alcotest® 9510 device is warranted to be free from defects in material and workmanship under normal recommended use and service for 12 months from date of delivery.

In the event that it fails to perform as warranted, Draeger Safety Diagnostics, Inc. (DSDI) will repair or replace any part proven to its satisfaction to be defective.

This warranty extends only to the original purchaser and does not cover damage or loss resulting from misuse, abuse, accident, neglect, improper use, operation or maintenance.

For the convenience to the State of Connecticut and in the interest of continuity of the program, DSDI will consign one fully compliant Connecticut device to the State for the duration of the warranty period to put into service in the event of a warranty failure of another device. This will alleviate any down time caused by shipping time to and from the manufacturer's location.

During the warranty period, if a second device requires maintenance or repairs (the consignment device is in use) a loaner devices shall be made available within 48 hours as needed and/or requested by the State which is equivalent in model, specifications and operation as the original equipment being repaired.

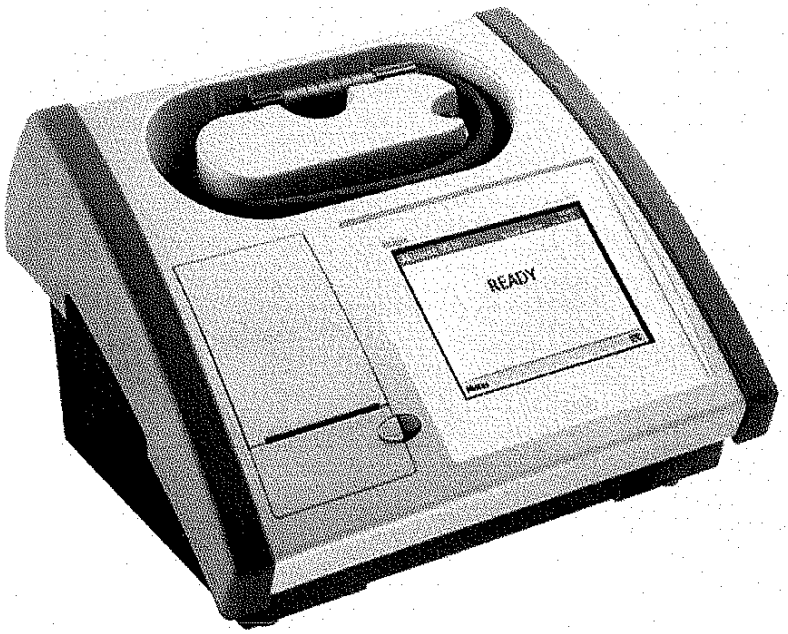
DSDI will assume the cost for freight for warranty repairs.

The warranty set forth above is in lieu of all other express or implied warranties, including but not limited to any implied warranties or merchantability or fitness for a particular purpose. Furthermore, DSDI shall not be liable for loss of use, income or profit, incidental, special or consequential or other similar damages, arising, directly or indirectly, out of or occasioned by the operation, use, repair or replacement of its devices whether such damages are based on a claim of breach of express or implied warranties, tortuous conduct (including negligence and strict liability) or any other cause of action.

Dräger safety

Spare Part and Consumables Price List Draeger Alcotest® 9510

Draeger Safety Diagnostics, Inc. will offer the State of Connecticut a 10% Discount off of the List Prices contained herein



Draeger Safety Diagnostics, Inc.
4040 W. Royal Lane, Suite 136
Irving, Texas 75063

December 2007

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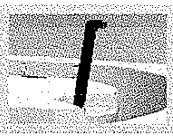
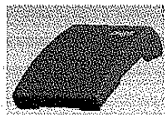
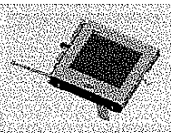
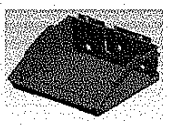
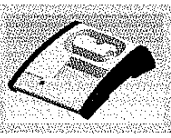
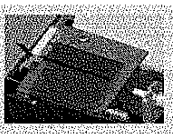
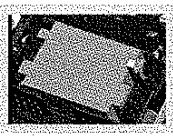
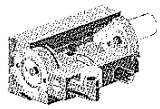
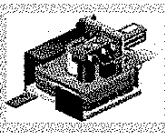
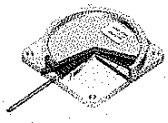
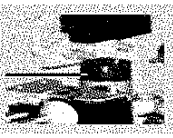
Stylus		8318402	15.00
Dust Cover (part of 8318844)		8318479	48.00
Display with touch screen		8319160	460.00
Bottom part (housing)		8318409	130.00
Upper part (housing)		8318844	138.00
Printer paper door (housing)		8318417	17.00
Interface panel (housing)		8318418	27.00
Receptacle cover (housing)		8318478	15.00
Padding		8318482	17.00
Breath hose retainers (housing)		8318438	12.00
PCB printer adapter		8318441	68.00
PCB Motherboard A9510		8319158	1600.00
PCB Touch screen interface		8319058	18.00
PCB green push button		8318981	29.00

Dräger safety

Power supply unit		8318451	280.00
Speaker with cable		8318899	24.00
Pressure sensor, delta-sigma, relative pressure		1892312	55.00
Pressure sensor absolute pressure		1892629	65.00
Fuse 10A		1892969	5.00
Fuse 0,83A		1892879	5.00
Screw, safety		8313669	50
Screw inside big		1340727	.50
Screw inside small		1342592	.50
Screw LP-Touch		1330217	.50
Screw printer roller		1336061	.50
Washer printer roller		1270869	.50
Breath hose standard A9510		6811501	410.00
IR - Cuvette 9510		6811334	1800.00
Sampling system (EC, motor, pump)		6808550	650.00
EC-Sensor		6808455	192.00
Purge-Pump with cable		8318476	240.00

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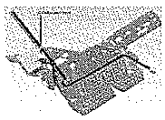
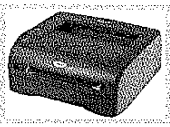
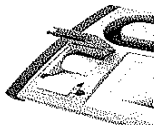
Cable set power A9510		8318849	48.00
Handle Set		8318455	50.00
Solenoid		12109	120.00
Keyboard – Black mini USB with 86 normal keys		8319441	33.00
Battery (backup)		1822667	32.00
IR Source		TBD	308.00
Case, soft		8319155	115.00
Seal, quick disconnect		4412009	8.25
Dry gas, 58L (NIST traceable/3 year shelf life)		4412012	75.00
External printer, Brother 2070N or equal		4412013	185.00
Locking dry gas enclosure		4412010	550.00
Wall mount bracket		4412011	24.00
Fitting, quick disconnect		4412008	18.00
Mouthpiece (bag of 25)		6805700	5.75
Printer paper - thermal		4415520	1.40
Simulator solution – 500 ml bottle, certified		4507061	5.60
Dry gas regulator with transducer		4412192	450.00

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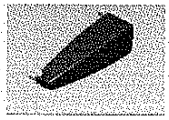
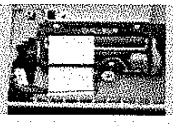
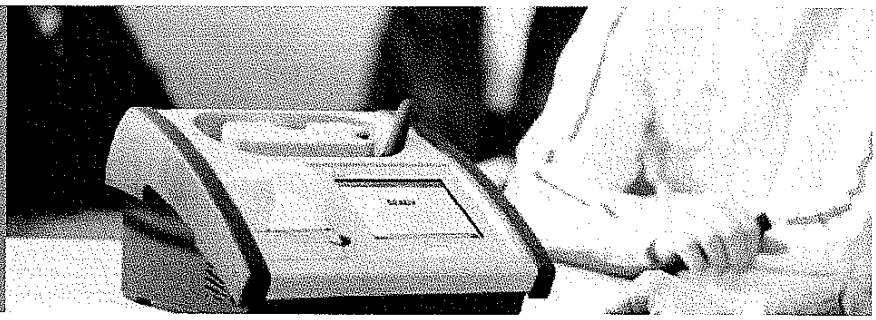
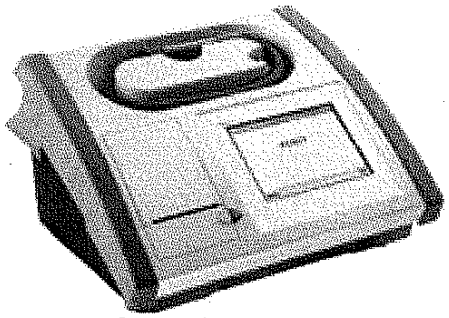
Transducer, dry-gas cylinder pressure		4412007	180.00
Cable for transducer		4412006	65.00
Hose kit for regulator		12062	42.00
Regulator		TBD	350.00
Heated hose kit for simulator		TBD	280.00
Cable channel cover		8318489	64.00
Internal Printer		8318456	71.00
12V Cable		12041	85.00
Breath temperature sensing breath hose A9510		6809505	647.00

Draeger Alcotest® 9510



The Draeger Alcotest® 9510 is the most advanced Evidential Breath-Alcohol Testing instrument exceeding all national and international program requirements. It features Draeger's famous dual sensoric technology, network and wireless communication, intuitive color touch screen interface, and was built for demanding 24/7 operation.



Draeger Alcotest® 9510

Dual alcohol sensor technology
The Draeger Alcotest® 9510 employs two different and independent technologies, each analyzing and quantifying a subject's breath alcohol concentration: IR spectroscopy and Electro-Chemical-Cell technology. This offers the highest possible level of forensic analytical integrity.

Infrared technology
IR spectroscopy at 9.5 µm is virtually non-sensitive to any potentially interfering substance in the breath of a subject. Furthermore, it eliminates the need for a chopper wheel with multiple IR filters.

Electro-Chemical-Cell ("fuel cell")
The Draeger fuel-cell is known worldwide for its superior accuracy, alcohol specificity, reliability, and fast recovery.

Breath temperature measurement
The Alcotest® 9510 offers the measurement of the subject's breath temperature to correct the alcohol test result for breath temperature variables.

True ambient air check
The Alcotest® 9510 performs an IR independent analysis of the ambient air in the absorption chamber to provide assurance that the IR system is set to zero prior to the breath test.

Internal printer
The quiet and reliable thermo printer delivers fast and legible high resolution documents. It does not require a printer cartridge or ink ribbons.

Display
The instrument employs a high resolution, color, LCD touch-screen. The large screen offers a virtual keyboard and delivers clear and complete text messages that allow for well guided operation.

Interface capability and flexibility
For optimal program integration, the Alcotest® 9510 offers almost unlimited communication and interface capabilities: 3 USB ports (for keyboard, ext. printer, memory stick, etc.), external video monitor, 2 RS232 ports, Ethernet, modem, GSM modem, wireless keyboard, and IrDA communication.

Hardware connectivity and flexibility
The instrument offers very elaborate hardware interfaces: 3 independently valved dry-gas inlet ports, vapor inlet port, air outlet port, RFI antenna, GSM antenna, electronic service port, several A/D inputs, logic outputs, and 5 VDC output for possible peripherals.

Data input
Data can be input into the Alcotest® 9510 in many ways including the internal virtual keyboard, USB keyboard, IrDA keyboard, mag-card reader, bar/symbolic code reader, stylus on touch screen, or finger tip on touch screen.

Diagnostic checks
The instrument performs intricate diagnostic checks on a continuous and simultaneous basis.

Power variety and flexibility
The instrument can be operated with any possible power source: 90-260 VAC, 12 VDC (vehicle), or rechargeable battery operation without the need for an adapter or an inverter.

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Breath hose:
Flexible, heated and temperature controlled breath hose

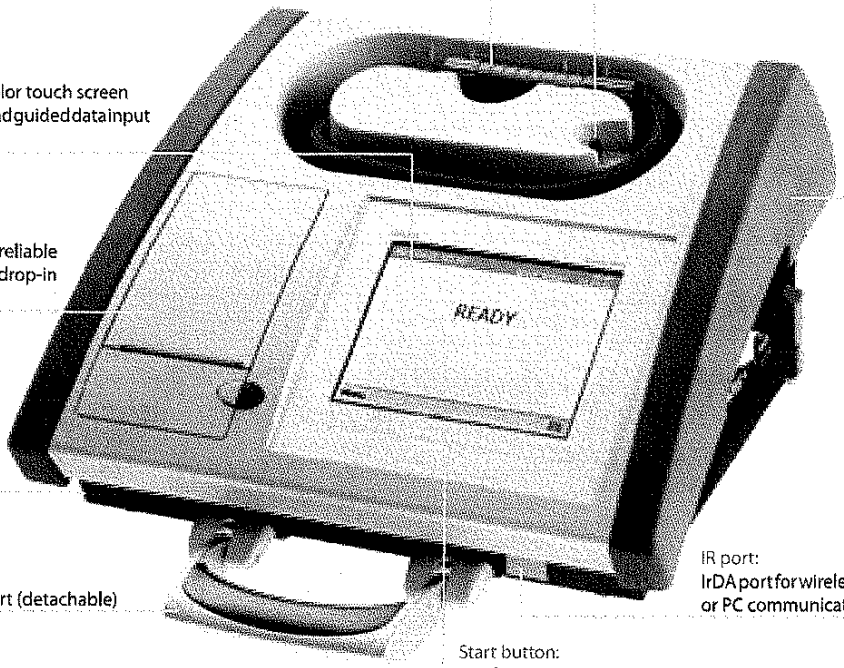
Stylus:
Stylus for data entries via the touch screen

Display:
High resolution, LCD color touch screen for intuitive operation and guided data input management

Thermal printer:
Fast, quiet and produces reliable documents. Easy paper drop-in feature.

Speaker:
For audio signals and synthesized voice prompts

Handle:
Handle for easy transport (detachable)



Rubber bumper:
Rubber bumpers for protection

IR port:
IrDA port for wireless keyboard operation or PC communication

Start button:
Single button, menu driven operation

RS-232:
2 RS-232 interfaces for PC communication or card readers

Dry-gas inlet port:
Internally valved with electro solenoid

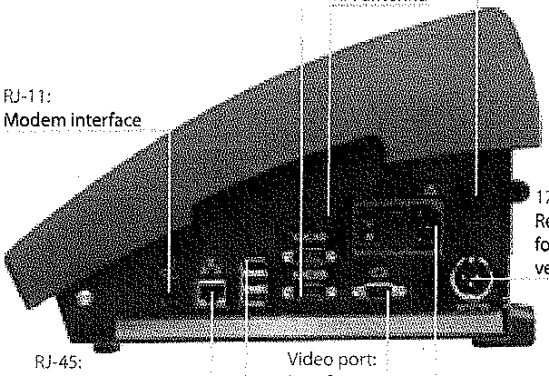
Cuvette inlet:
Simulator vapor inlet port

Dry-gas inlet ports:
Internally valved with electro solenoids

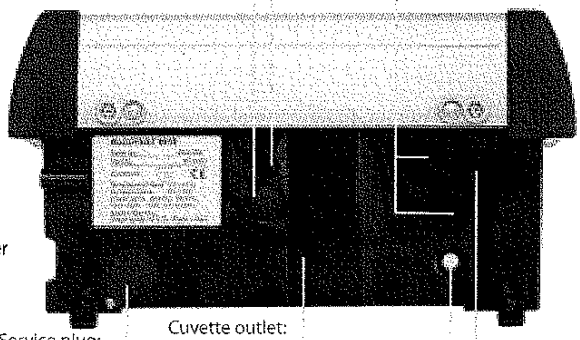
RFI antenna

GSM Antenna

RJ-11:
Modem interface



12 VDC:
Receptacle for 12 VDC vehicle power



RJ-45:
Ethernet interface

Video port:
Interface for external monitor, screen, or projector

AC receptacle:
For 90-260 VAC operation, with two fuses

Service plug:
Electronic interface with A/D inputs, logic outputs, 5 VDC output

Cuvette outlet:
Exhaust port, protected against blockage

Air inlet

USB:
3 USB interfaces for external printer, keyboard, memory stick

Air-out port:
Port to simulator

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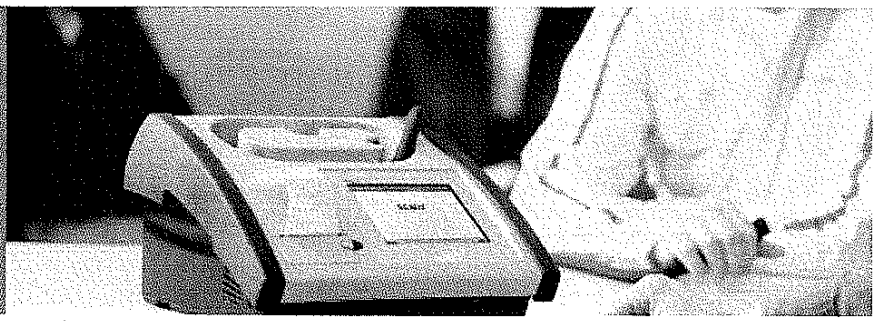
Draeger Alcotest® 9510



TECHNICAL SPECIFICATIONS

	Alcotest® 9510
NHTSA approved	Yes, on Conforming Products List for Evidential Breath Measurement Devices
Alcohol measurement technologies	Dual technology, Infrared and Electro Chemical Cell
Measurement range	0 to 0.500% (correlated to blood-alcohol); 0 to 3 mg/L (breath-alcohol)
Measuring accuracy	Better than ±5% or ±0.005% BAC, whichever is greater
Operating temperature	0°C to 45°C; 32°F to 113°F
Storage temperature	-20°C to 70°C; -4°F to 158 °F (greater than 50°C (122°F) for a few hours only)
Humidity (operation and storage)	10% to 99% (non condensing)
Atmospheric pressure (operation and storage)	600 hPa to 1300 hPa
Breathhose	46 inches, non-kinkable, flexible hose, temperature controlled heater
Breathhose retaining grips	Yes
Breath-flow and volume measurement	Dual Sigma Pressure Transducers
Display	LCD, Color
Dimensions (W x D x H)	12.9" x 9.8" x 2.2" (front) 7.3" (back)
Body volume	600 cubic inches
Weight	15.3 lbs
Internal printer	High speed, high resolution thermal printer
Maximum characters printed per line	42 characters (font size dependent)
Printer paper length	945 inches
Paper load concept	Simple drop-in
Dust cover	Yes
Carry-handle	Yes
Carry-handle removable	Yes
Protection cover over electrical interface	Yes
Table/wallmountingplate(screwlessdisconnect)	Yes
VAC operation	90-260 VAC
VDC operation	7-15.5 VDC
Barometric pressure measurement	Absolute pressure transducer
True ambient air check	Yes (fuel cell)

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Automaticcompensationforambientalcoholvaporcontamination(patented)	Yes
Infrared operational wave-length	9.5 micro meter
IR path length	Approximately 14"
All enclosed IR source and IR detector	Yes
Enhanced mouth alcohol detection routine	Yes
Enhanced interfering substance detection	Yes
Maximum characters on display	>100 (font size dependent)
Touch screen for touch commands	Yes
Real time breath monitoring assistance	Yes
Built in virtual keyboard	Yes
External keyboard wireless or USB	Yes
RS 232 ports	2
USB interface	3
Interface for external monitor	Yes
IrDA interface for keyboard or communication	Yes
Internal modem	115 KB/s, V.90
Ethernet (LAN)	Yes
Memory size	16,000 KB
Compliant with various external printers	Yes
Analog-to-Digital inputs	4
Logic outputs	2
Loudspeaker	Yes
Capable of playing audio streams	Yes

OPTIONAL FEATURES

Breath temperature measurement, compensation	Yes*
Utility bracket	Yes
External battery for VAC or VDC independent operation	Yes
Enclosed dry gas compartment with tank pressure monitoring	Yes
GSM modem (wireless communication)	Yes
External RFI antenna	Yes

*Internal wiring is in place

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