

ALCO-SENSOR® IV



DECEMBER 1996

TABLE OF CONTENTS

NOTICES	2
WARRANTY	3
SAMPLE TEST CHECK LIST	4
UNPACKING/CHECK-OUT PROCEDURE	5
MOUTHPIECE INSTALLATION AND REMOVAL	
INTRODUCTION	6
THEORY AND DESIGN OF ALCO-SENSOR IV	9
FUEL CELL AND DIAGRAMS	10
GENERAL COMPONENTS	14
BACKPLATE DIAGRAM	17
OPERATING INSTRUCTIONS	18
COLLECTING A BREATH SAMPLE	
RECALLING THE CURRENT TEST RESULT	23
EXPLANATION OF DISPLAY LEGENDS	24
ACCURACY CHECK INFORMATION	27
TRUE-CAL DEVICE & CALIBRATION STATION	27
SMALL and REGULAR DRY GAS STANDARD	28
LARGE DRY GAS STANDARD	30
SIMULATOR	32
TAMPER PREVENTION	34
CALIBRATION PROCEDURE	35
BATTERY REPLACEMENT	36

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IMPORTANT NOTICES

Please read this manual before any use of the instrument begins.

This manual covers the operating information and procedures for the **ALCO-SENSOR IV**. There are several versions available through Intoximeters. The internal programming is defined by a colored dot on the face plate of the unit or the version number located on the rear body of the unit.

Generally, the information and instructions contained in this manual are for the Red, Green and Blue Dot **ALCO-SENSOR IV**. If your unit has a different color dot on the face plate or no dot and just a version number on the back, please check the Notes pages at the back of this manual for specific information on your instrument.

When demonstrating the **ALCO-SENSOR IV DO NOT USE** commercially available mouthwashes as these substances contain many heavy hydrocarbons which will eventually damage the fuel cell and shorten its life.

TO PROTECT THE FUEL CELL FROM ENVIRONMENTAL CONTAMINANTS, HAVE THE SET BUTTON DEPRESSED WHEN ALCO-SENSOR IV IS NOT IN USE.

SMOKING

Under no circumstances should raw cigarette smoke be blown into the instrument. It will permanently damage the **FUEL CELL**.

STORAGE

Storage in cold or moderately hot environments will not harm the **ALCO-SENSOR IV**. Avoid extreme humidity or very dry storage areas for prolonged periods. The more extreme the storage temperature the longer it will take to get the unit adjusted to the proper temperature.

NOTE

Your unit is fully calibrated when it is shipped from the factory. However, before placing your unit in operation, you should perform a successful Accuracy Check (see pages 27-33) to assure yourself of the unit's accuracy. Be sure to record the results in the proper calibration log/book record.

ALCO-SENSOR IV WARRANTY

Intoximeters, Inc. warrants all new **ALCO-SENSOR IV**'s to be free from defects in material and workmanship, under normal use and service, for a period of 12 months from original invoice date to the original user-purchaser. This warranty does not cover disposables or supplies (for example, plastic mouthpieces) nor any damage which has, in Intoximeters' opinion, been the result of misuse, alteration, accident or abnormal conditions of operation or handling.

Software is warranted to be properly recorded on non-defective media. Intoximeters does not warrant that it will be error free or operate without interruption.

If the product, under warranty, is returned to an Intoximeters Authorized Service Center and, upon examination, it is determined to be defective, Intoximeters' obligation is limited to repair, replacement or refund of purchase price. Intoximeters reserves the option to choose either repair, replacement or refund as the means to satisfy this obligation. For warranty service, contact your nearest Intoximeters Authorized Service Center to obtain an authorization return number and the address of the closest repair center. The product should be sent to the Service Center with a description of the difficulty (postage and insurance prepaid.) Intoximeters assumes no risk for damage in transit. Intoximeters will pay postage for the return of the product repaired under warranty. If Intoximeters determines that the failure was caused by misuse, alteration, accident or abnormal condition of operation or handling, Intoximeters will provide an estimate of repair costs before the repairs are made. Following repair, the product will be returned to the purchaser, ground transportation prepaid (overnight or express delivery charges are additional), and the purchaser will be billed for the repair and the shipping cost.

Repaired components are warranted for a period of 90 days from the billing date of the repair if the original warranty has expired. If the original warranty has not expired, the repaired components, including the fuel cell, will be warranted for the unused portion of the original warranty or 90 days, whichever is longer. The warranty on repaired components are subject to the same limitations as this warranty. Components not repaired or replaced do not receive an extended 90 day warranty.

Warranty service is available outside the United States only on products purchased through an Intoximeters Authorized Sales/Service Outlet in the country of use, or if the Purchaser has paid the applicable Intoximeters international price. If Purchaser transports a product from the United States without having paid the applicable Intoximeters price, the product must be returned to the United States to receive warranty service. Purchaser shall pay for transportation to the service center and shall bear the risk of loss or damage in transit for all products so returned to the United States. Intoximeters reserves the right to invoice Purchaser for importation costs of repair/replacement parts when the product purchased in one country is exported and submitted for repair or service in another country.

THIS WARRANTY IS THE PURCHASER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED. INTOXIMETERS SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OR LOSSES, INCLUDING LOSS OF DATA, WHETHER ARISING FROM BREACH OF WARRANTY OR BASED ON CONTRACT, TORT, RELIANCE OR ANY OTHER THEORY.

Some countries or states do not allow the foregoing limitations. Other rights may also vary.

When the **ALCO-SENSOR IV** is used for evidential purposes, it is advisable to record the results either mechanically (using the RBT IV or another system) or manually on a form as per this sample.

SAMPLE
ALCO-SENSOR IV BREATH TEST CHECK LIST

Date of Test _____ / _____ / _____ Location of Test: _____
 Ship: _____ Subject: _____
 Operator: _____ Alco-Sensor IV Serial No. _____
 Witness: _____

Test #1* _____ Accuracy Check _____
 If Necessary* _____
 Test #2 _____ (Check as completed)
 Time Test Began. (Do not begin test#2 until at least 5 minutes after the end of test #1 or 15 minutes after the ingestion of any substance.)
 Mount mouthpiece to turn unit on.

1. _____ Reading Received, _____
 2. _____ Reading Expected _____
 3. _____ Observe temperature reading & record.
 4. _____ Depress **SET BUTTON**—if display shows **SET**.
 5. _____ When display shows **BLNK**, unit runs a Blank automatically and display shows **.000**.
 6. _____ If display shows **SET**, depress **SET BUTTON**—display shows **TEST**.
 7. _____ Instruct subject how to give a proper breath sample.
 8. _____ Record final 3 digit reading.
 9. _____ When display changes to **SET**, depress **SET BUTTON**.
 10. _____ Remove mouthpiece using the mouthpiece release button on side of unit—unit turns off. Discard mouthpiece.
- Note if sample was taken automatically (A) or Manually (M).
 Reason for Manual Sample _____

Time Test Ended: Test #1 _____ Test #2 _____
***IF TEST #1 IS POSITIVE, RUN AN ACCURACY CHECK BETWEEN TEST #1 AND #2 OR AFTER TEST #2.**

UNPACKING AND CHECK-OUT PROCEDURE

Carefully open the packing carton and remove contents, watching for any sign of shipping damage. **DO NOT DISCARD PACKING UNTIL YOU ARE SURE THAT ALL PARTS OF SHIPMENT ARE DAMAGE-FREE AND IN WORKING ORDER.**

Familiarize yourself with the operating instructions on pages 18-23. Be sure you understand the proper procedure for mounting and removing the mouthpiece. At this point try several dry-runs by inserting a mouthpiece and running through the instruction list. It is not necessary to use alcohol in these sequences—simply press the **MANUAL BUTTON** when the program displays "**Test**", if any condition is encountered which does not seem normal, consult the detailed operating instructions. If you are still not sure, contact Intoximeters, Inc., or your sales representative for additional help.

After the dry-run sequences, blow several breath samples when the unit displays "**Test**", to familiarize yourself with the (+) and (+ +) displays for proper breath flow.

INSERTING & REMOVING MOUTHPIECE

Before any testing is attempted with the **ALCO-SENSOR IV**, the operator should be familiar with the correct procedure for inserting and removing the mouthpiece.

The mouthpiece has a long end, which fits snugly and easily into the unit. When properly mounted, the mouthpiece turns the **ALCO-SENSOR IV** display on.

Insert the long end into its port on the **ALCO-SENSOR IV** (see illustration—page 13). As it is slipped into place, some resistance is felt from the cam that turns the unit on. The last 1/8" of travel encounters a slight additional resistance as the end of the mouthpiece enters a resilient seal. Be sure that the mouthpiece is solidly "home" (the shoulder of the flange is against the external shoulder of the port).

To remove the mouthpiece, press the red **MOUTHPIECE RELEASE BUTTON** on the side of the unit. If the mouthpiece does not eject, it may be easily pushed out using thumb pressure on the back side of the mouthpiece flange. **UNDER NO CONDITIONS** should the mouthpiece be pulled out without actuating the **MOUTHPIECE RELEASE BUTTON**, as this will ultimately lead to internal damage to the unit and expensive repair. The cam is designed to resist accidental pull-out. Pulling the mouthpiece out without disengaging it produces extreme stresses which can be damaging.

Practice these operations several times before attempting to operate the unit.

INTRODUCTION

The **ALCO-SENSOR IV** is a hand-held breath alcohol testing device designed to read breath/blood alcohol concentrations. Nothing more than a disposable mouthpiece and a 9 volt alkaline battery are necessary to keep the **ALCO-SENSOR IV** operational.

On the front label of most **ALCO-SENSOR IV** is a colored dot. At several points in this manual, specific information is given which mentions the color of the dot. Be sure that you are familiar with the information that relates to your instrument.

The Blue Dot **ALCO-SENSOR IV** runs the Omnibus Test Procedures. However, if the Blue Dot **ALCO-SENSOR IV** is not mated to a Blue Dot **RBT IV** (Omnibus) printer, it may **ONLY** be used for the Screening Test. To meet the requirements for testing under the Omnibus regulations, a second test, the Confirmation Test, must be run using a Blue Dot **RBT IV** (Omnibus) with your Blue Dot **ALCO-SENSOR IV** and all appropriate procedures followed. Information on the Omnibus regulations can be obtained by calling Intoximeters.

With normal usage the unit should provide thousands of tests before the fuel cell needs replacing. The plug-in 9 volt alkaline battery (other types of batteries do not have long life) should run at least 300 tests. Calibration is rapid and simple. The **APPROVED DRY GAS STANDARD** tanks or a simulator may be utilized for calibration (See pages 27-36 for details).

OPERATOR TRAINING

The results supplied by a calibrated **ALCO-SENSOR IV** can be no better than the quality of the sample collected. The **ALCO-SENSOR IV** sampling system assures a deep lung sample and a deep lung sample is essential to get a true breath/blood alcohol reading.

AS SIMPLE AS THE ALCO-SENSOR IV IS TO USE, TRAINING IN ITS USE IS RECOMMENDED.

There are several possible training resources. Often there are state organizations which train personnel in the use of the **ALCO-SENSOR**. Examples are: Health Departments; State Police; Municipal Police Academies; Junior College Systems, and others. Present users are frequently willing to assist new programs with advice and training. (References are available.)

***NOTE: The ALCO-SENSOR IV may also be mated to a P.C., laptop or palm top system which is programmed to run the Omnibus Protocol. In this manual any reference to "RBT" also refers to the other systems listed.**

Other options include the use of an instructional tape which is available for use with your **ALCO-SENSOR IV**. The tape will orient you to breath testing and the operation of the **ALCO-SENSOR IV**. A one hour training tape may be leased or purchased. (The tape is available in English only—PAL OR N.T.S.C.).

INSTRUMENT CALIBRATION

Once a month **ACCURACY CHECKS** are recommended. If the reading is not within range of the expected value, re-calibrate the unit (for technique see pages 35-36). **TO OBTAIN ACCURATE RESULTS, THE UNIT MUST BE IN CALIBRATION.**

ALCO-SENSOR IVs generally hold their calibration for months. However, there are some circumstances which will cause sensitivity to drop and low readings to occur. These are pointed out in the following pages.

A recommended procedure on setting up a new program is to put the unit in place and perform **ACCURACY CHECKS** weekly for the first month. Reviewing these results should give you confidence in the stability of the calibration. If the unit holds calibration in your environment, set a policy of performing **ACCURACY CHECKS** monthly, otherwise, continue weekly checks.

PRINCIPLE OF OPERATION

ALCOHOL IN THE BREATH

The accuracy of any breath alcohol test is dependent upon the relationship between the concentrations of alcohol in the blood and deep lung breath. This ratio of 2100 to 1 is well established.

The amount of alcohol in a properly collected breath sample is governed by the amount of alcohol in the bloodstream circulating in the lungs. To get an accurate reading, a deep lung breath sample must be collected and analyzed.

A recent drink of an alcoholic beverage or regurgitation could introduce "mouth alcohol" to the breath thus causing an exaggerated reading. A 15 minute waiting period prior to testing will insure the elimination of "mouth alcohol".

OPERATING CONDITIONS

The **ALCO-SENSOR IV** is designed to operate at instrument temperatures between 10°C (50°F) to 40°C (104°F). Tests can be run every 2 minutes. Temperature is important as the rate of the electro-chemical reaction is affected by temperature.

Once the unit is at operating temperature it will function properly in ambient temperatures of 0°C to 40°C and relative humidity of 0 to 100%.

THEORY AND DESIGN OF THE ALCO-SENSOR IV
THE FUEL CELL

The **ALCO-SENSOR IV** contains a **FUEL CELL** sensor provided with an **ELECTRICALLY OPERATED PISTON SAMPLING PUMP** which, when activated, draws a 1 cc sample from the breath in the **SAMPLING SYSTEM** into the **FUEL CELL** for analysis. A signal is generated in the **FUEL CELL** in response to the breakdown of the alcohol in the breath sample. An amplifier powered by the 9 volt alkaline battery provides an output curve of the **FUEL CELL** response which is then digitized and analyzed by a microprocessor. In some models, the result of the analysis is automatically displayed first as a 2 digit approximation and moments later in 3 digits as a final reading. In other programs just the final 3 digit reading is displayed. This reading is held in memory and may be recovered through use of the **RECALL BUTTON** before the mouthpiece is ejected.

The **FUEL CELL** is a porous disk coated with a thin layer of gold and platinum black on both faces and saturated with an electrolyte. The cell is supported at its outer edge in the fuel cell case. When the breath sample is drawn across the top surface of the cell, all of the alcohol is quickly adsorbed and is subsequently converted to acetic acid plus electrons. The resulting electric current is converted to a BAC and digitally displayed. Field use indicates the cells generally have a life of 2-5 years.

FUEL CELL CLEAN-UP

Sufficient time after each test must be allowed for all traces of alcohol on the cell surface to be eliminated. If the **ALCO-SENSOR IV** is ready for use, the output of the **FUEL CELL** will be stable at zero and the display will indicate this state by calling for a blank. Even when exposed to breath samples with moderate to high alcohol levels ($\geq .040$), a cell should clear within 2 minutes. Keeping the unit warm will speed this process. At least one minute should elapse after a positive test result which is greater than .000 and $< .040$ before another next test sequence is initiated.

The instrument's temperature is displayed when the mouthpiece is mounted. If it is below 10°C or above 40°C, the test is blocked. Remove the mouthpiece and place the unit somewhere that the temperature can adjust to an acceptable operating temperature. It will come to an acceptable operating temperature in a short period of time.

ACCURACY

With a good deep lung breath sample the **ALCO-SENSOR IV** reading of breath/blood alcohol concentration (BrAC/BAC) should not vary more $\pm 5\%$ from the blood drawn at the same time.

INTERFERING SUBSTANCES

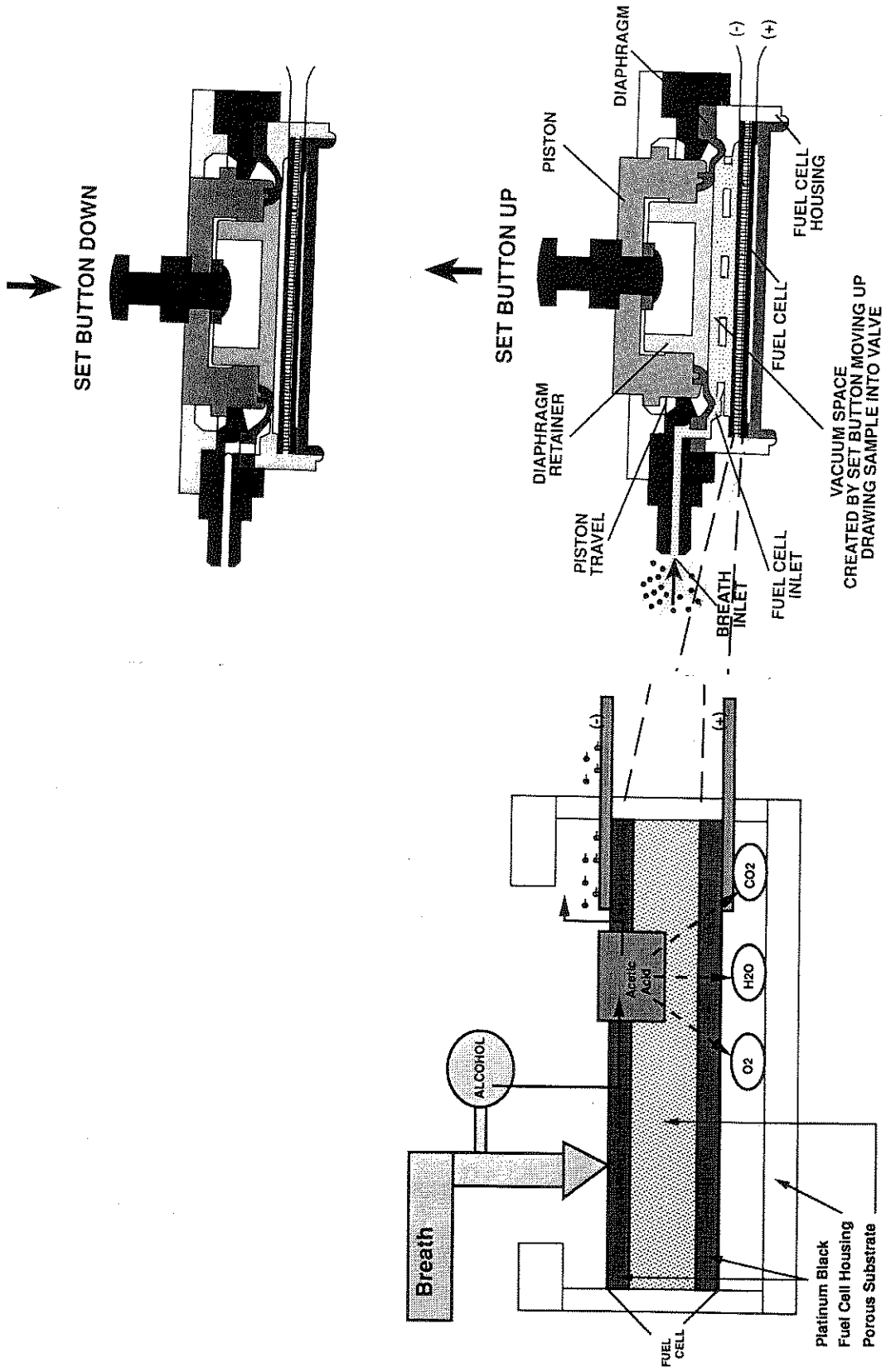
The **ALCO SENSOR IV** responds to alcohols in the breath. It does not read acetone or hydrocarbons which might be found in the breath.

SIGNIFICANT BREATH/BLOOD ALCOHOL CONCENTRATIONS (BrAC/BAC)

At this time, most states consider 0.10% BAC as presumptive evidence of impairment as far as driving skills are concerned. Some states use a 0.08% level, which is also used in Canada and most of Europe, and 0.04% is the upper level acceptable in most industrial sites. The accompanying generalized chart relates BrAC/BAC levels with numbers of drinks consumed for an "average" person.

Weight	DRINKS (Two Hour Period) 1-1/2oz 80° Liquor or 12 oz Beer												
	1	2	3	4	5	6	7	8	9	10	11	12	
100													
120													
140													
160													
180													
200													
220													
	CAUTION BAC TO 0.05											DRIVING IMPAIRED 0.05-0.09	LEGALLY DRUNK 0.10 & UP

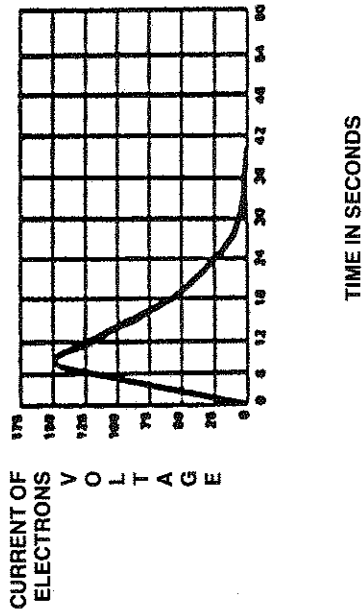
FUEL CELL & HOUSING DIAGRAMS



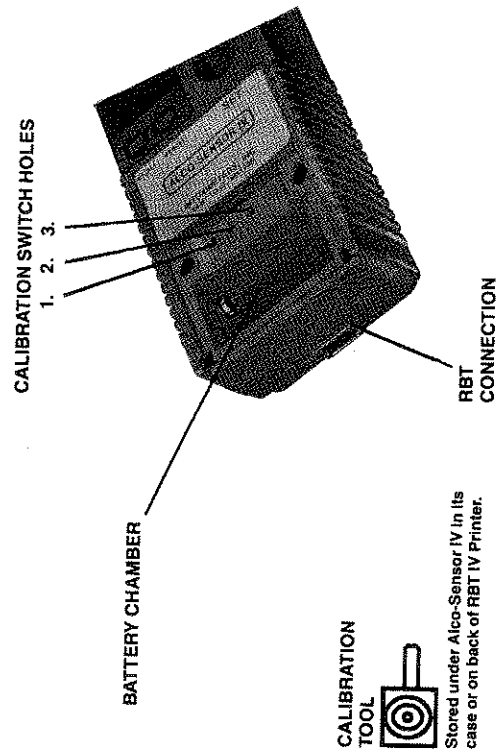
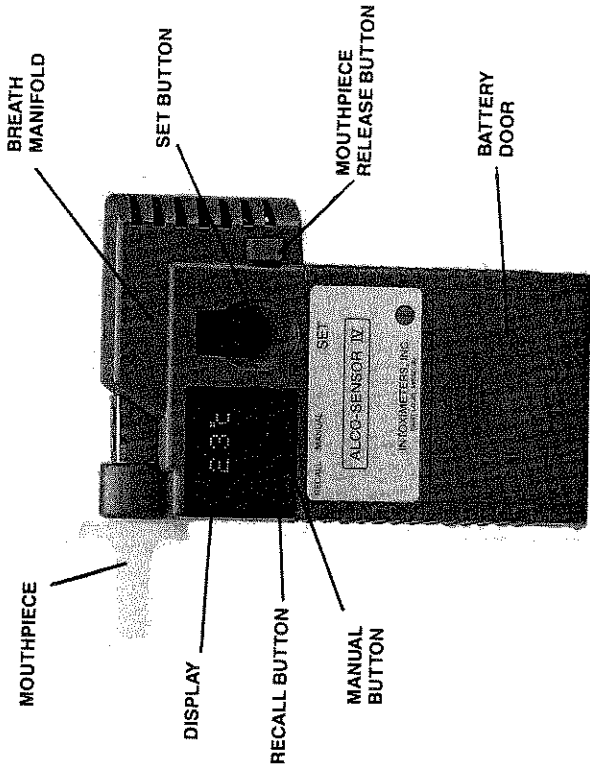
EXPLANATION OF THE CHEMISTRY OF THE FUEL CELL



WHEN A MOLECULE OF ETHANOL IS OXIDIZED,
 A GIVEN NUMBER OF ELECTRONS ARE
 RELEASED IN THE PROCESS.



AS USED IN THE
 ALCO-SENSOR IV



GENERAL COMPONENTS

The **SET BUTTON** cocks the pump when depressed; then the actuator returns to the original position. It is best that the internal pump be cocked when the **ALCO-SENSOR IV** is not in use. In this position the chance of contaminants entering the **FUEL CELL** is reduced.

The **MANUAL BUTTON** must be used to take a sample during the calibration or when the operator wants to test someone that cannot blow long enough to activate the automatic sampling system. The **MANUAL BUTTON** activates the sample valve and thus it can be used to sample the calibration gas when running an **ACCURACY CHECK** when the **ALCO-SENSOR IV** display shows "Test".

The **RECALL BUTTON** permits the operator to recall the current test result until the mouthpiece is removed.

The **DISPLAY** turns on when a mouthpiece is mounted in place. By various commands and symbols, it directs an operator through a fixed protocol of testing and announces any malfunctions of the system before and during a test as well as the corrective action to take.

The **MOUTHPIECE** contains a check valve which eliminates the possibility of the subject sucking room air into the sampling system. The mouthpiece is of different dimensions at either end and thus only mounts one way. When the long end of the **MOUTHPIECE** is slipped in place properly, the **ALCO-SENSOR IV** is turned on electrically. **Use only intoximeter ALCO-SENSOR IV mouthpieces.** Using mouthpieces of other design may cause inaccurate readings and could damage the instrument. The mouthpiece releases and ejects when the red **MOUTHPIECE RELEASE BUTTON** is depressed.

AUTOMATIC SAMPLING

A thermistor in the **MANIFOLD** monitors breath flow and causes sampling of only deep lung breath. A single plus sign "+" is displayed when the thermistor senses a breath sample. A second plus sign "+ +" is displayed when the minimal breath volume has been accomplished. Automatic sampling requires that at least "+ +" is displayed before the sample is taken, but the sampling system will not actuate until the subject's breath flow meets the requirement and the breath flow begins to decrease. Then, a 1cc deep lung breath sample is drawn into the fuel cell chamber.

POWER SOURCE

The **BATTERY CASE** opens when the serrated area is depressed and the door slides towards the bottom of the case. The **BATTERY** is a heavy duty 9 volt alkaline type which should be good for 300+ tests. When its voltage drops below 6.6 volts, the display shows "Bat" for 2 seconds when the mouthpiece is mounted. This warns that the **BATTERY** is getting low, but the current test can be completed and the **BATTERY** should then be replaced. When "Bat" is displayed for 2 seconds and is followed by "Void", the **BATTERY** has fallen to 6.6v and must be replaced before the test sequence can be continued (see page 36).

(The **ALCO-SENSOR IV** also has a lithium battery as part of its memory circuitry which should last up to 10 years. This battery allows the **ALCO-SENSOR IV** to retain the calibration memory when the 9 volt alkaline battery is removed or fails.)

CALIBRATION SWITCHES

The **PANEL WITH THE 3 CALIBRATION SWITCH ACCESS HOLES** in the top of the compartment is used in the calibration procedure as described on page 35-36.

The **CALIBRATION TOOL** is stored under the **ALCO-SENSOR IV** in its case.

RADIO FREQUENCY INTERFERENCE (RFI!)

An **RFI SENSOR** is built into the **ALCO-SENSOR IV**'s circuitry. If an interference signal is received which could influence the test result, the test will be voided and "RFI!" will be displayed. No result will be available. The test will have to be started over by removing the mouthpiece to turn the unit off. A possible source of **RFI** can be keying of a walkie-talkie.

ALCO-SENSOR IV BACK PLATE

A COMMENT ON BREATH SAMPLE VOLUME

The National Testing Laboratory in France announced the results of extensive testing with human subjects which demonstrated that instruments which required only a minimum volume of 1200cc be delivered were liable to underestimate the actual alcohol content of alveolar air by as much as 20%. Physiologists claim deep lung breath is reached after 800cc of breath has been expelled in a continuous exhalation. The laboratory was using infrared units which had >200cc dead space in their sampling system. Intoximeters hand-held instruments have less than 10cc dead space in the sampling system, so generally 1200cc fills the manifold with deep lung breath. It should be noted however, that a 1cc sample is not taken until the 1200cc requirement has been met, and the subject's exhalation slows down. So generally, much more than 1200cc of breath has passed through the mouthpiece before a sample is drawn to the fuel cell for analysis.

PROCEDURE FOR CONDUCTING A BREATH TEST WITH ALCO-SENSOR IV

If the **ALCO-SENSOR IV** is being used as a **SCREENER**, or if your protocol dictates, the subject can be asked if he has used any alcohol in the last 15 minutes. If the response is negative, test the subject immediately; if otherwise, wait 15 minutes before testing. If the test result is positive, wait 2 to 15 minutes as your regulations require and take a second test. A similar result indicates true blood alcohol level. A much lower result strongly suggests mouth alcohol was present at the time of the first test.

If only one (1) test is being administered **AND** the **ALCO-SENSOR IV** is being used **EVIDENTIALLY**, the subject must be kept under observation for 15 minutes prior to testing to be certain any residual alcohol which might have been in the subject's oral or nasal cavity has dissipated.

OPERATING INSTRUCTIONS

1. MOUNT MOUTHPIECE.

Unit turns on.

2. NOTE TEMPERATURE.

If unit displays Set,

3. DEPRESS SET BUTTON.

When unit displays Blink,
Unit runs **BLANK** automatically & displays .000 (*)

If unit displays Set,

4. DEPRESS SET BUTTON.

When unit displays Test,

5. COLLECT A BREATH SAMPLE.

6. RECORD 3 DIGIT READING.

7. DEPRESS SET BUTTON AND REMOVE MOUTHPIECE.

If unit displays a message not mentioned above, consult manual.

U.S. Patent No. 4,487,055

4,770,026

U.K. Patent No. 2201245

Other patents pending

SERIAL NUMBER



(*) The type of software in your unit requires specific information at this point. Each unit has different wording here. Complete information on what to expect for the Red, Green and Blue Dot **ALCO-SENSOR IV** follows.

EXPLANATION OF BACKPLATE OPERATING INSTRUCTIONS

Your ALCO-SENSOR IV must not be attached to an RBT IV printer at this time.

1. MOUNT MOUTHPIECE.

Unit turns on.

Remove ALCO-SENSOR IV from its case and mount a **NEW** mouthpiece as described previously. This will power up the unit and within 1 second the display will be active. If the battery is too low, the first display will be "Bat". Replace the battery as soon as the test is concluded.

2. NOTE TEMPERATURE.

The temperature in °C will be displayed for 3 seconds after turn-on. ALCO-SENSOR IV is designed to provide maximum accuracy when the unit temperature is between 10°C and 40°C. Below 10°C, the FUEL CELL process becomes progressively slower, measurement times become longer and some information begins to be lost, so that accuracy begins to decline. Clearing time for the cell increases and, consequently, the required interval between tests is increased. On the other hand, temperatures above 40°C tend to degrade FUEL CELL performance and shorten the useful life of the cell. All ALCO-SENSOR IV's with a serial number higher than 002343 will not allow a test if the unit, i.e. fuel cell, is out of the proper operating temperature range. If the temperature is outside of the proper operating range, take appropriate corrective action by removing the mouthpiece and placing the instrument in a cooler or warmer environment.

3. If unit displays SET DEPRESS SET BUTTON.

If the previous test has been properly concluded, the pump mechanism should already be cocked and "Set" will not appear. If this was not correctly done, or if by impact or rough handling the mechanism has been sprung, this instruction requires the pump to be restored to its cocked position. The test cannot proceed until it is done.

IMPORTANT:

The type of unit you purchased determines what will be the next step that you will observe. Following is an explanation for each type of unit. Depending upon the operating instructions as laid out on the back of your unit, you will notice a difference in the numeric sequencing.

During the initial phase of this step, the computer is monitoring the FUEL CELL output to be sure that the system is essentially zero so that a measurement may start. During the first ten seconds, a BUSY display consisting of alternating "<" and ">" characters appears. If, at the end of this time, the output is still not low enough, "Wait" or "Void" appears. Generally, if a minute or more has elapsed since the last test, the wait will only be a few seconds. If "Wait" persists more than 3 or 4 seconds, it is suggested, in the interest of battery life, that the mouthpiece be removed and the test be started again from Step 1 30 seconds later. When the FUEL CELL output is zero and stable, your unit will proceed in one of the following manners:

On Red Dot ALCO-SENSOR IV (Air Blank) unit, you will see:

4. When unit displays *Blink*, Unit runs *Blank* and displays *.000*

"Blink" appears on the ALCO-SENSOR IV display while the unit checks for alcohol residue in both the manifold and the fuel cell. The busy signal "><" displays while the sample is analyzed. If both the manifold and the fuel cell are clean, ".000" appears followed by "Set".

If the manifold and/or the fuel cell are not clean, ".XXX" (a numeric value) appears followed by "Void". Eject the mouthpiece and wait 15 seconds to 1 minute (depending upon the magnitude of the reading) before attempting to reinitiate the test with a new, clean mouthpiece. **DO NOT BLOW BY MOUTH THROUGH THE MANIFOLD AS THIS CAN RETARD THE CLEARING.**

5. When unit displays Set, DEPRESS THE SET BUTTON.

On Green Dot ALCO-SENSOR IV (Sensor Blank) unit, you will see:

When unit displays Blnk, Unit runs Blank automatically & displays .000

Depress the SET BUTTON to cock the breath pump and the unit is ready for a breath sample.

"Blnk" appears on the ALCO-SENSOR IV display while the unit draws a blank sample and checks for alcohol residue on the fuel cell only. The busy signal "><" displays while the check is being run. If the fuel cell is clean, ".000" appears.

If the fuel cell is not clean, ".XXX" (a numeric value) appears followed by "Wait". Eject the mouthpiece and wait 15 seconds to 1 minute (depending upon the magnitude of the reading) before attempting to re-initiate the test with a new, clean mouthpiece. **DO NOT BLOW BY MOUTH THROUGH THE MANIFOLD AS THIS CAN RETARD THE CLEARING.**

6. If the unit displays Set, DEPRESS SET BUTTON.

On Blue Dot ALCO-SENSOR IV (Omnibus) unit, there is no outward indication of the internal operation at this point:

If "Set" appears, depress the SET BUTTON to cock the breath pump and the unit is ready for a breath sample.

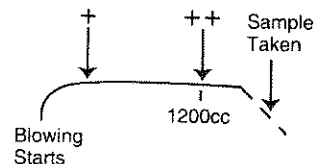
After the unit displays the temperature, the busy signal "><" flashes while the unit automatically draws a blank sample and checks for alcohol residue on the fuel cell. The busy signal "><" continues to display while the sample is analyzed. If the fuel cell is clean, the unit displays "Test". The Blue Dot ALCO-SENSOR IV unit is ready for a breath sample.

If the fuel cell is not clean, "Wait" appears. Eject the mouthpiece and wait 15 seconds to 1 minute (depending upon the magnitude of the reading) before attempting to re-initiate the test with a new, clean mouthpiece. **DO NOT BLOW BY MOUTH THROUGH THE MANIFOLD AS THIS CAN RETARD THE CLEARING.**

CHECK THE BACK PLATE OF YOUR UNIT FOR THE CORRECT NUMERIC SEQUENCE OF THE NEXT STEP.

5. COLLECT A BREATH SAMPLE.

BREATH PROFILE



At the beginning symbol "><" prev monitors the breath. (A display of "cates that the b disabled and that (is possible.) Wh "Test", instruct th **breath**, hold it a through the mouth can. A (+) sign a the subject is blc complete an autc does not appear, s him to blow hard blown a minimur mately 1.2 liters, appears. The sam when this conditc the flow diminishes of the exhalation is conditions are met the unit will autom: than 10 seconds e interrupted before appears, the unit and return to the t start another sampl

If subject has obvi ing, it is recommen taken manually a: exhalation as pos: **MANUAL BUTTON** can be used with e ject to get the best p the circumstances.

A total of 3 minutes is allocated to achieve a successful sample either automatically or manually. At the end of 3 minutes "Void" appears and the test must be started again at Step 1 with a NEW mouthpiece.

Any time the sampling pump does not successfully draw a sample on either the manual or automatic command, the display will show "Void". After 3 seconds an intermittent **BEEP** indicates that the mouthpiece should be removed to turn power off. The cause of this failure should be investigated by a technician.

THE BACKPLATE STATES:

6. RECORD 3 DIGIT READING.
OR RECORD INITIAL OR FINAL READING.

As soon as a successful breath sample has been taken, the busy signal "><" is displayed (BUSY) to indicate the **ALCO-SENSOR IV** is analyzing the breath sample.

On some units:

After a few seconds a 2 digit display (.XX) will appear for 3 seconds in addition to the busy symbol "><" I. This is an approximation of the final reading to better than 10%. If this value is too low to be of interest, or is adequate for screening purposes, the test may be terminated at this point by depressing the **SET BUTTON** and removing the mouthpiece. If not terminated, the display will continue to indicate **BUSY** until the final 3 digit display appears in 20-30 seconds. It is accompanied by a 3 second series of **BEEPS**.

On the Blue Dot **ALCO-SENSOR IV**:

The final 3 digit display appears in 20-30 seconds, accompanied by a 3 second series of **BEEPS**.

7. DEPRESS SET BUTTON AND REMOVE MOUTHPIECE.

After the 3 digit display disappears, "Set" appears. Depress the **SET BUTTON** and eject the mouthpiece unless you need to recall the test result. When the pump is cocked with the **SET BUTTON**, an intermittent **BEEP** signals that the mouthpiece should be removed to turn the unit off. At any time during this **BEEPING** period and before the mouthpiece is ejected, depressing the **RECALL BUTTON** will display the 3 digit result of the test just completed.

RECALLING THE CURRENT TEST RESULT

Until the **SET BUTTON** is depressed after a test, the **RECALL** function is not available. Once the **SET BUTTON** has been engaged, depressing the **RECALL BUTTON** will display the final reading of the current test. After the mouthpiece is ejected, the test result cannot be recalled.

QUICK REFERENCE GUIDE TO DISPLAY LEGENDS

DISPLAY	MEANING	RFI!
< and > alternating	The symbol "><" has been used in the previous text to denote this display. The computer is busy and the unit is functioning—wait for the next message.	
Wait	A waiting period is necessary to ready the system for another test. Generally, if "Wait" persists more than 3 or 4 seconds, the unit should be turned off for a period of time before another test is attempted.	
Blink	After the display shows "Blink", the instrument automatically reads a blank to be sure the system is free of alcohol residue.	
Set	SET BUTTON should be depressed to cock sampling pump.	
Void Followed by intermittent beep	An improper condition exists that requires the unit to be turned off and restarted from Step 1.	
Man	The breath flow sensor is inoperative and ONLY a manual sample may be taken. Proceed with breath sample, but depress the MANUAL BUTTON near the end of exhalation.	
Test	A breath sample should be collected from the subject or an ACCURACY CHECK sample should be delivered.	
RBT	Appears when ALCO-SENSOR IV is connected to an RBT printer in place of "Test".	
NoGo	The proper conditions for an automatic sample have not been achieved. When "Test" appears again, start a new sample.	
+	A sufficient minimum breath flow is being provided for automatic sampling.	
++	A minimum sample volume of at least 1.2 liters (1200cc) has been delivered.	
> XXX	A sample has been introduced that exceeds the measuring range of the instrument. This may be seen during testing, Cal, Cal1 or Cal2. Example: >400.	
Bat	The 9-volt alkaline battery should be changed. If this display is followed by normal operation, the battery is capable of completing the current test. If "Bat" is followed by "Void", the test must be terminated and a new battery must be installed. Good practice demands that the battery be changed at the end of the first test where "Bat" appears.	
		Followed by "Void" indicates that an RFI signal was detected which is sufficiently strong that the results of a test might be affected. Test must be started over by removing mouthpiece to turn unit off.
		Appears during the CALIBRATION PROCEDURE and indicates that a sample of the test gas should be delivered following instructions in the ACCURACY CHECK section.
		Temperature is displayed in Celsius.
		A high resistance or loose battery is indicated and should be replaced.
		The instrument's temperature is greater than allowed.(*)
		The instrument's temperature is less than allowed.(*)
		There are improper conditions during a calibration procedure that prevent proper calibration of the unit (requires servicing by a technician).
		(*) Seen only during Cal, Cal1, or Cal2

ACCURACY CHECK

An **ACCURACY CHECK** is the running of a sample of a known alcohol concentration through the **ALCO-SENSOR IV's** sampling system and checking to see that the unit reads the sample within an acceptable range. **The ACCURACY CHECK is performed when the temperature range of the ALCO-SENSOR IV is between 10°C and 40°C (the temperature range for testing).** If the **ACCURACY CHECK** reading is within an acceptable range, the **ALCO-SENSOR IV** is considered to be calibrated properly. If the reading is not within an acceptable range, the **ALCO-SENSOR IV** should be calibrated (see pages 35-36). At least two (2) minutes should elapse after a positive test ($\geq .040$) before a new mouth-piece is inserted and the **ACCURACY CHECK** test sequence is initiated. One (1) minute should elapse on a positive reading which is $< .040$ before initiating the **ACCURACY CHECK** test sequence.

The known alcohol concentration may come from a **TRUE-CAL Device**, the label of the approved dry gas standard or a reported known value of simulator solution (see following sections for details). Because the fuel cell is linear, calibrating the unit correctly at one known value will result in accurate calibration throughout a full range of breath testing values.

TRUE-CAL DEVICE

Variations in barometric pressure can alter the expected value of a pressurized dry gas standard, according to standard gas laws ($PV=nRT$). The **TRUE-CAL device** is designed to sense changes in barometric pressure and report an adjusted value for the dry gas standard.

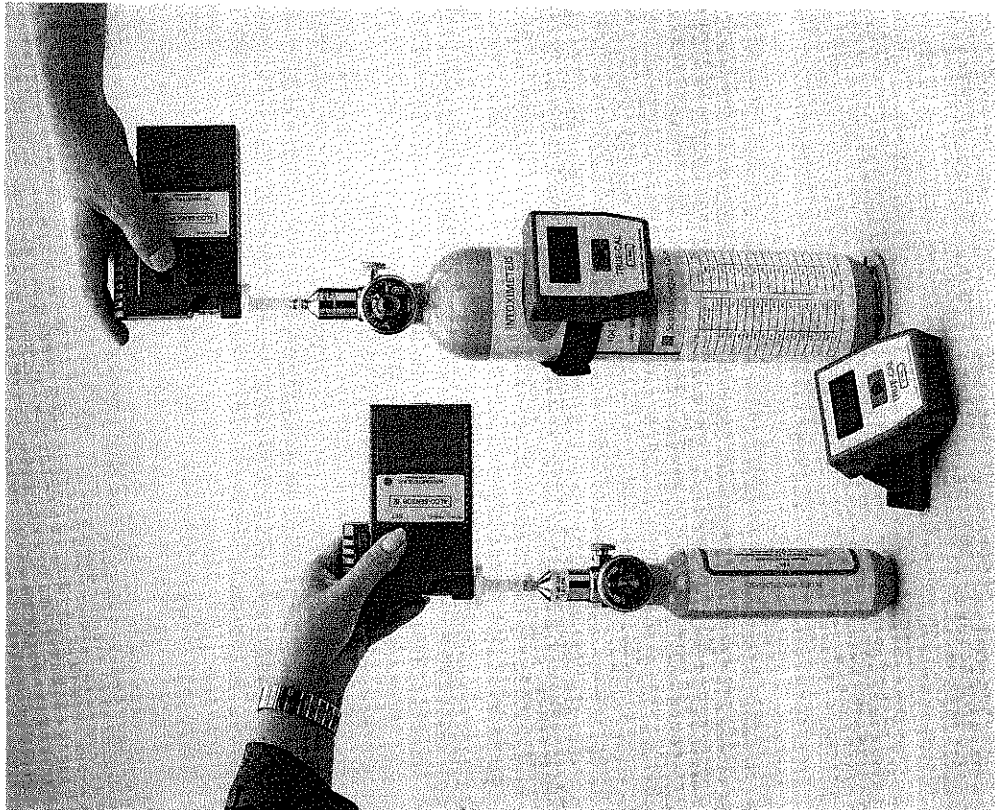
The **TRUE-CAL device** has been designed to work exclusively with Intoximeters' **APPROVED DRY GAS STANDARDS**. Due to Intoximeters' strict requirements for accuracy and quality for all tanks sold by Intoxards, the **TRUE-CAL device** should not be used with dry gas standards supplied by other vendors. The background color of the "%BAL" symbol (below the **TRUE-CAL** name) must match the color of the label on the Intoximeters' approved dry gas standard. A **TRUE-CAL device** with a yellow background "%BAL" symbol is set up for an Intoximeter approved dry gas standard with a value of .038% at sea level. The **TRUE-CAL device** with a white background "%BAL" symbol is set up for an Intoximeters' approved dry gas standard with a value of .082% at sea level.

Due to the **TRUE-CAL's** unique design, by simply depressing the button on the **TRUE-CAL device**, the LED display on the **TRUE-CAL** will show the current expected value of the gas. The **TRUE-CAL** is powered by a 9 volt alkaline battery which should be good for 800 assessments. "888" will appear on the **TRUE-CAL** display when the 9 volt alkaline battery needs to be replaced.

CALIBRATION STATION

A **CALIBRATION STATION** consists of a container of the approved dry gas standard and a **TRUE-CAL device** which corrects for barometric variations. The approved dry gas standards come in three sizes: small, regular and large.

SMALL & REGULAR SIZE TANKS OF APPROVED DRY GAS STANDARD (WITH TRUE-CAL DEVICE)



ELEMENTS:

- A. Pressurized approved dry gas tank.
- B. Regulator.
- C. **TRUE-CAL device.**

MAKEUP:

Tank contains a single-phased mixture of Nitrogen and Ethanol (105 ppm). The volume of gas in the small tank is 6.7 liters (6700cc) and 105 liters (105000cc) in the regular size tank.

CHARACTERISTICS:

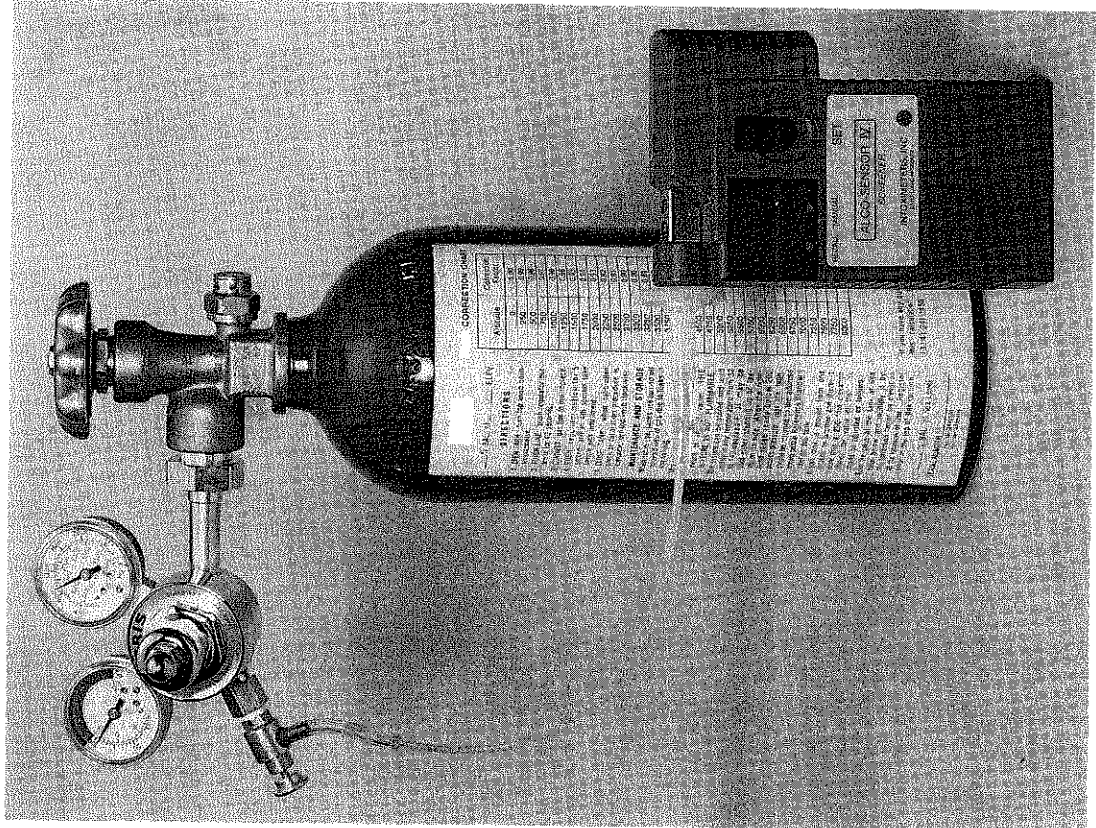
- A. Flow rate of the regulator is 1.0 liter per minute.¹
- B. Used properly, the tanks will supply at least 100 and 800 tests respectively.
- C. New tanks show approximately 1025 psi on the gauge. Follow instructions on the APPROVED DRY GAS STANDARD tanks to mount the regulator. When the regulator is initially mounted, depress the regulator control button and allow the gas to purge the valve for 10 seconds. Allow the system to sit idle for a minimum of 15 minutes before using.
- D. Expiration date is stamped on the label of the dry gas standard.
- E. The **TRUE-CAL** device used in the vicinity of the dry gas standard will display the true value of the standard at the time of the test. **BEFORE RUNNING AN ACCURACY CHECK OR CALIBRATION, ALWAYS PURGE THE VALVE FOR AT LEAST 2 OR 3 SECONDS BEFORE RUNNING YOUR FIRST ACCURACY CHECK OR CALIBRATION OF THE DAY.**

OPERATION:

- 1. When **ALCO-SENSOR IV** display shows "**Test**" or "**Cal**"; make an airtight connection between the delivery tube of the regulator and the open end of mouthpiece.
- 2. Depress the regulator control button for 7 seconds. On the 6th second, depress the **MANUAL BUTTON** on the **ALCO-SENSOR IV** to take a sample (The goal is to have gas **still flowing** through the **ALCO-SENSOR IV** when the sample is taken.) Release the regulator control button on the 7th second.
- 3. Carefully detach the **ALCO-SENSOR IV** mouthpiece from small plastic tube on the Scotty regulator so that the mouthpiece is not unseated from the unit.
- 4. Observe the 3 digit reading.
- 5. Record the 3 digit reading. If it does not correspond to the expected value, the unit needs calibration ($\pm .010$ for law enforcement) (+ .000—10% for other industrial programs is suggested, but unit must be calibrated accordingly.)

¹If using a regulator with a .3 liter flow rate, the sample must be introduced on the 9th second of a 10 second flow. If using a regulator with a 1.5 liter flow rate, the sample should be introduced on the 6th second of a 7 second flow as described above. Regulators of .3 or 1.5 liter flow rates are labeled appropriately.

LARGE APPROVED DRY GAS STANDARD



ELEMENTS:

- A. High Pressure approved dry gas tank.
- B. Single staged regulator.
- C. **TRUE-CAL device.**

MAKEUP:

Tank contains a single-phased mixture of Nitrogen and Ethanol (105 ppm). This is the same mixture as in the **SMALL** and **REGULAR** size tanks. The volume of gas is 787 liters (787000cc).

CHARACTERISTICS:

- A. Flow rate is determined by the instrument being checked.
- B. Tanks are high pressure containers and therefore contain more gas under greater pressure. When the tank and regulator are initially connected, flush the regulator for 10 seconds, then allow the system to sit idle for a minimum of 1 hour before using. When not in use, the tank tap must be turned off. When the tank is to be used, the tap is opened and the system flushed for at least 10 seconds before use.
- C. Expiration date is stamped on the label of the dry gas standard.
- D. The **TRUE-CAL** device used in the vicinity of the dry gas standard will display the true value of the standard at the time of the test.
- E. The **LARGE TANK** is required by Federal Law to bear special shipping labels and cannot be carried on a commercial carrier.
BEFORE RUNNING AN ACCURACY CHECK OR CALIBRATION, ALWAYS PURGE THE VALVE FOR AT LEAST 2 OR 3 SECONDS BEFORE RUNNING YOUR FIRST ACCURACY CHECK OR CALIBRATION OF THE DAY.

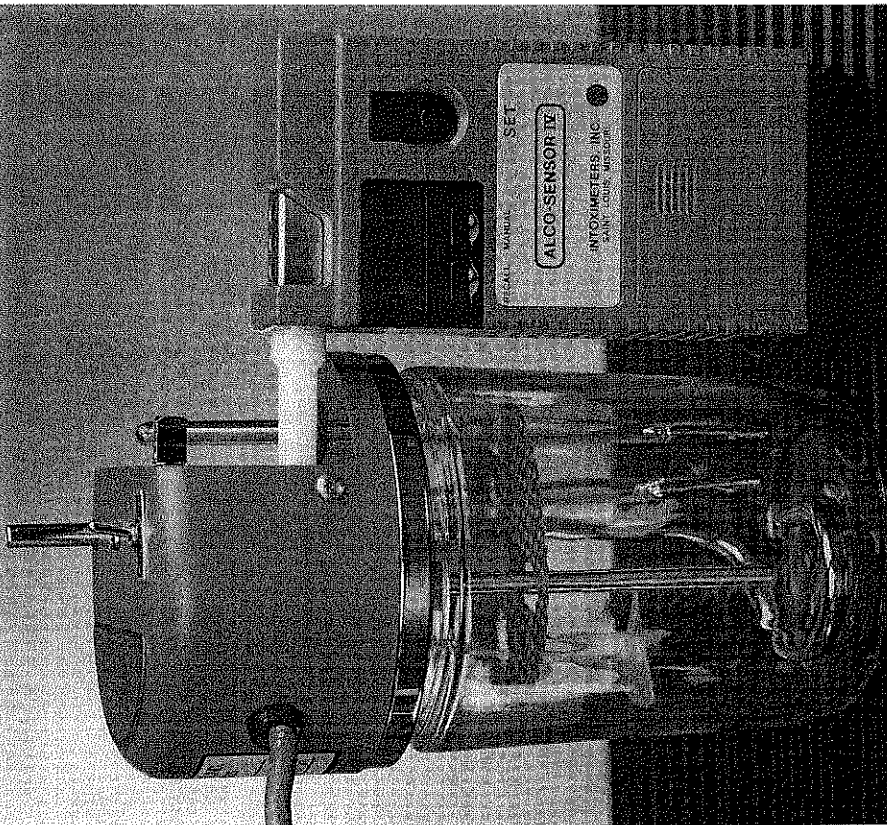
OPERATION:

1. When **ALCO-SENSOR IV** display shows "Test" or "Cal", make an airtight connection between the delivery tube of the regulator and the open end of mouthpiece.
2. Depress the regulator control button for 7 seconds. On the 6th second, depress the **MANUAL BUTTON** on the **ALCO-SENSOR IV** to take a sample (The goal is to have gas **still flowing** through the **ALCO-SENSOR IV** when the sample is taken.) Release the regulator control button on the 7th second.
3. Carefully detach the **ALCO-SENSOR IV** mouthpiece from small plastic tube on the regulator so that the mouthpiece is not unseated from the unit.
4. Observe the 3 digit reading.
5. Record the 3 digit reading. If it does not correspond to the expected value, the unit needs calibration ($\pm .010$ for law enforcement) (+ 000—10% for other industrial programs is suggested, but unit must be calibrated accordingly.)

SIMULATOR

ELEMENTS:

- A. Glass jar which holds 500cc of solution.
- B. Jar head contains heater thermostat, stirrer, thermometer, inlet and outlet ports for sampling headspace gas standing above the solution.



MAKEUP:

Solution is a water/alcohol mixture of certified concentration and known BAC value.

CHARACTERISTICS:

- A. Seven month shelf-life on refrigerated, unopened bottles of solution.
- B. 30 tests per bottle of solution.
- C. Liquid should be clear with no visible particles suspended in the solution.
- D. A simulator containing a solution of known BrAC value must be at the operating temperature 34°C. The simulator top must be on securely so the system is airtight. To check, cover the outlet port and blow into the intake port. Bubbles of air should not rise rapidly through the solution if the top is secure.

OPERATION:

1. Prepare simulator for use and be sure it has reached a stable temperature (34°C) and that the stirrer is operating properly.
2. When **ALCO-SENSOR IV** reaches "Test", "CAL", attach open end of mouthpiece to simulator outlet.
3. Blow into simulator inlet port for 4 seconds. Avoid blowing so hard that solution is aspirated into the **ALCO-SENSOR IV** mouthpiece. On the 3rd second, press the **MANUAL BUTTON** on **ALCO-SENSOR IV** to take a sample (the goal is to have gas still flowing through the **ALCO-SENSOR IV** when the sample is taken).
4. Detach simulator from mouthpiece carefully so that the mouthpiece is not unseated from the unit.
5. Record reading. If it does not correspond to the expected value, the unit needs calibration ($\pm .010$ for law enforcement) (+ .000—10% for industry is acceptable).

SECURITY TAPE FOR TAMPER PREVENTION OF A CALIBRATED UNIT

In order to prevent tampering with the calibration of the **ALCO-SENSOR IV** unit, a security tape is available for use to cover the 3 calibration switch access holes inside of the battery chamber. To use security tape the first time:

1. Calibrate the unit—run an accuracy check—if calibrated satisfactorily
2. Sign and date security tape strip.
3. Peel the tape off the wax paper. Mount the tape and position it so the dots and switch access holes (1,2,3) inside the **ALCO-SENSOR IV** battery chamber are aligned.
4. Replace battery cover.

When the unit needs recalibration, remove the security tape—it will fragment. Do not allow residue to accumulate as it will eventually impede closing the battery door. Proceed with calibration. Then follow above instructions for using security tape.

CALIBRATION

When a unit does not read a standard within acceptable limits, it must be re-calibrated by the following procedure. The unit must be calibrated when its temperature is between 23°-27°C. **If the temperature is not within the required range, the unit will not permit a calibration.** We recommend that calibration be done with carefully prepared fresh simulator solutions or APPROVED DRY GAS STANDARD.

PROCEDURE

Follow the instructions in the section on **ACCURACY CHECK** to ready the standard you have chosen for calibration.

1. Remove battery cover to expose calibration switch access holes. If used, carefully and completely remove any security tape covering the access holes.
2. On both the Red and Green Dot **ALCO-SENSOR IV**, insert a new mouthpiece and follow standard operation until **ALCO-SENSOR IV** displays a blank reading of “.000”.
The Blue Dot **ALCO-SENSOR IV** (Omnibus), requires that the unit go into the “Calibration Mode” in order to begin the Calibration Procedure. To do this, insert the mouthpiece while gently depressing **ACCESS HOLE #1** with the Calibration Tool. The display indicates the progress of the operation. When the unit has analyzed the automatic blank sample and determined that the unit is clean, the display shows “.000”.
3. On all units, regardless of the color of the dot, while “.000” is still being displayed, use the calibration tool and press **ACCESS HOLE #3** and hold down until “.XXX” is displayed (The actual number will be that used for the last calibration that was run). When “.XXX” display appears, release **ACCESS HOLE #3**. If the temperature is not in the range of 23°-27°C, instead of “.XXX” the display will be “Tmp <” or “Tmp >” and the unit will “Void”. Remove the mouthpiece and allow the instrument's temperature to come into the 23°-27°C range.
4. If, after a few seconds, the display goes to “Set”, the **SET BUTTON** should be depressed to cock sample pump. “.XXX” will return to the display.
5. With “.XXX” shown on the display, using the calibration tool adjust the number up (**ACCESS HOLE #1**) or down (**ACCESS HOLE #2**) until the value of the standard being used is displayed.
6. Push **ACCESS HOLE #3** again. The display must read “Cal” to proceed. This is the equivalent of “Test” in a normal sequence.

NOTES

.005
~~50.107 01.~~

7. Follow the instructions in **ACCURACY CHECK** to deliver a 7 second sample of the test gas. On the 6th second, and while the gas is still flowing, take a sample of the test gas by depressing the **ALCO-SENSOR IV's** manual button. This activates the sampling valve. The **ALCO-SENSOR IV** analyzes the output from the **FUEL CELL** and automatically makes the necessary calibration adjustments. They are exactly the number that was programmed in Step 5.

8. Conclude the test as usual by pressing the **SET BUTTON** when "Set" appears. Remove the mouthpiece at the intermittent **BEEP**. The conversion factors that were calculated in Step 7 are preserved in the **ALCO-SENSOR IV's** memory and are used for every test until a new set is computed by a subsequent calibration.

9. After a 2 minute wait, use a **NEW** mouthpiece to run an **ACCURACY CHECK** to confirm the calibration. **THE ACCURACY CHECK RESULT SHOULD BE WITHIN ± .003 OF THE TARGET READING.** This step guarantees that the calibration has been done properly.

The **ALCO-SENSOR IV** has a factory set constant to accommodate the temperature co-efficient of the **FUEL CELL** used on the unit. If you have calibrated the unit as instructed and subsequently notice that readings at the acceptable extreme temperature ranges read outside of specifications, please contact Intoximeters.

BATTERY REPLACEMENT

A "Bat" display indicates that the **BATTERY** is not strong enough to support an accurate reading and needs replacing.

- PROCEDURE:** Slide **BATTERY DOOR** open.
Remove old **BATTERY**.
Insert new **BATTERY**.
Close **BATTERY DOOR**.

*Use only **9 VOLT ALKALINE BATTERIES.**