



**Tennessee Bureau of Investigation
Forensic Services Division**

**INTOXIMETER EC/IR II
TWO TEST PROTOCOL
OPERATOR'S MANUAL**

Effective November 1, 2012

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TENNESSEE BUREAU OF INVESTIGATION
FORENSIC SERVICES DIVISION
BREATH ALCOHOL PROGRAM

Tennessee Code Annotated (TCA), Section 38-6-103 (g) requires the Tennessee Bureau of Investigation (TBI) through its Forensic Services Division to “...establish, authorize, approve, and certify techniques, methods, procedures, and instruments for the scientific examination and analysis of evidence...and to teach and certify qualifying personnel in the operation of such instruments to meet the requirements of the law for the admissibility of evidence.”

The TBI Breath Alcohol section is comprised of 3 Special Agent Forensic Scientists and 1 Special Agent Forensic Scientist Supervisor that maintain this requirement statewide. They are responsible for of the certification of evidentiary breath testing instruments and operator training for law enforcement personnel in the State of Tennessee.

All breath tests are performed in accordance with the standards and operating procedures promulgated by the forensic services division of the Tennessee Bureau of Investigation. Only personnel from a law enforcement agency shall be trained and certified as breath test operators.

To contact TBI Breath Alcohol Personnel:

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OVERVIEW OF THE INTOXIMETER EC/IR II EVIDENTIARY BREATH ALCOHOL TESTING INSTRUMENT

The Intoximeter EC/IR II is manufactured by Intoximeters, Inc. in St. Louis, Missouri. Intoximeters, Inc. has manufactured breath alcohol instruments since 1945. The Intoximeter EC/IR II is listed on the National Highway Traffic Safety Administration's (NHTSA) Conforming Products List (CPL) and has been approved by the Tennessee Bureau of Investigation for use as an evidential instrument.

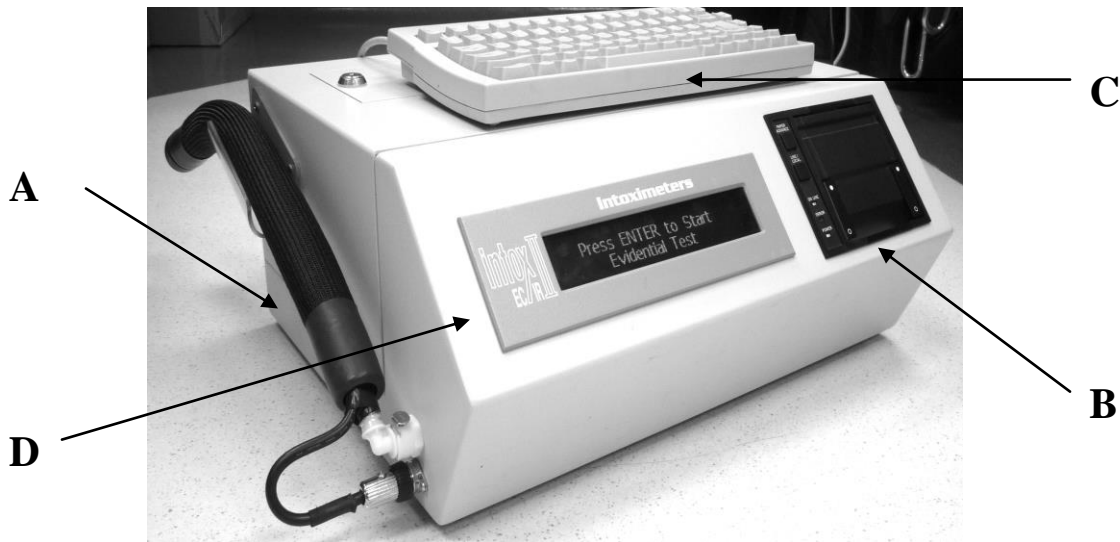


Figure 1: Intoximeter EC/IR II

- A. Breath Tube An insulated, heated tube which the subject provides a breath sample to the instrument. A sterile mouth piece is to be placed on the end of the breath tube before every subject blow. Mouth pieces are provided by TBI.
- B. Printer A thermal printer that prints 3 test copies of an Evidential Test. The "ON LINE" light (green) will be on if the printer is ready to print. Instructions on how to change the paper will be discussed on page 14.
- C. Keyboard A 7-pin connection keyboard is used to navigate instrument prompts. Specific keys also perform certain actions:

ENTER Start an evidential test, accept data entry, and review data entry when prompted.

- SPACE** Change options in data entry and begin the test after data entry is completed.
- P** Print the last test performed on the instrument.
- T** Restart the 20 minute observation countdown timer.
- R** Indicate the subject as having refused the test, i.e. refusal.
- ESC** Abort an evidential test at any time.

D. Display A two-line alphanumeric display. All information about the instrument's status, location, date and time, etc. will be shown here while the instrument is in ready mode.



Figure 2: Intoximeter EC/IR II Rear Panel Connectors and Controls

E. AC Power/ Power Switch The AC Power cord plugs into this port. This rocker type switch turns the instrument's power on and off.

F. Modem Output Connect to an analog phone line for data collection and troubleshooting, by TBI authorized personnel.

- G. Dry gas lock box Locked compartment where the dry gas standard is connected to the instrument. Access restricted to TBI authorized personnel.
- H. Keyboard Connection The keyboard plugs into this 7-pin port.

OPERATION OF AN EVIDENTIAL TEST

The subject will be required to provide 2 breath samples in one test sequence in order for the test to be completed. The following is an outline of steps taken by an operator to achieve a successful evidential test. For the purpose of this section, the bold print will represent the instrument display.

In ready mode, the display will be scrolling through information. This information will include: status, location, date, time, database capacity, and manufacturer's name.

Please ENTER to Start Evidential Test.

Initializing...

- | | |
|---------------------------------|--|
| Subject Last Name: | Up to 20 characters can be typed
<i>(Required Field)</i> |
| Subject First Name: | Up to 20 characters can be typed
<i>(Required Field)</i> |
| Subject Middle Initial: | 1 character |
| Subject Sex: | The Instrument defaults to MALE. Press the space bar to change to FEMALE. |
| Subject D.O.B.: | Has to be entered in this format, MM/DD/YYYY. The instrument will calculate the date of birth. |
| Subject D.L.N.: | Type up to 20 characters/ numerals |
| D/L State of Issue: | Abbreviation code for the state. |
| Subject race: | The instrument defaults to Caucasian. Press the space bar to change between the options of: Caucasian, African American, Hispanic, Asian, and Other. |
| Operator Last Name: | Up to 20 characters can be typed
<i>(Required Field)</i> |
| Operator First Name: | Up to 20 characters can be typed
<i>(Required Field)</i> |
| Operator Middle Initial: | 1 character |

Time of Arrest: 24 hour time

County of Arrest: Full name of county where test is being performed.

Accident Involved: The instrument defaults to “No Accident”. Press the space bar to change the option to: “Accident w/ no fatalities”, “Fatal Accident”.

Starting Test Sequence:
Space = Begin, Enter = Verify

This concludes the data entry portion of the test. The operator will have the option of reviewing data by pressing the enter key or going forward with the test by pressing the space bar.

Press the space bar to continue.

Test Number: XXX

Observation Period...
20:00

The observation time starts from 20:00 and counts down to zero. There is an audible beep at 3 minutes, 2 minutes, 1 minute, and zero. During this time, the operator is to observe the subject and ensure that the subject has no foreign matter in his/ her mouth and/ or has not regurgitated. With 30 seconds left, the purge fan will cut on.

First Sample

Purging The purge fan is drawing clean air through the instrument’s sampling system.

Blank Check Ambient air will be drawn into the sample chamber and tested to insure that the instrument is free of alcohol contamination.

Blank Checked Passed This will be displayed if the fuel cell has measured .000 g/210 L during the blank check.

Please Wait...

Please Blow Press 'R' for Refusal	The subject will have 3 minutes to provide a sample. The operator is to obtain a new mouthpiece and place it on the breath tube. Instruct the subject to take a deep breath, place their mouth on the mouthpiece, and blow as long as they can. It is important that the subject does not blow until their mouth is securely on the mouthpiece.
Analyzing Sample	Remove used mouthpiece
Subject X.XXX g/210 L	The result of the first sample will be displayed.
	<u>Second Sample</u>
Purging	The purge fan is drawing clean air through the instrument's sampling system.
Blank Check	Ambient air will be drawn into the sample chamber and tested to insure that the instrument is free of alcohol contamination.
Blank Check Passed	This will be displayed if the fuel cell has measured .000 g/210 L during the blank check.
Please Wait... 00:02:00	Countdown between the 1 st sample and 2 nd sample is a maximum of 2 minutes.
Please Wait...	
Please Blow Press 'R' for Refusal	The subject will have 3 minutes to provide a sample. The operator is to obtain a new mouthpiece and place it on the breath tube. Instruct the subject to take a deep breath, place their mouth on the mouthpiece, and blow as long as they can. It is important that the subject does not blow until their mouth is securely on the mouthpiece
Analyzing Sample	Remove used mouthpiece

Subject X.XXX g/210L The result of the second sample will be displayed. The 2 samples must agree within 0.020 g/210L.

Final Result:

X.XXX g/210L This final result is the lower of the 2 samples.

If the difference between the first and second sample is greater than 0.020 g/210L, the instrument will prompt the operator to obtain a 3rd and final sample.

A new mouthpiece will be placed on the breathtube.

Two of the 3 samples must agree within 0.020 g/210L and the lowest of the 2 samples will be displayed as the final result.

OPERATOR INSTRUMENT MESSAGES & BASIC TROUBLESHOOTING

High Blank - Test Aborted

The instrument is unable to detect 0.000 g/210 L during the blank check. The instrument will attempt 3 times before this message be displayed.

To Avoid a High Blank:

Keep subject's mouth away from breath tube during purge/ blank sequence.

Make sure there is no alcohol odor in the air or near the instrument, i.e. Lysol had just been sprayed or open containers of alcohol are present.

The ventilation in the room is not good. Open the door. Allow fresh air into the room.

Purge fan is not working properly. Listen for the buzz on the fan during the purge cycle.

Insufficient Sample - Test Aborted

The subject was unable to meet the minimum requirements for a proper breath sample. The subject will be allowed 3 attempts before the test aborts.

*The operator should change the mouthpiece after every **Insufficient Sample** message.*

To Avoid an Insufficient Sample:

Ensure the subject is capable of providing a sample by asking health related questions.

Ensure the subject's posture is upright when providing a sample.

Check the breath tube for any obvious kinks.

NO .02 AGREEMENT

Two test samples failed to agree within .020 g/210L. The operator must retest the subject.

Mouth Alcohol - Test Aborted

Mouth alcohol was detected by the instrument. The instrument will abort the test immediately and the operator must retest the subject.

*The operator should change the mouthpiece after every **Mouth Alcohol** message.*

To Avoid a Mouth Alcohol:

Do not allow the subject to exhale before his/her lips have a seal on the mouthpiece.

Do not reuse a mouthpiece.

Please Wait... Instrument warming up

Some components of the Intoximeter EC/ IR II are heated to prevent condensation inside the instrument. If one of those heaters is not working, this will be displayed.

Allow 15 minutes for the Instrument to warm up.

If this message is continuously displayed, contact a member of the TBI Breath Alcohol section for assistance.

Accuracy Check Required - Subject Test Disabled

The instrument is designed to test itself with the internal dry gas standard every Sunday at 11 am. This message will display when the test was not successful.

If the instrument was powered off at Sunday at 11am, this message will be displayed until the instrument is warmed up. Then, the test will perform automatically.

If the dry gas tank is expired, this message will be displayed.

If the last Accuracy Check performed failed to meet the preset tolerances, this message will be displayed.

If this message is displayed, contact a member of the TBI Breath Alcohol section for assistance.

Subject Test Disabled - Test Database Full

The instrument can hold up to 700 tests inside its database. When the database is full, this message will appear on the display.

If this message is displayed, contact a member of the TBI Breath Alcohol section for assistance.

Internal Printer Error - Printer Offline

The ONLINE button (green light) on the printer is not on. Simply, press the Line/Local button.

PRINTER TROUBLESHOOTING

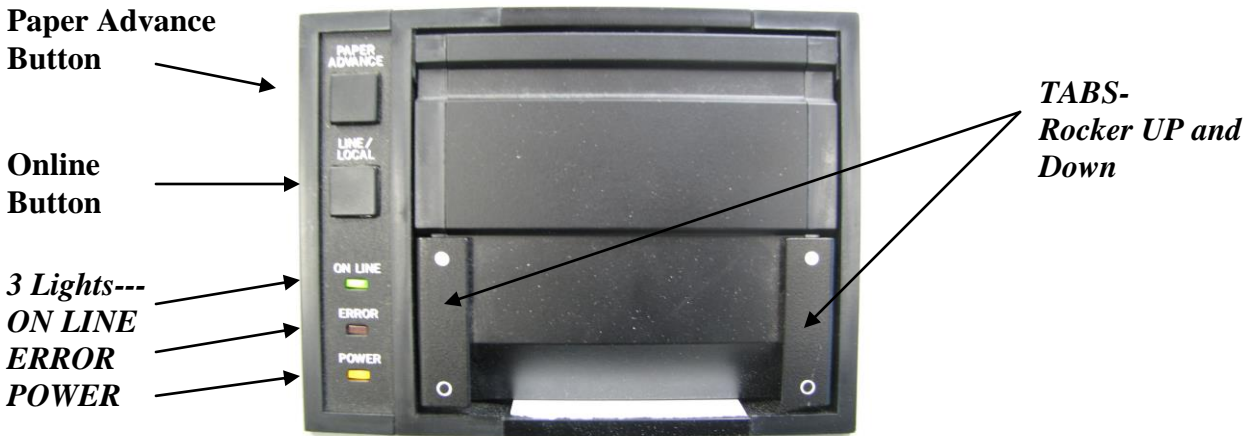


Figure 3: A photo of the thermal printer of the Intoximeter EC/IR II

Paper Advance	Advances the paper; ONLINE must be off to advance the paper.
Line/ Local (On line)	Places printer online. Must be on to print.
ON LINE Light	Green Light. If on, printer is ready.
ERROR Light	Flashing Red light. If on, printer is not ready.
POWER Light	Orange light. Will be illuminated when the Intoximeter EC/ IR II is on.
TABS	These 2 tabs open and close the door to the printer. When these latches are not secure, the ERROR light will flash.

The Printer paper is supplied by TBI.

Once the paper reaches the end of the roll, a red line will appear at the edge of the paper.

The operator will open the latches as shown above by pressing the lower circles.

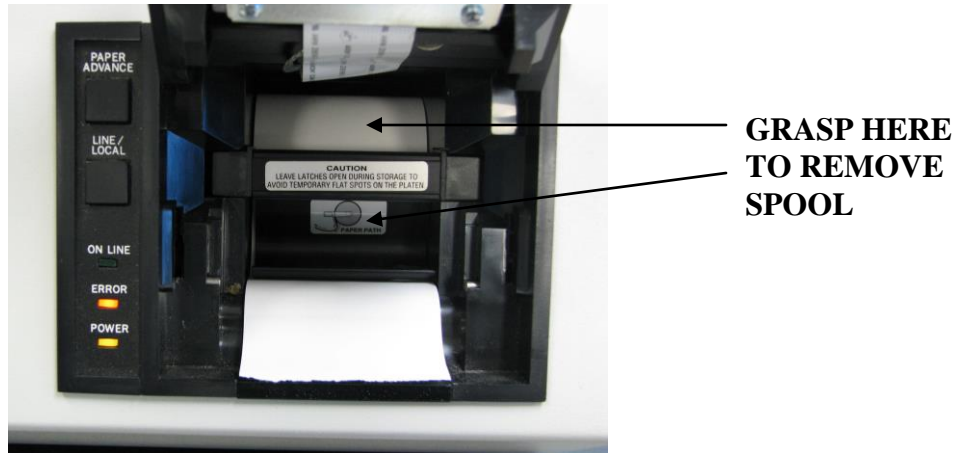


Figure 4: An open printer of Intoximeter EC/IR II.

Once opened, grasp the black bar, above and below the Caution sign. The paper should pull straight out.



Figure 5: A photo of spool of printer paper.

Replace the old spool of paper with a new spool. **Do not throw away the small dowel rod.**

Make sure that the edge of the new paper roll is falling forward like the photo. If it is in backwards, or underneath the roll, the paper will not print.

Slide the paper back in the instrument and close the lid.

Secure the latches. Finally, press the **LINE/ LOCAL** Button.

SCIENTIFIC PRINCIPLES
THE USE OF BREATH AS A SAMPLE

Law enforcement personnel that have been trained by individuals in the TBI Breath Alcohol section are certified to operate specific evidentiary breath alcohol instrumentation. They are not expected to master the scientific material of this manual. This manual contains more in-depth material for those who wish to gain more knowledge than required for operation of the instrument.

Measuring blood alcohol concentration by means of breath sampling has been around since the 1940's. In fact, studies were done as early as 1910 with the discovery of using breath as means to determine alcohol in the blood. The use of breath as a sample has been proven through years and many studies to be accurate and reliable.

Breath alcohol analysis follows the scientific principle of Henry's Law which states that "The weight of any gas that dissolves in a definite volume of liquid is directly proportional to the vapor pressure that the gas exerts above the liquid." This law governs the interaction between a gas and a liquid. Alcohol is a liquid in the blood stream, and a vapor in the lungs. When exhaled, alcohol will be exhaled in a small but measurable amount. The amount of alcohol exhaled will be approximately 1/2100th of the amount of alcohol in the blood stream. This breath to blood ratio is achievable due to Henry's Law.

This 2100 to 1 ratio means that there is the same amount of alcohol for 1 part blood as there is to 2100 parts deep lung air. This ratio is currently used by every breath alcohol instrument in the United States.

OPERATING PRINCIPLES OF THE EC/IR II

The Intoximeter EC/ IR II use two different types of analytical techniques to achieve an alcohol concentration. The electrochemical cell (EC), or fuel cell, is responsible for measuring the alcohol. The Infrared (IR) is responsible for the quality of the sample. These two types of technology offer a different advantage to the sampling process.

Electrochemical Cell (EC)

This is more commonly known as a fuel cell. The fuel cell is responsible for measuring the amount of alcohol in a sample. The cell consists of a porous, chemically inert disk that is coated on both sides with finely divided platinum. An acidic solution is applied to the disk and electrical connections applied to the surface. The fuel cell is encased in a sampling system that allows about 1 cubic centimeter (CC) of air inside the chamber.

When alcohol is introduced into the sample chamber via breath, an electrochemical reaction occurs. When this reaction takes place, an electrical charge is produced. This charge is directly related to the amount of alcohol that is introduced to the fuel cell. When the two surfaces of the fuel cell are connected electrically, a current flows through this circuit to neutralize the charge. This current can be measured, and with signal processing, a breath alcohol concentration can be determined.

One advantage of the fuel cell is that it is specific for alcohol. Interfering substances are not triggered by the fuel cell.

INFRARED SPECTROSCOPY (IR)

The Intoximeter EC/IR II uses an IR sampling assembly that is designed specifically for its application in this instrument. The breath sample is blown into the instrument and flows between the IR source and the IR detectors where the absorption is measured. The greater the alcohol concentration, the more light will be absorbed. The IR spectroscopy on the Intoximeter EC/IR II is responsible for the quality of the sample. That is, it constantly monitors the sample for mouth alcohol and determines the appropriate time to introduce a sample into the fuel cell.

LEGAL PRINCIPLES
State v. Sensing

The case of State v. Sensing began as a traffic stop which occurred in Dickson County, TN in 1988.

As a result of this case, preset requirements must be met in order for breath test results to be admitted into court without expert witness testimony. The requirements are as follows:

- 1) That the tests were performed in accordance with the standards and operating procedures promulgated by the forensic services division of the Tennessee Bureau of Investigation.
- 2) That the operator was certified in accordance with those standards.
- 3) That the evidentiary breath-testing instrument used was certified by the forensic services division was tested regularly for accuracy and was working properly when the breath test was performed.
- 4) That the motorist was observed for the requisite twenty (20) minutes prior to the test, and during this period, he did not have any foreign matter in his mouth, consume any alcoholic beverage, smoke, or regurgitate.
- 5) Evidence that the operator followed the prescribed operational procedure.
- 6) Identify the printout record offered in evidence as the result of the test given to the person tested.

Certified operators, are just that, operators. Certified operators are not required to know the theory of breath alcohol testing or principles of breath alcohol analysis.