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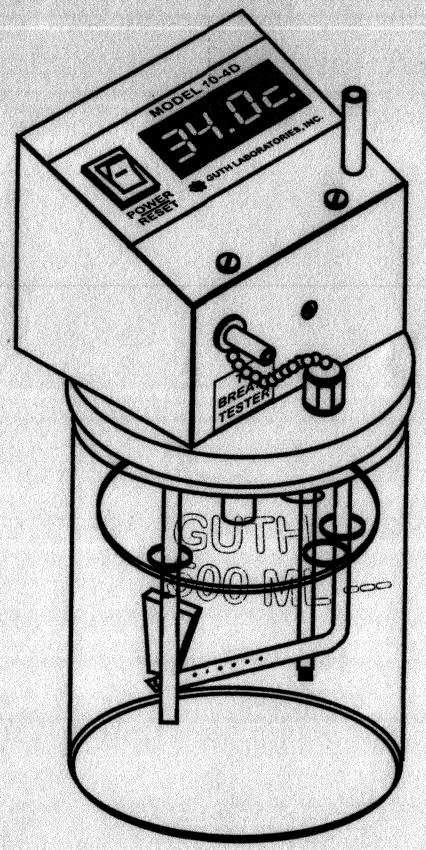
MODEL 10-4D SIMULATOR

OPERATION MANUAL



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PRICE $5.00

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SIMULATOR

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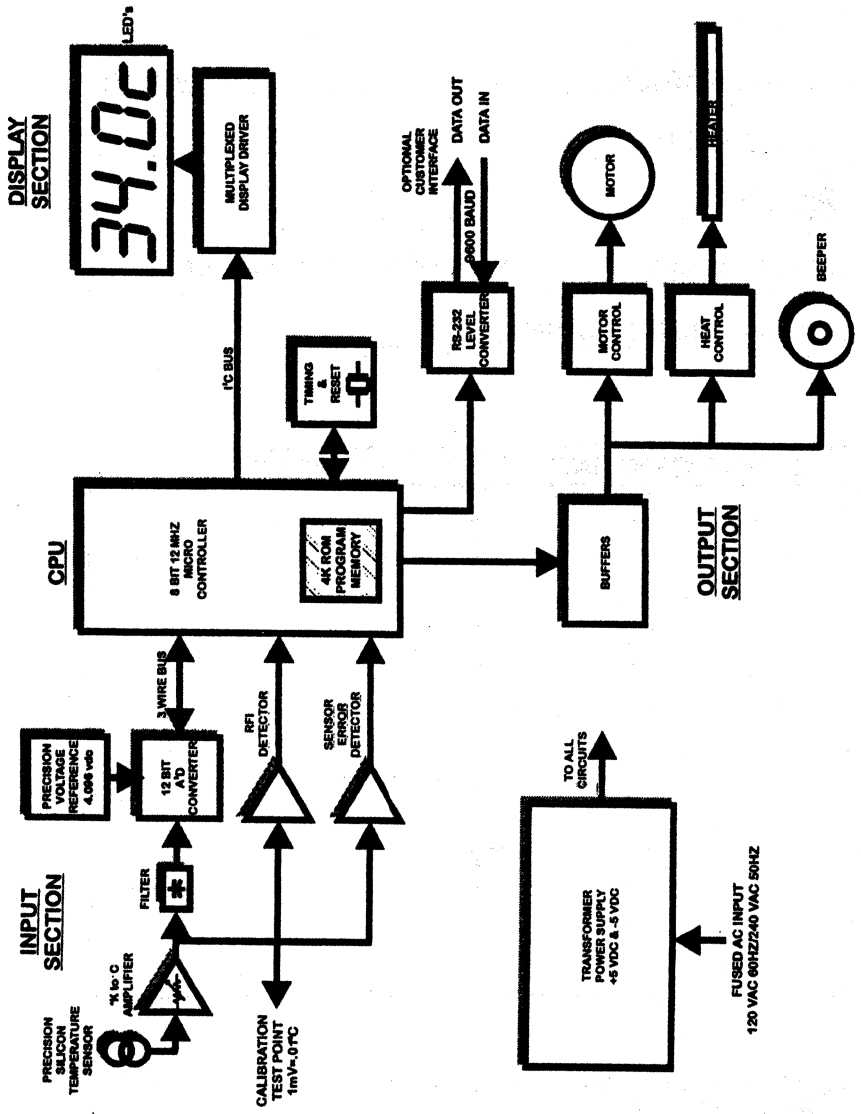


10-4D BLOCK DIAGRAM

INTRODUCTION

The Guth Model 10-4D Alcohol Breath Simulator is a State-of-the-Art, electronically temperature controlled, water-alcohol instrument for the purpose of providing a precise calibration standard. The water-alcohol solution placed in the simulator is maintained at a maximum temperature variation of 34°C ±.05°C (34°C ±.02°C Typical).

The Guth Model 10-4D Simulator is approved by the National Highway Traffic Safety Administration (NHTSA), published on their Confirming Product List (CPL).

CERTIFIED* SIMULATOR SOLUTION STANDARD

Please Note: *It is imperative your simulator Solution be of the highest quality in order to acquire the scientific and legal standards of acceptance.*

To establish a precise and accurate calibration standard when using a Guth simulator, GUTH LABORATORIES, INC. recommends using Guth Certified Simulator Solution*. Guth Laboratories, Inc., a pioneer and leader in the science of alcohol breath testing, has provided Certified Simulator Solution to state, municipal and local law enforcement for years.

Guth Certified Simulator Solutions are prepared in standard concentrations of .02%, .04%, .05%, .08%, .10% and .15%. Other special concentrations are available. Please contact Guth Laboratories, Inc. for availability and pricing:

Toll free: (800) 233-2338 Fax: (717) 564-2555
Or visit our web site at: www.guthlabs.com

STORAGE: Simulator solution should be kept in a cool place. Do not place solution in a freezer and -- DO NOT REFRIGERATE SIMULATOR.

*Guth Certified Simulator Solutions are tested by recognized laboratories.

EXCLUSIVE FEATURES OF THE MODEL 10-4D SIMULATOR

- MICRO COMPUTER CONTROLLER. Mercury column thermostat is eliminated.
- SOLID STATE TEMPERATURE SENSOR: The Model 10-4D incorporates a high precision silicon temperature sensor. (ref.° Kelvin)
- Maintains a precision of 34° C ±.05° C. (34°C ±.02°C Typical)
- TEMPERATURE RECOVERY: Simulator maintains its operating temperature with a constant air flow of 10L/min.
- Will not heat if temperature sensor is damaged (shorted or open circuit).
- GRADUATED LABORATORY GLASS CONTAINER.
- NON-MAGNETIC METAL TOP HOUSING ASSEMBLY: Provides uniform headspace heating.
- POWER SWITCH: On & Off/Reset.
- ELECTRICALLY ISOLATED: Internal power transformer and optically isolated control components prevent AC leakage.
- EXTERNAL FUSE: Provides protection in the event of an electrical malfunction.
- HIGH INTENSITY LED DISPLAY: Provides maximum readout visibility.
- RELIABLE AGITATOR MOTOR
- AGITATOR PADDLE: Designed by Guth Laboratories, Inc. Offers maximum circulation and uniformity of solution.
- HEATER ELEMENT: Electronically protected from overheating when removed from solution or when temperature sensor is damaged.
- RFI PROTECTED: The heating element and motor will turn off when the simulator is subject to a RF field of 10 volts/meter or greater.
- INTERNAL DIAGNOSTICS: Simulator computer provides internal diagnostics.
- ERROR CODES: Simulator provides an audible and visual indication if a malfunction occurs.
- POWER CHOICES: Available for 120 volts AC at 60 Hz. or 220/240 volts AC at 50 Hz.

OPTIONS:

- RS-232 COMMUNICATIONS: Provides the ability to monitor the temperature and status of the simulator on a personal computer.
- NIST SERIALIZED REFERENCE MERCURY-IN-GLASS THERMOMETER FOR CALIBRATION
- SURE-LOC™ CONNECTOR FOR OUTLET

RECORDS (SERIAL NUMBERS, CALIBRATION AND NOTES)

NIST TRACEABLE THERMOMETER – SERIAL NUMBER_____

CERTIFIED BY_____DATE_____

TEST TEMPERATURE_____°C NIST TRUE TEMPERATURE_____°C

MODEL 10-4D – SERIAL NUMBER_____

CALIBRATION DATE	CALIBRATED BY

NOTE: Field Calibration shall be performed only by a Guth Laboratories, Inc. certified technician.

RETURNING A SIMULATOR:

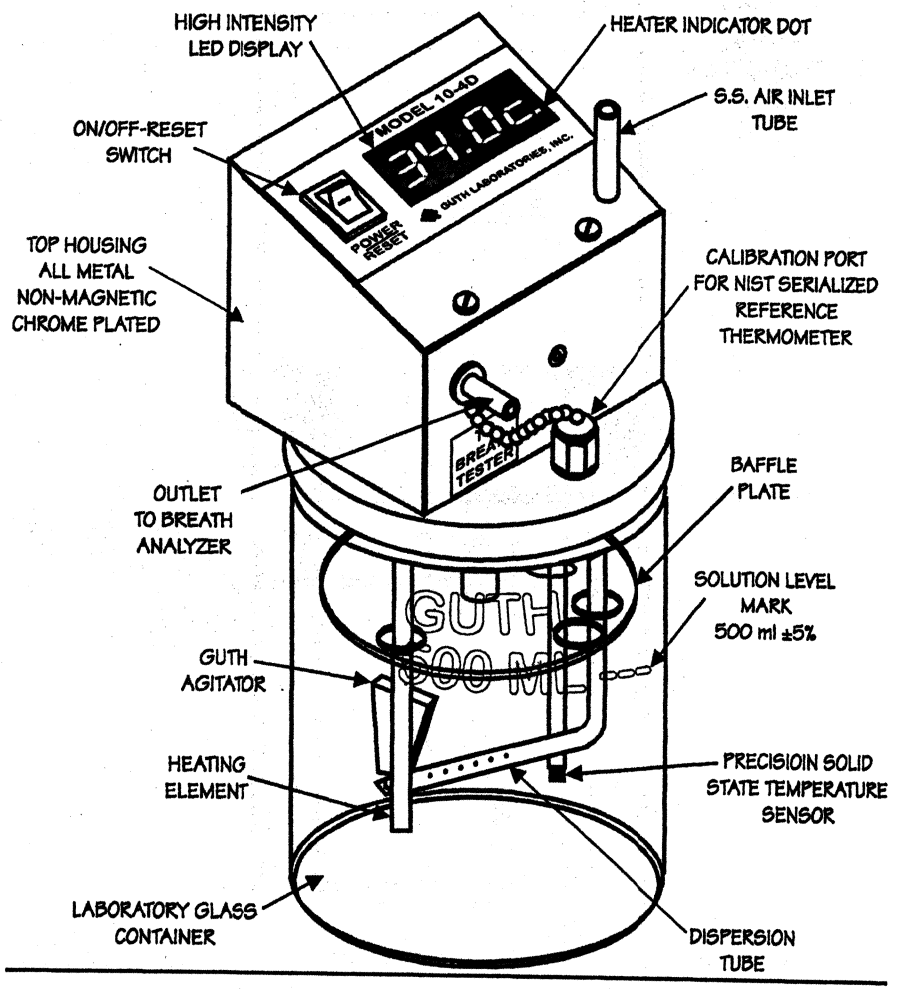
Before returning a simulator, please call our Product Service Department for assistance or a RMA (Return Material Authorization) number.

GUTH LABORATORIES, INC.
590 NORTH 67TH STREET
HARRISBURG, PA 17111-4511
(717) 564-5470
or
(800) 233-2338

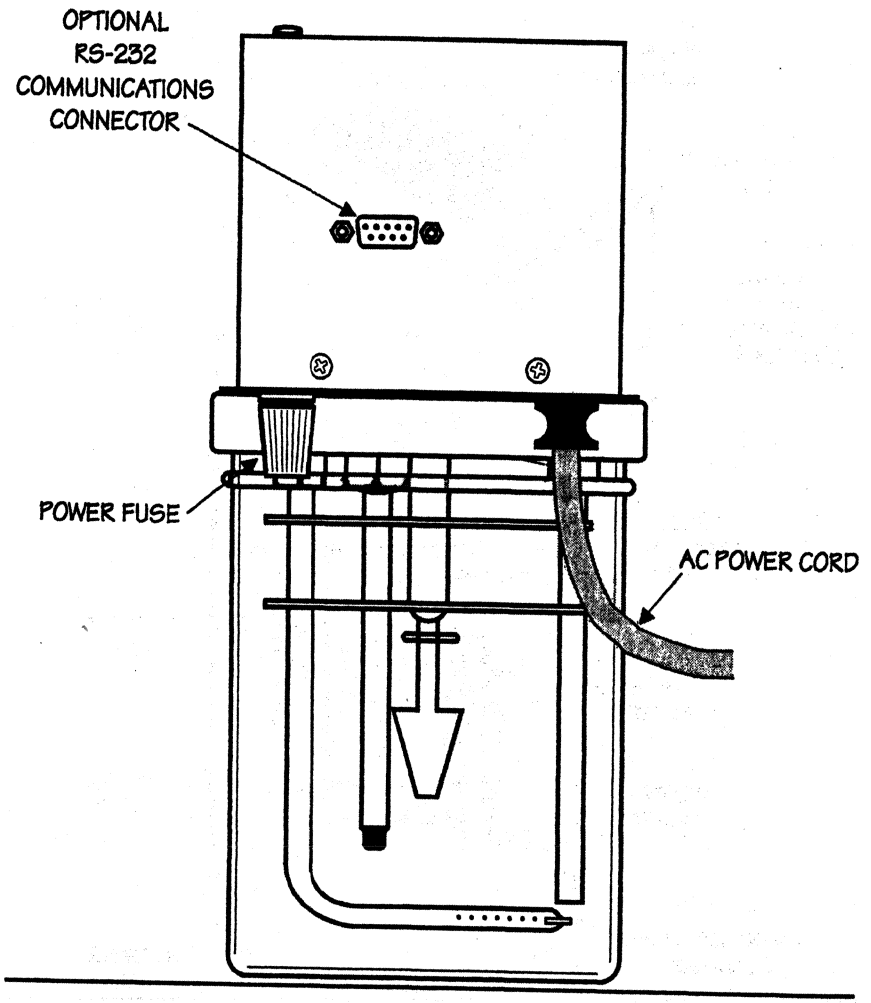
NOTE: When returning the simulator, it is imperative the glass container is attached. This prevents breakage of the mechanical and electrical components of the simulator, reducing repair costs. If a simulator is returned without the glass container, liability or damage to the simulator is the responsibility of the user.

NOTE: If using a NIST reference thermometer, remove the thermometer from the simulator and store in a safe location prior to shipping. Replace thermometer cap. Replacing the cap prevents damage to the chrome surface.

MODEL 10-4D ALCOHOL BREATH TEST SIMULATOR



MODEL 10-4D REAR VIEW



ELECTRICAL SAFETY PROCEDURE

If replacement of the EXTERNAL fuse is necessary, be sure to unplug the simulator from the electrical outlet. This will eliminate the possibility of shock hazard.

When checking or replacing fuse, do not turn fuse. Pull fuse directly away from the fuse socket.

After fuse replacement has been performed, replace fuse cover. But do not over-tighten. Over-tightening will damage or crack the plastic cover.

CAUTION: To reduce the risk of electrical shock, **NEVER** remove the back cover. Refer to qualified service personnel!

PREVENTIVE MAINTENANCE FOR THE 10-4D

A) Use mild detergent to clean the top housing. Use chrome cleaner for removing stains and heavy soils.

B) Use mild detergent and a soft cloth to clean the display filter. Do not use an abrasive cleaner or paper towel.

C) Cleaning of parts within the solution chamber:

ALGAE: To kill algae in your simulator use 1 TABLESPOON of CLOROX per 1 GALLON OF WATER. Soak 3 to 6 hours, rinse with COLD water (NEVER rinse with HOT water). Hot water may damage the precision sensor. Allow the 10-4D to AIR dry.

D) Check to see if the fuse cap is secure. DO NOT OVERTIGHTEN!!!

E) Replace the Container O-ring if uneven wear is noted. It is recommended the Container O-ring be replaced once a year.

F) Inspect the laboratory glass container threads for chips and cracks. Replace if necessary.

INSTRUCTIONS FOR USE OF THE GUTH MODEL 10-4D ALCOHOL BREATH SIMULATOR

1. Add tubing and optional connectors to the simulator.
2. Remove the glass container from the simulator top housing.
3. Pour 500 ml of certified solution into the simulator container.
4. Reassemble the simulator by replacing the container into the top housing. Be sure the container is properly seated to the top housing. **DO NOT OVERTIGHTEN.**
5. Turn the power **ON**. The simulator will beep once and the display will completely illuminate as shown in figure 1. This will give an indication if any of the display segments are malfunctioning.

Figure 1.

6. The display will remain lit for approximately 1 second and then will change to the COLD display as shown in figure 2.

Figure 2.

7. An indication the simulator is heating is shown by the decimal place dots scanning across the bottom of the display.
8. When the solution obtains 33.6°C, the display will indicate the actual temperature. As the simulator controls the temperature, the last decimal point of the display will turn on and off as an indication that the heater is being turned on and off.

9. When the temperature of the solution has been attained (as shown in Figure 3), the extreme right LED dot indicator pulses less frequently.

Figure 3.

10. Allow approximately fifteen minutes for the simulator to stabilize.

11. The simulator is now ready for use. Attach Breath Tube to **FRONT** of the simulator marked **"TO BREATH TESTER"**. (See figure 4):

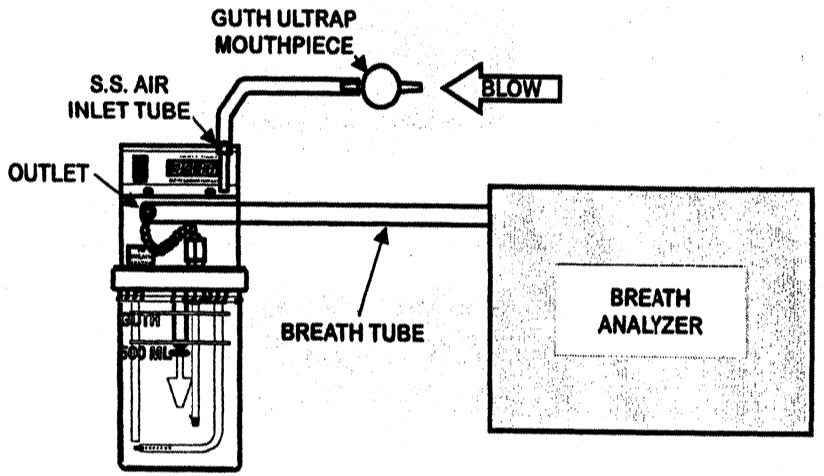


Figure 4.

When manually operating the simulator, take a deep breath and blow into the air inlet atop of simulator. Blow for 4 to 7 second duration.

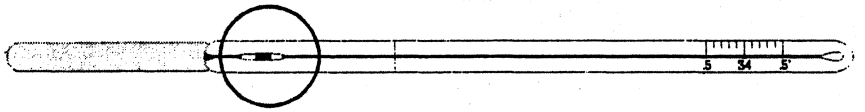
The blowing technique should imitate a person providing a breath sample into the breath test instrument. After the breath test sample is introduced into the breath analyzer, the breath analyzer performs the analysis and provides a final result.

mercury. In order to avoid breakage, great care must be taken to allow the mercury in the bulb to liquefy at the same rate as the mercury in the capillary.

While holding the thermometer vertically, allow it to return to ambient temperatures. Extreme care must be taken to ensure the thermometer is not jarred or at the slightest angle while the nitrogen gas and the mercury return into the capillary. If this care is not taken, mercury will enter the capillary prior to the gas. This will cause gas bubbles to develop in the bulb and, in turn, cause considerable inaccuracy which may be undetectable when the thermometer is placed into use.

CAUTION: If a mercury thermometer is accidentally broken, be very careful. Mercury is poisonous. DO NOT allow direct contact with the skin or the mouth! Use rubber gloves to clean up any spill.

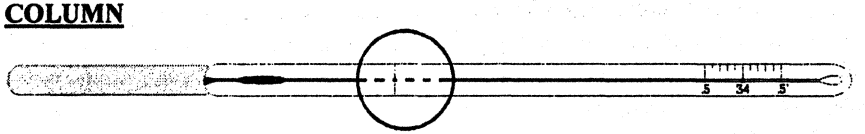
SEPARATION IN THE CONTRACTION CHAMBER



Separation of mercury in the contraction chamber is an entirely different problem. Many thermometers contain scale ranges which begin well above ambient temperatures. These thermometers are provided with a contraction chamber or enlargement which prevents the mercury from entering the bulb at ambient temperature. Unusual handling of the instrument may cause a separation in the contraction chamber.

The procedure to rejoin this mercury is relatively simple. If the separated mercury is in the form of a very slight amount, invert the thermometer and tap gently against the palm of the hand. It is recommended that protection be used in the palm of the hand (paper towel, cloth, etc.) against glass breakage. This will cause a greater separation, adding volume and weight to the separated portion. The thermometer should then be righted and gripped firmly in the hand at a 270 degree angle with bulb outward. Sharply swing the thermometer downward at one's side in a 270 to 180 degree arc. The centrifugal force thus generated will join the separated mercury to the main portion. If the original separation contained a large volume, only the later step of swinging the thermometer downward need be followed.

SEPARATION IN THE LOWER AND MIDDLE PORTION OF THE COLUMN



Separations of this type are less frequent and more difficult to repair. There are more variables, and no one explanation will cover all types of thermometers.

The general procedure is to subject the bulb only to a temperature (in an ice bath or freezer) sufficient to retract all the mercury into the bulb. A slow and careful return to ambient temperature will return an intact column. Our experience has shown that additional problems may be caused in these procedures, and we point out the following cautions:

Allow thermometers to return to ambient, or room air, or breakage may occur. This breakage is caused by mercury thawing in the capillary more slowly than the mercury in the bulb thereby creating an impasse to the expanding

If a low reading is obtained, check all tubing for leaks. Be sure the glass container is properly tightened to the metal top housing. **DO NOT OVERTIGHTEN.** Repeat the testing procedure.

IF THE SIMULATOR SHUTS OFF AND DISPLAYS AN ERROR:

The Model 10-4D monitors its own operation and will check for several conditions that would prevent the simulator from properly maintaining the temperature. When a condition or malfunction occurs, the simulator will turn off the heater and the motor. The simulator will beep several times and the display will continuously flash the error code. This will continue until the simulator is reset.

RESETTING THE SIMULATOR

To reset the simulator, turn the power off, wait a second or two and then turn the power on.

ERROR CODES

The following is a list of the error codes, the cause, and how to proceed:

CAUSE: The temperature sensor has failed. The computer is receiving no signal to allow it to control the temperature.
REMEDY: This cannot be remedied in the field. The simulator must be returned to Guth Laboratories, Inc. for repair (see page 14).

CAUSE: High power Radio Interference has been detected.
REMEDY: Remove the source of Radio Interference. Reset the simulator.

CAUSE: The temperature of the solution is above 34.2°C.
REMEDY: Turn off the simulator and allow the solution to cool. If this continues to occur, the simulator may require recalibration.

CAUSE: Simulator is taking too long (greater than 15 minutes) to reach operating temperature. The heating element may be open, there is no solution in the container or the solution was too cold.
REMEDY: Reset the simulator. If the simulator continues not to heat, the heating element may be defective and the simulator should be returned to Guth Laboratories, Inc. for repair (see page 14). The simulator may require recalibration.

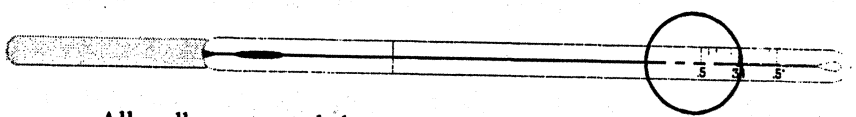
CAUSE: The temperature of the solution has dropped below 33.8°C after it has initially been at 34°C.
REMEDY: Reset the simulator. If the simulator fails to heat, the heating element may be defective and the simulator should be returned to Guth Laboratories, Inc. for repair (see page 14).

INSTRUCTIONS FOR REJOINING MERCURY SEPARATIONS IN GLASS THERMOMETERS

All Guth precision thermometers are sealed under extremely high nitrogen pressure while drawing the mercury into the lower portion of the capillary. The process, when coupled with acid washed tubing and triple distilled mercury, although costly, greatly reduces the frequency of separations in the capillary portion of the thermometer.

Many instructions for rejoining separations begin with "the mercury may be retracted into the bulb by immersing it in a suitable mixture of dry ice and alcohol..." This statement is NOT specific enough. Determine the type of separation from the illustrations provided and proceed according to these instructions.

SEPARATION AT THE UPPER PORTION OF THE MERCURY COLUMN



All well constructed thermometers contain an expansion chamber or bubble at the extreme top of the capillary. This chamber serves a twofold purpose; one, to accommodate an overflow of mercury when the thermometer is subjected to temperatures in excess of its scale range and two, as a means of rejoining this type of separation.

While holding the thermometer in a vertical position, slowly heat the bulb under WARM tap water until the separation segments and a portion of the main (intact) column enter the top chamber. (Extreme care must be taken to insure the mercury does NOT fill more than HALF to THREE-QUARTERS of the chamber volume; **otherwise, breakage of the bulb will result).** The nitrogen pressure will force the rejoining of the mercury. While holding the thermometer vertically, examine the column as it cools and retracts to be sure it is intact.