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## TECHNICAL INFORMATION

### Laboratory Type Fuming Cabinet and Heat Chamber

#### Catalog No. 214CA

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#### INTRODUCTION

The Laboratory Type Fuming Cabinet and Heat Chamber features the latest in digital temperature control. This device is designed for use in crime laboratories where large volumes of documentary evidence is to be processed with iodine fuming or ninhydrin development methods.

The cabinet is constructed of materials that resist corrosion, and once temperature adjustments have been made, there is little need to make changes in temperature settings.

#### Prior to First Use:

Upon receipt of the unit, switch both the power and Ninhydrin switches ON. Allow the unit to reach the full temperature of 175°F. A limited amount of smoke may be seen in the chamber as protective oils burn off. This is normal. After at least 15 minutes of operation, switch the unit OFF



and open the oven door to allow the smoke to dissipate.

*Note: Even though the Ninhydrin switch is OFF, the temperature of the heating plate will continue to rise as much as 20°F.*

## CAUTIONS

- Consult the appropriate Material Safety Data Sheets (MSDS) found on our website at [www.sirchie.com/support](http://www.sirchie.com/support).
- Iodine fuming is performed inside the chamber. Ninhydrin preparation must be undertaken outside the chamber. Only dry documents should be placed in the chamber.
- Temperature control is factory set, and under most circumstances these settings should not be changed.
- Be certain that the heating element is cool before introducing iodine crystals into the chamber. Use the IODINE temperature control when conducting iodine fuming.
- Be certain to read through all of the material contained herein prior to conducting any evidence recovery methods.
- **DO NOT** spray items of evidence inside the oven chamber. Flash fire can result in special circumstances resulting in possible injury and possible loss of evidence.
- Iodine fumes are harmful if inhaled or ingested and are a strong irritant to eyes and skin. Use with adequate ventilation and with protective measures. (Refer to MSDS sheet.)
- Iodine fumes are highly corrosive to metals. For this reason, the cabinet should be cleaned after every use to prolong useful service. However, **DO NOT clean with ammonia compounds**, as iodine residues will react to form minute quantities of a pressure-sensitive explosive compound.
- The oven door and oven components such as documents support rods and metal clips reach temperatures sufficient to cause burns. Use caution when working within and around a hot oven.

- The 214CA should not be used for Cyanoacrylate (Superglue) fuming.
- The use of an approved hood or ductless workstation is recommended.
- Always place control prints in the chamber along with any items of evidence.

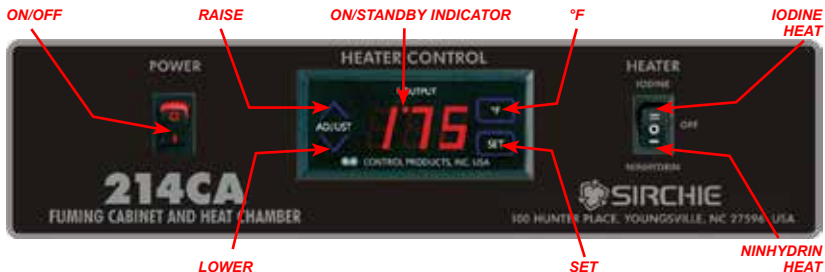
## PROCEDURE

### Oven Controls

Oven controls are located on the instrument's front panel. They consist of a **POWER** switch with ON (**I**) and OFF (**O**) settings, a **HEATER** switch with Iodine (=) and Ninhydrin (-) settings, and a temperature module. The temperature controller has been set to optimum at the factory and should not need adjustment. Should you wish to adjust these settings, follow the instructions below.

### Temperature Controller:

The microprocessor-based temperature controller monitors a sensor mounted near the floor of oven compartment to determine whether or not power should be supplied to the heater element. You control the



oven by telling it what the optimum temperature should be and how much the temperature within the oven should be allowed to drift. The limits of drift are controlled by the temperature HI and LO settings.

The temperature controller has a LED temperature display and four switches: **RAISE** ( $\wedge$ ), **LOWER** ( $\vee$ ),  $^{\circ}\text{F}$ , and **SET**. These switches are active only when oven power is ON. When first powered up, the display should flash “t 1” and then display a number. This number is the current temperature within the oven in degrees Fahrenheit. Press the Heater switch to the Ninhydrin setting and watch the temperature rise within the oven. When the oven reaches 175°F, it is ready to use with ninhydrin.

**NOTE:** *The temperatures indicated on the LED readout are measured at the stainless steel plate in the bottom of the oven. The actual chamber temperature will be in the range of 130°-140°F and can vary depending on ambient temperature.*

### Adjusting The Set Point

The **SET** switch allows adjustment of the controller set point—the temperature at which power to the heating element is shut off. The set point is set at the factory to 175°F, and we recommend that this setting be used for most operations. If you wish to adjust the set point, press and release the **SET** switch. The controller will display “SP1” (set point 1). Press and release the **SET** switch a second time. The controller displays the current set point value. If still set to the factory setting, this value will be 175. To increase or decrease the value, use the appropriate **ADJUST** switch ( $\wedge$  or  $\vee$ ). **Note:** The set point cannot be set lower than the LO Temperature (174°F) or higher than the HI Temperature (176°F) setting. If the set point stops responding to the “ $\wedge$ ” or “ $\vee$ ” switch, adjust the HI or LO Temperature setting out of the way first, as described below.

### Program Settings

The “ $^{\circ}\text{F}$ ” switch allows adjustment of the operating mode, adjustment of the differential temperature upper and lower limits, and calibration adjustment. (Actual programming sequence is described after the setting descriptions, which follow immediately.)

- 1. Differential Adjustments.** How quickly the controller responds to drift in temperature is controlled by the differential adjustments setting. The number entered tells the controller how many degrees the temperature is allowed to drift from the set point before corrective action is taken. The factory setting is 1, i.e. the controller responds after a drift of only one degree. This is the tightest setting. The controller may be set to operate in both heating and cooling applications, and operation of the chamber requires that a positive value be entered for the “dF” setting. *Do not attempt to operate the oven with a negative value or a value of zero entered.*
- 2. HI and LO Adjustments.** These settings control the range of temperatures within which the set points can be adjusted. For example, if “LO” is set to 150 and “HI” to 160, only set points between these two numbers can be entered using the SET function described above. If both are set to the same number, a fixed set point is established. Factory settings are LO=174 and HI=176.
- 3. Calibration Adjustment.** A calibrating adjustment of up to +/- 30°F can be entered here to compensate for the fact that temperature varies between top and bottom of the chamber, and to account for sensor shielding and any sensor variations. The factory-set calibration adjustment is 0.
- 4. Programming Sequence.** Press and release the °F switch. “dF is displayed. Press and release °F switch a second time. The current value of “01” should be displayed. If another number appears, use the raise-lower buttons to set “01”. Press and release the °F switch again. “HI” should be displayed. Press and release °F and the HI value of 176 should be displayed. Use the RAISE-LOWER buttons to change this value if necessary. Press and release °F and “LO” will be displayed. Press and release °F again and the LO value of 174 should be displayed. Use the RAISE-LOWER buttons to change this value. Press and release °F and “CAL” will be displayed. Press and release °F and the current calibration value of “01” is displayed. Adjust as needed using the RAISE-LOWER buttons. Press and release °F and the screen should go blank for a brief time, and then, the current temperature of the cabinet will be displayed. **(IMPORTANT:** If the programming sequence is interrupted for a period of 15 seconds, or if it is not carried

through to the point where the blank screen is displayed, the controller will *revert to its former settings*, ignoring any changes that may have been entered.)

### Using Iodine

Iodine reacts with oils and fatty deposits to produce a temporary yellow-brown reaction product. Iodine is useful on fresh prints on both porous and non-porous non-metallic surfaces. Latent prints developed by iodine fuming are fugitive and will disappear within a few minutes. Latents should be photographed immediately, and then fixed. If no prints are developed, proceed to DFO or ninhydrin methods. **CAUTION:** *Heater must be cool to the touch before Iodine Fuming is attempted. Iodine placed on a warm element will sublime rapidly—much faster than you can add documents and close the chamber. DO NOT attempt Iodine Fuming with the HEATER switch left in the Ninhydrin position (see #9 below).*

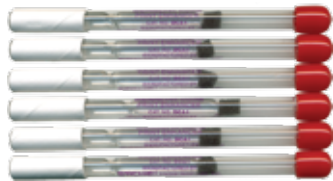
1. Set the **POWER** and **HEATER** switches to their respective OFF positions.
2. Prepare documents to be fumed by attaching a clip at each corner and threading a rod through the clips.
3. Empty the contents of one Iodine Crystal ampoule into the glass sublimation dish.
4. Place the dish (with the crystals in it) on the heating element inside the fuming cabinet.
5. Hang the documents to be fumed in the cabinet. Include a control document with known prints.
6. Close and clamp the chamber door.
7. Verify that the inlet and exhaust ports are closed.
8. Turn the **POWER** switch ON.
9. The **IODINE/NINHYDRIN** switch has three operating positions:
  - a. The **IODINE** position is a momentary switch that must be held depressed for heater warming.
  - b. The **NINHYDRIN** position is pressed once and the heater will continue to warm until the set temperature (175°F) is reached.

- c. The center position of the switch is “OFF” and disconnects power to the heater. Press and hold the IODINE switch until the temperature reaches approximately 80°F or until vapor can be seen rising from the iodine crystals indicating that the sublimation process has begun. Release the IODINE switch. (**CAUTION:** *Be sure to release the IODINE switch as soon as vapors are visible to avoid excessive consumption of iodine.*) It will be noted that the chamber temperature will continue to increase as much as 20 degrees. This is normal. As the heating element cools, the temperature will begin to decrease until room temperature is reached.

**WARNING:** *Iodine fumes are toxic and an irritant to skin and eyes, and corrosive to all metals. Release fumes only into a fan exhausting directly outdoors, or unplug the chamber and carry it outdoors before opening. Check with local authorities as to the release of iodine fumes into the environment.*

#### Iodine Enhancement

The Iodine Enhancer, DCA16, will darken weak prints to permit sufficient contrast for photography. Crush the ampoule by applying pressure with the thumb and forefinger. Saturate the swab, remove from packaging, and apply the chemical as needed. After use, recap the swab and dispose of properly. Prints will turn bluish brown in color. The surface should then be allowed to dry. **DO NOT** *apply enhancement if subsequent tests with DFO, ninhydrin, etc. are to be performed.*



The fuming cabinet should be cleaned after each use to avoid contamination of other documents and to completely avoid the possibility of any corrosion from Iodine fumes. Be sure the unit is turned OFF and power supply cord is disconnected. Wash the interior of the cabinet and the glass window with a mild detergent and water. **DO NOT** *use cleaning compounds containing ammonia.*

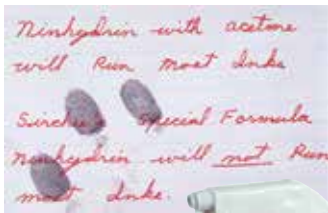
## Using Ninhydrin

The development of latent prints with ninhydrin is dependent on the chemical reaction with the amino acids and other constituents of sweat, which yield amino acids when broken down. Most latent fingerprints contain sufficient traces of amino acids to produce good results with Ninhydrin or Ninhydrin Spray.

Amino acids do not migrate in porous materials. As a result, there are (rare) reports of prints more than thirty years old having been developed using ninhydrin. Therefore, porous articles (cigarettes, stationery, paper bags, cardboard boxes, walls, etc.) found at the crime scene should be considered for processing by ninhydrin regardless of the suspected age of the latent prints. Ninhydrin is generally not useful on articles that have been exposed to water.

Ninhydrin reacts with amino acids to form a bluish-purple reaction product called “Rhuemann’s Purple” or “RP,” named for its discoverer. Development is slow, requiring up to ten (10) days at room temperature. Development may be accelerated by the application of heat and moisture, as can be accomplished with this chamber.

Articles to be tested for latents should be sprayed on both sides in a fuming hood or well-ventilated area until wet with Ninhydrin Spray or dipped in a Ninhydrin solution. **DO NOT spray inside the 214CA chamber.** Use care as ink on documents may run or be otherwise affected by the ninhydrin’s solvent. If ink running is a consideration, use No. NSI609 Ninhydrin Pump Spray, as this product is safe to use with most inks. *Let the document dry before placing it in the chamber.*





Attach clips to two corners of the treated document. Include a control document with known prints. **CAUTION:** Surfaces treated with Ninhydrin are sensitive to new fingerprints. Pass the suspension rod through the loops of the clips. Insert into the notches of the ledge at the top of the oven. Both clips and metal suspension rods reach the set point temperature during document processing. *Use care in removing documents to prevent skin burns.*

Articles should be kept at 175°F for approximately five minutes. Weak prints or articles showing no prints should be re-processed. (Suspect articles failing to develop prints should be allowed to continue to develop outside of the oven for several days before moving on to other methods such as silver nitrate or physical developer.)

Remove the developed document from the fuming cabinet. To prevent fading with the passage of time, lightly spray the developed prints with the NFS200 Ninhydrin Fixative included with your 214CA. Allow the document to air dry. **NOTE:** *Fixative interferes with subsequent Ninhydrin development. Therefore, DO NOT use fixative until you are certain that all prints have been developed and the results have been photographed. Always record your results in case of accident or unexpected reactions with foreign substances.*

Developed prints are blue-violet before fixing, and they deepen to a purple red after being fixed. Since Ninhydrin print patterns are difficult to read, they must be photographed. Orthochromatic film exposed with a green or orange filter for the unfixed print and a green or blue filter for the fixed print offers excellent results.



The addition of moisture accelerates the development process when using the Ninhydrin Spray method. The moisture inlet port on the side of the unit is designed for use with a PUM100A Portable Humidifier, which allows a controlled amount of humidity to be introduced into the chamber while the prints are developing.

#### Using The PUM100A Portable Humidifier

The PUM100A is used to provide a high humidity environment for documents undergoing Ninhydrin treatment. The following procedure affords optimum results for accelerating latent print development.

1. Prepare the documents as described previously and place them in the oven. Be certain the oven door is latched and secure (Fig. 1).
2. Set up the PUM100 according to instructions provided with the unit. Remove both plastic port caps from the rear of the 214CA.
3. Connect the flexible hose to the 214CA as shown in Figure 2 and rotate the Humidifier Control Knob to the HI position. The green ON light will illuminate. (It will take up to 5 minutes to produce steam.)
4. After waiting 5 minutes, turn the 214CA power ON and press the NINHYDRIN switch. At some point, condensation may form on the view panel. This is normal.



FIGURE 1



FIGURE 2

5. When the oven temperature indicates 160°F, turn OFF the PUM100, disconnect the hose from the 214CA, and replace both plastic port caps on the 214CA.
6. Once a temperature of 175°F is reached in the oven, allow heating to continue for 5 minutes, and then turn the 214CA NINHYDRIN and the POWER switches to the OFF position and allow the unit to cool down. Open the oven door to accelerate the cooling down process.
7. When the unit has cooled sufficiently, remove and examine the documents.

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100 HUNTER PLACE, YOUNGSVILLE, NC 27596 USA

919-554-2244 • 800-356-7311

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