

**MODEL 9131 HDRC**  
**INFRARED CALIBRATOR**  
**USER'S GUIDE**

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# Table of Contents

- 1 Before You Start . . . . . 1**
  - 1.1 Symbols Used . . . . . 1
  - 1.2 Safety Information . . . . . 2
  - 1.3 Customer Service Information . . . . . 3
- 2 Introduction . . . . . 5**
- 3 Specifications and Environmental Conditions. . . . . 7**
  - 3.1 Specifications . . . . . 7
  - 3.2 Environmental Conditions . . . . . 7
  - 3.3 Warranty. . . . . 8
- 4 Safety Guidelines . . . . . 9**
- 5 Quick Start . . . . . 11**
  - 5.1 Unpacking . . . . . 11
  - 5.2 Set-up . . . . . 11
  - 5.3 Power . . . . . 11
- 6 Parts and Controls . . . . . 13**
  - 6.1 Rear Panel . . . . . 13
  - 6.2 Prop View . . . . . 13
  - 6.3 Front Panel. . . . . 14
- 7 General Operation . . . . . 17**
  - 7.1 Set-up . . . . . 17
  - 7.2 Setting the Temperature . . . . . 17
  - 7.3 IR Thermometer Calibration . . . . . 17
- 8 Controller Operation . . . . . 19**
  - 8.1 Programming. . . . . 19
  - 8.2 Locking/Unlocking the Controller . . . . . 19
  - 8.3 Switching display units. . . . . 21
- 9 Test Probe Calibration . . . . . 23**
  - 9.1 Calibration Methods . . . . . 23














9.1.1	Direct Calibration . . . . .	23
9.2	Dry-Well Characteristics . . . . .	23
9.2.1	Stabilization and Accuracy . . . . .	23
<b>10</b>	<b>Calibration Procedure . . . . .</b>	<b>25</b>
10.1	Pre-Calibration . . . . .	25
10.2	Calibration . . . . .	25
10.2.1	Span Adjust . . . . .	25
10.2.2	Zero Adjust. . . . .	26
10.2.3	Accuracy Check . . . . .	26
<b>11</b>	<b>Maintenance . . . . .</b>	<b>27</b>
<b>12</b>	<b>Troubleshooting . . . . .</b>	<b>29</b>
12.1	Troubleshooting . . . . .	29
12.2	CE Comments . . . . .	30
12.2.1	EMC Directive . . . . .	30
12.2.2	Low Voltage Directive . . . . .	31
12.3	Wiring Diagram . . . . .	32

# 1 Before You Start

## 1.1 Symbols Used

Table 1 lists the symbols used on the instrument or in this manual and the meaning of each symbol.

**Table1** *International Electrical Symbols*

Symbol	Description
	AC
	AC-DC
	Battery
	CE
	DC
	Double Insulated
	Electric Shock
	Fuse
	PE Ground
	Hot Surface
	Read the User's Manual
	Off
	On

## 1.2 Safety Information

Use the instrument only as specified in this manual. Otherwise, the protection provided by the instrument may be impaired.

The following definitions apply to the terms “Warning” and “Caution”.

- “Warning” identifies conditions and actions that may pose hazards to the user.
- “Caution” identifies conditions and actions that may damage the instrument being used.



### WARNINGS

To avoid possible electric shock or personal injury, follow these guidelines.

**DO NOT** operate this unit without a properly grounded, properly polarized power cord.

**DO NOT** connect this unit to a non-grounded, non-polarized outlet.

The chassis is Hot above 350°C

**DO NOT** use this unit for any application other than calibration work.

**DO NOT** use this unit in environments other than those listed in the user’s manual.

Use of this instrument at **HIGH TEMPERATURES** for extended periods of time requires caution.

Completely **unattended operation is not recommended** for safety reasons.

Always replace the fuse with one of the same rating, voltage and type.

If the instrument is used in a manner not in accordance with the equipment design, the operation of the dry-well may be impaired or safety hazards may arise.

Follow all safety guidelines listed in the user’s manual.

**CALIBRATION EQUIPMENT should only be used by TRAINED PERSONNEL.**



### CAUTIONS

To avoid possible damage to the instrument, follow these guidelines.

**Never allow any foreign material** to come in contact with the black body surface.

**DO NOT** change the values of the calibration constants from the factory set values. The correct setting of these parameters is important to the safety and proper operation of the calibrator.

The prop was not designed to be used as a handle for carrying the instrument. To avoid damage, it should not be forced beyond the inclined position of the calibrator.

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## 1.3 Customer Service Information

Hart Scientific can be contacted by writing to:

Hart Scientific, Inc.  
799 E. Utah Valley Drive  
American Fork, UT 84003-9775

Or by calling or faxing:

Telephone: (801) 763-1700  
Fax: (801) 763-1010

Our World Wide Web site is: [www.hartscientific.com](http://www.hartscientific.com)

E-mail: [support@hartscientific.com](mailto:support@hartscientific.com)

When calling Hart Scientific Customer Service, please have the following information available:

- Model Number
- Serial Number
- Voltage

## 2 Introduction

Hart Scientific's Model 9131 HDRC black body temperature calibrator and temperature reference is a small, portable instrument designed for quick on-site checks and calibration of infrared (IR) thermometers and sensors. It features a one-inch diameter aperture with a 0.95 emissivity. A 1/8-inch diameter reference well allows insertion of a small PRT for reference or unit calibration. The instrument is controlled by a microprocessor based digital PID temperature controller and uses a precision platinum RTD as a sensor with a heater to control the target temperature. The controller display will show the target temperature and also the set-point temperature. The temperature may be set to any temperature within the range of 35°C to 400°C in 0.1 degree increments by using the three buttons on the control panel. The calibrator's multiple fault protection devices insure user and instrument safety and protection.

The 9131 was designed for portability, speed, and ease of operation. It's use will provide a means of quick, accurate calibration, and comparisons of IR thermometers or pyrometers and sensors.



## 3 Specifications and Environmental Conditions

### 3.1 Specifications

<b>Temperature Range</b>	35°C to 400°C (95°F to 752°F)
<b>Accuracy</b>	±1°C to 100°C (±2°F to 212°F) ±2°C to 250°C (±4°F to 482°F) ±3°C to 400°C (±6°F to 752°F)
<b>Resolution</b>	0.1°
<b>Stability (2-sigma)</b>	±0.25°C 35°C to 200°C (±0.45°F 95°F to 392°F) ±0.35°C 200°C to 300°C (±0.63°F 392°F to 572°F) ±0.45°C 300°C to 400°C (±0.81°F 572°F to 752°F)
<b>Heating Times</b>	15 minutes to maximum
<b>Cooling Times</b>	400 to 100°C: 25 minutes
<b>Stabilization</b>	3 minutes
<b>Target Emissivity</b>	0.95
<b>Aperture Diameter</b>	1" (25.4 mm)
<b>Power</b>	115 VAC (±10%), 1.5 A, 50/60 Hz or 230 VAC (±10%), 0.75 A, 50/60 Hz, 175 W
<b>Size</b>	2.25" H x 4.9" W x 5.9"D (57 mm x 125 mm x 150 mm)
<b>Weight</b>	2 lb. 3 oz. (1.08 kg)

### 3.2 Environmental Conditions

Although the instrument has been designed for optimum durability and trouble-free operation, it must be handled with care. The instrument should not be operated in an excessively dusty or dirty environment. Maintenance and cleaning recommendations can be found in the Maintenance Section of this manual.

The instrument operates safely under the following conditions:

- temperature range: 5–40°C (41–104°F)
- ambient relative humidity: 15–50%
- pressure: 75kPa–106kPa
- mains voltage within ±10% of nominal
- vibrations in the calibration environment should be minimized

- altitude less than 2,000 meters

### 3.3 Warranty

Hart Scientific, Inc. (Hart) warrants this product to be free from defects in material and workmanship under normal use and service for a period as stated in our current product catalog from the date of shipment. This warranty extends only to the original purchaser and shall not apply to any product which, in Hart's sole opinion, has been subject to misuse, alteration, abuse or abnormal conditions of operation or handling.

Software is warranted to operate in accordance with its programmed instructions on appropriate Hart products. It is not warranted to be error free.

Hart's obligation under this warranty is limited to repair or replacement of a product which is returned to Hart within the warranty period and is determined, upon examination by Hart, to be defective. If Hart determines that the defect or malfunction has been caused by misuse, alteration, abuse or abnormal conditions of operation or handling, Hart will repair the product and bill the purchaser for the reasonable cost of repair.

To exercise this warranty, the purchaser must forward the product after calling or writing Hart for authorization. Hart assumes NO risk for in-transit damage.

For service or assistance, please contact the manufacturer.

Hart Scientific, Inc.  
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E-mail: support@hartscientific.com

THE FOREGOING WARRANTY IS PURCHASER'S SOLE AND EXCLUSIVE REMEDY AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OR MERCHANTABILITY, OR FITNESS FOR ANY PARTICULAR PURPOSE OR USE. HART SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OR LOSS WHETHER IN CONTRACT, TORT, OR OTHERWISE.

## 4 Safety Guidelines

- Operate the instrument in room temperatures between 5–40°C (41–104°F). Allow sufficient air circulation by leaving at least 6 inches of space between the instrument and nearby objects. Never set objects on top of the calibrator.
- The calibrator is a precision instrument. Although it has been designed for optimum durability and trouble free operation, it must be handled with care. The instrument should not be operated in excessively wet, oily, dusty, or dirty environments. **DO NOT** operate near flammable environments.
- The instrument can generate extreme temperatures. Precautions must be taken to prevent personal injury or damage to objects.
- The instrument is programmed and calibrated at the factory for optimum performance and should never need to be readjusted. If the unit is suspected to be out of calibration or in need of repair, please contact Hart Scientific Customer Service for assistance. Never attempt to modify the unit or alter the programmed constants.
- Use only a grounded AC mains supply of the appropriate voltage to power the instrument. Refer to Section 3.1, Specifications for power details.
- Do not allow foreign material to come in contact with the black body surface.
- Before initial use, after transport, and anytime the calibrator has not been energized for more than 10 days, the instrument needs to be energized for a “dry-out” period of 1-2 hours before it can be assumed to meet all of the safety requirements of the IEC 1010-1.
- If a mains supply power fluctuation occurs, immediately turn off the instrument. Power bumps from brown-outs and black-outs could damage the instrument. Wait until the power has stabilized before re-energizing the instrument.
- The calibrator is equipped with an internal thermal fuse and an electrical fuse. If a fuse blows, it is likely caused by failure of another part. If this occurs, the calibrator should be returned to the factory for inspection.

## 5 Quick Start

### 5.1 Unpacking

Unpack the calibrator carefully and inspect it for any damage that may have occurred during shipment. If there is shipping damage, notify the carrier immediately.

Verify that the following components are present:

- 9131 Calibrator
- Power Cord
- Manual

### 5.2 Set-up

Place the calibrator on a flat surface with at least 6 inches of free space around the instrument. The prop may be swung down to raise the front of the instrument from a horizontal position. Plug the power cord into a grounded mains outlet. Observe that the nominal voltage corresponds to that indicated on the back of the calibrator.

Turn on the power to the calibrator by toggling the power switch on. The fan should begin quietly blowing air through the instrument and the controller display should illuminate after 3 seconds. After a brief self-test the controller should begin normal operation. If the unit fails to operate please check the power connection.

The heater will start operating to bring the temperature of the calibrator to the set-point temperature and the display will begin to show the actual target temperature.

### 5.3 Power

Plug the calibrator power cord into a mains outlet of the proper voltage, frequency, and current capability. Refer to Section 3.1, Specifications for power details. Turn the calibrator on using the switch on the rear panel. The calibrator will turn on and begin to heat to the previously programmed temperature set-point. The front panel LED display will indicate the actual calibrator temperature.

## 6 Parts and Controls

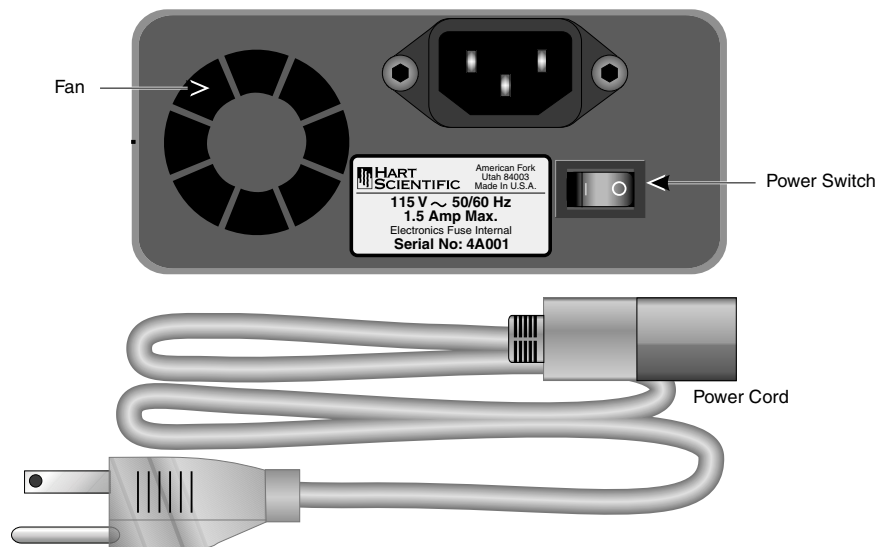
The user should become familiar with the calibrator and its parts. (Refer to Figures 1, 2, and 3).

### 6.1 Rear Panel

**Power Cord** - The power cord, (Figure 1) attaches to the back side of the 9131. It plugs into a standard 115 VAC (optional 230 VAC) grounded socket.

**Power Switch** - The power switch is located on the back panel of the calibrator. The switch is either on or off. The on position is for normal operation. The off position disconnects power to the entire unit.

**Fan** - A fan inside the calibrator runs continuously when the unit is being operated. This provides cooling to the instrument. Allow 6 inches of open space in front and behind the calibrator to allow adequate ventilation.

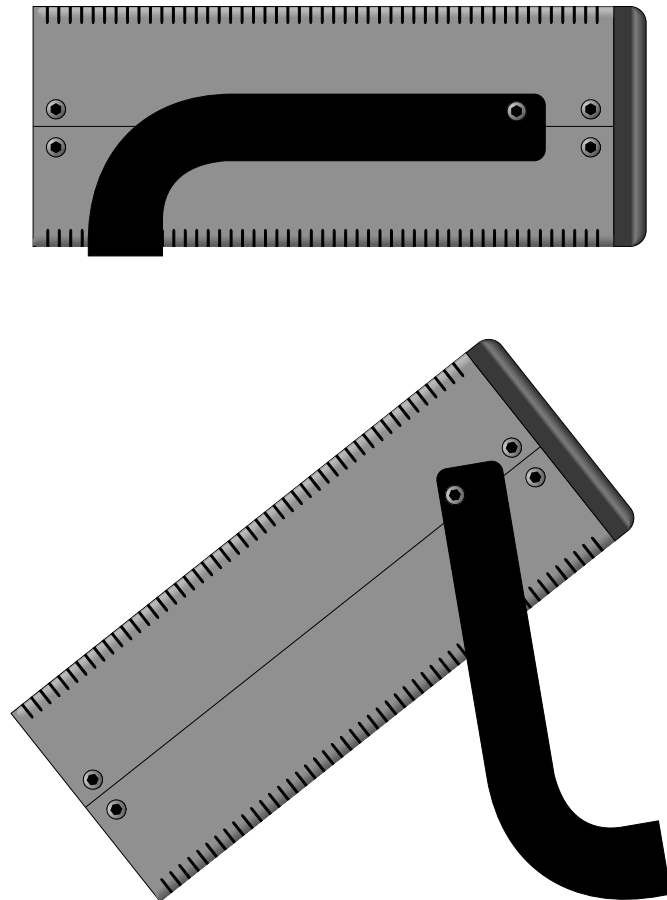


*Figure 1 Rear Panel*

### 6.2 Prop View

**Prop** - The prop (Figure 2) is located on the bottom side of the 9131. It lays flat against the bottom of the calibrator when not in use. It can be

swung down into a standing position when using the instrument at an inclined position.



*Figure 2 9131 Side View Showing the Prop*

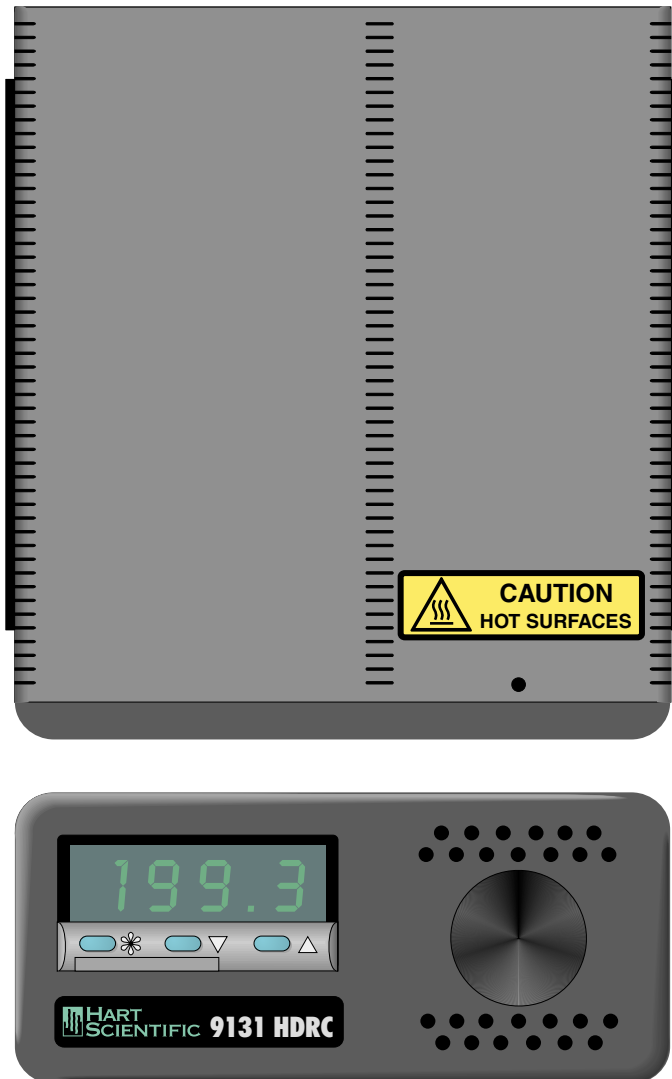


**Caution:** *The prop was not designed to be used as a handle for carrying the instrument. To avoid damage, it should not be forced beyond the inclined position of the calibrator.*

## 6.3 Front Panel

**Black Body Target** - Located on the right side (while facing the front of the 9131, Figure 3) is the heated target. IR thermometers or pyrometers with a spot diameter of one-inch or less may be calibrated. A hole above

the target and on top of the instrument allows access to the reference well (1/8-inch diameter). Surrounding the target area are small ventilation holes that provide cooling to the instrument.



**Figure 3** Front Panel and Top View

**Controller Display** - The numeric LED display shows the target temperature from 33°C to 400.0°C. (92°F to 752.0°F.) The display shows the set-point temperature when the \* button is pressed. Located in the upper

left of the temperature display is the main set-point (SP1) LED. This is the cycle indicator and shows the on/off state of the block heater.

**Controller Buttons** - The three buttons on the controller allow for adjustment of the set-point temperature. When pressed, the button marked \* toggles the display from the actual block temperature to the set-point temperature with the units of measure being used (°C or °F). While holding the \* button, the set-point temperature can be changed by pressing and holding in either the button marked ▲ or ▼ until the desired set-point is reached. The longer the keys are held down, the faster the set-point will change. When the desired set-point temperature is reached, releasing \* button immediately changes the display back to the actual block temperature and the controller begins to heat or cool to the new set-point temperature.



## 7 General Operation

### 7.1 Set-up

Place the calibrator on a flat surface with at least 6 inches of free space in front of and behind the instrument. The prop may be swung down to raise the front of the instrument from a horizontal position. Plug the power cord into an AC grounded outlet of the appropriate voltage.

The target must be clear of any foreign objects. Turn on the power to the calibrator by toggling the switch at the rear of the instrument to the on position. The controller display should illuminate and after a few second the fan should begin blowing air through the instrument. If the unit fails to operate check the power connection. When the calibrator is first powered on all of the LED segments will temporarily illuminate as the controller performs a brief self-test and set-up. The heater will begin operating to bring the temperature of the calibrator to the set-point temperature and the display will then begin to show the actual target temperature.

### 7.2 Setting the Temperature

The calibrator may be set to any temperature between 33 and 400.0°C in 0.1°C increments. To set the temperature, simply press and hold the \* key and the appropriate ▲ or ▼ button until the desired temperature is attained. Pressing the \* button changes the numeric display to show the set-point temperature and activates the ▲ and ▼ keys. Note that the longer the ▲ or ▼ keys are held down, the faster the set-point will change. When the desired set-point temperature is reached, release the ▲ or ▼ and the \* buttons. The panel will resume display of the actual block temperature.

If the set-point temperature is changed the controller will cause the unit to heat or cool to the desired set-point temperature. The cycle indicator LED will pulse on and off indicating the duty cycle of the heater. The display will indicate the actual target temperature which continuously changes until it reaches the set-point temperature. A small overshoot in the temperature is typical as it stabilizes to the set-point temperature. Three to five minutes is normally required for the target to reach the set-point temperature if the set-point is adjusted to a higher value. It may take a little longer if the set-point is adjusted to a lower temperature.

### 7.3 IR Thermometer Calibration

For optimum accuracy and stability allow the calibrator to warm up for 30 minutes after power-up and 10–15 minutes after setting the temperature.

The displayed target temperature should be within 0.2 degrees of the set-point temperature. Aim the IR thermometer/pyrometer carefully at the target. The thermometer should be positioned so that its spot diameter (area measured) is within the area of the target. Observe the temperature indication on the thermometer while moving the spot up and down and left and right to determine the maximum reading. Compare that maximum reading and the actual temperature indication on the 9131.

## 8 Controller Operation

The controller is fully programmable. Each of the parameters such as proportional band, integration time, display units, and calibration offset can be viewed and altered. The controller has been configured at the factory for optimum accuracy, stability, and response time. These parameters should not be changed although the user is free to do so if desired. The following section explains how the controller is programmed and particularly how to switch the parameter units from the factory settings.

### 8.1 Programming

The controller is shipped from the factory with a software lock on all programmable parameters. This prevents accidental accessing and changing of the pre-set parameters. The 9131 parameters can be browsed and read without unlocking the software lock mentioned above. (See Figure 4.)

Programming the controller and accessing the parameter settings is done using the three controller keys just below the display. The program menu is entered and exited by pressing the ▲ and ▼ buttons at the same time for three seconds. After three seconds the controller will enter level 1 of its menu. The display will toggle between *EUNE* and *OFF*.

From this point in the control menu, the ▲ and ▼ buttons can be used to step up or down through the parameters of level 1. To access another level of the controller, press the ▼ button to step through the controller parameters to the bottom of level 1 until the display toggles between *LEUL* and *1*. From this point the other 2 levels are accessed by pressing and holding in the \* button and pressing the ▲ button to step to levels 2 or 3. Each of the 3 levels can be stepped through in the same way using the ▲ or ▼ button.

### 8.2 Locking/Unlocking the Controller

In order to change any parameter, the controller will have to be unlocked. The lock/unlock parameter is accessed by going into level 3 as explained above. Once inside level 3 (see Figure 4), step up until the *UER* and *2* is toggling on the display. Now press and hold the ▲ and ▼ buttons simultaneously for 10 seconds. The *LOCK* and *ALL* should now be alternating on the display (see Figure 5). Press the \* button and step down using the ▼ button until *none* appears in the display. Holding down the ▲ and ▼ buttons for 3 seconds from this point will unlock all controller parameters and settings and return the controller display to show the block temperature.

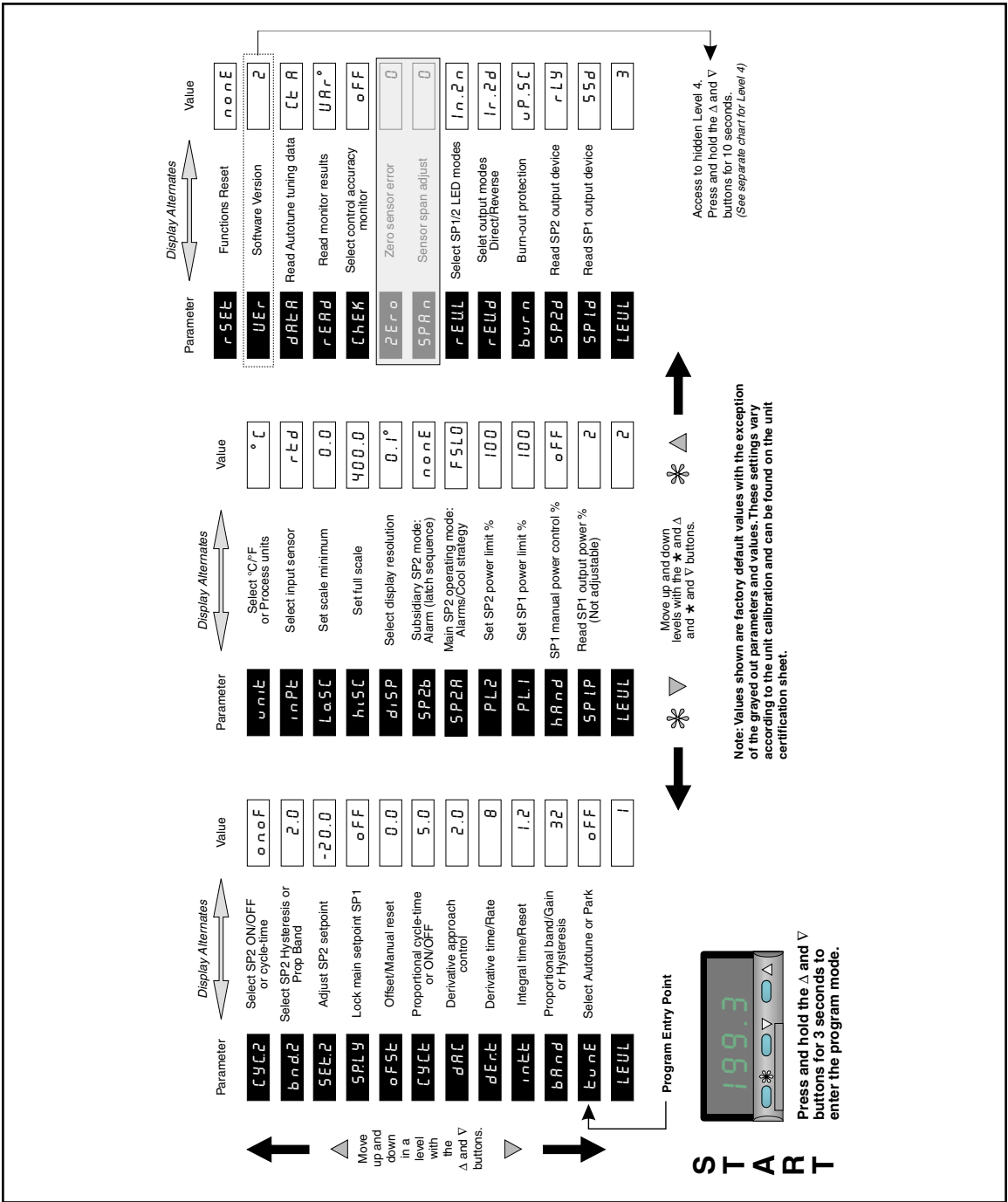


Figure 4 Controller Programming Chart

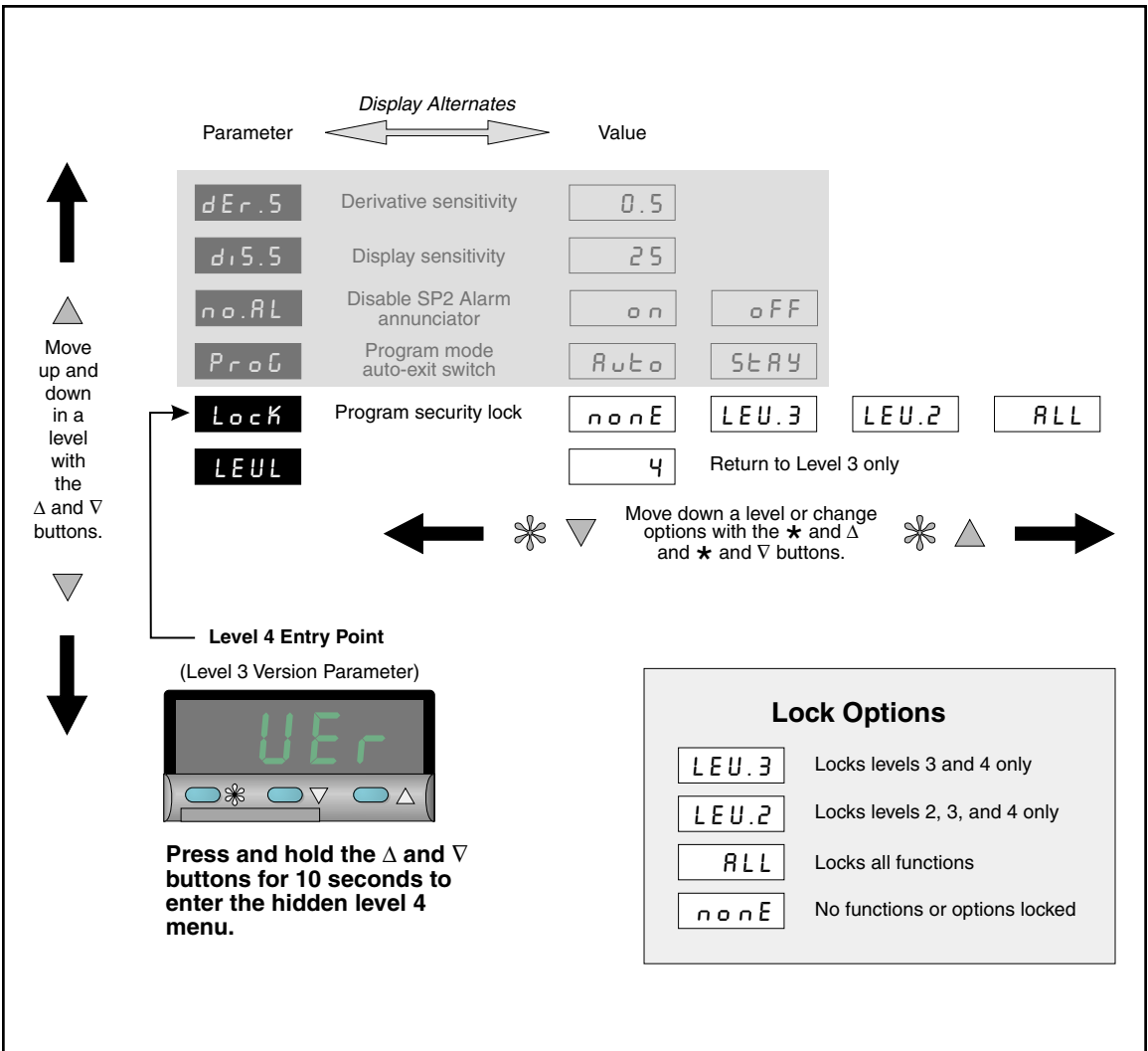


Figure 5 Controller Level 4 (Parameter Lock Options) Programming Chart

### 8.3 Switching Display Units

The calibrator is set at the factory to display in °C or °F. At some point the user may want to change units from °C to °F or from °F to °C. The unit change is a simple one that can be used as an example of changing any of the variables or parameters within the program menu. After unlocking the controller as described above, press the ▲ and ▼ buttons for 3 seconds. This accesses level 1 of the menu.

Once inside level 1, the other levels of the menu may be accessed. After looking at the menu chart (Figure 4), the user can see that the `UNIT` parameter is changed within level 2. Press the ▼ button to get to the bottom of level 1 where the `LEVL` and `1` are shown alternating in the display. Press and hold the \* button and press the ▲ button until the `2` shows on the display. Now inside level 2, use the ▲ and ▼ buttons to find the unit parameter. Notice how the display flashes between `UNIT` and `°C`. Press and hold the \* button and press the ▼ button until `°F` shows on the display. After the buttons are released, the display should be flashing `UNIT` and `°F` instead of `UNIT` and `°C`. The change has been made.

To return to the temperature display either press and hold the ▲ and ▼ buttons for 3 seconds or wait approximately 1 minute and the controller will automatically return. This is how all of the adjustable parameters for the controller work on the 9131 HDRC Calibrator. The controller may be locked again after changing parameters to avoid accidentally changing one of them. Follow the instructions above and replace the `NONE` at the `LOCK` menu with `ALL` and then exit out of the program menu as explained.

## 9 Test Probe Calibration

For optimum accuracy and stability, allow the calibrator to warm up for 10 minutes after power-up and then allow adequate stabilization time after reaching the set-point temperature. After completing calibration, allow the block to cool before switching the power off.

### 9.1 Calibration Methods

#### 9.1.1 Direct Calibration

Direct calibration involves testing a probe directly against the calibrator's temperature display. The advantage of this method is that it is quick and easy.

Point the infrared probe to be calibrated at the target of the calibrator. Avoid any dirt or grit that may cause an inaccurate reading. The infrared probe may be compared to the calibrator display temperature. The display temperature should be stable to within 0.1°C for best results.

Be sure that the infrared thermometer is pointed at the target with the "correct angle". Make sure that the thermometer is close enough for good "reading" contact.



**Caution:** *Never introduce any foreign material onto the target. Fluids, etc., can leak into the calibrator causing damage to the calibrator.*

### 9.2 Dry-Well Characteristics

Understanding the thermal characteristics of the calibrator can help you achieve the best accuracy and efficiency possible.

#### 9.2.1 Stabilization and Accuracy

The stabilization time of the calibrator will depend on the conditions and temperature involved. Typically, the calibrator will be stable to 0.2°C within 5 minutes of reaching the set-point temperature as indicated by the display. Ultimate stability will be achieved 10 to 20 minutes after reaching the set temperature.

Decreasing the time required for the calibration process can be accomplished by knowing how soon to make the measurement. It is recommended that typical measurements be made at the desired temperatures with the desired test probes to establish these times.

## 10 Calibration Procedure

### 10.1 Pre-Calibration

Make sure all parameters in the controller are set according to the parameter table provided in the operation manual.

- a) Turn the unit on.
- b) Set all parameters to the values shown in the chart.

### 10.2 Calibration

To calibrate the 9131 you must perform a span adjust, zero adjust, and accuracy check as explained in the following sections.

#### 10.2.1 Span Adjust

1. Record the current span value ( $span_{cur}$ )
2. Set the controller to 50°C ( $S_{low}$ ). Allow the calibrator to stabilize (about 15 minutes) after reaching the set temperature.
3. Record the actual temperature of the calibrator at 50°C ( $T_{low}$ ).
4. Set the controller to 400°C ( $S_{high}$ ). Allow the calibrator to stabilize (about 15 minutes) after reaching the set temperature.
5. Record the actual temperature of the calibrator at 400°C ( $T_{high}$ ). Use only a calibrated miniature PRT. Contact Hart Scientific for PRT specifications.
6. The new span value is calculated by the following formula:

$$span = 400 \left( \frac{error_{high} - error_{low}}{T_{high} - T_{low}} \right) + span_{cur}$$

where  $error_{high}$  is  $T_{high} - S_{high}$  and  
 $error_{low}$  is  $T_{low} - S_{low}$

7. Record and set the new span parameter.



## 10.2.2 Zero Adjust

**Note:** *New temperature measurements must be taken. You cannot use the values from span adjust.*

1. Record the current zero value ( $zero_{cur}$ ).
2. Set the controller to 50°C ( $S_{low}$ ). Allow the calibrator to stabilize (about 15 minutes) after reaching the set temperature.
3. Record the actual temperature of the calibrator at 50°C. ( $T_{low}$ )
4. Set the controller to 400°C ( $S_{high}$ ). Allow the calibrator to stabilize (about 15 minutes) after reaching the set temperature.
5. Record the actual temperature of the calibrator at 400°C. ( $T_{high}$ )
6. Calculate the “zero” parameter by averaging the error values:

$$zero = \left( \frac{error_{low} + error_{high}}{2} \right) + zero_{cur}$$

where  $error_{high}$  is  $T_{high} - S_{high}$  and  
 $error_{low}$  is  $T_{low} - S_{low}$ .

7. Record and set the zero parameter.

## 10.2.3 Accuracy Check

Set the controller to 50°C. Allow about 15 minutes for stabilization after reaching the set-point temperature. Record the actual temperature of the calibrator. Repeat for set-points of 100°C, 150°C, 200°C, 250°C, 300°C, and 400°C.

If any of the measured temperatures are not within specification, repeat the Span Adjust and the Zero Adjust as described in Sections 10.2.1 and 10.2.2.

# 11 Maintenance

- The calibration instrument has been designed with the utmost care. Ease of operation and simplicity of maintenance have been a central theme in the product development. Therefore, with proper care the instrument should require very little maintenance. Avoid operating the instrument in an oily, wet, dirty, or dusty environment.
- If the outside of the instrument becomes soiled, it may be wiped clean with a damp cloth and mild detergent. **DO NOT** use harsh chemicals on the surface which may damage the paint.
- It is important to keep the target of the calibrator clean and clear of any foreign matter. **DO NOT** use fluid to clean the target.
- The calibrator should be handled with care. Avoid knocking, bumping, or dropping the calibrator. Due to the size and portability of the 9131, it is vulnerable to being shocked and dropped as it is carried around. It may be easily dragged off from a counter top while in use. Never string probe cables or the power cord across an aisle where people could trip over them and pull the calibrator from its place. **DO NOT** place objects on top of the calibrator or apply excessive pressure to the chassis. With a little care, this calibrator will provide long-lasting, trouble-free operation.
- **DO NOT** slam any objects into the target. This type of action can cause a shock to the sensor.
- If a hazardous material is spilled on or inside the equipment, the user is responsible for taking the appropriate decontamination steps as outlined by the national safety council with respect to the material.
- If the mains supply cord becomes damaged, replace it with a cord with the appropriate gauge wire for the current of the instrument. If there are any questions, call Hart Scientific Customer Service for more information.
- Before using any cleaning or decontamination method except those recommended by Hart, users should check with Hart Scientific Customer Service to be sure that the proposed method will not damage the equipment.
- If the instrument is used in a manner not in accordance with the equipment design, the operation of the calibrator may be impaired or safety hazards may arise.
- The 9131 calibrator is programmed and calibrated at the factory for optimum performance. Field adjustment to the program should not be necessary. If the unit is suspected to be out of calibration or in need of

repair, please contact the factory for assistance. The unit should be recalibrated at the factory yearly. Never attempt to modify the unit or alter the programmed constants.

## 12 Troubleshooting

If problems arise while operating the 9131, this section provides some suggestions that may help you solve the problem. A wiring diagram is also included. Opening the unit without contacting Hart Scientific Customer Service may void the warranty.

### 12.1 Troubleshooting

Below are several situations that may arise followed by suggested actions for fixing the problem. You may need to refer to Section 8, Controller Operation and to Figures 4 and 5. Refer to the Report of Calibration for any unique controller values.

Problems	Causes and Solutions
Incorrect Temperature Reading	Check the sensor span adjust “SPAN” in Level 2 to see that it is set correctly. Check the zero sensor error “ZER 0” in Level 2 to see that it is set correctly. Check input sensor “INPT” in Level 2 is set to “red”. If not, <b>Master Reset</b> the controller. See the <b>Master Reset</b> instructions at the bottom of this table.
The display is off after waiting 30 seconds	Check that the power cord is plugged in. If the unit has power and the display is off, the fuse may be blown and the unit needs to be returned to Hart Scientific for repair. Contact Hart Scientific Customer Service.
The display flashes “Input Fail”	There is a sensor error. Contact Hart Scientific Customer Service.
The display flashes “Input None”	Contact Hart Scientific Customer Service.
Unit will not heat to 400°C	The ambient temperature is too low.
User cannot set the temperature to the maximum or minimum values of the unit	Check to see that “hi.5C” in Level 2 is set to 400 Check to see that “Lo.5C” in Level 2 is set to 0.0
Controller lock-up	Do a <b>Master Reset</b> of the controller. See the <b>Master Reset</b> instructions at the bottom of this table.

Problems	Causes and Solutions
Temperature readout is not the actual temperature of the well	With the unit stable, slowly rotate the unit. If no change occurs, the unit may need to be calibrated. Contact Hart Scientific Customer Service. If the display changes more than twice the normal display deviation, another unit in the area could be emitting therefore energy. Move the unit to a different location and rotate the unit again. If the temperature is correct in this new area or deviates differently than the first area, therefore energy is present in the room. If you have to perform the test in the effected area, use the comparison test to eliminate any possible errors.
Master Reset	<p>In Level 3 set “r 5 E E” The controller transfers to Level 5 where the following parameters must be re-entered.</p> <p style="margin-left: 40px;">I n P E - r E d U n i t - ° C S P I D - r L Y</p> <p>Re-enter Level 1, 2, and 3, parameters. Refer to Figures 4 and 5, and the Report of Calibration for Level 1, Level 2, and Level 3 values. to “R L L”.</p>

## 12.2 CE Comments

### 12.2.1 EMC Directive

Hart Scientific’s equipment has been tested to meet the European Electromagnetic Compatibility Directive (EMC Directive, 89/336/EEC). The Declaration of Conformity for your instrument lists the specific standards to which the unit was tested.

For units used in the “field”, a slight degradation of accuracy may be noticed between 300–350 MHz with a field intensity of 10V/M at the unit. A piece of equipment in proximity to the unit under test must emit greater than 1000 times the permissible CE standard (EN55022) at these specific frequencies to have any effect on the unit. Units used in a laboratory are not effected. See the Troubleshooting Section above.

## **12.2.2 Low Voltage Directive**

In order to comply with the European Low Voltage Directive (73/23/EEC), Hart Scientific equipment has been designed to meet the IEC 1010-1 (EN 61010-1) and IEC 1010-2-010 (EN 61010-2-010) standards.

## 12.3 Wiring Diagram

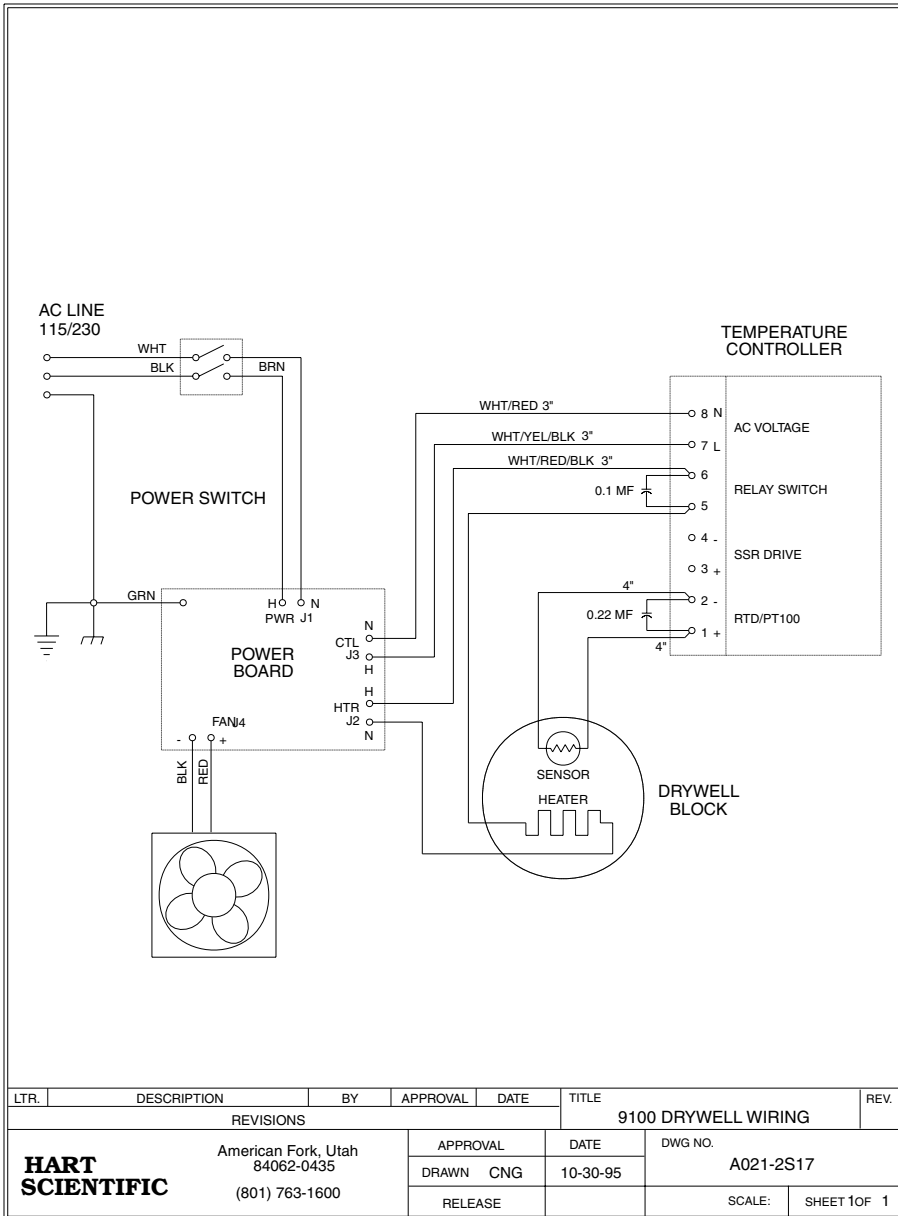


Figure 6 Wiring Diagram