Kaye LTR-90

Operating Manual
X0395, X0395CE, X0395JP, X0395AS

Amphenol
Advanced Sensors

Kaye LTR-90

Ultra Cool Dry Well Calibrator

Operating Manual

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Amphenol
Advanced Sensors

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Chapter 7. Maintenance and Troubleshooting

Chapter 1. Product Overview

The LTR -90 Ultra-Cool Dry Well Calibrator is a bench top temperature calibrator that can calibrate precision temperature instruments from-95°C to 140°C (see Figure 1 below).

Figure 1: LTR-90 Ultra-Cool Dry Well Calibrator

1.1 Safety Information

WARNING! **A Warning identifies conditions and procedures that are dangerous to the user.**

CAUTION! **A Caution identifies conditions and procedures that can cause damage to the product or the equipment under test.**

See Table 1 below for a list of symbols used in this manual and on the Calibrator.

Table 1: Symbols

Symbol	Description	Symbol	Description
$C\epsilon$	Conforms to European Union directives	ⓒⓈⓅus	Conforms to relevant North American Safety Standards.
⚠	WARNING - RISK OF DANGER. Consult user documentation.	⚡	WARNING. HAZARDOUS VOLTAGE. Risk of electric shock.
⏚	Earth ground	Ⓒ N10140	Conforms to relevant Australian EMC requirements.
☒	This product complies with the WEEE Directive marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste. Product Category: With reference to the equipment types in the WEEE Directive Annex I, this product is classed as category 9 "Monitoring and Control Instrumentation" product. Do not dispose of this product as unsorted municipal waste.		

WARNING! ⚠ **To prevent possible electrical shock, fire, or personal injury:**

Read all safety Information before you use the Product.

Use the Product only as specified, or the protection supplied by the Product can be compromised.

Use this Product indoors only.

Do not use the Product around explosive gas, vapor, or in damp or wet environments.

Do not use and disable the Product if it is damaged.

Use only the mains power cord and connector approved for the voltage and plug configuration in your country and rated for the Product.

Replace the mains power cord if the insulation is damaged or if the insulation shows signs of wear.

WARNING! ⚠️ **Make sure the ground conductor in the mains power cord is connected to a protective earth ground. Disruption of the protective earth could put voltage on the chassis that could cause death.**

Do not put the Product where access to the mains power cord is blocked.

Use caution when you install and remove probes and inserts from the Product. They can be hot.

Do not touch voltages > 30 V ac rms, 42 V ac peak, or 60 V dc.

Do not apply more than the rated voltage, between the terminals or between each terminal and earth ground.

Do not touch the well access surface of the instrument.

Do not turn off the product at block temperatures higher than 100°C. Select a SETPOINT less than 100°C and let the instrument cool before turning it off.

Use the correct terminals, function, and range for measurements.

Do not use test leads if they are damaged. Examine the test leads for damaged insulation, exposed metal, or if the wear indicator shows. Check test lead continuity.

Do not touch the probes to a voltage source when the test leads are connected to the current terminals.

Keep fingers behind the finger guards on the probes.

Do not exceed the Measurement Category (CAT) rating of the lowest rated individual component of a Product, probe, or accessory.

1.2   Contact Amphenol Advanced Sensors Customer Service

You may contact our North American customer service team at 814-834-9140 (fax: 814-781-7969). You may also call our European headquarters in Germany at +49 (0) 7231-14335 0.

1.3   Calibration and Repair Information

To schedule and send the Calibrator to Amphenol Advanced Sensors for calibration or repair:

1. Contact the Amphenol Advanced Sensors Service Center in your area to schedule the calibration or repair.

2. Pack and secure the Calibrator in a shipment box with a minimum of 2 inches of packing around the Calibrator to prevent damage.

3. Send the Calibrator to the Service Center.

Chapter 2. Specifications

2.1 Introduction

The Ultra Cool Dry Calibrator (LTR-90) provides a stable, portable temperature reference for performing thermocouple calibration. The LTR-90 operates over the range of -95°C to 140°C.

The LTR-90 is most commonly used with Kaye's Intelligent RTD (IRTD) probe and Kaye Validator to make up a complete validation system. The LTR-90 has the ability to rapidly heat and cool, making it an ideal instrument for performing multiple-point calibrations for a variety of processes, such as freeze dryer, cold rooms, incubators and steam sterilizers.

The LTR-90 has four wells for sensors and two wells for IRTD probes. For calibrating thermocouples, there are inserts that go into each well to reduce stem conduction errors, thereby providing maximum accuracy and stability. With inserts installed, each of the 4 sensor wells can hold three 22 gauge PTFE thermocouples, for a total of 12 thermocouples. Utilizing smaller gauge thermocouples can expand calibration capacity.

The Kaye Validator automatically performs the sensor calibration, including programming the set-point temperatures at the LTR-90. If you are using the LTR-90 as a standalone instrument, the temperatures can be manually set to any temperature within the specified range by using the control buttons located on the front panel.

These dry-well calibrators are designed for portability, moderate cost, and ease of operation. With proper use they should provide continued accurate calibration of temperature sensors and devices. The user should be familiar with the safety guidelines and operating procedures of the calibrator as described in this *Operator's Manual.*

2.2   Specifications

The following section lists the specifications for this instrument. Accuracy specifications are applicable for a one-year calibration interval.

2.2.1   Base Unit Specifications

Part Numbers and Descriptions

X0395	LTR -90 Low Temperature Dry Well -95° to 140°C, (115Volts, 60Hz)
X0395CE	LTR -90 Low Temperature Dry Well -95° to 140°C , (230Volts, 50Hz)
X0395JP	LTR -90 Low Temperature Dry Well -95° to 140°C, (115Volts, 50/60Hz)
X0395AS	LTR -90 Low Temperature Dry Well -95° to 140°C (230Volts, 50/60Hz)

Temperature Range at 23°C
-95°C to 140°C (-139°F to 284°F)

Display Accuracy
±0.2°C Full Range

Stability
±0.015°C Full Range

Loading Effect
(with a 6.35 mm reference probe and three 6.35 mm probes)
±0.006°C Full Range

(versus display with 6.35 mm probes)
±0.25°C at -95°C
±0.10°C at 140°C

Operating Conditions
0°C to 35°C, 0% to 90%
RH (non-condensing) < 2000 m altitude

Environmental conditions for all specifications except temperature range
13°C to 33°C

Immersion (Well) Depth
160 mm (6.3 in)

Well Diameter
30 mm (1.18 in)

Sleeve Hole Diameter
IRTD hole: 6.7 mm (0.265 in)
Sensor hole: 9 mm (0.354 in)

Heating Time [1]
-95°C to 140°C: 40 min

Cooling Time [1]
23°C to -90°C: 80 min
23°C to -95°C: 90 min
140°C to 23°C: 60 min

Stabilization Time [2]
15 min

Resolution
0.01°

Display
LCD, °C or °F user selectable

Size (H x W x D)
380 mm x 205 mm x 480 mm (14.9 in x 8.0 in x 18.8 in)

Weight
16 kg (35 lb)

Power Requirements
100 V to 115 V (±10%) 50/60 Hz, 575 W (X0395, X0395JP)
200 V to 230 V (±10%) 50/60 Hz, 575 W (X0395CE, X0395AS)

System Fuse Ratings
115 V: 6.3 A T 250 V (Kaye part #:193-100)
230 V: 3.15 A T 250 V (Kaye part#: 193-099)

Safety
IEC 61010-1, Installation Category II, Pollution degree 2

Electromagnetic Environment
IEC 61326-1: Basic

Refrigerants
R32 (Difluoromethane)   < 20 g, ASHRAE Safety Group A2L
R704 (Helium)   < 20 g, ASHRAE Safety Group A1

Notes:
[1] — For ambient temperature of 23°C.
[2] —Time from when the SETPOINT is reached to when the unit is within Stability specification.

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Chapter 3. Quick Start

3.1 Unpack and Inspect

Unpack the instrument carefully and examine it for any damage that could have occurred during shipment. If there is shipping damage, notify Amphenol Advanced Sensors Customer Service and the carrier immediately. Table 2 lists the equipment and the accessories that comes with the Calibrator. Verify that all the equipment and accessories in Table 6 are in the box.

Table 2: Parts and Accessories

Name	Quantity
LTR -90	1
2-meter (6-foot) Mains Power Cord	1
Certificate of Calibration	1
Insert Removal Tool	1
Well Insulator Cap	1
Temperature Reference to Communication Interface cable	1
Four extruded sleeves (for Thermocouples)	1
Calibration block (with 6 wells)	1

3.2 Placement

Put the Calibrator on a clean, flat surface. Make sure the Calibrator is 150 mm (6 inches) away from all objects. For best results, choose a location to set up the product where room temperature changes are minimal.

WARNING! ⚠️ **To prevent possible fire or personal injury:**

> **Do not operate the LTR -90 in orientations other than upright. A fire hazard can be made if the LTR -90 is put on its side.**
>
> **Do not remove Inserts when the product shows temperatures more than 50 °C.**
>
> **Do not operate near flammable materials.**
>
> **Do not touch the well access surface of the Product.**
>
> **Do not turn off the LTR -90 when the temperature is above 100 °C. Set a SETPOINT temperature below 100 °C and let the LTR -90 cool.**

3.2   Placement (cont.)

CAUTION!   ⚠   **For safe operation and maintenance of the Product:**
Energize the LTR -90 for a 2-hour dry-out period before use, if the LTR -90 was:
In transport
In a humid or semi-humid storage environment
Not energized for more than 10 days

If the product is wet or has been in a wet environment, take necessary measures to remove moisture prior to applying power.

Always operate the LTR -90 on a flat, level, stable surface.

Do not store the LTR -90 at temperatures above 50 °C. The product has a refrigeration system and contains gasses under pressure.

Do not turn the Product upside down. The inserts will fall out.

To prevent damage to the cooling system, do not tilt the LTR -90 on its side or upside down while the LTR -90 is operating.

3.3   Connect to Mains Power

Use the 2-meter (6-foot) mains power cord to connect the Product to a 120 V ac or 230 V ac outlet rated for at least 10 amps.

3.4   Turn On the Product

1. Push the "**I**" side of the power switch on the front panel of the Calibrator.

2. Monitor the Startup screen for errors while the product turns on. If an error shows, contact Amphenol Advanced Sensors Customer Service.

3.5   Change Language

To change the display language:

1. Push `MENU` .

2. Push `F3` .

3. Push `F1` .

4. Push `F1` .

5. Push ◖ or ◗ to highlight a language.

6. Push `ENTER` to set language.

Note: *If the incorrect language is set by accident, push softkeys* `F1` *and* `F4` *at the same time to temporarily switch back to the English language.*

3.6 Set Display Contrast

With the Main screen shown in the display, push ⬤ to increase or push ⬤ to decrease display contrast.

3.7 Toggle Key Beep On or Off

With the Main screen shown in the display, push **F1** and **F3** at the same time to enable or disable key beep.

3.8 Security and Password

The Calibrator has two user-level access security levels (Low and High) to protect from undesired changes to the settings (see Table 3 below). The Calibrator comes from the factory with the security level set to High and a default password of "1234".

If the password is not available, the information can still be viewed. To view the information without the password, push **ENTER** twice or push **EXIT** when prompted for the password. The information is then shown on the screen, but cannot be changed.

Note: *The Calibrator does not have a password reset function. If the password is lost, contact Amphenol Advanced Sensors Customer Service for password reset assistance.*

Table 3: Security Levels

Security Level	Definition
Low	Protects the specific metrological information and calibration information settings.
High	Protects all operating parameters. It is intended to minimize user choices, for example, to perform repeated identical calibrations under consistent conditions.

To change the password:

1. Push **MENU**.

2. Push **F3**.

3. Push **F2**.

4. Enter the current 4-digit password to open the password screen (the default factory password is **1234**).

5. Push ◀ and ▶ to highlight a digit, then push ⬤ to increase the digit or push ⬤ to decrease the digit.

6. Push **ENTER** to save the password.

To change the security level:

1. Push **MENU**.

2. Push **F3**.

3. Push **F2**.

4. Enter the current 4-digit password to open the password screen (the default factory password is **1234**).

5. Push ◀ and ▶ to highlight **HIGH** or **LOW.**

6. Push **ENTER** to save the selection.

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Chapter 4.   Parts and Controls

4.1   Calibrator Features

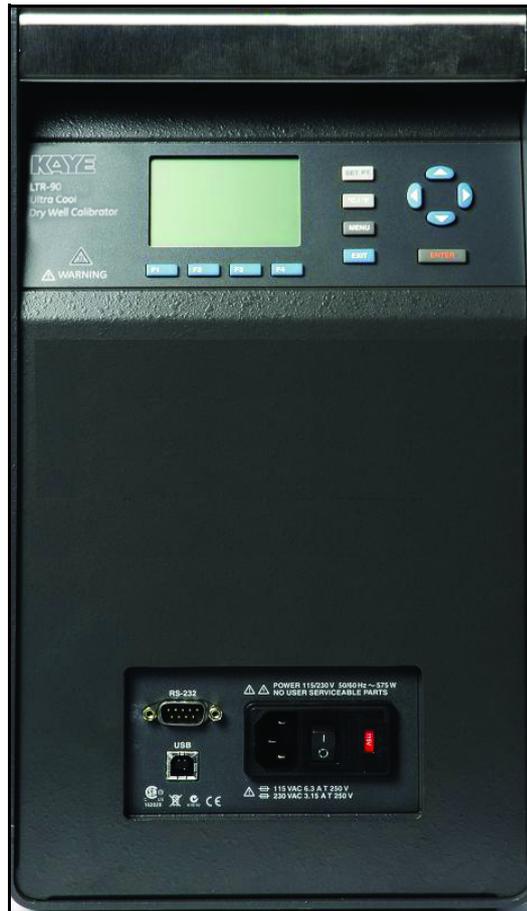Table 4 identifies and describes the panels on the front of the Calibrator.

Figure 2: The LTR -90 Front Panel

Table 4: LTR -90 Front Panel

Item	Name	Function
1	Display and Control Panel	Control panel and display. See "Display and Control Panel" on the next page.
2	Power and Remote Interface Panel	Power module and Remote Interface Panel. See "Power and Remote Interface Panel" on page 15.

4.1.1 Display and Control Panel

Table 5 displays and describes the function of each button on the Control Panel.
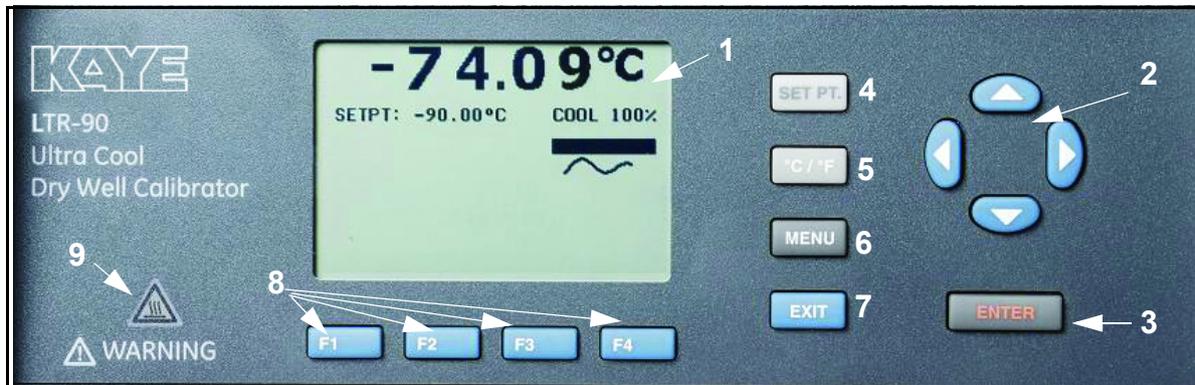

Figure 3: Display and Control Panel

Table 5: Display and Control Panel

Item	Name	Function
1	Display	Displays block temperature, measurements, status information, operating parameters, and softkey functions. The contrast of the display is adjustable. To adjust the contrast, push ▲ to increase contrast or ▼ to decrease contrast while the Main screen is shown.
2	Arrow Keys ▲▼◀▶	Navigates through menu selections, increases or decreases numbers, and scrolls menus up or down.
3	Enter Key ENTER	Selects menus and sets new values.
4	SET Point Key	Set a SETPOINT temperature to heat or cool to.
5	°C/°F Key	Switches the displayed temperature units between °C and °F. Key is enabled only when the Main screen is shown.
6	Menu Key MENU	Opens the Main menu. See "Menus and Menu Navigation" on page 25 for information on each menu and the settings found in the menus.
7	Exit Key EXIT	Cancels all changes and navigates back to the previous menu.
8	Softkeys F1 F2 F3 F4	Navigates the menus on the display. The functions of the softkeys are shown on the display above the buttons.
9	Block Temperature Indicator ⚠	Visual safety indicator that illuminates when the block temperature is unsafe and extinguishes when the block temperature is safe. If the block temperature is unsafe and the Calibrator is turned off or the mains power cord is disconnected, the indicator flashes until the block temperature cools to a safe temperature. Do not transport or remove Inserts until the indicator is off. **WARNING! For safe operation and maintenance of the product, do not remove Inserts when the Block Temperature indicator is illuminated.**

4.1.2 Power and Remote Interface Panel

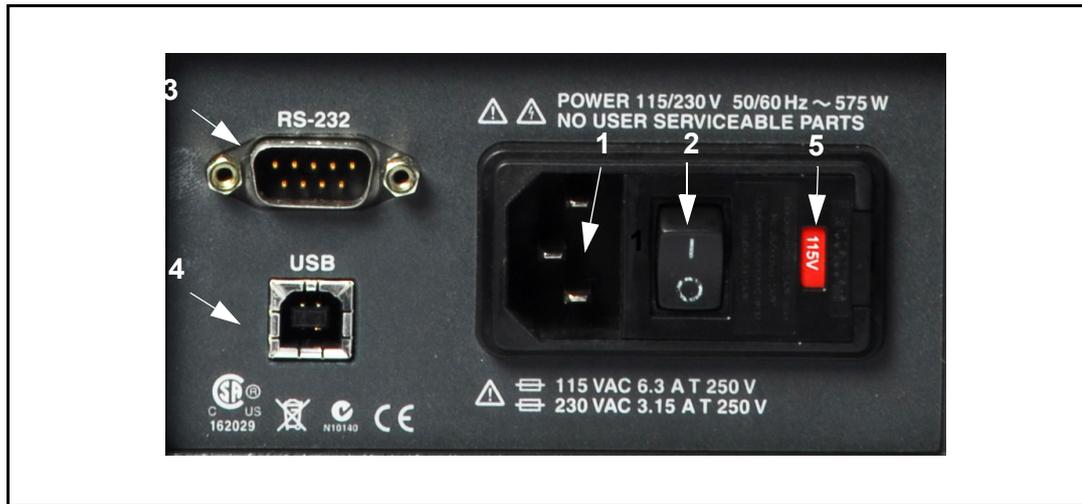Table 6 displays and describes the connectors and ports on the Power and Remote Interface Panel.

Figure 4: Power and Remote Interface Panel

Table 6: Power and Remote Interface Panel

Item	Name	Function
1	Mains Power Cord Receptacle	Receptacle for the mains power cord. Use an AC mains supply appropriate for the voltage range and region of use.
2	Power Switch	Turn on **(I)** and turn off **(O)** the Calibrator.
3	9-pin Subminiature Serial Connector (RS-232)	Transmits measurements and remotely controls the operation of the instrument.
4	USB Serial Connector	Transmits measurements and remotely controls the operation of the instrument.
5	Fuse	Product fuse. See Chapter 7 for fuse replacement instructions.

4.1.3 Constant Temperature Block

The block (Figure 5 below) provides a relatively constant and accurate temperature environment in which the sensors that are to be calibrated are inserted. There are four holes for sensors (9mm - 0.354") and two holes for IRTDs (6.7mm - 0.265").
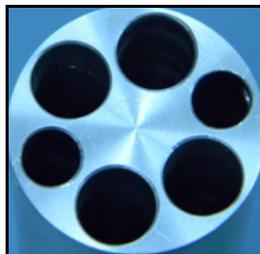

Figure 5: Constant Temperature Block

4.1.4 Startup and Main Screen

When the Calibrator turns on, the system initializes, does a self-check, then displays a startup screen that displays the model number and firmware version information. If the self-check finds an error, the error is shown on the Startup screen. Contact Amphenol Advanced Sensors Customer Service if an error displays on the Startup screen.

After the start-up initialization is complete, the Startup screen disappears and the Main screen is on the display. Table 7 below displays and describes the indicators on the Main screen.
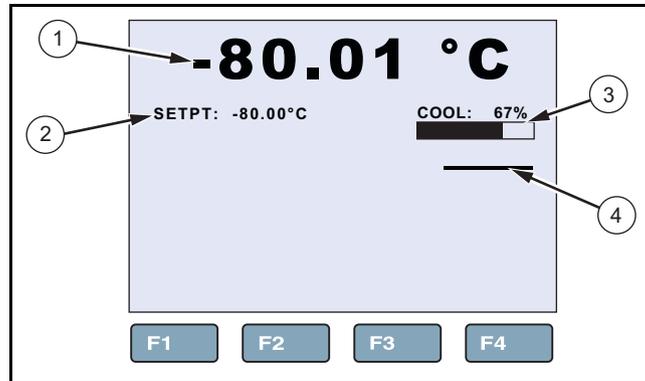

Figure 6: Main Screen

Table 7: Main Screen

Item	Name	Function
1	BlockTemperature	Temperature of the internal temperature block.
2	SETPOINT Temperature	Target SETPOINT temperature. A set temperature value is referred to as a "SETPOINT". The Calibrator uses the SETPOINT value to know what temperature to heat or cool to.
3	Heating/Cooling Status	Displays the mode the calibrator is in. The modes are: OFF, COOL, HEAT, and CUTOUT. The bar under the mode corresponds to the percent heating or cooling. The bar is blank at 0% when HEATING or COOLING is off or not necessary. The bar is completely dark at 100% HEATING or COOLING. CUTOUT is a feature that shuts off power to the heat source if the well temperature exceeds the set limit value. CUTOUT displays when a limit has been exceeded. For more information on CUTOUT, see "Cutout" on page 27.
4	Stability Status Indicator	Visually displays if the block temperature is stable and within the Stability Limits. When temperature of the internal temperature block is not within the Stability Limits, the indicator displays a wavy line (~). When the temperature is within the Stability Limits, the indicator displays as a flat line (---) which indicates that a measurement can be made. See "Stable Limits" on page 26. ***Note:*** *To prevent inaccurate measurements, do not make measurements until the Stability Indicator displays as a flat line (---).*

4.2   Setting Temperature

When you calibrate thermocouples using the LTR-90 and the Kaye Validator, the set-points are defined as part of the calibration procedure and automatically downloaded from the Kaye Validator to the LTR-90. To utilize automated calibration with the LTR-90, the Validator requires version 3.62 software and firmware. If you are using the LTR-90 as a standalone instrument, Chapter 6 explains in detail how to set the temperature set-point on the calibrator using the front panel keys.

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Chapter 5. General Operation

5.1 Calibrator Setup

Place the calibrator on a flat surface with at least six inches of free space around the instrument. DO NOT place under a flammable structure or cabinet. Plug the power cord into a grounded mains outlet. Observe that the nominal voltage corresponds to that indicated on the calibrator.

Gently insert the thermocouple probe sleeves into the well. The well must be clear of any foreign objects, dirt, and grit before the sleeve is inserted. The sleeve is inserted with the two small tong holes positioned upward.

5.2 Calibrating Sensors

Sensor calibration is performed prior to carrying out a validation test to correct raw temperature readings to a traceable temperature measurement standard. Due to the LTR-90's range of temperature and rapid heating and cooling capabilities, the instrument can be used to provide calibrations for a variety of validation processes. To provide maximum accuracy, a two-point calibration should be performed close to the operating temperature of the process.

The Kaye Validator automatically downloads the calibration set-points defined in your setup to the LTR-90 and controls the entire sensor calibration procedure.

Before you begin the calibration process:

Place the Validator in a location with stable and even temperature, not exposed to any local heat sources (i.e., close to a sterilizer, an open door causing a draft, etc.)

Connect the serial connector end of the Temp Reference Communication Interface cable to the front of the LTR-90 and the other end, to the back of the Validator unit.

To provide maximum accuracy during the calibration process, power up the Validator and let it run for approximately 30 minutes in the operating environment where calibration is to be performed in order for the Validator to acclimate to the ambient temperature.

Since transient environmental temperature will cause thermal measurements to change, Kaye specifies that the Validator system be allowed to stabilize for at least 30 minutes for every 10°C change in temperature. For example, if you move the Validator from a 25°C environment to a 40°C degree environment, it should be allowed to run for 45 minutes before use.

Place the thermocouples and IRTD into the LTR-90, making them pass through the rubber inserts first and then into the well (Figure 8 on page 23), making sure to use the well inserts for the thermocouples. The LTR-90 provides the stable temperature required for sensor calibration. The IRTD, a self-contained precision measurement standard that provides data directly to the Validator, accurately measures the temperature of the LTR-90. The IRTD provides a traceable standard that is used to correct the temperature readings of your thermocouples.

The rubber plugs should be placed in the hole after the thermocouples have been placed as desired. Once the rubber plug is inserted it will push the thermocouples to the three grooves along the outer rim of the hole, securing the thermocouples in these grooves. (Figure 9 on page 23).

5.2   Calibrating Sensors (cont.)

The rubber plugs can be used to cover unused holes.

Note: *The rubber insulator must be used at all times. If not used Amphenol Advanced Sensors does not guarantee specs. Also, at cold temperatures, there will be significant ice buildup, that will effect accuracy and uniformity*

5.3   Insert Installation and Removal Procedure

<u>WARNING!</u>   ⚠️ **For safe operation and maintenance of the product, do not remove inserts when the block temperature indicator is illuminated.**

To install the insert:

1. Remove the rubber well insulation cap.

2. Stand the insert upright.

3. Lock the insert tool into the attachment holes.

4. Pick up the insert and slowly and carefully lower the insert into the well.

To remove the insert:

1. Let the Calibrator cool to below 50 °C and make sure the high temperature indicator is not illuminated.

2. Use the insert tool to lift the insert from the well. Put the insert on a metal or ceramic fiber surface or container made to set hot materials on.

Note: *If the insert has not been cleaned periodically (see "Clean the Insert" in Chapter 7), hard-water deposits can form on the insert and make it difficult to remove. If the insert cannot be removed, try to remove the insert as follows:*

    a. Put the Calibrator in a cold environment that is less than 21 °C.

    b. Use the procedure in "Set the Temperature SETPOINT Manually" on page 29 to set the temperature to 100°C.

    c. When the temperature is between 50°C and 70°C, use the insert tool to lift the insert from the well. Put the insert on a metal or ceramic fiber surface or container made to set hot materials on.

    d. If the insert cannot be removed, turn off the Calibrator and contact Amphenol Advanced Sensors Customer Service (see Chapter 1).

3. Put the rubber well insulation cap back on the well.

Figure 7: Insert Installation and Removal

5.4   Probe Insertion and Removal Procedure

CAUTION!   ⚠️   **To prevent possible damage to probes, make sure all probes put into the furnace are rated for the temperature range used in the calibration procedure.**

Note: *Use a metal or ceramic fiber surface or container to set hot probes on.*
A solid (unstirred) mass, as in a furnace, can have heat loss through the probe stem. The loss changes between probes and temperatures.

For the best stable temperature and minimum gradient, put sample probes into the full depth of the well. Variation on equipment, probe dimension, and configuration can have an effect on temperature stability and gradients. At higher temperatures, temperature stability and gradients between test wells are equivalent. But the length of time for the wells to become stable is much longer.

The calibrator unit is designed to be used with the rubber insulator at all times. Specifically at lower temperatures, the insulator prevents frost buildup between the probes and the well.

Carefully insert the probes and sensors through the insulator holes, then continue into the well holes. After the sensors are immersed into the well fully, place the plug into the hole. That will push the sensors into the three small openings on the side, sealing the holes.

Make sure the unused holes are covered with the plugs.

Temperature changes at lower temperatures are slow. This is because high integration values are necessary to keep the controller stable (1,200 seconds) at the lower temperatures.
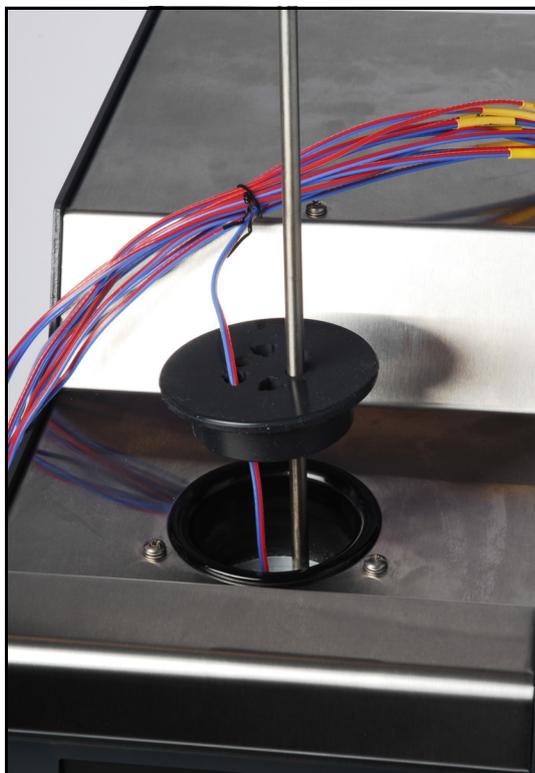
Figure 8: Probe Insertion

Figure 9: Rubber Insulator

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Chapter 6.   Calibrator Operation

6.1   Menus and Menu Navigation

The Main menu (**MENU**) contains four submenus that supply access to all features, tools, and functions. The three submenus are: Temperature Setup, Program Setup, and System.

Table 8 displays and describes the buttons used to navigate the submenus.

Table 8: Buttons for Navigation

Button	Navigation Function
F1 **F2** **F3** **F4**	Function softkeys to open submenus.
◖ ◗ ⬢ ⬢	Scroll menus, increases or decreases values, and highlights selections.
ENTER	Saves changes and navigates to the next menu.
EXIT	Cancels all changes and navigates back to the Main menu.

6.1.1   Temperature Setup Menu (TEMP SETUP)

The Temperature Setup menu contains Field Metrology Well functions related to temperature setup. The TEMP SETUP menu has three submenus: SETUP, CUTOUT, and STATUS.
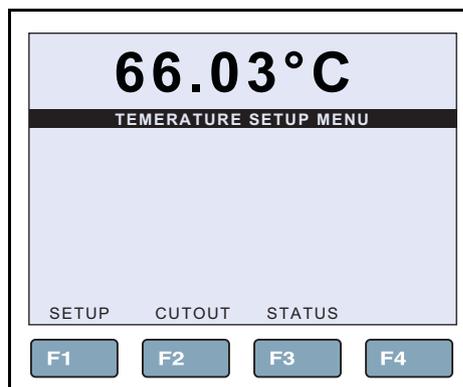

Figure 10: Temperature Setup Menu

6.1.1a Temperature Setup

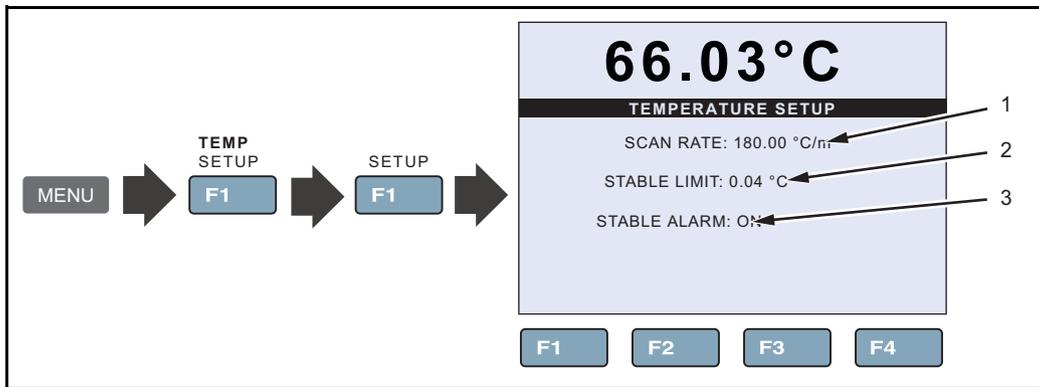Table 9 displays and describes the menu selections on the Temperature Setup menu.

Figure 11: Temperature Setup Menu Sequence

Table 9: Temperature Setup Menu

Item	Function
1	**SCAN RATE** sets the rate at which the Calibrator heats or cools in degrees per minute (°C/min or °F/min). The Scan Rate can be set from 0.1 °C/min to 500 °C/min (0.2 °F/min to 900 °F/min). *Note:* *The actual Scan Rate is limited to the natural rate the Product heats and cools. This is less than the maximum Scan Rate setting.*
2	**STABLE LIMIT** sets the temperature stability parameter the Calibrator uses to determine when the temperature is stable enough to make a measurement. When the temperature is within the range of the Stable Limit, the Calibrator displays a flat bar (---) on the Main screen (Stability Status Indicator) and audibly sounds the Stable Alarm if it is set to ON (see "Stable Alarm" below). The Stable Alarm sounds once per SETPOINT. Example: A specific calibration process requires the instrument to operate within ±0.1°C. "0.1" is entered into the Stability Limit parameter. When the block temperature is within ±0.1°C, the Stability Status indicator on the Main screen changes to a flat line (---) and the Stable Alarm sounds once. *Note:* *The LTR -90 should not be expected to operate better than the stability specification found in the Specifications section of this manual. Thus, the minimum setting of the Stability Limit should not be less than the stability specification. See the "Base Unit Specifications" in Chapter 2.*
3	**STABLE ALARM** turns on or turns off the audible Stable Alarm that sounds when the block temperature is within the Stable Limit. See "Stable Limit" above.

6.1.1b Cutout

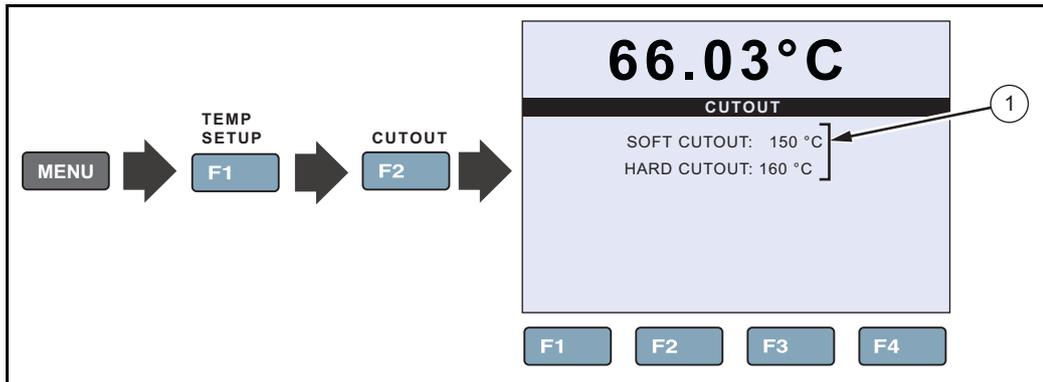Table 10 displays and describes the menu selections on the Cutout menu.

Figure 12: Cutout Key Sequence

Table 10: Cutout Menu

Item	Function
1	**SOFT CUTOUT** and **HARD CUTOUT** are limit parameters that shut off power to the heat source if the well temperature exceeds the set limit value.
	The Soft Cutout is a safety barrier to protect probes from temperatures more than their specified temperature limits.
	The Hard Cutout protects the Calibrator from irreparable internal damage. See "Set Soft Cutout" on page 31.
	Note: *The Soft Cutout is user configurable and should be set within 5°C to 10°C above the temperature limit of the instrument being calibrated. The Hard Cutout is not user configurable and is set by the factory to approximately 160°C.*
	If the cutout is activated because of an excessive well temperature, the Calibrator enters a "Cutout mode" where power to the heat source is shut off to immediately cool the Calibrator and instrument. When in Cutout mode, the instrument displays **"CUTOUT"** above the Stability Status indicator. The instrument stays in Cutout mode until the temperature is below the cutout SETPOINT and the cutout is reset. See "Reset an Over-Temperature Cutout" on page 31.

6.1.1c   Cooler Status

Table 11 displays and describes the menu selections on the Cooler Status menu.

Note: *The information on the Cooler Status menu is not editable. Kaye personnel use this information to help troubleshoot the system if a malfunction occurs.*
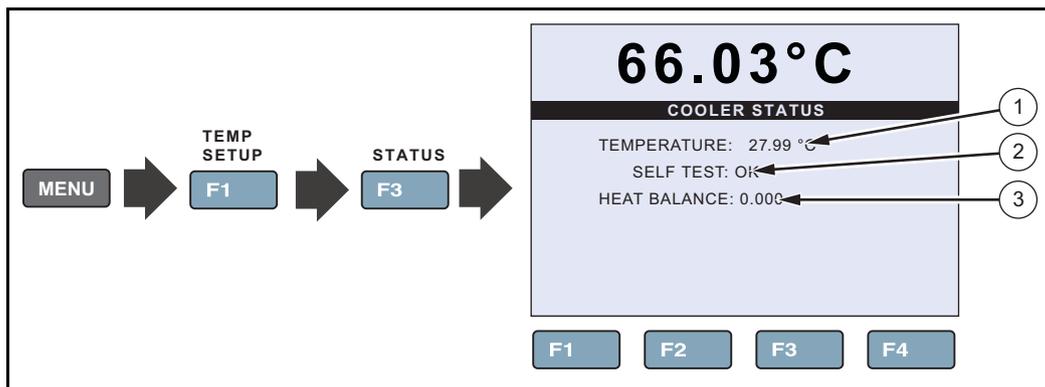

Figure 13: Cooler Status Menu Sequence

Table 11: Cooler Status Menu

Item	Function
1	TEMPERATURE displays the temperature of the condenser.
2	SELF TEST displays the Stirling Cooler self-test result.
3	HEAT BALANCE displays the power difference between the top and bottom heaters.

6.1.2 Set Temperature

A set temperature value is referred to as a "SETPOINT". The Calibrator uses the SETPOINT value to know what temperature to heat or cool to. Use the procedures in the subsequent sections to manually set a SETPOINT, load a SETPOINT preset, or change a SETPOINT preset.

6.1.2a   Set the Temperature SETPOINT Manually

To adjust the Calibrator temperature SETPOINT manually (see Figure 14):

1. Push [SET PT.] .

2. Push **ENTER**.

3. Push ◖ and ◗ to highlight a digit, then push ⬤ to increase the digit or push ⬤ to decrease the digit.

4. Push **ENTER** twice to save the SETPOINT temperature and start the Calibrator.
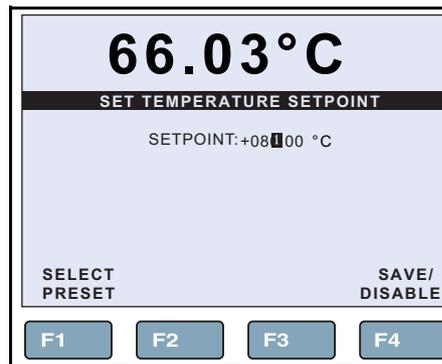

Figure 14: Set Temperature SETPOINT

6.1.2b   Set the Temperature with a Preset SETPOINT

The Calibrator stores eight user-configured preset SETPOINT temperatures to help quickly set a temperature. To change a SETPOINT preset see "Change a Preset SETPOINT" below.

To load and use a preset SETPOINT (see Figure 15 below):

1. Push `SET PT.` on the Main screen.

2. Push `F1`.

3. Push `◀` or `▶` to move between presets (1 through 8).

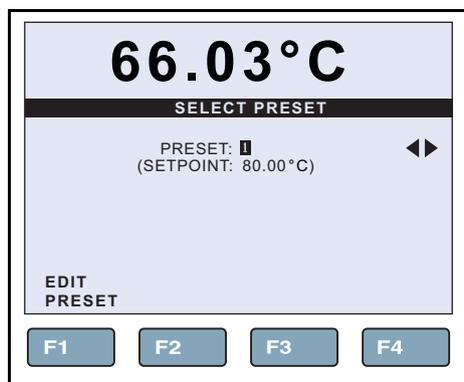4. Push `ENTER` to select a preset.

Figure 15: Preset Selection

6.1.2c   Change a Preset SETPOINT

To change a preset SETPOINT (see Figure 15 above):

1. Push `SET PT.` on the Main screen.

2. Push `F1`.

3. Push `F1`.

4. Push `▲` or `▼` to move between presets (1 through 8). Highlight the preset to change, then push `ENTER`.

5. Push `◀` and `▶` to highlight a digit, then push `▲` to increase the digit or push `▼` to decrease the digit.

6. Push `ENTER` to save the preset.

6.1.3 Cancel or Stop Temperature Change

To cancel or stop temperature change:

1. Push `SET PT.` on the Main screen.

2. Push `F4`.

6.1.4 Set a Soft Cutout

Soft Cutout is an upper-heat limit that protects the probes. The Hard Cutout protects the Calibrator and it cannot be changed (set by factory).

To set a Soft Cutout (see Figure 16 below):

1. Push **MENU** .

2. Push **F1** .

3. Push **F2** .

4. Push **ENTER** to select the Soft Cutout.

5. Push **◀** and **▶** to highlight a digit, then push **▲** to increase the digit or push **▼** to decrease the digit..
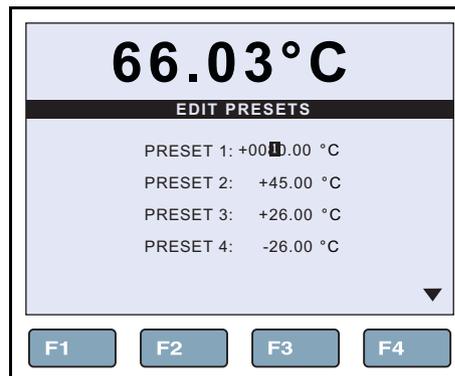
6. Push **ENTER** to save the Soft Cutout.

Figure 16: Soft Cutout

6.1.5 Reset an Over-Temperature Cutout

If the Soft or Hard Cutout is exceeded, the Calibrator enters Cutout Mode and must be reset.

To exit Cutout mode and reset the Calibrator:

1. Let the Calibrator cool to below the Soft Cutout limit.

2. After it has cooled, push **SET PT.** followed by **ENTER** to reset the Calibrator.

6.1.6 Programs (Automated Tests)

The Program menu (PROGMENU) supplies access to the automated and manual Program selections (see "Program Setup" on page 33). A Program is an automated test that can be configured and run on an instrument.

6.1.6a   Run a Program

To run a Program:

1. Push **MENU** .

2. Push **F2**

3. Push **F1** .

4. Push ❯ to change the **TEST STATUS** to **RUN**.

5. Push **ENTER** to save.

6. Push **EXIT** twice to leave programming.

6.1.6b   Stop a Program

To stop a Program:

1. Push **MENU** .

2. Push **F2** .

3. Push **F1** .

4. Push ❯ to change the **TEST STATUS** to **OFF**.

5. Push **ENTER** to save.

6. Push **EXIT** twice to leave programming.

6.1.7 Program Menu (PROG MENU)

The Program menu supplies access to the automated and manual program selections (see Figure 17 below). A Program is a test that can be configured and run to calibrate an instrument.
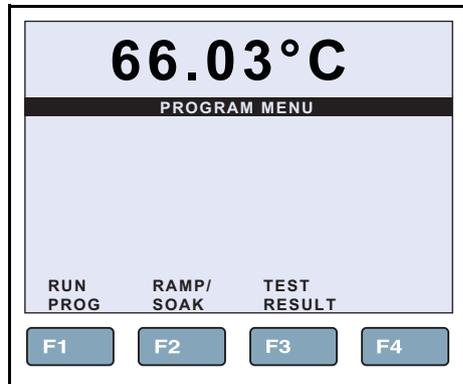

Figure 17: Program Menu

6.1.7a Program Setup

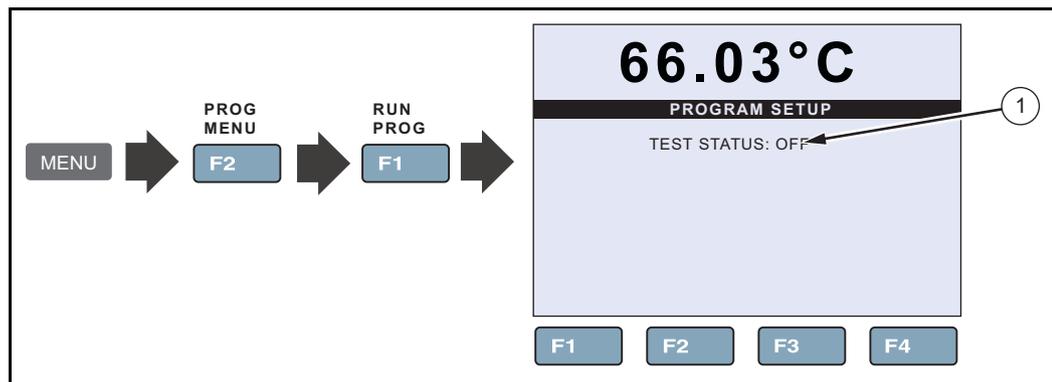Table 12 displays and describes the menu selections on the Program Setup menu.

Figure 18: Program Setup Menu Sequence

Table 12: Program Setup Menu

Item	Function
1	**TEST STATUS** starts (ON) or stops (OFF) a Program.

6.1.7b   Ramp/Soak

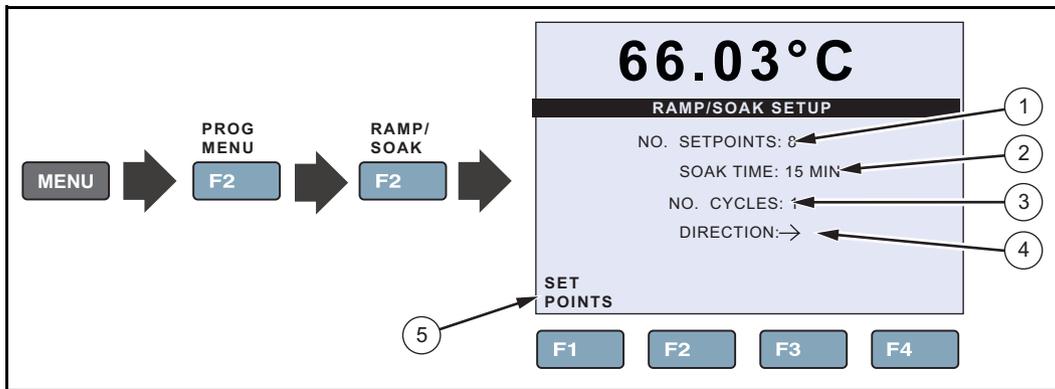Table 13 displays and describes the menu selections on the Ramp/Soak Setup menu.

Figure 19: Ramp/Soak Key Sequence

Table 13: Ramp/Soak Setup Menu

Item	Function
1	**NO. SETPOINTS** is the number of SETPOINTS for a Program. Eight SETPOINTs can be set for the program. Set the maximum number of SETPOINTS necessary.
2	**SOAK TIME** is the duration (in minutes) that each of the programmed SETPOINTS temperature is maintained. The time starts when the temperature settles to within the specified stability. The Stability Limit is set in the Temperature Setup menu (see page 25).
3	**NO. CYCLES** is the number of times that the Program is repeated.
4	**DIRECTION** controls whether the SETPOINTS are sequenced in one direction "" (ascending from 1 to 8) or in both directions $\circlearrowleft$ (ascending from 1 to 8 and then descending from 8 to 1) before the sequence is repeated. If the both directions option is selected, the Program sequences from the first SETPOINT to the last and then reverses direction sequencing from the last to the first.
5	**SETPOINTS MENU** opens a menu to set each of the SETPOINTS for the Program. Only the number of SETPOINTS defined by NO. SETPOINTS will be displayed.

6.1.8   System Menu (SYSTEM MENU)

The System menu lets the user set up the display settings, communications protocol, password settings, calibrations settings, and view system information (see Figure 20 below).
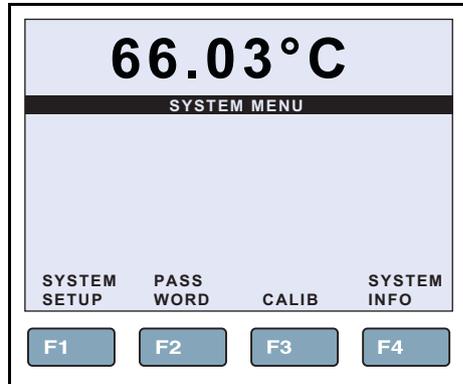

Figure 20: System Menu

6.1.8a   Display Setup

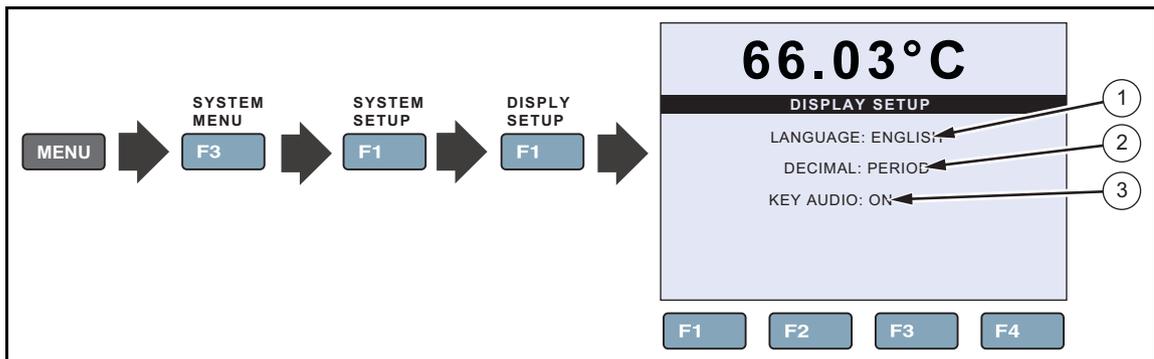Table 14 displays and describes the menu selections on the Display Setup menu.

Figure 21: Display Setup Key Sequence

Table 14: Display Setup Menu

Item	Function
1	**LANGUAGE** sets the display language. See "Change Language" on page 10.
2	**DECIMAL** sets the decimal separator to be a period (.) or a comma (,).
3	**KEY AUDIO** turns on (ON) or turns off (OFF) the key-beep sound. See "Toggle Key Beep On or Off" on page 11. **Note:** *With the Main screen shown in the display, push* **F1** *and* **F3** *at the same time to quickly toggle key beep on or off.*

6.1.8b Communications Setup

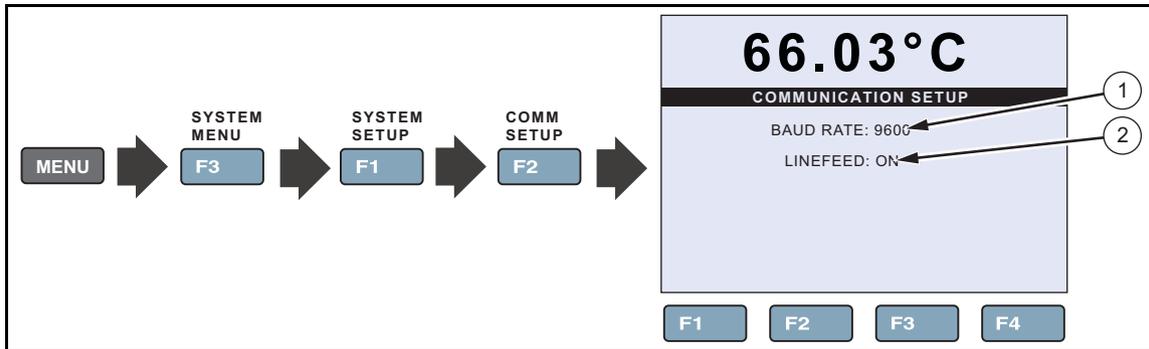Table 15 displays and describes the menu selections on the Communication Setup menu.

Figure 22: Communication Setup Key Sequence

Table 15: Communication Setup Menu

Item	Function
1	**BAUD RATE** is the serial communication transmission rate or baud rate. BAUD can be set to 1200, 2400, 4800, 9600, 19200, or 38400 baud.
2	**LINEFEED** turns on or turns off transmission of a line feed character (LF, ASCII 10) after transmission of a carriage-return.

6.1.9 Calibration Setup Menu

The Calibration Setup menu supplies access to all calibration parameters for the Calibrator. Calibration parameters are set at the factory when the instrument is calibrated. Access to these parameters is protected by a password to prevent unauthorized changes that could make the Calibrator inoperable. Calibration is required yearly, so these parameters require periodic adjustments by trained, knowledgeable personnel to maintain the accuracy of the instrument.

CAUTION! ⚠ **Do not change the values of the control parameters from the factory set values. Calibration parameters must be correct for the instrument to function properly.**

6.1.9a   System Information

Table 16 displays and describes the menu selections on the System Information menu.
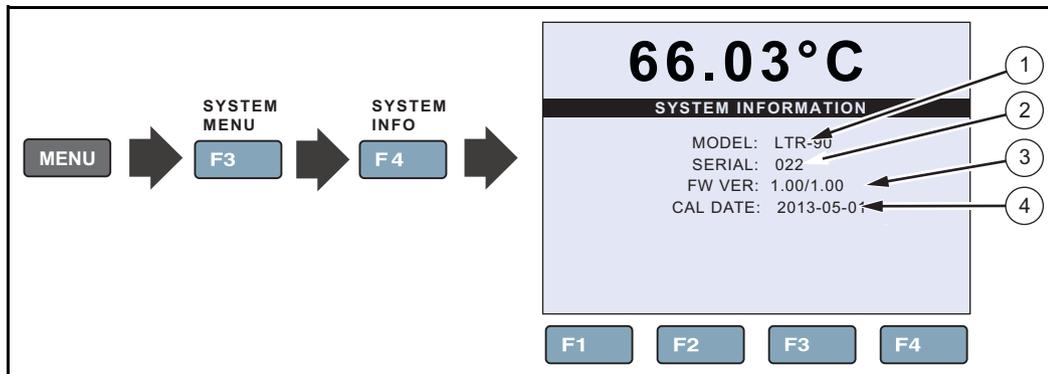

Figure 23: System Information Menu Key Sequence

Table 16: System Information Menu

Item	Function
1	**MODEL** displays the model number of the Calibrator.
2	**SERIAL** displays the serial number of the Calibrator.
3	**FW VER** displays the firmware version of the Calibrator.
4	**CAL DATE** displays the calibration date of the heat source.

[no content intended for this page]

Chapter 7.   Maintenance and Troubleshooting

7.1   Introduction

This chapter supplies information on how to service the Calibrator.

7.2   Maintenance

7.2.1   Clean the Product

Clean the Product surfaces with a damp cloth and mild detergent. Make sure liquids do not go into the Product.

7.2.2   Moisture Removal

When the Calibrator is run at a temperature below 0°C for a long period of time, moisture can build up in the well. This moisture needs to be removed from the well.

To remove the moisture from the well and the insert probe holes:

1. Remove the rubber well insulator.

2. Set a 100°C SETPOINT (see Chapter 6).

3. Cool the unit back to ambient.

4. Clean the insert (see "Clean the Insert").

Note: *Before you clean or decontaminate the Product with a procedure not recommended by Amphenol Advanced Sensors, speak with a Amphenol Advanced Sensors Customer Service associate for more information.*

7.2.3   Clean the Insert

The insert must be removed and cleaned regularly to prevent the buildup of hard-water deposits. Hard-water deposits can make it difficult to remove the insert from the Calibrator. If the insert is stuck in the well, use the special instructions in the "Insert Installation and Removal Procedure" in Chapter 5.

To clean the insert, remove the insert with the removal procedure in Chapter 5. After the insert is cool, wipe the insert with a cloth.

7.2.4 Change the Fuse

The Calibrator has a product fuse that protects from overcurrent.

<u>WARNING!</u> To prevent possible electrical shock, fire, or personal injury, use only specified replacement parts.

To replace the fuses (see Figure 24 below):

1. Disconnect the mains-power cord from the power-entry module.

2. Open the power entry module and remove the fuse holder.

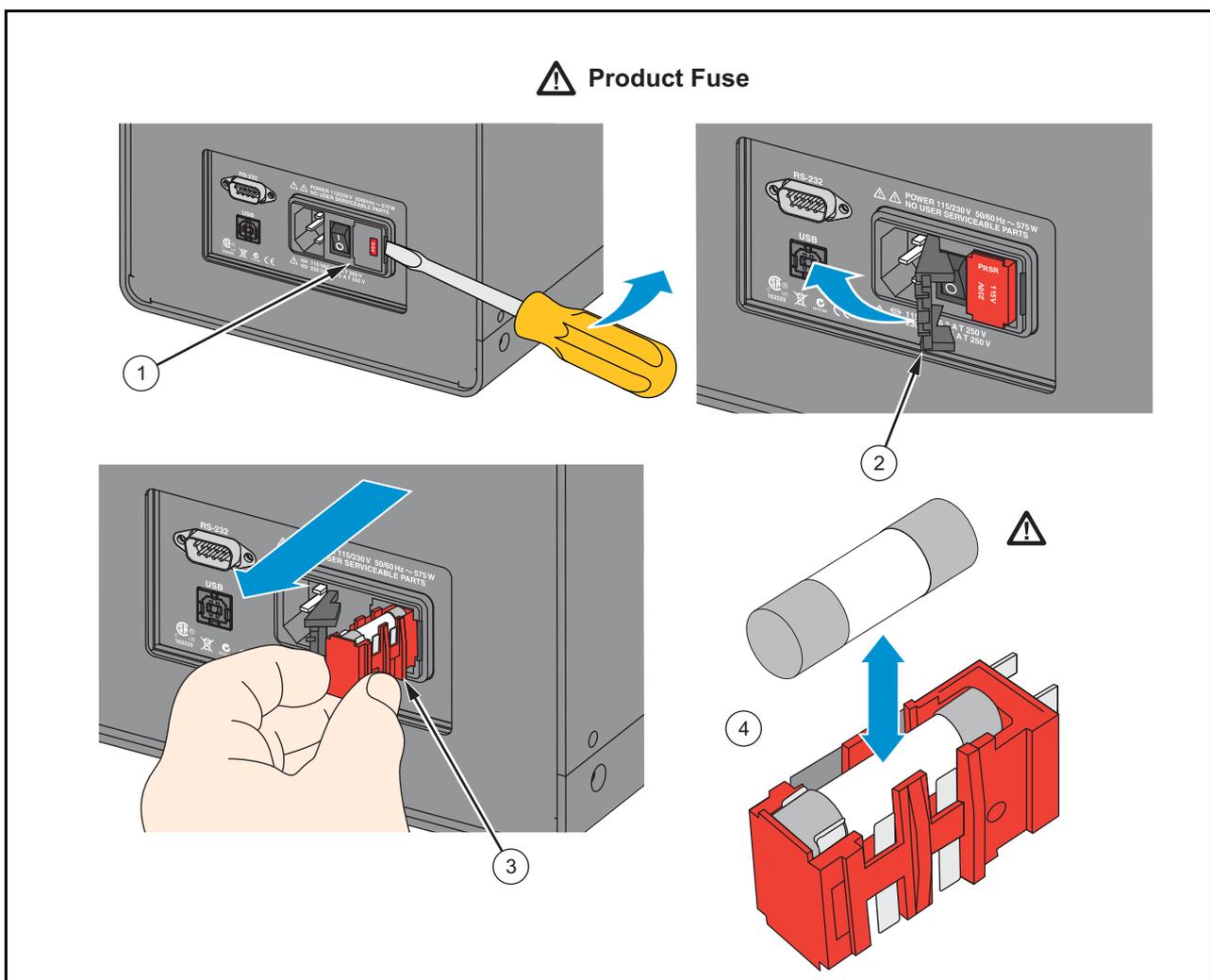3. Replace the fuse with exact replacements as indicated in the specifications in Chapter 2.

Figure 24: Changing the Product Fuse

7.3   Troubleshooting

In the event that the Product functions abnormally, Table 17 can help find and solve the problem. Several possible problem conditions are described with likely causes and solutions. If a problem occurs, please read this section carefully and attempt to understand and solve the problem. If the Product seems faulty or the problem cannot otherwise be solved, contact Amphenol Advanced Sensors Customer Service for assistance. Be sure to have the instrument model number, serial number, and voltage available.

Table 17: Troubleshooting Chart

Problem	Causes and Solutions
The instrument does not turn on.	**Cause:** Check the fuses
	Solution: If a fuse blows, it could be because of a power surge or a component failure. Replace the fuse once. DO NOT replace the fuse with one of a higher current rating. Always replace the fuse with one of the same rating, voltage, and type. If the fuse blows a second time, it is likely caused by failure of a component part.
	Cause: Power Cord.
	Solution: Check that the power cord is plugged in and connected to the instrument.
	Cause: AC Mains Power. **Solution:** Insure the circuit that supplies power to the instrument is on.
Blank display. The instrument powers up and the fan turns on, but the display is blank.	**Cause:** Contrast.
	Solution: Check the screen contrast. Toggle the down arrow key to see if the screen contrast darkens.
	If the contrast is not the issue, contact Amphenol Advanced Sensors Customer Service
The instrument heats or cools slowly.	**Cause:** Scan Rate.
	Solution: Check the Scan Rate settings. The Scan Rate may be set at too low a rate per minute for the current application.
The display displays an abnormal temperature.	**Cause:** The sensor is disconnected, open or shorted.
	Solution: Please contact a Service Center for further instructions.
The display displays CUTOUT.	**Cause:** Cutout limit was exceeded.
	Solution: If the Metrology Well exceeds the temperature set in the soft cutout menu, or if it exceeds the maximum operating temperature of the instrument, a cutout condition occurs. If this happens, the unit enters cutout mode and will not actively heat or cool until the user issues the command to clear the cutout or resets the instrument. See "Reset an Over-Temperature Cutout" in Chapter 6.

Table 17: Troubleshooting Chart (Continued)

Problem	Causes and Solutions
Temperature readout is not the actual temperature of the temperature block or incorrect temperaturereadingonthedisplay.	**Cause:** Operating Parameters. **Solution:** Check to make sure all operating parameters for the Product, reference thermometer, and/or probe parameters match the Report of Certification that was sent with the instrument and/or probe. **Cause:** Electrical Interference **Solution:** Look for sources of electrical interference, such as motors, welders, generating equipment nearby, or ground loops. Try shielding wires, removing ground loops, or changing location.
Probes stuck in the well at low temperatures.	**Cause:** Moisture. **Solution:** If the Product has been used at low temperatures for extended periods of time, moisture could possibly have built up in the well that formed ice. Set the temperature high enough to melt ice to remove probes. Set the SETPOINT to +100 °C and let the moisture evaporate out of the system.
Insert stuck in well.	**Cause:** If maintenance has not been performed on the insert as described in the Maintenance Section and the insert cleaned periodically, hard water build-up on the insert may cause it to stick. **Solution:** Use the special removal instructions in the "Insert Installation and Removal Procedure" in Chapter 5.If this does not remove the insert, contact Amphenpol Advanced Sensors Customer Service.
Password needed.	**Cause:** Password is required to change certain parameters. **Solution:** Enter password. The password by default is 1234.

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