



The Guardian III

Farm Bulk Tank Recording Thermometer

MODEL 5541 - Basic

Installation & Operator's Manual



Form AIC2057
© March 2007
Revised: 11/24/09

Note to Dealers: Once you have installed the Guardian and initiated operation, please leave this manual with the dairy producer.

Thank You,
Anderson Instrument



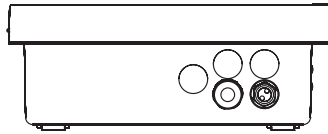
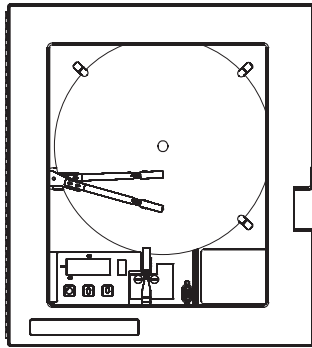


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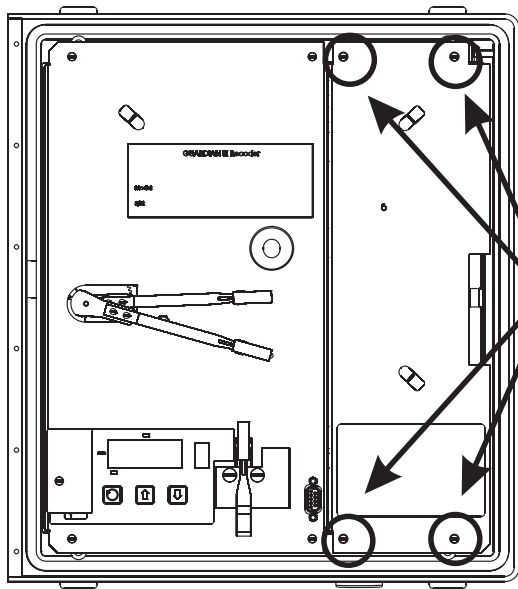
FIELD WIRING AND INSTALLATION



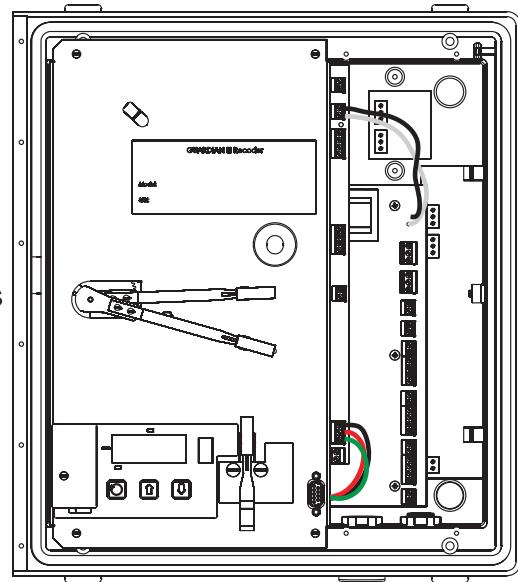
Bottom of case has pre-drilled wiring penetrations. It is not recommended that additional case penetrations be made.

View With Access Cover Installed

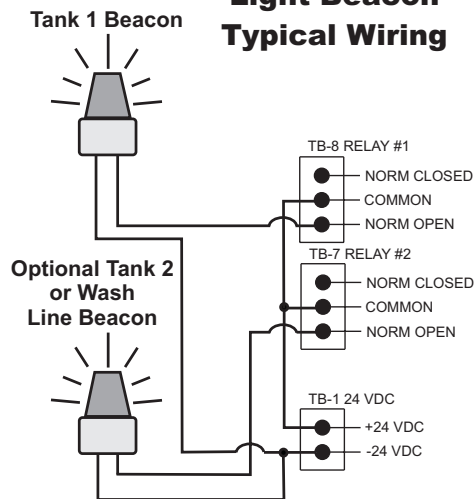
View With Access Cover Removed



Loosen Four Screws To Allow Access Panel To Be Removed



Light Beacon Typical Wiring



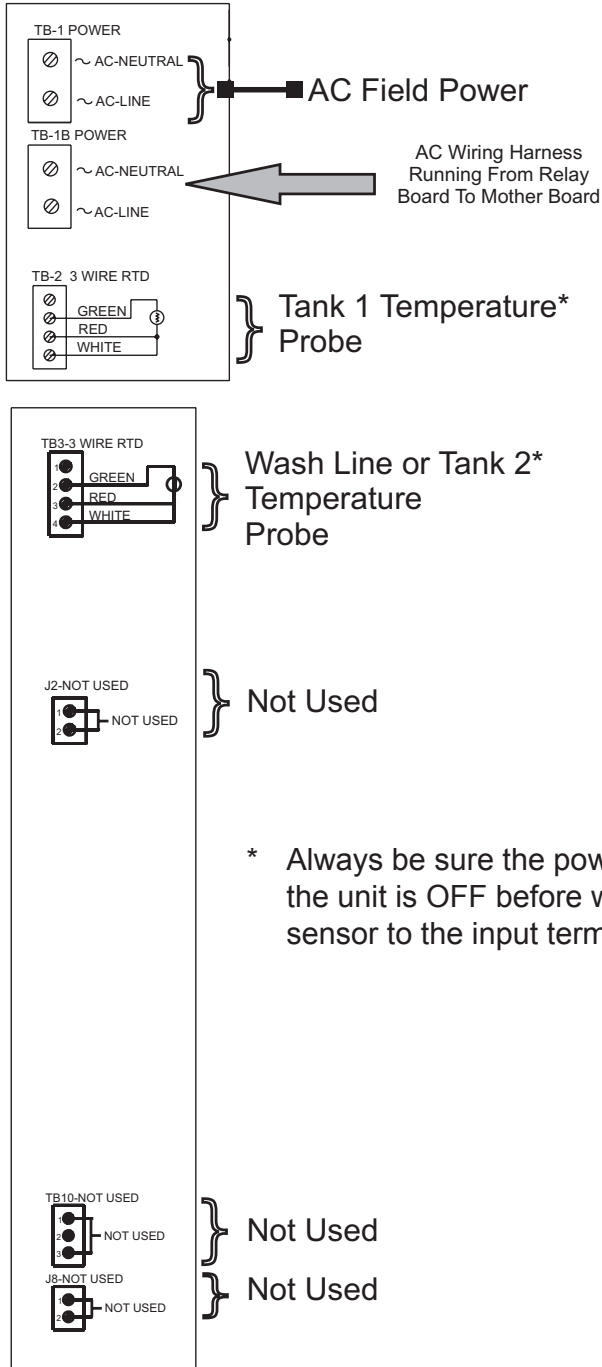
CAUTION
BE SURE ALL POWER IS DISCONNECTED PRIOR TO MAKING WIRING CONNECTIONS

NOTE
FOR PROPER CONNECTION, IT IS RECOMMENDED ALL WIRE TERMINATIONS BE STRIPPED AND SOLDER TINNED

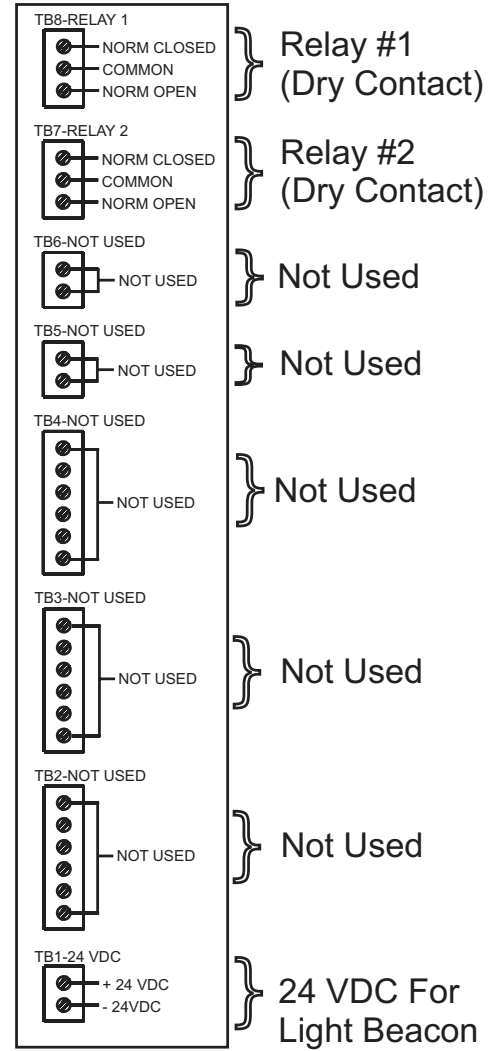
Light beacon is provided with a wall mount bracket.



Motherboard Terminal Connections

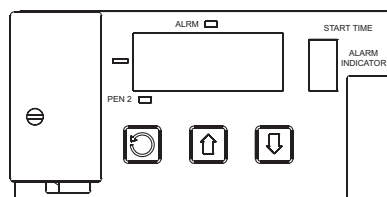


Relay Board Terminal Connections



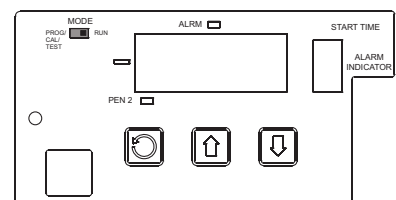
Power Up Procedure

Cover plate in place



Cover plate removed

Access to Run/Program Switch



I Overview

The Guardian is a circular chart recording thermometer specifically designed for dairy farm milking, cooling, storage, and cleaning applications. It provides an “around the clock” record of critical temperatures in the bulk tank, and in the milk line or COP sink. You can use this information to adjust or troubleshoot your cooling, storage, and cleaning systems. Optimally cooled milk and clean tanks and lines mean that your bacteria counts will diminish while you protect or even increase your profits.

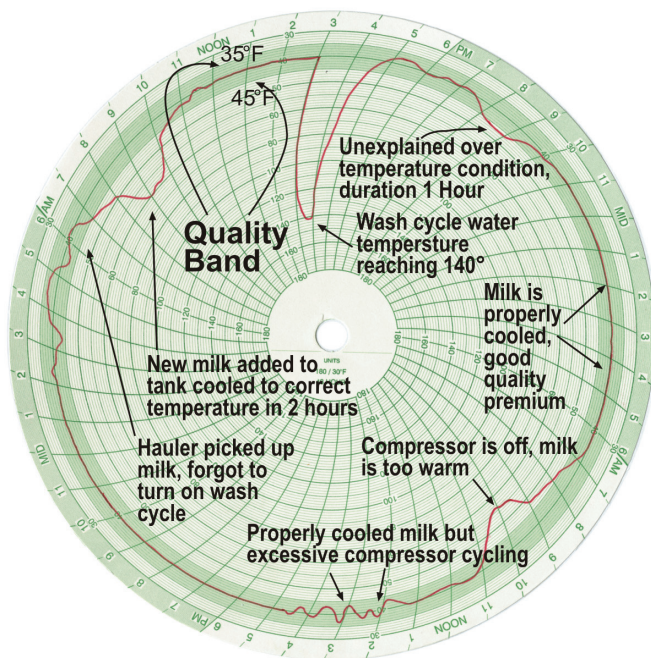
II Using Your Guardian Recording Thermometer

Your new Guardian will have one (red) pen, dedicated to bulk tank temperature, and a second (black) pen. This second pen can be used to monitor the temperature in the fill line during milking and cleaning, or for a second bulk tank, if present. The chart is designed to rotate once every 24, 48, 72 hours, or 7 days, depending on normal pick-up schedule. The shaded green band on the chart shows the quality range for milk once it has been cooled. If the pen line is outside the green quality band after the normal cooling time, you can assess your system and take corrective action.

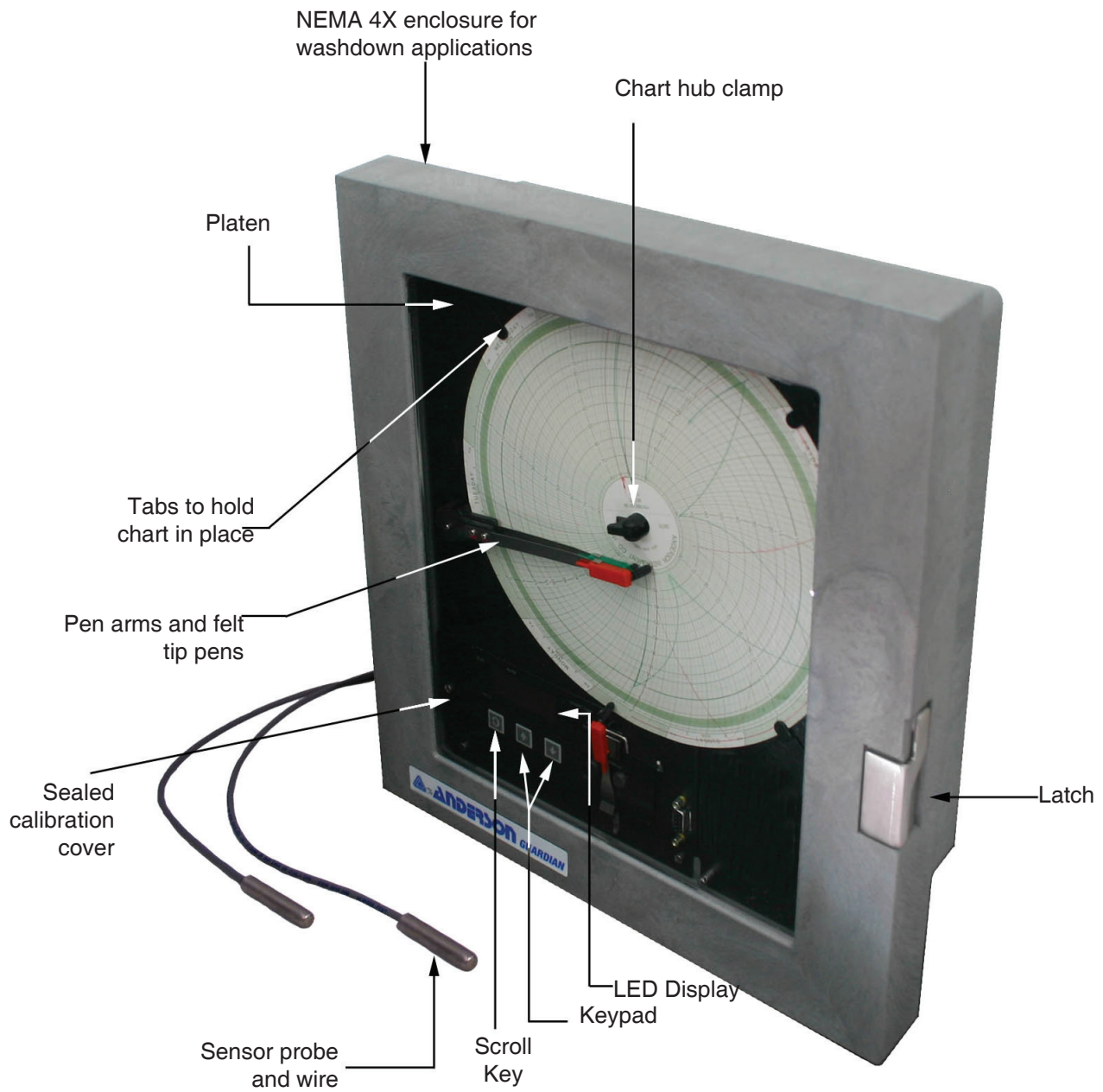
A “spiked” pen line on the chart shows the tank has been cleaned and indicates the time and temperature of the cleaning cycle. A digital display indicates the temperature at all times, will cycle between pen one and two temperatures once every three seconds.

Finally, all models are equipped with alarm relays that can be used for signaling problems. These relays can be wired by your installer to an external light, horn, or auto-dialer to alert you of an over-temperature condition so you can remedy it before it becomes critical.

An event pen located on the outer perimeter of the chart will record the state of the high alarm for each pen. This function is useful when utilizing the high alarm to confirm proper wash temperatures.



III Getting to Know Your Guardian



IV Regular Maintenance

You will need to change the chart on your Guardian regularly. Each chart is made for a specific time period: 24, 48, or 72 hour, or 7 days. The recording thermometer is programmed at the factory for the time period you specified when ordered. Usually the chart rotation time corresponds to the time between milk pick-ups. For example, if your milk is picked up every other day, you should order a Guardian recording thermometer with a 48-hour chart rotation time period. If you need assistance determining the correct chart rotation time, call Anderson Instrument at 1-800-833-0081.







Changing Your Chart

5 EASY STEPS TO CHANGE YOUR CHART

Action

Explanation

1. Open the door and press the **SCROLL** button.  CC, Chart Change will appear on the display.
2. Press the **DOWN** arrow button.  The pen will move to the outside perimeter of the chart.
3. Lift the black chart hub clamp in the center of the chart and remove the chart paper from under the chart holder clips around the outside of the chart. Try to avoid bending the pen arm.  Allows the removal of the chart paper.
4. Place a new chart on the black chart hub pin and align the correct time of day to the **START TIME** marker (see picture on page 9). Make sure the paper is placed under the black tabs around the outside of the recorder. Installation of new chart paper.
5. Close the black chart hub clamp and then press the **DOWN** arrow button.  The display will change back to the temperature. Close the recorder door and secure the latches. The unit is now back in normal operation.



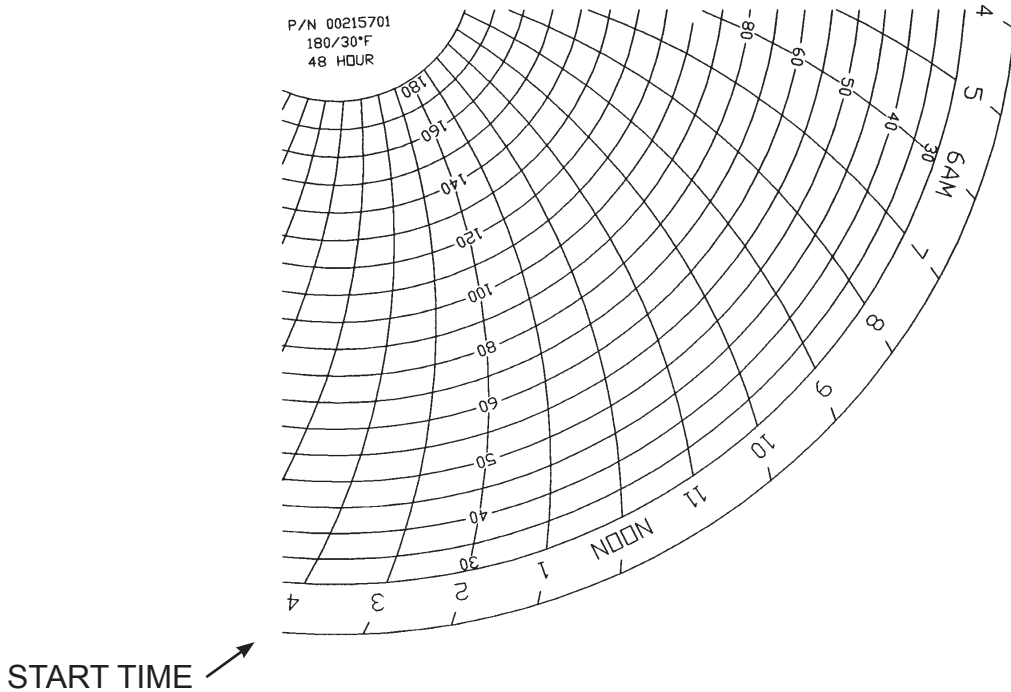
Keypad on the Guardian III





Chart Positioning

When placing a new chart on the Guardian, align the correct time of day to the “START TIME” marker located on the left of the event pen.



Changing the Felt Tip Pen on the Pen Arm

You will need to periodically change the felt tip pen on your Guardian. You will know this needs to be done when the chart is moving, the pen is in contact with the paper but the line is either faint or not printing at all.

Replacement pens are available from Anderson at 1-800-833-0081. See the “Customer Support and Replacement Parts” section for part numbers when ordering.

To change a pen, simply slide the felt tip marker off the end of the metal pen arm. Slide a new one on until it “clicks” in place.

<p>Installation</p> <p>Slide pen into holder (1) and push down (2) as shown by arrows.</p>	
<p>Removal</p> <p>To replace, pull up at back end (1) and push out (2).</p>	

Note: Be sure to replace the pen cartridges with the same type(color) that was removed. Be careful not to bend the pen arm while changing the pens.

For five replacement pens, order the following:

Black #60500408

Red #60500402





Changing the Rotation Time of the Chart

The chart rotation time is set at the factory before your Guardian is shipped. Rotation refers to the amount of time it takes the chart to complete one full rotation. For example, if the rotation time is set for 48 hours, it will take 48 hours for the chart to complete one full rotation.

To change the chart rotation time (i.e., from 48 hours to 7 days), follow this simple 11 step procedure:

1. Open the door to the Guardian recorder. On the front of the platen in the lower left hand corner is a small cover held in place by a screw. Remove the screw and the cover to reveal the **MODE** switch. Move the switch from the **RUN** position to **PROG/CAL/TEST**.
2. The display will read “Prog.” Press the **DOWN** arrow button. ↓
3. The display will read “Pen-1.” Press the **SCROLL** button. ↻
4. The display will read “Pen-2.” Press the **SCROLL** button. ↻ until the display reads “Chrt.”
5. Press the **DOWN** arrow button. ↓
6. The display will read “ChSP.” Press the **SCROLL** button. ↻
7. The existing rotation time period will be displayed (i.e., 48 hours). Press the **UP** or **DOWN** arrow keys to step through the rotation time periods (24 hr., 48 hr., 72 hr., 7 day). Stop at your desired rotation time. ↑ or ↓
8. Press the **SCROLL** button. The display will read ChSP. ↻
9. Press the **UP** arrow button. The display will read Chrt. ↑
10. Move the switch from the **PROG/CAL/TEST** position to the **RUN** position. Replace the small cover over the **MODE** switch and secure with the screw provided.
11. Install the new replacement chart onto the instrument. Be sure to use the chart which corresponds to the new chart speed that was just programmed. For example, if chart speed is programmed for 7 days, choose a 7-day chart. Close the door of the Guardian.

You are ready to go!





Calibration Check

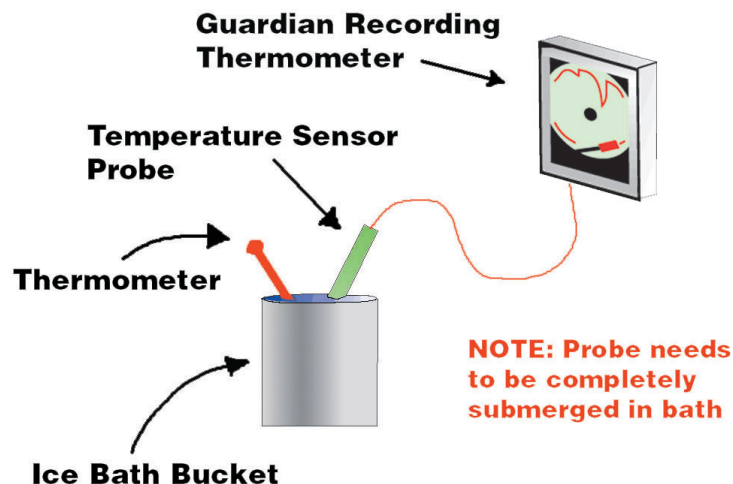
The Guardian is fully calibrated at the factory before it is shipped to you. There is a supplemental procedure detailing the process for complete calibration of the Guardian. Please consult Anderson at 1-800-833-0081 or your Dealer for assistance with the calibration procedure.

By running the Calibration Check Procedure, the Guardian verifies that the temperature displayed, recorded temperature on the chart, and the sensor temperature are all in agreement.

EQUIPMENT REQUIRED (See illustration below)

- Guardian Recording Thermometer with Sensor Probe
- Ice Bath
- Thermometer

1. Using an agitated ice bath (bucket of 50% ice and 50% water that is stirred), completely submerge the Guardian Sensor probe into the ice bath (bucket). The Guardian Recorder should be powered on.
2. After approximately five minutes, check the ice bath with a thermometer, verifying that the ice bath temperature is 32°F (0.0°C).
3. Verify that the reading on the display of the Guardian Recording Thermometer reads 32°F (0.0°C). Also verify that the pen position of the recording thermometer is at 32°F (0.0°C).
4. With the display reading 32°F (0.0°C) and the pen reading 32°F (0.0°C) the verification is complete.
5. The recording thermometer calibration is verified and the probe can be placed back into the milk tank thermowell.
6. If the pen does not match the LED display reading and the LED display reading is correct, a pen alignment should be performed. Please see pen alignment section for adjustments.
7. If the recorder temperature on the chart and the LED display are the same but are not within .75°F (1°C) of 32°F (0.0°C), an input calibration should be performed. Please consult Anderson at 1-800-833-0081 or your Dealer for the calibration manual and for assistance with the calibration procedure.





Pen Alignment (Positioning of pen on the chart)

Conduct a pen alignment when the sensor display and thermometer all agree but the red line on the chart is off by more than .75°F (1°C).

NOTE: The “Calibration Seal” may need to be removed to access the Mode Switch to gain access to the calibration section.

1. Open the door to the Guardian recorder. On the front of the platen in the lower left hand corner is a small cover held in place by a screw. Remove the screw and the cover to reveal the **MODE** switch. Move the **MODE** switch from the **RUN** position to the **PROG** position.
2. Press the **SCROLL** button until “CAL” is displayed. ↻
3. Press the **DOWN** button and “inP” will be displayed. ↓
4. Press the **SCROLL** button and “Chrt” will be displayed. ↻
5. Press the **DOWN** button and “Pen” will be displayed. ↓
6. Press the **DOWN** button once again and Pen Calibration is started. ↓
7. During Pen Cal, the pen will drive to the center of the chart, then the pen will drive to the inner most ring 180°F (82°C). The display will show “P1-Lo” (P2-Lo).
8. Using the **UP** or **DOWN** arrow buttons, adjust the pen positioning to the 180°F (82°C) division line. ↑ or ↓
9. Press the **SCROLL** button. The pen will drive to the 60°F (15.5°C) division on the chart. The display will show “PCNT”. ↻
10. Pressing the **UP** or **DOWN** arrows, adjust the pen position to the 60°F (15.5°C) division line. ↑ or ↓
11. Press the **SCROLL** button. The pen will drive to the outer most ring 30°F (-1°C). The display will show “P1-HI” (P2-HI). ↻
12. Pressing the **UP** or **DOWN** arrow, adjust the pen position to the 30°F (-1°C) division line. ↑ or ↓
13. Press the **SCROLL** button to save the new calibration values, and automatically start Pen 2 calibration. ↻
14. Repeat steps 8 through 12 for pen 2 (green pen).
15. Move the **MODE** switch to the **RIGHT** position. Replace the small cover over the **MODE** switch and secure with the screw provided.

If you have any additional questions concerning calibration, please consult Anderson at 1-800-833-0081.




V Troubleshooting


Your Guardian has been carefully designed to provide years of reliable data, helping you to produce quality milk. If you do have a problem though, call us at 1-800-833-0081.

The following is a checklist to help you troubleshoot common issues:

??? The chart is not rotating, pen does not print, and the LED display is not illuminating.


 Check to see that the unit is properly wired (see the “Wiring Connections” section of the installation manual) and that power is being applied to the recording thermometer.

??? The chart is not rotating, there is no red or black line forming on the chart paper and the LED display is illuminating.

 Check to see that the black chart hub clamp in the center of the chart is in the down (run) position. Also make sure that the program switch behind the small calibration plate is in the “RUN” position.

NOTE: Switch located behind screw sealed plate.


??? The chart is rotating, there is no red or black line forming on the chart paper and the LED display is illuminating.

 Check to see if the red felt tip is touching the paper. If not, gently bend the pen arm until the felt tip makes contact with the paper. If there is still no red line, check to see if the red felt tip on the pen arm is out of ink. Also verify that the pen cap has been removed. See the section titled “Changing the Red Felt Tip of the Pen Arm” for instructions on changing the pen.

??? The chart is rotating, but there are two red and black lines forming a circle around the chart.

 You need to change the chart. See the section titled “Changing your Chart” for chart changing instructions.

??? You are concerned that the Guardian (red and/or black pen) is not accurately recording milk temperature.

 Do a calibration check on the Guardian. See “Calibration Check” section in the Regular Maintenance Section of this manual.

??? One of the pens has moved to the inner ring of the chart and the display for that pen reads HI.

 The RTD sensor for that channel has failed. Disconnect power from the unit, install a new sensor, and reconnect the power.



VI Spare Parts

Call your local dealer or Anderson Instruments Inc. at 1-800-833-0081 for service or ordering spare parts.

CONSUMABLES

CHARTS

24 hour / °F	00215709
48 hour / °F	00215710
72 hour / °F	00215711
7 day / °F	00215712
24 hour / °C	00215705
48 hour / °C	00215706
72 hour / °C	00215707
7 day / °C	00215708

ACCESSORIES

Red Pen Cartridge	60500402 (5 pk.)
Black Pen Cartridge	60500408 (5 pk.)
Pen Blade with screws	64430501



VII Appendix



Programming Your Guardian

- **Programming Overview**

Your new Guardian recorder should be installed by a qualified professional. Most parameters will be factory programmed, or fine tuned at time of startup by the Installer. Future changes on items such as recording time or real time clock are updated via menu items shown in this section.

If you have a questions, feel free to call your Installer, or Anderson directly at 800-833-0081 before making program changes

- **Changing Parameters in Program Mode**

NOTE: When the **MODE** switch is placed in the Prog position the unit will stop rotating the chart and relays will de-energize.

The recorder setup programming can only be accomplished when the mode slide switch is placed in the **PROG/TEST/CAL** position, or the left position. This switch is located left of the display and is behind a sealed cover.

In the **PROGRAM/TEST/CAL** mode, the keys will function as follows: (see page 30 for detailed example).

SCROLL When a mode or section designation is displayed, **SCROLL** steps to the next mode or section. When a parameter code is displayed, **SCROLL** will display the corresponding parameter value. When a parameter value setting is displayed, **SCROLL** will display the next parameter code.



DOWN ARROW When a mode or section designation is displayed, **DOWN** will enter that mode or section. When a parameter code is displayed, **DOWN** will display the next parameter value. When a parameter setting is displayed, the setting will decrease, unless it is at a limit value.

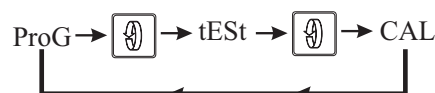


UP ARROW When a mode or section designation is displayed, **UP** will have no effect. When a parameter code is displayed, **UP** will revert back to the section designation. When a parameter setting is displayed, the setting will be increased unless it is at a limit value.

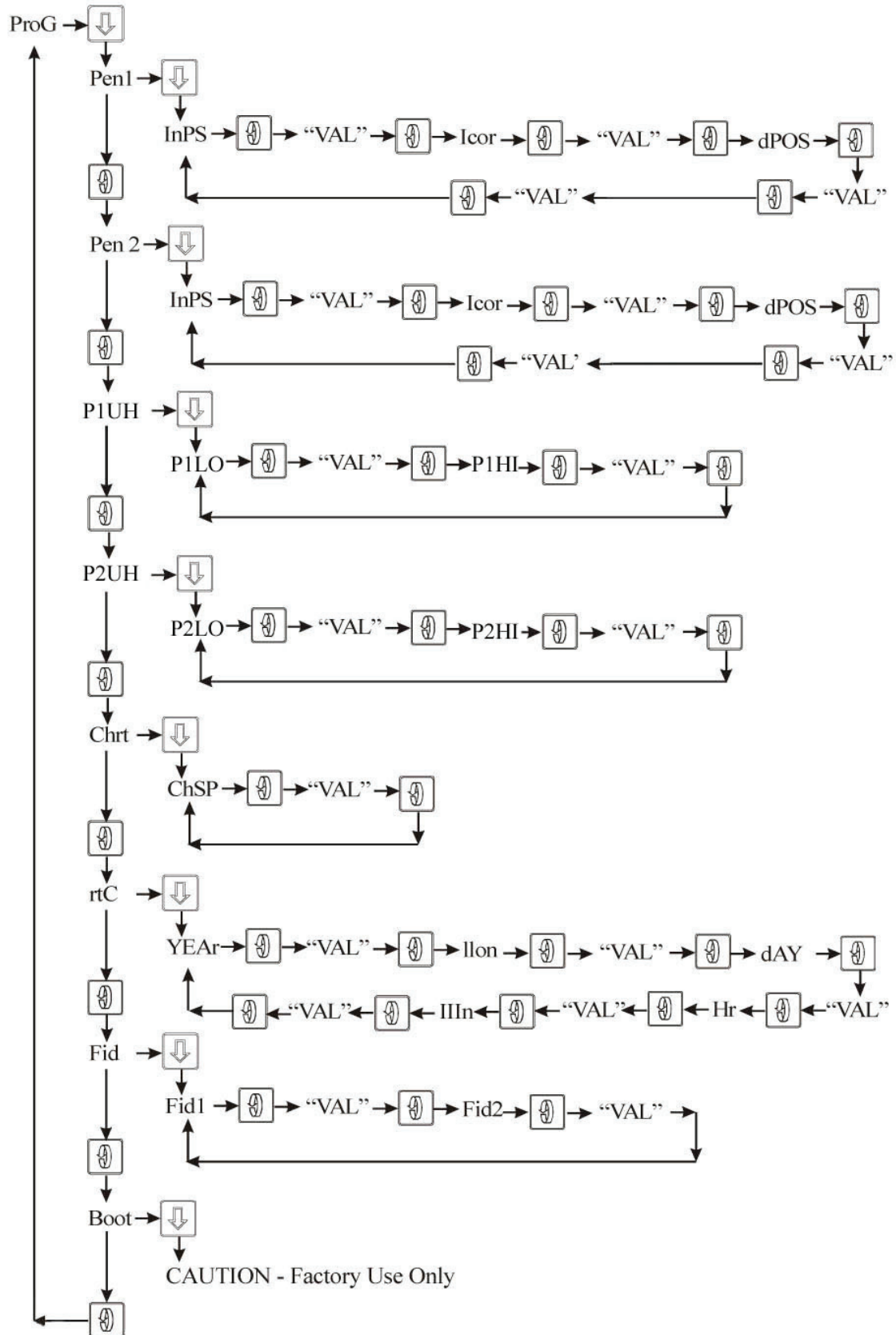


To enter the **PROGRAM/TEST/CAL** mode, the cover plate must be opened and the switch moved to the up position. The unit will display **Prog**. Subsequent depressions of the **SCROLL** will cause the unit to display **TEST**, then **CAL**, and then back to **Prog** (Program).

- **Main Menu**



- Program Menu Flowchart**



- **Program Menu Parameters**

Guardian Menu Definitions

Pen 1 (Configuration values for pen 1)

- InPS Selection for Deg F or Deg C
- Icor Input correction factor used to adjust recorder display and pen to match another reference device.
- dPOS Decimal position for recorder display

Pen 2 (Configuration values for pen 2)

- InPS Selection for Deg F or Deg C
- Icor Input correction factor used to adjust recorder display and pen to match another reference device.
- dPOS Decimal position for recorder display

P1UH (Pen 1 Alarm Setpoints)

- P1LO* Low setpoint for Pen 1
- P1HI* High setpoint for Pen 1

P2UH (Pen 2 Alarm Setpoints)

- P2LO* Low setpoint for Pen 2
- P2HI* High setpoint for Pen 2

Chrt (Chart programming parameters)

- ChSP Chart speed (24hr, 48hr, 72hr, and 7 day)

rtC (Real time clock programming values)

- YEAr Value representing year “20XX”
- IIon Value representing month
- dAY Value representing day
- Hr Value representing hour
- IIN Value representing minutes

Fid

- Fid1 First four digits of Farm Identification Number
- Fid2 Second four digits of Farm Identification Number

Boot

- Caution - this menu option for Factory Setup only

* See Alarm and Event Pen Guide





Alarm and Event Pen Guide

Low (Milk Temp) Alarms

The Low alarm is used to monitor the temperature of milk in the bulk tank. The setpoint is generally set at about 40 degrees, but for either channel, the setpoint is adjustable from 30°F (0°C) to 100°F (37°C). Should the milk temperature rise above the setpoint, the alarm will be triggered, the alarm LED's will light on the display, and the relay will change to the energized state (Normally open contacts are closed). Therefore, if an external alarm or beacon is to be wired to the relay, it should be wired to the normally open contacts of the relays, as shown in the wiring instructions.

For any temperature(s) between 100°F (37°C) and 120°F (48°C), all alarms and event pen logic is disabled. The relays are de-energized, the event pen remains in the “inward” position, and the alarm LED's on the display are not illuminated.

High (Wash Temp) Alarms

The high alarm is used to monitor the cleaning temperature of the tank(s) or pipeline. The setpoint is generally set at about 130°F, but for either channel, the setpoint is adjustable from 120°F (48°C) to 180°F (82°C). The event pen is programmed to trip (move toward the outside of the chart) when this setpoint is reached, providing a permanent record that the appropriate temperature was reached for cleaning.

The relays used for the low alarm may also be used here, with the following logic:

As the temperature rises above the setpoint, the relay will energize. Therefore, if a beacon is wired to alarm when the milk temperature is too hot, that same beacon will light when the wash temperature setpoint is met. This provides a visual indication that the proper temperature was met. To help differentiate these alarms, the alarm LED's on the display are not lit at the high alarm setpoint.





Specifications

• **INPUTS**

RTD	Type 100 ohm Platinum .00385 ohms/ohm/°C	Range -1°C to 82°C 30°F to 180°F
Sensor Fault Detection	LED displays “9999” and pen goes upscale if sensor break is detected LED displays “Hi” after 15-30 seconds	
Measurement Error	RTD: ±0.25% of span ± 1 degree	

• **RELAY OUTPUTS**

SPDT, contacts rated 5 amps resistive at 115 VAC, 2.5 amps resistive at 230 VAC, 1/8 HP at 230 VAC (single phase), 250 VA at 115/230

• **RECORDING**

Pen Colors:	Red (tank temp.), Black (wash cycle temp. or second tank temp) Red Event Pen (moves to chart periphery when minimum, adjustable wash temperature is met)
Chart Size:	10” (highlighted green zoned chart)
Chart Rotation:	User configurable; 24-, 48-, 72-hours, or 7 days
Chart Span:	0° to 80° C (30° to 180°F) reverse range, low temperature on outside of chart
Chart Recording Accuracy:	±0.75°F or 0.5% of chart span reference accuracy
Chart Rotation Accuracy:	0.5% of rotation time, assuming all backlash removed

• **OPERATOR INTERFACE**

Display:	Four digits 0.56” high, red seven-segment LED
Keypad:	Three keys for programming and unit operation

• **POWER REQUIREMENTS**

Line Voltage:	90-264 VAC, 50/60 Hz
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• **CONSTRUCTION**

Enclosure:	Injection moulded case & cover with acrylic window
NEMA Rating:	NEMA 4X standard
Conduit Openings:	Four; on bottom of unit
Mounting:	Wall; brackets provided
Dimensions:	13.5" wide X 15.5" high X 6.6" deep
Weight:	12 lbs. maximum

• **ENVIRONMENTAL AND OPERATING CONDITIONS**

Operating Temperature Range:	0°C to 50°C (32°F to 122°F)
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• **GENERAL INFORMATION**

Data Backup:	EEPROM for configuration parameters and calibration data
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• **WARRANTY**

Two Year Warranty

• **AGENCY APPROVALS**

UL Approved for USA and Canada - UL 61010-1, 2nd Edition,
QUYX - File E155886

• **INSTALL**

Recorder and Sensor Pre-calibrated



VIII Warranty

The company warrants base recorder for 24 months from date of shipment by the Company, and sensors for 12 months from date of shipment by the Company. Please keep proof of shipment date for warranty purposes. All work is performed at the factory.

Standard products manufactured by the Company are warranted to be free from defects in workmanship and material for a period of two (2) years from the date of shipment. Products defective in workmanship or material will be repaired or replaced at the option of the Company, at no charge to the Buyer. Final determination as to whether a product is actually defective rests with the Company. The obligation of the Company hereunder shall be limited solely to repair and replacement of products that fall within the foregoing limitations. This shall be conditioned upon receipt by the Company of written notice of any alleged defects, or deficiency promptly after discovery, within the warranty period. In the case of components or units purchased by the Company, the obligation of the Company shall not exceed the settlement that the Company is able to obtain from the supplier thereof. No products shall be returned to the Company without its prior consent. Products the Company consents to have returned shall be shipped F.O.B. to the Company's factory. The Company cannot assume responsibility or accept invoices for unauthorized repairs to its components, even though defective. The life of the products of the Company depends to a large extent upon type of usage.

THE COMPANY MAKES NO WARRANTY AS TO FITNESS OF ITS PRODUCTS FOR SPECIFIC APPLICATIONS BY THE BUYER NOR AS A PERIOD OF SERVICE UNLESS THE COMPANY SPECIFICALLY AGREES OTHERWISE IN WRITING AFTER THE PROPOSED USAGE HAS BEEN MADE KNOWN TO IT.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.





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