

Temperature Chart Recorder

Operation and Service Manual

Factory-Installed

TCR Version A

Standalone

TCR1 (0°C to 35°C) Version A

TCR2 (-5°C to 20°C) Version A

TCR3 (-50°C to 0°C) Version A



Document History

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Document Updates

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The screenshots and component images appearing in this guide are provided for illustrative purposes only, and may vary slightly from the actual software screens and/or product components.

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1 About this manual

This manual provides information on how to use the temperature chart recorder. It is intended for use by end users of this product.

1.1 Symbols

Symbols found in this document

The following symbols are used in this manual to emphasize certain details for the user:



Task Indicates procedures which need to be followed.



Note Provides useful information regarding a procedure or operating technique when using Helmer Scientific products.



CAUTION Advises the user against initiating an action or creating a situation which could result in damage to equipment or impair the quality of the products or cause minor injury.

Symbols found on the units

The following symbols may be found on the refrigerator or refrigerator packaging:



Caution: Risk of damage to equipment or danger to operator



Protective earth / ground terminal



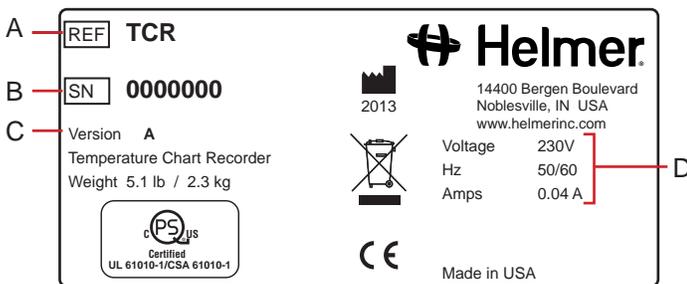
Manufacturer

1.2 Product Labels

The serial number for chart recorders installed on Helmer products can be found on the product's Product Specification label. For standalone chart recorders, the serial number can be found on the Product Specification label located on the rear panel.

Note

Helmer recommends recording the serial number on the front of this manual in order to provide more efficient service.



Sample Product Specification Label

Label	Description	Label	Description
A	Model	C	Version
B	Serial number (S/N)	D	Power requirements

Avoiding Injury

Review the following safety instructions before installing, using, or maintaining the chart recorder:

- ◆ Use the chart recorder for the purpose for which it was designed. Protection provided by the chart recorder may be impaired if the chart recorder is used improperly.
- ◆ Do not use the chart recorder if its components are damaged. Notify the appropriate personnel in your organization for guidance regarding usage and maintenance.
- ◆ Never attempt to physically restrict any of the moving components.
- ◆ Do not move or bump the chart recorder during operation.
- ◆ Before performing the procedures in this manual, review the specific safety instructions for each instruction.
- ◆ Perform only the maintenance and service described in this manual. Maintenance other than that specified in this manual should only be performed by technical service representatives authorized by Helmer.
- ◆ Inspect all electrical equipment and address any problems prior to installation.
- ◆ To adjust, maintain, or troubleshoot the chart recorder, you may need to either remove it from the product, or remove covers to access certain parts. Follow all safety instructions, including disconnecting the power as applicable.
- ◆ Decontaminate parts prior to sending for service or repair. Contact Helmer or your distributor for decontamination instructions and a Return Authorization Number.
- ◆ Use only the power cords supplied with the chart recorder (if applicable).

CAUTION

The product on which the chart recorder is installed has the potential of being a shock hazard. Review all safety instructions for the product prior to removing or installing the chart recorder.

1.3 General Information

The Temperature Chart Recorder (TCR) is an inkless instrument which continually records seven days of temperature information. This accessory can be installed within certain Helmer products, or purchased as a standalone unit to accompany other devices which require temperature monitoring.

2 Installation *(Standalone only)*

2.1 Location

- ◆ Stable horizontal or vertical surface (desktop, wall, undercounter).
- ◆ Access to a grounded outlet meeting electrical requirements for input voltage and frequency.
- ◆ Access to the power cord so it can easily be disconnected from the chart recorder.

2.2 Placement

Standalone chart recorders include a stand as well as mounting holes which allow you to place the device according to your needs. The rubber feet on the stand prevent scratches when the device is placed on a flat surface. The adjustment knob adjusts the viewing angle.

Adjust Viewing Angle

1. Using a #2 Phillips screwdriver, loosen pivot screws on either side stand.
2. Loosen the adjustment knob and pivot the chart recorder to the desired angle.
3. Hand tighten the adjustment knob.
4. Tighten the pivot screws using a #2 Phillips screwdriver.

2.3 Wall and Under Counter Placement

Two keyhole openings located on the back of the TCR allow the device to be mounted to a wall. The stand can be removed from the bottom of the TCR for wall mount, or reoriented for undercounter installation.

Note

The chart recorder stand must be removed prior to wall or under counter installation.

Remove Chart Recorder Stand

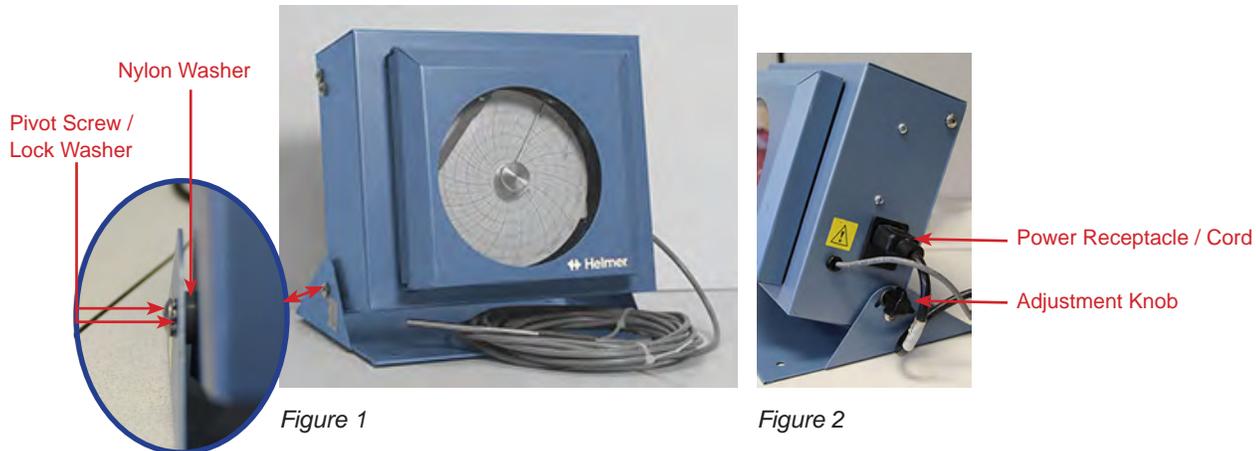


Figure 1

Figure 2

1. Disconnect the power cord from the power receptacle.
2. Unscrew and remove the adjustment knob and outer compression washer.
3. While holding the chart recorder in place, unscrew and remove the two pivot screws with lock washers, using a #2 Phillips screwdriver.
4. Remove the nylon washers and inner compression washer as you lift the chart recorder from the stand. Set the stand, adjustment knob and compression washer aside for future use.
5. On the chart recorder, reinstall the two screws, lock washers, and nylon washers previously removed.

Mount Chart Recorder to Wall



Figure 3

Note

Two mounting kits are needed when mounting a TCR to the wall.

1. Mark the wall with the location for the two anchors.
2. Install the mounting anchors in the wall.
3. Install the screws into the anchors, leaving a gap between the screw head and the anchor.
4. Align the wider end of the keyhole openings in the back of the chart recorder with the screw heads. Carefully place the chart recorder over the screws and slide downward to engage the screws in the narrow end of the keyhole. Ensure both screws are engaged in the narrow end of the key holes prior to letting go of the chart recorder.

Mount Chart Recorder Under Cabinet

Note

The screws from four mounting kits are needed when mounting the TCR under a cabinet.



Figure 4

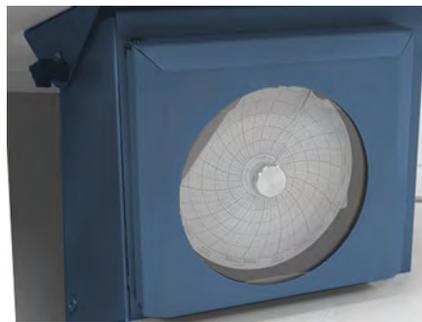


Figure 5

1. Using the chart recorder stand as a template, place the bottom of the stand under the cabinet with the adjustment slot on the left side, and mark the four screw locations on the underside of the cabinet (Figure 4).
2. While holding the stand in place, install the four screws from the mounting kits through the stand and into the underside of the cabinet using a #2 Phillips screwdriver. (The wall anchors are not needed.)
3. On the chart recorder, remove the two bottom pivot screws, lock washers and nylon washers, then reinstall the screws.
4. Remove the two top pivot screws (circled).
5. Slide the chart recorder between the sides of the stand, aligning the pivot holes in the stand with the pivot screw holes on the top of the chart recorder.
6. Insert the one nylon washer between the chart recorder and the stand on each side.
7. Reinstall both of the top pivot screws through the lock washer, through the pivot hole on the stand, through the nylon washer, and into the chart recorder. Do not tighten the screws all the way.
8. Install the adjustment knob by inserting it through the outer compression washer (black side toward the chart recorder), through the adjustment slot on the stand, and through the inner compression washer, then into the adjustment hole on the chart recorder.
9. Tilt the chart recorder to the desired angle, then tighten the knob to hold it in place.
10. Tighten the two top pivot screws to secure the chart recorder at the desired angle (Figure 5).

2.4 Connect AC Power

Chart recorders installed on Helmer products obtain main (AC) power through the product. Standalone chart recorders are shipped with a modular power cord.

 **CAUTION**

Before connecting to power, make sure the chart recorder is at room temperature.

2.5 Connect Backup Battery

The backup battery provides power to the chart recorder if AC power fails. The chart recorder is shipped from the factory with the backup battery installed but not connected to the leads. The leads must be connected to the battery to provide backup power to the chart recorder.

 **Note**

If chart recorder is operated on battery power, the battery should be replaced to ensure the back-up source has proper charge.

3 Configuration

3.1 Temperature Range

The chart recorder has three settings. The temperature range for a standalone chart recorder is set at the factory to match the model ordered. Each model has its own chart paper with the appropriate temperature range. The correct chart paper must be installed, and correct temperature range set in order to gain accurate temperature information.

Note

Chart recorders installed on Helmer products have the correct temperature range set at the factory for use with the product.

Temperature range	Helmer product	Range value
0 °C to 35 °C	Platelet Incubators	1 (LED single flash)
-5 °C to 20 °C	Refrigerators	2 (LED double flash)
-50 °C to 0 °C	Freezers	3 (LED triple flash)

Verify Temperature Range

1. Enter paper change mode by pressing and holding the C (Chart Change) button until the stylus starts to move to the left, then releasing the button. The LED flashes green to indicate the current temperature range value.
2. Exit paper change mode by pressing and holding the C (Chart Change) button until the stylus starts to move to the right, then releasing the button. The LED returns to a constant pattern.

Change Temperature Range

1. Enter paper change mode by pressing and holding the C (Chart Change) button until the stylus starts to move to the left, then releasing the button. The LED flashes green to indicate the current temperature range value.
2. Enter range change mode by pressing and holding the left arrow button. After about five seconds, the LED flashes red to indicate the selected temperature range value.
3. While continuing to press the left arrow button, press and release the right arrow button to cycle through and select the new range value.
4. Save the selected value by releasing the left arrow button. The chart recorder returns to paper change mode. The LED flashes green to indicate the current temperature range value.
5. Repeat steps 2-4 as necessary until the LED pattern indicates the correct range.
6. Exit paper change mode by pressing and holding the C (Chart Change) button until the stylus starts to move to the right, then releasing the button. The LED returns to a constant pattern.

3.2 Chart Paper

Products with the chart recorder already installed are shipped from the factory with chart paper packaged separately. Paper must be installed prior to use.

Each temperature range value requires a different chart paper. The temperature grid pre-printed on the paper corresponds with the temperature range. Be sure to use the correct paper for your product or application.

After seven days of continuous recording, the paper must be changed. If the paper is not changed, it will continue to rotate resulting in multiple temperature markings.

The chart recorder itself does not have an alarm to change the paper; however, an alarm can be set on select product models in which the chart recorder is installed. For more information and instructions to set the alarm, refer to the Operation Manual for your product.

Install / Replace Chart Paper

Note

For accurate temperature reading, ensure the current time is aligned with the time line groove when the chart knob is fully tightened.

1. Enter paper change mode by pressing and holding the C button until the stylus starts to move to the left, then releasing the button. The LED flashes to indicate the current temperature range value.
2. After the stylus has stopped, remove the chart knob by turning it counter-clockwise, then swing it toward the top of the chart recorder.
3. If chart paper is already installed, remove it by gently lifting the stylus and removing the paper.
4. Press the new chart paper onto the chart recorder
5. Gently lift the stylus and turn the paper so the correct time line coincides with the time line groove (*Figure 6*).



Figure 6

6. Hold chart paper in place while making sure the chart knob is fully tightened. (*Failure to fully tighten the knob can result in paper slipping and losing time.*)
7. Press and hold C button. When stylus begins to move right, release button.
8. Confirm stylus is marking on paper and stops at the correct temperature.
9. Calibrate chart recorder to match primary temperature if needed and close recorder door.

3.3 Calibration

Calibrate the chart recorder to ensure the temperature being marked matches that read by the chart recorder probe. The frequency for calibration and the acceptable tolerance may be determined by your organization. The chart recorder should be calibrated whenever the temperature range is changed.

Verify the probe is reading the temperature correctly by comparing the probe reading to the temperature measured by a calibrated independent thermometer. If the probe is not reading correctly, change the position of the stylus on the chart recorder so the temperature is marked in the correct location.

The chart recorder is calibrated at the factory prior to shipment.

Calibrate Temperature Probe

1. Using a calibrated reference thermometer, measure the temperature where the chart recorder probe is located after the chamber temperature has stabilized. If the probe is inserted into liquid, measure the temperature of the liquid. For more information and instructions, refer to the Operation Manual for the product in which the chart recorder is installed (if applicable).
2. Adjust the position of the stylus to reflect the appropriate temperature. The arrow buttons on the chart recorder indicate which direction the stylus will move. Press and hold the appropriate arrow button until the stylus has moved to the desired location, then release the button to save the setting. While the stylus is moving to the new location, the LED is off. After the button is released, the LED lights green (constant pattern) to indicate a return to normal operating mode.

4 Operation

4.1 Initial Power Up

Plug the power cord into a grounded outlet meeting the electrical requirements on the product specification label. Once power is connected, the chart recorder will begin an initialization sequence.

During the initialization sequence the LED will flash and the stylus will travel outward until the tip reaches near the outer edge of the chart paper, then back to the inner temperature ring of the chart paper. Finally, the stylus will swing out again and stop at the location corresponding to the temperature reading from the probe. The LED will return to a constant green upon reaching normal operation mode.

4.2 Temperature markings

The temperature marking will fluctuate as the temperature read by the probe fluctuates. A typical temperature marking fluctuates within a range of about 1 °C.

4.3 Visual indicators

The LED visually indicates the status of the chart recorder. The meaning of the LED pattern varies depending on the current chart recorder mode.

LED color/pattern	Mode	Meaning
Off	Test pattern	A test pattern is in progress.
	Normal operation	The chart recorder is not receiving power.
Green/Constant	Normal operation	The chart recorder is receiving AC power; and the backup battery for the chart recorder is installed and has sufficient power.
Red/Constant	Normal operation	The chart recorder is receiving AC power; and the backup battery for the chart recorder is either not installed or does not have sufficient power.
Red/Single flash (fast)	Normal operation	The chart recorder is receiving power only from the backup battery for the chart recorder.
Green/Single flash	Initialization	The chart recorder is initializing upon start-up or restoration of power.
	Normal	There is a problem with the probe circuit.
	Paper change	Temperature Range Value 1 (0 °C to 35 °C / incubator) is selected.
Red/Single flash (slow)	Range change	Temperature Range Value 1 (0 °C to 35 °C / incubator) is selected and can be changed.
Green/Double flash	Paper change	Temperature Range Value 2 (-5 °C to 20 °C / refrigerator) is selected.
Red/Double flash	Range change	Temperature Range Value 2 (-5 °C to 20 °C / refrigerator) is selected and can be changed.
Green/Triple flash	Paper change	Temperature Range Value 3 (-50 °C to 0 °C / freezer) is selected.
Red/Triple flash	Range change	Temperature Range Value 3 (-50 °C to 0 °C / freezer) is selected and can be changed.

5 Maintenance

Maintenance tasks must be completed according to the following schedule.

Note

These are minimum requirements. Regulations for your organization or physical conditions at your organization may require maintenance items to be performed more frequently. Follow the guidelines for your organization.

Task	Frequency		
	Quarterly	Annually	As Needed
Calibrate the chart recorder.			✓
Check the backup battery and replace it if necessary.	✓		
Clean the cover (standalone units only).			✓

5.1 Replace Backup Battery

The chart recorder has a visual alarm which is activated when the remaining battery charge is too low. When the alarm is active, the LED color changes from green to red (constant pattern) and remains active until the battery is replaced.

When the low battery alarm appears, the chart recorder can continue to operate on battery power for about 14 hours. While the chart recorder is operating on battery power only, the LED flashes red (fast).

Install Backup Battery

Note

Replace with 9V non-rechargeable alkaline (or equivalent) battery.

1. Disconnect the leads to the old battery and remove from holder.
2. Press the new battery into the holder and connect the leads. The LED color changes from constant red to constant green.

5.2 Test Chart Recorder Accuracy

Verify the mechanics of the chart recorder are working correctly by running a test pattern. Running a test pattern tests the full range of the chart recorder. The test prints a step pattern across the temperature range, regardless of the temperature range setting. During the test, the paper makes one complete revolution, then the chart recorder returns to normal operating mode. The pattern is used to check if the marking is being recorded accurately.

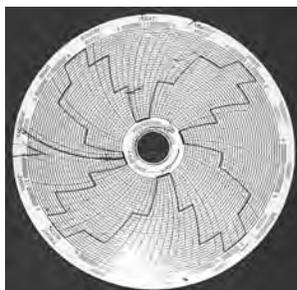


Figure 7

Run a Test Pattern

Press and hold the C (Chart Change) button and the right arrow button together until the LED turns off. The chart recorder marks the test pattern (Figure 7). When the pattern is completed, the LED lights green (constant pattern) to indicate a return to normal operating mode.

Stop a Test Pattern in Progress

Press and hold the C (Chart Change) button for one second. The stylus returns to the starting point, and the LED lights green (constant pattern).

5.3 Remove / Replace Rear Panel *(Standalone only)*

The rear cover must be removed to access the circuit board, stylus motor and paper motor.



Figure 8

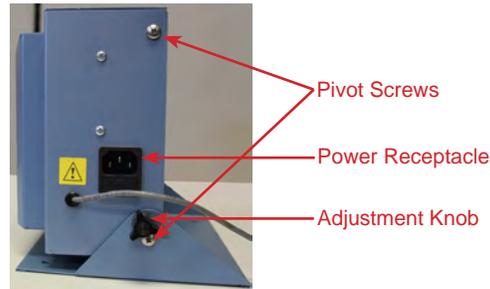


Figure 9

Remove Rear Panel

1. Disconnect the power cord from the power receptacle, and remove the modular cord from the chart recorder. Set the cord aside.
2. On the chart recorder stand, unscrew and remove the adjustment knob and outer compression washer.
3. While holding the chart recorder in place, unscrew and remove the two pivot screws with lock washers, using a #2 Phillips screwdriver.
4. Remove the nylon washers and inner compression washer as you lift the chart recorder from the stand. Set the stand and accessories aside.
5. Using a #2 Phillips screwdriver, remove all four pivot screws, then pull the rear panel away from the unit.

Replace Rear Panel

1. Replace the rear panel on the chart recorder in the same orientation as removed.
2. Insert four pivot screws and secure using a #2 Phillips screwdriver.
3. Slide the chart recorder between the sides of the stand, aligning the pivot holes in the stand with the pivot screw holes on the top of the chart recorder.
4. Insert the one nylon washer between the chart recorder and the stand on each side.
5. Reinstall both pivot screws with lock washers, through the pivot holes on the stand, through the nylon washer, and into the chart recorder. Do not tighten the screws all the way.
6. Install the adjustment knob by inserting it through the outer compression washer (black side toward the chart recorder), through the adjustment slot on the stand, and through the inner compression washer, then into the adjustment hole on the chart recorder.
7. Tilt the chart recorder to the desired angle, then tighten the knob to hold it in place.
8. Tighten the pivot screws to secure the chart recorder at the desired angle.

5.4 Probe Circuit Test

Test the probe circuit to ensure accurate readings are being recorded.

When the chart recorder is put into probe simulation mode, a jumper is added to the probe circuit in place of the chart recorder probe. The jumper causes the circuit board to provide a fixed resistance that simulates a temperature reading. The stylus should move to a fixed temperature on the paper.

While in probe simulation mode, the LED pattern indicates where the problem lies. If the LED changes to a constant pattern, then the problem is with the probe or its connectors or wiring. If the LED continues to flash slowly, then the problem is with the chart recorder.

☑ Test the Probe Circuit

1. Access the rear of the chart recorder by removing the rear panel (*refer to section 5.3*).
2. Disconnect the chart recorder probe from the circuit board.
3. On the circuit board, locate the JP1 connector and move the jumper so it connects both pins. The chart recorder is now in probe simulation mode (*Figure 10*).
4. From the front of the chart recorder, check whether the LED pattern is flashing or constant.
 - ◆ A constant pattern indicates a problem with the probe or its connectors or wiring. Verify all connections are tight. Replace the probe if necessary.
 - ◆ A flashing pattern indicates the chart recorder is faulty. Replace the chart recorder.
5. Return JP1 connector to its original position. The chart recorder is in normal operating mode (*Figure 11*).
6. Secure the chart recorder to its original location.



Figure 10



Figure 11

📘 Note

If the chart recorder was replaced, make sure the connections are correct and secure.

5.5 Restart Chart Recorder

Some troubleshooting actions require you restart the chart recorder. Restarting is typically done to address software or electronics issues when other actions have not effectively solved the problem.

☑ To restart the chart recorder using the reset button

1. Move the chart paper to expose the access hole for the reset button. The access hole is located below the LED.
2. Using a paper clip or other narrow tool, press and release the reset button. The chart recorder initializes and the LED flashes.

☑ To restart the chart recorder by disconnecting AC power to the product

1. On the chart recorder, disconnect the leads from the backup battery. The LED changes to constant red.
2. Disconnect the AC power to the chart recorder or the product in which the chart recorder is installed. The LED turns off.
3. Connect AC power to the chart recorder or the product in which the chart recorder is installed. The chart recorder initializes and the LED flashes. When initialization is complete, the LED changes to constant red.
4. On the chart recorder, connect the leads to the backup battery. The LED changes to constant green to indicate normal operating mode.

5.6 Cleaning the Chart Recorder *(Standalone only)*

⚠ CAUTION

Follow all chemical handling and disposal requirements and procedures specified by your organization.

For standalone chart recorders, clean the cover with a dry cloth.

6 Troubleshooting

Note

It may be necessary to remove the chart recorder from another product or remove a cover to access the rear of the chart recorder.

CAUTION

- Review all safety instructions prior to performing any service.
- Disconnect the chart recorder from power as applicable.
- Maintenance should be performed by a qualified service technician.

6.1 General Operation Problems

Problem	Possible cause	Action	
The chart recorder paper is not rotating.	The chart knob is not fully tightened.	Tighten the chart knob.	
	The connection between the paper rotation motor and the circuit board is loose or incorrect.	Confirm the ribbon cable from the paper rotation motor is securely connected to the P2 (PAPER) connector	
	The chart recorder is not receiving power (units installed on Helmer products only).	Verify the product on which the chart recorder is installed is receiving AC power.	Verify the correct voltage is being supplied from the chart recorder power source, and the connections from the power source to the J2 connector on the circuit board are secure.
		Verify the leads are securely connected to the battery and the J3 connector on the circuit board.	
		The chart recorder is not receiving power (standalone units only).	Verify the power cord is connected securely to the chart recorder and the outlet. Tighten the connections if necessary.
	The chart recorder is not receiving power (standalone units only).	Verify one or both fuses has not blown. Replace the fuse or fuses if necessary.	
		Verify power at the outlet. Repair the original outlet or connect to a different outlet if necessary.	
		Confirm voltage running through the power connector is appropriate, and that the connections from the power connector through the transformer to the J2 connector on the circuit board are secure. If it is not, secure the connections or replace the power cord, power connector, or transformer as appropriate.	
Verify the leads are securely connected to the battery and the J3 connector on the circuit board.			
The chart recorder electronics have locked up.	Run a test pattern to verify the mechanics of the chart recorder are working correctly. If the mechanics are working correctly, but the problem is not solved, restart the chart recorder.		
The chart recorder is hard to read (standalone units only).	The viewing angle is set wrong or has changed.	Adjust the viewing angle and tighten it in place.	

6.2 Visual Indicators

Problem	Possible cause	Action
The LED is constant red.	The backup battery is missing or not connected.	Verify a battery is installed and connected. Verify the leads are connected to the backup battery, and the connections from the lead wires to the J3 connector on the circuit board are secure.
	The backup battery power is low.	Replace the backup battery.
The LED is flashing red.	The chart recorder is in range change mode.	Verify the temperature range is set correctly for your application, then return to normal operation.
	The chart recorder is only receiving power from the backup battery. <small>(units installed on Helmer products only)</small>	Verify the product on which the chart recorder is installed is receiving AC power. Verify the correct voltage is being supplied from the chart recorder power source on the product, and that the connections from the power source to the J2 connector on the circuit board are secure.
	The chart recorder is only receiving power from the backup battery. <small>(standalone units only)</small>	Verify the power cord is connected securely to the chart recorder and the outlet. Tighten the connections if necessary. Verify one or both fuses has not blown. Replace the fuse or fuses if necessary.
		Verify power at the outlet. Repair the original outlet or connect to a different outlet if necessary. Check the voltage flowing through the power connector is appropriate, and the connections from the power connector through the transformer to the J2 connector on the circuit board are secure. If not, secure the connections or replace the power cord, power connector, or transformer as appropriate.
The LED is flashing green.	The chart recorder is initializing after start-up or restoration of power.	Wait for the initialization process to end.
	The chart recorder is in paper change mode.	Verify the temperature range is set correctly for your application, then return to normal operation.
	There is a problem with the probe circuit.	Verify the probe connections are secure. Test the probe circuit to determine if the probe is faulty. "

6.3 Stylus and Marking Problems

Problem	Possible cause	Action
The stylus is not marking the paper or is marking too lightly.	The stylus tip is not touching the paper.	Gently bend the stylus to move the tip closer to the paper. Adjust the mounting bracket angle by removing the stylus and gently bending the mounting bracket. Install the stylus, making sure the tip is aligned with the time line groove.
The stylus is at the edge of the paper and will not move.	There is a problem with the probe circuit.	Verify the probe connections are secure. Test the probe circuit to determine if the probe is faulty.
	The chart recorder is in paper change mode.	Verify the temperature range is set correctly for your application, then exit paper change mode.
	The chart recorder electronics have locked up.	Run a test pattern to verify the mechanics of the chart recorder are working correctly. If the mechanics are working correctly, but the problem is not solved, restart the chart recorder.
The stylus moves beyond the outer edge of the paper.	The temperature range is set to the wrong range.	Verify the temperature range is set correctly for your application.
	There is a problem with the probe circuit.	Verify the probe connections are secure. Test the probe circuit to determine if the probe is faulty.
	The chart recorder is in probe simulation mode.	Verify the jumper is set correctly for normal operation.
The stylus moves beyond the inner edge of the paper.	The temperature range is set to the wrong range.	Verify the temperature range is set correctly for your application.
	The chart recorder is in probe simulation mode.	Verify the jumper is set correctly for normal operation.

Problem	Possible cause	Action
The stylus is marking at the wrong time.	The chart recorder electronics have locked up.	Run a test pattern to verify the mechanics of the chart recorder are working correctly. If the mechanics are working correctly, but the problem is not solved, restart the chart recorder.
	After the paper was changed, the chart knob was not turned fully clockwise, causing the paper rotation motor to lag.	After changing the paper, verify the chart knob is turned fully clockwise.
The stylus is marking at the wrong temperature.	The temperature range is set to the wrong range.	Verify the temperature range is set correctly for your application.
	The chart recorder is in probe simulation mode.	Verify the jumper is set correctly for normal operation. "
	The chart recorder is not calibrated.	Calibrate the chart recorder.
	There is a problem with the probe circuit.	Verify the probe connections are secure.
Test the probe circuit to determine if the probe is faulty.		
The temperature line being marked is more erratic, fuzzy, or saw-toothed than normal (applies to chart recorders used with Helmer refrigerators and freezers only).	The chart recorder probe is not immersed in the probe bottle. (For more information, refer to the Operation Manual for your product.)	Verify the chart recorder probe is immersed correctly in the probe bottle.
		Verify the probe bottle has an adequate amount of product simulation solution.
Multiple markings appear for a time period.	The paper was not changed.	Change the paper.

7 Specifications

7.1 Operating Standards

Note

Information in this section is for the chart recorder. For information about the product in which the chart recorder is installed, refer to the Operation Manual for the product (www.helmerinc.com/support/knowledge-center/index).

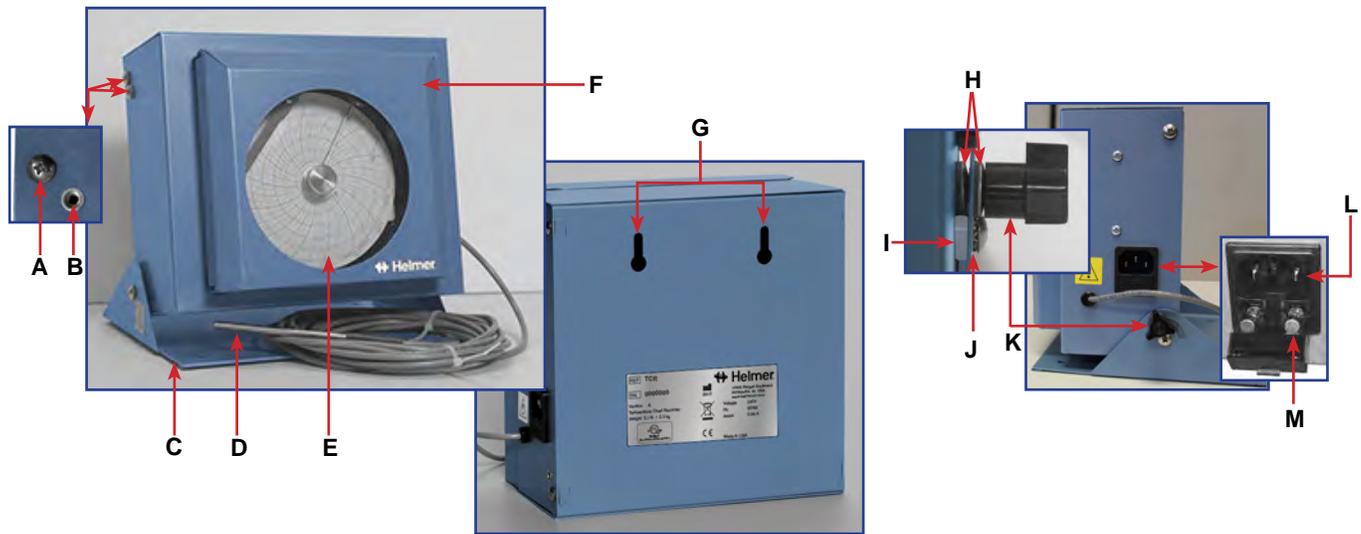
These chart recorders are designed to operate under the following environmental conditions:

- ◆ Indoor use only
- ◆ Altitude (maximum): 2000 m
- ◆ Ambient temperature range: 5 °C to 40 °C (41 °F to 104 °F)
- ◆ Relative humidity (maximum for ambient temperature): 80%

	Standalone	
	115V Models	230V Models
Input Voltage and Frequency	115V, 50/60 Hz	230V, 50/60 Hz
Voltage Tolerance	±10%	
Power Consumption	0.06 A	0.04 A
Fuses	One Fuse 0.063 A / 250V	Two Fuses 0.05 A / 250V
Weight	5.1 lb (2.3 kg)	
Exterior Dimensions <small>(without stand) W x H x D</small>	8 x 7 x 4.5 in (204 x 178 x 115 mm)	
Exterior Dimensions <small>(with stand) W x H x D</small>	9.5 x 8.25 x 6.75 in (242 x 210 x 172 mm)	

	Factory-Installed
Input Voltage and Frequency	Platelet Incubators: 12V dc -16V dc Refrigerators / Freezers: 12V dc - 16V dc

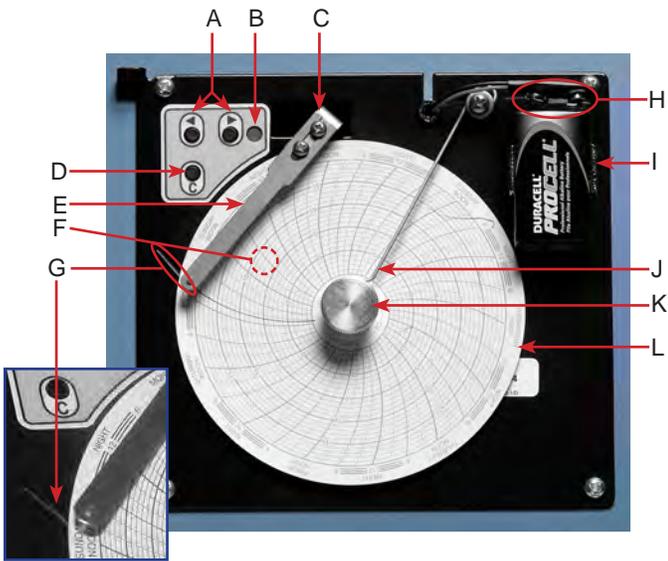
8 Chart Recorder Parts



Label	Description	Model	Part Number	Label	Description	Voltage	Part Number
A	Pivot screw	-	-	J	Lock washer	-	-
B	Adjustment hole	-	-	K	Adjustment knob	-	-
C	Stand	-	-	L	Power connector	115	120152*
D	Temperature probe	-	-			230	120379*
E	Chart Paper	Incubator	220273	M	Fuse	115	120572*
		Refrigerator	220366			230	120571*
		Freezer	220419	Not Shown	Modular Power Cord	115	120155*
		ULT	220352			230	120156*
F	Chart recorder door and cover	-	-	Not Shown	Backup Battery	-	120218
G	Wall mounting holes	-	-		Chart Recorder Assembly	-	400498-1*
H	Compression washers	-	-		Mounting Kit	-	230350*
I	Nylon washer	-	-				

* applicable to standalone units only

8.1 Interior Front

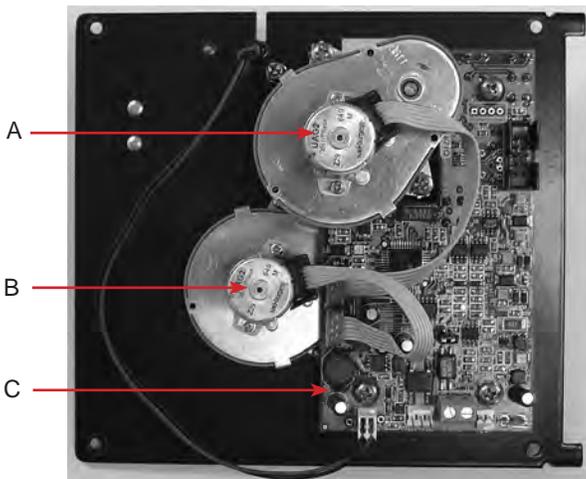


Label	Description	Label	Description
A	Left and Right Arrow buttons	G	Time line groove
B	LED (light-emitting diode)	H	Battery leads
C	Mounting bracket	I	Backup battery
D	C (Chart Change) button	J	Chart knob holder
E	Stylus	K	Chart knob
F	Reset button	L	Chart paper

8.2 Interior Back

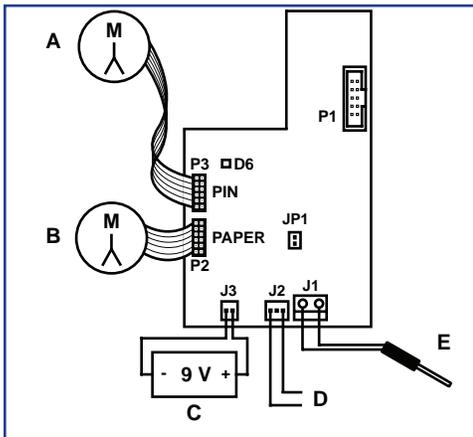
Note

For more information about connectors on the circuit board, refer to "Schematics."

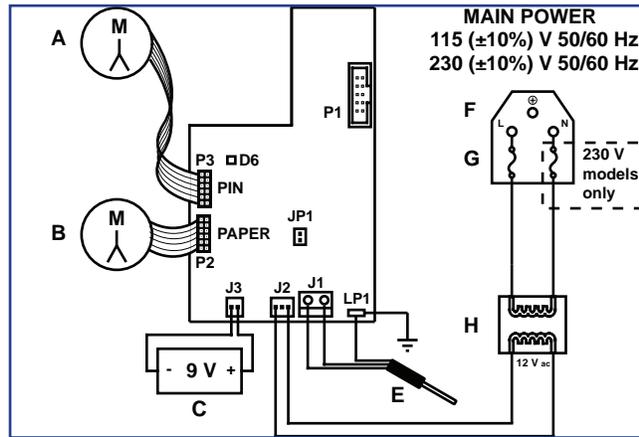


Label	Description	Label	Description
A	Stylus (pin) motor	C	Circuit board
B	Paper motor		

9 Schematics



As installed in a Helmer product



Standalone unit

Label	Description
A	Stylus (pin) motor
B	Paper (timer) motor
C	Backup battery
D	Chart recorder power source in Helmer product
E	Temperature probe
JP1	Jumper for probe simulation mode
P1	Programming port (factory use only)
D6	Heartbeat LED (alternately flashes red and green)
LP1	Ground for probe on standalone unit
F	Power connector for standalone unit
G	Fuses for standalone unit
H	Transformer for standalone unit

Appendix A

Compliance

Energy conservation and regulatory compliance

This product is certified to applicable UL and CSA standards by a NRTL.

Pollution Degree: 2 (for use in USA and Canada only)

WEEE compliance

The WEEE symbol (right) indicates this product falls under the scope of the WEEE (Waste Electrical and Electronic Equipment) directive.

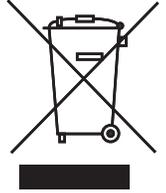
When disposing of this product in countries affected by this directive, ensure the following:

- ◆ Do not dispose of this product as unsorted municipal waste.
- ◆ Collect this product separately.
- ◆ Use the collection and return systems available to you.

For more information on the return, recovery, or recycling of this product, contact your local distributor.

CE Conformity for European Countries

This device complies with the requirements of directive 89/336/EEC Electromagnetic Compatibility, and 73/23/EEC Low Voltage Directive.



Appendix B

Warranty

USA and Canada

For technical service needs, please contact Helmer at 800-743-5637 or www.helmerinc.com. Be sure to have the model and serial number available.

Rapid Resolution

When a warranty issue arises it is our desire to respond quickly and appropriately. The service department at Helmer is there for you. Helmer will oversee the handling of your warranty service from start to finish. Therefore, Helmer must give advance authorization for all service calls and/or parts needs relating to a warranty issue. Any repeat service calls must also be authorized as well. This allows for proper diagnosis and action. Helmer will not be responsible for charges incurred for service calls made by third parties prior to authorization from Helmer. Helmer retains the right to replace any product in lieu of servicing it in the field.

Parts

For a period of two (2) years, Helmer will supply at no charge, including freight, any part that fails due to defects in material or workmanship under normal use, with the exception of expendable items. Batteries and chart paper are expendable items. Inspection of defective parts by Helmer will be final in determining warranty status. Warranty procedures must be followed in all events.

Labor

For a period of one (1) year, Helmer will cover repair labor costs, provided that the product is returned to Helmer for warranty service. Alternatively, your facility's staff may work with a Helmer technician to make repairs on site. Labor costs for repairs performed at a location other than Helmer, or for repairs made without the assistance of a Helmer technician, will be the responsibility of the end user.

Additional warranty information

The time periods set forth above begin two weeks after the original date of shipment from Helmer. Warranty procedures set forth above must be followed in all events.

THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. THIS WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY.

THE LIABILITY, IF ANY, OF HELMER FOR DIRECT DAMAGES WHETHER ARISING FROM A BREACH OF ANY SALES AGREEMENT, BREACH OF WARRANTY, NEGLIGENCE, OR INDEMNITY, STRICT LIABILITY OR OTHER TORT, OR OTHERWISE WITH RESPECT TO THE GOODS OR ANY SERVICES IS LIMITED TO AN AMOUNT NOT TO EXCEED THE PRICE OF THE PARTICULAR GOODS OR SERVICES GIVING RISE TO THE LIABILITY. IN NO EVENT SHALL HELMER BE LIABLE FOR ANY INDIRECT, INCIDENTAL, CONSEQUENTIAL, OR SPECIAL DAMAGES, INCLUDING WITHOUT LIMITATION DAMAGES RELATED TO LOST REVENUES OR PROFITS, OR LOSS OF PRODUCTS.

This warranty does not cover damages caused in transit, during installation by accident, misuse, fire, flood, or acts of God. Further, this warranty will not be valid if Helmer determines that the failure was caused by a lack of performing recommended equipment maintenance (per Helmer manual) or by using the product in a manner other than for its intended use. Installation and calibration are not covered under this warranty agreement.

Outside of USA and Canada

Consult your local distributor for warranty information.

Helmer Scientific
14400 Bergen Boulevard, Noblesville, IN 46060 USA
