



***Model 225
Chocolate Temper Meter
User's Manual***



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IMPORTANT

TRICOR's Mission Statement emphasizes Quality and Customer Service. Should you encounter any problem with your Model 225 Chocolate Temper Meter or discrepancies in this manual, please let us know at (847) 742-5542.

If TRICOR is made aware or discovers any discrepancies or problems you will be notified and corrective action will be taken as soon as possible.

To serve you better we request that primary and alternate contact names be provided on the enclosed product contact form and returned to TRICOR in the self-addressed envelope. This personalized approach will eliminate any delay in providing you with potentially important information.



WARRANTY INFORMATION FORM

Customer: _____

Address: _____

Please provide the following information for use by our hotline.

- The person(s) to contact with regard to the ***Model 225 Chocolate Temper Meter and manual:***

	Name	Telephone No.	Email
Primary	_____	_____	_____
Alternate (1)	_____	_____	_____
(2)	_____	_____	_____
(3)	_____	_____	_____

- The person(s) to contact with regard to ***New Product Releases:***

	Name	Telephone No.	Email
Primary	_____	_____	_____
Alternate (1)	_____	_____	_____
(2)	_____	_____	_____
(3)	_____	_____	_____



SECTION 1 GENERAL DESCRIPTION

The Model 225 Chocolate Temper Meter provides a much more convenient and accurate method of determining chocolate temper than the conventional “ice bath” techniques. The 225 uses a solid-state, thermoelectric cooling unit with state-o-the-art electronic control circuitry to precisely maintain and regulate the cooling temperature of the chocolate sample.

The chocolate temperature-sensing probe is maintained at a controlled, fixed temperature prior to chocolate sample testing to eliminate any errors due to temperature variations. The 225 is also designed to maintain constant sample size and temperature-sensing probe depth. These field proven features ensure accuracy and repeatability in measuring chocolate temper.

The 225 is housed in a small, laboratory enclosure. All controls, indicators and the internal printer are located on the front panel. The chocolate sample well and cover door are found on the top of the unit. On the back of the model 225 is the power entry module with the on/off switch and the RS232 and USB communication ports.

1.1 Supplied Items

The Model 225 is supplied to the customer along with the following additional items:

- Power Cord
- RS232 Serial Data Cable and 9-Pin Adaptor
- A spare Roll of Thermal Print Paper for the Internal Printer
- Temper Well Cleaning Tool (attached to Model 225)
- 200 Sample Cups
- A CD with Microsoft Windows-Compatible Configuration Software
- Certificate of Calibration for this Model 225
- This Manual



1.2 Optional Items

The following are optional items that may be purchased for the Model 225:

- Sample Cups (5000 / box)
- External Printer with Serial Cable Adaptor (plotting option)
- Temper Meter Data Acquisition Software (TMDAS)
- USB Communications Cable
- Calibration / Verification Fixtures
- Optional Software Features

1.3 Serviceable Items

There are no user serviceable parts and no adjustments in the Model 225. Opening the Model 225 voids the warranty and the Certificate of Calibration.

WARNING

There are dangerous voltages inside the Model 225 which may cause injury or death. Service of the Model 225 should be performed only by a qualified service technician.

1.4 Calibration

TRICOR Systems recommends a yearly calibration. Two separate calibrations are performed on Temper Meters. The first is an electronic calibration/verification of the electronics. This verification can be performed by your internal personnel provided that they have been given the proper training and the verification tools have been purchased.

The second part of the calibration is a check of the heat transfer coefficients between the cooler well and the sample cups. This calibration is performed at TRICOR using specially crafted tools and procedures to obtain repeatable/consistent results. This procedure takes 3 days provided that no repairs are needed and the unit has been scheduled. An electronic calibration is performed at the same time.



1.4 Calibration (Cont'd)

If you would like to schedule your Model 225 to be calibrated at TRICOR Systems, please call TRICOR's Contracts Department at (847) 742-5542 for a Return Material Authorization (RMA#).



SECTION 2

MODEL 225 SETUP

2.1 Equipment Location

The Model 225 uses a thermoelectric cooler to generate the cold temperature well. To obtain the temperature reduction, a great amount of forced air must be passed through the unit to remove the heat produced in the cooler. It is ideal that the 225 be located in a spot where relatively cool, clean and dry air may pass through the unit. The intake port on the bottom of the unit (shown below) as well as the exit ports on the back must be kept unobstructed. Do not place papers under the unit. The paper will be drawn up against the intake restricting air flow. If the intake becomes clogged, the screen can be removed for cleaning by removing the 4 screws which hold it to the base cover.

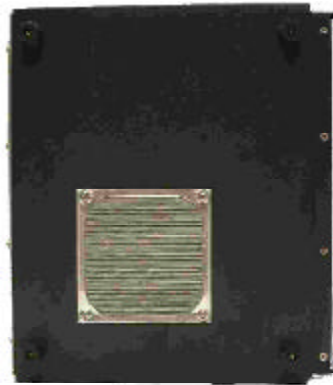


Figure 2.1 Bottom View Showing Fan Intake

The repeatability and precision of the chocolate temper is affected by the length of time it takes to get the chocolate sample from the source to the Model 225 temperature well and to get the sample door closed. It is recommended that the unit be placed in close proximity to the chocolate so that this transfer can be minimized. If excessive cooling takes place before the measurement process begins, inaccurate result may result.

The Model 225 is a precision measurement instrument. It is important that a clean, uninterrupted supply of electrical power be provided to the unit. If unexpected problems occur, please verify your power source or move the Model 225 to a location where good power is assured. Noise filtering and transient suppression may be beneficial.



2.2 Power Connection

The Model 225 has contained within it a "universal" power supply. The unit will operate on line voltages from 85 to 264 vac, 50 or 60 Hz. Current requirements are a maximum of 1.5 amps. The 225 should operate in most parts of the world. If your power source exceeds this range, please contact TRICOR before applying power.

2.3 Internal Printer

The Model 225 has a built-in printer which makes a permanent record of the chocolate sample test. The serial # of the unit on which the test was performed is recorded, the time and date (optional feature), user supplied text and a unique (for this unit), auto-incrementing test number are printed on the paper header. The cooler temperature at the start of the run is recorded and the two inflection points are printed. The CTU value and slope test results are printed as the final calculation. This data concisely records the temper measurement for this sample.

```
*****
MODEL 225   S/N 101
Version 1.40
08/03/04 08:12:38

Tested By 6 * Choc Line 1 *
TEST RUN No. 14

COOLER = 47.81°F

-----

FIRST POINT
0:05   +78.77   -13.19

SECOND POINT
2:20   +59.70   + 3.67

CTU=-8.5 SLOPE= 3.67
*****
```

Figure 2.2 Internal Printer Sample Printout



2.3 Internal Printer (Cont'd)

To install the thermal print paper, grasp the latching clips on the translucent printer paper supply door. Squeeze the clips and fold the door down. If the remains of the previous roll of paper are still in the printer, remove this spool. Unwrap a new roll of paper and cut or tear the end so that the paper is free to spool off of the roll. Insert the paper roll into the printer opening with the loose paper end coming over the top of the roll from the back side. Snap the door closed being sure to align the paper so that it is centered below the tear-off metal teeth. If the power is turned on, the "Feed" button can be pressed to advance the paper.

The internal printer can be tested by holding the "Feed" button down while the Model 225 is powered up. The printer will print several inches of text and graphic symbols.

2.4 External Print / Plot (Option)

The external printing is an optional feature that must be purchased. This feature creates a full page time / temperature graph of the chocolate sample. This allows easy visualization of tempering problems.



2.4 External Print / Plot (Option) (Cont'd)

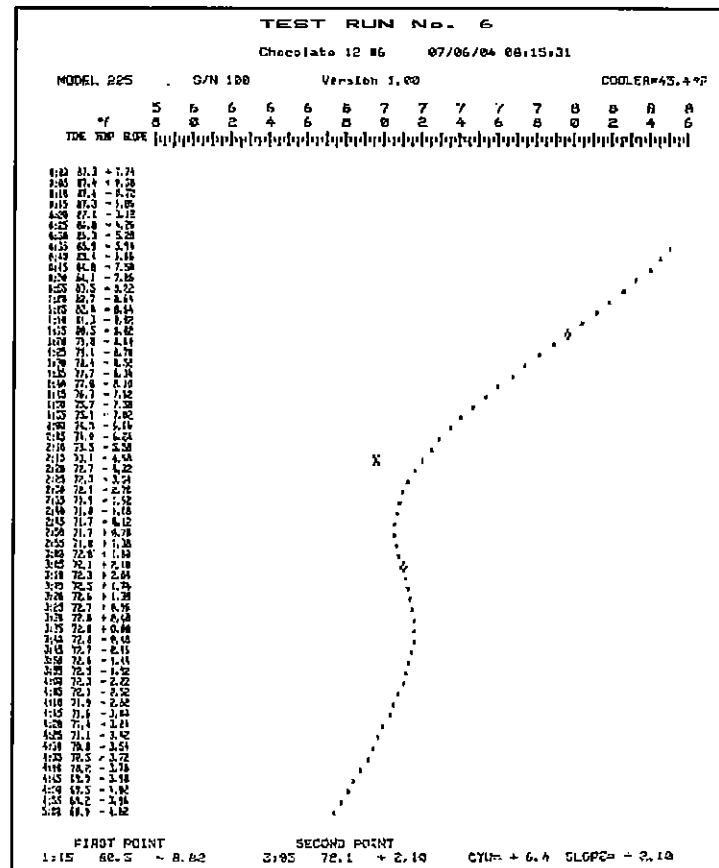


Figure 2.3 External Temperature Plot

The external printer can not be used while the PC configuration or TMDAS application are being used. There is just one external serial data port used for both the RS232 and USB ports. To use the external printer, these other uses must be discontinued.

TRICOR supplies an Okidata 184 Turbo Printer for this print option. This specific printer is required since the block graphics mode used to display the curve is unique to the Okidata line of printers. TRICOR also supplies an RJ-11 to 25-pin adaptor (shown below). This adaptor uses the Serial Data Cable supplied with all Model 225s to connect between the unit and the printer.



2.4 External Print / Plot (Option) (Cont'd)



Figure 2.4 Printer Adaptor

To attach the external printer to the Model 225, plug the Printer Adaptor into the 25-pin D connector on the back of the Okidata 184. Tighten the thumb jacks. Plug one end of the RJ-11 flat cable (telephone cable) into the Printer Adaptor. The other end plugs into the RJ-11 jack on the back of the Model 225. Be sure that nothing is attached to the USB jack on the Model 225.

Install tractor feed paper according to the Okidata 184 Printer Manual. Align the paper perforation at the tear off edge of the viewing window. Be sure to follow all instructions provided by Okidata regarding setup of this printer. The shipping restraints holding the print head must be removed. Connect AC power to the printer.

NOTE

The Okidata 184 must be ordered with the correct line voltage input for your region of the world. The printer does not contain a “universal” power supply nor a line voltage selector. TRICOR is not responsible for damages caused by operating the Okidata 184 at the wrong line voltage.

2.5 TMDAS (Option)

The Temper Meter Data Acquisition Software (TMDAS) is a Windows application that accepts and interprets the external printer output from the 225, plots smooth curves for display/printing and saves the data to a file where multiple results can be analyzed. The TMDAS application and the external printing feature of the Model 225 are both options that must be purchased.



2.5 TMDAS (Option) (Cont'd)

Refer to the TMDAS manual for discussion of installing the software and attaching the Model 225 to the PC. The discussion below, concerning PC Configuration also describes the attachment of the Model 225 to a PC.

2.6 PC Configuration

The Model 225 is supplied with a Windows application that is used to configure features. Not all the features shown in this manual are available on all Model 225 units. Some features are common to all units, while others are provided only when originally purchased with the unit. A list of features which can be configured is shown below:

- Set Real Time Clock/Calendar **(Option)**
- Set Power Line Frequency
- Adjust Sample Run Time **(Option)**
- Set User Text
- Extended Temperature Plotting **(Option)**
- Change CTU Offset
- Set Password
- Select CTU or Slope/Temperature
- Select Temperature Units
- Enable/Disable Internal Printer Auto-Print
- Enable/Disable External Printer Auto-Print **(Option)**
- Change Cooler Reference Temperature **(Option)**
- Change Heater Reference Temperature **(Option)**

Some, but not all of these features can also be changed using the menu on the Model 225 itself. The Configuration Application does make setting these features easier and more intuitive. See section 3 for menu descriptions.



2.6.1 Software Installation

To install the configuration application, follow the procedure below:

NOTE

You must have administrator privileges to properly install this software on Windows NT, 2000 and XP.

1. Insert the installation CD into the CD-ROM drive of the PC.
2. If the auto-run feature does not work, navigate to the root directory folder of the CD. Double click the file "**SETUP.EXE**".
3. It is recommended that you accept the default installation options provided by the install program. Simply press the "**Enter**" key to accept the choices.
4. The program can be run by going to the **Start** menu and selecting **Programs | Model225 | Model225 Configure**. The application software can be run without the Model 225 attached, but the operations are limited until there is communications established between the PC and the unit.
5. If the USB connection is to be used on the Model 225, leave the installation CD in the drive and skip down to section 2.6.3.

The communications between the PC and the Model 225 is handled over either an RS232 serial port or a Universal Serial Bus (USB) port. The application software will automatically attempt to find the unit if it is attached. Once communications is established the buttons and the controls on the Configuration dialog will become active. The choice of communications port is dependant on the type of hardware resources available on the PC. Both methods provide the same level of performance. Review the connection discussion below for proper connection of the 225 to the PC.



2.6.1 Software Installation (Cont'd)

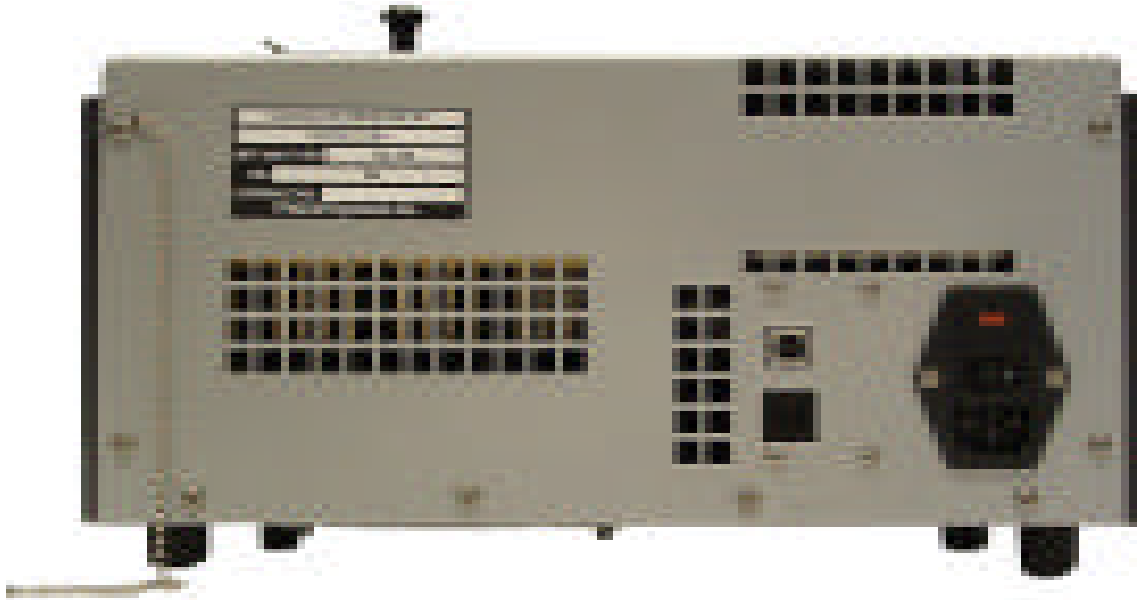


Figure 2.5 Serial and USB Connectors on Back of Model 225

2.6.2 RS232 Connection

The cabling required to communicate between the PC and the Model 225 is provided. It consists of a 9-pin adaptor which attaches to the serial port of most recent PCs. This adaptor accepts one end of the flat cable with RJ-11 connectors. The other end of the cable is plugged into the Model 225. The black "phone" jack on the back of the unit is intended for the serial communications.



Figure 2.6 RS232 Serial Cable



2.6.2 RS232 Connection (Cont'd)

The cable provided is a standard “telephone” cable. If a longer cable is required, a standard cable may be used as long as it is a 6-conductor cable. Four-conductor cables will not work with the external printer.

WARNING

Though the serial cable may be the same as those used for telephone communications, the interface is not a modem connection. Do not plug the Model 225 or the 9-pin adaptor into a telephone network. They are incompatible. Damage to the Model 225 or PC may result.

2.6.3 USB Connection

The Model 225 may communicate with the PC using a USB interface. A standard AB USB cable is required (not supplied). These cables have a length limited by the USB specification. Extension cables violate the USB specification and TRICOR Systems will not support equipment operated using a USB cable longer than 6 feet.

IMPORTANT

Do not connect the Model 225 with the USB cable to the PC until instructed to do so, below. If you are not ready with the proper software, you may create difficulties when connecting in the future.

USB is not supported (directly) by Windows 95, and may have incompatibilities with early versions of Windows 98 and Windows NT 4.0. These are limitations of the operating systems and not the Model 225.

For the USB communications to function, software drivers must be installed on the PC. These drivers are provided on the installation CD that is provided. If you have already installed the application software and have removed the CD from the drive, you can prevent the auto-run installation from running again by holding down the left shift key for several seconds while inserting the CD. If the auto-run starts, simply cancel the operation.



2.6.3 USB Connection (Cont'd)

With the Model 225 turned off, attach the unit to the PC using a USB cable. Be sure Windows has started and is up and running. Turn on the power to the Model 225. Within a few short seconds the Windows operating system should recognize that new hardware has been attached. The dialog will prompt you to load new software for this hardware. Navigate to the root directory of the CD ROM drive. Press the next button to install the drivers. Depending on the version of the operating system you may be asked to re-boot the PC. Follow the directions provided by the operating system.

Run the Configuration application. It will search through all the available resources on the PC in an attempt to find a connection to the Model 225. The status bar of the application shows in the lower-left corner the communication channel being used or currently searched.

If there is trouble installing the USB drivers, the most likely cause are legacy RS232 serial ports on the PC conflicting with the USB port designation. To correct this problem, open the Windows Device Manager from the Control Panel System folder. The newly installed USB connection should show up as a serial port as shown below. Note, the port resource will not appear in this list if the Model 225 is not attached and turned on. Be sure to close the Configuration application.

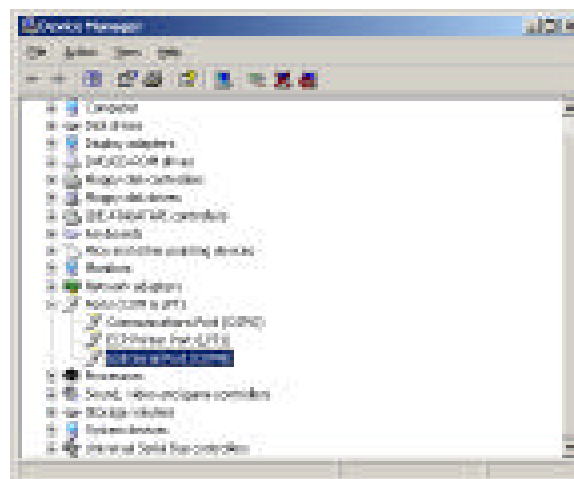


Figure 2.7 Newly Installed USB Port



2.6.3 USB Connection (Cont'd)

The currently selected COM channel is appended after the port name. This channel selection should not be less than COM3. If it is, double click to edit the port properties. Choose the Port Settings tab and press the Advanced button.

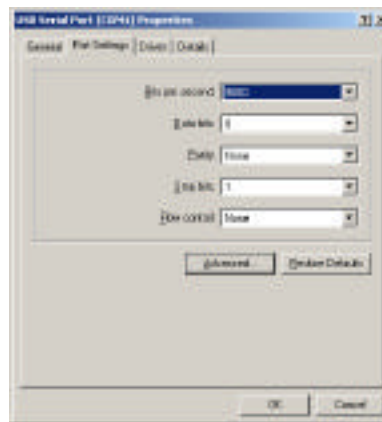


Figure 2.8 USB Port Settings

Change the port channel setting to some other value greater than COM4. Use the Com Port Number drop down list box to choose the channel. Never select a channel that is the same as an RS232 com port on the PC. Press the OK buttons to back out with the new settings.

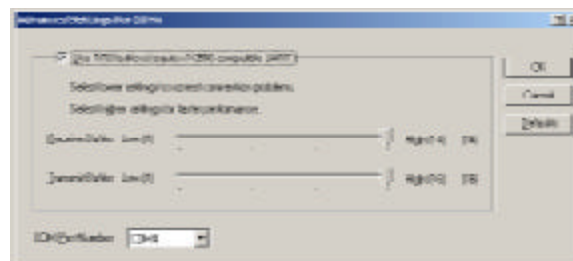


Figure 2.9 Advanced Port Settings

Turn off the Model 225 and reboot the Windows operating system. Wait for Windows to again restart. Turn on the Model 225. Verify that the Configuration application can communicate with the Model 225. The channel should match that set in the driver configuration dialog. If problems persist, please call TRICOR for assistance.



2.6.3 USB Connection (Cont'd)

WARNING

Turning off the Model 225 or disconnecting the USB cable causes the Windows operating system to terminate the USB driver software, in effect, pulling the driver out from under the Configuration or TMDAS application. Always close the applications communicating with the 225 before terminating the link to avoid program crashes.



SECTION 3

MODEL 225 OPERATIONAL PROCEDURE

This section describes the normal use of the Model 225. The methods for achieving the best repeatability of chocolate measurements are discussed. The messages displayed are listed and the use of the keyboard demonstrated.

3.1 Turning On The Model 225

Turn on the Model 225. The switch is located on the power entry module on the back of the unit just above the power cord connection. The backlight for the liquid crystal display (LCD) will illuminate as well as the power indicator on the internal printer. The red error LED may be illuminated on the internal printer. If it is, check the paper supply and replace the roll if out of paper. The red indicator may also be on if the paper roll is improperly positioned. Check the roll and try advancing the paper using the printer **Feed** button. The unit power indicator on the bottom-right of the front panel will flash at a fast rate.



Figure 3.1 Front Panel of Model 225

The Model 225 power indicator will be on continuously when ready to test chocolate or while testing chocolate. This indicator will flash at a fast rate during the initial self test / scan and whenever there is a warning message displayed that requires the operator to press the **Cancel** button. This indicator will flash at a slow rate under the following conditions:



3.1 Turning On The Model 225 (Cont'd)

- Waiting for temperature to stabilize
- Menu options selected
- Chocolate testing completed, remove sample

Chocolate testing can not be performed while the power indicator is flashing.

3.2 Display Contrast

The LCD contrast is a user adjustable feature. The setting is stored in program memory and recalled each time the unit is turned on. TRICOR has preset the contrast for optimal performance.

However, the user can change this setting. The adjustment is a menu option. Because of this, it is possible for the user to set the contrast so that nothing appears on the LCD. It would then be impossible to navigate through the menu to readjust the contrast. To provide a method to overcome this complication, there is a power up procedure to regain control.

If the display comes up without any characters visible, turn the Model 225 off and allow 10 seconds to power it down. Press and hold the **Scroll Up** and **Scroll Down** buttons. Turn on the Model 225. When you can again see characters displayed, release the buttons. The display setting may not be optimal. To improve the contrast use the contrast menu adjust feature.

3.3 Initialization And Testing

The Model 225 starts operation by performing self tests on the unit hardware and software. During this test the message shown below is displayed. The bottom line of text is a continuously scrolling progress bar incremented after each test.

I n i t i a l i z i n g S y s t e m . . .



3.3 Initialization And Testing (Cont'd)

The following tests are performed during initialization:

- Initialize and test LCD display
- Program checksum test
- Real time clock test
- Power supply tests
- Load and test user preferences
- Set and test cooler
- Set and test heater
- Test temperature control hardware

After the hardware is configured and tested, the Model 225 searches through the stored results to locate the last chocolate sample test result. Test results are stored in a memory device which retains the results even while power is off.

Searching Stored Results

The results are searched starting from the beginning of memory looking for the last valid result. Corrupted or non-used result memory is ignored. A progress bar is shown across the bottom row of the display indicating continuing scanning. During this scan time, the heater and cooler control circuits are working to obtain the desired temperature

The LCD will show the current and desired temperature for both the cooler and heater.

Cooler	*	WAIT	*	Heater
68.4	»	48.7		71.3 » 78.0

Once the cooler well and heated probe tip are at the desired temperature, the LCD will show the message below. The Model 225 is now ready to test chocolate.

Ready For Sample



3.4 Running A Chocolate Sample

IMPORTANT

Accurate and repeatable test results depend on minimizing the time it takes to get the chocolate sample into the Temper Meter and avoiding cooling errors. Perform the steps below as quickly as possible. Hold the chocolate sample cup by the lip after filling it with the sample chocolate.

Slide the ejector knob completely to the right and open the sample well door.



Figure 3.2 Sample Well and Ejector

Fill the sample cup from the enrober curtain or depositor to just below the top of the cup lip. Remove any excess from sides of cup. Avoid touching the walls of the sample cup. Handle by the cup lip.

Push the sample cup firmly down into the cooler well. The temperature probe in the center of the well will pierce the pre-scored cutting on the bottom of the cup. Close the well door. The unit will begin testing the chocolate sample after a short, programmed delay.



3.4 Running A Chocolate Sample (Cont'd)



Figure 3.3 Close Door After Inserting Sample

The Model 225 takes temperature readings of the sample every 5 seconds. These samples are shown on the LCD. The time marker and temperature are displayed. Also displayed is the measure slope of the temperature profile at that time mark.

Ti me	Temp	Sl ope
1: 55	+56. 8	- 11. 74

The standard test time has the measurements taken for 5 minutes. An optional feature that may be purchased is a variable “run” time. Times from 3 minutes to 10 minutes may be selected in 30 seconds increments. This feature permits complex or non-chocolate samples to be processed.

When the testing is complete, the LCD will show the message below. This message will alternate with text that displays the measurement results.

Remove Sample

There are two alternate methods of displaying the test results. The standard method is to show the Chocolate Temper Units (CTU) and the slope at the inflection point. The CTU is a quick read value that users can use as a guide to proper tempering. The CTU number can be offset by user choice so that “good” temper results in a value of 0.0.



3.4 Running A Chocolate Sample (Cont'd)

CTU=- 8. 5 Slope= 3. 57

The alternate choice for displayed results is with two inflection points and the slope at the intercept point.

S= 3. 5 T1= 63. 7 T2= 61. 5

The chocolate sample may not have a temper. In this case there is no inflection measured in the temperature profile. The Model 225 does not show a numeric value but instead a simple message.

No I n f l e c t i o n

While the unit is waiting for the sample to be removed, the power LED on the front panel flashes to alert the user that the testing is complete. Remove the chocolate sample as soon as the test is complete. If the sample remains for a very long time, it gets hard and sticks to the temperature probe. It is much easier to remove while still warm.

Slide the ejector knob completely to the right. This will catch the sample cup under the lip. Pull the door up. The door will lift the sample cup out of the well. If the chocolate sample should stick in the well twist the sample while pulling upward. Use extreme caution to avoid breaking the temperature probe.

Clean any excess chocolate that remains in the well using the well cleaning tool only attached to the Model 225. Scrape well walls and blow out excess. Don't use sharp instruments such as screwdrivers and knives. These instruments may cause damage that will result in a costly repair.



3.4 Running A Chocolate Sample (Cont'd)

WARNING

Do not use sharp objects to clean the well. The temperature probe is a multi-part assembly with a sensitive temperature thermistor as well as a heating blanket. These are easily damaged with the wrong tools and the repairs are expensive.

Close the well door so that the cooler well and temperature probe heater can bring these assemblies back to the desired temperature. When the door is closed, the external printout will commence (if this feature is available and enabled).

During the chocolate testing, communications with the PC are disabled. This allows the full attention of the software to be directed at the testing and also prevent the user from changing any preferences that could affect the test. The Configuration application will reestablish communications after the test is complete and the sample is removed.

3.5 Menu / Keyboard Operation

The Model 225 has a menu of features which the user can choose from using the display and 4 buttons on the front panel. The features include how and when the unit prints data, display and printing of previous test data, clock settings, temperature units and system status.

From the ready for testing screen, the menu is entered by pressing the **Select** button. The menu is laid out as a choice of 16 top level groups. Some menu groups have sub-choices. When the **Select** button is press, the first menu group, "**0 – User ID**", is indicated. To select this top menu group, press the **Select** button. To choose another top menu group, press the **Scroll Up** and **Scroll Down** buttons. The **Select** button is used to enter or confirm the choices. To cancel an operation or menu choice, press the **Cancel** button. The system will return to the previous state that it came from. Pressing the **Cancel** button from the Top Menu Selection will return the system to the Ready For Sample screen.



3.5 Menu / Keyboard Operation (Cont'd)

While in the menu mode, the Model 225 is unable to communicate with the Configuration application. The PC software will continue to run, trying to find the temper meter on any available port. When you exit the menu mode, the Configuration application should find and start communications with the Model 225.

3.5.1 Passwords

The menu features of the Model 225 can be password protected so that only authorized individuals may make changes to the options and features available. Without a valid password, the user can only run tests on the chocolate. The unit has a programmable password. Only authorized user should be given the password. The password can be disabled so that anyone may access the features.

The password is 8 characters in length and consists of the digits 1, 2, 3 and 4. These are the same digits as the buttons on the front panel of the 225. If prompted, enter the 8 digit password on the keypad. You must enter the characters quickly and accurately to avoid the automatic timeout cancellation. If you make a mistake, just stop and let the system return to the previous mode.

The password can only be programmed from the Configuration application. The password can be cleared by setting it to **00000000**. The system will then not ask for a password. This is the state of the Model 225 as delivered to the customer.

3.5.2 User ID

The User ID is a number from 1 to 199 which can be used to identify the personnel running the test or the chocolate line on which the tests are being performed. The User ID is printed on both the internal and external (optional item) printer. The TMDAS software (optional item) collects and stores this information.

The User ID is retained only until the Model 225 is powered down. It is not permanently saved. If the ID is set to 0, the information is not printed.



3.5.2 User ID (Cont'd)

To enter the User ID, press the **Select** button from the ready to test screen. Use the scroll buttons to choose the User ID group.

Top Menu Selection 0 - User ID

Press the **Select** button to select this menu group. Use the scroll buttons to change the ID setting. The minimum value is 0 and the maximum is 199. Setting the ID to 0 will disable the User ID feature, and the ID value will not be printed.

User ID Menu User ID = 199

To accept the newly entered value, press the **Select** button. If you decide not to change the value, press the **Cancel** button to return without making the change. In both cases the Top Menu Selection display will show again. To return to the ready to test screen press the **Cancel** button.

3.5.3 Print Result Data

The Model 225 saves previous test results so that they can be recalled and printed. These results can be sent to the internal printer or the external printer if this optional feature is available. The TMDAS software (optional) also substitutes for the external printer.

The standard Model 225 retains only the last 5 test samples. The unit can be ordered with an optional multi-store capability. The number of stored results is a function of the length of the test time. Standard 5 minute runs allow approximately 198 sample runs. The 9:55 length run can store only about 112 runs. Short 3 minute runs allow over 280 runs to be saved. The variable run time feature is an option.

To print a previous test sample, press the **Select** button from the ready to test screen. In the menu mode, use the scroll buttons to choose the Print Result Data group.



3.5.3 Print Result Data (Cont'd)

Top Menu Selection
1 - Print Result Data

Press the **Select** button to select this menu group. The LCD will show the most recent test result. Use the **Scroll Down** and **Scroll Up** buttons to select the test to print. Scrolling beyond the top and bottom of this list will result in a data display error message. The results of the test are displayed as well as the unique run number assigned by the Model 225.

CTU=- 8. 9 SLOPE= - . 33
Run = 44

If the real time clock option was purchased, the display will alternate between the time and date that the test was performed and the run number.

CTU=- 8. 9 SLOPE= - . 33
09/24/04 08: 02: 36

If you decide not to print any results, press the **Cancel** button to return to the Top Menu Selection. To print or transfer the current test result, press the **Select** button.

Printer Output Choice
External Printer

If you have purchased the external printer or TMDAS options, a menu screen will be displayed allowing the choice of where to print the data. Pressing either the **Scroll Up** or **Scroll Down** buttons will toggle the choice between the external (TMDAS) or internal printer. Press the **Select** button when you have chosen the destination. If neither option has been purchased, this menu choice is skipped.

The result will be printed to the selected printer. The LCD will show a message with a progress bar.

Printing Data



3.5.3 Print Result Data (Cont'd)

When printout is complete, the unit will return to the previous display of test results. A new result can be chosen by scrolling to it, or you may return to the Top Menu Selection by pressing the **Cancel** button.

To return to the ready to test screen press the **Cancel** button from the Top Menu Selection.

3.5.4 Clear Test Memory

The Model 225 saves previous test results so that they can be recalled and printed. It may be desirable to clear all the results in the memory. For example, to protect the data when returning the unit for repair or when moving the Model 225 to another production line, the memory holding previous test samples can be wiped clean.

To clear the previous test results, press the **Select** button from the ready to test screen. In the menu mode, use the scroll buttons to choose the Clear Test Memory group.

Top Menu Selection 2 - Clear Test Memory

Press the **Select** button to select this menu group. You will be asked to confirm the clear operation. To clear memory, press the **Scroll Up** button. Pressing any other button will leave the memory unaffected.

Clear Test Memory Menu Are you sure? Press Up
--

The unit will return to the Top Menu Selection. To return to the ready to test screen press the **Cancel** button.



3.5.5 Internal Printer

The properties of the internal printer can be modified with this menu choice. Normally, the internal printer will automatically print the chocolate test run data during the testing. The Auto Print feature is turned on. If you do not wish to print data while running chocolate samples, you may disable this feature. The data can still be printed from the stored test results at a later time.

To change the Auto Print feature for the internal printer, press the **Select** button from the ready to test screen. Use the scroll buttons to choose the Internal Printer group.

Top Menu Selection
3 - Internal Printer

Press the **Select** button to select this menu group. Use the scroll buttons to toggle the setting.

Internal Printer Menu
Auto Print ON

To accept the newly entered value, press the **Select** button. If you decide not to change the value, press the **Cancel** button to return without making the change. In both cases the Top Menu Selection display will show again. To return to the ready to test screen press the **Cancel** button.

3.5.6 External Printer

The external print is an option that must be purchased when ordering the Model 225. If you do not have this option, selecting this menu group will cause a warning message indicating that the feature is not available. The properties of the external printer can be modified with this menu choice. Normally, the external printer will automatically print the chocolate test run data after the chocolate sample has been removed. The Auto Print feature is turned on. If you do not wish to print external data, you may disable this feature. The data can still be printed from the stored test results at a later time.



3.5.6 External Printer (Cont'd)

To change the Auto Print feature for the internal printer, press the **Select** button from the ready to test screen. Use the scroll buttons to choose the External Printer group.

Top Menu Selection
3 - External Printer

Press the **Select** button to select this menu group. Use the scroll buttons to toggle the setting.

External Printer Menu
Auto Print ON

To accept the newly entered value, press the **Select** button. If you decide not to change the value, press the **Cancel** button to return without making the change. In both cases the Top Menu Selection display will show again. To return to the ready to test screen press the **Cancel** button.

3.5.7 Temperature Units

The Model 225 can display temperatures in either degrees Celsius or Fahrenheit. The user is free to make the choice.

To change the temperature units, press the **Select** button from the ready to test screen. Use the scroll buttons to choose the Temperature Units group.

Top Menu Selection
5 - Temperature Units

Press the **Select** button to select this menu group. Use the scroll buttons to toggle the setting.

Temperature Units Menu
Fahrenheit



3.5.7 Temperature Units (Cont'd)

To accept the newly entered value, press the **Select** button. If you decide not to change the value, press the **Cancel** button to return without making the change. In both cases the Top Menu Selection display will show again. To return to the ready to test screen press the **Cancel** button.

NOTE

The CTU value has degrees as its unit of measure. Changing the temperature units will affect the CTU values and the stored CTU offset. Be sure that you correct the CTU offset when switching between Celsius and Fahrenheit.

3.5.8 Set Clock/Calendar

The real time clock is an option that must be purchased when ordering the Model 225. If you do not have this option, selecting this menu group will cause a warning message indicating that the feature is not available. This menu group allows the time and date for the Model 225 to be set.

NOTE

The Model 225 does not automatically correct for daylight savings time. You must manually reset the time. The clock is automatically corrected for leap years.

To change the time and date, press the **Select** button from the ready to test screen. Use the scroll buttons to choose the Set Clock/Calendar group.

Top Menu Selection 6 - Set Clock/Calendar
--

Press the **Select** button to select this menu group. The current date and time will be displayed. There will be a flashing cursor under the 2 digits that are to be changed. Press the **Scroll Up** and **Scroll Down** buttons to change the date and time.

Set Clock/Calendar Menu 0 <u>9</u> /27/04 10: 27: 00



3.5.8 Set Clock/Calendar (Cont'd)

Press the **Select** button to move to the next group of digits. It is suggested that the year be set first, then the month and finally the day. The system is automatically calculating valid dates and would not allow a date of 02/29/07, where it would permit 02/29/08.

To accept the newly entered value, press and hold the **Select** button for 5 seconds. A message indicating the new date and time will be displayed

S e t t i n g s S t o r e d

The display will return to the previous menu showing the time and date that was stored. Press the **Cancel** button to return to the Top Menu Selection.

If you decide not to change the time and date, press the **Cancel** button to return without making the change. The date and time will have been changed if you see the Settings Stored message.

In both cases the Top Menu Selection display will show again. To return to the ready to test screen press the **Cancel** button.

3.5.9 Run Time

The run time is an option that must be purchased when ordering the Model 225. If you do not have this option, selecting this menu group will cause a warning message indicating that the feature is not available. The run time adjusts how long the temperature profile is measured to find the inflection point. Some products can get by with shorter run times, allowing more measurements to be made. Other product may need extended run times because of higher initial temperatures. The run time can be adjusted from 3:00 to 9:30 in 30 second increments as well as 9:55. Standard test time is 5:00.

To change the Run Time, press the **Select** button from the ready to test screen. Use the scroll buttons to choose the Run Time group.

T o p M e n u S e l e c t i o n
7 - R u n T i m e



3.5.9 Run Time (Cont'd)

Press the **Select** button to select this menu group. Use the scroll buttons to change the Run Time

Run Time Menu 5: 00

To accept the newly entered value, press the **Select** button. If you decide not to change the value, press the **Cancel** button to return without making the change. In both cases the Top Menu Selection display will show again. To return to the ready to test screen press the **Cancel** button.

3.5.10 Plot Baseline Temp

The Plot Baseline Temperature is an option that must be purchased when ordering the Model 225. It is only available as an option if you also purchase the external printer or TMDAS option. If you do not have this option, selecting this menu group will cause a warning message indicating that the feature is not available. This menu group allows the baseline of the printed graph to be adjusted. This option is necessary with some products where the inflection point may occur above or below the range of the normal printout.

To change the baseline temperature, press the **Select** button from the ready to test screen. Use the scroll buttons to choose the Plot Baseline Temp group.

Top Menu Selection 8 - Plot Baseline Temp
--

Press the **Select** button to select this menu group. Use the scroll buttons to change the temperature. Each press of the scroll buttons increment/decrements the temperature 1°C or 2°F (even numbers).

Plot Baseline Temp Menu 58. 0

To accept the newly entered value, press the **Select** button. If you decide not to change the value, press the **Cancel** button to return without making the change. In both cases the Top Menu Selection display will show again. To return to the ready to test screen press the **Cancel** button.



3.5.11 History / Status

To enter the History / Status menu, press the **Select** button from the ready to test screen. Use the scroll buttons to choose the User ID group.

Top Menu Selection
9 - History / Status

Press the **Select** button to select this menu group. Use the scroll buttons to move through the displayed status.

The first item displayed is the total number of chocolate samples which have been tested.

History / Status Menu
58 Samples

The next item is the total number of hours that the Model 225 has been powered.

History / Status Menu
71.0 Hours

The current cooler temperature is displayed.

History / Status Menu
COOLER = 48.6° F

The current heater temperature is displayed.

History / Status Menu
HEATER = 77.4° F

Channel 0 is the cooler voltage. The voltage reading are dynamic and are continuously measured.

History / Status Menu
Ch0 » 3.01



3.5.11 History / Status (Cont'd)

Channel 1 is the 28 volt internal power supply.

Hi s t o r y / S t a t u s M e n u Ch1 » 28. 11
--

Channel 2 is the internal voltage reference, normally 2.5 volts.

Hi s t o r y / S t a t u s M e n u Ch2 » 2. 49

Channel 3 is the heater voltage.

Hi s t o r y / S t a t u s M e n u Ch3 » 1. 30

Channel 4 is the cooler current.

Hi s t o r y / S t a t u s M e n u Ch4 » . 89
--

Channel 5 is the cooler stability servo screen.

Hi s t o r y / S t a t u s M e n u Ch5 » 2. 42

Channel 6 is the heater stability servo screen.

Hi s t o r y / S t a t u s M e n u Ch6 » 2. 65

To return to the Top Menu Selection, press the **Cancel** button. To return to the ready to test screen press the **Cancel** button.



3.5.12 LCD Contrast

The LCD Contrast is adjusted using this menu group. The contrast can be adjusted from light to dark. The user should adjust the contrast for best viewing under the lighting conditions available.

To enter the LCD Contrast group, press the **Select** button from the ready to test screen. Use the scroll buttons to choose the LCD Contrast group.

Top Menu Selection 10 - LCD Contrast

Press the **Select** button to select this menu option. Use the scroll buttons to change the contrast. You may hold the scroll buttons down to allow the value to continuously change. A sample line of text is displayed so that best contrast can be obtained for both text lines.

LCD Contrast Menu @BDFHJLNPRTVXZ¥^ ' bdf h j l n

To accept the newly adjusted value, press the **Select** button. If you decide not to change the value, press the **Cancel** button to return without making the change. In both cases the Top Menu Selection display will show again. To return to the ready to test screen press the **Cancel** button.

3.5.13 CTU Offset Adjust

The CTU offset is a constant added to the CTU calculation. TRICOR uses this value to adjust the temper meter models so that a consistent reading is obtained between models. The chocolate manufacturer can also use this value to adjust for minor differences between temper meters.

To enter a CTU offset, press the **Select** button from the ready to test screen. Use the scroll buttons to choose the CTU Offset Adjust group.

Top Menu Selection 11 - CTU Offset Adjust
--



3.5.13 CTU Offset Adjust (Cont'd)

Press the **Select** button to select this menu group. Use the scroll buttons to change the CTU Offset. The minimum value is -9.9 and the maximum is +9.9. Holding the scroll buttons will make the value increment/decrement at a fast rate.

CTU Offset Adjust Menu - 1.0

To accept the newly entered value, press the **Select** button. If you decide not to change the value, press the **Cancel** button to return without making the change. In both cases the Top Menu Selection display will show again. To return to the ready to test screen press the **Cancel** button.

3.5.14 Cooler Set Point

The Cooler Set Point Temperature is an option that must be purchased when ordering the Model 225. If you do not have this option, selecting this menu group will cause a warning message indicating that the feature is not available. This menu group allows the cooler temperature to be adjusted.

Top Menu Selection 12 - Cooler Set Point

Press the **Select** button to select this menu group. Use the scroll buttons to change the temperature. The temperature can be changed in 0.1 degree steps.

Cooler Set Point Menu 48.6

To accept the newly entered value, press the **Select** button. If you decide not to change the value, press the **Cancel** button to return without making the change. In both cases the Top Menu Selection display will show again. To return to the ready to test screen press the **Cancel** button.



3.5.14 Cooler Set Point (Cont'd)

WARNING

Changing the cooler set point will effect the calibration of the Model 225. TRICOR uses the set point to obtain uniformity between its temper meter lines. Changing the temperature voids any calibration certification provided by TRICOR. This feature is intended for advanced users only.

3.5.15 Heater Set Point

The Heater Set Point Temperature is an option that must be purchased when ordering the Model 225. If you do not have this option, selecting this menu group will cause a warning message indicating that the feature is not available. This menu group allows the heater temperature to be adjusted.

Top Menu Selection 13 - Heater Set Point

Press the **Select** button to select this menu group. Use the scroll buttons to change the temperature. The temperature can be changed in 0.1 degree steps.

Heater Set Point Menu 78.0

To accept the newly entered value, press the **Select** button. If you decide not to change the value, press the **Cancel** button to return without making the change. In both cases the Top Menu Selection display will show again. To return to the ready to test screen press the **Cancel** button.

WARNING

Changing the heater set point will effect the calibration of the Model 225. TRICOR uses the set point to obtain uniformity between its temper meter lines. Changing the temperature voids any calibration certification provided by TRICOR. This feature is intended for advanced users only.



3.5.16 Line Frequency

The Model 225 is designed to work on either 50 or 60 Hz AC power. For optimal noise rejection the system needs to be told the AC line frequency. To select the line frequency, press the **Select** button from the ready to test screen. Use the scroll buttons to choose the Line Frequency group.

Top Menu Selection
14 - Line Frequency

Press the **Select** button to select this menu group. Use either scroll buttons to toggle the frequency setting. Set the frequency to value of your facility power.

Line Frequency Menu
60 Hz

To accept the newly entered value, press the **Select** button. If you decide not to change the value, press the **Cancel** button to return without making the change. In both cases the Top Menu Selection display will show again. To return to the ready to test screen press the **Cancel** button.

3.5.17 Self Test

This menu choice runs the system test that is performed when the Model 225 is first turned on. All the same checks are performed.

To run the self test, press the **Select** button from the ready to test screen. Use the scroll buttons to choose the User ID group.

Top Menu Selection
15 - Self Test

Press the **Select** button to select this menu group. The display will show a testing system message with a scrolling progress bar..

Testing System . . .



3.5.17 Self Test (Cont'd)

When testing is complete, the system will return to the Top Menu Selection. To return to the ready to test screen press the **Cancel** button.

Any failures detected during the self test will halt the testing and display a warning message with a numeric code. The warning codes can be found in the appendix.

<p>System Warning - 10 Push Cancel To Continue</p>
--



SECTION 4

CONFIGURATION SOFTWARE

This section describes the use of the Configuration application. This software communicates with the Model 225 and allows changes to the settings and features available. Not all the feature choices are available through the menu screen on the Model 225. This software permits changes to these items. The features available only with this software include:

- Password setup
- User text message on printouts
- Display format (CTU or slope)

The Configuration application also makes management of the 225 much easier. For example, most modern Windows operating systems now synchronize the PC clock with a NIST traceable clock source. The Configuration application, with the push of a button, can then synchronize the Model 225 clock (optional feature) with the PC clock.

The installation and setup of the Configuration application and the connection to the PC is discussed in section 2.6. Install the software and connect the Model 225 to the PC using your preferred method; USB or RS232.

Turn on the Model 225 and allow it to come to the "WAIT" or "Ready To Test" mode. Start the Configuration application. Note the communications channel number in the status bar at the bottom-left of the dialog. It should increment from 1 to 8 checking each channel to see if it can location the Model 225. The scanning will stop, and full control of the 225 will begin once it is found.

NOTE

During chocolate testing or when using the menu mode of the unit, the PC is not allowed to communicate. The Configuration application will discover that there is no one to talk to and will start to scan for the Model 225. When the 225 is again ready to accept communications, the application will discover it

The controls and buttons of the Configuration application are grayed-out until full communication is established. If you experience trouble making the connection to the Model 225, please contact TRICOR Systems for assistance.



The Configuration application is a dialog with a “tabbed” window. Each of the tabs group together common features. The discussion below describes the features available and is broken into each of the tab groups.

Most of the controls and text windows have fly-over help descriptions. Simply move the mouse cursor over a item of interest, and a help message should pop up.

4.1 Clock / Calendar Set (optional)

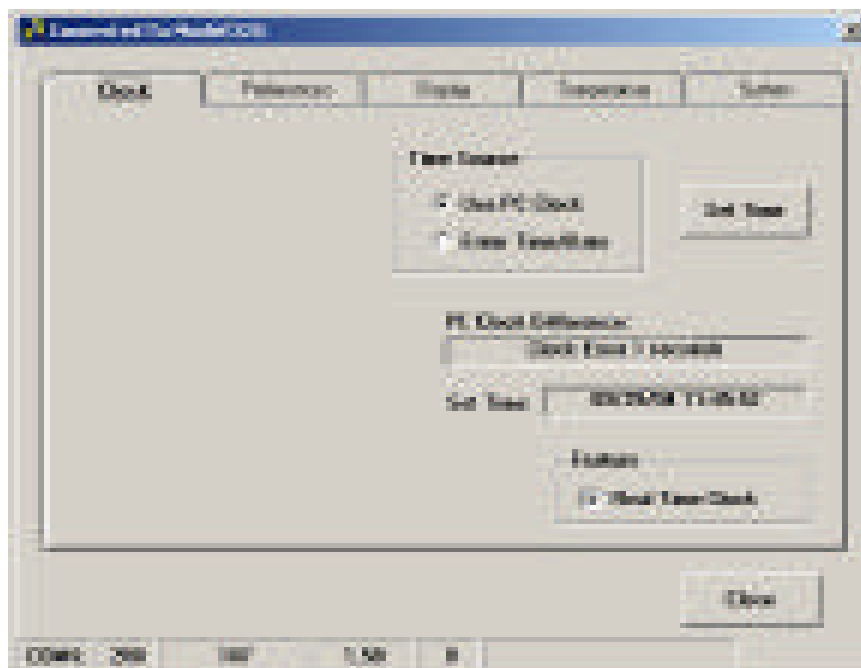


Figure 4.1 Configuration Application Clock Tab

The real time clock is a feature of the Model 225 which is optionally ordered at time of purchase. This hardware keeps track of the time and date so that the information is available to add to the printed data. Traceability of test conditions is improved with automatic date stamps.

The date and time should be set to local conditions, and are not corrected for daylight savings offsets. The date is, however, corrected for leap years. All time is displayed in 24 hour format. Noon is 12:00, while midnight is 0:00.



4.1 Clock / Calendar Set (optional) (Cont'd)

If your Model 225 has the date/time option, you may use the Configuration application to correctly set the clock. There are 2 methods that can be used. The first and easiest is to use the time of day from the clock in the PC running the application software. The other requires you to manually choose the month, day and year as well as specify the time in hours and minutes. Seconds are force to 0. Use the radio button selector for **Time Source** group and choose which method is appropriate. Note that when the **Use PC Clock** option is selected, the **Set Time** field is incrementing as the PC's clock changes.

Press the **Set Time** button to set the clock in the Model 225. The new time is transferred and the application checks for the correct settings. Note that the PC and the Model 225 only measure time to the nearest second. It is quite possible to have both set the same and have a 1 second error.

The **Features** group at the bottom of this tab has a check box, **Real Time Clock**, which indicates whether this feature is available. This is an indication only. Clicking on the check box will not change the optional feature.

4.2 Preferences

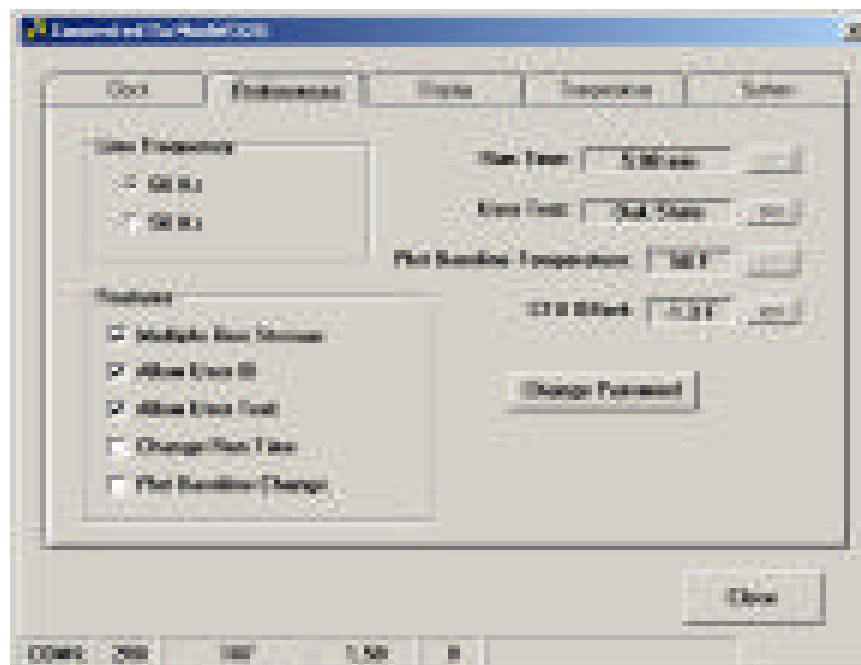


Figure 4.2 Configuration Application Preference Tab



4.2 Preferences (Cont'd)

The **Preferences** tab allows changes to the basic setup of the Model 225. This includes the following features:

- Line frequency
- Password (to the menu)
- Sample run time (option)
- User text
- Plot baseline temperature (option)
- CTU offset

The **Features** group has a series of check boxes which indicate the availability of various optional features. These are indicators only; they can not be clicked on to change the state of the feature.

The **Allow User ID** check box indicates if the user is permitted to enter an ID which is printed in the test results. The ID is a value of 1-199. The value is not permanently stored in the Model 225 and can only be entered from the 225 menu. This ID can not be set from the Configuration application.

The **Multiple Run Storage** checkbox indicates the ability to store many previous runs in the unit. The standard is to store only the last 5. The multiple store uses a large memory to store to the capacity of the memory previous runs. The number is a variable function that depends on the length of the run and the number of aborted runs. Typical multiple storage results are:

Run Time	Capacity (Runs)
3:00	288
3:30	261
4:00	238
4:30	219
5:00 (standard)	202
5:30	188
6:00	176
6:30	165
7:00	156
7:30	147
8:00	140
8:30	133
9:00	127
9:30	121
9:55	117



4.2 Preferences (Cont'd)

These are maximum runs stored depending on the run time of the sample (an optional feature). Longer runs use more memory and allow fewer results to be stored in the fixed memory size. Your usage may be somewhat less.

The remaining features on this tab are described below.

4.2.1 Line Frequency

The hardware in the Model 225 can optimize the data collection process to eliminate noise generated by AC electric and magnetic fields in your facility. To accomplish this noise reduction, the unit must know the power line frequency in use. In the Western hemisphere, 60 Hz is common. Europe and Asia, with the exception of Japan use 50 Hz.

To obtain the best performance, select the frequency in use at your location. Click the appropriate radio button in the **Line Frequency** group.

4.2.2 Change Password

A password may be applied to the Model 225 to prevent users from changing settings by using the menu mode of the unit. Entry into the menu mode requires entry of an 8-digit password made up of the numbers 1 to 4 (the numbers on the 255 buttons). A correct and speedy entry of this 8-digit value is required when the **Select** button on the 225 is pressed. Entering the incorrect value or delaying too long will result in the unit returning to the Ready To Test mode. Once in the menu mode, the operator can return to the Ready To Test mode and re-enter the menu if 60 seconds does not expire.

The password is by no means a major security feature. It only prevents casual users for modifying the setting of the Model 225 through the menu. It also prevents easy changes to those features you may want to use following each chocolate test run. Consider carefully if you need to enable this feature. The password has no effect on the operation of the Configuration application.

Press the **Change Password** button on this tab screen. A dialog box will appear asking for a new password. Enter 8 digits only using the numbers 1 through 4. Any other combination will not be accepted. A warning dialog will appear. If a valid password is entered, clicking on the **Ok** button will set this value as the new password in the 225.



4.2.2 Change Password (Cont'd)

You may disable the password protection. To remove the password, follow the procedure above and enter a single 0. A value of 0 is a disabled password.

4.2.3 Sample Run Time (Option)

The run time is an option that must be purchased when ordering the Model 225. If you do not have this option, the **Change Run Time** check box in the feature group will be unchecked and the feature will be unavailable. In addition, the small pushbutton to the right of the **Run Time** field will be grayed-out.

The run time adjusts how long the temperature profile is measured to find the inflection point. Some products can get by with shorter run times, allowing more measurements to be made. Other product may need extended run times because of higher initial temperatures. The run time can be adjusted from 3:00 to 9:30 in 30 second steps as well as 9:55.

To change the run time, press the small button next to the **Run Time** field. A dialog will open with a drop down list of available choices. Select the time that is appropriate for your process. Do not make this time so short that you may miss the second inflection point. Press the **Ok** button to accept the change.

4.2.4 User Text

The Model 225 can store a 12-character line of text that gets printed at the top of both the internal and external print outputs, and can be transferred to the TMDAS program. This text can be any string of characters you wish to use. For example, your company name, or if there are multiple 225s, the production line where the temper meter is being used.

Note that because of the difficulty in entering text data using just 4 buttons on the Model 225 menu mode, it is only possible to change this line of text using the Configuration application.

Press the small button next to the **User Text** field and enter your text in the dialog that appears. If you wish to delete the text message from the Model 225, enter a blank line that contains no characters, not even spaces. Press the **Ok** button to accept the changes and transfer the new text to the Model 225.



4.2.5 Plot Baseline Temperature (Option)

The Plot Baseline Temperature is an option that must be purchased when ordering the Model 225. It is only available as an option if you also purchase the external printer or TMDAS option. If you do not have these options, the **Plot Baseline Change** check box in the feature group will be unchecked and the feature will be unavailable. In addition, the small pushbutton to the right of the **Plot Baseline Temperature** field will be grayed-out.

This menu group allows the baseline of the printed graph to be adjusted. This option is necessary with some products where the inflection point may occur above or below the range of the normal printout.

To change the baseline temperature of the external printout, press the small button next to the **Plot Baseline Temperature** field and enter your new temperature in the dialog that appears. The range is limited and indicated on the dialog. Press the **Ok** button to accept the changes and transfer the new value to the Model 225.

4.2.6 CTU Offset

The CTU offset is a constant added to the CTU calculation. TRICOR uses this value to adjust the temper meter models so that a consistent reading is obtained between models. The chocolate manufacturer can also use this value to adjust for minor differences between temper meters.

The current value of the CTU offset is displayed in the **CTU Offset** field. Press the small button next to this field to make a change. Enter the new value in the dialog box that appears. The CTU offset is limited in range to ± 9.9 . Press the **Ok** button to accept the changes and transfer the new value to the Model 225.



4.3 Display

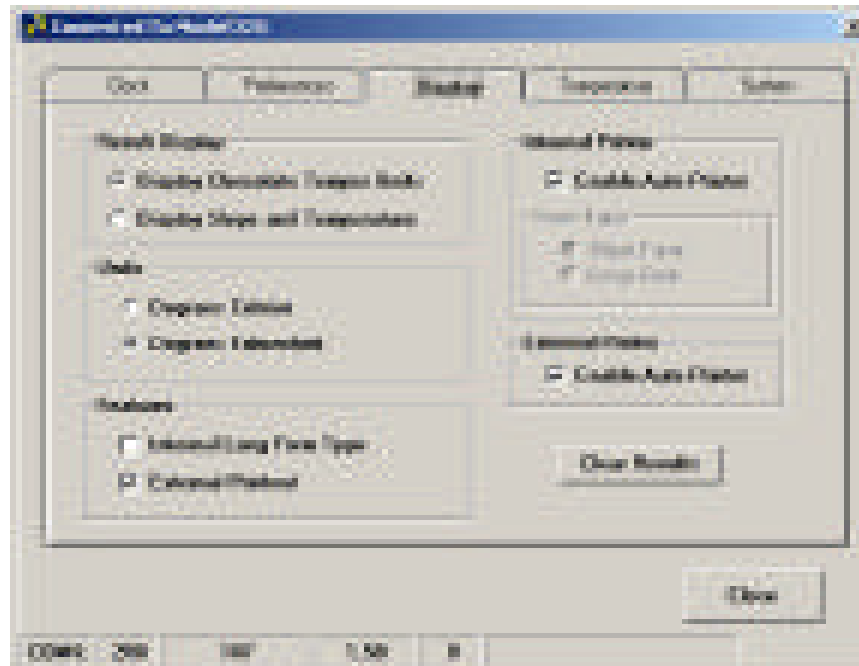


Figure 4.3 Configuration Application Display Tab

The **Display** tab allows changes to the formatting of the Model 225 data. This includes the following features:

- CTU or Slope/Temperature
- Temperature unit
- Internal Printer Setup
- External Printer Setup (option)

The **Features** group has two check boxes which indicate the availability of optional features. These are indicators only; they can not be clicked on to change the state of the feature.



4.3.1 Result Display Method

There are two alternate methods of displaying the test results. The standard method is to show the Chocolate Temper Units (CTU) and the slope at the inflection point. The other choice for displayed results is with two inflection points and the slope at the intercept point.

To change the format, select the desired radio button in the **Result Display** group.

4.3.2 Temperature Units

The Model 225 can display temperatures in either degrees Celsius or Fahrenheit.

To choose the temperature units, press the radio button in the **Units** group. Both the Model 225 and the Configuration application use this setting when displaying any temperature.

4.3.3 Internal Printer

By default, the internal printer is set to print the results of every chocolate sample tested. It is possible to turn the auto-printing off. In this case the test will be performed and the final result saved in memory and shown on the LCD. There will not be any paper printout on the internal printer. You may go back later and print a result which is saved in memory. In this case, the auto-printing flag is ignored.

To change the state of the internal auto-print flag, click on the **Enable Auto Print** check box in the **Internal Printer** group.



4.3.4 External Printer (Option)

The external printer is an option that must be purchased when ordering the Model 225. It is only available as an option if you also purchase the external printer or TMDAS option. If you do not have these options, the **External Printout** check box in the feature group will be unchecked and the feature will be unavailable. In addition, the **External Printer** group will be grayed-out.

By default, the external printer is set to print the results of every chocolate sample tested. It is possible to turn the auto-printing off. In this case the test will be performed and the final result saved in memory and shown on the LCD. There will not be any paper printout on the external printer. You may go back later and print a result which is saved in memory. In this case, the auto-printing flag is ignored.

To change the state of the external auto-print flag, click on the **Enable Auto Print** check box in the **External Printer** group.

4.3.5 Clear Results

The Model 225 saves previous test results so that they can be recalled and printed. It may be desirable to clear all the results in the memory. For example, when moving the Model 225 to another production line, the memory holding previous test samples can be wiped clean.

To clear the previous test results, press the **Clear Results** button. This procedure takes quite some time, and communication with the Model 225 will be lost while the unit is searching through the data. Communications will be re-established once the clear operation is complete.



4.4 Temperature Control

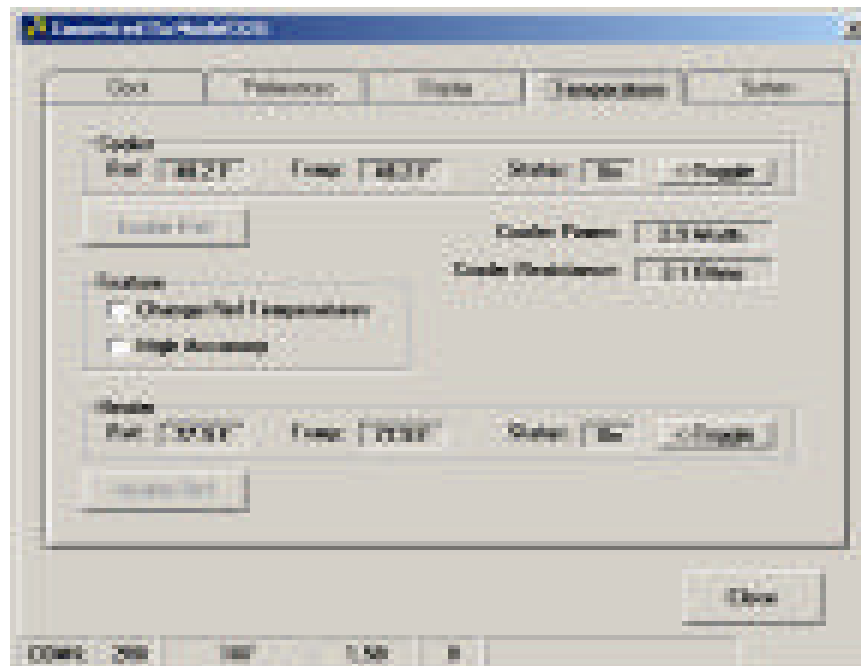


Figure 4.4 Configuration Application Temperature Tab

The **Temperature** tab displays the current temperatures of the cooler well and the heated temperature probe. It also displays information about the cooler assembly.

For both the heater and the cooler there is a group on the display which shows (from left to right) the requested temperature, the current measured temperature, the status of the temperature control loop and a button to toggle control screen on and off.

Normally the control loop toggle buttons should not be pressed. The main software of the 225 may not restart the control if a test is started. If you use these buttons to toggle control off, TRICOR recommends that you turn off the Model 225 before making any chocolate test.

The **Features** group has two check boxes which indicate the availability of optional features. These are indicators only; they can not be clicked on to change the state of the feature. Both of these features are used from experimental testing and not available for normal use. The **Change Ref Temperatures** option being disabled also disables the **Cooler Ref** and **Heater Ref** buttons.



4.4 Temperature Control (Cont'd)

The thermoelectric cooler is monitored on this window. The average power being put into the device to maintain the well temperature is displayed. Under normal room ambient conditions, the power level should range from 2 to 6 Watts. At elevated temperatures, the power increases. The resistance of the cooler device is measured while it is turned on. An instantaneous reading is displayed. TRICOR expects this information to be valuable when troubleshooting customer problems. You may be asked to check these numbers.

4.5 System Status

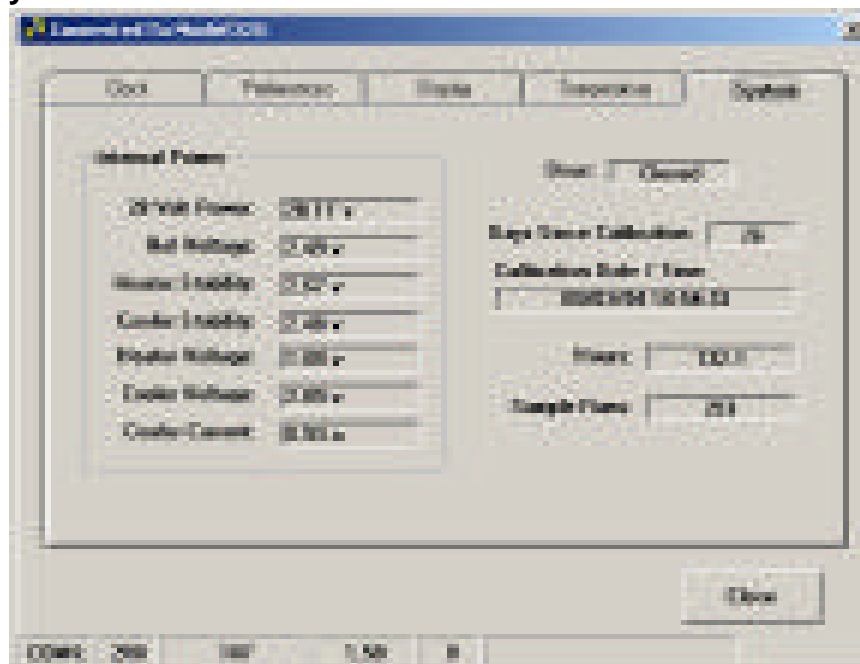


Figure 4.5 Configuration Application System Tab

The **Status** tab displays information about the Model 225 unit that is connected.

The **Internal Power** group displays the internal voltages and currents that are monitored. The main power supply is 28 volts and the top reading. A critical internal reference voltage is next and should be 2.5 volts.

The remainder of the information displayed is self-explanatory.

4.6 Status Bar

The **Status Bar** is at the bottom of the Configuration application window.



SECTION 5

CHOCOLATE TEMPER CURVE INTERPRETATION

Chocolate exhibits the best physical properties, in terms of appearance and handling characteristics, when stable Beta crystals form. Since stable Beta crystals break down (melt) above 95°F (35°C), the chocolate sample being tested must be below this temperature. The chocolate sample should be extracted from a batch of tempered chocolate for the purpose of verifying or adjusting the tempering process. Test results obtained using the 225 permit establishing an accurate, repeatable procedure for determining the temper of a chocolate batch.

5.1 Temper Curve

The temper curve is a temperature-versus-time curve resulting from uniform cooling of the chocolate sample while precisely measuring the temperature of the chocolate sample over a specified period of time. If the chocolate did not generate heat during the crystallization process (latent heat of crystallization), the curve would fall at an exponential rate (refer to Figure 5.1) approaching the cooling temperature. However, chocolate does generate heat during the crystallization process, and the resultant curve deviates from the exponential curve while crystals are actively being formed. When the crystallization process is complete, the temperature (decrease)-versus-time curve resumes at an exponential rate. The type of crystals being formed (Alpha, Beta, or Gamma) as well as the various additives in a particular chocolate formulation will affect the temperature-versus-time curve (temper curve).

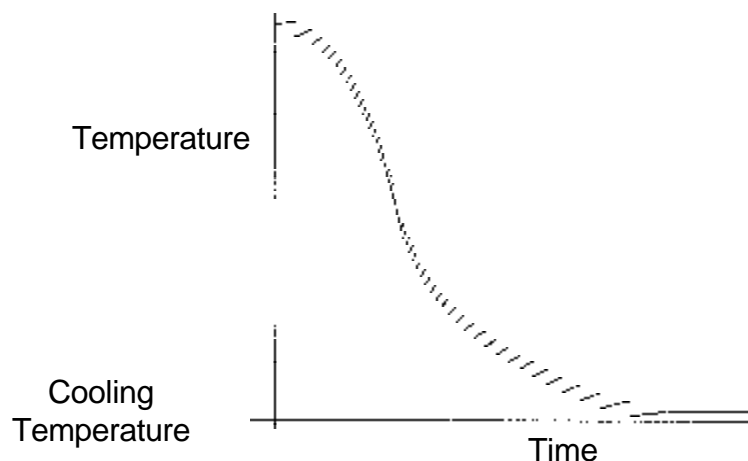


Figure 5.1 Configuration Application Clock Tab



The resultant temper curve can be interpreted qualitatively as described in section 5.2 or analytically using the Chocolate Temper Unit (CTU) and slope method described in section 5.3.

5.2 Qualitative Method

The qualitative method of interpreting the temper curve is dependent upon visually interpreting the temper curve by comparing it to the typical temper curves of Figure 5.2. By comparing the temper curve obtained from the chocolate sample test run to typical temper curves one can obtain a rough estimate of the chocolate temper. Experience has shown that variations in chocolate formulations somewhat affect the shape of the temper curve. The typical temper curves of Figure 5.2 may therefore not be suitable for the particular chocolate formulation being tested. If this is the case, users must define the required shape of the temper curve for their specific chocolate formulation. The qualitative method, at best, provides a crude estimate of chocolate temper.

5.3 Analytical Method

The analytical method of interpreting the temper curve involves determining the Chocolate Temper Unit (CTU) and slope from the temper curve obtained during the chocolate sample test run.

5.3.1 CTU and Slope Determination

The 225 analyzes the temper curve obtained from the test sample run to determine the CTU and slope. The CTU and slope provide a quantitative means of interpreting the temper curve produced by the heat of crystallization process for the test sample. The subjective interpretation of the temper curve is eliminated by providing the operator these two numeric results derived from the temper curve.



5.3.1 CTU and Slope Determination (Cont'd)

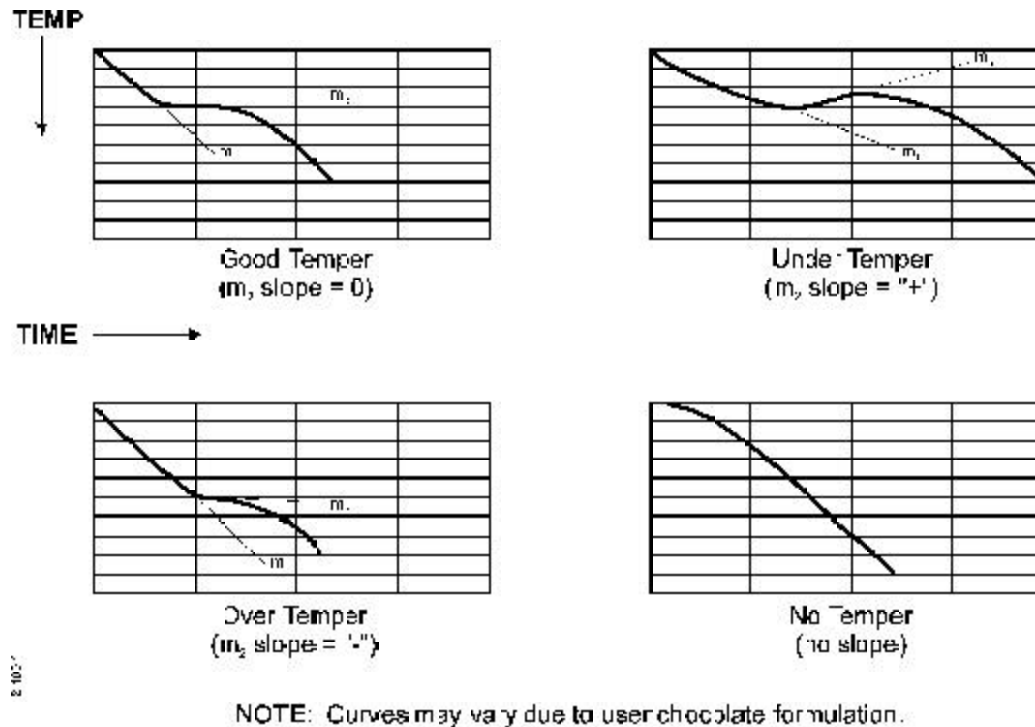


Figure 5.2 Typical Chocolate Temper Curves

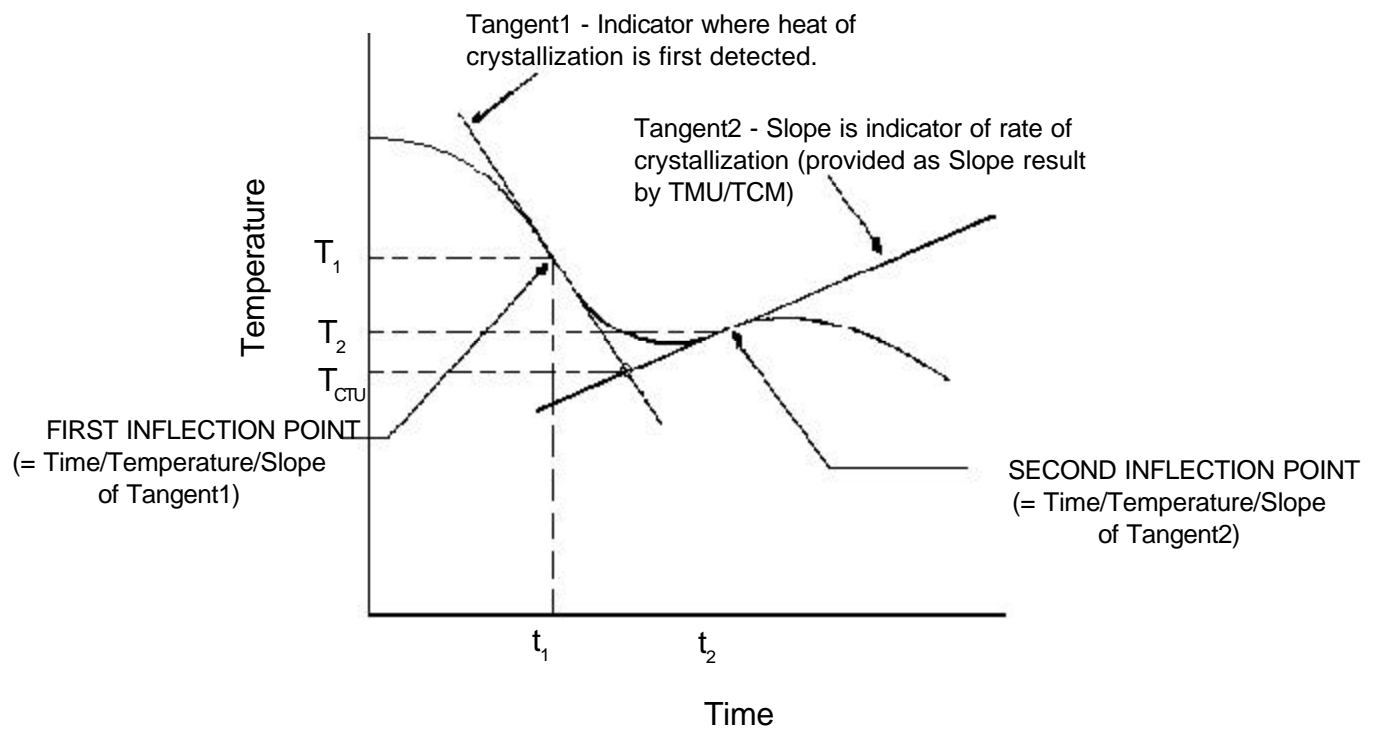
Figure 5.3 illustrates a temper curve and the key parameters analyzed by the 225. The temper curve is analyzed to determine:

- Tangent1** - Time, Temperature, Slope (First Inflection Point)
- Tangent2** - Time, Temperature, Slope (Second Inflection Point)



5.3.1 CTU and Slope Determination (Cont'd)

These are provided as part of the hardcopy results. The 225 then calculates the CTU results as illustrated in Figure 5.3. The slope result is the slope of Tangent2. Examining Figure 5.3 it is readily seen that a change in the shape of the temper curve would result in a different CTU and slope result. Therefore, the combination of CTU and slope results provides a unique numeric representation of the temper curve. Further, since Tangent1 is determined by the heat of crystallization process, which begins at a specific temperature for a given formulation and temper, the original (starting) temperature of the sample is not a factor in the test results. This is not to say that temperature does not affect temper. This is to say, for a given temper present in the test sample, the starting temperature is not a factor in the CTU and slope test results. This is important since the temperature will vary slightly as part of the tempering process in order to maintain the desired temper.



Intersection of Tangent1 and Tangent2 provides Temperature (T_{CTU}) for CTU calculation

$$\text{CTU} = T_{CTU} - 63^{\circ}\text{F} + \text{CTU}_{\text{ADJUST}}$$

(RESULT) (17.2°C)

Figure 5.3 Temper Curve and Key Parameters Analyzed



5.3.1 CTU and Slope Determination (Cont'd)

The CTU and slope combination define the shape of the temper curve. Since the correct temper or temper curve for a given application are dependent upon the formulation and process involved, only the user can establish the correct temper or temper curve for their application. However, TRICOR's automatic temper meters provide a repeatable, accurate and convenient means to measure the temper providing the quantitative CTU and slope results that define the temper curve.

Once the users determine the correct CTU and slope values for their applications, these test results can be used to ensure that the proper temper is maintained.

The optional print/plot temper curve provides additional information for research and development activities, as well as troubleshooting manufacturing processes. For these types of activities, a graphical plot (temper curve) allows visualization of the effects of formulation and process changes.

5.3.2 CTU Criteria

The CTU is a relative number providing a figure-of-merit for chocolate temper. The smaller the number, the less the temper (i.e., "0" or negative is typically very under-tempered); and the larger the number, the greater the temper (i.e., "12" or greater is typically over-tempered). The specific CTU number reflecting "good temper" is dependent upon the user's chocolate formulation and must be empirically derived.

5.3.3 Slope Criteria

The slope also provides an indication of the temper condition. The more negative the slope, the more over-tempered the chocolate. The more positive the slope, the more under-tempered the chocolate. Good temper is indicated by small positive or negative values of slope. The slope values for good temper can also vary with chocolate formulation; therefore it is best for users to determine empirically what values are acceptable for their specific formulations.



SECTION 6 TROUBLE SHOOTING

The Model 225 Temper Meter Unit is designed for many years of trouble free operation. There are many way that the equipment owner can help to extend the life of this product. These include:

- Power down when not in use. Save the energy, save the wear and tear on the fans, save money. On average, the 225 takes less than 3 minutes to get to stable operation. Consider turning of the unit if it is not to be used in the next hour.
- If the printed results are not needed, turn off the auto-print feature. Save paper, save the print mechanism.
- Protect the electrical input with a surge suppressor. Where electrical power quality is poor, use line filters and regulation transformers.
- Keep the unit clean. Avoid use in dusty areas. The ventilation air will coat the inside of the Model 225 with this dust, reducing cooling capability.
- Clean the intake air filter regularly.
- Clean the sample well. Use only the cleaning tool provided. Vacuum or blow chocolate particles from the sample well.
- Keep chocolate from entering the ventilation holes and connectors on the back of the unit.
- Use the Model 225 in the best environment possible. Avoid excessively hot and humid conditions.

Should you have any trouble with the Model 225, check the problems identified below. If nothing here solves the issues, please contact TRICOR Systems.

6.1 No Power

Check the fuses in the power entry module. There are two fuses, both 2 amp, slow blow, 3AG. If blown, replace and test for proper operation. Open the fuse cover by prying open the cover flap with a small flat blade screw driver. Pull the fuse holding module out of the power entry assembly. Verify that both fuses are good before returning the module. Close the cover flap.

Power is present if the fans are turning, the printer lights flash, the LCD backlight illuminates or the power on indicator flashes.

Try replacing the power cord with a known, good power cord.



6.2 Blank LCD Display

If the display comes on without any characters visible, read section 3.2 about display contrast. Perform the recommended adjustment procedures.

6.3 Warning Messages

Warning messages are generated when the Model 225 is first turned on and when the self test is run in the menu mode. The warnings indicate a failure of a test to obtain the correct response from the system. No warning message will prevent the unit from operating with the exception of the message below:

System Critical Failure
Push Cancel To Continue

This message indicates that the unit software can not continue. The unit will be reset when the **Cancel** button is pressed.

All other warnings allow the user to continue. A typical message is:

System Warning - 23
Push Cancel To Continue

This message indicates that the Model 225 is “out of calibration”. A list of all the failure codes follows:

- 01 – The stored clock data is corrupted
- 02 – The clock battery has failed, time is invalid
- 03 – The clock hardware has failed
- 04 – The EEPROM data is corrupted (user preferences)
- 05 – The program checksum is corrupt
- 06 – The heater set point is out of range
- 07 – The cooler set point is out of range
- 08 – The 28v power supply is out of tolerance
- 09 – The 2.5v reference is out of tolerance
- 10 – The heater is on when commanded off
- 11 – The cooler is on when commanded off
- 12 – The cooler is off, but current is flowing
- 13 – The cooler stability test failed (+2 degrees)



6.3 Warning Messages (Cont'd)

- 14 – The cooler stability test failed (-2 degrees)
- 15 – The heater stability test failed (+1 degree)
- 16 – The heater stability test failed (-1 degree)
- 17 – The stored user preferences are invalid
- 18 – The cooler was too cold (should have been warmer)
- 19 – There is insufficient cooler voltage
- 20 – There is insufficient cooler current
- 21 – The computed cooler resistance is too high
- 22 – Six month left before calibration due*
- 23 – Unit is out of calibration*

* The unit is considered out of calibration 18 months from the date displayed in the system status window on the Configuration application (see section 4.5). Six months prior to the “out of calibration” warning, the user will receive a warning 22 indicating that calibration is due. With the exception of the warning message, the “calibration due” message causes no changes in the behavior of the Model 225. The “out of calibration” warning causes a banner to be added to the printed output from the Model 225.

Warning 04, EEPROM data is corrupt can be caused by turning off the Model 225 while in the menu mode after making changes. Always return to the “ready to test” mode before turning off power. If corruption occurs, make a change to some feature, for example, change the temperature units. Then change them back and exit the menu mode. The warning should go away.

Warnings 13 through 16 may occur if the Model is turned off then back on while the heater and cooler temperatures are changing. Under these conditions you may ignore the warning. These failures should not occur when the unit is turned on after 15 minutes of down time.

If you have problems with recurring errors, please call TRICOR Systems with the warning codes.



6.4 Stored Result Errors

The Model 225 saves test results in a memory that retains the results even after power is turned off. The memory is organized as a linked list of test results, one following the other. Occasionally, this linking might fail. The primary cause is a power failure before the complete test record is written to memory. The broken linkage will cause read failures when moving back through the latest results.

The result error messages consist of the following menu screen:

Bad Record - 5: 10

The first number is the indication of the searching that was attempted and the reason for the failure. The values below describe the fault.

1. No next data record header
2. The next record is empty (last record)
3. No previous data record header
4. The next data record is corrupted
5. The previous data record is corrupted
6. The previous data record is empty (first record)
7. The current data record is corrupted
8. The data record has mismatched linkage
9. The data has no inflection
10. The data record has a bad checksum
11. No record was found

The second number in the Bad Record field is an identifier to help pin-point the failure reason. The values below describe the fault.

1. Bad data locator, pointer 1
2. Bad data locator, pointer 2
3. Bad data locator, pointer 3
4. Bad data locator, pointer 4
5. Bad data header checksum
6. Beyond storage limit capacity
7. The previous data record is empty
8. The data record sample count is invalid
9. The data record sample count indicates empty
10. The data record count was not empty
11. The header does not have a valid pattern match



6.4 Stored Result Errors (Cont'd)

Data record corruptions will usually clear themselves as more data gets stored. If problems persist, clear the stored result memory by following the instruction in section 3.5.4.

6.5 Temperature Stability

If you suspect that the temperature stability of the Model 225 is poor, first check that there is adequate air flow through the unit. Read section 2.1 concerning equipment setup. Check the bottom screen to see if it is clogged. Be sure your AC line power is of good quality.

Go to the menu history view, section 3.5.11, and monitor the unit's behavior. Both the heated temperature probe and the cooler well temperature can be checked. The temperature should not vary by more than 0.2 °C once the stable temperature point is reached.

Be certain you have not exceeded the ambient temperature limits of the unit. If problems persist, call TRICOR Systems technical support department.

6.6 Non-Repeatable Results

If inconsistent results are observed, first check your procedure. Are the users introducing variability because of the manner in which they fill or hold the sample cup? Is the time from filling the cup to starting the test excessively long or variable? Review Running A Chocolate Sample, section 3.4 to help reduce errors.

If you are attempting to obtain identical results from multiple TRICOR temper meters, remember that this is the reason each unit has a CTU offset adjustment. It may be necessary to adjust the temper meter to obtain the same reading across multiple machines.