



CSC SCIENTIFIC

DIGITAL MOISTURE BALANCE

Operating Instructions

**v. 0596
P26900INST2**

CSC SCIENTIFIC COMPANY, INC.

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Please read all instructions before operating your CSC Digital Moisture Balance. Whenever using the instrument, remember to follow all of the appropriate operating and safety instructions and observe all the warning labels and cautions mentioned in this manual.

If you need assistance, please call 1-800-458-2558.

For your reference and protection, please record the following:

Model Number _____

Serial Number _____

Purchase Date _____

Date Warranty Card Mailed _____

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INTRODUCTION

Thank you for purchasing the CSC Digital Moisture Balance. This electronic moisture balance is engineered to measure 0 – 100% moisture or solid content of materials that maintain their chemical structure while drying under infrared heat. Since drying and weighing are simultaneous, this instrument is especially useful in measuring the moisture content of substances that quickly reabsorb moisture.

This state-of-the-art moisture balance has been designed to make testing as easy and convenient as possible. It can be operated in three different drying modes -- automatic, timed, and manual -- to enable you to tailor the instrument to your particular application and needs. It also offers built-in RS-232 interface capability for automatically recording your test data either to a printer or PC.

The instruction manual has been written to assist you in all aspects of the proper operation of the moisture balance. If we, CSC Scientific, can be of further assistance to you, please call our toll-free number: 1-800-458-2558.

Before installing your moisture balance, check your shipping carton for the following:

- CSC Digital Moisture Balance
- Pan Support
- Retainer Pan
- Disposable Sample Pans (1 box)
- Power Cord
- Fuses (2)
- Balance Check Weight
- Infrared Bulb (Industrial Strength Heat Lamp)
- Instruction Manual
- Warranty Card

PREPARATION

Select a suitable work area.

- Work area should be relatively free from air drafts and vibrations.
- Work surface should be level and rigid.
- Power line voltage to your instrument should be constant and free from fluctuations. It is **not** advisable to use an outlet that is shared with fluorescent fixtures or other electrical equipment that draws voltage in an inconsistent manner. *Be aware that an improper power supply can cause erroneous readings.* If necessary use a line conditioner. (See Appendix: "Power Line Conditioner, Part #P269951.)
- Do not locate near magnetic materials or equipment/instruments which incorporate magnets in their design.
- Avoid areas which have variations in room temperature or have excessive room temperature. Room temperature above 105°F/40°C or below 60°F/15°C could affect the operation and accuracy of your moisture balance.

INSTALLATION

Set up your moisture balance by following these steps:

(see Set-Up Figure 1)

- Remove moisture balance and all accessories from the carton. We strongly recommend saving the specially designed packaging for future transport or storage to adequately protect your instrument in transit.
- Insert pan support into pan support receptacle, making sure it does not touch pan stem. Gently set retainer pan on pan stem. Be aware that the pan stem is connected to the most delicate part of the instrument, so treat with care.
- Insert power cord into the receptacle located on the rear panel of the moisture balance. Firmly push in the plug. (The factory setting for US is 120 volts.)
- Turn power switch to the **ON** position. Switch is located on back panel above power cord. **Allow the moisture balance to warm up for 20 minutes before beginning operation.** To avoid this required warm up period, we recommend that you leave the power switch in the **ON** position at all times.
- Complete and return the enclosed warranty card to CSC Scientific to validate your warranty. Record warranty information in the space provided on the inside cover of this manual for your convenience.
- Perform balance check (see *Balance Check* page 6)

Figure 1: CSC Digital Moisture Balance Pan Assembly

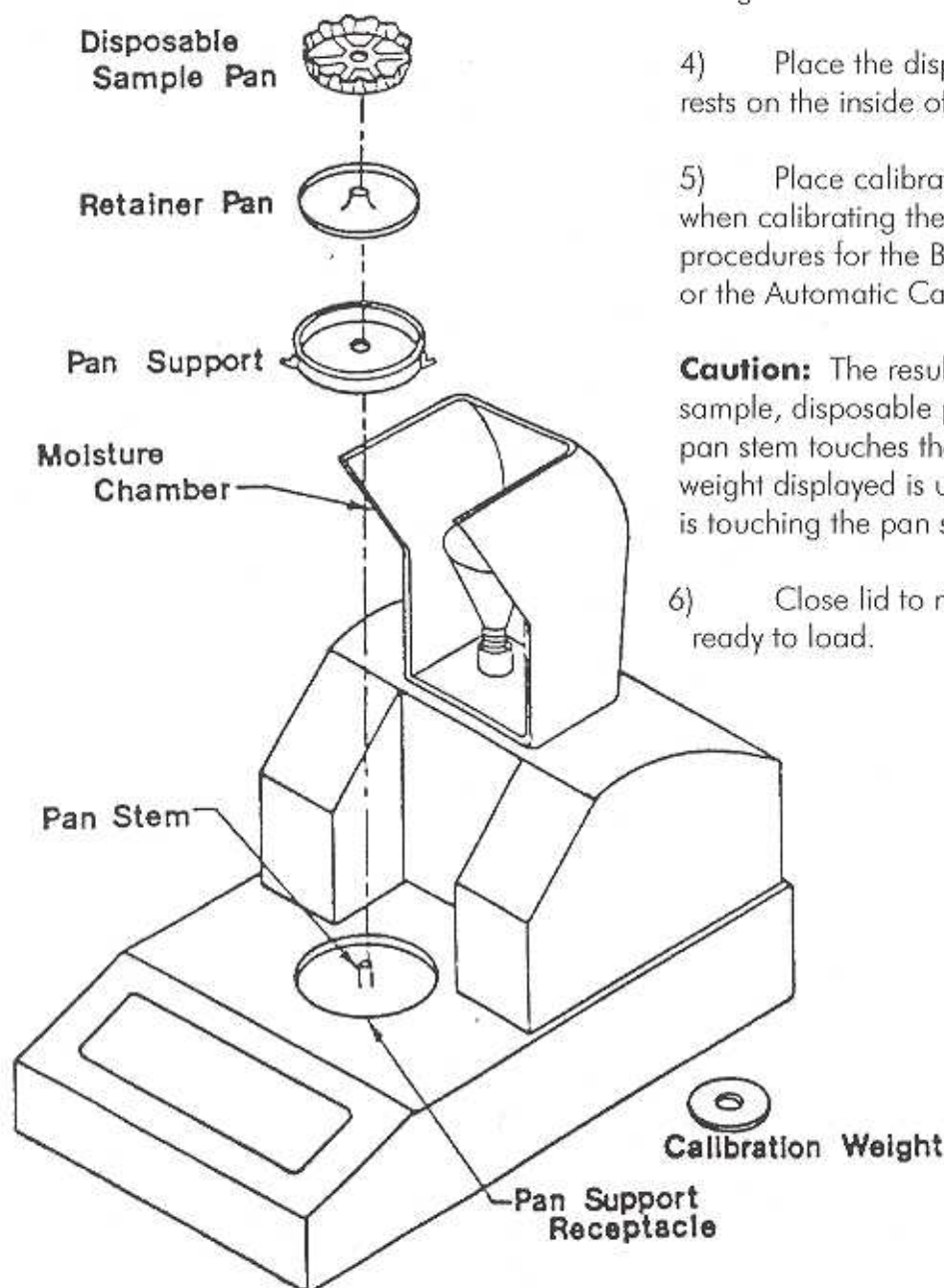
- 1) Lift lid to moisture chamber to reveal pan stem.
- 2) Insert pan support into pan support receptacle, making sure it does not touch the pan stem.
- 3) Gently set retainer pan on pan stem, being careful not to move pan support.

4) Place the disposable sample pan so it rests on the inside of the retainer pan.

5) Place calibration weight on retainer pan when calibrating the instrument following the procedures for the Balance Check on page 6 or the Automatic Calibration on page 30.

Caution: The results will be inaccurate if the sample, disposable pan, retainer pan, or the pan stem touches the pan support. Anytime the weight displayed is unstable, check that nothing is touching the pan support.

6) Close lid to moisture chamber until ready to load.



SAFETY PRECAUTIONS

We at CSC Scientific have made every attempt to make your new CSC Digital Moisture Balance safe and easy to use. However, please follow these simple safety steps to help you avoid burns and possible exposure to harmful fumes from the materials you are testing.

1. Do **NOT** touch the aluminum disposable pan or its contents while hot, especially during a test.
2. Know the materials that you are testing. Some materials may present a fire hazard if the materials are heated. Some materials may cause dangerous or noxious fumes when heated. The CSC Digital Moisture Balance may be used in a fume hood if the fumes are too strong.
3. Know where your fire extinguishers are located. Use only certified and tested fire extinguishers rated for electrical fires.
4. Keep the instrument clean. Always turn off, unplug and let the Digital Moisture Balance cool for at least 15 minutes before cleaning the instrument.
5. Keep the instrument in a well-ventilated area. Air coming out of the instrument can be hot. Do **NOT** block the instrument with papers or other combustible items.

BALANCE CHECK

All units are calibrated and checked for accuracy at the factory prior to shipment. However, you should check the operation of your unit before using it for the first time, and you should periodically check the balance to ensure that it has not been damaged. The Balance Check procedure is an indication of whether or not the internal scale has been damaged. For complete auto calibration procedure, see *Auto Calibration* on page 29.

1. Lift up the hood of your unit
2. Press the **TARE** key.
3. Place the Calibration Weight provided on the retainer pan.
4. When the weight is stable, press the **AUTO CAL** key.
5. If the balance is operating normally, the display reads OK.
6. Press the **TARE** key to return the unit to normal operation after the check procedure is finished.
7. Remove the Calibration Weight. The display returns to zero.

DISPLAY SHOWS

Moisture Auto
0.00 g

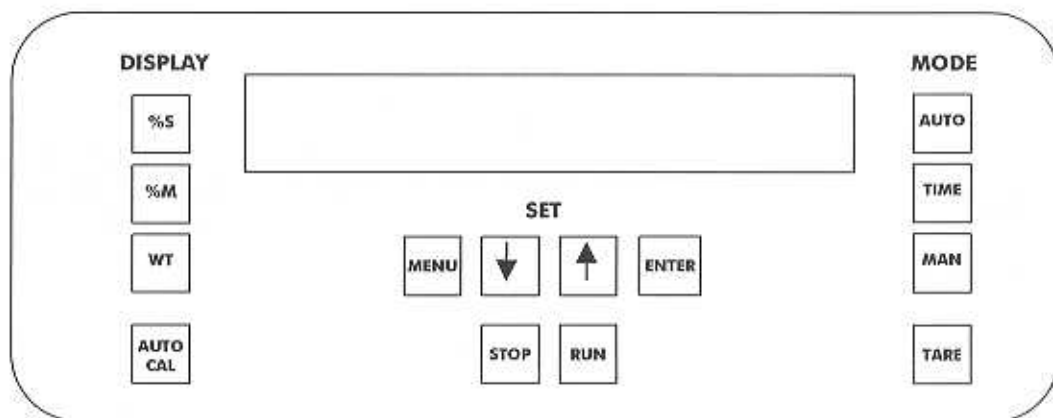
Balance Check

Balance Check
OK

Moisture Auto
0.00 g

Note: If display reads: Balance Check – Error at this point refer to Trouble Shooting Section.

KEYPAD



DISPLAY KEYS

Note: **Power** – on/off switch (located on back of the instrument) supplies power to the unit.

Power may remain on at all times to eliminate warm up period.

The display keys are used to select the format of the test result shown on the display screen. These keys may be used at any time – either when the test is in progress or when the instrument is in standby.

%S	Results displayed as percent SOLIDS (0-100%) *Note: 100% solids is equal to 0% moisture (or 100% minus % moisture content)
%M	Results displayed as percent MOISTURE LOST (0-100%)
WT	Weight of sample displayed in grams.

MODE KEYS

The mode keys are used to select an operating method which is defined by HOW the instrument ENDS a test. *Note: Test Mode **CAN NOT** be changed while a test is in progress.

AUTO	In AUTOMATIC MODE , the unit runs until the % weight value changes less than "x" grams for "y" amount of time. Factory set parameters are less than .01g weight change in two minutes after a one minute delay after test begins. This mode looks at the evaporator condition of the sample. Parameters may be changed (see <i>Changing Mode Parameters</i>).
-------------	---

TIME

In **TIME MODE**, the instrument runs until it reaches a predetermined time set by you. The clock counts down from the set time in minutes and seconds to zero and shuts off (see *Changing Mode Parameters*).

*This mode looks only at the clock.

MAN

In **MANUAL MODE**, the instrument runs continuously until the **STOP** key is pressed by you. This mode is useful in establishing your testing standards, but not as a routine test mode.

SET KEYS

These four keys work together to operate the Menu. The Menu allows you to set up and select various instrument options.

MENU

This key allows you to enter and exit the Menu.



This key allows you to scroll cursor to desired selection downward or to decrease a numeric test parameter. *At the conclusion of a test, this key allows you to view initial weight of test sample to 0.001 grams.*



This key allows you to scroll cursor to desired selection upward or to increase a numeric test parameter. *At the conclusion of a test, this key allows you to view final weight of test sample to 0.001 grams.*

ENTER

This key allows you to select and save a menu entry.

RED KEYS

These four keys are color coded for easy identification of the most commonly used functions.

**AUTO
CAL**

This key allows you to verify that the balance is operating within tolerance and functioning properly (see *Balance Check*). This key also allows you to calibrate the instrument using the 100 gram calibration weight provided (see *Automatic Calibration*) (For those who are ISO9000, a custom traceable SI Certified calibration is available, see Appendix: *Parts and Accessories* page 36).

STOP

This key allows you to stop a test in progress.

RUN

This key allows you to start a test.

TARE

This key has two important functions: one, before a test and one after a test. Before a test, this key sets the weight display to zero (0.00). After a test, this key acts as a reset button, clearing the display of the previous test results.

Note:

When running a weight loss test, be sure to press the **TARE** key after you have placed the disposable pan on the Retainer Pan (this subtracts out the weight of the disposable pan) and before you add your sample.

DISPLAY SCREENS

This instrument has three display screens: **STANDBY**, **TEST IN PROGRESS** and **END OF TEST**.

Confirms display readout
selected: %M, %S or WT →

Sample Weight →

Moisture	Auto
+0.00 grams	

← Confirms Mode selected:
Auto, Time or Manual.

STANDBY SCREEN

Before a test this is how the display screen looks. All keys are accessible at this time. Remember to press the TARE key to clear previous test results from memory.

Current % Moisture
%Solids or weight →
in grams

Moisture	Auto
0.00%	00:00

← Selection Mode
← Time (duration of test)

TEST IN PROGRESS SCREEN

Key access is limited at this stage to protect test results.

During a test, the screen shows elapsed numbers in progress. Accessible keys during a test are **%M**, **%S** and **WT** to allow you to view elapsed moisture, elapsed solids or change in weight of sample as the moisture is being evaporated. Time elapsed is always shown while test is in progress.

Final test result →

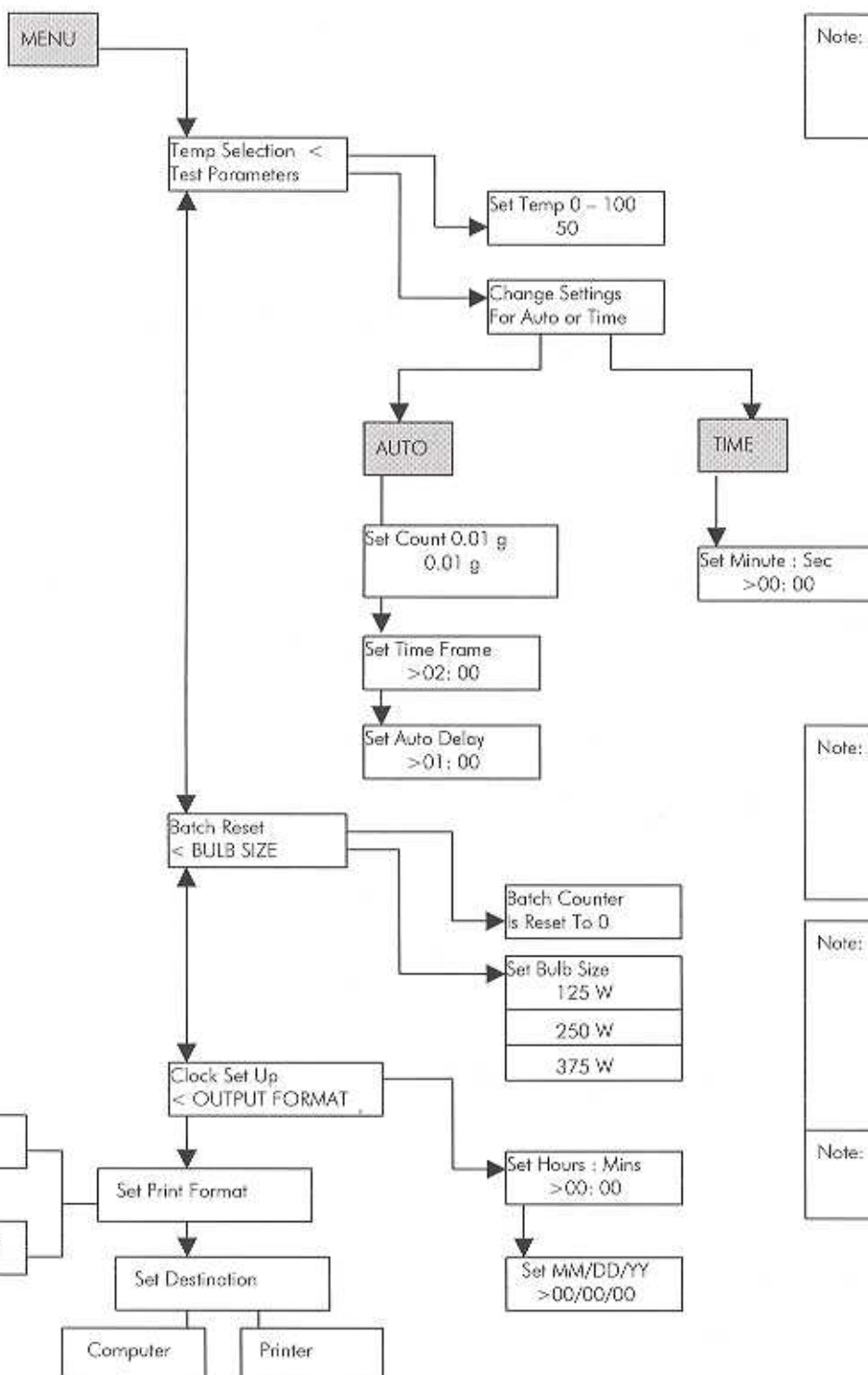
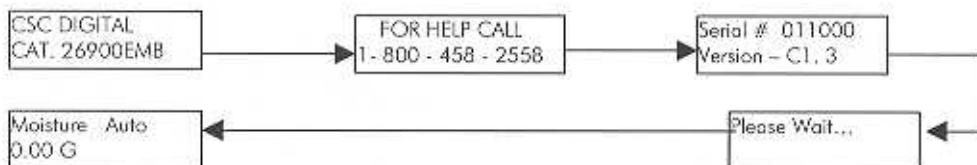
Moisture	Auto
1.5%	4:21

← Final time duration of test

END OF TEST SCREEN

After a test, the entire keypad is frozen momentarily (up to 6 seconds) to allow data to be transported through the RS232 port. After the data is transported, only these keys are functional: UP ARROW, DOWN ARROW and TARE. *Note: The TARE key acts as a clear button and should not be pressed until all test data is recorded. While the instrument is retaining test results in memory, you may access the UP ↑ key to view the initial weight of the sample or the DOWN ↓ key to view the final weight of the sample. Remember: the TARE key clears the test data.

FLOW CHART OF MENU STRUCTURE CSC DIGITAL MOISTURE BALANCE



Note: Use the UP and DOWN arrow keys (↑ or ↓) to navigate the MENU. Use the ENTER key to save a selection.

Note: Factory Default settings shown:
To return instrument to Factory Default settings, press the key sequence: MENU + STOP + ENTER.






Note: Bulb Size Factory Default =250 W
This setting must match the wattage of the bulb installed in the unit. E.g. when using a 375 W bulb, change this setting to 375 W.

Note: Unit with serial numbers 8000 to 9500 have a factory default of 125 W

NAVIGATING THE MENU

CHANGING TEMPERATURE SELECTION

The CSC Digital Moisture Balance has a Temperature Selection default setting equal to 50. To select the proper temperature setting, see *Establishing Test Standards*. If you already know your desired temperature setting, please follow these simple steps.








1. Press  Cursor should automatically be on "Temp Selection".
(This represents an intensity setting of the infrared bulb from zero to 100%.)
2. Press  Use  or  keys to select desired temperature setting.
3. Press  Saves selected temperature setting.*














NOTE

Your selected heat setting will remain in memory until changed by you or if the Factory Default key sequence is pressed.










CHANGING AUTO MODE TEST PARAMETERS

The standard Auto Mode parameters have already been set for you. These parameters determine when the instrument should shut off in the Auto Mode according to the programmed criteria of "x" amount of weight change over "y" amount of time. These parameters may be changed by you to tailor the instrument to your particular application.

1. Press  Choose "Test Parameters" by pressing  key.
2. Press 
3. Press  Use  or  key to set desired counts in grams.
(See Test Parameters: Auto Mode page 18.)
4. Press  Saves counts selected.

5. Use  or  to set time frame in minutes. Press  to save minutes.
6. Use  or  to set time frame in seconds. Press  to save seconds.
7. Use  or  to set Auto Delay in minutes. Press  to save minutes.
8. Use  or  to set Auto Delay in seconds. Press  to save seconds.
9. Press  to exit.

CHANGING TIME TEST PARAMETERS

1. Press  Use  or  to place cursor on "Test Parameters".
2. Press 
3. Press  Use  or  to set desired time in minutes and seconds.
4. Press 
5. Press  to exit.

Note:

Time Mode is used most often when the shortest possible test time is the objective. A time test must be determined by trial and error test data based upon a repeatable point on the drying curve. (see *The Moisture Curve*)






CHANGING BATCH RESET

For use with a RS-232 interface only! Batch counter counts each test sequentially from 0 to 99. Prior to a new shift or testing period, this may be reset to zero so that the first test of the day or shift will be numbered as test one, second test as test two, etc...

1. Press  Use  to select "Batch Reset".

2. Press  This will automatically reset batch counter to zero.
3. Press  to exit.








CHANGING BULB SIZE

1. Press  Use  to select "Bulb Size".
2. Press  Use  or  keys to set bulb size wattage. *

IMPORTANT: *The CSC Digital Moisture Balance uses either a 125W, 250W or 375W bulb. The standard bulb installed is a Sylvania industrial strength infrared (R40) – 250 watts bulb – 7 1/4" in length with an average life expectancy of 5000 hours. The factory default setting is 250 watts. (Note: Instruments with serial numbers 8000-9500 have a factory default of 125 watts) **Always check to make sure that the bulb size installed matches the bulb size selection in the menu.** We strongly recommend for continued accuracy that you use our standard Sylvania bulb. Using other bulbs is the most frequent cause of service calls related to inaccuracy of test results! (See Parts & Accessories page 37.) The strength and length of the bulb—as well as finish and filament shape are all determining factors on the way heat is applied to the sample. This is one area you should NOT try to economize by using an inferior bulb. Although bulbs of varying wattage and lengths may be installed in the instrument, *it is important to be consistent in your use of a bulb so that the test parameters do not have to be changed due to either an increase or decrease of heat to the sample.*



CHANGING CLOCK SET UP

For use with an RS-232 Interface: Factory Default time is Eastern Standard Time.









1. Press  Use  to select "Clock Set Up".
2. Press  Use  or  to set correct time in hours and minutes (24 Hour Clock).
3. Press 
4. Set Date following the same steps, or continue to next step if date change is not needed.
5. Press  to exit

BASIC OPERATING INSTRUCTIONS

SETUP

1. Turn power ON. Switch is located at the left rear of the instrument. (This switch may be left in the ON position at all times to eliminate the need for warm-up.)
2. Allow the Digital Moisture Balance to warm up for 20 minutes before starting operation. ***Note:** *If the unit is not allowed to warm up for this time, the results of the first test may not be accurate. This is sample dependent.*
3. Place the pan support, retainer pan, and disposable sample pan onto the balance pan stem. Press  and  for "Stand-By" Mode.
4. Read all instructions prior to operating the instrument. Always follow appropriate operating instructions, safety procedures and observe all warning labels.


TEMPERATURE SELECTION

1. Press .
2. Use the  and  keys to position the < cursor at "Temp Selection".
3. Press  to select "Temp Selection".
4. Use the  and  keys to select desired temp setting.
5. Press  to store temp setting and exit to menu.
6. Press  to exit menu.




NOTE:

Temp settings represent the INTENSITY of the infrared bulb from zero to 100%.




RUNNING A TEST

1. Place an empty disposable sample pan on the retainer pan.
2. Press  to zero out the weight of the sample pan. Display shows 0.00g.
3. Load sample to desired weight. For best test results, a minimum of five (5) grams is recommended. For samples with high moisture content, you may reduce sample size to between 3-5 grams. For samples with very low moisture content increasing sample size above 5 grams may achieve better repeatability. You must use trial and error to determine most effective sample size for application.
4. Close the lamp housing.

5. Select the desired display function by pressing one of the DISPLAY keys located on the left hand side of the keypad:

	Percent Solid
	Percent Moisture
	Weight in grams

6. Select the desired drying mode by pressing one of the MODE keys located on the right hand side of the keypad:


	Automatic
	Pre-determined Time
	Manual

7. Press  to start the test.

NOTE:



After the first test, it is only necessary to do steps 1, 2, 3, 4, and 7. Selections remain in memory and it is only necessary to press the "RUN" key for subsequent tests.

8. During a test, it is possible to change to a different DISPLAY function by pressing the appropriate key: **%S**, **%M**, or **WT**. *These are the only keys activated during a test.*

9. A beeper tone signals when the test is complete or when the **stop** key  is pressed to end a test. The test is complete when:

- Auto Mode ← lamp shuts OFF automatically by preset parameters. (see *Setting Mode Parameters*)
- Time Mode ← pre-specified TIME has been reached
- Manual Mode ← STOP key is pressed (In this mode the bulb stays on until the STOP key is pressed manually by the operator)

10. At the conclusion of a test, it is possible to display the results of the test by pressing the appropriate display function: **%S**, **%M**, or **WT**. Initial and final weights (displayed to 0.001g) may also be checked. All other keys will be locked-out.

- Press  to display the INITIAL weight of sample.
- Press  to display the FINAL weight.

Percent moisture may be manually calculated by subtracting the FINAL weight from the initial weight and dividing the number by the initial weight x 100.]

$$\frac{(\text{Initial wt} - \text{Final wt})}{(\text{Initial wt} \times 100)} = \text{Percent Moisture Lost}$$

11. Linking your CSC Digital Moisture Balance to a printer or computer enables the test results to be printed automatically when the test is complete or when the **STOP** key is pressed. The moisture balance defaults to a communication rate of 300 baud when powered up. *If a test is stopped prematurely – the print out will read "Operator Interrupt."
12. To clear the data stored from the most recent test and unlock the keypad, press the **TARE** key.

TEST PARAMETERS

This menu selection enables you to set testing criteria for Auto Mode or Time Mode, thus allowing you to define the conditions that the Digital Moisture Balance will use to determine when a test is complete. Typically, the user chooses appropriate settings for a sample material that will give accurate, repeatable test results in a reasonable length of time.

AUTO MODE

When the unit is set in **AUTO MODE**, the instrument automatically shuts off when evaporation is complete. As in all Loss-On-Drying methods, the sample loses weight as the heat evaporates moisture from the sample. When the sample no longer loses weight, it is considered to be fully dry. * When the unit is set in **AUTO MODE**, this allows the Digital Moisture Balance to automatically stop the test when it determines the sample has reached a constant weight. The weight loss is monitored by the internal balance which converts the readings to % moisture and continually checks the results to see if they meet the end-of-test shut-off criteria. The instrument automatically shuts off when evaporation is complete, i.e. when the sample stops losing weight over a specified length of time according to the pre-set parameters. The parameters are defined as Counts, Time Frame and Delay. For example, the factory default settings stop a test when the sample weight changes less than 0.01g (Counts) in 2:00 minutes (Time Frame) after an initial 1:00 minute delay (Delay). These settings may be changed by you to tailor the shut-off point to your particular application. The instrument dries at a default heat setting of 50 unless changed by you.

Note

If a sample is heated at too high a temperature, the sample may scorch and continue to lose weight, even after all of the moisture has evaporated.

CHANGING AUTO MODE PARAMETERS

Changing the Auto Mode parameters require:

- Determining the Counts
Factory Default = 0.01g (must be a value between 0.01 and 0.99g)
In general, increasing the counts shortens the test time, while decreasing the counts offers maximum accuracy, but lengthens the overall test time.
(Using a 5 gram sample, 0.01gram counts = 0.1% moisture)

With this selection, you are asking the instrument to dry the sample down to the last one tenth of a percent. If this degree of accuracy is not needed, you may increase the counts, telling the instrument to shut off sooner by leaving the specific number of count of moisture in the sample. This is used in applications where moisture content is high and less accuracy is acceptable in order to achieve a shorter test time.

CHANGING AUTO MODE – *continued*

- Determining the Time Frame

Factory Default = 2:00 minutes (value must be between 0:10 and 99:99 minutes)

Decreasing the Time Frame shortens the length of the test, while increasing the Time Frame Lengthens the shut-off period. *Note: Changing counts or time frame may affect the repeatability of test results. For optimum test results - experiment.

- Determining the Delay

Factory Delay = 1:00 minute (value must be between 0:00 and 99:99 minutes)

The Delay postpones the start of the Auto Mode checking for shut-off criteria until after the Delay Time has elapsed. This is most useful when testing a sample which is slow to evaporate moisture. It prevents the instrument from shutting off before evaporation begins.

*The time frame tells the instrument that once evaporation is complete as determined by the counts set, to remain in that condition for the specified length of time to be sure evaporation is complete. In general, AUTO MODE looks at the evaporation process of the sample to determine the end point, where as time mode looks at a pre-set time on a clock.

How to: see *Navigating the Menu*

TIME MODE

When the unit is set in TIME MODE, the instrument shuts off when a pre-determined time has been reached. This pre-set time may be changed by you for various applications. A time test can be set from 01:00 to 99:99 minutes:seconds. During a test, the instrument will *count down* from the selected time to 00:00, at which time, the lamp will go out and the test will be complete. Results will be displayed on the screen as 00:00 time and the amount of moisture lost (or solids remaining) during the *specific* time period.

It is important when using this mode to know enough about your sample and its unique evaporation characteristics to select a time that represents a repeatable point on the drying curve. This makes it possible to select a time anywhere from the beginning to the end of the evaporation process that is a reliable prediction of total sample moisture. In general, TIME MODE is used in situations when the shortest possible test time is critical.

CHANGING TIME MODE PARAMETERS

Changing the TIME MODE parameters requires:

- Determining a significant test time for your particular application. (see *The Moisture Curve*)
Factory Default = 00:00 minutes:seconds (must be a value between 00:00 and 99:99 minutes:seconds)

How to: see *Navigating the Menu*

RS-232 SUPPORT FOR THE CSC DIGITAL MOISTURE BALANCE

The data sent to the RS-232 port is intended primarily to go directly to an attached printer, but it can easily be captured and logged to a disk file by commercially available comm software or software of your own devising.

The correct communication parameters are as follows:

Baud	300
Parity	Even
Data Bits	7
Stop Bits	1

NOTE:

You may connect the CSC Digital Moisture Balance to a printer of your own choosing if that printer supports a serial data interface. A RS-232 serial printer cable is available at any retail computer store. The Digital Moisture Balance does not support a parallel data interface.

CSC does provide a custom printer and cable package -catalog No: 50000EMB

Connect the Digital Moisture Balance to a PC either with a **NULL modem cable** OR a regular RS-232 serial printer cable and a NULL adapter, also available at any retail computer store.

The data should appear on your printer as:

MM/DD/YY	18:19
Batch No	xx
Start Weight	+x.xxx
End Weight	+x.xxx
Test Time	xx:xx
% Solid	xx.x
% Moisture	xx.x

All of the data is output as ASCII characters intended for a printer. There is no comma or " " delimiting. You may consider the fields in the above output example to be space delimited. Each line of data is terminated by a CR (carriage return, hex 0D) followed by a LF (line feed, hex 0A). Printers with custom cables are available through CSC Scientific.

RS-232 SUPPORT FOR THE CSC DIGITAL MOSITURE BALANCE

(Serial numbers 11000 and up)

The data sent to the RS-232 port may be formatted for the CSC serial printer or in Comma and Quote Delimited format for easy importation into various spreadsheets, databases, etc . . .

Your Digital Moisture Balance is set up for the CSC serial printer when it arrives from the factory. To switch RS-232 output settings to Comma and Quote delimited, please follow the below instructions.

Press the DOWN ARROW to format the RS-232 output for the Printer, or press the UP ARROW to format the RS-232 output in Comma and Quote Delimited format, (*The display switch from PRINTER to COMPUTER*). Press the ENTER key.

You have now changed the RS-232 output format. Please feel free to repeat this procedure to verify your RS-232 output settings.

The below information is provided for users who will be using the Comma and Quote Delimited format.

The correct communication parameters are as follows:

Baud	300
Parity	Even
Data Bits	7
Stop Bits	1

Connect the Digital Moisture Balance to a PC either with a NULL modem cable OR a regular RS-232 serial printer cable and a NULL adapter, also available at any retail computer store.

NOTE:

You may connect the CSC Digital Moisture Balance to a printer of your own choosing if that printer supports a serial data interface. A RS-232 serial printer cable is available at any retail computer store. The Digital Moisture Balance does not support a parallel data interface.

CSC does provide a customer printer and cable package – catalog No: 50000EMB

ESTABLISHING TEST STANDARDS

The CSC Digital Moisture Balance is weight loss technology and uses infrared heat to dry liquid or solid samples while constantly calculating weight change on an interior electronic balance. The determination or percent moisture is calculated by the difference between the initial weight and the final weight, divided by the initial weight.

$$\frac{\text{Initial Weight} - \text{Final Weight}}{\text{Initial Weight}} \times 100 = \% \text{Moisture for Solids}$$

Subtract number from 100.

This is done either after a predetermined time period (**TIME MODE**) or by drying a sample to equilibrium or a constant weight specification (**AUTO MODE**).

Since the instrument uses the same methodology as the standard oven, it is designed to match oven standards. To achieve this, it is important to understand both your sample and the capabilities of the Digital Moisture Balance.

Preparation of a drying curve consists of drying a sample and recording the % of moisture loss at intervals. When these values are plotted, you will be able to see a moisture profile of your sample. The curve will reach a high point and then level off, indicating that evaporation is complete.

Determination of the optimum temperature for the drying of a sample is a trial and error process. For the greatest accuracy, drying curves should be run at several different heat settings from high to low. The higher the heat, the faster the test. The objective is to find the optimum amount of heat for your sample in order to evaporate moisture, but **NOT** burn off any of the solids. Once you have determine the maximum acceptable heat, the next step is to run a series of **AUTO MODE** tests at that heat setting to test the repeatability of this heat selection.

Once you have determined the desired temperature setting, you may look to the test parameters to fine tune your testing to meet your particular testing objectives.

NOTE:

* If you selected the Printer accessory, you may change "PRINTER FORMAT" to "continuous print" (See Flow Chart). The printer will print the change in weight of your sample every 6 seconds. This print out gives a visual of the moisture curve by illustrating where the weight levels off.

ESTABLISHING TEST STANDARDS - *continued*

With an existing standard method

Ideally, a standard oven method should be used as a benchmark. This can be obtained by using an outside testing laboratory or your own oven test method. Divide your sample and do a standard oven test. Use the remaining sample to find the setting on your digital moisture balance that matches the oven results within $\pm 0.2\%$. Be sure to gather and preserve your sample carefully so that all of the test samples are uniform.

Follow the same testing procedure used on the previous page and look for the heat setting that matches your standard. For example, if you run a standard oven test on your sample and get reading of 32%M, then you need to look on the chart to find out what heat setting gives you a reading of 32%M or run a series of tests on **AUTO MODE** at different heat settings to find the test parameters that match your oven tests. The objective is to find the optimum amount of heat that will evaporate the moisture without burning off any of the solids.

There are many ways to shorten the test time once you have established the proper heat setting. Everyone has different expectations and needs. Think of the moisture balance as a tool that can be used to meet your own testing requirements.

Sample gathering and sample preparation are a very important part of accurate, repeatable test results. In general, the larger the sample size the more representative it is of the whole. The smaller the sample, the shorter the test time. The smaller the particle size, the faster and more repeatable the test. Grinding your sample also improves test repeatability.

Factors influencing accuracy are:

- 1) compatible heat for your sample,
- 2) balance calibration,
- 3) consistent sample preparation,
- 4) uniformity of the sample itself, and
- 5) adequate line voltage to the instrument
- 6) using proper Infrared Bulb.

ESTABLISHING TEST STANDARDS - *continued*

Without an existing standard method (standard vacuum oven test)

Determination of the optimum heat setting is an experimental procedure. The more you know about your sample, the easier the heat setting is to determine. Ideally, a standard oven method should be used as a benchmark. However, if no oven results are available for comparison, a systematic approach still exists to determine the optimum heat setting for your Digital Moisture Balance.

On the test sheets provided, run a series of tests at different heat settings using the same size sample each time, approximately 5-6 grams, and take a reading from the digital display every two minutes and record those numbers on the chart. The first test should be run on **MANUAL MODE**. In this mode, the instrument stays on until you turn it off **manually**, thus giving you control of how long to run the tests. Heat settings should vary from high to low so that you can get a visual picture of how your product evaporates at different heat settings. (see *The Moisture Curve*) *If using the Printer Option – this can be done automatically.

NOTE:

The heat setting represents the intensity of the bulb from zero to 100, **NOT** the temperature setting. (see *Temperature Correlation*)

For example, you might start your test at a heat setting of 50°. If your sample does not burn at this heat setting, then your next setting might be 55° or 60°. If burning does occur, then your next heat setting should be lower, perhaps 40° to 45°. Please note that in some samples, browning of the sample does not necessarily mean that you are burning off more than moisture. Though in other cases, this is an indication of scorching. This is product specific.

Once you have established the optimum heat setting that evaporates the moisture without burning off the solids, run a series of test on **AUTOMATIC MODE** to test for reproducibility. For these tests, you should always use the same size sample, same heat setting, and same test procedure to eliminate all variables. The % solids or % moisture should match within a few tenths of a percent, plus or minus.

CAUTION:

This weight loss instrument is NOT suitable for testing samples that emit corrosive or toxic fumes; or for materials with a low flash point which may catch on fire or explode; or for samples that start to decompose at very low temperatures, such as products that contain a high degree of sugars, i.e. refined sugar, honey, etc...

CSC Scientific
MOISTURE TEST SHEET

Date: _____
 Product: Wet Green Salt Cod
 Company: Northland Fisheries LTD

Time in minutes:	1	3	5	7	9	11	13	15	20	25	30								Total %M/S%S	Total Time
Heat setting:																				
60	2.0	10.6	20.4	29.0	36.2	42.2	47.2	51.2	51.2	57.6	57.8									
65	2.4	13.4	25.0	35.0	43.2	48.2	52.4	55.8	57.8	57.8	57.8									
70	3.4	15.4	26.6	35.6	43.2	48.8	52.8	55.4	57.8	57.8	57.8								57.8	30 Min
75	3.6	17.0	29.0	38.4	45.6	51.2	54.8	56.8	57.7	58.0	58.2									
80	3.6	17.2	28.6	38.0	45.8	51.0	54.8	57.0	57.8	58.2	58.4									

Comments: Note: A plateau in moisture readings usually indicates the percent moisture in the sample, as seen above on a heat setting of 70. If the moisture reading continues to rise, burning of the sample is occurring (as shown a heat setting of 80).

Be aware that determination of the optimal heat setting is an experimental procedure. The more you know about your sample, the easier this is to determine. Ideally, a standard oven method should be used as a benchmark. It is possible for some samples to reach a moisture plateau at heat settings.

- THIS MANUAL PROCEDURE CAN BE ELIMINATED BY USING THE PRINTER OPTION. The custom printer (#5000EMB) does this automatically in "continuous mode format" by printing the change in weight every 6 seconds.

CSC Scientific
MOISTURE TEST SHEET

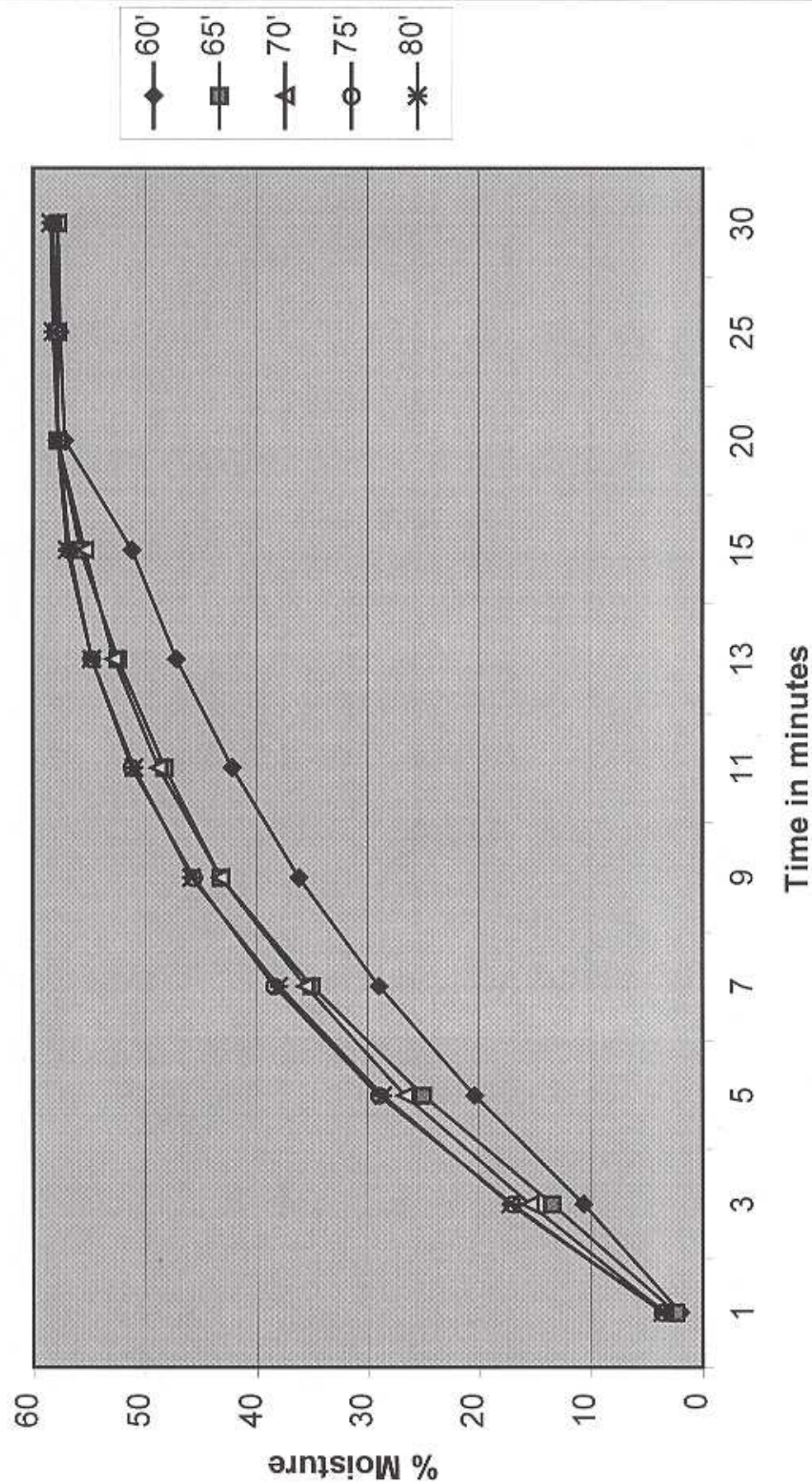
Date: _____
Product: _____
Company: _____

[illegible]

Comments:

Northland Fisheries LTD

(Wet) Green Salt Cod

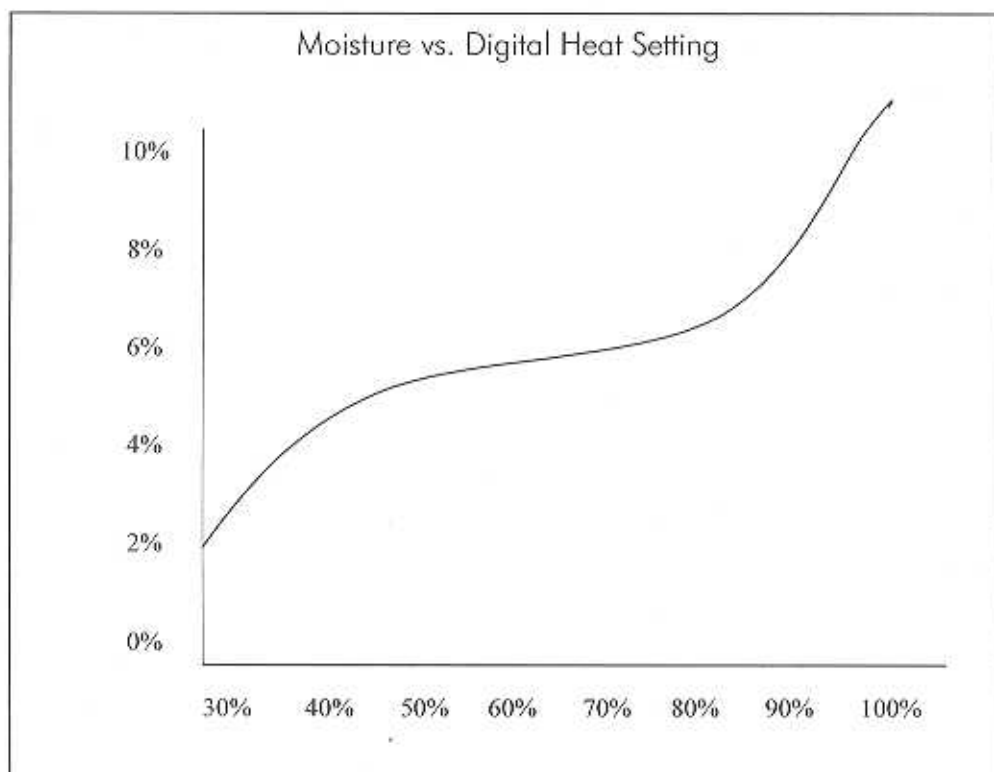


THE MOISTURE CURVE

If no oven results are available for comparison, a systematic approach still exists. A moisture curve may be used to determine optimum heat setting.

- 1) For the proper heat setting for either **AUTO** or **TIME MODE**, run a series of tests with the same sample. Plot the final moisture versus the heat setting. The moisture should increase rapidly at first, then level off to a plateau. This plateau indicates the optimum heat setting. Beyond the plateau, the moisture level will once again rapidly increase in a straight line. This indicates scorching and sample loss.
- 2) To optimize the time for **TIME MODE**, run a sample at the optimized heat setting range. Read the balance at periodic intervals and plot the moisture versus time. The resulting curve should sharply increase over the first few minutes, then it should level off to a plateau. If the heat setting is right, the point where the plateau occurs should indicate the proper time.

EXAMPLE:






NOTE:

It is possible for some samples to plateau at various heat settings. Adequate knowledge of your target moisture is important.

RESET TO FACTORY DEFAULT

Should your Digital Moisture Balance need to be reset after experiencing a power surge, power outage, or calibration error, simply follow these steps to reset your instrument.

PROCEDURE

1. Turn the instrument OFF.
Let instrument cool for 15 minutes.
2. Turn the instrument ON.
3. Press the  key.
4. Press the  key.
5. Press the  key.*
6. Run the Automatic Calibration using the calibration weight provided.
See Auto Calibration Procedure is on page 30.
7. The instrument should now be ready for testing.

DISPLAY SHOWS

Reset to DefaultMoisture Auto
0.00g

NOTE

When pressing ENTER to answer YES on step 5, this will reset the instrument to these factory settings:

- TEMP = 50
- AUTO MODE PARAMETERS = 1 count (0.06grams), 2 minutes, 1 minute delays.
- BULB SIZE = 250W (Note: Units with serial numbers 8000-9500 have a factory default of 125 watts)

If you have not changed these settings, there is no need to reset them. Factory default will be held in memory. If using a 375-watt bulb, the bulb size must be changed in the menu. See *Menu Flow Chart (p 11)*.

If this procedure not help clear up the problem, please call 1-800-458-2558 and ask for technical assistance.

AUTOMATIC CALIBRATION

The calibration of your moisture balance is highly stable, and does not require frequent re-calibration. If your application requires compliance with international standards, we recommend that you calibrate with our ISO 9000 certified weights (go to Appendix: Parts & Accessories page 36). Otherwise, it is acceptable to use the calibration weight provided with the CSC Digital Moisture Balance. Always perform the Automatic Calibration Procedure after the instrument has been moved for any reason.

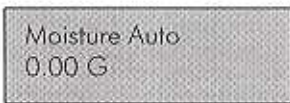
DISPLAY SHOWS

1. Lift up the hood of your unit

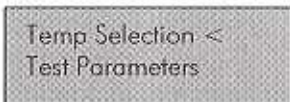
2. Press the  key.

3. Press the  key to enter the Menu.


4. Press the  Calibration function key to begin the Auto



Moisture Auto
0.00 G

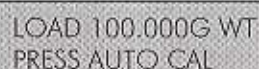


Temp Selection <
Test Parameters



USE 100.000 G

5. After a moment, the message on the screen will change to "LOAD"



LOAD 100.000G WT
PRESS AUTO CAL

6. Place the appropriate 100g weight on the retainer pan now. **DO NOT PUT WEIGHT ON THE RETAINER PAN UNTIL THE WORDS "Load 100 g. wt." and "Press Auto Cal" APPEARS.**


7. Press the  key.

8. If the calibrating weight is within allowable tolerances, and the balance is operating normally, the display returns +100.00 G.




CALIBRATING
+ 100.00 G

9. Press the  key.



Moisture Auto
100.00 G

10. Remove the check weight. The display returns to zero.



Moisture Auto
0.00 G

TEMPERATURE CALIBRATION PROCEDURE

FREQUENCY OF APPLICATION:

This procedure allows you to calibrate your instrument to you own unique temperature environment. For optimum performance, the frequency of the temperature calibration application is determined by the following:

1. When the bulb size is changed from a 125W or 250W or 375W bulb. The factory temperature calibration is for a 250W bulb;
2. When the instrument has been moved to a new location with extreme temperatures;
3. When the room temperature changes sharply;
4. When the seasons or other conditions alter temperatures sharply; and/or
5. When application requires using high heat for extended periods of time.
6. When experiencing slight balance drift – due to any of above conditions

PROCEDURE:

1. Let the instrument completely cool to the ambient temperature. (Please wait 12 to 24 hours after the last test has been performed on the instrument.) The instrument should be powered **ON** during this time, but no test should have been run.
2. Install the bulb size that will normally be used during a test (125W, 250W, or 375W). For example, do **NOT** temperature calibrate the instrument with a 375W bulb if the tests are normally performed with a 250W bulb. In menu, select bulb size installed (standard bulb size is 250W).
3. Verify that a retainer pan, the pan support and an empty sample pan have been installed. These pans must be *completely clean and completely dry*. Use new pans if available.

NOTE:

If the above procedure is not followed exactly, a poor calibration could result. Please follow Instructions carefully and precisely.

4. Close the lamp-housing lid.
5. Press 
6. Press and continuously hold  for 10 plus seconds, or until the lamp comes on.

TEMPERATURE CALIBRATION – *Continued*

7. The display will read: TMPCAL 12:34
 LN
8. The lamp will remain **ON** for 4 hours. Take care to avoid disturbing the instrument during these four hours. Do not bump or move the instrument during this time.
9. When the procedure is finished, the lamp will turn itself **OFF** automatically. The display will read: TMPCAL 16:34
 XX

NOTE:

If temperature calibration number reads 99, it is likely that you ran the procedure incorrectly. Redo the temperature calibration making sure that you follow the instructions, step by step.

TROUBLE SHOOTING

<u>Symptom</u>	<u>Possible Cause</u>	<u>What to do</u>
Display does not light up.	1) Power cord not connected. 2) Power switch in off position. 3) Fuse blown.	1) Check power cord. Disconnect and reconnect the cord. Wait 10 seconds before reconnecting. 2) Be sure power switch is in ON position. 3) Check the fuse and change if necessary. Fuse located in rear, above plugs.
Bulb does not come on.	1) Temperature setting is zero. 2) Bulb blown. 3) Line voltage below 100 volts.	1) Reset temp to desired setting. 2) Replace bulb (use Sylvania R40; call CSC 800-458-2558) 3) Check line voltage, use line conditioner if necessary.
Test results not repeatable.	1) Sample size may be too small. 2) Sample may not be uniform. 3) Instrument may be in unstable environment. 4) Instrument out of calibration.	1) Increase sample size to 5 grams or more. (Low moisture samples perform better with larger sample size.) 2) Try grinding your sample. 3) Check for vibrations, drafts and line voltage to unit. These may effect on the instrument's performance. 4) Do calibration procedure. Do reset procedure to reset all settings to factory default. Make sure that you re-enter customized settings for your sample (ie. Temp Selection, Test Parameters, Bulb Size, etc.) Check to makes sure that the bulb installed matches the bulb size selection in the menu. Do temp calibration procedure.

TROUBLE SHOOTING – *Continued*

<u>Symptom</u>	<u>Possible Cause</u>	<u>What to do</u>
Test results not repeatable (cont.)	5) Bulb installed may not be CSC Standard Sylvania Industrial Strength-Infrared 7 1/2 " Lenth 6) Instrument may need to be cleaned & and calibrated due to internal build-up of dust and sample particles.	5) Call CSC 800-458-2558 6) Call CSC for Manufacturers' Cleaning Calibration Service
Instrument will not Auto-Calibrate.	1) Calibration weight added too soon. 2) Internal scale may be damaged due to trauma or need to be cleaned 3) May need cleaning and calibration	1) Place 100g weight on <u>ONLY</u> after the display prompt, "Load 100.00g Weight" appears. See Auto Calibration. 2) Call CSC. 3) Call CSC at 1-800-458-2558 for Manufacturer's Certified Cleaning and Calibration Service.
Light flickers	1) Slight pulsating is normal. Exaggerated flicker may be low line voltage	1) Check line voltage, should be 110-120 volts.
Heat output seems lower or higher than usual.	1) "Bulb Size" selection in menu does not match bulb installed. 2) Bulb installed may not be the CSC standard bulb.	1) Check "Bulb Size" setting. (See Navigating the Menu) 2) Check bulb installed. Is it a CSC standard Sylvania industrial strength infrared, 7 1/4" in length? (Bulbs come in different lengths and wattage. If you change the bulb type, it may necessitate changing the test parameters.)
Balance Check Error	1) Forgot to press "TARE" before loading 100g weight. 2) Support pan is touching pan stem. Misshapen retainer pan is touching support pan. 3) Internal scale may be damaged, due to trauma	1) Do procedure again, following instructions step by step. 2) Check to make sure all pans are installed properly and pan system is centered in opening. 3) Call CSC Scientific for Service.

CARE AND MAINTENANCE

- In order to keep your CSC Digital Moisture Balance operating properly, it is important to follow a few preventative maintenance techniques:
- Before any cleaning procedure, UNPLUG the moisture balance.
- Housing and all removable pans should be kept clean and dry. A dry paintbrush is handy for brushing away sample residue.
- Keep area around the pan stem free from sample residue. Periodically, remove all pans; carefully unscrew pan stem (counter clockwise). Brush or use compressed air to clean away any foreign material collected around pan stem. Replace pan stems and pans.

NOTE:

Should the retainer pan stick to the pan stem for any reason, DO NOT try to dislodge it while it is installed. This could result in damage to the balance. Instead, unscrew the pan stem *with* the retainer pan attached. After it is free from the instrument, then dislodge the retainer pan, clean thoroughly and replace.

- Use disposable pans for testing. Remove only the disposable pan at the conclusion of the test. **Do not** remove retainer pan frequently, as it may cause damage to the pan stem.
- **DO NOT USE CHEMICALS TO CLEAN THE INSTRUMENT.** Use ONLY a damp cloth with a mild, non-abrasive soap detergent. Do not allow any liquids to flow inside the balance. Moisture will cause damage to the electronic boards.
- For further routine maintenance, call CSC Scientific at 1-800-458-2558. Inquire about our Manufacturer's Calibration Certificate Cleaning & Calibration Service (#26900SER). We have found from experience that routine maintenance extends the life of your instrument and ensures optimum performance.

NOTE:

Be aware that removing the bottom panel of your instrument will result in voiding your warranty on your CSC Digital Moisture Balance.

CUSTOMER SERVICE

If you are not able to remedy a problem on your CSC Digital Moisture Balance by troubleshooting, please call for assistance on our toll free number 1-800-458-2558. Should it become necessary to return the instrument to the CSC Repair Department, be sure to take the following steps:

1. Call for a Return Authorization (RA) number. A form will be sent to you via facsimile. Ask about our Loaner Program.
2. Fill out the RA form completely and fax one copy back to CSC. Describe the fault in full detail, this will help in facilitating a quick repair. Also, be sure to include a copy of the RA in the box that ships back to CSC. Don't forget to include your purchase order #, the serial # of your instrument, and proper "Ship To" and "Bill To" addresses. Indicate if you require special UPS services. They offer 1, 2, and 3 day delivery.
3. Use the original shipping carton or an adequate packaging substitute to prevent further damage to the instrument in shipping. This is extremely important. Call CSC and order custom box and packaging if necessary.
4. Write the RA number on the outside of the shipping carton.
5. Ship the instrument to our Repair Department address:
(please note this is different from our office address)

CSC Scientific Repair Department
2711-O Dorr Avenue
Fairfax, VA 22031

RA# _____

* In all cases including warranty service, customer is responsible for shipping charges.

PARTS AND ACCESSORIES

<u>Description</u>	<u>Part Number</u>
--------------------	--------------------

ACCESSORIES

Printer with custom cable for hard copy of test data.....	50000EMB
Lab grinder for sample preparation.....	26900BLN
Power Line conditioner for electrical power protection.....	269951
Power Var Line Conditioner.....	269951

PARTS

Calibration weight – 100 gram	P26900CAL
ISO 9000 Certified Calibration weight – 100 gram	P269CAL3
Disposable pans, solids – pkg. 50	26678050
Fuse, 5x20mm 4A SLOW-BLOW – pkg. 2	P269905
Infrared bulb – 125 watt**	26681033
Infrared bulb – 250 watt**	26587000
Infrared bulb – 375 watt**	26680035
Infrared bulb – 250 watt/220 VAC**	P20237
Infrared bulb – 250 watt Shatterproof.....	265888000
Instruction Manual (English).....	26900INST
Instruction Manual (Spanish).....	P26900INST
Pan stem	P269201
Pan support tray	P65491
Power cord	P100255
Printer paper rolls	50000PAP
Printer ribbon	50000RIB
Red window replacement	P22264
Retainer pan	26677000
Fiberglass filter pad – pkg. 200	26900FIL

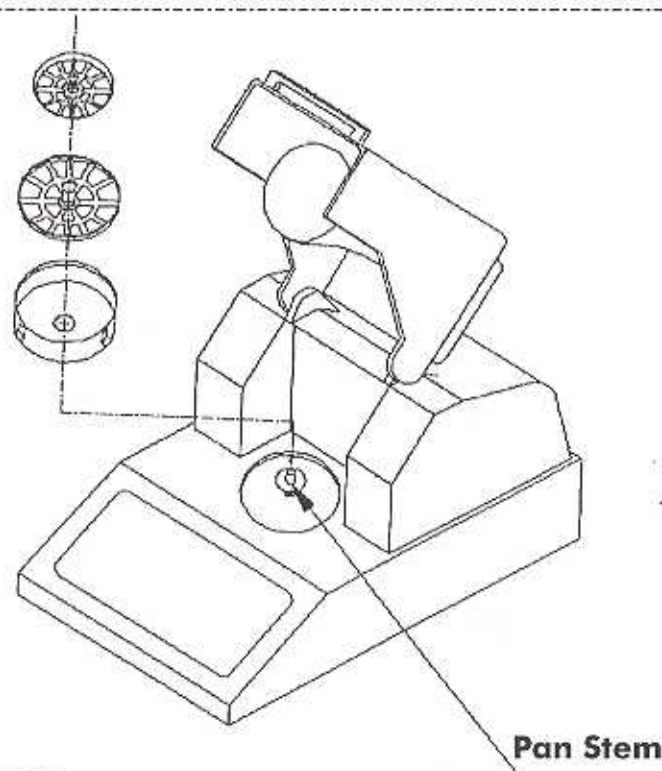
Ask about our case price discounts on bulbs and disposable pans.

**** PLEASE NOTE:** Infrared bulbs vary greatly. The standard bulb supplied with the instrument is an Osram Sylvania Industrial Strength Infrared Reflector (R40), 250W, with a frosted glass bottom, and an overall length of 7.25 inches. Be aware that if you replace the bulb with something other than this standard, you will possibly need to make adjustments to the heat setting to compensate for a different wattage or length. CSC maintains stock of this item for your convenience. For best results we encourage you to use standard CSC Bulb only.

CAUTION CARD

This page includes a CAUTION CARD that can be removed from the manual and placed on or nearby your CSC Digital Moisture Balance. The caution card informs all operators of the instrument about the most delicate part of the instrument. Should you need additional cards, please feel free to contact CSC at 1-800-458-2558.

To remove card, cut along dotted line.



CAUTION!!!

- The pan stem is connected to the most delicate part of the instrument.
 - Use great care when placing or removing the sample pan or pan support to prevent damage to the balance.
 - Should the retainer pan stick to the pan stem, unscrew the pan stem with the retainer pan attached. After it is free from the instrument then dislodge the retainer, clean thoroughly and replace.
- We recommend using a disposable sample pan for daily use.