

Mark 2 Moisture Analyzer Validation Procedure

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1.0 INTRODUCTION

The Mark 2 moisture analyzer system is comprised of a top loading balance, an electronic controller, quartz infrared heating system, an internal thermal printer, and a supporting base and cover. This document details the validation test procedures used to verify performance of the Mark 2 family of moisture analyzers.

Follow the procedures below and record the results on the Mark 2 Validation Checklist located on page 10 of this document.

2.0 CLEANING OF MARK 2

Procedure:

- 1) Unplug the unit.
- 2) Allow the unit to cool for at least thirty (30) minutes.
- 3) Check that the unit is still unplugged.
- 4) Use a mild detergent and a soft rag to clean the external surfaces of the unit.
CAUTION: DO NOT IMMERSE unit in water or any other cleaning solution.
- 5) Carefully remove the pan support and pan shield to thoroughly clean them.
- 6) Keep all warning labels clean.
- 7) Periodically remove the perforated plate by unscrewing the two screws in order to clean the chamber below. Use extreme care in removing the accumulated residue with a clean, damp cloth.
- 8) Replace screws.
- 9) Keep the mechanical part of the printer free from dirt and dust. Periodically lift up the printer cover to clean the printer mechanism with a soft brush.

3.0 TOOLS REQUIRED

All tools, fixtures, and other test or assembly devices described in this procedure must be properly maintained and calibrated, where appropriate. Each device requiring calibration should have a valid calibration sticker attached to it.

Tools:

- Test weight set (2, 5, 20, 20, 50 gram)
- External temperature sensor (Tool#T0880)
- Digital multi-meter (Tool#T0244)
- Standard sample pans (Part#0-2005)
- Pan height adjustment tool (Tool#T0252 Rev A)

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4.0 BALANCE FUNCTIONAL TESTS

Note: *The unit should be powered up for a minimum of thirty (30) minutes prior to starting these tests with the following settings.*

- 1) Recall the program "Factory Default" if previously stored. If the settings have not been stored previously perform the following key presses from the STANDBY menu to set up the test conditions for the balance functional tests:

Key	Description
2 SETUP	- Access Setup Menu 1
2 DEVELOP	- Access Develop Menu
1 UNITS: MOISTURE	- Set unit to moisture %
2 TEMP 1: 105°C	- Set Temp 1 to 105°C
6 SLOPE	- Change slope settings
2 WINDOW: 1.0 Min.	- Set slope window to 1.0 min.
3 %IW: 0.050%	- Set slope value to .050%
4 ENDPT: ACTUAL	- Set to ACTUAL slope mode
e	- Accept current settings
7 STANDBY: 80°C	- Set standby to 80°C
9 IDL WT: 5.0	- Set ideal weight to 5 grams
e	- Accept current settings
1 SAVE PROGRAM	- Save current settings
Enter unused program number	- Select an unused program number
Enter "Factory Default" name	- Enter program name

These settings should be saved for future reference under the name of "Factory Default" using any available program number. This program can then be recalled by name rather than re-programming the settings.

A. Pan Height Check/Adjustment

This section describes the steps necessary to check the balance for the proper sample pan height. This section is applicable to NR series Mark 2 moisture analyzers.

Procedure:

- 1) Remove the pan support and breeze shield.
- 2) Remove the perforated grill.
- 3) With the Mark 2 powered ON, place the pan height tool (T0252) on/over the pan stem. The top of the tube should be level with the top of the machined groove on the tool $\pm .020$ inches. If the top of the tool is not within this tolerance, an adjustment is necessary. If the top of the tube is lower than the bottom of the tool the balance is bent and needs to be returned to Omnimark for service.

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A. Pan Height Check/Adjustment cont.

- 4) To adjust the pan height, remove the entire cover of the instrument by removing the hex screw located near the front/center of the unit in the balance opening. Once the cover has been removed, locate the adjustment screw at rear of the rectangular balance arm cover. Using a screwdriver of the correct size, turn the screw 1/16-1/8 turn clockwise to raise. **DO NOT EXERT DOWNWARD PRESSURE ON THE ADJUSTMENT SCREW. BALANCE WILL BE DAMAGED.** Turn screw until the pan stem is level with the machined groove on the tool.
- 5) Reinstall instrument cover and grill.

B. Calibration

This test verifies that the "Automatic Calibration" software feature functions properly. Since the customer should recalibrate the instrument after installation using his or her own test weights, this test is not meant, as an indication of the absolute accuracy the customer will experience. From the SETUP 1 menu, select "4 Calibrate". Place a 50 gram weight on to the pan support and then close the hood. The CALIBRATION DONE message should appear and then the SETUP 1 menu will be displayed. Open the hood and remove the weight. **Record completion.**

C. Linearity

A balance is linear when the displayed weight is equal (within the tolerance specified) to the actual weight, for weights between minimum and maximum capacity. To determine if the unit is linear, the same test mass is weighed at two pre-loads.

Procedure:

- 1) From the STANDBY screen zero the balance by pressing the REZERO key.
- 2) Place a 20 gram test weight in the center of the standard pan and **record the reading.**
- 3) Remove this weight, and then place a second 20 gram weight in the center of the standard pan. Zero the balance.
- 4) With the weight from step 3) still on the pan, place the same test weight used in step 2) above in the center of the standard pan. **Record** the reading.

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C. Linearity cont.

Acceptance - Linearity:

The unit is acceptable if the difference between the value obtained in step 4) and the value obtained in step 2) is less than or equal to the tolerance below:

Mark 2 HP only	± 0.0020 grams
Mark 2	± 0.003 grams

D. Repeatability

With the heater hood closed, ZERO the balance and do three (3) successive weighing with a 50 gram test weight in the center of the standard pan. **Record the readings.** The balance is acceptable if the difference between the minimum and maximum value of these tests is less than or equal to the tolerance of:

Mark 2 HP only	+ 0.0010 grams
Mark 2	± 0.002 grams

The balance returns to zero using the same tolerances after removing the weight.

E. Stability

The test in this section should be done after a total recommended warm up period of two (2) hours at a standby temperature of 100°C with the hood closed.

In this test, the stability (drift) of the unit is checked at temperature. From the default, recall the program "Stability" if previously stored. If the setting has not been stored previously perform the following key presses from the STANDBY menu to set up the test conditions for the balance stability tests:

<u>Key</u>	<u>Description</u>
2 SETUP	- Access Setup Menu 1
2 DEVELOP	- Access Develop Menu
1 UNITS: WEIGHT	- Set units to WEIGHT
2 TEMP 1: 130°C	- Set Temp 1 to 130°C
3 TIME 1: 10.0 min.	- Set Time 1 to 10 minutes
6 SLOPE	- Change slope settings
1 TURN SLOPE OFF	- Turn slope mode OFF
e	- Accept current settings
7 STANDBY: 100°C	- Set standby to 100°C
9 IDL WT: 5.0	- Set Ideal Wt. to 5 grams
e	- Accept current settings
1 SAVE PROGRAM	- Save current settings
Enter unused program number	- Select an unused program number
Enter "Stability" name	- Enter "Stability" program name

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E. Stability cont.

These settings should be saved for future reference under the name of "Stability" using any available program number. This program can then be recalled by name rather than re-programming the settings.

Press the START/STOP key to begin the test. When prompted, place a five (5) gram weight on the standard pan. Lower the hood, the test will begin automatically after stabilizing. The heating elements will bring the chamber to the set temperature and hold it steady until the time period has elapsed. **Record the weight loss (+/-) for all three tests.** The unit will then lower the chamber to the standby temperature.

Allow the unit to cool to 100°C degrees. Repeat this test for a total of three tests.

The unit is acceptable if difference between the initial and the final readings over the ten minute total period is less than or equal to:

Mark 2 HP only	± 0.0030 grams
Mark 2	± 0.005 grams

F. Simulated Weight Tests

The sequence below simulates an actual moisture determination test. The ACTUAL SLOPE mode allows the instrument to run a test until the controller determines that the test sample no longer is losing weight*. At this point, all moisture in the sample is considered to be evaporated.

In this mode, *A "dry" sample is defined by the system software as one that has met the specified tolerances previously entered into the controller. For example, the default setting of the system will end a test when the test sample has lost less than 0.05% of its initial weight in a one minute time period.

Recall the program "Simulated Weight" if previously stored. If the settings have not been stored previously perform the following key presses from the STANDBY menu to set up the test conditions for the balance stability tests:

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F. Simulated Weight Tests cont.

<u>Key</u>	<u>Description</u>
2 SETUP	- Access Setup Menu 1
2 DEVELOP	- Access Develop Menu
1 UNITS: MOISTURE	- Set units to Moisture
2 TEMP 1: 105°C	- Set Temp 1 to 105°C
3 TIME 1: OFF	- Set Time 1 to OFF with "0" key
4 TEMP 2: OFF	- Set Temp 2 to OFF with "0" key
5 TIME 2: OFF	- Set Time 2 to OFF with "0" key
6 SLOPE	- Change slope settings
2> WINDOW: 1.0 minutes.	- Set slope window to 1.0 minute
3> %IW: 0.050%	- Set slope value to 0.050%
4> ENDPT: ACTUAL	- Set to ACTUAL slope mode
e	- Accept current settings
7 STANDBY: 60°C	- Set standby to 60°C
9 IDL WT: 7.0	- Set Ideal Wt. to 7 grams
e	- Accept current settings
1 SAVE PROGRAM	- Save current settings
Enter unused program number	- Select an unused program number
Enter "Simulated Wt" name	- Enter "Simulated Wt" program name

These settings should be saved for future reference under the name of "Simulated Weight" using any available program number. This program can then be recalled by name rather than re-programming the settings.

- 2) Press the START/STOP key. Place both a five (5) gram and a two (2) gram test weight on the standard pan then lower the hood.
- 3) After approximately ten (10) seconds, lift the hood and remove the two (2) gram weight from the pan. This simulates the "evaporation" of moisture in a test sample. Lower the hood. The heating elements will increase the chamber temperature to the TEMP 1 value.
- 4) Because no further weight can be "evaporated", in approximately one minute the system will automatically stop the test and lower the chamber to the standby temperature. **Record the % moisture result for this test.**

The unit is acceptable if the % moisture result is between 28.4% and 28.8%. (These values are based on a formula of 2 grams/7 grams = approximately 28.6).

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5.0 TEMPERATURE SENSOR CALIBRATION

An internal temperature sensor (1000 ohm platinum RTD) is located within the heating chamber in close proximity to the quartz infrared heating elements. This sensor is used by the electronic controller to maintain the desired chamber temperature selected by the operator. The purpose of this test is to calibrate the unit's internal temperature sensor against an external reference so that the temperature setting of all units are comparable.

The reflective surfaces in the heater chamber must be clean prior to proceeding with this test.

A. Temp Verification

Procedure:

- 1) Recall the program "Temp Verify" if previously stored. If the settings have not been stored previously perform the following key presses from the STANDBY menu to set up the test conditions for the temp verification tests:

<u>Key</u>	<u>Description</u>
2 SETUP	- Access Setup Menu 1
2 DEVELOP	- Access Develop Menu
2 TEMP 1: 180°C	- Set Temp 1 to 180°C
3 TIME 1: 25 min.	- Set Time 1 to 25 minutes
7 STANDBY: 80°C	- Set standby to 80°C
e	- Accept current settings
1 SAVE PROGRAM	- Save current settings
Enter unused program number	- Select an unused program number
Enter "Temp Verify" name	- Enter "Temp Verify" program name

These settings should be saved for future reference under the name of "Temp Verify" using any available program number. This program can then be recalled by name rather than re-programming the settings.

- 2) Make sure the temperature calibration fixture is in place and the heater hood is closed.
- 3) Allow the standby temperature to equilibrate for twenty-five (25) minutes.
- 4) Verify the ohm measurement equals the 80°C ohm reading from the provided temperature table, (± 20 ohms). **Record reading** and proceed if within tolerance.

Note: In case of non-conformance, advance to Section B, Calibration Setup. If Calibration has been performed, advance to Section 8.0, Non-Conformance.

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A. Temp Verification cont.

- 5) Press the START/STOP key a total of three (3) times in order to initiate a test. Allow the test to progress for twenty-five (25) minutes.
- 6) A few seconds prior to the test ending at 25 minutes, Verify the ohm measurement equals the 180°C ohm reading from the provided temperature table, (± 20 ohms). **Record reading** and proceed to Section 6.0 if within tolerance.

Note: In case of non-conformance, advance to Section B, Calibration Setup. If Calibration has been performed, advance to Section 8.0, Non-Conformance.

B. Calibration Setup

Procedure:

- 1) If you have not already done so in the temp verification section, setup test parameters as described in section 5.0 A 1).
- 2) From the Setup 1 menu, press the "." key. The screen will change to a security screen.
- 3) Enter the code "RTD" followed by \ominus to access the RTD CAL screen.
- 4) Open the heating chamber hood and remove the tray support and breeze shield.
- 5) Install the temperature calibration bowl in place of the breeze shield and connect the leads to a digital ohmmeter. Select the 2K range.
- 6) Close the hood. The Mark 2 should begin heating to the 80°C standby temperature. Allow the Mark 2 to equilibrate to the 80°C standby temperature for 25 minutes.

C. Calibration

Procedure:

- 1) From the RTD CAL screen, press the 1 key for 1>LOW TEMP.
- 2) Read the ohmic value from the ohmmeter and cross-reference the temperature from the low temp table.
- 3) After thirty-one (31) seconds the display will prompt "Enter Low Temp". Enter the low temperature and press the \ominus key.
- 4) From the RTD CAL screen, press the 2 key. The Mark 2 will heat to a high temperature. Allow the unit to equilibrate for twenty-five (25) minutes.

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C. Calibration cont.

- 5) Read the ohmic value from the ohmmeter and cross-reference the temperature from the high temp table.
- 6) From the RTD CAL screen, press the 3 key for HIGH TEMP.
- 7) After thirty-one (31) seconds, the display will prompt "Enter high temp". Enter the High Temperature and press the \ominus key. After high temp is entered the "m" and "b" coefficients on lines 7 and 8 will change. **Record** these for future reference.
- 8) Press the 4 key to save, then press the \ominus key to exit to the Setup 1 menu. **Record initials upon completion.**
- 9) Repeat temperature verification, Section A.

6.0 VERIFICATION OF STORED PROGRAMS

A list of the stored programs can be printed by pressing "1 RECALL" from the STANDBY menu followed by the "PAPER FEED" key. A comparison should be made between the current stored programs and the originally established stored programs. This check will verify that the test conditions have not been altered. **Record initials upon completion.**

7.0 RE-INSTALLATION OF SECURITY CODE

If a security code was previously active, re-install the security code upon completion of the validation checkout using the following steps:

<u>Key</u>	<u>Description</u>
2 SETUP	- Access Setup Menu 1
8 SECURITY	- Access Security Menu
1 TURN SECURITY ON	- Enable security
Enter the previous security code	- Input security code
\ominus	- Accept security code
\ominus	- Exit Security Menu
\ominus	- Exit Setup Menu 1

Record initials upon completion if used.

8.0 NON-CONFORMANCE

If the measurements do not fall within the specified ranges, call Omnimark Instrument Corp. at 1-800-835-3211 for assistance.

Mark 2 Validation Checklist

Date: _____ Serial #: _____ Model #: _____

Software Ver: _____ Inspected by: _____

Passed

2.0 Cleaning of Mark 2

4.0 Balance Functional Tests

Reading

A) Calibration

B) Linearity 20 gram, diff. (STD \pm .003g, HP \pm .0020g) 1 _____

2 _____

Diff (1-2) _____

C) Repeatability 50 gram (STD \pm .002g, HP \pm .0010g)

D) Stability 5 gram (STD \pm .005g, HP \pm .003g)

E) Simulated Drying Test (2g / 5g) (28.4%-28.8%)

5.0 Temperature Sensor Calibration

A. Verification 80°C (\pm 20 ohms)

Check with Temperature Table 180°C (\pm 20 ohms)

If necessary:

B. Calibration coefficients

m _____ b _____

C. Calibration - completed

6.0 Verification of Stored Programs

7.0 Re-Installation of Security Code
