TrueDry CV-9
Moisture Analyzer

Operator's Manual

Decagon Devices, Inc.

Version: February 29, 2016 — 10:02:30

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Contents

1 Introduction

Welcome to Decagon's TrueDry CV-9 Moisture Analyzer. It is an easy to use, accurate and efficient instrument for determining moisture loss-on-drying.

Customer Support

If you ever need assistance with your TrueDry, have any questions or feedback, there are several ways to contact us. Decagon has Customer Service Representatives available to speak with you Monday through Friday, between 8 am and 5 pm Pacific time.

Note: If you purchased your TrueDry through a distributor, please contact them for assistance.

Email:
support@AquaLab.com or **sales@AquaLab.com**

Phone:
1-509-332-5601

Fax:
1-509-332-5158

If contacting us by email or fax, please include as part of your message your instrument serial number, your name, address, phone, fax number, and a description of your problem or question.

About This Manual

This manual includes instructions for setting up your TrueDry, verifying the calibration of the instrument, preparing samples, and maintaining and caring for your instrument. Please read these instructions before operating your TrueDry to ensure that the instrument performs to its full potential.

Warranty

The TrueDry has a 30-day satisfaction guarantee and a one year warranty on parts and labor. Your warranty is automatically validated upon receipt of the instrument. We contact customers within the first 90 days of their purchase to see how the TrueDry is working.

Seller's Liability

Seller warrants new equipment of its own manufacture against defective workmanship and materials for a period of one year from the date of receipt of equipment.

Note: We do not consider the results of ordinary wear and tear, neglect, misuse, accident and excessive deterioration due to corrosion from any cause as defects.

The Seller's liability for defective parts shall in no event exceed the furnishing of replacement parts Freight On Board the factory where originally manufactured. Material and equipment covered hereby which is not manufactured by Seller shall be covered only by the warranty of its manufacturer. Seller shall not be liable to Buyer for loss, damage or injuries to persons (including death), or to property or things of whatsoever kind (including, but not without limitation, loss of anticipated profits), occasioned by or arising out of the installation, operation, use, misuse, nonuse, repair, or replacement of said material and equipment, or out of the use of any method or process for which the same may be employed. The use of this equipment constitutes the buyer's acceptance of the terms set forth in this warranty. There are no understandings, representations, or warranties of any kind, expressed, implied, statutory or otherwise (including, but without limitation, the implied warranties of merchantability and fitness for a particular purpose), not expressly set forth herein.

2 About the TrueDry

The AquaLab TrueDry CV-9 is a loss-on-drying moisture analyzer with the ability to run multiple samples under controlled vapor pressure conditions. The TrueDry utilizes a unique design combined with a sound scientific understanding of moisture loss to create the ideal loss-on-drying moisture analyzer. A turntable approach enables high sample throughput by analyzing up to nine samples simultaneously using primary reference methods. (Figure 1)

The TrueDry controls the temperature of each sample position individually using controlled contact drying and tracks the weight loss of each sample over time. An easy to use test setup interface makes it simple to match any reference moisture method without the need to use extreme temperatures to predict the moisture content. TrueDry has a growing list of standard configurations based on AOAC, AACC, and Swiss Food Manual standards.

Figure 1: Nine Sample Turntable

2.1 Interface

The TrueDry is a stand-alone instrument that does not require any additional software or a computer to operate. The instrument con-

sists of a case which houses the power supply, air pump, balance, and the temperature controlled sample chamber. The TrueDry has a capacitive touchscreen and Power button. The touch surface is glass, and may be used while wearing rubber gloves or with a capacitive touch stylus (not included). The capacitive touch button is in the center below the screen. (Figure 2) The power switch is located on the rear of the TrueDry. The USB port for data exportation and updates is located at the bottom right front of the TrueDry.

Figure 2: TrueDry CV-9

When you turn on the main power switch for the TrueDry there is a short delay before the Home screen appears. (Figure 3) From the Home screen you may select Run Test, Archives, Settings, Diagnostics or the globe icon. The globe icon on the Home screen allows you to switch the software language.

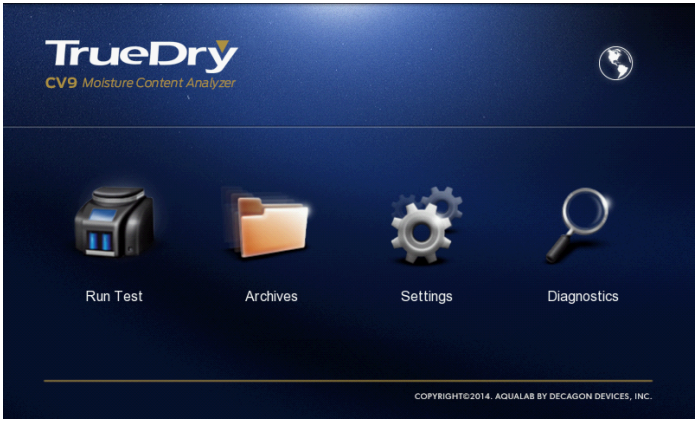


Figure 3: Home Screen

The capacitive touch button below the screen places the unit in standby mode. To enter standby mode, press and hold the touch button. Three beeps followed by a double beep occur to indicate the TrueDry is in standby mode. Although the screen powers off, the instrument still has power and is ready to run tests as soon as you exit standby mode. Press and hold the touch button again to bring the TrueDry unit out of standby mode. A short beep indicates that the unit is coming out of standby mode. The screen takes about ten seconds to turn on and the machine may take up to a minute to completely power up from standby mode and return to the Home screen. For detailed operation instructions refer to the the User Interface section of this manual.

2.2 Functionality

The TrueDry utilizes loss-on-drying methodology for moisture determination. The TrueDry measures loss-on-drying by first weighing a sample and recording the weight, heating the sample to a specified dryness, then recording the dry weight. The TrueDry determines the amount of water present in the sample by subtracting the dry weight from the initial weight and calculates the moisture content of the sample by dividing the amount of water by the dry weight or total weight depending on the reporting method.

Although the TrueDry records and exports data for the entire drying curve of each sample, it only uses the initial and final weight measurements for moisture content calculations. It is important to understand how and when these two measurements are taken so that you can obtain consistent and repeatable results.

When setting up a test, the TrueDry detects if a cup is present, weighs the empty sample cup, then prompts operators to load the sample. The TrueDry takes another weight measurement and then calculates the starting weight of your sample. The TrueDry uses this initial weight measurement in the moisture content calculation and compares the value to the final weight taken at the end of the test. The TrueDry does not determine the dry weight until the completion of the test. The TrueDry considers a test complete when it reaches either a timeout or weight trigger. The TrueDry scale is sensitive and easily affected by vibrations or movement of any kind. To ensure accurate weight measurements the unit must be on a stable surface with no sources of vibration and the lid must remain closed during weight measurements.

Decagon designed the TrueDry to maintain a constant chamber vapor pressure to create a definable endpoint for each test regardless of ambient conditions. The TrueDry controls this process by releasing desiccated air into the chamber during the heating process. This controlled vapor pressure technique eliminates the impact of varying ambient conditions on the test results and improves reproducibility of loss-on-drying moisture measurements by better defining the endpoint of the test.

2.3 TrueDry Instrument Specifications

Measurement Values

Moisture Range: 0.1% to 99%

Repeatability (4 g Sample): 0.05%

Repeatability (10 g Sample): 0.01%

Sample Size Range: 1 to 25 g

Moisture Content Measuring Method: Loss-on-drying using any standard method

Balance

Balance Readability: 0.0001 g

Balance Max Weight: 50 g

Balance Min Weight: 0 g

Balance Calibration: Menu Driven

Drying Unit

Temperature Technology/Heat Source: Resistive coils provide conductive heat (convective heat in lid)

Temperature Range: 50 to 150 °C

Temperature Control: ±1 °C

Temperature Adjustment Increments: 1 °C

Unit Specifications

Number of Samples: Nine

Operating Environment: 4 to 50 °C; 0 to 90% Relative Humidity (Non-Condensing)

Sample Cup: 5.7 cm (2 1/4") diameter, 4.32 cm (7/10") height

Chamber Humidity: 1% (0.01 a_w)

End of Analysis Mode: Time or Weight Trigger

Units of Results: % moisture (dry basis or wet basis) and % dry solids

Data Storage: 8 GB SD Card

Display: 7" LCD capacitive touchscreen

Output: FAT32 formatted USB storage device

Power Requirements: 110 to 220 VAC, 50/60 Hz, 500 W

External Dimensions: 17" x 20" x 15"

Net Weight: 60 lbs

Warranty: One year parts and labor and a 30-day satisfaction guarantee

3 Theory

Moisture content is a measure of the quantity of water in a product reported on either a wet or dry basis. Moisture content provides valuable information about yield and purity, making it important from a financial standpoint. In addition, moisture content provides information about texture, since increasing levels of moisture provide mobility and lower the glass transition temperature. In theory, moisture content determination is simply a comparison of the amount of water in a product to the mass of everything else in the product. While moisture content determination is simple in theory, further investigation demonstrates that obtaining reliable results involves an extremely complex process.

3.1 Moisture Content Measurement

There are many choices available when it comes to methods for determining the amount of water in a product. The AOAC lists 35 different methods for measuring moisture content that fall into two general categories, direct or indirect measurement methods.

Direct moisture content methods either force water out of a sample at elevated temperatures while tracking the weight change or involve a chemical reaction with water and titration. The most common and representative direct moisture methods include air-oven drying and Karl Fischer titration.

Indirect methods try to predict the moisture content based on either testing under accelerated heat conditions or by correlating another measured property to the moisture content. These secondary methods require calibration to a primary or direct method. Examples of indirect measurement methods include: halogen or IR based moisture balances, NIR absorption, and dielectric capacitance.

The advantage of direct methods is that they are a primary measurement typically with superior precision, but may have the disadvantage of being more labor intensive and having long analysis times. Indirect methods are typically much faster than direct meth-

ods, but are not primary measurements based on accepted standards and consequently can suffer in reliability. Due to the absence of a scientific definition of "dry," all moisture methods suffer from the lack of a moisture standard to allow the comparison of methods or determination of accuracy. Furthermore, any loss-on-drying method is subject to ambient environmental conditions. The ideal moisture method would combine high throughput testing with a primary measurement method, eliminate variability due to changing ambient conditions, and provide a scientific standard for dry.

3.2 Oven Loss-on-Drying

A majority of loss-on-drying reference methods state that a sample should be dried at a given temperature until achieving a constant weight. However, a rate of weight loss that identifies constant weight is rarely provided. Additionally, in practice it is a very labor intensive process to use a conventional oven and balance to repeatedly check the sample weight until noticing a constant weight. Consequently, these reference methods include a suggested analysis time that is conservatively long to ensure that you reach a constant weight. The advantage of the TrueDry is that it tracks the weight change gravimetrically and can easily compare the current weight reading to the previous reading to determine when the weight loss rate falls below the operator controlled "trigger value." By ending the moisture determination based on constant weight, the TrueDry obtains accurate measurements in a shorter time period than reference methods with equivalent precision.

TrueDry eliminates the multiple interruptions needed to move samples in and out of the oven and to take weight measurements, while reducing the chances for mistakes that can occur each time you handle a sample. A comparison of testing performance on white bread between a conventional oven and the TrueDry indicates that while the oven required 20 minutes of work time, 110 minutes of analysis time and three interruptions to work flow to analyze nine samples, the TrueDry only required four minutes of work time, 70 minutes of analysis time, and one interruption to work flow. (Table 1)

This works out to an average of 14 minutes total test time (this includes both preparation and test time) per sample for the general oven method, but only 8.7 minutes per sample for the TrueDry with an equivalent level of precision.

3.3 Moisture Balance Loss-on-drying

A moisture balance method automates the weighing process of loss-on-drying and speeds up the test time by over-heating the sample. These methods adjust the test time or constant weight settings so the results at high temperatures match those obtained using the reference method. However, the moisture balance method requires a predetermined and unique testing program for each type of sample.

Since a moisture balance is not a primary measurement, it lacks the reliability of a reference method. In addition, while the moisture balance method reduces testing time for a single sample, multiple samples diminish this advantage because of the numerous interruptions required to record results and set up the next test. (Table 1)

Table 1: Moisture content test time and precision for a moisture balance and the TrueDry on white bread

Metric	Moisture Balance	TrueDry
Reading Time (nine samples)	197 minutes	70 minutes
Work Time (nine samples)	54 minutes	4 minutes
Interruptions	10	1
Standard Deviation	0.1	0.06
Drying Temperature	135 °C	130 °C

3.4 Improving Reproducibility of Loss-on-Drying

It is difficult to obtain reproducible results with all loss-on-drying methods, including both the moisture balance and conventional oven.[1] The relative humidity of the lab environment also impacts moisture content results.[2] To better understand why this is the case requires

a review of the drying process.

Fickian diffusion determines the movement of water out of a sample during drying. The integrated form of the Fick equation gives the rate of water loss from a sample.

$$E = \frac{k}{x}(e_s - e_a) \tag{1}$$

where E is the evaporation rate ($gm^{-2}s^{-1}$), k/x is the permeance (g/m^2skPa), and e_s and e_a are the vapor pressures of water at the sample surface and in the air (kPa). When the sample is dry, E becomes zero because the sample and air vapor pressures become equal. The vapor pressure of the air in a well-ventilated oven equals the vapor pressure of the air in the laboratory in which the oven resides. The vapor pressure of air is the product of the air humidity (expressed as a fraction) and the saturation vapor pressure at air temperature. If we assume a typical laboratory relative humidity of 40% and a laboratory temperature of 25 °C (saturated vapor pressure of 3.17 kPa), the vapor pressure of the oven air is 0.4 x 3.17 = 1.27 kPa.

The vapor pressure of the sample is the product of its water activity and the saturation vapor pressure at sample temperature. A typical standard drying oven temperature is 105 °C. The saturation vapor pressure of water at that temperature is 121 kPa. Knowing this value and the vapor pressure of the oven air allows us to calculate the water activity of a dry sample. For the conditions specified it is $a_{wdry} = \frac{1.27}{121} = 0.01$.

Outcomes

Dry does not mean there is no more water in the sample. There is always more water in the sample, and the amount of that water which is removable by the drying process depends only on the vapor pressure of the air around the sample and the sample temperature. Changing the analysis temperature not only changes the measurement speed, but also the final outcome. At a controlled vapor pressure, different amounts of water vaporize at different temperatures.

[1]de Knegt & van den Brink 1998; Reh et al. 2004.
[2]de Knegt & van den Brink 1998.

Thus, increasing the temperature to speed up the test not only runs the risk of volatilizing substances other than water, but also changes the amount of water that you can remove.

Many standard methods recommend using a vacuum oven at lower temperatures to determine moisture content. The benefit of applying vacuum suction during oven drying is that by lowering the vapor pressure with a vacuum, an equivalent amount of water leaves the sample at a lower temperature than with a standard oven. By using lower temperatures, fewer volatiles other than water exit the sample, presumably making a vacuum oven moisture content reading more specific to water.

In principle, the vacuum oven approach should work, but in practice it has several problems. Foremost, sufficiently low pressures that match the value achieved in a conventional oven (around 1 kPa) are extremely hard to achieve with typical laboratory vacuum pumps. It adds difficulty when you must achieve the even lower pressures needed to compensate for the lower sample temperatures. The range required is called "medium vacuum," and pumps that work in this range are expensive and intolerant of water vapor. To remedy this, researchers often bleed desiccated air into the vacuum oven. A similar result could be obtained with much less expense by simply supplying desiccated air to a conventional oven.

A second problem with the vacuum oven approach comes in knowing how much to reduce the vapor pressure in the vacuum oven to make it equivalent to the conventional oven. The water activity of foods is temperature dependent, so the higher the temperature the more water is lost at a given water activity. The high temperature of an oven removes water from a sample both by increasing its vapor pressure and by loosening the grip of the matrix on the water. The vacuum oven can mimic the vapor pressure effect by lowering the surrounding pressure, but it cannot loosen the water without increasing the sample temperature. If sample temperature is increased, then it is no different than a conventional oven.

Environmental factors further complicate the vacuum oven method.

Anything that alters the oven vapor pressure alters the dry weight of the sample, so increased laboratory humidity, or lack of proper oven ventilation results in increases in oven dry weight. Water content measurements can never be accurate until the industry defines a dry water activity and requires drying methods to bring samples to that water activity. The level of error introduced by varying ambient humidity heightens with higher moisture content samples.

The way to overcome the challenge posed by inconsistent lab humidity is to identify a dry vapor pressure and make sure every sample is dried to that vapor pressure at a chosen temperature. Then, results would conform to consistent standards for the dry weight as the weight of the sample at this oven dry vapor pressure.

Decagon designed the TrueDry to maintain a constant chamber vapor pressure, regardless of ambient conditions or oven temperature, thereby creating a scientifically dry condition. It does this by flowing controlled dry air into the chamber during the heating process. This design is similar to one proposed for milk powder.[3] A product tested in the TrueDry is dry when its weight has stopped changing while exposed to a constant vapor pressure at the recommended temperature, thus making its weight the true dry weight.

The controlled vapor pressure technique of the TrueDry makes it possible to improve reproducibility of loss-on-drying moisture contents since it eliminates the impact of varying ambient humidities. In addition, by defining dry as a sample that has been equilibrated to a controlled vapor pressure, the TrueDry creates a moisture content standard for any product.

[3] de Knegt & van den Brink 1998

4 Getting Started

4.1 Shipping Contents

The AquaLab TrueDry CV-9 is a stand-alone instrument and does not require a computer or additional software to operate. Your TrueDry ships with these items.

- TrueDry
- 3/16 Hex Wrench
- 2 g NIST Traceable Weight
- Two Refillable Desiccant Tubes
- Squeeze Bottle
- Power Cord
- Operator's Manual
- Quick Start Guide
- 4 Gigabyte Portable USB Drive
- 500 Sample Cups

4.2 Instrument Setup

1. Remove the TrueDry from the shipping box and set aside the included items. Place the TrueDry on a flat and stable surface that is free from vibration. Turn the three adjustable feet to level the instrument. Check the level using a circular level in the desiccant receiver. The small plastic bumpers in the rear corners do not need to be touching the table.
2. You must loosen the shipping screw before using the instrument. Move the instrument to the edge of the workbench or table to expose the shipping screw. (Figure 4) All three feet should remain on the table when loosening the shipping screw. Locate the black shipping screw and use the provided hex-key to unscrew the shipping screw until it stops. (Figure 5) The

shipping screw extends about a quarter of an inch and does not come out completely. (Figure 6)

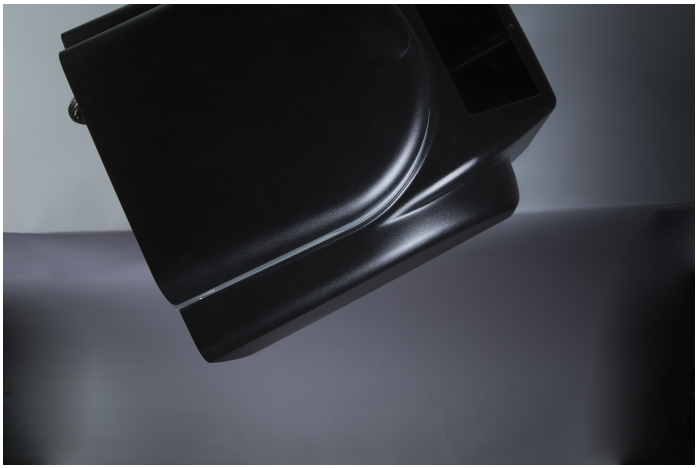


Figure 4: Move TrueDry to Table Edge

Figure 5: Locate Shipping Screw

Figure 6: Loosened Shipping Screw

3. Return the TrueDry to the center of the workbench or table and plug in the included power cord. Turn on the power using the main switch on the back of the instrument.

   Note: For best results, let the instrument warm up for two hours before use.

   Leave the TrueDry powered on in standby mode when not in use to maintain optimal instrument speed and performance.

4. Install the desiccant tubes in the front of the instrument. Before insertion, remove the black vinyl covers from the air fittings. Place the desiccant tube into the area above the desiccant receiver and then insert the fittings into the mating holes. Be sure to place the black fitting into the corresponding black hole.

   Note: The fittings can be moistened with DI water if the desiccant tube is difficult to install.

5. Calibrate the scale.

   (a) After power-up, select Settings on the Home screen, then navigate to and select the Weight Calibration option.

(b) Empty the chamber, shut the lid, and select Next to begin taring the scale.

Note: Do not touch the table or TrueDry during calibration to prevent disturbing the calibration routine.

(c) When prompted, open the lid and add an empty sample cup to the 0 position. Shut the lid and select Next.

(d) When prompted, open the lid and place the 2 g NIST traceable weight in the center of the empty sample cup. Shut the lid and select Next.

Note: The NIST traceable standard weight should only be handled with gloved hands or tweezers

(e) The weight offset appears on the screen. Select Next to accept and store the calibration or cancel to abort the calibration. If the weight is within 0.5 mg select cancel as the scale does not require calibration.

6. Test scale stability and location of the unit.

(a) Select Diagnostics on the Home screen. Locate the weight reading at the top of the screen. (Figure 18)

(b) Lightly tap on the workbench or table with one finger. If the readings vary by more than 0.2 mg after tapping, the table holding the TrueDry is probably too unstable for accurate weight readings during a test. Make the table more rigid or find a more stable location.

5 User Interface and Menus

The AquaLab TrueDry CV-9 is a stand-alone instrument and utilizes a capacitive touchscreen as an operator interface. There are four main menu options on the Home screen as well as a language selection (globe icon). This section reviews the primary Home screen menu options and explores the software options.

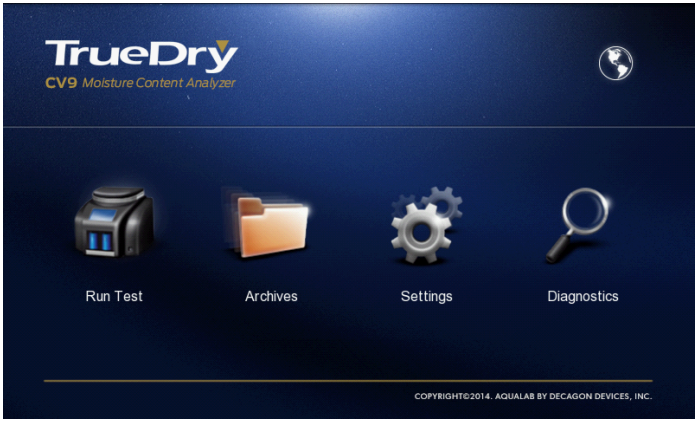


Figure 7: Home Screen

Languages (Globe Icon)

The globe icon in the upper right corner of the Home screen brings you to a language selection screen. The currently selected language displays in white text. To change to a different language select the button for the desired language. The TrueDry supports English, Spanish, Italian, French, German, Dutch, Japanese, Portuguese, and Polish. If you select a language, the TrueDry prompts you to verify that you wish to change the language. You must restart the system to implement your language change request. (Figure 8)

Figure 8: Select Language

Run Test

In the Select Test Type screen you can choose New Configuration to create a custom test, or choose from preloaded standard or saved configurations.

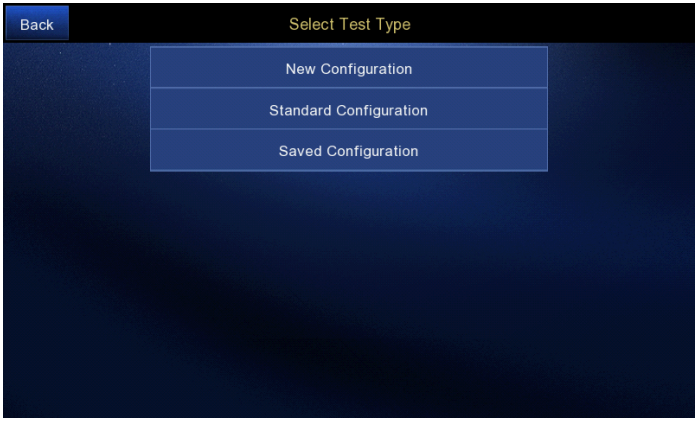


Figure 9: Select Test Type Screen

Archives

The TrueDry stores every test that it runs. Select Archives from

the Home screen to access a stored test file. The Select Test screen appears with a list of test names with a time and date stamp. (Figure 10) If you have a large number of tests saved select the Load More button at the bottom to load additional tests. Tests list with the most recent tests at the top of the screen. To view the results of a specific test, click on the test name. This takes you to the test summary screen. (Figure 11)

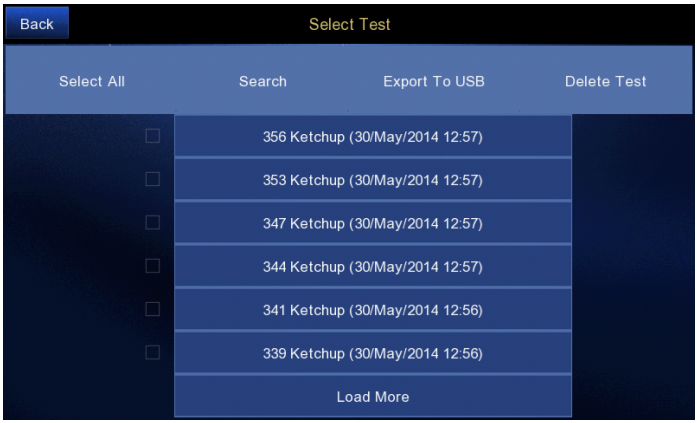


Figure 10: Select Test List

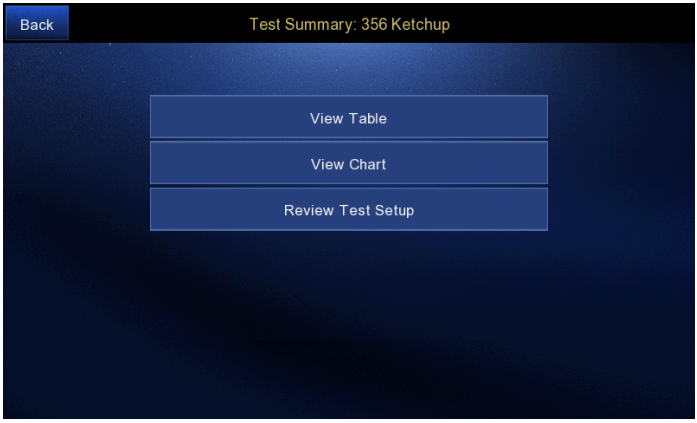
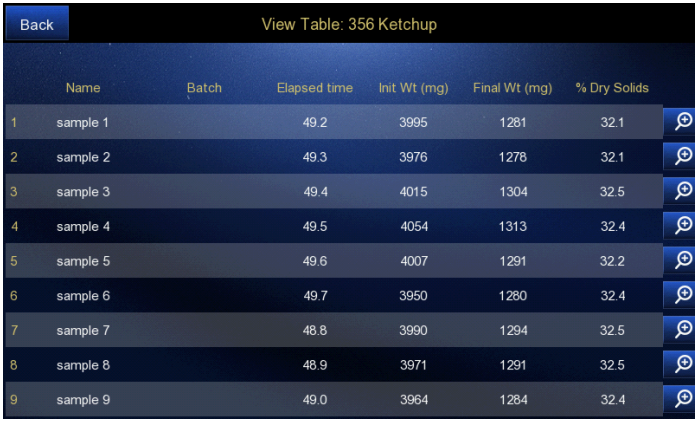


Figure 11: Test Summary Screen

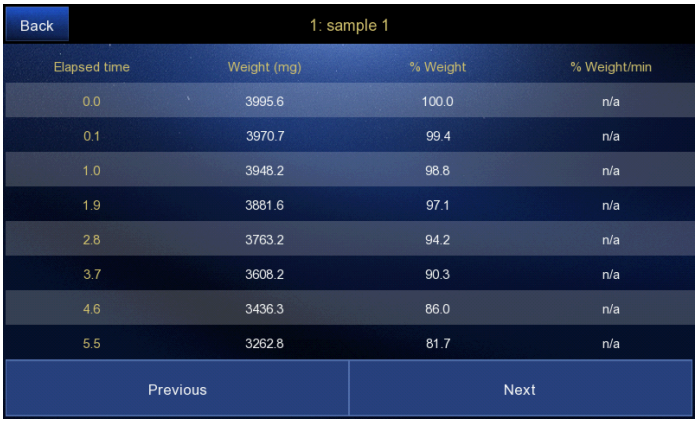


	Name	Batch	Elapsed time	Init Wt (mg)	Final Wt (mg)	% Dry Solids
1	sample 1		49.2	3995	1281	32.1
2	sample 2		49.3	3976	1278	32.1
3	sample 3		49.4	4015	1304	32.5
4	sample 4		49.5	4054	1313	32.4
5	sample 5		49.6	4007	1291	32.2
6	sample 6		49.7	3950	1280	32.4
7	sample 7		48.8	3990	1294	32.5
8	sample 8		48.9	3971	1291	32.5
9	sample 9		49.0	3964	1284	32.4

Figure 12: View Table

The test name displays at the top of the screen. You have the option to View Table, View Chart or Review Test Setup. View Table displays summary results for all samples in the test. (Figure 12)

Select the magnifying glass icon on the right to pull up a table of intermediate data for a specific sample. The Specific Sample Data screen shows the intermediate weight readings taken for that sample throughout the test ordered by elapsed time. Select Previous and Next to scroll through the data. (Figure 13)



Elapsed time	Weight (mg)	% Weight	% Weight/min
0.0	3995.6	100.0	n/a
0.1	3970.7	99.4	n/a
1.0	3948.2	98.8	n/a
1.9	3881.6	97.1	n/a
2.8	3763.2	94.2	n/a
3.7	3608.2	90.3	n/a
4.6	3436.3	86.0	n/a
5.5	3262.8	81.7	n/a

Figure 13: Specific Sample Data Tables

View Chart displays the dry down curves for all samples in the test. (Figure 14)

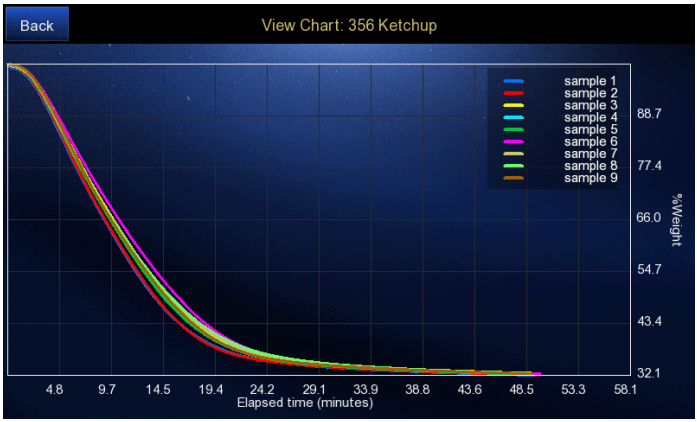


Figure 14: View Chart Dry Down Curve

Review Test Setup displays the following test parameters: Name, Temperature (°C), Min Weight (mg), Max Weight (mg), Timeout (min), Trigger (% Weight Change/minute). (Figure 15)

Figure 15: Review Test Setup

From the Select Test screen you can select tests to export or delete. To select a test tap the box to the left of the test name to check it.

You may select multiple test names using this technique or select all tests using the select all button at the top. To deselect a test simply tap on the check mark again. (Figure 10)

Export your selected tests to the AquaLab USB drive included with your TrueDry by selecting the export to USB button at the top. You cannot connect a computer directly to the TrueDry; you must export data onto a USB drive or other portable storage device. Data exports as a .xls file and a .tdb file. The .xls contains measurement data and the .tdb has a variety of indicators useful in troubleshooting your TrueDry.

You may also delete selected tests by selecting the delete button.

Note: Once deleted from the unit the test file cannot be recovered.

If you wish to save files long term, export the files to a USB drive or other portable storage device and then store them on your computer. You may also search for a specific file by either name or date. To search for a file select the Search button. (Figure 16) Select the text field to bring up a keyboard and type in the test name or date desired. Hit Enter when done typing and then select Search. Results matching your search query display on the screen.

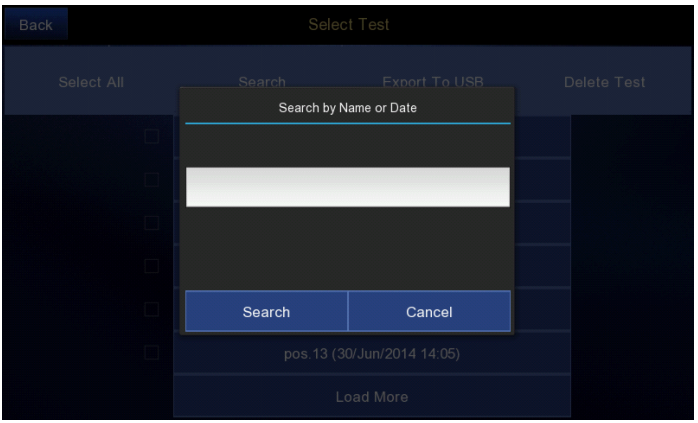


Figure 16: File Search

Settings Menu

You can access settings on your TrueDry instrument by clicking on the Settings icon. You may modify a variety of measurement settings as your research demands from the Settings Menu.

Reporting Basis changes the moisture content calculation in relation to either the initial (wet) weight or the final (dry) weight. The TrueDry can calculate moisture content in different ways and report it with a variety of different units. The basis parameter allows the reporting of moisture content in three different ways, percent moisture on a wet basis, percent moisture on a dry basis, and percent moisture of dry solids. Only the chosen settings appear in the exported data.

Percent Moisture on a Wet Basis (% wb, g/100 g total)

$$\% \text{ Moisture} = \frac{\text{initial weight} - \text{dry weight}}{\text{initial weight}} \times 100 = \frac{\text{grams of water}}{100 \text{ grams solid}}$$

Percent Moisture on a Dry Basis (% db, g/100 g solids)

$$\% \text{ Moisture} = \frac{\text{initial weight} - \text{dry weight}}{\text{dry weight}} \times 100 = \frac{\text{grams of water}}{100 \text{ grams total}}$$

Many food applications report moisture contents on a wet basis. A simple equation converts between the wet and dry basis.

$$\% \text{ moisture dry} = \frac{\% \text{ moisture wet}}{100 - \% \text{ moisture wet}} \times 100$$

$$\% \text{ moisture wet} = \frac{\% \text{ moisture dry}}{100 + \% \text{ moisture dry}} \times 100$$

Percent Moisture on Dry Solids (%ds, g/g solids)

$$\text{Dry Solids} = \frac{\text{final weight}}{\text{initial weight}} \times 100$$

Moisture Content determines if the TrueDry reports moisture content in decimal or percent format.

Temperature Units reports results in °C or °F.

Time Units changes time reporting to hours, minutes, or seconds.

Product ID Label allows you to enter a "Sample" name when loading samples and a second text field allows for additional sample information. By default, the second text field is labeled "Lot," though you may change the term lot to any terminology you like with this setting.

Date/Time Allows you to manually adjust the time and date as they do not automatically adjust for your time zone or daylight savings.

Weight Calibration runs a calibration routine for the scale. Calibration requires you use an empty sample cup and the supplied 2.0000 gram standard.
Note: We factory calibrate the TrueDry scale with a 2.0000 g weight to ensure scale precision.

Figure 17: TrueDry Settings

Diagnostics Menu

The Diagnostics screen provides detailed information about the status of the machine. (Figure 18) It scrolls down to display the status of the following items.

Weight displays the current scale reading.

Temperature 0 to 9 lists the temperature for each individual coil under the tray positions 0 through 9.

Desiccant RH details the percent relative humidity of the air flowing through the desiccant system.

Encoder position tells you the encoder value for tray position.

Tray position 0-9 states which position on the tray is currently over the scale.

Pump state tells you if the pump is on or off.

Desiccant tube state left or right identifies which desiccant tube is currently in use.

Desiccant system state tells whether the desiccant system is on or off.

Lid version tells you the version of the lid firmware.

Lid state informs you if the lid is open or closed.

USB drive detects when you insert the USB drive.

Firmware Version informs you of the current version of installed firmware.

Software version informs you of the current version of installed software.

Serial number lists the serial number of the instrument.

Figure 18: Diagnostics Screen

6 Running a Test

6.1 Configuring a Test

You must set up your test before taking measurements. To set up a test select Run Test on the Home screen and choose from the options provided. (Figure 19)

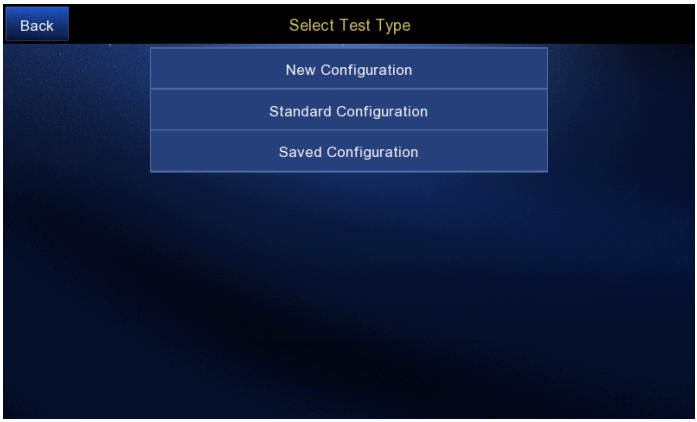


Figure 19: Select Test Type Screen

New Configuration – Selecting New Configuration allows you to choose from four options to load your custom test. After selecting New Configuration you may create a custom test using a Standard or Saved Configuration as a template, load a configuration from your USB drive, or create a new test from scratch. (Figure 20)

Figure 20: Select New Configuration

1. **Standard** - Choose from the standard configurations preloaded onto the machine which are listed by product type.
2. **Saved** - Choose from a list of tests (saved configurations) you have previously set up and saved on the machine. You can also run saved configurations by selecting Run Test $\longrightarrow$ Saved Configurations.
3. **USB** - Runs a test that you saved on a USB drive, perhaps from a different TrueDry machine.
4. **Scratch** - Start a new test with the default settings or input your own settings.

Standard Configuration – Selecting standard configuration allows you to choose from a list of preset standard tests organized by product type. These are standard tests based primarily on AOAC methods. (Figure 21)

Standard configurations are preset templates that are based on standard methods for the product type listed. These files cannot be deleted. Selecting a product from the list takes you to the Configure Test screen. You may view the test parameters in this screen but they cannot be modified. The test name can be changed to identify the test. To run the standard test select Save Configuration and Proceed which brings you to the Tare and Prepare screen. AquaLab

may periodically load new standard configurations with future software updates, but it is easiest to create your own configuration and save it should you need a configuration not available in Standard Configuration mode.

Figure 21: Standard Configurations

Saved Configuration – Selecting Saved Configuration (Figure 22 allows you to choose from a list of tests that you have previously set up and saved to the machine. To save tests to this list, create a custom test under New Configuration and select Save Configuration in the Configure Test screen. (Figure 23)

TrueDry stores any configurations that you save under Saved Configurations. Select tests by clicking the box to the left of the test name. To search for a specific test, select Search. You can search for a test using either the test name or the date. Selecting the test name brings you to the Configure Test screen. You are able to view the test parameters for a saved configuration but you cannot modify them. The software requires a unique name that is not already saved in the system or a message appears saying "Name already in use." Changing the test name can also help you more easily identify the test later. To run the test select Save Configuration and Proceed, which takes you to the Tare and Prepare screen.

Note: If you select the Standard or Saved Configuration options, you may not change any of the test parameters.

Figure 22: Saved Configurations

Note: If the standard method you use does not appear under Standard Configuration, you can create and save it by using the New Configuration setup and then selecting Save Configuration.

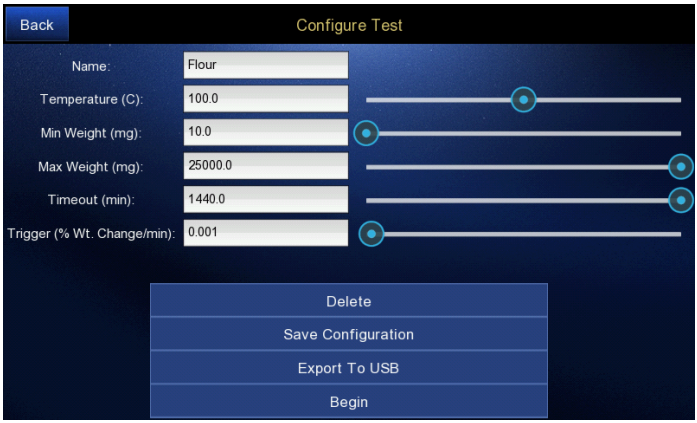


Figure 23: Configure Test Screen

Selecting any of the four custom test options in New Configuration brings you to the Configure Test screen. You may enter or modify

the test parameters in the Configure Test screen for the From Scratch option only. To change the values for any of the parameters in the From Scratch mode you may either select the text field and enter a value using the pop up keyboard, or you can use the slider to adjust the value.

Configure Test Screen Options

The **Name** field holds up to 60 alpha-numeric characters. The export data file name consists of this name appended with the date and time of your test.

Temperature (°C) defines the temperature at which you want to run the test. Users must enter this value in Celsius.

The **Minimum Weight (mg) and Maximum Weight (mg)** values are useful if you intend to save the configuration to use later and you want to ensure the test is run with a similar sample size in the future.

The **Timeout (min)** value allows you to run a sample for a set period of time. If you wish the test to timeout instead of stopping at a trigger value, set the time here and then set the trigger value to zero.

The **Trigger (% Weight Change/Minute)** stops the test when the TrueDry reaches the trigger value, unless the timeout occurs first. Set the timeout value to its maximum to ensure that the test ends based on the trigger value.

Note: You may modify output units and test properties by selecting Settings from the Home screen. (Figure 17)

6.2 Trigger Values

The TrueDry detects when a sample is dry according to the trigger value. The trigger value on the TrueDry determines the definition of dry for your test. As the TrueDry heats a sample, most of the moisture escapes in an initial high-dry-down phase. Though most of

the moisture exits during this phase, trace moisture remains. This trace moisture is tightly bound to the sample material and must be very slowly vaporized over hours or days. By definition, the trigger value represents the instantaneous slope of the drying curve and the acceptable change in mass per change in time to indicate that the sample weight has stopped changing and the sample is dry. Figure 24 shows a typical drying curve for flour with labeled trigger points.

Setting a trigger value higher can make the test faster, but may leave the sample with some water. In Figure 24, a trigger value of 0.1 shows that the sample has not reached a constant weight. A lower trigger value ensures the sample has been dried to constant weight, but a very stringent trigger value adds time to the test. The trigger values of 0.01 and 0.006 give similar results, however the test run using a trigger of 0.006 takes much longer. The default setting is a trigger of 0.01, however, you many need to optimize the trigger value for your specific product.

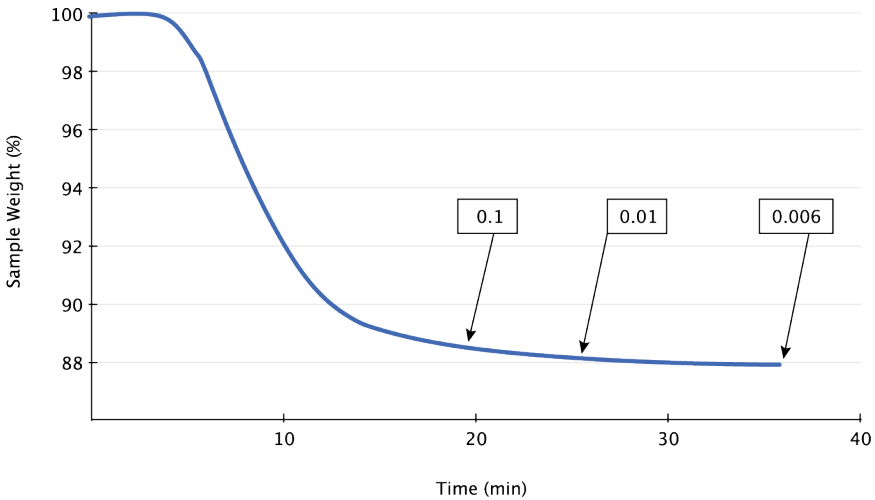


Figure 24: Drying Curve

In the Configure Test screen (Figure 23) you can select Save Configuration to store your test parameters in the Saved Configuration list. Save Configuration saves the name, temperature, weight limits, timeout, and trigger values for future use as a measurement

template. To run a test from the Saved Configurations list select Run Test⟶Saved Configuration and select the desired test. You can also access the same template by selecting Run Test⟶New Configuration⟶From Saved and then selecting the desired test. Once you load the test parameters select the Begin button. This takes you to the Tare and Prepare screen.

6.3 Sample Preparation

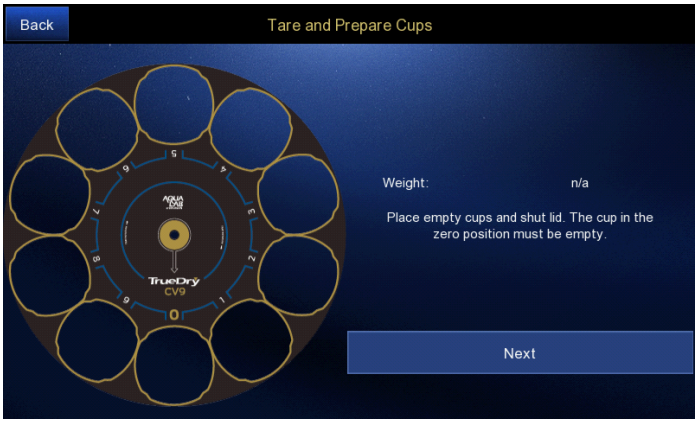


Figure 25: Tare and Prepare Screen – No Cups

Once you select a method and upload the parameters the TrueDry takes you to the Tare and Prepare screen. Screen prompts guide you through sample preparation. First, add the desired number of cups in the tray while always leaving the zero position with an empty sample cup. Nothing can be tested in the zero position and the cup must remain empty for reference. You may test up to nine samples at a time using the other positions. When empty sample cups have been placed in the desired positions, close the lid and hit Next. The TrueDry weighs the zero position sample cup and then moves the first sample cup onto the scale. With the lid still closed it weighs the empty sample cup. When the TrueDry scale determines the empty cup weight, it prompts you to add your sample.

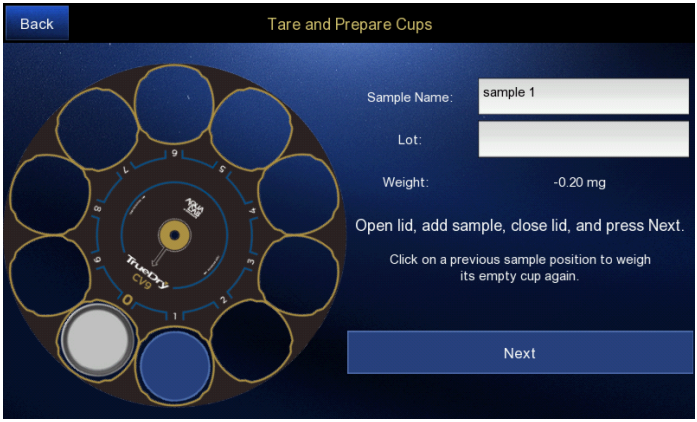


Figure 26: Tare and Prepare Screen – with Cups

Open the lid and remove the empty cup from the machine. Place the cup on a flat surface. Add your sample, and then return the cup with sample to the same tray position. The default sample name is the sample number. You can use the default name or enter a sample name in the box. You can also add a batch or lot number to help identify the sample.

Note: It is very important to remove the sample cup from the machine when adding the sample to prevent any material spilling in the drying chamber.

Once you have placed the cup with sample in the tray and named the sample, close the lid and select Next. The TrueDry takes a precise weight measurement of the cup and the sample. Both measurements, the empty cup and the cup + sample, are very important, the TrueDry uses them in the calculation of final moisture content. The lid must remain shut to minimize air movement over the sample for precise measurements. It is also important not to touch or move the TrueDry in any way during these weight measurements.

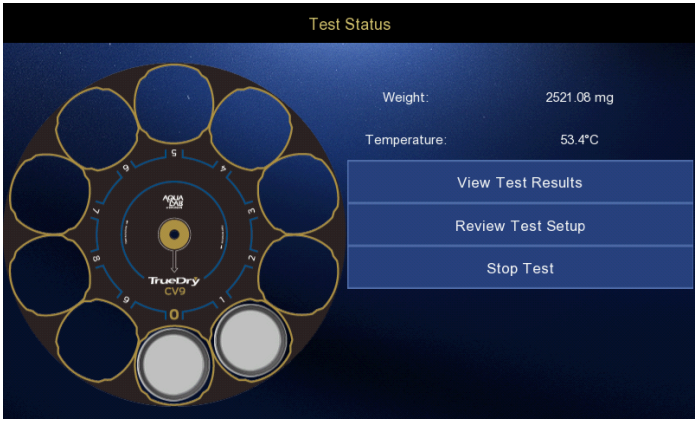


Figure 27: Running a Test

Once the TrueDry determines the weight of the sample select Next to move to the next position on the tray. Repeat this process for each sample. The TrueDry identifies all positions that contain an empty sample cup; if no sample cup is present, the sample tray automatically moves to the next position. If you need to redo a sample, replace it with an empty sample cup, close the lid, and tap that sample position on the touchscreen using the tray numbers as reference.

If you wish to exit the test setup you can select the Back button. This takes you back to the Configure Test screen. Once the last sample has been weighed the internal airflow and heating process begins automatically. During a test the Test Status screen shows you what is happening inside the drying chamber and gives you options for viewing ongoing test results or the test setup parameters.

From the Test Status Screen, you may press "View Test Results" to see the test results as either a table or chart during a test. Viewing the test data as a chart displays the drying curve of your samples and allows for an estimate of the progress of the test. Viewing the test data as a table shows the current readings for each sample.

Select "Stop Test" to cancel the test and return to the Home screen.

Sample weight should be a minimum of 2 g to achieve optimal re-

sults, however having 10 g of sample improves the repeatability of the measurements. When preparing the sample make sure to place a representative selection of the material in each cup. If the sample requires chopping, cutting, or grinding, then make sure the process is consistent across all samples. When adding the sample to the cup, spread it out over the bottom of the cup as much as possible. Avoid piling the sample on one side or in the middle of the cup. If there are spikes or dips then you may need to clean the drying chamber. If the test stops before the sample has finished drying, this may indicate that the Trigger is too high or that the test timed out too soon.

Viewing a graph of your test results is a good indicator of how well you have set up your tests. The graph should be smooth and continuous.

7 Care and Maintenance

This section describes cleaning and maintenance necessary to keep your TrueDry taking precise measurements. Please follow the care and maintenance instructions in this section to ensure the continued operation of your TrueDry.

TrueDry Cleaning Instructions

Keeping the TrueDry sample chamber clean is an important part of regular instrument care and maintenance. Dust, debris, and spills can interfere with the sample cup rotation, disrupt conductance between the heating surface and the samples, and alter weight measurements. It is best to remove spills prior to starting a measurement cycle. Spills left in the chamber while the TrueDry is running burn and can be difficult to remove after the test is complete.

Errant weight readings can occur if the drying chamber is dirty. Debris in the drying chamber can stick to the outside of sample cups or deposit on the weighing pan. Blow out the drying chamber with compressed air between tests and remove the tray to clean off the bottom heater to help prolong instrument life.

If a spill occurs near the scale pan, it is a good idea to clean the reservoir under the scale pan. Remove the scale pan and soak up any liquids or debris in the reservoir.

Note: Be very careful to not drop debris, water, or cleaning supplies down the scale rod shaft.

Cleaning Supplies

A moist towel, sponge, or Kimwipe can remove most (non-burnt) debris and you can clean greasy substances with a gentle liquid detergent or isopropyl alcohol. Burnt or dried substances are more difficult to remove; try gently scrubbing in a small circular motion using a very fine (scratch free) cleanser (i.e. Bon Ami). You may also use canned air for minor dry debris. After using any soap or cleanser,

be sure to rinse the surfaces using a moist towel, sponge, or Kimwipe.

Do not use anything abrasive: Scouring pads, sandpaper, and course cleansers wear down the surface of the sample chamber. Kitchen degreasers containing methylene chloride should also be avoided as methylene chloride strips the surfaces of the chamber.

Clean All Surface Areas

You must keep the lid, sample tray, lower heating plate, and scale well clean. To access the lower heating plate, remove the sample tray by removing the two thumb screws in the center of the tray.(Figure 28)

Note: It is very important to remove the sample cup from the machine when adding the sample to prevent any material from spilling in the drying chamber.

Figure 28: Removing Thumb Screws

To access the scale well, remove the scale pan by removing the screw from the center. (Figure 29)

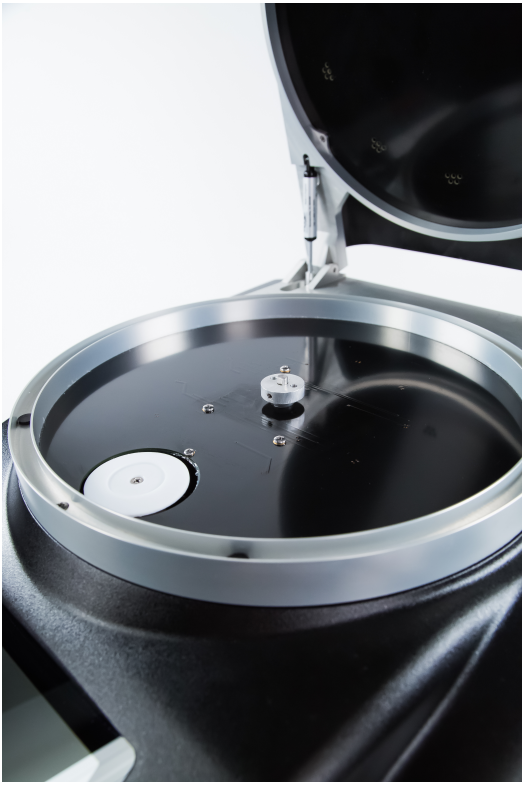


Figure 29: Scale Pan Removal

Be very careful not to drop debris, water, or cleaning supplies down the scale rod shaft.

Note: Be sure the scale pan and sample tray are screwed in place prior to starting a test.

Weight Calibration

Frequent weight calibration is not necessary for TrueDry moisture content measurements. However, operators can calibrate the scale with the included 2.0000 gram NIST traceable standard. Select Weight Calibration from the TrueDry Settings to begin calibration. Then empty the chamber, shut the lid, and select Next to begin taring the scale.

Note: Do not touch the table or TrueDry during calibration to prevent disturbing the calibration routine.

Once the TrueDry prompts you, open the lid and add an empty sample cup, shut the lid, and select Next. Once the TrueDry prompts you, open the lid, add the 2.0000 g standard, shut the lid, and select Next. TrueDry then displays the weight offset it applies if you accept the calibration. Select Next again to store the calibration or Cancel to abort.

Desiccant Cartridge and Desiccant Replacement

1. Removal of the desiccant material.

    (a) Orient the desiccant cartridge or tube (Figure 30) so the lid is up.
    (b) Remove the lid.
    (c) Remove the foam located below the lid. (Figure 31)
    (d) Hold the small tubing to prevent desiccant from getting into the tube.
    (e) Pour out the desiccant material.

Figure 30: Desiccant Cartridges

Figure 31: Cartridge Foam

2. Loading the desiccant into the desiccant cartridge.

    (a) Orient the desiccant tube so the opening is upward.
    (b) Hold the tubing to the side and fill the cartridge to the top with desiccant.
    (c) Shake or vibrate the desiccant cartridge to settle the ma-

terial.

(d) The top of the desiccant should be about 0.1 inches from the cartridge rim.

(e) Place the foam in the top and insert the small tubing through the hole in the foam.

(f) Take water and wet the cartridge (bottle) lip or the edge of the washer adjacent to the bottle lip and located in the lid. (Figure 32)

Figure 32: Desiccant Lid

Figure 33: Checking Desiccant Cartridge for Leaks

(g) Screw the lid onto the desiccant cartridge.

(h) Verify that the lid seal is correct by using the squeeze bottle (included with your TrueDry). (Figure 33)

i. Have a pan or cup with about one inch deep water in the bottom .

ii. Hold one finger over the output fitting.

iii. Pressurize the desiccant tube using the pressure bottle. (Figure 33)

Note: Do not put water into the Squeeze bottle, the bottle just needs to be squeezed with air in it.

iv. Place the desiccant tube with the lid into the water. If the lid is not sealed, water will flow into the desiccant cartridge. Hold the tube in the water only as long as needed to verify the lid seal.

v. Look for bubbles escaping from the lid. If there are bubbles, the lid is not sealed. Remove the lid and reset the washer. Lubricate the washer with water and put the lid back.

(i) When you place the desiccant cartridge into the desiccant receiver, you should wet the o-rings on the fittings to ease installation and reduce wear.

8 Troubleshooting

This section reviews problems you could experience with the TrueDry. Please refer to this section before contacting AquaLab support.

If this problem occurs:	**Refer to:**
Export Failed!	Problem #1
Test name cannot contain / * < > : ? | \ ’ ”	Problem #2
Test name already exists	Problem #3
Sample names cannot contain / * < > : ? | \ ’ ”	Problem #4
You must supply a name for each sample!	Problem #5
Unable to acquire weight reading from scale: %s	Problem #6
Weight must be between 10 mg and 25000 mg...	Problem #7
First cup position must have an empty sample cup!	Problem #8
At least one sample must be present...	Problem #9
Sample names cannot be more than 60 characters!	Problem #10
Missing USB Drive	Problem #11
No records are available to plot!	Problem #12
Scale Error	Problem #13
Scale could not determine weight!	Problem #14
Delete Failed!	Problem #15
Export Failed for ‘x’ Files!	Problem #16
An unknown error occurred!	Problem #17
Scale Underload!	Problem #18
Scale Overload!	Problem #19
Please name test before proceeding.	Problem #20
No communication	Problem #21
USB Unavailable	Problem #22
Disk Error	Problem #23
Insufficient storage space for test data	Problem #24
Corrupt File!	Problem #25
Unable to change date	Problem #26
Cannot read from USB drive/USB Drive no power	Problem #27
Tray stuck spinning while updating software	Problem #28
Unable to load test configuration from USB	Problem #29
TrueDry taking too long to boot to Main Screen	Problem #30
TrueDry detects lid is open when closed	Problem #31

1. PROBLEM:
Export Failed!

SOLUTION:

- Check to make sure you completely inserted the USB drive.
- Verify that the USB drive has been formatted in FAT32.
- Try removing the USB drive, waiting ten seconds, and then reinserting the USB drive.
- Wait up to ten seconds after inserting the drive and try exporting again.
- If it continues to fail, restart the system with the USB inserted into the slot.
- If the problem persists after completing all steps, it is likely the file is corrupted.

2. PROBLEM:
Test name cannot contain / * < > : ? | \ ' ".

SOLUTION:

Rename the test. The following characters are not allowed in test names: / * < > : ? | \ ' ".

3. PROBLEM:
Test name already exists.

SOLUTION:

Input another name for your test.

4. PROBLEM:
Sample names cannot contain / * < > : ? | \ ' ".

SOLUTION:

Rename the sample. The following characters are not allowed in sample names: / * < > : ? | \ ' "

5. PROBLEM:
You must supply a name for each sample!

SOLUTION:

Enter in a name in the sample name field.

6. PROBLEM:
Unable to acquire weight reading from scale: %s

SOLUTION:

- Make sure that the TrueDry is on a steady platform and there is little to no vibration occurring near the machine.
- Make sure that the sample cup contains between 10 mg to 25,000 mg.

7. PROBLEM:
Weight must be between x mg and y g for each sample!

SOLUTION:

- Check to make sure there is a sample in the cup and that it weighs between your defined minimum(x), ¡ 10 mg, and maximum (y), ¿ 25 g
- The sample weight cannot be less than 10 mg or more than 25,000 mg.
- If there is more than 25,000 mg in the sample cup, remove sample material until 25,000 mg or lower is reached.

8. PROBLEM:
First cup position must have an empty sample cup!

SOLUTION:

The zero position must have an empty sample cup. Place an empty

sample cup in the zero position.

9. PROBLEM:
At least one test sample must be present to do a test!

SOLUTION:

In addition to position zero, there should be at least one empty cup in one of the 1 to 9 positions.

10. PROBLEM:
Sample names cannot be more than 60 characters!

SOLUTION:

The sample name has a maximum of 60 characters. Reduce the number of characters in the sample name field.

11. PROBLEM:
Missing USB Drive

SOLUTION:

- Check to make sure the USB drive is firmly connected.
- Verify that the USB drive has been formatted in FAT32.
- Remove and reinsert the USB drive, wait ten seconds and then try again.
- If it still fails, restart the system with the USB inserted into the slot.

12. PROBLEM:
No records are available to plot!

SOLUTION:

Select Back and wait for the TrueDry to measure a few cups before viewing the graph again.

13. PROBLEM:
Scale Error

SOLUTION:

- Make sure that the TrueDry is on a steady platform and there is little to no vibration occurring near the machine.
- Make sure that the sample cup contains between 10 mg to 25,000 mg of sample.

14. PROBLEM:
Scale could not determine weight!

SOLUTION:

- Make sure that the TrueDry is on a steady platform and there is little to no vibration occurring near the machine.
- Make sure that the sample cup contains between 10 mg to 25,000 mg of sample.

15. PROBLEM:
Delete Failed!

SOLUTION:

Restart the system. If it still fails it is likely the file is corrupted.

16. PROBLEM:
Export Failed for 'x' Files!

SOLUTION:

- Check to make sure the USB drive is inserted.
- Try removing and reinserting the USB drive; wait 10 seconds after inserting the drive.
- Verify that the USB drive has been formatted in FAT32 and then try exporting again.
- Next, restart the system with the USB inserted into the slot.

- It it still fails it is likely the file is corrupted.

17. PROBLEM:
An unknown error occurred! **SOLUTION:**

Turn the TrueDry off and then back on and retry. If the problem still persists, please contact your Decagon representative.

18. PROBLEM:
Scale Underload!

SOLUTION:

Check the scale to make sure there is nothing lodged under it and that the cup lays completely over the scale pan. If nothing is interfering you must add weight to the cup $\geq$ 10 mg.

19. PROBLEM:
Scale Overload

SOLUTION:

Remove weight from the cup to $\leq$ 25,000 mg. This can also happen if you accidentally press down on the cup while adjusting it.

20. PROBLEM:
Please name test before proceeding.

SOLUTION:

Enter in a name in the Test Name field.

21. PROBLEM:
No Communication

SOLUTION:

Restart the machine.

22. PROBLEM:
USB Unavailable

SOLUTION:

- Check to make sure you firmly inserted the USB drive.
- Try removing and reinserting the USB drive. Wait up to 10 seconds after inserting the drive. Try again.
- If it still fails, restart the system with the USB inserted into the slot.

23. PROBLEM:
Disk Error.

SOLUTION:

Restart the machine. If it still fails contact Decagon.

24. PROBLEM:
Insufficient storage space for test data.

SOLUTION:

- Delete Tests from the Archive page.
- You may delete Saved Configurations if you desire more space for tests. Do this from the Run Test $\longrightarrow$ Configure Test screen.

25. PROBLEM:
Corrupt File!

SOLUTION:

- Restart the system and try accessing the file again.
- The file is corrupt and the data is lost. Redo test.

26. PROBLEM:
Unable to change the month in the settings screen.

SOLUTION:

The calendar does not allow invalid dates. Ex. Feb. 31. Change the day to 28 then change through the months. When arriving at the desired month, change the date.

27. PROBLEM:
Cannot read from USB drive/USB drive has no power.

SOLUTION:

- Check to make sure the USB drive is inserted.
- Verify that the USB drive has been formatted in FAT32.
- Try removing and reinserting the USB drive. Wait up to 10 seconds after inserting the drive. Try accessing the USB drive again.
- If it still fails, restart the system with the USB inserted into the slot.

28. PROBLEM:
Tray stuck spinning while updating software.

SOLUTION

Restart the machine and try updating again.

29. PROBLEM

Unable to load test configuration from USB.

SOLUTION

- Make sure that you have not changed the file name of the saved test file.
- Check to make sure the USB drive is inserted.

- Try removing the USB drive, wait ten seconds and reinsert the USB drive. Wait up to 10 seconds after inserting the drive.
- If it still fails, restart the system with the USB inserted into the slot.

30. PROBLEM
TrueDry is taking much longer than normal to boot to the Main screen.

SOLUTION

TrueDry takes a weight reading during boot-up, any vibration, movement, or unstable surfaces can upset this reading and stall normal boot up. Ensure the TrueDry is on a stable and non-moving surface.

31. PROBLEM
TrueDry detects lid is open when closed.

SOLUTION

A digital level housed in the lid detects whether the lid is open or closed. If the TrueDry detects that the lid is open even when it is closed, the instrument may not be level. Try propping up the rear of the instrument. If this fixes the problem remove the prop, and use the adjustable feet to level the machine.

9 Support and Repair

If, after trying these steps, you are still experiencing problems please contact Decagon Devices for instrument servicing and support.

Note: If you purchased your TrueDry from one of our international distributors, please contact them. They can provide you with local support and service.

When encountering problems with your TrueDry (that you are unable to resolve with the help of this manual), please contact Decagon Customer Support at support@AquaLab.com, 509-332-5601 or fax us at 509-332-5158. Please have the serial number, available in the Diagnostics screen and on the back of the TrueDry, formatted as CV9####, and model of the instrument ready.

All TrueDrys returned to Decagon for servicing must be accompanied by a Return Material Authorization (RMA) number. Prior to shipping the instrument, please contact a Decagon customer support representative to obtain an RMA.

Shipping Directions

The following steps help to ensure the safe shipping and processing of your AquaLab TrueDry.

1. Ship your TrueDry in its original cardboard box with suspension packaging. If you do not have the original box we can ship you another one.
2. Remove the desiccant tubes before packaging.
3. Tighten the shipping screw before packaging your instrument.
4. Place the TrueDry in a plastic bag to avoid disfiguring marks from the packaging.
5. Do not ship the power cord.
6. On the RMA form, please verify the ship to and bill to information, contact name, and problem description. If anything is

incorrect please contact a Decagon representative.

7. Tape the box in both directions for added support.
8. Include the RMA number in the attention line on the shipping label.

   Ship to:
   Decagon Devices Inc.
   ATTN: RMA (insert your RMA #)
   2365 NE Hopkins Court
   Pullman, WA 99163

Repair Costs

We repair manufacturer defects and instruments within the one year warranty at no charge. We bill all non-warranty repair charges for parts, labor and shipping to you. An extra fee may be charged for rush work. Decagon can provide an estimated repair cost, if requested.

Loaner Service

Decagon has loaner instruments to keep you working while your instrument is being serviced. If your TrueDry is still under warranty or you have a service plan with your instrument, there is no charge for the loaner service.

10 Declaration of Conformity

Application of Council Directive:	2004/108/EC and 2011/65/EU
Standards to which conformity is declared:	EN 61326-1:2013 and EN 50581:2012
Manufacturer's Name:	Decagon Devices, Inc 2365 NE Hopkins Ct. Pullman, WA 99163 USA
Type of Equipment:	AquaLab Moisture Analyzer
Model Number:	TrueDry CV-9
Year of First Manufacture:	2014

The undersigned hereby declares on behalf of Decagon Devices, Inc. that the above referenced products, to which this declaration relates, fully conform to the provisions of the Council Directives and standards referenced above.

Michael Wadsworth
Engineering Director
7-9-2015

11 Reference

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