2166
Grain Moisture Meter

Operation Instructions

FARMSCAN AG

INTRODUCTION

THANK YOU for purchasing a Farmscan Product.

READ THIS MANUAL carefully to learn how to operate and service your machine correctly.

THIS MANUAL SHOULD BE CONSIDERED a permanent part of your machine and remain with the machine when you sell it.

WRITE IDENTIFICATION NUMBERS in the Notes section. Your dealer needs these numbers if your tester needs repairs.

WARRANTY is provided by Farmscan Electronics for 1 (one) year or through Farmscan dealers for customers who operate and maintain their equipment as described in this manual.

All information, illustrations and specifications in this manual are based on the latest information available at the time of publication. The right is reserved to make changes at any time without notice.

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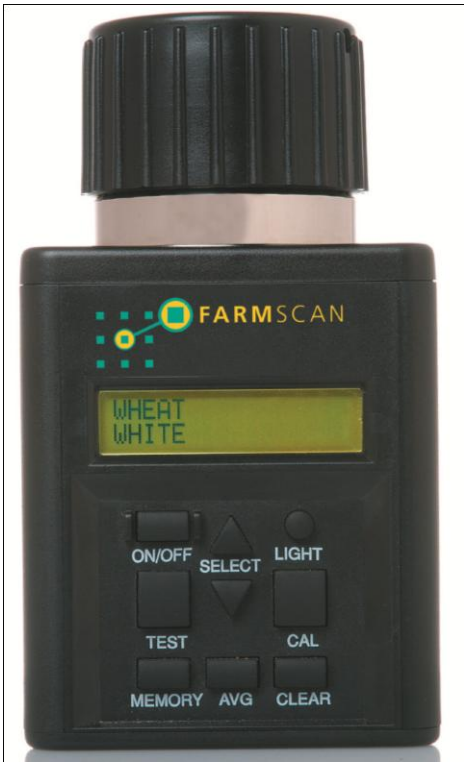
1.0 OPERATION

1.1 OPERATING CONDITIONS



Test cell and grain MUST be free of any condensation or surface moisture. Moisture on grain or in test cell will cause high readings. Very hot or cool grain will pick up moisture when it warms or cools. The pressure cap of the tester can squeeze moisture from high moisture grains, such as corn, into the bottom of the cell.

Because grains are irregularly shaped and may not always pack the same way in the test cell, minor variations in readings may occur. To enhance accuracy, always take three (3) successive readings of the total sample being tested, and average the results. Empty and refill the tester between each test.

The tester is most accurate when the **grain and tester** are between 16^{o} C and 32^{o} C. The unit will, however, operate at temperatures between 0^{o} C and 49^{o} C. For best results, grain temperatures should not be below 4^{o} C or above 43^{o} C. If the grain temperature is 11^{o}C more or less than the temperature of the unit, preheat the tester per instructions on page 5. Condensation on the grain or test cell is best avoided by having the tester and grain at about the same temperature.

The environment to which a grain sample is exposed can appreciably change its moisture content. Exposed to the open air, grain can gain or lose 1% to 2% indicated moisture in only a few minutes. If a sample is to be held for even a short time before being tested, it should be placed into a tightly closed, air-tight container, such as a ziplock bag or jar.

OPERATIONAL MESSAGES

Symbol	Definition
SYSTEM BATTERY LOW	System battery needs replacing
MOISTURE BELOW LIMIT	Moisture is below limit
MOISTURE ABOVE LIMIT	Moisture is above limit
NEEDS SERVICE (---)	Electronic Failure

1.2 OPERATING PROCEDURE - PREHEATING

IMPORTANT: If the temperature of the grain sample is 11ºC more or less than the temperature of the unit, preheat the tester and test as follows.

PREHEATING PROCEDURE

1. Remove cap (A) and inspect test cell (B) to be sure that it is clean and empty.
2. Press ON-OFF button (C) to turn on tester. The display (D) will show the name of the last grain tested.
3. When the grain to be tested has been selected using the SELECT arrows (E), fill the test cell (B) even to the top of the cell with sample to be tested.
4. Replace cap loosely. DO NOT TIGHTEN.
5. After 30 seconds, empty test cell and immediately refill with fresh grain.
6. Replace cap (A) and tighten until pressure-indicator screw (F) is flush with the top of cap (A). (Use finger-flush test as illustrated in figure 1.)
7. Immediately press TEST button (G). The words TESTING will be displayed for about 10 seconds, while the tester compensates for temperature. The moisture % and temperature will then be displayed for about 10 seconds.

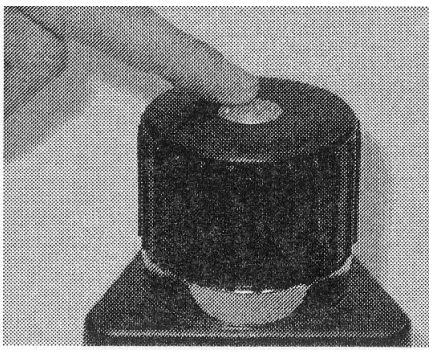
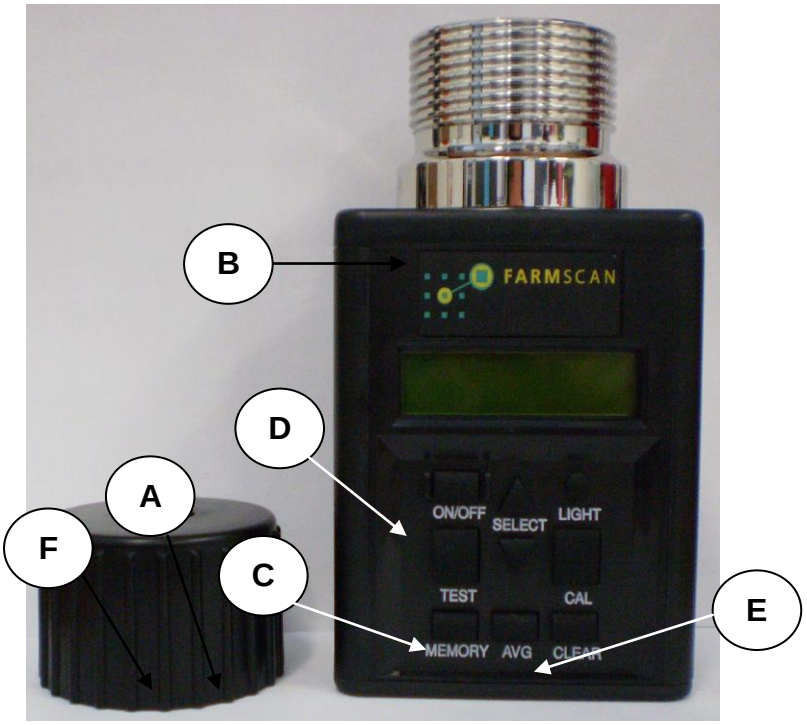


Figure 1.



A - Cap
B – Test Cell
C – ON-OFF Button
D - Display
E – Select Arrows
F – Pressure-Indicator Screw
G – Test Button

1.3 OPERATING PROCEDURE - NORMAL OPERATION

1. Remove cap (A) and inspect test cell (B) to be sure that it is clean and empty.

2. Press ON-OFF button (C) to turn on tester. The display (D) will show the name of the last grain tested.

3. When the grain to be tested has been selected using the SELECT arrows (E), fill the test cell (B) even to the top of the cell with sample to be tested.

4. (For Initial Test Only) Before tightening pressure cap, turn on tester and allow to warm up for 30 seconds before attempting first test.

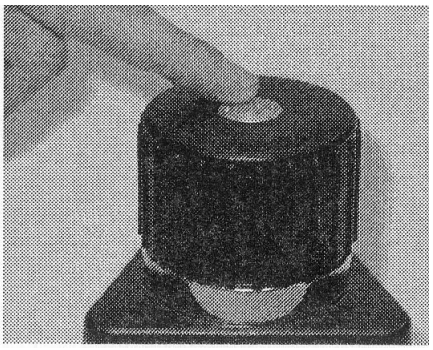
5. Replace cap (A) and tighten until pressure-indicator screw (F) is flush with the top of cap (A). (Use finger-flush test as illustrated.)

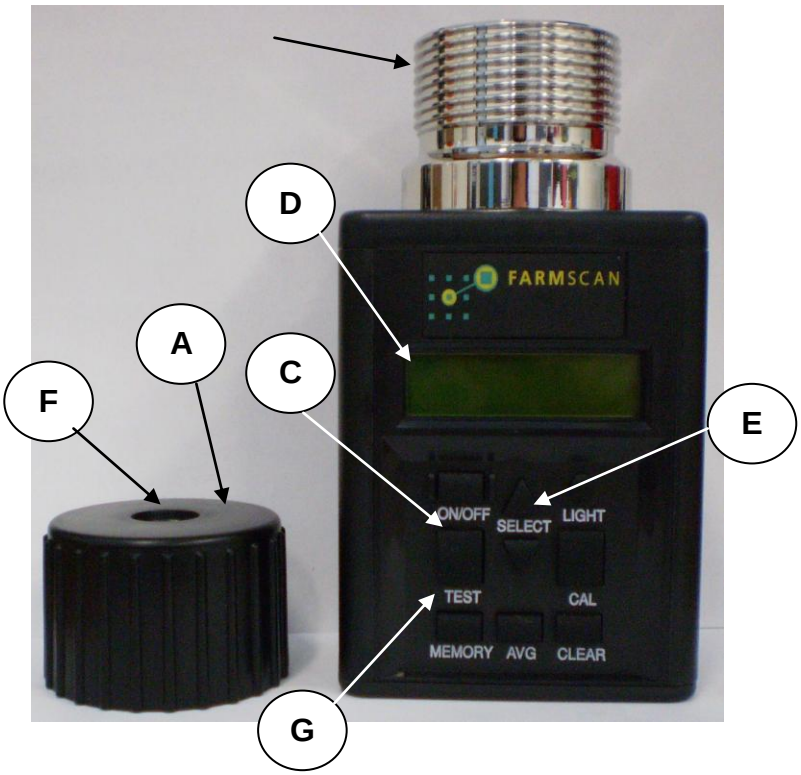
6. Immediately press TEST button (G). The words TESTING will be displayed for about 10 seconds, while the tester compensates for temperature. The moisture % and temperature will then be displayed for about 10 seconds.

7. The tester will then return to displaying the name of the last grain tested. Empty the test cell and refill with a fresh sample and test again.

Note: *Take at least three readings of new grain from the sample collected and average the results.*

A – Cap
B - Test Cell
C – ON-OFF Button
D – Display
E – Select Arrows
F – Pressure-Indicator Screw
G – Test Button

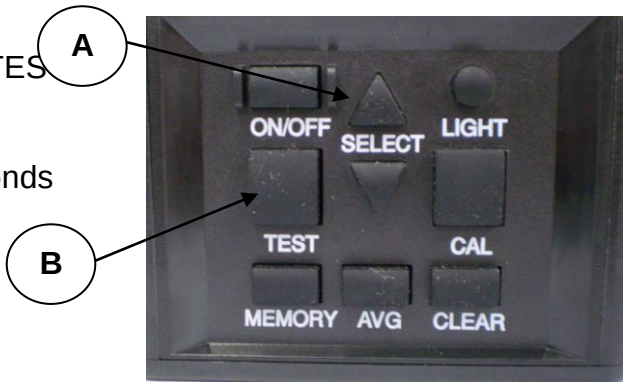



D
A
C
F
E
G
FARMSCAN
ON/OFF
SELECT
LIGHT
TEST
CAL
MEMORY
AVG
CLEAR

1.4 TO DISPLAY TEMPERATURE IN THE CELL

To display the temperature in the cell, press either the up or down arrow on the SELECT button (A) to index forward or backward through the grain (function) menu until the word TEMPERATURE is displayed.

When TEMPERATURE is displayed, press TES button (B). The current temperature in cell will be displayed in both F° and C°. Temperature will be displayed for a few seconds then will return to the main grain menu.



Note: *If the tester and grain are different temperatures, the mass of the metal tester will quickly warm or cool the grain. Therefore, the temperature reading is the cell temperature, not necessarily the temperature of the grain before being put into cell.*

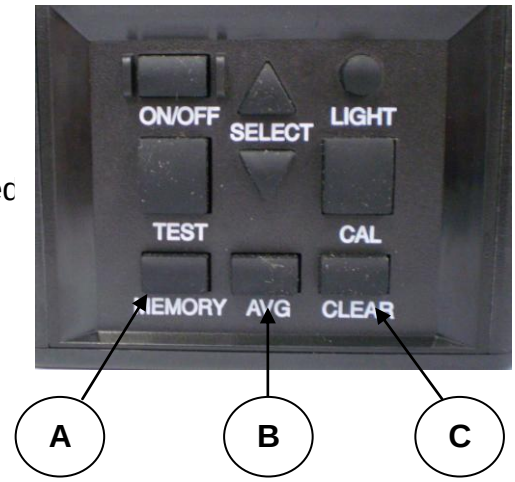
1.5 TO AVERAGE TEST RESULTS

1. When testing grain, the test result is displayed for about ten seconds. During the period that the test moisture % and temperature is displayed, press the MEMORY button (A). The tester will acknowledge that it has entered the reading into memory, by displaying the current average and then the number of stored readings. Up to 20 readings can be stored into memory. If the maximum number of readings has been reached, the tester will not allow anymore readings to be stored.

   Note: *Averaging is stored for one grain only. When a test for a new grain is performed, existing averaging data for the previous grain is erased when the new grain's averaging data is taken. Averaging data is retained even if batteries are removed.*

2. Press the AVG button (B) to display the average of all results entered for the grain being tested.

3. To clear the averaging, press the AVG button.
   The current average will be displayed.
   Then press the CLEAR button (C) and the tester will then display “0.0% (0)”.
   This indicates that the averaging has been clearec



1.5 TO CHECK BATTERY POWER LEVELS AND REPLACE BATTERIES

1. The tester is supplied with two 9 volt, alkaline batteries. The left battery (A) powers the backlight circuit. The right battery (B) powers the system.

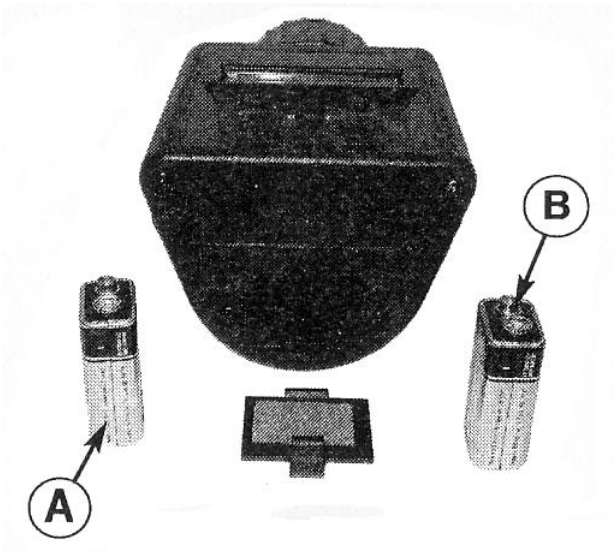
2. The tester will flash a BATTERY LOW message if system battery needs replacing when unit is turned on. It will not say this for the Backlight battery. In the event that the backlight battery is low, the backlight will not work.

3. At any time select BATTERY from main menu and press TEST to display the percentage available for both batteries.

4. The tester systems functions will operate, if no backlight battery is installed or if it is low.

5. SYSTEM BATTERY LOW message will be presented when unit is turned ON and the battery is 10% or less usable.

Note: *If the backlight battery is fresh and the system battery needs replacing, the backlight battery can be used to operate the system, by moving it to the system battery location.*



1.6 TO CLEAN TESTER

Remove cap and wipe out inside of the tester with a dry paper towel.

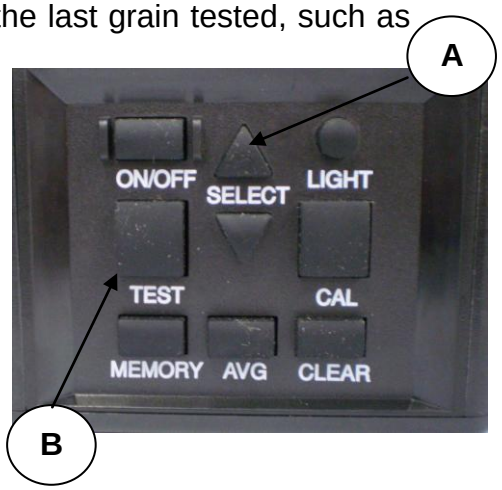
Note: *Grain may become lodged in threads of cap and should be removed with a small blade.*

1.7 TO SELECT A NEW GRAIN SCALE (OR FUNCTION)

1. At start up, the tester will always display the name of the last grain tested, such as corn.

2. To select a new grain scale, press either the up or down arrow on the SELECT button (A) to index forward or backward through the grain (function) menu The grains are listed in alphabetical order followed by other tester functions.

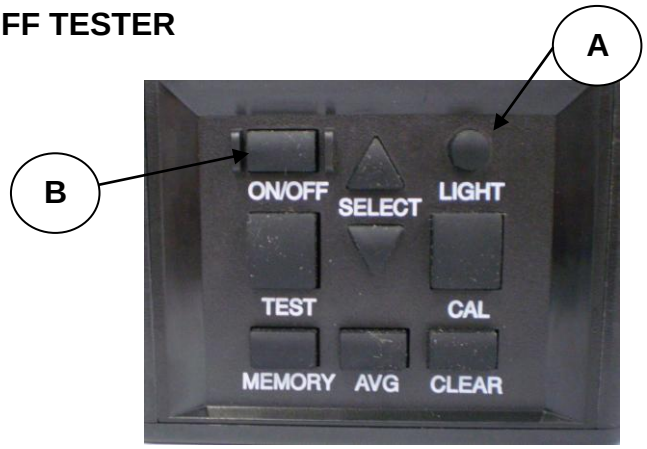
   Note: *To use other functions included with the tester, push SELECT button (A) up or down to get desired function.*
   Push TEST button (B) to perform that function.



1.8 TO TURN ON BACKLIGHT AND TURN OFF TESTER

1. Press LIGHT button (A).

2. Press again to turn off backlight.



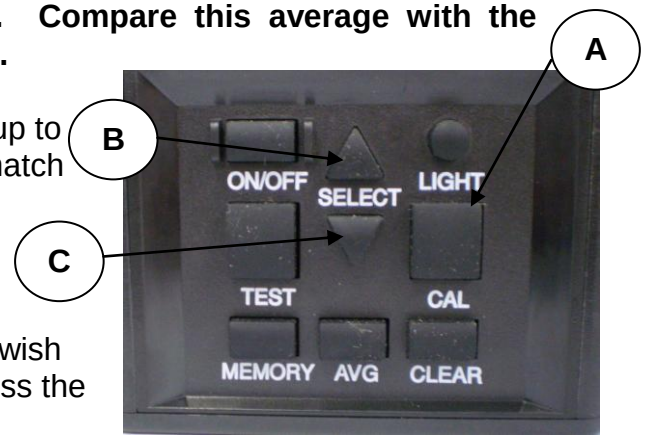
Note: *The backlighting feature is designed to improve display visibility in low light conditions. In bright light conditions the backlighting cannot be seen.*

3. To turn off tester, press ON-OFF button (B). Tester will automatically turn itself off 2 minutes after the last button has been pushed.

2.0 CALIBRATION

2.1 TO ADJUST CALIBRATION

IMPORTANT:
Always obtain three (3) test results from the grain elevator for the sample being compared. Average these three (3) results. Compare this average with the average of three (3) test by the moisture tester.



1. Each grain scale can be individually adjusted up to 5.0% by increments of 0.1% to more closely match the results of an elevator tester.

2. First select the grain to be adjusted.

3. Test the grain selected, using the sample you wish to adjust to. Once valid moisture appears, press the CAL button (A).

   Note: *Calibration of given grain cannot be performed unless a valid moisture test has been performed.*

4. Once CAL Button (A) is pressed, tester will now display the obtained moisture reading and the current offset applied to that moisture range.

5. Press the Up Arrow (B) to raise the adjustment amount or press the Down Arrow (C) to lower. The tester will add or subtract up to 5.0% by increments of 0.1% to the current moisture range.

6. After the adjustment amount has been selected, press the CAL Button (A) to return to grain tester mode.

   Note: *Adjustment can NOT be made to factory calibration to produce moisture readings in a tester that shows "BELOW LIMIT" or "ABOVE LIMIT" readings.*

IMPORTANT:
This tester incorporates Multi-Point calibration for each grain. Therefore, once a valid test is taken and an adjustment is made, the adjustment will only effect the moisture range of the sample tested.

2.2 GRAIN MOISTURE LIMIT GUIDELINES

(Specifications and design subject to change without notice.)

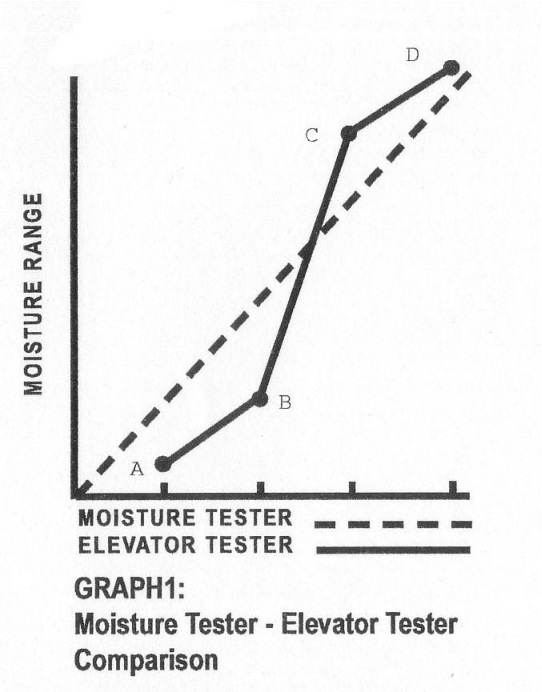
Grains	Moisture Range Low Limit	Moisture Range High Limit
Alfalfa	6.0%	24.0%
Barley	7.0%	25.0%
Beet	8.0%	20.0%
Buckwheat	6.0%	23.0%
Canary	8.0%	23.0%
Clover: Purple	6.0%	20.0%
Clover: White	6.0%	20.0%
Corn: high moisture	15.0%	40.0%
Corn: low moisture	6.0%	22.0%
Dactyl	7.0%	22.0%
Fescue	6.0%	22.0%
Flax (Linseed)	5.0%	17.0%
Lentils	7.0%	18.0%
Millet	6.0%	21.0%
Mustard	5.0%	21.0%
Navy Beans	8.0%	20.0%
Oats	6.0%	23.0%
Peanuts: Spanish	6.0%	15.0%
Peas: FODDER	7.0%	20.0%
Peas: Green	8.0%	21.0%
Peas: Yellow	8.0%	21.0%
Phleum	6.0%	24.0%
Popcorn: White	6.0%	24.0%
Popcorn: Yellow	6.0%	25.0%
Rapeseed (canola)	7.0%	15.0%
Rice: Long	8.0%	22.0%
Rice: Medium	8.0%	22.0%
Rye	7.0%	26.0%
Rye Grass	9.0%	20.0%
Safflower	6.0%	28.0%
Sorghum (milo)	9.0%	21.0%
Soybeans	8.0%	25.0%
Sunflower: Stripe	7.5%	22.0%
Triticale	6.0%	23.0%
Wheat: Durum	8.0%	20.0%
Wheat: hard red spring	7.0%	21.0%
Wheat: hard red winter	7.0%	21.0%
Wheat: soft red winter	8.0%	22.0%
Wheat: white	7.0%	22.0%

Note: *If grain temperature is 4^{o}C or below, or 43^{o}C or above, and the grain moisture is near either the high or low limit (listed above), the tester is programmed to close down its range of operating limits.*

2.3 CALIBRATION CONSIDERATION / LIMITS

Typically the moisture tester will be consistent with most elevator testers over a broad range of moisture levels. However, there are some things to consider when thinking about your moisture tester calibration.

Note: *Graphs provided are for illustration purposes only and do not reflect actual test data.*



GRAPH1:
Moisture Tester - Elevator Tester Comparison

Tester Differences: Your moisture tester unit, 08125, may not match a given elevator tester. None of the testers exactly match the actual weighted moisture of any given grain. There is no national standard for elevator testers. The difference between moisture tester and various U.S.D.A. approved elevator testers is not a constant value. A correction at one moisture level may not be valid for a different moisture level. Graph 1 shows how the moisture tester might compare to an elevator tester over a broad range of moisture levels. The moisture tester, and most elevator testers (shown in graph by solid line) will closely match those of the moisture tester (shown by dashed line) for that range, as illustrated. However, as we get away from mid-range into the high and low moisture levels, differences between elevator tester and moisture tester not only become greater, but may switch from moisture tester reading higher than elevator tester to a reading lower than the elevator tester. For example, in Graph 1, the area between B and C represents the mid-range moisture. Moisture tester readings match elevator tester readings in this area with an accuracy of plus or minus 0.5 percent. The area between A and B represents the low moisture range. Moisture tester readings differ more from elevator tester readings, and are LOWER than elevator tester readings. The area between C and D represents the high moisture range. Moisture tester readings again differ more from elevator tester readings than they did at mid-range moistures, but now the readings are HIGHER than elevator tester readings.

Calibration Requirements: Graph 1 illustrates that moisture tester readings closely match elevator tester readings for mid-range moisture levels. (Graph is for illustration purposes only and does not reflect actual test data.) Calibration changes required for grain in this moisture range will be small, if any. However, if grain is very dry (Low Moisture Range) or very wet (High Moisture Range), it may be necessary to calibrate your moisture tester unit against the elevator tester using a sample of your grain in both testers. Record the calibration correction required. It will be valid for all testing in that moisture range for that grain.

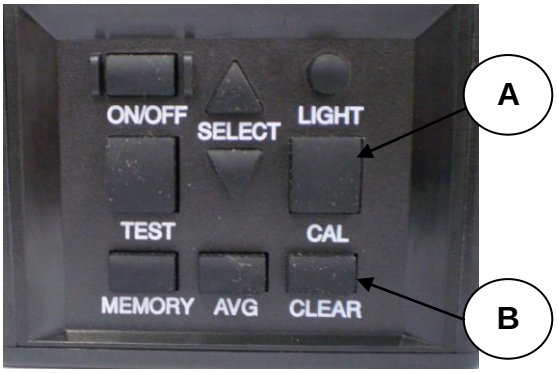
2.4 TO CLEAR CALIBRATION

1. Select grain to clear.

2. Press CAL Button (A), tester will then display last calibration that was made.

3. Press CLEAR Button (B).

4. Tester will then display 0.0% for both lines if the calibration has been cleared.



Note: *If you press the CAL Button and tester displays 0.0% on both lines, then no calibration has been made for this grain.*

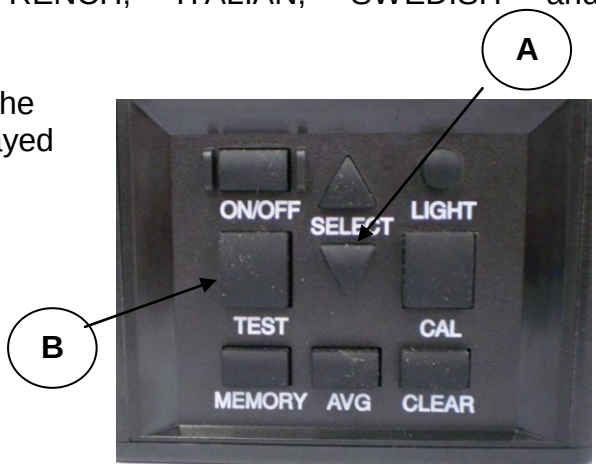
2.5 TO SELECT A DIFFERENT LANGUAGE

1. At start up, the tester will always display the name of the last grain tested in the current language selected. (English is the default language from the factory.)

2. To select a new language, press either the up or down arrow on the SELECT button (A) to index forward or backward through the grain (function) menu until the word LANGUAGE is displayed.

3. When LANGUAGE is displayed, press TEST button (B). The current language selected will be displayed. Press either the up or down arrow on the SELECT button (A) to index forward or backward through the grain language menu until your choice of language is displayed. The seven (7) languages (as displayed) are: ENGLISH, SPANISH, GERMAN, FRENCH, ITALIAN, SWEDISH and PORTUGUESE.

4. Press TEST button (B) again to return to the main grain menu, which will now be displayed in the new language.



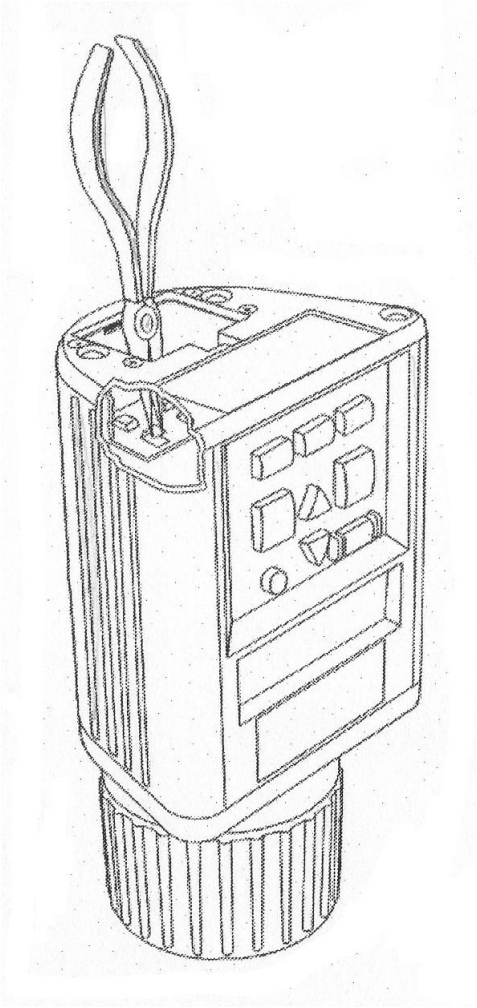
3.0 TROUBLESHOOTING

Symptom A: Unit does not power up or loses power occasionally (or backlighting does not operate.)

Solution 1: Press ON-OFF button for shorter time. Do NOT hold button down.

Solution 2: Check batteries for 0% or higher. Replace as necessary. (page 7)

Solution 3: Battery contacts may be making poor contact. Remove batteries and pull metal contacts up from bottom of compartment and above height of plastic knob using needle-nose pliers.



Symptom B: Unit is inaccurate.

Solution 1: Temperature of the grain and unit may be more than 11ºC different. Follow preheat procedure (page 4).

Solution 2: If grain is at an extreme temperature, let grain settle to reach room temperature. Retest grain.

Solution 3: Grain and/or test cell may have developed surface moisture from rapid change in temperature of the grain sample. Allow grain and tester to stabilize near room temperature. Inspect for visible moisture on grain and inside test cell. Dry test cell with soft cloth or blow dryer, if necessary. Retest grain. (See pg. 5)

Solution 4: If the tester displays SYSTEM BATTERY LOW, the test results may be inaccurate. Replace battery.

Solution 5: Unit may need to be recalibrated by factory. Return to your Farmscan dealer for repair or replacement.

Symptom C: Unit reads MOISTURE BELOW LIMIT or MOISTURE ABOVE LIMIT.

Solution 1: Grain may be too wet or dry to test. Check moisture limit guidelines on page 10 of Operating Instructions. NOTE: Page 10 Limits are only guidelines.

Symptom D: Unit reads NEEDS SERVICE (---).

Solution 1: Electronic failure. Return to your Farmscan dealer for repair or replacement.

4.0 SPECIFICATIONS

Battery :	9 volt Alkaline Type
Accuracy :	Within 0.5% of oven dried method
Moisture Range :	See Low/High Limits for each grain type. (page 10)
Grain Temp Range :	0º C to 49º C
Scale Adjustment :	± 4.9% by 0.1% increments
Weight :	800g (1.3kg packed)
Dimensions :	H 175mm x W 100mm x D 75mm

RECORD SERIAL NUMBER

Note: *The tester serial number is located on the bottom of the unit.*

Write your model number, serial number, and date of purchase in the space provided below. Your dealer needs this information when ordering parts and when filing warranty claims.

Date of Purchase_____

Serial No._____

Model No._____

(To be filled in by purchaser)

IMPORTANT: Keep original invoice or other proof of purchase. Proof of purchase is required to determine if service will be performed within warranty period at no charge.

CARRYING CASE

The 2166's carrying case is constructed of padded vinyl to protect the tester.
A zipper bottom, and Velcro® sealing flap permit operation with tester in carrying case.

Part No. 06053

Velcro is a registered trademark of VELCRO Industries.