

AGTRON MODEL E30FP POTATO PRODUCTS ANALYZER

OPERATION MANUAL

SOFTWARE VERSION TC-130CS

10/20/04

INTRODUCTION

The E30FP evaluates potato par-fry using two bands of energy reflected from the surface of the sample. With standard analyzer calibration, the ratio of these two energy bands correlates directly to a composite development of both process (degree of fry / par-fry) and appearance indexes. The resolution and linearity of the standard Agtron Scale provides a useful reference for controlling the consistency of pre and post-process development. Because measurements are relative to the standards used during calibration, the analyzer is extremely flexible. The user can bias the measurement scale by changing the ratio of the chromaticity index to that of the process index. The user can also modify analytical resolution (the difference the E30FP sees between two products), and dynamic range, by adjusting the slope and span of one or both energy bands. These calibration options add to the versatility of the analyzer to accommodate a wide variety of products.

BASIC THEORY of OPERATION

There are two fundamental considerations in establishing quality control references for the thermal processing of potato products, appearance and sensory character. Appearance covers the physical properties of size, shape, uniformity, and the perceived complex color/lightness/darkness of the product. Sensory character embodies mouth feel and texture, olfactory, and organoleptic parameters. The Agtron E30FP uses a comprehensive approach for the classification of process progression by focusing on both perceived color and constituent development relative to olfactory and organoleptic character.

Using the standard calibration, both chromatic-specific and process-specific energy reflected from the product surface is evaluated and equally weighted in calculating the Agtron Score. The process and chromatic parameters have overlapping domains allowing photometric normalization of sample surface area and geometry. As a result sample preparation is non-critical and product can be evaluated in its natural format.

Process assessment is based on a narrow band of the near-infrared spectrum selected for its linear relationship to the polymerization of sugars, significant to organoleptic character and linked directly to the development of many other sensory constituents. The polymerization of surface sugars also affects perceived color.

Chromatic assessment is based on a narrow band of the visible spectrum selected because it has a linear correlation to Maillard reaction progression. Amino groups form condensation products with aldehydes, principally responsible for the browning effect when amino acids and sugar coexist. In addition to affecting product appearance, primarily the perceived lightness/darkness of the product, Maillard reaction progression is also related to the thermal development of other constituents essential to organoleptic character. As potatoes vary in the concentrations of both aldehydes and sugars, consideration of a composite of these overlapping parameters provides an accurate and high-resolution indication of process development.

BENEFIT

Process control derived from constituent analysis, such as with the E30FP, is important to both the appearance of the product presented to the consumer, and to the development of favorable and optimized flavor. In addition, by maintaining an exact par-fry baseline in pre-processing, product post-processing can be controlled to an exacting degree with simple time/temperature methodology.

I. INITIAL SET-UP

Carefully remove the analyzer from the shipping box.

Inspect the analyzer for any signs of shipping damage.

Contact Agtron immediately if any signs of damage are apparent. A claim for damage will need to be filed as soon as possible.

IMPORTANT: Keep the box and all packing material. Any equipment returned to Agtron for service must be shipped in the original packaging or Agtron will not accept the unit.

The carton contains:

- One E30FP analyzer
- One Power Cord with surge protector attached
- One Life Disk
- One Two-Sided Scale Reference Disk
- One Pumpkin Colored Ratio Reference Disk
- One Calibration Disk Locating Tray
- Two Sample Dishes
- This Operation Manual

Place the Agtron analyzer on a clean level surface.

IMPORTANT: Make certain that the analyzer is level as the samples are liquid and need to be kept flat.

Keep the cooling fan vent on the back of the unit free of obstruction.

Avoid placing the unit where it will be in direct sunlight.

Remove the large disk from the box marked LIFE DISK.

Fully open the sample drawer by pulling it straight out until it hits the bumper stop.

Place the LIFE DISK in place under the drawer with the handle facing down, flat side up, so that the disk handle fits into the mating hole in the bottom of the analyzer. The life disk may have marks or scratches on the surface. This will not affect performance.

NOTE: *The life disk should be cleaned periodically. To clean the disk, remove it from the analyzer and wipe it with a soft cloth and a 10% solution of Windex and distilled water.*

Place the rectangular metal tray into the cutout on the sample drawer top so that it recesses into the cutout.

Fully close the sample drawer.

Connect the AC power cord to its mating socket on the back of the unit. Make certain that the plug is firmly seated.

WARNING: *Before connecting the analyzer to mains power, check the serial number tag to confirm that the unit is correctly configured for both your Mains Voltage and Frequency. Contact Agtron immediately if a power incompatibility exists. Do not attempt to connect to either an incorrect Voltage or Frequency line. Use only a 3-prong earth grounded connection. Do not bypass the power cord grounding pin or serious electrical shock to the operator and damage to the unit may occur.*

Connect the unit to AC mains power. It is strongly recommended that the power cord be connected to the mains using the supplied surge protector.

NOTE: *The E30TP VEX III has no ON / OFF power switch and will **power-up** as soon as it is connected to mains power. Always leave the unit on (connected to power). The Analyzer uses very little power, about as much power as a 25-watt light bulb.*

The display will activate and begin timing a 45-minute warm-up period.

The analyzer model type will appear on the display along with the unit serial number and other information.

The display will repeat / cycle the startup display information until the 45-minute warm-up period is over.

At the end of the warm-up period, the display will show:

<<< **AGTRON MODE** >>>

Contact Agtron immediately if the Display does not show <<< AGTRON MODE >>> following the initial warm-up period. Internal shipping damage may have occurred and a damage claim will need to be filed as soon as possible.

II. FRONT PANEL

The front of the analyzer has two panels, one vertical and the other tilted. The vertical panel is the sample drawer face. The lower center edge of the drawer has a relief cutout. This is where you place your fingers to open the drawer. Open the drawer by pulling the panel straight-out from the unit until the drawer hits the stop bumper. When using the E30FP, it is necessary to pull the drawer out fully until the stop is contacted to initialize calibration.

The tilted panel has the LCD display and two keypads, one for Numeric entry and the other for Function selection.

Active keys on the Numeric Keypad are:

0 thru **9**, **E** (Enter), **YES**, *****

Active keys on the Function Keypad are:

CAL (Calibrate), **SKIP**, **DATE** (Date / Time), **F1**, **F2**, **F3**, **QUICK CAL**

The back panel on the analyzer has the socket / fuse holder for mains power connection, the cooling fan and filter media frame, a serial port for communication inter-face (optional software required), and a push button for system reset.

WARNING: Do not connect any peripheral devices to the communications port or serious damage may occur to the analyzer. Optional software and internal interface modifications are required for each specific application. Contact Agtron for assistance.

NOTE: *The E30FP can be fully reset by depressing the back panel reset button for about 5 seconds. Resetting puts the analyzer into the 45minute warm-up mode.*

NOTE: *The **SKIP** key on the function keypad can be depressed at any time to exit the warm-up mode and go to the <<< **AGTRON MODE** >>>. Whenever the system is reset, the analyzer will prompt the operator to recalibrate.*

III. SETTING THE DATE & TIME

Depress the **DATE** key on the function keypad.

Current time and date settings will be displayed on the top of the display as follows:

XX:XX:XX **XX/XX/XX**

The time is displayed in the 2400-hour format. The bottom of the display will alternate between the following two statements:

SKIP QUILTS ANY TIME

- and -
PRESS F1 TO CHANGE

If the date and time displayed are correct, depress the **SKIP** key on the function keypad to save the settings and exit the Date & Time function.
IF you wish to change the Date & Time displayed, depress the **F1** key.

The display will show: **YEAR** **(YY):**

Using the numeric keypad, enter the last two digits of the year (2002 would be 02).

The display will show: **MONTH** **(MM):**

Enter the month in two-digit format (April would be 04, October would be 10).

The display will show: **DAY** **(DD):**

Enter the day of the month in two-digit format.

The display will show: **24 HOUR** **(HH):**

Enter the current hour in 24hour format (7 am would be 07, 10 am would be 10, 2 pm would be 14, 12 pm / midnight would be 24).

The display will show: **MINUTE** **(mm):**

Enter the current time minutes in two-digit format.

The display will now show the new Date & Time settings. To change the settings, press the **F1** key. To keep the settings, and exit the Date & Time program, press the **SKIP** key.

NOTE: *Whenever you exit the program Date / Time function, the analyzer will prompt the operator to RECALIBRATE.*

IV. FULL CALIBRATION PROCEDURE FOR THE AGTRON MODE

REQUIRES THE SCALE REFERENCE AND PUMPKIN RATIO REFERENCE DISKS

The E30FP VEX III automatically re-calibrates each time the sample drawer is opened. It reads the LIFE DISK under the drawer and adjusts to an established reference. The reference value is established and stored during the FULL CALIBRATION procedure.

The FULL CALIBRATION procedure should be performed at the beginning of shift or every 24 hours, whichever occurs first, to maintain analytical accuracy.

NOTE: *FULL CALIBRATION can be performed more frequently if desired. The computer keeps track of CALIBRATION intervals and will prompt the user to recalibrate every 24-hour cycle at 00:00:01.*

FULL CALIBRATION Requires Two Steps:

CALIBRATION STEP I / AGTRON STANDARD MODE

The first step establishes the scaling for each of the two energy bands; both span and slope. The supplied two-sided Scale Reference disk (black on one side and white on the other side) is used for this step. The high and low values referenced as factory defaults are suggestions only. With the TC-130CS version of the E30FP, these values produce the greatest analytical resolution and are the basis for the Agtron Mode. The Agtron Mode is the standard calibration for French Fry Par Fry Analysis. Other values can be used and depending on product category, may have a small or significant effect on analytical resolution (the difference the analyzer sees between two different product samples). For products such as seasoned or battered, the effect of changing slope and span reference values may be dramatic. For standard par-fry analysis changes will have only a small effect on resolution.

This procedure should be performed every 24 hours or at the beginning of each shift, whichever occurs first.

Depress the **CAL** key on the function keypad.

The display will show: *** OPEN SAMPLE DRAWER ***
 < <<< ----->>> > (Bottom line strobes)

Fully open the sample drawer.

The display will first show: **=CAL MODE ENGAGED=**
 *****STAND-BY*****

The display will change to: **INSERT WHITE DISK**
 ->>CLOSE DRAWER<<-

Remove the sample dish from the sample drawer and insert the disk-locating tray. Place the two-sided Scale Reference disk, white side “facing up”, between the locating pins on the tray.

Make certain that the dish and disk lay flat on the drawer surface.
Fully close the sample drawer.

The display will show: **HIGH GREEN REFERENCE**
 ENTER SCORE : 95.0

The unit will display the previous High Green Reference entered.
The default value for this reference is 95.0.

* If a value other than 95.0 is displayed, key-in 95.0 using the numeric keypad.

Depress the **E** key to enter the displayed value.

NOTE: You may edit the analytical slope and span of the analyzer by changing the high green reference value. Consult Agron for assistance with non-standard Scale calibration.

The display will show: **MEASURING HIGH GREEN**

Followed by: **HIGH NIR REFERENCE**
 ENTER SCORE: 95.0

The unit will display the previous High NIR Reference entered.
The default value for this reference is 95.0.

* If a value other than 95.0 is displayed, key-in 95.0 using the numeric keypad.

Depress the **E** key to enter the displayed value.

NOTE: You may edit the analytical slope and span of the analyzer by changing the High NIR reference value. Consult Agron for assistance with non-standard Scale calibration.

The display will show: **MEASURING HIGH NIR**

Followed by: **OPEN SAMPLE DRAWER**
 <<<<----->>>>

Fully open the sample drawer.

The display will show: **INSERT BLACK DISK**
 ->>CLOSE DRAWER<<-

Turn the two-sided Scale Disk over so that the black side faces up.
Place the disk onto the tray between the locating pins and fully close the drawer.

The display will show: **LOW GREEN REFERENCE**
 ENTER SCORE: 05.0

The unit will display the previous Low Green Reference entered.
The default value for this reference is 05.0.

* If a value other than 05.0 is displayed, key-in 05.0 using the numeric keypad.

Depress the **E** key to enter the displayed value.

NOTE: You may edit the analytical slope and span of the analyzer by changing the Low Green reference value. Consult Agron for assistance with non-standard Scale calibration.

The display will show: **MEASURING LOW GREEN**

Followed by: **LOW NIR REFERENCE**
 ENTER SCORE: 05.0

The unit will display the previous Low NIR Reference entered.
The default value for this reference is 05.0.

* If a value other than 05.0 is displayed, key-in 05.0 using the numeric keypad.

Depress the E key to enter the displayed value.

NOTE: *You may edit the analytical slope and span of the analyzer by changing the Low NIR reference value. Consult Agtron for assistance with non-standard Scale calibration.*

The display will show: **MEASURING LOW NIR**
Followed by: **OPEN SAMPLE DRAWER**
 < <<< ----->>> >

Proceed to CALIBRATION STEP II (Any Option) immediately.

CALIBRATION STEP II / AGTRON STANDARD MODE

The second step determines the relationship (ratio) of the two energy bands that will be used to determine product scores. There are three options for establishing the ratio used in the second step, AGTRON STANDARD MODE, OPTION I, OPTION II. The following procedure addresses STEP II / AGTRON STANDARD MODE which is the most commonly used.

This procedure requires the supplied Pumpkin Colored Ratio Disk and the Agtron Score noted on the sticker on the back of the disk as the ratio reference (the Agtron Standard Calibration). **This step should be performed every 200 readings or every 4 hours, and can be accomplished using the Quick Calibration procedure (See Section V) which ever occurs first.**

NOTE: *Avoid touching the top surface of the disks. Clean the disk surfaces occasionally with a soft cotton cloth. Use very light pressure and a 10% solution of Windex and distilled water or denatured alcohol. Keep the disk stored in the box provided and away from direct sunlight or heat. With the exception of the Life Disk, never leave a Calibration disk in the analyzer.*

From Calibration Step I The Display Shows:
 OPEN SAMPLE DRAWER
 < <<< ----->>> >

Fully open the sample drawer.

The display will show: **POTATO REFERENCE**

-->>CLOSE DRAWER<<--

Remove the two-sided Scale Disk and place the pumpkin colored Ratio Disk in its place. Make certain that the locating handle on the backside of the disk sits into the center hole on the tray and that the disk lays flat.

Fully close the sample drawer.

The display will show: **PRODUCT CALIBRATION**
 ENTER SCORE: XX.X

If the score displayed does not match the Reference Score on the disk label; key-in the correct score using the numeric keypad.

Depress the **E** key on the bottom right corner of the numeric keypad to enter the displayed value.

Display shows: **MEASURING GREEN**

Followed by: **MEASURING NIR**

Followed by: ***CALCULATING SCALE***

Followed by: **<<<<AGTRON MODE>>>>**

The E30FP is now ready to read Product Scores in the Standard Agtron Mode.

CALIBRATION STEP II / OPTION I

CALIBRATION PROCEDURE USING PRODUCT FOR REFERENCE

The E30FP may be calibrated to an internal company standard using an actual potato sample.

Complete Step I of the standard calibration procedure using the two-sided Scale Disk.

Prepare the product sample.

Display shows: **OPEN SAMPLE DRAWER**
 <<<<----->>>>

Fully open the sample drawer.

The display will show: **POTATO REFERENCE**
 -->>CLOSE DRAWER<<--

Place the prepared sample into the sample tray and fully close the drawer.

The display will show: **PRODUCT CALIBRATION**
 ENTER SCORE: XX.0

Key-in your desired product score using the numeric keypad.

Depress the **E** key on the bottom right corner of the numeric keypad to enter the displayed value.

The display will show: **MEASURING GREEN**

Followed by: **MEASURING NIR**

Followed by: ***CALCULATING SCALE***

Followed by: **<<<AGTRON MODE>>>**

There are now two options:

- 1) You may read the pumpkin colored ratio reference disk to establish a new reference score for use with normal calibration (recommended if the product is being used to establish a new analytical ratio).
- 2) You may proceed to measure product scores if the product calibration is temporary.

The E30FP is now ready to read Product Scores.

Contact Agtron for additional assistance with optional calibration methods.

CALIBRATION STEP II / OPTION II

CALIBRATION PROCEDURE USING A SYNTHETIC REFERENCE

The E30FP may be calibrated using a synthetic product sample. (Contact Agtron for assistance in acquiring synthetic product samples.)

Complete Step I of the standard calibration procedure using the two-sided Scale Disk.

When the display shows: **OPEN SAMPLE DRAWER**
 <<<<----->>>>

Fully open the sample drawer.

The display will show: **POTATO REFERENCE**
 -->>CLOSE DRAWER<<--

Place the synthetic sample into the sample tray and fully close the drawer.

The display will show: **PRODUCT CALIBRATION**
 ENTER SCORE: XX.0

Key-in the synthetic product score using the numeric keypad.

Depress the **E** key on the bottom right corner of the numeric keypad to enter the displayed value.

The display will show: **MEASURING GREEN**

Followed by: **MEASURING NIR**

Followed by: ***CALCULATING SCALE***

Followed by: **<<<AGTRON MODE>>>**

There are now two options:

- 1) You may read the pumpkin colored ratio reference disk to establish a new reference score for use during normal calibration (recommended if the product is being used to establish a new analytical ratio).
- 2) You may proceed to measure actual product scores if the product calibration is temporary.

The E30FP is now ready to read Product Scores.

V. QUICK CALIBRATION FEATURE

The Quick Calibration Feature provides a rapid reset of the ratio to allow the operator to move from one product classification to another. It can also used more frequently than a Full Calibration to maintain better analytical accuracy. While a Full Calibration is recommended every 24 hours, or at the beginning of each shift, the Quick Calibration procedure should be performed every 100 readings or every four hours, whichever occurs first.

Quick CALIBRATION deletes STEP I and only requires STEP II of the Full Calibration Procedure detailed in Section IV.

REQUIRES THE PUMPKIN RATIO REFERENCE DISK

Depress the **QUICK CAL** key. Fully open the sample drawer and follow the screen-prompted ratio calibration procedure as detailed in Section IV STEP II.

VI. SAMPLE PREPARATION

As with any piece of analytical equipment, good sample preparation is important if meaningful and repeatable results are to be achieved.

Sample Temperature: Samples should always be analyzed at room temperature. Evaluating a hot or cold product will affect the score.

Sample Preparation: The surface geometry of the sample will somewhat affect results. It is important that the height of the product be fairly level with the top edge of the sample

dish. It will improve repeatability if the product is arranged in a random manner and that the total amount of product area at the surface is consistent.

VII. NORMAL OPERATION

In the normal operating mode, the display shows the last product score read or the statement: <<< **AGTRON MODE** >>>

Prepare the sample following recommended procedures.

Fully open the sample drawer.

The display will show: **CALIBRATING ANALYZER**
 <- KEEP DRAWER OPEN ->

Followed by: **READY FOR SAMPLE**

NOTE: *The drawer must be closed to read the sample within 30 seconds or the calibration will time-out and the analyzer will not take a reading.*

When a time-out occurs, the display will show:

<<< **AGTRON MODE** >>>

To read the sample following a time-out, you must fully close and then fully open the sample drawer to recalibrate.

Fully close the sample drawer.

The display will show: *** ANALYZING SAMPLE ***
 >KEEP DRAWER CLOSED<

Followed by: **AGTRON SCORE : XX.X**

VIII. USING THE SCALE MULTIPLIER FEATURE

There are three programmable scale multipliers that can be accessed for special product categories. The F1 / F2 / F3 keys access the multiplier functions.

Example

To activate the **F1** multiplier to multiply the root Agtron product score displayed in the Agtron Mode by 1.128:

Depress the **F1** key.

Enter the desired multiplier of 1.128. (Any value from 0.005 to 9.876)

Depress the **E** key.

The display will show: **PRODUCT MULTIPLIER 1
 ACTIVATED**

Followed by: **<<<AGTRON MODE>>>**
(shows only once after multiplier activation)

For all product measurements, the root Agtron Score will be multiplied by the entered factor (1.128) and the results will be displayed as:

CATEGORY 1 SCORE: XX.X

Separate multipliers can be programmed for each of the F1 / F2 / F3 keys and activated by depressing the associated key. All factors will be stored until edited.

To return to the normal root Agtron Score (no product score multipliers, depress the Agtron key.

IX. PERIODIC MAINTENANCE

CLEANING THE FAN FILTER MEDIA

The fan filter media should be cleaned with a mild soap and warm water solution or replaced periodically. If the analyzer is used in a clean laboratory environment, it may require attention every six months. If the analyzer is used in the production environment, it may require cleaning as frequently as once a week.

CAUTION: DO NOT REMOVE THE FOUR SCREWS HOLDING THE FAN IN PLACE. The screws hold the entire fan assembly in place and do not need to be removed to remove the filter media.

There is a snap-in frame that holds the media in place. Use a small screwdriver or knife to snap-out the inner frame holding the media. Remove the media and clean thoroughly with a warm water/soap solution. Dry the filter, align it in the fan frame, and snap the retaining frame back in place. Replace with new media if there are tears or holes.

CLEANING THE DISKS

Agtron calibration disk surfaces should be kept clean and free of contaminants. Clean disk surfaces periodically using a soft, lint-free cloth and denatured alcohol or a 20% solution of Windex and distilled water. Be careful not to scratch the disk surfaces. Don't forget to clean the Life Disk located under the sample drawer.

STORING THE TWO-SIDED CALIBRATION DISK

Keep the two-sided calibration disk in its box and away from direct sunlight whenever the disk-set is not in use. Never leave the disk-set in the analyzer.

CLEANING THE ANALYZER INTERIOR

Unplug the analyzer. Remove the LIFE DISK from under the sample drawer. Remove the rectangular sample tray. Use compressed air to blow out any product that may have

accumulated on the inside of the unit. Wipe drawer top surface with a soft cloth and denatured alcohol or Windex at full strength.

CLEANING THE LCD DISPLAY/ANALYZER EXTERIOR SURFACE/KEYPAD

Use a soft cloth moistened with a 20% solution of water and Windex to clean the LCD display window.

CAUTION: *Apply very light pressure to the LCD or you might crack the window glass or damage the LCD.*

Use denatured alcohol or Windex at full strength to clean the analyzer exterior surfaces. Use a soft dry cloth to clean the Analyzer keypads.

X. IMPORTANT ANALYZER OPERATION NOTES

- ✦ Avoid exposing the analyzer to direct sunlight.
- ✦ More frequent **Full Calibration** will be required if the environment temperature changes significantly.
- ✦ Do not connect the analyzer to a computer UPS, only connect directly to an AC line using the supplied surge suppressor.
- ✦ Keep the fan media clean.
- ✦ Keep the interior of the analyzer clean and free of stray product or frying oil.