

AGTRON, INC
S-SERIES III ANALYZER
OWNERS MANUAL
Revision F
Version 2.0 III-F
01/15/2020

General Application
Abridged Spectrophotometer
Made in the USA

AGTRON INCORPORATED
9395 Double 'R' Boulevard
Reno, Nevada 89521 USA
PHONE: (775)-850-4600
FAX: (775)-850-4611

AGTRON S-SERIES III OPERATION MANUAL

Analyzer Version 2.0 III-F 02/15/2020

INTRODUCTION

The new S-SERIES III is the result of Agtron's 50-years of experience supplying analytical equipment to the food industry. It is an all solid-state replacement for the previous Agtron M-45 general applications analyzer. Agtron analyzers have become the quality control standard for a variety of products worldwide. These products include, but are not limited to, coffee, cereal, whole grain, flour, nuts, tomatoes, potatoes, produce, fruit, baked goods, chips, and snack foods.

The AGTRON S-SERIES III is a reflectance abridged spectrophotometer with a large viewing area of approximately 3.5 in², it designed to deal with the challenge of measuring color and process related changes associated with food.

More importantly, for most applications, the S-SERIES III views the product in the same manner as the consumer.

S-SERIES FEATURES

- Continuous Sample Reading (Updates Reading every two seconds)
- Self Contained Micro-Processor Control
- Excellent Linearity & Resolution
- Ultimate Stability
- Long Life Solid-State Illumination
- Fully Automated Calibration
- Easily adaptable to analyze many product types
- Durable Synthetic Calibration Standards
- Only One Two-Sided Calibration Disk Required for All Analytical Scales
- Calibration Flexibility
- High Contrast Backlit LCD Display
- Hermetically Sealed Keypad
- Super-Regulated & Isolated Power Supply
- Production Environment Construction
- Access to Agtron's 50-years of food analysis application experience

USER SELECTABLE MODES OF OPERATION

The S-SERIES III has eight selectable analytical modes:

1) ALL COLOR MODE

Displays reflectance score of all four color-bands simultaneously

2) RYGB COLOR-SPACE MODE

Displays color-space using three numbers derived from four color bands:

L = Grey scale where 0.0 is full VIS absorption (absolute black) and 100.0 is full VIS reflection (pure white)

± a = Red / Green chromatic value (+a) represents red shift and (-a) represents green shift

± b = Yellow / Blue chromatic value where (+b) represents yellow shift and (-b) represents blue shift

3) APPEARANCE MODE

Displays a numeric score related to the difference perceived in the appearance of like-products. This mode mimics the way human vision senses the relative change of chromaticity and saturation in the visible spectrum. In this mode, it is the difference in score from one like-product to another that is significant.

4) BRIGHTNESS MODE

Displays a numeric score based on all-four color bands, where each band has equal significance. It is similar to lightness/darkness or gray scale analysis. A lighter product will have a higher score.

5) RED MODE

Displays reflectance score of the red color-band

6) YELLOW MODE

Displays reflectance score of the yellow color-band

7) GREEN MODE

Displays reflectance score of the green color-band

8) BLUE MODE

Displays reflectance score of the blue color-band

For a further description of the analyzer modes, refer to section VII: ANALYSIS MODE OPTIONS

INTRODUCTION SUMMARY

Simple calibration, non-critical sample preparation, easy to understand single number scores, and robust construction make the S-SERIES the ideal choice for both product development and production quality control.

**PLEASE TAKE THE TIME TO READ THIS OPERATOR MANUAL BEFORE
ATTEMPTING TO USE YOUR AGTRON S-SERIES III ANALYZER**

CONTACT AGTRON

To discuss your specific application, or if you are having problems operating or calibrating the S-SERIES III analyzer, please contact us directly:

Agtron Incorporated
9395 Double 'R' Boulevard
Reno, Nevada 89521 USA

Phone: (775)-850-4600

Fax: (775)-850-4611

E-mail: Agtron@aol.com

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I. INITIAL ANALYZER SETUP

Remove the analyzer from the shipping box and carefully inspect for any sign of shipping damage.

Contact Agtron immediately if any sign of damage is apparent. A claim for shipping damage needs to be filed immediately with the carrier.

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 delivery.

The Carton Contains:

- S-SERIES III Analyzer
- Power Cord
- Two Glass Bottomed Sample Cups
- This Operation Manual

- Place the Agtron on a clean and level surface
- Keep the cooling fan vent on the back of the unit free of obstruction
- Avoid placing the analyzer where it will be directly under overhead light or in direct sunlight

WARNING: 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.

NOTE: The power switch for the S-SERIES III is on the back panel directly next to the power-cord connector. Always leave the unit on for best accuracy and stability; it uses very little power, about as much power as a 20-watt light bulb.

- Turn the power switch to the -ON- position
- The display will activate and begin timing a 45-minute warm-up period

The model type, serial number and other information will appear on the display. The startup display information will repeat until the 45-minute warm-up period is over. At the end of the warm-up period, the display will first show:

**<< ALL COLOR MODE >>
** PLEASE CALIBRATE ****

Followed by:

**RED= XXX.X YEL= XXX.X
GRN= XXX.X BLU= XXX.X**

Alternately showing:

**RED= XXX.X YEL= XXX.X
** PLEASE CALIBRATE ****

II. KEYPAD FUNCTIONS

1	2	3	CAL	FCAL
4	5	6	FNC	SEND DATA
7	8	9	SCALE	DATE TIME
EXIT	0	ENTER	+/-	SKIP

[CAL] : Invokes calibration function and allows calibration value editing

[F-CAL] : Activates fast calibration using calibration values entered during [CAL] function

[ENTER] : Used to accept a function selection or edited value

[EXIT] / Alternately [•] : Leaves a sub-menu and usually resumes previous function without change

[DATE-TIME] : Edit date and time

[FNC] : Select various analysis modes

[SCALE] : Access/ Activate scale multiplier

[1] + [CAL] : Resets system gain (Consult Factory)

[2] + [F-CAL] : Calibrates to factory preset reference values (Analyzer and Cal Disk Specific)

III. SETTING THE DATE & TIME

- 1) Momentarily depress the [DATE/TIME] key on the function keypad

Current date and time settings will be displayed as follows:

MM:DD:YY= (Month:Day:Year) / HH:mm:ss = (Hours:minutes:seconds)

The bottom of the display will alternate between the following two statements:

[SKIP] QUILTS ANY TIME
- and -
PRESS [F-CAL] TO EDIT

If the date and time displayed are correct:

- 2) 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:

- a) Depress the [F-CAL] key

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

- b) Using the numeric keypad, enter the last two digits of the year (i.e. 2016 would be 16)

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

- c) Enter the month in two-digit format (01 = January to 12 = December)

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

- d) Enter the day of the month in two-digit format (01 to 31)

The time is displayed in the 24:00:00 hour format

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

- e) Enter the current hour in 24hour format (i.e. 7 am would be 07, 10 am = 10, 12am / Noon = 12, 6 pm = 18, 12 pm / midnight = 24)

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

- f) Enter the current time minutes in two-digit format (00 to 59)

Note: Seconds are not editable

The display will now show the new Date & Time settings

- g) Depress the [SKIP] key to accept the displayed Date & Time and exit the edit function

IV. ASSIGNING AN AGTRON UNIT IDENTIFICATION NUMBER

This function is useful when data is being transmitted from multiple Agtron analyzers. If programmed, a Unit Number will accompany the data transfer and allow data to be easily tracked to the machine of origin.

- Depress the [DATE/TIME] key followed by the [SCALE] key
- Use the numeric keypad to enter the two digit number assigned to the unit (01 – 99)

NOTE: The unit will automatically save the number assigned to it and exit back to the Mode screen. The Unit Number may be reprogrammed at any time using the same method.

V. CALIBRATING THE ANALYZER

For best results, calibrate the unit every four-hours of operation

The S-SERIES III has four calibration options:

- A) Manual Calibration
- B) Fast-Calibration
- C) Factory Default Calibration
- D) Calibration to Desired Product Score

A) MANUAL CALIBRATION / [CAL] Key

This calibration procedure is used when the operator wishes to edit the high and /or low calibration references. Values entered during this procedure will be stored for use in the FAST CALIBRATE mode. A new analyzer will have initial factory settings set to **095.0** for the high reference and **+003.0** for the low reference.

NOTE: MANUAL CALIBRATION is the only mode that allows the operator to edit calibration values

NOTE: Analytical resolution can be expanded, compressed, or shifted by changing the high and low values.
(See Section IV)

- Place the two-sided calibration disk in place on the viewing window, **White-Side facing down**

NOTE: Do not move the disk during this procedure

- Depress the [CAL] key

The display will ask:

HIGH DISK ON WINDOW?

- Depress the [ENTER] key to confirm the high reference disk is in place

The display will show:

**== HIGH REFERENCE ==
RED SCORE : 095.0**

- **To keep the value displayed:** Depress the [ENTER] key
- **To change the value displayed:** Key-In the desired value using the numeric keypad then depress the [ENTER] key to accept the entered value

The display will first show:

**== HIGH REFERENCE ==
ACCEPTED : 095.0**

Followed by:

**== HIGH REFERENCE ==
YELLOW SCORE : 095.0**

- **To keep the value displayed:** Depress the [ENTER] key
- **To change the value displayed:** Key-In the desired value using the numeric keypad then depress the [ENTER] key to accept the entered value

B) FAST CALIBRATION / [F-CAL] Key

The values entered during MANUAL CALIBRATION are stored in memory and are automatically entered in rapid sequence during FAST CALIBRATION. Initial factory settings are 095.0 for the high reference and +003.0 for the low reference.

- Place the two-sided calibration disk in place on the viewing window, **White-Side facing down**

NOTE: Do not move the disk during this procedure

- Depress the [F-CAL] key

The display will ask: **HIGH DISK ON WINDOW?**

- Depress the [ENTER] key to confirm that the high reference is in place

The top line of the Display will show: **== HIGH REFERENCE ==**

The display will quickly show each of the four colors and the relative high scores stored during MANUAL CALIBRATION followed by confirmation that they have been accepted

When all of the high references have been accepted, the display will first show:

**== HIGH REFERENCE ==
=== COMPLETE ===**

Followed by: **== LOW REFERENCE ==**

The display will ask: **LOW DISK ON WINDOW?**

- Turn the two-sided calibration disk over on the viewing window, **Black-Side facing down**

NOTE: Do not move the disk during this procedure

- Depress the [ENTER] key to confirm that the low reference is in place

The top line of the Display will show: **== LOW REFERENCE ==**

The bottom line of the display will quickly display each of the four colors and the relative low scores in sequence stored during MANUAL CALIBRATION followed by confirmation that they have been accepted.

When the FAST CALIBRATION procedure is completed, the display will first show:

**<< ALL COLOR MODE >>
GRN= XXX.X BLU= XXX.X**

Followed by: **RED= XXX.X YEL= XXX.X
GRN= XXX.X BLU= XXX.X**

This completes the FAST CALIBRATION procedure

C) FACTORY DEFAULT CALIBRATION

The Factory Default calibration values are reference values specific to each S-SERIES II and calibration disk originally supplied with that analyzer. The Factory Default values for the supplied two-sided calibration disk are stored in the analyzer memory and cannot be edited by the operator. These calibration values are the “Reference Values” specific to each S-SERIES III and calibration disk supplied with that S-SERIES III.

There are two instances when FACTORY DEFAULT CALIBRATION should be used:

- 1) When using the APPEARANCE MODE
- 2) When using the BRIGHTNESS MODE
- 3) When using the RYGB COLOR SPACE MODE

NOTE: The default values are only relative to the two-sided calibration disk supplied with the analyzer. If it becomes necessary to replace the calibration disk, please consult Agron for assistance.

Place the two-sided calibration disk in place on the viewing window, **White-Side facing down**

NOTE: Do not move the disk during this procedure

- Depress the [2] + [F-CAL] keys simultaneously

The display will ask if the high reference disk is on the viewing window

- Depress the [ENTER] key to confirm

The top line will show: == **HIGH REFERENCE** ==

The bottom line of the display will display each of the four color bands and the factory default high reference scores in the sequence Red / Yellow / Green / Blue, followed by a confirmation that they have been accepted.

When the High Reference default calibration is finished, the display will show:

== **HIGH REFERENCE** ==
=== **COMPLETE** ===

Followed by: == **LOW REFERENCE** ==

The display will also provide additional information and ask if the low disk is on the sample window

- Turn the two-sided calibration disk over on the viewing window, **Black-Side is facing down**

NOTE: Do not move the disk during this procedure

- Depress the [ENTER] key to confirm that the low reference disk is in place

The top line of the Display will show: == **LOW REFERENCE** ==

The bottom line of the display will quickly display each of the four colors and the relative factory default low scores stored in the default memory, followed by a confirmation that they have been accepted.

When the FACTORY DEFAULT CALIBRATE procedure is completed, the display will first show:

<< ALL COLOR MODE >> or (Whichever mode is presently active)
GRN= XXX.X BLU= XXX.X

Followed by:

RED= XXX.X YEL= XXX.X
GRN= XXX.X BLU= XXX.X

Or (Displays whichever mode is presently active)

NOTE: In FACTORY DEFAULT CALIBRATION, the values “XXX.X” will be different for each color of the disk high and low readings, and may also be different from analyzer to analyzer, this is normal. In example, following FACTORY DEFAULT CALIBRATION, the values for the White-Side of the calibration disk might be as follows:

RED = 097.8 YEL = 098.3
GRN = 095.0 BLU = 96.1

This completes the FACTORY DEFAULT CALIBRATE procedure

D) CALIBRATING WITH A PRODUCT TO A DESIRED SCORE

This mode is used to achieve customer-desired product scores. A sample of the product to be referenced is required.

If the desired product score is above 45.0:

- a) Place the product sample onto the viewing window
- b) Depress the [CAL] key
- c) When the display asks if the high reference is on the window, depress the [ENTER] key
- d) Enter the desired product score using the numeric keypad and depress the [ENTER] key
- e) When the display requests the low calibration reference, remove the product and sample cup from the viewing window and place the calibration disk on the viewing window, **black-side facing down**.
- f) When the display prompts the low score, enter +003.0 and depress the [ENTER] key
- g) Turn the two-sided calibration disk over so that the white-side is facing down on the viewing window:

Record the score and use it for the white-side of the calibration disk for future High Calibration Reference for this product category

Use the two-sided Calibration Disk with the white-disk high reference set to the value recorded above and the black-disk low reference set to +003.0 when calibrating for this product category

If the desired product score is below 45.0:

- a) Place the calibration disk on the viewing window, **white-side facing down**
- b) Depress the [CAL] key
- c) When the display asks if the high reference is on the viewing window, depress the [ENTER] key
- d) Enter 095.0 using the numeric keypad and depress the [ENTER] key
- e) When the display asks if the low reference is on the viewing window, remove the calibration disk from the viewing window and place the sample on the viewing window and depress the [ENTER] key
- f) Enter the desired product score using the numeric keypad and depress the [ENTER] key
- g) Remove the product sample from the viewing window and place the calibration disk, black-side facing down on the sample window:

Record the score and use it for the black-side of the calibration disk for future Low Calibration Reference for this product category

Use the two-sided Calibration Disk with the white-disk high reference set to 095.0 and the black-disk low reference set to the value recorded above when calibrating for this product category

VI) SCALE EXPANSION

Higher analytical resolution, (increasing the difference the analyzer sees between two samples), can be achieved by using calibration values for the supplied two-sided calibration disk that will expand the calibration scale. There are two calibration methods to increase the analytical resolution using the supplied calibration disk-set

METHOD 1

The following example illustrates the basic method for increasing analytical resolution.

In this example, the calculations will determine the value needed during calibration for the white-side of the calibration disk (high-reference) to increase resolution by 1.50

Note: Referencing a scale of Black Disk = 003.0 & White Disk = 100.0 (scale span of 100.0), the analyzer resolution can be increased up to 4.50 times with the following input limits:

The **maximum** number the analyzer will accept for a high-reference during calibration is **300.0**

The **minimum** number the analyzer will accept for a low-reference during calibration is **-150.0**

To calculate new calibration values for a scale expansion of 1.50:

a) Calculate the span of the 'scale-in-use' with the calibration values in-use by subtracting the low reference value from the high reference value

In this example we will use the standard calibration values of 095.0 for the white-side of the calibration disk, and +002.0 for the black-side of the calibration disk:

$$\Rightarrow (095.0 - 003.0) = 092.0 \Rightarrow \text{The span of the scale in-use is } \underline{92.0}$$

b) Next, multiple the span by the desired increase in resolution

In this example, we want to increase the resolution by 1.50 so the span multiplier becomes 1.50:

$$\Rightarrow (92.0 \times 1.50) = 138.0$$

c) The new span for a scale expansion of 1.50 is 138.0. If we keep the Black Disk value at 003.0, to calculate the new value required for the white-side of the calibration disk add the new calculated span to the standard calibration value for the black-side of the calibration disk:

$$\Rightarrow (138.0 + 003.0) = 141.0 \Rightarrow \text{The new calibration value for the white-side of the calibration disk is: } \underline{141.0}$$

To Calibrate the Analyzer to the New Expanded Scale:

- Select the desired color mode then momentarily depress the [CAL] key to activate Manual Calibration
- Place the calibration cup on the sample window with the calibration disk in the cup, white-side facing down
- Enter the new high-reference value for the white-side to the new calculated value of 141.0 as opposed to the standard 095.0

NOTE: Unless you want to expand the scale of all four color-modes, only enter the new value for the color mode you selected above)

- Turn the calibration disk over so that the black-side is facing down and set the low-reference value for the black-side to +003.0

METHOD 2

This example offers an alternate method to increase resolution while maintaining a product score similar to the nominal product score prior to expansion.

Result: With this strategy, the nominal product score noted prior to expansion will be similar, product scores above and below the nominal will show a greater difference relative to that nominal.

Note: Higher calibration values can be used for the white-side of the calibration disk, and lower values can be used for the black-side if more expansion is desired however the maximum number the analyzer will accept for a high reference during calibration is 300.0, for the low reference -150.0

To calculate new calibration values for a scale expansion of 1.50 with the intention of keeping the nominal product score similar to the value obtained using standard calibration values:

a) Calculate the span of the 'scale-in-use' for the calibration values in-use by subtracting the low reference value in-use from the high reference value in-use. In this case we will use the same calibration values of 095.0 for the white-side of the calibration disk, and +003.0 for the black-side of the calibration disk as in the example above:

$$\Rightarrow (095.0 - 003.0) = 92.0 \Rightarrow \text{The span of the scale in-use is } \underline{92.0}$$

b) Determine the expanded span by multiplying the span in-use by 1.50:

$$\Rightarrow (92.0 \times 1.50) = 138.0$$

c) Subtract 95.0 from 138 and multiply by 0.5:

$$\Rightarrow (138.0 - 95.0) = 43.0 \Rightarrow (43.0 \times 0.5) = \underline{21.5} \text{ (If necessary round up to the nearest tenth)}$$

d) To get the value for the white-side of the calibration disk, add the value calculated in (Step 3) above to 095.0:

$$\Rightarrow (095.0 + 21.5) = \underline{116.5}$$

e) To get the new value for the black-side of the calibration disk subtract the value calculated in (Step 3) above from 003.0:

$$\Rightarrow (003.0 - 21.5) = \underline{-018.5}$$

To Calibrate the Analyzer to the New Expanded Scale:

- Select the desired color mode then momentarily depress the [CAL] key to activate Manual Calibration
- Place the calibration cup on the sample window with the calibration disk in the cup, white-side facing down
- Enter the new high-reference value for the white-side to the new calculated value of 116.5 as opposed to the standard value of 095.0

NOTE: Only enter the new values for the color mode you selected above

- Turn the calibration disk over so that the black-side is facing down and set the low-reference value for the black-side to -018.5 as opposed to +003.0.

NOTE: Don't forget the depress the [+/-] key to change the sign of the black disk calibration reference to a negative number

VIII. ANALYSIS MODE OPTIONS

The S-SERIES III has eight user-selectable Analytical Modes:

ALL COLOR MODE: Displays the analysis result as a numeric score for each of the (four) color-bands of the visible spectrum simultaneously (640nm Red & 580nm Yellow & 520nm Green & 460nm Blue). The higher the score, the less saturated the color.

RYGB COLOR-SPACE MODE: RYGB color space is a set of three coordinates derived from the four color-bands of the visible spectrum (red, yellow, green, blue). The coordinates signify a product's chromaticity and saturation location in a spherical space.

NOTE: Factory Default calibration should always be used for color space measurements to be relevant

Results are displayed as $S = (0.00 \text{ to } + 100.0)$, $\pm a = (0.00 \text{ to } \pm 100.0)$, and $\pm b = (0.00 \text{ to } \pm 100.0)$

Where;

- S represents black to white saturation, 0.00 being pure black and +100.0 being pure white
- + a (Positive a) represents red chromaticity
- - a (Negative a) represents green chromaticity
- + b (Positive b) represents yellow chromaticity
- - b (Negative b) represents blue chromaticity

RED MODE: Displays the reflectance for CWL 640nm / FWHM 30nm

This is the mode most suited for evaluating Maillard reaction (food browning) progressions such as degree of bake, fry, roast, or toast. Many thermally processed products are suited for this mode. Fried or par-fried potato products, toasted or baked cereals, fried breaded products, and roasted nuts are a few. Accurate control of Maillard development is essential to both appearance and flavor; the lower the score the more processed.

Maillard Reaction: An endothermic reaction in which the amino group in an amino acid forms condensation products with aldehydes; believed to cause the browning reaction when an amino acid and a sugar co-exist producing a favorable appearance and flavor.

YELLOW MODE: Displays the reflectance for CWL 580nm / FWHM 30nm

GREEN MODE: Displays the reflectance for CWL 520nm / FWHM 30nm

BLUE MODE: Displays the reflectance for CWL 460nm / FWHM 30nm

APPEARANCE MODE: Displays the analysis results as a numeric score calculated using all four color-band values with each color-band biased to emulate the human eye's sensitivity to that color band. This score relates to how differences in the complex color of like-products will appear to the consumer. It is the difference in score from one like-product to another that is significant and not the actual score.

BRIGHTNESS MODE: Displays the analysis result as a numeric score calculated using all (four) color band values where each color has equal significance. It is similar to lightness/darkness or gray scale analysis. A lighter product will have a higher score.

NOTE: Each time a new mode is selected, the analyzer should be recalibrated

IX. SELECTING THE ANALYSIS MODE

The [FNC] key toggles the analysis modes as follows:

All Color Mode → RYGB Color-Space Mode → Appearance Mode → Brightness Mode

└ ← Blue Mode ← Green Mode ← Yellow Mode ← Red Mode ← ┘

- Depress [FNC] Key

Display Shows:

ALL COLOR MODE
[ENTER] TO SELECT → All Color Mode
[SKIP] Moves to Next Mode
↑
RYGB COLOR-SPACE MODE
[ENTER] TO SELECT → RYGB Color-Space Mode
[SKIP] Moves to Next Mode
↑
APPEARANCE MODE
[ENTER] TO SELECT → Appearance Mode
[SKIP] Moves to Next Mode
↑
BRIGHTNESS MODE
[ENTER] TO SELECT → Brightness Mode
[SKIP] Moves to Next Mode
↑
RED MODE
[ENTER] TO SELECT → Red Mode
[SKIP] Moves to Next Mode
↑
YELLOW MODE
[ENTER] TO SELECT → Yellow Mode
[SKIP] Moves to Next Mode
↑
GREEN MODE
[ENTER] TO SELECT → Green Mode
[SKIP] Moves to Next Mode
↑
BLUE MODE
↑ [ENTER] TO SELECT → Blue Mode
← [SKIP] Returns to Beginning

Selecting [EXIT] from Blue Mode will cause the analyzer to resume whatever previous mode it was in prior to selecting the [FNC] selection mode

NOTE: Calibration is recommended whenever the mode is changed. The operator can use any of the three calibration modes.

X. UNDERSTANDING THE APPEARANCE MODE

The APPEARANCE MODE matches the sensitivity of the analyzer's four color bands to that of the human eye. This allows the analyzer to "see" the same chromaticity and saturation differences a human does. For color homogeneous products of conformal geometry, APPEARANCE SCORE differences of ± 3.0 would be noticeable to an observer. To determine how sample color variation, particle size or non-uniform sample geometry will affect scores relative to human perception, empirical assessment is required. (See notes below)

In the appearance mode, the spectral bands for the four colors are either exaggerate or compressed and an average value is calculated.

Here is the equation for **APPEARANCE MODE SCORE**:

$$\text{AMS} = [(\text{RED} \times 0.449) + (\text{YEL} \times 1.915) + (\text{GRN} \times 1.472) + (\text{BLU} \times 0.164)] \times [0.250]$$

A) APPEARANCE MODE CALIBRATION

Only the Factory Default Calibration should be used for the APPEARANCE MODE in order to emulate human visual perception

- Depress [2] + [F-CAL] keys simultaneously to activate Factory Default Calibration

NOTE: Appearance mode is only useful when comparing products of the same type as it is a relative measure (one product sample relative to another 'like-product' sample). In example, it would be possible for a sample of blueberries to have the same score as a sample of dried apple chips while they look nothing alike to the human eye. The only relevant comparison would be blueberries to blueberries or dried apple chips to dried apple chips.

NOTE: In all cases when using the APPEARANCE MODE as an indicator of product consistency, it is advised that expert opinion determine the actual acceptable score tolerance.

XI. SAMPLE PREPARATION

Agtron has over 50-years of experience analytically assessing food products. Please feel free to contact us for S-SERIES product application assistance

There are five main geometry categories for dry product:

Powders
Small Particle
Medium Particle
Large Particle
Very Large Particle

With the exception of powders, the other four main geometry categories have two sub-categories:

Uniform Geometry- All particles are of the same shape and size
Irregular Geometry- Particles vary in shape and size

For all main and sub-categories of geometry there are two color classifications:

Homogenous: Uniform color throughout the sample
Non-homogenous: Variations in color throughout the sample

The S-SERIES Analyzer's small viewing area provides high resolution analysis of powders, slurries, small and medium particles both color homogenous and color non-homogenous.

POWDERS

Any product similar to flour in consistency can be considered a powder.
If the product to be evaluated is not color homogenous to the eye, it should be well stirred before preparing the sample for testing.

To prepare the sample for evaluation:

Pour the sample into a sample cup covering the entire bottom of the cup. Spread the sample evenly and use a product depth of about ½ inch of product. Be careful not to compress/compact the powder as this may alter results. Cover the top of the sample cup with a 3" x 3" piece of black craft paper or opaque black plastic to prevent overhead light from entering the analyzer viewing window.

SMALL PARTICLE

Granular products similar to sugar, table salt, fine milled grain, instant coffee, and fine bread-crumbs would be considered small particle products.

If the product to be evaluated is not color homogenous to the eye, it should be well stirred before preparing the sample for testing.

To prepare the sample for evaluation:

Pour the sample into a sample cup covering the entire bottom of the cup. Spread the sample evenly and use a product depth of about 1/2 inch. As with powders, be careful not to compress or compact the powder as this may alter results. Cover the top of the sample cup with a 3" x 3" piece of black craft paper or opaque black plastic to prevent overhead light from entering the analyzer viewing window.

MEDIUM PARTICLE

Products like dried seasonings, rice, capers, relish, and coarse salt are typical of medium particle products. If the product to be evaluated is not color homogenous to the eye, it should be well stirred before preparing the sample for testing. Always cover the sample cup with an opaque material to prevent overhead lighting from affecting results.

To prepare the sample for evaluation:

Pour the sample into a sample cup covering the entire bottom of the cup. Spread the sample evenly and use a product depth of about ½ inch of product. Be careful not to compress/compact the powder as this may alter results. Cover the top of the sample cup with a 3" x 3" piece of black craft paper or opaque black plastic to prevent overhead light from entering the analyzer viewing window.

IMPORTANT: Always cover the sample cup during sample testing with a dark opaque material such as black craft paper while it sits on the viewing window to prevent overhead ambient light from affecting results.

SPECIAL PRODUCT APPLICATIONS

General sample preparation techniques may not suit every product. The objective of good sample preparation is to provide accurate and repeatable data. To accomplish satisfactory results, some products may require milling, chopping, sieving, compression, or special sample cups.

For most common food products, Agtron can recommend the analytical mode and calibration method. Selecting the correct analytical mode for special products may require experimentation.

Consult Agtron for Special Application Assistance

XII. DATA-TRANSMIT / CONNECTING THE ANALYZER TO A COMPUTER

The Data-Transmit function sends sample analysis results from the serial or USB data connectors on the analyzer back panel to a PC or data acquisition system each time the [SEND DATA] key is depressed

Transmitted data is configured as followed:

XX:XX:XX (Hr:Min:Sec), **XX/XX/XXXX** (Mo/Day/Year), Analyzer Mode, Test Results

WARNING: The serial connection to an external PC or data terminal must be isolated.

1) RS232 Connection for Data Output for the S-SERIES III

Windows based PC: Open the *HYPER TERMINAL*. Select an available serial port. Set the *HYPER TERMINAL* to receive data at 9600 baud, 7 or 8 bits, 1 stop bit, No-Parity and No-Handshaking for the selected port.

a) Connecting the Analyzer to a PC or Data Terminal

WARNING: The S-SERIES III does not have serial port isolation. Connecting the analyzer to a non-isolated serial port can permanently damage the internal micro-processor.

- Connect the analyzer serial data port to the PC. The serial connector legend is as follows:

Pin 2 (transmit) / **Pin 3** (receive) / **Pin 5** (ground) / **Pin 1 & Pin 4** (no connections)

b) Sending Data / Downloading data to a Spreadsheet

- Use the *HYPER TERMINAL* capture feature to download data as a TEXT file
- Open a Windows Spread Sheet to accept a TEXT DELIMITED file
- Open SCORE DATA
- Depending on the analyzer mode selected, data will be formatted as 4 to 7 columns on the spreadsheet

2) USB Connection for S-SERIES III Data Output

IMPORTANT: Software compatible with a FT232R USB component must be downloaded **before** connecting the S-SERIES III via the USB port to avoid complications

Before connecting the analyzer to a PC/Mac:

- Open the computer's browser and navigate to www.ftdichip.com
- Download the D2XX software compatible with the computer's operating system. You can find detailed installation guides on the D2XX page which can be found under the Driver Menu listed in the side bar.
- Once the software has been downloaded and activated, connect the S-SERIES III USB to the computer.

NOTE: Data results will be automatically sent to the computer whenever the USB cable is connected and can be imported to the computer's existing data collection software program

3) Using the data Transmit Feature

Once the sample test results that appear on the analyzer display are stable (usually within 5 seconds), transmit the data at any time by depressing the [SEND DATA] key. The display will show: **SENDING >>>**.

IMPORTANT: Do not move the sample drawer until the display returns to its initial mode

XIII. RESETTING SYSTEM GAIN

System gain should be reset periodically to maintain resolution

System gain must be reset whenever the display prompts the operator to do so

System gain may be reset frequently but once every six months of use is usually sufficient

NOTE: Recalibration of the analyzer is required whenever the gain is reset

- Place the two-sided Calibration Disk on to the sample window with the **white-side facing down**
- Depress the number [1] + [CAL] keys on the keypad simultaneously

The display will ask if the high reference disk is in place

- Depress the [ENTER] key on the function keypad to confirm the disk is in place

The analyzer will automatically adjust the system gain. This may take several minutes

Do not move the disk during this procedure

When the gain adjustment is finished, the display will first show:

**<< ALL COLOR MODE >>
GRN= XXX.X BLU= XXX.X**

Followed by:

**RED= XXX.X YEL= XXX.X
GRN= XXX.X BLU= XXX.X**

Alternately showing:

**RED= XXX.X YEL= XXX.X
** PLEASE CALIBRATE ****

Calibration is now required to return to normal analyzer functions

NOTE: If the analyzer does not complete and exit the set gain mode within 4 minutes, depress and hold the [SKIP] key until the unit exits the set gain mode and contact Agtron for assistance

This completes the RESETTING SYSTEM GAIN procedure

XIII. S-SERIES III SPECIFICATIONS / VERSION 2.0 III-E4

GENERAL: Self Contained Small Viewing Area Visible-Spectrum Abridged Spectrophotometer

ACTIVE VIEWING AREA: Circular, Approximately 3.4 in²

MEASUREMENT GEOMETRY: Coincident / Collimated

ILLUMINANT: Co-axial Configuration / Diffused Broad-Spectrum LED

ILLUMINANT MTBF: 8-Years Continuous Duty

MEASUREMENT BAND SPECIFICATIONS:

Red Band – CWL 640nm (+/- 2.0nm), FWHM 30nm (+/- 1.5nm)

Yellow Band – CWL 580nm (+/- 2.0nm), FWHM 30nm (+/- 1.5nm)

Green Band – CWL 520nm (+/- 2.0nm), FWHM 30nm (+/- 1.5nm)

Blue Band – CWL 460nm (+/- 2.0nm), FWHM 30nm (+/- 1.5nm)

ANALYTICAL RESOLUTION: $\pm 0.10\%$

FULL SCALE LINEARITY: $\pm 0.50\%$

INTER-INSTRUMENT AGREEMENT: $\pm 0.50\%$

ABSOLUTE REFLECTANCE SCALE: 003.0 to 100.0%

MEASUREMENT SCALE LIMITS: -150.0 to +300.0

CONTROL & LOGIC: Dual Microprocessors

DISPLAY: Dual line 21 x 2 Character Back Illuminated Alpha/Numeric LCD

ANALYZER DUTY RATING: Continuous

MAIN DC POWER SUPPLY: Universal Input Voltage, HF Switching, RFI/EMI filtered, 86db Line Isolation

SECONDARY POWER REGULATION: On PCBs, linear, 65db Isolation, 0.25% Line-Load Regulation

POWER REQUIREMENT: Universal AC mains connection: 100-240volt, 50/60 Hz, Approximately 20-Watts

XIV. CE CERTIFICATION



CERTIFICATE & DECLARATION OF CONFORMITY FOR CE MARKING

Company contact details:

AGTRON INCORPORATED
9395 Double R Boulevard, Reno, Nevada, 89521, USA
Tel: (775)-850-4600 Fax: (775)-850-4611 Email: Agtron@aol.com

AGTRON INCORPORATED declares that their:

Tabletop Abridged Spectrophotometers
listed as the following models
E20CP-II, E30FP-II, M-SERIES II, S-SERIES II and M-BASIC II

comply with the Essential Requirements of the following EU Directives:

Low Voltage Directive 2006/95/EC
Electromagnetic Compatibility Directive 2004/108/EC

and further conform with the following EU Harmonized Standards:

EN 61326-1:2006
EN 61010-1:2010

Dated: 27 November 2012

Position of signatory: President / CEO

Name of Signatory: Carl A. Staub

Signed below:

on behalf of AGTRON INCORPORATED