

**AGTRON**  
**COFFEE ROAST/FLAVOR ANALYZER**  
**E20-CP OWNERS MANUAL**

VERSION IR. 126 C.S. 1/05  
Special Applications  
Abridged Spectrophotometer

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Made in the USA.

# **AGTRON MODEL E20CP COFFEE ROAST ANALYZER**

## **OPERATION MANUAL**

### **INTRODUCTION**

Since the earliest days of roasting, a common practice has been to evaluate roast development by color, specifically the lightness or darkness of the whole bean and/or ground coffee. Organic chemistry is the source of all of the smell and flavor of coffee. Using color to classify roast introduces a problem in that the color of the coffee and the development of the organic soluble chemistry are only elastically related.

Coffee from various origins and / or lots also differs in mineral, organic, and physical structure making the color to classification relationship even more vague. Simply stated, it is possible to have two coffee samples roasted to the exact same color that present with quite different development in the cup.

### **E20CP ROAST ANALYZER THEORY OF OPERATION**

An analysis of the organic chemistry is the most accurate method of classifying true roast development. Roasted coffee contains over 850 constituents, making a comprehensive chemical analysis next to impossible. Selectivity is the key. An association with beverage olfactory and organoleptic character can be established by evaluating the progression of a specific compound group directly linked to the development of the organic chemistry.

The E20CP ignores color and evaluates changes to a specific group of chemical compounds using selected wavelengths of NIR (near-infrared) energy. The compounds selected are linearly related to sensory character.

Analyzer results are posted as a numbered score from 0.0 to 100.0, the lower the number the darker the roast.

The Agtron Gourmet Roast Classification Scale has two chemical anchor points of reference. A product score of zero (00.0) indicates a thermal reduction of one hundred percent (100%) of the soluble organic chemistry to carbon, a roast so dark that it would have no flavor or aromatic qualities in the cup.

A product score of one hundred and five (105.0) indicates the fracturing of three to five (3–5%) percent of the principle coffee sugar sucrose, too light a roast for consumption but one that could be identified as “coffee-like” in a double blind tasting.

Most coffee is roasted between scores of 25 and 75, with commercial scores primarily between 55 and 75, and specialty scores in the range of 25 to 55. As a reference, the character of one of the more pronounced classifications, French Roast, begins to develop at a score of about 35, while Cinnamon classification, often used when sample roasting to exaggerate cup defects, is between a score of 85 and 90.

### **CONCLUSION**

Roasters need a measurement system that can accurately determine roast development relative to cup character. The E20CP evaluates selected compounds in roasted coffee that relate linearly to beverage olfactory and organoleptic development. This method of analysis is not sensitive to color anomalies and provides an accurate classification of roast development as it relates to sensory assessment.

## E20CP VERSION IR126CS 01/25/05

### I. INITIAL SET-UP

Carefully remove the analyzer from the shipping box.

Inspect the analyzer for any sign of shipping damage.

***Contact Agtron immediately if any damage is apparent. A shipping claim for damage will need to be filed as soon as possible.***

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

The carton contains the following items:

- One E20CP analyzer
- One Power Cord with surge protector
- One Life Disk
- Two Plastic Sample Dishes
- One Two-Sided Calibration Disk Set
- One Metal Sample Dish Tray
- This Operation Manual

- **Place the Agtron analyzer on a clean level surface.**

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 is normal and 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 sample dish tray into the cutout on the sample drawer top so that it recesses into the cutout.

**NOTE:** The sample dish holder should always remain in the analyzer to protect the LIFE DISK from over-exposure by the internal light source. It should only be removed for periodic cleaning. Always keep the sample drawer in the fully closed position when not in use. Always keep the sample dish holder installed in the sample drawer.

- **Fully close the sample drawer.**

Connect the AC power cord to its mating socket on the back of the unit. The power cord is supplied with a surge protector attached. It is strongly recommended that you use this surge protector.

- **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.**

**NOTE:** *The E20CP 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 E20CP VEX III uses very little power, about as much power as a 15-watt light bulb.*

- **IMPORTANT !!! – Press the Re-Start Button on the back of the unit.  
(this sets up the computer for use)**

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

Your company name 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:

**<<< COFFEE MODE >>>**

**Contact Agtron immediately if the Display does not show <<< COFFEE 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. SETTING THE DATE & TIME

- **Momentarily 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/XXX**

The time is displayed in the 2400hour 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 (2003 would be 03).

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.

## III. STANDARD CALIBRATION PROCEDURE FOR COMMERCIAL SCALE

The E20CP VEX III automatically calibrates each time the sample drawer is opened. It reads the LIFE DISK under the drawer and adjusts to an established reference. This reference is determined and stored during the REFERENCE CALIBRATION procedure.

**NOTE:** *The CALIBRATION procedure should be performed at the beginning of each day or shift to maintain maximum instrument accuracy. REFERENCE CALIBRATION can be performed more frequently if desired. Once the TIME/DATE are set, the computer keeps track of REFERENCE CALIBRATION intervals and will prompt the user to recalibrate every 24-hour cycle at 00:00:01.*

**NOTE:** *The E20CP VEX III can be CALIBRATED to either the Commercial Coffee Scale (the standard scale for the E10CP / E20CP), or the Gourmet Coffee Scale (the standard scale for the Agron M-BASIC) using the supplied two-sided Calibration Reference Disk set. The Commercial Scale offers greater dynamic range (the capacity to measure a wider range of roast classifications and grinds) and the Gourmet Scale offers higher resolution (shows a greater difference in scores between two roast classifications).*

***The E20CP VEX III can also be calibrated with REFERENCE COFFEE SAMPLES of known or desired scores.***

NOTE: If coffee samples are to be used for calibration, contact Agron for assistance.

- **Remove the two-sided Calibration Reference Disk set and dish from its storage box**

**NOTE:** *The two-sided Calibration Reference Disk-set supplied with the analyzer is your permanent calibration reference. Disk-sets are matched by serial number to a specific E20CP and can only be used with that unit.*

**NOTE:** *There are three adhesive labels affixed to the side of the Calibration Reference Disk dish. One of the labels lists the black and gray disk scores for the Commercial Scale. One lists the black and gray disk scores for the Gourmet Scale. One lists the unit serial number and disk certification date.*

**Write down the Commercial Scale Reference Scores for both the black and gray disks located on the Commercial Scale Calibration label.**

**NOTE:** *Avoid touching the surface of the disks. Periodically clean the disk surfaces with a soft cotton cloth using very light pressure and a 20% solution of Windex and distilled water. Keep the disk set stored in the box provided and away from direct sunlight or heat.*

*Never leave the reference calibration disk set in the analyzer. Never use the dish supplied with the Calibration Reference disk set for coffee samples.*

**IMPORTANT:** *Always place the disk-set into the shallow side of the dish.*

Momentarily depress the **CAL** key on the function keypad.

The display will show:       **- OPEN SAMPLE DRAWER -**  
                                      **< SET REFERENCE MODE >**

- **Fully open the sample drawer.**

The display will show:       **-- HIGH REFERENCE --**  
                                      **HIGH DISK / SAMPLE**

- **Place the Calibration Reference Disk into the shallow side of the dish *gray side facing up*.**
- **Place the dish/disk into the sample tray in the drawer.**

Make certain that the dish sits flat and fully into the recess in the tray.

- **Fully close the sample drawer.**

The display will first show:   **-- HIGH REFERENCE --**  
                                      **ENTER SCORE : XX.X**

The unit will display the previous High Calibration Reference Score entered.

**NOTE:** *For a new unit, the initial High Calibration Reference Score displayed will match the Gray Score on the label for Commercial Scale Calibration.*

- Depress the **E** key on the bottom right corner of the numeric keypad to enter this default Commercial Scale High Calibration Reference.

The display will show:       **-OPEN SAMPLE DRAWER-**

- **Fully open the sample drawer.**

Momentarily, the display will show:

**\* SETTING REFERENCE \***  
                                      **- KEEP DRAWER OPEN -**

The analyzer will now measure the LIFE DISK under the sample drawer and record a reference value.

**NOTE:** *The LIFE DISK reference value recorded will be used every time the drawer is opened to automatically recalibrate the analyzer.*

The display will change to:    **-- LOW REFERENCE --**  
                                  **LOW DISK OR SAMPLE**

- **Turn the Calibration Reference Disk over into the shallow side of the dish so that the *black side* is facing up.**
- **Place the Calibration Reference Disk-set back into the sample tray.**
- **Fully close the sample drawer.**

The display will show:        **-- LOW REFERENCE --**  
                                  **ENTER SCORE : XX.X**

The unit will display the previous Low Calibration Reference Score entered.

**NOTE:** *For a new unit, the initial Low Calibration Reference Score displayed will match the Black Score on the label for Commercial Scale Calibration.*

- **Depress the E key on the numeric keypad to enter this default Commercial Scale Low Calibration Reference.**

The display will show:        **LOW REFERENCE**  
                                  **\*\*\* MEASURING \*\*\***

The display will quickly flash: **CALCULATING SCALE**

Followed momentarily by:    **REFERENCES SAVED**

The display finally shows:    **<<< COFFEE MODE >>>**

**Place the two-sided disk set into its storage box and close the lid.**

*The E20CP VEX III is now ready for normal Commercial Scale operation.*

#### **IV. OPTIONAL CALIBRATION PROCEDURE FOR GOURMET SCALE**

- **Locate the Gourmet Scale Calibration label on the side of the two-sided disk set dish.**



- Write down the Gourmet Scale Reference Scores for both the black and gray disks.
- **Momentarily depress the CAL key on the function keypad.**

The display will show:       **-OPEN SAMPLE DRAWER-  
<SET REFERENCE MODE>**

- **Fully open the sample drawer.**

The display will show:       **-- HIGH REFERENCE --  
HIGH DISK / SAMPLE**

- **Place the Calibration Reference disk set into the shallow side of the dish *gray side* facing up and place it in the drawer sample tray.**

**NOTE:** *Make certain the dish sits flat and fully into the recess in the sample tray.*

- **Fully close the sample drawer.**

The display will first show: **-- HIGH REFERENCE --  
ENTER SCORE :    XX.X**

The High Reference Score from the previous calibration will be displayed.

- **Type-in the Gourmet Scale (High Reference) Gray Score with the numeric keypad.**
- **Depress the E key on the numeric keypad to enter the new score.**

The display will show:       **-OPEN SAMPLE DRAWER-**

- **Fully open the sample drawer.**

The display will first show: **\* SETTING REFERENCE \*  
- KEEP DOOR OPEN -**

The display will change to:   **-- LOW REFERENCE --  
LOW DISK OR SAMPLE**

- **Turn the disk over in the dish so that the *black side* is facing up.**
- **Put the disk-set back into the sample tray in the drawer.**
- **Fully close the sample drawer.**

The display will show:        **-- LOW REFERENCE --**  
                                    **ENTER SCORE : XX.X**

The Low Reference Score from the previous calibration will be displayed.

- **Type-in the Gourmet Scale (Low Reference) Black Score with the numeric keypad.**
- **Depress the E key on the numeric keypad to enter the new score.**

The display will first show:   **-- LOW REFERENCE --**  
                                    **\*\*\* MEASURING \*\*\***

Followed momentarily by:     **CALCULATING SCALE**

Followed momentarily by:    **REFERENCES SAVED**

The display will finally show: **<<< COFFEE MODE >>>**

**Place the two-sided calibration disk set into its storage box and close the lid.**

*The E20CP VEX III is now ready for optional Gourmet Scale operation.*

## **V. USING THE E20CP TO MEASURE COFFEE ROAST CLASSIFICATION COMMERCIAL OR GOURMET SCALE**

*After the scale has been selected, and the references set, the E20CP is ready to evaluate coffee.*

## **How Does the AGTRON E20CP Evaluate Roast Development?**

The E20CP does not look at the color of the coffee or the lightness or darkness of a sample. Instead, it measures the amount of near-infrared energy at specific wavelengths reflected from the surface of a sample. The wavelengths selected relate to compounds that directly correlate to the development of the organic chemistry. The entire flavor of coffee is related to soluble organics. By ignoring color and concentrating on the development of organic compounds, the E20CP is capable of identifying subtle changes introduced by various roasting strategies. It also provides a much more accurate and repeatable method for controlling roast consistency relative to sensory assessment.

## **Sample Preparation Follows:**

### **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. Never evaluate a hot or warm product, as this will affect the score.

Grind Specification: The grind coarseness / fineness affects the amount of surface that the analyzer sees. It is important to have a grind similar to the CBC standard for auto-drip. A screen specification is included for reference. (See attachment). If you do not have access to screens, you can adjust the grind by observing the surface of the coffee during sample preparation. When the particles plow (form waves) during a second pass of trowling, the grind is too coarse. If the surface compacts, compresses and cakes, the grind is too fine. Remember, what may look like an identical surface to the eye can appear quite different to the analyzer.

Time from Roasting / Cooling / Grinding, to Analysis: Once coffee is roasted, it acts like organic compost and begins to decompose. Since the E20CP is a system based on chemistry, it will see the change of decomposition much in the same way you taste it in the cup. A sample's score can change (lower) as much as 4 points in 24 hours. To eliminate this variable, it is important to analyze samples as soon as possible after roasting /cooling. Within 15 minutes is preferable.

Roast Classification, Whole Bean and Ground: The E20CP is designed to evaluate both whole bean and ground samples. A sample is first analyzed as whole bean and then as ground. The difference between the two scores approximates how uniformly or non-uniformly the sample is roasted. The character of the cup varies with different uniformities. While both measurements should be included in the QC program, it is the ground score that determines cup development (roast classification). For any given product, it is ultimately the ground roast score that should be the focus of controlling product consistency.

Whole Bean Sample Preparation: Pour the whole bean sample into the deep side of the sample dish. Put enough coffee into the dish to form a flat surface that is level with the edge of the dish. Use your hand or a straight edge to pat the surface until it is flat.

Ground Coffee Sample Preparation: Once you obtain the whole bean score, grind the same sample into the shallow side of the sample dish. Overfill the dish. Use a straightedge (a wood ruler with a metal edge insert works very well) to level the surface. Hold the straight edge perpendicular to the top surface. Rest the straightedge the rim of the dish and make a sweeping motion to the opposite side. Repeat this motion starting at the opposite side. Avoid compressing or overworking the sample. The surface of the coffee should be flat and uniform with no voids or irregularities. Make certain that the sample covers the entire area of the dish, including the edges.

## **VI. NORMAL OPERATION / COMMERCIAL OR GOURMET SCALE**

**NOTE:** *The calibration procedure determines which scale the analyzer uses during normal operation. Recalibration is required to switch scales.*

In the normal operating mode, the display shows the last product score read.

- **Prepare the coffee sample following the recommended procedures.**
- **Fully open the sample drawer.**
- **Place the coffee sample into the sample location.**

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: <<< COFFEE MODE >>> To read the sample, you must fully close and then fully open the sample drawer to recalibrate.*

- ***Fully close the sample drawer.***

The display will show:       **- KEEP DRAWER CLOSED -**  
   **READING ROAST SCORE**

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

## **VII. DATA STORAGE / TRANSMIT OPTION (Option II)**

On units supplied with Data Option II, the E20CP will store a log of 320 samples. Product scores, along with the dates and times, are stored in numeric sequence in non-volatile internal memory. Once the memory is full, the analyzer will inform the operator that the memory is full. At this time, the data should be downloaded to a printer or to a Windows based computer spreadsheet. If the data is not downloaded, the analyzer will continue to operate normally, but the Data Storage program will halt.

### **ACCESSING THE DATA STORAGE MODE**

- **Momentarily depressing the S2 key on the function keypad to access the data storage menu options. Use the numeric keypad to select one of the following options:**
- **Depress the number 1 key to activate data storage.**

**CAUTION:** *Depressing the number 1 key will delete all data stored in the log.*

- **Depress the number 0 key to terminate the data storage function. There is no resume function. The stored data will remain available for download at anytime until the number 1 key is depressed.**

**NOTE:** *It is necessary to download stored data before reactivating the record mode. Reactivating the record mode will delete all previously recorded data in the log.*

- **Depress the number 9 key to download / print all data stored in the log.**  
- or -
- **Depress the PRINT key while in the COFFEE mode to download / print all data.**
- **Depress the SKIP key to leave the Data Storage mode without action or change.**

### **DOWNLOADING STORED DATA TO A SPREADSHEET**

On a 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 on the selected port.

**WARNING:** *The E20CP does not have serial port isolation. In the event that the connection might cross a power phase, the user is responsible for providing the proper cables and isolation.*

Serial connector legend (located on E20CP rear panel):

Pin 1 (nc) / Pin 2 (transmit) / Pin 3 (receive) / Pin 4 (nc) / Pin 5 (ground)

Download data from the E20CP.

Verify valid data transfer.

Use the HYPER TERMINAL capture feature to acquire downloaded data as a TEXT file.

Open a Windows Spread Sheet to accept a TEXT Delimited file.

Open the SCORE DATA.

Data will be formatted as five columns on the spreadsheet.

## **VIII. 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 the 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 20% solution of Windex and distilled water. Be careful not to scratch the disk surface. 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.

#### 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: Use very light pressure on the LCD or you might crack the window glass or damage the LCD.***

Use denatured alcohol or Windex at full strength to clean all other 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, connect only 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 coffee.

**AGTRON, INC.** \_\_\_\_\_  
*Reno, Nevada USA*

August 1, 1997

**CE MARKING  
DECLARATION OF COMPLIANCE**

This declaration certifies that this product is in total compliance with CE - Marking and CE Legislation.

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Certified  
Agtron, Incorporated