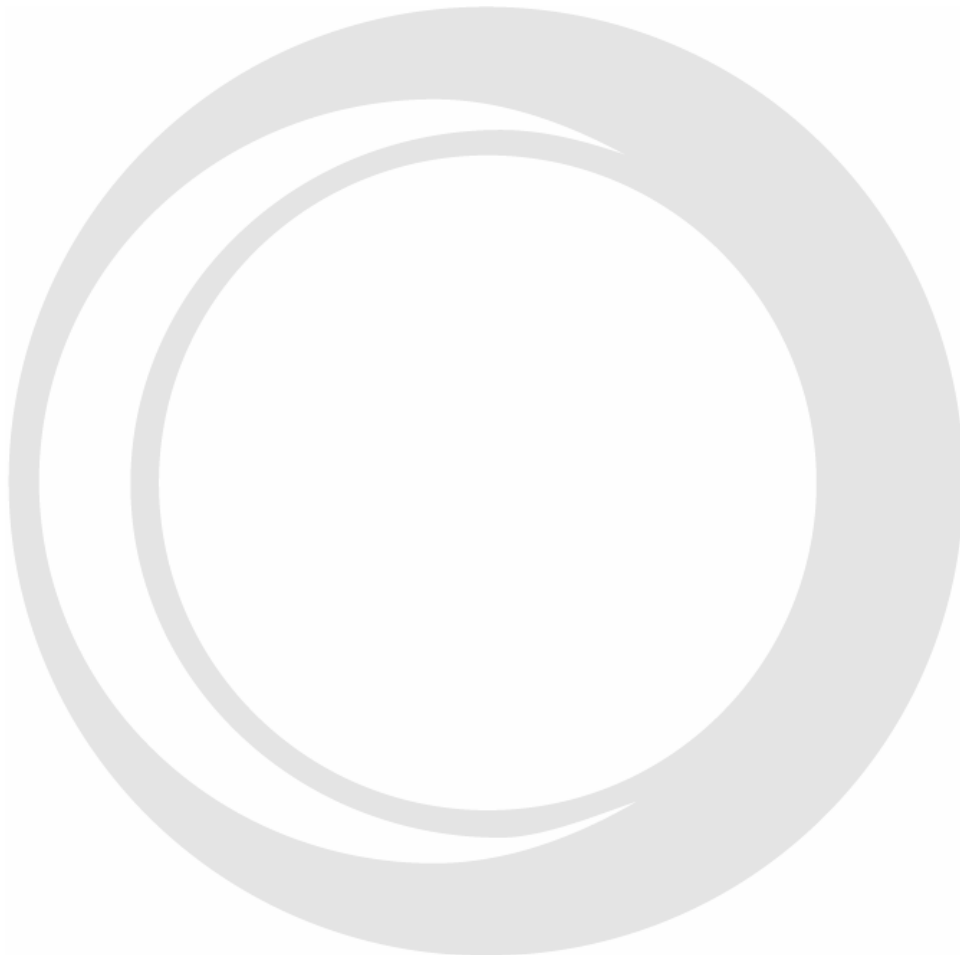


243

User Manual



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Measurement Systems



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INTRODUCTION

PURPOSE OF EQUIPMENT

The 243 is a dedicated non-destructive plating thickness tester. It is designed to precisely measure the following plating over steel with an Eddy current probe: Zinc (Zn), Nickel (Ni), Copper (Cu), Chrome (Cr), or Cadmium (Cd). Using a Magnetic probe it is designed to measure non-magnetic coatings over steel.

LOCATION OF INSTRUMENT

The 243 is a hand-held plating thickness gage designed to be used in a shop environment. All cable connections are covered to prohibit foreign matter from getting into the unit. The carrying case provides additional coverage of any openings on the unit.

ELECTRICAL CONNECTIONS

Each 243 operates from a 9-volt battery or a low voltage power supply connected to a 115-volt, 50/60 Hertz, single-phase alternating current power source. If a battery is the source of power to the gage, when the battery voltage drops below the level required for operation a low battery condition will occur. The unit will show "BAT" in the lower right of the display. The battery should be replaced with an alkaline type before the unit will function properly.

SETUP

UNPACKING

Carefully open and inspect the shipping box, and remove all items. Notify Oxford Instruments and/or the carrier immediately in case of damage to the unit.

CABLE CONNECTIONS

There are three connectors provided at the top on the unit. Each cable connection to the 243 is unique to prevent incorrect connection. There is a phone type jack for connection of the printing or serial dump cable, a jack for the connection of a low voltage power supply, and a polarized 6 pin threaded connector for the probe. Connection of any other external device may damage the gage.

POWER ON/OFF

The unit can be turned on at any time by pressing the ON/OFF key. The ON/OFF key turns off the unit or it will turn off automatically after ten minutes have passed and no entry or measurement has been made. When the unit is turned on, the software version will show in the upper left of the display and the model number will flash before advancing to show the Application (for ECP-M probe only) and Conductivity Factor of the last used memory location, displaying each for about 1 second. After this, the display will show the last reading taken in the main display and the memory location in the upper left of the display. "FE"

shows in the lower left of the display indicating that all measurements must be taken on plating over steel (FE).

PROBES

The 243 uses the ECP-M Eddy Current probe and/or an SMP-1 Magnetic probe.

UNITS

The measurement units can be changed from mils (1/1000 in) to um (micrometer) by pressing the ZERO/UNITS key. Both statistics and readings will be changed to reflect the units selected.

MEASUREMENT

Measurements can be taken in Continuous Mode (with an activation setting, see How to Take Measurements —Continuous Mode), Regular Mode or Scan Mode. Pressing the C/M key changes the mode of measurement.

Continuous Mode

When the probe is placed on a sample, instantaneous readings are displayed. These readings cannot be saved into the statistics unless the Capture feature is activated. Refer to the section on How to Take Measurements -- Continuous Mode for directions on activating this feature. When the probe is placed in air “InF” will show on the display until the probe is placed on a sample.

Regular Mode

When the probe is placed in contact with a sample a single reading is taken, displayed, and saved into the statistics. When the probe is placed in air, the last reading taken will remain on the display until another reading is taken.

Scan Mode

The 243 is configured by default with Scan Mode software. This feature allows for moving the probe around the surface of a sample to obtain an average thickness of the coating. This is useful when measuring large parts, samples where the thickness of the coating varies across the surface, sandblasted parts, and textured surfaces. The probe must be held in contact with the sample, while being slid across its surface, for the specified scan time. Readings are continuously being taken at a rate of approximately 6 readings per second for a magnetic probe (SMP-1) and 2 readings per second for a eddy current probe (ECP-M). After the scan time has elapsed, three beeps will sound and the word “dOnE” will show in the main display. The mean, low, or high value of the readings can be shown and inserted as one measurement into the statistics. The scan time can be set from 1 to 60 seconds. The mode of printing or displaying the statistics can be selected. See How to Take Measurements — Scan Mode.

MEMORY STRUCTURE

Memory locations 1 to 99 are available. Locations 1 to 24 are for the SMP-1 probe and locations 25 through 99 are for the ECP-M probe. Each location stores readings and corresponding statistics, probe type, Application, Conductivity Factor and Offset. The memory location is shown in the upper left of the display.

APPLICATIONS

The applications of plating over steel, their measurement thickness ranges and the probe to be used is shown in the table below. The last entry “Non-Mag” is for non-magnetic coatings over steel using the SMP-1 probe. See Memory Management – How to Change Application or Conductivity Factor.

Plating / Fe	Thickness Range	Probe
Zn	0 to 1.5 mil/38 um	ECP-M
Ni	0 to 1.5 mil/38 um	ECP-M
Cd	0 to 1.5 mil/38 um	ECP-M
Cr	0 to 3.9 mil/99 um	ECP-M
Cu	0 to 0.40 mil/10 um	ECP-M
Non-Mag	0 to 50 mil/1270 um	SMP-1

CONDUCTIVITY FACTOR

The Conductivity Factor compensates for the samples plating properties. It is used when readings differ from the known value. When this is the case, it should be calculated using the following equation: $\text{Conductivity Factor} = \text{Known Value} / \text{Measured Value}$. Valid Conductivity Factors can range from 0.5 to 4.0. See Memory Management – How to Change Application or Conductivity Factor and Corrections – How to Do a Conductivity Factor Correction.

OFFSET

An Offset can be stored in any memory location. It is subtracted from any reading taken in that location. Valid Offsets can range from 0.0 to the maximum thickness for an application. See Applications above.

SAMPLE FOR MEASUREMENT

The sample must be clean and free of surface defects for proper measurement.

UNIT OPERATION

PROBE TUNING

This procedure must be performed for each probe.

1. Connect the probe to the gage and turn it on.
2. Press the key sequence “*” “1” “1” “1” ENTER.
3. The word “tunE” will appear on the display for about 1 second, and the unit will turn off.
4. The probe is now tuned and the gage can be turned on and used.

CALIBRATIONS

Universal Calibrations

The Universal Calibration feature allows the user to make one calibration that then can be used by an assigned number of memory locations. This feature saves time in the calibration process, and allows statistics to be stored in separate memory locations.

How to Store Individual and Universal Calibrations

Individual calibrations can be stored in any active memory location. Universal Calibrations can only be stored in memory locations 1 and 25 for Eddy Current and Magnetic applications, respectively. The individual calibration will apply only to that memory location. Calibrations are automatically stored in the memory location where they are performed.

1. To make and store a Universal Calibration for a Magnetic application select memory location 1 or for an Eddy Current application, select memory location 25. To select a memory location, refer to Memory Management: How to Select a Memory Location. Then calibrate the gage as described in How to Make Calibrations.
2. To make and store an individual calibration choose any location from 1 to 24 for a Magnetic application and 25 to 99 for an Eddy Current application. Then calibrate the gage as described in How to Make Calibrations.
3. To reset all locations to use the Universal Calibration, perform the procedure in step 1.

How to Assign Universal Calibration Locations

A number, N, of memory locations can be assigned to use the Universal Calibration. The maximum value of N for the Magnetic application is 24 and for the Eddy Current application is 75, which corresponds to the total memory locations for each of these application types.

1. Press the key sequence “*” “9” ENTER. The letters “uc” will appear in the upper left corner of the display, and the number of locations previously assigned will appear on the display. The default value is one.
2. Using the numerical keys, enter the number of memory locations that are to use the universal calibration and press ENTER.

How to Make Calibrations

Four types of calibrations can be performed.

1. A two point calibration with SMP-1 must be performed once on a gage. All gages come with a two point factory calibration. This calibration should be performed again if a new probe is to be used.
2. Once the two point calibration has been made, the one point calibration with SMP-1 can be used to quickly reset the gage.
3. A three point calibration with ECP-M probe must be performed once on a gage. All gages come with a three point factory calibration. This calibration should be performed again if a new probe is to be used.
4. The surface roughness calibration with SMP-1 is used with parts that have varying coating thickness, an uneven surface, and/or variations in the base alloy.

One Point Calibration with SMP-1 Probe

For this calibration, use the standard whose value is closest to the actual coating thickness to be measured, or according to the expected measurement range. See table below. For ranges greater than 10 mils (254um), consult Oxford Instruments Technical support for shim size information.

Measurement Range	Std
Less than 1 mil	1 mil (25.4 um)
Greater than 1 mil	10 mil (254 um)

1. Select the memory location for the re-calibration as described in Memory Management: How to Select a Memory Location.
2. To re-zero the unit:
 - a. Press the CAL key.
 - b. Place the probe on the bare part.
 - c. Press the ZERO/UNITS key.
 - d. Lift the probe off the bare part and wait for the beep.
3. To reset the thickness:
 - a. Re-zero the unit as stated in step 2.
 - b. Place the desired shim over the bare part.
 - c. Press the CAL key.
 - d. Place the probe on the shim over the bare part or the plated standard.
 - e. Enter the thickness of the shim or std, lift the probe at least 3 inches (76 mm) away from the part, and press the ENTER key. Once a numerical key has been pressed, the probe can be lifted from the shim without affecting the calibration.

Two Point Calibration with SMP-1 Probe

The two point calibration with the SMP-1 probe is performed with two shims according to the expected measurement range. See table below. For ranges greater than 10 mils (254 um), consult Oxford Instruments Technical Support for shim size information.

Measurement Range	First Shim Value	Second Shim Value
Less than 1 mil	0.2 mil (5.08 um)	1 mil (25.4 um)
Greater than 1 mil	1 mil (25.4 um)	10 mil (254 um)

NOTE: After the calibration on the bare part, 0.00 will appear on the display. After a thickness calibration, the value entered will appear on the display. Neither of these readings will affect the statistics.

CAUTION: When a calibration (or a re-calibration) is made while in location 1, or location 25, the new calibration will overwrite all calibrations assigned to the universal calibration. See Calibrations – How to Assign Universal Calibration Locations.

1. Select the memory location for the calibration as described in Memory Management: How to Select a Memory Location.
2. Press the CAL key. The word CAL will appear on the right of the display and “C” will appear in the upper left.
3. Place the probe on the bare part and press the ZERO/UNITS key.
4. Lift the probe off the bare part and wait for the beep.
5. Press the “*” key and the press the CAL key. The word CAL will appear on the right side of the display and “C1” will appear in the upper left.
6. Place the first shim on the bare part and place the probe over the shim.
7. A thickness will be displayed on the unit. Enter the thickness of the shim using the numerical keys, even if the displayed value is correct. Once a numerical key has been pressed, the probe can be lifted from the shim without affecting the calibrations.
8. Check the display. If incorrect, press the CLEAR key and re-enter the number. When finished, lift the probe at least 3 inches (76 mm) away from the part and press the ENTER key. The display will now show “C2” in the upper left corner.
9. Place the second shim on the bare part and place the probe over the shim.
10. A thickness will be displayed on the unit. Enter the thickness of the shim using the numerical keys, even if the displayed value is correct. Once a numerical key has been pressed, the probe can be lifted from the shim without affecting the calibration.
11. Check the display. If incorrect, press the CLEAR key and re-enter the number. When finished, lift the probe at least 3 inches (76 mm) away from the part and press the ENTER key.
12. The gauge is now calibrated and ready for measurement with the SMP-1 probe.

Three Point Calibration with ECP-M

The Oxford Instruments Zinc on Steel (Non-Cyanide) ZN-FE-EM-3 standard set or equivalent is required to successfully complete the three point calibration.

1. Select the memory location for the calibration as described in Memory Management: How to Select a Memory Location.
2. Press the CAL key. The word CAL will appear on the right of the display and "C" will appear in the upper left.
3. Place the probe on the Bare Steel standard and press the ZERO/UNITS key.
4. Lift the probe off the bare part and wait for the beep.
5. Press the '*' key and then press the CAL key. The word CAL will appear on the right side of the display and 'C1' will appear in the upper left.
6. Place the probe on the Low value standard.
7. A thickness will be displayed on the unit. Enter the thickness of the Low standard using the numerical keys, even if the displayed value is correct. Once a numerical key has been pressed, the probe can be lifted from the standard without affecting the calibration.
8. Check the display. If incorrect, press the CLEAR key and re-enter the number. When finished, lift the probe at least 3 inches (76 mm) away from the standard and press the ENTER key. The display will now show 'C2' in the upper left corner.
9. Place the probe on the High value standard.
10. A thickness will be displayed on the unit. Enter the thickness of the High standard using the numerical keys, even if the displayed value is correct. Once a numerical key has been pressed, the probe can be lifted from the standard without affecting the calibration.
11. Check the display. If incorrect, press the CLEAR key and re-enter the number. When finished, lift the probe at least 3 inches (76 mm) away from the standard and press the ENTER key.
12. A "br" will appear in the upper left of the display for all applications except copper for which a "cu" will appear. Place the probe on the appropriate standard, on brass if "br" appears or on copper if "cu" appears, and press ENTER.
13. The gauge is now calibrated and ready for measurement with the ECP-M probe.

Surface Roughness Calibration with SMP-1 Probe

This calibration with the SMP-1 probe consists of taking readings on several points over the surface of the bare part and again with shims, instead of taking a reading at just one spot. The averages of the bare readings and the readings taken with the shims are stored as the calibration. If a surface roughness calibration is necessary, more than likely the individual readings taken on coated

parts will vary. To lessen the variation in the readings it is suggested that an average reading be taken. The averages should be fairly consistent.

1. Select the memory location for the calibration as described in Memory Management: How to Select a Memory Location.
2. Press the CAL key. The word CAL will appear in the right side of the display and "C" will appear in the upper left.
3. Place the probe on the bare part.
4. Wait for the reading to stabilize, then press the ENTER key.
5. Repeat steps 3 and 4 (up to 9 times), moving the probe around the entire part. A "Cn" will be displayed on the upper left, with n representing the number of readings taken so far in the calibration.
6. Press the ZERO/UNITS key.
7. Press the "*" key, then press the CAL key. The word CAL will appear on the right and "C1" will appear in the upper left.
8. Place the 1 mil (25.4 um) shim on the bare part. Place the probe over the shim. Wait for the reading to stabilize, then press the ENTER key.
9. Repeat step 8 (up to 9 times), moving the probe and shim around the entire part so as to take readings over the area of interest.
10. After the last measurement has been taken, enter the thickness of the shim using the numerical keys. Once a numerical key has been pressed, the probe can be lifted from the shim without affecting the calibration.
11. Check the display. If incorrect, press the CLEAR key and then re-enter the number. When finished, lift the probe at least 3 inches (76 mm) away from the part and press the ENTER key.
12. The display will now show "C2" in the upper left corner.
13. Place the 10 mil (254) shim on the bare part. Place the probe over the shim. Wait for the reading to stabilize, then press the ENTER key.
14. Repeat step 13 up to a maximum of 9 times. Move the probe and shim around the entire part to take readings over a large area.
15. After the last measurement has been taken, enter the thickness of the shim using the numerical keys. Once a numerical key has been pressed, the probe can be lifted from the shim.
16. Check the display. If incorrect, press the CLEAR key and then re-enter the number. When finished, lift the probe at least the probe at least 3 inches (76 mm) away from the part and press the ENTER key.
17. The gage is now calibrated and ready for measurement with the SMP-1 probe.

MEMORY MANAGEMENT

Memory Structure

The 243 has 99 memory locations. See the tables below for the allocation of these locations.

Plating over Steel Application	Location	Probe
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Non-Magnetic	1-24	SMP-1
Zn, Ni, Cu, Cr or Cd	25-99	ECP-M

Each location can store probe type, application, Conductivity Factor, Offset, measurement readings, and statistical data. When the gage is turned on, it selects the last memory location that was used to take measurements and displays the application, Conductivity Factor (if not 1.0) and Offset (if not 0.0) for that memory location. (If the SMP-1 probe is connected, the application does not show.) The application, Conductivity Factor and Offset display for approximately one second each. Each time the gage is turned on or when a new memory location is selected, the display will show the application, Conductivity Factor and Offset for the current memory location in the following sequence.

1. "AP" will show in the upper left of the display. The two letter abbreviation for the application will show in the main display. The abbreviations are as follows: Zn (Zinc), Ni (Nickel), Cu (Copper), Cr (Chrome) and Cd (Cadmium).
2. "CF" will show in the upper left of the display. The Conductivity Factor will show in the main display. The CF will only show if different from 1.0.
3. "OF" will show in the upper left of the display. The Offset will show in the main display. The Offset will only show if different from 0.0.
4. The current memory location will show in the upper left of the display and the last reading taken will be displayed.

How to Select A Memory Location

A memory location must be made active before it can be used to store information. To activate a memory location, select it by using Method 1. To select memory locations that already are active, use either of the following methods.

Method 1

1. Press the SEL key. The word SEL will appear on the display.
2. Enter the desired memory location (1-99) using the numerical keys. The location number will appear in the upper left of the display.
3. Press the ENTER key.
4. The unit will show the application in the chosen location.
5. The unit will beep twice if this memory location was just activated and 0.000 will show in the main display, otherwise the unit will beep once and the last reading taken will show in the main display.

Method 2

1. Press the SEL key. The word SEL will appear on the display.
2. Press the SEL key again, causing the display to scroll through the active memory locations. The location number will appear in the upper left of the display.
3. When the desired memory location is displayed, press the ENTER key.
4. The unit will show the application in the chosen location.
5. The last reading taken will show in the main display.

How to Change Application, Conductivity Factor or Offset

When a memory location is first made active with the ECP-M probe connected, by default it has the Zn (Zinc) application, Conductivity Factor of 1.0 and Offset of 0.0. To change any follow this procedure.

1. Using either method described above in How to Select a Memory Location, go the memory location in which you want to change the Application, Conductivity Factor or Offset.
2. Press the "*" key followed by the SEL key. The two-letter abbreviation for the application will show in the main display and "AP" will show in the upper left of the display. Applications and their two-letter abbreviation are as follows: Zinc (Zn), Nickel (Ni), Copper (Cu), Chrome (Cr), and Cadmium (Cd). Press the ENTER key to select the shown application or press the SEL key until the desired application shows then press the ENTER key.
3. Next the Conductivity Factor will show in the main display. A "CF" will show in the upper left of the display. Valid Conductivity Factor's are from 0.5 to 4.0. Enter the desired Conductivity Factor using the numerical keys. Check the display. If incorrect, press the CLEAR key and reenter the value. When finished press the ENTER key.
4. Next the Offset will show in the main display. An "OF" will show in the upper left of the display. Valid Offsets are from 0.0 to the maximum thickness for the application. See Applications above. Enter the desired Offset using the numerical keys. Check the display. If incorrect, press the CLEAR key and reenter the value. When finished press the ENTER key.
5. The change is now complete.

Note: To change a memory location back to its defaults (Zn Application, CF=1.0 and Offset= 0.0) without changing each parameter, clear the memory location (See How to Clear a Memory Location below) and then select it (See How to Select a Memory Location above).

How to Clear a Memory Location

When a memory location is cleared it is deactivated and all statistics, measurements, and parameters are deleted. A memory location can be cleared using one of the following methods.

Method 1

1. Press the SEL key. The word "SEL" will show on the main display.
2. Enter the desired memory location (1-24 for SMP-1 and 25-99 for ECP-M). The location number will show in the upper left of the display.
3. Press the CLEAR key. If the location was active its number will flash, otherwise the numbers will clear and a different location number can be entered.
4. To continue the clearing process, press the CLEAR key again then press the ENTER key. Otherwise, to abort the clearing process, press the ENTER key only.

Method 2

1. Press the SEL key. The word "SEL" will show on the main display.

2. Press the SEL key again, which causes the display to scroll through the active memory locations. The memory location number will show in the upper left corner of the display.
3. When the desired memory location shows, press the CLEAR key. If the location was active the number will flash, otherwise the numbers will clear and a different location number can be entered or the SEL key can be pressed again.
4. To continue the clearing process, press the CLEAR key again then press the ENTER key. Otherwise, to abort the clearing process, press the ENTER key only.

How to Print Active Memory Locations

To print out all active memory locations and their application, Conductivity Factor (if not 1.0) and Offset (if not 0.0) press in sequence "*" "8" "0" "0" keys. See also Printing Output.

How to Clear all Memory Locations

To clear and deactivate (except memory location 1 and 25 which are the initial locations for the SMP-1 and ECP-M probes, respectively) all memory locations and their storage of calibrations, readings, statistics, application, Conductivity Factor, Offset and corrections, press in sequence "*" "9" "1" "9" "1".

HOW TO TAKE MEASUREMENTS

Press the C/M key to change the mode of measurement between Continuous, Regular and Scan.

Regular Mode

Select a memory location to store readings. Place the probe in contact with the sample to be measured. The gage will beep, the measurement will be displayed, and the reading will be saved into the statistics. If an unwanted measurement is taken while in the Regular Mode, it can be cleared from the statistics by pressing the CLEAR key. After the CLEAR key is pressed, the reading will be deleted and the previous reading will be displayed.

Continuous Mode

To take measurements in Continuous Mode, place the probe on the part. Instantaneous readings will be displayed until the probe is lifted off the part. They will not be saved into the statistics unless the Capture Readings feature is activated as described below.

How to Activate the Capture Readings Feature

1. Place the gage in Continuous Mode.
2. Press the key sequence "*" "4" "0" ENTER. The feature is now active and readings will be saved into the statistics.
3. Place the probe on the sample to be measured. Press the ENTER key to capture the reading.
4. Continue taking readings, and press the ENTER key for each reading to be captured.

5. The statistics can be viewed in the normal manner. See Statistics – Viewing the Statistics.

How to Deactivate the Capture Readings Feature

1. Place the gage in Continuous Mode.
2. Press the key sequence “*” “4” “1” ENTER.
3. The capture feature is not active and readings taken will not be saved into statistics.

Scan Mode

The 243 can be configured with the optional Scan Mode feature. Units with this feature allow for sliding the probe around the surface of a sample to obtain an average thickness of the coating on the sample. This feature is convenient for measuring large samples or for samples where the thickness of the coating varies across the surface. Review the scan time and the print options before using the Scan Mode to take measurements. Make any desired changes to the default settings as described below.

How to Set the Scan Time

The default scan time is 5 seconds. To enter a different time, press in sequence the “*” “1” “1” keys and then press the ENTER key. “Sc” will show in the upper left of the display and the present scan time will show in the main display. Using the numerical keys enter a new value from 1 to 60 and then press the ENTER key. The new value will be accepted, if it is from 1 through 60, and the gage will go back to the measure mode. If an out of range value is entered, a long beep will sound. The gage will revert back to the previous value and remain in the set time mode until either an acceptable value is entered, or the ENTER key is pressed.

How to Set the Output Options

When in Scan Mode, information about the measurement can be printed out from a serial printer, or sent to a PC serial port to be displayed. The print option is selected by pressing a key sequence that begins with the “*” key, then the two digits that determine the option, and then the ENTER key. The table below lists the available options and the corresponding keystrokes. The default option setting is Low – High – Mean.

Print Display Option	Key Code Sequence
Print Nothing	“*” “2” “1” ENTER
Low – High	“*” “2” “2” ENTER
Mean	“*” “2” “3” ENTER
Low – High – Mean	“*” “2” “4” ENTER
All Readings Output During Scan	“*” “2” “5” ENTER

How to Set Display Options

When in Scan Mode, the mean, low or high values of the measurement can be shown on the display. The display option is selected by pressing a key sequence that begins with the “*” key, then the two digits that determine the option, and

then the ENTER key. The table below lists the available options and the corresponding keystrokes. The default option setting is Mean.

Display Option	Key Code Sequence
Mean	“*” “2” “6” ENTER
Low	“*” “2” “7” ENTER
High	“*” “2” “8” ENTER

STATISTICS

After readings have been taken, the statistics saved in each memory location can be displayed. If a statistic is displayed while the gage is in the Regular Mode, the statistic will remain on the display until the ENTER key is pressed or the probe is placed on another sample. With the gage in Continuous Mode and with the Capture Feature on, a statistic will remain on the display for three seconds after which time the gage reverts to the Continuous Mode.

Viewing the Statistics

Measurements taken in each memory location are stored separately as individual sets of statistics. Select the memory location from which you wish to display the statistics. The statistic keys are located in the top two rows of the keypad. The information associated with each key is listed below. When a statistics key is pressed, a letter shown in parenthesis below, and the word STAT will show in the lower left of the display.

Number (N) Number of Readings
 MEAN (M) Mean or Average
 S.D. (S) Standard Deviation
 High (H) Highest Reading
 Low (L) Lowest Reading

To leave the statistics mode and continue taking readings press the ENTER key or place probe on the part. Upon leaving the statistics mode, the last reading taken will be displayed. Any subsequent readings will be added to the statistics in the memory location selected.

Clearing the Statistics

If the word “FULL” appears on the display and the unit error (long duration) beeps while taking measurements, the statistics’ memory is full. To clear the statistics, follow the procedure below. This can be done in Regular or Continuous Modes.

1. To clear statistics from a memory location, select the desired memory location.
2. Press any of the statistics keys so that the gage is displaying a statistic.
3. Press the CLEAR key. The word “STAT” will flash in the lower left of the display.
4. To abort the clearing of the statistics, press the C/M key while the unit is flashing “STAT”.
5. To continue the clearing process, press the CLEAR key again to confirm that the statistics are to be cleared.

CORRECTIONS

How to Do a Rezero Correction With the ECP-M or SMP-1

This Rezero Correction will be stored in the memory location where it is performed. To do a Rezero Correction with the ECP-M or SMP-1 probe attached follow this procedure.

1. Select the memory location to store the Rezero Correction.
2. Press the CAL key. "c" will show in the upper left of the display and "CAL" in the upper right of the display.
3. Place the probe on a bare part. A thickness will show in the main display.
4. With the main display showing a thickness, press the ZERO/UNITS key.
5. Lift the probe. The unit will revert to the measurement mode and the rezero correction is complete.

How to Do a Conductivity Factor Correction

A Conductivity Correction Factor can be generated automatically with a plated part of known thickness.

1. Press the CAL key. "c" will show in the upper left of the display and "CAL" in the upper right of the display.
2. Place the probe on a part of known thickness. A thickness will show in the main display.
3. With the main display showing a thickness, enter the known thickness of the part by using the numerical keys and then press the ENTER key.
4. Lift the probe (the probe may be lifted after the first numerical key or decimal key is pressed in 3). The unit will revert to the measurement mode and the Conductivity Factor is calculated automatically according to the formula: $\text{Conductivity Factor} = \text{Known Value} / \text{Measured Value}$. It will act as a multiplication factor for all subsequent readings at this memory location.

How to Do an In-Air Correction

Due to changing environmental conditions an In-Air Correction may become necessary when measuring with the ECP-M or the SMP-1 probe. To do this correction follow this procedure in any memory location.

1. With the probe held in the air away from the part. Press in sequence the "*" "1" "1" "1" keys, and then press the ENTER key.
2. The word "tunE" will show in the main display and the gage will shut off.
3. The In-Air correction is complete and the gage may be turned on and used.

How to Clear Corrections

To reset the Rezero Correction for the ECP-M or SMP-1, use this procedure.

1. Select the memory location in which you want to clear these corrections.
2. Press in sequence the "*" "5" "2" keys, and then press the ENTER key.
3. The Rezero Correction is no longer used for this memory location. The gage reverts to the measurement mode.

To reset the Conductivity Factor Correction to 1.0 see How to Change Application, Conductivity Factor or Offset above.

LIMITS

Limits can be entered into the 243 gage to provide an indication that a reading exceeds a high or low thickness specification. When a reading is taken in Regular Mode that falls outside of the limits, there will be a long beep and the word “HI” or “LO”, as appropriate, will appear in the upper left of the display. The limits apply only to the memory location that is in use when the limits are entered. Each memory location can have its own set of limits.

How to Set Limits

1. Press the LIMIT key. H-L will show in the main display.
2. To enter the high limit, press the HIGH key. Or to enter the low limit, press the LOW key.
3. The default (See Setup – Applications for the range for each application and probe type) or any previously entered limit will be displayed.
4. To accept press ENTER key, otherwise enter the desired limit using the numerical keys and press the ENTER key.

How to Remove Limits

1. Press the LIMIT key. H-L will show in the main display.
2. To remove the high limit, press the HIGH key. Or to remove the low limit, press the LOW key.
3. For high limit enter default high limit shown in the table above for Setup - Applications, for low limit enter 0.000 mil/ 0.000 um and press the ENTER key.

DATE AND TIME STAMP

The 243 has a Date and Time Stamp feature. This feature is supplied in one of the two options described in Memory Capacity. The date and time information will be included when statistics and readings are printed, or uploaded to a PC.

Memory Capacity

The 243 is supplied with the Date and Time Stamp Every Reading feature installed as a default. See Printing the Date and Time below. With this feature the date and time is stored with each reading. The maximum number of readings saved is 8900.

Setting the Date and Time

Before taking measurements with the gage, the correct time and date should be entered. This information will be stored with the readings and appear on the printouts or uploads.

1. Press in sequence the “*” “1” “0” keys, and then press the ENTER key.

2. The word “cL” will show in the upper left of the display and a time in the main display. The time displays and prints in a 24-hour format. Example: 1:18 P.M. will display as 1318.
3. Enter the correct time in a 24-hour format. Press the ENTER key if entering three digits and the display will advance to the next setting.
4. The word “dA” will now show in the upper left of the display and a date in the main display. Key in the value for the month and day in the format of MMDD and press the ENTER key.
5. The word “yr” will appear in the upper left of the display and a year in the main display. Enter the last two digits of the year and press the ENTER key.

Printing the Date and Time

When the time and date has been stored with each reading with the Date and Time Stamp Every Reading feature installed, the default is to print them alongside each reading when using the printing selection P-A or P-d (see Printing Output). Without this feature, the default is to print the date and time of the first and last reading of the memory location with any printing selection.

OUTPUT SELECTIONS

Review the default settings for the output selections before printing or performing a serial output. To change the baud rate and /or formatting enter the appropriate keystrokes described in the following table. Select and make one entry for lines 5 through 8 of the table. The factory default settings in the gage are “*” “2” “ENTER”; “*” “3” “ENTER”; “*” “7” “ENTER”. This is a setting of “Carriage return and line feed”; “Disregard BUSY line”; and “4800 baud”.

1	“*” “1” ENTER	End each line with a carriage return
2	“*” “2” ENTER	End each line with a carriage return and a line feed
3	“*” “3” ENTER	Disregard the printer BUSY line when outputting data
4	“*” “4” ENTER	Output data only when the printer BUSY line is not active
5	“*” “5” ENTER	Set output baud rate to 300
6	“*” “6” ENTER	Set output baud rate to 1200
7	“*” “7” ENTER	Set output baud rate to 4800
8	“*” “8” ENTER	Set output baud rate to 9600

Separator Character

The Separator Character is ASCII 29. When the Separator Character feature is enabled, this character is inserted with stored readings each time the MEAN key is pressed. The printing functions P-A and P-d (See Printing Output) will recognize the Separator Character and insert “start of block n” in the printout. When uploading to a PC (See Serial Output), the ASCII 29 character will be transmitted. These printing and uploading functions will ignore the Separator Character when the feature is disabled even though the character remains with the readings until the readings are deleted.

How to Enable the Separator Character Feature

1. Press the “*” key. The display will be cleared and “OP” will appear in the upper left of the display.
2. Press the “5” “0” keys. The Separator Character Feature is now activated and the unit returns to the measurement mode.

How to Add Separator Character

1. With the Separator Character Feature enabled, press the MEAN key in the measurement mode.
2. The gage will beep twice. The first beep is for pressing the MEAN key which will display the mean and the second beep indicates the insertion of the Separator Character. The Separator character is now inserted with the stored readings.

How to Remove a Separator Character

Separator Characters can only be removed by deleting the statistics. See Statistics - Clearing the Statistics. Note, that if the Separator Character feature is disabled, these special characters will be ignored when printing or uploading to a PC.

How to Disable the Separator Character Feature

1. Press the "*" key. The display will be cleared and "OP" will appear in the upper left of the display.
2. Press the "5" "1" keys. The Separator Character Feature is now disabled and the unit returns to the measurement mode.

Blocks

The 243 can be ordered with the Block feature installed. This allows the labeling of specific blocks of readings within a memory location. The purpose of the Block feature is to separate groups of readings to be transmitted as Serial Output. See Serial Output. With the Block feature installed (it cannot be disabled), all printing functions are disabled. The Block feature does not affect the calculation of statistics for the total readings at a memory location. For multiple blocks at a memory location, statistics are not available for each block.

How to Label Blocks

1. Press the PRINT key. "bL" will show in the upper left of the display.
2. Enter a number between 1 and 255, then press the ENTER key. This activates the selected block.
3. All subsequent measurements will store readings in the currently active block. If a block that already contains readings is selected, all subsequent readings will be appended to the currently stored readings in that block.

How to Transmit Blocks

See Serial Output for output connections. Then follow this procedure.

1. Press DUMP key. "bL" will show in the upper left of the display.
2. Enter the block number using the numerical keys and press the ENTER key to begin data transfer from the selected block. To transfer all blocks enter "0" and press the ENTER key.

How to Remove Blocks

1. Press the "*" key. The display will be cleared and "OP" will appear in the upper left of the display.
2. Press the CLEAR key. "bL" will appear in the upper left of the display.
3. Enter the block number to be cleared by using the numerical keys and then press the ENTER key. All readings stored in that block will be cleared.
4. After clearing any block number, the active block will be block number 1.

Printing Output

Readings taken in Regular Mode, Continuous Mode or Scan Mode can be printed. To print readings and/or statistics, connect the serial printer to the gage with the cable supplied from Oxford Instruments. Select the memory location and the type of information to be printed as described below. If the printer is connected to the gage while the readings are being taken, the reading will be transferred directly to the printer and printed out. If the printer is not connected to the gage while readings are being taken, the readings are stored in the statistics' memory and can be printed out later. To print the statistics and/or readings perform the following steps.

1. Select the memory location to print from.
2. Press the PRINT key.
3. The main display will show "P-A". Repeatedly pressing the PRINT key causes the display to scroll through the available printing options.

P-A	=	Print Stats, Data, and Histogram
P-S	=	Print Stats only
P-d	=	Print Data only
P-H	=	Print Histogram only
P-	=	No Printing

4. To start the printing, press the ENTER key when the required option is displayed or wait for 3 seconds when the required option is displayed.

Serial Output

The stored readings can be uploaded to a PC with the Oxford Instruments upload cable.

1. Connect the cable to the serial output port of the gage and connect the other end of the cable to a PC that has software suitable for receiving serial data.
2. Select the memory location from which to upload readings.
3. Press the DUMP key to begin the data transfer.