

**WARNING:**



*Dear Customer:*

*Congratulations! We at X-Rite, Incorporated are proud to present you with an X-Rite Multi-Angle Spectrophotometer. This instrument represents the very latest in microcontrollers, integrated circuits, fiber optics, and display technologies. As a result, your X-Rite MA68 is a*

*with one year limited warranty, a*



## ***Limited Warranty***

X-Rite, Incorporated warrants each unit manufactured to be free of defects in material and workmanship (excluding battery pack) for a

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## ***General Description***

The X-Rite MA68 is a multi-angle spectrophotometer designed for measuring color on metallic and pearlescent paint finishes. The instrument incorporates a single light source and five fixed (aspecular) viewing angles (15°, 25°, 45°, 75° and 110°), using an electro-mechanical shutter system to sequentially view the different angles. Wavelength discrimination is accomplished with an array of interference filters.

To ensure measurement accuracy, the MA68 also includes a dual read switch triggering mechanism. This allows a measurement to be taken only after the spectrophotometer has been properly positioned.



## ***User Interface***

This information will familiarize you with the typographical conventions, display function, and general terms used in this manual.

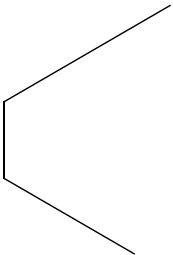
- In the text portion of this manual the MA68 key names are shown

*What To Do First!*

**Subjects covered in Section 1 are:**

□

## Packaging Illustration



## **1.2 Installing the Battery Pack**

The instrument is shipped from the factory with the battery pack



## 1.4 Charging the Battery Pack

***“The Battery Pack Must Be Charged Before Use!”***

The MA68 is powered by six nickel-metal hydride batteries in a removable battery pack. The battery pack must be in the instrument for proper operation. The AC adaptor charges the batteries when it is plugged in, but does not eliminate the need for the batteries.

The MA68 can be operated while the batteries are being charged. Before plugging in the AC adaptor, make sure that the voltage indicated on the adaptor complies with the AC line voltage in your area. If not, contact X-Rite or your Authorized Representative.

The instrument battery pack should be fully charged (100%) in 16 hours and



### **AC Adaptor Connection Procedure**

1. Plug the small connector end of the AC adaptor into the adaptor jack on the back of the instrument or the battery pack.
2. Plug the adaptor into the AC wall outlet.

\* The unit will not lose any of the preset information (i.e., cal, ref, etc.) if the battery pack is r

## **1.5 Menu Page Selection**

## 1.6 Display Description

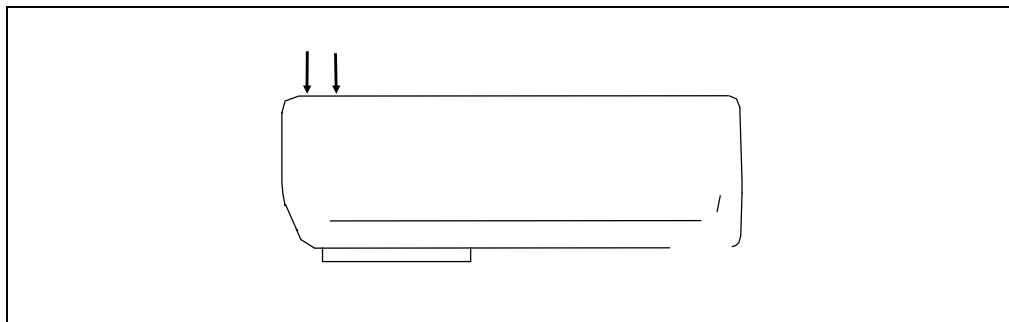
The characters in the display above each keyswitch dictate which





**General**

In order for the MA68 to obtain accurate and repeatable measurements, the bottom of the sensor nose must be flat with the surface to be measured. Any movement of the sensor nose can cause the measurement angles to vary, greatly affecting measurements on metallic and pearlescent paint finishes.



## **Narrow Sensor Nose & Read Key Operation**

The MA68 can be configured to allow a key depression to take a measurement. This configuration option is intended for use with the optional narrow sensor nose (P/N MA58-102), which allows measurements in recessed areas. The read key option can be enabled for measuring samples that are slightly curved, where normal read switch depression is difficult. However, any measurements taken with the sensor nose not completely flat on the sample can result in inconsistent measurement data.

With the optional narrow sensor nose installed, the dual read switches are eliminated and the instrument must be configured to allow a key depression to take a measurement.

Your instrument is sent from the factory with the “read key”



**3.2 Quick Calibrating to the Standard**  
Subjects covered in Section 3 are: **3.1 Positioning the Instrument on the Call**

**3.3 L**







### 3.3 Long Calibrating to the Standard

*To perform a long cal measurement:*

1) Make sure white cal standard is clean.

---

2) Press **[menu]** key #1 twice to enter menu selection.

---

3) Press **[cal]** key #2 to enter calibration function.

- The software datecode and copyright are momentarily displayed.

- **“READ WHITE CALIBRATION PLAQUE”** is displayed.

★ Pressing **[exit]** key #1 will abort the calibration procedure and calibration will not be updated.

Pressing **[zero cal]** key #4 will activate zero reflectance measurement.

If **“READ ZERO REFLECTANCE”** is displayed, refer to Measuring Zero Reflectance in this

section. is dis6.0549 Tc 0.Key#06 T20.028O REFL.Key#206 T20.228O REFL.Key#306 T26.28O REFL.Key#

- 4) Position the instrument on the white standard and take measurement. Hold instrument down until all 4 calibration readings are complete. To

### 3.4 Measuring Zero Reflectance

- \* The zero reflection standard (black glass) is dramatically affected by smudge marks, dust and fingerprints. Smudges and fingerprints should be cleaned with a lens tissue and a few drops of the lens cleaner provided. The standard should always be polished with lens tissue and dusted with the blower brush before being measured.

*To perform a zero reflectance measurement:*

- 1) Clean black glass on zero reflection standard.
- 2) Press **[menu]** key #1 twice to enter menu selection.
- 3) Press **[cal]** key #2 to enter calibration function.

- The software datecode and copyright are  
mo814 18D -0.05nda





**Subjects covered in Section 4 are:**



## 4.2 Illuminant/Observer Selection

## **4.3 Reference Entry**

The MA68 can display the difference between a reference and a sample. In order to display these differences the reference must first be

5) After selecting reference location, center measurement aperture in sensor nose over reference to measure. Use the alignment marks on the front and sides of the unit for positioning.

6) Press firmly on the front of the unit until sensor nose is flat on reference and both read switches are activated.

- Remove unit from reference after “**READING COMPLETE**” is displayed.

★ If an error message occurs during the measurement, try reading reference again. If error message still occurs, refer to Display Messages in Appendix B.

7) The measurement data is entered into the selected reference location.

- Press [**exit**]

## 4.4 Sample Measurement

Measurement data can be displayed as absolute or difference. The MA68 measures five angles but will only display three, due to display limitations. If desired, all five angles can be printed after a measurement when the instrument is interfaced to a serial printer. The three angles displayed can be changed in Operation Options (refer to Sec. 7.2).

### *To take a sample measurement:*

- 1) If taking a difference measurement, make sure a reference is entered into the instrument (refer to Section 4.3 Reference Entry).
- 2)

*Sample Measurement . . . continued*

- 4) Press firmly on the front of the unit until sensor nose is

## 4.5 Using Measurement Averaging

- \* Measurement Averaging must be activated in Operation Options before averaging can take place.





**Subjects covered in Section tectare:Su Su5.1 Adjusting Tolerance ValuesSu**

*Adjusting Tolerance Values . . . continued*

**PASS/FAIL METHOD =  $\Delta L^*a^*b^*$  or  $\Delta L^*C^*H^*$**

- \* The  $L^*a^*b^*$  and  $L^*C^*H^*$  tolerance setups are similar and will be covered in the same procedure.

5) Press **[next]** key #4 to advance to  
“**15° HIGH TOLERANCE**” screen.

6) Set 15° high tolerance values by  
pressing the **[→]** key #4 to move  
cursor to desired attribute. Press  
**[+]** key #2 to increase value or **[-]**  
key #3 to decrease value.

- Press **[next]** key #1 to advance to  
“ **15° LOW TOLERANCE**” screen.

7) Set 15° low tolerance values by  
pressing the **[→]** key #4 to move  
cursor to desired attribute. Press  
**[+]** key #2 to increase value or **[-]**  
key #3 to decrease value.

- Press **[next]** key #1 to advance to  
“ **25° HIGH TOLERANCE**



*Adjusting Tolerance Values . . . continued*

**PASS/FAIL METHOD =**

**PASS/FAIL METHOD =  $\Delta E_{CMC}$**

5) Press **[next]** key #4 to advance to  
“15° TOLERANCE” screen.

6) Set 15° tolerance values by  
pressing the **[→]** key #4 to move  
cursor to desired “cf”, “l”, & “c”  
attribute. Press **[+]** key #2 to  
increase value or **[-]** key #3 to  
decrease value.

- Press **[next]** decrease value.

- Press **[next]** decrease value.

## 5.2 Pass/Fail Measurement

The Pass/Fail measurement will indicate a pass or fail signal only for the three angles selected. Difference data can also be viewed for the last sample measured.

### *To take a pass/fail measurement:*

- \* References must be measured and tolerances edited before a pass/fail measurement will display usable data. Refer to Sections 4.3 and 5.1.

- 1) Press **[pass/fail]** key #3 at the  
**MENU PAGE 1**

4) A



Subjects covered in Section 6:



## **6.2 Viewing Stored Measurements**

Any measurement stored can be retrieved by the instrument for



- 5) Press **[exit]** key #1 to return to the delete mode menu.

## **Delete Group**

- 3) Press **[group]** key #3.
- 4) Press [↓] key #2 or [↑] key #3 to select desired group number.

## **Delete All**

3) Press **[all]** key #2.

4) Press **[yes]** key #4 to clear all

## **6.4 Printing Stored Measurements**

The MA68 has the ability to output stored measurement data directly to a serial printer or a computer. Stored data can be output in a “simplified” format or a more detailed “report” format.

*Printing Stored Measurements . . . continued*

4) Press **[no]**



## **Print Group**

5) Press **[group]** key #3 to enter print group mode.

6) Press [↓]

## *Report Printing Format*

### *To print reports:*

- 1) In storage mode, press **[edit]** key #4 to enter **“SELECT OPTION”** screen.
  
  - 2) Press **[print]** key #3 to enter **“PRINT REPORT ?”** screen.
  
  - 3) Press **[yes]** key #4 to enter **“SELECT REPORT FORMAT”** screen.
- Refer to the following pages for **“standards”** and **“samples”**



*Printing Stored Measurements . . . continued*

## **Samples**

4) Press **[samples]** key #4 to enter













## **MetalliX-QC Group Name Special Feature**

The MA68 has a unique feature that allows the user to automatically switch to a “group” that uses the same name as the scanned tag.

## 6.6 MetalliX-QC “Run Job” Operation

The “Run Job” function is used to activate a series of tagging and storing operations that can be programmed in the unit by X-Rite’s MetalliX-QC software package. A typical “job” would allow multiple information tags to be applied to each stored measurement. See the MetalliX-QC Users Manual for further information.

A [run job] key will appear on “MENU PAGE 2 ( ) Tj 2040.8 0 TD /F0 14 TD -0.0

Subjects covered in Section 7 are:

- ☐ 7.1 Setting RS232 Communication Options
- ☐ 7.2 Setting Operation Options
- ☐

28c -0.0089

***To change the communication options:***

1) Press **[menu]** key #1 twice to enter  
    **"MENU PAGE 2"** screen.

2) Press **[cnfg]** key #3 to enter  
    configuration functions.

3) Press **[↑][-**



## 7.2 Setting Operation Options

There are ten operation options to edit. Listed below is a description of each option followed by the editing procedure.

**Set Averaging** - averaging mode is used to select “1 - 16”

measurements for calculating a single sample reading. Measurements are taken at different locations on a sample to achieve average measurement values.

Average mode is also used to select Statistical Measurement Control. Statistical Measurement Control (SMC) is a method of performing a statistical analysis of several measurements to determine the quality of the measurements and/or the sample, before an average value is calculated. The calculation includes a test for outliers, a stability test of the average values and an overall “grade” that indicates the quality of the averaged measurements. These tests are performed automatically in the SMC mode and are transparent to the user.

SMC requires a minimum of 5 measurements taken at various locations on the sample. A statistical analysis of the measurements (mean and standard deviations eliminates outliers) determines the variability of the measurements. Additional measurements may be required until a minimum of 5 outlier-free measurements are achieved, or the sample is determined too variable.

### Auto Reference - when set to “Enable”

“ ‘16Tj 0.13.2-18.24 TD/F212 T\*

**Display Angles** - allows the user to select which three angles will be seen on the display and used for pass/fail determination. Available settings are: “15°/45°/75°”, “25°/45°/75°”, “25°/45°/110°” and “15°/45°/110°.”\*

\* 15°/45°/110° viewing geometry by license from E.I. DuPont de Nemours and Co., Inc. U.S. Patent No. 4,479,718.

**Read Switch Method** - allows a measurement to be taken with a key depression when the “Menu Key” option is enabled. This configuration option is intended for use with the optional narrow nose (P/N MA58-102), which allows measurement in recessed areas.





*Setting Operation Options . . . continued*

6) Select the number of reference



## 7.3 Setting Printout Options

Setting the printout options will determine what data will be transmitted out of the RS232 port for normal and storage operation. Listed below are the available options.

**Printout Format** - determines if the measurement data is output as "Spectral Data" (400nm - 700nm in 10nm increments), or "Color Space Data" (L\*a\*b\* or L\*u\*v\*).  
**Printout separator** - determines if the data is output as a continuous stream or as a series of lines separated by a carriage return (CR) or a line feed (LF).  
**Printout header** - determines if the data is output with a header line containing the instrument name, model number, and serial number.

- 3) Press [**↑**] key #3 or [**↓**] key #4 to select Printout Options, then press [**yes**] key #2.
  
- 4) Select the printout format by pressing [**↓**] key #2 or [**↑**] key #3. The available settings are:  
    “**COLOR SPACE DATA**” or  
    “**SPECTRAL DATA.**”
  - Press [**next**] key #4 to advance to the next option.
  
- 5) Set the header printout to Enabled or Disabled. Press [**on**] key #2 to print header (enabled), or press [**off**] key #3 to disable header print.
  - Press [**next**] key #4 to advance to the next option.



## 7.4 Setting Date and Time

The date and time function allows you to adjust the instruments internal clock. Eastern Time Zone is the factory default setting.

The date and time will be printed (if “Header” is On) with each measurement when data is output to a printer. Refer below for setting procedure.

- \* If data is downloaded to the instrument from X-Rite's MetalliX-QC software program, the instrument's clock will automatically be set to the computer's time and date.

### *To set the date and time:*

1) Press **[menu]** key #1 twice to enter  
**MENU PAGE 2.**

2) Press **[cnfg]** key #3 to enter  
configuration functions.

3) Press the [

Subjects covered in Section 8 are:



## 8.2 Cleaning the Optics

The optics should be cleaned once a week in normal environments, and more often in dirty or dusty environments.

- 1) **Unplug the AC adaptor and turn the power switch Off.**
- 2) Carefully lift the instrument up and blow short bursts of clean air into the measurement aperture. This should remove any accumulated dust in the optics area.

### **WARNING:**

€ Do not invert cans that use freon as a propellant. Doing so could

## **8.3 Replacing the Battery Pack**

- 1) Unplug the AC adaptor and turn the power switch Off.**
- 2) Carefully place the instrument on it's top and remove battery access cover by sliding towards rear of unit.
- 3) Grasp plastic tab that extends from battery pack and pull until pack is removed.
- 4) Slide new (or charged) battery pack into instrument until connector is properly seated.





Subjects covered in Section 9 are:

- ☐ 9.1 Attaching SP78-200 Bar Code Reader to an Instrument
- ☐ 9.2 Scanning a Bar Code
- ☐ 9.3 Troubleshooting

The Optional SP78-200 Bar Code Reader is used to scan bar codes. When the BCR is used in conjunction with an X-Rite instrument, a scanned bar code becomes a tag for the measurement(s) taken with the instrument. When the data is uploaded into a software program (e.g., MetalliX-QC®) the bar code tag(s) become sample tag(s).

## 9.1 Attaching The SP78-200 BCR to the Instrument

Attach the BCR to the instrument's I/O Port. The instrument must be operating in the Storage mode before the BCR will operate.

### ***To attach the SP78-200 BCR:***

- 1) Insert the connector on the BCR into the I/O port of the instrument until it locks, usually indicated by an audible click. The connector inserts in one direction, (tab up) *DO NOT FORCE*. See Figure 1.
- 2) Power the instrument up, "**BAR CODE READER DETECTED**" will appear on the instrument display if the BCR is properly attached.

### ***To disconnect the SP78-200 BCR:***

- 1) Depress the tab on the connector and remove the connector from the instrument.

## 9.2 Scanning a Bar Code ---

*Follow these guidelines for successful bar code scanning.*

- 1) Turn on the X-Rite instrument. Be sure the instrument is in the Storage mode.
  - 2) Hold the BCR in your hand as you would a pencil. The BCR works best when tilted from 10° to 30°, although any angle from 5° to 45° will work. See Figure 2.
- 
- 3) Place the tip of the BCR on the white space to the left or right of the bar code. Drag the BCR smoothly and lightly across the bar code. Do not lift the tip of the BCR from the surface of the bar code. See Figure 3.
  - 4) The instrument will display the title of the bar code if the scan was successful. If the display appears blank try scanning the bar code again. If after several scanning attempts the display still appears blank, see Section 9.3, Troubleshooting.

## 9.3 Troubleshooting

The factory default mode can be restored if the SP78-200 BCR is placed into an unusable or unknown configuration.

*To restore the factory default mode:*

**Was the entire bar code scanned?**

- ☐ Drag the BCR through the entire bar code at a constant speed. Increase the scanning speed. Typically the BCR is moved too slowly.
- ☐ Be sure the BCR scans the entire bar code.
- ☐ Be sure the BCR maintained contact with the surface of the bar code.
- ☐ Be sure the bar code is not damaged, dirty or worn. Try to scan an area without these defects.

**Does the SP78-200 BCR tip need replacement?**

If the tip becomes damaged or shows signs of excessive wear, it must



**Measuring Geometries:**

45° illumination

15°, 25°, 45°, 75°, 110° off  
specular viewing

Angular accuracy  $\pm 0.2^\circ$

Fiber optic pick-up with  
multi-sensor array

**Measuring Area:**

.5 inch dia (12mm)

**Light Source:**

Gas-filled tungsten lamp, approx.  
3000°K

**Illuminant Types:**

C,







- Battery Pack Assembly

