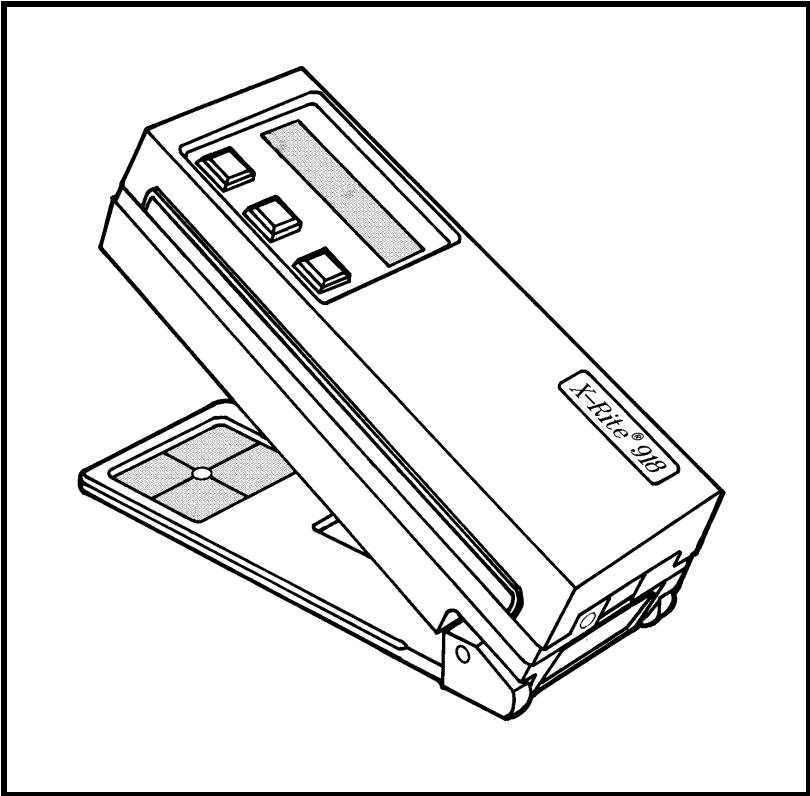


X-Rite® 918

Tristimulus Reflection Colorimeter



Operation Manual

CAUTION: Operational hazard exists if AC adaptor other than X-Rite SE30-61 (115V) or SE30-62 (230V) is used.

VORSICHT: Betriebsgefahr besteht bei Gebrauch von anderen Adaptern als X-Rite SE30-61 (115 U) oder SE30-62 (230 U).

AVISO: No use otro adaptador C.A. que no sea la pieza X-Rite SE30-61 (115V) o SE30-62 (230V), por el riesgo de mal funcionamiento del equipo.

ATTENTION: Ne pas utiliser d'adaptateur autre que SE30-61 (115V) ou SE30-62 (230V) de X-Rite au risque de mauvais fonctionnement de l'appareil.

AVVISO: Non usare un altro adattatore C.A. che non è del pezzo X-Rite SE30-61 (115V) o SE30-62 (230V), per il rischio di malfunzionamento dell'apparecchio.

WARNING: Shielded interface cables must be used in order to maintain compliance with the desired FCC and European emission requirements.

WARNUNG: Um das Produkt innerhalb von FCC (Vereinigten Staaten) und europäischen Emissionsrichtlinien zu halten, müssen geschirmte Schnittstellenkabel verwendet werden.

AVISO: Para satisfacer las deseadas regulaciones de emisión para Europa y el FCC, se debe utilizar los cables de interfaz protegidos contra las interferencias electromagnéticas.

AVERTISSEMENT: Des câbles d'interface blindés doivent être utilisés afin de se conformer aux règlements d'émission européens et de FCC (Etats-Unis).

AVVISO: Per conformare con i desiderati regolamentazioni di emissione per Europa ed il FCC, utilizzare i cavi d'interfaccia protetti contro l'interferenze elettromagnetiche.

WARNING: This instrument is not for use in explosive environment.

WARNUNG: Das Gerät soll in einer explosiven Umgebung NICHT verwendet werden.

ADVERTENCIA - NO use este aparato en los ambientes explosivos.

ATTENTION: Cet instrument NE DOIT PAS être utilisé dans un environnement explosif.

AVVERTIMENTO - NON usare questo apparecchio in ambienti esplosivi.

USE ONLY: AA NiCad batteries that are 600/700mAh rated, six required. Other types may burst causing personal injury.

VORSICHT: Verwenden Sie nur AA NiCad Akkus von 600/700mAh (Milliampere/Stunde) Nennstrom, 6 Stück erforderlich. Mit anderen Akkus besteht Explosions- und Verletzungsgefahr.

ATENCION: Use solamente las pilas de AA NiCad (se requiere seis) con condiciones normales de funcionamiento 600/700mAh (horas miliamperios). Es posible que los otros tipos puedan estallar y causar daños corporales.

ATTENTION: Utiliser seulement les batteries NiCad à courant nominal de 600mAh (milliampère/heure) (6 pièces nécessaire). Il y a danger d'explosion et de blessures avec les autres types.

ATTENZIONE: Usare solamente gli accumulatori al AA NiCad (si richiede sei) con le condizioni normali di funzionamento 600/700mAh (ore milliampere). E possibile che altri tipi possano scoppiare e causare danno personale.

FCC

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

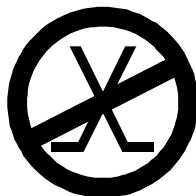
Canada

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

The Manufacturer: X-Rite, Incorporated
Der Hersteller: 3100 44th Street, S.W.
El fabricante: Grandville, Michigan 49418
Le fabricant:
Il fabbricante:

Declares that: Colorimeter
gibt bekannt: 918
advertit que:
avverte che:



is not intended to be connected to a public telecommunications network.
an ein öffentliches Telekommunikations-Netzwerk nicht angeschlossen werden soll.
no debe ser conectado a redes de telecomunicaciones públicas.
ne doit pas être relié à un réseau de télécommunications publique.
non deve essere connesso a reti di telecomunicazioni pubblici.

Dear Customer:

Congratulations! We at X-Rite, Incorporated are proud to present you with the X-Rite 918 Colorimeter. This instrument represents the very latest in microcontrollers, integrated circuits, optics, and display technology. As a result, your X-Rite 918 is a rugged and reliable instrument whose performance and design exhibit the qualities of a finely engineered instrument, which is not surpassed.

To fully appreciate and protect your investment, we suggest that you take the necessary time to read and fully understand this manual. As always, X-Rite stands behind your 918 with a full one year limited warranty and a dedicated service organization. If the need arises, please don't hesitate to call us.

Thank you for your trust and confidence.

*Ted Thompson
Chairman and CEO*

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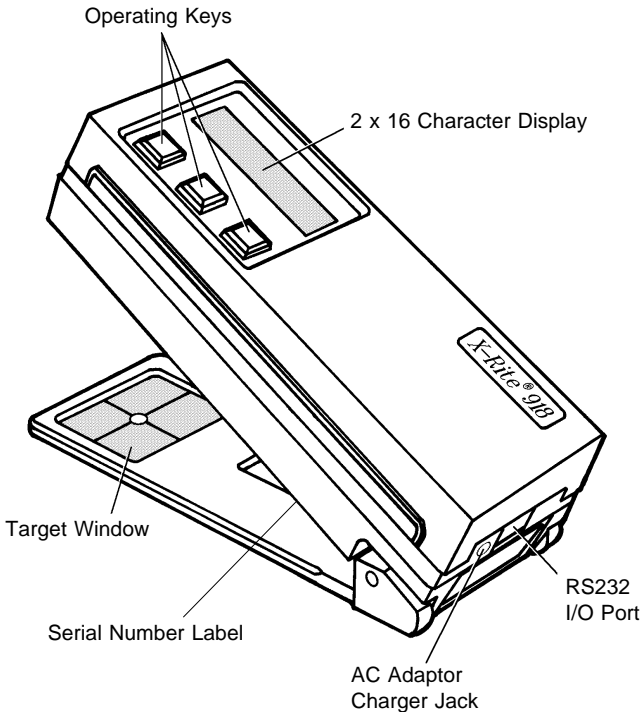
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PROPRIETARY NOTICE: The information contained in this manual is derived from patent and proprietary data of X-Rite, Incorporated. This manual has been prepared expressly for the purpose of assisting in the use and general maintenance of this instrument.

Publication of this information does not imply any rights to reproduce or use this manual for purposes other than installing, operating, or maintaining this instrument. No part of this manual may be reproduced, transcribed, transmitted, stored in a retrieval system, or translated into any language or computer language, in any form or by any means, electronic, magnetic, mechanical, optical, manual, or otherwise, without the prior written permission of an officer of X-Rite, Incorporated.

These provisions are intended to state all of the rights and responsibilities between X-Rite, Incorporated and the customer. They supersede all warranties, expressed or implied, and whether of merchantability, fitness or otherwise. The remedies contained in this manual are exclusive. Customer and X-Rite, Incorporated waive all other remedies, including but not limited to consequential damages.

This instrument is covered by one or more of the following U.S. and foreign patents:
U.S. patent #4,080,075, #4,591,978, #5,015,098 and other patents pending.



LIMITED WARRANTY: X-Rite, Incorporated warrants each unit manufactured to be free of defects in material and workmanship for a period of twelve months and excludes the lamp and nicad batteries. THERE ARE NO WARRANTIES OF MERCHANTABILITY OR FITNESS. THIS WARRANTY OBLIGATION IS LIMITED TO SERVICING THE UNIT RETURNED TO X-RITE, INCORPORATED or AN AUTHORIZED SERVICE DEALER FOR THAT PURPOSE. The unit shall be returned with transportation charges prepaid. If the fault has been caused by misuse or abnormal conditions of operations, repairs will be billed at a nominal cost. In this case, an estimate will be submitted before work is started, if requested. Always include serial number in any correspondence concerning the unit. The serial number is located on the bottom housing.

X-Rite, Incorporated offers a repair program for instruments out of warranty. For more information, contact X-Rite Technical Services Department.

This agreement shall be interpreted in accordance with the laws of the State of Michigan and jurisdiction and venue shall lie with the courts of Michigan as selected by X-Rite, Incorporated.

General Description

The X-Rite 918 is a tristimulus reflection colorimeter with spectral response functions directly proportional to the CIE color matching functions $\bar{x} \lambda$, $\bar{y} \lambda$, and $\bar{z} \lambda$. The 918 uses a 0° illumination angle and a 45° viewing angle for measuring precise areas of printed matter and other glossy surfaces. A 1.7mm, 3.4mm, or 6.8mm aperture is available.

Your 918 measures absolute color or color difference, absolute colorimetric density or density difference, and absolute index or index difference for Whiteness and Yellowness.

- XYZ or RGB & ΔXYZ or ΔRGB (CIE 1931 or RGB = X%Y%Z%)
- $> Z\%$ is one method used to measure paper brightness. Refer to Section 5.2 to activate RGB (X%Y%Z%).
- Yxy & ΔYxy (CIE 1931)
- $L^*a^*b^*$ or Lab & $\Delta L^*a^*b^*$ or Lab (CIE 1976 or HUNTER)
- $L^*u^*v^*$ & $\Delta L^*u^*v^*$ (CIE 1976)
- $L^*C^*h^\circ$ & $\Delta L^*C^*H^*$ (CIE 1976, ab or uv)
- Colorimetric Density & Δ Colorimetric Density
- Whiteness & Tint & Δ Whiteness & Tint (CIE & ASTM E313)
- Yellowness & Δ Yellowness (ASTM E313 & ASTM D1925)

The 918 has three different CIE Illuminants for calculations under varying lighting conditions. In addition, you can select the CIE 1931 2° Observer or the CIE 1964 10° Observer.

- Illuminant C, 2° observer (C^2) & Illuminant C, 10° observer (C^{10})
- Illuminant D_{65} , 2° observer (D_{65}^2) & Illuminant D_{65} , 10° observer (D_{65}^{10})
- Illuminant D_{50} , 2° observer (D_{50}^2) & Illuminant D_{50} , 10° observer (D_{50}^{10})

To assure better correlation there are separate calibration locations for each illuminant/observer combination.

Twenty four different reference values (Ref 01 - Ref 24) can be entered into the 918 manually (numerically) or by measuring a reference sample. The exceptions are that the reference values for $\Delta L^*C^*h^\circ$, Δ Whiteness, and Δ Yellowness can only be entered by measurement. During reference entry all color spaces are automatically updated when a change has been made in one of them.



The store data feature allows the unit to store up to two thousand measurements for transferring to a printer or computer (via RS232) at a later time.

The averaging feature allows the unit to make several measurements from the same and/or different locations on a sample or reference. This will allow for a better overall average of a color.

You can also enter in twenty four different hitching posts (Hit 01 - Hit 24). Hitching posts allow the colorimeter to be adjusted to measure a sample the same as a different colorimeter or spectrophotometer.

The 918 functions best as a color difference meter. By entering in your reference (by measurement or numerically), the 918 will indicate the amount of difference between the reference and the measured sample.

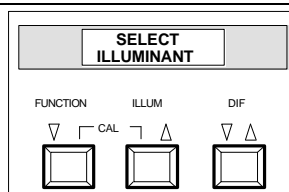
The colorimeter is powered by six AA rechargeable batteries, or by the AC adaptor/charger provided. Additionally, the unit retains calibration and reference values when the unit turns off, or if the Ni-Cad batteries are discharged.

User Interface

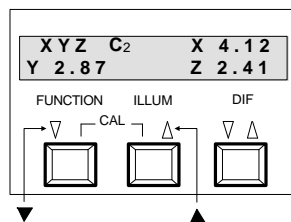
This section will familiarize you with the typographical conventions, display functions, and general terms used in this manual.

- In the text portion of this manual the 918 keys are shown with brackets on both sides and in boldface. Ex., **[FUNCTION]**, **[ILLUM]**, and **[DIF]**.
- When a key is to be momentarily pressed, the statement "press" will be used. Ex., Press **[FUNCTION]**.
- When a key is to be held depressed until another action occurs, the statement "hold down" will be used. Ex., Hold down **[ILLUM]** until **"SELECT ILLUMINANT"** is displayed.

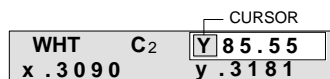
- Information that will appear in the display window will be shown with quotation marks on each side and in boldface. Ex., **"SELECT ILLUMINANT"**



- The symbols ▼ and ▲ represent the blue and red arrows on the 918. In calibration and reference value entry the arrows indicate which direction a value can be changed. Holding **[DIF]** depressed and pressing **[▼]** decreases the value and **[▲]** increases the value.



- The term "cursor" represents a black rectangle that will blink next to or over a value or function in the display. In most cases it means that value is active and can be altered via the **[▼]** and **[▲]** keys.



- A "hand" indicates important notes and possible operations that need to be performed before the normal operation.



- When a procedure is continued on the next page an arrow will appear in the bottom right hand corner of the page.



- Illuminant/observers combinations are expressed by special notations (Ex., D_{65}^2 indicates illuminant D, 6500°k, and 2° observer).
- You can exit Calibration or System Setup without making any changes by pressing **[FUNCTION]** and **[ILLUM]** at the same time

What To Do First!



See how to unlock the shoe, charge the batteries, and adjust the display angle...read *Section 1 - Getting Started*.



See how the positioning of the colorimeter during measurement effects the reading...read *Section 2 - Positioning Techniques*.



Calibrate your colorimeter...read *Section 4 - Calibration*.



Setup your colorimeter. You can set the operating parameters, RS232 parameters, and format output parameters of your unit. Remember, you can lock out of the display any function you do not want to use...read *Section 5 - Setting System Parameters*.



Learn the basic functions of your colorimeter...read *Section 3 - Operation*.

1.

Getting Started

1.1

Packaging Check List

After removing the instrument from the shipping carton, inspect for possible damage. If any damage is noted, contact the transportation company immediately. Do nothing more until the carrier's agent has inspected the damage.

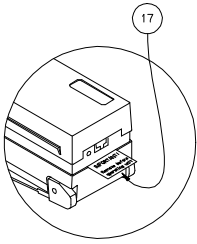
If damage is not evident, check and make sure that all items are included (Refer to the parts list below, and following page for the packaging illustration).

The X-Rite 918 was packaged in a specially designed carton to assure against damage. If reshipment is necessary, the instrument should be packaged in the original carton. If the original carton is not available, a new one can be obtained from X-Rite Inc. Refer to the packaging drawing on the following page (items 1, and 2).

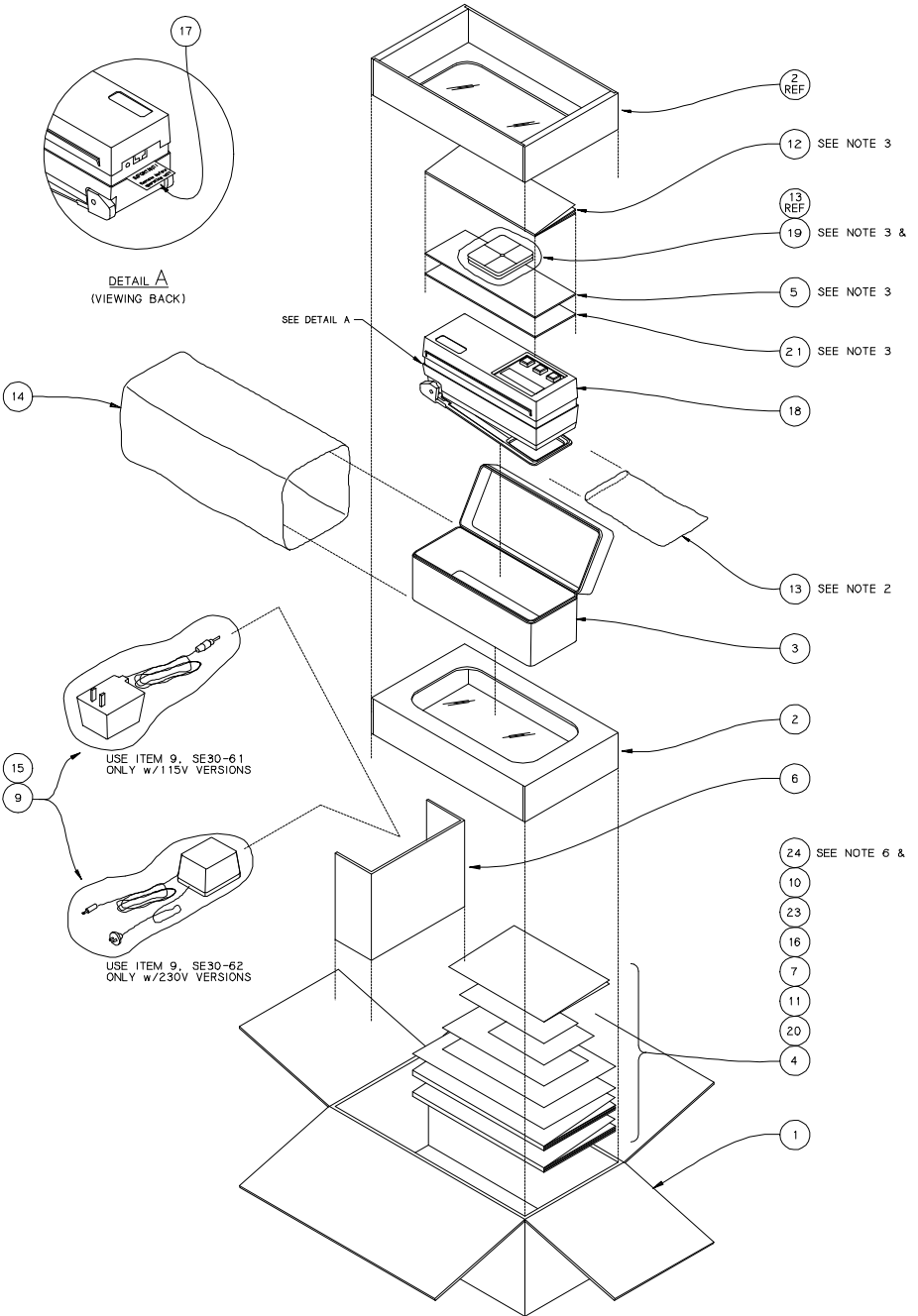
25	-	-	-	-	-	-	NOT USED	
24	1	1	1	1	1	1	SD01-41	CERTIFICATE OF CALIBRATION
23	1	-	1	-	1	-	SD01-30	FLAT RATE POLICY BROCHURE
22	-	-	-	-	-	-	NOT USED	
21	1	1	1	1	1	1	SD01-16	918 POSITIONING NOTICE
20	1	1	1	1	1	1	918-506	SERIAL INTERFACE MANUAL
19	-	-	-	-	3	3	418-21-068	TARGET WINDOW
	-	-	3	3	-	-	418-21-017	TARGET WINDOW
	3	3	-	-	-	-	418-21-034	TARGET WINDOW
18	1	1	1	1	1	1	SEE CHT (MOD/RESP)	STANDARD OBSERVER ASSEMBLY
17	1	1	1	1	1	1	SD200-418-08	BATTERY ISOLATION NOTICE
16	1	1	1	1	1	1	SD01-14	IMPORTANT NOTICE "AC ADAPTOR"
15	1	1	1	1	1	1	SD65-13	PLASTIC BAG
14	1	1	1	1	1	1	SD65-10	PLASTIC BAG
13	2	2	2	2	2	2	SD65-03	PLASTIC BAG
12	1	1	1	1	1	1	918-505	REFERENCE GUIDE
11	1	1	1	1	1	1	SD01-11	CHARGING NOTE
10	1	1	1	1	1	1	SD01-10	IMPORTANT NOTICE - SERVICE
9	-	1	-	1	-	1	SE30-62	BATTERY CHARGER, 230V
	1	-	1	-	1	-	SE30-61	BATTERY CHARGER, 115V
8	-	-	-	-	-	-	NOT USED	
7	1	1	1	1	1	1	SD01-04	WARRANTY REGISTRATION
6	1	1	1	1	1	1	SD200-418-11	CARTON INSERT
5	1	1	1	1	1	1	918F-62	COLOR REFLECTION REFERENCE
4	1	1	1	1	1	1	918-500	OPERATION MANUAL
3	1	1	1	1	1	1	418-67-01	CARRYING CASE
2	2	2	2	2	2	2	SD200-418-10	CARTON INSERT
1	1	1	1	1	1	1	SD200-308-02	CARTON

ITEM	QTY 918F	QTY 918FX	QTY 918FS	QTY 918FSX	QTY 918FL	QTY 918FLX	PART NUMBER	DESCRIPTION
PARTS LIST								

UNPACKING



DETAIL A
(VIEWING BACK)



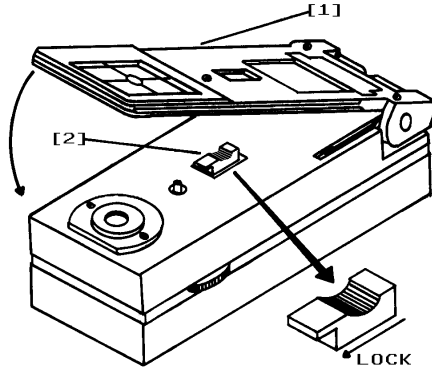
The 918 shoe can be locked next to the 918 housing for ease of storage.

Unlocking Shoe

1. Hold shoe [1] against unit.
2. Slide black lock button [2] on bottom of unit towards the back until it stops, then slowly release shoe [1].

Locking Shoe

1. Hold shoe [1] against unit.
2. Slide black lock button [2] towards the front until it stops, then release shoe [1].

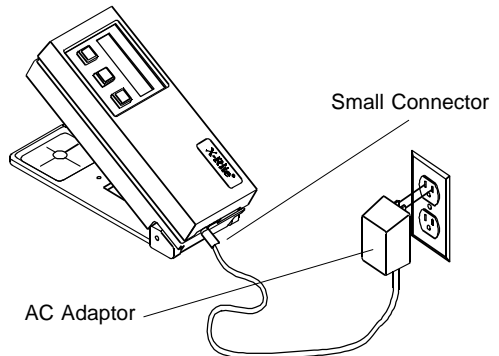


NOTE: THE 918 SHOULD BE CHARGED BEFORE USE. The unit can be operated while the batteries are being charged.

Before using:

- Remove the battery isolation insert protruding from the battery cover.
- Make sure the voltage indicated on the AC adaptor complies with the AC line voltage in your area. If not contact your X-Rite dealer.

1. Plug the small connector end of the adaptor into back of 918.
2. Plug AC adaptor into the wall outlet.
3. Unit should be fully charged in 14 hours.



Notes:

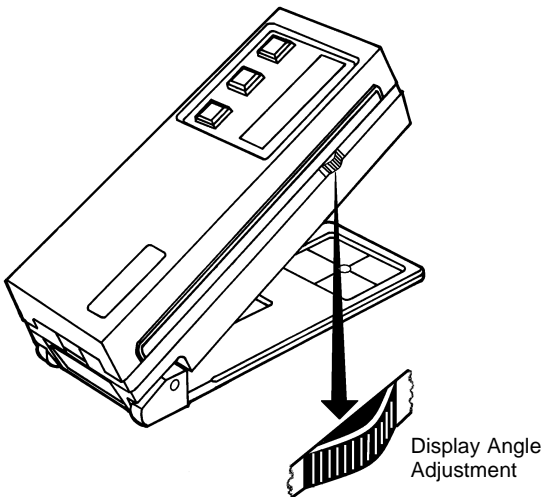
- If your unit has not been used for several weeks recharge for approximately 24 hours.
- When storing the unit for a long period of time, the batteries should be removed.

1.4 Applying Power and Display Angle Adjustment

1. Power is applied automatically when a measurement is taken or if a key is pressed. It automatically shuts off (within 45 seconds) if no keys are pressed or no further measurements are taken. The unit will not automatically shut off if the AC adaptor is connected.
2. Set the Display Angle Adjustment to a midway setting.

-Activate the display by pressing any key.

-Adjust the display angle until the data in the display can best be seen at your line of sight.



> This unit retains calibration, reference values, and all other data when the unit turns off after 45 seconds of non-use (in battery operation), or if the Ni-Cad batteries are discharged.

2.

Positioning Techniques

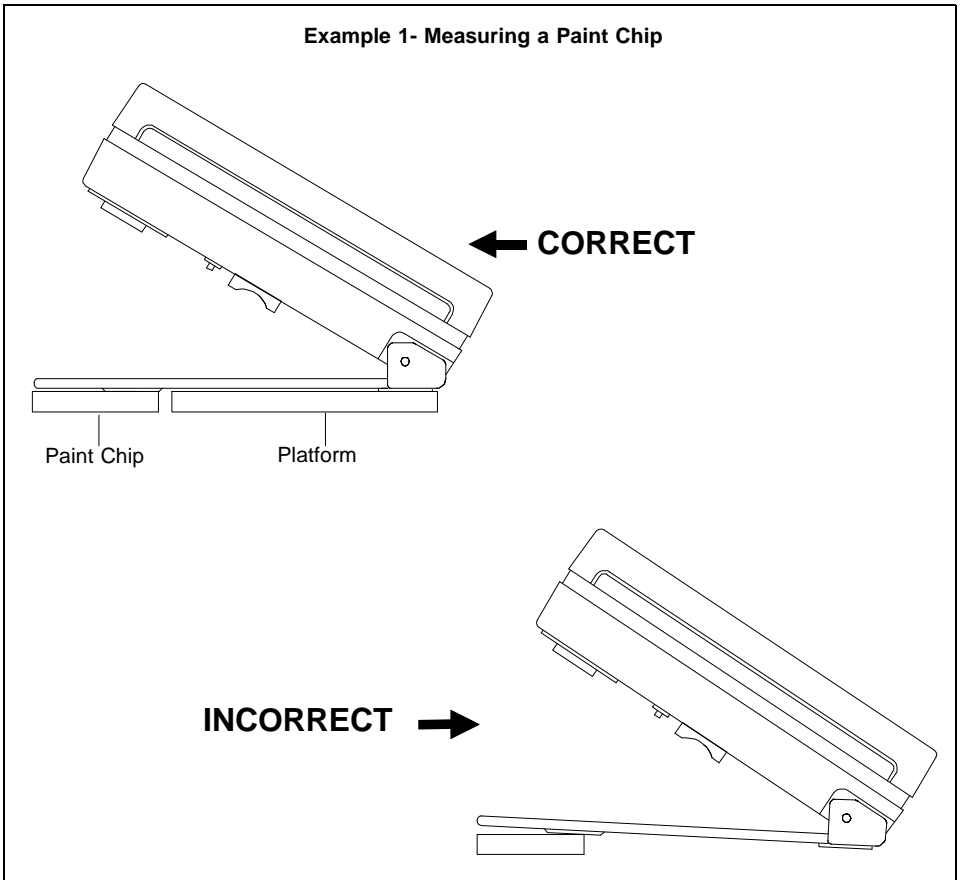
The variety of items that the 918 can provide colorimetric measurements for is almost endless. However, in order to obtain accurate and repeatable measurements, the bottom of the 918 shoe must be:

- *Parallel* with the surface to be measured if the surface is *flat*.
- *Tangent* to the surface to be measured if the surface is *curved*.

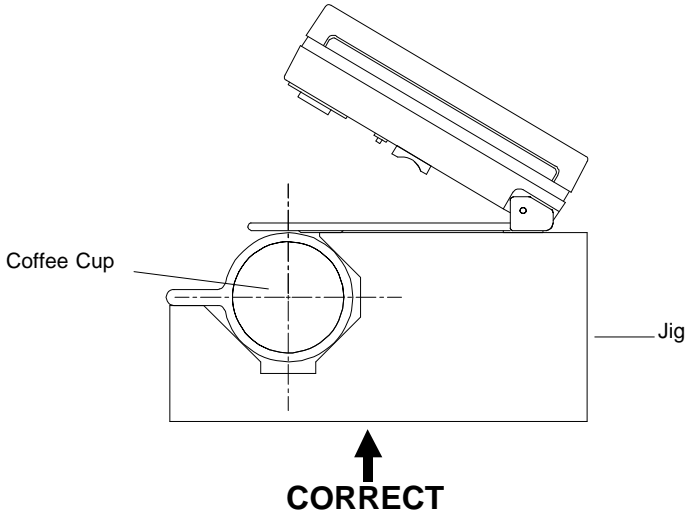
The reason for this is that any movement during measurement can cause the reading to vary as much as $1\Delta E$ or more. Now the question arises, "How can I accomplish this?" There are different answers for different cases.

If the item to be measured is smaller than the 918 shoe, you may want to make a platform (the same height of the item) for the 918 to sit on. If the item to measure is curved, you may want to make a jig for the item to rest in.

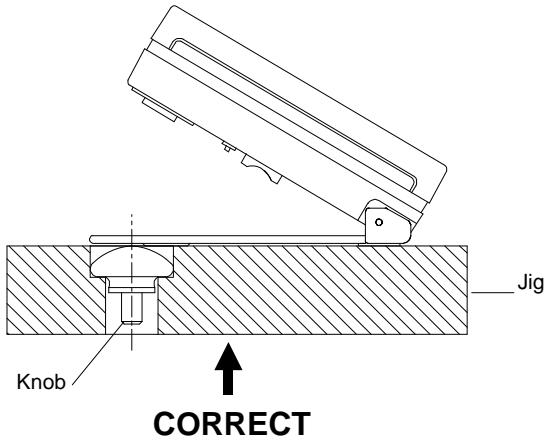
Shown below are some examples of methods to accomplish this. Example 1 shows a platform for measuring a paint chip. Example 2 shows a jig being used to measure a coffee cup. Example 3 shows a jig being used for measuring a small knob.



Example 2 - Measuring a Coffee Cup

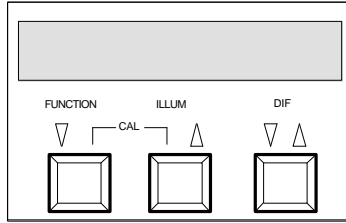


Example 3 - Measuring a Small Knob



3.1

Key Descriptions

**[FUNCTION]/[▼]**See Section

- Selects the function that will be used for measurement. Each momentary depression will cause the display to page through CIE XYZ, Yxy, L*a*b*, L*u*v*, L*C*h°, Density, Whiteness, & Yellowness. 3.2
- Decreases numeric values when used with the **[DIF]** key during entry of reference or calibration values. 4.0
- Selects Calibration when pressed with **[ILLUM]** key. 4.0
- Selects various steps when in system setup procedures. 5.0

[ILLUM]/[▲]

- When held depressed activates illuminant/observer selection, thereafter, momentary depressions select the illum/obs to be used. The available illuminants are: 3.3
- C² & C¹⁰
D65² & D65¹⁰
D50² & D50¹⁰

- Increases numeric values when used with **[DIF]** key during entry of reference or calibration values. 4.0
- Displays the reference or hitch number when pressed momentarily. 3.5
- Selects Calibrate when pressed with the **[FUNCTION]** key. 4.0

[DIF]/[▼▲]

- When at function level, toggles Delta (Δ) On and Off with each depression. Delta being the difference mode. 3.5
- Decreases reference or calibration values when used with the **[FUNCTION]** key. 4.0
- Increases numeric values when used with the **[ILLUM]** key. 4.0

Each momentary depression of [FUNCTION] will sequentially page through the available functions: CIE XYZ (or RGB), Yxy, L*a*b* (or Lab Hunter), L*u*v*, ^a_bL*C*h° (or ^u_vL*Ch°), Density, Whiteness, & Yellowness.

If Δ is active the following is displayed

YEL C² Y_e+33.56
Y_d+87.97

ΔYEL C² Y_e+33.56
Y_d+87.97

WHT C² W_e-1.37
W 97.87 T -115.8

ΔWHT C² W_e-1.37
W+97.87 T -115.8

DEN C² DX 1.266
Y 1.046 Z 1.478

ΔDEN C² DX+1.266
Y+1.046 Z+1.478

^u_vL*Ch°
OR ↑
^a_bL*Ch° C² L' 23.45
C' 20.78 h° 25.79

ΔL*CH° C² L'+ 23.45
C'+ 20.78 H+25.79

L'u'v' C² L' 12.33
u'+22.46 v'+6.89

ΔL'u'v' C² L'+12.33
u'+22.46 v'+6.89

(Hunter)
Lab
OR ↑
L*a*b' C² L' 23.48
a'+18.59 b'+8.75

(Hunter)
ΔLab
OR ↑
ΔL*a*b' C² L'+23.48
a'+18.59 b'+8.75

Yxy C² Y 3.24
x .2678 y .3598

ΔYxy C² Y+3.24
x+.2678 y+.3598

RGB

ΔRGB

OR ↑
XYZ C² X 4.12
Y 2.87 Z 2.41

OR ↑
ΔXYZ C² X+4.12
Y+2.87 Z+2.41

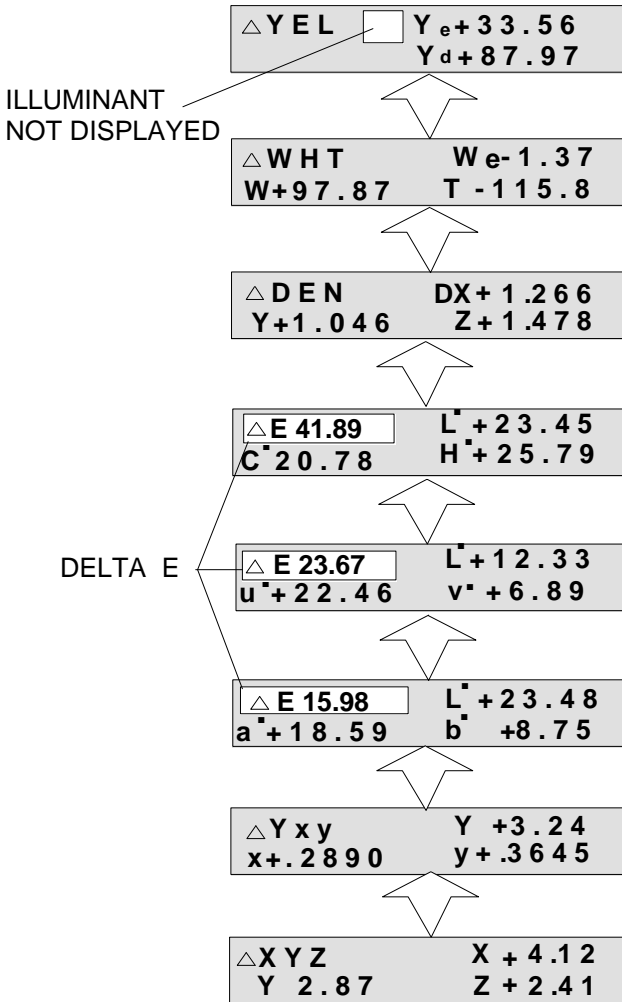
FUNCTION ILLUM DIF
▽ ▽ CAL ▽ ▽

PRESS TO SELECT THE NEXT FUNCTION



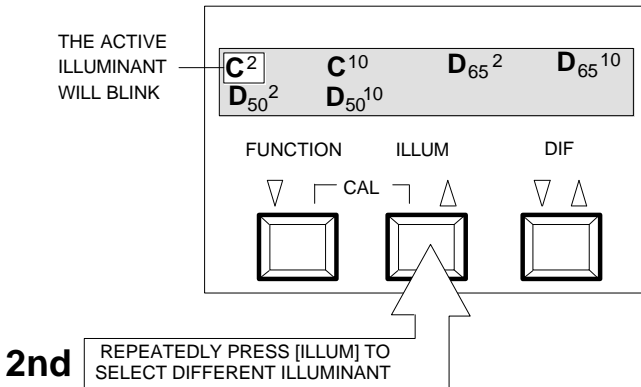
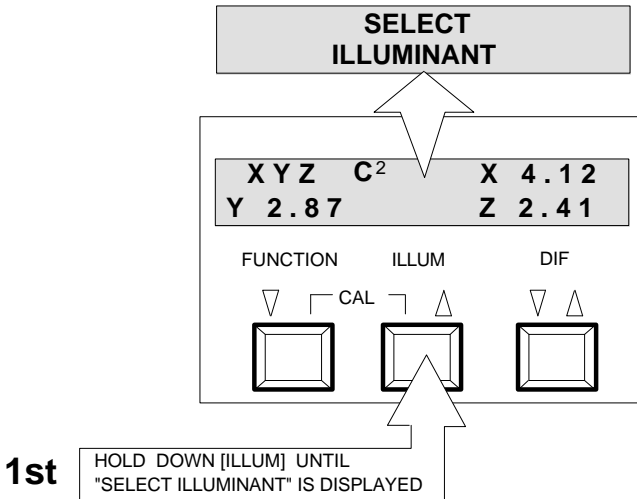
> The illuminant/observer will not be displayed in the difference mode during operation of that function. It is only displayed during function selection.

> ΔE will be displayed in place of $\Delta L^*a^*b^*$, $\Delta L^*u^*v^*$, and $\Delta L^*C^*H^*$ during difference



To enable illuminant selection: Hold down [ILLUM] until "SELECT ILLUMINANT" is displayed. The active illuminant will blink, thereafter, each depression of [ILLUM] will cause the next illuminant to blink.

Continue pressing [ILLUM] until the desired illuminant blinks. To exit illuminant selection, wait until the unit automatically returns to normal operation (approx. 5sec.), or press [FUNCTION] or [DIF] to return to main menu.



3rd AFTER SELECTING THE DESIRED ILLUMINANT, WAIT APPROXIMATELY 5 SECONDS FOR THE UNIT TO RETURN BACK TO THE MAIN MENU.



> The 918 will display "NEED CALIBRATION" if the selected illuminant/observer has not been calibrated.

3.4

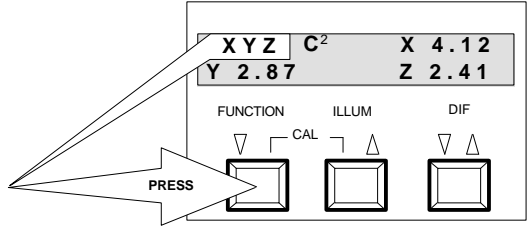
Absolute Measurements

The 918 can perform absolute measurements in XYZ (RGB), Y_{xy} , $L^*a^*b^*$ (Lab), $L^*u^*v^*$, $L^*C^*h^\circ$, Density, Whiteness, & Yellowness.

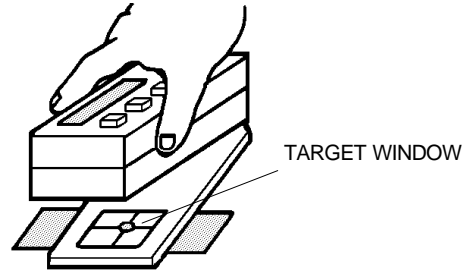


- > If the Δ is displayed, press [DIF] to activate absolute mode.
- > If the desired illuminant is not displayed refer to Section 3.3.

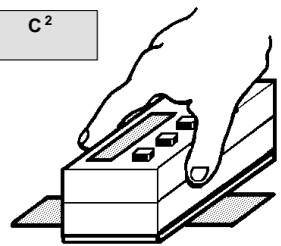
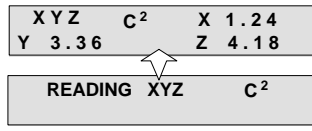
- 1) Press **[FUNCTION]** to select desired measurement space.



- 2) Center the target window over the area to be measured

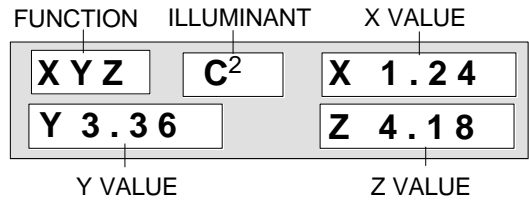


- 3) Lower unit to target window and hold compressed. "READING XYZ C²" (i.e., the selected function & the illum/obs) will momentarily be displayed, and then the data.



Release unit after data is displayed.

- 4) The display will show the absolute values for XYZ.



The 918 can measure the difference between a sample color and a reference. In order to measure these differences the reference must first be entered into memory. There are 24 different locations to store references.

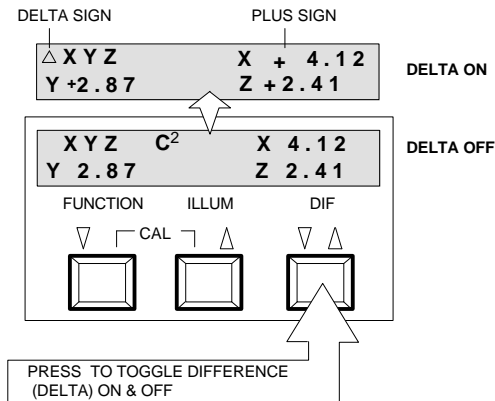
The reference can be entered numerically using keys, or by measuring the reference color. Note, the reference color can only be entered by measurement in $\Delta L^*C^*H^*$, Δ Whiteness, and Δ Yellowness functions.

The 918 can be set to operate in an automatic mode, where it will automatically select the closest reference; or in manual mode, where you have to manually select the reference locations you want to use. Refer to Section 5.2, Setting Operation Parameters for information on selecting manual or automatic operation.

In automatic mode, the 918 will select the reference that is closest to the measured color. If by some chance it is not the correct reference, simply press the [ILLUM] key twice and the unit will select the next closest reference.

In manual mode, you must manually select the reference. Once you have selected a reference, that reference will be used until you select a different reference.

- To activate the Difference mode, press [DIF] and the Δ sign will appear in the display. You will also notice that the Δ Functions will have a "+" sign in front of them for positive values instead of being implied as in the absolute function.



> $\Delta L^*a^*b^*$, $\Delta L^*u^*v^*$, & $\Delta L^*C^*H^*$ show ΔE in function location.



Note: You can set reference locations 2 thru 24 to OFF by:

- Activating difference mode.
- Hold down [DIF] until reference entry is activated.
- Hold down [DIF] and then simultaneously press [ILLUM] and [FUNCTION].

Note: Reference number 1 will always remain ON.

Refer to Steps 1 and 2 on the following page.

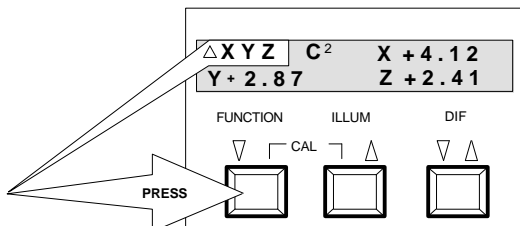
Entry of Reference Values

By Measurement



> If Δ is not displayed, press [DIF] to activate Difference mode.

- 1) Press [FUNCTION] to select desired measurement space.

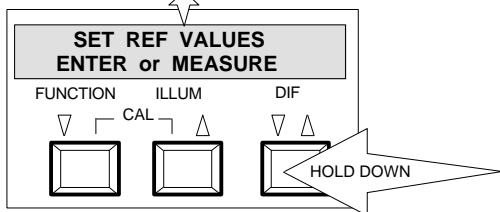
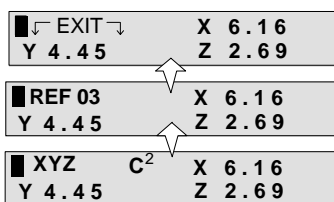


- 2) Hold down [DIF] until "SET REF VALUES - ENTER or MEASURE" is displayed.

The unit will first display the previous entered reference values for the last selected reference location.

The reference location is momentarily displayed.

Then "EXIT" is displayed.

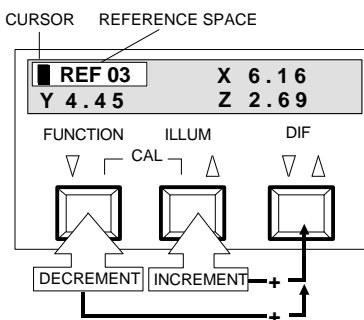


> You can set all 24 reference locations to OFF by: Holding down [DIF] and then simultaneously pressing [ILLUM] and [FUNCTION].

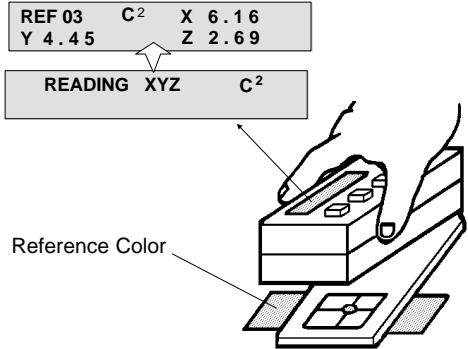
- 3) Select the reference location.

If the cursor is not blinking next to the reference location, press [DIF] until it does.

Hold down [DIF] and press [▼] to decrement thru the reference locations or press [▲] to increment.



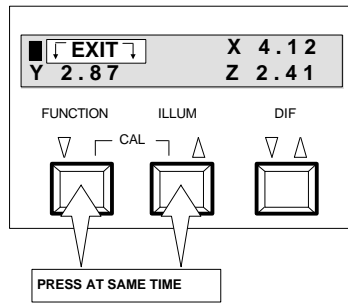
4) Measure the reference color.



5) Press [FUNCTION] and [ILLUM] at the same time to exit to the main menu.

"REFERENCES UPDATED" is momentarily displayed and the procedure is finalized.

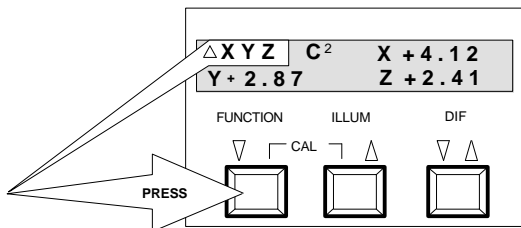
If no measurement or entry is made the unit will display "REFERENCES - NOT UPDATED".





- > If Δ is not displayed, momentarily press [DIF] to activate Difference mode
- > L*C*H*, Whiteness, & Yellowness reference values can not be entered via the keyboard.

- 1) Press [FUNCTION] to select desired measurement space.

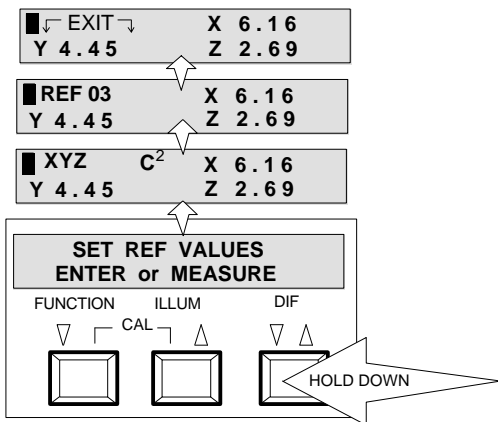


- 2) Hold down [DIF] until "SET REF VALUES - ENTER or MEASURE" is displayed.

The unit will first display the previous entered reference values for the last selected reference location.

The reference location is momentarily displayed.

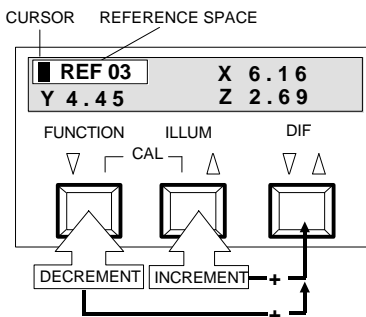
Then "EXIT" is displayed.



- 3) Select the reference location.

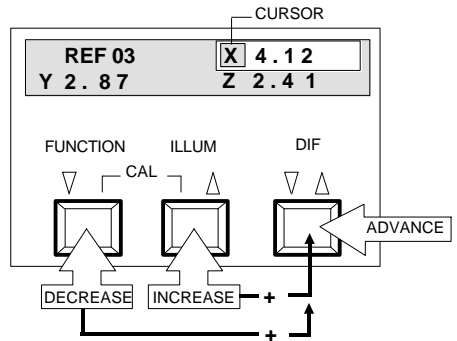
If the cursor is not blinking next to the reference location, press [DIF] until it does.

Hold down [DIF] and press [▼] to decrement thru the reference locations or press [▲] to increment.



4) The cursor will blink over the active value that can be edited. Enter the numbers for each value.

- The [DIF] key advances the cursor to the next value to be edited.
- The [DIF] key is used in conjunction with [▼] to decrease and [▲] to increase the value. Note: Hold [DIF] depressed then press either [▼] or [▲] to change value.

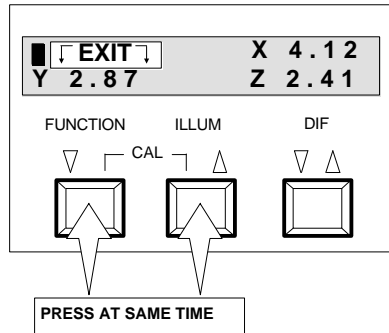


4) Press [FUNCTION] and [ILLUM] at the same time to exit to the main menu.

"REFERENCES UPDATED" is momentarily displayed and the procedure is finalized.



> If no measurement or entry is made the unit will display "REFERENCES - NOT UPDATED".

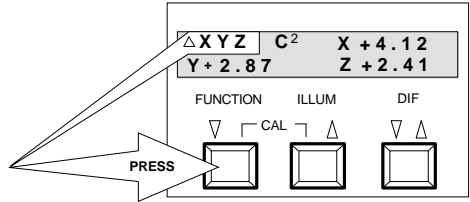


3.5.2 Taking A Difference Measurement

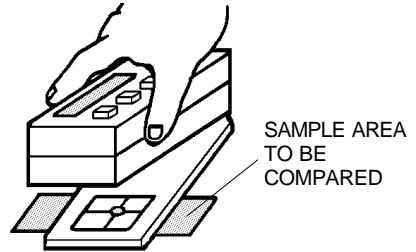


- > The reference color must first be entered into memory, refer to Section 3.5.1.
- > If the Δ is not displayed, press [DIF] to activate difference mode.
- > If manual reference selection is activated, select the correct reference location before following the procedure below (refer to Section 3.5.1).
- > If the desired illuminant is not displayed refer to Section 3.3.

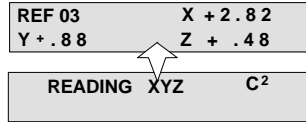
- 1) Press **[FUNCTION]** to select desired measurement space.



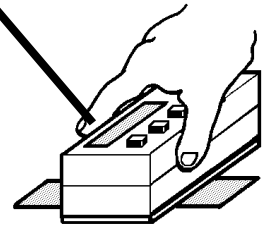
- 2) Center target window over area to be compared.



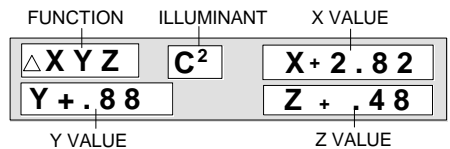
- 3) Lower unit to target window and hold compressed. **"READING XYZ C²"** (i.e., the selected function and illum/obs) will momentarily be displayed, and then the Reference location and data.



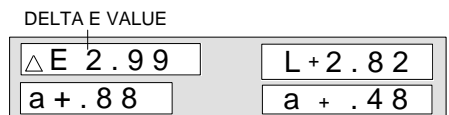
Release unit after data is displayed.



- 4) The display will show the difference between the reference color and the area measured.



OR



- > If L*a*b*, L*u*v*, or L*C*H* are selected, ΔE value will be displayed in place of the Function & Illuminant.
- > If you want to display the selected reference space, press **[ILLUM]**.

3.6

Averaging Measurement Procedure

When averaging is activated in setup, averaging operation will occur on absolute measurements, reference entry measurements, and difference measurements.

There are two averaging methods that are used together (see Sec. 5.1 for program details):

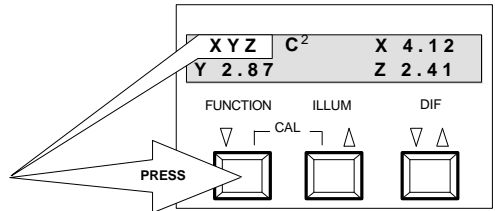
- **SAMPLES AVERAGED** - allows you to enter the number of measurements you will make (1-99) at various locations on a sample, to obtain an average value.
- **SUB AVERAGE** - allows you to enter the number of measurements the unit will take (1-6) on a sample at a stationary location, to obtain an average value.



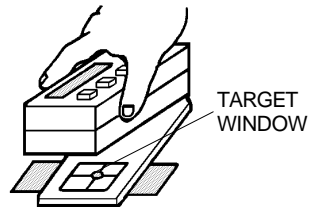
> When average and sub average are set to one, no averaging is performed and no averaging messages will be displayed.

The following example was taken in the absolute measurement mode using: XYZ function, two sub averages, and two measurement averages.

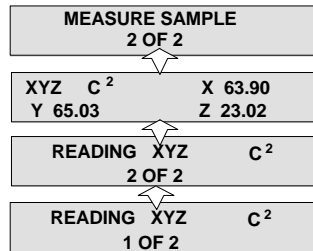
- 1) Press **[FUNCTION]** to select XYZ measurement space.



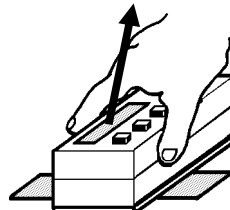
- 2) Center the target window over first area on the sample to be measured.



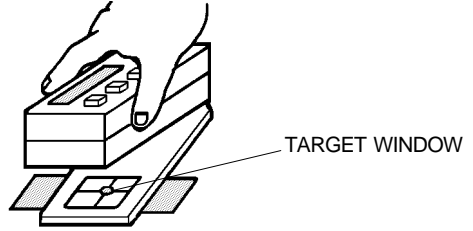
- 3) Lower unit to target window and hold compressed. "READING XYZ C² 1 OF 2", "2 OF 2", and the data is display.



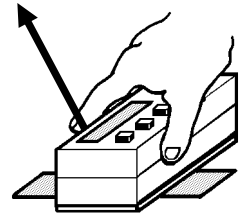
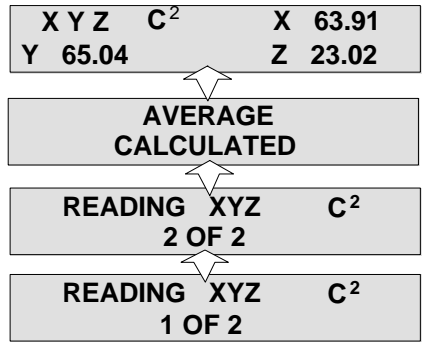
After releasing the read head, "MEASURE SAMPLE 2 OF 2" is displayed.



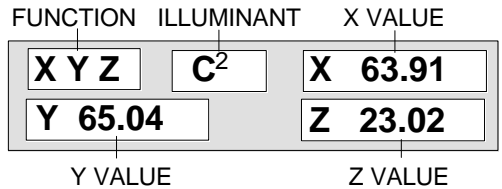
- 4) Center the target window over second area on the sample to measure.



- 5) Lower unit to target window and hold compressed. "READING XYZ C² 1 OF 2" and "2 OF 2" will momentarily be displayed, and then the averaged data.



- 6) The display will show the average absolute values for XYZ.



- > Do not jar or lift reading head during sub averaging measurements.
- > Refer to Section 5.1 averaging setup procedure.
- > When averaging is activated, this basic procedure must also be followed during reference measurements and difference measurements.

The data storage feature allows the unit to store measurement data for up to 2000 readings. (Refer to Sec. 5.4 to activate.)

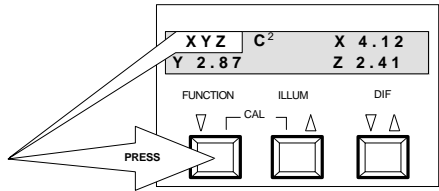
There are three basic operations of the store data function that can occur after measurements are stored.

- **Send data** - allows all of the stored data to be transferred to a computer or serial printer. Data is sent as determined by the function displayed and modes enabled.
- **Delete last** - allows only the last measurement data to be deleted from stored memory.
- **Clear all** - causes all of the measured data in stored memory to be deleted.

The following sample (made in XYZ absolute) illustrates the different functions of the data storage feature.

MEASUREMENT

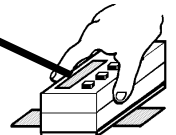
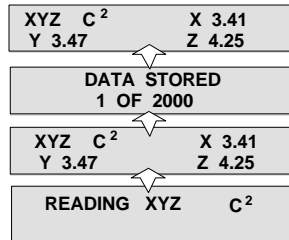
- 1) Press **[FUNCTION]** to select XYZ measurement space.



- 2) Measure first sample.

"READING XYZ C²" is momentarily displayed, then the measurement.

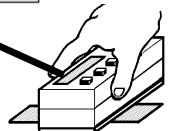
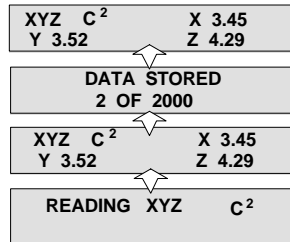
Upon release of the read head, "DATA STORED 1 OF 2000" and then the measurement is displayed.



- 3) Measure second sample.

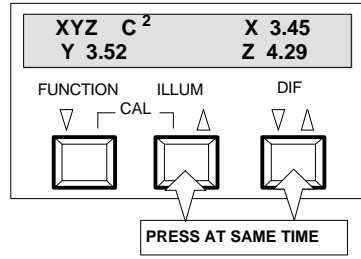
"READING XYZ C²" is momentarily displayed, then the measurement.

Upon release of the read head, "DATA STORED 2 OF 2000" and then the measurement is displayed.



SEND DATA

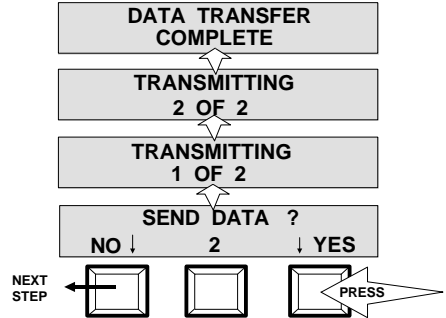
- 4) Press both **[ILLUM]** and **[DIF]** at the same time.



- 5) Press **[DIF]** to transfer data.
If "NO" is selected, press **[FUNCTION]** and advance to Step 6.

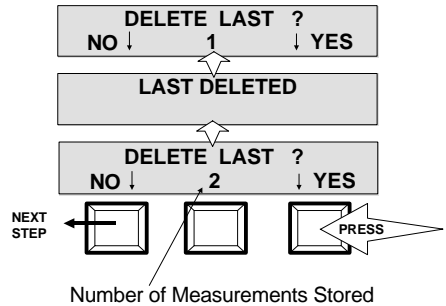
Sample Printout

XYZ	C_2	#0001			
X	3.41	Y	3.47	Z	4.25
XYZ	C_2	#0002			
X	3.45	Y	3.52	Z	4.29



DELETE LAST MEASUREMENT

- 6) Press **[DIF]** to delete the last measurement made (this step can be repeated to delete several of the last measurements).
If "NO" is selected, press **[FUNCTION]** and advance to Step 7.

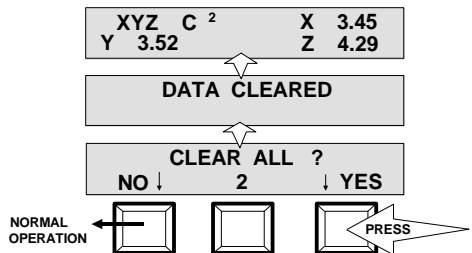


CLEAR ALL DATA

- 7) Press **[DIF]** to clear all stored measurement data taken.
If "NO" is selected, press **[FUNCTION]** to return to normal operation.



- > The Send/Clear data function may be entered at any time by pressing **[FUNCTION]** and **[ILLUM]** at the same time.
- > Refer to Section 5.4 to activate the store data function.
- > "STORAGE FULL" will display on all measurements after 2000 stored measurements has been reached.



Hitching Post allows you to enter in a specific set of color values for a color. Then each time you measure that specific color, the 918 will enter in the calculated correction factors. This is useful when a color sample has been supplied with an assigned set of colorimetric values, and you want the 918 to give you the same measured results.



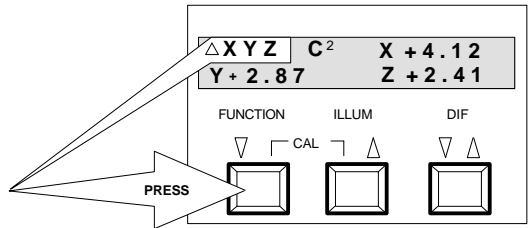
> **Hitching Post Operation is not activated as sent from the factory. Before using Hitching Post operation you must activate it, refer to Section 5.2 (Setting Operation Parameters).**

- > If the Δ is not displayed, press [DIF] to activate difference mode.
- > If the desired illuminant is not displayed refer to Section 3.3.

Hitching Post is part of the reference entry procedure. You first activate Difference mode, select the Reference location, activate Hitching Post, measure the Hitching Post color, and then enter the Hitching Post values.

Entering a Hitching Post

- 1) Press [FUNCTION] to select desired measurement space.

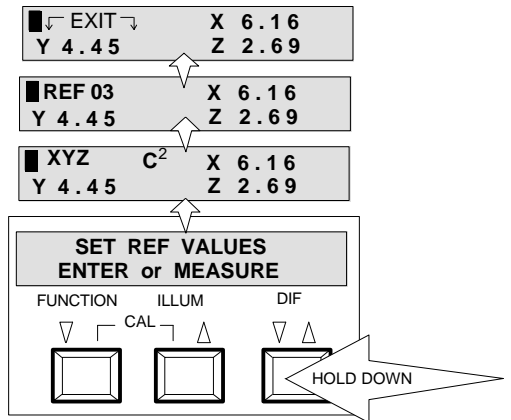


- 2) Hold down [DIF] until "SET REF VALUES - ENTER or MEASURE" is displayed.

The unit will first display the previous entered reference values for the last selected reference location.

The reference location is momentarily displayed.

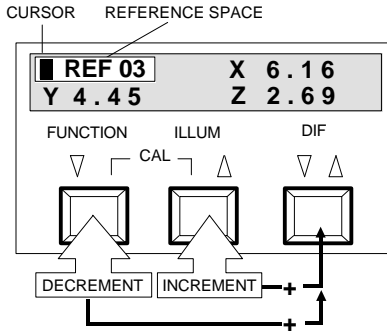
Then "EXIT" is displayed.



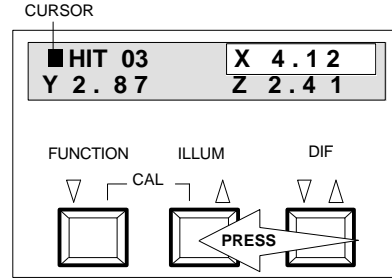
3) Select the Reference location.

If the cursor is not blinking next to the reference location, press [DIF] until it does.

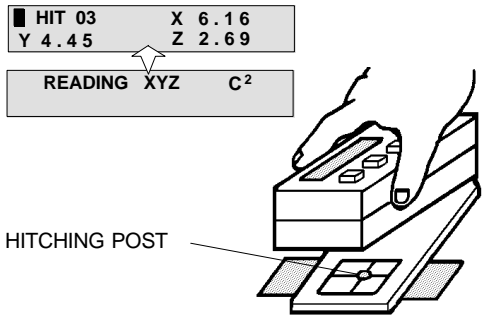
Hold down [DIF] and press [▼] to decrement thru the reference locations or press [▲] to increment.



4) Activate Hitching Post, repeatedly press [ILLUM] until "HIT" is displayed.

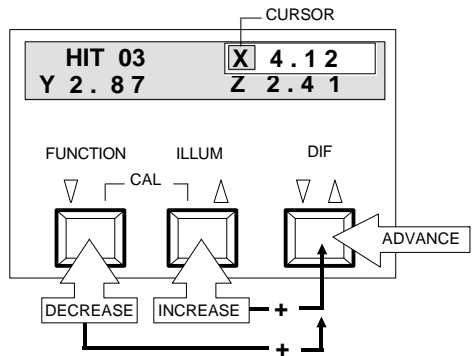


5) Measure the Hitching Post color then release the unit after data is displayed.



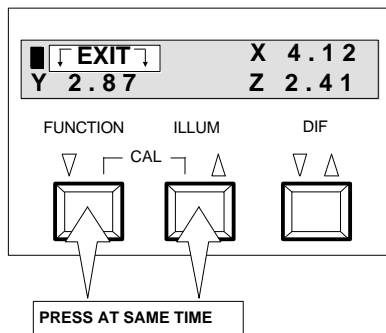
6) Enter in the Hitching Post values. The cursor will blink over the active value that can be edited. Enter the numbers for each value.

- The [DIF] key advances the cursor to the next value to be edited.
- The [DIF] key is used in conjunction with [▼] to decrease and [▲] to increase the value. Note: Hold [DIF] depressed then press either [▼] or [▲] to change value.



- 7) Press **[FUNCTION]** and **[ILLUM]** at the same time to exit to the main menu.

"REFERENCES UPDATED" is momentarily displayed and the procedure is finalized.



Hitching Post Measurement

The procedure for measuring with a Hitching Post is the same as the reference function (refer to Section 3.5.2). The *manual/automatic* operating mode is also the same as reference operation. The only difference is that you select **"HIT"** instead of **"REF"**.

The 918 Reference Guide (P/N 918-505), Section 5.2 illustrates taking a Hitching post measurement.

Power-Up Messages

"CLEAR MEMORY? - NO ↓ ↓ YES " is displayed if the Read button and **[ILLUM]** key are pressed during power up. This procedure allows the user to totally clear the units memory.

"MEMORY CLEARED" is displayed if the user selects YES to the "CLEAR MEMORY? - NO ↓ ↓ YES" display message.

"MEMORY NOT CLEARED" is displayed if the user selects NO to the "CLEAR MEMORY? - NO ↓ ↓ YES " display message.

"MEMORY LOST" is displayed when the 918 determines that the data in the (battery backed up) RAM has been corrupted, if the internal lithium battery on the P.C.B. is bad, or if a new EPROM has been installed.

Operational Messages

"C² ONLY FOR - YELLOWNESS" is displayed when trying to select an illuminant other than C² for Yellowness.

"INVALID READING" is displayed when the unit is not held down long enough during a measurement.

"NEED CALIBRATION" indicates that white has not been calibrated. You must calibrate it before you can take a measurement.

"OUT OF RANGE" indicates that the sample measured is out of normal range.

"READING XYZ C²" is displayed during a measurement. XYZ can be any of the functions and C² can be any of the illum/obs combinations.

"REFERENCES - NOT UPDATED" is displayed after leaving the Reference Entry function, and no change was made.

"REFERENCES UPDATED" is displayed when **[FUNCTION]** and **[ILLUM]** are simultaneously pressed, when exiting reference mode.

"SAMPLE TOO DARK" is displayed when a measurement causes the XYZ values to be less than zero.

"SELECT ILLUMINANT" is displayed when the **[ILLUM]** key is held down for three seconds, activating illuminant selection.

"SET REF VALUES - ENTER or MEASURE" is displayed if the difference mode is on, and the **[DIF]** key has been held down for three seconds, activating reference entry mode.

"SET REF VALUES - MEASURE ONLY" is displayed in $\Delta L^*C^*H^*$, ΔWHT , and ΔYEL when reference entry mode is enabled. You can only enter these reference values by measurement.

"USE ANOTHER COLOR SPACE" is displayed when you try to enter the reference value numerically in $\Delta L^*C^*H^*$, ΔWHT , and ΔYEL . You can only enter the reference values by measurement.

Calibration Messages

- "CALIBRATION - FAILED"** is displayed when making a calibration measurement and something is wrong (invalid reading or data is out of range).
- "CALIBRATION - NOT CHANGED"** is displayed when the user decides to terminate the calibration procedure by simultaneously pressing **[FUNCTION]** and **[ILLUM]**.
- "CALIBRATION - UPDATED"** is displayed after the calibration procedure has been successfully completed.
- "ENTER WHT VALUES - THEN MEASURE"** indicates that you must enter the white patch values, and then measure that same area.
- "INVALID ENTRY"** is displayed when the numbers entered for the white values are inappropriate.
- "INSUFFICIENT READINGS"** indicates that all the five cal reading were not made.
- "INVALID READING - CAL FAILED ERROR 1"** indicates an invalid reading was made.
- "CAL FAILED ERROR (3 thru 5)"** will display when the unit is moved during the 5 cal readings.
- "CAL FAILED ERROR 6"** indicates that the color comp is out of range.

Miscellaneous Messages

- "BATTERIES LOW"** indicates that the batteries are getting low and will soon need to be charged. It will only be displayed while the measurement is in progress. Once displayed you will have approximately 100-200 measurements remaining before charging is mandatory.
- "CHARGE BATTERIES"** indicates that the batteries are reaching the state where the unit may fail to operate properly.
- "BATTERIES MUST - BE CHARGED "** indicates that the batteries are too low to operate the unit. It will be displayed until you begin the recharge cycle, thereafter, the unit will be functional and all previous data will be accessible.
- "LAMP FAILURE"** Measurement lamp is bad. The lamp should be examined and replaced. When this message occurs, you can get out of this condition by pressing **[FUNCTION]** then **[ILLUM]** then **[FUNCTION]**; or waiting until the unit powers down.
- "THANKS! - I NEEDED THAT!"** indicates that the charger has been plugged in and the batteries are being charged. This is in response to the message **"BATTERIES MUST BE CHARGED."**
- "WEAK LAMP - REPLACE SOON"** indicates that the lamp is getting weak and should be replaced in the near future. When this message occurs, you can get out of this condition by pressing **[FUNCTION]** then **[ILLUM]** then **[FUNCTION]**; or waiting until unit powers down.
- "X-Rite VER#### - COPYRIGHT 1989"** is displayed when first activating calibration. #### represents the datecode of the software.

The 918 can be calibrated to the X-Rite white standard or to a different white standard.

If you want the 918 to measure in closer agreement to another colorimeter, do the following:

- 1st: Calibrate the colorimeter that you want the 918 to correlate with using that instrument's own standard (pay attention to the illuminant/observer used).
- 2nd: Using the same colorimeter, measure the X-Rite standard and record the X Y Z values of the White patch.
- 3rd: Follow the calibration procedure in Section 4.2. In step 4 enter the values you previously measured and recorded instead of the values listed on the back of the X-Rite standard.

If you desire to calibrate to a surface other than the white standard (i.e., hitching post), follow the hitching post procedure in Section 3.7.



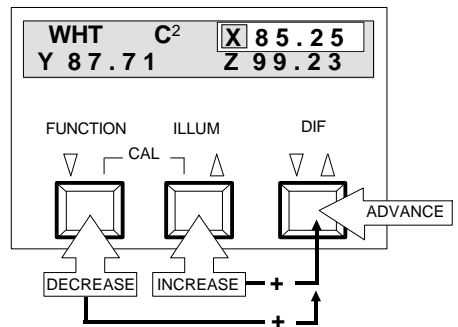
Important Calibration Notes:

- Each illuminant/observer must be individually calibrated. If you are only going to use one illuminant, calibrate to that illuminant and ignore the other illuminant/observers.
- If the instrument is calibrated to illuminant C² and any other illuminant/observer pair is not calibrated, the 918 will perform a mathematical calculation for the selected illuminant/observer based on illuminant C². This will give a reasonable approximation until a proper calibration for that illuminant/observer is performed.
- You can abort the calibration procedure at any time by simultaneously pressing [FUNCTION] and [ILLUM].
- **You must set the 918 on the white standard so that the maximum amount of the bottom rubber pad of the shoe resides on the standard and the target window is centered in the circle. (Refer to the illustration in Section 4.2).**



When Entering Calibration Values:

- The [DIF] key advances the cursor to the next value to be edited.
- The [DIF] key is used in conjunction with [▼] to decrease and [▲] to increase the value.
- Note: Hold [DIF] depressed then press either [▼] or [▲] to change value.



4.1

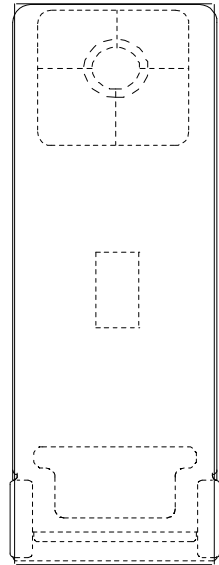
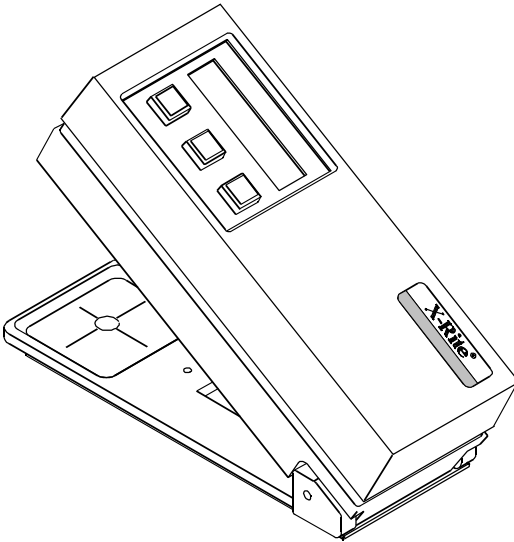
Frequency of Calibration

Under normal operating conditions, the instrument should be calibrated once a week or when instrument displays a message regarding calibrations.

4.2 Positioning the 918 Onto the X-Rite Standard

You must set the 918 on the white standard so that the maximum amount of the bottom rubber pad of the shoe resides on the standard, and the target is centered on the circle. If you do not, the unit may rock slightly and cause an erroneous reading of the standard.

- 1) Center the 918 target window on the White or Black circle, making sure that the rubber pad is completely on the standard.

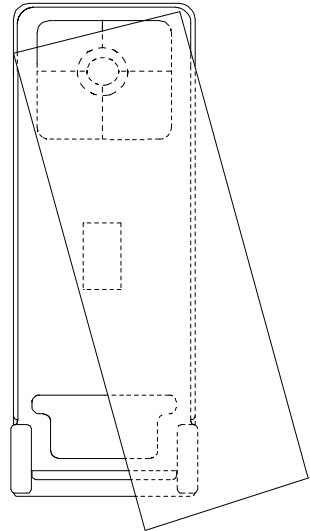
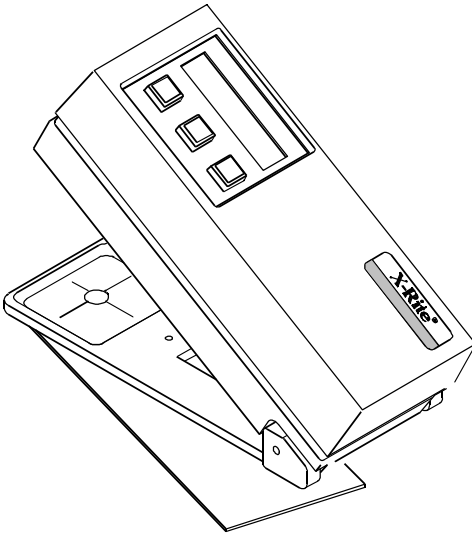


BOTTOM VIEW

- 2) Take the measurement.



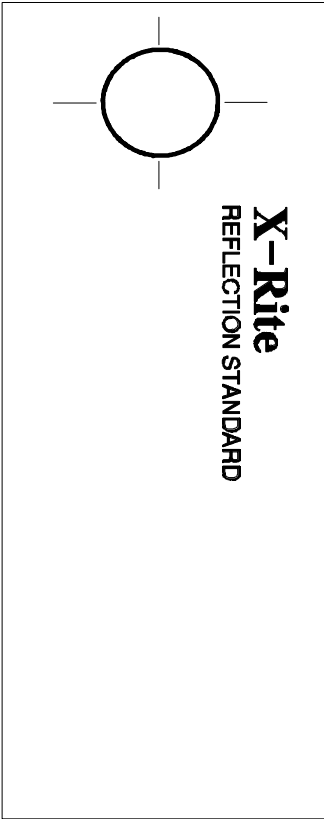
Shown below is a **IMPROPER METHOD** of measuring the standard.



BOTTOM VIEW

INCORRECT!

X-Rite Reflection Standard



X-Rite®

Reflection Standard
P/N 918F-62 0°/45°
Serial No. C4048205C-589
Date 04/10/91

WHITE STEP

Illum	Obs	X	Y	Z
C	2°	84.39	86.70	102.12
C	10°	83.79	86.72	100.31
D65	2°	81.78	86.72	94.05
D65	10°	81.66	86.73	92.70
D50	2°	82.92	86.66	71.33
D50	10°	83.26	86.68	70.40

IMPORTANT!

The standard is dramatically affected by smudge marks and dust; and must be kept clean during use.

The Calibration Values for the white spots are affected by the environment and cleaning method of the standard.



> The white spot has XYZ values set at the factory. If the white spot does not measure correctly, it could be that the unit needs to be calibrated; there is dust in the optics; or the standard has smudge marks or is dirty.

IMPORTANT! The ceramic standard should be cleaned using a mild soap and water solution, thoroughly rinsed with warm water, and wiped dry with a clean, lint free cloth.

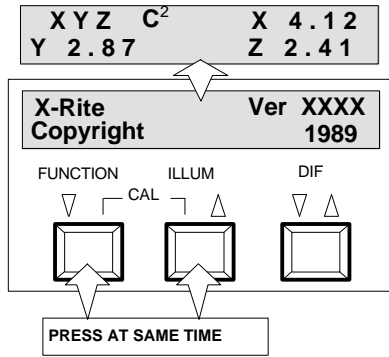


- > Select the proper illuminant (see Section 3.3)
- > Calibration must be completed for each illum/obs to be used.

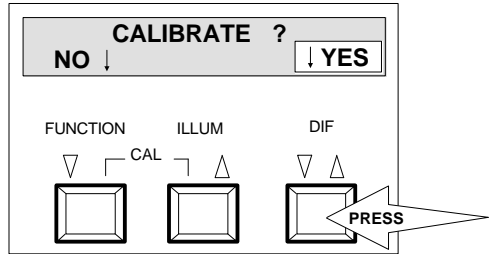
1) Press both **[FUNCTION]** and **[ILLUM]** at the same time.



- > To exit Calibration: Press **[FUNCTION]** and **[ILLUM]** at the same time and the unit will return back to normal operation.



2) Select "YES", press **[DIF]**.

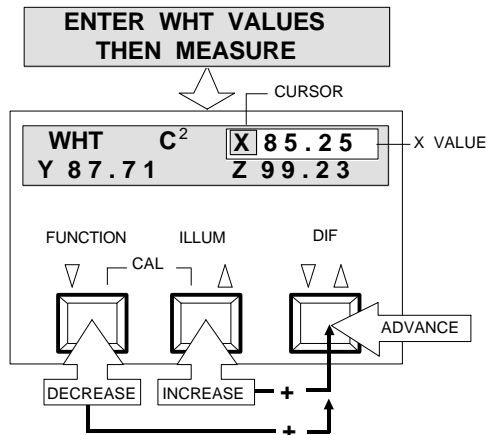


3) "ENTER WHT VALUES THEN MEASURE" is momentarily displayed.



- > If the white values displayed are correct, proceed to step 4.

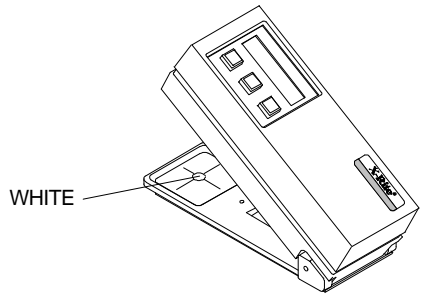
- The cursor will blink over the active value that can be edited. Enter the numbers for each value.
- For the X-Rite standard enter the X Y Z value for the selected illuminant & observer as listed on the back of the standard.



- 4) After entering the white values measure the **WHITE** patch on the standard.



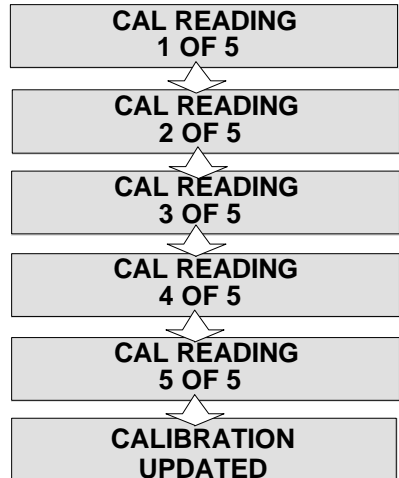
- > You must set the 918 on the standard so that the maximum amount of the bottom rubber pad of the shoe resides on the standard (refer to Section 4.1).



- 5) "**CAL READING 1 OF 5**" thru "**CAL READING 5 OF 5**" is displayed, then "**CALIBRATION UPDATED.**" The calibration procedure is finalized and the unit returns back to the main menu.



- > During the Cal Reading Messages, read head must remain down and stable or an error message may occur.
- > If "**PLEASE WAIT XX (1-30) SECONDS**" is displayed during calibration, continue to hold read head down until after calibration readings are over. This will only occur if the calibration procedure is performed within 30 seconds of a previous measurement.



5. Setting System Parameters

5.1 Averaging

The averaging feature allows the unit to make several measurements from the same and/or different locations on a sample. This will allow you to have a better overall average of a sample color. The averaging feature has two functions:

- **SAMPLES AVERAGED** - allows you to enter the number of measurements you will make (1-99) at various location on a sample, to obtain an average value.
- **SUB AVERAGE** - allows you to enter the number of measurement the unit will take (1-6) on a sample at a stationary location, to obtain an average value.

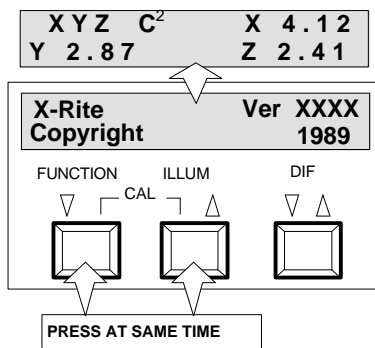


> When average and sub average are set to one, no averaging is performed and no averaging messages will be displayed.

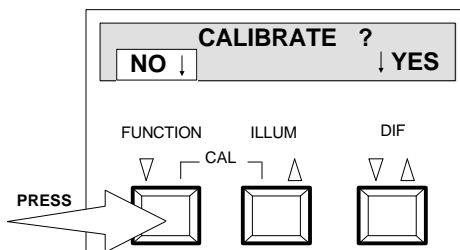
- 1) Press both **[FUNCTION]** and **[ILLUM]** at the same time.



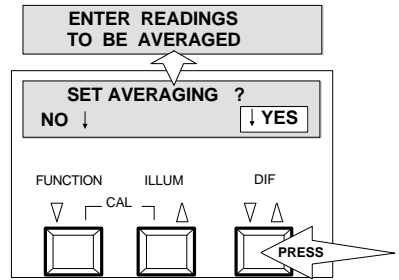
> To exit Averaging Setup: Press **[FUNCTION]** and **[ILLUM]** at the same time and the unit will return back to normal operation.



- 2) Select "NO", press **[FUNCTION]**.

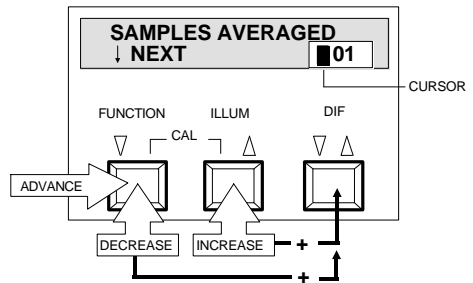


3) Select "YES", press [DIF].



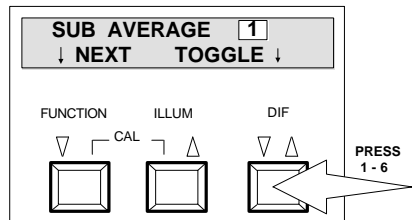
4) Select the amount (1 - 99) of sample measurements required.

- Hold down [DIF] and press [▼] to decrease the sample measurement number or press [▲] to increase the sample measure number.
- Press [FUNCTION] to advance to the Sub Average number entry.



5) Select the amount (1 - 6) of sub average measurements required.

- Press [DIF] to select sub average number.



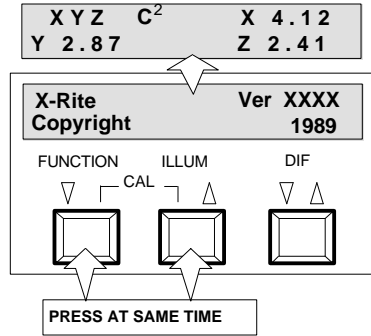
6) Press [NEXT] to return to "SET AVERAGING ?" Menu. Or, press [FUNCTION] and [ILLUM] at the same time to exit to normal operation.

Operation setup allows you to individually turn on/off certain functions. When a function is turned off it will not be displayed during operation.

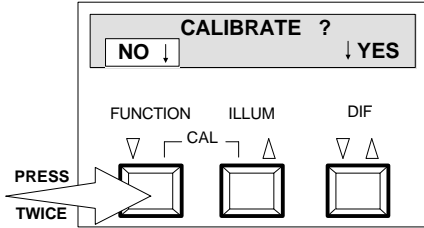
- 1) Press both **[FUNCTION]** and **[ILLUM]** at the same time.



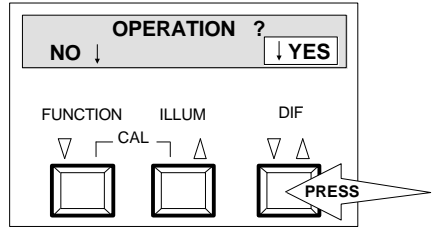
> To exit Operation Setup:
Press **[FUNCTION]** and **[ILLUM]** at the same time and the unit will return back to normal operation.



- 2) Select "NO", press **[FUNCTION]** twice.

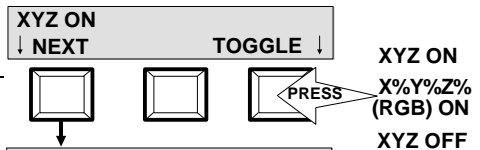


- 3) Select "YES", press **[DIF]**.

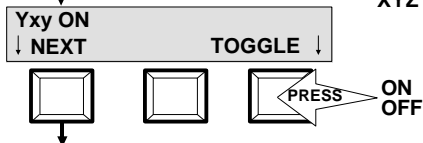


The procedure for the following steps is to press **[TOGGLE]** to turn the function on or off. Press **[NEXT]** to advance to the next step.

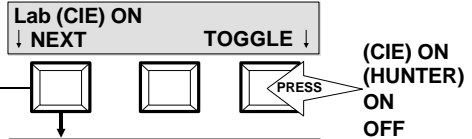
- 4) Select XYZ ON, X%Y%Z% (RGB) ON, or OFF.



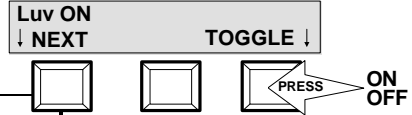
- 5) Select Yxy ON or OFF.



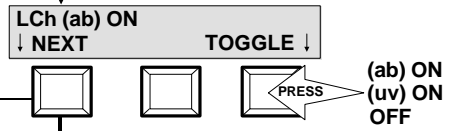
6) Select Lab (CIE), Lab (HUNTER), or OFF.



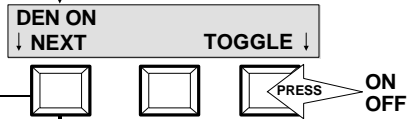
7) Select L*u*v* ON or OFF.



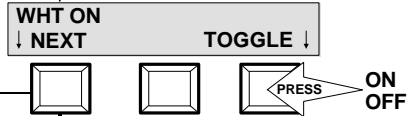
8) Select L*C*h° ab, uv, or OFF.



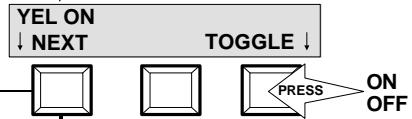
9) Select Density ON or OFF.



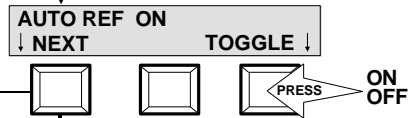
10) Select Whiteness ON or OFF.



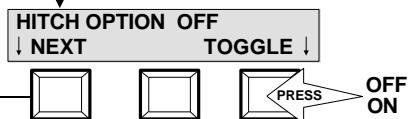
11) Select Yellowness ON or OFF.



12) Select Auto Reference ON or OFF.



13) Select Hitch Option OFF or ON.



BACK TO STEP 3



Exit via [NEXT] OR press [FUNCTION] & [ILLUM] at the same time to return back to normal operation.

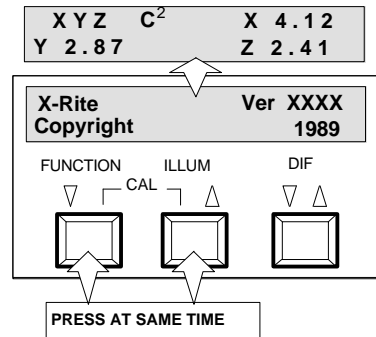
Your 918 comes equipped with a serial port that allows data to be transmitted/received by the 918 to/from an external device. Also, the 918 can be externally controlled by the Serial Input Commands discussed in the 918 RS232 Communications Protocol - Interface Manual (P/N 918-506). Listed below are the available I/O parameters.

- **"RCI ON/OFF"** (Remote Control Interface) - enables or disables the ability to externally control the 918 via the I/O port.
- **"BAUD"** - determines the input/output rate (characters per second) of the I/O port. Available outputs are: 300, 600, 1200, 2400, 4800, and 9600.
- **"CR WITH LF/CR WITH NO LF"** (Carriage Return with Line Feed/Carriage Return with no Line Feed) - varies the delimiter at the end of each line of data. When set to CR WITH NO LINE FEED, just a Carriage Return is sent at the end of a line of data. When set to CR WITH LF, a Carriage Return and then a Line Feed are sent at the end of a line of data.
- **"HANDSHAKE"** is used for data transmission. Handshake may be set to HANDSHAKE OFF (ASCII = 13H), PIN 5 CTS (Clear to Send), PIN 5 BUSY, or XON/XOFF ENABLED (ASCII = 11H). Handshake should normally be set to OFF when it is not being used.

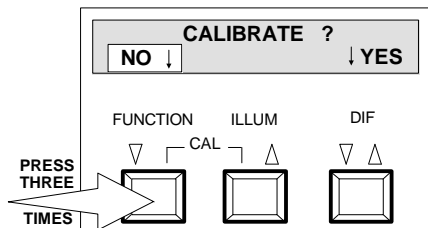
- 1) Press both **[FUNCTION]** and **[ILLUM]** at the same time.



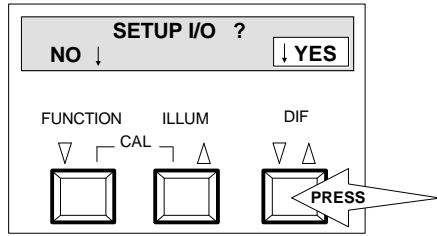
To exit I/O Setup: Press **[FUNCTION]** and **[ILLUM]** at the same time and the unit will return back to normal operation.



- 2) Select **"NO"**, press **[FUNCTION]** three times.

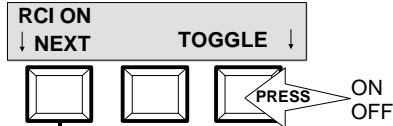


3) Select "YES", press [DIF].

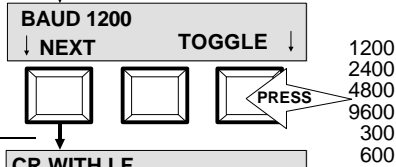


> The basic procedure for the following steps is to press [TOGGLE] to set the I/O parameter. Press [NEXT] to advance to the next step.

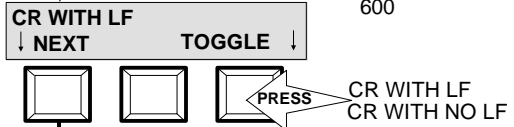
4) Select RCI ON or OFF.



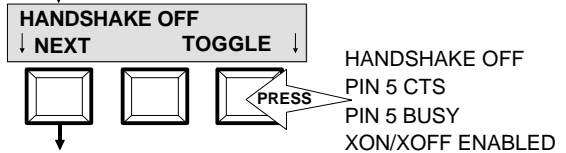
5) Select the BAUD Rate.



6) Select Carriage Return with or without Line Feed.



7) Select HANDSHAKE OFF, PIN 5 CTS, PIN 5 BUSY, or XON/OFF ENABLED.



BACK TO STEP 3



Exit via [NEXT] OR press [FUNCTION] & [ILLUM] at the same time to return back to normal operation.

This procedure allows you set the output format of the RS232 port. Refer to Section 6 for sample print outs. Listed below are the available options.

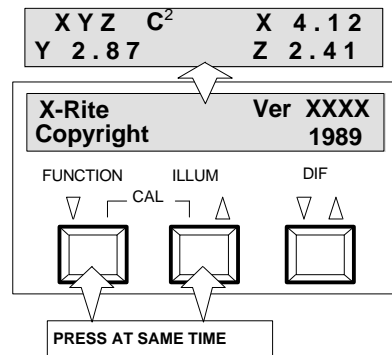
- **AUTO PRINTOUT/STORE DATA/PRINTOUT OFF** - determines if data will be transmitted after each measurement, stored until transmitted, or not allow data transfer.
 - AUTO PRINTOUT** - enables the unit to transmit data after each measurement.
 - STORE DATA** - allows the unit to store up to 2000 measurements.
 - PRINTOUT OFF** - disables the ability to output data via the RS232 port from a reading.
- **COMPUTER/PRINTER/SPECIAL** - selects which device you are going to communicate with. This option varies the output format of the RS232 port.
 - COMPUTER** - transmits a space after each group of data values and then the delimiter in accordance with the Carriage Return-Line Feed setting in Section 5.2.
 - PRINTER** - the multiple data values are each delimited with CR or CR LF in accordance with the Carriage Return-Line Feed setting in Section 5.2.
 - SPECIAL** - transmits data in the same format as the *Minolta CR200 Series Colorimeter product line. In this format each line of data consists of 24 characters plus a Carriage Return and Line Feed.
- **ALL PRINT OFF/ON** - determines which functions (XYZ, Yxy, etc.) are transmitted. When set to OFF, only the active function will be transmitted. When set to ON, all the functions that are turned on in the "Operation Parameters" are transmitted.
- **PRINT HEADER OFF/ON** - enables or disables the header (XYZ, Yxy, etc.) during transmit.
- **PRINT REF OFF/ON** (Reference) - disables or enables the Reference values during transmit.
- **DEC. POINT ON/OFF** (Decimal Point) - enables or disables the decimal point during transmit.

* Minolta is a trademark of Minolta Camera Co., Ltd.

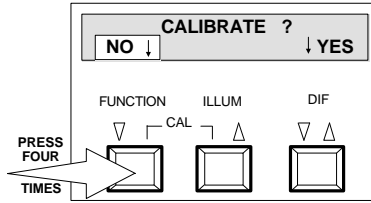
- 1) Press both **[FUNCTION]** and **[ILLUM]** at the same time.



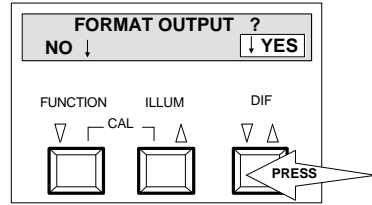
To exit Format Setup:
Press **[FUNCTION]** and **[ILLUM]** at the same time and the unit will return back to normal operation



- 2) Select "NO", press [FUNCTION] four times.

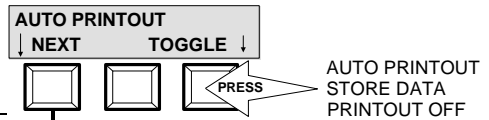


- 3) Select "YES", press [DIF].

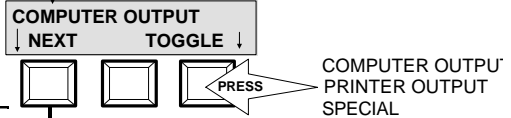


> The procedure for the following steps is to press [TOGGLE] to set the format. Press [NEXT] to advance to the next step.

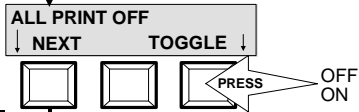
- 4) Select Auto Printout, Store Data or Print Out.



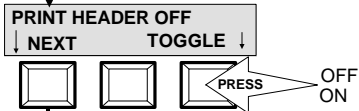
- 5) Select Computer, Printer, or Special.



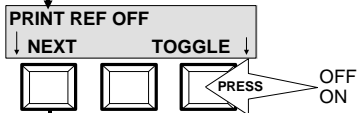
- 6) Select All Print OFF or ON.



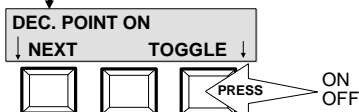
- 7) Select Print Header OFF or ON.



- 8) Select Print Reference OFF or ON.



- 9) Select Decimal Point ON or OFF.



> Exit via [NEXT] OR press [FUNCTION] & [ILLUM] at same time to return to main menu.

BACK TO STEP 3

The RS232 parameters for the 918 serial interface are configured in Section 5.3. The variables are:

- Remote Control Interface (On/Off)
- Baud Rate (300, 600, 1200, 2400, 4800, or 9600)
- Carriage Return (With or Without Line Feed)
- Handshake (Off, Pin 5 CTS, Pin 5 Busy, or XON/XOFF Enabled)

The manner in which output data is arranged is determined by the Format Output Parameter settings in Section 5.4. The variables are:

- Printout (Auto, Store Data, Off)
- Output Type (Computer, Printer, or Special)
- All Print (On/Off)
- Print Header (On/Off)
- Print References (On/Off)
- Decimal Point (On/Off)

Data is transmitted from the serial port after each measurement if "Printout" is set to Auto. The display will show **"TRANSMITTING DATA"** while transmission is taking place, and then return back to normal operation.

The following five pages contain some examples of the different types of outputs that can be obtained according to the Format Output Parameter settings.

Print Example 1:

- Printer ON
- All Print ON
- Header ON
- References ON
- Decimal Point ON

```
d(XYZ) C_2
X +.58
Y -.28
Z +1.15
REF
X 75.00
Y 60.92
Z 27.99
d(Yxy) C_2
Y -.28
x -.0005
y -.0050
REF
Y 60.92
x -.4596
y .3717
d(L*a*b*)C_2
L -.16
a +1.86
b -1.95
E 2.70
REF
L 82.34
a +33.36
b +45.83
d(L*u*v*)C_2
L -.16
u +2.30
v -2.57
E 3.45
REF
L 82.34
u +84.24
v +53.74
d(L*C*H*)C_2 (ab)
L -.16
C -.41
H -2.67
REF
L 82.34
C 56.68
H 53.88
d(DEN) C_2
DX -.003
Y +.003
Z -.017
REF
DX +.116
Y +.215
Z +.625
d(WHT) C_2
We +4.69
W +8.62
T -2.65
REF
We -87.47
W -115.43
T -111.43
d(YEL) C_2
Ye -56.39
Yd -99.70
REF
Ye +61.08
Yd +108.32
```

Print Example 2:

- Computer ON
- All Print ON
- Header ON
- References ON
- Decimal Point ON

```

d(XYZ) C_2
X +.32 Y -.12 Z +.25
REF 01
X 75.00 Y 60.92 Z 27.99
d(Yxy) C_2
Y -.12 x +.0007 y -.0018
REF 01
Y 60.92 x .4576 y .3717
d(L*a*b*)
L -.07 a +.97 b -.49 E 1.09
REF 01
L 82.34 a +33.36 b +45.83
d(L*u*v*)C_2
L -.07 u +1.43 v -.80 E 1.65
REF 01
L 82.34 u +84.24 v +53.74
d(L*C*H*)C_2
L -.07 C +.19 H -1.07 E 1.09
REF 01
L 82.34 C 56.68 H 53.88
d(DEN) C_2
DX -.002 Y +.001 Z -.004
REF 01
DX +.116 Y +.215 Z +.625
d(WHT) C_2
We +1.00 W +2.38 T -1.87
REF 01
We -87.47 W-151.43 T-111.43
d(YEL) C_2
Ye -60.08 Yd-105.94
REF 01
Ye +61.08 Yd+108.32

```

Print Example 3:

- Special ON
- All Print ON
- Header ON
- References ON
- Decimal Point ON

```

d(XYZ)      C_2
000 T01
  X   +.32  Y   -.12  Z   +.25
REF 01
  X  75.00  Y  60.92  Z  27.99
d(Yxy)      C_2
000 T01
  Y   -.12  x  +.0007  y  -.0018
REF 01
  Y  60.92  x   .4576  y   .3717
d(L*a*b* C_2
000 T01
  L   -.07  a   +.97  b   -.49
REF 01
  L  82.34  a +33.36  b +45.83
d(L*u*v*)C_2
000 T01
  L   -.07  u  +1.43  v   -.80
REF 01
  L  82.34  u +84.24  v +53.74
d(L*C*H*)C_2
000 T01
  L   -.07  C   +.19  H   -1.07
REF 01
  L  82.34  C  56.68  H  53.88
d(DEN)      C_2
000 T01
DX  -.002  Y   +.001  Z   -.004
REF 01
DX  +.116  Y   +.215  Z   +.625
d(WHT)      C_2
000 T01
e   +1.00  W   +2.38  T   -1.87
REF 01
e  -87.47  W -151.43  T -111.43
d(VEL)      C_2
000 T01
e  -60.08  Vd-105.94
REF
e   +61.08  Vd+108.32

```

Print Example 4:

- Printer ON
- All Print OFF
- Header ON
- References ON
- Decimal Point ON

```

XYZ      C_2
X      +.58
Y      -.28
Z      +1.15
REF 01
X      75.00
Y      60.92
Z      27.99

```

Print Example 5:

- Computer ON
- All Print OFF
- Header ON
- References ON
- Decimal Point ON

```

XYZ      C_2
X      +.32  Y      -.12  Z      +.25
REF 01
X      75.00  Y      60.92  Z      27.99

```

Print Example 6:

- Special ON
- All Print OFF
- Header ON
- References ON
- Decimal Point ON

```

XYZ      C_2
000
X      +.32  Y      -.12  Z      +.25
REF 01
X      75.00  Y      60.92  Z      27.99

```

Print Example 7:

- Printer ON
- All Print OFF
- Header ON
- References OFF
- Decimal Point ON

```

XYZ      C_2
X      .58
Y      .28
Z      1.15

```

Print Example 8:

- Computer ON
- All Print OFF
- Header ON
- References OFF
- Decimal Point ON

```

XYZ      C_2
X      .32  Y      .12  Z      .25

```

Print Example 9:

- Special ON
- All Print OFF
- Header ON
- References OFF
- Decimal Point ON

```

XYZ      C_2
000
X      .32  Y      .12  Z      .25

```

Print Example 10:

- Printer ON
- All Print OFF
- Header OFF
- References OFF
- Decimal Point ON

```
X      .58
Y      .28
Z      1.15
```

Print Example 11:

- Computer ON
- All Print OFF
- Header OFF
- References OFF
- Decimal Point ON

```
X      .32  Y      .12  Z      .25
```

Print Example 12:

- Special ON
- All Print OFF
- Header OFF
- References OFF
- Decimal Point ON

```
000
X      .32  Y      .12  Z      .25
```

Print Example 13:

- Printer ON
- All Print OFF
- Header ON
- References ON
- Decimal Point OFF

```
d(XYZ) C_2
X      +58
Y      -28
Z      +115
REF 01
X      7500
Y      6092
Z      2799
```

Print Example 14:

- Computer ON
- All Print OFF
- Header ON
- References ON
- Decimal Point OFF

```
d(XYZ) C_2
X      +32  Y      -12  Z      +25
REF 01
X      7500  Y      6092  Z      2799
```

Print Example 15:

- Special ON
- All Print OFF
- Header ON
- References ON
- Decimal Point OFF

```
d(XYZ) C_2
000 T01
X      +32  Y      -12  Z      +25
REF 01
X      7500  Y      6092  Z      2799
```


7.1. Troubleshooting

The X-Rite 918 is covered by a one-year limited warranty (excluding lamp and ni-cad batteries) and should be referred to the factory or authorized service center for repair within the warranty period. Attempts to make repairs within this time frame may void the warranty.

X-Rite provides a factory repair service to their customers. Because of the complexity of the circuitry all circuit repairs should be referred to the factory or an authorized service center.

X-Rite will repair any 918 past warranty. Shipping costs to the factory or to an authorized service center shall be paid by the customer and the instrument shall be submitted in its original carton, as a complete unaltered unit.

CAUTION: DO NOT use any ketone solvents to remove ink from the unit. This will cause damage to the cover.

IMPORTANT! ALWAYS CHECK TO SEE IF READ LAMP IS WORKING BEFORE TROUBLESHOOTING.

-----TROUBLE CHART-----

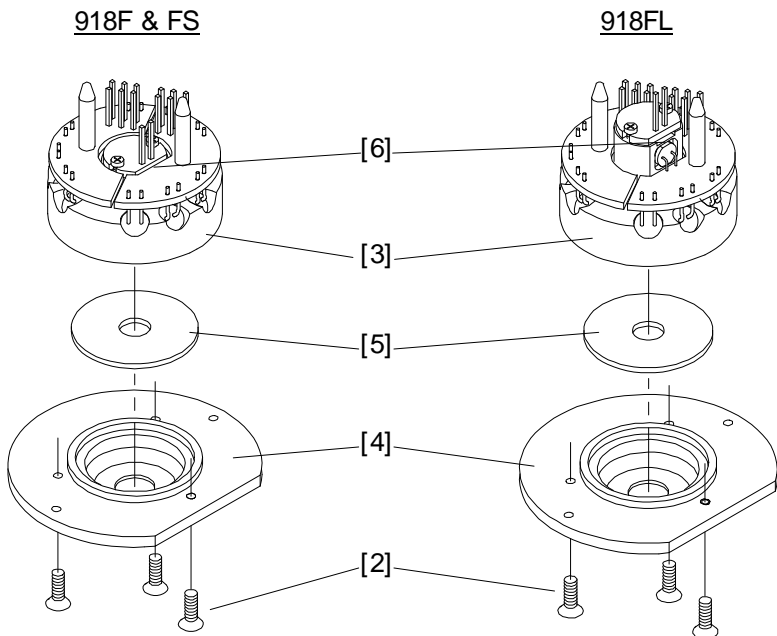
- A. If a wrong reading exists:
 1. Recalibrate unit.
 2. Check Read Lamp for brownness or decolorization.
 3. Clean Optics.
 4. Contact authorized service center.
- B. Unit does not turn on.
 1. Check display angle adjustment.
 2. Check for low batteries.
 3. Contact authorized service center.
- C. Display not working.
 1. Check display angle adjustment.
 2. Check for low batteries.
 3. Contact authorized service center.
- D. Reading Drifts.
 1. Clean Optics.
 2. Recalibrate unit.
 3. Change lamp.
 4. Contact authorized service center.
- E. Unit will not calibrate properly.
 1. Dirty reference.
 2. Read lamp weak.
 3. Optics dirty.
 4. Contact authorized service center.

Target Window

1. Remove dust and lint from target window by wiping it with a lint free cloth, slightly moistened with water.

Optics

1. Remove Optics assembly by removing sensor nose screws from colorimeter housing, and then lifting assembly upward.
2. Remove three inner screws [2] on sensor nose [4] and rotate Optics over carefully so sensor nose [4] is at bottom.
3. Carefully lift up Optics ass'y [3] separating from sensor nose [4].
4. Clean Optics sensors with camelhair brush and set aside.
5. Carefully remove IR Glass [5] from sensor nose [4].
6. Remove dust and lint from inner sensor nose and filter(s) with camelhair brush.
7. Carefully reinstall IR Glass [5] (holding by edge) into sensor nose, making sure IR glass is properly seated.
8. Align flat edge of sensor nose [4] with flat edge on Lamp ass'y P.C.B [6] and secure sensor nose [4] to Optics ass'y [3] with three inner screws [2].
9. Carefully reinstall Optics assy into colorimeter by facing flat edge of sensor nose to front of colorimeter. Work into position until alignment pins and connector pins are properly seated.
10. Insert and tighten sensor nose screws.

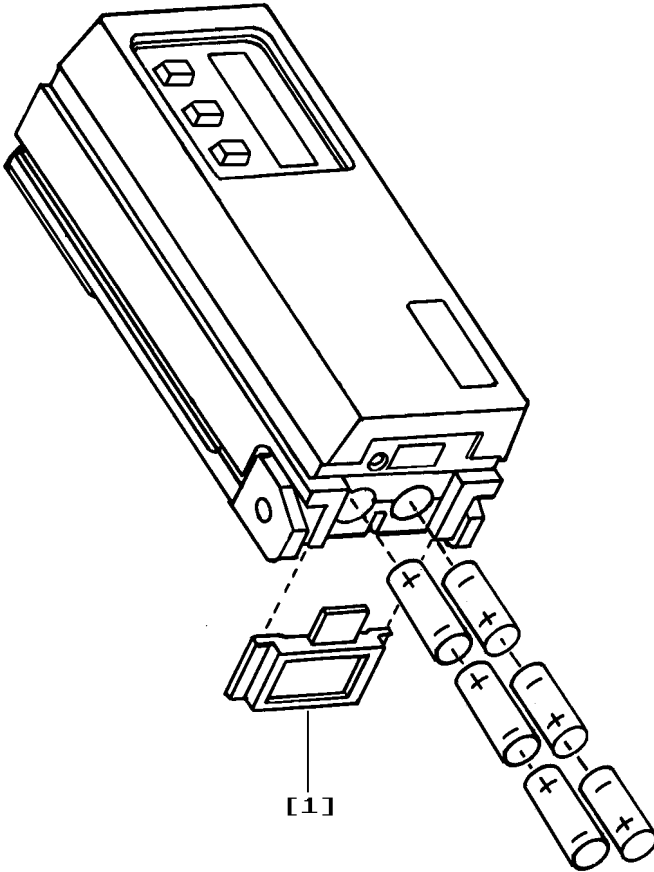


7.3.

Battery Replacement

1. Set the 918 on it's side and lock shoe in place. The shoe must be locked.
2. Slide battery access door [1] toward bottom of unit and remove.
3. Remove old AA NI-CAD batteries, and install six fresh AA NI-CAD (recognizing proper polarity).
4. Compress batteries into unit with fingers and reinstall battery access door [1] .
5. Unlock shoe.
6. Unit should be charged for 24 hours after new battery installation is performed.

Batteries P/N SE15-19 (6 Required)

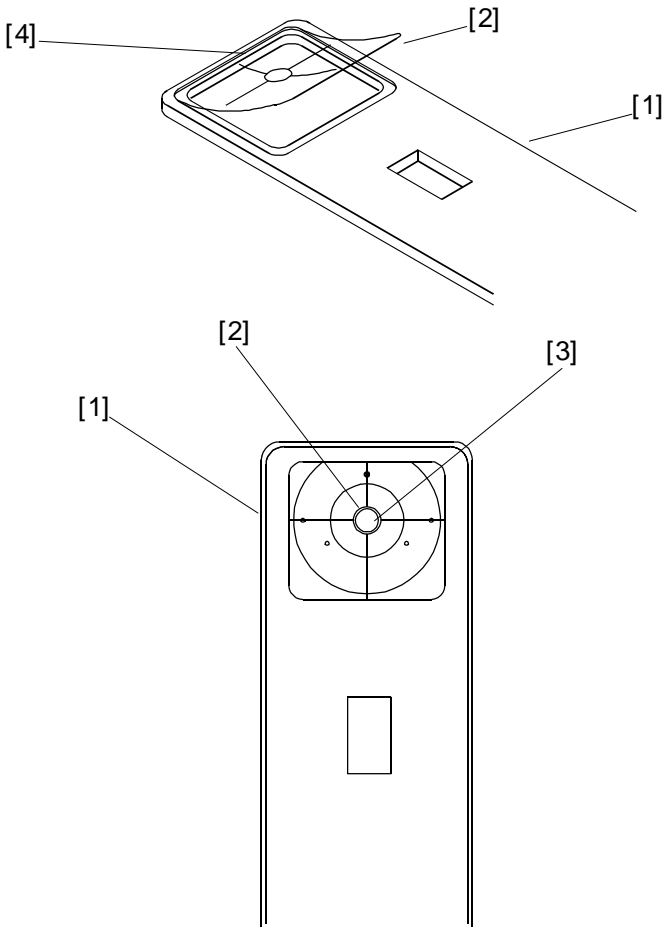


7.4. Target Window Replacement

1. Remove old target window by pushing downward on top of shoe [1] . Clean off any remaining adhesive from shoe.
2. Turn unit over and compress shoe [1] all the way down, and lock shoe.
3. Remove paper backing from tape strip on new target window [2] .
4. Place one taped edge of target window [2] on indent [4] at bottom of shoe [1].
5. Align hole of target window [2] exactly in center of hole in sensor nose [3] and press remaining three sides of target window into place.
6. Unlock shoe.

Target Window

P/N 418-21-017-KIT (1.7mm), P/N 418-21-034-KIT (3.4mm), or
P/N 418-21-068-KIT (6.8mm)



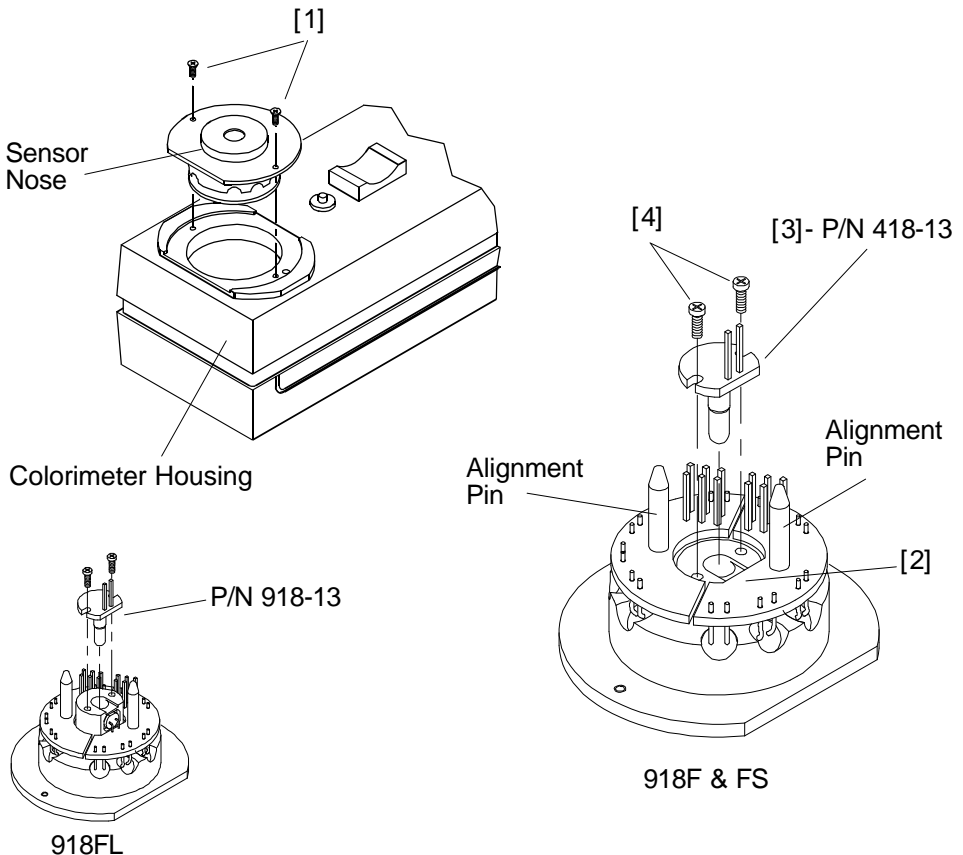
7.5.

Replacement Lamp Instruction

1. Remove Optics assembly by removing sensor nose screws [1] from the colorimeter housing, and then lifting assembly upward. THE THREE INNER SCREWS ON SENSOR NOSE ARE NOT TO BE REMOVED.
2. Once Optics assembly is free, rotate over and remove two screws [4] from the lamp PCB [3].
3. Carefully remove old Lamp assembly [3] by lifting upward and discarding.
4. Align the flat edge of Optics PCB [2] with flat edge on new Lamp PCB [3], and insert into Optics assembly.

NOTE: EXTREME CAUTION MUST BE TAKEN WHEN INSTALLING NEW LAMP.

5. Insert and tighten the two lamp screws [4].
6. Carefully reinstall Optics assembly into colorimeter by facing flat edge of sensor nose to front of unit. Work into position until alignment pins and connector pins are properly seated.
7. Insert and tighten sensor nose screws [1].



Measuring Functions:	<u>Absolute</u>	<u>Difference</u>	
	CIE XYZ	$\Delta(XYZ)$	
Optional	X% Y% Z%	$\Delta(X\% Y\% Z\%)$	
	CIE Yxy	$\Delta(Yxy)$	
	CIE LAB	$\Delta(L^*a^*b^*)$	& ΔE^*_{ab}
Optional	Hunter LAB	$\Delta(Lab)$	& ΔE
	CIE LUV	$\Delta(L^*u^*v^*)$	& ΔE^*_{uv}
	CIE LCH	$\Delta(L^*C^*H^*)$	& ΔE^*
	(ab or uv space)		
Colorimetric Density:	$D_x D_y D_z$	$\Delta(D_x D_y D_z)$	
Indices:	- Whiteness	per ASTM E313	
	- Whiteness & Tint	per CIE	
	- Yellowness	per ASTM E313	
	- Yellowness	per ASTM D1925	
Display:	2 row by 16 character Supertwist dot matrix LCD		
Measuring Geometry:	0°/45°, multi-sensor array		
Measuring Area:	918FL - 6.8mm		
	918F - 3.4mm		
	918FS - 1.7mm		
Receiver:	Blue enhanced silicon photodiodes		
Light Source:	Gas filled tungsten lamp, approx. 2856°K		
Spectral Responses:	Closely matches CIE Standard Observer curves ($\bar{x}_2 \lambda, \bar{y} \lambda, \bar{z} \lambda$) under illuminant D ₆₅ , 10°.		
Illuminant Types:	C, D ₆₅ , & D ₅₀		
Standard Observers:	2° & 10°		
Measurement Range:	.3 to 200% reflectance		
Short Term Repeatability¹:	≤ 0.15 ΔE^*_{ab}		
Interinstrument Agreement¹:	≤ 1.0 ΔE^*_{ab} rms., ≤ 2.0 ΔE^*_{ab} max.		
Temperature Coefficient¹:	≤ .05 ΔE^*_{ab} avg./°C		
Calibration:	Adj. of White for XYZ for each illuminant/observer pair		
Warm Up Time:	None		
Measurements Per Charge:	Approx. 3500		
Measuring Time:	Approx. 2 seconds		
Data Interface:	Patented ² Bidirectional RS-232, 300 to 9600 baud (user selectable), bipolar output		
Power Supply:	Six rechargeable AA NiCad batteries 7.2v total rated @ 600mAh (included)		
Charge Time:	Approx. 14 hours		
AC Adaptor Requirements:	918 90 - 130VAC, 50 - 60Hz, 15W Max. 918X 180 - 260VAC, 50 - 60Hz, 15W Max.		
Operating Temp. Range:	50° - 95° F / 10° - 35° C		
Storage Temperature:	-4° - 122° F / -20° - 50° C		
Weight:	800 grams		
Dimensions:	7.4cm H x 8.cm W x 19.6cm L		

Accessories Provided: Calibration Standard
Operation Manual
RS232 Serial Interface Manual
Reference Guide
AC Adaptor
Carrying Case

¹ Measurement performance specified for calculations based on L*a*b*, D65, and 10° observer function at 25°C.

Short-term repeatability: maximum deviation of 10 measurements made at 2 second intervals without instrument recalibrated on the calibration spot of the X-Rite reflection standard.

Interinstrument agreement: rms and maximum deviation based on 12 tiles (BCRA) compared to reference colorimeter. Interinstrument agreement deviations are accumulative.

Temperature coefficient: average deviation based on 12 tiles (BCRA) over operating temperature range.

² This product covered by U.S. Patent 4,591,978 and other patents pending.

Specifications and design subject to change without notice.

A2 Accessory Items

	<u>Part Number</u>
• 0°/45° Calibration Standard.....	918F-62
• Security Cable.....	418-75
• 1.7mm Target window	418-21-017-KIT
• 3.4mm Target window	418-21-034-KIT
• 6.8mm Target window	418-21-068-KIT
• 1.7mm Aperture	418-63-017
• 3.4mm Aperture	418-63-034
• Lamp Ass'y (for 1.7mm & 3.4mm optics)	918F-13
• Lamp Ass'y (for 6.8mm optics)	918FL-13
• Portable Thermal Printer (115VAC).....	418-113
• Portable Thermal Printer (230VAC).....	418X-113
• Interconnect cable for *Macintosh computers with 8 pin mini-DIN connector.....	418-79
• Modular Interconnect Cable (requires adaptor below).....	SE108-69
• DB25P DCE (Null Modem) Interface Adaptor	418-70
• DB25S DCE (Null Modem) Interface Adaptor	418-71
• DB25P DTE (Normal) Interface Adaptor	418-80
• DB25S DTE (Normal) Interface Adaptor	418-81
• DB9P Interface Adaptor	418-90
• DB9S Interface Adaptor	418-91

* Macintosh is a trademark of Apple Computer, Inc.

Shown below are the factory presets for the Averaging, Operation, I/O, and Format parameters.

AVERAGING PARAMETERS

Average - 01
Sub Average - 1

OPERATION PARAMETERS

XYZ - ON
Yxy - ON
L*a*b* - ON (CIE)
L*u*v* - ON
L*C*h° - ON (ab space)
Density - ON
Whiteness - ON
Yellowness - ON
Auto Reference - ON
Hitching Post - OFF

RS232 I/O PARAMETERS

RCI - ON
BAUD RATE - 1200
CR/LF - Carriage Return With Line Feed
HANDSHAKE - OFF

FORMAT PARAMETERS

Printout - AUTO
Comp/Print/Special - COMPUTER
All Print - OFF
Print Header - OFF
Print Reference - OFF
Decimal Point - ON

The unit is shipped from the factory with function "L*a*b*" and illuminant/observer "D50 10°" activated. If the memory is reset, the function, illum/obs, and all parameters will return to the settings described above.



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P/N 918-500
Rev. P-4/23/98
