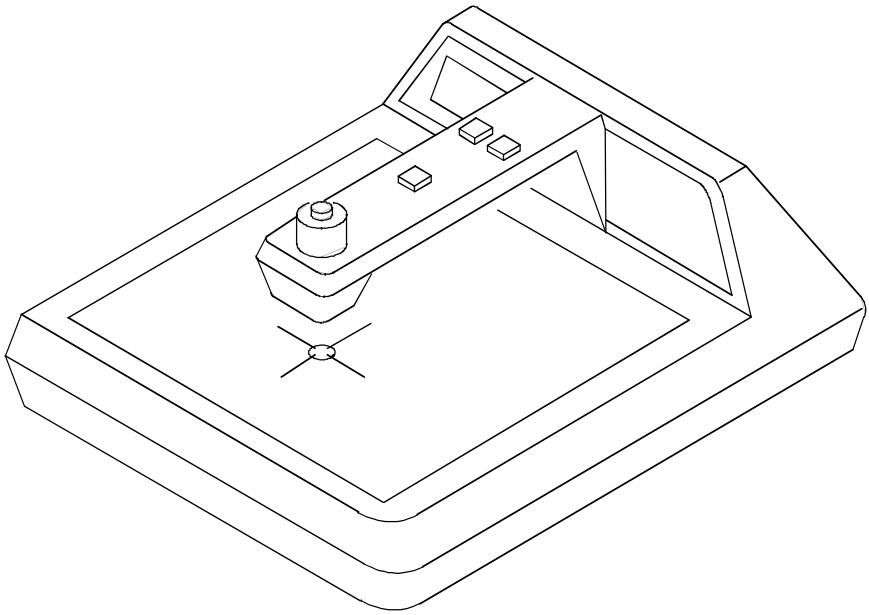
369

B / W T R A N S M I S S I O N
D E N S I T O M E T E R



Operation Manual

x-rite

Federal Communications Commission Notice

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.

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

Industry Canada Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

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

CE DECLARATION

Manufacturer's Name:	X-Rite, Incorporated
Manufacturer's Address:	X-Rite, Incorporated Siemensstraße 12b 63263 Neu-Isenburg • Germany Phone: +49 (0) 61 02-79 57-0 Fax: +49 (0) 61 02 -79 57-57
Model Name:	Densitometer
Model No.:	369
Directive(s) Conformance:	EMC 2004/108/EC LVD 2006/95/EC

RoHS/WEEE

X-Rite products meet the **R**estriction **o**f **H**azardous **S**ubstances (RoHS) Directive 2002/95/EC and European Union – **W**aste **E**lectrical and **E**lectronic **E**quipment (WEEE) Directive 2002/96/EC. Please refer to www.xrite.com for more information on X-Rite's compliance with the RoHS/WEEE directives.

CAUTION: To prevent electrical shock. DO NOT remove cover. No user serviceable parts inside. Refer servicing to qualified service personnel.

ADVERTENCIA: Para evitar un choque eléctrico, NO QUITE el recubrimiento del aparato. No hay ninguno componente reparable de usuario, dentro del aparato. Consulte un técnico calificado para servicio o arreglo.

AVVERTIMENTO: Per evitare una scossa elettrica, non staccare la coperta del apparecchio. C'è nessuno componenti riparabili d'utente, interno del apparecchio. Consultare un tecnico qualificato per servizio o manutenzione.

VORSICHT: Diese Abdeckung darf nicht entfernt werden. Sie schützt vor elektrischem Schock. Sie deckt auch keine vom Benutzer zu wartenden Teile ab. Mit notwendigen Wartungen wenden Sie sich bitte nur an autorisiertes Fachpersonal.

ATTENTION: Pour prévenir un choc électrique, ne pas enlever le couvercle. Aucune pièce se trouvant á l'intérieur n'est réparable par l'utilisateur. Toute réparation doit être adressée à du personnel compétent.

CAUTION: For continued protection against risk of fire, replace only with same type Time Delay fuse.

ADVERTENCIA: Para evitar el peligro de incendio en el caso de funcionamiento defectuoso del fusible de retrasar, es preciso reemplazarlo con un fusible del mismo tipo

AVVERTIMENTO: Per evitare il pericolo di un incendio nel caso di funzionamento difettoso del fusibile di ritardare, rimpiazzarlo solamente con un fusibile dello stesso tipo.

VORSICHT: Für fortgesetzten Schutz gegen Feuer, ersetzen Sie die Verzögerungssicherung nur mit einer vom gleichen Typ.

ATTENTION: Pour éviter les risques d'incendie, ne remplacer le fusible à retard qu'avec un fusible du même type.

TABLE OF CONTENTS

General Description

Your X-Rite 369 has been specifically designed to aid in the quality control of film (Diazo/Silver) used to manufacture printed circuit boards (P.C.B.). The 369 provides a measuring range of 0-5.0D with an accuracy of ±.04D at 4.5D, when using the 2mm aperture.

When measuring diazo type films, we suggest that the 2mm aperture be used. Even thought the 369 is safe-lighted against ultraviolet light, we recommend that preexposed film and preprocessed film be kept a safe distance away from the densitometer.

General features include:

Electronic Filter Selection eliminates the problems that mechanical filter wheels create.

Large Liquid Crystal Display and Electroluminescent Backlighting allows optimum legibility. Larger and Fewer Keys which have been functionally placed for ease of operation and to cut down operator confusion.

x10 provides an extra digit of display when extreme resolution is required.

RS232 Interface & RCI (Remote Control Interface) provides a Two-way interface for use with computerized quality control systems and electronic printers.

Lamp Timer if enabled, automatically turns OFF Reading lamp after 2 hours of instrument non-use. This will extend the life expectancy of the read lamp.

Visual and UV responses allow measurements on a broad range of films.

Density provides density and density difference measurements.

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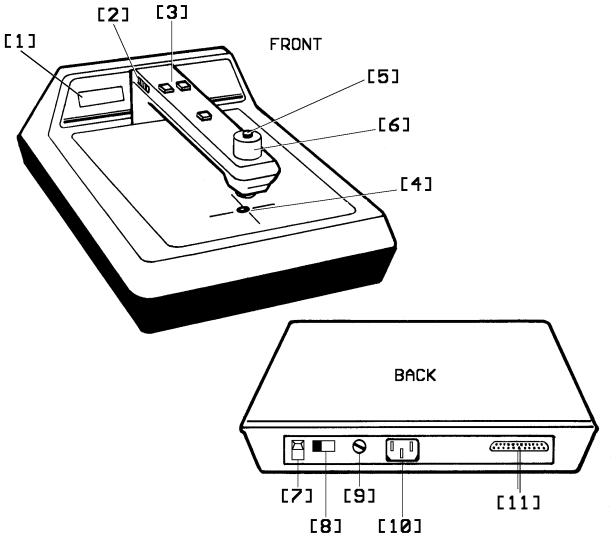
The light table on the 369 densitometer is safe-lighted against ultraviolet light. However, there is a minimal amount of ultraviolet light leakage present at the aperture. X-Rite Incorporated suggests that preexposed and preprocessed film be kept a safe distance away from the 369 densitometer.



1. **DISPLAY** - is an 8-character Liquid Crystal Display.
2. **DISPLAY ANGLE ADJUSTMENT** - allows you to adjust the display to your line of sight.
3. **KEYBOARD** - consists of three keys that are used for selecting functions, color, and zeroing operation.
4. **APERTURE** - is the area where you center your film.
5. **READ BUTTON** - used to lower the Read Head when taking readings.
6. **READ HEAD** - is the component that contains the optics which comes in contact with your film when taking measurements.
7. **POWER SWITCH** - turns the unit ON (1) and OFF (0).
8. **VOLTAGE SELECTION SWITCH** - selects 115V or 230V operation.
9. **FUSE HOLDER** - holds the proper fuse.
10. **POWER INPUT** - is where the 115V/230V AC line cord plugs in.
11. **I/O PORT** - is used for RS232 bi-directional serial communications.

Dear Customer:

Congratulations! We at X-Rite, Incorporated are proud to present you with the X-Rite 369 Transmission Densitometer. This instrument represents the very latest in microprocessors, integrated circuits, optic and display technology. As a result, your X-Rite 369 is a rugged and reliable instrument whose performance and design exhibit the qualities of a finely engineered instrument, which is not surpassed.

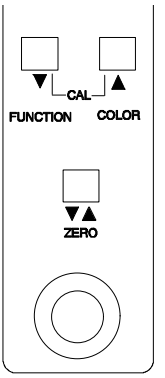
To fully appreciate and protect your investment, we suggest that you take the necessary time to read and fully understand this manual. As always, X-Rite stands behind your 369 with a full one year limited warranty and a dedicated service organization. If the need arises, please don't hesitate to call us.

Thank you for your trust and confidence.

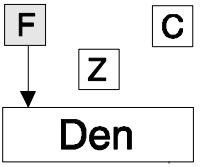
User Interface

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 keys are shown with brackets on both sides and in boldface. Ex., **[FUNCTION]**, **[COLOR]** and **[ZERO]**.



- To the right of the text will be a drawing representing the keys on your instrument. The key(s) that you are to press will be grayed as shown. Below the keys will be a rectangle representing the display screen.



- When a key is to be momentarily pressed, the statement "depress" or "press" will be used. Ex., Depress **[FUNCTION]**.

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

- The symbols ↓ and ↑ shown on the display label are used for value adjustments. Pressing ↓ key decrements and ↑ increments the values.

- The key names will be used when changing function or color. Ex., Depress **[FUNCTION]**.

Safety Precautions

When using your 369 Densitometer, basic safety precautions should always be followed:

1) Read and understand all instructions.

2) Do not operate the 369 with a damaged cord or if the 369 has been dropped or damaged - until it has been examined by a qualified service person.

3) Position the cord so that it will not be tripped over, pulled or contact hot surfaces.

4) If an extension cord is necessary, a cord with a current rating at least equal to that of the 369 should be used.

5) Always unplug 369 from electrical outlet before cleaning and servicing and when not in use. Never yank cord to pull plug from outlet. Grasp plug and pull to disconnect.

6) To protect against electrical shock hazards, do not immerse the 369 in water or other liquids.

7) To avoid electrical hazard, do not disassemble the 369. Take it to a qualified service person when some service or repair work is required. Incorrect reassembly can cause electrical shock hazard when the 369 is used subsequently.

8) The use of an accessory attachment not recommended by the manufacturer may cause a risk of fire, electric shock, or injury to persons.

9) Connect the 369 to a grounded outlet.

1.0 Getting Started

1.1 Packing Checklist

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 below for parts list and the following page for packaging illustration).

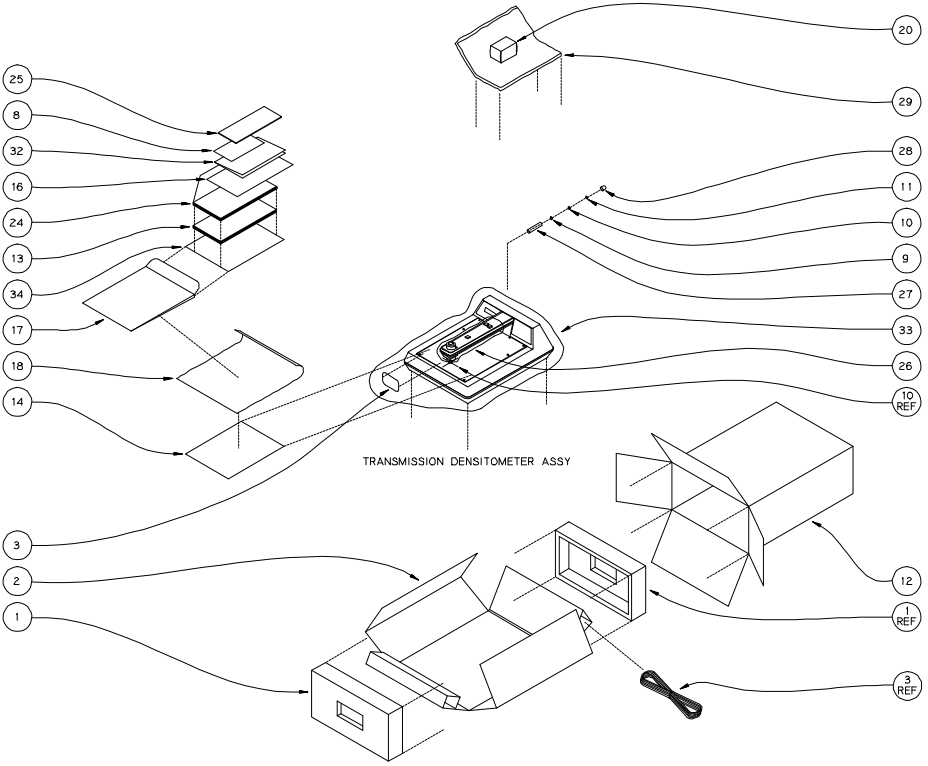
Your X-Rite 369 was packaged in a specially designed carton to assure against damage. If reshipment is necessary, the instrument should be packaged in the original carton. If the original carton is not available, a new one can be obtained from X-Rite, Incorporated.

Refer to the parts list below and packaging drawing on the following page (items 1, 2, & 12) for packaging part numbers.

ITEM	QTY 369	QTY 369X	PART NUMBER	DESCRIPTION
34	1	1	SD01-41	CERTIFICATE OF CALIBRATION
33	1	1	SD65-12	PLASTIC BAG
32	1	-	SD01-30	FLAT RATE POLICY BROUCHURE
31	-	-	NOT USED	
30	-	-	NOT USED	
29	1	1	SM48-01	PACKAGING MATERIAL (12" x 12")
28	1	1	SD124-02	VIAL PLUG
27	1	1	SD124-01	SHELL VIAL
26	1	1	SD65-13	PLASTIC BAG
25	1	1	SD01-10	IMPORTANT NOTICE
24	1	1	369-601	REFERENCE GUIDE
23	-	-	NOT USED	
22	-	-	NOT USED	
21	-	-	NOT USED	
20	1	1	310-60	LAMP ASSEMBLY, REPLACEMENT
19	-	-	NOT USED	
18	1	1	SD65-07	PLASTIC BAG
17	1	1	SD68-10	ENVELOPE
16	1	1	SD01-04	REGISTRATION FORM
15	-	-	NOT USED	
14	-	1	361X-600	CAUTION NOTICE, 230VAC
	1	-	361-600	CAUTION NOTICE, 115VAC
13	1	1	369-500	OPERATION MANUAL
12	1	1	SD200-319-01-01	CARTON
11	1	1	319-40-03	APERTURE, 3mm
10	2	2	319-40-02	APERTURE, 2mm
9	1	1	319-40-01	APERTURE, 1mm
8	1	1	339-68	STEP TABLET ASSEMBLY
7	-	-	NOT USED	
6	-	-	NOT USED	
5	-	-	NOT USED	
4	-	-	NOT USED	
	-	-	NOT USED	
3	2	2	SD203-02	RUBBER BAND
2	1	1	SD200-319-02	CARTON INSERT
1	2	2	SD200-361-03	FOAM END CAPS

PARTS LIST

Packaging Drawing



1.2 What to do First

This section explains the necessary steps you should take to properly setup and use your X-Rite 369 densitometer for the very first time. Follow each step carefully and do not proceed to the next step until you have completed the prior step and thoroughly understand its function.

Step 1... Get generally acquainted with your X-Rite 369 by reading **General Description** (Pages 3 and 4). This section provides you with an overall view and description of your 369.

Step 2... Read **Applying Power** (Sec.1.3). Follow the steps listed in this section to get your 369 up and running.

Step 3... Set the **Display Angle Adjustment** (Sec.1.3).

Step 4... Now its time to get more acquainted with your 369. Begin with **Operation** (Sec.2.0) to learn some basic operating functions.

Step 5... Get familiar with the keyboard by reading Key **Description** (Sec.2.1).

Step 6... Learn the proper procedure for taking measurements by following the steps in **Measurement Procedure - General** (Sec.2.5).

Step 7... Now its time to learn the rest of the operating functions of the 369 densitometer. Proceed with **Measurement Procedure** (Sec.3.0). These sections will show you how to use the Density and Density X10.

Step 8... Now that you feel comfortable with your 369, and you're familiar with the basic operating and measurement functions, **Calibrate** the unit by following the steps in Section 4.0 .

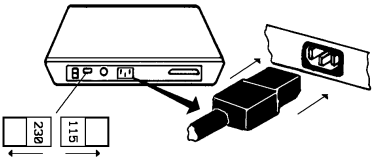
Step 9... Your X-Rite 369 was preset at the factory with certain Modes turned On or Off. The Mode function controls such things as: I/O Port setup, and the Read Lamp Timer. If you need to change any of these Modes, read Section 5.0 and thoroughly understand it before proceeding with any changes.

1.3 Applying Power and Display Angle Adjustment

- **NOTE: If the unit has been stored in an abnormal (cold) environment, DO NOT apply power to the unit until it has sat for several hours in a normal environment (10°- 30°C/ 50°- 86°F).**

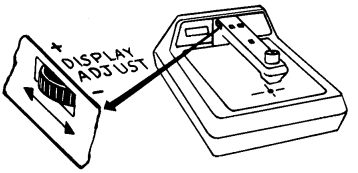
- **CAUTION: For safety and unit stability, do not modify line cord provided with this instrument. Connect to a grounded 3 wire receptacle.**

1. Ensure that the proper operating line voltage is selected (slide switch to 115V or 230V as necessary). Plug the female end of the Power Cord into the back of the 369, and the other end into the wall outlet.



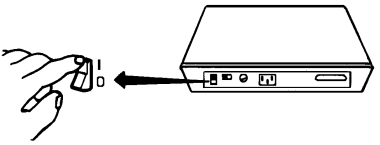
- **NOTE: When voltage setting is changed, the proper fuse, fuse carrier, and line cord must be used. 115vac [Fuse SE24-0060, Fuse Carrier SE71-05, Cord SD33-07] or 230vac [Fuse SE49-0030, Fuse Carrier SE71-06, Cord SD33-08]**

2. Set the Display Angle Adjustment to a midway setting.



3. Set the power switch to "1" (ON). Adjust the Display Angle until the data in the display can best be seen at your line of sight.

4. Upon power up, the unit will display the software date code. Next, the unit will perform a self test, and if everything is ok, "TST Pass" will be displayed.



Ver XXXX

Year Month Day

- **NOTE: If the unit does not pass the self test, an error message will be displayed, indicating the probable cause (Refer to Section 2.6 - Display Mes sages).**

5. After the unit passes the self test, the unit will automatically return to the last function performed (ex. DEN).

1.4 Display (EL) Backlighting

This feature backlights the display for use in reduced room lighting. The Electroluminescent (EL) Backlighting turns OFF after 10 minutes of instrument non-use, and turns back ON when a measurement is taken or any key is depressed.

2.0 Operation

2.1 Key Description

The Keyboard consists of three key switches, the **[FUNCTION]** ↓ key, the **[COLOR]** ↑ key, and the **[ZERO]** ↓↑ key.

FUNCTION ↓

- Selects Density and Density x10.
- Decreases numeric values when used with **[ZERO]** key.
- Depressed together with **[COLOR]** to enter Calibration or Modes.

COLOR ↑

- Selects either Visual or UV Filters during normal operation.
- Increases numeric values when used with **[ZERO]** key.
- Depressed together with **[FUNCTION]** to enter Calibration or Modes.

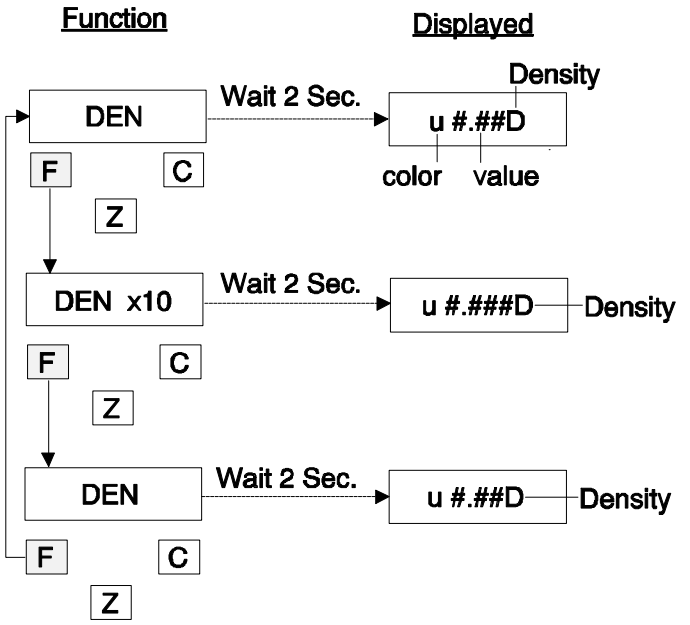
ZERO ↓↑

- Zeros density during a measurement.
- Used in conjunction with **[FUNCTION]** or **[COLOR]** to numerically enter a value.

NOTE: If you get lost while selecting functions or don't know exactly where you are during a certain procedure…PRESS THE [FUNCTION] KEY as many times as it takes until you get back to a main level function (Den or Den x10).

2.2 Function Selection

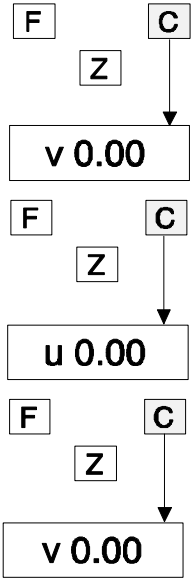
The **[FUNCTION]** key normally selects between one of three functions; DEN and DEN x10. They are sequentially selected with each momentary depression of the **[FUNCTION]** key. Once the function you want is displayed, wait for the 369 to automatically drop into the function selected (approximately a 2 second waiting period). At this point, the previous measurement is displayed.



2.3 Color Selection

The **[COLOR]** Key selects one of two colors, Visual or UV. They are alternately selected with each depression of the **[COLOR]** key. "v" is displayed for Visual and "u" for Ultraviolet.

Each depression of the **[COLOR]** key will alternately display **"v"** (Visual) or **"u"** (Ultraviolet).

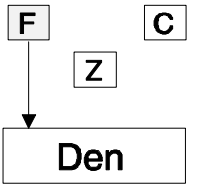


2.4 Density Reference Entry

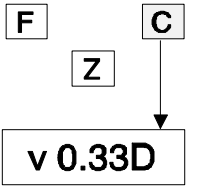
Reference value are values which are subtracted from each density measurement to display a density difference value.

2.4.1 Density Reference Entry Via Keyboard

1. Depress **[FUNCTION]** key repeatedly **[FUNCTION]** until **"DEN"** is displayed.



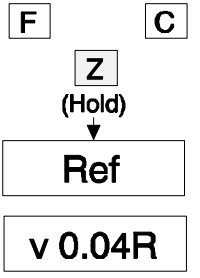
2. Select color by depressing the **[COLOR]** key.



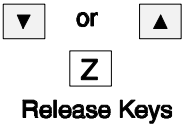
3. Hold **[ZERO]** down (thru step 4).

   "REF" is displayed.

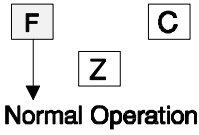
   Reference value is displayed.



4. Enter Ref value using the ↓**[FUNCTION]** key to decrease value or ↑**[COLOR]** key to increase value. (Depress both to reset to zero.) Release keys.



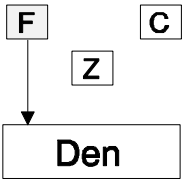
5. Depress **[FUNCTION]** to return to normal operation.



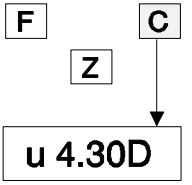
2.4.2 Density Reference Entry Via Measurement

Momentarily depress **[ZERO]** while measuring area to be Zeroed (Nulled) out.

1. Repeatedly depress **[FUNCTION]** until **"DEN"** is displayed.



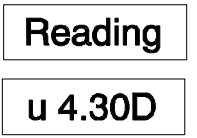
2. Select color by depressing **[COLOR]**.



3. Measure the density to be zeroed, and keep the **[READ]** button depressed (thru Step 4).

Take Measurement

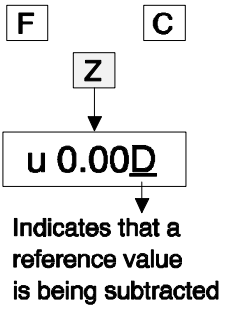
"Density value of density being measured" is displayed.



4. Press **[ZERO]** key.

"Zero density" is displayed.

5. Release the **[READ]** button and **[ZERO]** key.



2.5 Measuring Films

2.5.1. Diazo Film - (UV Operation)

Some diazo films are susceptible to light, and as these films are exposed to light the density measured will decrease in value. The decrease in density is due to the effect that ultraviolet light energy has on diazo films. The UV effect is most noticeable in the mid-range (1.0D-4.00).

In order to minimize this effect, the 369 has a safeguard built into its software. First, the lamp is not allowed to brighten to full intensity until the reading goes above 4.0D. This reduces drift for reading between 1.0D and 4.0D. For reading above 4.0D, the lamp brightens thus extending the range capability of the unit.

If consecutive measurements are taken on the same area of the film, without allowing the ultraviolet light energy effect to dissipate between readings, the density measurements taken will decrease successively. (Dissipation time approximately one minute.)

Occasionally, you may notice that the lamp will momentarily flicker if the area being read is approximately 4.0D. This is caused by the turn on/off point of the range extension software, for reading above 4.0D.

If this does occur, just continue holding the read button until the reading stabilizes.

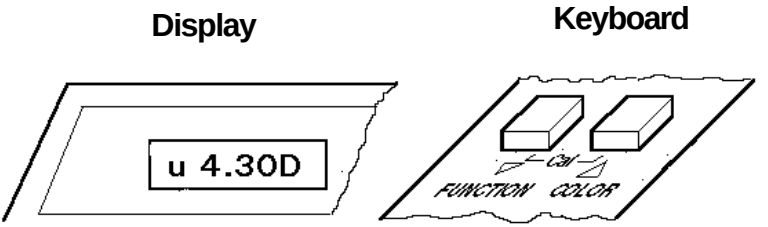
2.5.2. All Other Films - (Visual Operation)

Since all other films are not effected by UV light energy, there is no need to follow the procedure discussed for diazo film.

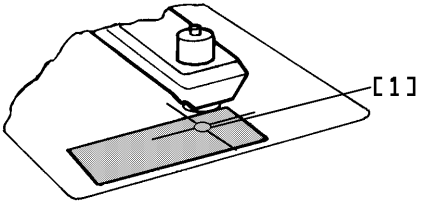
To extend the visual range capability of the densitometer, the lamp brightens for readings above 4.0D.

2.6 Measurement Procedure - General

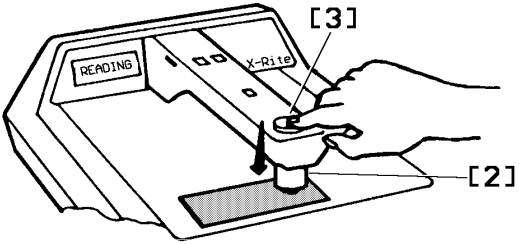
1. Select desired function and color.



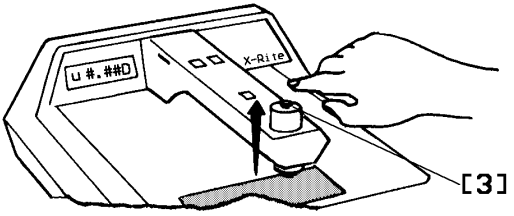
2. Center area being measured over center of aperture **[1]**.



3. Lower reading head **[2]** by pressing on Read button **[3]**. **"READING"** will be displayed during a measurement cycle.



4. Release Read Button **[3]** after data is displayed.



NOTE: "INVALID" will be displayed if the Read button is not depressed for enough time.

2.7 Display Messages

MESSAGE	REASON
1. BATTERY:	The memory backup battery has failed. The Lithium battery needs replacement by qualified technician.
2. INVALID:	The Read button was held down too short a period causing an invalid measurement. If **"INVALID"** appears after the Read button was held down for the proper length of time; or **"READING"** is displayed an abnormal length of time while taking a measurement, possible causes are defective: Side Sensor, Reading Head Assembly, or Transmission PCB.
3. LAMP FAIL:	The Read Lamp has failed its intensity test. The Read Lamp should be examined and possibly replaced. When this happens, you can get out of this error condition (if lamp was O.K. or replaced) by pressing **[FUNCTION]** then **[COLOR]** then **[FUNCTION].**
4. MEM TEST:	The memory in the unit is going thru an extended memory check. If **"MEM TEST"** remains on the display, Display PCB needs to be replaced.
5. MEM LOST:	Calibration of the unit has been lost and recalibration is necessary.
6. NEED CAL:	Unit needs full length calibration.
7. uP FAIL:	The microprocessor has failed its memory test. The Display PCB should be replaced by a qualified technician.

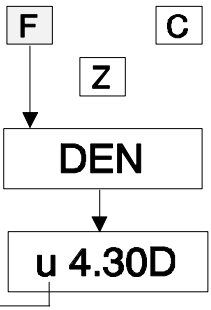
3.0 Measurement Procedures

3.1 Density Function

The DEN function allows you to take density and density difference measurements. This also, allows an extra digit (x10 function) to be displayed at the right of the decimal point when extreme resolution is required. The procedure for each of these are as follow.

3.1.1. DENSITY MEASUREMENT

1. Repeatedly depress **[FUNCTION]** key until **'DEN"** is displayed.



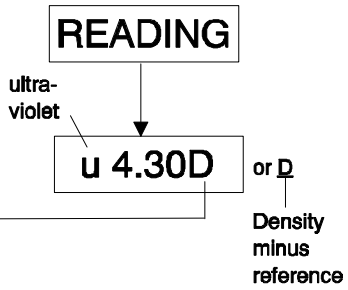
Previous density is displayed.

2. Select color (visual or ultraviolet).

3. Measure film.

Take Measurement

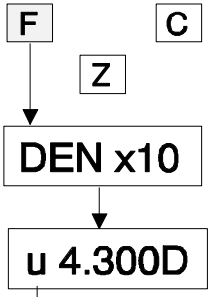
Density value is displayed.



absolute density (reference = 0)

3.1.2. DENSITY x10 MEASUREMENT

1. Repeatedly depress **[FUNCTION]** key until "DEN x10" is displayed.



Previous density is displayed.

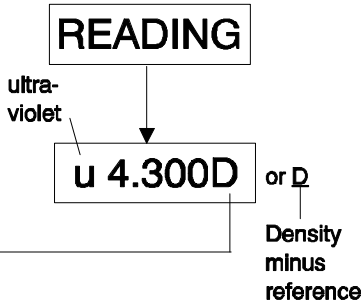
2. Select color (visual or ultraviolet).

---

3. Measure film.

Take Measurement

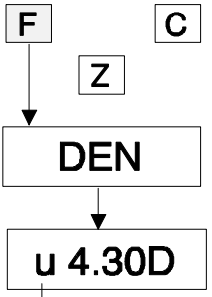
Density value is displayed.



absolute density (reference = 0)

3.1.3. DENSITY DIFFERENCE MEASUREMENT

1. Repeatedly depress **[FUNCTION]** key until **"DEN"** is displayed.



Previous density is displayed.

2. Select color (visual or ultraviolet).

---

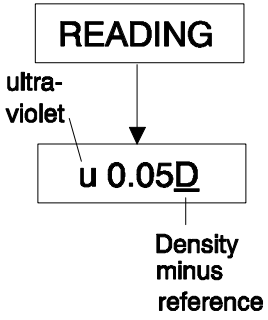
3. Enter a reference value. Refer to Section 2.4.1 for entry of reference via the keyboard, or Section 2.4.2 for entry via a measurement.

---

4. Measure film that is to be compared.

Take Measurement

Density difference value is displayed.



4.0 Calibration

The X-Rite 369 is designed for long life and extremely stable measurements. To follow good quality control practice, you should check density calibration periodically to verify measurement accuracy and proper operation of your unit. To verify and perform density calibration, a calibrated transmission reference has been provided. The transmission reference has a five step grey scale ranging from approximately .06D (step 1) to 4.0D (step 5).

4.1 Frequency of Calibration

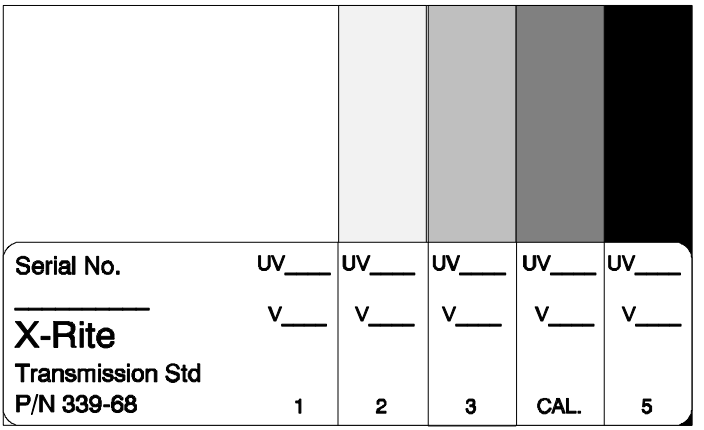
Under normal operating conditions, the instrument should be calibrated once a week or when instrument displays a message regarding calibration.

4.2 Density Calibration Check

To check density calibration, first zero the unit, then measure the "cal" step on the transmission reference. If the measurement is within .02D of the densities specified , the unit is properly calibrated. If not, the unit must be recalibrated (see Section 4.3).

NOTE: On the transmission reference, step 4 (CAL) is used for calibration, and steps 1, 2, 3, and 5 are used for checking the linearity of the unit.

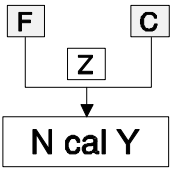
Transmission Reference



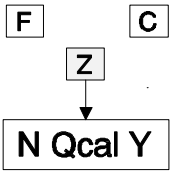
4.3 Density Calibration Procedure

Handle the transmission reference at the edges only. Fingerprints or any other foreign substances on the measurement area will cause errors. Attempts to dust or clean the surface with anything other than a soft camel hair brush may change densities. Minimize change by storing in a dark, cool, dry place.

1. Depress **[FUNCTION]** and **[COLOR]** keys at the same time until **"N cal Y"** is displayed.

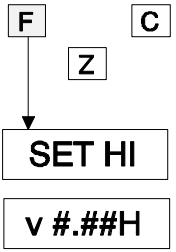


2. Depress **[ZERO]** for YES.

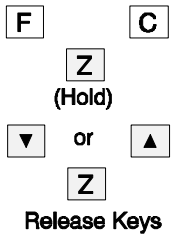


3. Depress **[FUNCTION]** for NO.

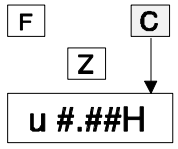
4. Calibration Hi value for Visual is displayed. (If value is correct skip to Step 6.)



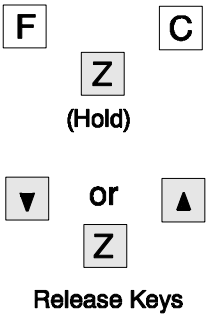
5. Enter the correct Cal Hi value for Visual (as marked on the step tablet) by pressing and holding ↓↑**(Zero)** down and using the ↓ **(Function)** key to decrease value or the ↑ **(Color)** key to increase value. Then release both keys.



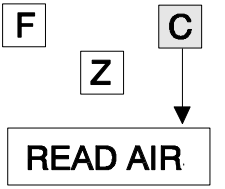
6. Depress **[COLOR]** key to select Ultraviolet cal value. Cal Hi value is displayed for Ultraviolet. (If value is correct skip to Step 8.)



7. Enter the correct Cal Hi value for Ultraviolet (as marked on the step tablet) by depressing and holding ↓↑**(Zero)** down and using the ↓**(Function)** key to decrease value or the ↑**(Color)** key to increase value. Then release both keys.



8. Depress **[COLOR]** key.

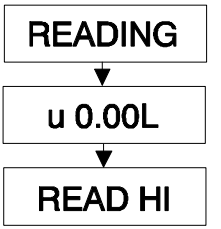


9. Remove all film from table and take measurement.

Take Measurement

"Cal LO" value is displayed during measurement.

10. Release Read button.

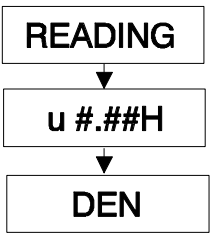


11. Take measurement of Cal Step on the Step tablet.

Take Measurement

"CAL HI" value is displayed during measurement.

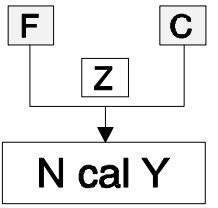
Display automatically returns back to **"DEN"** upon release of the Read button.



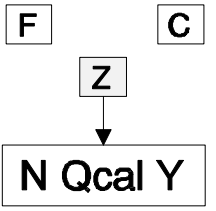
4.4 Quick CAL™ Procedure

Quick Cal™ provides you with an easy means of re-establishing zero (Calibration Low). This method is included because the zero (Calibration Low) is the major factor of drift over a period of time.

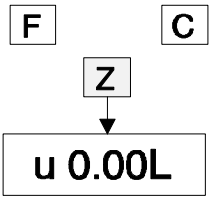
1. Depress **[FUNCTION]** and **[COLOR]** keys at the same time until "N cal Y" is displayed.



2. Depress **[ZERO]** for YES.



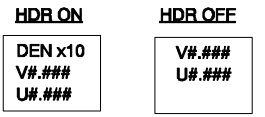
3. Depress **[ZERO]** for YES.



4. Remove all film from table, and take a measurement.

Take Measurement

5. Release the Read button, display will automatically return back to DEN.



5.0 Mode Selection

The Mode function controls four factors: I/O Port set-up, and Read Lamp On/Off. Modes come preset from the factory as follows:

1. I/O PORT
   - RCI [ON]
   - RPT [OFF]
   - P5 [OFF]
   - BAUD [1200]
   - HDR [OFF]
   - DPT [ON]
   - COMP [ON]
   - CR [LF]

2. READ LAMP [ON]

To change any of the above settings refer to the following setup procedures: I/O Port Setting (Sect. 5.2), and Read Lamp (Sect. 5.4).

5.1 I/O Port Selection

Your X-Rite 369 comes equipped with a serial port that allows data to be transmitted and/or received by the 369 to/from an external device. The 369 can be externally controlled by the Serial Input Commands discussed in Section 6.3.

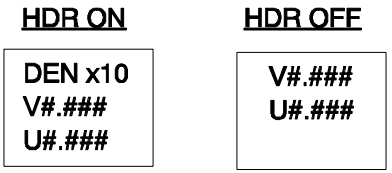
5.1.1 **RCI** [Remote Control Input] enables or disables the ability to externally control the 369 via the I/O port.

5.1.2 **RPT ON/OFF** [Reference Print] enables or disables the Reference values during print-out.

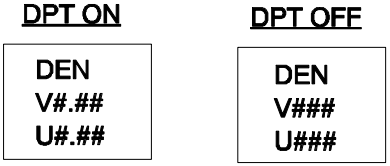
5.1.3 **P5** determines the status of Pin 5 of the I/O port. Pin 5 may be set to OFF, BUSY , or CTS (Clear To Send). Note: Pin 5 should normally be set to OFF when Pin 5 is not going to be used.

5.1.4 **BAUD RATE** determines the output rate (characters per second) of the I/O port. Available outputs are: 300, 600, 1200, 2400, 4800, 9600, and OFF.

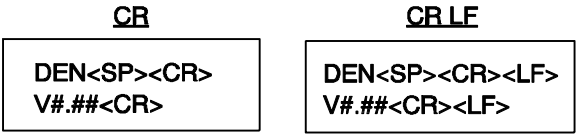
5.1.5 **HDR** [Header] enables or disables the header (DEN or DEN x10) during print-out. When set to ON, the header will print. When set to OFF, the header will not print.



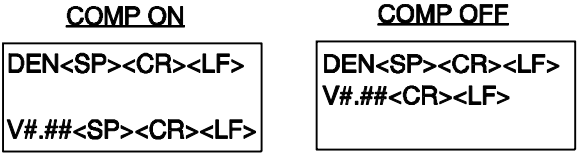
5.1.6 **DPT** [Decimal Point] enables or disables the decimal point during print-out. When set to ON, the decimal point will print. When set to OFF, the decimal point will not print.



5.1.7 **CR / CR LF** [Carriage Return / Carriage Return, Line Feed] varies the delimiter at the end of each line of data. When set to CR, just a Carriage Return is sent at the end of a line of data. When set to CR LF, a Carriage Return and a Line Feed are sent at the end of a line of data.



5.1.8 **COMP** [Computer output] varies the output format of the I/O port. When set to ON, a Space will appear after each group of data values. When set to OFF, no space will appear after each group of data values.



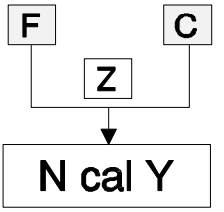
NOTE: <SP>= Space, <CR>= Carriage Return, and <LF>= Line Feed

5.1.9 **X ON / X OFF** - not available at this time.

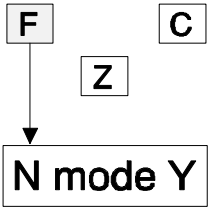
Show I/O Port Selection...contined

The procedure for setting the I/O port options is shown below.

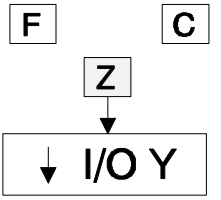
1. Depress **[FUNCTION]** and **[COLOR]** keys at the same time until **"N cal Y"** is displayed.



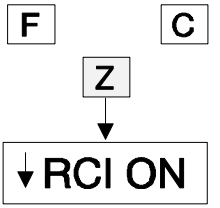
2. Depress **[FUNCTION]** for NO.



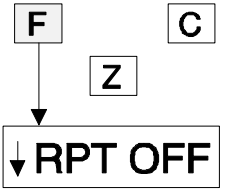
3. Depress **[ZERO]** for YES.



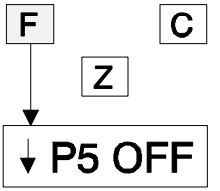
4. Press **[ZERO]** to advance to RCI. Each depression of the **[ZERO]** key will alternate between RCI OFF and RCI ON.



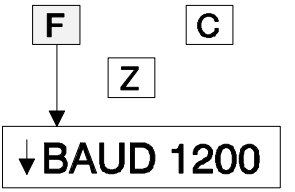
5. Press **[FUNCTION]** to advance to FUNCTION RPT. Each depression of **[ZERO]** key will alternate between RPT ON and RPT OFF.



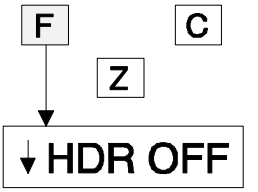
6. Press **[FUNCTION]** to advance to P5. Each depression of **[ZERO]** key will select between P5: Busy, CTS, or OFF.



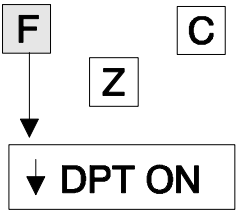
7. Press **[FUNCTION]** to advance to BAUD. Each depression of **[ZERO]** will page thru BAUD 2400, 4800, 9600, OFF, 300, 600, and 1200.



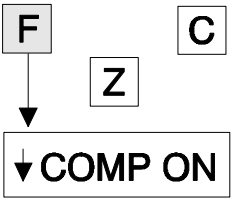
8. Press **[FUNCTION]** to advance to FUNCTION HDR. Each depression of **[ZERO]** key will alternate between HDR ON and HDR OFF.



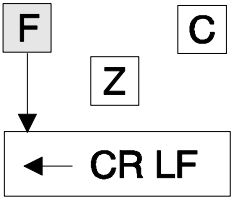
9. Press **[FUNCTION]** to advance to FUNCTION DPT. Each depression of **[ZERO]** key will alternate between DPT OFF and DPT ON.



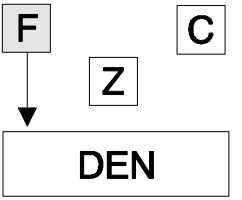
10. Press **[FUNCTION]** to advance to FUNCTION COMP. Each depression of **[ZERO]** key will alternate between COMP OFF and COMP ON.



11. Press **[FUNCTION]** to advance to FUNCTION CR. Each depression of **[ZERO]** key will alternate between CR LF and CR.



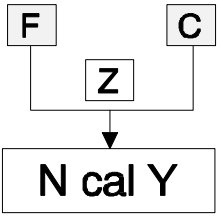
12. Press **[FUNCTION]** four (4) times and the 369 returns to normal operation.



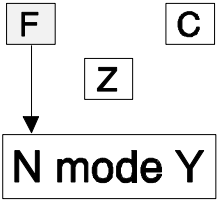
5.2 Read Lamp ON/OFF

This feature allows the densitometer to automatically turn the Read lamp OFF after 2 hours of instrument non-use. Having the Transmission lamp turn OFF will extend the time before lamp replacement. The lamp will turn back ON after any key is pressed, the Read button is pressed, or any "M, P,U, or Y" RCI command has taken place. LAMP ON causes the lamp to stay ON as long as the unit is powered on. LAMP OFF causes the lamp to turn OFF after two hours of non-use of the Transmission unit.

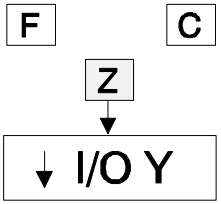
1. Depress **[FUNCTION]** and **[COLOR]** keys at the same time until **"N cal Y"** is displayed.



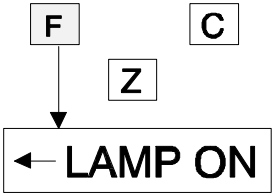
2. Depress **[FUNCTION]** for NO.



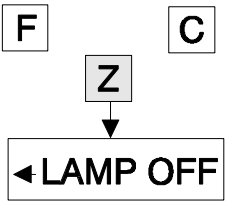
3. Depress **[ZERO]** for YES.



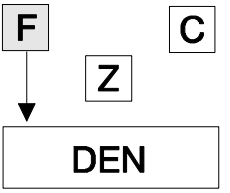
4. Depress **[FUNCTION]** to advance to **"LAMP ON"**.



5. Each depression of **[ZERO]** will alternate between LAMP OFF and LAMP ON.



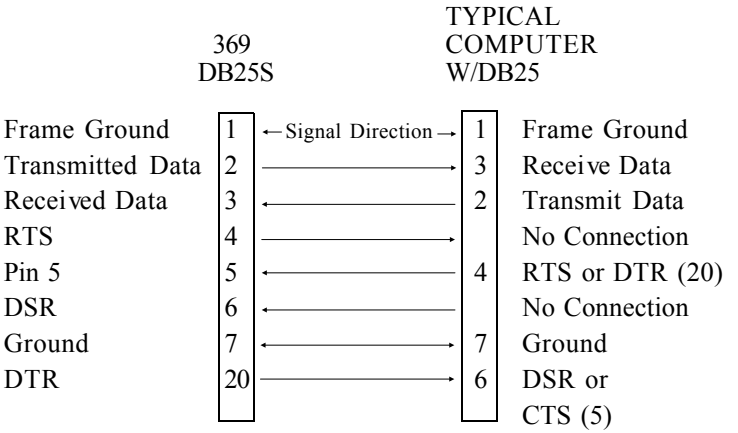
6. Press **[FUNCTION]** one (1) time to return to normal operation.



6.0 Serial Interface

6.1 Interconnect and Definition

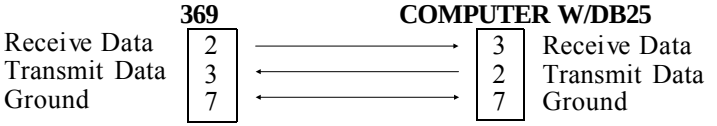
The 25-pin connector used for serial input/output is a DB25S type. Below is the connection diagram.



Pin #	Term Definition
2	**Transmitted Data -** Data transmitted from the densitometer with parameters (baud rate,format) set by the densitometer.
3	**Received Data -** Data received the densitometer from outside source using the same parameters as the densitometer.
4	**RTS (Request To Send) -** Logic 0 only.
5	**PIN 5 -** if set to CTS = Logic 0 active, if set to BUSY = 1 active, and if set to OFF = IGNORE.
6	**DSR (Data Set Ready) -** Logic 0 active.
20	**DTR (Data Terminal Ready) -** Logic 0 active (On Line) and Logic 1 during: Power Off, Power Up, Self Test, during measurements, and when serving RCI.

- **NOTE: Logic 1 = + .8VDC to -25VDC**
  Logic 0 = + 2.25VDC to + 25VDC

A typical interconnection (in its simplest form) between the 369 and a computer is shown below.



6.2 Serial Output

The data format that is transmitted from the 369 is determined by the I/O PORT options found in Sec. 5.2.

- ***Serial Output Note*** **- Data transmitted by the 369 shall have one start bit (Logic 0), 7 bits of ASCII, one parity bit set to zero, and then one stop bit (Logic 1).**

6.3 Serial Input Commands

Your 369 is equipped with an input which allows the 369 to be controlled or monitored remotely. Every function which can be performed by the 369 (plus a few special functions not activated by the keyboard) can be activated via the serial input. This Remote Control Interface is covered by U.S. Patent 4,591,978.

Basically, the Remote Control Input (RCI) format consists of a series of characters (a command string) sent to the 369 in an ASCII FORMAT with a Carriage Return or Line Feed at the end of each command string to act as a delimiter. The 369 then acts on that command. The serial input buffer of the 369, upon receiving its first command string character, sends a "Buffer Full" interrupt to the 369 microprocessor. The 369 microprocessor then halts all normal operation and dedicates itself to receiving and responding to remote control command strings. Normal execution is returned to upon receiving a GO command via the serial input.

- ***Serial Input Notes*** **- 1) Data transmitted by the 369 shall have one start bit (Logic 0), 7 bits of ASCII, one parity bit set to zero, and then one stop bit (Logic 1). 2) To ensure proper processing of received data by the 369, a delay of 50 msec. should be added between every character sent to the 369, and a delay of 500 msec. should be added after a "p", "t", or "u" command.**

6.3.1 Instruction Format

In general, the format used as the command string for serial input is as follows:

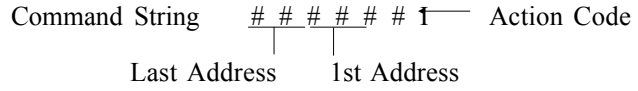
1 2 3 4
DATA → ADDRESS → ACTION CODE ——→ < LF>

1. DATA - is a two character hexadecimal code (in ASCII) which is written to the control register that is being addressed; and is used during a Write Action only.
2. ADDRESS - is a one to three character hexadecimal code (in ASCII) that selects the memory location which will be acted upon.
3. ACTION CODE - is a single character which is used to define the Remote Control Action as follows: **NOTE: ALL ACTION CODES FOR THE 369 MUST BE SENT AS CAPITAL (UPPERCASE) LETTERS.**

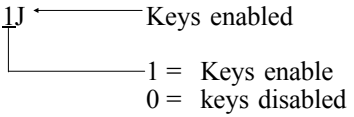
G **[Go]** is the ASCII character sent to the 369 to release it to operate as instructed after the "LF" (or "CR") is received.

- **NOTE: The reason for the "G" command is that when the 369 senses that data is being received on the serial input, it stops normal operation and only allows the serial input to modify or monitor keys and control registers, until a "G" Action Code is given to return the 369 to normal operation.**

I **[INTERROGATE]** reads the external RAM memory from the 1st Address to the last Address, and sends the data value(s) out the Transmit line of the I/O port in the following format, # # CR(LF). The 1st and last Address must both be designated as 3 hexadecimal characters in the command string. If the last Address is not sent or is a lower Address than the 1st Address, then only the 1st Address is read.

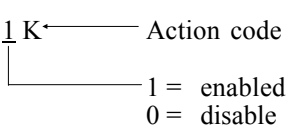


J **[KEY ENABLE]** is used to enable or disable all keys (with the exception of the Read button) from altering the operation of the unit. This switch enables or disables the keys by the 369 receiving the following as the address and action code portions of the string:



- **NOTE: This switch will reset itself to "keys enable" each time the unit is turned on by applying power or by executing a "P" command from RCI.**

K **[KEY DEPRESSION]** is used to enable to 369 to transmit a K plus a number to indicate which key has been depressed. This switch is enabled or disabled by the 369 receiving the following as the address and action code portion of the command string. The "KEYS ENABLED" switch (J) must be set to disable for the "K" code to function.



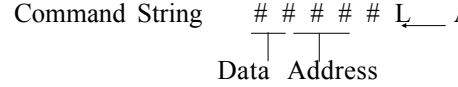
When enabled, the 369 will transmit the following when a key is pressed.

K1 = Function key
K2 = Color key
K3 = Zero key
K4 = Read button

In addition, a Carriage Return < CR> or a < CR> and a Line Feed < LF> will be sent after KX depending on how CR / CR LF is set in Modes.

- **NOTE: This switch will reset itself to "KEY DEPRESSED DISABLE" each time the unit is turned on by applying power or by executing a "P" command for RCI.**

L **[LOAD]** writes Data to the external RAM memory location Address. Data must be designated as 2 hexadecimal characters and the Address location as 3 hexadecimal characters, in the command string.

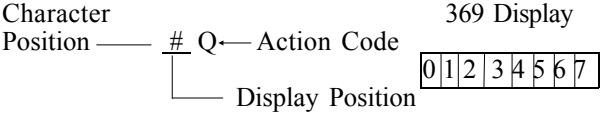


M **[MEASUREMENT]** causes the 369 to take a measurement.

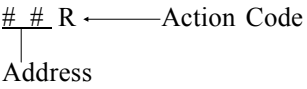
N **[NULL]** causes a Reference measurement if either the Read button is pressed or if a measurement is being forced by use of the "M" action code.

P **[POWER UP RESET]** causes the 369 to do a software reset.

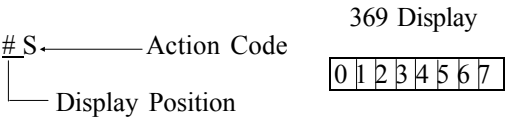
Q **[QUERY]** transmits a single display character to the serial port, as designated by a single hexadecimal character (equal to the character position in the display) preceding the action code "Q".



R **[READ]** reads the Address location of the microprocessor's internal memory; and causes the 369 to serially output in ASCII Format two hexadecimal characters representing the binary data specified by the (2 hexadecimal characters) Address portion of the command string.



S **[STRING]** is used to display a string. The 369 will display whatever data it receives via the serial port, starting from the Display Address location, as designated by a single hexadecimal character preceding the action code "S".



The data to be displayed must be received by the 369 immediately after the first delimiter (# 4 in command string), and a delimiter must be received after the data before the "G".

T **[BAUD]** is used to change the baud rate of the 369. The unit must receive the following as the address and the action codes portion of the command string:

XXT ← Action Code

03 = 300 baud
06 = 600 baud
0C = 1200 baud
18 = 2400 baud
30 = 4800 baud
60 = 9600 baud

After the 369 receives the first delimiter (# 4 in the command string) it automatically performs a "g LF" (# 5 and # 6 in command string). The unit should not receive an additional "g< LF> ".

A command string with a "T" as the action code with no address preceding it, sent to the 369 at the correct baud rate will force the 369 to transmit the proper hexadecimal code for its baud rate.

U **[UPDATE]** command must be received by the 369 after any write commands to internal or external RAM Memory and after any "Y" action codes. This command forces the unit to update the data written to RAM or process a "Y" action code and forces a position within a function as determined by an address preceding the "U" command. The 369 must receive the following as the address and action code portion of the command string.

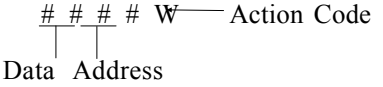
1U ← Action Code

1 = forces display to data level.
0 = forces display to beginning of function.

V **[VERSION]** transmits the software date code (that is displayed on the character displayed during power-up), and a < CR> or < CR> < LF> to the serial port.

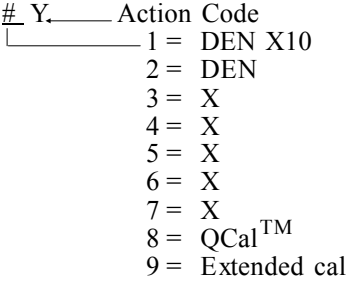
X-RITE 369 VER. XXXX (XXXX = Date Code)

W **[WRITE]** writes Data to the Address location of the microprocessor's internal RAM memory. This action causes the 369 to replace the contents of the microprocessor's RAM location, designated by the (2 hexadecimal characters) Address portion of the command string, with 8-bits of binary data, designated by the (2 hexadecimal characters) Data portion of the command string.



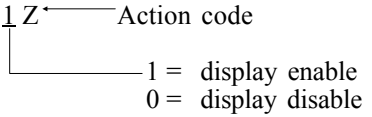
X **[TRANSMIT]** sends the present contents of the 369 display (8 characters) plus a < CR> or < CR> < LF> to the serial port.

Y **[FUNCTION]** is used to select the function of the 369. The unit must receive the following as the address and the action code portion of the string command.



A "U" command must also be received by the unit following a "Y" command.

Z **[DISPLAY ENABLE]** is used to enable or disable the display from being updated with data that occurs from normal operation. This switch enables or disables the display by the 369 receiving the following as the address and action code portion of the command string:



- **NOTE: This switch will reset itself to "Display enable" each time the unit is powered up by applying power or by executing a "P" command from RCI.**

4 < LF> (Line Feed) is an ASCII Line Feed used as a delimiter and tells the 369 to perform the preceding command and unless that command was "G", wait for the next command. (Note: A "CR" can be sent instead of a "LF" if necessary.)

6.3.2 Internal RAM Data Addresses

The Internal RAM Data Addresses are used to access parameters not handled by action codes. The following list covers the most commonly used parameters, their addresses, and a bit map for each address. In addition there are several notes that indicate the limitations and cautions that must be followed in using these addresses.

NAME	BIT #	FUNCTION
Mode (Address 2AH) (Enabled when Bit = 1)	0 1 2 3 4 5 6 7	X x10 Lamp 2 Hour Shut-off RCI On X X X X
Color (Address 2CH) (Enable when Bit = 1)	0 1 2 : 7	Visual UV 0 : 0
I/O (Address 2E)	0 1 2 3 4 5 6 7	Pin5: CTS = 1, BUSY = 0 Pin5: OFF = 1 DPT ON = 1 Baud Off = 1 CR LF = 1 COMP ON = 1 RPT ON = 1 HDR ON = 1

X = Don't Care

6.3.3 External RAM Data Addresses

The External RAM Data Addresses are used to access data values, reference values, and other values. The following lists covers the most commonly used addresses. In addition there are several notes that caution the user and must be followed.

NAME	ADDRESS	DATA	PARAMETERS
* Memory Reset	0C8	1 Byte	Write a 00 to address plus a "P" command to reset system.
DEN Data REF	VISUAL 0C0,0C1 0D0,0D1 UV 0C2,0C3 0D2,0D3	2 Bytes	Least significant bit (LSB) = .001D Values are in hexadecimal.
CAL HI			
VISUAL	05A , 05B	2 Bytes	
UV	066 , 067	2 Bytes	
SKIP PROMPTS	700	1 Byte	Write 80 for skip prompts. Write 00 for prompts (default).

* USE THIS ADDRESS WITH CAUTION: Writing to this address will force system reset, and the unit will clear all memory locations. Calibration and data will be lost. Make sure that a system reset is what is desired.

7.0 Maintenance

7.1 General

The X-Rite 369 is covered by a one-year limited warranty (excluding lamps) 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.

Always verify instrument calibration to assure proper instrument operation. Make sure all connections are properly made.

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

X-Rite will repair any 369 past warranty at a cost based on a flat-rate repair program. Shipping costs to the factory or authorized service shall be paid by the customer and the instrument shall be submitted in its original carton, as a complete unaltered unit.

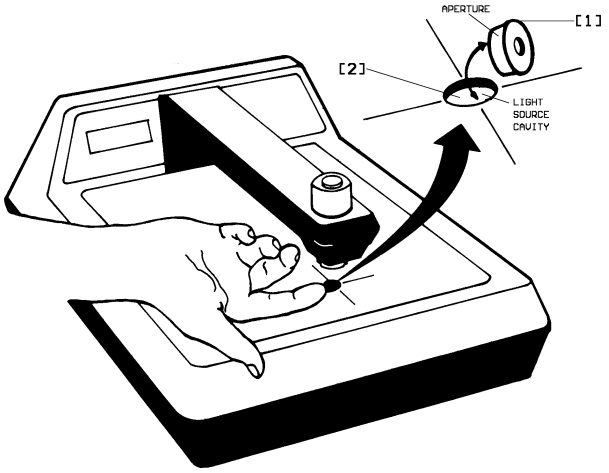
AS A ROUTINE MAINTENANCE PROCEDURE, replace the read lamp after every 1200 hours of operation. This allows approximately a half year of operation (based on an 8 hour operating shift per five days a week). Failure to do so may cause erroneous density readings. X-Rite has also provided you with an extra Transmission read lamp. This lamp should only be replaced by a qualified service repair person.

7.2 Aperture Replacement & Cleaning

APERTURE REPLACEMENT

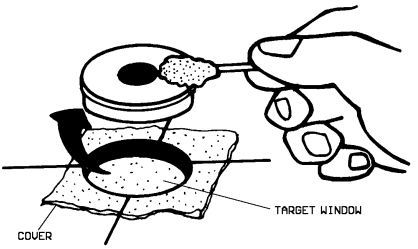
You have a choice of apertures (measuring area) size for the 369 Densitometer. Select the aperture which best fits your application from the 1mm, 2mm, and 3mm aperture supplied. The 3mm aperture will give the best averaging effect. However, we suggest that the 2mm aperture be used on diazo film. The 1mm aperture (and an optional .5mm aperture) should be used when measuring verfy fine lines or areas at the sacrifice of density accuracy above 4.0D.

1. Remove aperture **[1]** by wedging edge of aperture upwards with fingernail.
2. To reinstall aperture, insert aperture into target opening **[2]** making sure aperture is pressed flush against surface.



APERTURE CLEANING

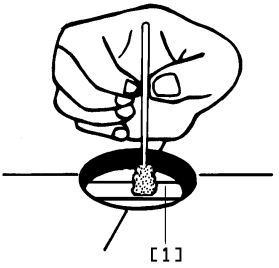
1. Remove aperture as described above.
2. Clean aperture with Q-tip moistened with alcohol.
3. Reinstall aperture.

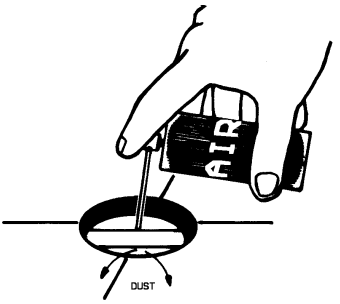


- **NOTE: When cleaning the aperture always cover the target opening.**

7.3 Beam Splitter Cleaning

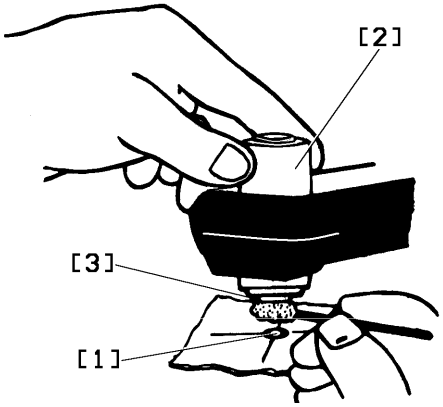
1. Remove aperture as described in Section 7.2.
2. Clean residue from Beam Splitter **[1]** with dry Q-Tip.
3. Remove dust and lint by lightly blowing air into target opening.





7.4 Optics Cleaning

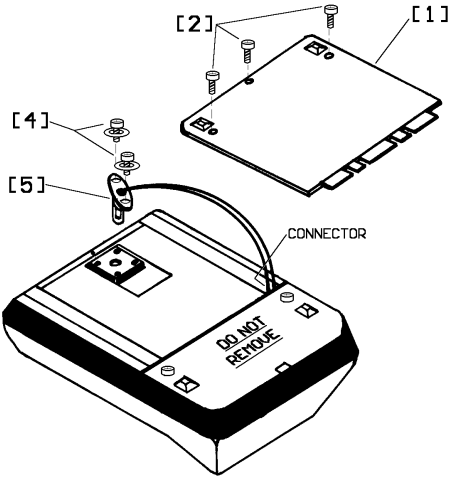
1. Cover aperture **[1]** with small piece of plastic.
2. Grasp reading head assembly **[2]** and lift upwards.
3. Clean residue and dust from optics **[3]** with Q-tip slightly moistened with alcohol.



7.5 Lamp Replacement

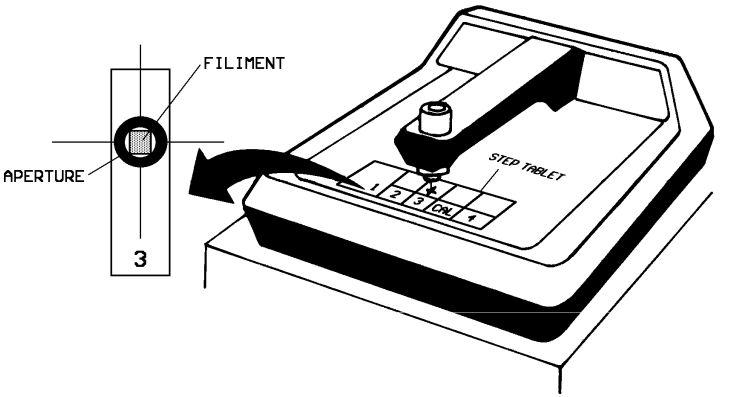
AS A ROUTINE MAINTENANCE PROCEDURE, replace the read lamp after every 1200 hours of operation. This allows approximately a half year of operation (based on an 8 hour operating shift per five days a week). Failure to do so may cause erroneous density readings. X-Rite has also provided you with an extra Transmission read lamp. This lamp should only be replaced by a qualified service repair person.

1. *DISCONNECT LINE CORD FROM POWER RECEPTACLE.*
2. Set unit upside down and remove larger bottom cover **[1]** by unscrewing the three screws **[2]** located in front portion of cover.
3. Unplug lamp connector from circuit board (located under small bottom cover).
4. Remove lamp assembly by unscrewing the two phillips-head screws **[4]** (with washers) from bottom of lamp assembly then discard lamp assembly **[5]**.
5. Fasten new lamp assembly **[5]** in place with two phillips-head screws **[4]** , and two flat washers supplied with lamp.
6. Plug lamp connector into circuit board.
7. Check lamp alignment. (See following page.)



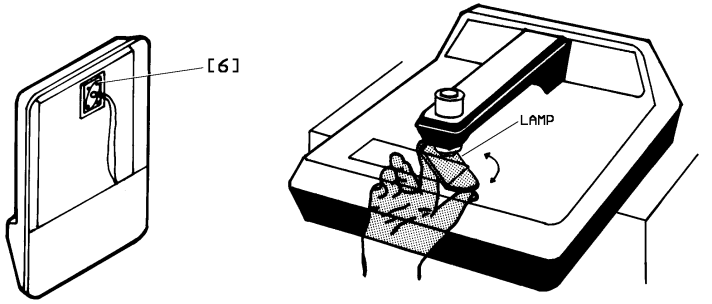
. . .ALIGNMENT CHECK. . .

8. Set unit upright, plug line cord into wall receptacle, and turn power switch to "ON" position.
9. Locate your transmission reference (used for calibration) and center step "3" or "CAL" over aperture. (Use 3mm aperture.)
10. Look at the light coming through the round aperture. The lamp's filament will appear as a square in the middle of the aperture.
11. If lamp is properly aligned: Unplug line cord, turn unit upside down, then fasten bottom cover in place with three screws removed in step 2. If lamp is not properly aligned proceed with Step 12 thru 16.



Alignment Check...continued

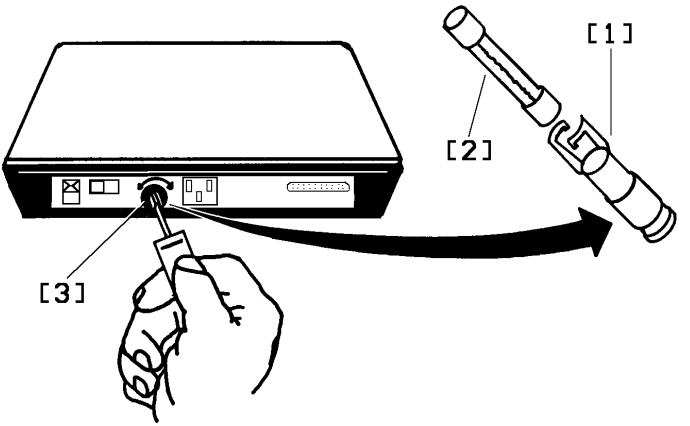
12. Unplug line cord then loosen two phillips-head screws 6 in bottom of lamp assembly.
13. Set front half of unit over edge of table, then plug line cord into wall receptacle.
14. Carefully move lamp assembly until lamp filament is centered with aperture (see Step 9 and 10).
15. After alignment, unplug line cord and tighten two phillips-head screws 6 in bottom of lamp assembly WITHOUT moving lamp assembly out of alignment.
16. Fasten bottom plate in position with three screws removed in Step 2.



7.6 Fuse Replacement

[DISCONNECT LINE CORD BEFORE SERVICING]

1. Insert flatblade screwdriver into slot of fuse cap **[1]**.
2. Push in and turn counterclockwise one-half turn until fuse **[2]** and fuse cap pop out.
3. Remove fuse from fuse cap and replace with same type fuse.
   - 115vac operation (600ma 250v 3AG Slo-blo, P/N SE24-0060)
   - 230vac operation (300ma 250v Type T Time Lag, P/N SE49-00300)
4. Insert fuse into fuse cap, insert fuse into fuseholder **[3]**, push-in and turn clockwise one-half turn until fuse cap locks.



8.0 Appendix

8.1 Proprietary Notice

The information contained in this manual is derived from patent and proprietary data from X-Rite, Incorporated. This manual has been prepared expressly for the purpose of assisting operation and maintenance personnel in their use and general maintenance of the X-Rite 369.

Publication of this information does not imply any rights to reproduce or use it for purposes other than installing, operating, or maintaining the equipment described herein.

This instrument is covered by the following U.S. and Foreign patents: U.S. Patent #4,080,075, #4,591,987, and other patents pending.

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8.2 Limited Warranty

X-Rite warrants this Product against defects in material and workmanship for a period of twelve (12) months from the date of shipment from X-Rite's facility, unless mandatory law provides for longer periods. During such time, X-Rite will either replace or repair at its discretion defective parts free of charge.

X-Rite's warranties herein do not cover failure of warranted goods resulting from: (i) damage after shipment, accident, abuse, misuse, neglect, alteration or any other use not in accordance with X-Rite's recommendations, accompanying documentation, published specifications, and standard industry practice; (ii) using the device in an operating environment outside the recommended specifications or failure to follow the maintenance procedures in X-Rite's accompanying documentation or published specifications; (iii) repair or service by anyone other than X-Rite or its authorized representatives; (iv) the failure of the warranted goods caused by use of any parts or consumables not manufactured, distributed, or approved by X-Rite; (v) any attachments or modifications to the warranted goods that are not manufactured, distributed or approved by X-Rite. Consumable parts and Product cleaning are also not covered by the warranty.

X-Rite's sole and exclusive obligation for breach of the above warranties shall be the repair or replacement of any part, without charge, which within the warranty period is proven to X-Rite's reasonable satisfaction to have been defective. Repairs or replacement by X-Rite shall not revive an otherwise expired warranty, nor shall the same extend the duration of a warranty.

Customer shall be responsible for packaging and shipping the defective product to the service center designated by X-Rite. X-Rite shall pay for the return of the product to Customer if the shipment is to a location within the region in which the X-Rite service center is located. Customer shall be responsible for paying all shipping charges, duties, taxes, and any other charges for products returned to any other locations. Proof of purchase in the form of a bill of sale or receipted invoice which is evidence that the unit is within the Warranty period must be presented to obtain warranty service. Do not try to dismantle the Product. Unauthorized dismantling of the equipment will void all warranty claims. Contact the X-Rite Support or the nearest X-Rite Service Center, if you believe that the unit does not work anymore or does not work correctly.

THESE WARRANTIES ARE GIVEN SOLELY TO BUYER AND ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR APPLICATION, AND NON-INFRINGEMENT. NO EMPLOYEE OR AGENT OF X-RITE, OTHER THAN AN OFFICER OF X-RITE, IS AUTHORIZED TO MAKE ANY WARRANTY IN ADDITION TO THE FOREGOING.

IN NO EVENT WILL X-RITE BE LIABLE FOR ANY OF BUYER'S MANUFACTURING COSTS, OVERHEAD, LOST PROFITS, GOODWILL, OTHER EXPENSES OR ANY INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES BASED UPON BREACH OF ANY WARRANTY, BREACH OF CONTRACT, NEGLIGENCE, STRICT TORT, OR ANY OTHER LEGAL THEORY. IN ANY EVENT OF LIABILITY, X-RITE'S MAXIMUM LIABILITY HEREUNDER WILL NOT EXCEED THE PRICE OF THE GOODS OR SERVICES FURNISHED BY X-RITE GIVING RISE TO THE CLAIM.

8.3 Technical Specifications

PARAMETER	
Display	8 character LCD, 9.4mm H w/ EL backlighting
Measuring Range	2mm aperture 0 - 5D 1mm aperture 0 - 4.5D
Reference Range	All possible density values measured
Calibration	Digital w/ lithium battery backup
Zero	Auto
Slope	Yes
Accuracy	2mm aperture ±.02D @ 0 - 3.8D ±.04D @ 3.9D - 4.5D ±.12D @ 5D 1mm aperture ±.02D @ 0 - 3.0D ±.04D @ 3.1 - 3.5D ±.06D @ 3.6 - 4.5D
Repeatability	±.01D
Interinstrument Agreement	±.02D, ±2%
Zero Stability	±.02D max per 8hr
Slope Stability	±1% max per 1 year
Warm-up Time	5 min.
Measuring Geometry	Per ANSI PH2.19, ISO5/2
Illumination	0 degrees
Light Collection	Diffusing surface
Aperture Angle Incident Light	Approx. ±5 degrees

PARAMETER		
Measuring Area Diameter		1, 2, 3mm .5mm optional, P/N 309-14-005 (Reduces sensitivity by .6D than 1mm aperture.)
Response Ultraviolet (Diazo) **Visual (Silver)**		X-Rite UV X-Rite Visual
Interface		Bidirectional, Serial RS-232-C DTE
Baud Rate		300, 600, 1200, 2400, 4800, 9600
Voltage Requirements		Domestic 90-130VAC, 50-60Hz Export 180-260VAC, 50-60Hz
Power Requirements		80VA max
Operating Temp. Range		+10° to +40°C (+50° to +104°F)
Storage Temp Range		-20° to +50°C (-4° to +122°F)
Dimensions (HxWxD)	[cm] [in]	15.2 x 33. x 43.5 6. x 13.1 x 17.1
Gross Weight	[kg]	8.64 [lb] 19.0
Net Weight	[kg]	7.95 [lb] 17.5

Specifications and design appearance subject to change without notice.

8.4 Optional Equipment

Accessories:

Operation Manual	(P/N 369-500)
Reference Guide	(P/N 369-601)
Spare Lamp Assembly	(P/N 310-60)
Transmission Reference	(P/N 339-68)
1mm Aperture	(P/N 319-40-01)
2mm Aperture	(P/N 319-40-02)
3mm Aperture	(P/N 319-40-03)

Specifications and design appearance subject to change without notice.

Interface Cables available:

1) P/N 361-83 DB25P to 10 Circuit Modular Interface Cable
(Available Adaptors for 361-83 cable above)

a) P/N 418-70 DB25P DCE (Null Modem) Interface Adaptor
b) P/N 418-71 DB25S DCE (Null Modem) Interface Adaptor
c) P/N 418-80 DB25P DTE (Normal) Interface Adaptor
d) P/N 418-81 DB25S DTE (Normal) Interface Adaptor
e) P/N 418-90 DB9P Interface Adaptor
f) P/N 418-91 DB9S Interface Adaptor

2) P/N 309-149 Whisper Printer Interface Cable

3) P/N 309-249 Seiko Printer Interface Cable

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P/N 369-500 Rev. P