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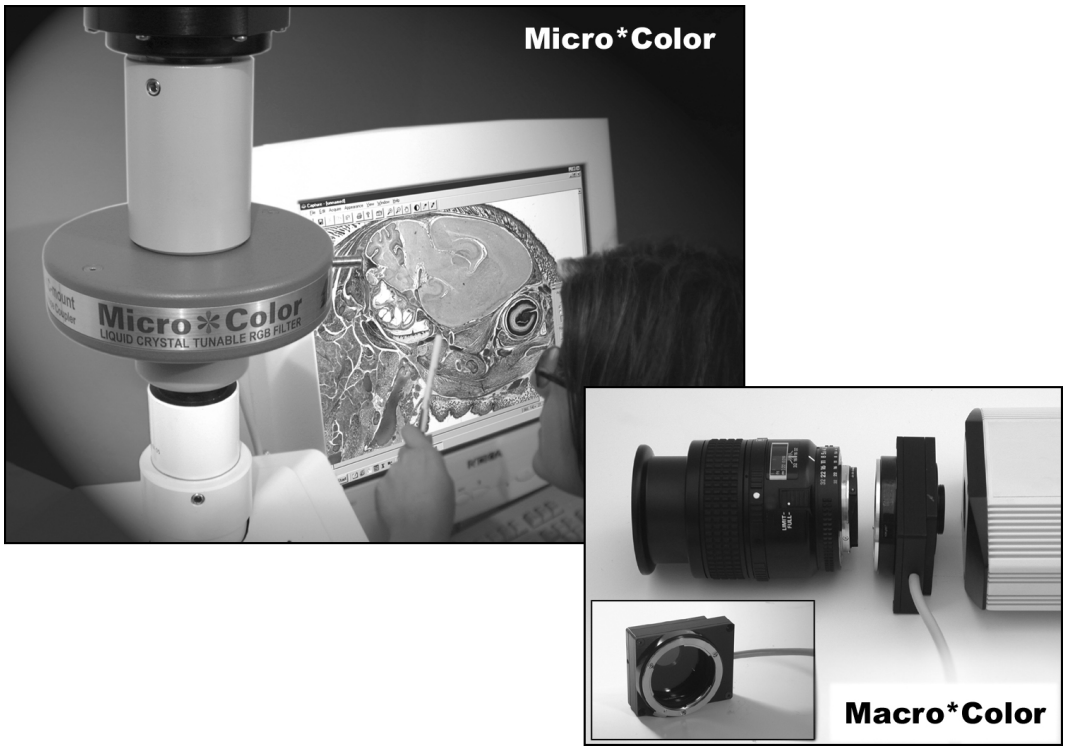
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Cambridge Research & Instrumentation, Inc.

Micro*Color™ & Macro*Color™ Tunable RGB Filter for Digital Imaging

User's Manual



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Foreword

F.1 Summary Instructions

READ THIS USER'S MANUAL BEFORE USING THE MICRO*COLOR & MACRO*COLOR TUNABLE RGB FILTER.

Please take special note of the following point:

- Do not heat the optics module above 40° C, drop it, or subject it to intense light from laser (> 500 mW/cm2), focused arc or Hg lamp sources.

F.2 Warnings and Cautions

IMPORTANT: It is important that you read and understand this manual BEFORE attempting to set up, operate, or troubleshoot the Micro*Color & Macro*Color Tunable RGB Filter. Reading this manual first makes it easier and safer to use the system. Following the recommended procedures helps ensure optimal performance over years of use. As with any scientific instrument, there are important safety considerations. These are highlighted within the text.

F.3 Contents of Manual

This manual is designed to serve the users of the CRI Micro*Color & Macro*Color Tunable RGB Filter. Operating instructions, functional descriptions, troubleshooting, illustrations, and other relevant information are contained in this manual.

Chapter 1: Introduction, furnishes information about CRI's Micro*Color & Macro*Color Tunable RGB Filters. Topics include system description, filter components, electronics controller module description, and a supplied software description.

Chapter 2: Specifications, lists the system's specifications.

Chapter 3: Setup, explains how to set up the CRI filter hardware; how to install microscope couplers; and how to install the supplied CRI software.

Chapter 4: Operation, explains in detail how to acquire images using the CRI-provided software and identifies and describes the software's menu items and toolbar icons.

Chapter 5: Troubleshooting, contains a troubleshooting chart that identifies most common system problems or error messages, descriptions, and corresponding corrective actions.

F.4 Design Change Disclaimer

Due to design changes and product improvements, information in this manual, including software screens, is subject to change without notice. Cambridge Research & Instrumentation, Inc. (hereafter called "CRI") reserves the right to change product design at any time without notice to anyone, which may subsequently affect the contents of this manual.

CRI will make every reasonable effort to ensure that this User's Manual is up-to-date and corresponds with the shipped Micro*Color & Macro*Color Tunable RGB Filter.

F.5 Reproduction Disclaimer

Neither this manual nor any part of it may be reproduced, photocopied, or electronically transmitted in any way without the advanced written permission of CRI.

F.6 User Operation Assistance

Should you experience any difficulty when setting up, operating, or troubleshooting your Micro*Color & Macro*Color Tunable RGB Filter, please contact your CRI representative. Feel free to contact our website at http://www.cri-inc.com or contact our Technical Support department at 1-800-383-7924 (+1 781 935 9099 outside the United States) (or contact CRI via e-mail at techsupport@cri-inc.com). Hours are 8:00 a.m. to 6:00 p.m. (Eastern Standard Time), Monday through Friday.

F.7 Warranty

CRI warrants its Micro*Color & Macro*Color Tunable RGB Filter and other items of its manufacture for a period of one year from date of shipment against defects in material and/or workmanship provided its installation, application, and maintenance are within specifications. Normal wearing parts are excluded. This warranty covers only items manufactured by CRI.

CRI will correct, by repair or replacement, at its option and its expense, any proved defects in items of its manufacture, subject to above, provided immediate written notice of such defects is given. Repair or replacement will be provided F.O.B. (Freight On Board) at CRI's factory.

The total financial obligation of CRI, under this warranty, does not exceed the purchase price of the items of its manufacture as set forth on normal pricing schedules. We will not assume any expense or liability for repairs made by others without our prior written consent.

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CRI assumes no liability for damages or injuries resulting from the misuse, misapplication, or unauthorized repair or modification of its equipment. We assume no liability to users of our equipment or to any other person or persons for special or consequential damages of any kind and from any cause arising out of or in any way connected with the use of the equipment.

All warranty and post-warranty service is non-transferable from the original shipping address to another without the prior written consent of CRI.

F.8 Software License

CRI provides this Capture program (and any other program included) at no charge, and licenses its use. (For license information about third-party software, consult the appropriate software license.) You assume responsibility for the selection of the program to achieve your intended results and for the installation, use, and results obtained from the program.

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This Agreement will be governed by the laws of The Commonwealth of Massachusetts.

Should you have any question concerning this Agreement, you may contact CRI by writing to CRI, Inc., 35-B Cabot Road, Woburn, MA 01801.

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Product: _____

Serial Number: _____

Date of Purchase: _____

Chapter 1: Introduction

Chapter 1 furnishes information about the CRI's Micro*Color & Macro*Color Tunable RGB Filter. Topics include system description, filter components, electronics controller Module description, and a supplied software description.

1.1 Description

CRI's tunable RGB filters employ liquid crystal technology to switch rapidly between the red, green, and blue color states. The red, green, and blue color states can be selected by computer control in any order, and the exposure time for each color can be varied to provide an accurate white balance.

Three grayscale images are acquired in quick succession as the filter changes color states automatically. The images are then combined into a single high-quality RGB image. The whole vibration-free process occurs within milliseconds and uses no beamsplitters, filter wheels, or any moving parts.

The Micro*Color filter is designed for use on microscopes with C-mount camera ports and comes built into a slider mechanism in a 0.65X microscope coupler. The C-mount-equipped coupler simply screws onto standard C-mount fixtures between your microscope and your CCD camera. No other adapters are necessary.

Versions also exist of the Micro*Color filter that fit into the "infinity" space of certain research-grade Zeiss and Olympus microscopes. See your local dealer or contact CRI for more information.

The Macro*Color filter is designed to accommodate the wide variety of CCD cameras and lens adapters used in standard or macro digital photography, and features a large, 35 mm active area.

Both the Micro*Color and Macro*Color filters operate using computer control via a separate compact electronics controller module that accepts simple commands from either a serial (COM) port, parallel (LPT) port, or a TTL/Sync source.

1.1.1 Important Features and Benefits

- High-resolution color images from a monochrome CCD camera when desired
- Better spatial resolution and color accuracy than conventional "painted-pixel" CCD cameras
- Lower cost than triple-CCD cameras and no pixel misregistration issues
- Solid-state liquid crystal technology with no moving parts, no vibration, and no noise
- A near-infrared (NIR) hot mirror to reject unwanted NIR light
- Integration of Color Shaping Glass (CSG) in some models, which corrects for spectral response of most CCD cameras, and improves color balance and dynamic range

1.2 Filter Components

Figure 3-1 illustrates the shipped components while Table 3-1 identifies and describes each.

1.3 Compatibility

1.3.1 Compatible Software

Any program capable of controlling devices such as microscope stages or filter wheels using serial (COM) or parallel (LPT) signals can easily control the Micro*Color and Macro*Color filters.

Many popular third-party image processing and analysis programs have plug-ins or extensions written to drive the Micro*Color or Macro*Color filters. These include the following third-party developers, who have implemented image capture procedures utilizing the RGB filter and compatible cameras:

- AIS™ (Imaging Research, Inc.)
- AnalySIS® (Soft Imaging System)
- AQM (Kinetic Imaging, Ltd.)
- Image™ (QED Imaging, Inc.)
- ImagePro® Plus (Media Cybernetics®)
- IPLab (Scanalytics, Inc.)
- MCID™ Elite (Imaging Research, Inc.)
- Metamorph® (Universal Imaging Corp.™)
- Openlab (Improvision®)
- Quantim (Zedec Technologies)
- SimplePCI (Compix, Inc.)

1.4 Electronics Controller Module

The Electronics Controller Module contains the circuitry and firmware necessary to control the CRI LC (liquid crystal) filter optics module. Supplied with each Micro*Color or Macro*Color filter, this module uses an internal jumper block (labeled J6 on the circuit board) that lets you change the communications interface method, depending on different host computers configurations. (Changing this jumper to accommodate different computer communication configurations is described in section 3.1.3.) Adapters are furnished with each filter for Windows-compatible serial (COM) and parallel (LPT) ports and Macintosh serial (GeoPort) ports.

1.4.1 Power Switch

The Power Switch turns on the electric power. Figure 1-1 shows the front panel controls.

1.4.1 Power On LED

The Power On LED lights green when the electric power is on.

1.4.2 Color Status LED

The Color Status LED changes color from red to green to blue and indicates the filter's current color state.

During image acquisition, the LED lights red when the red component of an image is being acquired, the LED lights green when the green component is being acquired, and the LED lights blue when the blue component is being acquired.

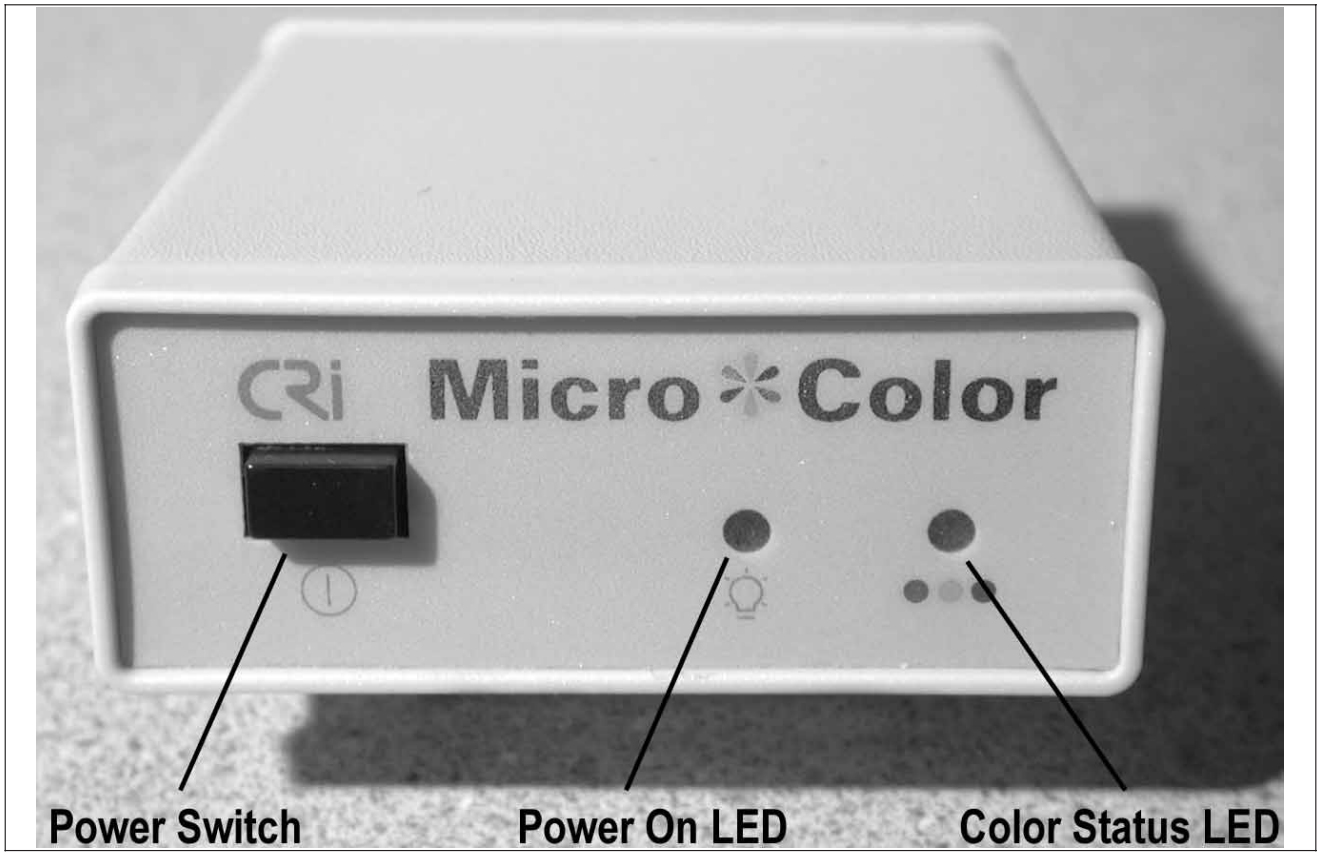


Figure 1-1 Electronics Controller Module Front View

Figure 1-2 shows the rear panel control and connectors of the electronics controller module.

1.4.4 Digital In Connector

The Digital In Connector is a non-standard RJ-12 connector that provides communications between the electronics controller module and your personal computer. Note: this accepts a straight-through data cable only.



Figure 1-2 Electronics Controller Module Rear View

1.4.2 Optics Connector

The Optics Connector (8-pin high density cable) connects the drive signals from the electronics controller module to either the Micro*Color filter optics module OR the Macro*Color filter optics module (depending on which filter you purchased), using the cable attached to the filter. **Do not attempt to send signals directly to the filter optics module from your computer. Doing so may damage the filter optics module and voids the warranty.**

1.4.3 TTL/Sync Port

The TTL/Sync Port (transistor to transistor logic) is a timing sync input signal, to synchronize the filter tuning with an external TTL signal. This causes the filter to change color from red to green to blue (and back to red for another cycle) each time a signal is received.

1.4.8 AC In Jack

The AC In Jack connects to the power transformer, which provides electric power to the electronics controller module. **Do not substitute a power transformer with a different output voltage or power rating.** If you use the filter in a location with different electric power at the wall outlet from that specified, consult the factory for a suitable power transformer.

1.5 Software

CRI supplies a Windows-based imaging software program with an easy-to-follow user interface. A **CD-ROM** containing an installer program and a demo standalone image-acquisition program, **Capture**, which works with a limited number of CCD camera models, is included. The Capture program automates the image acquisition process. The resulting files can be used with most popular image processing software, such as NIH Image, Adobe Photoshop, or Corel Photopaint.

In addition, CRI furnishes an RgbTool Test program. This program ensures proper communications between the electronics controller module and your computer and allows you to change the color of the filter manually to make sure the filter is operating as designed. For details, see section 3.4.

Section 1.3.1 describes compatible third-party imaging software.

Table 3-1 identifies and describes the menu items and toolbar icons, while Figure 4-2 shows a full-screen view of the Capture software program's main window.

Chapter 2: Specifications

Chapter 2 lists the system's specifications and includes a system configuration guide

Parameter or Component	Specification
Liquid crystal (LC) filter aperture	20 mm (Micro*Color models) 35 mm (Macro*Color)
Computer interface	Serial (COM), Parallel (LPT), or TTL/Sync (cable and adapters are included for use with PC-compatible ports and Macintosh-compatible serial ports)
Color states	Red, green, and blue (RGB)
Field-of-view	± 20 degrees off-axis
Wavelength range	Approximately 400 nm to 700 nm
Switching time	See Figure 2-1
Maximum optical throughput	500 mW/cm^2
Power for electronics controller module	100/220 VAC, 50/60 Hz with appropriate AC power transformer
Operating temperature	10° to 40° C
Storage temperature	-15° to 55° C
Demo CRI Capture software	Windows 98/2000 compatible (third party software available with CRI-compatible drivers for image capture, display, and analysis).
Computer required for demo software	Pentium, 90 MHz or higher
RAM required for demo software	32MB or greater

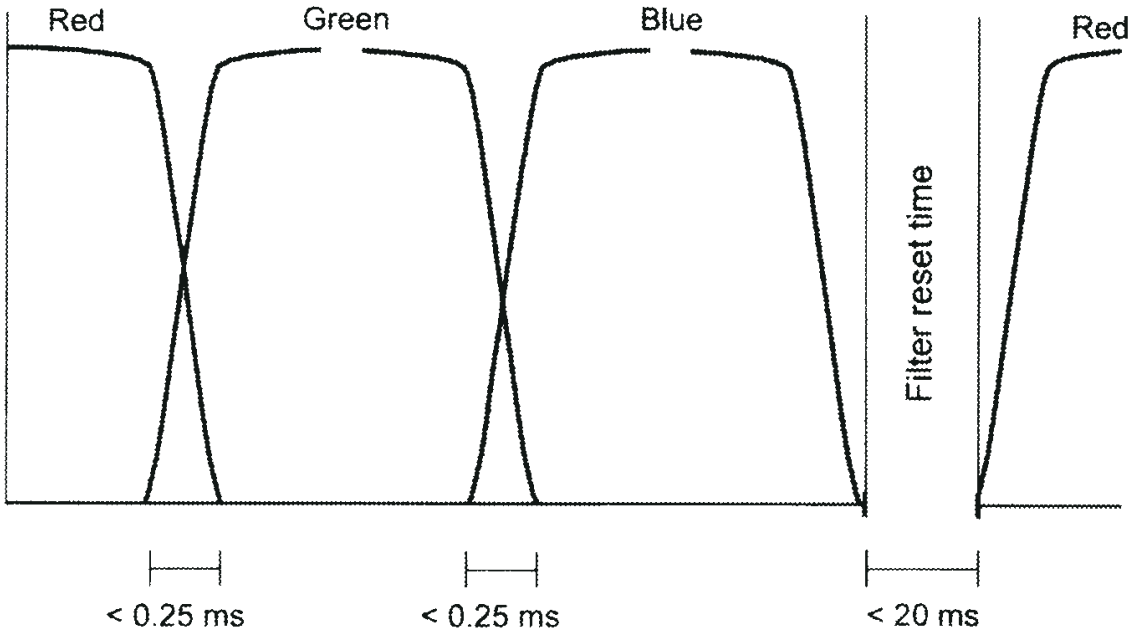


Figure 2-1 Switching Speed Diagram

The switching speed of the Micro*Color and Macro*Color RGB tunable filter as it is cycled through the red, green, and blue color states, and then back to the red state.

Note that the filter can remain in any color for any desired exposure time.

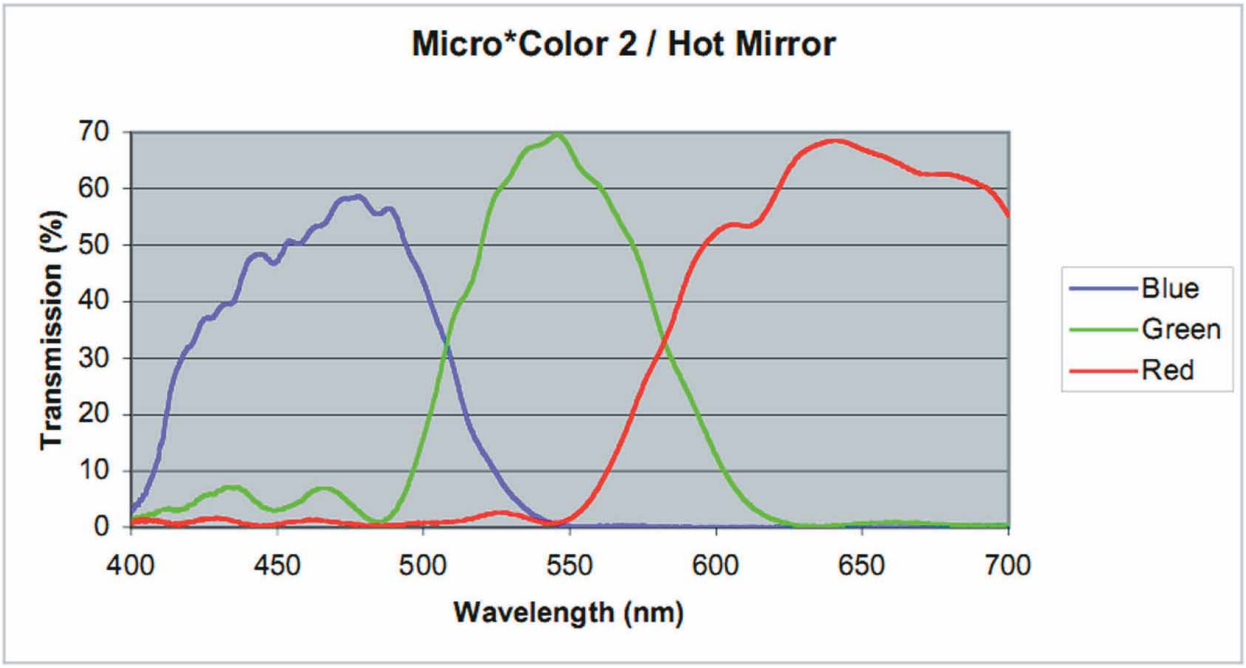


Figure 2-2 RGB Curves Diagram

Chapter 3: Setup

Chapter 3 explains how to set up the CRI filter hardware; how to install microscope couplers; and how to install the supplied CRI software.

3.1 Setting Up the Hardware

Figure 3-1 show the major components included in the shipping container. Each is identified and described briefly in Table 3-1.

3.1.1 Unpacking the Components

1. Upon receiving the Micro*Color & Macro*Color filter components, unpack the components and compare the contents against the Packing Slip included with the shipping container.
2. Confirm that all of the components have been received and that there has been no damage to any of the parts during shipping.
3. Keep any exposed optical surfaces clean and free of dust.

Table 3-1. Component List

Letter	Description
A	**Electronics controller module** (this is configured at the factory for PC-serial operation).
B	Either a **Micro*Color filter optics module** with attached mini-DIN 8 cable (a) (Olympus slider shown) (with or without coupler) OR (b) a **Macro*Color filter optics module** with attached mini-DIN 8 cable or MicroColor 2.
C	**CD-ROM disc** containing an installer program and a standalone image-acquisition program, **Capture**, which works with a limited number of CCD cameras, is included.
D	**RJ-12 straight-through data cable**.
E	**AC power transformer** (U.S. domestic model shown; an international version is also available).
F	**Communications adapters**, (i) DB-9 COM port-to-RJ-12 modular jack adapter, (ii) 25-pin parallel port-to-RJ-12 adapter, or (iii) Mac serial adapter used in conjunction with F (i) on Figure 3-1.
G	**Macro*Color adapters** for your particular configuration: G (1-6) on Figure 3-1: (1) F-Mount, female adapter, (2) Adapter plate for inserts, (3) T-Mount, male kit, (4) C-Mount, female kit, (5) C-Mount, male kit, and (6) 52 mm filter adapter kit for T-Mount.

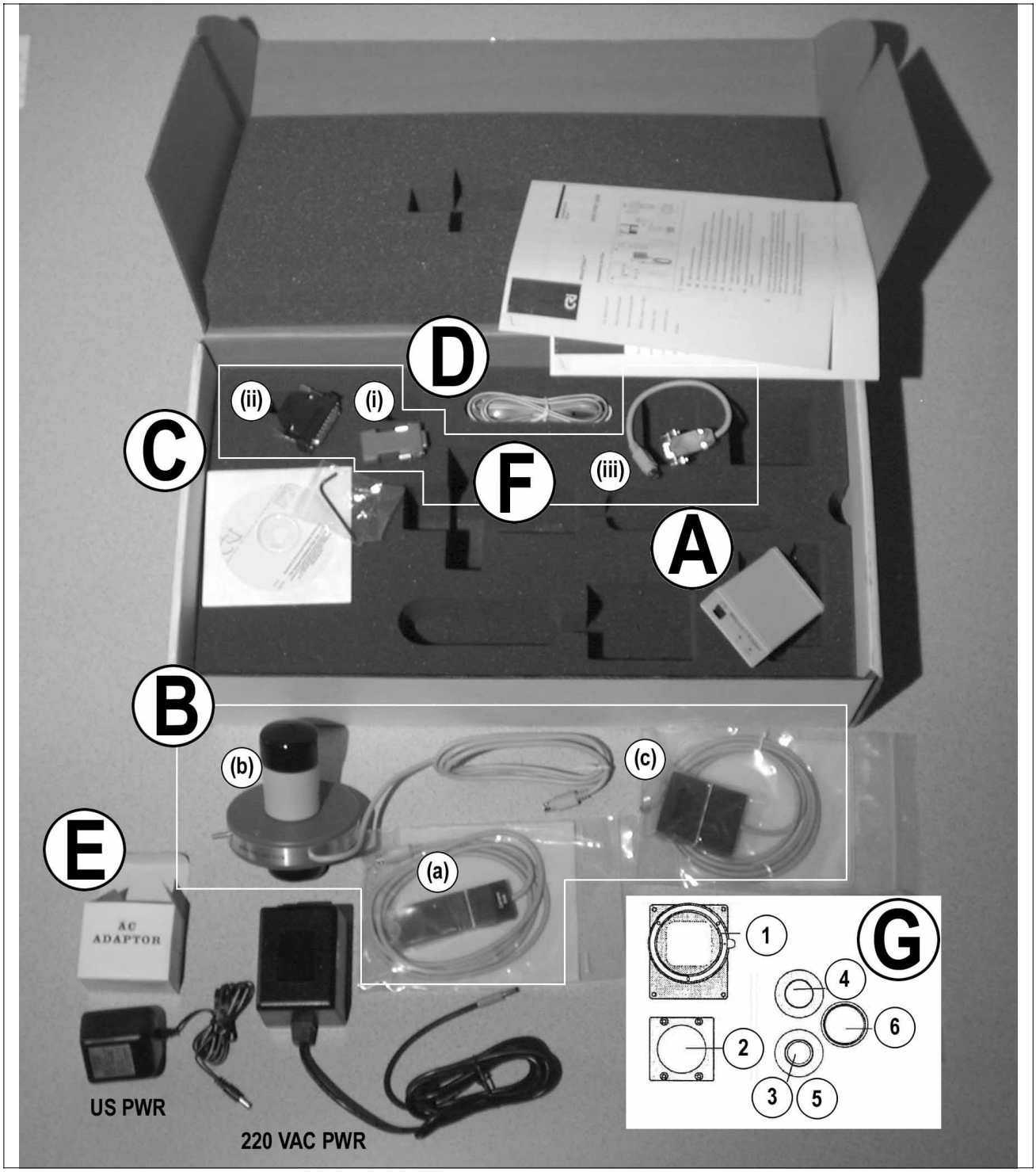


Figure 3-1 Shipped Components

3.1.2 Connecting the Components

1. Carefully remove the Micro*Color filter optics module OR the Macro*Color filter optics module (labeled B on Figure 3-1) from the plastic bag. Do NOT touch the exposed surface of the filter.

   If the optics surface needs cleaning, use only water-free spectroscopic-grade methanol and lint-free lens tissue. Drag-wipe the surface once and discard the tissue. Repeat if necessary.
2. Connect one end of the appropriate **communications adapter** (labeled F on Figure 3-1) to either the serial (COM) or parallel (LPT) port on the rear of your computer. Insert the other end of the Communications Adapter (the end with the RJ-12 telephone-style cable) into the “Digital In” port on the rear of the electronics control module. See Figure 3-2 for reference.

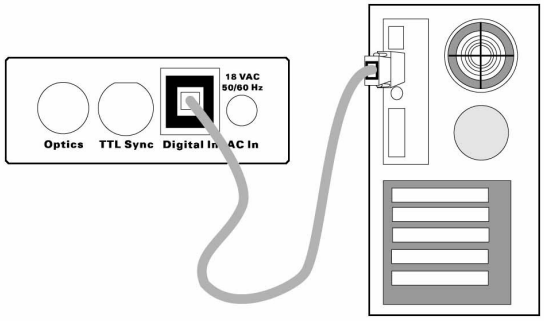


Figure 3-2 Connecting Electronics Module to Computer

3. Connect the appropriate **CRI filter optics module** (labeled B on Figure 3-1) attached mini-DIN 8 cable to the "Optics" port on the rear of the electronics controller module. See Figure 3-3.

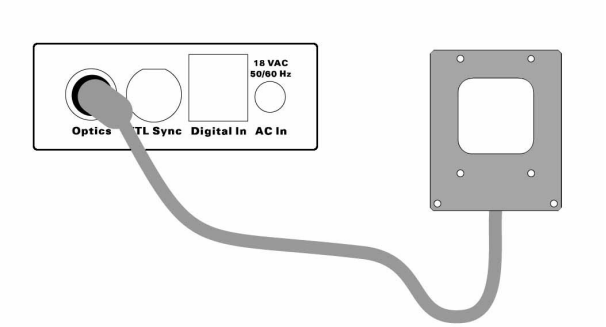


Figure 3-3 Connecting Fiber Optics Module

4. Ensure that the Power switch on the front panel of the electronics controller module is in the "OFF" (extended) position, then connect the AC power transformer (labeled D on Figure 3-1). Plug one end of the the **AC power transformer** into an acceptable electric power outlet and then plug the other end of the transformer into the "AC In" connector on the rear of the electronics controller module. See Figure 3-4.

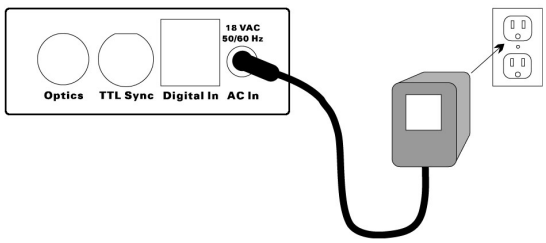


Figure 3-4 Connecting AC Power Transformer

5. Press the "Power" switch on the front panel of the electronics controller module to activate the electronics module. The "Power" LED lights. The CRI filter optics module is now ready to receive tuning commands in ASCII via a COM (serial) or LPT (parallel) port you specify on your computer. Refer to Table 3-2 below.

Table 3-2. RGB Color State

Input to the "Digital IN" port on the electronics controller module	
Data	**Color**
4	RESERVED FOR FUTURE USE
5	RED
6	GREEN
7	BLUE
8	DARK (with shutter option)

You have now finished connecting the filter hardware components. If necessary, change or verify the specified communications interface as described in the next section or go to section 3.2 immediately to install the microscope coupler.

3.1.3 Changing the Communications Interface

NOTE: The electronics controller module is configured at the factory for PC-serial or Macintosh-serial operation. If you need to change this configuration, follow this procedure.

The electronics controller module contains the circuitry and firmware necessary to control the CRI LC (liquid crystal) filter optics module. Supplied with each Micro*Color or Macro*Color filter order, this module uses an internal jumper block (labeled J6 on the circuit board) that lets you change the communications interface method, depending on host computer configurations. Cables are furnished with each filter for Windows-compatible serial (COM) and parallel (LPT) ports and Macintosh serial (GeoPort) ports.

NOTE: Use the correct cable and adapter for your computer. If you need to use a USB port with your filter, you MUST purchase a USB Serial Adapter from a local computer dealer. Even though CRI neither recommends nor endorses any such product, customers have noted success with the USB Twin Serial Adapter from Keyspan.

2. Remove the two retaining screws on the rear panel of the electronics controller module (refer to Figure 1-2).
3. Discharge any residual static electricity by touching the metal casing of the computer or by using a grounded wrist strap.
4. Slide the beige vinyl-coated metal housing cover toward the rear of the electronics controller module and remove it.

   The jumper block is located on the printed circuit board immediately behind the "AC In" power connector. **DO NOT bend the pins on the jumper block when installing the jumpers.** Figure 3-5 shows the respective settings for both serial and parallel communication.

Caution: Do not use the OPEN setting when operating the Micro*Color filter in serial communication mode as this can cause irreparable damage to the filter!

5. Slide the housing cover back onto the electronics controller module, replace the rear panel, and replace and tighten the two retaining screws.

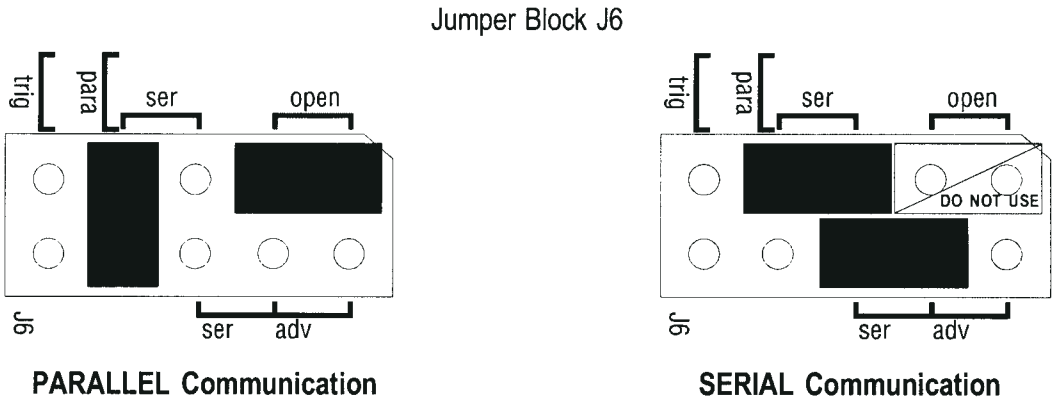


Figure 3-5 Changing/Verifying Jumper J6

1. To change or verify the jumper settings, make sure that the electric power to the electronics controller module is OFF and the module is not connected to a host computer.

3.2 Installing Microscope Couplers

At the time of order, CRI supplies you with the appropriate microscope coupler for your particular microscope type. These are shown graphically as "G" in Figure 3-1.

1. Connect the CRI coupler (either the 0.65X coupler of the 1.0X coupler; both connect to the microscope in the same fashion) above the C-Port on the microscope. (The Micro*Color 2 coupler integrates both a 0.65X microscope coupler and a built-in liquid crystal RGB filter.)

   NOTE: Remove any plastic caps on the couplers before connecting.
2. Connect the CCD camera on top of the adapter provided by CRI.
3. Slide the adapter horizontally into the slot on the microscope.
4. If using the Micro*Color 2 coupler, pull the silver lever out of the coupler to position the liquid crystal color changing stack in the optical path.
5. (Applies only to Micro*Color 2 Coupler.) Remove the three "set screws" at the top of the camera side of the Micro*Color 2 coupler. Remove the fitting and then thread the fitting into the CCD camera.

   Mount the CCD camera with the fitting onto the Micro*Color 2 coupler without screwing in the entire coupler.

   Retighten the three set screws at the top of the Micro*Color 2 coupler.

You are now finished connecting the coupler both to the CCD camera and to the microscope. Go to section 3.3 and install the CRI software.

3.3 Installing the CRI Software

The CD-ROM disc supplied by CRI contains an installer program and a standalone image-acquisition program, Capture, which works with limited supported CCD camera models. To install this software, follow the steps in this section.

1. Insert the CRI CD-ROM your computer's CD-ROM drive. (The "Auto-Run" feature does not engage.)
2. Navigate to the directory containing the appropriate installer program for your Windows operating system.

   Two installer programs are supplied to accommodate different Windows operating systems, "RGBMS_2001.exe" for Windows 95/98 and "RGNT_2001.exe" for Windows 2000 and XP. **Make sure you select the correct program**.
3. Double-click on the corresponding installer program appropriate for your operating system and then select **OK** when that program appears in the Run window. The software installation procedure begins, with the Choose Installation Type screen displaying.

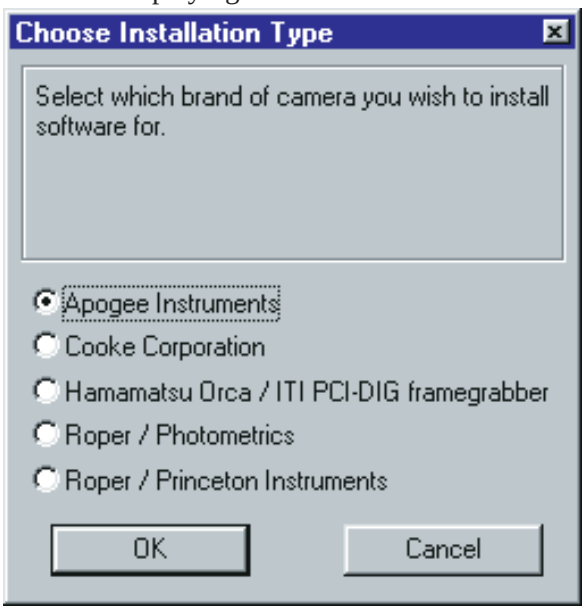


Figure 3-6 Choose Installation Type Screen

4. If you have one of the CCD cameras listed in this screen, select it and click **OK**. If you do not, just click **OK**. The Select (CCD camera) Model screen displays.

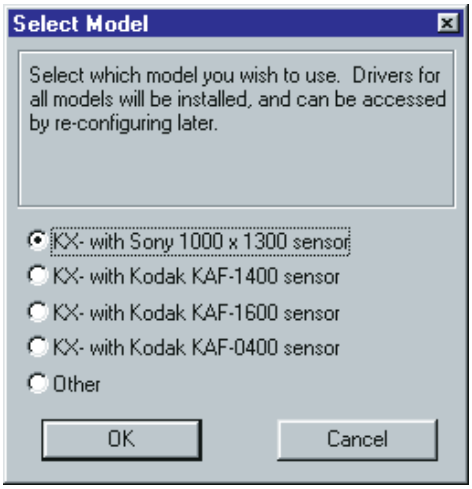


Figure 3-7 Select Model Screen

5. If you have one of the CCD camera models listed on this screen, select it and click **OK**. If you do not, just click **OK**.

   A Micro*Color Imaging Welcome screen displays (not shown).

6. Click **Next** to begin the installation of the Micro*Color Imaging software. The Select Destination Directory screen displays.

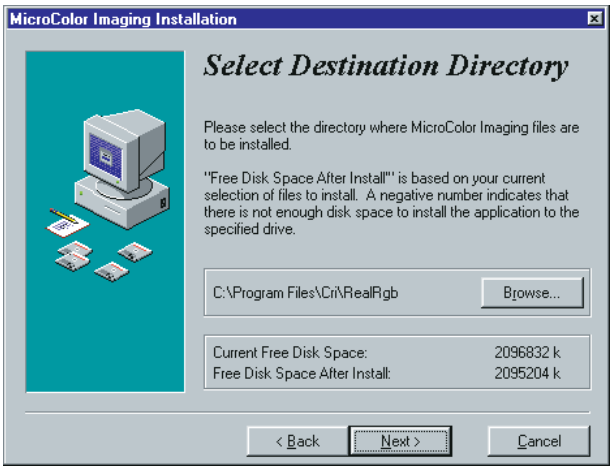


Figure 3-8 Select Destination Directory Screen

CRI recommends that you accept the default selections on all screens during the software installation process.

7. Click **Next** to accept the default Destination Directory selection; this is where the software installation program stores the CRI software program files. The Backup Replaced Files screen displays.

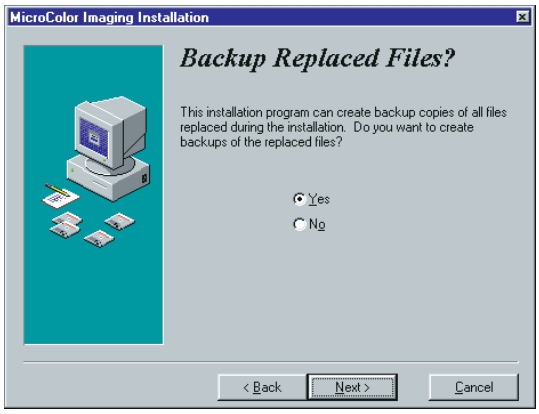


Figure 3-9 Backup Replaced Files Screen

8. If you want the software to create backup copies of all files replaced during this installation (which is the default response), click **Yes** and **Next.** If you do not, click **No** and **Next**. The Select Backup Directory screen displays; this screen shows the directory where any backup files will be copied.

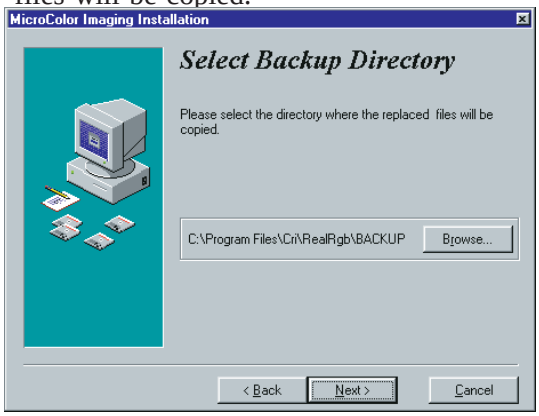


Figure 3-10 Select Backup Directory Screen

9. Click **Next** to continue. A Ready to Install MicroColor Imaging screen displays (not shown).

10. Click **Next** to begin the actual installation of the software. Various messages display during installation to keep you informed.

    The CRI software Readme Text file displays (not shown). CRI suggests that you read and/or print this file as it may contain important last-minute information about the software.

11. When you finish reading/printing the Readme file, close its window. An Installation Completed screen displays.

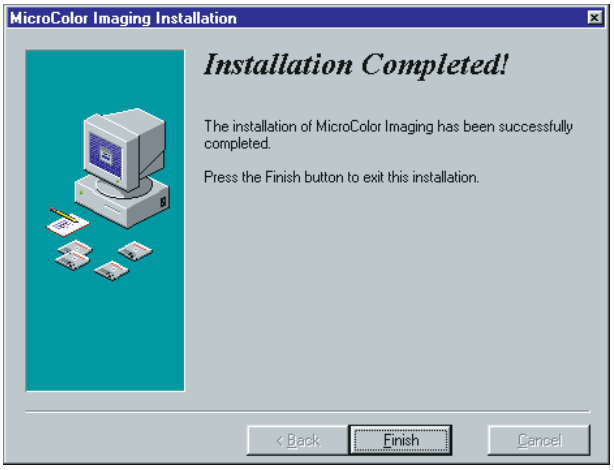


Figure 3-11 Installation Completed Screen

12. Click **Finish** to exit the software installation.

    The programs you just installed are located in this folder, Start/Programs/MicroColor Imaging

    If the installation stops with only about 6% of the software installed, most likely you selected the wrong installer program for your operating system. The solution is to repeat the installation by selecting the appropriate software installer program for your operating system.

    Go to section 3.4 and test the Micro*Color filter now.

3.4 Testing the Micro*Color Filter

This procedure ensures that the communications interface between the electronics controller module and your computer is set correctly and that the CRI RGB filter is operating as designed. You monitor the red, green and blue LEDs on the electronics controller module to make sure that all three filter colors are working correctly.

1. Start the RgbTool test program by selecting the **RgbTool test** program using the Windows Start option as shown in the screen below.

   The RGB Filter Setting screen displays.



Figure 3-12 Starting RgbTool Test

2. Select the appropriate communications interface

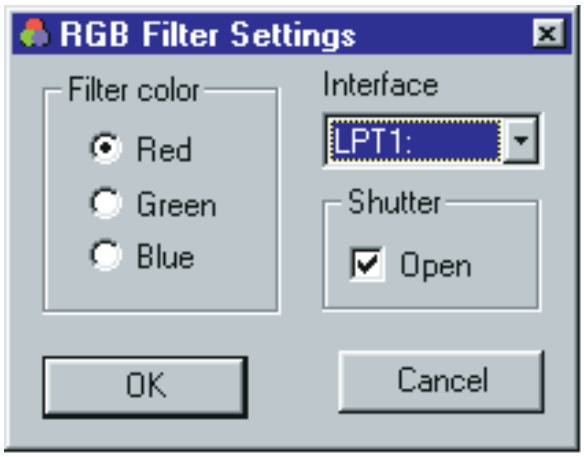


Figure 3-13 RGB Filter Setting Screen

for your system, in the Interface drop-down list. ("COM" designates serial ports, "LPT" parallel ports. "LPT1" is the default setting.) If you specify an incorrect communications interface setting, an error message results. For details if this occurs, see Chapter 5, Troubleshooting.

3. Verify that the red, green, and blue filters are working correctly, in turn, as described in step 4.
4. While monitoring the red LED on the front of the electronics controller module, click **Red** on the RGB Filter Settings screen. This causes the filter to change to red. Do not click OK until all three colors have been tested; clicking OK closes the RGB Filter Settings screen.

   Repeat step 4, in turn, for both the green and blue filters.

   If any of the corresponding LEDs on the electronics controller module do not light as described, the communications interface setting is probably incorrect. Remedy this by selecting a different setting in step 2 and repeating steps 3-4.

   Once you verify that all three color LEDs on the electronics controller module are working as required, the filter hardware and software are installed correctly. You can now being acquiring images as described in Chapter 4, Operation.

Chapter 4: Operation

Chapter 4 explains in detail how to acquire images using the CRI-provided software and identifies and describes the software's menu items and toolbar icons.

*NOTE: The procedure in section 4.1 presumes that you have a good working knowledge of the components and operation of your CCD camera and microscope, and the Microsoft Windows™ operating system. It may be helpful to have the User's Manuals of your CCD camera, microscope, and/or the Microsoft Windows documentation available. Figure 1-6 shows a full-screen view of the Micro*Color & Macro*Color Tunable RGB Filter software user interface while Table 1-1 identifies and describes important screen components.*

4.1 Acquiring Images

1. Make sure that you complete all the setup procedures described in Chapter 3, including the RgbTool test.
2. Start the Capture program by selecting the **Capture** program using the Windows Start option as shown in the screen below.

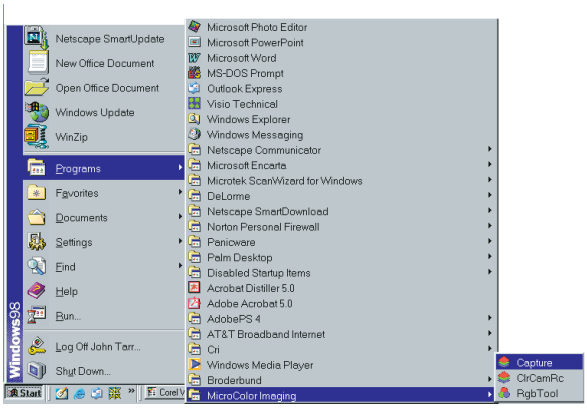


Figure 4-1 Starting Capture Program

The Capture program main screen displays as shown in Figure 4-2.

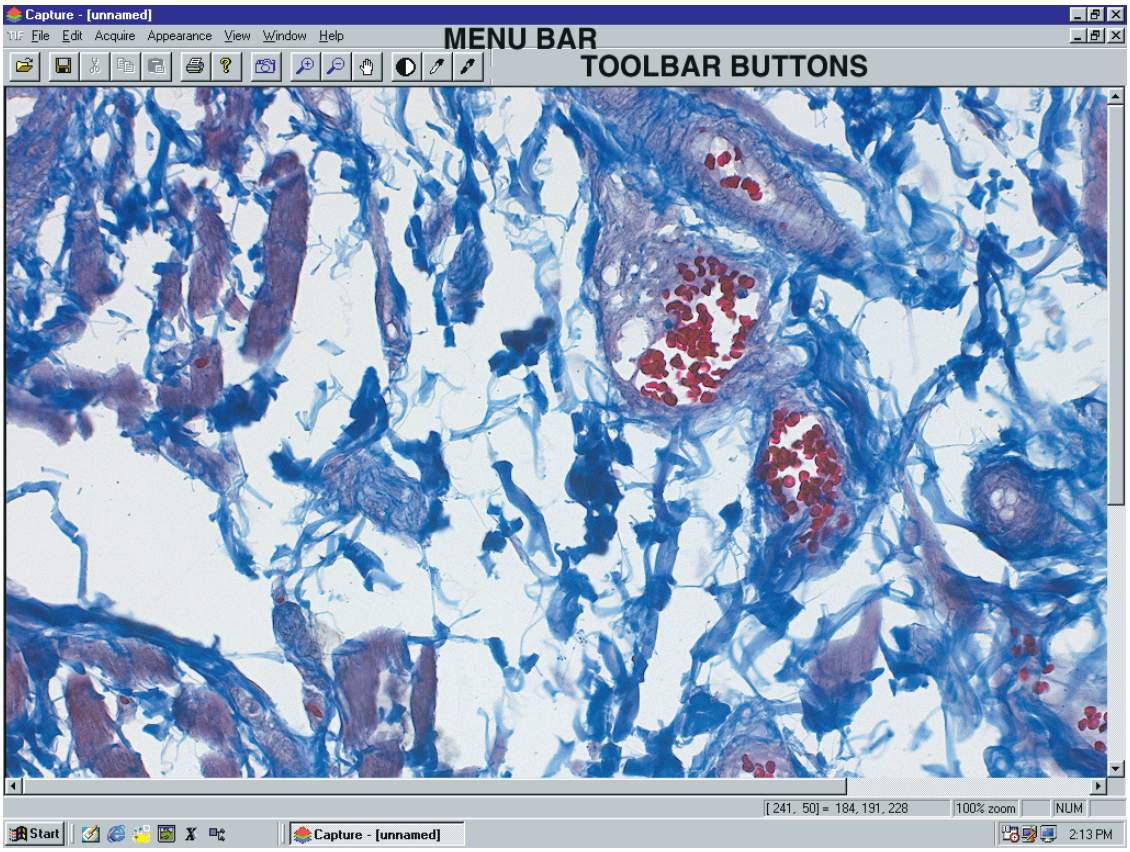


Figure 4-2 Capture Program Main Window

2. Select **Acquire/Configure Camera** from the menu bar. A prompt displays asking if you wish to modify the camera configuration.
3. Click **Yes** in reply. A message appears briefly followed by the Configuration Dialog box.

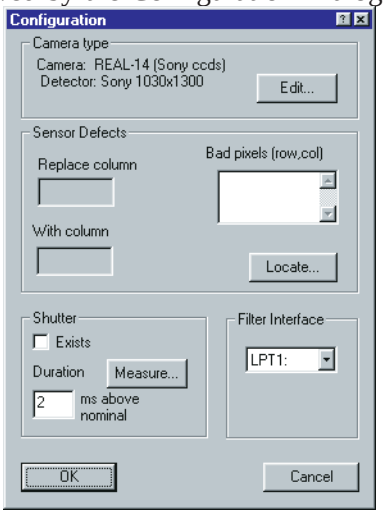


Figure 4-3 Configuration Dialog Box

4. Click the **Edit** button to view the supported models of CCD cameras; the CCD cameras supported by CRI are listed in section 1.3. A Detailed Camera Setup screen displays.

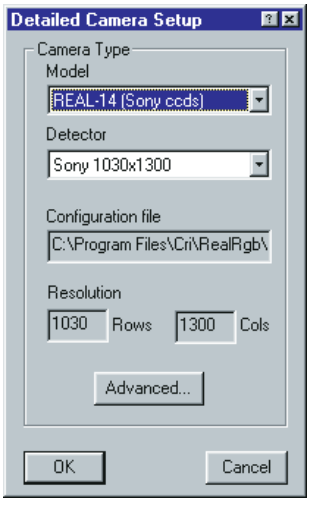


Figure 4-4 Detailed Camera Setup Screen

NOTE: While the software is compatible with a few CCD cameras, the CRI filter is compatible with virtually ALL cameras.

5. Select your model CCD camera in the "Model" drop-down list and click **OK**. You do not have to select the detector type as the software matches this automatically with camera model.
6. Close the Configuration dialog box by clicking **OK**, then select **Acquire/Show Camera Controls** from the menu bar to show more detailed configuration information. The RGB/BW Acquire screen displays. Table 4-1 identifies and describes the components of this screen.
9. If prompted, block any ambient light from the microscope's eyepiece and click **OK**. Next, unblock the microscope eyepiece so that the light reaches the CCD camera. A message displays to "Fully Insert the Filter Slider into the beam Path."
10. Insert the filter slider fully into the beam path as directed. Another message displays directing you to "Move to a uniformly white portion of the slide."
11. Move to a uniformly white portion of the slide as prompted and verify by looking through the microscope's eyepiece.

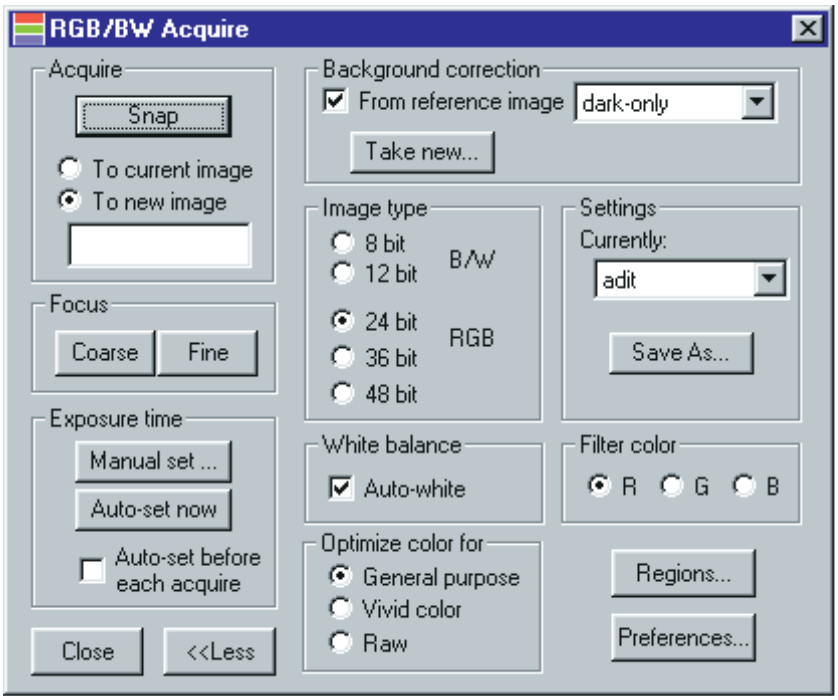


Figure 4-5 RGB/BW Acquire Screen

7. Take a **BACKGROUND CORRECTION** image (background correction is designed to filter out irrelevant data from the image); select "dark only" and click **OK**.
8. When prompted, assign a thematic name to the Background Corrected image. A message may display telling you to "Block the Light" so no light enters the image from the microscope's eyepiece.
12. When you are ready to acquire the image, click the **Snap** button.

    This triggers the following image acquisition process: the filter sets to the red color first (the red LED on the electronics controller module lights), takes an auto exposure, then captures the image; this same process repeats for the green color followed by the blue color. The software integrates all three composite colors and displays the resulting integrated image in the Capture software.

Table 4-1. RGB/BW Acquire Screen Components

Button/Field	Description
Snap	Directs the system to acquire the image currently in the microscope. You can choose to acquire the image "To current image" or "To new image," which is the default.
Focus	Lets you perform either a "**Coarse**" or "**Fine**" focus adjustment on the image. Selecting either displays an almost identical screen (see Figure 4-6). The top scroll bars on this screen show which portion of the image you are viewing currently. When finished focusing, click the **Stop Focusing** button.
Exposure Time	Provides three choices for exposure time: "**Manual set**" displays an Exposure Setting screen (Figure 4-7) containing sliders that let you specify exposure settings for each color channel manually in milliseconds; "**Auto-set now**" this optional setting directs the system to optimize exposure time based on current lighting automatically; if the "**Auto-set before each acquire**" checkbox is checked, before each acquisition, the system performs an auto-exposure for that particular color channel.
Close, Less	Closes the RGB/BW Acquire screen; "Less" shows less information in this screen, clicking it again shows more.
Background correction	When selected, background correction filters out irrelevant data from the image. You specify parameters from a dialog box (Figure 4-8).
From reference image	When checked, lets you specify dark only or the 8-character name (user-selected) of a background correction (created using a light-frame background image and a dark current image that you are directed to take when clicking on the "Take new" button).
Take new	Directs the system to perform a background correction. At the end of the procedure, an 8-character name may be entered to designate the correction. Note that since changing objectives or using other microscope configurations may require a new background correction, we recommend naming the background corrections to facilitate re-using them as much as possible. For example: AxPL20x, IX7010x, or BX6020x could be used as names to remind the user of the type of microscope and objective used, so that taking a new background correction is not necessary each and every time the configuration is changed.
Image type	Permits you to select the bit resolution for two types of black & white image (8 bit or 12 bit), or three types of RGB images (24 bit, 36 bit, or 48 bit).
White balance	Finds the brightest point in the image and makes it white.
Optimize color for	Supplies three choices: "**General purpose**," which is the default, "**Vivid color**," which produces brighter colors, or "**Raw**," which uses the unfiltered signal data.
Settings	"**Currently**" displays the current file name for the settings; "**Save As**" displays a standard Windows screen that lets you save the current settings to a file.
Filter Color	Lets you specify the filter color, Red, Green, or Blue.
Regions	Displays a Regions and Binning dialog box (Figure 4-9) that lets you make selections to acquire an image only within particular coordinates (rows and columns). Also can select "Binning" in which 4 pixels are combined as 1 for less resolution but a brighter image.
Preferences	Displays a Preferences dialog box (Figure 4-10) containing controls that let you specify which colors to acquire, gain image, auto set exposure, and image process sharpened.

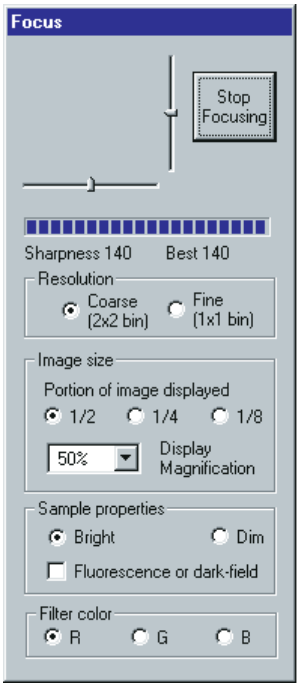


Figure 4-6 Focus Dialog Box

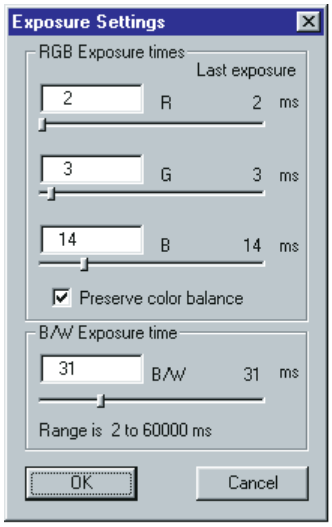


Figure 4-7 Exposure Settings Dialog Box



Figure 4-8 Take New Background Correction Dialog Box

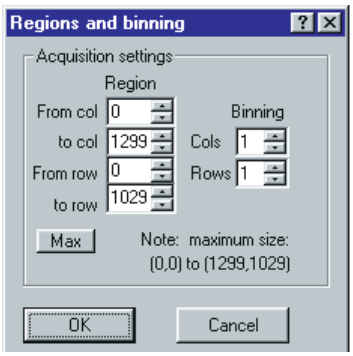


Figure 4-9 Regions and Binning Dialog Box

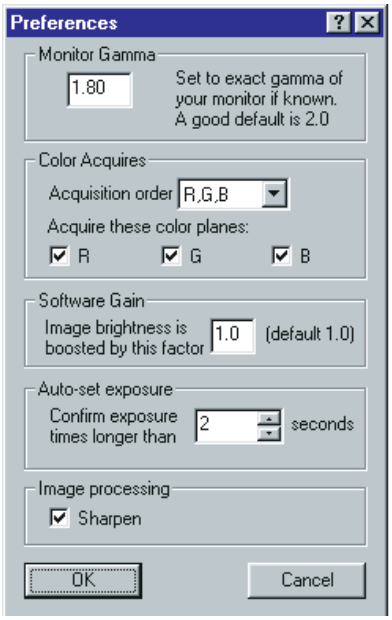


Figure 4-10 Preferences Dialog Box

4.1.1 Adjusting an Acquired Image

The Capture program provides a number of tools for you to adjust the acquired image for sharpness, display selected portions of the image, optimize the focus, magnify/demagnify portions of the image, set exposure times, perform white balancing, optimize color, and select particular regions, perform binning, and more.

At this point, the acquired image has not been saved to a file, and you are free to manipulate it as desired.

If the acquired image appears coarse or not in focus, bring it into focus using the appropriate microscope controls.

To do this, click on the **Coarse** or **Fine** button. A live image of your sample displays. Using the focal knob on your microscope, sharpen the image on the computer screen.

The **Sharpness** slider (see Figure 4-6), which shows the numbers as you step through the microscope focus control. The sharpness of a particular image increases until it reaches an optimal point and then drops off as you go out of focus.

4.2 Identifying Software Menu Items and Toolbars

The Capture program's main window (shown in Figure 4-2) contains a top level Menu Bar with a Toolbar located beneath it.

As in most Windows software, the Menu Bar allows you to choose various Menu Items that allow you to access additional functions.

The Toolbar contains icons that let you adjust or manipulate the current image.

4.2.1 File Menu

You can perform the following functions using the File menu.

- OPEN a previously stored image.
- PRINT SETUP, which permits you to specify various printing parameters in a standard Windows dialog box: type of printer, orientation, number of copies, etc.
- RECENT FILE, which lets you redisplay a file you had been working on recently.
- EXIT the Capture program.

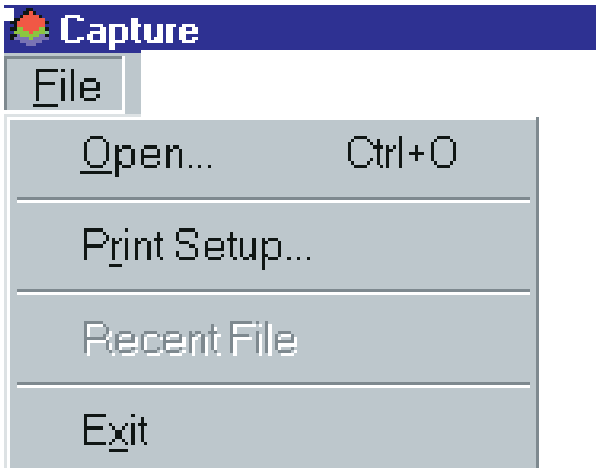


Figure 4-11 File Menu

4.2.2 Edit Menu

You can perform the following function using the Edit menu.

- UNDO, lets you recover from the last action by "undoing" the action to the state the image was in just prior to the last action
- CUT, cuts the selected portion of the image from the screen, placing it in the Clipboard. The cut portion disappears from the image.
- COPY, copies the selected portion of the image to the Clipboard. The selected portion remains in the image.
- PASTE, pastes the current contents of the Clipboard into the current image. CUT, COPY, and PASTE are standard Windows features.
- MERGE COLORS, merges the red, green, and blue images of a sample to give a color image.
- UNMERGE COLORS, splits a color image into its red, green, and blue constituent images.
- SET IMAGE INFORMATION, displays a Document Information screen into which you can enter optional information about an image. Figure 4-13 shows an example.
- VIEW IMAGE PROPERTIES, displays a Document Information screen for the current image, if one exists.

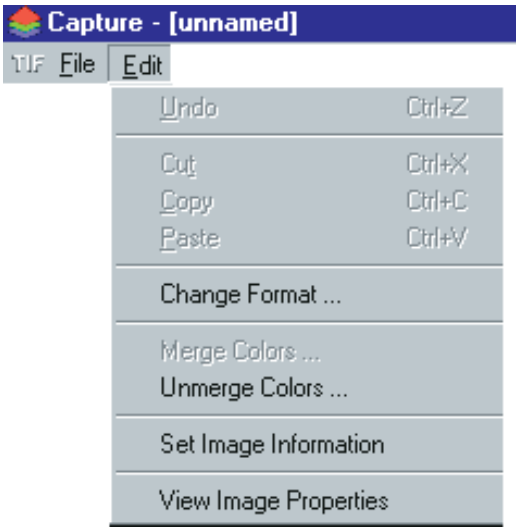


Figure 4-12 Edit Menu

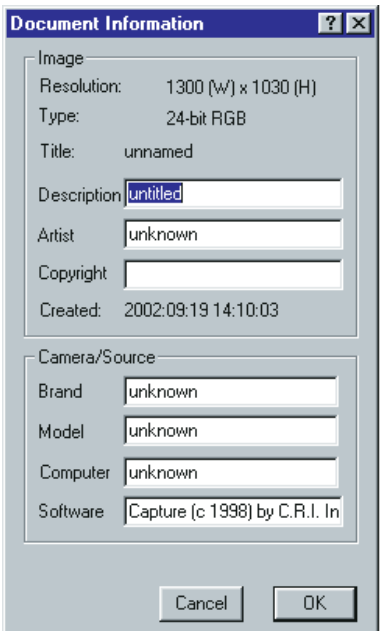


Figure 4-13 Document Information Box

4.2.3 Acquire Menu

You can perform the following functions using the Acquire menu.

- SHOW CAMERA CONTROLS, displays the RGB/BW Acquire dialog box (Figure 4-5) that lets you specify or modify the acquired image.
- CONFIGURE CAMERA, displays the Configuration dialog box (Figure 4-3) that lets you specify or modify the camera's configuration.

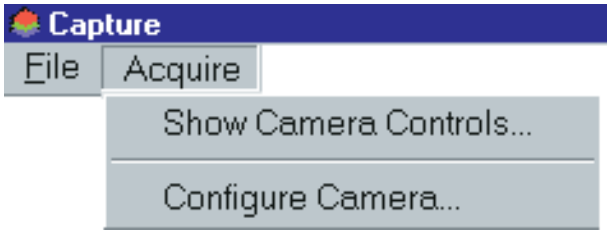


Figure 4-14 Acquire Menu

4.2.4 Appearance Menu

You can perform the following functions using the Appearance menu.

- SET WHITE LEVEL, lets the user find a white point and perform a white color balance.
- SET BLACK LEVEL, lets the user find a black point and perform a black color balance.
- CONTRAST/BRIGHTNESS, displays a dialog box that has controls with which you can specify the contrast and brightness of an image.

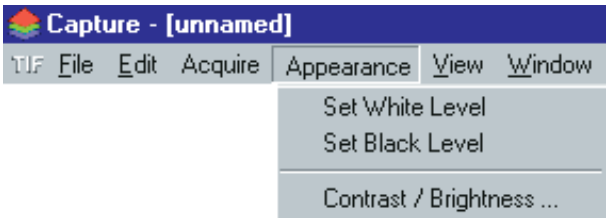


Figure 4-15 Appearance Menu

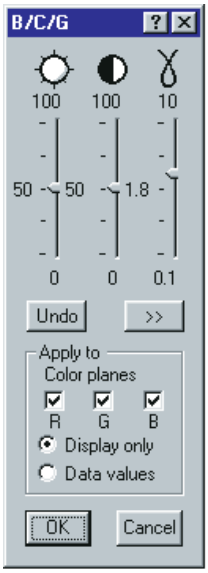


Figure 4-16 Brightness/Contrast Dialog Box

4.2.5 View Menu

You can turn ON and turn OFF the display of the Toolbar and Status Bar using this menu.

- TOOLBAR (can be toggled ON and OFF; if checked, the bar displays)
- STATUS BAR (can be toggled ON and OFF; if checked, the bar displays at the bottom left of the main window)

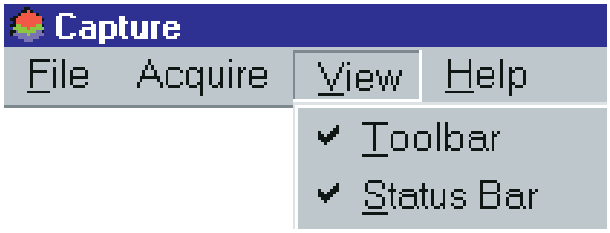


Figure 4-17 View Menu

4.2.6 Window Menu

The Window menu is a standard Microsoft Windows construct. It contains options that let you display multiple images in different ways. The last several opened images also appear at the bottom of the menu; you can select one by highlighting it.

- NEW WINDOW, draws a new window on screen into which you can place an image.
- CASCADE, displays all open images in a cascading fashion, overlapped on top of each other with the title bar of each showing. You bring the desired image to the foreground by clicking its title bar.
- TILE, displays all open images in a tiled fashion, with each image appearing in its own window.
- ARRANGE ICONS, lets you arrange the icons in the program in a customized manner.

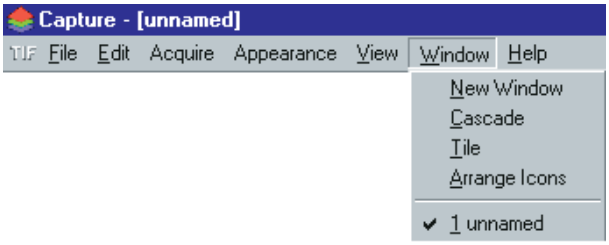


Figure 4-18 Window Menu

4.2.7 Help Menu

- By selecting the ABOUT CAPTURE function, you can display version number information about the Capture program, which may be useful when troubleshooting.

4.2.5 Toolbar

The icons in the Capture program Toolbar located on the second line at the top are illustrated and described briefly below.

	**Open** button, opens an existing document.
	**Save** button, saves the active document or image to disk.
	**Cut** button, cuts a particular selection of the image and puts it in the Clipboard.
	**Copy** button, copies the text or image currently selected to the Clipboard.
	**Paste** button, pastes or inserts the text or image currently in the clipboard to the location you specify.
	**Print** button, prints the active document or image.
	**Question** button, displays program information, version number, and copyright.
	**Camera** button, shows the camera controls.
	**Magnify** button, increases the view magnification.
	**Demagnify** button, decreases the view magnification.
	**Pan** button, pans image location.
	**Contrast** button, adjusts contrast and brightness.
	**Set White Level** button, lets the user find a white point and perform a white color balance.
	**Set Black Level** button, lets the user find a black point and perform a black color balance.

Chapter 5: Troubleshooting

Chapter 5 contains a troubleshooting chart that identifies most common system problems or error messages, descriptions, and corresponding corrective actions.

Problem/Error Message	Description/Corrective Action
A. The CRI software installation procedure stops with only about 6% of the software installed.	1. You most likely specified the wrong installer program, which does not match your Windows operating system. — Reinstall the CRI software as described in section 3.2, ensuring that you specify the appropriate installer program, “RGBMS_2001.exe” for Windows 95/98 or “RGNT_2001.exe” for Windows 2000 and XP.
B. None of the LEDs on the electronics controller box front panel light when you run the RgbTool test program (section 3.4).	1. The electronics controller box is not turned ON.
C. The Color Status LEDs do not change color to green and blue and remains on red (the default color)	— Make sure that the filter components, including the electronics controller module, are connected correctly as described in section 3.1.2 and that the power switch on the front panel of the module is ON. — Specify the correct communications interface setting (which is determined when you order the filter) when testing the Micro*Color filter in section 3.4, step 2. 2. One or more of the pins inside the communications adapter connecting the computer and the electronics controller module is/are bent. — Remove the communications adapter and visually inspect the pins. If any appear bent, carefully straighten them out using a small flat screwdriver or a ballpoint ben. Reconnect the adapter and re-run the RgtTool test program (section 3.4). — If this does not resolve the problem, you may need to purchase another communications adpater.

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