The software within the CMUcam2 and Windows GUI software has been provided by groups outside of Innovation First, Inc. Therefore Innovation First can not support these softwares. This document is being provided as a courtesy to aid users in basic testing and familiarization with the CMUcam2 hardware product produced by Innovation First, Inc.

1. Use a computer with enough horsepower. I have had reports from the field that machines with Windows 98 are too slow. I personally have only used it with Windows XP on a 730 MHz Pentium III and a 2.66 GHz P4.
2. Testing with Hyperterminal
   Start simple first by connecting to the camera using a PC.
     a. Make sure any Java GUI programs are closed.
     b. Make sure a jumper is installed across J7 (near the power switch) and J13 (near U4) of the CMUcam2. These should be the only jumpers.
     c. Make sure the camera module is installed on the camera assembly. U5 and U1 of the main board will be covered up if the orientation is correct.
     d. Connect the computer to the CMUcam2 via a DB9 serial cable.
     a. Attach a pwm cable from your RC to J2 of the camera assembly, justifying the black wire with the "B" near "J2" on the CMUcam2 and near "Black" on the RC. This will provide the CMUcam2 power.
     b. Make sure you have a charged 7.2v battery attached to the BACKUP battery input of the RC, as well as a the 12v battery connected to the MAIN input of the RC.
     c. Turn on the SW1 power switch of the CMUcam2 (move the slide toward the camera module). You should see DS1 (green) and DS3 (red) turn on. DS2 will blink on (green), then turn off.
     d. Open up Hyperterminal (start \ All Programs \ Accessories \ Communications \ Hyperterminal).
     e. In Hyperterminal,
          1. Select the com (serial) port you are using.
          2. Select a baud rate of 115200.
          3. Data bits: 8.
          4. Parity: None.
          5. Stop bits: 1
          6. Flow Control: None.
          7. Hit OK
          8. Under File \ Properties \ Settings \ ASCII Setup… select the "Send line ends with line feeds", "Echo typed characters locally", "Append line feeds to incoming line ends", and "Wrap lines that exceed terminal width" boxes.
          9. The "Force incoming data to 7-bit ASCII" box should NOT be checked.
          10. Hit OK twice.
          11. If you can't get to the baud rate, click on the telephone symbol that will "disconnect", then do file/properties/configure,… to change baud rate and other items as listed above.
          12. Hit <enter> on the keyboard a couple of times. You should get an "ACK" response.
          13. Try some commands, such as RS <enter>, which will cause "CMUcam Version 2 type 7 ready." to be printed displayed.
          14. Another command is Get Button. Type in GB <enter>. You should get a "0". Push/release the pushbutton PB1. Type in GB <enter> again. You should get a "1". Type in GB <enter> again, you'll get a "0".
          15. Connect a servo to the CMUcam2 servo 5 port justifying the black wire of the servo to the "B" silkscreen near "J1". The three pins farthest from the "5" silkscreen of the 3x5 header block is servo 1. The three pins nearest the "5" is servo 5.

16. Command the servo full forward by entering SV4 255 <enter>. The servo should rotate fully one direction.
17. Command the servo to the full reverse position by entering SV4 0 <enter>. The servo should rotate fully the opposite direction.
18. SV0, SV1, … ,SV4 control servos 1 through 5 respectively. Try other servos as desired. Some documents list them as servos 0 through 4.
19. Note: The Pan reverse and Tilt reverse jumper inputs are only active in tracking. The SVx commands do not get reversed.
20. Note: My tests indicate the Tilt reverse and Pan reverse header locations are swapped compared with FIRST generated documentation (Start_Here-CMUcam2_fe-r2.pdf Rev-1 / 6 January 2005). Tilt should be closer to the Servo Header and Pan further away.
21. Close Hyperterminal.

3. Test with CMUcam2GUI_fe
   a. Be sure the lens cap is off of the camera module.
   b. Open up the CMUcam2GUI_fe from FIRST. Be sure it is in a root level directory, without any spaces in the directory name. This may be important.
   c. Select the applicable serial port. I have connected successfully direct with a serial port (as com1) and through an iogear GUC232A USB to serial converter (as com5).
   d. You should get the "CMUcam Version 2 type 7 ready." response.
   e. To look at a color picture using Grab Frame:
      1. In the CMUcam2GUI_fe, select the Config tab, then the Color Space tab, then RGB if not already selected.
      2. In the Camera View tab, select Grab Frame.
         1. FYI, this picture can be made upside down and inverted by selecting the IMAGE bar on the top of the window.
         2. It is normal for the picture to have a yellow tint under florescent lights. You may select the Config tab, then the White Balance option to On. Pause about 5 seconds to let the vision chip stabilize. Then in the Camera View tab, select Grab Frame again.
      3. If the picture is too small, try changing your display resolution. I know 800x600 and 640x480 DOES NOT show the whole picture. 1024 x 768 does.
      4. To change display resolution select start \ Control Panel \ Display \ Settings, then change to a valid denser Screen Resolution.
   f. To look at real time black and white video (NTSC), connect the IFI cmu cam2 J3 connector to the monitor (video) input of a television via a modified PWM to RCA cable.
      1. Connect the black wire from the socket side of a PWM cable to the RCA plug shield.
      2. Connect the red wire from the socket side of a PWM cable to the RCA plug center lead.
      3. The white wire of the socket side of a PWM cable can be left unconnected.
      4. Connect the red wire into the CMUcam2 J3 pin "1" and the black wire into the pin away from the J3 and pin 1 silkscreens.
      5. In the CMUcam2GUI_fe, select the Config tab, then the Color Space tab, then YCrCb (under RGB).
      6. You should see a black and white image on the screen. It will be upside down if the camera is oriented per existing FIRST suggestions.
   a. To look at PAL video out: I have not tried this. The OV7620 vision chip data sheet says the Video Test Output is NTSC only. I assume that PAL can not be displayed on a monitor.

4. Other CMUcam2GUIs. For reference, the GUI I downloaded from http://www-2.cs.cmu.edu/~cmucam2/downloads.html gives the picture orientation in agreement with the black and white video output.