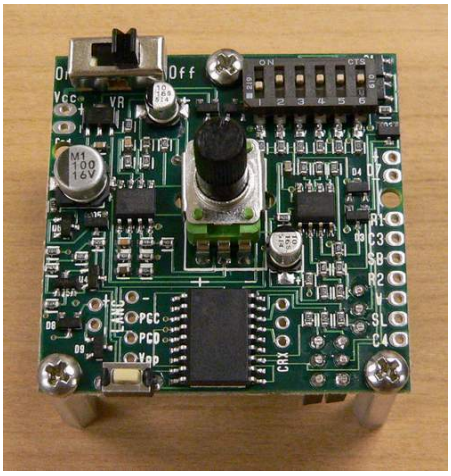
BG2 Complete Board

(Revision 1)

Operations Manual



This manual is a living document, therefore it will change when needed to clarify and explain the operation of the BG2 Complete Board. Please refer to the revision date to verify if your copy is the latest edition. Any document updates will include an update to the revision date.

Revision Date 12/2/06

The BG2 Complete Board is designed to control various film cameras, digital cameras and video camcorders (LANC or hardwired). The BG2 Complete Board can also power a slave flash, but at this time, will not trigger a slave flash. The BG2 Complete Board can only be programmed to control one camera or camcorder at a time (LANC or hardwired). The BG2 Complete Board retains its name if programmed as a trail camera controller and adopts a new name if programmed as a video camcorder controller, the BG2 LANC Complete Board. You will be required to specify this when ordering. Updates are available to the BG2 Complete Board by shipping back the complete board for reprogramming. Please keep this in mind when building your system and utilize separable connectors for flexibility. The standard trail camera programmed settings for the BG2 Complete Board will be described in this document with notation at possible alteration points.

An Energizer or Duracell 9-volt battery power source is recommended when using the BG2 Complete Board as a trail camera controller. The advertised runtime with a fresh 9-volt battery is 9 months, but you may experience longer battery life depending on personal use and weather. The idle current draw of the BG2 Complete Board is 40uA.

The **BG2 Complete Board** control the following cameras:

Canon Sure Shot Owl PF 35mm Camera Modification
Olympus D370 / D380 Digital Camera 'Always On' Modification – *Slow and Fast Refresh*
Olympus D370 / D380 Digital Camera 'On-Off' Modification
Sony DSC-P32 / P52 Digital Camera Modification
Sony DSC-P41 Digital Camera Modification
Sony S600 Digital Camera Modification
Sony S40 Digital Camera
Digital Concepts 2.1 Digital Camera
Samsung A402 Digital Camera
Olympus D360L Digital Camera

BG2 Complete Board Features:

1. Day / Night / 24 Hour / Single / Double / Movie / Delay Selection:

   The **6 Position DIP Switch** control features listed below.

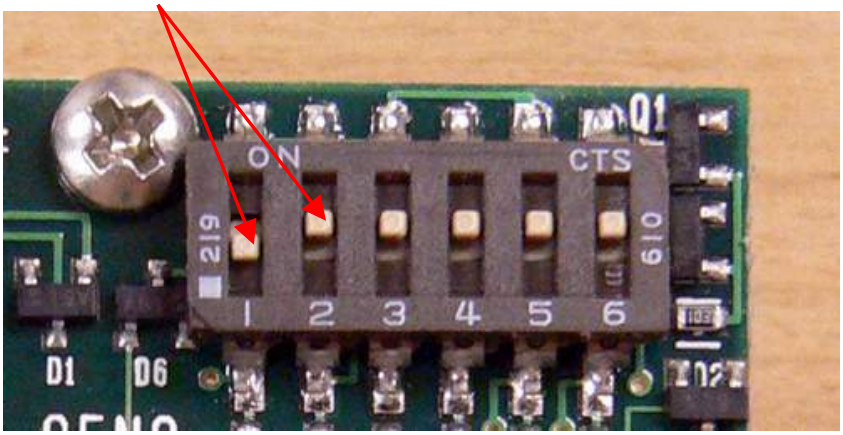
   The BG2 Complete Board reads the settings of the 6 Position DIP Switch on power up. To select or change settings you have to power the BG2 Complete Board off, make your selection or changes, and power it back up. The brown out setting is not enabled on the BG2 Complete Board, so wait 10 to 15 seconds before you power the BG2 Complete Board back up after powering it down. This allows the voltage to drop low enough for an adequate reset.

Day / Night / 24 Hour Selection (Switches 1,2)

The BG2 Complete Board has 4 selectable periods of active operation when used as a trail camera controller. There are two 24 hour operation modes which allow certain cameras faster shutter times when in optional 24 hour (off / off) mode. Please see the camera specific descriptions in Appendix A below for further explanations of special operations for day and night.

Switches 1 and 2 control the **Day / Night / Both Selection** listed below:

On / off combinations of the two switches determine which setting is being used.



Day / Night / 24 Hr. Selection (Switch 1, 2)
1 / 2 *(Switch Position)*
on / on = **24 hour** operation of BG2 Complete Board
on / off = **Day** time only operation of BG2 Complete Board
off / on = **Night** time only operation of BG2 Complete Board
off / off = **24 hour** operation of BG2 Complete Board (P41 Fast Mode)*
(* new programming for Sony P41 Digital Camera)

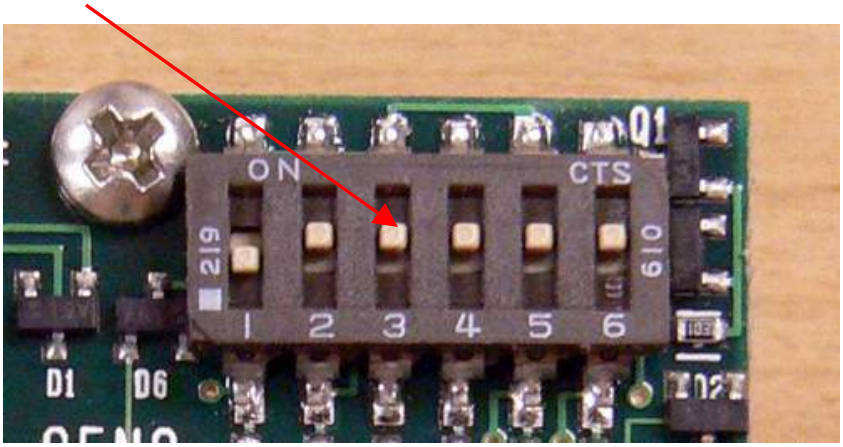
Single / Double / Movie Selection (Switch 3)

The BG2 Complete Board contains programmed code to allow selection of single picture, double picture, or movie mode.
The **single picture mode** setting allows only one picture per trigger from the BG2 Complete Board.
The **double picture mode** setting automatically activates the camera to take a second picture 5 seconds (day) to10 seconds (night) after the initial picture, with or without a second trigger pulse from the BG2 Complete Board itself. (Timing of second picture is camera specific)
The double picture mode setting can operate as a **movie mode** setting by using the movie setting instead of the picture setting on certain digital cameras along with day only setting on the BG2 Complete Board. The combination will allow you to record 5-second video clips instead of two individual pictures.

* NOTE: Alternate delay times for double picture / movie mode are available with custom programming.

Switch 3 control the **Single / Double / Movie Selection** listed below:

On or off setting of the switch determines which setting is being used.



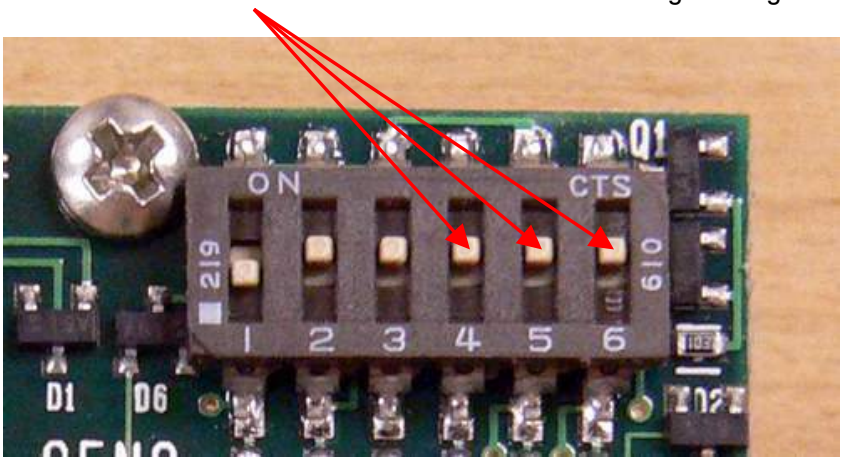
Single / Double / Movie Selection (Switch 3)
3 *(Switch Position)* on = **Double Picture / Movie Mode** off = **Single Picture Mode**

Delay Selection (Switches 4, 5, 6)

The BG2 Complete Board contains programmed code to allow selection of 8 different delay periods between possible pictures or movies.

Switches 4, 5 and 6 control the **Delay Selection** listed below:

On / off combinations of the three switches determine which setting is being used.



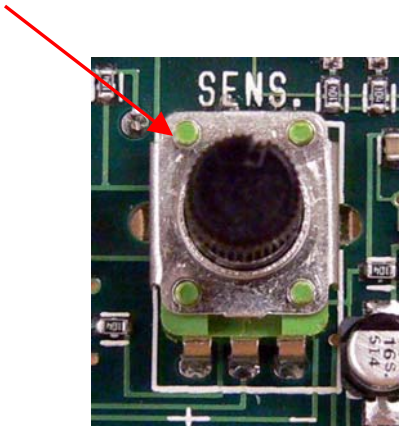
Delay Selection (Switch 4, 5, 6)	
4 / 5 / 6 *(Switch Position)*	4 / 5 / 6 *(Switch Position)*
on / on / on = **10 Second Delay**	off / on / on = **3 Minute Delay**
on / on / off = **30 Second Delay**	off / on / off = **5 Minute Delay**
on / off / on = **1 Minute Delay**	off / off / on = **10 Minute Delay**
on / off / off = **2 Minute Delay**	off / off / off = **15 Minute Delay**

* NOTE: Alternate delay times are available with custom programming.

2. Sensitivity Adjust: The **Sensitivity Potentiometer** control features listed below.

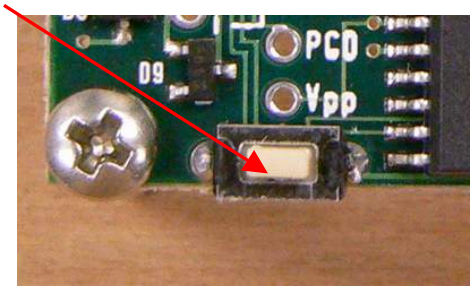
*** NOTE: DO NOT SET THE POTENTIOMETER AT THE FULL CLOCKWISE OR FULL COUNTERCLOCKWISE SETTING.**

The sensitivity potentiometer is actually a voltage divider and requires an amount of voltage on each side of the divider. Extreme clockwise or counterclockwise use of the potentiometer cancels this effect.



- Slightly back from full Clockwise is the **lowest sensitivity** setting.
- Slightly back from full Counterclockwise is the **highest sensitivity** setting.
- At highest sensitivity the sensor will detect out to 70'. (With proper lens alignment)
- At lowest sensitivity the sensor will detect out to 30'.
- A mid point setting that detects to the range of the camera's flash is recommended.

3. Count Feature: The **PB-1 Push Button Switch** control features listed below:



- Pressing the PB-1 Push Button Switch during **normal operating mode** will trigger the LED to count the total number of trigger events of the BG2 Complete Board while it was in normal operating mode.

- The count is a sequence of LED flashes of different time duration, to denote the total count.
    - Hundreds place will be denoted with a 3 second LED pulse for each number.
    - Tens place will be denoted with a 1 second LED pulse for each number.
    - Ones place will be denoted with a 300 millisecond LED pulse for each number.

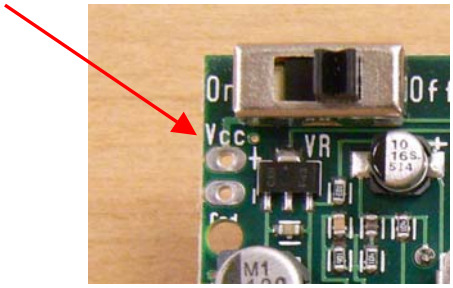
  (Example: 125 events would count as one (three second pulse), followed by two (one second pulses), followed by five (300 millisecond pulses)

- Pressing the PB-1 Push Button **within 2 seconds** of the last LED flash of the current count will clear the present count total. 4 quick flashes of the LED will denote the cleared count.
- Not pressing the PB-1 Push Button within 2 seconds of the last LED flash of the current count will not clear the present count total.
- The count total will remain even if the power is turned off to the BG2 Complete Board.
- Double picture mode / movie mode will add two to the count total per trigger event. Single picture mode adds one to the count total per trigger event.

4. Power Connection / Walk Test Mode / Normal Operating Mode:

The **On-Off Slide Switch** control features listed below.

Power supply to the BG2 Complete Board is applied at the VCC+ connection. The positive lead from the battery holder is applied at the VCC+ solder pad and the negative lead is applied at the GND solder pad.



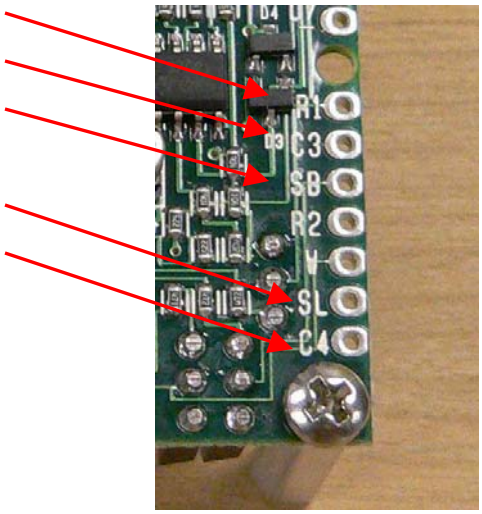
After you have selected your DIP Switch settings, set your POT sensitivity per the instructions above, and added a 9-volt battery, turn the On-Off Slide Switch to on and you will see the LED blink once as a signal the board started and everything is okay. If you do not see a blink then cycle the power again. The BG2 Complete Board has an almost instant PIR trigger or cycle, so the board goes into **walk test mode** immediately**.** You may even see a second blink on power up. This second blink is the BG2 Complete Board catching the PIR trigger early. The PIR trigger will cycle as you trigger the sensor and the LED will blink to denote the trigger event.

The **walk test mode** is a visual confirmation of the distance and area the sensor will detect, from its current position. Simply walking in front of the sensor will trigger the BG2 Complete Board to activate the LED.

The BG2 Complete Board is programmed to automatically switch to **normal operating mode** from walk test mode after 3 minutes of inactivity. The 3-minute countdown is reset after each trigger event during walk test mode.
To return to walk test mode from normal operating mode; turn the power switch off, wait 15 seconds, and then turn the power switch back on.

* NOTE: Pressing the PB-1 push button switch right after a LED indication of a walk test trigger can interrupt Walk test mode. The BG2 Complete Board LED will flash a 1 second routine to show the day night calibration setting. (This calibration setting is preset and nonadjustable) During this flash routine, press and hold the PB-1 push button switch until the LED flashes and then release the PB-1 push button switch. The BG2 Complete Board is now in normal operating mode.

5. Camera / Slave Flash Connection:



3 Wire Camera Connection to BG2 Complete Board

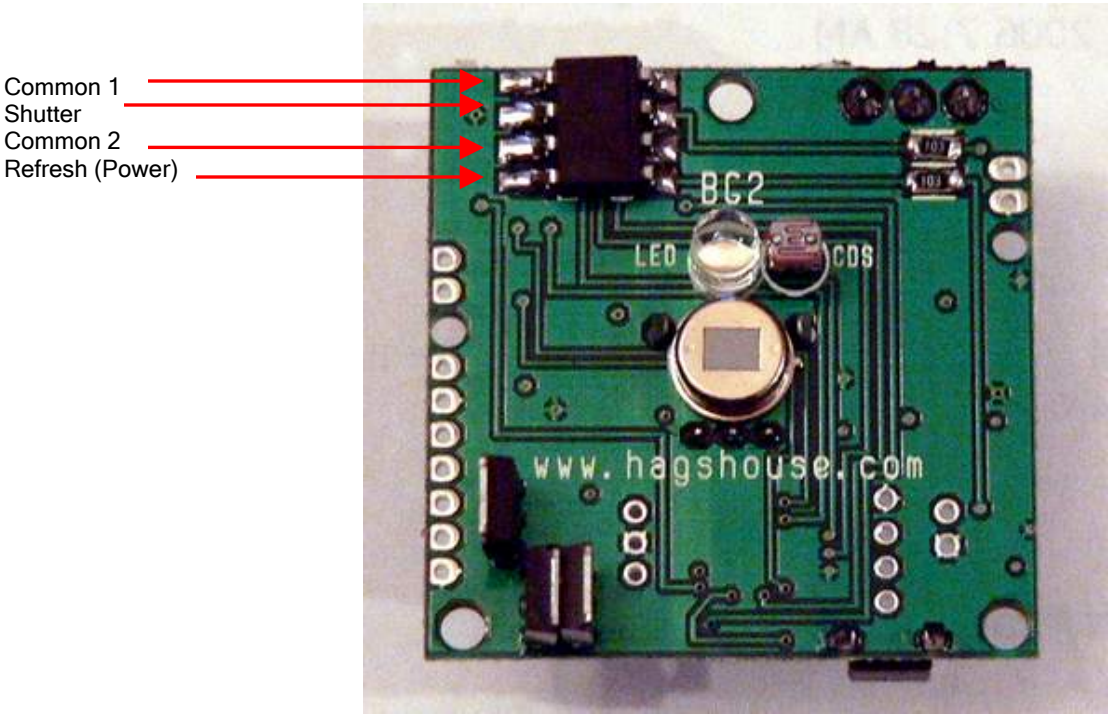
- The Refresh / Power connection is labeled **R1** on the BG2 Complete Board.
- The Common connection is labeled **C3** on the BG2 Complete Board.
- The Shutter connection is labeled **SB** on the BG2 Complete Board.

Slave Flash Connection to BG2 Complete Board

- The slave battery negative out is labeled **SL** on the BG2 Complete Board.
- The slave battery negative in is labeled **C4** on the BG2 Complete Board.

4 Wire Camera Connection to BG2 Complete Board

- The camera control wires for a 4-wire camera are not connected to the row of solder holes provided for 3-wire camera connection as shown above.
- An optocoupler is added to the IR sensor side of the BG2 Complete Board to operate 4-wire modified cameras, in which separate grounds are needed for each set of controls.
- 4 larger solder pads are positioned on the output side of the optocoupler to provide an area for you to solder your camera control wires to. (See photo below)



Appendix A: Individual Camera Operations / Special Features:

Sony P41: Special programming features for the Sony P41 only.

- Setting DIP Switch 1 and 2 both to the off position puts the BG2 Complete Board in a **24-hour fast trigger mode**. This fast trigger mode will detect day or night from each trigger of the sensor and process the fastest settings for the camera to take another picture. The day or night reading determines how long to wait before allowing the next picture to be taken, depending on the day or night detection of the sensor. The bonus to this feature is the P41 will take a picture almost instantly after the BG2 Complete Board is triggered. The camera is also capable of another daytime picture in approx. three to four seconds with another trigger from the sensor. During dark conditions the P41 is still set for the almost instant initial picture, but the time delay for the next picture is longer due to the flash capacitor recharging. The camera is turned off between pictures and waits in the fast trigger mode for a trigger from the sensor. An interval time period with the camera remaining on is not used to save valuable camera battery power. A draw back of this fast trigger mode is placing the camera in a dark location, ie. deep woods, and the camera mistakenly tries to use the flash during daylight pictures. The BG2 Complete Board may detect the daylight and use the proper fast trigger timing, but the camera detects the need for a flash. The result will be an initial instant flash picture with possible missed subsequent pictures due to the camera waiting for the flash to recharge and the BG2 Complete Board sending the faster 'take picture' command. You may note this when testing the BG2 Complete Board inside your home. Another draw back of this fast trigger mode is the camera batteries will expire quicker compared to the standard 24-hour normal trigger mode, due to the quicker timing used for the almost instant picture capabilities. Using the 24-hour fast trigger mode, the P41 will take the fastest initial picture possible and subsequent pictures as fast as camera possible.
- Setting DIP Switch 1 and 2 both to the on position puts the BG2 Complete Board in **24-hour normal trigger mode**. The BG2 Complete Board will detect daylight or dark and speed up the timing between pictures if daylight is detected. You should not miss any pictures with this setting even if the camera has to flash or not. The initial 'take picture' command is delayed for flash compensation. Using this setting will also prolong the life of the camera batteries. The usual delay of the picture being taken after the trigger of the BG2 Complete Board will be noted when using this setting.
- Setting DIP Switch 1 and 2 combinations to **day only** or **night only** active operation modes will automatically use the same timing as the 24-hour normal trigger mode. Pictures will only be recorded during programmed periods of active operations, either day only or night only. You will again note the usual delay of the picture being taken after the trigger of the BG2 Complete Board when using either day only or night only settings.

Taking a Picture: (Always On Cameras)

When the BG2 Complete Board sensor senses motion, it triggers the PIC chip, which will turn both the Refresh and Shutter relays on simultaneously and the camera takes a picture immediately. Another picture cannot be taken again until the Time Delay determined by the Delay Setting expires.
Double picture mode is a little different. Once the BG2 Complete Board sensor triggers the PIC chip, it will energize the shutter and refresh relays and take a picture, then when the shutter time has timed out (4seconds) it will wait (6 seconds) for the flash to recharge and then take another picture. Once this 2nd picture has been taken and the shutter time has expired, the PIC chip starts the delay between pictures, depending on the selected delay mode.

Taking a Picture: (On-Off Cameras)

When the BG2 Complete Board sensor senses motion, it triggers the PIC chip, which will turn on the camera and then the shutter relay, at the proper sequence, to take the picture. The camera remains on for x-seconds while the picture is recorded and then the PIC chip will turn the camera off. Another picture cannot be taken again until the Time Delay determined by the Delay Setting expires.
Double picture mode is a little different. Once the BG2 Complete Board sensor triggers the PIC chip, it will turn on the camera and then the shutter relay, at the proper sequence, to take a picture. Then the camera will record the picture and wait the remaining time of the x-seconds it is usually on and shutter another picture. Once this 2nd picture has been taken and the second x-second record time has expired, the PIC chip turns off the camera and starts the delay between pictures, depending on the selected delay mode.

PIC Chip Explanation of Terms:

PIC Chip – Programmable Integrated Circuit Chip (the IC Chip itself)
WALK TEST MODE – This is when the PIC chip signals all the sensor's activity by lighting the onboard LED of the BG2 Complete Board. There is no delay after the sensor is triggered before it can be triggered again. The walk test mode will time out after 3 minutes of inactivity and the PIC chip returns the BG2 Complete Board to normal operating mode. Walk test mode in only accessible from power up.
DELAY MODE – This is the time delay configured by you using the delay settings of the 6 Position Dip Switch. It is the time measured from when the relay for taking a picture turns off to when you can take another picture.
DOUBLE PICTURE MODE – This is when the PIC Chip automatically signals the camera to take a second picture 5 to 10 seconds after an initial sensor triggered picture was taken.
MOVIE MODE - This is when the PIC Chip automatically signals certain digital cameras to start and stop recording of a video clip instead of recording two separate pictures. The digital camera has to be switched to movie mode and the start / stop of video record must be activated by the shutter controls of the camera. The initial press (first trigger signal) starts the video record and the second press (automatic 5 to 10 second signal from double picture mode) stops the video record.
REFRESH PULSE – This is a 500millisecond pulse generated at a set time by the PIC chip.
In 35mm cameras the refresh pulse keeps the camera in a "ready" mode by 'topping' off the flash capacitor. Without the refresh pulse, the flash capacitor would top off first then a picture would be recorded. A delay that may take several seconds could occur while the flash capacitor is recharged.

In ‘always on’ digital cameras the refresh pulse keeps the digital camera awake, and does not allow auto shut down to occur. The digital camera is able to reach the camera’s sleep mode setting with the slow (2.5-hour) refresh, which in turn uses less power and still refreshes soon enough so the digital camera does not automatically shut off. The digital camera do not reach sleep mode with the fast (2.5-minute) refresh, which in turn uses more power, but faster shutter speeds are realized to capture faster moving animals.
In ‘on-off’ digital cameras the refresh keeps the digital camera’s settings active and recharges the flash capacitor. Certain digital cameras will reset to default setting if power is discontinued for extended periods of time. Some default settings are not used for various reasons, when using the digital camera as a trail camera.
NORMAL OPERATING MODE – This is when nothing is happening except the refresh countdown of the set refresh time. The PIC chip is ready to be triggered by the BG2 Complete Board sensor so it can take a picture. It is also ready to receive any button command from the PB-1 Push Button. Normal operating mode is accessible after time expires in walk test mode, or after calibration mode is accessed and closed. Normal operating mode is the default mode the PIC chip will return the BG2 Complete Board to, when all time outs expire.
SLEEP MODE – This is when the PIC chip is shutdown except for a low power internal oscillator, which keeps up with the timing or interrupts generated for the PIC chip. By shutting down the main oscillator the PIC chip draws less current. (4 to 5uA in sleep mode.) Sleep mode is inaccessible and automatically switched to by the PIC chip.
“ALWAYS ON” – This refers to the state of the camera itself while operating as a trail camera. The camera itself is always on and controlled by the programming of the PIC chip.
“ON-OFF” - This refers to the state of the camera itself while operating as a trail camera. The camera itself is off and controlled by the programming of the PIC chip. When the sensor is triggered the PIC chip turns the camera on and shutters a picture. The camera remains on for a specified time interval to record the picture and then is powered off by the PIC chip.

Troubleshooting:

If the LED doses not signal during a walk test check the following.

- You have installed the BG2 Complete Board with the IR sensor located behind the fresnel lens. The IR sensor is the ¼” round component with the rectangular glass window on top. The fresnel lens focuses the detection field into the IR sensor, so the sensor must be behind the fresnel lens.
- You have the fresnel lens at the correct focal distance from the IR sensor. The distance between the IR sensor and fresnel lens is critical in that the focus of the lens is determined by the distance it is located from the IR sensor. Changing the distance from what the lens is designed for will affect the focus to the IR sensor.
- The fresnel lens is in the right orientation and centered. The fresnel lens is designed to be installed with the groove side of the lens facing the IR sensor and the lens centered over the IR sensor. Double check alignment of the fresnel lens to the IR sensor.
- The sensitivity setting on the BG2 Complete Board is at its highest sensitivity. Locate the sensitivity potentiometer and turn the sensitivity to the highest sensitivity setting.
- The Day / Night / Both switch is set incorrect. Check the day / night / both switch combinations on the 6 Position DIP Switch. The BG2 Complete Board will not trigger if the switches are set to night and the walk test is performed in daylight. The BG2 Complete Board will not trigger if the switches are set to day and the walk test is performed in the dark. The BG2 Complete Board will trigger during the walk test in both daylight and dark if the switches are set to 24 hour mode.

- The PIC chip has returned to normal operating mode. Check to make sure the walk test time hasn't expired. Inactivity of 3 minutes returns the BG2 Complete Board back to normal operating mode. This is a precaution so the sensor is never left in walk test mode. Power down the BG2 Complete Board, wait 15 seconds, power up the BG2 Complete Board, return to walk test mode.

To change settings:
Power down BG2 Complete Board, make new selections, wait 15 seconds, power up.

<table>
<tr><td colspan="2">Day / Night / 24 Hr. Selection (Switch 1, 2)</td></tr>
<tr><td colspan="2">1 / 2 (Switch Position)
on / on = 24 hour operation of BG2 Complete Board
on / off = Day time only operation of BG2 Complete Board
off / on = Night time only operation of BG2 Complete Board
off / off = 24 hour operation of BG2 Complete Board</td></tr>
<tr><td colspan="2">Single / Double / Movie Selection (Switch 3)</td></tr>
<tr><td colspan="2">3 (Switch Position)
on = Double Picture / Movie Mode
off = Single Picture Mode</td></tr>
<tr><td colspan="2">Delay Selection (Switch 4, 5, 6)</td></tr>
<tr><td>4 / 5 / 6 (Switch Position)
on / on / on = 10 Second Delay
on / on / off = 30 Second Delay
on / off / on = 1 Minute Delay
on / off / off = 2 Minute Delay</td><td>4 / 5 / 6 (Switch Position)
off / on / on = 3 Minute Delay
off / on / off = 5 Minute Delay
off / off / on = 10 Minute Delay
off / off / off = 15 Minute Delay</td></tr>
</table>

Cut around outside border and fold over, place in camera enclosure for quick reference.

Additional Notes:

Suggested Camera Settings:

Sony DCS-P32 / P52 / P41:

(Double Check Camera Settings When Deploying Trail Camera) *SEE NOTES BELOW
Date / Time (On), **Red Eye** (Off), **AF Illuminator** (Off), **Power Save** (Off), **Beep** (Off), **Focus** (Infinity), **ISO** (400), **Picture Quality** (Standard), **Flash Level** (High), Leave the camera on **Program Setting, LCD Screen** (off).

*Camera's LCD screen is returned to default if camera is disconnected from the BG1 Complete Board for 2 hours or longer.
*Camera's LCD screen is returned to default if the BG1 Complete Board is powered off for more then 2 hours or longer.
*Double check camera settings when deploying trail camera and return camera to off position after checking.