628 -1 (BG1) PIC CHIP

(Revision 1)

BG1 Complete Board

This manual is a living document, therefore it will change when needed to clarify and explain the operation of the 628-1 (BG1) PIC chip and the BG1 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 2/9/05

The 628-1 (BG1) PIC chip is a custom programmed micro controller chip. It is one of the PIC chips that can be used in the BG1 Complete Board. The 628-1 (BG1) PIC chips are reprogrammable, and the program can be altered if custom settings are desired. The standard programmed settings will be described in this document with notation at possible alteration points.

The **628-1 (BG1) PIC chip** and **BG1 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 - *Slow and Fast Shutter Delay*
Sony DSC-P32 / P52 Digital Camera Modification
Sony DSC-P41 Digital Camera Modification
Minolta X20 Digital Camera Modification

628 -1 (BG1) PIC Chip Features:

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

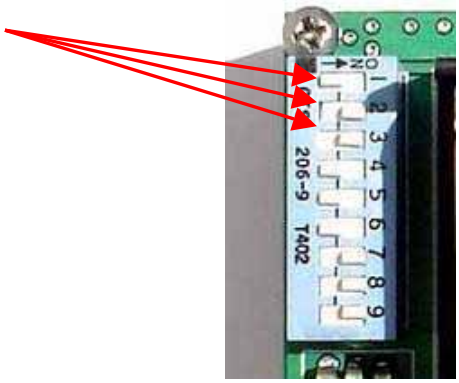
   The **9 Position DIP Switch** control features listed below.

   The 628-1 (BG1) PIC Chip reads the settings of the 9 Position DIP Switch on power up. To select or change settings you have to power the BG1 Complete Board off, make your selection or changes, and power it back up. The brown out setting is not enabled on the 628-1 (BG1) PIC Chip, so wait 10 to 15 seconds before you power the BG1 Complete Board back up after powering it down. This allows the voltage to drop low enough for a reset.

Camera Selection (Switches 1, 2, 3)

The 628-1 (BG1) PIC Chip contains programmed code to operate these 8 different camera setups commonly used in trail cameras.

Switches 1, 2, and 3 control the **Camera Selection** listed below:
On / off combinations of the three switches determine which setting is being used.

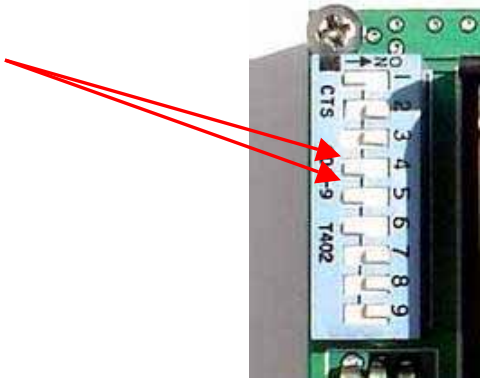


Camera Selection (Switch 1, 2, 3)
1 / 2 / 3 *(Switch Position)*
on / on / on = **Olympus D370 / 380** w/ 2.5 hour refresh setting (Always On, Slow Refresh, Longer Battery Life)
on / on / off = **Olympus D370 / D380** w/ 2.5 minute refresh setting (Always On, Fast Refresh, Lower Battery Life)
on / off / on = **Sony DSC-P32 or Sony DSC-P52 Digital Cameras** (On-Off, Set Shutter Delay, Long Battery Life)
on / off / off = **Minolta X20 Digital Camera** (On-Off, Set Shutter Delay, Long Battery Life)
off / on / on = **Canon Sure Shot Owl PF** w/ 7 minute refresh setting. (Always On, Multiple 35mm cameras will run on this setting also)
off / on / off = **Olympus D370 / D380** w/ 2.0 second shutter delay setting (On-Off, Slow Shutter Delay, Longer Battery Life)
off / off / on = **Olympus D370 / D380** w/ 1.5 second shutter delay setting (On-Off, Fast Shutter Delay, Longer Battery Life)
off / off / off = **Sony DSC-P41 Digital Camera** (On-Off, Set Shutter Delay, Long Battery Life)

Day / Night / 24 Hour Selection (Switches 4, 5)

The 628-1 (BG1) PIC Chip contains programmed code to allow selection of 3 different periods of active operation for the trail camera.

Switches 4 and 5 control the **Day / Night / Both Selection** listed below:
On / off combinations of the two switches determine which setting is being used.



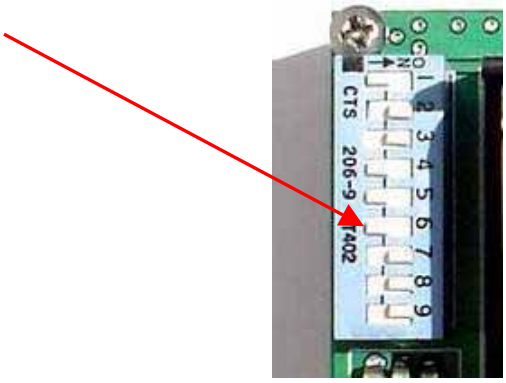
Day / Night / 24 Hr. Selection (Switch 4, 5)
4 / 5 *(Switch Position)*
on / on = **24 hour** operation of BG1 Complete Board
on / off = **Day** time only operation of BG1 Complete Board
off / on = **Night** time only operation of BG1 Complete Board
off / off = **24 hour** operation of BG1 Complete Board

Single / Double / Movie Selection (Switch 6)

The 628-1 (BG1) PIC Chip contains programmed code to allow selection of single or double picture mode.
The **single picture mode** setting allows only one picture per trigger from the BG1 Complete Board.
The **double picture mode** setting automatically activates the camera to take a second picture 10 seconds after the initial picture, with or without a second trigger pulse from the BG1 Complete Board itself.
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. The combination will allow you to record 10-second video clips instead of two individual pictures.

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

Switch 6 control the **Single / Double / Movie Selection** listed below:
On / off combinations of the two switches determine which setting is being used.

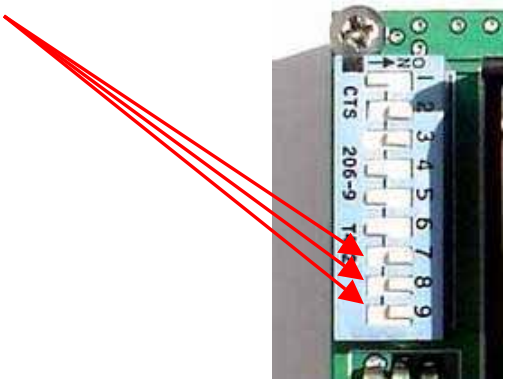


Single / Double / Movie Selection (Switch 6)
6 *(Switch Position)* on = **Double Picture / Movie Mode** off = **Single Picture Mode**

Delay Selection (Switches 7, 8, 9)

The 628-1 (BG1) PIC Chip contains programmed code to allow selection of 8 different delay periods between possible pictures or movies.

Switches 7, 8 and 9 control the **Delay Selection** listed below:
On / off combinations of the three switches determine which setting is being used.



Delay Selection (Switch 7, 8, 9)	
7 / 8 / 9 *(Switch Position)* on / on / on = **10 Second Delay** off / on / on = **30 Second Delay** on / off / on = **1 Minute Delay** off / off / on = **2 Minute Delay**	7 / 8 / 9 *(Switch Position)* on / on / off = **3 Minute Delay** off / on / off = **5 Minute Delay** on / off / off = **10 Minute Delay** off / off / off = **15 Minute Delay**

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

2. Initial Delay / Walk Test Mode: The **On-Off Slide Switch** control features listed below.
The initial delay will last approximately 30 seconds.
After you have selected your DIP Switch settings per the instructions above, and added a 9-volt battery to the battery holder, turn the On-Off Slide Switch to on and you will see the LED blink once as a signal the board started it's initial delay and everything is okay. If you do not see a blink then cycle the power again.
When the initial delay is complete, the 628-1 (BG1) PIC chip will automatically switch to **walk test mode**. The built in initial delay allows the sensor to stabilize, and avoid a false picture from an errant trigger pulse.

After initial delay the 628-1 (BG1) PIC chip automatically switches to walk test mode. 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 628-1 (BG1) PIC chip to activate the LED.
The 628-1 (BG1) PIC chip 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 and then back on, wait for initial delay to time out, and then the BG1 Complete Board will switch automatically to walk test mode.

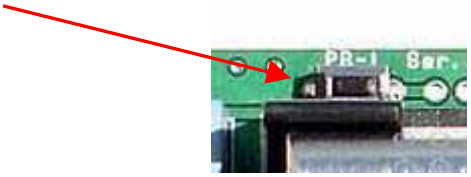
* NOTE: During walk test mode there is approx. a **20** second delay after the sensor is triggered before it can be triggered again. This delay is the time needed for the sensor to reset itself and may vary slightly.

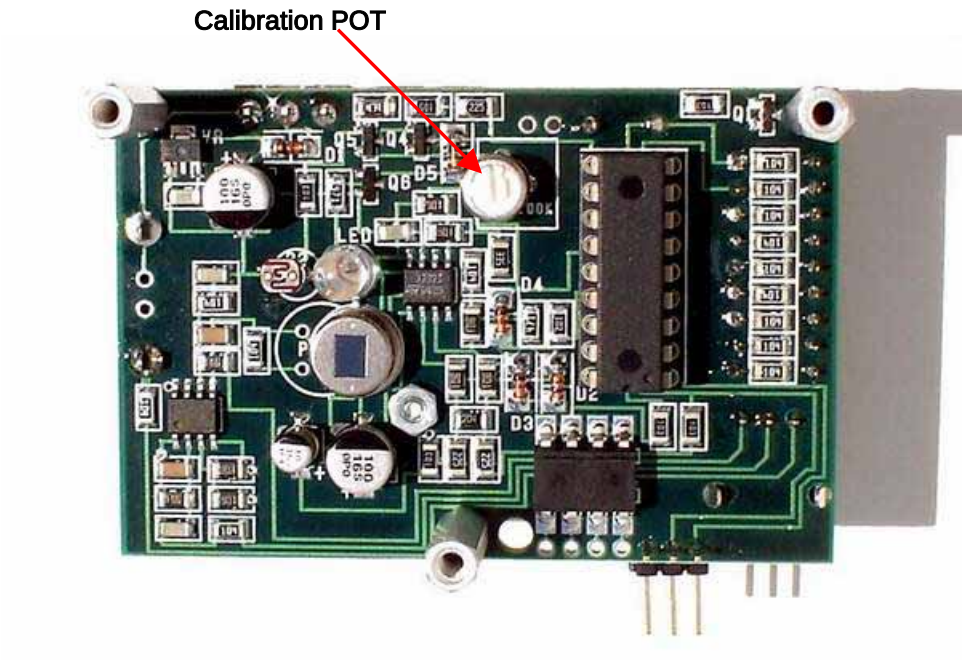
3. Day / Night Calibration of Photocell: The **Calibration POT** control features listed below.

* NOTE: The day / night calibration of the photocell only needs to be set once. The calibration should be set during daylight and performed either next to a window or outside.

During walk test mode, press the PB-1 onboard push button switch. You will see eight blinks from the LED to signal the calibration mode. The BG1 Complete Board circuit now samples the day / night setting every second. If it is daylight, then you will see a blink every second as the BG1 thinks it is daylight. If you do not see a blink every second then the BG1 thinks it is night. Adjust the Calibration POT counterclockwise until the BG1's LED blinks every second.
Push and hold the PB-1 onboard push button switch until you see the LED blink repeatedly. Release the push button and the calibration of the photocell is complete. The BG1 Complete Board is now returned to normal operating mode.

PB-1 Push Button Switch

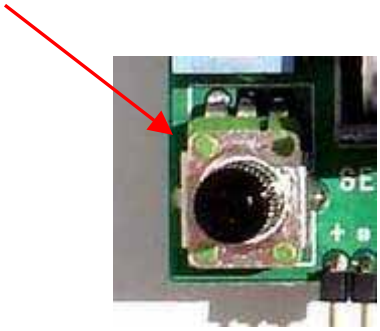




4. Sensitivity Adjust: The **Sensitivity Potentiometer** control features listed below.

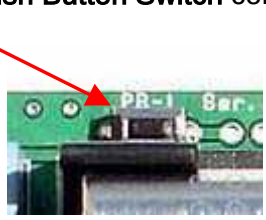
* NOTE: **DO NOT SET THE POTENTIOMETER AT THE FULL CLOCKWISE OR FULL COUNTERCLOCKWISE SETTING.**

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.

5. 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 BG1 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 BG1 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.

Taking a Picture: (Always On Cameras)

When the BG1 Complete Board sensor senses motion, it triggers the 628-1 (BG1) 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 BG1 Complete Board sensor triggers the 628-1 (BG1) 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 628-1 (BG1) PIC chip starts the delay between pictures, depending on the selected delay mode.

Taking a Picture: (On-Off Cameras)

When the BG1 Complete Board sensor senses motion, it triggers the 628-1 (BG1) 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 628-1 (BG1) 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 BG1 Complete Board sensor triggers the 628-1 (BG1) 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 628-1 (BG1) PIC chip turns off the camera and starts the delay between pictures, depending on the selected delay mode.

PIC Chip Explanation of Terms:

628-1 (BG1) PIC Chip – Programmable Integrated Circuit Chip (the IC Chip itself)
INITIAL DELAY - This is the 30-second startup period of time from when the power is initially turned on to the BG1 Complete Board to when the 628-1 (BG1) PIC chip automatically switches to walk test mode. The sensor and the PB-1 push button are inactive during initial delay.
WALK TEST MODE – This is when the 628-1 (BG1) PIC chip signals all the sensor's activity by lighting the onboard LED of the BG1 Complete Board. There is approx. a 20 second delay after the sensor is triggered before it can be triggered again. This delay is the time needed for the sensor to reset itself and may vary slightly. The walk test mode will time out after 3 minutes of inactivity and the 628-1 (BG1) PIC chip returns the BG1 Complete Board to normal operating mode. Walk test mode in only accessible after initial delay times out.
DELAY MODE – This is the time delay configured by you using the delay settings of the 9 Position Dipswitch. 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 628-1 (BG1) PIC Chip automatically signals the camera to take a second picture 10 seconds after an initial sensor triggered picture was taken.
MOVIE MODE - This is when the 628-1 (BG1) 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 sensor signal) starts the video record and the second press (automatic 10 second signal from double picture mode) stops the video record.

ADJUSTABLE REFRESH MODE – This is a 500millisecond pulse generated at a set time by the 628-1 (BG1) 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 keeps the digital camera awake, and does not allow auto shut down to occur. The digitals are able to reach the camera’s sleep mode setting with the 2.5-hour refresh, which in turn uses less power and still refreshes soon enough so the digital does not automatically shut off. The digitals do not reach sleep mode with the 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 setting 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 628-1 (BG1) PIC chip is ready to be triggered by the BG1 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 initial delay times out and time expires in walk test mode, or after initial delay times out and calibration mode is accessed and closed. Normal operating mode is the default mode the 628-1 (BG1) PIC chip will return the BG1 Complete Board to, when all time outs expire.
SLEEP MODE – This is when the 628-1 (BG1) PIC chip is shutdown except for a low power internal oscillator, which keeps up with the timing or interrupts generated for the 628-1 (BG1) PIC chip. By shutting down the main oscillator the 628-1 (BG1) PIC chip draws less current. (4 to 5uA in sleep mode.) Sleep mode is inaccessible and automatically switched to by the 628-1 (BG1) 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 628-1 (BG1) 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 628-1 (BG1) PIC chip. When the sensor is triggered the 628-1 (BG1) 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 628-1 (BG1) PIC chip.

6. Troubleshooting:

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

- You have installed the BG1 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 BG1 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. Locate the day / night / both switches on the 9 Position DIP switch. The BG1 Complete Board will not trigger if the switches are set to night and the walk test is performed in daylight. The BG1 Complete Board will not trigger if the switches are set to day and the walk test is performed in the dark. The BG1 Complete Board will trigger during the walk test in both daylight and dark if the switches are set to 24 hour.
- The 628-1 (BG1) 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 BG1 Complete Board back to normal operating mode. This is a precaution so the sensor is never left in test mode. Power down the BG1 Complete Board, power up the BG1 Complete Board, allow initial delay to expire to return to walk test mode.

To change settings:
Power down BG1 Complete Board, make new selections, wait 15 seconds, power up.

Camera Selection (Switch 1, 2, 3)

1 / 2 / 3 *(Switch Position)*

on / on / on = **Olympus D370 / 380** w/ 2.5 hour refresh setting
(Always On, Slow Refresh, Longer Battery Life)

on / on / off = **Olympus D370 / D380** w/ 2.5 minute refresh setting
(Always On, Fast Refresh, Lower Battery Life)

on / off / on = **Sony DSC-P32 or Sony DSC-P52 Digital Cameras**
(On-Off, Set Shutter Delay, Long Battery Life)

on / off / off = **Minolta X20 Digital Camera**
(On-Off, Set Shutter Delay, Long Battery Life)

off / on / on = **Canon Sure Shot Owl PF** w/ 7 minute refresh setting.
(Always On, Multiple 35mm cameras will run on this setting also)

off / on / off = **Olympus D370 / D380** w/ 2.0 second shutter delay setting
(On-Off, Slow Shutter Delay, Longer Battery Life)

off / off / on = **Olympus D370 / D380** w/ 1.5 second shutter delay setting
(On-Off, Fast Shutter Delay, Longer Battery Life)

off / off / off = **Sony DSC-P41 Digital Camera**
(On-Off, Set Shutter Delay, Long Battery Life)

Day / Night / 24 Hr. Selection (Switch 4, 5)

4 / 5 *(Switch Position)*

on / on = **24 hour** operation of BG1 Complete Board
on / off = **Day** time only operation of BG1 Complete Board
off / on = **Night** time only operation of BG1 Complete Board
off / off = **24 hour** operation of BG1 Complete Board

Single / Double / Movie Selection (Switch 6)

6 *(Switch Position)*

on = **Double Picture / Movie Mode**
off = **Single Picture Mode**

Delay Selection (Switch 7, 8, 9)

7 / 8 / 9 *(Switch Position)*	7 / 8 / 9 *(Switch Position)*
on / on / on = **10 Second Delay**	on / on / off = **3 Minute Delay**
off / on / on = **30 Second Delay**	off / on / off = **5 Minute Delay**
on / off / on = **1 Minute Delay**	on / off / off = **10 Minute Delay**
off / off / on = **2 Minute Delay**	off / off / off = **15 Minute Delay**

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.