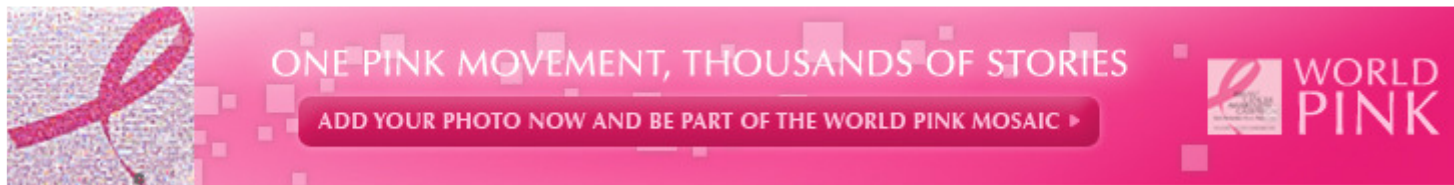


Magic Lantern 0.1.6 User Manual



Contents

User Manual

Introduction



This manual is designed to be a layman's introduction to Magic Lantern release No. 0.1.6. Technical information regarding this release as well as the history and development of Magic Lantern can be reviewed the Magic Lantern wiki.

Magic Lantern is a program that has been developed by Canon 5D Mark II users to provide video and still enhancements to the operating system in the camera. It loads from the CF card on board the camera and does not modify the camera's factory firmware in anyway. Magic Lantern is modeled on CHDK, a system developed in the open source community that provided enhancements to Canon Power Shot compact digital cameras.

Warranty Issues

Bear in mind that this Magic Lantern release comes with no warranty for any use; you use it at your own risk. This project is attempting to improve uses of the product for professional level uses and is intended for that purpose.

Developers and Users contend that using the Magic Lantern does not harm your camera since it is loaded into the memory only temporarily and if you turn off the camera, it's gone completely. Alpha testers have used Magic Lantern for several versions now, and there have been no reported camera issues developed in using the software. The original camera firmware is left untouched in the camera. There have been two prior released versions as the software and the developers have had no report of any damage arising out of its use.

Canon support maintains that any upgrades to the software of the camera not performed by an authorized Canon Repair Facility or installed as directed by Canon, would void the warranty. Thus you should consider it likely that damage occurring to your camera while using Magic Lantern software would not be covered under your Warranty, should Canon challenge the Warranty on that basis. Whether or not their position would hold up legally, has not been tested.

However, the open source developers of this software are essentially accessing settings that are available on board the camera as part of the Canon design, and it is unclear how such usage would be determined in a repair situation in any event.

What does Magic Lantern Do: A General Description of Process

Simply stated Magic Lantern 0.1.6 provides a system that allows the user to obtain access to various settings on the camera, some of which are not available in the Canon 5D Mark II firmware release 1.1.0. This most recent factory release provided some additional manual setting capabilities for video shooting, but left many needs unfulfilled. Magic Lantern 0.1.6 only works with firmware version 1.1.0.

The choice of settings can be accomplished by one of two methods. The first is by accessing the Magic Lantern Menu, after starting Magic Lantern. The second method is to make changes on a configuration file, prior to invoking Magic Lantern and then including that configuration on the CF root directory along with the Magic Lantern software before starting Magic Lantern. The Magic Lantern process also allows the saving of the current settings as a repeatable configuration, once the configuration has been set while in Magic Lantern, so the particular setup can be repeatably invoked at start up.

In both cases, the process is started by starting the camera in the standard configuration. That means you start your Canon 5D Mark II as usual, using firmware version 1.10.

Then, with a card that has been loaded with the Magic Lantern 0.1.6, you will select firmware update from the firmware update menu on the camera. After selecting it, the camera will reboot, using Magic Lantern 0.1.6. Nothing in the firmware rewrites or changes the

standard firmware on board the the camera. The Magic Lantern Firmware actually supplements the firmware but is not written permanently in the Camera's operating system.

After Magic Lantern is running, the user will:

1. have access to a new set of data reporting on the LCD or monitor,
2. have access to audio level meters
3. have access to zebras on screen (LCD use only)
4. have access to menus for setting of audio gain,
5. set audio monitoring levels
6. invoke design and define and invoke crop marks
7. set histogram on or off
8. set up stack focus for multiple still photos with variable focus.
9. set up automated rack focusing on auto focus lenses
10. save a new configuration setting based on the set up you have made

After completing the use of the camera in Magic Lantern mode, the power of the camera is turned off. This will normally clear the camera of any vestiges of the opeating system, and the camera can then be restarted in the normal firmware operating system.

Note: After all uses developers are recommending that users also open, and remove the battery briefly, to assure memory is cleared, before restarting of the camera in normal modes. This recommendation also prevents a potential that some process might continue to be running in the camera causing it to drain the battery or overheat the camera even after shut down.

Installation

Preparing Your Compact Flash Card

Any compact flash card that you intend to shoot with Magic Lantern, will have to have magic lantern installed to it. Remember, the card supplies the additional operating instructions for the firmware running on the camera.

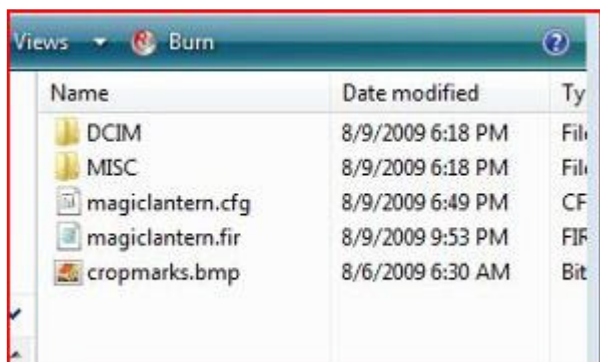
About choice of cards: Generally, most cards that can be used with the Canon 5D Mark II in regular mode, will work with Magic Lantern. However, the user should be prepared to consider changing cards should continuous trouble be noted with a particular card or brand of cards.

Preparing the Card for Transfer of Magic Lantern: It is recommended that any card on which Magic Lantern is to be installed be formatted in the Canon 5D Mark II, prior to installation of Magic Lantern on that card.

Installing Magic Lantern on your card:

1. Download the latest version of Magic Lantern from this site: Download firmware
2. Extract the zip file to a directory of your choice. In order to preserve prior downloads, use a new directory for each version you download. Otherwise the resulting file may overwrite a prior download.
3. From the download directory, transfer the `magiclantern.fir`, `magiclantern.cfg`, and `cropmarks.bmp` to the root directory of you CF card.

Your CF card directory should look like the following as a result of the transfer:

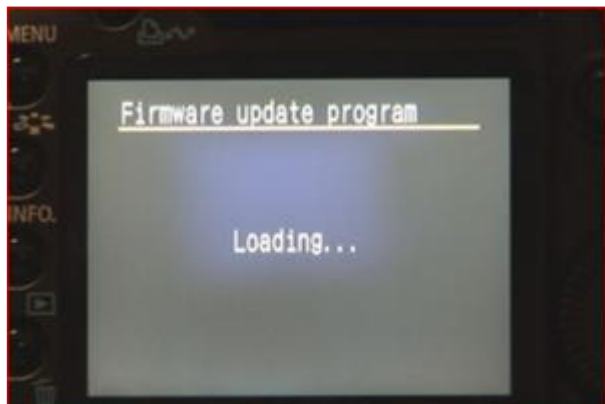


Repeat these steps each compact flash card you want to use for recording with Magic Lantern.

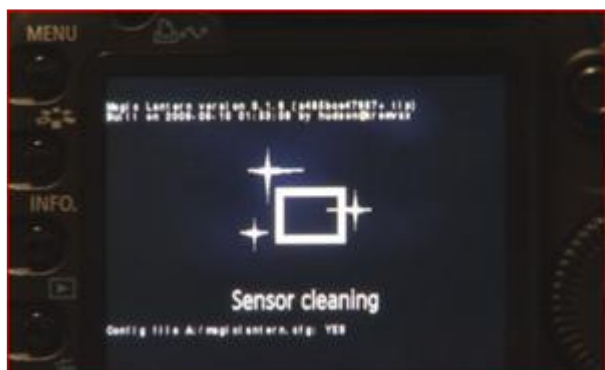
Starting Magic Lantern

1. Start your camera with the CF card with Magic Lantern installed in the camera card slot.
2. Press the menu button, then locate the firmware update utility. (see picture below)
3. Push the set button after navigating to the firmware line.
4. Select Okay, when prompted

The Magic Firmware program will then load:



The screen will go blank, and then show this screen:



It will then go blank again. If it does not come up after a few seconds, push the Live View button.

(Note: Some users report that turning off automated sensor cleaning will eliminate the need to turn Live View back on after loading Magic Lantern 0.1.6.)

Magic Lanterns screen will look something like this now:



At this point you can just press the `Set` button to record, especially if you had your camera set-up pre-configured in the configuration file. In the next chapters you will learn how to configure various setting, for that purpose.

Configuring Magic Lantern

The sole purpose of Magic Lantern is to enhance use of the Canon 5D MKII, by allowing the user to adjust certain camera settings that are normally not accessible in the stock Canon firmware. There are five menus in Magic Lantern Version 0.1.6. They are Audio, Video, Bracket, Focus, and Debug.

Magic Lantern takes over the `Picture Style` button on your Canon 5D Mark II and uses it to access the Magic Lantern menu system. Press that button to enter the system. You will see the default Audio screen at start up:



You will toggle to each menu or up and down the menu selections with the four way mini-joy stick. Depressing the joy stick will select changes for the item. The `Set` button can also be used to select.

Audio Settings

Output vol

This selection provide four settings from 0-6 to set sound levels for sound monitoring from the AV Jack of the Canon 5D Mark II.

Anlg gain

This selection sets analog gain levels. Typically you would want this to be as low as possible if you are using a high quality pre-amp that can drive a hot signal into the camera. The 5D's preamps are noisy when turned about +20 dB.

L.Gain

This selection sets left digital gain level

R.Gain

This selection sets right digital gain level

AGC

This selection toggles audio gain on or off. One of the entire reasons for installing Magic Lantern is to be able to turn this off.

Input

INT= internal camera mic, EXT set camera to external mic input.

Monitor

ON means that the A/V jack will loopback the microphone input, OFF means that the A/V jack will playback audio from a recorded clip.



Audio menu screenshot

Notes

- Due to camera design, the highest level may not be sufficient for some monitoring situations without adding a headphone amp. A headphone amp that that can provide further volume control should be employed.
- Remember that the jack from the AV is an AV jack, and actually has two channels of audio, and one channel of video. Using a two channel standard stereo headphone jack will usually result in only one channel being heard. Adapters splitting the AV output into video and left + right audio are available.
- In early testing of the 5D with standard firmware, it has been noted that monitoring SD video through the AV port can cause a recorded feedback noise. That carries over to Magic Lantern. A notch filter may have to be employed in post to eliminate that sound, if video monitoring is used through the AV port.
- Best audio is obtained by use of a preamp system fed to the camera. As a general rule, the use of a quiet preamp to send the signal to the camera will result in better the sound recorded in camera. Use of a preamped XLR adapter like the Juiced Link CX 231 or a field mixer will give superior results.

Video Settings

Zebras

This setting toggles Zebras on and off.

Zebra Thrs

This setting toggles through various level of zebras. As of this writing actual values have not been analyzed. The authors believe 0xf000 approximates 100%.

Cropmarks

This setting toggles cropmarks on or off. The Magic Lantern will access a cropmark file in the root directory to write user developed crop marks. There is a sample version provided. The camera can only access a simple 8 bit bitmap file and should be designed within the parameters of the demonstration file provided. There are more sample cropmark files available with different aspect ratios. Under the current version, the replacement file must also be named `cropmarks.bmp` and be stored in the root directory of the CF card.

Edgedetect

This function currently is still in development an in current implementation does not provide usable edge detection for focusing purposes.

Histogram

Toggles a histogram display.

Notes

- Zebra currently do not write properly to monitors fed by the Canon 5D, either SD or HDMI. They should therefore be turned off if you are not using the internal LCD.
- The cropmarks file will occasionally not load correctly. If this happens, power cycle the camera and restart the Magic Lantern firmware as described above.
- Canon's liveview menus (like ISO, whitebalance, etc) will not be displayed correctly when Zebras, edge detection or histograms are displayed. The menu will flicker onscreen for an instant, but then be overdrawn by the zebra stripes. You can still select from the menu with the scroll wheel.

Bracket menu

This feature is provided for still photography purposes to test several different exposure level of a scene.

Test bracket

Exposure the desired number of exposures

AE Count

Number of exposures in the bracket

AE Step

Number of camera exposure compensation steps between exposures. Each step is about 1/3 EV, but they do not seem to directly relate to the same EV as displayed on the camera body.

Notes

- This feature is experimental and may have problems.
- Sequential exposures are not as fast as the cameras built-in bracketing right now.
- Must be invoked in liveview mode
- Camera must be in Av, Tv or P modes (not M)

Focus menu



Video menu screenshot



Bracketing menu

The focus menu system is designed to take advantage of autofocus lenses to provide an automated rack focus for motion filming, and stack focusing for still photography. It is currently in Beta status, and is provided for user testing and development.

Settings are as follows:

Focus Dir

This is the direction the lens moves when pressing the camera's zoom in button to set the focus start point. After setting the focus end point select this direction then press the zoom in button to move the lens to the focus start point. Near means to focus closer to the camera. Far means to focus further away from the camera.

Focus A

This is end point of rack focus. To set, focus the lens, then press "Set".

Rack speed

Sets the focus speed. Select a speed and test and reset as needed.

Rack Focus

Triggers the rack focus operation that moves between the start and end focus points. After the move is complete pressing again reverses the move.

Run Stack Focus

This selection will shoot a series of photographs with varying focal distances. Used in macro photography to assemble sharper final images by merging photos where each has a different focus point.

The following are display only:

Focal Dist

The distance to the focal point. Value is returned by most newer Canon lenses. If the lens does not report any distance information, 0 will be displayed and the DOF calculations will not be correct.

Hyperfocal

The hyperfocal distance is the point of focus where everything from half that distance to infinity falls within the depth of field. This is the largest depth of field possible for the current f-number.

DOF Near

The nearest distance in which objects appear in focus.

DOF Far

The farthest distance in which objects appear in focus.

How it Works:

Now that you know what the buttons are about, here is how you make it work:

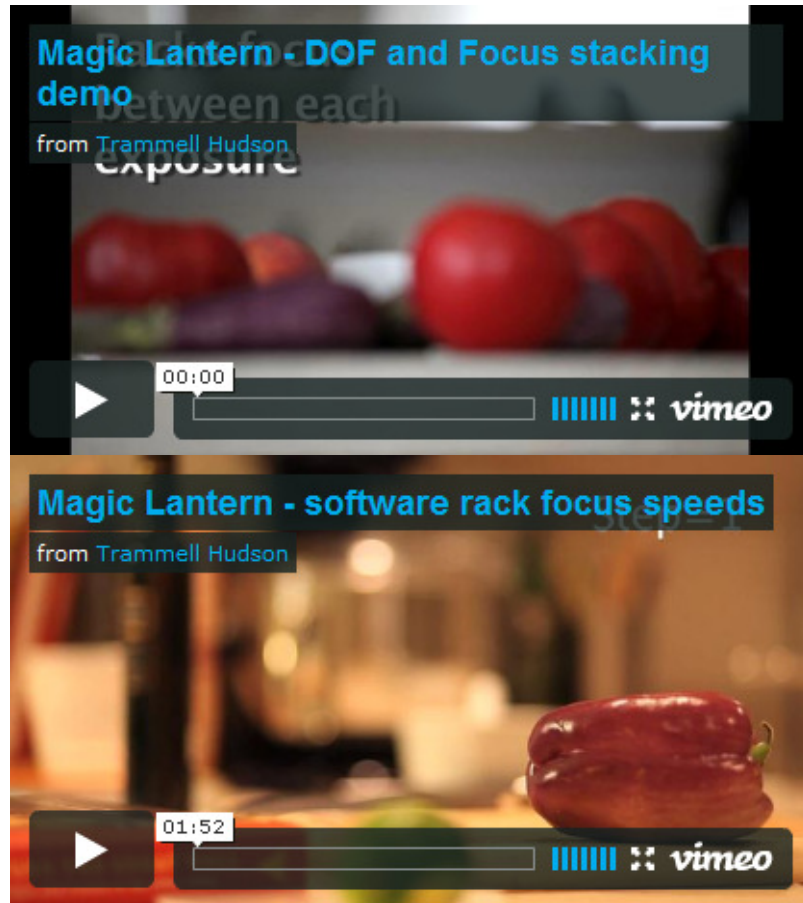
1. After opening the focus menu, pick the end point of your rack focus, focusing manually with your lens on that point.
2. Next on the Focus Menu, select the direction you will have to focus to in order to find the start point. If the start point is a closer focus, pick Near, if it a farther away focus point, pick Far. (Remember, you are simply telling camera which direction to go to find the start point.)
3. Next, scroll down to Focus A. You need to zero this setting out, before going on. Press "Set" to zero it out.
4. Once that is completed you will use the Zoom + button in the very right hand upper corner of the back of the camera to move the focus point to your start point. You will need to watch the screen closely to make sure you reach the proper point.
5. Next select the time period of the pull, by scrolling down to rack speed. The lower the number, the longer the rack will take. It is recommended for testing purposes to start around 20.
6. Once that is done, you need to exit the Magic Lantern Menu, to start the camera recording
7. Once the camera is recording, re-enter the Magic Lantern Focus Menu, and scroll to Rack Focus. To start the rack focus, press "Set". You should see the rack focus commence and complete its cycle.

8. To return to the beginning point, you can press Set again to return to that point, once again.

Notes

- The rack focus command may "sutter" while racking with some lenses, causing overshoot or undershoot of the desired position. This feature is still under development and should be more mature in a later version.
- The Stack Focus command must be invoked in Liveview mode and with the lens in Manual Focus mode.

Sample videos



Debug Menu

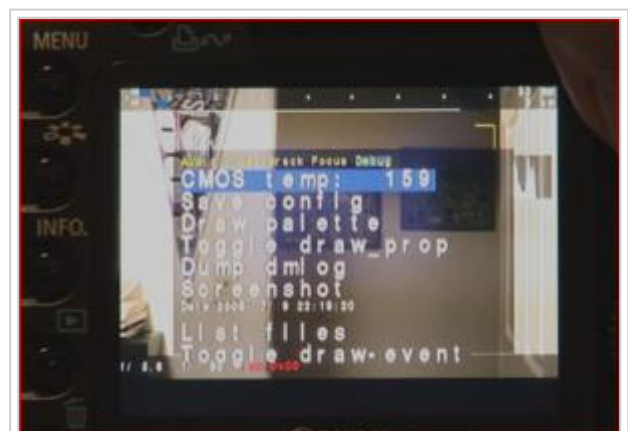
The menu provides various commands designed to help the developers determine what is happening during processes. The general user may be asked to provide information about bug reports from these menus.

However, it is expected that the general user will use the Save Config command to develop her own configuration settings for repeatable use. That process is explained more below.

Configuration Files

The basic configuration file on board at first start:

Magic Lantern comes with a basic configuration file, `magiclantern.cfg`, used to set the camera up you can view and modify the file in a text editor such as Note Pad. The configuration file will look like this:



Debug menu

```

# Zebra levels
zebra.level = 61440 # == 0xF000
zebra.draw = 1

# Edge detection (too slow for real use)
edge.draw = 0

# Crop marks for 2.35:1
crop.draw = 1

# Audio data
# mgain is according to this table:
# 0 == +0 dB
# 1 == +20 dB
# 2 == +26 dB
# 3 == +32 dB
# 4 == +10 dB
# 5 == +17 dB
# 6 == +23 dB
# 7 == +29 dB
# mgain affects both channels equally.
audio.mgain = 4

# dgain is in dB. If you want separate gains per channel,
# use audio.dgain.l and audio.dgain.r to set their gains.
audio.dgain = 18 # dB

# mic-power is boolean. Turn it on if you are using an electret mic
# or the internal microphone. Turn it if you are using a CX231 for
# best audio quality.
audio.mic-power = 1

# Enable liveview automatically?
# Turn this off if your card has trouble booting or
# with HDMI output connected at boot time. You will need
# to hit the Live-View button in a few seconds after booting
enable-liveview = 1

# Disable the powersave so that the LiveView never shuts off?
# WARNING -- this can cause problems with your sensor!
# DO NOT LEAVE THE CAMERA ON CONTINUOUSLY.
disable-powersave = 1

```

Many of the settings in the initial configuration file are on off or level settings for various basic features of the camera that are enhanced or brought up by Magic Lantern. 0 will generally mean no, and 1 will mean turn it on. So a `zebra.draw=1` at Zebras will turn zebras on and so on.

The user can edit this file in a text editor, making setting changes. As shown, the initial file contains instructions for setting the configuration settings.

Saved Configuration Files

Magic Lantern will generate a more complete configuration file. After starting Magic Lantern and making settings to your Camera in the Magic Lantern Menus, you can save that current configuration for future start ups in the Debug menu by selecting `Save Config` in that menu. By selecting that, the original Configuration file will be replaced with a new extended configuration file such as the following (note that all comments are removed from the file):

```

# Magic Lantern 0.1.6 (4770e23b8cd9 tip)
# Build on 2009-08-10 22:54:23 by hudson@kremvax
# Configuration saved on 2009/08/10 16:51:20
disable-powersave = 1
debug.draw-event = 0
debug.menu-timeout = 15
debug.draw-prop = 0
debug.timed-dump = 0
audio.mgain = 5
audio.dgain.l = 18
audio.dgain.r = 12
audio.mic-power = 1
audio.lovl = 3
audio.o2gain = 0
audio.alc-enable = 0
audio.mic-in = 1
audio.loopback = 1
focus.step = 100
focus.count = 5
focus.rack-speed = 4
zebra.draw = 0
zebra.level = 61440
crop.draw = 0
crop.file = A:/cropmarks.bmp
edge.draw = 0
enable-liveview = 1
hist.draw = 0
hist.x = 582
hist.y = 100
timecode.x = 520
timecode.y = 50
timecode.width = 225
timecode.height = 60
timecode.warning = 120

```

You can use this file for future start up, and you may also want to edit further for future startups and develop several different files for various uses.

Magic Lantern Screen Information

Magic Lantern produces additional on screen information, not available on the stock firmware:



1. Audio Levels with color indicators

2. Lens focal length and focus distance information report
3. Recording indicator. Displays an estimate of minutes:seconds left on card during recording process.
4. Current F stop setting
5. Current shutter speed setting
6. Current ISO (red color indicates auto setting)
7. Digital gain settings (only displayed for a second while recording)
8. Analog Gain Setting (only displayed for a second while recording)

Troubleshooting

Playback, and Blank Screen Post Playback

Alpha users have reported occasional blank screens after invoking playback on their Canon 5D Mark II, while in Magic Lantern 0.1.6. If this occurs, try pushing various left side buttons. In particular, pushing the Info, Playback, Picture Style or Menu buttons several times, may resolve this.

If the blank screen is not resolved after such attempts, users should immediately shut down the camera, and remove the battery briefly and then restart the camera.

