



Massa, Italy - 20 Jan. 2010

To all our valued dealers

LVI SmartGuider 2 Imaging Control System

- Product Overview -

1. Product Overview



The LVI SmartGuider 2 Imaging Control System (I.C.S.) is a major improvement respect to the stand-alone autoguiding SmartGuider camera.

Although the camera hardware is pretty the same, the improvement is involving the internal firmware and a new external device called **MGA** coming with the camera.

In addition to the usual stand-alone capability offered by the present SmartGuider, the new model features more flexibility thanks to the expanded **MENU ADVANCED** which allows new functions - as suggested by our customers - for an optimal guiding performance in any situation with any setup.

The SmartGuider 2 I.C.S. comes with the special MGA device which allows a wide variety of most wanted applications as:

1. Full control of DSLR cameras as **Canon, Nikon, Pentax and Sony** and other possibly.
2. Full control of **motorized focusers** (a stepping motor fitted into the focuser is required) with temperature compensation and absolute positioning.
3. Special autoguiding port featuring an **opto-isolated output** with non-simultaneous corrections to the RA and DEC axes (Losmandy non GoTo users).
4. Dedicated **Meade Autostar autoguiding port** for LX90 and LX200 telescopes.



The present SmartGuider stand-alone autoguiding camera is not compatible or upgradable to the SmartGuider 2 I.C.S.

LVI can exceptionally make such an upgrade to resellers and distributors only.



1.1 SmartGuider vs. SmartGuider 2

Here below the SmartGuider 2 I.C.S. is compared with the present SmartGuider stand-alone autoguiding camera. The table is showing all the differences while anything else not listed here in the table is pretty the same.

	PULSE GUIDE	MAX EXPOSURE	DITHERING	HOT PIXEL REMOVAL	DSLR CONTROL	FOCUSER CONTROL	AUTOSTAR GUIDING	LOSMANDY CONTROL	LIMITING MAGNITUDE
SMARTGUIDER	FIXED 500 MSEC	FIXED 2 SEC	NO	NO	NO	NO	NO	GEMINI ONLY	D=80mm: Mv 8 Expo: 2 sec
SMARTGUIDER 2	ADJUSTABLE 25, 50, 100, 250, 500 MSEC	ADJUSTABLE 1, 2, 4 SEC	YES	YES	YES	YES	YES	ALL THE SYSTEMS	D=80mm: Mv 9 Expo: 4 sec

1.2 MENU ADVANCED - New functions

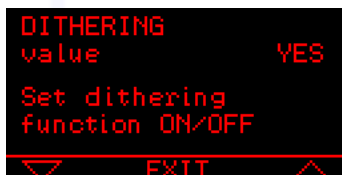
Here are displayed all new functions coming with the SmartGuider 2 I.C.S. camera. All other functions already implemented into the SmartGuider camera not shown here were kept safe. New functions are also displayed in the Flux Diagram provided apart.



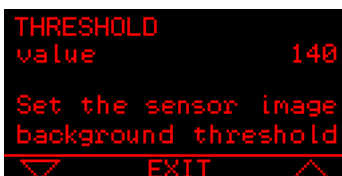
The PULSE GUIDE function sets the duration of the corrective pulse. Allowed values are: 30, 60, 125, 250 and 500 msec. Together with the AGGRESSIVENESS, this parameter helps in better tuning the proper correction to the mount. High precision mounts do require a small value, all other mounts do require a mid to high value.



The MAX EXPOSURE function sets the maximum exposure. Allowed values are: 1, 2 and 4 seconds. This allows the user to push the camera sensitivity further (up to +1 magnitude) respect to the fixed 2 seconds maximum exposure delivered by the present SmartGuider.



The DITHERING function allows a slight framing displacement between Canon single shots when activated. This allows the photographer to avoid cold pixels (black "holes" in the raw frames) in the final image when dark frames are removed and the subject is perfectly stationary in the same portion of the sensor.



The THRESHOLD function allows the hot pixel removal by adjusting the image background threshold level. Pixels having an ADU value lower than threshold value are not considered by SmartGuider 2 I.C.S. camera while searching for a guide star. This does avoid hot pixels to be considered as fake stars.

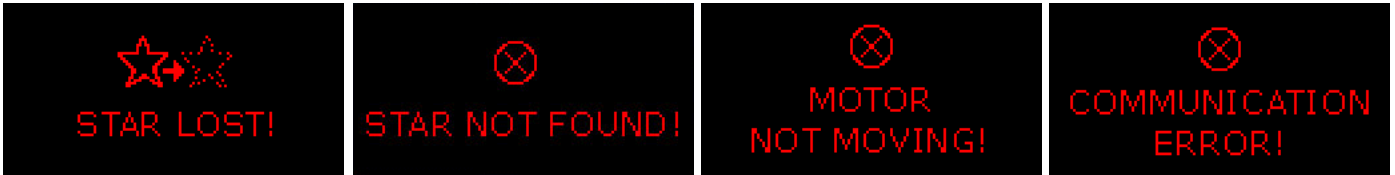


1.3 NEW MESSAGES

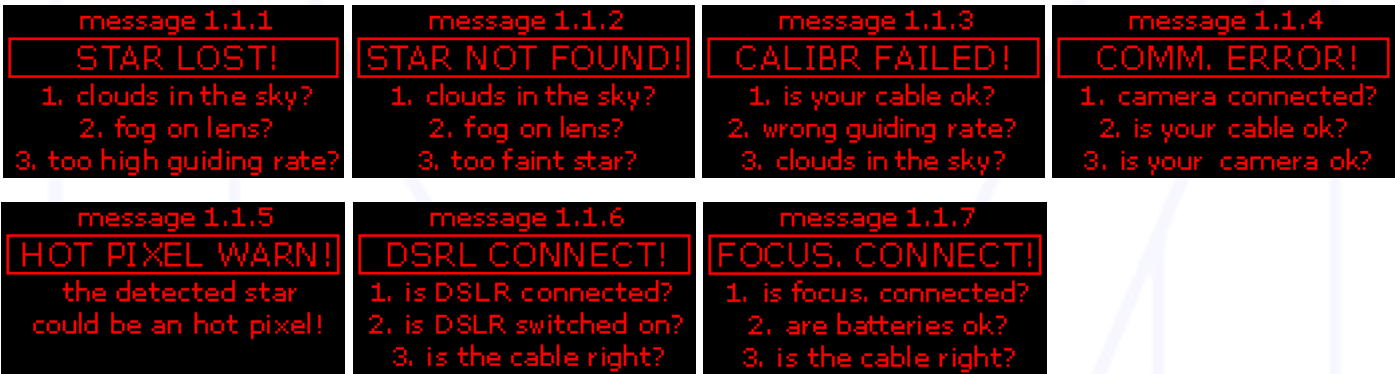
The *SmartGuider 2 I.C.S.* also displays renewed "speaking" messages for a faster and easier comprehension of the problems which might happen sometime. The identification number displayed at the top of the message (*message 1.1.1, 1.1.2, etc*) is linked to the message explanation widely described in the *Tips and Tricks* manual provided with the camera.

Some new message was also added regarding the DSLR and the FOCUSER sections.

SMARTGUIDER MESSAGES



SMARTGUIDER 2 MESSAGES



2.1 MGA DEVICE - Overview



Beyond the DSLR control, LVI is now introducing 3 unprecedented functions which are not implemented yet by anyone.

All these new functions are possible through the MGA unit which is explained in detail here below.

- 1. Nobody has delivered yet a special device both controlling and focusing DSLR cameras at the same time, through the same device. On particular, this should add much value to those focusers provided with a stepping motor drive.
- 2. Nobody has made possible yet a non-simultaneous correction system for the Losmandy #492 Digital Drive which can't accept two corrections at the same time. An opto-isolated port is also used.
- 3. Nobody has made possible yet a stand-alone autoguiding camera for Meade Autostar mounts (LX90, LX200, LX200GPS and ETX) because not featuring a typical ST4-like guiding port.



```
REFLEX SETTINGS
Exposure:      5000
Set the duration
of each shot (sec)
▽ BRACKETING ▲
```

```
REFLEX SETTINGS
Bracketing:    -3
Set the stop down
with the new sequence
▽ SHOTS ▲
```

```
REFLEX SETTINGS
Shots:        1000
Set the number of
shots to be taken
▽ PAUSE ▲
```

```
REFLEX SETTINGS
Pause:        100
Set the pause (sec)
between the shots
▽ MIRROR ▲
```

```
REFLEX SETTINGS
Mirror Lock-up: OFF
Set mirror position
before of exposing
▽ DARK FRAME ▲
```

```
REFLEX SETTINGS
Dark framing:  5
Set the number of
dark frames
▽ DELAY ▲
```

```
REFLEX SETTINGS
Delayed start: 1000
Set the delayed start
of the sequence
▽ INFO ▲
```

```
REFLEX INFO 1
Exposure:     -5000
Shots:        -1000
Pause:        -100
Mirror:       OFF
PAGE 2
```

```
REFLEX INFO 2
Bracketing:   -3
Dark framing: 5
Delayed start: 1000
SET TEST SAVE
```

```
REFLEX TEST
Exposure:    -4851
Check the setted
exposure time
STOP
```

2.2 MGA DEVICE – DSRL section

The DSRL section managed by MGA device can take control with several parameters, roughly the same which are usually controlled by dedicated softwares running into PCs.

The *SmartGuider 2 I.C.S.* allows the user to take both the guiding camera and the imaging camera fully controlled in a looped feedback through the same Control Paddle unit.

The pricey Timer Control offered by DSLR manufacturers is thus no longer required and couldn't either control most of important functions useful for astrophotography.

The MGA can control following parameters:

1. **Exposure** with single shots. Range: 0.01 - 5000 seconds.
2. **Bracketing**. When switched on, the camera automatically takes a new sequence with an exposure as shorter as the stop down set. Range: OFF, -1, -2, -3.
3. **Number of shots**. Range: 1 – 1000 shots.
4. **Pause** between consecutive shots for the sensor cooling down. Range: 0 – 100 seconds.
5. **Mirror lock-up** to avoid vibrations caused by the mirror flip prior the shutter release. Range: ON, OFF.
6. **Dark framing**. When switched on, the camera automatically takes a new sequence with the set number of dark frames after the telescope has been capped. Range: OFF, 1 - 5.
7. **Delayed start**. When switched on, the camera starts to capture images after the set time has expired. Range: OFF, 1 - 1000 sec.
8. **Statistical info**. Two windows with all parameters displayed.

When all parameters are set, the user can immediately give the exposure a test and eventually modify any parameter according to the result he takes out of his DSRL camera.

When parameters are saved, the sequence of shots will automatically start when the autoguiding is launched and the delayed start, if active, has gone.

The statistic screen will be also displayed during the autoguiding as an alternate window to the guiding graphs.

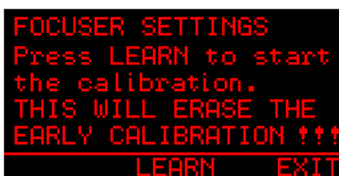
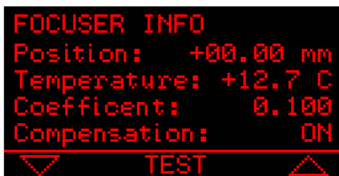
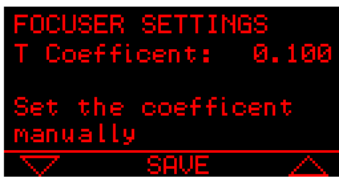
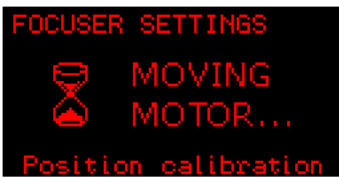
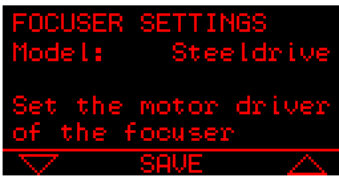


2.3 MGA DEVICE – Focuser section

The FOCUSER section managed by MGA device can control any focuser of any size equipped with a stepping motor. The MGA thus replaces the typical control box coming with motorized focusers and can directly supply the motor with 3xAA batteries through the same connecting cable.

The MGA can control following parameters:

1. **Focuser model selection** from an internal database.
2. **Automatic calibration** for an absolute positioning.
3. **Temperature compensation** with an external thermo probe.
4. **Temperature coefficient self-learning** in an automatic way.
5. **Permanent saving** of one T coefficient.
6. **Manual adjustment** of the T coefficient.
7. **Statistical info** with parameters.



The MGA focuser section has been planned and optimized for the Steeltrack focuser motor drive solution (a.k.a *Steeldrive*) designed by Lazzarotti Optics company for Baader Planetarium company. The Steeldrive motor drive will be available by March. All FeatherTouch focusers can be also set as an option into the MODEL window.

When the focuser model has been set, the SmartGuider 2 I.C.S. camera automatically starts to calibrate the focuser and then displays the absolute position of the drawtube with 0.01mm reading accuracy.

The positioning accuracy is 2.4 micron along any Steeltrack focuser.

The SmartGuider 2 I.C.S. features the temperature compensation in order to keep safe the initial image focusing also when the external temperature has a noticeable variation over the night. This function can be switched on or off without getting the learned coefficient as lost.

The coefficient is learned by SmartGuider 2 I.C.S. camera through a very easy self-calibration function. When LEARN button is pressed, the procedure begins and it can be only stopped when the temperature delta is bigger than 1.0°C. The STOP button won't appear any time before to get a safe and accurate measurement of the coefficient.

The coefficient calculated at this way will be permanently stored in the SmartGuider 2 I.C.S. internal memory for the time being until a new learning is done overriding the early stored value. A message clearly warns the user the early value will get lost any time a new procedure is launched.

The FOCUSER section works very close to the DSRL section when the reflex should be properly focused. SHOOT button releases the Canon shutter to take a picture as long as the button is pressed. When the button is released, the SmartGuider 2 I.C.S. takes a step back to the FOCUSER INFO window in order to further adjust the DSLR focusing and take any parameter under control. In case of Canon cameras featuring the LiveView image focusing, there's no need to take a shot, but the directional buttons are only required to perfectly focus the live image displayed into the LCD.