G2 revision 3+, G3 and G4 Series CCD Camera Driver for AstroArt v4.0

G4 and G3 series of CCD cameras, as well as G2 cameras revision 3 and higher, can be operated under AstroArt camera control software package using proper camera driver.

Note:

Also G0 and G1 CCD guider cameras can be used in AstroArt, but these cameras require different driver. This driver can be downloaded separately and also contains driver specific documentation.

Driver installation is quite easy – AstroArt scans DLLs (Dynamic Link Libraries) matching particular file name conventions in the folder, where it is installed, and checks if the DLL exports required driver API functions. Only DLLs named 'd_*.dll' are tested, so every driver file name must begin with 'd_' characters. When a proper DLL is found, AstroArt offers it as CCD Camera Plug-in.

To install the G3/G2 CCD driver for AstroArt, just:

1. Download the package 'd_gxccd.zip' from the web site http://www.gxccd.com/.
2. Unzip the package into the AstroArt folder (e.g. 'C:\Program Files\AstroArt').

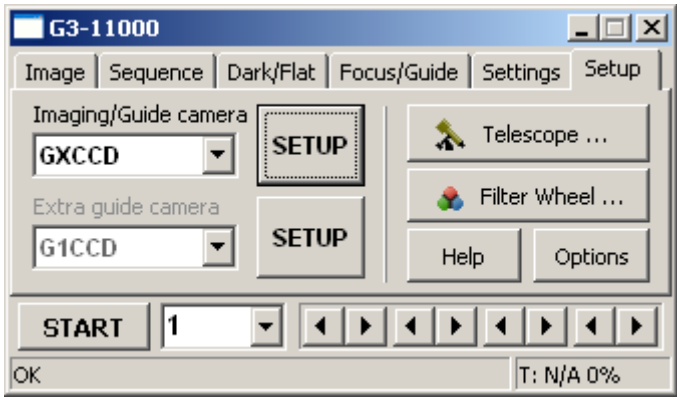
Use the AstroArt CCD User Interface DLL (file 'piccdgui.dll') version 4.10 or better. Older versions do not properly support filter wheel integrated into CCD cameras.

Note that the driver file name is 'd_gxccd.dll', but the driver needs two more DLLs to work – 'vproc4.dll' and 'vtools4.dll'. Both DLLs are included into the driver package and both must be unpacked into the same folder like the driver DLL itself.

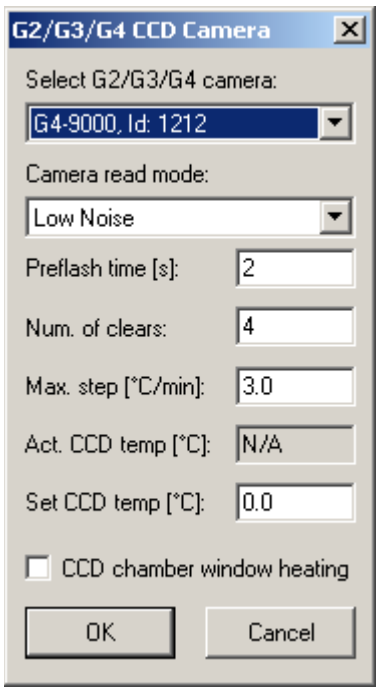
Note:

Beginning from version 1.2, Gx camera driver is linked with C-runtime library MSVCR90.DLL. See notes in Driver history chapter.

AstroArt then offers the Gx CCD driver in the “CCD Camera – Control panel” window.



The CCD Camera – Control panel window contains “SETUP” button, which opens dialog box allowing the user to choose from all connected G2/G3/G4 cameras.



Because Gx cameras can be plugged and unplugged anytime, the driver scans for all currently available (plugged) cameras each time the setup dialog box is opened. If you plug in the camera while the dialog box is opened, just close the dialog and open it again to reflect changes.

Beside choosing of the particular connected camera, the configuration dialog box allows definition of other parameters:

Camera read mode allows choosing between slightly slower “Low Noise” mode with slightly lower read noise and slightly faster “Standard” mode with slightly higher read noise.

Preflash time defines time in seconds, for which the CCD is illuminated with near-IR LEDs to eliminate Residual Bulk Image (RBI), accumulated during previous exposure (more precisely not to eliminate RBI, but to make it uniform and reproducible regardless of the illumination of the scene previously imaged). If the LED preflash is not desired, this parameter must be set to zero.

Num. clears parameter defines the number of commands performed to purge the charge accumulated during preflash. If no preflash is performed (preflash time equals zero), default single clear is performed regardless of the value of this parameter.

Note:

Preflash is not enabled on all cameras. If the particular camera does not enable preflash, these parameters remain grayed (disabled) indicating no preflash can be performed.

Even if the particular camera implements preflash electronics, is is necessary to use system driver 'g3ccdf.sys' version 2.3 or higher. Preflash function does not work if older camera system driver is used.

Max. step defines the speed of temperature changes in degrees Celsius per minute. Ramped temperature changes (as opposed to rapid cooling/heating, often with temperature overshot on both sides) protects the CCD from shocks and ensures its longer life.

Act. CCD temp shows actual temperature of the detector.

Set CCD temp defines the desired CCD temperature (setting of target detector temperature is not supported by AstroArt itself, it is necessary to define it in driver-specific setup dialog box).

CCD chamber window heating allows increasing of heating of the CCD chamber front window, which limits condensation on the window front surface. Gx cameras already implement some level of chamber window heating to suppress fogging. Increasing of heating power can slightly limit the

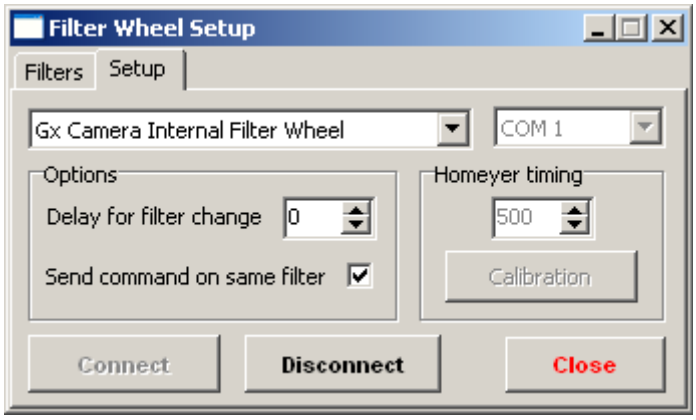
cooling efficiency on the one side, but on the other side it can prevent condensation in front of the CCD, which ruins images.

Gx Camera Internal Filter Wheel in AstroArt v4.0

IMPORTANT:

Use the AstroArt CCD User Interface DLL (file 'piccdgui.dll') version 4.10 or better. Older versions do not properly support filter wheel integrated into CCD cameras.

Each G2, G3 or G4 camera can operate without internal filter wheel or can be equipped with internal filter wheel (these cameras also supports external filter wheels with larger number of filter positions, which operate the same way like internal wheels). The user can order camera with various filters, or he or she can change individual filters or even the whole filter wheel. There is no way how to determine the actual filters in the filter wheel automatically. This is why the camera driver for AstroArt reads the 'd_gxccd.ini' file to determine actual configuration of filters, which will be then reported to AstroArt.



The 'd_gxccd.ini' file is placed in the same directory, where the driver file and the AstroArt itself is installed. This file is ordinary text file following the .INI file conventions. Here is an example of the 'd_gxccd.ini' file:

```
[filters]
Luminance, Gray
Red, LRed
Green, LGreen
Blue, LBlue
Clear, 0
```

The file should contain just one section “[filters]” (other sections, if present, are ignored). Every line in this section defines one filter position.

The first string defines the filter name, which can be used within the application GUI or will be part of file name of acquired images (if the user chooses including of filter name to file name). The second parameter, delimited by comma, represents a color, by which the string is to be displayed. The color can be expressed by a name (White, Red, LRed, etc.) or directly by number representing the particular color (0 represents black).

While the driver can report filter names and also colors, which should be used to display these names, AstroArt does not utilize this feature and asks the driver only to report number of available filters. Still, the initialization file must be present and the number of lines must correspond to the actual filter count else the CCD camera driver reports zero filters available.

Further reference

For the documentation of Gx cameras, refer to the 'G2 CCD Camera Operating Manual' and 'G3

CCD Camera Operating Manual'. These manuals are supplied with each camera in the printed form and can be also downloaded as PDF file from the web site http://www.gxccd.com/.

Driver revision history

Version 1.0, released on Feb 1st, 2010

- Initial release, driver supports the following camera models:
  - G2-0402, G2-1600 and G2-3200 (revisions 3 and higher)
  - G2-2000, G2-2000C, G2-4000, G2-4000C
  - G3-11000, G3-11000C, G3-06300, G3-01000

Version 1.1, released on Oct 12th, 2010

- Added support for following cameras:
  - G2-8300, G2-8300C
  - G4-09000, G4-16000
- Camera setup dialog allows choosing of camera read mode. Standard (slightly faster) mode can be chosen beside the default low noise (slightly slower) mode.
- Camera setup dialog also displays the last measured CCD temperature.
- Fixed problem, which could cause downloading of image before the shutter was closed. This problem was caused by the inability of the driver to handle messages due to continuous activity of AstroArt main thread during exposure.
- Driver file renamed to “d_gxccd.dll” from original “d_g3ccd.dll” to reflect increased number of supported camera types.

Version 1.2, released on February 23rd, 2011

- Driver is newly linked with C-runtime library MSVCR90.DLL. This particular library is included with all Windows Vista and Windows 7 operating systems. Older systems must preinstall this library, preferably from “Microsoft Visual C++ 2008 Redistributable Setup” package 'vcredist_x64.exe' for 64-bit systems or 'vcredist_x86.exe' for 32-bit systems. This redistributable package can be downloaded from Microsoft web server.

  Because this library is used by many other software packages, it is likely that it is already installed also on older systems.

  It is also possible to copy the 'msvcr90.dll' dynamic link library directly to the MaxIm DL folder (where the 'CCDPlugGx.dll' is placed), but it is also necessary to copy appropriate .manifest file 'Microsoft.VC90.CRT.manifest'. Still the best way is to use above-mentioned redistributable package, which installs Visual C++ support libraries for all applications on the particular operating system installation.

Version 1.3, released on Jun 22nd, 2011

- Added support for cameras with additional heating of the CCD chamber front window. Window heating can be set on or off in the driver Advanced dialog box.

Version 1.4, released Aug 10th 2011

- Added support for External Filter Wheel for G2, G3 and G4 cameras. Note these cameras require system driver g3ccdI.sys or g3ccdF.sys version 2.0 or later to work properly with External Filter Wheel.

Version 1.5, released Jun 5th 2011

- Fixed problem with inverted y-coordinate of defined sub-frame. While the driver followed FITS standard, placing coordinate origin to lower-left corner, AstroArt defines sub-frame from upper-left corner. Y-coordinate is now handled in accordance with AstroArt.

Version 1.6, released Nov 28th 2012

- Added support for IR Preflash feature, introduced in new KAF based Gx cameras. Preflash control allows definition of preflash time as well as number of subsequent CCD clear commands performed to purge the charge accumulated during preflash.

  Please note not all cameras support preflash in hardware and even if the particular camera implements preflash electronics, is is necessary to use system driver 'g3ccdf.sys' version 2.3 or higher. Preflash function does not work if older camera system driver is used.

- Fixed problem with improper cooling power utilization in the camera control widow status line, introduced in driver version 1.5.

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