Quantile Auto Contrast

Quantile Auto Contrast is a modern, high-performance display auto-contrast algorithm designed for today's large CCD and CMOS cameras. It delivers excellent out-of-the-box results, remains responsive even on very large images, and provides intuitive controls for users who want to fine-tune their final photo.

This method was created specifically to address the limitations of older auto-contrast approaches when used with modern, high-resolution astronomical sensors.

Why Quantile Auto Contrast

Modern astronomical cameras produce very large images with extreme dynamic range. Traditional auto-contrast methods often:

- Scan entire images multiple times and are too slow for large sensors
- React poorly to hot pixels or saturated stars
- Become slow or unresponsive on large sensors
- Require excessive tuning to achieve acceptable results, or offer no tuning at all

Quantile Auto Contrast was designed to solve these problems by providing a fast, robust, and predictable display stretch.

Key benefits:

- Fast and responsive, even on very large images
- Robust against outliers such as hot pixels and saturated stars
- Excellent default appearance with no tuning required
- Predictable, intuitive controls when customization is desired
- Works consistently for both monochrome and color FITS images

Quick Start

You do not need to immediately commit to using Quantile Auto Contrast globally. You can open any image, set AutoContrast to Quantile, and experiment with the available presets and controls. Once you are satisfied with the results, you may then choose to make Quantile the global AutoContrast method.

Most users can simply:

1. Open an image
2. Set AutoContrast Method to Quantile (Telescope > Telescope Setup > select Camera > Auto Contrast Setup)
3. Try the built-in presets, starting with Default

For the majority of images, Quantile Auto Contrast produces a clean background, preserved highlights, and good visibility of faint structure without any adjustments.
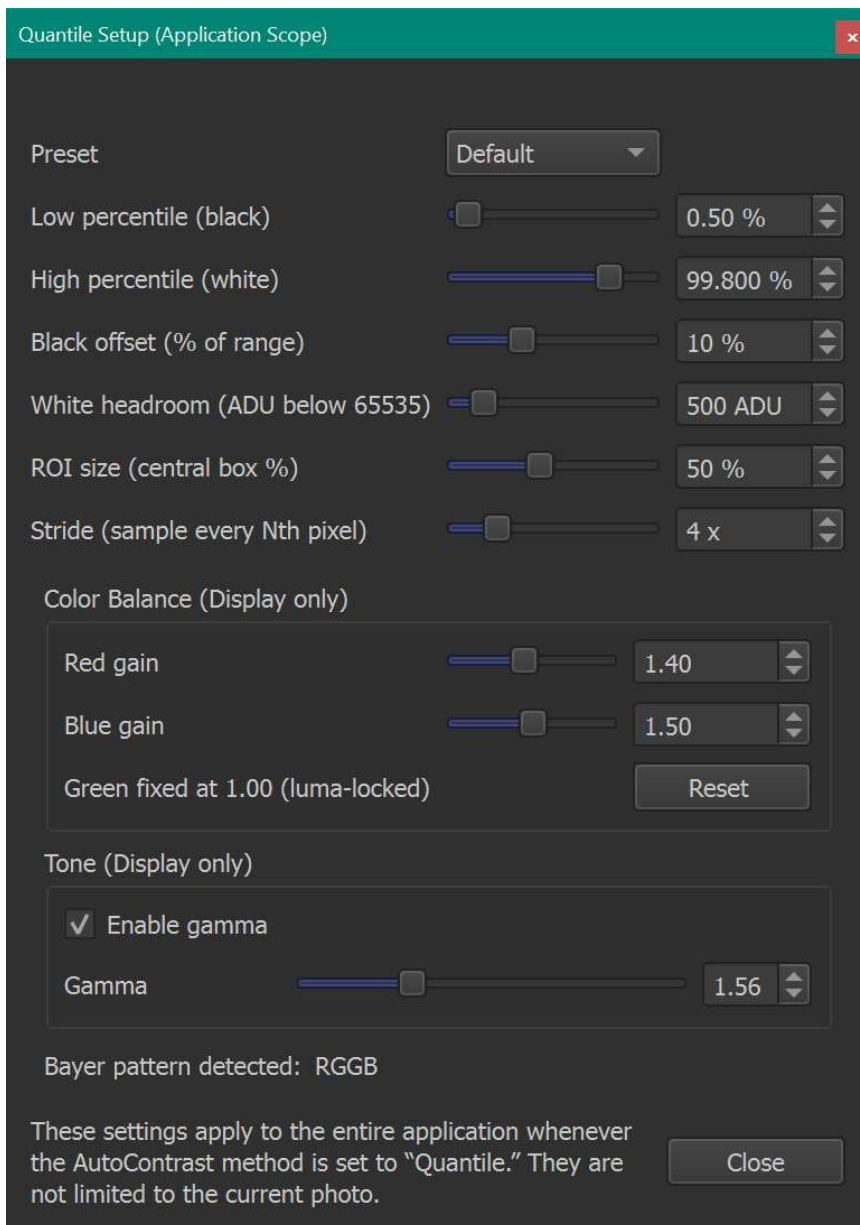
Quantile Setup – Monochrome Images

The following dialog shows the Quantile Auto Contrast setup when working with monochrome images.
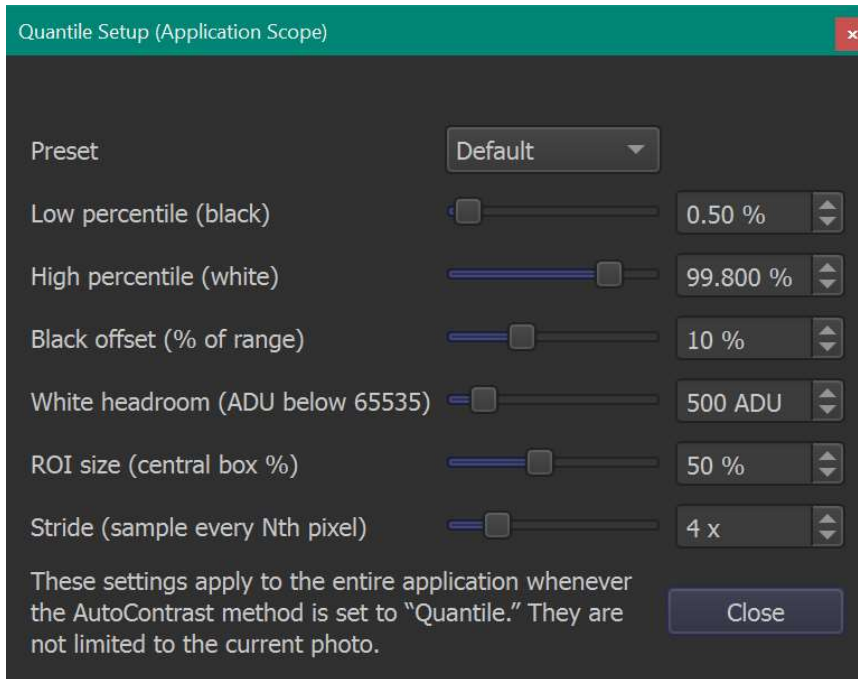
Quantile Setup – Color FITS Images

When a color FITS image is loaded, additional display-only controls for color balance and tone are available.

Quantile Setup (Application Scope)

Preset   Default ▾

Low percentile (black)   0.50 %

High percentile (white)   99.800 %

Black offset (% of range)   10 %

White headroom (ADU below 65535)   500 ADU

ROI size (central box %)   50 %

Stride (sample every Nth pixel)   4 x

Color Balance (Display only)

    Red gain   1.40

    Blue gain   1.50

    Green fixed at 1.00 (luma-locked)   Reset

Tone (Display only)

    ☑ Enable gamma

    Gamma   1.56

Bayer pattern detected: RGGB

These settings apply to the entire application whenever
the AutoContrast method is set to "Quantile." They are   Close
not limited to the current photo.

Application-Wide Behavior

Quantile Auto Contrast settings are application-wide. When AutoContrast is set to Quantile, these settings apply to all images displayed in the application, not just the current photo.

Quantile Setup Controls

Preset

Presets provide known-good starting points and a fast way to return to a balanced display. Presets such as Default and Survey Turbo are useful for general viewing and rapid previews.

Low percentile (black)

Controls where the black point is placed and suppresses background noise.

High percentile (white)

Controls highlight preservation in bright stars and cores.

Black offset (% of range)

Keeps the background from being pushed to pure black.

White headroom (ADU below 65535)

Prevents harsh clipping of bright cores.

ROI size (central box %)

Balances representativeness and performance.

Stride (sample every Nth pixel)

Improves performance when working with very large images.

Color FITS Images

Quantile Auto Contrast fully supports color FITS images using a stable, luma-locked contrast stretch. All color balance and tone controls are display-only and do not modify the underlying FITS data.

Display-only White Balance

Typical starting values are Red ≈ 1.10 and Blue ≈ 1.20.

Gamma (display-only)

Gamma adjusts midtones without changing black or white points and is most effective after background levels are set.

Recommended Workflows

Noisy or uncalibrated images: Increase Low percentile and Black offset to suppress background noise.

Bright cores or saturated stars: Increase White headroom and slightly raise High percentile.

Very large images or fast preview: Use the Survey Turbo preset for improved responsiveness.

Summary

Quantile Auto Contrast is a modern display solution for modern astronomical data. It is fast, robust, predictable, and designed to simply work—while still offering precise control for users who want it.