

FieldNotes: SyQon Studio, Raw Frames to Finished Image (OSC)

My end to end SyQon Studio path for colour camera data: organise and stack in Fusion Stack, solve and flatten while linear, calibrate colour against Gaia, restore, then stretch stars and background separately and finish on layers.

Rig context: ASI585MC Air on the Askar FRA400 (400 mm, 280 mm reduced) and 107PHQ (749 mm), captured through ASIAIR; Seestar S30 Pro (150 mm). All OSC. SyQon Studio Public Beta 1.1 with Axiom V3, DeepPrism V2 and Parallax licensed.

The workflow at a glance



The logic in one line: calibration and geometry come first, colour is measured on flat linear data, restoration works on linear signal, and stars and background are stretched and finished apart before they meet again.

- NON-NEGOTIABLE
- One acquisition per rig, night family, gain, offset and exposure. The ASI585MC Air and the S30 Pro never share calibration.
 - Darks within 2 °C of the lights; Studio rejects a bigger gap when both headers carry temperature.
 - First integration at native resolution, Drizzle Off.
 - Plate solve and gradient removal before SPCC, all on linear data.
 - Every neural step goes on a new layer and is judged at Fit and at 100%.
 - Keep the original frames and stacking-manifest.json with the master.
 - Save an editable SYQ or SYQPRJ before the final export.

- YOUR CALL
- Deep Gradient for complex wide fields; sampled DBE when the target fills the frame.
 - 2x CFA drizzle only on well dithered S30 Pro data; never on the 107PHQ.
 - SPCC or statistical Color Calibration for L-Ultimate and L-eNhanace data.
 - DeepPrism profile: Advanced for clean data, up to Max for walking noise or very faint signal.
 - Parallax Correction for FRA400 corner stars; Deblur for compact galaxy or nebula detail.
 - Rejection: Automatic unless the rejection map gives me a reason.

Why this order

Fusion Stack produces a linear Float64 master, and everything that measures the sky needs that data untouched. The solver writes the WCS that SPCC depends on, so the solve comes first. Gradient removal follows because a light pollution gradient from a Bortle 8 to 9 garden is a colour cast in its own right; calibrating colour on top of it bakes the gradient into the white balance.

Restoration comes next, still linear. I deconvolve with Parallax before any noise reduction, the same principle I follow with BlurXTerminator, because deconvolution needs the real noise and star profiles to work from. DeepPrism then cleans the corrected signal. Axiom splits the stars off last in the linear stage, which gives a linear Stars Only layer that Star Stretch is built for.

The Learn Studio reference files Gradient Removal under Finishing. I move it into the linear stage deliberately: Deep Gradient is documented as a linear tool, and SPCC must see a flat background.

Check: confirmed by SyQon. The Learn Studio guide says to solve the image first with Image Solver before SPCC, describes SPCC as calibrating a solved linear colour image, requires a linear pixel layer for Deep Gradient, and describes Star Stretch as reintroducing linear stars from the Axiom Stars Only layer.

Check: not stated by SyQon. The documentation does not prescribe an order between Parallax and DeepPrism. Deconvolution first is my standing rule from other suites, not a SyQon instruction.

Stage 0: Organise

Step 1. Open Fusion Stack, filter RGB. Processing Tools, Calibrate, SyQon Fusion Stack, or New stack from the Welcome workspace. No light frame needs to be open first. I choose Classic for a single night on one rig and Multi-night / camera when I combine nights or both scopes. For OSC lights, including dual-band L-Ultimate and L-eNhance data, the filter is RGB: calibration happens in the sensor domain before demosaic.

Step 2. One acquisition per rig and night. Every change of night, camera, telescope, gain, offset, exposure family or panel gets its own acquisition. FRA400 native, FRA400 reduced, 107PHQ and S30 Pro are always separate. I tick Use scientific preprocessing defaults, set a new results folder name (Studio never overwrites an existing one) and save the session so I can reload the setup later.

Frame role	Scope	What I watch
Lights	Filter and acquisition	Same dimensions and Bayer layout throughout
Darks	Acquisition	Match exposure, gain, offset; within 2 °C
Flats	Filter and acquisition	Corrected by dark-flats first, else bias
Dark-flats	Filter and acquisition	Preferred for raw flats; not a substitute for darks
Bias	Acquisition	Optional; never borrowed, never subtracted twice

Check: confirmed by SyQon. Darks and bias belong only to their acquisition; flats and dark-flats belong to the acquisition and the filter. A dark to light temperature difference above 2 °C is rejected when both headers provide temperature, and missing metadata cannot prove compatibility. Import dataset folder can propose roles from subfolders and FITS frame-type headers, but every assignment needs reviewing.

The documentation does not say whether a lights-only acquisition is accepted, which matters for S30 Pro sessions without separate calibration frames. I test that on a small set before relying on it.

Stage 1: Integrate

Step 3. Analyse and review subframes. Analyse subframes measures without building a master. In Review and select frames I sort by quality, look at the best and worst tails, switch plots to find step changes (cloud, dew, moonrise) and preview anything suspicious. I only override a recommendation when the preview backs me up, then Apply.

Metric	What it tells me
FWHM	Relative star width; distorted by undersampling and saturation

Eccentricity	Elongation; compare across the session, not against a fixed number
Background	Per-channel sky level; jumps mean cloud, Moon or transparency
Noise, Stars	Background noise estimate and detections supporting registration
Weight	Final contribution from the chosen weighting rule

Step 4. Validate, then Analyse and Stack. I resolve every reported mismatch rather than bypassing it. Drizzle stays Off for the first integration. Rejection stays on Automatic, which picks a method to suit the frame count. Normal affine registration suits a consistent ASIAIR sequence; blind projective registration is only for real rotation, scale or perspective differences.

Rig	Image scale	Drizzle stance
FRA400 native	1.50"/px	Off
FRA400 reduced	2.14"/px	Off first; 2x only with good dithering
107PHQ	0.80"/px	Off
Seestar S30 Pro	3.99"/px	2x CFA drizzle candidate if dithered

Check: confirmed by SyQon. Drizzle reconstructs sampling from real sub-pixel offsets and does not invent resolution; always integrate at native resolution first. CFA drizzle integrates original Bayer samples at 2x, 4x or 6x and is not for demosaiced input. 2x means four times the pixels, so memory and disk climb fast; SyQon recommends 32 GB or more for high-resolution drizzle and mosaics.

Step 5. Verify master, maps, manifest. A linear master opens nearly black; that is expected. I enable Display Stretch to look, never to alter the master. Then: warnings and accepted counts, centre and corners at 100%, the coverage map at the edges, the rejection map for trails and hot pixels (and nothing target-shaped), and stacking-manifest.json filed next to the master.

Stage 2: Solve and colour

Step 6. Image Solver. Local ASTAP, no internet needed for the solve. I give it the focal length or image scale for the rig from the table above, run it, and confirm the reported scale matches. The WCS attaches to the document and unlocks SPCC and the coordinate overlay.

Step 7. Deep Gradient or Gradient Removal. On the linear layer, as a new layer. Deep Gradient models complex illumination and suits the FRA400 reduced and S30 Pro fields. Where a large target fills the frame, I compare it with Gradient Removal in sampled DBE mode, placing samples only on real background, and keep whichever leaves the faint outer signal intact.

Check: confirmed by SyQon. Deep Gradient expects a linear pixel layer and is free during the beta. SyQon itself advises comparing it against classical Gradient Removal when preserving signal near large targets is critical.

Step 8. Spectrophotometric Color Calibration. Choose the white reference, review the matched Gaia DR3 XP stars, apply, and check with a linked RGB display stretch. If a plate solve is not possible, Color Calibration neutralises the background and balances white from image statistics instead.

Check: partly confirmed by SyQon. SPCC is documented for solved linear RGB colour images. The Learn Studio guide does not describe a narrowband or dual-band filter mode, so for L-Ultimate and L-eNhance data I treat the result as something to verify, not assume.

Stage 3: Restore

Step 9. Parallax. Choose Correction to round off stars distorted by tilt, coma or astigmatism (FRA400 corners are the usual suspects) or Deblur for compact structure. Move the preview region over representative stars, apply conservatively to a new layer and compare star cores at 100%. Reduction mode shrinks stars and belongs later, if at all.

Check: confirmed by SyQon. Parallax offers Reduction, Correction and Deblur, in a free Nano model and a licensed Pro model. SyQon describes it as trained on 32-bit floating-point raw data and correcting spatially variant aberrations that grow towards the sensor corners.

Step 10. DeepPrism V2. Pick the profile for the data and the machine: Essential is free; Advanced, Ultra and Max come with the licence. Ultra is the everyday flagship; Max is for extreme noise and walking noise tangled with faint dust. Preview at native scale, apply to a new layer and pull back strength or mask it if faint texture turns too smooth.

Step 11. Axiom V3. Apply to the restored layer. It creates the starless result and a reusable Stars Only layer. From here the two travel separately.

Stage 4: Stretch

Step 12. Continuum Stretch the starless layer. Set black, midtone and white targets and watch shadow separation and highlight protection in the preview. Apply only when background and target both look balanced. Baking a Display Stretch through New layer and Apply is the simpler alternative.

Step 13. Star Stretch the Stars Only layer. Select the latest Axiom Stars Only layer, set the transfer strength, then optional colour boost and SCNR. This happens before Star Editing and Reapply Stars.

Stage 5: Finish and save

Step 14. Tone, colour and detail on the starless. Small moves, each on its own layer so opacity stays a control. Background Tone for sky level and cast, SCNR on green if the OSC background still leans that way, Protected Color Boost for colour without clipping, Curves for contrast, and HDR Compression for bright cores. Smart Nebula Detail or Final Sharpen come last, gently. Masks decide where: white reveals, black protects.

Step 15. Star Editing, then Reapply Stars. Global flux first, then saturation, temperature, core and halo at 100%. Reapply Stars when the stars sit naturally on the background.

Step 16. Save, then export. SYQ is a self-contained archive with sources and history; SYQPRJ is a compact project that must travel with its .syqprj.assets folder. Then Output target: 16-bit TIFF for printing, JPEG or PNG with the embedded sRGB profile for the web. Color Management and Proof can soft-proof before print.

Troubleshooting

Symptom	Likely cause	Fix
Calibration mismatch reported	Different gain, offset, exposure, temperature or Bayer layout	Move the odd files into their own acquisition; do not bypass
Master opens almost black	Linear data	Display Stretch to inspect; leave the master alone
Stars fail to register	Poor reference frame, cloud or trails	Choose a representative reference, drop bad frames; projective only for real geometry changes
Drizzle holes or blotchy noise	Too few dither phases or pixfrac too small	Check Coverage, raise pixfrac, lower the scale or go back to native
Target shape in the rejection map	Rejection too tight	Relax sigma limits or return to Automatic
Colour still wrong after SPCC	Gradient left in, or dual-band data	Remove gradient first; verify against Color Calibration
Job runs out of memory or disk	Drizzle, maps and checkpoints	Local SSD, drop unneeded drizzle or maps, delete checkpoints only after verifying
Interrupted run	Cancel or crash	Nothing partial is published; reload the session and reuse checkpoints

Sources checked

- SyQon, Learn SyQon Studio (syqon.eu/learn-studio), Public Beta 1.1: Fusion Stack manual sections 01 to 06 (session preparation, calibration roles, subframe analysis, integration settings, drizzle and resources, results and diagnostics, troubleshooting) and the function reference entries for Image Solver, SPCC, Color Calibration, Deep Gradient, Gradient Removal, Parallax, DeepPrism V2, Axiom V3, Display Stretch, Continuum Stretch, Star Stretch, Star Editing, masks, SCNR, finishing tools, projects and export. Read 26 September 2026.
- SyQon, SyQon Studio product page (syqon.eu/syqonstudio): system requirements, recommended memory, platform availability, local ASTAP and Gaia XP details.
- SyQon, Parallax model page (syqon.eu/parallax): modes, training data and corner aberration behaviour.
- SyQon, DeepPrism V2 model page (syqon.eu/prism): Essential, Advanced, Ultra and Max profiles and licensing.
- Not confirmed in the documentation: order between Parallax and DeepPrism, whether a lights-only acquisition is accepted, and

any dual-band mode for SPCC.