

## Autoguiding with the LX90

The standard use of the LX90 and other fork-mounted scopes is Alt/Az mounting. This is fine for visual use and for short exposure astrophotography (perhaps up to 30 or 40 seconds), but is not the most desirable way to capture images. The problem with Alt/Az is that it cannot rotate the scope as it tracks the image and therefore field-rotation will be evident. Field-rotation is where the centred image physically rotates upon itself and other objects near the edge of the FOV will appear to display arc-like trailing.

### Imaging methods

In order to avoid field rotation during astrophotography, you really have three options:

#### 1. Take short (eg. 30 second) exposures and stack them

I am not opposed to this method and it surely works. Indeed many of the images on my website were obtained in this manner. However, using this method is labour and computer resource intensive. I can demonstrate this in the following table:

##### Processing set-up

Software: Images Plus v2.x

Computer: Dell Inspiron 2.0 GHz; MP-IV; 512 Mb RAM

	Scenario 1 - 100 x 30 seconds		Scenario 2 - 10 x 300 seconds	
Process	Time (seconds)	Hard disk space (Mb)	Time (seconds)	Hard disk space (Mb)
Acquisition	$100 \times 30 + 100 \times 10 = 4000$	$100 \times 6.5 = 650$	$10 \times 300 + 10 \times 10 = 3100$	$10 \times 6.5 = 65$
Convert to TIF	$100 \times 15 = 1500$	$100 \times 36 = 3600$	$10 \times 15 = 150$	$10 \times 36 = 360$
Calibration	$100 \times 30 = 3000$	$100 \times 36 = 3600$	$10 \times 30 = 300$	$10 \times 36 = 360$
De-rotation	$200 \times 10 = 2000$	$100 \times 36 = 3600$	$20 \times 10 = 200$	$10 \times 36 = 360$
Combination	$100 \times 20 = 2000$	$1 \times 36 = 36$	$20 \times 20 = 400$	$1 \times 36 = 36$
<b>TOTAL</b>	8900 (148.3 minutes)	11486 (11.468 Gb)	4150 (69.2 minutes)	1181 (1.181 Gb)

#### 2. Use a field de-rotator

A field de-rotator attaches to the visual back of the scope. This electronic device slowly rotates the camera to offset any rotation of the image through the scope. However, a field de-rotator is prohibitively expensive (much more than a standard wedge) and problems have been reported with their use. That's a lot of money to pay for something that might not quite do the job!

#### 3. Autoguide your exposures using a second camera

You will need more than an autoguiding camera to autoguide. You also need a wedge so that you can polar align your scope, a guidescope to guide through, and a field computer that can run guiding software.

After experimenting for several months with the multiple short exposures method, I have now begun experimenting with autoguiding. Here is a list of the equipment I use in addition to my LX90:

Device	My Equipment	Description
Guide scope	Sky-Watcher 804	Short-tube 80 mm achromatic refractor piggybacked on my LX90
Guide camera	Philips ToUcam 740k Pro webcam	This webcam is NOT modified for long exposures
Computer	DELL Inspiron 8500 laptop	2.2 GHz, 512 Mb RAM. Autoguiding occurs through the parallel port
Scope port	APM (Accessory Port Module)	This accessory for the LX90 accepts guide commands of the generic ST4 type
Relay box	<a href="#">Shoestring Astronomy</a> guide interface	This device converts parallel signals into guide port signals recognisable by the APM
Guide software	<a href="#">GuideDog</a> by Steve Barkes	This is a freeware application for autoguiding (K3CCDTools also works)

### My autoguiding technique

With GuideDog (or K3CCDTools) and an unmodified webcam, you can guide your scope via the serial port using the #505 cable that plugs into the Autostar handbox OR you can guide from your parallel port directly through the APM. The problem with the latter is that you need a relay or interface box to convert the signals into something readable by the APM autoguiding port. Of course, you need the APM also. (The APM Autoguiding port is a standard ST4-type used by a number of manufacturers.)

The parallel port and relay interface method is considerably better for guiding. Dick Seymour has reported that the serial method updates the scope position every second or so but only if resources

aren't being directed elsewhere at the time, whereas the APM autoguider method updates the star position 10 or more times per second and is independent of what the scope may be thinking at the time.

Below is my ever first autoguided image. It is a single 600 second (10 minute) exposure of M42 taken on 30 October, 2004. The intention was not to create a great image but simply to check the autoguiding potential of this setup. A full description of this image is below.



**Image:** This image is a 10 minute (600 second) autoguided exposure of M42 taken after [PEC training and retraining](#). This was taken using Canon's 300D DSLR through the Meade LX90 at f/6.3. The image was captured using DSLR Focus as a large/fine JPG image at ISO 800. Autoguiding was via a ToUcam Pro 740k unmodified webcam through the parallel port to the ST4 (CCD) input on the APM. The guidescope was a Sky-Watcher 80 mm Short Tube refractor (f/5). Guiding corrections were made automatically using GuideDog software by Steve Barks. The image size was reduced in Photoshop and slightly darkened using Photoshop levels.

### **Autoguiding conclusions**

Meade's LX90 SCT can autoguide very effectively, particularly if the APM is used via a relay box. There is no discernable affect of the worm gear cycle this image above (image is 10 minutes; worm gear cycle is about 8.5 minutes). The stars in this image are nearly perfectly round (some vignetting is evident due to the f/6.3 FR) and there is no reason why longer exposures of 30 or even 60 minutes couldn't achieve success should one desire to do so. My ultimate plan is to take several 5 minute images of dim objects for later average or median combination.