Setting Up And Using Your Telescope

The Tripod & Mount

Remember, you can set your scope up outside during the day if you're happy it will be safe. This makes it easier to see what's what and perform your finder alignment. Use a polythene sheet, a bin liner or other waterproof cover to keep things dry and save you taking down and setting up every 5 minutes! Tie these in place with bungee cords or rope to make sure they don't blow off. Be careful if it gets windy as lighter setups can blow over surprisingly easily.

Set up your tripod on a solid surface if you can and with the legs as short as is practical/comfortable. The lower it is to the ground, the more stable it will be but remember where your eyepiece will be. Its best if it's at a height that works for you either standing or sitting comfortably (you're likely to spend more time at the scope if you are comfortable!). If the tripod is quite shaky and light, it helps to hang a weight from the centre of it or put something heavy on the eyepiece tray.

For equatorial mounts (the ones with counterweights), use either a compass or the Pole Star to point one tripod leg roughly North. It's best to have the counterweight bar pointing towards the ground and parallel to this leg. Try to get the mount reasonably level, but if you are not using tracking motors this doesn't have to be perfect.

Equatorial mounts have 2 axes of movement, the right ascension (RA axis) and the declination (Dec axis). Moving these two axes allows you to centre the scope on different objects in the sky. Each axis has a 'clutch' which is a fancy name for a bolt which can be loosened or tightened to allow each axis to rotate or to lock it in place. Once locked, fine adjustment arms can still be used to move the scope to keep up with the apparent movement of the sky. Sounds more complicated than it is. Here's a link to a site which explains what's happening better than I can here along with some simple animations: http://www.astronomyboy.com/eq/

When fitting a reflector scope (one with a mirror rather than a lens) onto an equatorial mount, release the clutch bolt, turn the Declination axis (the part holding the tube rings and their mounting bar) so that the tube rings open out towards you and you can set the telescope into the 'cradle' of the rings parallel to the ground. This means you can close and tighten the rings from a 'guarding' position in case something slips or falls. It's good to balance the scope on the mount at this point if you can. This is more important if you have motor drives as you want to minimise the work they have to do, but for manual operation just make sure the scope is reasonably central with regard to the tube rings. Once secure, release the Dec clutch and rotate until you are in the 'scope up, weights down' position. We call this 'home position'.

With computerised 'GoTo' scopes, don't trust the built in bubble level. Take the scope and mount off the tripod and level it with a small spirit level. It's very important you get this as accurate as you can. It can be a bit of a fiddle, but persevere. Check it once it's level in each direction to see where the built in bubble actually is and maybe put a mark on that position to help speed things up next time. Obviously, you don't want to move the tripod after you've gone through this procedure!

On equatorial mounts, there are several dials. Find the one relating to the altitude of the scope. Use the nearby adjustment bolt to set this to 55 degrees. This is our latitude here in the Tweed Valley and once set to this the scope and mount should be pointing pretty much towards the Pole Star (if you've followed the above guidelines). This is termed 'Polar Alignment' of your mount. See below for more detail.

With a GoTo, set up so the scope is parallel with the ground and pointing roughly North. The mount should hold the scope about half way along its support bar.

The Finder Scope

The finder scope helps you to, yes, find things. It has a wide field of view compared to your scope and so you can use it to get objects of interest into the field of view of the eyepiece. However, this only works if the finder scope and the telescope are aligned well (they are pointing at exactly the same point in the sky).

Aligning the finder scope is best done during the day. You can also use this as an opportunity to roughly focus your scope in preparation for the evenings viewing.

There are different types of finder scope (red dot, Telrad, 6 x 30 miniscope etc) but all have the same purpose. Make sure you understand what type you have, how to switch it on and off, maybe change it's brightness, how to secure it to your scope and importantly how to adjust where it points. Usually it has up/down and left/right adjustment knobs or a couple of adjustment screws in it's holder. Once you are satisfied what you're dealing with, secure it to the scope. With a computerised scope, you can just switch on and ignore the setup procedure so you can get on with aligning the finder. You can come back to the full setup later.

Put a long focal length eyepiece (say 25mm) into the focuser and secure it with the thumbscrews. Move the scope manually (after releasing the appropriate clutch(es)) or with your handset so it's pointing at a distant object (a tree on a hill or a chimney for example). Use the focuser on the scope to bring the object into sharp focus. This is a good starting focus point for viewing the night sky so just leave this in the same position when you've finished. Put the object right in the middle of the field of view.

Switch on (red dot only) and look through the finder. Is the red dot or the crosshair centred on the same object? If not, use the adjustment knobs on the finder to shift the alignment of the finder scope until the object is centred. Check the scope hasn't moved whilst you've been doing this and when you're satisfied the finder and scope are centred on the same distant object you've completed alignment. You could swap in a shorter (higher magnification) eyepiece after this to really fine tune it, it's up to you, the procedure is the same.

Unless you remove the finder, knock it or move it (say putting caps or covers on it) it should stay reasonably well aligned, but worth a quick check each time you set up.

More on Polar Alignment

For visual work, highly accurate polar alignment is not necessary and even then it's only really of interest to those with equatorial mounts. If you have a polar scope built into your equatorial mount, this should be used to align the mount with the north/south axis of the Earth by moving the up/down (Altitude) and side to side (Azimuth) bolts until Polaris sits on the crosshairs in the centre of the polar scope eyepiece. This will be fine for viewing purposes, but wouldn't be good enough for taking long exposure images. more on that another time!

If you don't have a polar scope in the mount, you need to line the scope up as accurately as possible with the leading leg of the tripod in a 'scope up, weights down' fashion. You can then use the Alt/Az bolts to adjust the direction the scope is pointing so that Polaris is centred in the finder and the main scope eyepiece. in this case the main telescope is acting like the polar scope. Once this is the case you're good to go.

Bit confusing having a main scope, finder scope, polar scope, but you'll very quickly get used to the jargon.

GoTo Scope Alignment

Computerised scopes don't need to be polar aligned but do require you to supply some information to enable them to find objects in the sky for you.
When switched on they will typically ask for a location (Peebles is 55 degrees 39 minutes North, 3 degrees 11 minutes West). You can get your location like this online or on your phone via GPS. It needs to be in degrees and minutes rather than degrees with a decimal point format. They will also ask for a date in the US format (MM/DD/YY), a time, maybe a time zone (+0.00 for us) and whether it's daylight saving time (same as British Summer Time).

You can then choose which method to use to align the scope. You'll need to have got it into reasonable focus (as above) before starting this, Methods are similar between brands, but Skywatcher requires you to know the names and locations of certain stars to do the alignment, whereas Celestron does not. The process usually requires you to use the handset to move the scope to at least one star, centre it using the finder scope then centre it in the main scope eyepiece. The computer should then take over and may do a further alignment on another star.

Remember, GoTo scopes 'eat' batteries, so best to have a well charged power pack and a nice tight power connection. The GoTo accuracy will start to fail if the power is not sufficient.

Focusing & Tracking

Make life easy on yourself and start by focusing on the Moon if it's around. Use a 20-25mm eyepiece to start on each object you view. You should use this eyepiece when moving to new objects too as it gives the widest field of view for finding things in conjunction with the finder scope.

If the Moon isn't around, turn the scope on a bright star and focus until it's as small as possible. You could also use a Bahtinov Mask, which creates a cross-like pattern when used on a bright star and allows you to achieve very good focus.

Remember, changing eyepieces usually means you'll have to refocus. Keep caps on the eyepieces you're not using so they don't get fogged up with dew.

Buy or make a dew shield, especially if you have a refractor or a compound scope (like a Maksutov) to stop the lens fogging.

NEVER wipe lenses or eyepieces with a finger or sleeve as you will damage any anti-reflective coatings on their surfaces. If you can run an extension cable to your scope, use a hairdryer to gently warm the lens and remove dew (take it easy though). Eyepieces can be treated the same (but can be taken inside to do the job).

A GoTo scope will track an object automatically once it is centred on it (provided you have set it up correctly and given all the appropriate info).

On a manual equatorial mount, once you have released the clutches, swung the scope around and centred the object using the finder, lock the clutches again and use the fine motion adjusters (the long stalks with the round handles) to centre the object in the eyepiece. If the polar alignment is decent, you should be able to keep the object in the field of view easily using small turns of both, or even just one of these. As you increase the magnification, you will need to adjust more often to keep the object centred.

With motors on an equatorial mount, these will take over the job of the fine adjusters and allow automatic tracking. Alignment needs to be good though and they are not capable of finding objects for you. Happy to 'plumb' these in and get you up and going if required.

Viewing and Magnification

Finally, refractors and compounds benefit from the use of a 'star diagonal' to make viewing more comfortable. They also make the image 'upright' (remember normally you'll be seeing it upside down). Worth investing in a good one, such as a dielectric type. Happy to advise.

Packaged eyepieces can let a scope down and give poor views. Worth looking at upgrading a little when you can. Lots of choice, but no need to spend a fortune. Viewing nights are a great opportunity to try other peoples eyepieces in your scope to see what works for you.

A good quality Barlow lens is an excellent investment and like a good diagonal can be used for years and on many different scopes. A Barlow effectively doubles your eyepiece collection. A 2x Barlow is a good start and will turn your 25mm eyepiece for example into a 12.5mm and your 10mm into a 5mm. I have a Celestron Ultima 2x Barlow which I'm very pleased with. Again, there's a lot of choice out there.

Just to remind you. Dividing the focal length of the eyepiece into the focal length of the scope gives you the magnification e.g. 25mm eyepiece and 1200mm focal length scope gives a 48x magnification. A 2x Barlow would double this to 96x.

Finally finally, there's a theoretical limit to magnification on any scope, usually felt to be two times the aperture in mm. So my 200mm reflector has a max theoretical magnification of 400x. This is a lot, but practically the limit for my scope is more likely to be 250 to 300x as the 'seeing' comes into the equation as will the quality of the optics. So do consider this before investing in eyepieces or Barlows.

Tweeddale Astronomical Society