**[HFT SCOPE SETUP GUIDE](https://www.anstonftc.co.uk/hft-scope-setup-guide/%22%20%5Co%20%22Permanent%20Link%20to%20HFT%20Scope%20setup%20guide)**

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So – you’ve bought your rifle and scope and you want to get into the world of competitive Hunter Field Target shooting (HFT).

The first thing you need to do is fit your scope to your rifle. A common mistake that a lot of new shooters make is to just fit the scope so it looks about right and assume that everything’s OK. Later on when problems arise it’s very difficult to diagnose the cause of those problems if things aren’t set up correctly in the first place. So although setting up a scope properly can take a little bit of time to do, it will save hours of frustration in the long term.

**Focusing the Eyepiece and Crosshairs**

Your scope will have an adjustable eyepiece. This allows people with differing eyesight to set up the scope for their own eyes. If not correctly adjusted the crosshair will appear out of focus and eyestrain will occur as the eye tries to compensate. There are generally two kinds of adjustment mechanism. The most widespread is where the whole eye bell twists round and sets with a locking ring which screws down onto the eye bell. The other kind, known as a “fast-focus” just alters a narrow ring right at the back of the scope.



Diagram of scope ocular with locking ring and scope ocular with fast focus

If your scope has an adjustable parallax, set it to infinity, look through the scope at an area of bright, clear sky (Not the Sun!). Twist the eyepiece or fast-focus ring until the crosshairs are as black and sharply defined as they can be for your particular vision. If not the fast-focus type then lock the eyepiece in place using the locking ring.

**Setting your scopes parallax**

Parallax is the apparent movement of the target relative to the reticle when moving your head up and down, while looking through the eyepiece of the scope. It occurs when the target does not fall on the same plane as the reticle.

When you look through a scope that’s parallaxed to 30 yards at an object that is 30 yards away the sight picture and the crosshairs should be in sharp focus.

The human eye will do it’s best to compensate for out of focus images, but a good way to tell is to look through your scope and concentrate on the crosshairs, then switch your concentration to the target, and switch back again.  If you notice that when you concentrate on the target the crosshairs are slightly blurred and when you concentrate on the crosshairs the target is slightly blurred, then the scope’s parallax isn’t set up for the target distance.



Example of an in focus reticle and sight image



Example of a sight picture in focus but crosshairs out of focus



Sight picture out of focus but crosshairs in focus

Some scopes allow parallax adjustment (PA) by turning the objective bell – known as Front PA.  Some have an extra turret opposite to the windage adjustment that allows you to adjust the parallax (Side PA) and some have parallax adjustment at the rear ocular end. (known as Rear PA).  And some don’t seem to have any parallax adjustment on them at all.

If you have a parallax adjustable scope, then this step is going to be dead easy.  If you have the sort of scope that doesn’t seem to have any parallax adjustment, then you may need to ask around on the various airgun bulletin boards to find out how to set parallax for your particular scope.

Generally, most scopes that don’t have parallax adjustment will have a locking ring at the front, objective end of the scope.  You will need to unscrew this locking ring in order to set your parallax and then re-fit the locking ring to set it.  Sometimes the locking rings can be very stiff to turn and you may need an adjustable rubber strap to turn it.  It’s best to seek advise for your particular scope if in any doubt.

Most scopes that don’t have parallax adjustment tend to be set at either 50 yards or 100 yards – neither of those distances is going to help you much in HFT since the furthest target is only going to be 45 yards away.

If you shoot at a target that is out of focus, not only is it more difficult to hit – especially on those tiny 15mm kill-zone targets, but you also run the risk of introducing what’s known as parallax error.  Parallax error just means that the crosshairs will shift position depending on where your head is positioned.

Under the most popular set of rules for HFT (UKAHFT rules) you aren’t allowed to adjust your parallax once you’ve started shooting a course, so some targets are going to be in focus and some aren’t.  This fact can actually help you to gauge the range of the target (I’ll go into much greater detail on range finding in HFT in a later article).  This means that you will need to set your parallax up to a compromise setting.   Personally, I find a good compromise setting to be at around 23 yards, but a slightly different setting might be better for your particular scope and setup.  Generally, most HFT shooters set their parallax between 20 and 30 yards but for initial setup purposes, I’d suggest going with 23 yards as a starting point.

To set parallax, set a target out at 23 yards and adjust your scopes parallax until the target and the crosshairs are as crisp and sharp as you can make them.  If you have a parallax adjustable scope with yardages marked on the adjuster, don’t rely on them – they’re wrong more often that they’re right in my experience.

You can use anything as a target, some people use a page from a magazine with varying font sizes as a guide.  The theory being that if you can read the fine print and your crosshairs are crisp and clear, then the scope is perfectly focused.   I prefer to use a knock-over target that already has pellet strikes on it as my guide.  The reason I do this is because that’s what I’m going to be shooting at in competition, not a magazine.  But either will do.  You might also find that focus will alter slightly in different lighting conditions and different temperatures, so try to set your focus up in the sort of temperatures and lighting conditions that you are likely to be shooting in competition.  There’s no need to go overboard at this stage, that’s something you might want to tweak at a later stage though.

You can set parallax up with the scope off of the gun, but it’s much easier to do with it mounted, so it’s not a bad idea to just roughly mount the scope on the gun at this stage.

**Centring your scope**

Before you fit your scope, you should set the turrets so that your scope’s internal workings (the erector tube) is in the centre position.  There are a couple of ways to do this.

**Centring the turrets**

1. Turn the elevation turret to the limit of it’s travel (don’t put too much pressure on the final clicks in case you permanently damage your scope).
2. Slowly turn the turret (counting the clicks as you do so) until you reach the opposite extent of the turrets travel.
3. Divide the number of clicks you’ve just counted by 2 and turn the turret back that number of turns.
4. Repeat this for the windage turret.

You should now have each turret set in the centre of it’s range of travel.

This will give you a reasonable rough approximation of the optical centre of your scope and a good starting point for any further centring you want to carry out.

**Optical centring with a mirror**

If your scope has a variable magnification, select the lowest magnification. Start with your parallax set as above.

1. Find a mirror that can be laid flat on a flat surface – the thicker the glass on the mirror the easier it makes things.
2. Stand your scope up on the mirror so that the objective end is rested on the surface of the mirror.
3. Look through your scope from directly above, if it’s too dark you may need to shine more light onto the surface of the mirror (this is where having thick glass on your mirror will help because the thicker the glass the more light it’ll let through)
4. You should be able to see two sets of reticles when looking down your scope.  If you can’t, then this method won’t work for you. Try to get more light reflecting back up from the mirror and try resetting the parallax to infinity if you have an adjustable parallax scope. If nothing works use the harder method detailed below.
5. Adjust both turrets until the two reticles that you can see are perfectly aligned with each other.

That’s it – you now have one optically centred scope.

**Optical centring without a mirror (the hard way)**

For this method you may need to make a scope stand – this could be two identical pieces of wood with ‘V’ slots cut in them, attached to a base.  The idea is that you can rest your scope in the ‘V’ slots in such a way that the whole scope can be rotated.  You might want to put some felt in the V slots so that you don’t damage your scope while you centre it.

1. Start by centring the turrets using the method above ‘Centreing the turrets’.
2. Rest your scope stand on a flat surface (clamping the stand down isn’t a bad idea) so that you can look through the scope and clearly see an aiming point.  Any aiming point will do, it doesn’t have to be the centre of a target, it could be a nail head on your shed at the bottom of the garden. Ideally you should choose an aim point that’s at the same distance your scope is parallaxed to
3. Now slowly turn your scope in the ‘V’ slots and check to see if the crosshairs are still pointing at your aiming mark.
4. If they aren’t then adjust the turrets slightly and repeat.

You’ll soon get a feel for which way you need to adjust your turrets to get things lined up.

The idea is that if your scope is optically centred then you should be able to turn your scope round completely in the V slots and the crosshairs should hold their aim point.

This method can take some time.

**Selecting mounts and scope height**

Getting the right mounts can be a costly business. if you already know someone with the same gun and scope combination then you could start with buying the same mounts that they have.

If you don’t then you’ve got a couple of choices – low mounts or medium mounts (high mounts are a bad idea for HFT in my opinion).  But, there’s no standard definition of what height low or medium mounts are – you might find that one brands set of low mounts can be the same height as another brands medium mounts.

You may also find that fitting low mounts makes it difficult for you to load your rifle because it restricts access to the loading port of your gun.

Probably the safest option and a good starting point is to buy a set of quality medium mounts.  During the process of setting up your scope you might need to switch to a set of adjustable mounts, so be prepared for the extra cost.

**Cheek piece fit**

If your scope is mounted too low you may find that you have to “cram” your head onto the cheek piece or crank your head at an extreme angle in order to see the image. Conversely, if your scope is mounted too high, you may find yourself “hovering” over the cheek piece, without your head touching the stock. Usually it is the most vertical head position that is best, but this varies from shooter to shooter.

An adjustable cheek piece will ensure the perfect fit with any size mounts and it’s an addition to your rifle that you might want to consider at some point in the future.

The majority of your shots will be taken in the prone position, so it’s worth making sure that this position is the most comfortable for you, but you don’t want to make it so that standing and kneeling positions are too uncomfortable.  You will probably need to find a compromise setting.  That’s where an adjustable stock and cheek piece can really help to gain you a couple of extra points.

**Eye Relief and magnification**

Eye relief is the distance between your eye and the ocular eyepiece of your scope.  This will be different on different scopes and will normally be different at different scope magnifications if your scope is a variable magnification scope.

When mounting your scope, you should set the magnification of a variable magnification scope to the setting that you intend to use when shooting HFT.  If you have a fixed magnification scope, the choice is easy.

There are no restrictions (currently) in the UKAHFT rules about which magnification you’re allowed to use for a competition, the only rule is that you aren’t allowed to change your scope settings once you’ve started shooting the course.  That being said you will find it much easier later on if you set your scope magnification to the setting where your mildots are said to be true.  This can vary from scope to scope, but it’s usually either at the maximum magnification of your scope or at 10x magnification.  Usually this will be marked on your magnification ring in some way for example the number 10 might be in red with other numbers in white.  If in doubt, seek advice from the various airgun bulletin boards on the Internet, but later in this article I’ll show you a method you can use to check that your mildots are ‘true’ at your chosen magnification.

**Fitting your scope**

Remove the screws from the top part of the mounts and set these to one side. Slightly unscrew the side clamps and slide the mounts onto the rifle’s scope mounting rail (dovetail). Gently tighten these until firm. Take the scope and lay it in the mounts. Replace the mounts’ top straps and nip up the screws until finger tight. The scope should be able to move length-ways, and also rotate, albeit with some resistance. Then, follow these steps:

* Assume your normal prone shooting position on level ground, with rifle comfortably in the shoulder.
* Allow your head to meet the cheek piece in a comfortable natural motion. Observe the sight picture. You will initially “hunt” for a good sight picture, and will move your head backwards or forwards in order to acquire correct eye-relief. The edges of the sight picture should be crisp and clear when you’ve got the correct eye relief and head position and there should be an equal amount of black around the edges of the sight picture.
* Determine whether the scope will have to be moved forwards or backwards and slide the scope length-ways until a full picture is obtained. The image should be crisp right to the edges and have a thick black ring around it.



Correct eye relief - sight picture is crisp round the edges



Incorrect eye relief - edges of sight picture aren't crisp

* Position the mounts so that they are at maximum spacing from each other. This gives the most stable base for the scope. Then, tighten these firmly.
* Roughly align the vertical crosshair perpendicular to the dovetail, then tighten the top screws. The crosshair will be aligned more precisely later on but for now the above will suffice.

**Plumbing the crosshairs**

The purpose of plumbing is to make sure that the vertical crosshair is perfectly aligned with the action and barrel of the rifle. As the name suggests, this involves the use of a “Plumb-Line”, a weighted string hanging down, providing a true vertical reference line.

This procedure can only be performed with an action-mounted spirit bubble, i.e. the small glass tubes found in a common spirit level. One of these “bubbles” should be temporarily fixed to the scope’s flat dovetail in such a way that you can see it with your non-aiming eye while the aiming eye looks at the plumb line.

The string needs to be highly visible, e.g. orange nylon target reset cord, and it needs to be placed far enough from the scope for any errors to be apparent. A range of 20 yards is sufficient and it will also be about the distance that you’re scope is parallaxed to. The plumb line needs to be long enough that the string reaches from the top of the scope image to the bottom. Once the above has been established:

* Adjust your rifle hold until the spirit bubble is central
* Without altering hold, look at the plumb-line through the scope.
* Line up the vertical crosshair with the plumb-line.
* If the plumb crosshairs don’t line up with the plumb-line, you will need to rotate the scope in the mounts until they’re lined up.
* Loosen the top screws of the mounts just enough for the scope body to be rotated.
* Before re-tightening the mounts check that your desired eye-relief has not changed. Once eye relief is checked, re-tighten the mounts.

**Setting an initial zero**

Once you’ve got your scope fitted to your rifle you can start to set the zero.

To do this it’s best to draw a thick cross on a sheet of plain white paper and set it out at about 10 to 15 yards.  It’s a good idea to tape the target to something like a large cardboard box because when you first set the scope up it might be so far out that you’ll miss an A4 sheet of paper at 10 yards!.

Adopt a nice stable prone position and take a shot at the thick cross, if the pellet strikes on the paper and isn’t too far away from the centre of the cross then you should go ahead and set the zero, by adjusting one turret at a time.  Start with the windage turret so that each shot lands on the vertical line of the cross.  Then once that’s set, adjust the elevation turret so that the pellet hits close enough to the centre of the cross.  You’ll probably want the pellet to hit about an inch low at 10 yards so don’t spend too much time fine tuning the elevation turret at this stage.

If you find that you need to turn the windage turret more than half a turn then at this stage you should consider fitting adjustable mounts.   If the elevation turret requires more than half a turn to get it shooting about an inch below the cross then you might need to pack the rear scope mount with a small piece (or two) of old photographic negative.  If you pack the mount, be careful not to tighten the screws on the mounts too tightly otherwise you may damage the scope tube.

Fine tuning the zero and checking your mildots

Once you have a rough zero at 10 yards, it’s time to start fine tuning that zero at a greater distance – 25 yards is a good starting point.  This might not be your final preferred zero distance for HFT but it’s a good distance to start setting things up at because your parallax should be set at about this distance and this will help to eliminate any parallax errors while zeroing your rig.



HFT zeroing target PDF

Print out the attached adobe acrobat (PDF) and check that the 150mm line at the bottom of the target measures 150mm.  It’s not too critical if it isn’t exactly 150mm – near enough by a few mm’s will do fine.  If the line isn’t 150mm’s you may need to check your printer settings to make sure it’s set to print the page at 100%.

Set the target out at exactly 25 yards and then check that your mildot spacings line up with the spacings on the target (which are set to be correct at exactly 25 yards).  It’s also a good idea to use your plumb-line to make sure that the target isn’t wonky.  This will help to eliminate rifle ‘cant’ while you zero your rifle – if the scope is on level and the target is level then you should be shooting on the level when you take your shot.

If your mildots don’t match up with the target, then you may need to adjust the magnification of your scope until they do.  If you do need to do this, then it might be a good idea to make a small mark on your magnification ring to denote where it should be set for true mildot spacing.

If you have a fixed magnification scope and the mildot spacings don’t match up with the target then you may have either set the target out at the wrong distance or your scope might not have ‘true’ mildots.

True mildots aren’t essential for HFT, but they do come in handy for accurate holdover and can assist with range finding (covered at depth in a later article).

If everything’s set up and adjusted correctly you can start to fine tune your zero.  Just do this in a similar way to the method used to set up your rough 10 yard zero.  You shouldn’t need to make too much of an adjustment to your turrets before you’re hitting the centre of the target every time.

If it’s a windy day, it might be better to wait for a calmer day before you make any final adjustments to your windage turret, but if you don’t have the luxury of waiting for a calm day you can ask another shooter to take a few shots at your 25 yard target so you can get a feel for how much your shot should be blown off target at that range and adjust your windage turret to match theirs.  This isn’t ideal, but it’s a good enough start to get you somewhere in the ballpark for windage.

Parallax error – how to overcome it

It took me a few seasons of HFT to realise that one of the most common reasons that I missed a target was due to parallax error.

As a test, I set a target out in my garage.  I was fortunate enough to have a long garage with a utility room at the end, allowing me to set a target out at around 11 yards in a completely wind free environment.  My parallax was set at around 25 yards so the target was slightly blurred at this distance.

I got into a nice comfortable prone position, with my rifle resting on a beanbag to eliminate as many variables as possible and took a shot at my 11 yard target.  I then got up from my prone position and got back down into position again and took another rested prone shot.  After repeating this process several times I noticed that I was struggling to produce a grouping that was smaller than 15mm when I should have expected my rifle to be able to repeatedly put pellet on pellet at that distance with no wind.

The solution for me was to fit a scope enhancer ( [DG Designs scope enhancer](http://www.airgunbuyer.com/details.asp?cat=Accessories&SubCat=Misc.%20Accessories&Product=1977) ) to my scope.  With the enhancer fitted it meant that if my head wasn’t in the exact same position then I couldn’t see a clear sight picture through my scope.  It took a little while to adjust it so that it felt comfortable against my face and I needed to trim the rubber a little to make it fit.

After I’d fitted the scope enhancer I repeated my earlier test and I was then able to produce a single pellet hole group of 10 shots (getting up from my prone position between each shot as I’d done before).

Curiously I found that with the scope enhancer fitted, the single hole group was slightly low and left of the centre of the target, so fitting it had altered my zero and it needed to be re-adjusted to take this into account.

Scope enhancers don’t suit everyone though, another method to get a consistent head position shot after shot is to check that when you look through your scope you get the same amount of black around the edges of the sight picture.  The amount of black around the edges of the picture can be exaggerated by moving your scope forward on it’s mounts by a small amount so that the eye relief is no longer perfect.  Then all you need to do is check that you have an equal amount of black around your sight picture when you take your shot and hopefully that will reduce parallax error to a minimum.  With so many other things to think about when shooting an HFT course, that’s something you might forget to do though, that’s why I prefer the scope enhancer method.

Now you have your scope set up it’s time to start practicing your technique… The next article in this series will cover trigger technique, breathing and follow through.