

Converting a Height Gauge to Digital

David Haythornthwaite converts a bargain vernier height gauge to digital readout.

Background

I saw a very nice and substantial Draper 12" height gauge at a car boot sale and bought it for a very modest price. However I am more and more getting used to using digital readouts and I yearned for a digital version. However at around £100 to purchase, a conversion of my existing height gauge looked an attractive proposition.



Photo. 1 The finished Height Gauge Viewed From Both Sides

What is a Height Gauge?

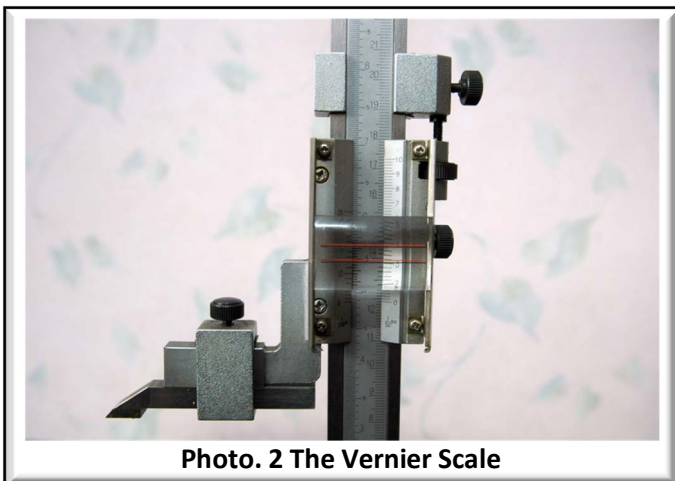


Photo. 2 The Vernier Scale

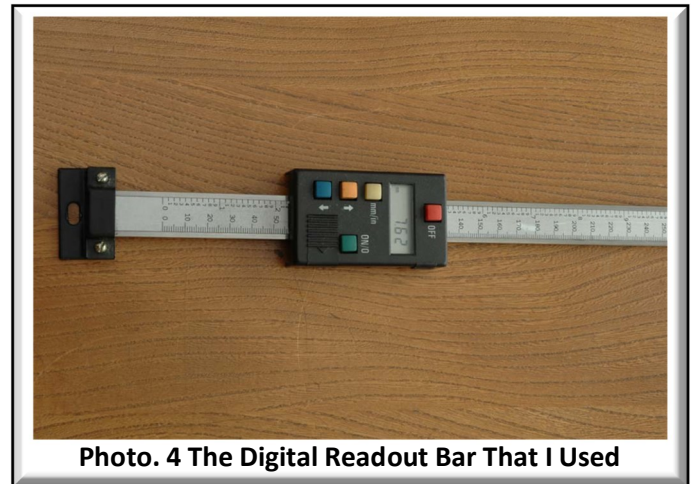
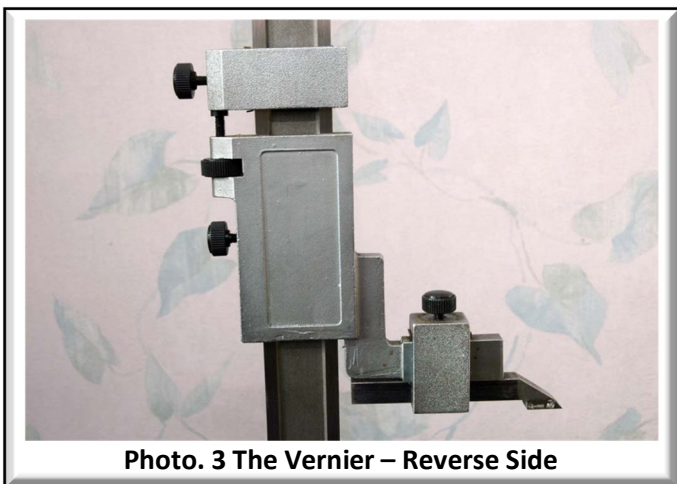
For the benefit of those readers who are new to model engineering, and who may not have come across a height gauge, it is a most useful device for accurately marking out, rather than using rulers and a scriber. The device is used on a flat surface plate and has a vertical column, as shown in **Photo. 1** carrying a scriber attached to a vernier scale enabling the scriber to be set very accurately to a set distance (within one thousandth of an inch or 0.025 mm) from the surface of the surface plate. The height gauge is

used by sliding it along the surface plate, past the object to be marked, and thus scribing a line on the object, a set distance from one edge. The vernier head is shown in **Photo. 2** and as you may see, incorporates a magnifying lens to facilitate accurate setting. There is a clamp above the vernier scale, which may be clamped to the column and a fine adjustment wheel allows the user to raise or lower the scribe in fine increments until the correct position on the vernier is found.

The vernier which I already had was well constructed and was a very rigid and practical tool. It was 12" high, although I doubt whether I had ever used it to scribe a line above the 6" level. I looked at various advertisements on the internet and it seemed that prices for a digital equivalent started around £90 upwards. The cheapest models seemed to utilise the popular imported digital readout bars, using the actual bar as the vertical column, and these are nowhere near as rigid as the old style height gauge that I had. In these days of everything going digital, the old style of vernier height gauge can often be bought, pre used, for a very reasonable price. At the time of writing this article, a vertical, 300 mm digital readout bar can be bought from Arc Euro Trade, who advertise in this magazine, for £34 including VAT, so it does seem well worthwhile converting an old existing height gauge. The vernier system works well, but it does involve mental arithmetic to use, and the zero point cannot be reset if you are mounting the object to be scribed on top of parallels. In all, a digital readout is so much more convenient. In my case I already had an unused 300 mm vertical bar, bought some years ago and used for some time on my milling machine – but no longer - so it was an easy decision.

Design Considerations

My height gauge had a flat area on the back of the slide see **Photo.3** where a suitable readout could be fixed. My digital readout bar is shown in **Photo.4**.



At first glance, my readout seemed ideal to fix on the rear face of the vernier scale, being virtually identical in size. However this took careful thought in order not to make a mistake. The vernier scale must be able to go to the bottom of the column, as the scribe touches the surface plate. At this point, the zero point on the analogue scale would be set to read zero by using an adjustment system at the top of the column (more about this later). On my gauge, when the scribe touched the surface plate, the bottom of the vernier block was almost touching the base plate of the height gauge. Now for reasons mentioned later, the digital readout bar needed to sit on a mounting foot, meaning that

the digital readout itself must be slightly raised from the base, when the vernier block is touching the base. Therefore I needed to attach the readout to the vernier block in such a way that it was mounted slightly higher than the block. There were two 6 B.A. threaded holes on the back of the digital readout, and I intended to drill and countersink the vernier block from the inside to take two 6 B.A. countersunk screws. The fine adjustment clamp, above the vernier block, was thicker than the vernier block and so it would be necessary to insert a spacing plate between the vernier block and the digital readout in order that the readout would clear the adjustment clamp, when the clamp was at it's lowest setting.

Finally, the readout bar was just 1" too long and would require shortening if it was to clear the zero adjustment mechanism at the top of the bar. I wondered if shortening the digital readout bar would render the whole unit useless, but a call to Arc Euro Trade confirmed, with their usual help, that it would not affect the performance.

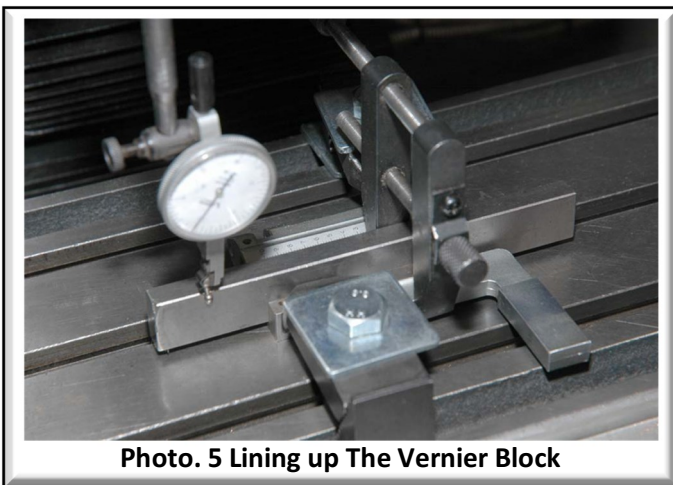


Photo. 5 Lining up The Vernier Block

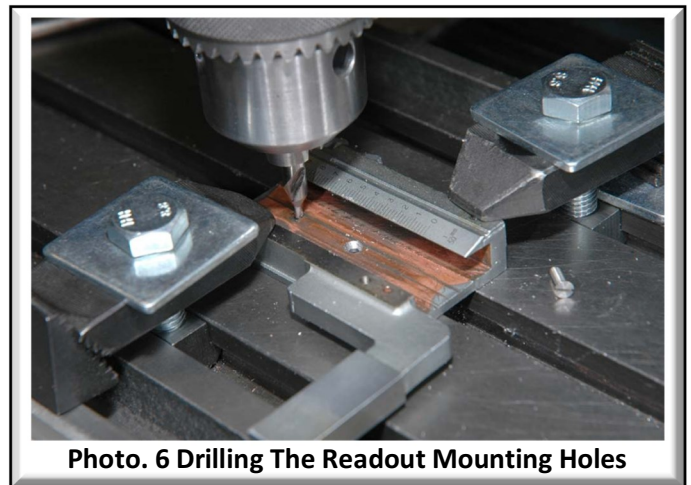


Photo. 6 Drilling The Readout Mounting Holes

Attaching the Digital Readout

The vernier slide was built in two pieces and the left hand facia was detachable by removing the two larger screws shown in **Photo. 2**. The zeroing adjustment mechanism was removed from the top of the column, together with the graduated slide from the centre of the column. The fine adjustment clamp could then be slid from the top of the column, followed by the vernier slide. This left the vernier slide free for the drilling of two 6 B.A. clearance holes to attach the digital readout. It is absolutely critical that the digital readout is attached exactly in line with the analogue version, and **Photo. 5** shows the vernier slide being aligned on the milling table in preparation for drilling the countersunk attachment holes. Although not very clear in the photo, the slide has been clamped to the table by two clamps. A parallel has then been clamped to the pads which ride on the vertical column using an engineer's clamp. A "Verdict Gauge" was then attached to the milling head, and run back and forth against the parallel. A few light taps ensured that it was accurate to within one thousandth of an inch. **Photo. 6** shows one hole drilled and countersunk whilst the second hole is about to be started with a centre drill. My column was 26 mm wide exactly, and the holes in the vernier slide were being drilled 13 mm from the sliding pads on the vernier to ensure that the digital readout bar finished central to the original column. You will note that the holes are not being drilled symmetrically in a vertical direction, but are being drilled offset towards the top of the vernier slide, so that the digital readout will be higher than the vernier slide in order to clear the foot to be shown later.

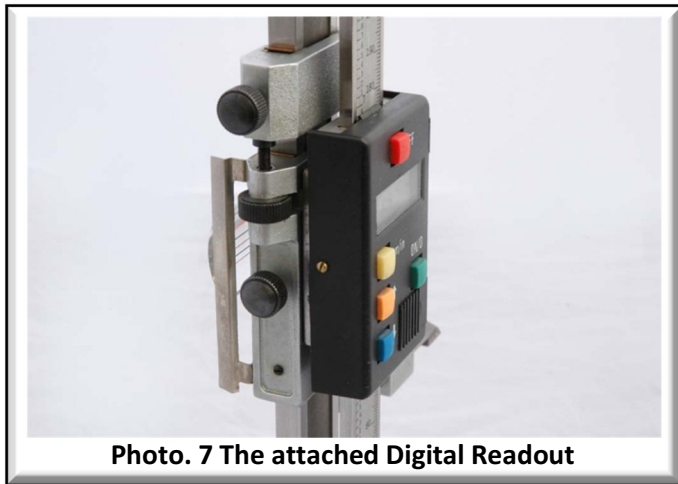


Photo. 7 The attached Digital Readout

The digital readout head is illustrated in **Photo.7** attached to the analogue system and you can clearly see that a 1/8" plate (3 mm) has been interspersed between the two heads in order that the fine adjustment clamp, at the top, can pass behind the digital readout.

The combined reading head was now slid towards the bottom of the column and the position of the digital readout bar relative to the height gauge base was marked out as illustrated in **Photo. 8**.

As you can see from the photo the readout bar overhung the front of the base plate, as anticipated, so a mounting plate – or foot – needed to be made to attach the lower end of the bar to the baseplate.



Photo. 8 Marking Out For The Foot



Photo. 9 The Foot Before Finishing

I would have liked to "mortise" the bottom of the readout bar into the baseplate, but the overhang was too great and in any event, the process would have been difficult to achieve in such close proximity to the bottom of the column. Therefore the foot shown in **Photo.9** was made up with a slot milled into it that was a tight fit on the bottom of the digital readout bar. The slot was marked out from the bottom of the readout bar (4mm x 26mm) taking care to ensure that there was space between the foot and the original column, in order that the vernier slide could pass behind and reach the base plate. It is easier to leave the foot square at this stage for better holding whilst milling the slot. The mortice slot was first drilled 1.5 mm on each corner of the slot, before milling out the slot with a 1/8" (3mm) slot drill. Two 5 B.A. grub screws were fitted to hold the readout bar in place.

It would have been great to have fixed this foot to the base plate using two 7 B.A. countersunk screws, which was the original plan, but it proved impossible to drill and tap these into the baseplate without fouling the column with the chuck during the drilling phase. Very reluctantly I therefore attached the foot to the base plate using Araldite epoxy resin. Perfectly secure and practical, but the engineer in me did feel to have cheated by doing this. "Simply not done old chap" !! When painted



Photo. 10 The Foot Attached and Painted

with smooth silver Hammerite paint, it looked to be part of the original height gauge. Shown in **Photo.10**. At the design stage, I was unhappy with the overhang of the foot, but in practice, the shape makes a convenient place to rest the index finger when marking out.



Photo. 11 The Zeroing Arrangement

The attachment was beginning to take shape, but the readout bar was just 2.5cm too long and the top of it interfered with the reverse side of the analogue zero adjustment device, illustrated in **Photo. 11**. Having received assurances from the supplier that I could shorten it, without damage, I cut 2.5cm from the end using a small cut-off disc on a “Dremel” mini grinder. I took care not to get the bar too hot as it would damage any magnets in the bar. (I presume there are magnets there). These bars can be shortened with a hack saw, but they are hardened and it is tough going.

The slide was raised to it’s very top position on the column, and the distance between the readout bar and the column was carefully measured. A spacer and clamping piece were made, utilising the original end clamp so that the readout bar could be clamped to the column, leaving the correct distance between them. The arrangement is shown in **Photos 12 & 13**. The spacer is drilled clearance 5 B.A. (No. 30 Drill), whilst the clamping piece was drilled 2.7mm and tapped 5 B.A.

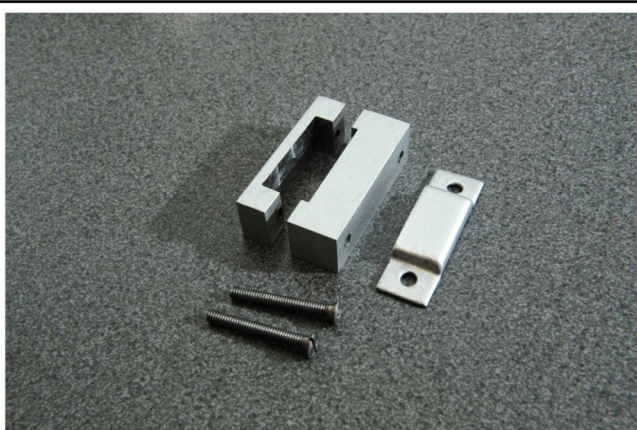


Photo. 12 The Clamping Pieces



Photo. 13 The Readout Bar Clamped In Place

Using the Digital Height Gauge

In use, the digital gauge is a joy to use. I have the advantages of an extremely rigid height gauge, coupled with the ease of use that a digital readout gives. It is important to remember to zero the readout with the scriber flat on the surface plate before each use. One advantage of the digital system is that the readout may be zeroed to the top of parallels, if it is necessary to place the object being scribed on top of parallels. Also it is possible to zero the gauge at any point if incremental measurements are to be marked out. The only possible disadvantage is that – for a right handed person – the digital scale is facing away from the operator when actually scribing, but the sliding head is locked at that point anyway.

Obviously the readout may be changed from imperial to metric at any point without disturbing the setting and if one of the new scales, which also display fractional inches, is used then that helps with some older plans shown in 64ths of an inch.

Readers may wonder why I shortened the readout bar rather than removing the old analogue adjustment from the top of the bar. Well, I can still use the height gauge to 11" which is plenty high enough for my requirements, and if I find that the battery is flat in the digital scale, I still have the analogue system available to fall back on.

I have not shown plans or measurements, as each reader's height gauge will be different, but I am well pleased with my converted gauge and hope that this article may guide others who wish to carry out a similar conversion.