Cnoc Coinnich, Beinn Reithe and The Saddle

Pedantic Surveys

Report of surveys carried out by Alan Dawson on 11 May 2016

Background

Cnoc Coinnich is a steep rocky hill near Lochgoilhead in Argyll. It is situated between Loch Goil and Loch Long, south of the A83 between Arrochar and Inveraray. It is shown on Ordnance Survey Landranger sheet 56 and other OS maps as 761 metres high (2497 feet) at NN233007. Cnoc Coinnich can be climbed relatively easily from either Lochgoilhead or Ardgartan.

The main purpose of the survey was to measure the exact height of Cnoc Coinnich, to find out if it is over 2500 feet high (762 metres). Scottish hills between 2000 and 2499 feet high (609.6-761 metres) are classed as Grahams if they have over 150 metres of relative height. Hills from 2500 to 2999 feet high (762-914.4 metres) are classed as Corbetts if they have over 500 feet of relative height (152.4 metres).

The Cnoc Coinnich survey was fitted in as part of a long day's hill walking and hill bagging, in order to combine scientific research with an enjoyable and productive day in the hills. Two other hills were also surveyed during the day: Beinn Reithe and The Saddle.

All heights were measured using a Leica Geosystems RX 1250 antenna and controller, with data processing using OS Rinex data and Leica software to obtain results to within 0.1 metres accuracy or better.

Cnoc Coinnich survey

Cnoc Coinnich was approached from Lochgoilhead, via the Cowal Way at first then along a good path to the top of a 378m high hill called The Steeple. A party of ten-year-old children were resting on the summit of The Steeple, accompanied by two members of staff from Ardroy Outdoor Education Centre. It was heartening to see the group enjoying themselves and the wonderful views down over Loch Goil and the hills to the west and north.



Party from Ardroy Outdoor Education Centre on the summit of The Steeple

There is no path from The Steeple to Cnoc Coinnich but the terrain is reasonable most of the way. It becomes much steeper and rockier near the top. Although the cloud was high and the views were good, the wind increased in intensity near the summit of Cnoc Coinnich. The summit itself is a large rock outcrop, steep-sided but flat on top. It was not easy to stand upright in the wind. Two problems were immediately apparent. The wind was far too strong for a tripod to be stable on top of the outcrop, and it was impossible to use a surveying pole as there was no vegetation in which to secure the pole. The Leica antenna requires a secure and stable mounting in order to record satellite data from the Global Navigation Satellite System (GNSS). It is possible to set up the antenna on the ground, where the effect of the wind is slight, but this is only effective if there is a clear line of sight around it.

The large unruly cairn on the summit posed two problems - it was covering the highest natural rock and it would interfere with the satellite signals if the antenna was set up on the ground next to the cairn. The solution to these problems was to remove the cairn. This took about half an hour of unpleasant hard labour, with dust and debris swirling around in the wind. Once the cairn had been dismantled, it was possible to identify a flat area of rock as the highest point of the hill. The antenna was set up on this rock, using an improvised base of small rocks in order to raise it slightly (11cm) above the rock without being significantly affected by the wind. Satellite data was recorded for 50 minutes, which is easily long enough to obtain a height that is accurate to 0.1m or better. The data was later processed using Leica software and OS Rinex data from eight OSNet base stations. Ideally base stations used should be within 80km of the survey point, but at this location there are only four base stations within 80km. Despite this, all eight base stations produced good-quality data and so all eight were usable:

Base station	km away	Height
CAML	94	763.525
DRUM	92	763.475
EDIN	101	763.512
GIRA	102	763.486
GLAS	49	763.575
KILN	46	763.484
LOCG	40	763.527
OBAN	49_	763.561
	Mean:	763.52

Cnoc Coinnich result:

Summit: 763.5m

Summit gridref: NN 23351 00754 Summit feature: Large rock outcrop Summit survey time: 50 minutes Antenna height at summit: 0.11m

Estimated margin for error at summit: 0.01m

The survey result clearly showed that Cnoc Coinnich is over 762m high and it was therefore removed the list of Grahams. Data from all eight base stations gave figures within 5cm of the mean of 763.52cm, showing a remarkable degree of consistency in unfavourable conditions and with only four base stations within 90km of the summit. The col for Cnoc Coinnich was not surveyed on this occasion as it was not on the route taken via The Steeple. Before leaving the summit, a new cairn was built just next to the highest point but not covering it, using several of the rocks from the dismantled cairn.



Approaching the summit of Cnoc Coinnich from the south

Beinn Reithe

Beinn Reithe is a significant hill 2.5km south of Cnoc Coinnich, approached via an undulating ridge, steep and rocky in places but mostly grassy, giving excellent walking. It is shown as 653m on OS Landranger map 56. This is the height of the OS trig pillar, but larger-scale maps show a height of 655m north of the pillar.

The purpose of the survey was to establish the location of the summit and also the relative height of the hill. The col was surveyed first as it was on the way to the summit. Once the summit area had been reached it was obvious that the trig pillar was not on the summit, but two points were surveyed anyway in order to confirm the result and measure the difference. Data collection times were kept short as satellite coverage was good at the time and the GPS controller showed the coordinate quality at col and summit to be excellent. During later data processing, all eight base stations produced good-quality data for both col and summit, and seven base stations for the alternative summit - a rock next to the trig pillar.

Base station	km	Col	Summit	Rock by Trig
CAML	94	524.534	656.283	653.967
DRUM	92	524.478	656.184	653.904
EDIN	101	524.506	656.214	653.899
GIRA	102	524.517	656.255	653.952
GLAS	49	524.524	656.219	653.908
KILN	46	524.439	656.209	
LOCG	40	524.514	656.248	653.988
OBAN	49	524.563	656.271	653.971
	Mean:	524.51	656.24	653.94

For each of the three survey points, data from at least seven base stations gave figures within 5cm of the mean, showing a high degree of consistency even though only four base stations were within 90km.

Beinn Reithe result:

Summit height: 656.2m

Summit gridref: NS 22934 98581 Summit feature: Large rock Summit survey time: 21 minutes Antenna height at summit: 0.21m

Estimated margin for error at summit: 0.01m

Col height: 524.5m Col gridref: NS 2238 9967 Col survey time: 18 minutes Antenna height at col: 0.71m Relative height: 131.7m



Trig pillar on Beinn Reithe

The Saddle

The Saddle is a distinctive rocky and knobbly hill 4km south of Cnoc Coinnich. It is shown as 521m high on OS maps. The main purpose of the survey was to find out the relative height of The Saddle. If it turned out to have a relative height of 100 metres or more then it would qualify as a Hump (a hill of any height with 100 metres prominence). The col was surveyed first as it was on the way to the summit. The cairn on the summit area was left untouched as it was a neat-looking well-built cairn that was not quite on the highest visible rock.

Light was fading by the time the hill was reached, so data collection times were kept very short in order to avoid benightment. The vegetation around The Saddle is rough and deep in places, and the long walk back to Lochgoilhead through the trees would be easier in the fading light of dusk than with a headtorch in the dark. Extensive previous experience had shown that a survey time as short as ten minutes could produce good-quality and reliable data in favourable conditions. The GPS controller indicated that coordinate quality was reasonably good after just ten minutes, and subsequent data processing confirmed this to be the case.

	Mean:	423.68	520.60
OBAN	49	423.688	
LOCG	40	423.678	520.624
KILN	46	423.647	520.561
GLAS	49	423.681	520.618
GIRA	102	423.676	520.608
EDIN	101	423.676	520.594
DRUM	92	423.661	520.595
CAML	94	423.715	
Base station:	km	Col	Summit

For the col, data from all eight base stations gave figures within 4cm of the mean, while for the summit six base stations gave figures within 4cm of the mean, again showing a high degree of consistency even though only four base stations were within 90km and satellite data was recorded for only ten minutes.

The Saddle result:

Summit height: 520.6m

Summit gridref: NS 22584 96927 Summit feature: Rock near cairn Summit survey time: 10 minutes

Col height: 423.7m Col gridref: NS 2271 9711 Col survey time: 10 minutes Relative height: 96.9m

The survey showed that The Saddle has a relative height of less than 100 metres and is therefore not eligible for classification as a Hump.



The Saddle in evening light