Magnetic Declination: Δ

Magnetic North: MN

True North: $TN = MN - \Delta$

Polarisation Readings:

$$s_1 \qquad\qquad s_2$$

$$a_1 = \frac{1}{10^{s_1}+1} \qquad a_2 = \frac{1}{10^{s_2}+1}$$

$$b_1 = 1-2a_1 \qquad b_2 = 1-2a_2$$

$$c = \begin{cases} -\sqrt{3}\tan(2\phi - \frac{\pi}{3}) \\ -\sqrt{3}\tan(2\phi - \frac{\pi}{3}) \end{cases}$$

Solar Azimuth:

$$\phi = \frac{\arctan(-\frac{c}{\sqrt{3}}) + \frac{\pi}{3})}{2}$$

$\phi =$ *Solar Azimuth*

Solar Altitude:

$$\tan(h_s) = \frac{\sqrt{2}\sin(s_1 - s_2)}{\sqrt{\left[\frac{-\sqrt{2}\sin(s_1+s_2)}{2}\right]^2 + \left[\cos(s_1)\cos(s_2)\right]^2}}$$

$$h_s = \arctan\left[\frac{\sqrt{2}\sin(s_1 - s_2)}{\sqrt{\left[\frac{-\sqrt{2}\sin(s_1+s_2)}{2}\right]^2 + \left[\cos(s_1)\cos(s_2)\right]^2}}\right]$$

$h_s =$ *Solar Altitude*

Declination Angle:

$$\delta = 23.45\frac{\pi}{180}\sin\left[\frac{2\pi(284+n)}{36.25}\right]$$

$n = day$

LATITUDE:

$$\cos(\phi) = \frac{\sin(\delta) - \sin(h_s)\sin(LATITUDE)}{\cos(h_s)\cos(LATITUDE)}$$

Hour Angle:

$$\omega = \sin^{-1}\left[\frac{-\cos(h_s)\sin(\phi)}{\cos(\delta)}\right]$$

LONGITUDE:

$$LONGITUDE = \omega - (UTI + E) * 15 + 180$$