The general running fix requires finding positions P_1 and P_2 that satisfy the following conditions

1) P_1 lies on LoP_1
2) P_2 lies a distance D from P_1 along a rhumb line course with bearing C.
3) P_2 lies on LoP_2

The required fix is given by P_2. In general it is to be expected that two geographically widely separated sets of points can be found to satisfy these conditions. A similar situation arises in double altitude sights. A reasonable initial estimate of position ensures that the correct solution is selected.

Assume a value L_1 for the latitude of position P_1 and find the corresponding longitude, λ_1, such that P_1 lies on LoP_1 using the equation

$$\lambda_1 = -\mathrm{GHA}_1 \pm \cos^{-1}\left(\frac{\cos ZD_1 - \sin\delta_1 \sin L_1}{\cos\delta_1 \cos L_1}\right)$$

The upper (lower) sign applies when the object lies to the observer's west (east). This formula follows from the familiar cosine rule of spherical trigonometry.

Compute the position P_2, with latitude L_2 and longitude, λ_2, located a distance D along a rhumb line course of bearing C from P_1. This is the direct Mercator sailing problem which can be solved, in principle, using the equations

$$L_2 = L_1 + \left(\frac{D}{a}\right)\cos C \tag{1}$$

$$\lambda_2 = \lambda_1 + \left(\mathrm{MP}\left(L_2\right) - \mathrm{MP}\left(L_1\right)\right)\tan C \tag{2}$$

Here a is the Earth's radius and $\mathrm{MP}(\phi)$ is the meridional part

$$\mathrm{MP}\left(\phi\right) = \ln\left(\tan\left(\frac{\pi}{4} + \frac{\phi}{2}\right)\right)$$

When $L_2 = L_1$ eq.(2) becomes

$$\lambda_2 = \lambda_1 + \left(\frac{D}{a}\right)\sec L_1$$

Having obtained L_2 and λ_2 for position P_2 from eq.(1) and (2) compute the quantity

$$\mathrm{f} = \sin\delta_2 \sin L_2 + \cos\delta_2 \cos L_2 \cos\left(\lambda_2 + \mathrm{GHA}_2\right) - \cos ZD_2$$

P_2 lies on LoP_2 when $\mathrm{f}(L_1) = 0$ and the 3 conditions listed above will all be satisfied. The starting value L_1 can be adjusted iteratively using standard methods for finding the root of a function of one variable. Convergence is expected to be rapid provided the intersection angle between the LoP's is not too small which is a standard requirement for reliable fixes.

In this procedure the path between P_1 and P_2 is a single rhumb line but it could equally be constructed from multiple rhumb line legs by the repeated application of eq.(1) and (2).