

## Network Rank and Datum Defects

A network containing a datum defect (insufficient datum definition or rank defect) cannot be adjusted. The table below shows the datum parameters required, and the constraints necessary to correct rank defects, for various types of networks.

Type of Network	Observation type	Position			Rotation			Scale	Datum Parameters Required	Defined by Obs	Datum Defects	Minimum Constraints to Fix
		X	Y	Z	X	Y	Z					
<b>1D Level Network</b>	Height Diff	-	-	x	-	-	-	y	2	1	1	1 Height
<b>2D Trilateration</b>	Horiz. Dist	x	x	-	-	-	x	y	4	1	3	1 (X,Y) plus 1 X or 1 Y
<b>2D Triangulation</b>	Azimuth	x	x	-	-	-	y	x	4	1	3	2 (X,Y) or 1 (X,Y) + 1 X, Y or Dis
<b>2D Triangulation</b>	Horiz. Angle / Direction	x	x	-	-	-	x	x	4	0	4	2 (X,Y) or 1 (X,Y) + 1 Az + 1 X, Y or Dis
<b>3D Terrestrial</b>	Spatial Distance	x	x	x	x	x	x	y	7	1	6	2 (X,Y,Z) or 1 (X,Y,Z) + ZA, Az etc
<b>3D Terrestrial</b>	Zenith Angle	x	x	x	y	y	x	x	7	2	5	1 (X,Y,Z) + ZA, Az Sp.Distance etc
<b>3D GPS</b>	GPS Vector	x	x	x	y	y	y	y	7	4	3	1 (X,Y,Z)
<b>3D GPS</b>	GPS Coordinate	y	y	y	y	y	y	y	7	7	0	None

where: Height = Fixed height

(X,Y) = Point fixed horizontally in X & Y

(X,Y,Z) = Point fixed horizontally in X & Y and vertically in Z (or Height)

X = Fixed X coordinate component

Y = Fixed Y coordinate component

Z = Fixed Z (or Height) coordinate component

Az = Fixed azimuth

Dis = Fixed horizontal distance

Sp.Distance = Fixed spatial/slope distance

ZA = Fixed zenith/vertical angle