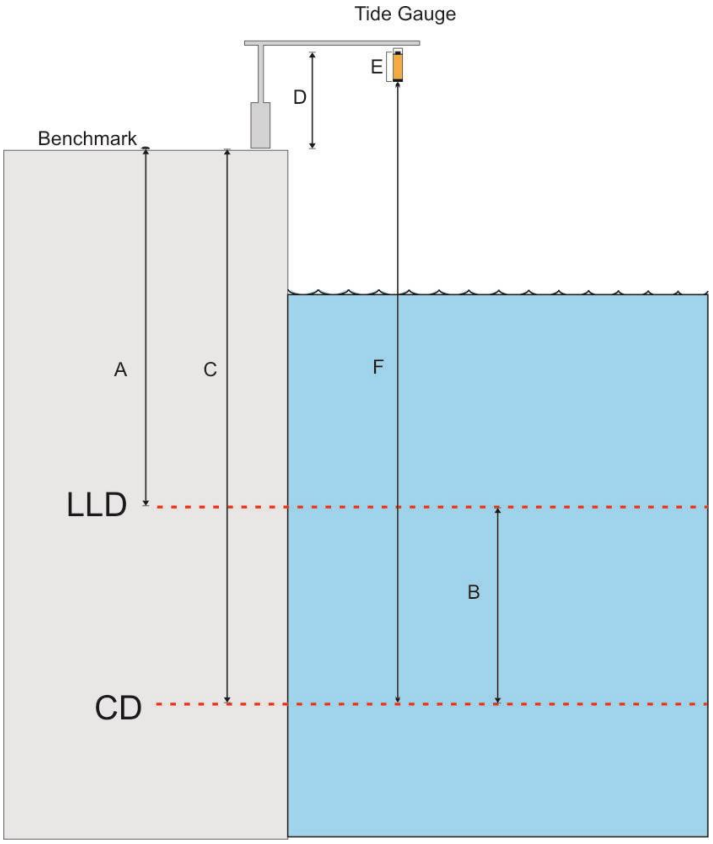
Determining the Tide Gauge Zero and Calibrating an altimeter type tide gauge

Ruth Farre (BSc. Cert. Nat. Sci.)
South African Navy Hydrographic Office, Private Bag X1, Tokai, 7966
Contact person: R. Farre (hydrosan@iafrica.com)

The method of using a set of stirrups to calibrate a tide gauge can be seen not only as checking of the accuracy of the equipment in situ, but that of your data as well. Upon installation a reference level or *Tide Gauge Zero* need to be set into the logger. This reference level can be established either in the field, or a temporary level can be calculated and set into the logger before installation.

Using the following diagram a basic idea of what the reference level should be can be calculated



A = Height of a nearby benchmark above Land Levelling Datum (LLD)
B = Chart Datum (CD)/ LAT below LLD
D = The difference between the local benchmark and the height of the top of the transducer. (before installation this would be the height of the davit or structure)
E = The length of the transducer to the face

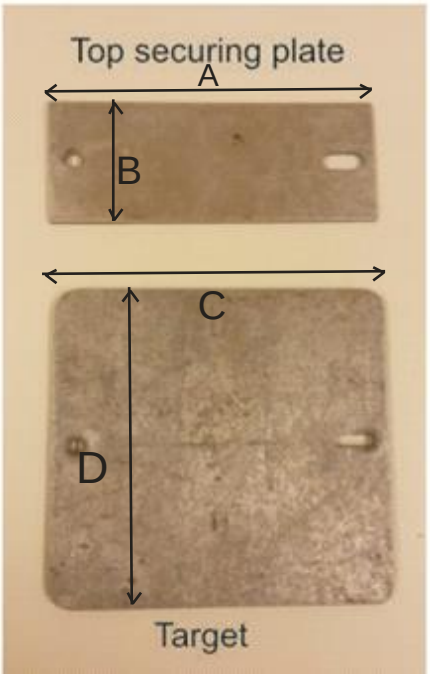
Thus C = A + B which is the Height of the benchmark above CD

So the temporary reference level or tide gauge zero could be calculated as being

$$C + D - E = F$$

To confirm the reference level, as well as calibrate the equipment, a set of calibrating stirrups can be used. The stirrups should be made up of 1m length poles that screw into one another. The total length required will depend on the maximum range experienced in your country, and can be made up of carbon fibre or thin stainless steel or aluminium tubing. The lighter the material that they are made up from the better as you do not want a large weight balancing on top of the transducer, shifting its level position or damaging it. A stainless steel plate can be used as a target that will be suspended below the transducer. Calibration should always be done at Spring Low tide so as to be able to establish accuracy over a large range.

Stirrup Poles screw together to increase and decrease length

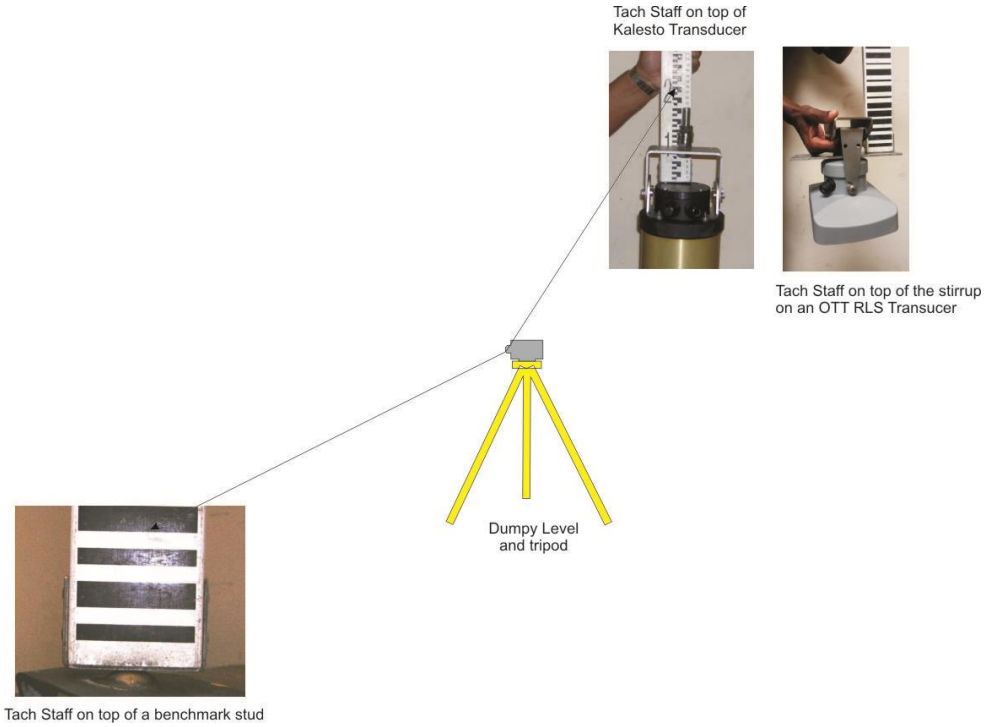


Target bolted to the calibrating rods

A = 23cm
B = 8cm
C = 22cm
D = 22cm

The following process should be followed in order to calibrate the equipment *in situ*

1. Using a dumpy level and tach staff get the “ground height” of the benchmark nearest the tide gauge. Make sure you have the true height of the benchmark above LLD (Ordinance Datum/ MSL). Make sure that your tripod and dumpy level are equidistant between the transducer and the benchmark.

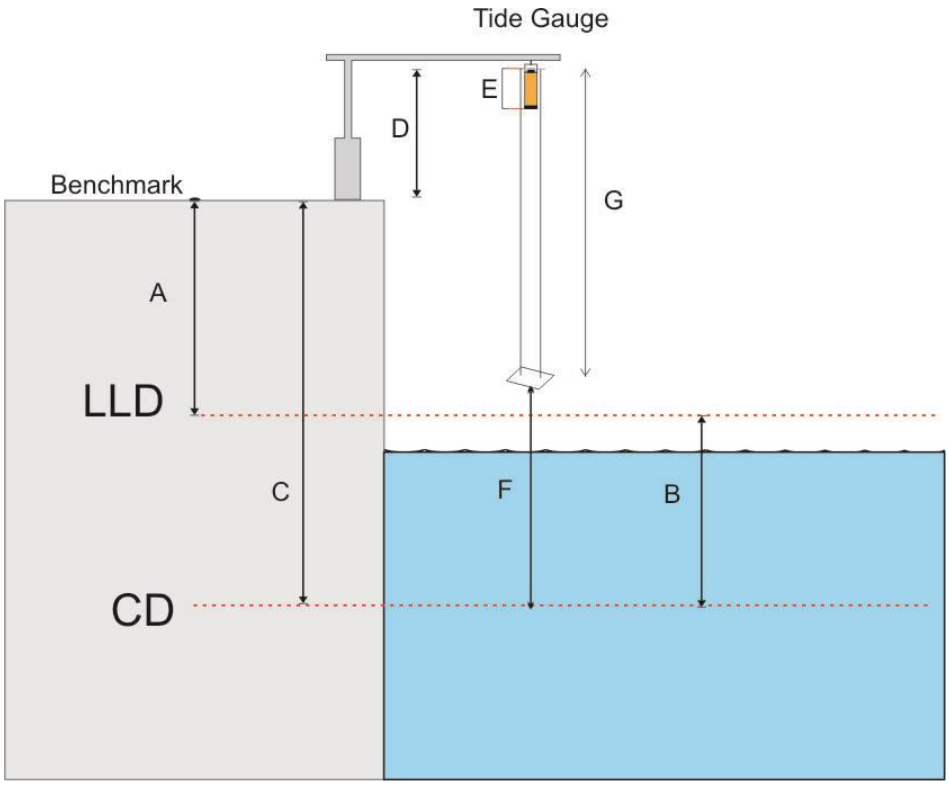


2. Using the dumpy level and tach staff get the “ground height’ of the transducer.

3. Deploy the stirrups at its longest length to simulate Spring Low tide.

Calibrating Stirrups deployed below the transducer

4. Calculate what the tide gauge should be reading the height of the target at.



D = is now the difference in “ground height” between the benchmark and the top of the transducer.
G = Length of the rods of the stirrups

Height of Benchmark above MSL	A
Add: Difference between benchmark and top of the transducer	D
Less: length of transducer from the top to the transducer Face	E
Less: thickness of top calibration plate	0.005
Thus the transducer face above LLD is	A+D-E-0.005
Add: the relationship between CD and LLD	B
The height of tide gauge reference face above CD	A+D-E-0.005+B

Let us now say that A+D-E-0.005+B = Y,

∴ The tide gauge (TG) should read @ long stirrups = Y- (G - E)

F = Y- (G - E)

5. Allow the logger to record at least 30 minutes worth of 1 minute values. However if a longer time period can be achieved the accuracy of your calibration increases and should be taken advantage of.

6. Download the data from the logger and obtain the average of the 1 minute readings. Compare this average with the value you calculated for F.

a. If the TG is reading a value less than F you need to ADD the difference between the average reading and F to the reference level/ Tide Gauge zero.
b. If the average reading is greater than F, remove the difference from the reference level.
c. If the Average TG reading and F are the same, no adjustments need to be made to the reference level.

If you have made any adjustments to the reference level repeat step 5 and 6 until no more adjustments need to be made.

7. Now shorten the stirrups to simulate high tide and repeat steps 4 through 6.

8. It is very important to make sure you note all this information and any changes to the reference level in your field notes that will be included in your Station file. Your TG is now calibrated.