

Memorandum on Calibration of Tipping Bucket Rain Gauge

*Calibrator is Integral part of Tipping bucket rain gauge
Maintain Accuracy of Precipitation Measurement*

Q: Why calibration?

Calibration helps with obtainment of high quality rainfall measurements of tipping bucket rain gauge which are the data sources for meteorological / hydrologic research / disaster mitigation.

Q: When calibration?

It is recommended to do calibration for the following statuses:

Maintenance on a regular basis; Annual / Every two year calibration; After high intensity rainfall event; In doubt about the accuracy of collected rainfall data

Q: How calibration?

Option	Action or reason	Cost	Issue
No TBRG calibration	No request	None	Either a higher cost or long periods with no valued data
Manual calibration	With a measuring cup pour water into the funnel and manual count the tips which allow of larger error range	Few	Under large uncertainty
Factory calibration or laboratory calibration	Wait for a schedule and the calibration is performed off-site with extra delivery cost	High	No idea that whether the error will be derived from Installation
Calibration on site with a portable field calibrator	Pour a known volume of water and the water will drip at a constant flow rate from the bottle into the rain gauge	Low	Desired tips of test vs. actual counts

Equip with a proper calibrator to perform Calibration in the field could get the accuracy of precipitation data at the prompt time.

Summary of available field calibrators

Model	Specification	Cost	Issue
H type Field Calibration Device	A preset volume of 653ml water Nozzles for various flow rates	\$310	Get the desired tips by a conversion table or calculator and then check the error band for verification. The nozzles of different size need extra high cost.
N type Rain Gauge Calibrator	Fill lines for of 150, 450, 750 ml water Nozzles for various flow rates	\$125	Need a conversion table and/or calculator to verify the counts. The orifices are easily damaged.
A type Precipitation Gauge Calibrator	A preset volume of 1000ml water A fixed flow rate at 25mm/hr	NA	Need a conversion table and/or calculator to verify the counts
Y type Rain Gauge Calibrator	Fill lines for of 250, 500, 750, 1000 ml water Graduated 1000 ml bottle Nozzles various flow rates	\$140	Need a conversion table and/or calculator to verify the counts
TW-270C Easy TBRG calibrator	A designed amount of water to produce a round number of tips can be obtained according to different fill lines with graduation marked on the bottle.	\$65	No need of tips conversion and the calculation mistake is reduced.
TW-271C Precise TBRG calibrator	A designed amount of water to produce a round number of tips	\$95	©No need of tips conversion and

	can be obtained with the spill from a bore on the neck of bottle. A rotation handle on the end of dispenser can switch flow rates easily.		the calculation mistake is reduced. ⊙ Convenient switch to various flow rates for dynamic calibration. ⊙ A “Last Tip” Cylinder for calibration data of high resolution.
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Low cost and easy operation design makes one calibrator for each rain gauge possible.

Summary of methods to get calibrator data

Option	Source / methods	Cost	Issue
Manual counting	By hearing the sound of bucket tipping	NA	
Counting with local Logger	Register the original counts in Logger or AWS and calculate the increments after calibration	NA	Have to reset or record the calibration event
Where no local display for calibration data on monitoring device			
Get Counts with Digital Event Counters	LCD 0.3"/0.2" high display with Reset Button for counting tips	US\$30/ US\$135	Only the total number of tips is available
Get Counts and Timely messages with dedicated TBRG Counter	LCD 10mm high displays counts, intervals and durations smartly	US\$75/ US\$105	the duration of contact closure help debugging and the time intervals between tips help proper rain gauge adjustment
Get Counts and Timely messages with dedicated TBRG Logger	Smart Logger with calibration function	NA	Monitoring system should have update on more intelligent functions.
Get Counts and Timely messages with dedicated TBRG Transmitter	Smart Rain Transmitter with calibration function	NA	Distance from Rain gauge to monitoring system can be 300~800m
Get Counts and Timely messages with dedicated Rainfall Intensity converter	Smart Rain Intensity converter with calibration function	NA	Rain gauge can be a standard RI gauge with precise RI data output.

In calibration, bucket tips can be counted manually or electronically. TWSI provides a digital counter with a 10mm high LCD which displays timely messages besides total tips counts.