The Calibrated Bicycle Method

1. Name this Course will be Known By ANNAPOLIS TEN MILE RUN
2. Advertised Race Distance 10 MILES
3. Location of Start ANNAPOLIS MD. (city, state) Finish (if different) _____ (city, state)
4. Person in Charge of Measurement:
   WILL SCOTT (name) 1024 HYDE PARK DR, ANNAPOLIS, MD (address) (301) 267-8013 (telephone)
5. Race Director (if course is measured for a specific race):
   PATRICK HOFFMAN (name) 34 WILLIAMS DR, ANNAPOLIS, MD (address) (301) 268-6092 (telephone)
6. Is this an application for **recertification** of a previously certified course? If so give the reason(s) for recertification. YES, COURSE MODIFIED DUE TO NEW TRAFFIC PATTERNS,

CALIBRATION OF BICYCLE

7. Did you calibrate the bicycle on a calibration course previously certified by the Road Running Technical Committee? YES (YES or NO)
   If YES, enclose a copy of the letter or certificate, and map, verifying RRTC certification of the calibration course.
   If NO, you must enclose an Application for Certification of Calibration Course.
8. Is your **bicycle calibration data sheet** attached? YES (YES or NO)
9. Did you include the factor of 1.001 in your calibration constant? YES (YES or NO)

SUMMARY OF MEASUREMENTS

10. Date(s) of measurements 7/15/89, 7/2/89
11. How many measurements of the course were made? FOUR
12. Name(s) of measurer(s) WILL SCOTT, DON KENNEDY
13. Exact length of course 9.75 MILES PLUS 52 FT. (PORTION MEASURED FOR CERTIFICATION. THE REMAINING 1/4 M WILL BE CHAINED OFF THE DAY BEFORE THE RACE)
14. Difference between longest and shortest measurements _____
15. Which measurement was used to establish the final race course and WHY? THE SUM OF THE SHORTEST MEASUREMENTS OF EACH INTERMEDIATE SPLIT POINT (MILE) AS DETERMINED USING THE WORKING CONSTANT.
16. Is your **course measurement data sheet** attached? YES (YES or NO)

COURSE LAYOUT AND MARKING

17. Is your **course map** attached? YES (YES or NO)

NOTE: The course map need not be to scale but must indicate direction of north. It must be in one color and fit on 8.5x11 paper. Descriptions of the **exact** positions on the **start, finish**, and all **turn-arounds** relative to permanent landmarks must be included on the map. Details of any restricted portions where cones and monitors are required must be detailed. Include a line representing the actual measured path.

18. List all intermediate **splits** (attach list describing the position of each relative to permanent landmarks).
19. How far from the curb (edge of pavement) did you measure on curves? AS CLOSE AS POSSIBLE ABOUT 6 TO 8 INCHES
20. If your course contains pairs of opposite turns (right-to-left or left-to-right) did you follow the shortest diagonal path? YES (YES or NO)
    If NO, attach a detail of the measured path.

The Calibrated Bicycle Method (continued)

21. Does your course contain any turn-around (double-back) points? NO (YES or NO) If YES, attach a detail of the measured path.

22. Does your course include any winding or "S" curved sections? YES (YES or NO) If YES, show, by attached example, how you chose the route you measured.

23. Are the runners to be restricted to a route longer than the shortest possible route for any portion of the race course? YES (YES or NO) If YES, attach a description of how you plan to insure that the runners follow the measured course.

24. Type of course (check one):

____ one loop ____ time(s)	____ same out/back ____ time(s)
✓ figure-8 1 time(s)	____ several out/back sections
____ partial loop	____ keyhole (out/loop/back)
____ complex of different loops	____ point-to-point

25. Straight-Line Distance (as the crow flies) between Start and Finish 300 FEET

26. Altitude of Race Course (above mean sea level):

start 30 FEET finish 20 FEET highest 60 FEET lowest 6 FEET

27. Total Climb (summation of all up-hill altitude changes) _____ (optional)

28. Type of surface (give percentages):

30% curbed streets	____ graded dirt road
69% uncurbed streets/roads	____ ungraded dirt road
____ concrete sidewalk	____ gravel road
____ concrete/brick streets/roads	____ undefined paved surface
____ paved bike path	____ undefined dirt surface
____ unpaved bike path	1% undefined grass surface
____ trail (single file)	____ track (curbed or uncurbed)

If your course includes any unpaved sections, please attach a detail of the method(s) used to measure such sections. THE LAST ¼ MILE WHICH WILL BE CHAINED OFF AND MARKED WITH LIME AND CONES THE DAY BEFORE THE RACE.

29. Is a description of the exact starting and finishing points (and any turn-around points, if any) attached? This description should include diagrams, including street names and taped distances from the start/finish points to near-by prominent landmarks, so that a stranger could find them. YES (YES or NO)

30. How did you mark the start and finish points (and turn-around points)?

PAINT

31. Did the same person ride the bicycle on both the calibration course and the race course for any given measurement? YES (YES or NO)

32. Were both the calibration and the race courses DRY during the calibration and measurement rides: YES (YES or NO)

33. Did you perform both the pre-measurement and post-measurement calibrations and the measurement of the race course on the same day? YES (YES or NO)

COURSE MEASUREMENT DATA SHEET

Name of Course or Race Name ANNAPOLIS TEN MILE RUN

Name of Measurer #1 WILL SCOTT — Working Constant #1 15518

Date 7/2/89 Start: Time 7:15 AM — Temperature 66°

Finish: Time 8:55AM — Temperature 68°

Name of Measurer #2 DON KENNEDY — Working Constant #2 15033

Date 7/2/89 Start: Time 7:15AM — Temperature 66°

Finish: Time 8:55AM — Temperature 68°

Measurement Data. Use the first measurement ride to lay out the start/finish points and all intermediate split points. Use the second ride to check the location of **those same points. Do not use two sets of marks!**

Measured Point	Counts for Measurer #1 Recorded	Counts for Measurer #1 Elapsed	Counts for Measurer #2 Recorded	Counts for Measurer #2 Elapsed
9 3/4 MILE	52317	—	10634	—
9	63956	11639	21917	11274
8	79474	15518	34950	15033
7	94992	15518	51983	15033
6	10510	15518	67016	15033
5	26028	15518	82049	15033
4	41546	15518	97082	15033
3	57064	15518	12115	15033
2	72582	15518	27148	15033
1	88100	15518	42181	15033
0	03618	15518	47214	15033

Preliminary Course Length	start-to-finish counts	divide by	working constant	=	measured length
Measurer #1	151301	/	15518	=	9.7500322
Measurer #2	146571	/	15033	=	9.7499501

Difference between lengths #1 and #2	divide by	length #1	=	Measurement comparison (less than 0.0008?)	(yes or no)
0.0000821	/	9.7500322	=	0.0000084	(YES)

IMPORTANT. Before you leave the course, compare the two measurements. They should agree to within 0.08%. If the two preliminary measurements do not agree to within 0.08%, something is wrong. Fix it! Then go to the calibration course and recalibrate.

If either of the **Constants for the Day** (for measurements #1 and #2) are **not** the same as the **Working Constant**, recalculate the length of the course here.

Final Course Length	start-to-finish counts	divide by	constant for day	=	length of course
Measurer #1		/		=	
Measurer #2		/		=	

The length of the race course as measured by the calibrated bicycle is the *lesser* of the two lengths calculated above. 9.7499501 MILES. THE LAST 1/4 M WILL BE CHAINED OFF THE DAY BEFORE THE RACE

Measured course length 9.7499501. Desired course length 9.75

Use a steel tape to add or subtract distance as required to bring the **minimum** length to the same value as the desired course length.

[illegible]thing: difference less than 1ft.

How much did you add or subtract, and where (start, finish, turn-around point)?

3 FT AT THE START ? 3[illegible] " SHORT

Note: You need not adjust intermediate split points unless certification is desired for those points as well. Did you adjust the intermediate points and, if so, how?

[illegible]

Date of Measurement 7/2/89

Name of Measurer Don Kennedy

1. Ride the calibration course 4 times, recording data as follows:

Ride	Start Count	Finish Count	Difference
1.	55708	63218	7510
2.	65739	73248	7509
3.	77898	85407	7509
4.	89573	97082	7509

Pre-measurement Average Count 7509

Time of Day 7:15 am

Temperature 66°

Length of Calibration Course _____

WORKING CONSTANT = Number of counts in one kilometer or one mile, calculated from Pre-measurement average count, and multiplied by **1.001 "safety factor".**

Working Constant = 7509 X 2 X 1.001 = 15033

2. Now, measure the course, including all intermediate distances, using the working constant. Enter data on the **"Course Measurement Data Sheet".**

3. Recalibrate the bicycle by riding the calibration course 4 times, recording data as follows:

Ride	Start Count	Finish Count	Difference
1.	75698	83207	7509
2.	85693	93203	7510
3.	95810	03320	7510
4.	05958	13467	7509

Post-measure Average Count 7509.5

Time of Day 8:55 am

Temperature 68°

FINISH CONSTANT = Number of counts in one kilometer or one mile, calculated from Postmeasure average count, and multiplied by **1.001 "safety factor"**

Finish Constant = 7509.5 X 2 X 1.001 = 15034

Constant for the Day = **Either** the Working Constant **or** the Finish Constant, whichever is the **larger**.

CONSTANT FOR THE DAY = 15033

Remember, each day's measurement must be preceded and followed by a calibration run. You may measure as much as you want in a day, just so calibration precedes and follows it in the same 24 hour period. This is done to minimize error due to changes in tire pressure from thermal expansion and slow leakage. Frequent recalibration "protects" the previous measurement. A smart measurer will recalibrate frequently—you never know when a flat tire is coming!

CONVERSION FACTOR: 1 mile = 1.609344 kilometers

Date of Measurement 7/2/89

Name of Measurer Will Scott

1. Ride the calibration course 4 times, recording data as follows:

Ride	Start Count	Finish Count	Difference
1.	31800	39550	7750
2.	42600	50351	7751
3.	52800	60552	7752
4.	67800	75551	7751

Pre-measurement Average Count 7751

Time of Day 7:15 am

Temperature 66°

Length of Calibration Course _____

WORKING CONSTANT = Number of counts in one kilometer or one mile, calculated from Pre-measurement average count, and multiplied by **1.001 "safety factor".**

Working Constant = 7751 X 2 X 1.001 = 15517.5

2. Now, measure the course, including all intermediate distances, using the working constant. Enter data on the **"Course Measurement Data Sheet".**

3. Recalibrate the bicycle by riding the calibration course 4 times, recording data as follows:

Ride	Start Count	Finish Count	Difference
1.	57100	64852	7752
2.	66900	74650	7750
3.	79500	87250	7750
4.	89800	97551	7751

Post-measure Average Count 7751.

Time of Day 8:55 am

Temperature 68°

FINISH CONSTANT = Number of counts in one kilometer or one mile, calculated from Postmeasure average count, and multiplied by **1.001 "safety factor"**

Finish Constant = 7751 X 2 X 1.001 = 15517.5

Constant for the Day = **Either** the Working Constant **or** the Finish Constant, whichever is the **larger**.

CONSTANT FOR THE DAY = 15518

Remember, each day's measurement must be preceded and followed by a calibration run. You may measure as much as you want in a day, just so calibration precedes and follows it in the same 24 hour period. This is done to minimize error due to changes in tire pressure from thermal expansion and slow leakage. Frequent recalibration "protects" the previous measurement. A smart measurer will recalibrate frequently—you never know when a flat tire is coming!

CONVERSION FACTOR: 1 mile = 1.609344 kilometers

COURSE MEASUREMENT DATA SHEET

Name of Course or Race Name ANNAPOLIS TEN MILE RUN

Name of Measurer #1 WILL SCOTT — Working Constant #1 15518

Date 7/15/89 Start: Time 6:30 AM — Temperature 69°

Finish: Time 8:05 AM — Temperature 71°

Name of Measurer #2 DON KENNEDY — Working Constant #2 15033

Date 7/15/89 Start: Time 6:30 AM — Temperature 69°

Finish: Time 8:05 AM — Temperature 71°

Measurement Data. Use the first measurement ride to lay out the start/finish points and all intermediate split points. Use the second ride to check the location of **those same points. Do not use two sets of marks!**

Measured Point	Counts for Measurer #1 Recorded	Elapsed	Counts for Measurer #2 Recorded	Elapsed
9 3/4 MILE	38176	—	73217	—
9	49815	11639	84492	11275
8	65333	15518	99525	15033
7	80851	15518	14558	15033
6	96369	15518	29591	15033
5	11887	15518	44624	15033
4	27405	15518	59657	15033
3	42923	15518	74690	15033
2	58441	15518	89723	15033
1	73959	15518	04756	15033
0	89477	15518	19789	15033

Preliminary Course Length	start-to-finish counts	divide by	working constant	=	measured length
Measurer #1	151301	/	15518	=	9.7500322
Measurer #2	146572	/	15033	=	9.7500166

Difference between lengths #1 and #2	divide by	length #1	=	Measurement comparison (less than 0.0008?)	
0.0000156	/	9.7500322	=	0.0000015	(~~YES~~) [yes or no]

IMPORTANT. Before you leave the course, compare the two measurements. They should agree to within 0.08%. If the two preliminary measurements do not agree to within 0.08%, something is wrong. Fix it! Then go to the calibration course and recalibrate.

If either of the **Constants for the Day** (for measurements #1 and #2) are **not** the same as the **Working Constant**, recalculate the length of the course here.

Final Course Length	start-to-finish counts	divide by	constant for day	=	length of course
Measurer #1		/		=	
Measurer #2		/		=	

The length of the race course as measured by the calibrated bicycle is the *lesser* of the two lengths calculated above. 9.7500322 MILES. THE LAST ¼ MILE WILL BE CHAINED OFF THE DAY BEFORE THE RACE.

Measured course length 9.7500322. Desired course length 9.75 MILES

Use a steel tape to add or subtract distance as required to bring the **minimum** length to the same value as the desired course length.

How much did you add or subtract, and where (start, finish, turn-around point)?

Note: You need not adjust intermediate split points unless certification is desired for those points as well. Did you adjust the intermediate points and, if so, how?

NO.

Date of Measurement 7/15/89

Name of Measurer Don Kennedy

1. Ride the calibration course 4 times, recording data as follows:

Ride	Start Count	Finish Count	Difference
1.	16600	24108.5	7508.5
2.	34300	41809	7509
3.	77900	85409.5	7509.5
4.	91200	98708	7508

Pre-measurement Average Count 7509

Time of Day 6:30 am

Temperature 49°

Length of Calibration Course _____

WORKING CONSTANT = Number of counts in one kilometer or one mile, calculated from Pre-measurement average count, and multiplied by **1.001 "safety factor".**

Working Constant = 7509 x 2 x 1.001 = 15033

2. Now, measure the course, including all intermediate distances, using the working constant. Enter data on the **"Course Measurement Data Sheet".**

3. Recalibrate the bicycle by riding the calibration course 4 times, recording data as follows:

Ride	Start Count	Finish Count	Difference
1.	41500	49010	7510
2.	52100	59611	7511
3.	63800	71311	7511
4.	74900	82409	7509

Post-measure Average Count 7510

Time of Day 8:05 am

Temperature 71°

FINISH CONSTANT = Number of counts in one kilometer or one mile, calculated from Postmeasure average count, and multiplied by **1.001 "safety factor"**

Finish Constant = 7510 x 2 x 1.001 = 15035

Constant for the Day = **Either** the Working Constant **or** the Finish Constant, whichever is the **larger**.

CONSTANT FOR THE DAY = 15033

Remember, each day's measurement must be preceded and followed by a calibration run. You may measure as much as you want in a day, just so calibration precedes and follows it in the same 24 hour period. This is done to minimize error due to changes in tire pressure from thermal expansion and slow leakage. Frequent recalibration "protects" the previous measurement. A smart measurer will recalibrate frequently—you never know when a flat tire is coming!

CONVERSION FACTOR: 1 mile = 1.609344 kilometers

Date of Measurement 7/15/89

Name of Measurer Will Scott

1. Ride the calibration course 4 times, recording data as follows:

Ride	Start Count	Finish Count	Difference
1.	13300	21051	7751
2.	31400	39151	7751
3.	76600	84352	7752
4.	97485	05235	7750

Pre-measurement Average Count 7751

Time of Day 6:30 am

Temperature 69°

Length of Calibration Course _____

WORKING CONSTANT = Number of counts in one kilometer or one mile, calculated from Pre-measurement average count, and multiplied by **1.001 "safety factor".**

Working Constant = $7751 \times 2 \times 1.001 = 15517.5$

2. Now, measure the course, including all intermediate distances, using the working constant. Enter data on the "**Course Measurement Data Sheet**".

3. Recalibrate the bicycle by riding the calibration course 4 times, recording data as follows:

Ride	Start Count	Finish Count	Difference
1.	57814	65564	7750
2.	70159	77910	7751
3.	79368	87119	7751
4.	90147	97899	7752

Post-measure Average Count 7751

Time of Day 8:05 am

Temperature 71°

FINISH CONSTANT = Number of counts in one kilometer or one mile, calculated from Postmeasure average count, and multiplied by **1.001 "safety factor"**

Finish Constant = $7751 \times 2 \times 1.001 = 15517.5$

Constant for the Day = **Either** the Working Constant **or** the Finish Constant, whichever is the **larger**.

CONSTANT FOR THE DAY = 15518

Remember, each day's measurement must be preceded and followed by a calibration run. You may measure as much as you want in a day, just so calibration precedes and follows it in the same 24 hour period. This is done to minimize error due to changes in tire pressure from thermal expansion and slow leakage. Frequent recalibration "protects" the previous measurement. A smart measurer will recalibrate frequently—you never know when a flat tire is coming!

CONVERSION FACTOR: 1 mile = 1.609344 kilometers