INTERNATIONAL
AMATEUR
ATHLETIC
FEDERATION

THE MEASUREMENT OF ROAD RACE COURSES

ACKNOWLEDGMENTS

The IAAF wishes to acknowledge the use of material first published by The Athletics Congress of the U.S.A. in their booklet "Course Measurement Procedures".

Also included in this booklet is material adapted from the work of Dr. Robert Baumel (USA), John Disley (GBR), Helge Ibert (GER), Lennart Julin (SWE), Wayne Nicoll (USA), Ted Paulin (AUS) and Pete Riegel (USA)

Joint Editors:
John Disley and Pete Riegel

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INTERNATIONAL AMATEUR ATHLETIC FEDERATION
3 Hans Crescent, Knightsbridge, London SW1X 0LN, England
Telephone: 071 581 8771

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THE MEASUREMENT OF ROAD RACE COURSES

INTRODUCTION

Over the past ten years road running has become the fastest growing aspect of the sport of Athletics.

Races are now staged in every major city in the world and the marathon has become the popular challenge for runners of all abilities. Whilst the elite runners at the head of the race are totally involved in winning the competition in a record breaking time, for the majority it remains a personal race against the clock that is of paramount importance. Attempting to break three or four hours, making a new "personal best" or just finishing the race is the challenge.

For this reason, the guaranteed accuracy of the "course length" is a vitally important condition of the organisation of a road race.

This booklet, *The Measurement of Road Race Courses,* is produced to amplify the basic instructions given under IAAF Rule 165 paragraph 3 in the "IAAF Handbook".

The IAAF would like to take this opportunity to thank the Association of International Marathons (AIMS) for its invaluable work in developing responsible attitudes to road-course measurement among its members and for developing the measuring techniques first instigated by the Road Racing Club of America and the Road Runners Club of England.

DR. PRIMO NEBIOLO
IAAF President

EXTRACT FROM THE IAAF HANDBOOK

RULE 165 — ROAD RACES

3. "In events on roads the course shall be measured along the shortest possible route that a competitor could follow within the section of the road permitted for use in the race.

   The length of the course must not be less than the official distance for the event. In meetings under Rule 12.1 (a), (b) and (c) and in races sanctioned directly by the IAAF the uncertainty in the measurement should not exceed 0.1% (i.e. 42 metres for the Marathon) and the length of the course should have been certified in advance by an IAAF approved course measurer.

   NOTE 1.—For measurement, the "Calibrated Bicycle Method" is recommended.

   NOTE 2.—To prevent a course from being found to be short on a future re-measurement, it is recommended that a "short course prevention factor" is built in when laying out the course. For bicycle measurements this factor should be 0.1% which means that each kilometre on the course will have a "measured length" of 1001 metres.

   NOTE 3.—If it is intended that parts of the course on race day will be defined by the use of non-permanent equipment such as cones, barricades, etc., their positioning must be decided not later than the time of the measurement and the documentation of such decisions must be included in the measurement report".

* * *

MEASUREMENT PROCEDURES

There are two basic measurement procedures used in the creation of a validated/certified road race course.

The first is the standard course "LAY-OUT" procedure. It is used when laying out a new race course. It is designed to ensure that the course will be validated when measured by a nominated National or IAAF Course Measurer.

If this *lay-out* procedure is followed properly it will produce a course that is slightly long but will be free of any doubts about its correct length when measured by an experienced official.

The second measurement procedure is the "VALIDATION" process and is used by the nominated "expert" when the course length is checked for validation and certification. This procedure is to determine, as closely as possible, the true length of the course.

COURSE LAY-OUT PROCEDURE

There are many known and accepted difficulties of accurate measurement on public roads in a variety of temperature and weather conditions. Therefore, the IAAF has set a "safety factor" that needs to be applied to all road course measurements.

This safety-factor is called the *"Short Course Prevention Factor–(SCPF)"*, and must be built-in to all course lay-outs. The factor is 1:1,000, so that a 10 kilometre race would be measured at 10,010 metres and a marathon at 42,237 metres.

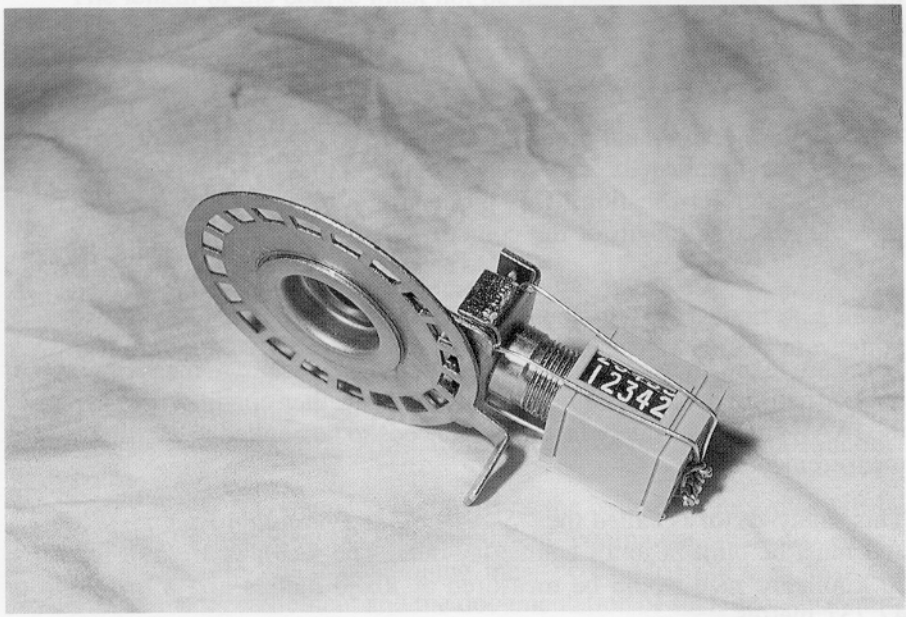
The method of applying the SCPF ensures that an "extra" metre is built into every kilometre of the course.

It is important to recognise that this "over-distance" is not necessarily a true reflection of the "actual" course length but it does guarantee that the actual length is *not less than the advertised course length.*

This procedure has been used to measure the major road race courses throughout the world over the past few years. During this time over 100 courses — all involving "record" performances, have been checked. Only one course failed the validation check. Without the short course prevention factor built into the lay-out, at least half the courses checked would have failed the test by the official course measurer.

THE BASIC STEPS

A *calibrated bicycle* is used to lay-out a race course. It is necessary to count the number of wheel revolutions very accurately. A *Jones Counter*, named after its inventor, Alan Jones, is used for this purpose. Mounted on the front wheel of the bicycle, it records 20 counts for each revolution of the wheel.

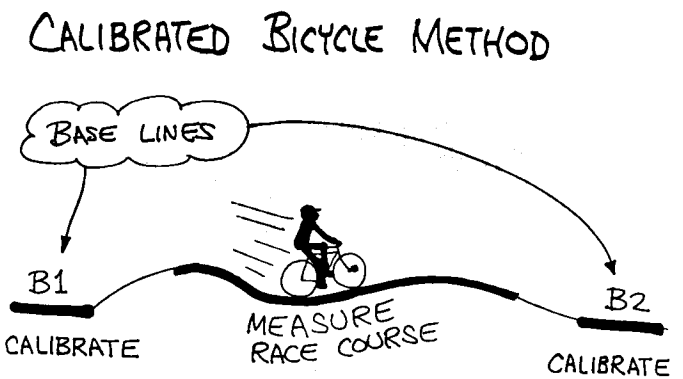


ALLSPORT/GRAY MORTIMORE

A Jones Counter which is mounted on the front wheel of the bicycle

The following steps are used in laying out a race course. They will be discussed at greater length elsewhere within this document:

1) Define the course itself. Know exactly what is to be measured and run.
2) Lay out a calibration course.
3) Calibrate the bicycle and calculate a layout constant, including the 1.001 short course prevention factor (referred to hereafter as "SCPF").
4) Lay out a tentative race course.
5) Recalibrate the bicycle and calculate a Constant for the Day.
6) Using the Constant for the Day, calculate the length of the tentative race course.
7) Make final adjustments. Add or subtract the necessary distance to make the course the correct distance.
8) Draw a clear course map. This map is the end result of all the work.



1. CREATE BASE LINE(S) WITH STEEL TAPE OR ELECTRONIC METER

2. BICYCLE B1 (4 TIMES)
3. BICYCLE RACE COURSE } SAME DAY
4. BICYCLE B2 (4 TIMES)

5. CALCULATE LENGTH

6. ADJUST COURSE AS REQUIRED

DEFINE THE COURSE

This is the most important step in measuring a race course. Before you can measure something, you must know what to measure. You will probably have a rough route in mind and you will know the streets that the runners will follow. Before you measure, decide how much of those streets will be available to the runners. Will they have the entire road, from kerb to kerb? Will they be kept to the right or left-hand side? Are there any places where the course crosses a grass or gravel area?

If runners are expected to stay to one side of the road, this may cause uncertainty in measuring corners. The precise route around each restricted corner must be defined by barriers on race day. It is the responsibility of the measurer to locate those barriers exactly.

The result of your work will be a map that shows the entire race course. The map should be good enough to allow a perfect stranger, using the map alone, to measure exactly where you did. If your course has many restrictions, they must all appear clearly on the map.

DO IT THE EASY WAY

The easiest way to define a course is to assume that the runners will have full use of the entire road, from kerb to kerb, or from kerb to solid central divider, if one exists. This leaves the measurer with no doubt as to where to measure. On race day, the Race Director may erect some barriers for safety, but this will only lengthen the course slightly.

If you lay out a course with many restrictions and barriers, it may measure short if the race organisation omits or misplaces the barriers. If a best performance is involved, a short course can be extremely embarrassing to the race organisation and the measurer. So try to keep the course design simple.

SHORTEST POSSIBLE ROUTE–FOLLOW THE STRETCHED STRING

Once you have defined the limits of the course, you are ready to measure. Your measured path must be the *Shortest Possible Route* (referred to hereafter as "SPR") within the limits of the course boundaries. Imagine how a stretched string would follow the course. Follow that imaginary string when you measure. Runners may swing wide on corners, but you should not attempt to measure what you think they will do. The exact SPR is the correct route to follow.

Measuring the SPR means hugging the inside edges of curves. The measured path should be 30 centimetres from the kerb or other solid boundaries of the running surface. Attempt to maintain this distance on curves and corners. On stretches between curves, the SRP takes the shortest possible straight path. It zig-zags from one edge of the road to the other, whenever necessary, to minimize the distance.

LAYING OUT A CALIBRATION COURSE

Use a steel tape to establish a calibration course close to the race course. The calibration course must be straight. A minimum length of 500 metres is recommended, but longer is better. A short calibration course nearby is better than a long one far away.

Use pieces of masking tape to stick on the pavement for marking. Put several numbers on the roll before you tear off tape for marking. This will prevent you from losing count of the tape lengths. Once you have stuck it down in the approximate position, use a narrow pen to make distance marks on the masking tape. Do not lose count! This is the most common source of error.

Check your steel tape carefully to be sure you know where the zero mark is. Not all tapes are the same. Pull the steel tape firmly to stretch it tight before marking.

The correct tension for your tape is usually marked on the tape winder or recorded on the tape box. For a nylon-clad steel tape the standard tension required is 20 Newtons or 2.0 kgf or 4.4 lbf. Once you have experienced the pull required to produce the correct tension, it is then acceptable to judge rather than measure that pull on future occasions.

When you have laid out the calibration course, add the appropriate correction for temperature. The reason for this addition is that steel tapes are accurate at 20°C. At colder temperatures they contract, becoming shorter. At warmer temperatures they expand, becoming longer. A short calibration course will lead to a short race course. When you finish, put a nail in the road, at each end of the calibration course, for future use.

CORRECTION FACTORS FOR CALIBRATION COURSES

Correction factors are in centimetres

	LENGTH OF CALIBRATION COURSE (METRES)						
DEG°C	400	500	600	700	800	900	1000
35°	-7	-9	-10	-12	-14	-16	-17
30°	-5	-6	-7	-8	-9	-10	-12
25°	-2	-3	-3	-4	-5	-5	-6
20°	0	0	0	0	0	0	0
15°	2	3	3	4	5	5	6
10°	5	6	7	8	9	10	12
5°	7	9	10	12	14	16	17
0°	9	12	14	16	19	21	23
-5°	12	15	17	20	23	26	29
-10°	14	17	21	24	28	31	35

Example: You lay out a 600 metre calibration course at 10°C. To correct for temperature, add 7cm to the length before you put down permanent marks. If the temperature is 25°C, remove 3cm before putting down final marks.

Use the bicycle to check that you have not made a major mistake. The counts obtained on the calibration course should be very close to counts obtained on other calibration courses. If you are riding an unfamilar bicycle, obtain the count on a single tape length. Use it to check the length of the entire calibration course. The calibration values should be close.

An error at this point in the measurement process will lead to serious consequences later. Check, check, check!

CALIBRATING THE BICYCLE

OBTAINING A LAY-OUT CONSTANT

Begin at one end of the calibration course. You will be making four rides — two in each direction. Set the counter to a number of your choice and record it. Start with the recorded count. Ride to the other end of the calibration course, stop, and record the count again. Lock the wheel with the hand brake, turn the bicycle around, and set it down exactly on the mark. Ride back to where you started and record the count again. *Repeat the operation.*

Now you will be back where you started and will have five recorded numbers. If you do not wish to lock the hand brake each time, you may begin each calibration ride with a new number. As an example, using a 600 metre calibration course, Jack and Jill obtain calibration values as follows:

	JACK		JILL	
	Recorded Count	Elapsed Count	Recorded Count	Elapsed Count
Start Count	12000		24000	
End first ride:	17554.5	5554.5	29502	5502
End second ride:	23111.5	5557	35001	5499
End third ride:	28667	5555.5	40503	5502
End fourth ride:	34221.5	5554.5	46003.5	5500.5
Average counts for 600 metres	=	5555.375		5500.875
Counts for 1 kilometre	=	9258.96		9168.125
Counts/km with 1.001 SCPF	=	9268.21		9177.29
Rough layout constant	=	9268		9177

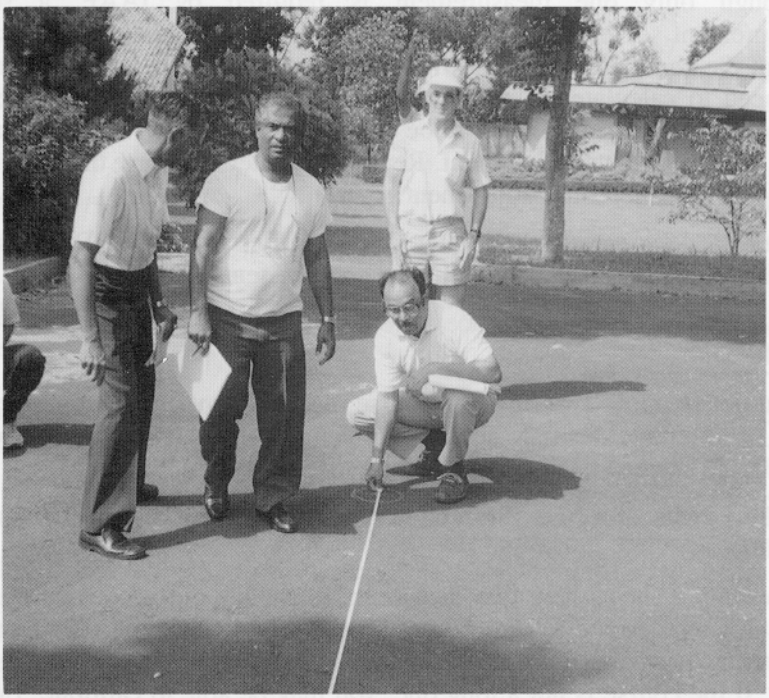
Use rough lay-out constant for establishing a tentative race course. Exact values will be used in final calculation.

Once you have obtained a lay-out constant, lay out the race course. When you have finished, return to the calibration course and repeat the calibration procedure to obtain a post-calibration constant and a *Constant for the Day.* To minimize calibration change, the calibration, measurement and re-calibration should be done in as short a time as possible.

POST CALIBRATION

	JACK		JILL	
	Recorded Count	Elapsed Count	Recorded Count	Elapsed Count
Start Count	38000		82000	
End first ride:	43559	5559	87500.5	5500.5
End second ride:	49116.5	5557.5	92999.5	5499
End third ride:	54675.5	5559	98498.5	5499
End fourth ride:	60233	5557.5	1,03999	5500.5
Average counts for 600 metres	=	5558.25		5499.75
Counts for 1 kilometre	=	9263.75		9166.25
Counts/km with 1.001 SCPF	=	9273.01		9175.42

Constant for the Day — use the *average* of the pre-calibration and post-calibration constants	JACK	JILL
	9270.61	9176.35



Laying out a Calibration Course at an IAAF Measurement Seminar in Jakarta, Indonesia

LAYING OUT A RACE COURSE

Once you have calibrated the bicycle, you will have determined a *Lay-out Constant.* Use this constant to lay out the race course.

Go to one end of the course. Either end will do — provided you follow the correct line, direction of measurement does not matter. Look at your Jones Counter. Rotate the wheel until the counter reaches a value you would like to use as a starting point.

Calculate how many counts it will take to cover the various split points you wish to lay down on the course. Add these to the starting count. When you have finished calculating you will have listed the proper count for each split point.

Ride along the course, stopping at the pre-calculated counts. Make a mark on the road at each place you stop. Record the location of the mark for later documentation. When you reach the end, you will have established a tentative race course.

Although only one measurement is required by IAAF, a second measurement serves as a check against mistakes. The second rider should stop at the *same* points laid down by the first rider. The second rider does not need to calculate his own split points, although this does serve as a check. Exact agreement is *not* to be expected. *Do not shift the marks* at this point when you see disagreement. Read the counter and leave the mark alone until it is time for final adjustment.

Re-calibrate the bicycles and determine the Constant for the Day. Use this constant to calculate the official length of the tentative course.

Finally, add or subtract distance as required to make the course the correct length.

If you decide to do two or more course measurements, you may repeat the ride, or another rider may accompany you. Each rider must use a bicycle that has been calibrated and ridden by that person.

See the **Layout of a Marathon Course** for an example of how the numbers will appear.

The example shows how two measurers might lay out a course. A single measurer may do the job by riding the course twice. Remember that each measuring occasion must be preceded, and followed, by four calibration rides. If the course is not a long one, you may be able to calibrate, ride the course twice and then re-calibrate. Since a flat tyre will destroy your calibration, it is wise to re-calibrate frequently to protect previous work.

LAY-OUT OF A MARATHON COURSE (42.195 KM)

JACK'S LAY-OUT			JILL'S LAY-OUT		
Constant	=	9268 counts/km	Constant	=	9177 counts/km
1km	=	9268 counts	1km	=	9177 counts
5km	=	46340 counts	5km	=	45885 counts
2.195km	=	20343 counts	2.195km	=	20144 counts

Course Lay-out — Jack lays down the marks. Jill stops at Jack's marks and records each number on her Jones Counter.

	JACK		JILL	
Point	Counter Reading	Interval Counts	Counter Reading	Interval Counts
Start	17000	0	43000	0
1km	26268	9268	52178	9178
5km	63340	37072	88873	36695
10km	1)09680	46340	1)34734	45861
15km	1)56020	46340	1)80610	45880
20km	2)02360	46340	2)26504	45890
25km	2)48700	46340	2)72367	45863
30km	2)95040	46340	3)18237	45870
35km	3)41380	46340	3)64125	45888
40km	3)87720	46340	4)09982	45857
42.195km	4)08063	20343	4)30103	20121
Total counts =		**391063**		**387103**

Check for agreement between
Jack's distance = 391063 ÷ 9268 = 42.1950km
Jill's distance = 387103 ÷ 9177 = 42.1819km
Difference = 13.1m

NOTE: These are *not* final values. Do not adjust any marks at this time!

Jack and Jill now re-calibrate their bicycles. When they have finished, they obtain the following *Constants for the Day:*
Jack : 9270.61 counts per kilometre
Jill : 9176.35 counts per kilometre

REMEMBER: The Constant for the Day is the *average* of pre-calibration and post-calibration

Now they *calculate their official measured distances:*
Jack: 391063÷9270.61=42.1831km
This is the *Official value,* since it is the *lower* of the two measurements.
Jill: 387103÷9176.35=42.1849km

Length of course before final adjustment = 42183.1 metres
Desired length of course = 42195 metres
Final Adjustment: (42195 minus 42183.1) = **add 11.9 metres to course.**

COURSE CHECK BY AN IAAF APPROVED COURSE MEASURER

IAAF COURSE MEASUREMENT SEMINARS

The IAAF has successfully staged several measurement seminars and will continue to provide leadership in this area by conducting future seminars around the world.

The objectives of the IAAF COURSE MEASUREMENT SEMINARS are to introduce and teach, in a practical manner, the principles and skills of using the bicycle method of measuring road race courses. The delegates attending the courses, nominated by their National Federations, are expected to take back their newly acquired expertise and develop, through their own teachings, a group of measurers within their own countries.

CERTIFICATION AND VALIDATION

Courses used for IAAF Events, and other major international races, should be certified in advance by an IAAF Approved Course Measurer.

This is best done several days before the event is held when the road system is finalized and all road works around the course are completed.

The Official Measurer will "certify" the course if he* finds it conforms to IAAF Rules for Road Races (Rule 165.3).

If the course length is incorrect the IAAF Measurer, the "validator", will advise on how the course distance can be adjusted to conform to IAAF Rules. The validator will also witness the race, from the lead car, to ensure that the course run by the athletes follows the same course that was measured and approved. He will check that the corners are barriered as shown on the official map of the course and that the runners only have access to the road surface as indicated on the map.

In this way, if a best performance is achieved, there will be no doubt about its validity. The official measurer can then "validate" that the performance was run on a certified course conforming to IAAF Rules.

BEST PERFORMANCES SET ON A NON-CERTIFIED COURSE

If a "Best Performance" is set on a course that has not been checked by an approved IAAF Course Measurer before the race, then it will be necessary for a post-race measurement to be made.

Without substantial visual evidence of the route taken by the runners, ie. television film or video, it will be very difficult for the measurer to make a satisfactory check of the course.

If the course is found to be short, the performance will not be recognised as a best performance.

**Where appropriate in this booklet, the masculine shall include the feminine.*

The validator will use the following procedure to check the course and the conduct of the race on the day of the performance:—

1) Review existing course maps and consult with the Race Director and witnesses to the race. Videotapes of the race may be used. This is done to determine the exact course that was used. If the exact course cannot be determined, the process will end and the performance will not be recognised as a "Best Performance".

2) Once the exact course is determined, the validator will establish a calibration course and calibrate his bicycle. He will ride the race course and obtain a measurement of its length. He will then re-calibrate his bicycle.

3) He will use the *average* of the pre-measurement calibration and the post-measurement calibration to determine a constant. The 1.001 SCPF will not be added. The constant may be adjusted to account for unusual conditions if it is felt that such conditions exist. Otherwise, the average will be used.

4) He will divide the counts obtained on the race course by the calibration constant. This will yield a measured length for the course.

5) If the measured length is less than the nominal length of the course, the performance will not be ratified.

6) If the measured length shows the course to be at least as long as it is supposed to be and, if evidence of correct timing can be obtained, the performance may then be considered as valid.

ALLSPORT

Ingrid Kristiansen of Norway (middle) on her way to setting a Womens Marathon World Best Performance of 2:21.06 during the 1985 London Marathon

THE COURSE MAP

It makes no sense to measure something unless you document what you measured. If this is not done correctly, the measurer will be the only person who knows where the course is supposed to go, or where it begins and ends. Paint on the pavement is not enough. The map should be good enough so that the Race Director could re-establish the course, even if the roads were re-paved.

Drawing a good course map is just as important as measuring the course accurately. The purpose of the map is to provide all information that race officials need to correctly use the course as it was laid out.

The map must show clearly the course route and all the streets and roads it uses. Include all necessary notes to make the route totally clear. Good maps are usually not drawn to scale. Portions may be enlarged or distorted to show details, such as when a course begins or ends in a stadium.

The map must describe precisely the positions of the start, finish and any turn-around points, using taped distances from nearby permanent landmarks. These descriptions must be clear enough to enable a complete stranger to re-locate accurately the points, even after the road has been resurfaced and all the markings you made on the road have disappeared.

If you laid out the course so that runners have use of the entire road, the map will be simple to draw. It will also be easy for the Race Director to set up the course correctly on race day.

If the route is restricted (whole road not available), the map must show exactly how the runners are to be guided onto the correct path. Descriptions of all required barriers must be just as precise as for a start, finish or turn-around.

If you are not sure whether your map is adequate, give it to another person. Ask them to identify the race route and location points. If they cannot do so, without your help, your map is not good enough. Improve it until a stranger can follow the route.

(See Appendix B for examples of course maps).

APPENDIX A

SUPPLEMENTARY INFORMATION

USEFUL EQUIPMENT FOR MEASURERS

a) **Bicycle** — in good condition and comfortable to ride. A touring bicycle is safer to ride than a racing bicycle. However, any bicycle can be used, provided the measurer is comfortable with it.

b) **Jones Counter**

c) **Steel Tape** — A 30m or 50m steel tape is needed for measuring calibration courses and final course length tuning. A nylon coating will protect the figures and graduations.

d) **Spring Balance** — needed to ensure that the steel tape is under correct tension. *Note:* Once the measurer has determined the "feel" of the correct tension, the spring balance may be eliminated and the tension applied using a firm pull at the estimated correct tension.

e) **Thermometer** — A small thermometer will provide the information necessary for the steel tape readings to be corrected for temperature, if necessary.

f) **Pocket Calculator** — A battery model is more reliable if measuring in the dark.

g) **Notebook, pens, etc.** — A small notebook will go into a pocket in bad weather. More than one pen/pencil is vital.

h) **Crayon or Chalk** — Useful for making temporary marks on the road.

i) **Spray Paint** — Very useful for marking distances on the road. Can be used with a simple cardboard template to keep marks neat in appearance.

j) **Bicycle Tools** — As many as are required to keep you on the road and riding safely.

k) **Safety Equipment** — A day-glow harness or jacket and safety helmet are essential, especially on busy roads.

l) **Masonry Nails and Hammer** — Nails are needed to mark the ends of calibration courses and other important sites on the course.

m) **Food and Drink** — Measurers, like runners, need to keep their blood sugar and fluid levels high. Take a chocolate bar or two and some juice.

CALIBRATION COURSES

The effectiveness of the Jones Counter/Bicycle method of measurement depends entirely on good calibration techniques. Good techniques demand quick access from the race course to the calibration area. Calibrations need to be "fresh" if they are to be effective.

The following arrangements would be ideal:

— Pre-measurement calibration within 10 minutes (2km) of start of measurement of course.
— Mid-way calibration. A section on the course which can be used as a check calibration. Very useful in full marathon courses.
— Post-measurement calibration within 10 minutes (2km) of the finish line.

Remember, it is better to have a 500m calibration course within several minutes bicycle ride of the start and finish rather than a 1000m calibration course 10km away.

Note:— There are three reasons why variations in calibration occur during a measurement session:—

1) A mechanical fault with a tyre — slow air leak.
2) A significant change in the temperature during the measurement. This includes the time taken, before and after measurement, to make the calibrations.
3) If different calibration courses are used, the calibration value may be slightly affected by the difference in road surface texture.

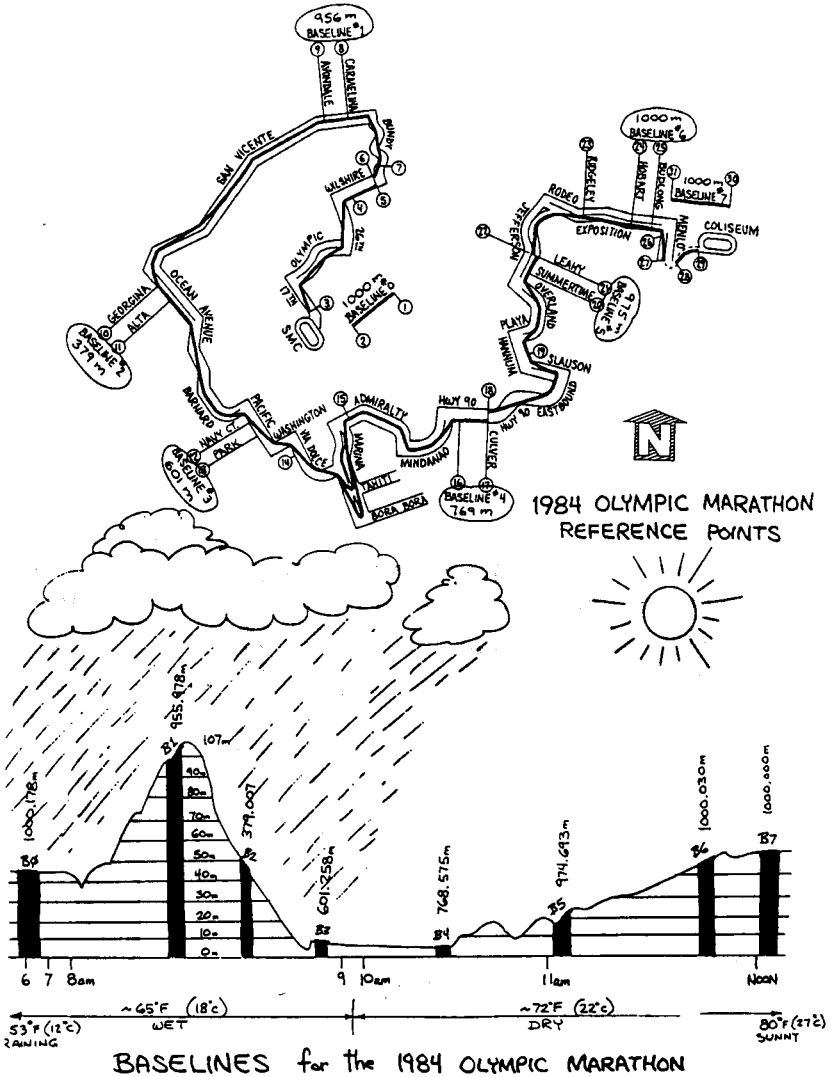
A mechanical fault may be avoided by using good equipment — inner tubes, tyres and valves — but punctures do happen to pneumatic tyres. Solid tyres — when available — will also alleviate this problem.

Calibration change due to temperature can be avoided by:—

a) Making the measurement in the stable seasons — late spring and autumn, avoiding high summer.
b) By measuring on overcast days when the sun does not heat up the road surface.
c) By measuring at a time of day when the temperature has stabilised. Avoiding a before-and-after sunrise measurement will be helpful.

Differences in road surface texture are unavoidable and are an inherent source of measurement error. Do not worry about them. It is wise to avoid very rough surfaces, whenever possible.

It is to be expected that the value of the pre-calibration and post-calibration constants will differ. That is why the average is used. It is not perfect, but is generally the most accurate estimate of the true value.



BASELINES for the 1984 OLYMPIC MARATHON
Measured with 13 bicycles on April 24, 1983
Accurately established with electronic measurements in Jan, Mar 1983

MULTIPLE BASELINES

To increase accuracy, multiple baselines may be used along the course. They have been used for measuring major marathons including the 1984 and 1988 Olympic marathon courses. Use of multiple baselines will help to offset large calibration changes due to changing weather conditions.

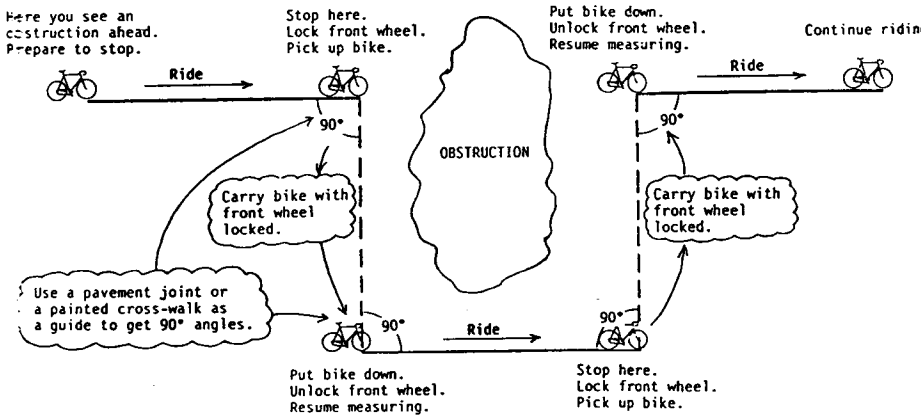
AVOIDING ROAD HAZARDS

Always try to stay on the correct measuring line. Occasionally, there will be a road hazard or pothole in your path. Try to think ahead. If you see a road hazard or pothole in your path, begin to drift sideways so as to clear the hazard. Do not wait until you are at the pothole. This way, the measurement will not be greatly affected. Alternatively, use an Offset Manoeuvre (see diagram) to go around the obstacle.

GETTING AROUND A PARKED CAR OR OBSTACLE

If the obstacle is on a long, straight portion of the course, simply make a gradual sideways movement to clear it, as with an ordinary road hazard or pothole. If a car is parked on the inside of a bend, ride to the rear bumper. Lock your wheel and move the bicycle sideways until you have clear space ahead. Roll forward until clear of the car. Lock the wheel and again move sideways back to the correct line. Resume measuring.

OFFSET MANOEUVER



COUNTER BACKLASH

Look at your Jones Counter as you roll the bicycle back and forth a few centimetres each way. You will see that the counter does not move until the backlash is taken up. This can affect calibration accuracy. Good procedure is to always take a count when the bicycle has just finished rolling *forward*. If you roll past a mark, roll back until the bicycle is 10-20cm behind the mark. Roll it gently forward again, stopping exactly at the mark. Then read the counter.

When calibrating, you wish to start on an exact count. Roll the bicycle forward until you see the number you want. Lock the wheel with the hand brake (or your hand). Pick up the bicycle, with the wheel still locked, and place it directly on the starting mark. This will eliminate backlash. With practice, this will become natural to you.

MEASURING ACROSS OFF-ROAD SURFACES

Short stretches of grass or dirt may be measured with the bicycle. If an extensive portion (more than 5 per cent) of the course lies on an irregular surface, measure these portions with a steel tape, or lay down a calibration course on the off-road surface, calibrate the bicycle and use it to measure.

BADLY-DEFINED ROAD EDGES

The course is theoretically defined as lying 30cm from kerbs or road edges. Occasionally, you will find that the edge of the road is worn or in poor condition. Sometimes, you may find a drain grating in your path. In such cases, use your best judgement of the shortest path available to the runners.

WALKING THE BICYCLE

Your bicycle is calibrated for your weight in your riding position upon it. A change in your riding position — leaning forward or standing on the pedals — will alter the weight on the front wheel and, hence, change the wheel profile and calibration figure. Consistency of riding position during calibrations and measurement is essential. Getting off the bicycle will produce even greater changes in the wheel profile, so it should be avoided, wherever possible.

FLAT TYRES AND LOSS OF PRESSURE – CALIBRATE FREQUENTLY

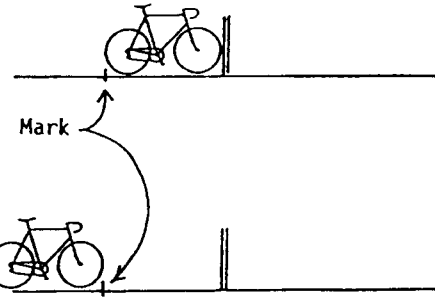
If you get a flat *front* tyre and have not yet obtained a post-measurement calibration, *your measurement is void.* You must start again. For this reason, it is best to re-calibrate as frequently as possible. This protects the previous measurement. If you get a flat *rear* tyre, you may fix it and resume measuring. The rear tyre has no effect on the calibration of the front tyre.

Never use a tyre gauge between calibrations. Each use of the tyre gauge lets some air out of the tyre. This changes its calibration.

A change in temperature will affect your calibration. If a large temperature change is expected, it is wise to re-calibrate as frequently as possible. This will keep your measurements accurate.

MEASURING PAST A GATE OR BARRIER

Stop at gate.
Mark pavement at back of rear wheel.
Lock front wheel.
Pick up the bicycle.



Place front of front wheel over mark.
Unlock front wheel.

Roll bicycle to gate.
Lock front wheel.
Pick up bicycle.

Carry bicycle around gate.
Set bicycle down so rear wheel touches gate.
Unlock front wheel.
Resume measuring.

RECORD TEMPERATURES DURING MEASUREMENT

Keeping a record of temperatures during the measurement can be important. Occasionally, something strange may happen during a measurement. When it does, knowledge of measurement conditions can sometimes resolve the problem. Therefore, record the temperatures. If the road is dry, record this. If it is raining or the road is wet, record it. These seemingly minor points may help later.

A FINAL NOTE:—

The most important figure of the whole measurement is the last one! Most measurers start with a "round" number on their Jones Counter and there is little danger of noting down a wrong figure at the starting line. However, at the other end of the course, a reading error can be made very easily (eg. 58967 instead of 58697) and it is almost impossible to check it exactly afterwards. It is recommended, therefore, to have at least two people read the final figures independently.

APPENDIX B

EXAMPLES OF COURSE MAPS

The following are course maps, showing different ways they may be drawn.

1) *Old Style (Chicago) Marathon* — This map shows the full width of the roads and the location of the measured path within the roadway.

2) *Columbus Marathon* — This is a single-line type of map. Notes on the measured route amplify the line drawing as required. This type of map may be used when runners have full use of the roads everywhere on the course. This is noted on the map.

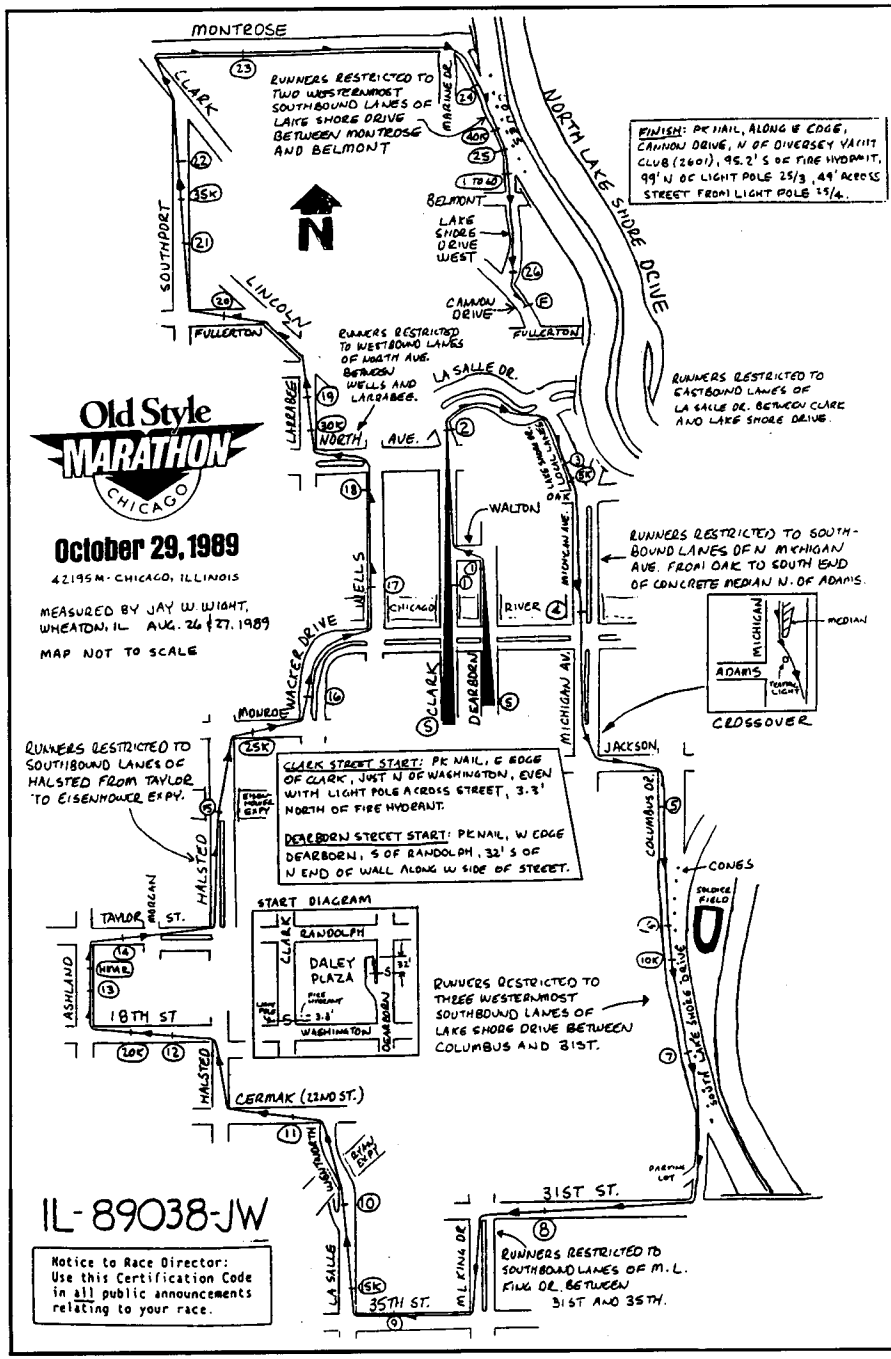
3) *Carnaval Miami 8K.* — This is an example of a map which shows considerable care by the measurer. Note that details of the measured path are clear and easy to follow.

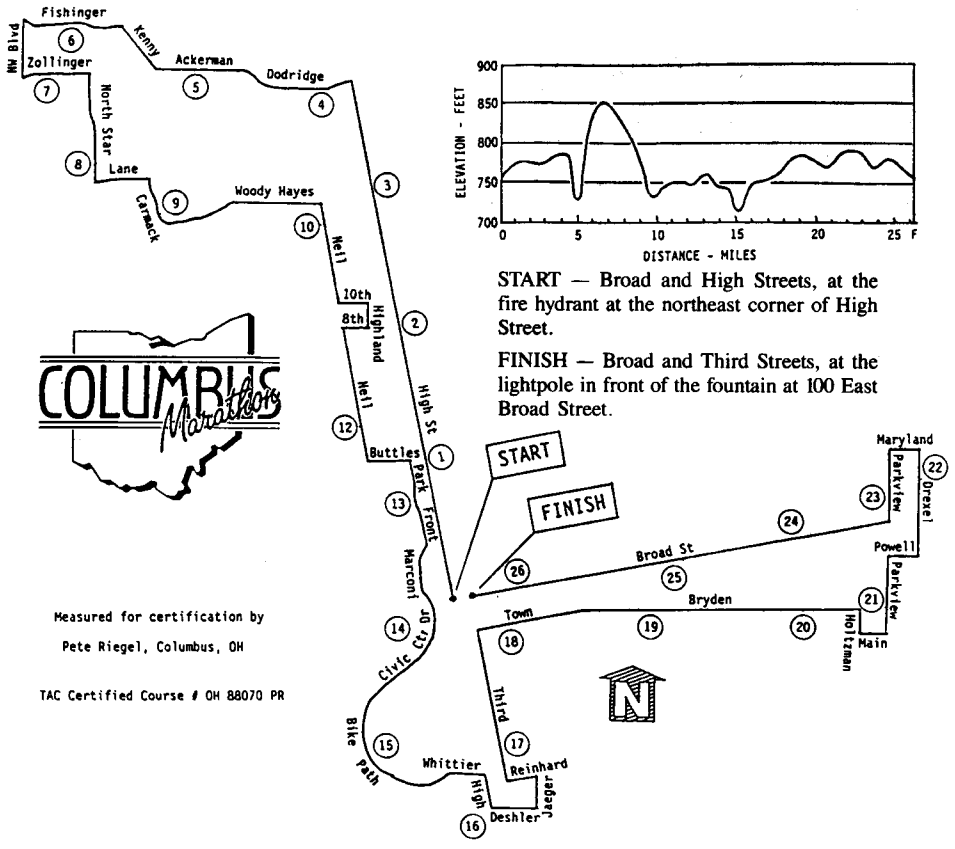
4) *Whitehall Baptist Church 5 Mile* — This is an example of a map which was overdrawn on a city map. Note that runners have full use of the roads. If the course was restricted to one side of the road, supplementary sketches of the path at corners would be required.

5) *New York Marathon* — Similar to the Chicago map, this drawing shows the two start positions necessary for the large field and includes a height profile of the course.

6) *London Marathon* — An example of a city map being used to show the route where all the road is available to the runners. Note the amplification of the Start and Finish areas.

Note that all maps have an exact description of the location of the start and the finish of the course.


Old Style
MARATHON
CHICAGO
October 29, 1989
42.195 M · CHICAGO, ILLINOIS
MEASURED BY JAY W. WIGHT, WHEATON, IL AUG. 26 & 27, 1989
MAP NOT TO SCALE
MONTROSE
CLARK
SOUTHPORT
LINCOLN
FULLERTON
RUNNERS RESTRICTED TO TWO WESTERNMOST SOUTHBOUND LANES OF LAKE SHORE DRIVE BETWEEN MONTROSE AND BELMONT
MARINE DR.
BELMONT
LAKE SHORE DRIVE WEST
CANNON DRIVE
NORTH LAKE SHORE DRIVE
FINISH: PK NAIL, ALONG E EDGE, CANNON DRIVE, N OF DIVERSEY VARSITY CLUB (2601), 95.2' S OF FIRE HYDRANT, 99' N OF LIGHT POLE 25/3, 49' ACROSS STREET FROM LIGHT POLE 25/4.
RUNNERS RESTRICTED TO WESTBOUND LANES OF NORTH AVE. BETWEEN WELLS AND LARRABEE.
LA SALLE DR.
RUNNERS RESTRICTED TO EASTBOUND LANES OF LA SALLE DR. BETWEEN CLARK AND LAKE SHORE DRIVE.
LARRABEE
NORTH AVE.
WELLS
WALTON
MICHIGAN AVE.
RUNNERS RESTRICTED TO SOUTHBOUND LANES OF N. MICHIGAN AVE. FROM OAK TO SOUTH END OF CONCRETE MEDIAN N. OF ADAMS.
MEDIAN
MICHIGAN
ADAMS
CROSSOVER
WACKER DRIVE
MONROE
CLARK
DEARBORN
MICHIGAN AVE.
JACKSON
RUNNERS RESTRICTED TO SOUTHBOUND LANES OF HALSTED FROM TAYLOR TO EISENHOWER EXPY.
CLARK STREET START: PK NAIL, E EDGE OF CLARK, JUST N OF WASHINGTON, EVEN WITH LIGHT POLE ACROSS STREET, 3.3' NORTH OF FIRE HYDRANT.
DEARBORN STREET START: PK NAIL, W EDGE DEARBORN, S OF RANDOLPH, 32' S OF N END OF WALL ALONG W SIDE OF STREET.
HALSTED
TAYLOR
HARRISON ST.
ASHLAND
18TH ST
CERMAK (22ND ST.)
START DIAGRAM
RANDOLPH
DALEY PLAZA
WASHINGTON
CLARK
DEARBORN
32'
3.3'
COLUMBUS DR.
CONGS
SOLDIER FIELD
LAKE SHORE DRIVE
PARKING LOT
RUNNERS RESTRICTED TO THREE WESTERNMOST SOUTHBOUND LANES OF LAKE SHORE DRIVE BETWEEN COLUMBUS AND 31ST.
31ST ST.
M.L. KING DR.
RUNNERS RESTRICTED TO SOUTHBOUND LANES OF M.L. KING DR. BETWEEN 31ST AND 35TH.
LA SALLE
35TH ST.
IL-89038-JW
Notice to Race Director:
Use this Certification Code in all public announcements relating to your race.



START — Broad and High Streets, at the fire hydrant at the northeast corner of High Street.

FINISH — Broad and Third Streets, at the lightpole in front of the fountain at 100 East Broad Street.

NOTES ON THE MEASURED ROUTE

The course was measured entirely *on the pavement* of the roads and paths described in this map. At corners and turns, the measured path is one foot from the curb or edge. Leaving turns, the course takes the shortest possible route to the next turn, without regard to direction of vehicular traffic.

There is a curved shortcut which allows vehicles to make a right turn onto Fishinger from Northwest Blvd. The course passes through this shortcut.

Runners may be directed to either side of the center divider on Woody Hayes. Both routes are legal, although runners must sooner or later move right to turn onto Neil Ave.

When runners turn right onto Neil, they will immediately encounter Ohio State University sidewalks. Proceed straight ahead, rejoining Neil Ave. in a few hundred feet when the sidewalk ends.

As Civic Center Drive begins to turn left at Rich St., runners should get onto the sidewalk and follow it along the riverfront to the bike path. They emerge from the bikepath onto Whittier St. This short stretch of sidewalk and the sidewalk on Neil Ave. in the University, are the only places on the course where runners may use sidewalks.

OFFICIAL ROUTE OF

CARNAVAL MIAMI 8K

MIAMI, FLORIDA

START - On Biscayne Blvd. 107 ft. 5 in. W of the Challenger Monument.

MILE ① - On Brickell Ave. 57 ft. 10 in. N of traffic signal pole on W side of road (N end of bridge) at the intersection of SE 4 St. (by the DuPont Plaza)

MILE ② - On Brickell Ave. 35 ft. 9 in. SW of telephone pole 8 7253 7652 04 at 1550.

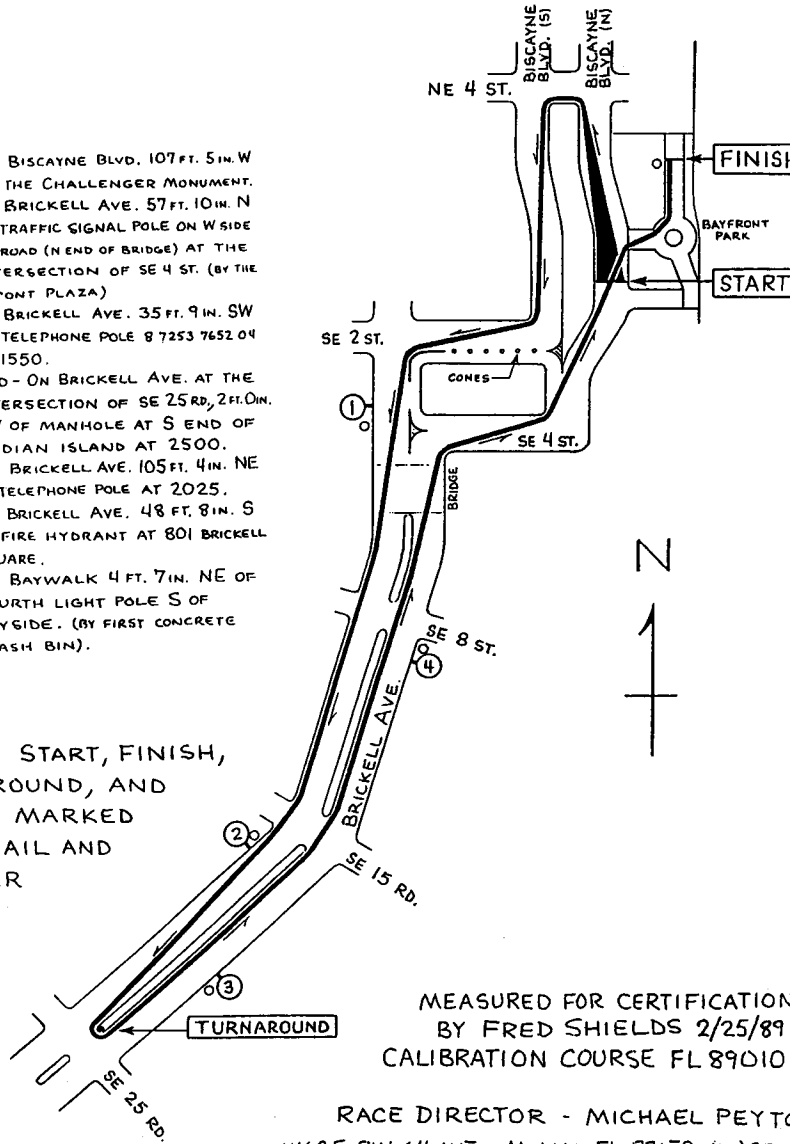
TURNAROUND - On Brickell Ave. at the intersection of SE 25 Rd., 2 ft. 0 in. SW of manhole at S end of median island at 2500.

MILE ③ - On Brickell Ave. 105 ft. 4 in. NE of telephone pole at 2025.

MILE ④ - On Brickell Ave. 48 ft. 8 in. S of fire hydrant at 801 Brickell Square.

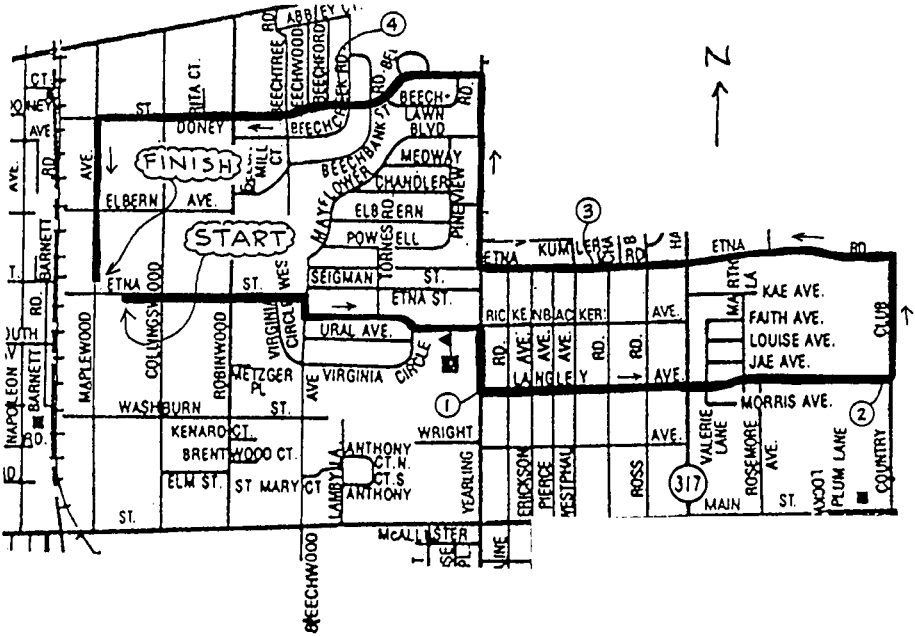
FINISH - On Baywalk 4 ft. 7 in. NE of fourth light pole S of Bayside. (By first concrete trash bin).

NOTE: START, FINISH, TURNAROUND, AND SPLITS MARKED WITH NAIL AND WASHER



MEASURED FOR CERTIFICATION
BY FRED SHIELDS 2/25/89
CALIBRATION COURSE FL 89010BH

RACE DIRECTOR - MICHAEL PEYTON
14625 SW 64 AVE., MIAMI, FL. 33158 (305) 251-6689



WHITEHALL BAPTIST CHURCH 5 MILE RUN

WHITEHALL, OHIO

LIST OF MEASURED POINTS

START - On Etna St, 11.5 ft E of telephone pole #3676. Pole is on the N side of street and is directly in line with the property line between houses at 3670 and 3676 Etna St.

1 MILE - On Yearling Road, at the point where the curb begins to turn left into Langley Ave.

2 MILE - On Langley, opposite the W front window of #4885. This house is at the SW corner of Langley and Country Club Rd.

3 MILE - On Etna Rd, about 35 ft W of the W curb of Bernhard. Point is at a concrete walkway that spans the park strip, and is the first walkway on the S side of Etna W of Bernhard.

4 MILE - On Doney, 15 ft W of the hydrant at the NW corner of Beechcreek & Doney.

FINISH - On Maplewood Ave, at the telephone pole just W of the church. Telephone pole is numbered "60A22" and "382", and is directly opposite the N edge of the driveway at 389 Maplewood.

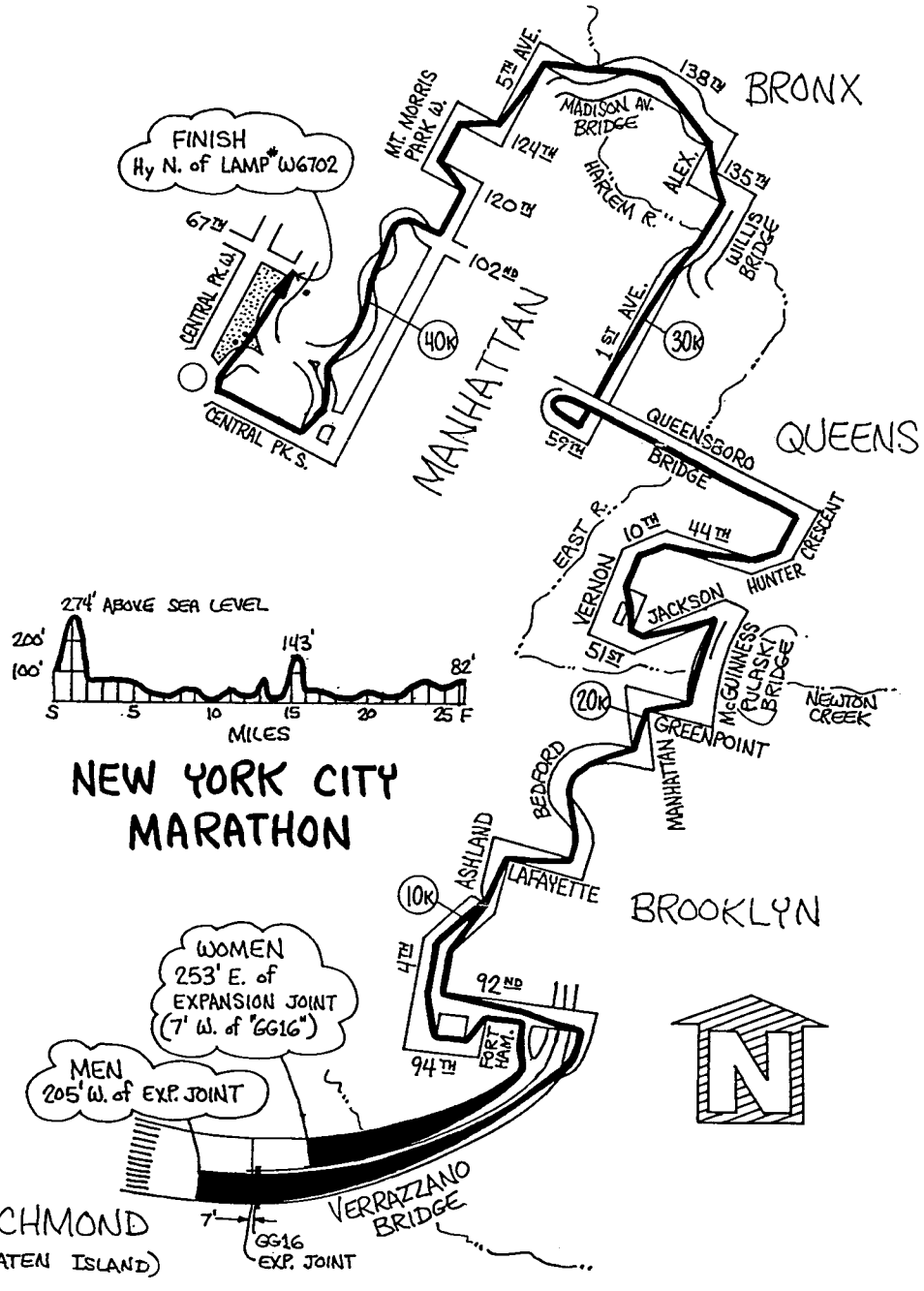
DESCRIPTION OF ROUTE

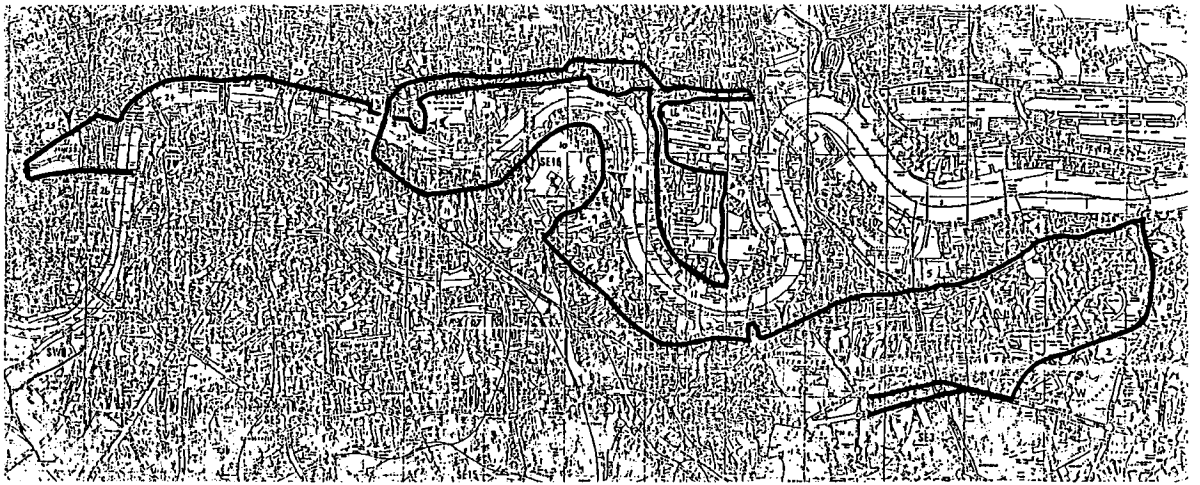
From START, go E on Etna St. Right on Beechwood. Left on Rickenbacker. Right on Yearling. Left on Langley. Left on Country Club. Left on Etna Rd. Right on Yearling. Left on Doney, following winding Doney St. Left on Maplewood and follow to FINISH.

The course was measured so that runners will have the full use of the roads, from curb to curb. The course may be coned for safety as desired, just so runners are kept on the paved road.

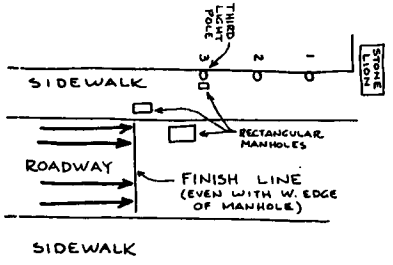
Measured by Pete Riegel, Columbus, OH
September 19, 1987

TAC Certified Course No. OH87076PR


FINISH
Hy N. of LAMP* W6702
67TH
CENTRAL PK. W.
CENTRAL PK. S.
40K
MT. MORRIS PARK W.
5TH AVE.
120TH
102ND
124TH
MADISON AV. BRIDGE
HARLEM R.
ALEX.
135TH
138TH
BRONX
WILLIS BRIDGE
1ST AVE.
30K
MANHATTAN
59TH
QUEENSBORO BRIDGE
QUEENS
EAST R.
10TH
44TH
HUNTER CRESCENT
VERNON
JACKSON
51ST
McGUINNESS (PULASKI) BRIDGE
NEWTON CREEK
20K
GREENPOINT
MANHATTAN
BEDFORD
ASHLAND
LAFAYETTE
10K
BROOKLYN
4TH
92ND
94TH
FORT HAM.
WOMEN
253' E. of EXPANSION JOINT
(7' W. of "GG16")
MEN
205' W. of EXP. JOINT
RICHMOND
(STATEN ISLAND)
7'
GG16
EXP. JOINT
VERRAZZANO BRIDGE
274' ABOVE SEA LEVEL
200'
100'
143'
82'
S
5
10
15
20
25 F
MILES
NEW YORK CITY
MARATHON
N



ADT London Marathon 1989



FINISH - WESTMINSTER BRIDGE

Course Restrictions - Runners have the full use of the entire roads in the order described, subject to the following restrictions:

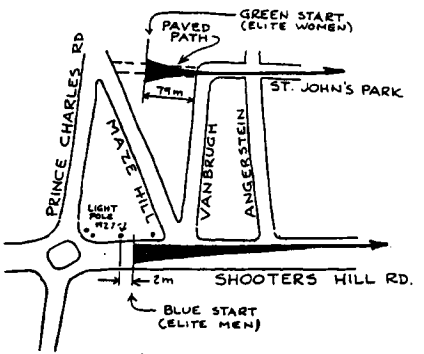
1) Runners stay to left of the first median divider on Grand Depot Road just after leaving Ha Ha Road. They then stay to the right of the median dividers on Grand Depot Road and John Wilson Street, following the roundabout at John Wilson Street and Woolwich Church Street in a counterclockwise direction. They then have full use of the entire road.

2) The route takes the long way (clockwise) around the roundabout at Brunel Road and Jamaica Road.

3) After passing through the underpass beneath Blackfriars Bridge, the route stays to the right of the median divider on Victoria Embankment.

THE ROUTE

Blue start (Elite men)	–	Shooters Hill Road, Charlton Park Lane, Ha Ha Road, Grand Depot Road, John Wilson Street, Woolwich Church Street.
Green Start (Elite Women)	–	St. John's Park, Old Dover Road, Shooters Hill Road (continuing along Blue Start route).
Route after Merge of Red and Blue Starts	–	Woolwich Road, Trafalgar Road, Romney Road, King William's Walk, Cutty Sark Gardens, Greenwich Church Street, Creek Road, Evelyn Street, Lower Road, Redriff Road, Salter Road, Brunel Road, Jamaica Road, Tooley Street, Tower Bridge, Mansell Street, Royal Mint Street, Cable Street, Butchers Row, Commercial Road, West India Dock Road, Meng Street, Poplar High Street, Preston's Road, Northern Reief Road, Marsh Wall, Lime Harbour, East Ferry Road, West Ferry Road, Limehouse Causeway, Narrow Street, The Highway, Thomas More Street, St.Katharine's Way, Tower of London Wharf, Lower Thames Street, Upper Thames Street, Victoria Embankment, Northumberland Avenue, Trafalgar Square, The Mall, Birdcage Walk, Parliament Square, Westminster Bridge [Finish]



START - GREENWICH

APPENDIX C

COURSE MEASUREMENT DATA SHEET

Name of Event .....

Name of Course Measurer .....

Date of Measurement ..... Start Time ..... Temperature .....

Finish Time ..... Temperature .....

Constant for the Day ..... counts/km ..... counts/metre

Measurement Data

Measured Point	Recorded Count	Count Elapsed since previous Point	Interval Length Metres	Cumulative Length Metres

Desired length of course .....

Length of course as measured .....

Note any adjustments made to the course after measurement:

APPENDIX D

I A A F
ROAD RACE COURSE MEASUREMENT CERTIFICATE

Name of Race: .....

Location: .....
CITY COUNTRY

Date of Race: ..... Distance of Race: .....

Measured Distance of Course: .....Date Measured .....

Altitude (in metres above sea level):

Start: ..... Highest ..... Lowest ..... Finish .....

Type of Course (loop, point-to-point, etc): .....

Local Race Measurer: .....

Address: .....

.....

Method of Measuring: Bicycle ..... Steel Tape .....

IAAF Approved
Course Measurer: .....

Address: .....

.....

This is to certify that the course described above and defined by the attached map has been measured and approved for certification. The course measurement complies with IAAF Rules For Road Race Course Measurement and the measured distance is not less than the official distance for the event.

....
Signature Date
IAAF Approved Course Measurer