A SHORT HISTORY OF MAP MEASURING DEVICES:
HOW TOOLS TO MEASURE SCALE ON MAPS HAVE EVOLVED FROM THE VICTORIAN AGE TO THE PRESENT

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HOW DID I GET ONTO THIS SUBJECT

• I started working as a cartographer for Defense Mapping Agency in 1991 and used a few map measuring devices on the job back in the early 1990s

• With the decline of printed maps, I thought it might be interesting to collect the devices that were designed to used with paper maps

• About 5 years ago I started collecting map measuring devices, and bought a collection of about 70 of them from a engineers estate that I found for sale online

• Most of the remaining ones I have found were on eBay and gifts from friends

• The more I collected them, the more variety I spotted in them, and thought it might interesting to put together a presentation about them to the CMS

• Here is a presentation on what I’ve been able to find out so far
HISTORY OF MAP ACCURACY

- Accurate and correctly scaled maps had to exist before developing accurate map measuring devices.
- Map projections have been around for at least 2500 years, but accurate scales and well defined map projections were a product of advances in surveying and statistics starting in the 16th century.
- The production of accurate maps improved with the adoption of the metric system, developments in chronometers and accurate astronomical tables for determining longitude, improved statistical survey methods and surveying equipment and techniques, and the development of modern datums and map projections (see the History of Cartography series set by the University of Chicago for more details).
- Starting in the mid 19th century accurate maps became widely available and affordable.
MAP SCALE

• The scale of the map being measured has to be stated some way on the map for map measure to be used

• Three Types of Scale:
  • Verbal Scale: This type of scale use simple words to describe a prominent surface feature.
  • Fractional or Ratio Scale: A fractional scale map shows the fraction of an object or land feature on the map.
  • Linear Scale: A linear scale shows the distance between two or more prominent landmarks.
CHRONOLOGY OF MAP MEASURING DEVICES

- Rulers
- Dividers
- Opisometers (1675)
- Planimeters (1854)
- Morris Chartometer patented in 1873
- Curvimeters
  - Analog
  - Digital
RULERS

- String
- Traditional Rulers
- Tape Measures
- Roller Rulers
- Fixed Scale Map Rulers
TRADITIONAL RULERS
TAPE MEASURES
PARALLEL RULES
DIVIDERS
An opisometer is a small device for measuring the lengths of features and distances on maps that include a bar code scale diagrams.

Opisometers are made up of a milled wheel set on a screw and held by a handle.

The wheel traces a route on the map and then is wound backwards on the scale diagram to reveal the scaled distance traveled by the wheel.
OPISOMETERS

(1) STARTING POSITION—Handle perpendicular to map, wheel at a stop against side with pointer, pointer on one terminal of line to be measured. Roll wheel along line, being careful to cover exactly all curves and turns. Stop when second terminal is reached.

(2) TO GET DISTANCE—Back wheel up along Graphic Scale on map—repeating across length of scale as necessary until wheel comes to a stop against side with pointer. As wheel approaches pointer, use left side of scale only, to arrive at smaller distance units without interpolation.

Your care in exactly following irregularities of the line on the map determines the accuracy of your measurement.
The first England and Wales road atlas was published in 1675. This seminal work, Britannia, comprised 100 maps and was created by map maker John Ogilby. It was the first to use a scale of one inch to the mile and to use the Statute mile of 1760 yards. Each vertical strip map in the atlas showed compass orientation and distances in miles and furlongs. Such accurate measurements had been made possible by surveyors measuring the roads. A favoured and accurate method was walking the ground with a surveyor’s measuring wheel, otherwise known as a perambulator or waywiser. Paying homage, both man and instrument were depicted in Ogilby’s Britannia, shown on the frontispiece and on two maps within https://threepointsofthecompass.com/planning-3/map-measurers/.

Surveyor and waywiser are shown at the head of Ogilby’s ‘The Road from London to Holyhead’ map. c1698

Face of surveyor’s waywiser
CHARTOMETER

- Chartometers are similar to opisometers, but have a dial and pointer to provide the scaled distance measurement immediately.
- Englishman Edward Russell Morris, of the Morris Patents Engineering Works, High Street, Birmingham, began manufacture of his ‘Patent Chartometer’ in the 1870s, the chartometer design was patented in 1873.
- Morris was a member of the Institute of Civil Engineers from 1880 and designed and manufactured map measurers in a range of sizes, this is possibly the largest he produced.

Morris’s Patent Chartometer and scale cards with leather bound wooden case

6 inch to the mile scale card measures furlongs. Five turns of the dial will indicate 40 furlongs, or five miles. Dials are 2” / 50mm diameter

ADDITIONAL MORRIS CHARTOMETERS
WEALEMEFNA WATCH FOB CHARTOMETERS

Designed to hang from the end of a gentlemen’s watch chain.

The measurer will measure lines on maps or anything else, by holding it in the hand, face toward you, then wheeling forward.

Each complete rotation of the larger blued hand measures 12 inches and moves the smaller hand forward one digit of the inner circle on the paper dial. One inch of measurement is registered on the outer marked circle, showing eighth of an inch graduations.

It has an odd name. The English Mechanic and World of Science: Vol. 33, London, 1881, informs us that Morris created a wholly original name in an attempt to outwit his imitators, also declining to disclose the actual origin of the word.

https://threepointsofthecompass.com/2020/05/10/map-measurer-of-the-month-morrisss-patent-wealemefna/
WAELEMEFNA CHARTOMETERS
OTHER ROTAMETERS
CURVIMETERS

Lots of overlap between military and commercial devices

Wider variety of analog curvimeters devices than digital ones

Materials vary from steel, brass, nickel and chrome plate, gold, silver, aluminum, cardboard, paper, bone and various plastics

Made world wide, basic design set in WWI, unchanged until after WW2 with the introduction of plastics

Extra functions include: compass, magnifier, mirror, calculator, light, thermometer, calendar, watch fob

Audible devices were made so users didn’t have to closely watch a opisometer wheel turn
CURVIMETER: MECHANICAL NO HANDLES SINGLE DIAL
CURVIMETER: MECHANICAL NO HANDLES SINGLE DIAL
CURVIMETER: MECHANICAL NO HANDLES
COMBINATION COMPASS
CURVIMETER: MECHANICAL WITH HANDLE
COMBINATION COMPASS
CURVIMETER: MECHANICAL NO HANDLES MULTIPLE DIALS
CURVIMETER: MECHANICAL NO HANDLES MULTIPLE DIALS
CURVIMETER: MECHANICAL WITH HANDLES SINGLE DIAL
CURVIMETER: MECHANICAL WITH HANDLES SINGLE DIAL
K AND R STYLE MAP MEASURES
K AND R STYLE MAP MEASURES
CURVIMETER: MECHANICAL WITH HANDLES
MULTIPLE DIALS
CURVIMETER: MECHANICAL WITH HANDLES
MULTIPLE DIALS
CURVIMETER: SOVIET CURVIMETERS
FRIEBERGER PRAZISIONSMECHANIK KRIVKOMER MAP MEASURES (EAST GERMAN)
EXTRA FEATURES

MAP MEASURER
Comes with compass and magnifier.

INSTRUCTIONS:
1. Set zero to arrow.
2. Roll small wheel along map from starting point to destination.
3. Distance in inches multiplied by scale on map equals distance in miles.
4. One revolution of large disc equals 4", two revolutions equal 8", etc.

THE PATHFINDER
Three in One

MAP MEASURE - For length and distance
COMPASS - For direction
PENCIL - For handy notes

Edwardsville, Ill.
County Institute for the Blind

First Federal Savings & Loan Assn.
1944
EXTRA FEATURES

BMW Map Measuring Tool Instructions
The map-measuring tool has 5 modes. Scroll through the 5 modes by pressing the white "◄" button on the keypad.

Mode 1 - Time
The Time Mode is the default mode and is indicated by the round clock icon in the upper left-hand corner of the display. If you are in another mode, simply press the white "◄" button on the keypad until you are in the clock mode. The tool will automatically return to the clock mode if no buttons are pushed within 2 minutes. To switch between 12-hour and 24-hour format press the "CE" button. To view time on other cities, press the code for that city and the time will change to that city.

Mode 2 - Calculator
From any mode, press the white "◄" button on the keypad until you are in the Calculator Mode. The small calculator icon shown on the top center of the screen indicates the calculator mode.

Mode 3 - Countdown Timer
From any mode, press the white "◄" button on the keypad until you are in the Countdown Timer Mode. The small "CT" icon shown on the upper right-hand corner of the display indicates the countdown timer is active. The small "D" counter counts down your input. Using the keypad input the desired countdown time in the "Time (minute:second)" format and press the "CE" button instant and stop the countdown timer. When "0" seconds is reached, the display will flash "00:00:00" for 10 seconds.

Mode 4 - Temperature
From any mode, press the white "◄" button on the keypad until you are in the Temperature Mode. The small temperature icon shown on the top center of the screen indicates the temperature mode. To switch between Fahrenheit and Celsius press the "CE" button.

Mode 5 - Time Setting
When setting the clock for the first time or after battery placement you must select a time zone. Select a code for the city in your time zone from the list below or on the inside of the back of the tool. The display will begin in the grey "RESET" button. To input the code on the keypad for the city in your time zone and press "CE" to confirm. The clock will switch to your time zone.

Map Distance Measurement
The following two examples use a map scale of 1:24,000 (1 inch measured = 24,000 inches real life) and 1:10 miles (1 inch = 10 miles in real life).

1) 1:24,000 Scale - Press the blue SCALE button in any mode. Zero Baffles awaiting for an entry of "2400". After "2400" is entered, press "ce" to confirm. To measure, press the blue MEASUREMENT button and press "CE" to select either DEF or MILE. Place the measuring wheel on the starting position on the two, and roll the wheel to the destination. Read the number of inches on the black wheel and multiply by "100" to enter "100", etc. The result is the map distance in any mode is entered.

2) 1 inch = 10 miles Scale - First, we must change 10 miles to inches, so that both sides of the " inch are the same units. With some calculation, 1 mile = 63,360", so we can say 100 miles = 633,600", or when 10 miles with the blue SCALE button in any mode. Enter "100", and select "CE" to confirm by pressing "ce". Press the blue MEASUREMENT button, and press "ce" to select either DEF or MILE. Now the map measure is ready to measure.

To re-measure using the best entered scale, press the blue MEASUREMENT button again and after selecting another mode. The map measure remembers the value of other units. If you determine the value to enter, remember, the scale should always start with a "1" (100).

Light
Press and hold the blue LIGHT button on the back of the tool to turn the light ON. Releasing the button will turn the light OFF.

Compass
View the compass on the backside of the map tool.

Battery
The tool uses two AA10 batteries (included).
PEN STYLE CURVIMETERS
**ROLLER RULER**

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**“The Pencil with a Brain”**

Take Advantage of Its Thousand-and-One Uses

- Hold the Way You Hold a Pencil. Tilt as though writing a letter—holding at proper angle is important to accuracy. Start on Zero. Moving indicator must point to zero on Inchometer on Roller Rule’s side, and zero must also be indicated on head’s “fractional meter” when you start to measure. The gold stripe of across top of head must then fall directly on starting point of surface to be measured. “Roll the Head.” That’s all there is to operating Roller Rule. Roll the head over surface being measured.

- Stop at “Point-of-Contact.” Be sure that tire on head rests on finishing point before taking reading.

- Inches Recorded on Inchometer. Measure anything, rolling head to right, Inchometer shows inches as you roll head.

- Measures Any Distance. Inchometer records 36 inches in one direction. For measuring greater distances simply reverse motion of head when 36 is reached.

- Measures Fractions of an Inch. Fractions are shown on head. Line under head indicates eighths of an inch as you roll. Each complete revolution of head is 2 inches. When “1” shows on head an odd inch is recorded on Inchometer, when “0” shows on head an even inch is recorded.

- Measures Curves, Allow 1/8-inch for wall or similar corners. Use for tailoring measurements, pipes, and Straightaways, Etc. Use for tailor measurements, pipes, and

- Gripper Prevents slipping and Marring. The tiny rubber tire around head grips furniture and glass. (Extra tires available, 2 for 10c prepaid)

- Pencil Propels, Repels and Expels. This is an all-quality writing instrument that firmly grips standard leads, and provides spacious eraser-topped chamber for extra leads.

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**AUTOMATIC Roller Rule**

MEASURING - MATHEMATICAL-WRITING INSTRUMENT

Note: Lead is manipulated by bottom metal tip, not by head. (Over)
CURVIMETERS: DIGITAL
CURVIMETERS: WEARABLE

- Watch
- Watch Style
- Watch Fob
- Belt Clip
CURVIMETER: TOYS
MAP COMPUTERS: ANALOG
MAP COMPUTERS: DIGITAL

AAA TripWizard™
TRAVEL COMPUTER
INSTRUCTION MANUAL

You AAA TripWizard™ performs three main functions:

1. You determine your services including:
   - AAA locations (restaurants, repair facilities, attractions, campgrounds, lodging)
   - Gas stations, food, hospitals, rest areas
   - Stick stops and shopping
   - Road help and most toll-free numbers

2. U.S. Highway Data including:
   - Distance and driving time to towns along your U.S. Highway Route
   - City-to-City Directions for over 250 cities including:
     - Shortest complete route
     - Total distance
     - Driving time

NOTE: Turn-by-turn directions for AAA lodging, AAA restaurants, AAA attractions and AAA campgrounds are provided even if located at a significant distance from the interstate.
POLAR PLANIMETER

- Planimeters are used to measure enclosed areas on maps and charts.
- The polar planimeter measures areas by tracing the outline. It consists of 2 arms, one with a pin to fix it to the map surface and the other with a tracing point. A wheel records the tracing points movement and the area is read off of the dial.
- Invented by Jakob Amsler in 1854 at the University of Schaffhausen, Switzerland.
  - Analog
  - Digital
PLANIMETERS AND AREA MEASURES
MAP MAGNIFIERS
FABRIC MEASURES?
LINKS AND SOURCES

• [https://threepointofthecompas.com/planning-3/map-measurers/](https://threepointofthecompas.com/planning-3/map-measurers/)

• Books
  • Story of Maps by Lloyd Brown
  • History of Cartography series by University of Chicago Press
LESSONS LEARNED

- Need better lighting to photograph map measures
- Need a database to manage descriptions, photos, and catalog map measures
- Don’t back up the chair when you drop one on the floor
  - RIP

60 year old Du Pont luggage tag
plastic doesn’t age well
I have still have 2 Cutie Computers available if anyone wants one?