

Richta

Rally Calculator

User's Guide

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Introduction

The Richta Rally Calculator is a software program which is intended to perform the calculations necessary for time-speed-distance road rallies, such as those sanctioned by the Sports Car Club of America (SCCA – www.scca.org). It runs on a hand held personal digital assistant (PDA) hardware using the Palm OS operating system, Version 3.5 or later.

Richta History and Design Philosophy

Richta was designed and written by a TSD navigator with experience in competing in over 50 events. The author previously used a Curta mechanical calculator to perform the rally calculations, but the limitations of that device spawned the realization that the functions performed by the Curta could be duplicated and the navigator's job made easier through the use of current computer technology.

The operating principles and application of the Curta to TSD rally are well documented. A good description of these techniques is available from Rally Racing News (<http://www.rallyracingnews.com/manuals/curtaman.html>).

Throughout the 2004 and early 2005 rally season several shortcomings of the Curta became apparent to the author. First, speed changes on the Curta can not be executed rapidly. Changing average speed on the Curta requires setting 6 small lugs on the side of the device to the minutes per mile factor (the amount of time it takes to traverse one mile at the desired average speed. The factors are typically determined prior to the rally and copied to the route instruction before the event or during the odometer calibration run. Entry and verification of these factors (small numbers entered while bouncing down the road) is time consuming and error prone. It can be very difficult when several route instructions involving speed changes are to be executed in short order. The navigators can find themselves concentrating on the route instructions (as they should) and entering a checkpoint without a precise calculation as to whether they are early or late.

A second issue arises after a calculation is performed and it must be determined whether the rally team is early or late. Performing rally calculations with a Curta is very accurate. Accuracy to within .01 minute or better is possible when using an accurate odometer that reports mileage to the .01 mile. The Curta output, the calculated time of day at which the rally team should arrive at the indicated mileage, must be manually compared to the time of day clock. The navigator must concentrate to determine whether the team is .01 minute early or .01 minute late and this operation can be mentally exhausting when performed five to ten times per mile over the course of a 150 mile event.

The Richta Rally Calculator was designed and written to overcome these shortcomings of the Curta calculator.

About the Name

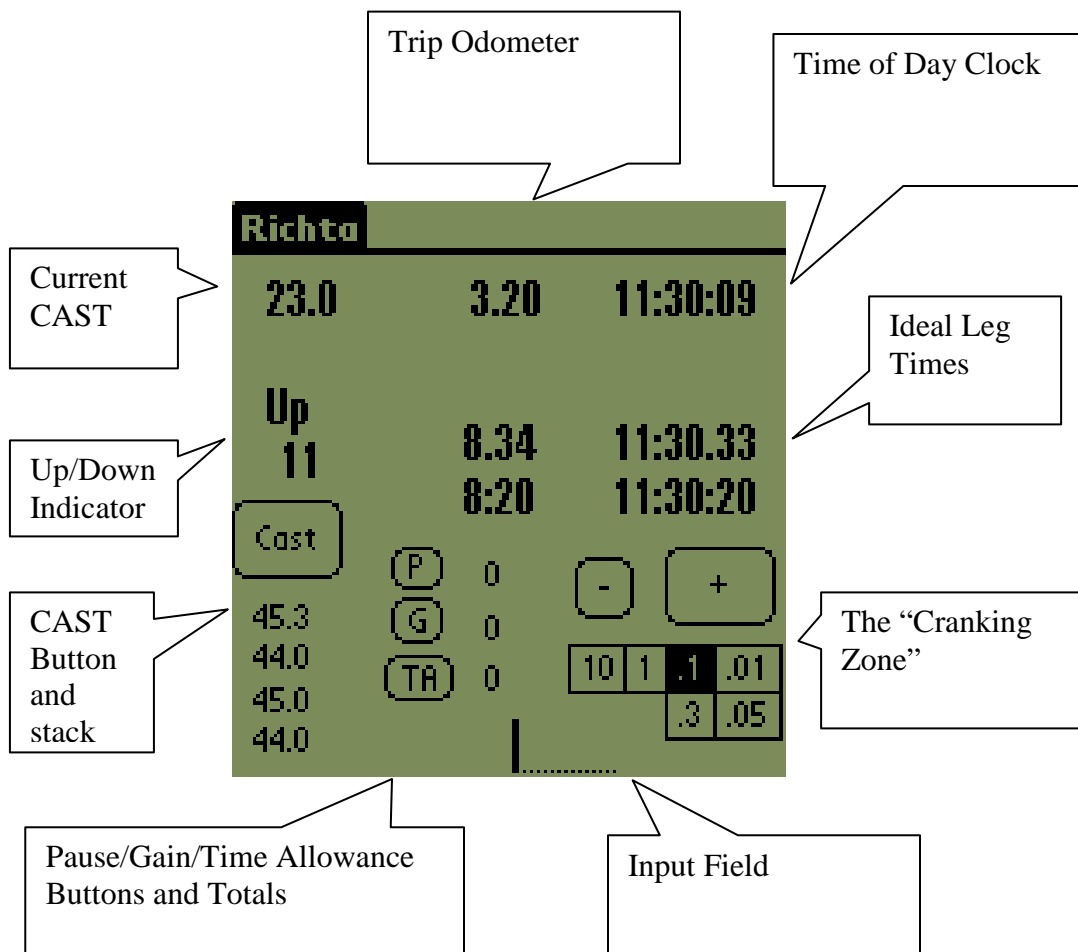
The name Richta (pronounced rik'-ta) is a play on words, combining the designer/author's first name (Rich) with name of the mechanical device the software replaces (the Curta calculator). The original Curta calculators were designed by Curt Herzstark and manufactured from 1946 through about 1966.

The Forms and Richta Operations -

There are four primary forms in Richta.

Primary Richta Form

The main form is described below.



This form is the primary form for the application and the TSD navigator will spend most of their time working with and reading this form. It has eight areas and they are described below:

Current Cast – This field displays the current average speed the rally team is required to average. An average speed of zero is taken to mean an infinite average speed. The trip odometer may be freely adjusted when the CAST is zero.

Trip Odometer – This field displays the current value of the trip odometer.

Time of Day Clock – This field displays the current value of the Palm's time of day clock. This is the time reference used to determine whether the rally team is early or late. The internal Palm clock has a resolution of one second. Tapping on the TOD clock once activates a split-action function. When the split-action function is activated a copy of the TOD clock is frozen and displayed immediately beneath the TOD display. Tapping on the TOD display dismisses the TOD split display. When the split-action function is active the Up / Down indicator uses the split-action TOD value for comparison instead of the running TOD clock.

Up / Down Indicator – These fields report whether the rally team is Up (early arrival at the mileage indicated at the trip odometer) or Down (late arrival) and by how many seconds.

Ideal Leg Times – These four fields display the results of the time-speed-distance calculations in four different formats. The ideal elapsed time of the current leg is reported in minutes and hundredths of a minute (mm.th) and minutes and seconds (mm:ss). The time of day at which the rally team should arrive at the indicated mileage is reported in a similar format (hh:mm.th and hh:mm:ss).

Multiple display formats are used to accommodate different navigating styles. Rally teams who require accuracy to the nearest second will rely on the Up / Down indicator and use the displayed leg times at check points to verify the rallymaster's calculations. Rally teams who require accuracy to the nearest hundredth of a minute will use the Up / Down indicator to get close and then compare the display ideal time of day to their external clock and manually calculate the precise amount of being early or late. (The technical reason for this is that the internal clock in the Palm devices is only accurate to the nearest second. There is a second, higher resolution clock in the Palm devices, but it does not run while the device is asleep).

CAST Button and CAST Stack – The CAST Stack holds the next 32 average speeds, allowing the navigator to pre-enter the next 32 CASTs. The next 4 CASTs are shown on the main form. Pressing the CAST button makes the top entry in the stack the current average speed and shifts the remaining entries in the stack up one position. Future CASTs are entered using the input field as follows: Enter the desired average speed in the input field using the Graffiti language then use the stylus to tap one of the CAST Stack fields. If the CAST Stack field tapped is currently 0.0, the input field is copied to

the tapped stack entry. If the CAST Stack field tapped contains a non-zero value, the input field is copied to the tapped stack entry and the lower stack entries are shifted down one position. This allows the navigator to insert a CAST in the middle of the pre-entered values. (Do not use the decimal point when entering CASTS. When entering two digits, the decimal point is presumed to be after the second digit (entering 23 results in a CAST of 23). When entering three digits, the decimal point is presumed to be after the second digit (entering 235 results in a CAST of 23.5). When entering 4 digits, the decimal point is presumed to be after the third digit (entering 1200 results in an average speed of 120.0).

Pause / Gain / Time Allowance Buttons and Totals – These buttons are used to execute pauses, gains and time allowances. The fields display the total amount of pauses, gains and time allowances for the current rally leg. To execute a pause, enter the number of seconds to pause in the input field and press the pause button. Gains and time allowances are handled in a similar manner. Do not enter a decimal point in the input field as this terminates the reading of the input field.

Input Field – This input field is used to enter future CASTs and the amount of time for a pause, gain or time allowance.

Cranking Zone – These buttons are where the navigator will spend most of their time tapping and the aspect in which the Richta software is most similar to an actual Curta mechanical calculator. The navigator taps the “+” button to increase the trip odometer. The amount of the increase is determined by which field is highlighted beneath the “+” button. Increments of 10, 1, 0.1, 0.3, 0.01, and 0.05 miles are available. The trip odometer is decremented in the same fashion by pressing the smaller “-“ button.

The New Leg Form

The form used to start a new rally leg is described below.

Richta - New Leg

2.70 12:20:00
Odo Out Time

Zero Odo

- +

Apply Cancel

10 1 .1 .01
hh mm ss

This form is accessed from the main form by tapping on the title (“Richta”) and selecting the New Leg menu item.

This form allows the navigator to set the value of the trip odometer and out time at the start of a new leg of the rally. The values are set using the same “cranking zone” input model that is used on the main form. Pressing the “Apply” button sets the calculator to use the new out time and trip odometer, pressing the “Cancel” button returns to the main form with no changes made to the calculator settings.

The Leg Summary Form

The leg summary form is described below.

Richta - Leg Summary	
0.00	12:15:00
Odo	Out Time

(Shows Trip odometer and time of day at start of this leg).

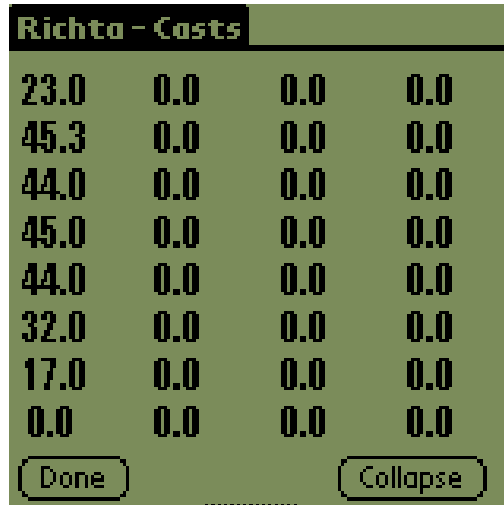
Done

This form is accessed from the main form by tapping on the title (“Richta”) and selecting the Leg Summary menu item.

This form displays the trip odometer setting and Out time for the current rally leg. It can be used by the navigator to verify the current settings without risk of changing any values.

The CAST Form

The Cast form is described below.



Richta - Casts			
23.0	0.0	0.0	0.0
45.3	0.0	0.0	0.0
44.0	0.0	0.0	0.0
45.0	0.0	0.0	0.0
44.0	0.0	0.0	0.0
32.0	0.0	0.0	0.0
17.0	0.0	0.0	0.0
0.0	0.0	0.0	0.0

Done Collapse

This form is accessed from the main form by tapping on the title (“Richta”) and selecting the CASTS menu item.

This form allows the navigator to enter up to 32 future average speed changes. The first four of these CASTs are shown on the main Richta form.

Future CASTs are entered using the input field as follows: Enter the desired average speed in the input field using the Graffiti language then use the stylus to tap one of the CAST Stack fields. If the CAST Stack field tapped is currently 0.0, the input field is copied to the tapped stack entry. If the CAST Stack field tapped contains a non-zero value, the input field is copied to the tapped stack entry and the lower stack entries are shifted down one position. This allows the navigator to insert a CAST in the middle of the pre-entered values. (Do not use the decimal point when entering CASTS. When entering two digits, the decimal point is presumed to be after the second digit (entering 23 results in a CAST of 23). When entering three digits, the decimal point is presumed to be after the second digit (entering 235 results in a CAST of 23.5). When entering 4 digits, the decimal point is presumed to be after the third digit (entering 1200 results in an average speed of 120.0).

If the input field is blank or zero, then the current CAST value is overwritten with a zero value.

The Collapse button is used to collapse the CAST stack, removing any imbedded zero CASTs and shifting all non-zero values to the front.

Known Restrictions and Limits

Gains may not be entered that exceed the current leg elapsed time. The technical reason for this is that the calculator uses unsigned integers to store the elapsed time and negative values are not allowed.

Decimal points may not be entered in the input field. Doing so terminates the internal scanning/conversion parsing that is done. This may be the subject of a future enhancement.

Precautions

As with any piece of rally equipment, the rally team should be thoroughly familiar and comfortable with the Richta rally calculator prior to using it in an event. Using it to run through prior rallies on the dining room table (with the checkpoint slips) and practicing with the calculator on a mock rally are both practical methods for familiarizing a rally team with this software.

Installation

The Richta Rally calculator is distributed as two files: this documentation (Richta Documentation.doc) and the executable resource file (richta.prc). Simply move richta.prc to any convenient directory on the computer to which the Palm PDA is attached and use the Palm Quick Install utility to specify that richta.prc should be installed. The next hot sync operation will install the software.

Technical Overview

Richta is written in the C programming language and built using the open source GNU and Pilrc compilers. Two books were used as resources and technical guides in the development of the calculator: Palm OS Programming, by Neil Rhodes and Julie McKeehan, and Palm OS Programming From the Ground Up, Robert Mykand.

The calculator source code, header files and resources definitions comprise approximately 2,400 lines of source code.

The calculator uses a Palm OS database to retain critical internal values (trip odometer, out time, current and future CASTs, pause / gain / time allowance totals) and these values are saved each time they change. Should the calculator be accidentally ended (by hitting the Palm OS Launcher, for example), the values are restored from the database each time the calculator is launched.

Software Testing

Documented test cases are used in each instance for repeatability. The following testing is performed on each release of software.

- 1) Basic functional testing – each element of the input forms is verified for basic functional accuracy. Basic calculations (leg time including pause, gain and time allowance) are verified.
- 2) Simulated rally – a twenty leg rally is run with the calculator. Leg times are verified for accuracy. The simulated rally is based on the 2005 Moonlight Monte from the Detroit Region SCCA.
- 3) Gremlin testing – a minimum of two million Gremlin events are processed via the POSE Emulator.
- 4) Garnet compatibility – the test cases listed for Palm OS Version 5, as documented on the Palm Developers web site (cite URL here ...) are executed.

Requests for Enhancements

Requests for functional enhancements, reports of software defects or questions about the use or internal operational of the calculator may be directed to the author: Rich Bireta, RichtaRally@aol.com or rbireta@us.ibm.com.

(Items on the to-do list include:)

Adding a Start of Rally form to allow setting the TOD and an Odo Correction Factor. (Use the Big Clock application to easily set the TOD clock).

Allow more intelligent entry of CASTs, pauses, gains, etc. to include a decimal point whose position is honored.

Software Change Log

Version 1.0.0 November 11, 2005

First release distributed to testers.