

# The WP 34S Evolves

Jake Schwartz

## Introduction

Back in Issue #24, we introduced the WP 34S, a suite of firmware which repurposes either an HP20b or HP 30b financial calculator into a sophisticated RPN scientific keystroke-programmable calculator. The team of Walter Bonin (in Germany), Paul Dale (in Australia) and Marcus von Cube (also in Germany) worked hard to bring this masterwork to life. Then last September at our HHC2011 conference in San Diego, Marcus presented a detailed history of the project and spent additional time discussing the 34S' inner workings while Neil Hamilton introduced his 34S programming tools and Eric Rechlin showed the process by which his keyboard overlays and custom key covers were made and applied to a "clean" calculator.

Subsequently, the development team had proposed some significant upgrades to the then-existing version-2 firmware, but after discussing them with the user community via the HP Museum Forum<sup>(1)</sup>, it was decided to incorporate them into a new version 3, while allowing version 2 to coexist in its earlier, more-familiar configuration. Fig. 1 shows an image of both version-2 and version-3 machines.



Fig. 1 - WP 34s Version 2 (left) and Version 3 (right). The Version-3 machine is in Double-Precision mode, displaying decimal places 16 through 33 of a popular irrational number.

## Keyboard Rearrangements and More

The first thing one will notice when comparing the two versions is the modest keyboard rearrangement.

The  $CL\alpha$ ,  $X \rightarrow \alpha$ ,  $\alpha \rightarrow x$  and L.R. functions were removed (and relocated into catalogs). Also pi, STATUS the X.FCN catalog and the left-shift-display-window and right-shift-display-window functions were relocated. The SF (set flag) and CF (clear flag) was brought out to the keyboard and SUMS and MATRIX catalogs were added. The SUMS catalog represents the summation-functions separated from the STAT catalog and the MATRIX catalog is new, providing basic matrix functionality for the first time. At HHC2011, Gene Wright had presented his initial version of user-code programs based on matrix routines “M1” through “M5” from the PPC ROM (for the HP41 calculator series); and this evolved afterward to a suite of 19 matrix routines (including determinant, inverse and transpose) incorporated into the 34S itself, with the capability to handle two-dimensional matrices up to 100 elements in size.

### **Other Highlights of Version Three**

There are several additional changes added to the version-three software which are significant. A user may now choose to allocate fewer than the default number of numeric registers (R00 to R99) in order to allow additional space for other items such as (among others) more program steps, subroutine levels or the newly-created local data registers. Local data, numbered R.00, R.01 and so forth, may be allocated for any or all programs in memory, so similarly-numbered registers may contain their own private values if need be. (Local flags F.00, F.01, etc. may likewise be created and used.) Flash memory has been reorganized so a large library of user-created programs may be easily managed in flash and accessed by programs in RAM. The statistical summation registers have been pushed out of the numeric-register range and into their own area so they do not interfere with other directly-addressable storage and in fact are not allocated from RAM if no statistical sums are accumulated. Many mathematical functions have been modified to produce more accurate results through the use of higher-precision intermediate values. And now, a double-precision mode has been made available to the user which, when enabled, maintains virtually every value in the calculator with 34-digit decimal accuracy (plus up to 4-digit exponents).

From the chatter on line, the WP 34S developers have several other ideas under consideration, but we may have already reached the point of diminishing returns with a full complement of firmware, no more RAM and just about every clever trick employed to take advantage of the keyboard and limited display of the 20b/30b family. (As Bill Wickes once said in the days of the HP48SX, “Life is short and ROM is full”.) If only the Pioneer-Series-like platform of the HP 17BII+ with its larger RAM and full, two-line dot-matrix LCD were available for repurposing, Walter, Pauli and Marcus would likely be fulfilling their original goals of endeavoring to create the home-grown successor to the HP42S (introduced in 1988), which arguably boasted the “pinnacle” of keystroke programming power.

If you haven't touched a WP 34S yet but are anxious to get in on the excitement, you need the following items:

- An HP 20b or HP 30b financial calculator
- The 34S firmware and extensive user manual, available at <http://sourceforge.net/projects/wp34s/>
- A serial programming cable, which may be obtained for nominal cost from Gene Wright, who may be reached at [genewright143@hotmail.com](mailto:genewright143@hotmail.com)
- An overlay and set of key covers to re-label the calculator keyboard, which may be obtained from Eric Rechlin at <http://commerce.hpcalc.org/overlay.php>

Alternately, there are computer emulators available for experimentation from Pascal Meheut who may be reached at [pascal.meheut@density-tech.com](mailto:pascal.meheut@density-tech.com). In addition, a set of programming tools were developed by Neil Hamilton which may be obtained by contacting him at [nfhwp34s.tbw9z@ncf.ca](mailto:nfhwp34s.tbw9z@ncf.ca). An introductory

wiki also has been maintained for the machine at <http://www.wiki4hp.com/doku.php?id=34s:start> for those searching for additional information. If you are a long-time HP enthusiast and remember the excitement of cracking open the box of a new HP calculator for the first time, you will begin to feel that same kind of excitement with the 34S. Many HHC2011 attendees who had not even heard of the machine, became “converts” almost instantly, and now use the 34S as their everyday RPN “workhorse”. You will be impressed.

### **Observations and Conclusions**

The new version-3 WP 34S is somewhat cosmetically similar to the older version-2 firmware, but adds a significant enough amount of new functionality to justify both the new and veteran user to sample its capabilities. The development team is to be commended for their continued achievements in the areas of keystroke efficiency, memory usage and user programmability.

---

### **The WP 34S Evolves - Notes**

(1) Check out the discussion on the WP 34S plus many other new and legacy HP calculators at the HP Museum forum by going to <http://www.hpmuseum.org> and then clicking on “HP Forum” on the right column.

### **About the Author**



Jake Schwartz has been an HP calculator fan since 1971 after first trying the HP9810A desktop RPN machine at a co-op job at RCA in New Jersey. He has owned most of the scientific top-of-the-line handhelds since the HP35A in the early 1973, joined the PPC Calculator Club in 1977 and contributed to many of the clubs since, including serving as Peripheral Routines coordinator for the PPC ROM project for the HP41 in 1980. Currently working at Lockheed-Martin as a software engineer, Jake has been presenting at and videotaping the annual U.S. HP calculator conferences for more than two decades.