**WP34S Patch Descriptions**

This file describes a number of small patches for the WP-34S firmware. These aren't bug fixes in any sense; rather, they are small pieces of code that change the behaviour of the calculator in various ways.

Here is a description of the patches. Each patch can be enabled by uncommenting the relevant #define statement in the trunk\features.h file and rebuilding the firmware.

**NEW:** Some of these features can now be turned on or off by setting or clearing flags. This allows a version of the calculator firmware including all of these features to be customised to the tastes of each user.

**Summary Table**

|  |  |  |
| --- | --- | --- |
| **Patch** | **Brief Description** | **Enabled / disabled by . . .** |
| Casio-style exponent key | Makes the EEX key enter PI if pressed at start of number entry | **Flag L** |
| *Casio-style fraction separator* | \_| instead of / | *Cannot be disabled if compiled in* |
| *Double-dot fraction separator* | Makes “3..7” enter 3/7 instead of 3 0/7 | *Cannot be disabled if compiled in* |
| SIGFIG display mode | Replaces ALL mode; displays numbers to fixed number of significant figures | **Flag I** |
| y-register display mode | Displays y-register contents in dot-matrix display | **Flag J** |
| *Right-justify the exponent* | Pads the three-digit exponent with zeros | *Cannot be disabled if compiled in* |

**More detailed descriptions**

**1.** *“Casio style” exponent key behaviour.*

* Turned on by uncommenting #define INCLUDE\_EEX\_PI
* **NEW:** this patch is enabled by setting FLAG L and disabled by clearing this flag.

On older Casio calculators pressing the exponent key when a number is expected – e.g., after an arithmetic operator – enters PI. Doing this on the WP-34S enters “1 EEX”; this behaviour is standard on HP machines. I prefer the Casio behaviour and so this patch emulates it on the WP-34S.

* Note: in program mode, this changed behaviour persists. This means that this patch will break code (written by you or a third party) that depends on the standard HP behaviour.
* Note 2: in program mode the key still displays as EEX even though it acts as PI.

**2.** *New “Casio style” fraction separator.*

* Turned on by uncommenting #define INCLUDE\_CASIO\_SEPARATOR
* If compiled into the firmware, this patch cannot be disabled.

This is simple: on old 7-segment Casio calculators fractions were displayed with \_| as the separator. I remember this from my childhood, and this patch duplicates this on the WP-34S.

**3.** *Double-dot fraction entry.*

* Turned on by uncommenting #define INCLUDE\_DOUBLEDOT\_FRACTIONS
* If compiled into the firmware this patch cannot be disabled.
* **NEW:** with this patch installed fraction entry is displayed in a different way. Pressing 3.4. puts 3 4/ in this display, rather than 3.4. . Pressing 3.. displays 3/ in the display, rather than the previous “comma” arrangement.

On the HP-32SII, pressing 3..7 enters the fraction 3/7. On the WP-34S, the same key sequence enters 3 0/7. The WP-34S behaviour is logical, but the HP behaviour is (to me) more convenient. This patch implements the double-dot entry on the WP-34S.

Note: once again, code that depends on the standard behaviour will be broken by this patch. Such code is unlikely to be common.

**4.** *A new display mode.*

* Turned on by uncommenting #define INCLUDE\_SIGFIG\_MODE
* **NEW:** this patch requires FLAG J to be set. It can be turned off (and the normal behaviour of ALL mode restored) by clearing this flag.

The new mode (SIGFIG) takes over from the ALL display mode and can be activated by selecting ALL mode. SIGFIG mode formats numbers to a number of significant figures equal to one more than the argument to ALL. Unlike SCI or ENG mode, exponent notation is not used unless the number is outside the range 10-3 to 109, and by default trailing zeros are removed. So entering PI and successively multiplying it by 10 would display (in ALL 5 mode):

|  |  |
| --- | --- |
| 3.14159 | 3.14159 |
| 31.4149 | 0.314159 |
| 314.159 | 0.0314159 |
| 3,141.59 | 0.00314159 |
| 31,415.9 | 3.14159e-4 |
| 314,159 | 3.14159e-5 |
| 3,141,590 | Etc. |
| 31,415,900 |  |
| 314,159,000 |  |
| 3.14159e9 |  |

As a physics teacher I like this mode because the data that I am working with is normally correct to 4 significant figures at best. I could use SCI 5 instead but I like not being forced to look at trailing zeros or exponents unless I have to.

If you would prefer trailing zeros, setting user flag K will give them. So in mode ALL 2 the number “3” displays either as 3 or as 3.00 depending on the state of flag K.

Flag K has no effect when ALL 10 or ALL 11 are selected.

Note: SHOW and RND still work as expected.

**5.** *y-register displayed in dot matrix portion of the display.*

* Turned on by uncommenting #define INCLUDE\_YREG\_CODE
* **NEW:** this patch requires FLAG J to be set. If FLAG J is clear, the y-register is only displayed after complex operations.

This patch inspired the inclusion of the new complex display mode on the WP-34S, and the improved code from that has been fed back into this. Briefly, it does what it says: instead of the y-register only being shown after a complex operation, it is visible at all times. (See below.)

* Alpha-mode display and messages are not affected.
* In integer mode the y-register is not displayed; mode and bit number (e.g., 2c64) are shown as normal.
* The y-register contents are displayed as a decimal number even when the main display is in fraction or HMS mode.
* Double precision mode is handled with four digits of exponent display, if needed, but for four digit exponents the “e” is replaced by a colon for positive exponents and removed completely for negative exponents.
* The y-register display replaces certain information normally displayed in that area - grad angle mode and date format mode. These annunciators are still visible when a function shift key is pressed.
* **NEW:** this patch now includes the previously separate "Smaller Hyphens" patch, which allows more digits to fit in the dot-matrix display.

**6.** *Right-justified exponent*

* Turned on by uncommenting #define INCLUDE\_RIGHT\_EXP
* If compiled in, this path cannot be disabled.

This patch right-justifies the exponent display, including leading zeroes. So 2 × 10-3 appears as 2 -003, rather than as 2 -3. All my old LED calculators behave like this; I prefer it

Three flags: I, J, K.

When I is clear, ALL mode behaves normally. When I is set, SIG\_FIG mode is operative.

When J is clear, the y-register is always displayed. When J is set, the y-register is displayed only after complex operations.

When K is clear, SIG\_FIG mode trims zeroes; if K is set, it does not.

Big improvement in the way fractions appear when being entered.

Other stuff:

#define INCLUDE\_SIGFIG\_MODE // FLAG I

#define INCLUDE\_YREG\_CODE // FLAG J

#define INCLUDE\_DOUBLEDOT\_FRACTIONS // compulsory

#define SMALLER\_HYPHENS // compulsory

#define INCLUDE\_CASIO\_SEPARATOR // compulsory - too hard to define multiple fractions.

#define INCLUDE\_RIGHT\_EXP // compulsory

Flag L is the only remaining "letter" flag.

#define INCLUDE\_EEX\_PI // FLAG L