HP Forum Archive 15

[Return to Index | Top of Index]

Radix-100 Information

Message #1 Posted by Palmer O. Hanson, Jr. on 16 June 2005, 10:26 p.m.

In an earlier thread on results obtained with analysis of the Albillo matrices with the CC-40 Mathematics module I noted that as a result of the radix-100 mechanization of the CC-40 some numbers will have 13 decimal digit mantissas and others will have 14 decimal digit mantissas. Marcus von Cube asked for more information about radix-100. Valentin Albillo suggested that Marcus should read the paper "Mathematics Written in Sand" to see what Kahan thinks about radix-100 arithmetic and demonstrates some of its side effects. I can't second that recommendation. Much of what Kahan has to say about radix-100 is based on an example from a Visicalc program running on an IBM personal computer which yields incorrect results. My tests show that the radix-100 mechanization in the CC-40 (and in the TI-74) does NOT yield those incorrect results.

There is a small amount of material on radix-100 in the Compact Computer 40 User's Guide. The discussion of Internal Numeric Representation on Page F-2 begins with the paragraph

"The CC-40 uses radix-100 format for internal calculations. A single radix-100 digit ranges in value from 0 to 99 in base 10. The computer uses a 7-digit mantissa which results in 13 to 14 digits of decimal precision. A radix-100 exponent ranges in value from -64 to + 63 which yields decimal exponents from 10^{-128} to 10^{+126} . The expnent and the seven digit mantissa combine to provide a decmal range from -9.99999999999=+127 through -1.E-128; zero; and then +1.E-128 through +9.99999999999=+127. ..."

The remainder of the page continues on with more discussion of the internal representation including examples of some specific internal representations. It's more material than I want to retype. If you can't find a manual and want a copy of the page let me know. I could not find any mention of Radix 100 in the *TI-74 User's Guide*. Page A-33 of the *TI-74 Programming Reference Guide* contains a statement similar to that quoted above from the CC-40 manual.

Pages 6 and 7 of the Volume 9 Number 5 issue of *TI PPC Notes* provide some additional discussion of the CC-40 arithmetic as written by the CC-40 user community. To see the pages on-line go to Viktor Toth's Programmable Calculator web site at www.rskey.org/. Then go to the Library, to Texas Instruments, to PPC Notes and to Volume 9 Number 5.

Although I do not think the Kahan paper is very helpful to an understanding of radix-100 mechanizations I do recommend reading the paper. My only caveat is that the reader should recognize that the material in the paper is somewhat biased. Readers from the LOL community will see the bias as justifiable pride in a superior product -- the HP-15c. Readers from the dark side will see the paper as containing some useful material together with a lot of blatant salesmanship.

Finally, running the small version of Kahan's Paranoia analysis confirms that for the CC-40 the radix is 100, the precision (the number of radix positions) is seven and the machine has a guard digit for add/subtract.

Re: Radix-100 Information

Message #2 Posted by Marcus von Cube on 17 June 2005, 4:29 a.m., in response to message #1 by Palmer O. Hanson, Jr.

Thanks for the inside. I'm a little busy at the moment but I'll check out both the article and my CC-40 manual. (I do have the German version and just found the chapter.)

The funny thing is that I actually *hacked* the format myself in September 2004. When playing around with my HEX-bus equipment I noticed that one interesting program (the directory lister for my Quick Disk drive) couldn't be LISTed on the CC-40. So I sent the file to the PC (with help of the PC interface) and wrote a small utility: UNTIC74. It is a kind of disassembler for CC-40/TI-74 BASIC programs in internal form. TI provides the opposite, TIC74. I wrote some BASIC code to contain all possible tokens and a range of numbers and tried to figure out how the encoding worked.

Chapter F-2 would have easily saved me some hours if I had known about it. :-)

Edited: 17 June 2005, 5:12 a.m.

Re: Radix-100 Information

Message #3 Posted by **Palmer O. Hanson, Jr.** on 20 June 2005, 10:06 p.m., in response to message #2 by Marcus von Cube

For the printout of the inverses of the Albillo matrices all one needs to remember is that if the integer portion has an odd number of digits then the total number of digits will be 13 not 14. In essence, the 14th digit is thrown away as a zero in the left position of the left most 100 radix digit.

Somewhere back in my head I remember deciding that if a number must be expressed in scientific format then its mantissa will have only 13 digits but I haven't been able to find that or reproduce it.

An observation on the inverses of the Albillo matrices. For every row and every column the first and seventh elements are of approximately the same size but of opposite sign, and about an order of magnitude or more larger than any other element in the same row or column.

[Return to Index | Top of Index]

