GUIDE & INFO ABOUT IEEE 754 CONVERTER

AUTHORS

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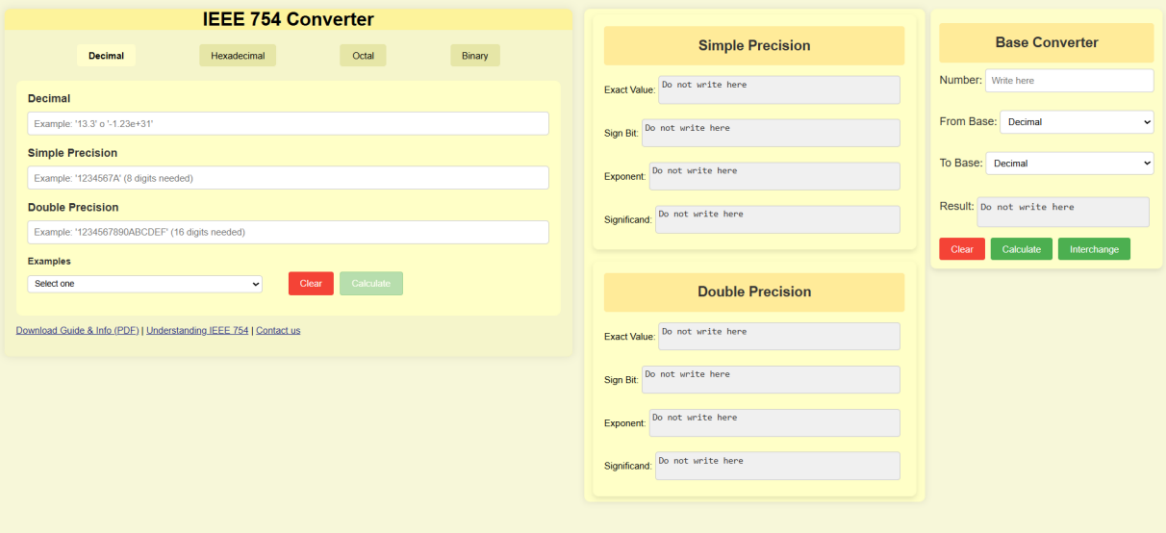
INTRODUCTION

In this file is shown the information needed to use the website in the correct way. Currently, this page is in a very recent version, that's why, it may contain errors, we are working to find and solve them and, in addition, we are trying to improve and extend the precision of this site.

If you find an error or you have any questions or suggestions, you can contact us at this e-mail.

Before continuing with this guide, you should know that this website is completely running in the client-side and we do not collect any kind of information.

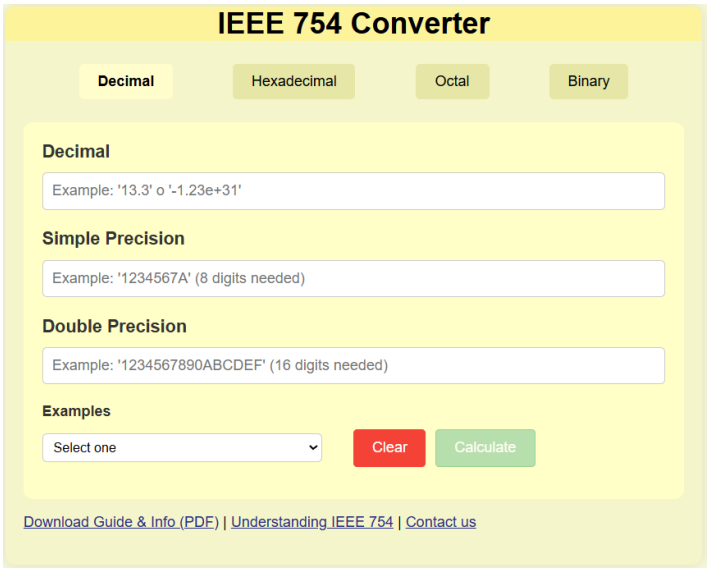
1. MAIN INTERFACE



This is the main interface of the page, it has three (3) principal sections:

1. At the left, there is the principal section, where you can do the conversions from a number in classic notation to IEEE 754 notation and vice-versa.
2. In the middle, it is the block intended to show the user the extended properties about the IEEE 754 number.
3. At the right, it is an additional block, where you can change a number through different bases.

2. BLOCK ONE (1)



We are going to describe the previous menu showed in the image from the top to the bottom:

1. At the top, there is the title of the website.
2. There are four (4) buttons to choose the base number of the first input, the input of the fractional numbers.
3. The first input: fractional numbers are introduced here. You can write here positive, negative and all real numbers in any of the four available bases (decimal, hexadecimal, octal and binary). If you choose decimal base, you can write the number in exponential notation (ex. '23.14e-12').
4. The second input: the simple precision of the IEEE 754 number goes here. You should write an IEEE 754 number in simple precision in this input, eight (8) digits are needed.
5. The third and last input for the double precision. You should write IEEE 754 numbers in this input, with sixteen (16) digits.
6. The select of the examples. In this select you can choose one example of the list and look its representation.
7. The 'Clear' button. This button is to delete all the information in the boxes, included the boxes of the second block (the section of the middle).
8. The 'Calculate' button. This button is for calculate the IEEE 754 number (simple and double) after you introduce the fractional number in the first input.
9. The link to download this file.

Notes:

-The three inputs are for write and read, i.e., when you use the first input to write a fractional number you will see the conversion (simple and double precision) in its respective inputs. And vice-versa, when you write a number in, for example, simple precision input you will see its conversion to real number in the first input and its equivalent in double precision in the third input. The same when the input is in the double precision box.

-To convert a fractional number in its IEEE 754 representation, you should write the number firstly and then, press the 'Calculate' button. But, when the input is one of the two precisions of the IEEE 754, you do not need to press that button, you only must write all the digits for that number (eight (8) for simple and sixteen (16) for double).

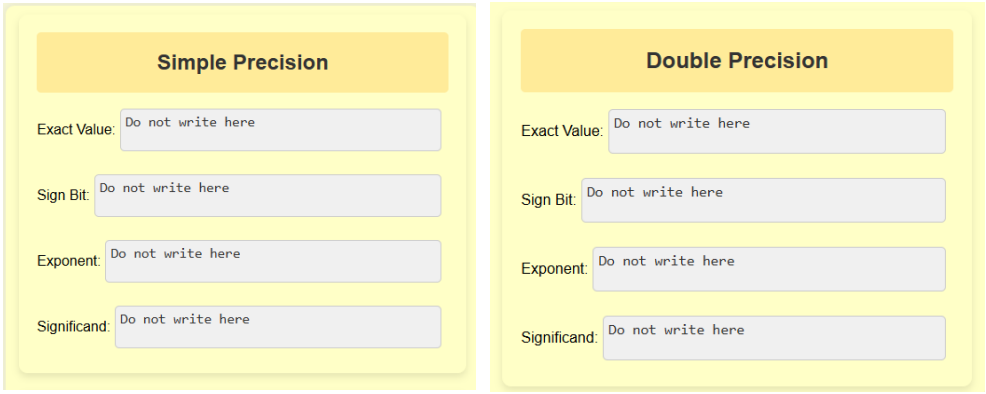
-If you introduce a number but it is an incorrect format, the input borders will turn red.

-In the examples select the ‘sNaN’ and ‘qNaN’ will not be able to be showed in the inputs of this menu, that’s why, they will only be showed in the next section.

-If you use a base other than decimal, the accuracy of the IEEE 754 equivalent may be slightly reduced.

-The rounding method used is *roundTiesToEven*.

3. BLOCK TWO (2)

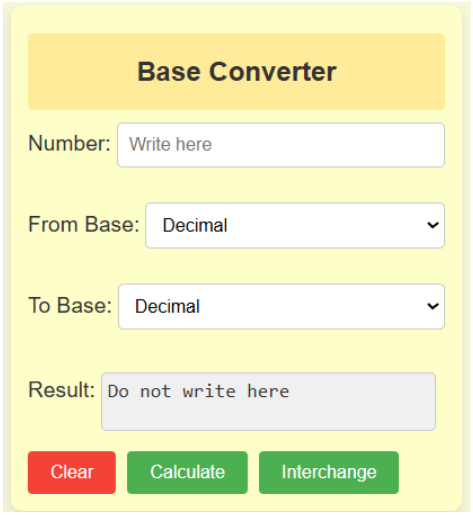


In this section, you cannot write in any box. You only can see the three (3) areas of the two precisions (sign bit, exponent and significand) bit by bit. The box ‘Exact Value’ contains the exact real number in decimal base (always in decimal base) that the IEEE 754 number represents.

Important note:
-In this section, “exponent” is used with the meaning of “biased exponent”. For more information, check Understanding IEEE 754 out.

Note:
-When in the section one (1) you choose the ‘sNaN’ or ‘qNaN’ examples you will see some ‘X’ in the boxes of this block, the ‘X’ represents that does not matter if that bit is ‘1’ or ‘0’.

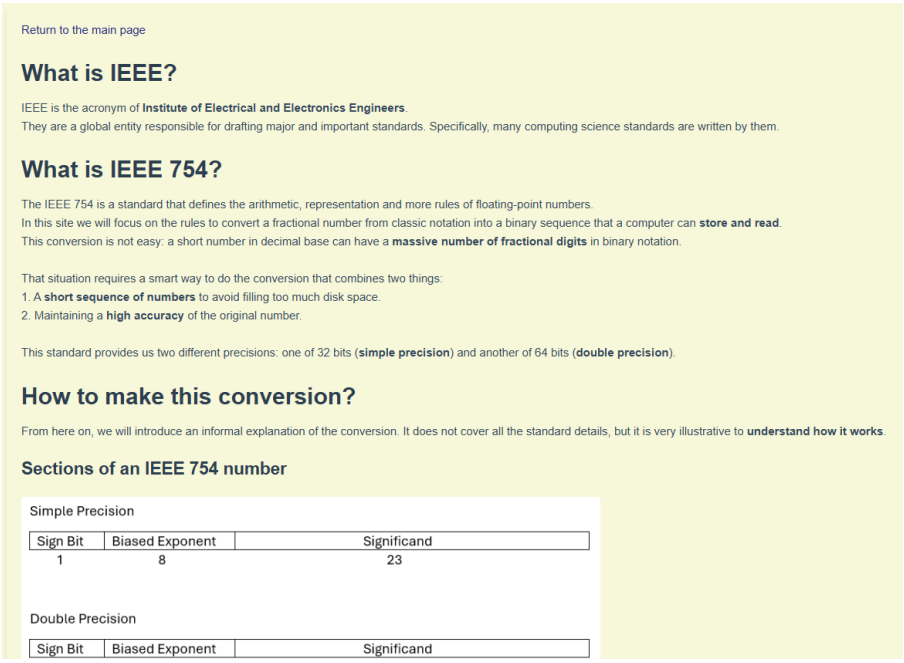
4. BLOCK THREE (3)



This block is additional and works independently of the other two. It can do base conversions in the four (4) bases (works for positive real numbers): decimal, hexadecimal, octal and binary. You should write the original number in the first input, secondly, select the base for that number and then select the base you want, when you press the ‘Calculate’ button, you will see the conversion in the box ‘Result’.
The button ‘Clear’ is to delete all the information in the boxes and the button ‘Interchange’ is for change the values between the ‘From Base’ select and ‘To Base’.

Note:
-If you write a number in the incorrect format, you will be advised in the ‘Result’ box after press the ‘Calculate’ button.

5. APPENDIX (Understanding IEEE 754)



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What is IEEE?

IEEE is the acronym of **Institute of Electrical and Electronics Engineers**.
They are a global entity responsible for drafting major and important standards. Specifically, many computing science standards are written by them.

What is IEEE 754?

The IEEE 754 is a standard that defines the arithmetic, representation and more rules of floating-point numbers.
In this site we will focus on the rules to convert a fractional number from classic notation into a binary sequence that a computer can **store and read**.
This conversion is not easy: a short number in decimal base can have a **massive number of fractional digits** in binary notation.

That situation requires a smart way to do the conversion that combines two things:
1. A **short sequence of numbers** to avoid filling too much disk space.
2. Maintaining a **high accuracy** of the original number.

This standard provides us two different precisions: one of 32 bits (**simple precision**) and another of 64 bits (**double precision**).

How to make this conversion?

From here on, we will introduce an informal explanation of the conversion. It does not cover all the standard details, but it is very illustrative to **understand how it works**.

Sections of an IEEE 754 number

Simple Precision

Sign Bit	Biased Exponent	Significand
1	8	23

Double Precision

Sign Bit	Biased Exponent	Significand

There is a link on the main page that redirects you to another page with a very basic explanation of the conversion.