Advantech AE Technical Share Document

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Category	■FAQ □ SOP	Related OS	N/A
Abstract	How to read floating point value via RS-485 on WISE		
Keyword	Floating point, RS-485, IEEE-754		
Related Product	WISE-4051, WISE-S250, WISE-S251, WISE-S472, WISE-S672		

■ **Problem Description:**

WISE-4000 is able to read floating point via RS-485. This document will show you how to read it.

■ **Answer:**

➢ The IEEE-754 standard defines kinds of floating point value format. WISE support reading 32 bit floating points (Single precision). WISE converted the 32 bit floating points into two Modbus address. Below is the process to know how it is converted:

Convert floating value into IEEE-754 format.
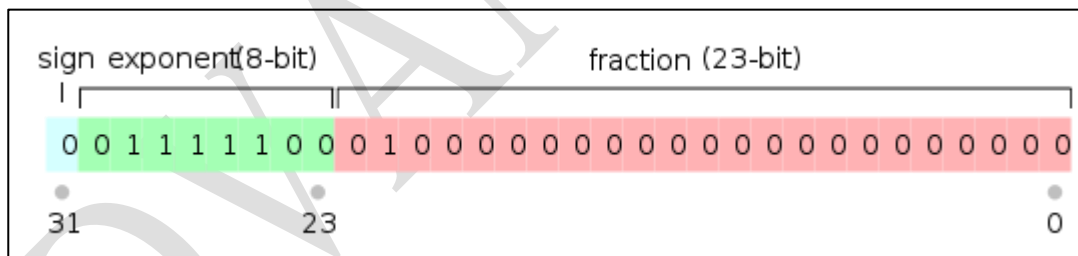The format of IEEE-754 32-bit floating point is defined in below figure.

Figure1. IEEE-754 32-bit floating point format.

IEEE floating point numbers have three basic components: the sign, the exponent, and the mantissa. The sign bit is 0 for positive, 1 for negative. The exponent base is two. The exponent field contains 127 plus the true exponent for single-precision. The first bit of the mantissa is typically assumed to be 1, yielding a full mantissa of 1.f, where f is the field of fraction bits. In this document, we will not show you the detail calculation process. Instead, we use online tool in below link to get the result directly.

IEEE-754 Floating Point Converter

https://www.h-schmidt.net/FloatConverter/IEEE754.html

For example, we have a floating number 3.1415926. After entering into online converter, we could get its Binary Representation which is 01000000010010010000111111011010.
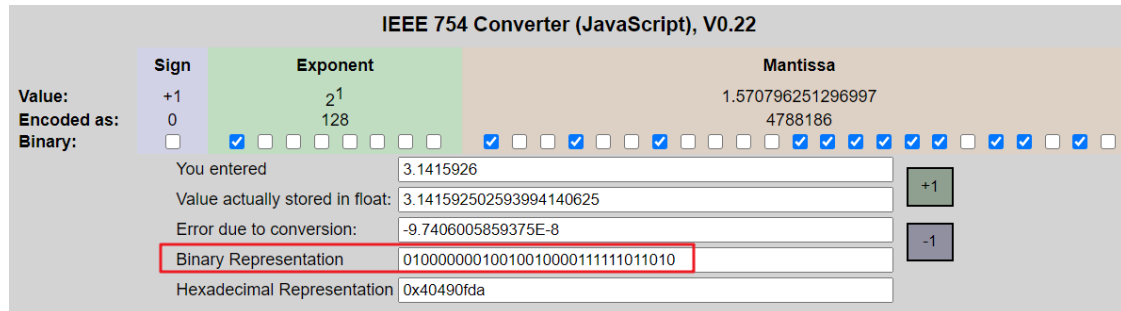

Figure2. IEEE-754 32-bit floating point online converter.

Divide Binary Value into two register

In previous step, we already get 32 bit floating points into binary. Next, we divide this into two parts. Bit 0~16 represent low order word and bit 17~32 represent high order word. Usually, The Modicon standard is to send the low order word (register) first and the high order word second.

Following previous step's result:

Low order word: 0000111111011010
High order word: 0100000001001001

Convert binary value to decimal value which will be the value we see on WISE:

Low order word: 04058
High order word: 16457

■ **Example: Read floating point value on WISE-4051:**

In below figure 3, we are going to show you how to read the floating point value in WISE-4051. As mentioned, the 32-bit floating value is read by two 16-bit register in WISE. In addition, the low order value is usually sent first and then the high order value. It is depending on signal source, so the user need to be careful in order to get the correct value. In this example, we simulate the floating point value 3.1415926 on 40001~40002 Modbus Register by a Modbus simulation software (Modsim). Therefore, we need to configure WISE-4051 to read 40001~40002.

📊 IO Status

DI COM1

| Status | Modbus/RTU Configuration | Diagnostician |

Modbus/RTU Configuration

| Common Setting | Rule Setting |

Rule	Slave ID	Type	Start Address	Length	R/W	Scan Interval	Mapping Channel	Log	Deviation/COS	Deviation Value	Rule Status
0	1	03 Holding register	1	2	R ▼	1000	0	☑	☑	3276	✔
1	1	Disable ▼	1	1	R ▼	1000	0	☐	☐	3276	✖
2	1	Disable ▼	1	1	R ▼	1000	0	☐	☐	3276	✖

Figure3. Modbus/RTU configuration page in WISE-4051.

Because the Modsim sent low order value first then high order value. Therefore, according to figure4, value in ch0 and ch1 are the low order and high order value of 3.1415926 respectively. After collecting the value in WISE-4051 via RS-485, the user is able to upload the data to cloud, SCADA and so on. One thing should be noticed is that, the user need to use mapping address in order to get the RS-485 value in WISE-4051. Take below figure4 for example, if the user read mapping address 41001, they will get value 4058.

| Bit Status | Word Status |

Show 32 ▼ entries

Channel		Value	Status	Slave ID	Slave Address		Mapping Address(4X)
0	Low order	4058	No error	1	1	Mapping	1001
1	High order	16457	No error	1	2		1002

Figure4. Floating point reading on WISE-4051.