SIEMENS

Data Communications Reference

Working With 32-Bit Numbers

Application examples

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Legal information

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This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

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⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

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indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

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Table of contents

Introduction 1

1.1 Objective

The objective of this application guide is to help the user become familiar with the steps required to resolve 32-bit numerical values stored in 16-bit Modbus registers.

1.2 Equipment

Equipment Description	MLFB/A5E Number
Siemens LUT400 (or other 32-bit field instrument using Modbus protocol)	7ML5050-0....-1D.0
Host device (Modbus compatible PC or PLC)	
Any necessary links, modems, or converters	

1.3 Disclaimer

Note

While every effort is made to verify the following information, no warranty of accuracy or usability is expressed or implied.

Overview

2

Some field instruments store large numerical values as 32-bit numbers. These numbers are represented in the Modbus memory map as two 16-bit registers. Data conversion requirements vary depending on the host device used.

Planning/configuring

3

3.1 Common Data Conversion Requirements

Two conditions must be addressed before performing data conversion: Word Order and Signed Integers.

Word Order

To represent a 32-bit number as two 16-bit bit numbers, the word order must be established to define whether the higher order word is first or second. By default, the first register is the MSW (most significant word) and the second register is the LSW (least significant word).

Example: If Modbus register R41,442 is read as a UINT32 (unsigned 32-bit integer), the 32-bits would look like this:

R41,442			**R41,443**		
16	MSW	1	16	LSW	1
32	32-bit integer value (UINT32)				1

If a reversed word order is required, change the word order flag (R40,062 in most Siemens Milltronics instruments).

Signed Integers

A signed integer uses the last bit to indicate if the number is negative. The formulas given in this document require that the integers be unsigned.

To convert a signed integer N to an unsigned integer:

If N < 0 then N = N + 65536

To convert an unsigned integer N to a signed integer:

If N > or = 32768 then N = N - 65536

3.2 Data Conversion

Some programs will do the conversion as part of the setup. If not, perform the following calculations.

For two unsigned 16-bit registers, N1 and N2 (with N1 being the MSW and N2 being the LSW).

1. To convert them to one number, use this formula:

   N = N1 * 65536 + N2

2. To convert back to two 16-bit integers, use these formulas:

   N1 = Int (N / 65536)

   N2 = N - N1 * 65536

The Int function truncates (removes the decimal part of) the number. Example: 3.9 becomes 3.

Note

Some Siemens instruments store 32-bit numbers with a fixed decimal place of 3 digits. (Refer to the corresponding instruction manual for register format details.)

To convert these numbers to a floating point value:

F = N / 1000

Where N is the 32-bit integer representation of N1 and N2, and F is the floating point value.

Example

For an Allen-Bradley PLC-5, prepare the code as follows to convert two 16-bit numbers (N9:11 and N9:12) into a floating point number (F8:1).