# Communication Add-on

# Modbus - RTU

# Addendum A

First edition, October 2008



**Revision History:**

1.00 – 1st Release
1.01 – Added RSM
1.02 – Updated bookmarks

# Table of Contents

# 1. Introduction

The Modbus-RTU protocol runs over the RS-485 communication medium. For tips regarding setting up a RS-485 network, see the user manual specific to your controller.

The Arcus implementation of Modbus-RTU supports the holding register data type only. Coils, Discrete Inputs and Input Registers are not supported.

# 2. Communication Settings

### *Baud Rate*

The RS-485 baud rate can be changed using the **DB** command.

Please note that the device baud rate must be within the range [1, 5].

| Device Baud Value | Baud Rate (bps) |
|---|---|
| 1 | 9600 |
| 2 | 19200 |
| 3 | 38400 |
| 4 | 57600 |
| 5 | 115200 |

To write the values to the device's flash memory, use the **STORE** command. After a complete power cycle, the new baud rate will be written to memory. Note that before a power cycle is completed, the settings will not take effect.

By default: Baud rate is set to: **1 (9600 bps)**

This setting can be made either through RS-485 ASCII or USB communication depending on your controller.

### *Modbus Device Number*

Arcus Modbus controllers allow the user to set the Modbus device number (used for addressing) from the range of [1-127]. In order to make this change, use the **DNM** command.

To write the values to the device's flash memory, use the **STORE** command. After a complete power cycle, the new device number will be written to memory. Note that before a power cycle is completed, the settings will not take effect.

By default: Modbus device number is set to **1**

This setting can be made either through RS-485 ASCII or USB communication depending on your controller.

### *RS-485 Communication Mode*

Changing from RS-485 to Modbus

By default, Arcus controllers are configuring for ASCII protocol when using RS-485 communication. In order to enable Modbus-RTU communication, set **RSM=1**.

To write the values to the device's flash memory, use the **STORE** command. After a complete power cycle, the communication mode setting will be written to memory. Note that before a power cycle is completed, the settings will not take effect.
This setting must be made through RS-485 ASCII.

Below is a table of the ASCII commands that are mentioned above. To see a complete list of all ASCII commands, see the user manual specific to your controller.

| **Command** | **Description** | **Return** |
|---|---|---|
| DB | Return the current baud rate of the device | 1 – 9600 bps<br>2 – 19200 bps<br>3 – 38400 bps<br>4 – 57600 bps<br>5 – 115200 bps |
| DB=[1,2,3,4,5] | Set the baud rate of the device | OK |
| DNM | Get Modbus device number | [1-127] |
| DNM=[1-127] | Set Modbus device number | OK |
| RSM | Get RS-485 Communication mode | 0 – ASCII<br>1 – Modbus-RTU |
| RSM=[0,1] | Set RS-485 Communication mode | OK |
| STORE | Store settings to flash | OK |

Changing from Modbus to RS-485
Once your controller is in Modbus communication, it can no longer accept ASCII commands. In order to change communication back to ASCII, you must write the value 1 into register **V30**. After writing to register V30, a power cycle must be performed before the setting takes effect. Note that the setting is automatically stored to flash when written.

See "Modbus RTU Addressing" for details on how to write the value.

# 3. Sample Usage

### *Achieving functionality via variables*

Only the general purpose variables V1-V30 of the controller are accessible via Modbus-RTU communication. By reading/updating these variables, the desired functionality can be achieved by referencing them within a running stand-alone program. For details regarding stand-alone programming, see the user manual specific to your controller.

In a typical application, the controller runs a stand-alone program while the Modbus master accesses variables over the Modbus-RTU protocol.

The following is a sample of such a stand-alone program.

### *Standalone Example Program 1*

```
EO=1                    ;* Enable the motor power

WHILE 1=1               ;* Forever loop
        GOSUB 1         ;* Set speed settings
        IF V1=1
                X1000   ;* If V1 is set to 1 then go to position 1000
                WAITX   ;* Wait for move to complete
        ELSEIF V1=2
                X3000   ;* If V1 is set to 2 then go to position 3000
                WAITX   ;* Wait for move to complete
        ELSEIF V1=3
                X0      ;* If V1 is set to 3 then go to position 0
                WAITX   ;* Wait for move to complete
        ENDIF

        V2 = PX         ;* Store pulse position in V2

ENDWHILE        ;* Go back to WHILE statement

END

SUB 1
        HSPD=V4             ;* Set the high speed to V4 pulses/sec
        LSPD=V5             ;* Set the low speed to V5 pulses/sec
        ACC=V6              ;* Set the acceleration to V6 msec
END SUB
```

# 4. Modbus RTU Addressing

The Arcus implementation of Modbus-RTU supports the holding register data type only. Coils, Discrete Inputs and Input Registers are not supported.

### *Data Model*

| Data Type Parameter | Size (Bits) | Data Type Description | Access | Address Range |
|---|---|---|---|---|
| 03h | 16 | Holding Registers | Read/Write | [1-60] |

### *Holding Registers – Read/Write – 16 bits*

| Address | Name | Description |
|---|---|---|
| 1 | V1_H | V1 Higher 16 bits [31:16] |
| 2 | V1_L | V1 Lower 16 bits [15:0] |
| 3 | V2_H | V2 Higher 16 bits [31:16] |
| 4 | V2_L | V2 Lower 16 bits [15:0] |
| 5 | V3_H | V3 Higher 16 bits [31:16] |
| 6 | V3_L | V3 Lower 16 bits [15:0] |
| 7 | V4_H | V4 Higher 16 bits [31:16] |
| 8 | V4_L | V4 Lower 16 bits [15:0] |
| 9 | V5_H | V5 Higher 16 bits [31:16] |
| 10 | V5_L | V5 Lower 16 bits [15:0] |
| 11 | V6_H | V6 Higher 16 bits [31:16] |
| 12 | V6_L | V6 Lower 16 bits [15:0] |
| 13 | V7_H | V7 Higher 16 bits [31:16] |
| 14 | V7_L | V7 Lower 16 bits [15:0] |
| 15 | V8_H | V8 Higher 16 bits [31:16] |
| 16 | V8_L | V8 Lower 16 bits [15:0] |
| 17 | V9_H | V9 Higher 16 bits [31:16] |
| 18 | V9_L | V9 Lower 16 bits [15:0] |
| 19 | V10_H | V10 Higher 16 bits [31:16] |
| 20 | V10_L | V10 Lower 16 bits [15:0] |
| 21 | V11_H | V11 Higher 16 bits [31:16] |
| 22 | V11_L | V11 Lower 16 bits [15:0] |
| 23 | V12_H | V12 Higher 16 bits [31:16] |
| 24 | V12_L | V12 Lower 16 bits [15:0] |
| 25 | V13_H | V13 Higher 16 bits [31:16] |
| 26 | V13_L | V13 Lower 16 bits [15:0] |
| 27 | V14_H | V14 Higher 16 bits [31:16] |

| | | |
|---|---|---|
| 28 | V14_L | V14 Lower 16 bits [15:0] |
| 29 | V15_H | V15 Higher 16 bits [31:16] |
| 30 | V15_L | V15 Lower 16 bits [15:0] |
| 31 | V16_H | V16 Higher 16 bits [31:16] |
| 32 | V16_L | V16 Lower 16 bits [15:0] |
| 33 | V17_H | V17 Higher 16 bits [31:16] |
| 34 | V17_L | V17 Lower 16 bits [15:0] |
| 35 | V18_H | V18 Higher 16 bits [31:16] |
| 36 | V18_L | V18 Lower 16 bits [15:0] |
| 37 | V19_H | V19 Higher 16 bits [31:16] |
| 38 | V19_L | V19 Lower 16 bits [15:0] |
| 39 | V20_H | V20 Higher 16 bits [31:16] |
| 40 | V20_L | V20 Lower 16 bits [15:0] |
| 41 | V21_H | V21 Higher 16 bits [31:16] |
| 42 | V21_L | V21 Lower 16 bits [15:0] |
| 43 | V22_H | V22 Higher 16 bits [31:16] |
| 44 | V22_L | V22 Lower 16 bits [15:0] |
| 45 | V23_H | V23 Higher 16 bits [31:16] |
| 46 | V23_L | V23 Lower 16 bits [15:0] |
| 47 | V24_H | V24 Higher 16 bits [31:16] |
| 48 | V24_L | V24 Lower 16 bits [15:0] |
| 49 | V25_H | V25 Higher 16 bits [31:16] |
| 50 | V25_L | V25 Lower 16 bits [15:0] |
| 51 | V26_H | V26 Higher 16 bits [31:16] |
| 52 | V26_L | V26 Lower 16 bits [15:0] |
| 53 | V27_H | V27 Higher 16 bits [31:16] |
| 54 | V27_L | V27 Lower 16 bits [15:0] |
| 55 | V28_H | V28 Higher 16 bits [31:16] |
| 56 | V28_L | V28 Lower 16 bits [15:0] |
| 57 | V29_H | V29 Higher 16 bits [31:16] |
| 58 | V29_L | V29 Lower 16 bits [15:0] |
| †59 | V30_H | V30 Higher 16 bits [31:16] |
| †60 | V30_L | V30 Lower 16 bits [15:0] |

†V30 is reserved for communication mode setting. In order to change from Modbus communication to ASCII, set V30=1.

### *Dealing with the Swapped-Long Registers*

Variables V1-V30 are 32-bit twos-complement numbers. Since standard Modbus holding registers only hold 16 bits, the full 32-bit numbers are stored into two different registers. The lower addressed register represents the higher 16 bits of the 32-bit number, while higher addressed register represents the lower 16 bits of the 32-bit number. This is known as swapped-long.

Example 1: Set **V1** to: -34930493 (0xFDEB00C3)

**V1** holding register is found at address 1.

Set Holding Register Address 1 [bits 16:31] to 0xFDEB
Set Holding Register Address 2 [bits 0:15] to 0x00C3

Example 2: Read **V2** register

**V2** holding register is found

Assuming that the values stored in these registers are:

Holding Register Address 3 [bits 16:31] = 0x0000
Holding Register Address 4 [bits 0:15] = 0x4933

When reading this value, the full 32-bit value is: +18739 (0x00004933)

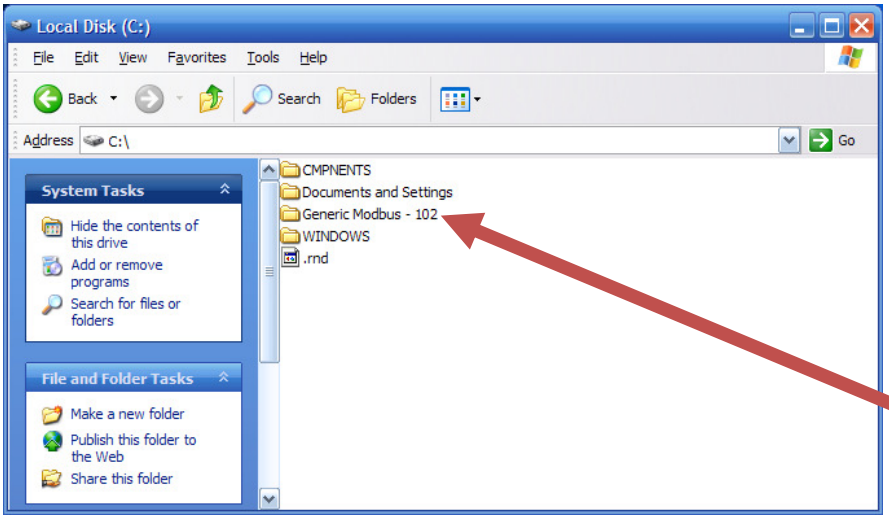
# 4. Modbus GUI

Arcus provides a GUI that allows Modbus communication to be achieved between a PC and the controller. Visit our website to download this software.

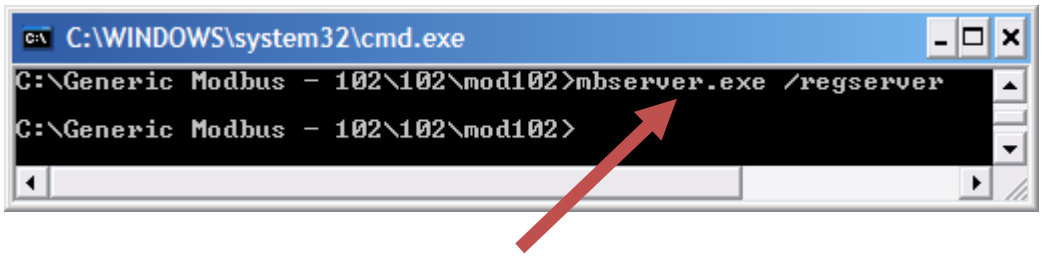
www.arcus-technology.com

Before running the program, make sure to register the 3rd party Modbus master driver on your PC. See instructions below:

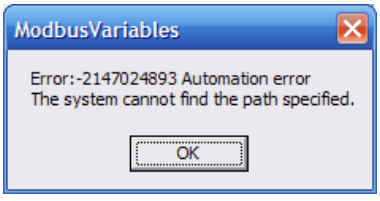
a. Download and extract GUI folder onto your PC.




b. Using the command line, browse to the "mod102" directory within the GUI folder and type "**mbserver.exe /regserver**" and press enter.




c. Note that if this process is not done correctly, you will receive the following error when trying to run the program.

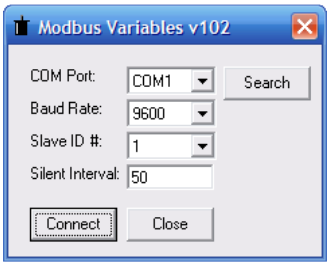


### *Connection Configuration*

After the 3rd party Modbus driver has been successfully registered, start the program and the following screen should show up.

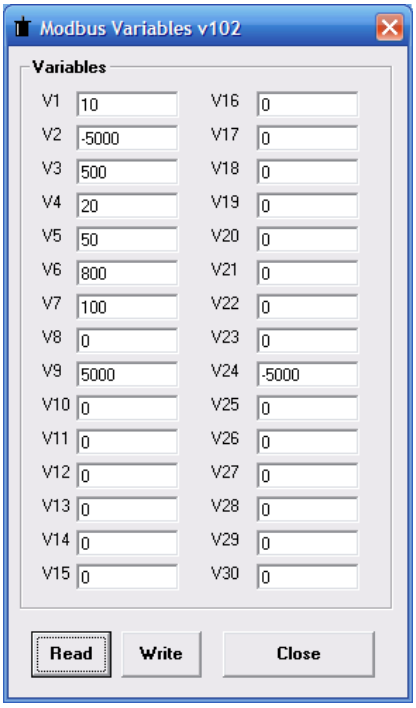
Select the correct COM port, Baud Rate and Slave ID (Modbus Device Number).

The search function allows the user to search for a device on a COM port at a given baud rate.




### *Main Screen*

The main screen allows the user to read/write variables V1-V30.



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