

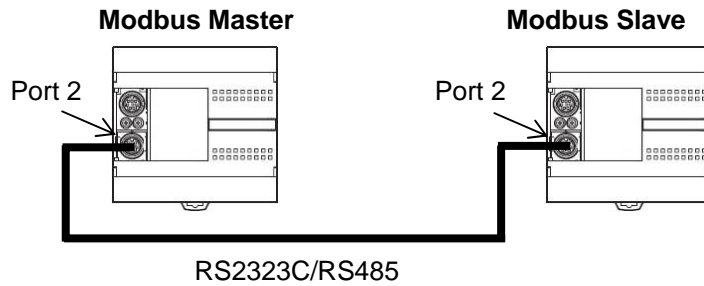
FC5A Modbus Communication Tutorial

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1 System Setup

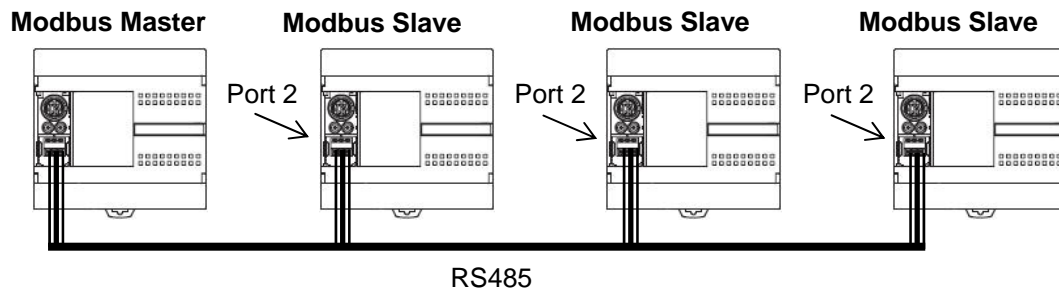
1.1 1:1 network

1:1 network can be established with either RS232C or RS485.



1.2 1:N network (Up to 31 Slaves)

1:N network can be established with either RS485. Up to 31 Modbus slaves can be connected to a master.



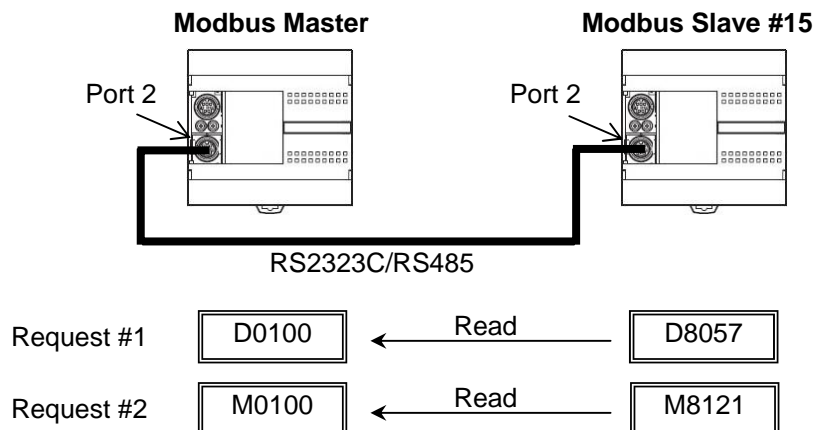
2 Modbus Communication Examples

2.1 Example 1 - Reading 1 word and 1 bit data from a slave

In the example 1, steps to set up 1:1 Modbus communication are shown in detail. A FC5A Modbus Master communicates with a FC5A Modbus Slave, whose slave number is 15. The master reads D8057 of the slave and stores it in D0100, and reads M8121 and stores it in M0100.

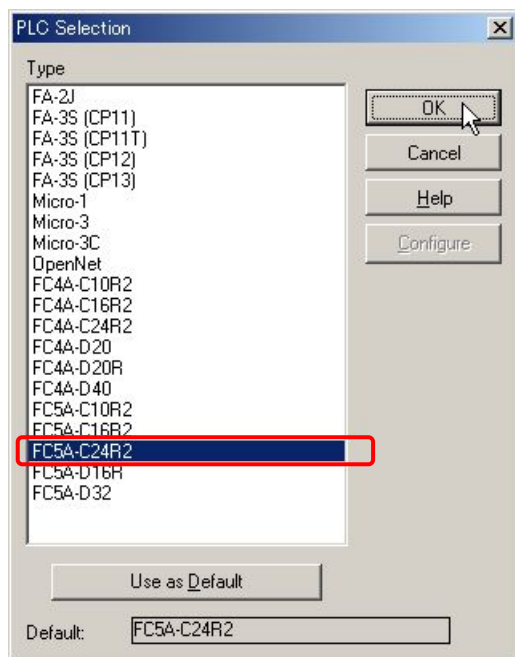
2.1.1 System Setup

The port 2 of two FC5A All-in-one CPUs is connected with RS232C/RS485 cable. The master communicates with the slave using two communication requests.



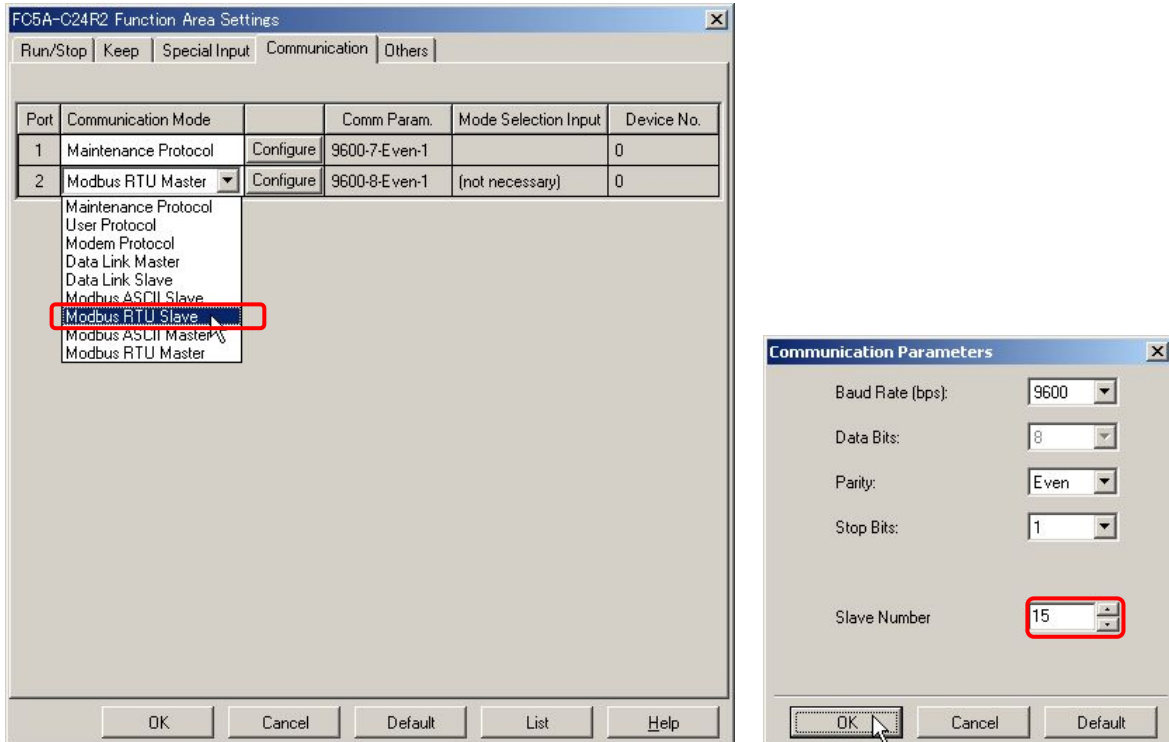
2.1.2 Programming WindLDR - Setting up the Modbus Slave #15

- (1) Start WindLDR and create a new program.
- (2) Select the appropriate PLC type. In this example, FC5A-C24R2 is used. Select Configure > PLC Selection from the main menu to open the PLC Selection dialog box. Select FC5A-C24R2 in the PLC list and click OK to close the dialog box.

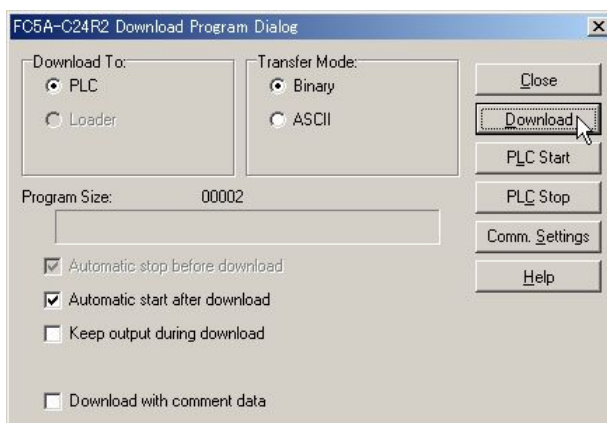


- (3) Select Configure > Function Area Settings... from the main menu to open the Function Area Settings dialog box, and then select the Communication tab.

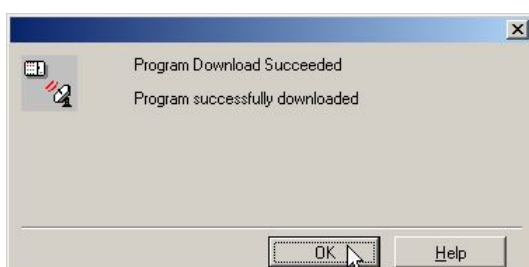
- (4) Select Modbus RTU Slave from the dropdown list for the Port 2, and then Communication Parameters dialog box appears. Input "15" as the Slave Number and click OK to close the dialog box, and then click OK to close the Function Area Settings dialog box.



- (5) Connect the FC5A to be the Modbus Slave #15 to the PC and select Online > Download Program... from the main menu to open the Download Program dialog box. Click Download button to start downloading the program.

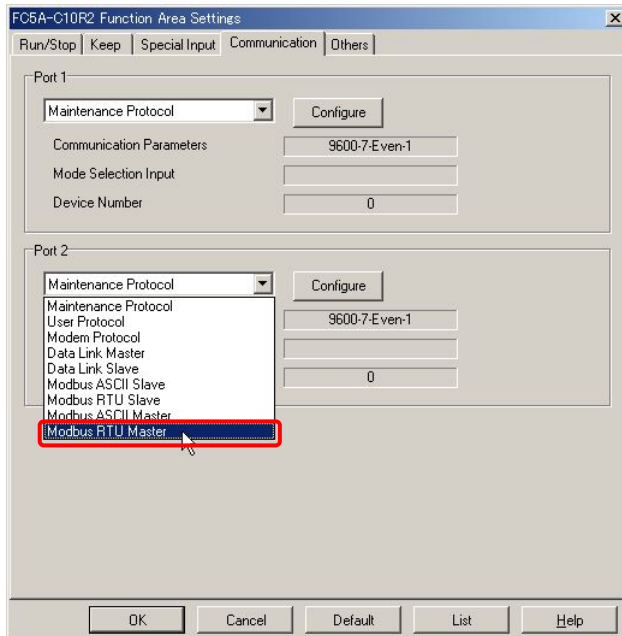


- (6) Program Download confirmation dialog box will appear, and the setup for the Modbus Slave has been finished.

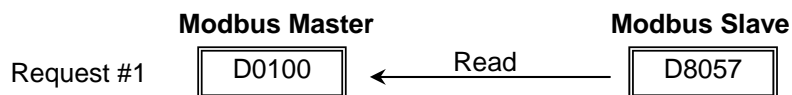


2.1.3 Programming WindLDR - Setting up the Modbus Master

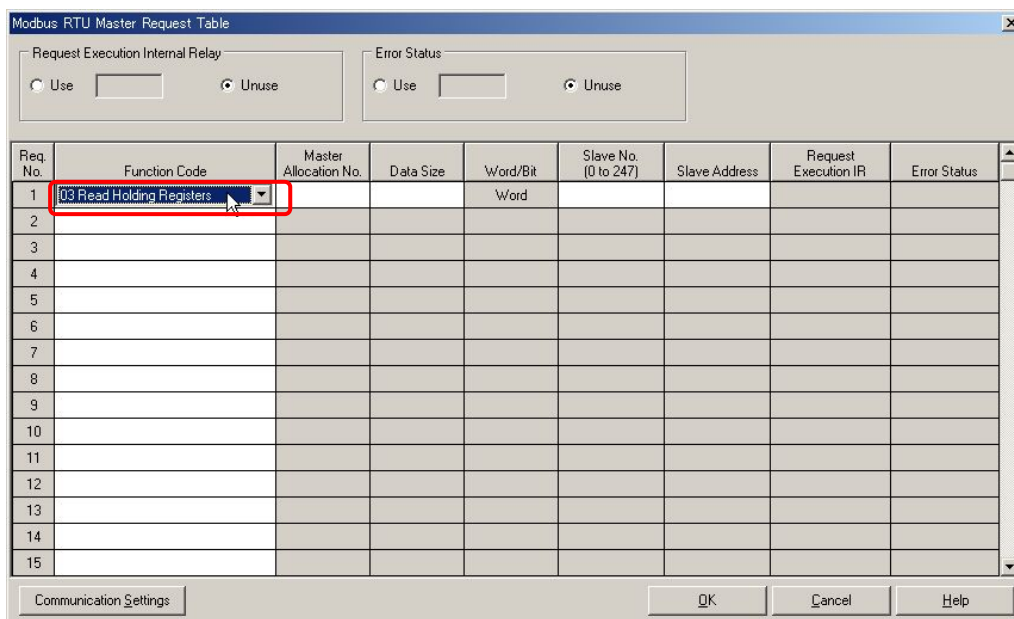
- (1) Create a new program and select the appropriate PLC type. In this example, select FC5A-C10R2.
- (2) Select Configure > Function Area Settings... from the main menu to open the Function Area Settings dialog box, and then select the Communication tab.
- (3) Select Modbus RTU Master from the dropdown list for the Port 2, and then Modbus Master Request Table dialog box appears.



- (4) Define the first communication request.



- (5) Click on the cell of the Function Code of the Request #1 in the dialog box, and then the dropdown list will appear. From the dropdown list, select the 03 Read Holding Register.



Note: Modbus Device, Modbus Address, and Function Code

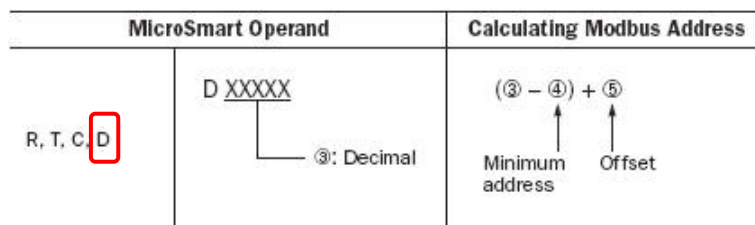
When using FC5A as a Modbus Slave device, Modbus Addresses are assigned to all the operands available on FC5A. In the page 30-9 of the FC5A User's Manual, the Address Map of the FC5A Modbus Slave is shown as below.

For example, special data registers D8000 thru D8499 are considered the Holding Registers, the Modbus Addresses 408001 thru 408500 are assigned to these operands, and the Function Code 3, 6, or 16 can be used to manipulate these operands.

Modbus Device Name	Modbus Address Map (Decimal)	Communication Frame Address	MicroSmart Operand	Applicable Function Code
Coil (000000 and above)	000001 - 000504	0000 - 01F7	Q0 - Q627	1, 5, 15
	000701 - 000956	02BC - 03BB	R0 - R255	
	001001 - 003048	03E8 - 07F7	M0 - M2557	
	009001 - 009256	2328 - 2427	M8000 - M8317	
Input Relay (100000 and above)	100001 - 100504	0000 - 01F7	IO - I627	2
	101001 - 101256	03E8 - 04E7	T0 - T255 (timer contact)	
	101501 - 101756	05DC - 06DB	C0 - C255 (counter contact)	
Input Register (300000 and above)	300001 - 300256	0000 - 00FF	T0 - T255 (timer current value)	4
	300501 - 300756	01F4 - 02F3	C0 - C255 (counter current value)	
Holding Register (400000 and above)	400001 - 408000	0000 - 1F3F	D0 - D7999	3, 6, 16
	408001 - 408500	1F40 - 2133	D8000 - D8499	
	409001 - 409256	2328 - 2427	T0 - T255 (timer preset value)	
	409501 - 409756	251C - 261B	C0 - C255 (counter preset value)	
	410001 - 450000	2710 - C34F	D10000 - D49999	3, 6, 16

In order to obtain the Modbus address of MicroSmart operands, the formula shown below can be used. For example, the Modbus address of D8057 can be calculated as follows.

$$D8057 \text{ (MicroSmart Operand)} = (8057 - 8000) + 408001 = 408058 \text{ (Modbus Address)}.$$



Modbus Device Name	MicroSmart Operand	Minimum Address ④	Offset ⑤
Coil	Q0 - Q627	0	1
	R0 - R255	0	701
	M0 - M2557	0	1001
	M8000 - M8317	8000	9001
Input Relay	IO - I627	0	100001
	T0 - T255 (timer contact)	0	101001
	C0 - C255 (counter contact)	0	101501
Input Register	T0 - T255 (timer current value)	0	300001
	C0 - C255 (counter current value)	0	300501
Holding Register	D0 - D7999	0	400001
	D8000 - D8499	8000	408001
	T0 - T255 (timer preset value)	0	409001
	C0 - C255 (counter preset value)	0	409501
	D10000 - D49999	10000	410001

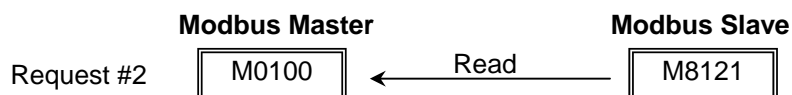
To reduce the calculation effort, the Modbus Address table “FC5A_ModbusSlave_AddressMap.xls” showing all the operands available on FC5A and corresponding Modbus address is provided.

	A	B	C	D	E	F
1	FC5A MicroSmart Operand	Modbus Address (Decimal)	Communication Frame Address			
57	D8055	408056	1F77			
58	D8056	408057	1F78			
59	D8057	408058	1F79			
60	D8058	408059	1F7A			
61	D8059	408060	1F7B			

- (6) Input “D100” in the Master Allocation No., “1” in the Data Size, “15” in the Slave No., and “408058” in the Slave Address. The setup for the communication request #1 has been completed. The 1 word data at the address 408058 of the Modbus Slave #15 is read out and stored in D0100 of the Modbus Master.

Req. No.	Function Code	Master Allocation No.	Data Size	Word/Bit	Slave No. (0 to 247)	Slave Address	Request Execution IR	Error Status
1	03 Read Holding Registers	D0100	1	Word	15	408058		
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

- (7) Define the second communication request.



- (8) To obtain the Modbus Address of M8121, select Special Internal Relay sheet in the Modbus Address table and look up the M8121.

	A	B	C	D	E	F
1	FC5A MicroSmart Operand	Modbus Address (Decimal)	Communication Frame Address			
97	M8117	009096	2387			
98	M8120	009097	2388			
99	M8121	009098	2389			
100	M8122	009099	238A			
101	M8123	009100	238B			

- (9) Click on the cell of the Function Code of the Request #2 in the dialog box, and then select the 01 Read Coil Status from the dropdown list. Then, Input "M100" in the Master Allocation No., "1" in the Data Size, "15" in the Slave No., and "009098" in the Slave Address.

Req. No.	Function Code	Master Allocation No.	Data Size	Word/Bit	Slave No. (0 to 247)	Slave Address	Request Execution IR	Error Status
1	03 Read Holding Registers	D0100	1	Word	15	408058		
2	01 Read Coil Status	M0100	1	Bit	15	009098		
3								
4								

- (10) The setup for the communication request #2 has been completed. The 1 bit data at the address 009098 of Modbus Slave #15 is read out and stored in M0100 of the Modbus Master.

- (11) Click OK to close the Modbus RTU Request Table dialog box, and then click OK to close the Function Area Settings dialog box.

- (12) Connect a FC5A to be the Modbus Master to the PC and select Online > Download Program... from the main menu to open the Download Program dialog box. Click Download button to start downloading the program.

- (13) Program Download confirmation dialog box will appear, and the setup for the Modbus Master has been finished.

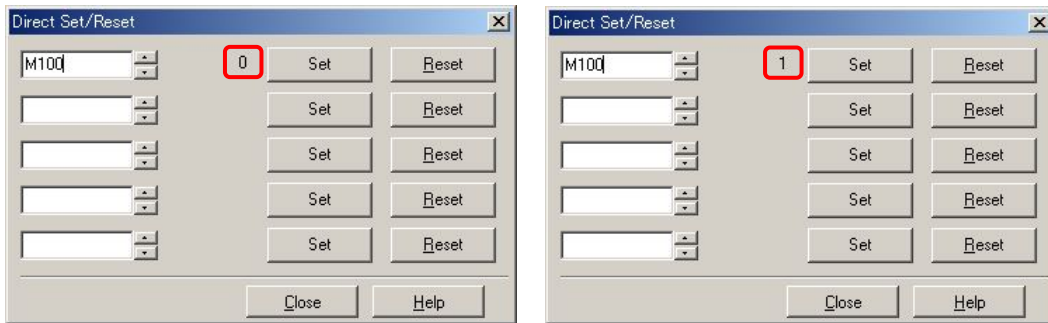
2.1.4 Check the system

- (1) Connect the PC to the Modbus Master and select Online > Monitor from the main menu to start the Monitor mode.
- (2) Select Online > Point Write to open a Point Write dialog box, and then input D100 to monitor. On the Modbus Slave, change D8057 with the Analog Potentiometer 1 and see the D100 of the Modbus Master changes between 0 through 255.

Point	Value	Unit
D100	0	DEC (W)
		DEC (W)
		DEC (W)
		DEC (W)
		DEC (W)

Point	Value	Unit
D100	255	DEC (W)
		DEC (W)
		DEC (W)
		DEC (W)
		DEC (W)

- (3) Select Online > Direct Set/Reset to open a Direct Set/Reset dialog box, and then input M100 to monitor. M100 turns on and off every second.

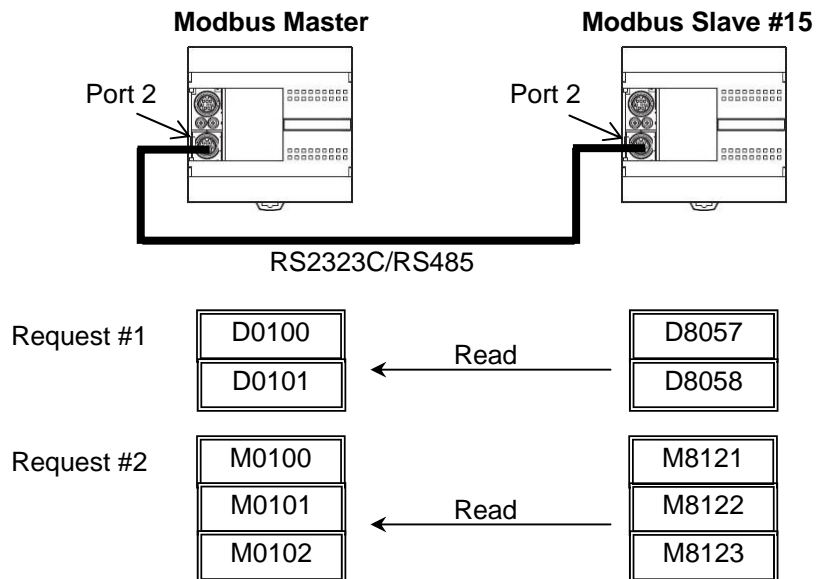


2.2 Example 2 - Reading multiple words and bits data from a slave

In the example 2, a FC5A Modbus Master communicates with a FC5A Modbus Slave, whose slave number is 15. The master reads D8057 and D8058 of the slave and stores it in D0100 and D0101, and reads M8121 through M8123 and stores them in M0100 through M0102.

2.2.1 System Setup

The port 2 of two FC5A All-in-one CPUs is connected with RS232C/RS485 cable. The master communicates with the slave using two communication requests.



Note: Data Size of the Function Code

Each Function Code has the certain range of the Data Size for the communication. For example, if you use the Function Code 03 Read Holding Registers, you can read a maximum of 64 words data from a slave at a time. Although FC5A Modbus master supports the Data Size shown in the table below, Modbus slave devices may have different range of Data Size.

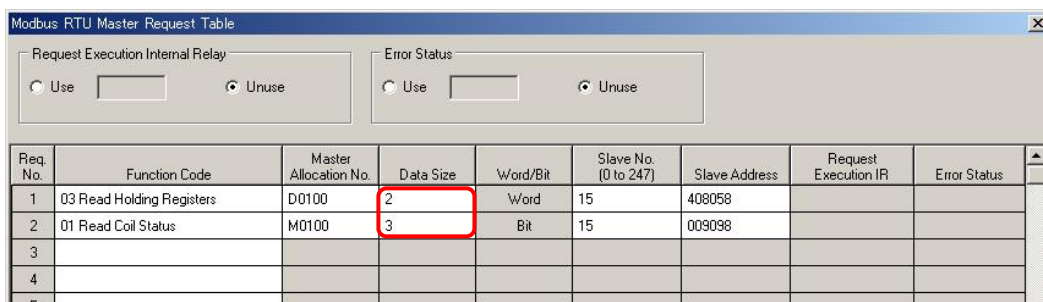
Function Code	Data Size	Slave Address	MicroSmart as Modbus Slave
01 Read Coil Status	1 to 128 bits	000001 - 065535	Reads bit operand statuses of Q (output), R (shift register), or M (internal relay).
02 Read Input Status	1 to 128 bits	100001 - 165535	Reads bit operand statuses of I (input), T (timer contact), or C (counter contact).
03 Read Holding Registers	1 to 64 words	400001 - 465535	Reads word operand data of D (data register), T (timer preset value), or C (counter preset value).
04 Read Input Registers	1 to 64 words	300001 - 365535	Reads word operand data of T (timer current value) or C (counter current value).
05 Force Single Coil	1 bit	000001 - 065535	Changes a bit operand status of Q (output), R (shift register), or M (internal relay).
06 Preset Single Register	1 word	400001 - 465535	Changes word operand data of D (data register).
15 Force Multiple Coils	1 to 128 bits	000001 - 065535	Changes multiple bit operand statuses of Q (output), R (shift register), or M (internal relay).
16 Preset Multiple Registers	1 to 64 words	400001 - 465535	Changes multiple word operand data of D (data register).

2.2.2 Programming WindLDR - Setting up the Modbus Slave #15

Nothing has to be changed from the example 1.

2.2.3 Programming WindLDR - Setting up the Modbus Master

- (1) Open the Modbus Master program of the example 1 and open the Modbus Master Request Table dialog box.
- (2) Change the Data Size of the Request #1 from 1 to 2 and of the Request #2 from 1 to 3.

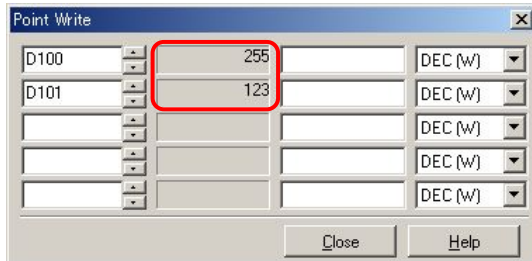


Req. No.	Function Code	Master Allocation No.	Data Size	Word/Bit	Slave No. (0 to 247)	Slave Address	Request Execution IR	Error Status
1	03 Read Holding Registers	D0100	2	Word	15	408058		
2	01 Read Coil Status	M0100	3	Bit	15	009098		
3								
4								
5								

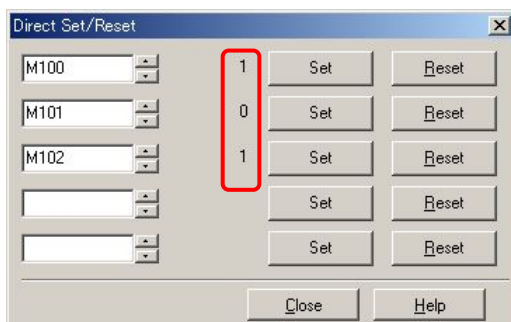
2.2.4 Check the system

- (1) Connect the PC to the Modbus Master and select Online > Monitor from the main menu to start the Monitor mode.

- (2) Select Online > Point Write to open a Point Write dialog box, and then input D100 and D101 to monitor. On the Modbus Slave, change D8057 with the Analog Potentiometer 1 and see that the D100 of the Modbus Master changes between 0 through 255. Similarly, change the Analog Potentiometer 2 and see that D101 changes.



- (3) Select Online > Direct Set/Reset to open a Direct Set/Reset dialog box, and then input M100, M101, and M102 to monitor. See that M100, M101, and M102 turn on and off.

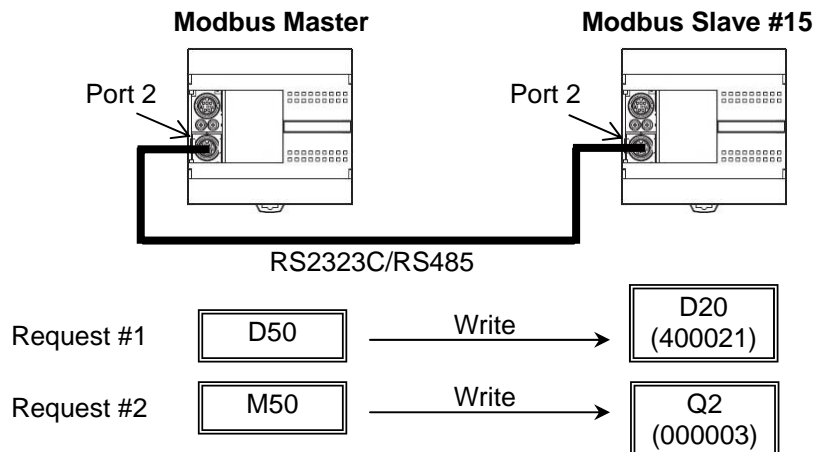


2.3 Example 3 - Writing 1 word and 1 bit to a slave

In the example 3, a FC5A Modbus Master communicates with a FC5A Modbus Slave, whose slave number is 15. The master writes D50 to the D20 of the slave, and writes M50 to Q2 of the slave. The slave outputs Q0 when D20 is equal to 5000.

2.3.1 System Setup

The port 2 of two FC5A All-in-one CPUs is connected with RS232C/RS485 cable. The master communicates with the slave using two communication requests.



Note: Function Code

FC5A Modbus Master supports 8 Function Codes as shown below (30-5 in the FC5A User's Manual). Though the Function Codes 05, 06, 15, or 16 can be used to write values to Modbus Slave devices, you need to make sure that which function codes the Modbus Slave devices support. In fact, some Modbus devices do not support Function Code 15 and 16.

For example, FC5A Modbus Slave supports all the 8 function codes, and you need to select function code according to the operand type you want to access. If you want to read the status of I0, you need to use "02 Read Input Status", and if you want to write values to D1, you need to use either "06 Preset Single Register" or "16 Preset Multiple Registers."

Function Code	Data Size	Slave Address	MicroSmart as Modbus Slave
01 Read Coil Status	1 to 128 bits	000001 - 065535	Reads bit operand statuses of Q (output), R (shift register), or M (internal relay).
02 Read Input Status	1 to 128 bits	100001 - 165535	Reads bit operand statuses of I (input), T (timer contact), or C (counter contact).
03 Read Holding Registers	1 to 64 words	400001 - 465535	Reads word operand data of D (data register), T (timer preset value), or C (counter preset value).
04 Read Input Registers	1 to 64 words	300001 - 365535	Reads word operand data of T (timer current value) or C (counter current value).
05 Force Single Coil	1 bit	000001 - 065535	Changes a bit operand status of Q (output), R (shift register), or M (internal relay).
06 Preset Single Register	1 word	400001 - 465535	Changes word operand data of D (data register).
15 Force Multiple Coils	1 to 128 bits	000001 - 065535	Changes multiple bit operand statuses of Q (output), R (shift register), or M (internal relay).
16 Preset Multiple Registers	1 to 64 words	400001 - 465535	Changes multiple word operand data of D (data register).

2.3.2 Programming WindLDR - Setting up the Modbus Slave #15

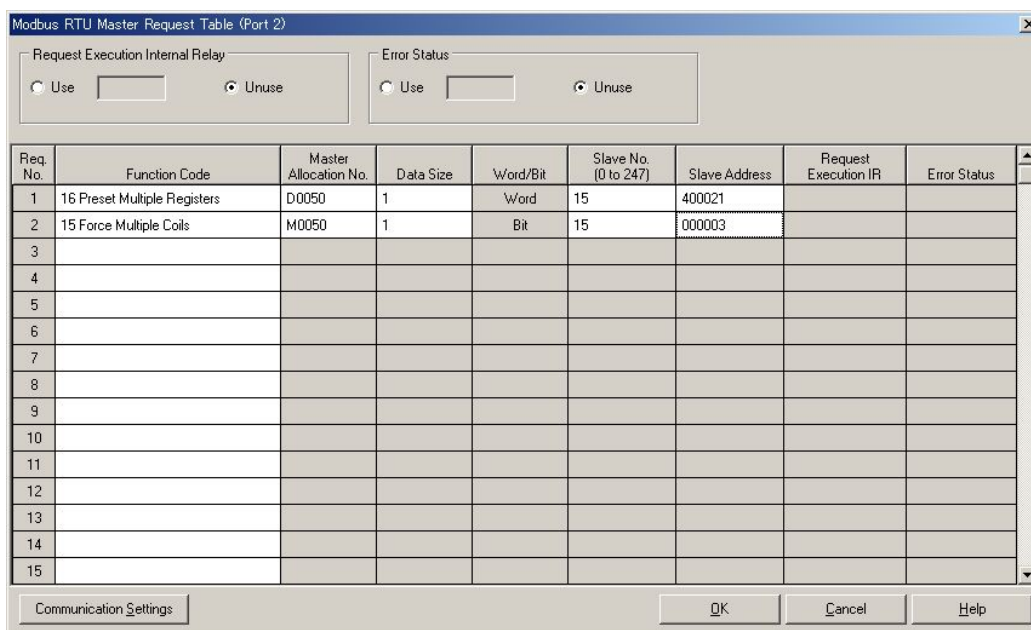
- (1) Create a new file and configure the function area settings as shown in the example 1.
- (2) Create the ladder program as shown below. When D20 is equal to 5000, Q0 turns on.



- (3) Download the program to the Modbus Slave.

2.3.3 Programming WindLDR - Setting up the Modbus Master

- (1) Create a new file and open the Modbus RTU Master Request Table.
- (2) Input the two communication requests according to the specification. After inputting the all parameters, Modbus RTU Master Request Table becomes as shown below.



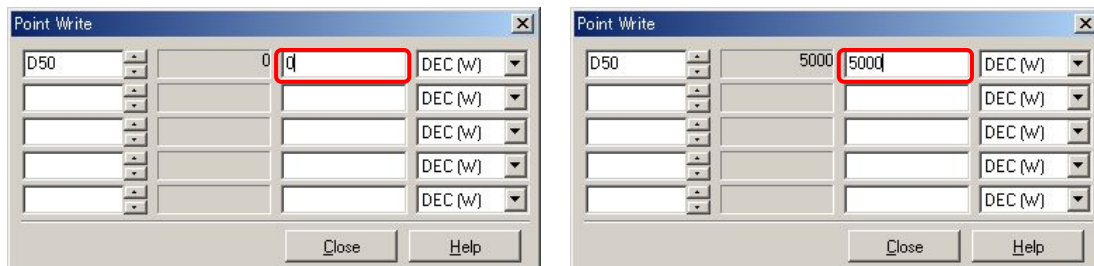
Req. No.	Function Code	Master Allocation No.	Data Size	Word/Bit	Slave No. (0 to 247)	Slave Address	Request Execution IR	Error Status
1	16 Preset Multiple Registers	D0050	1	Word	15	400021		
2	15 Force Multiple Coils	M0050	1	Bit	15	000003		
3								
4								
5								
6								
7								
8								
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15								

- (4) Close the Request Table and Function Area Settings dialog boxes, and then download the program to the Modbus Master.

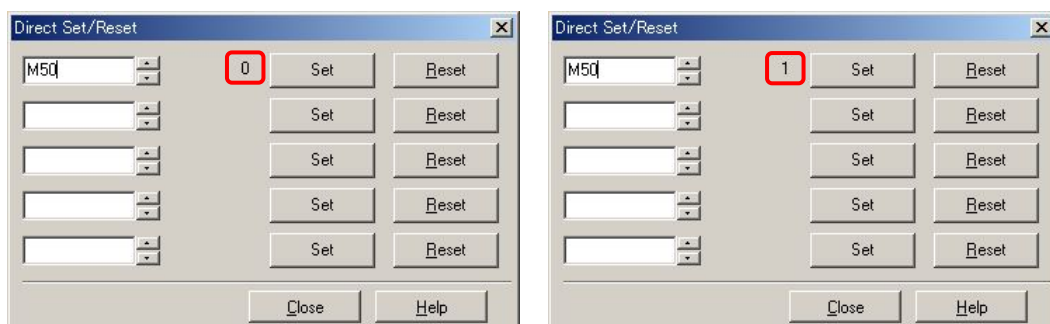
2.3.4 Check the system

- (1) Connect the PC to the Modbus Master and select Online > Monitor from the main menu to start the Monitor mode.

- (2) Select Online > Point Write to open a Point Write dialog box, and then input D50 to monitor. Change the D50 value and see if Q0 of the Modbus Slave turns on when D50 of Modbus Master is equal to 5000.



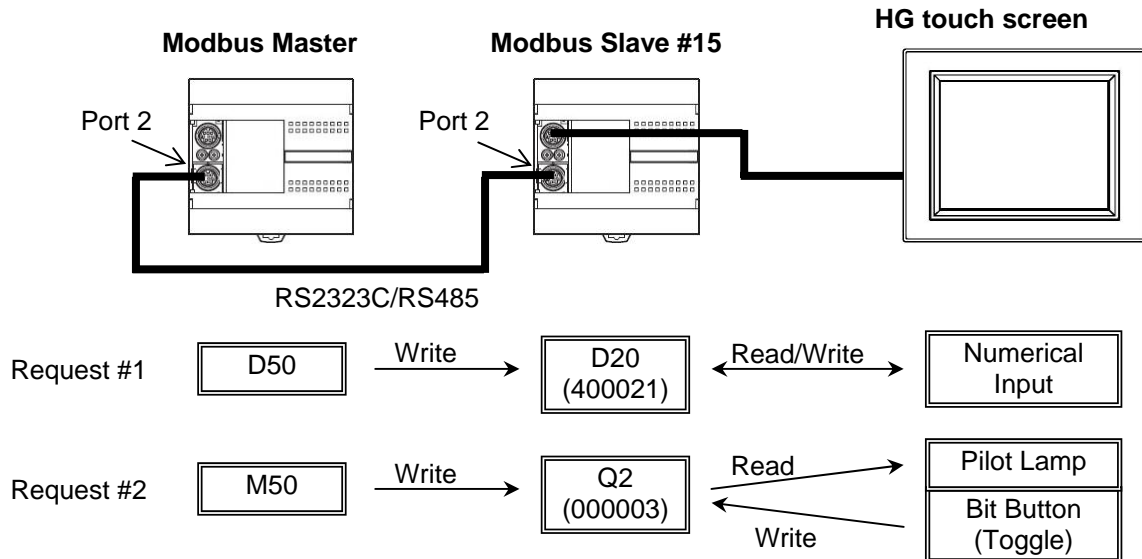
- (3) Select Online > Direct Set/Reset to open a Direct Set/Reset dialog box, and then input M50 to monitor. Set/reset M50 and see if Q2 of the Modbus Slave turns on/off accordingly.



2.4 Example 4 - Using Request Execution Relay

In the example 4, a FC5A Modbus Master communicates with a FC5A Modbus Slave, whose slave number is 15. The master writes D50 to D20 and M50 to Q2 when M0100 turns on. The slave outputs Q0 when D20 is equal to 5000. A touch screen also monitors the Modbus Slave through the port 1 of the slave and changes the value of D20 and Q2.

2.4.1 System Setup



Note: Modbus Master Request Table and Request Execution Relay

When the Request Execution Relay is disabled, all the registered requests in the Request Table are executed repeatedly. For example, if 4 communication requests are registered as below, request 1 through 4 are executed in order, and when the request #4 is completed, FC5A starts over from the request #1. As a result, even if the value in D20 of the Modbus Slave #15 is changed with the touch screen, the value will be over-written by the Modbus Master.

Req. No.	Function Code	Master Allocation No.	Data Size	Word/Bit	Slave No. (0 to 247)	Slave Address	Request Execution IR	Error Status
1	03 Read Holding Registers	D0100	1	Word	15	408058		
2	01 Read Coil Status	M0100	1	Bit	15	009098		
3	16 Preset Multiple Registers	D0050	1	Word	15	400021		
4	15 Force Multiple Coils	M0050	1	Bit	15	000003		
5								
6								

When the Request Execution Relay is enabled, internal relays are assigned to all the communication requests registered in the Request Table. The communication requests are executed only when corresponding internal relays are ON. For example, when M200 is assigned as the Request Execution Relay, 4 internal relays starting from M200 are assigned to the communication requests as below. And only when M202 is ON, the Modbus Master executes the communication request #3. Therefore, when M202 is OFF, the value in D20 of the Modbus Slave #15 can be changed with the touch screen without over-written by the Modbus Master.

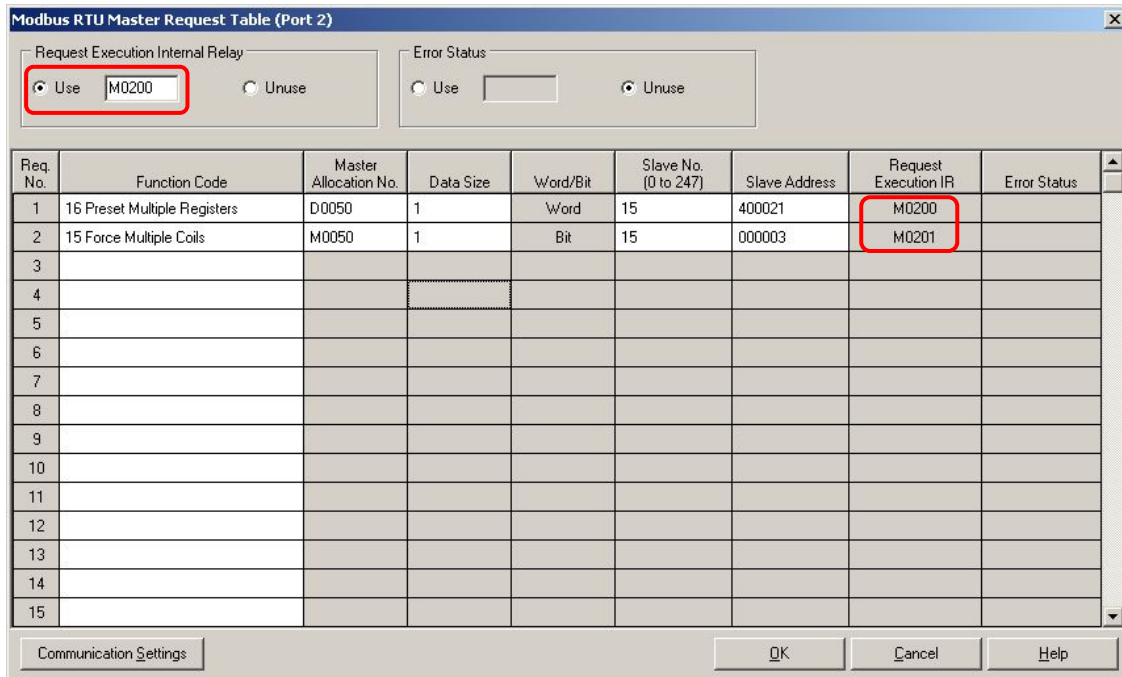
Req. No.	Function Code	Master Allocation No.	Data Size	Word/Bit	Slave No. (0 to 247)	Slave Address	Request Execution IR	Error Status
1	03 Read Holding Registers	D0100	1	Word	15	408058	M0200	
2	01 Read Coil Status	M0100	1	Bit	15	009098	M0201	
3	16 Preset Multiple Registers	D0050	1	Word	15	400021	M0202	
4	15 Force Multiple Coils	M0050	1	Bit	15	000003	M0203	
5								

2.4.2 Programming WindLDR - Setting up the Modbus Slave #15

The setup for the Modbus Slave is the same as the example 3.

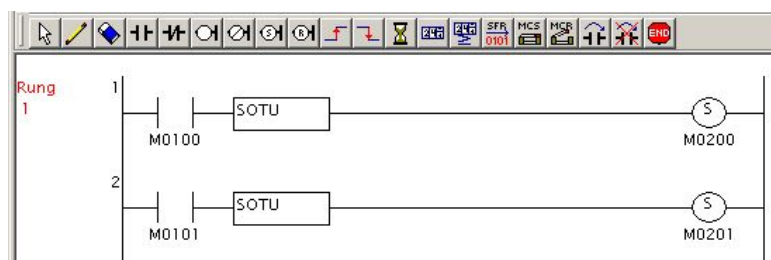
2.4.3 Programming WindLDR - Setting up the Modbus Master

- (1) Create a new file and open the Modbus RTU Master Request Table.
- (2) Input the two communication requests according to the specification. And then click on Use and input M0200 in the Request Execution Internal Relay setting. After inputting the all parameters, Modbus RTU Master Request Table becomes as shown below.



Req. No.	Function Code	Master Allocation No.	Data Size	Word/Bit	Slave No. (0 to 247)	Slave Address	Request Execution IR	Error Status
1	16 Preset Multiple Registers	D0050	1	Word	15	400021	M0200	
2	15 Force Multiple Coils	M0050	1	Bit	15	000003	M0201	
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

- (5) Close the Request Table and Function Area Settings dialog boxes.
- (6) Create a ladder program as shown the picture below. When M100 is turned on, M200 is set, and when M101 is turned on, M201 is set.

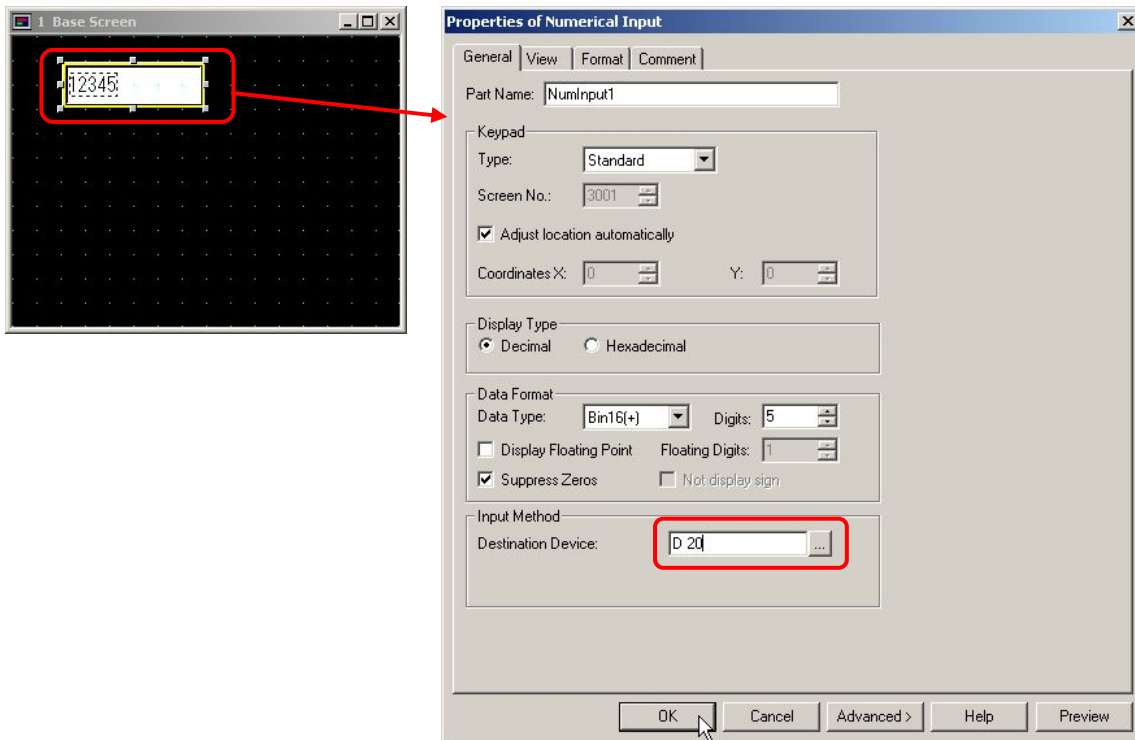


Note: When a Request Execution Relay is turned on, the corresponding communication request is executed, and the Request Execution Relay is automatically turned off when the request is completed. Therefore, when a Request Execution Relay is turned on with a SET instruction following a SOTU/D instruction as shown above, the communication request is executed just one time.

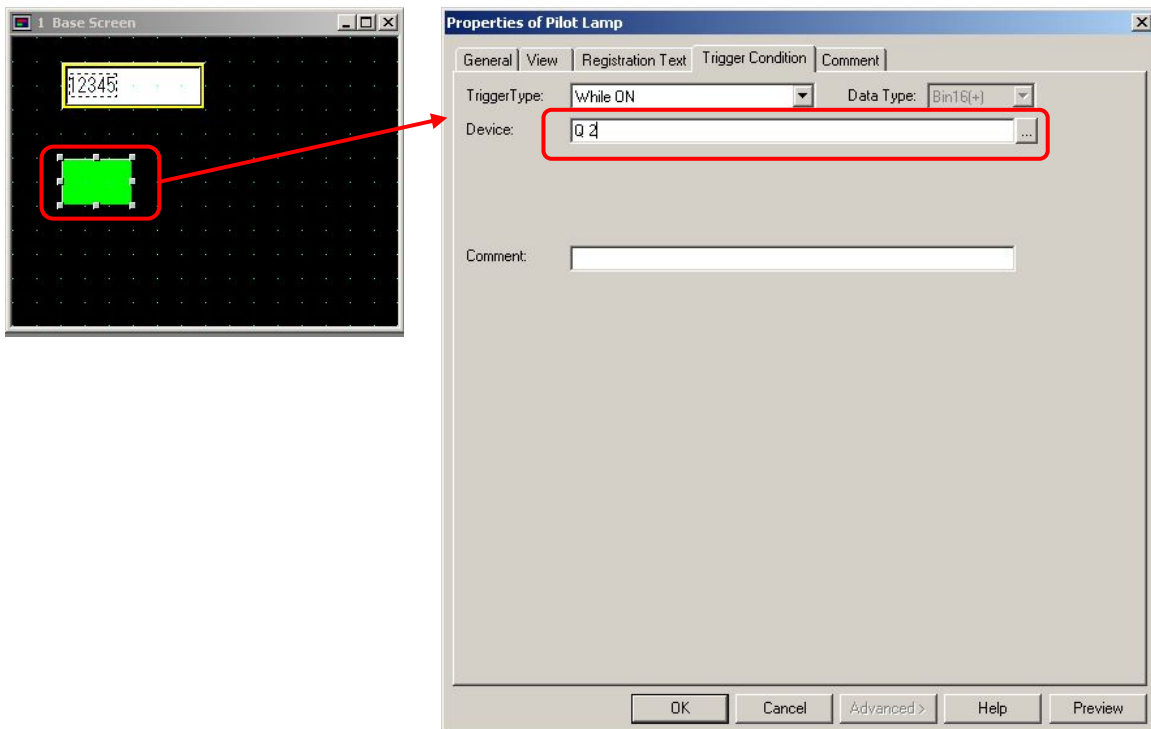
- (7) Download the program to the Modbus Master.

2.4.4 Programming WindO/I NV2 - Setting up the Screen

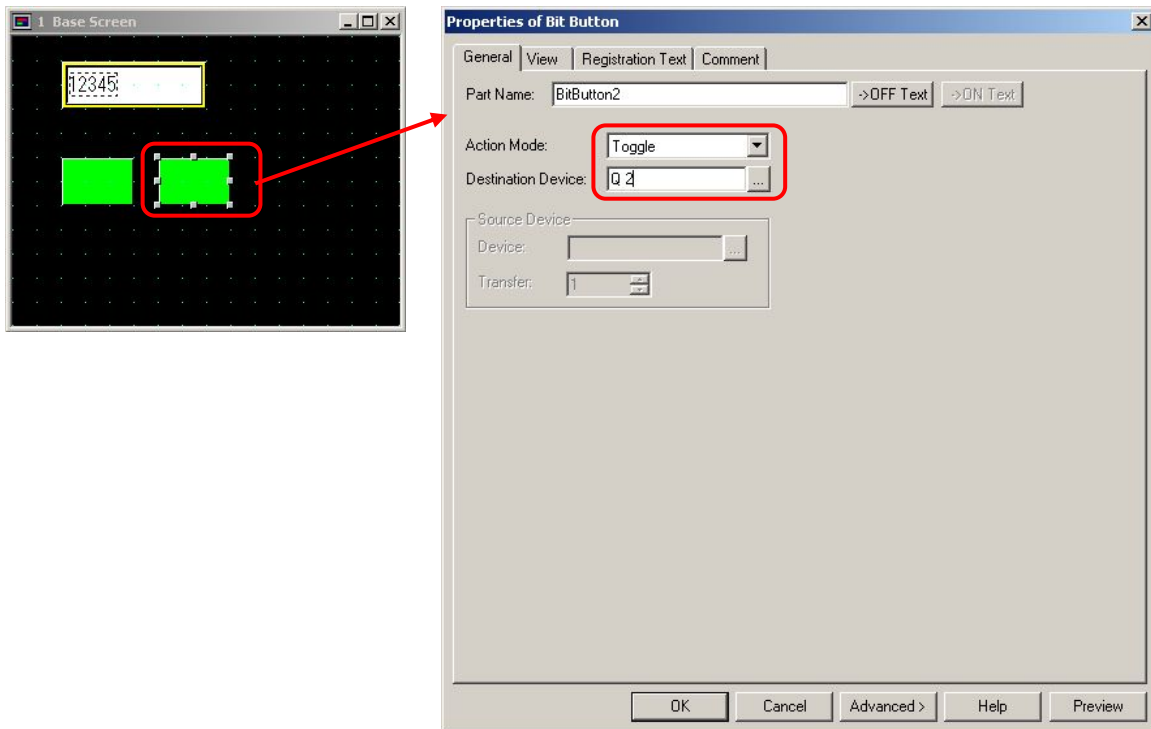
- (1) Create a new project and select an appropriate screen type and the Host interface driver.
- (2) Create a Numerical Input and input "D 20" as the Destination Device.



- (3) Create a Pilot Lamp and input "Q 2" as the Device.



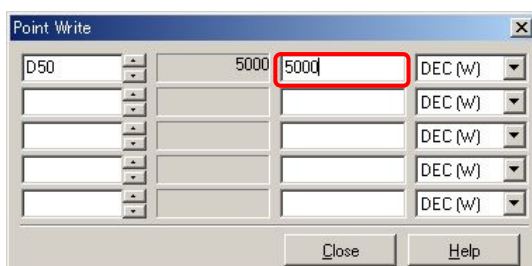
- (4) Create a Bit Button and input “Q 2” as the Destination Device and select “Toggle” as the Action Mode.



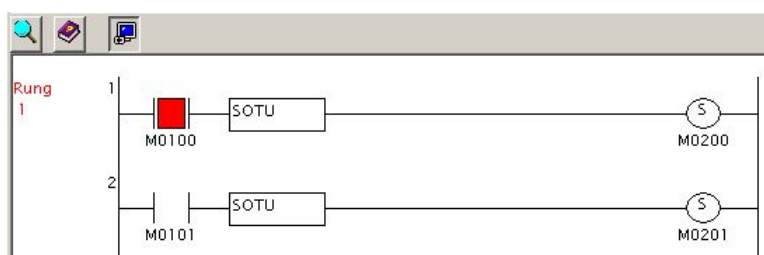
- (5) Download the project to the Touch Screen connected to the port 1 of the Modbus Slave #15.

2.4.5 Check the system

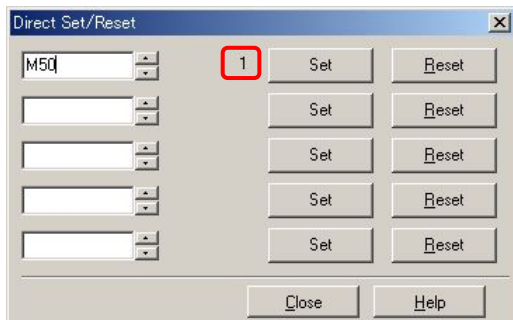
- (1) Connect the PC to the Modbus Master and select Online > Monitor from the main menu to start the Monitor mode.
- (2) Select Online > Point Write to open a Point Write dialog box, and then input D50 to monitor. Change the D50 value to 5000 and confirm that Q0 of the slave does not turn on, and the D20 value of the slave shown on the touch screen remains 0.



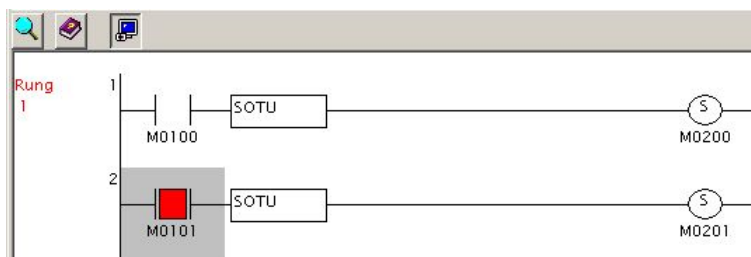
- (3) Turn on M100 of the master, and then Q0 of the Slave turns on and the D20 value shown on the touch screen becomes 5000.



- (4) Change the D20 value to other value such as 9999 using the Numerical Input on the screen, and the Q0 of the slave turns off. Change the D20 value back to 5000, and then Q0 turns on again.
- (5) Select Online > Direct Set/Reset to open a Direct Set/Reset dialog box, and then input M50 to monitor. Set/reset M50 and confirm that Q2 of the slave does not turn on, and the Pilot Lamp on the touch screen also does not turn on.



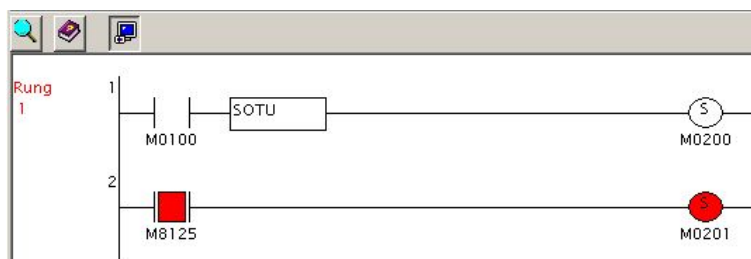
- (6) Turn on M101 of the master, and then Q2 of the slave turns on, and the Pilot Lamp on the touch screen also turns on.



- (7) Toggle Q2 using the Bit Button on the screen and see that Q2 of the slave and the Pilot Lamp on the screen turn off. Toggle Q2 again, then Q2 and the Pilot Lamp turn on.

Note:

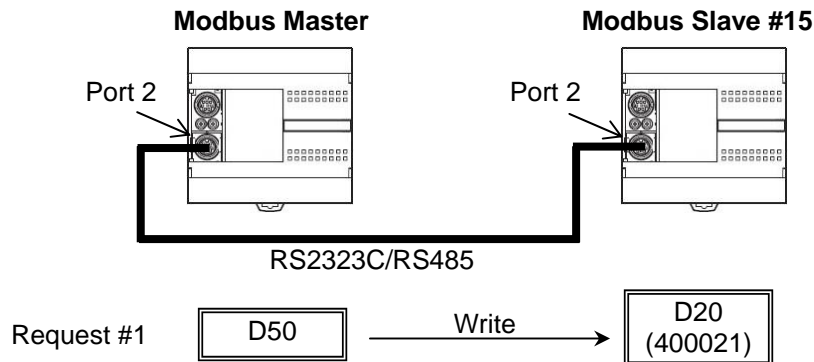
If you want to execute communication requests repeatedly when the Request Execution Relay is enabled, you have to program SET instructions following M8125 (In-operation Output) to set the relays. For example, if you program as below, the communication request #1 is executed only when M100 is turned on, but the communication request #2 is executed repeatedly as long as the PLC is running.



2.5 Example 5 - Changing the preset values of Timers or Counters

In this example, a method to change the preset value of a TIM instruction in a Modbus slave from the Modbus Master. A FC5A Modbus Master communicates with a FC5A Modbus Slave, whose slave number is 15. The master writes D50 to D20. Q0 of the slave is turned on D20 ms later after I0 turns on.

2.5.1 System Setup



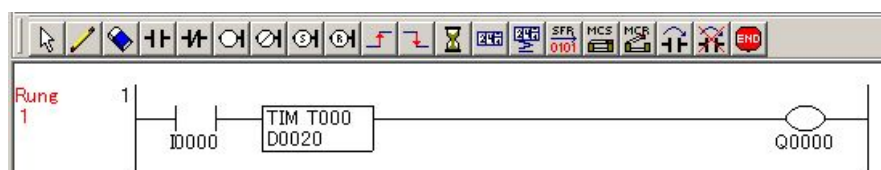
Note:

As shown below (FC5A Modbus Slave Address Map in 30-5 of FC5A User's Manual), only the Function Code 3 can be used to access the preset values of timers and counters. As the Function Code 3 is "03 Read Holding Registers," you can read these values but cannot write values to them.

Modbus Device Name	Modbus Address Map (Decimal)	Communication Frame Address	MicroSmart Operand	Applicable Function Code
Coil (000000 and above)	000001 - 000504	0000 - 01F7	Q0 - Q627	1, 5, 15
	000701 - 000956	02BC - 03BB	R0 - R255	
	001001 - 003048	03E8 - 07F7	M0 - M2557	
	009001 - 009256	2328 - 2427	M8000 - M8317	
Input Relay (100000 and above)	100001 - 100504	0000 - 01F7	I0 - I627	2
	101001 - 101256	03E8 - 04E7	T0 - T255 (timer contact)	
	101501 - 101756	05DC - 06DB	C0 - C255 (counter contact)	
Input Register (300000 and above)	300001 - 300256	0000 - 00FF	T0 - T255 (timer current value)	4
	300501 - 300756	01F4 - 02F3	C0 - C255 (counter current value)	
Holding Register (400000 and above)	400001 - 408000	0000 - 1F3F	D0 - D7999	3, 6, 16
	408001 - 408500	1F40 - 2133	D8000 - D8499	
	409001 - 409256	2328 - 2427	T0 - T255 (timer preset value)	3
	409501 - 409756	251C - 261B	C0 - C255 (counter preset value)	
	410001 - 450000	2710 - C34F	D10000 - D49999	

2.5.2 Programming WindLDR - Setting up the Modbus Slave #15

- (1) Create a new file and configure the function area settings as shown in the example 1.
- (2) Create a ladder program as shown below. When I0 turns on, TIM T000 starts, and D20 ms later, Q0 is turned on.



- (3) Download the program to a FC5A to be the Modbus Slave #15.

2.5.3 Programming WindLDR - Setting up the Modbus Master

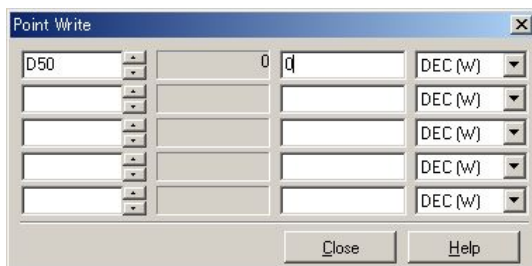
- (1) Create a new file and open the Modbus RTU Master Request Table and configure the Request #1 as follows.

Req. No.	Function Code	Master Allocation No.	Data Size	Word/Bit	Slave No. (0 to 247)	Slave Address	Request Execution IR	Error Status
1	16 Preset Multiple Registers	D0050	1	Word	15	400021		
2								
3								
4								

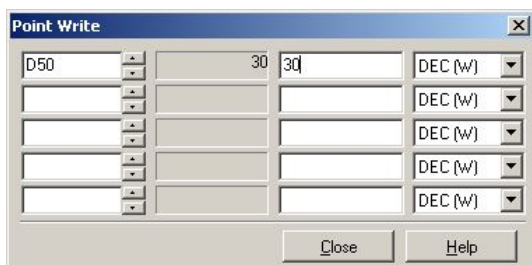
- (2) Close the dialog box and download the program to a FC5A to be the master.

2.5.4 Check the system

- (1) Connect the PC to the Modbus Master and select Online > Monitor from the main menu to start the Monitor mode.
- (2) Select Online > Point Write to open a Point Write dialog box, and then input D50 to monitor. Write 0 to D50, and then turn on I0 of the slave and see that Q0 turns on right after I0 turns on.



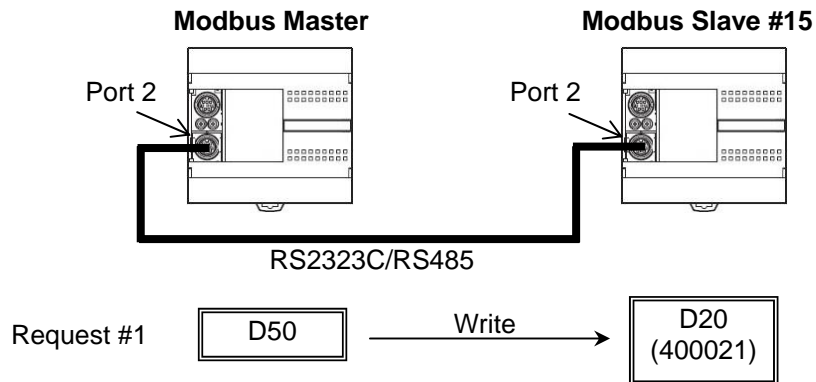
- (3) Write 30 to D50, and then turn on I0 of the slave and see that Q0 turns on about 3 sec after I0 turns on.



2.6 Example 6 - Communication Verification

This example shows a method to see whether the communication requests completed successfully or not. A FC5A Modbus Master communicates with a FC5A Modbus Slave, whose slave number is 15. The master writes D50 to D20 when M0 is turned on.

2.6.1 System Setup



2.6.2 Programming WindLDR - Setting up the Modbus Slave #15

Take the same steps as shown in the Example 1.

2.6.3 Programming WindLDR - Setting up the Modbus Master

- (1) Create a new file and configure the Modbus Master Request Table as below. Then close the Function Area Settings dialog box.

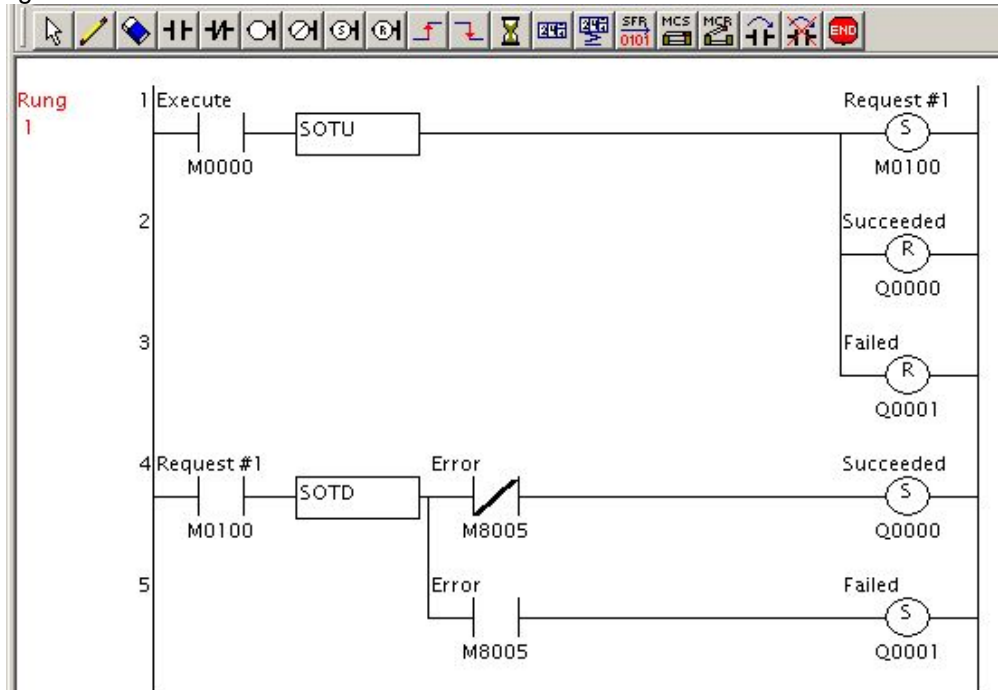
Modbus RTU Master Request Table (Port 2)								
Request Execution Internal Relay				Error Status				
<input checked="" type="radio"/> Use M0100 <input type="radio"/> Unuse				<input type="radio"/> Use <input checked="" type="radio"/> Unuse				
Req. No.	Function Code	Master Allocation No.	Data Size	Word/Bit	Slave No. [0 to 247]	Slave Address	Request Execution IR	Error Status
1	16 Preset Multiple Registers	D0050	1	Word	15	400021	M0100	
2								
3								
4								

- (2) Create the ladder program as shown below. When an input M000 turns on, M100, Request execution relay for the request #1, is turned on, and Q0 and Q1 are reset. When the request #1 is completed, M100 is turned off automatically. Then, if the communication succeeds, Q0 turns on, and if the communication fails, Q1 turns on.

Descriptions for the operands used in the program.

Operand	Description
M0000	Execute the communication request #1.
M0100	The communication execution relay for the request #1. When this bit is turned on, the communication request #1 is executed, and this bit is turned off automatically when the communication request #1 is completed.
M8005	When a communication request is completed, M8005 turns on for 1 scan time if any communication errors happen during the communication.
Q0000	Turns on when the communication request #1 succeeded.
Q0001	Turns on when the communication request #1 failed.

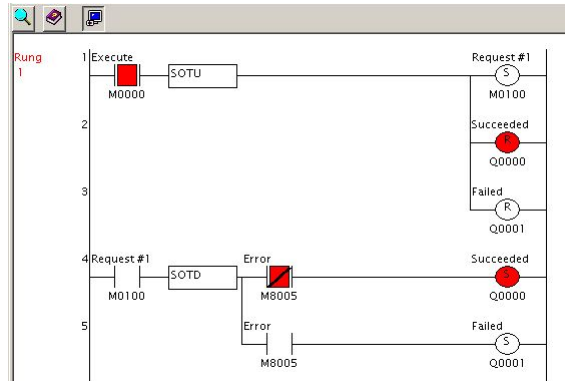
Program



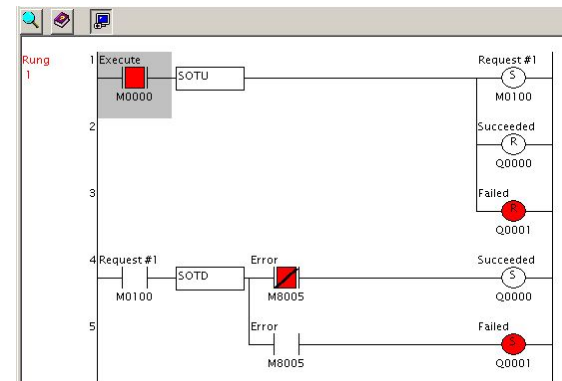
2.6.4 Check the system

- (1) Connect the PC to the Modbus Master and select Online > Monitor from the main menu to start the Monitor mode.
- (2) Double click on M0000 and see that the communication is completed successfully, and Q0 is turned on. Turn off the slave and double click on M0000 again, and see that the communication failed, and Q1 is turned on.

Succeeded



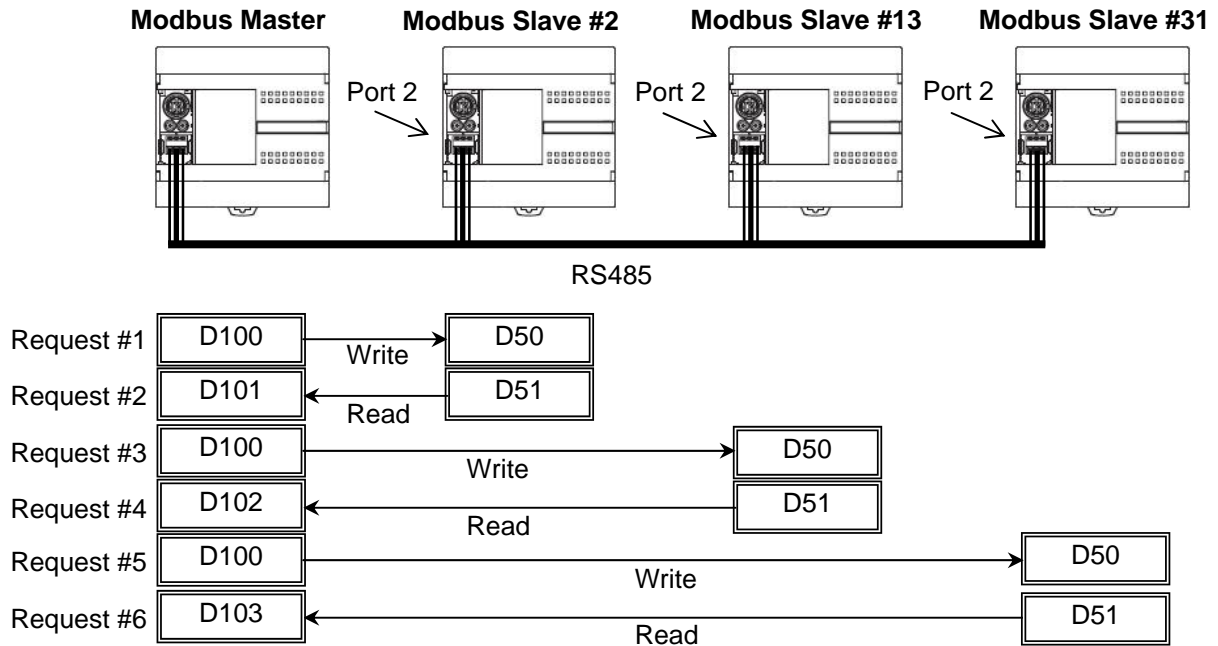
Failed



2.7 Example 7 - Simple 1:N Communication

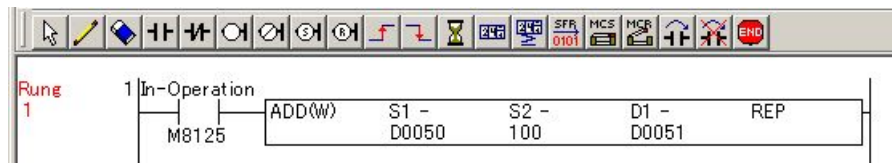
This example shows steps to set up a 1:N Modbus network. A FC5A Modbus Master communicates with 3 FC5A Modbus Slaves whose slave numbers are 2, 13, and 31. The master writes D100 to D50 of all the slaves. The slave #2 adds 100 to D50 and stores the result in D51, the slave #13 subtracts D50 by 100 and stores the result in D51, and the slave #31 doubles D50 and stores the result in D51. The master reads D51 of each slaves and stores them in D101 through D103.

2.7.1 System Setup



2.7.2 Programming WindLDR - Setting up the Modbus Slave #2

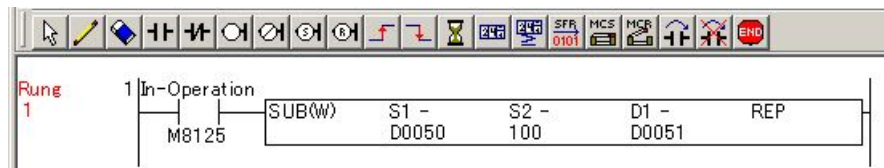
- (1) Create a new file, and select Modbus RTU Slave for the Port 2 and input the slave number 2 in the Function Area Settings dialog box as shown in the example 1.
- (2) Create the ladder program as below. The value in D50 is incremented by 100, and the result is stored in D51.



- (3) Download the program to a FC5A to be a Modbus Slave #2.

2.7.3 Programming WindLDR - Setting up the Modbus Slave #13

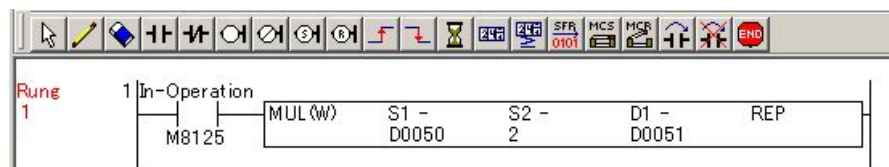
- (1) Create a new file, and select Modbus RTU Slave for the Port 2 and input the slave number 13 in the Function Area Settings dialog box as shown in the example 1.
- (2) Create the ladder program as below. The value in D50 is decremented by 100, and the result is stored in D51.



(3) Download the program to a FC5A to be a Modbus Slave #13.

2.7.4 Programming WindLDR - Setting up the Modbus Slave #31

- (1) Create a new file, and select Modbus RTU Slave for the Port 2 and input the slave number 31 in the Function Area Settings dialog box as shown in the example 1.
- (2) Create the ladder program as below. The value in D50 is doubled, and the result is stored in D51.



(3) Download the program to a FC5A to be a Modbus Slave #31.

2.7.5 Programming WindLDR - Setting up the Modbus Master

- (1) Create a new file, and select Modbus RTU Master for the Port 2 and register the communication requests as shown below.

Modbus RTU Master Request Table (Port 2)

Request Execution Internal Relay: Use Unuse

Error Status: Use Unuse

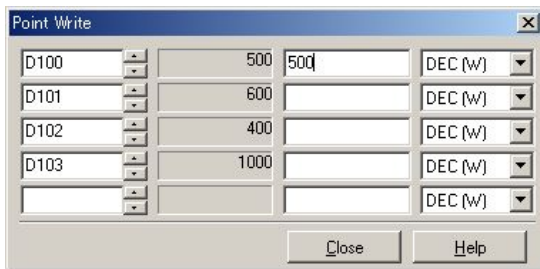
Req. No.	Function Code	Master Allocation No.	Data Size	Word/Bit	Slave No. (0 to 247)	Slave Address	Request Execution IR	Error Status
1	16 Preset Multiple Registers	D0100	1	Word	2	400051		
2	03 Read Holding Registers	D0101	1	Word	2	400052		
3	16 Preset Multiple Registers	D0100	1	Word	13	400051		
4	03 Read Holding Registers	D0102	1	Word	13	400052		
5	16 Preset Multiple Registers	D0100	1	Word	31	400051		
6	03 Read Holding Registers	D0103	1	Word	31	400052		
7								
8								
9								
10								
11								
12								
13								
14								
15								

Communication Settings: [OK] [Cancel] [Help]

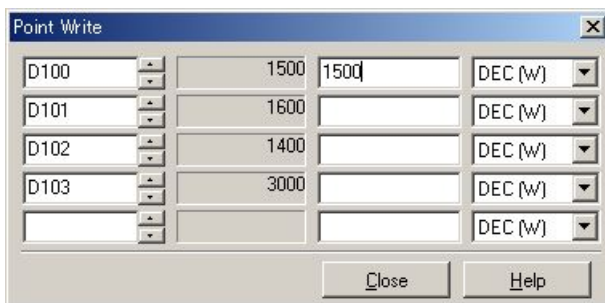
(2) Close the Function Area Settings dialog box and download the program to a FC5A to be the master.

2.7.6 Check the system

- (1) Connect the PC to the Modbus Master and select Online > Monitor from the main menu to start the Monitor mode.
- (2) Select Online > Point Write to open a Point Write dialog box, and then input D100, D101, D102, and D103 to monitor. Write 500 to D100 and see that 600 is stored in D101, 400 is stored in D102, and 1000 is stored in D103.



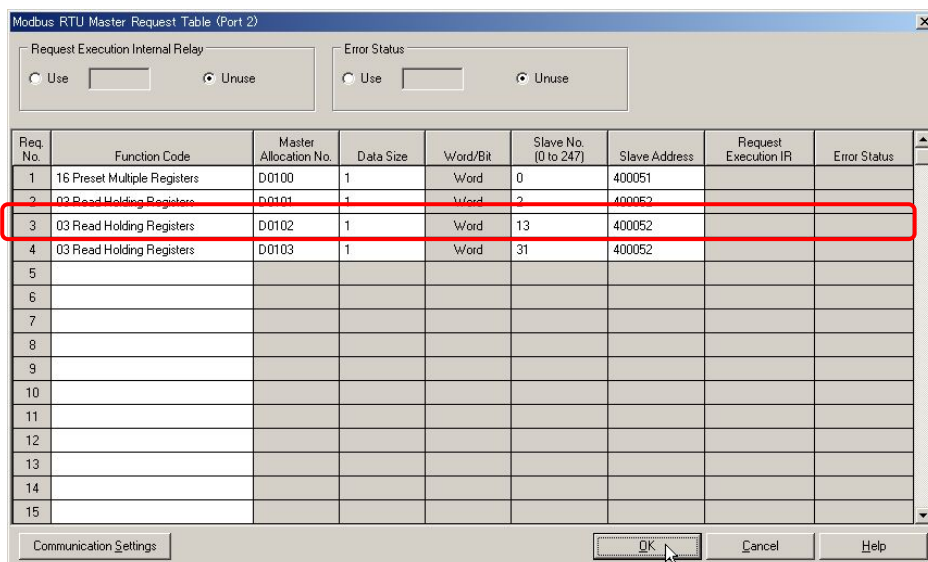
- (3) Write 1500 to D100 and see that 1600 is stored in D101, 1400 is stored in D102, and 3000 is stored in D103.



Note: Broadcast

A broadcast communication request can be executed to write the same value to all the slaves in the network by assigning the slave No. 0 to the communication request. Note that if the broadcast is used, the slaves do not send replies to the master; therefore, the master cannot detect any communication errors.

For example, the communication requests of the example 7 can be simplified using a broadcast request as below.



Req. No.	Function Code	Master Allocation No.	Data Size	Word/Bit	Slave No. (0 to 247)	Slave Address	Request Execution IR	Error Status
1	16 Preset Multiple Registers	D0100	1	Word	0	400051		
2	03 Read Holding Registers	D0101	1	Word	2	400052		
3	03 Read Holding Registers	D0102	1	Word	13	400052		
4	03 Read Holding Registers	D0103	1	Word	31	400052		
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								