

# MODBUS

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# MODBUS

## MODBUS Version 2.02

MODBUS enables you to establish master-slave communications with any connected device that supports the MODBUS protocol. Any controller in the network may function as either **master** or **slave** using any of the controller's existing COM Ports.

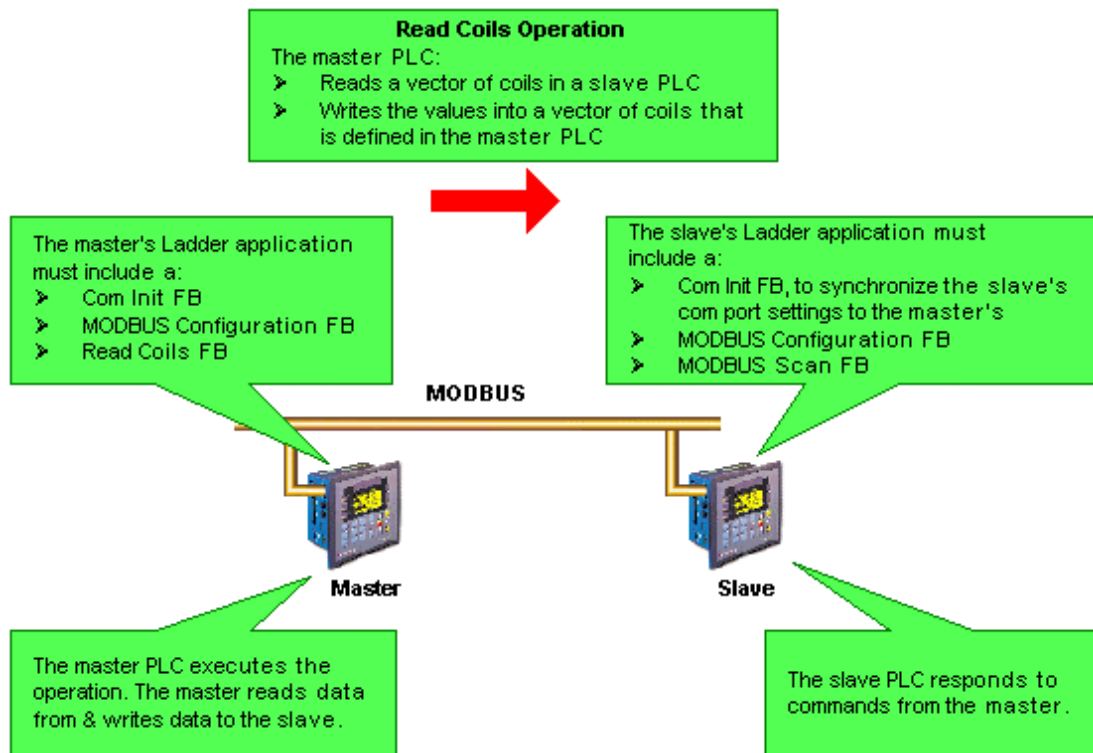
Unitronics currently supports RTU (binary) transmission mode.

### Using MODBUS: Unitronics' PLCs, Master - Slave

Before using a MODBUS operation in your application, you must:

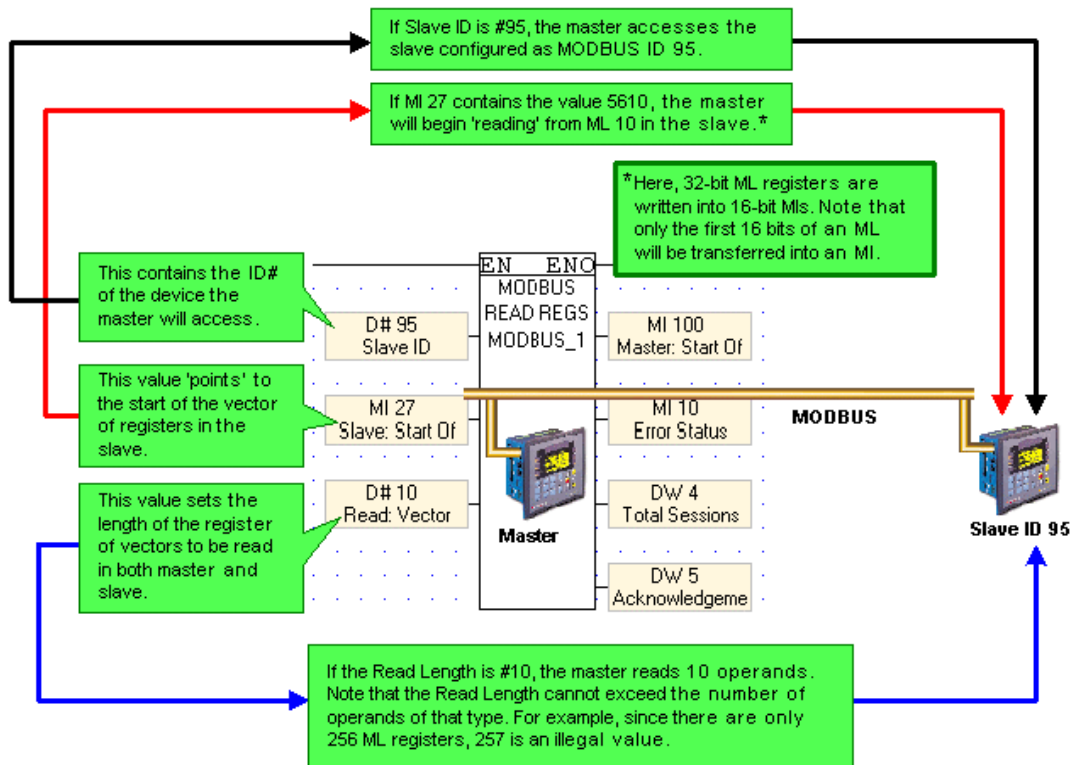
- Synchronize the communication port settings of master and slave devices. This is done by placing Com Port Init FBs, set with identical parameters, in the ladder application of both master and slave.
- Include at least 1 MODBUS Configuration FB in the ladder application of both master and slave. The port you select must be the same port selected in the Com Port Init FB.
- The condition that activates the Configuration must turn ON for a single program scan (positive transition recommended). **However, the MODBUS configuration must be scanned during every program cycle--after the Configuration is activated. One way to ensure this is by placing the configuration in the first subroutine of the main module.**
- Enable slave devices to be accessed by placing a Scan FB in the slave's Ladder application.

The figure below shows the elements required to carry out a Read Coils Operation.



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Note that the operand addresses in slave PLCs are indirect addresses (pointers).

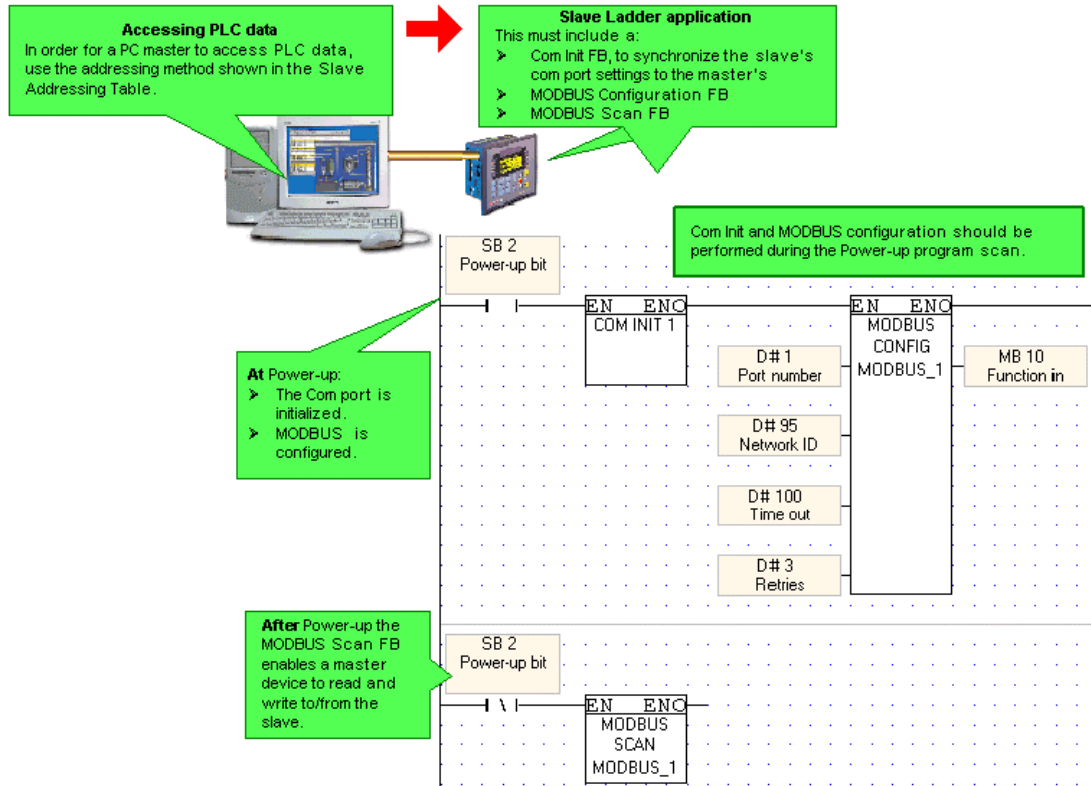


### Using MODBUS: Accessing PLC data via SCADA/OPC server

The PC master can access data within the PLC via the addresses given in the Slave Addresses Table.

The PLC slave's Ladder application must include the following:

- A Com Port Init FB.
- A MODBUS Configuration FB. Within the Configuration, the port you select must be the same port selected in the Com Port Init FB.  
**Note** ♦ The condition that activates the Configuration must turn ON for a single program scan (positive transition recommended). **However, the MODBUS configuration must be scanned during every program cycle--after the Configuration is activated. One way to ensure this is by placing the configuration in the first subroutine of the main module.**
- A Scan FB.

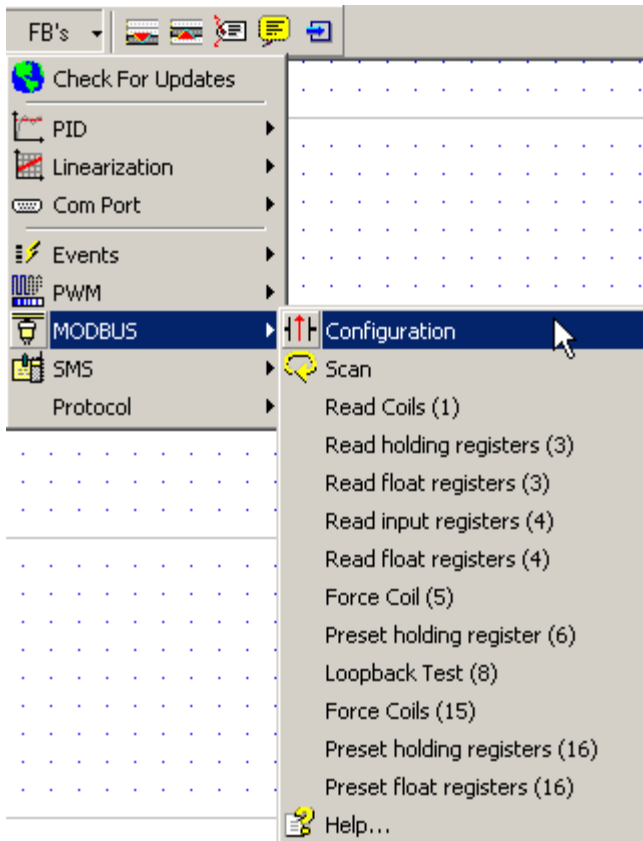


Note ♦ The operand addresses in slave PLCs are indirect addresses (pointers).

### MODBUS Operations

The MODBUS FBs are grouped under *MODBUS on the FB's menu*.

## MODBUS



[MODBUS: Configuration](#)

[MODBUS: Scan](#)

[MODBUS: Read Coils \(1\)](#)

[MODBUS: Read Inputs \(2\)](#)

[Read Holding Registers \(3\)](#)

[Read Float Registers \(3\)](#)

[Read Input Registers \(4\)](#)

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[Force Coil \(5\)](#)

[Preset Holding Register \(6\)](#)

[Force Coils \(15\)](#)

[Preset Holding Registers \(16\)](#)

[Preset Float Registers \(16\)](#)

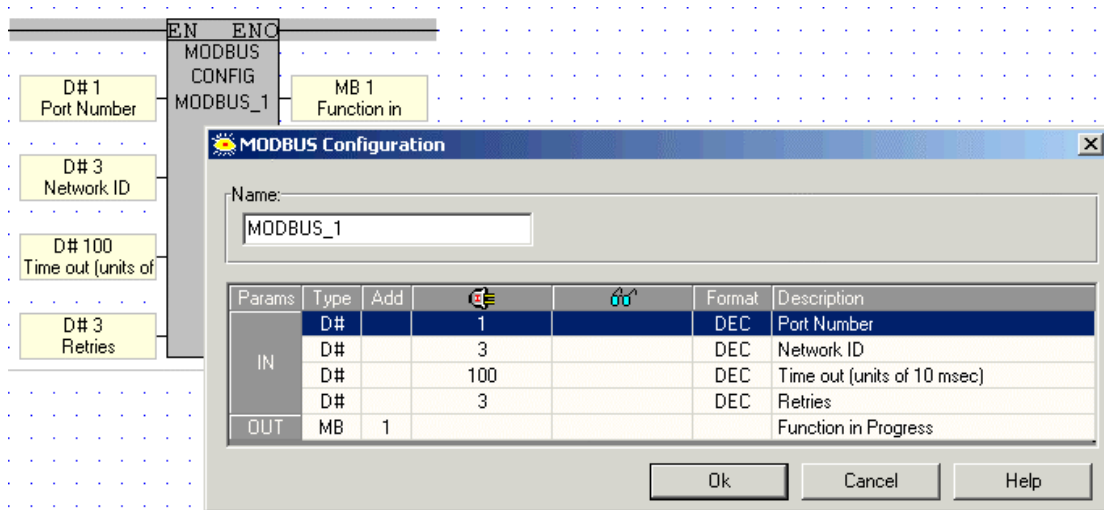
### **Examples**

The applications listed below use MODBUS. To locate application examples, select Examples from the Help menu.

- MODBUS Slave.vlp
- MODBUS Master.vlp

## MODBUS: Configuration

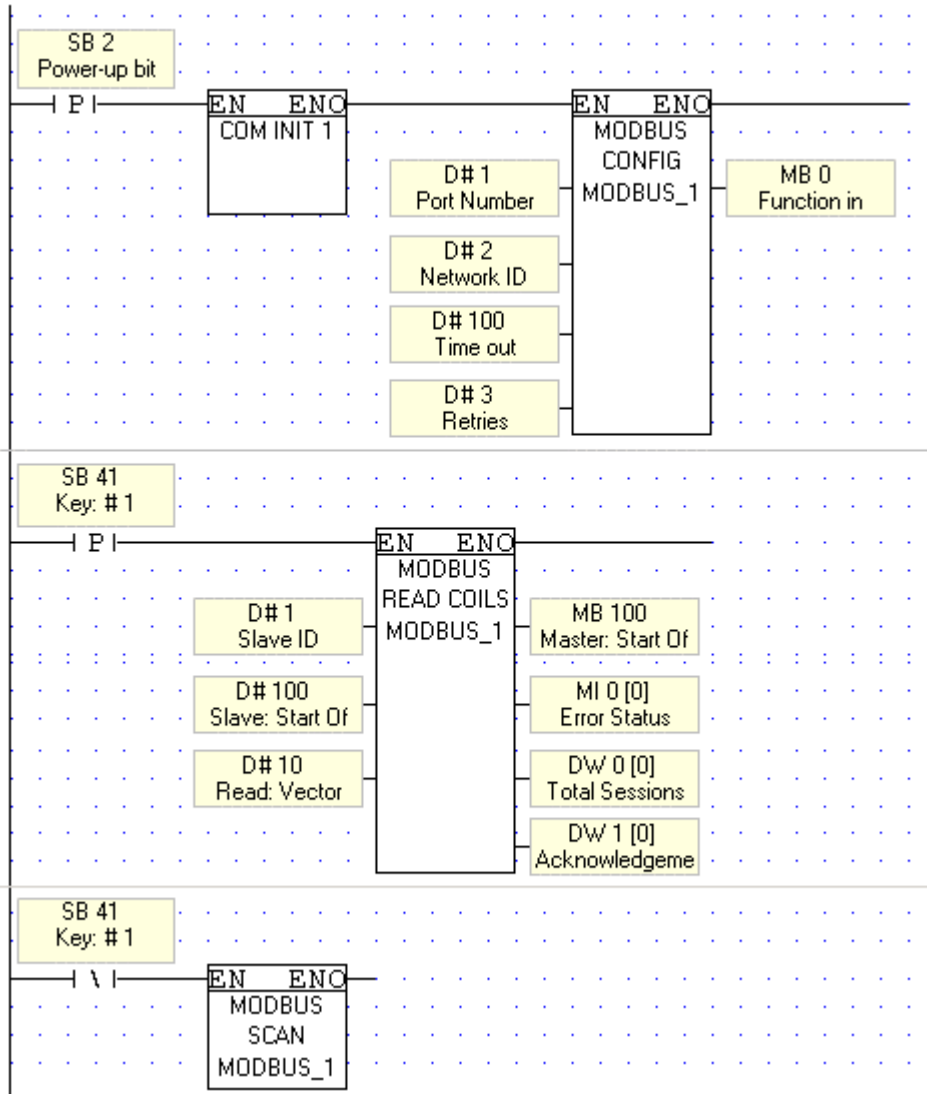
A MODBUS Configuration FB must be included in both master and [slave](#) Ladder applications as shown below.



Parameter	Type	Function
Port Number	Constant	Click the drop-down arrows to view available ports; click the port you want to use.
Network ID	Constant	This number identifies the device on the network. You can either assign an ID via an MI, or directly via a constant number. The unit ID range is from 0-255. Do not assign the same ID number to more than one device.
Time out	Constant or MI	This is the amount of time a master device will wait for an answer from a slave. Time out units are defined in 10 msec; a Time out value of 100 is equal to 1 second.
Retries	Constant or MI	This is the number of times a device will try to send a message.
Function in Progress	MB	This bit is ON when MODBUS is active. Use this as a condition bit for MODBUS operations to avoid communication conflicts.

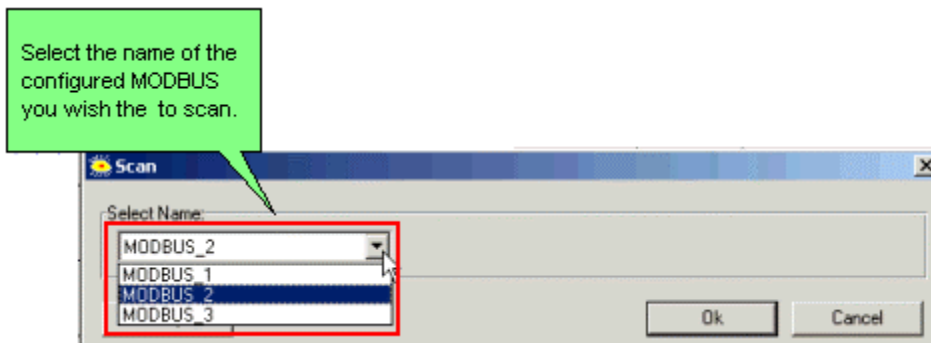
The Ladder application below enables the controller act as a MODBUS master and read coils in a slave PLC. The Scan operation in the final net enables the controller to also act as a slave.

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## MODBUS: Scan

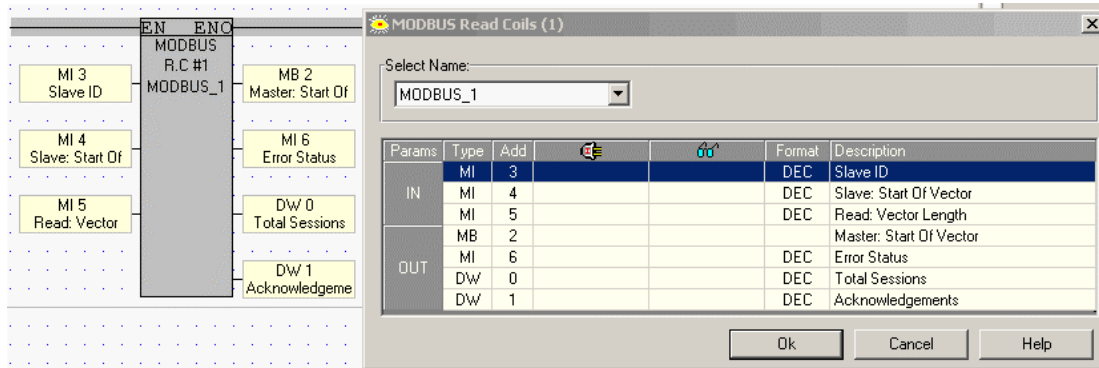
This enables a master device to access a slave PLC.



## Read Coils (1)



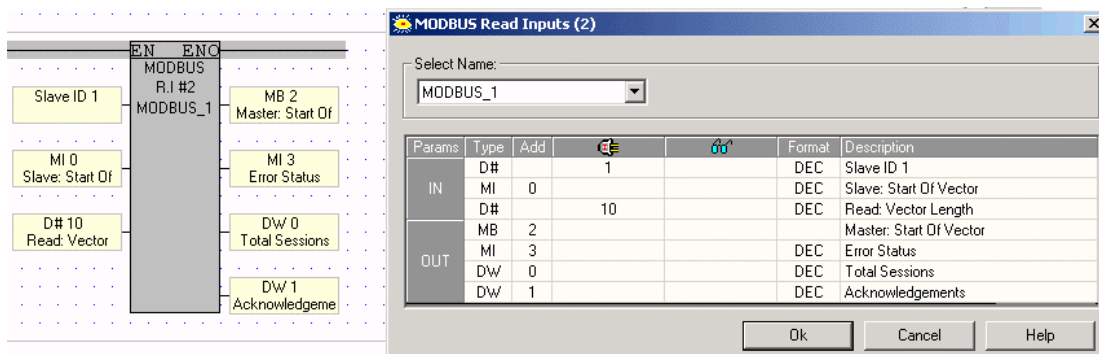
Use this command to read the status of a selected group of coils and write them into a vector. The coil's status is written into a vector of MBs in the master PLC.



Parameter	Type	Function
Slave ID	Constant or MI	The ID of the slave device containing the coils to be read (data source).
Slave: Start of Vector	Constant, MI, ML, or DW	The start of the vector of coils to be read (data source).
Read: Vector Length	Constant or MI	The vector length.
Master: Start of Vector	MB	This is the start of a vector of MBs that will contain the coils' status in the master (data destination).
Error Status	MI	Shows an error message number. To diagnose the error, check the MODBUS Error Table.
Total Sessions	DW	This is the number of times the master PLC will attempt to access the slave device. Note that this is a simple incremental counter. Initialize it by storing 0 into the selected DW.
Acknowledgements	DW	This is the number of times the slave device answers.

## Read Inputs (2)

Use this command to read the status of a selected group of inputs in a slave device and write them into a vector. The inputs's status is written into a vector of MBs in the master PLC.



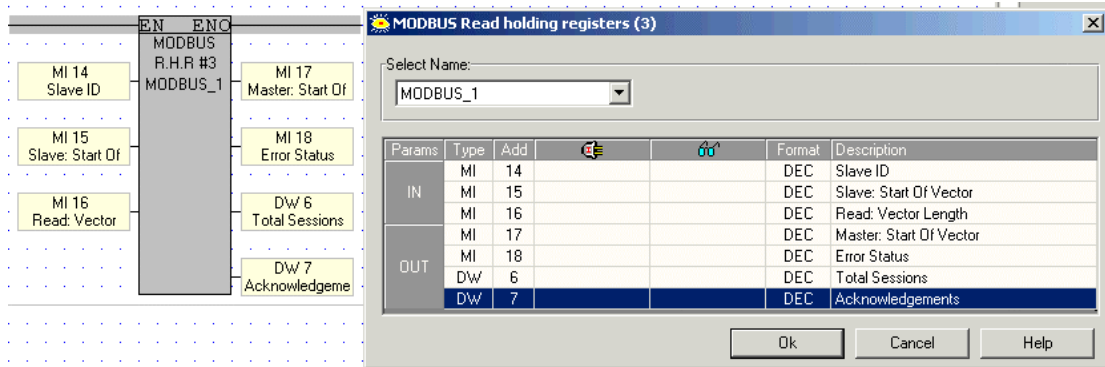
Parameter	Type	Function
Slave ID	Constant	The ID of the slave device containing the inputs to be read

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	or MI	(data source).
Slave: Start of Vector	Constant, MI, ML, or DW	The start of the vector of inputs to be read (data source).
Read: Vector Length	Constant or MI	The vector length.
Master: Start of Vector	MB	This is the start of a vector of MBs that will contain the inputs' status in the master (data destination).
Error Status	MI	Shows an error message number. To diagnose the error, check the MODBUS Error Table.
Total Sessions	DW	This is the number of times the master PLC will attempt to access the slave device. Note that this is a simple incremental counter. Initialize it by storing 0 into the selected DW.
Acknowledgements	DW	This is the number of times the slave device answers.

### Read Holding Registers (3)

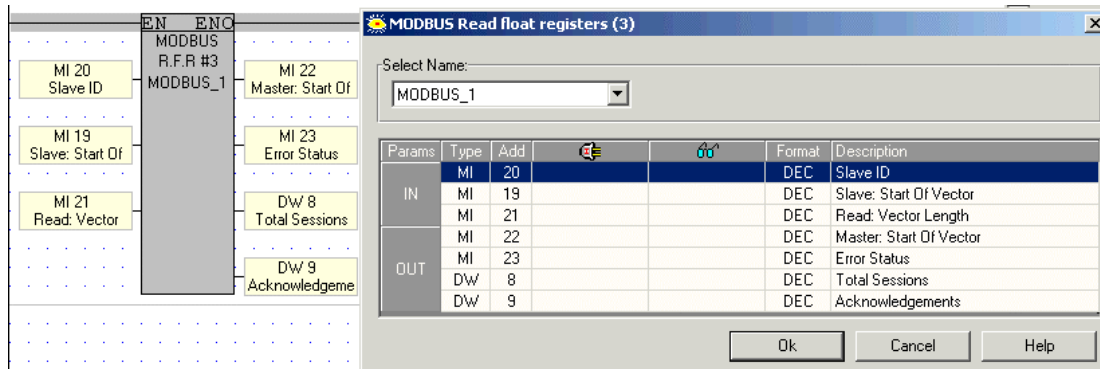
Use this command to read the values of a selected group of registers in a slave PLC and write them into a defined vector of registers in the master.



Parameter	Type	Function
Slave ID	Constant or MI	The ID of the device containing the registers to be read (data source).
Slave: Start of Vector	Constant, MI, ML, or DW	The start of the vector of registers to be read (data source).
Read: Vector Length	Constant, MI, ML, or DW	The vector length.
Master: Start of Vector	MI	This is the start of a vector of MIs that will contain the registers' values in the master (data destination).
Error Status	MI	Shows an error message number. To diagnose the error, check the MODBUS Error Table.
Total Sessions	DW	This is the number of times the master PLC will attempt to access the slave device. Note that this is a simple incremental counter. Initialize it by storing 0 into the selected DW.
Acknowledgements	DW	This is the number of times the slave device answers.

### Read Float Registers (3)

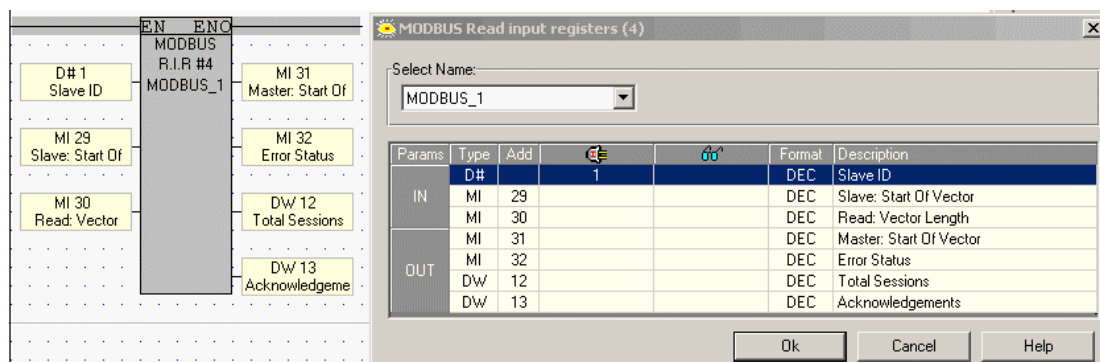
Use this command to read the values of a selected group of floating point registers in a slave device and write them into a defined vector of registers in the master. Values after the decimal point are rounded to the nearest whole value.



Parameter	Type	Function
Slave ID	Constant or MI	The ID of the device containing the registers to be read (data source).
Slave: Start of Vector	Constant, MI, ML, or DW	The start of the vector of registers to be read (data source).
Read: Vector Length	Constant, MI, ML, or DW	The vector length.
Master: Start of Vector	MI	This is the start of a vector of MIs that will contain the registers' values in the master (data destination).
Error Status	MI	Shows an error message number. To diagnose the error, check the MODBUS Error Table.
Total Sessions	DW	This is the number of times the master PLC will attempt to access the slave device. Note that this is a simple incremental counter. Initialize it by storing 0 into the selected DW.
Acknowledgements	DW	This is the number of times the slave device answers.

### Read Input Registers (4)

Use this command to read the values of a selected group of registers in a slave PLC and write them into a defined vector of registers in the master.



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Parameter	Type	Function
Slave ID	Constant or MI	The ID of the device containing the registers to be read (data source).
Slave: Start of Vector	Constant, MI, ML, or DW	The start of the vector of registers to be read (data source).
Read: Vector Length	Constant, MI, ML, or DW	The vector length.
Master: Start of Vector	MI	This is the start of a vector of MIs that will contain the registers' values in the master (data destination).
Error Status	MI	Shows an error message number. To diagnose the error, check the MODBUS Error Table.
Total Sessions	DW	This is the number of times the master PLC will attempt to access the slave device. Note that this is a simple incremental counter. Initialize it by storing 0 into the selected DW.
Acknowledgements	DW	This is the number of times the slave device answers.

### Read Input Float Registers (4)

Use this command to read the values of a selected group of floating point registers in a slave device and write them into a defined vector of registers in the master. Values after the decimal point are rounded to the nearest whole value.

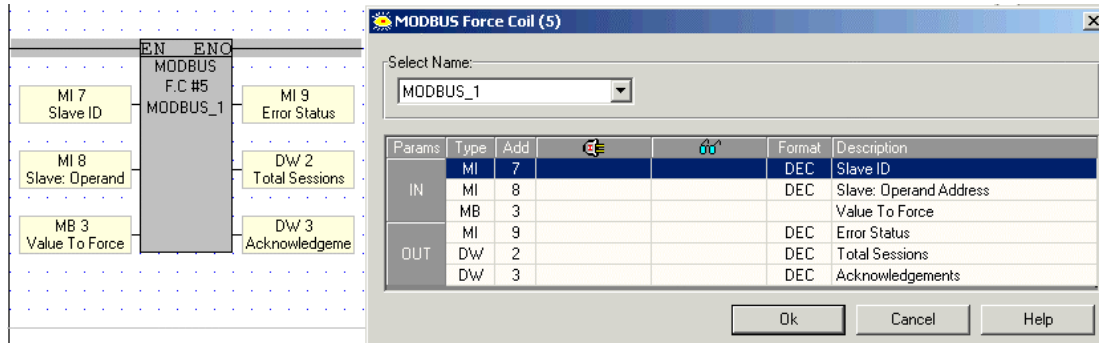
Params	Type	Add	Format	Description
IN	MI	33	DEC	Slave ID
	MI	34	DEC	Slave: Start Of Vector
	MI	35	DEC	Read: Vector Length
	MI	36	DEC	Master: Start Of Vector
OUT	MI	37	DEC	Error Status
	DW	14	DEC	Total Sessions
	DW	15	DEC	Acknowledgements

Parameter	Type	Function
Slave ID	Constant or MI	The ID of the device containing the registers to be read (data source).
Slave: Start of Vector	Constant, MI, ML, or DW	The start of the vector of registers to be read (data source).
Read: Vector Length	Constant, MI, ML, or DW	The vector length.
Master: Start of Vector	MI	This is the start of a vector of MIs that will contain the registers' values in the master (data destination).
Error Status	MI	Shows an error message number. To diagnose the error, check the MODBUS Error Table.
Total Sessions	DW	This is the number of times the master PLC will attempt to access the slave device. Note that this is a simple incremental counter. Initialize it by storing 0 into the selected

DW.  
 Acknowledgements DW This is the number of times the slave device answers.

### Force Coil (5)

Use this command to force the status of a selected coil in a slave PLC. The coil's status is forced according to the status of a selected MB in the master PLC.



Parameter	Type	Function
Slave ID	Constant or MI	The ID of the device containing the coil to be forced (data source).
Slave Address	Constant, MI, ML, or DW	The address of the coil to be forced (data source).
Value to Force	M, SB, I, O, T	This MB is located in the master PLC; this MB contains the <b>status</b> to be forced. If, for example, the status of this MB is OFF, the status of the coil in the slave will be forced to OFF.
Error Status	MI	Shows an error message number. To diagnose the error, check the MODBUS Error Table.
Total Sessions	DW	This is the number of times the master PLC will attempt to access the slave device. Note that this is a simple incremental counter. Initialize it by storing 0 into the selected DW.
Acknowledgements	DW	This is the number of times the slave device answers.

### Preset Holding Register (6)

Use this command to preset the value of a single register in a slave PLC. The value is set in a register contained in the master PLC.

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Parameter	Type	Function
Slave ID	Constant or MI	The ID of the device containing the register to be preset (target).
Slave: Operand Address	Constant, MI, ML, or DW	The address of the register to be preset (target).
Value to Preset	Constant, MI, SI, ML, SL, DW, SDW or T	This is the address of the register containing the value in the master PLC (source). This value will be written into the slave's register, the register that is to be preset.
Status	MI	Shows an error message number. To diagnose the error, check the MODBUS Error Table.
Total Sessions	DW	This is the number of times the master PLC will attempt to access the slave device. Note that this is a simple incremental counter. Initialize it by storing 0 into the selected DW.
Acknowledgements	DW	This is the number of times the slave device answers.

## Loopback Test (8)

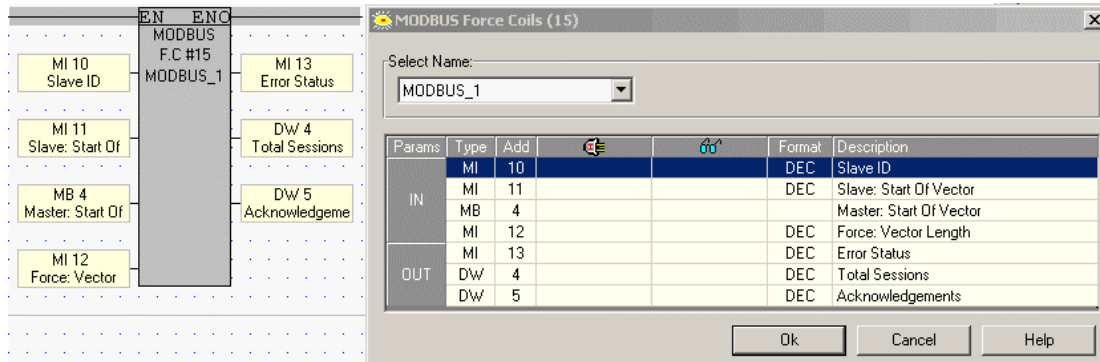
Use this command to send a test message to a slave device and receive Acknowledgements when communications are functioning properly.

Parameter	Type	Function
Slave ID	Constant or MI	The ID of the device to be checked.
Error Status	MI	Shows an error message number. To diagnose the error, check the MODBUS Error Table.
Total Sessions	DW	This is the number of times the master PLC will attempt to access the slave device. Note that this is a simple incremental counter. Initialize it by storing 0 into the selected DW.

Acknowledgements DW This is the number of times the slave device answers.

### Force Coils (15)

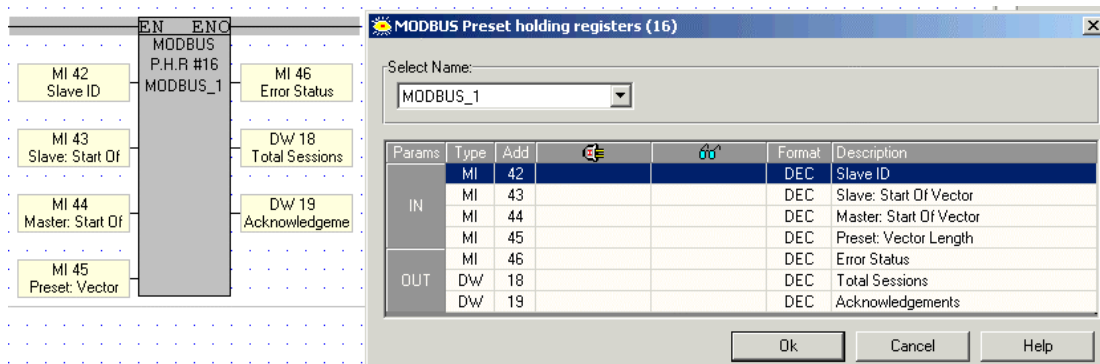
Use this command to force the status of a selected group of coils in a slave PLC. The coils' status is forced according to the status of a group of MBs in the master PLC.



Parameter	Type	Function
Slave ID	Constant or MI	The ID of the slave device containing the coils to be forced (target).
Slave:Start of Vector	Constant, MI, ML, or DW	The start of the vector of coils to be forced (data source).
Master: Start of Vector	MI, SB, I, O,T	This is the start of a vector of MBs that will contain the coils' status in the master (data destination).
Force: Vector Length	Constant or MI	The vector length.
Error Status	MI	Shows an error message number. To diagnose the error, check the MODBUS Error Table.
Total Sessions	DW	This is the number of times the master PLC will attempt to access the slave device. Note that this is a simple incremental counter. Initialize it by storing 0 into the selected DW.
Acknowledgements	DW	This is the number of times the slave device answers.

### Preset Holding Registers (16)

Use this command to preset the value of a group of registers in a slave PLC. The values are set in a vector of registers contained in the master PLC.



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Parameter	Type	Function
Slave ID	Constant or MI	The ID of the device containing the registers to be preset (target).
Slave: Start of Vector	Constant, MI, ML, or DW	The start of the vector of registers to be preset (target).
Master: Start of Vector	Constant, MI, SI, ML, SL, DW, SDW or T	This is the start of a vector of MIs that will contain the registers' values in the master (data source).
Preset: Vector Length	Constant, MI, ML, or DW	The length of the vector of registers in both master and slave.
Error Status	MI	Shows an error message number. To diagnose the error, check the MODBUS Error Table.
Total Sessions	DW	This is the number of times the master PLC will attempt to access the slave device. Note that this is a simple incremental counter. Initialize it by storing 0 into the selected DW.
Acknowledgements	DW	This is the number of times the slave device answers.

### Preset Float Registers (16)

Use this command to preset the value of a group of floating point registers in a slave PLC. The values are set in a vector of registers contained in the master PLC. Values after the decimal point are rounded to the nearest whole value.

The screenshot shows a software interface for configuring MODBUS Preset float registers. On the left, a ladder logic diagram shows a coil labeled 'MODBUS P.F.R #16' with 'MODBUS\_1' as the operand. The coil is connected to a set of contacts labeled 'EN' and 'ENC'. Below the coil, several parameters are listed: D# 5 Slave ID, MI 47 Slave: Start Of, MI 48 Master: Start Of, and MI 49 Preset: Vector. On the right, a dialog box titled 'MODBUS Preset float registers (16)' is open. It has a 'Select Name:' dropdown menu with 'MODBUS\_1' selected. Below the dropdown is a table with the following data:

Params	Type	Add	Format	Description
D#	DEC	5		Slave ID
MI	DEC	47		Slave: Start Of Vector
MI	DEC	48		Master: Start Of Vector
MI	DEC	49		Preset: Vector Length
MI	DEC	50		Error Status
DW	DEC	20		Total Sessions
DW	DEC	21		Acknowledgements

At the bottom of the dialog box are 'Ok', 'Cancel', and 'Help' buttons.

Parameter	Type	Function
Slave ID	Constant or MI	The ID of the device containing the register to be preset (target).
Slave: Start of Vector	Constant, MI, ML, or DW	The address of the register to be preset (target).
Master: Start of Vector	MI, SI, ML, SL, DW, SDW or T	This is the address of the register containing the value in the master PLC (source). This value will be written into the slave's register, the register that is to be preset.
Status	MI	Shows an error message number. To diagnose the error, check the MODBUS Error Table.
Total Sessions	DW	This is the number of times the master PLC will attempt to access the slave device. Note that this is a simple

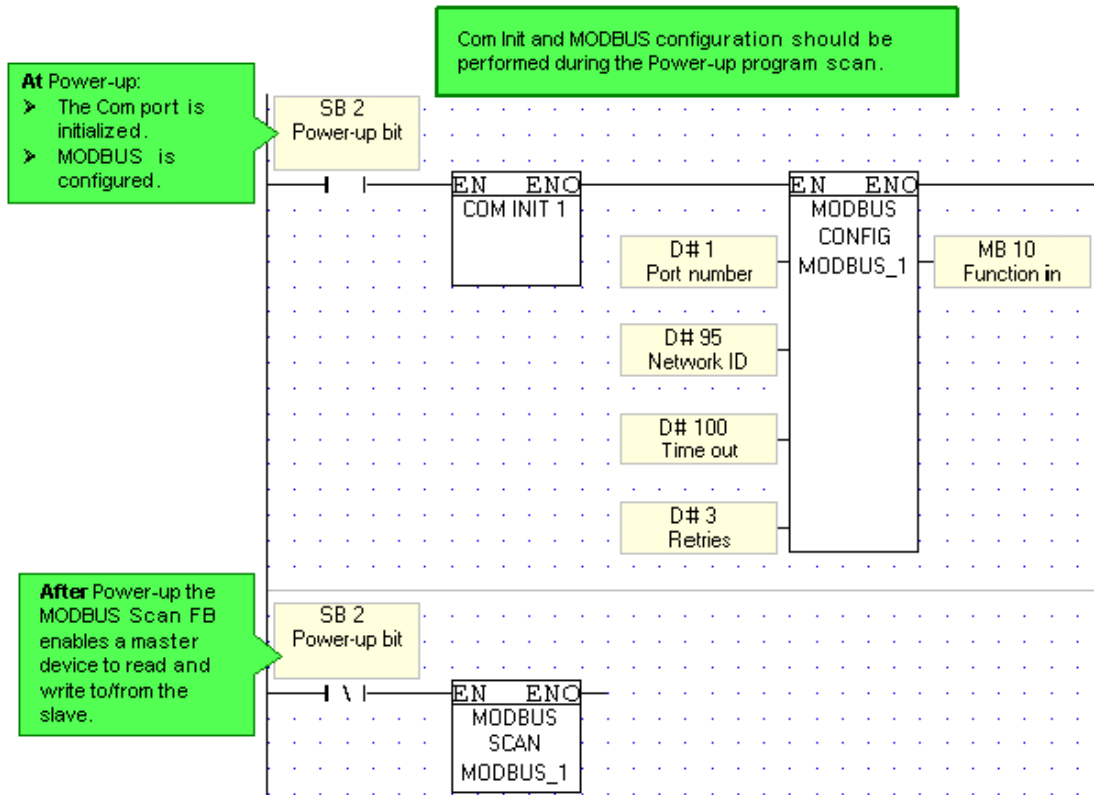


incremental counter. Initialize it by storing 0 into the selected DW.  
 Acknowledgements DW This is the number of times the slave device answers.

### Configuring a MODBUS slave device

The Ladder section below shows what elements are necessary to enable a master device to read from a slave. Note that the MODBUS Scan operation should **not** be performed during the initial program scan.

Note that you must use a condition (**RLO**) to activate the MODBUS Configuration.



### Slave Address Tables

The value in a pointer causes operands in a slave to be accessed as follows:

Registers			
Unitronics' slave devices can return requested data in floating point format. Values after the decimal point are rounded to the nearest whole value.			
Pointer Value From:	Operand type	Register size	Convert to Float
0000	MI	16 bit	No
2000	MI	16 bit	Yes
4000	SI	16 bit	No
4550	SI	16 bit	Yes
5100	ML	32 bit	No

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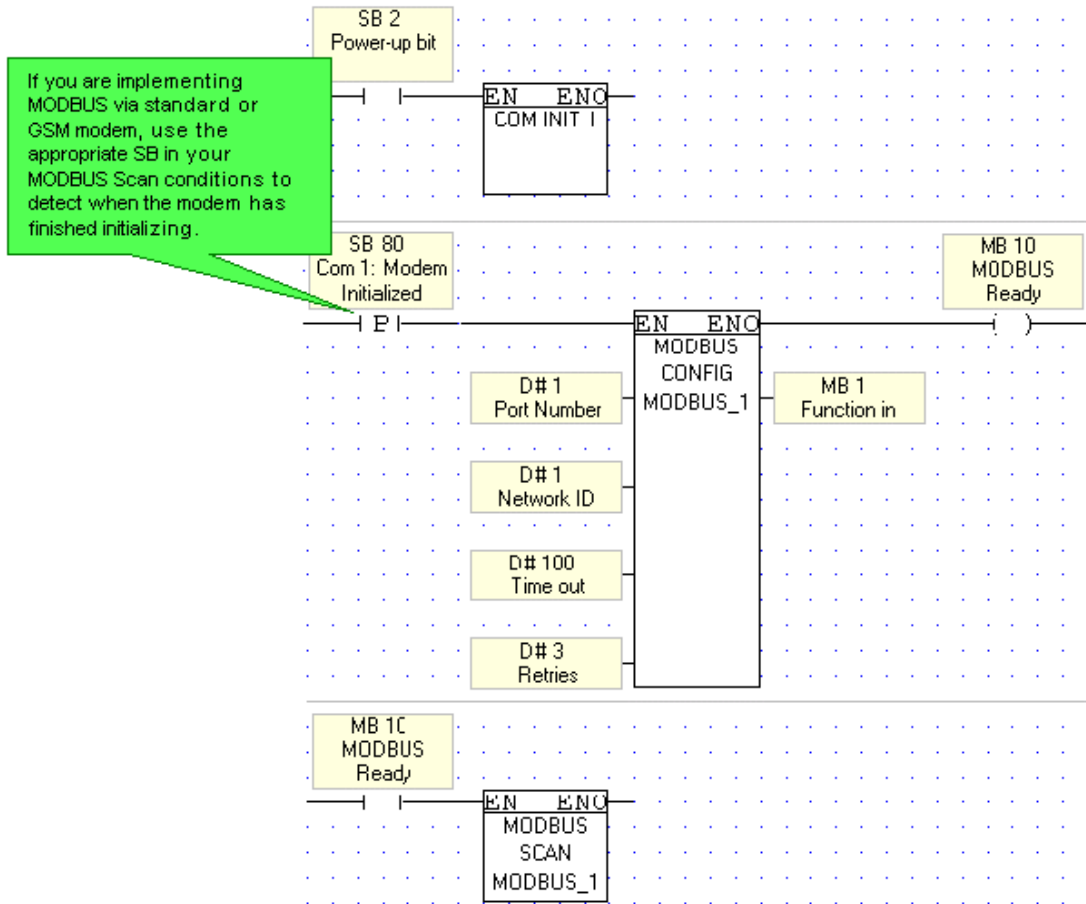
5600	ML	32 bit	Yes
6100	SL	32 bit	No
6200	SL	32 bit	Yes
6300	MDW	32 bit	No
6500	MDW	32 bit	Yes
6700	SDW	32 bit	No
6800	SDW	32 bit	Yes
6900	Timer preset	32 bit	No
7200	Timer current	32 bit	No
7700	MF 0	32 bit	Yes

### Coils

Note that you may use MODBUS 'coil' operations' to refer to any bit operand.

Pointer Value From:	Operand type
0000	MB
3000	SB
4000	I
5000	O
6000	T

## MODBUS via GSM or Standard Modem



### MODBUS Error Table

Error #	Error Message
0	No Errors
1	Illegal Function
2	Illegal Data Address
3	Illegal Data Value
4	Master--Time Out
5	No Communication
6	Mismatched Unit ID
7	Mismatched Command
8	Length of message
9	Function not supported
10	Illegal format
11	Mismatched received data



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